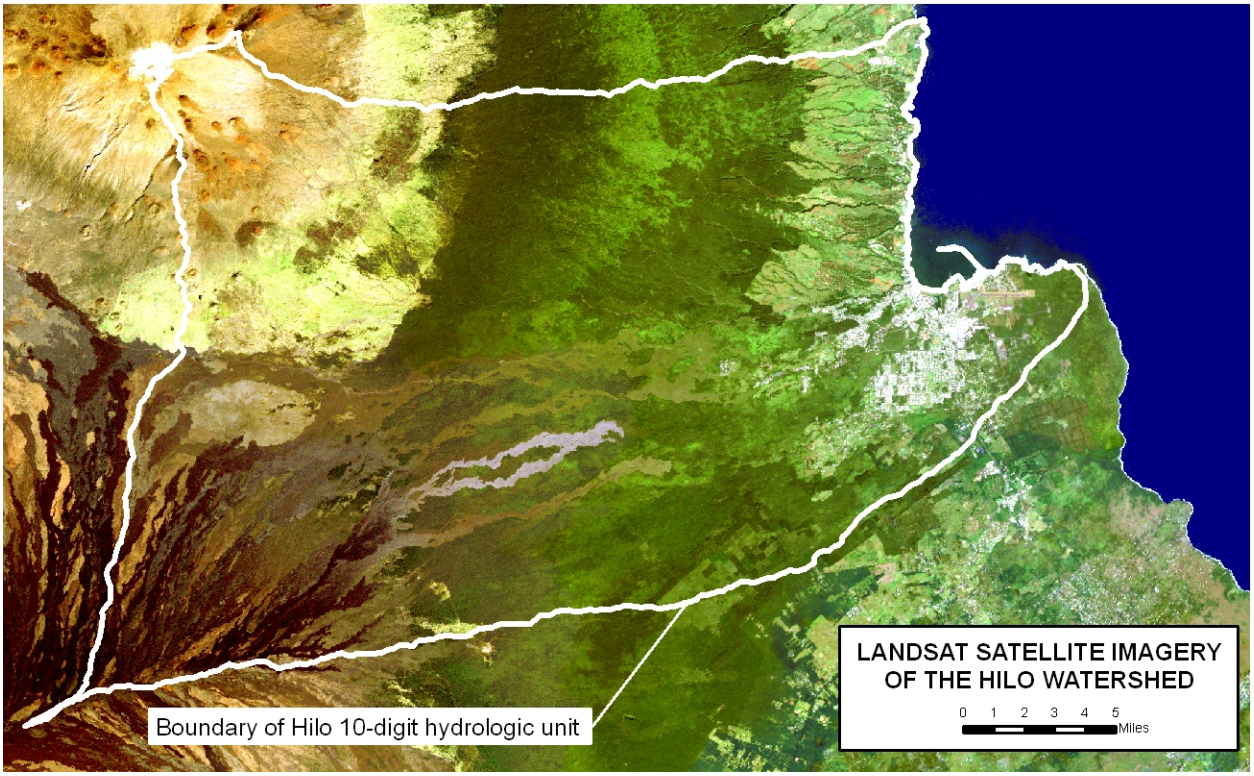
USDA NRCS
Natural Resources Conservation Service

RAPID WATERSHED ASSESSMENT

HILO WATERSHED, HAWAI`I

HYDROLOGIC UNIT CODE (HUC) – 2001000003



PART 1: WATERSHED PROFILE

This Rapid Watershed Assessment (RWA) was compiled by the US Department of Agriculture Natural Resources Conservation Service (NRCS) to assist local land managers, planners, and others in evaluating opportunities to implement conservation and resource protection measures within the Hilo watershed. This document is the first component of a two-part assessment:

- Part 1, the **Watershed Profile**, is an overview of geographic and social attributes within the watershed, and it summarizes current natural resource conditions that are particularly relevant to management of agricultural and natural lands. A synopsis of NRCS-backed activities completed between 2005 and 2007 provides an indication of resource protection progress as well as prospects for future partnerships in various land-use categories.
- Part 2, the **Assessment of Conservation Opportunities,** provides initial estimates of installation quantities and associated costs for specific measures having strong potential to be implemented during the coming five-year time frame of 2009-2013. The assessment focuses on measures commonly applied by agricultural producers at the management unit level, for which NRCS may be able to provide technical or financial assistance.

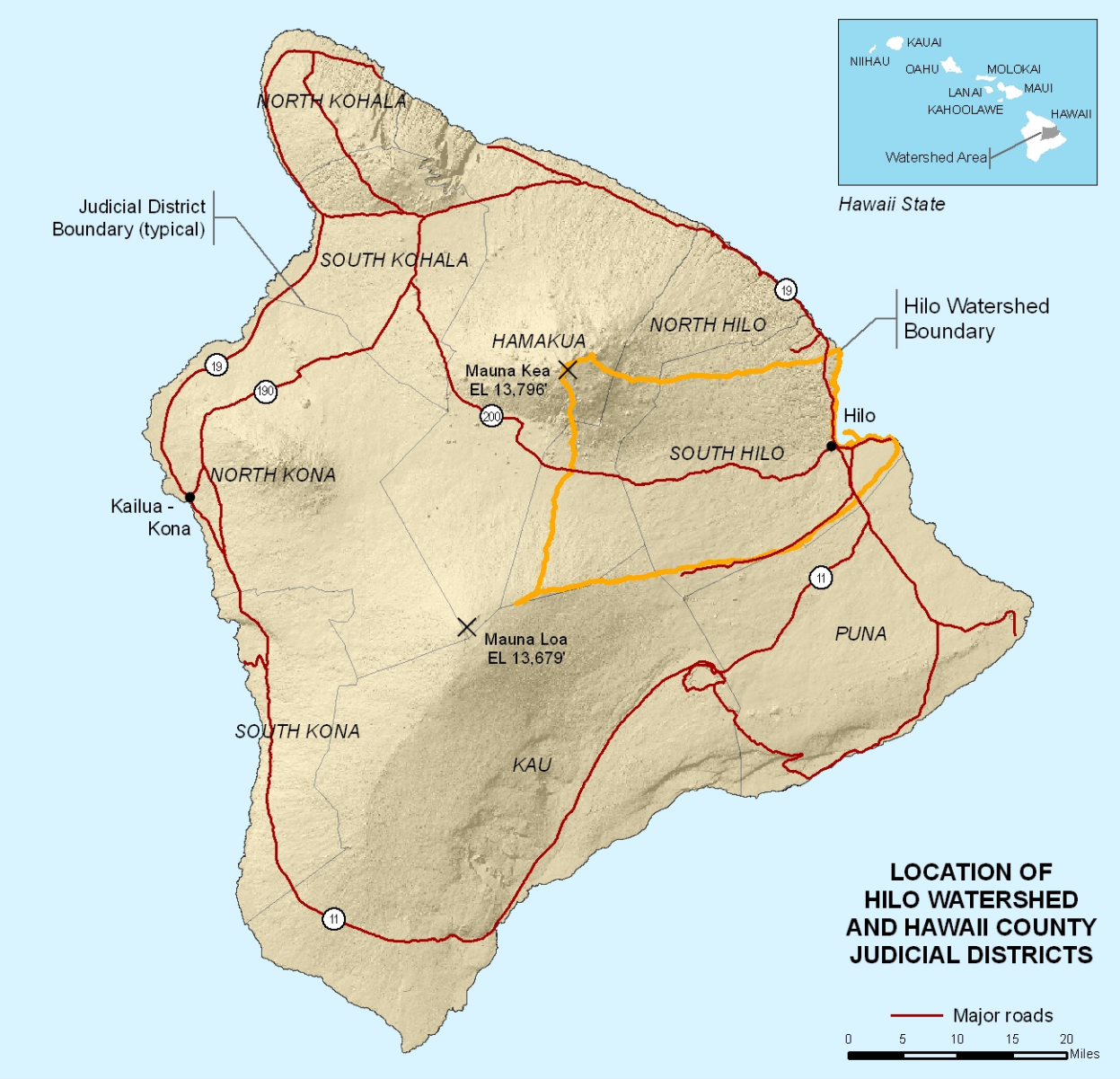
An electronic version of this Hilo RWA is available through the NRCS Pacific Islands Area (PIA) web site at http://www.pia.nrcs.usda.gov/technical/rwa.html. Additional Rapid Watershed Assessments completed in Hawai`i, American Samoa and Micronesia can also be found at the site.

PHYSICAL DESCRIPTION

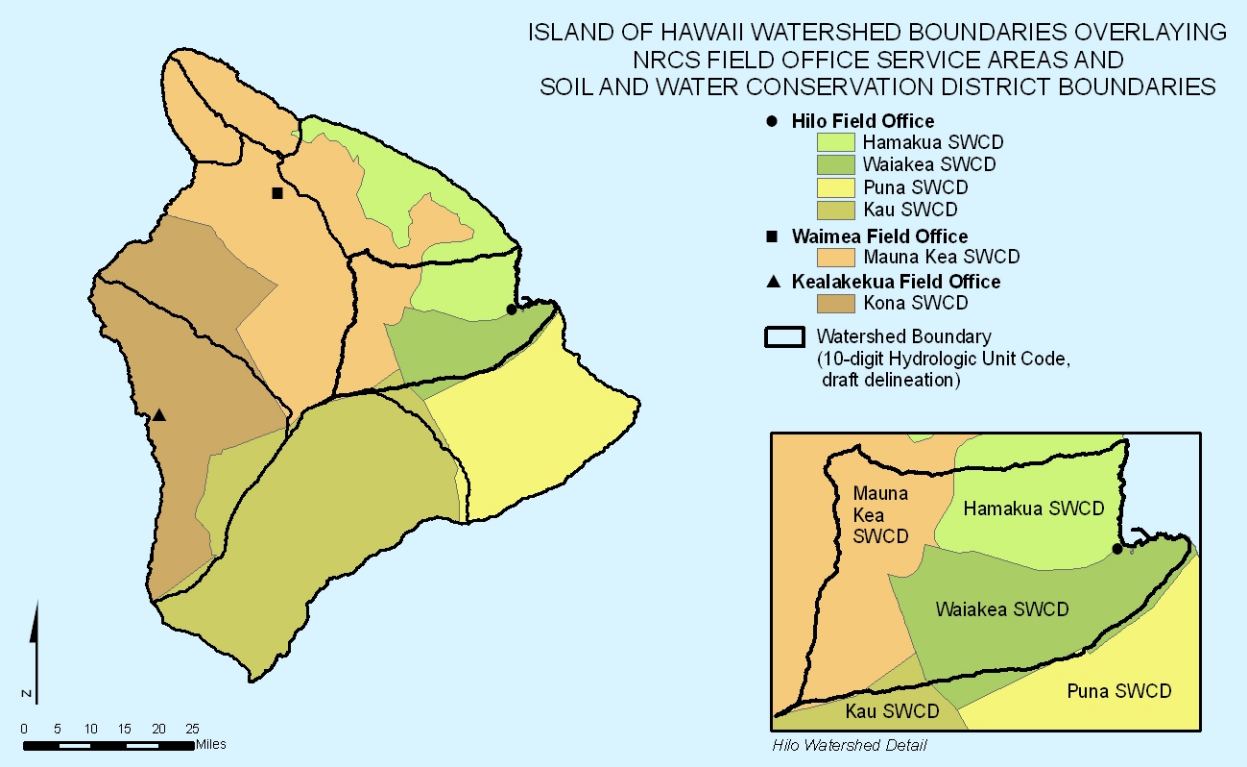
LOCATION

The Hilo watershed covers 301,047 acres on the island of Hawai`i, the largest island in the Hawaiian Islands chain. The watershed drains the eastern slopes between the summits of Mauna Kea to the northwest and Mauna Loa to the southwest, draining toward the city of Hilo and its adjacent shorelines.

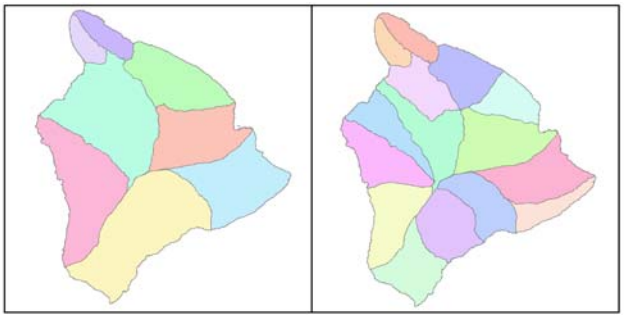
The entire Hilo watershed is located in the County of Hawai`i, which is subdivided into nine judicial districts. Most of the watershed lies in the North Hilo and South Hilo judicial districts, with small portions lying in the Hāmākua and Ka‘ū districts. The watershed includes the city of Hilo, which is both the seat of county government and the major commercial and industrial center for the island.



The Hilo watershed includes land under the jurisdiction of four Soil and Water Conservation Districts: Mauna Kea, Hāmākua, Waiākea, and Kaʻū Soil and Water Conservation Districts. The Hilo watershed is served primarily by the NRCS Service Center in Hilo. The NRCS Service Center in Waimea has jurisdiction over the summit areas of the watershed. Programs for natural resource projects are also provided through the Big Island Resource Conservation and Development Council, whose offices are located in Hilo.



A majority of this Hilo RWA was completed in early summer of 2008, just as work was being done by others to finalize Hawai`i watershed boundaries to the standards set by the national Subcommittee on Spatial Water Data. The watershed boundary used throughout this RWA follows the earlier delineation in which there were eight 10-digit hydrologic units on the island, with Hilo identified as HUC 2001000003. The revised delineations establish fifteen 10-digit hydrologic units, and the area of our currently-defined Hilo watershed will lie within the new HUC 2001000004 as well as the southeast portion of the new HUC 2001000003. The general resource information and trends described in this RWA have relevance to all watershed areas draining towards Hilo Bay, regardless of the specific watershed boundary.

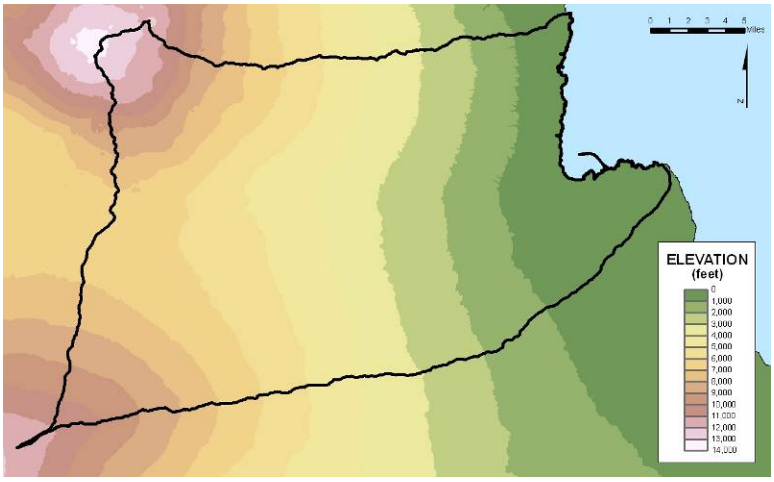


Previous (left) and revised (right) boundaries of Hawai`i County 10-digit HUCs

TOPOGRAPHY

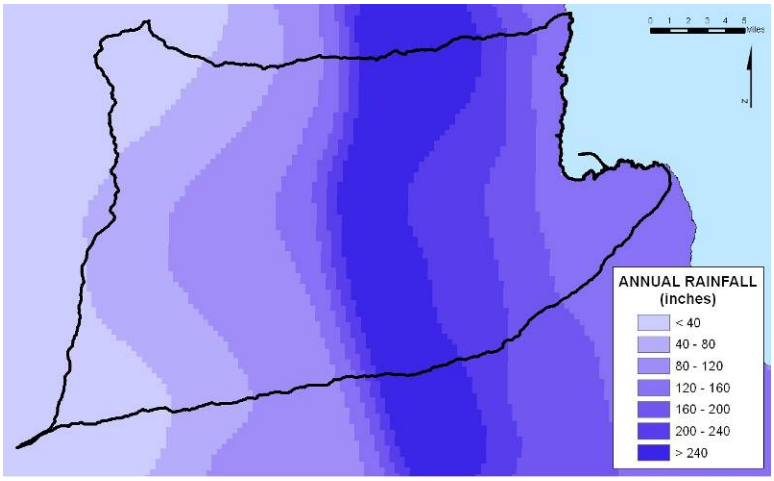
The Hilo watershed includes the combined eastern slopes of the two shield volcanoes, Mauna Kea and Mauna Loa, whose summits are at 13,796 and 13,679 feet elevation, respectively. The "saddle" between the two mountains drains mostly through Hilo into Hilo Bay. The watershed is characterized by a consistent rising gradient of 5 to 30 percent toward the mountain tops.

Due to the youthfulness of the landform, large valleys or alluvial plains have not yet developed. Smaller gulches and river valleys have formed in the lower elevations of the northern half of the watershed.



CLIMATE

The Hilo watershed is exposed to the prevailing trade winds from the northeast. Rainfall conditions in the watershed reflect the variation in elevation with an orographic effect as moisture carried by winds is lifted, cooled, and condensed into rain. Annual rainfall amounts average 110 to 140 inches along the coast, increasing to more than 200 inches in the 3,000 to 4,000-foot elevations, and dropping to less than 35 inches near the mountain summits, which normally stand above the clouds (PRISM Group 2006).



Extreme rainfall events occur frequently in the Hilo watershed. Damaging flood events have occurred on an average of once every two years in Hilo.

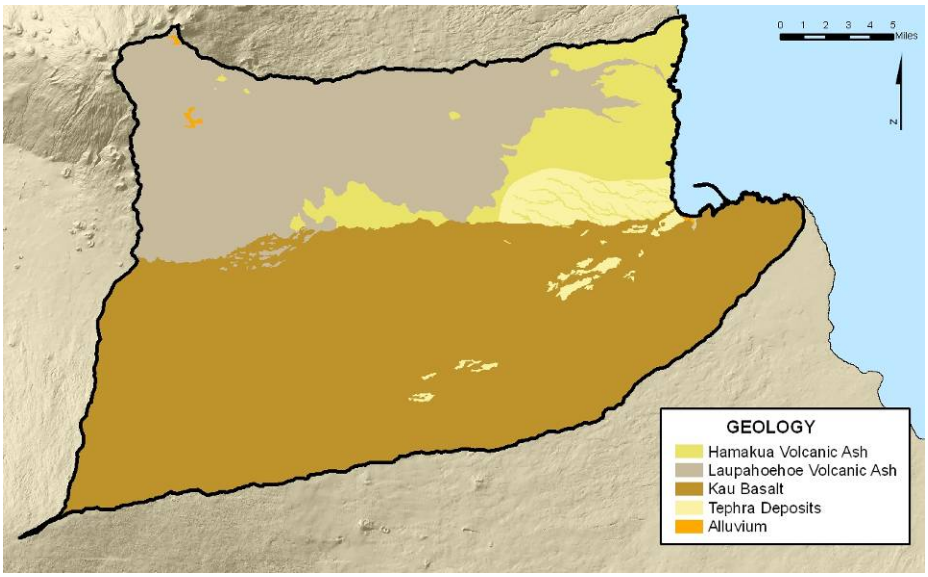
The mean annual temperature of locations near sea level varies between 72° and 75° F. The temperature decreases by about 3° for each 1,000 feet of elevation, but this trend is affected by a tendency for temperatures to be higher in sunny, dry areas. August and September are the warmest months; January, February, and March are the coldest.

The prevailing wind throughout the year is the east northeasterly trade wind. Generally, the trade winds are more persistent in summer than in winter. They range over the open sea near Hawai`i from a minimum of about 50 percent of the time in January to a maximum of more than 90 percent in July, with an annual frequency of about 70 percent.

GEOLOGY

The Hilo watershed is generally divided into two geological zones. The northern portion of the watershed is formed by Mauna Kea lava flows called the Hāmākua and Laupahoehoe Volcanics, dating from the Pleistocene epoch (more than 11,000 years ago) and early Holocene epoch (approximately 7,500 to 10,000 years ago). The northern portion also includes small areas of tephra deposits of similar age, and at higher elevations there are small areas of alluvial soils (Sherrod et al. 2007).

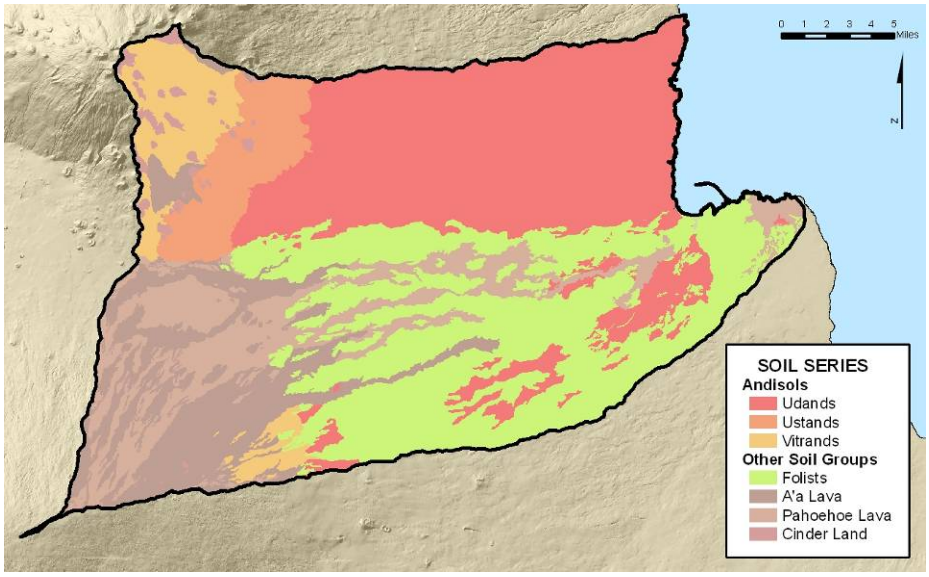
In contrast, the southern part of the watershed is formed by younger lava flows from Mauna Loa, called the Ka'u Basalts and aged less than 7,500 years before present. Small areas of tephra deposits are interspersed throughout the southern portion.



Mauna Loa is an active volcano which last erupted in 1984. The USGS has mapped potential lava flow inundation zones which include most of the southern half of the Hilo watershed and most of the city of Hilo.

SOILS

The soils of the Hilo watershed generally follow the same pattern as the geology. The northern part of the watershed is characterized by andisols, which are deep to very deep soils formed in volcanic ash deposits. Andisols are generally fertile soils for agriculture.



Many andisols in the Hilo watershed were historically cultivated for sugar cane. They are now used for vegetables, fruits, flowers and other crops. At higher elevations in the watershed, andisols have been used for grazing.

Many of the Hilo andisols are on moderate to steep slopes, particularly in the upper elevations of the watershed and in areas near streams. Erosion is a concern in steeper areas, especially when these soils are cleared and tilled. These soils have moderate permeability and surface

runoff is generally low except from the steepest slopes. They are seldom prone to flooding. Some of the andisols in wetter areas (udands) can exhibit thixotropic properties; that is, they liquefy when compressed and shaken. Special care must be taken in the construction of buildings and roads in these areas.

The southern half of the watershed is derived from the Mauna Loa lavas. The youngest lava flows, located at higher elevations, are characterized by significant areas of bare or sparsely vegetated land. The slightly older lava flow areas, mostly at lower elevations, are characterized by shallow organic soils that form either over the lava (in paho'eho'e) or in between the lava clinkers (in 'a'a). These areas are generally less suitable for agriculture since the thin soils hold few nutrients and are easily degraded; even so, some of these areas are currently used for cultivation of perennial species such as papaya and macadamia nut. Infiltration from these soils ranges from very slow to very rapid depending on the cracks and crevices in the underlying lava. Surface runoff can be extremely rapid, especially from steeply sloping areas dominated by paho'eho'e, and some areas can be prone to flash flooding during and after heavy rains. Building and road construction in these areas can be difficult due to the amount of cutting and filling of rock required to level the landscape,

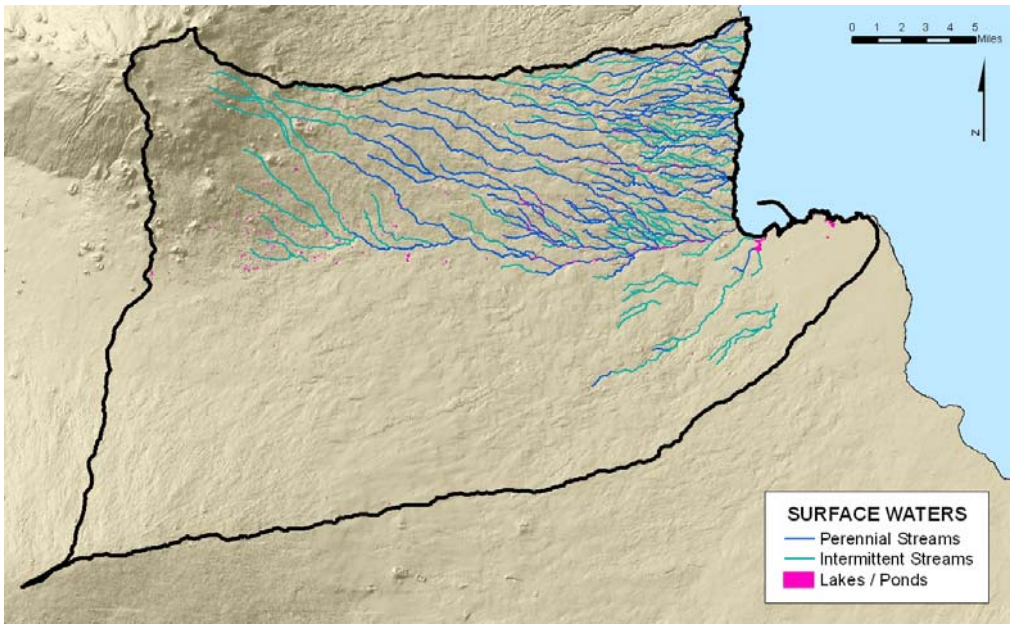
Additional information on the specific soils present in the watershed can be found in the Soil Survey of the Island of Hawai`i , available at http://soils.usda.gov/survey/printed_surveys/.

WATER RESOURCES

Surface Waters

The USGS hydrography dataset classifies 442 miles of streams in the Hilo watershed (USGS 1987). Perennial streams account for 247 miles (56%) of stream length, and 195 miles (44%) are classified as intermittent streams. An enhanced subset of the same dataset identifies 438 lakes and ponds covering 182 acres in the watershed.

Streams and riparian corridors are better developed in the northern portion of the Hilo watershed, within the area of the older Mauna Kea geology. The two major stream systems in the northern part of the watershed are the Wailuku and Honoli`i, which have yearly mean flows of 84 cfs and 125 cfs, respectively. These streams have formed deep gulches that will contain most storm runoff.



The southern part of the watershed includes three significant streams that flow through Hilo: the Alenaio, Waiākea, and Palai. These streams are shallow and normally intermittent for most reaches. During storms these streams

do not have the capacity to convey floodwater causing frequent urban and rural flooding. The expansion of development into the forested areas has increased the volume of runoff during storms. The southern watershed stream systems are also connected to a network of shallow lava tubes that complicate the identification and estimation of runoff paths and quantities.

Marine Waters

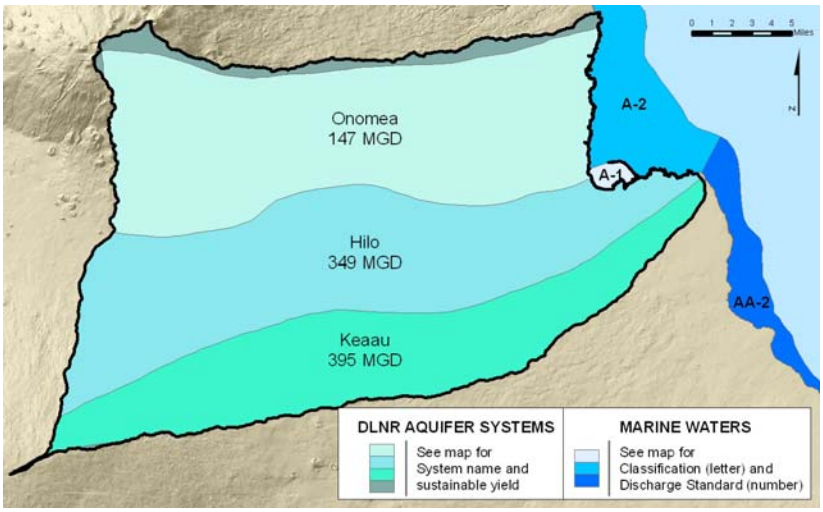
Hilo Bay is the major harbor on the east side of Hawai`i Island, and it serves as an economic artery processing the shipment of goods onto and away from the island. Marine waters of the Hilo watershed also provide recreational opportunities for fishermen, canoe paddlers, surfers, and beach goers, and they are a scenic resource important to the visitor industry.

There are no defined reef areas in the Hilo watershed coastal waters, based on a survey of benthic habitat completed in 2000 (Anderson 2002). The Hawai`i Water Quality Standards designate the waters as Class A -1 (also known as Class A - Restrictive) inside the Hilo Bay breakwater, and Class A -2 (or Class A - Open Coastal) outside the breakwater. Further discussion of discharge standards can be found in the Water Quality section starting on page 19.

Groundwater

The State of Hawai`i has classified its groundwater resources in two different data sets. One set, maintained by the Department of Health, summarizes information such as aquifer geology, salinity, and vulnerability to contamination. The DOH data set indicates the northern part of the watershed (in the East Mauna Kea aquifer sector) includes "upper aquifers", which are in contact with surface water drainage tables, as well as "lower aquifers", which are confined beneath impermeable layers that keep them segregated from the upper aquifers. Aquifers in the southern part of the watershed (in the Northeast Mauna Loa sector) have only a single layer of unconfined aquifers. All aquifers in the Hilo watershed other than the "lower aquifers" are classified as being highly vulnerable to contamination (DOH 1992).

A second set of groundwater data is maintained by DLNR to define and identify issues more administrative in nature, such as the presence of Groundwater Management Areas and the estimated sustainable yield of aquifer systems. The Hilo watershed lays primarily over three aquifer systems. The Onomea system of the East Mauna Kea sector has a reported sustainable yield of 147 million gallons per day (mgd), while the Hilo and Kea`au systems of the Northeast Mauna Loa sector have sustainable yields of 349 and 395 mgd (DLNR 2008).

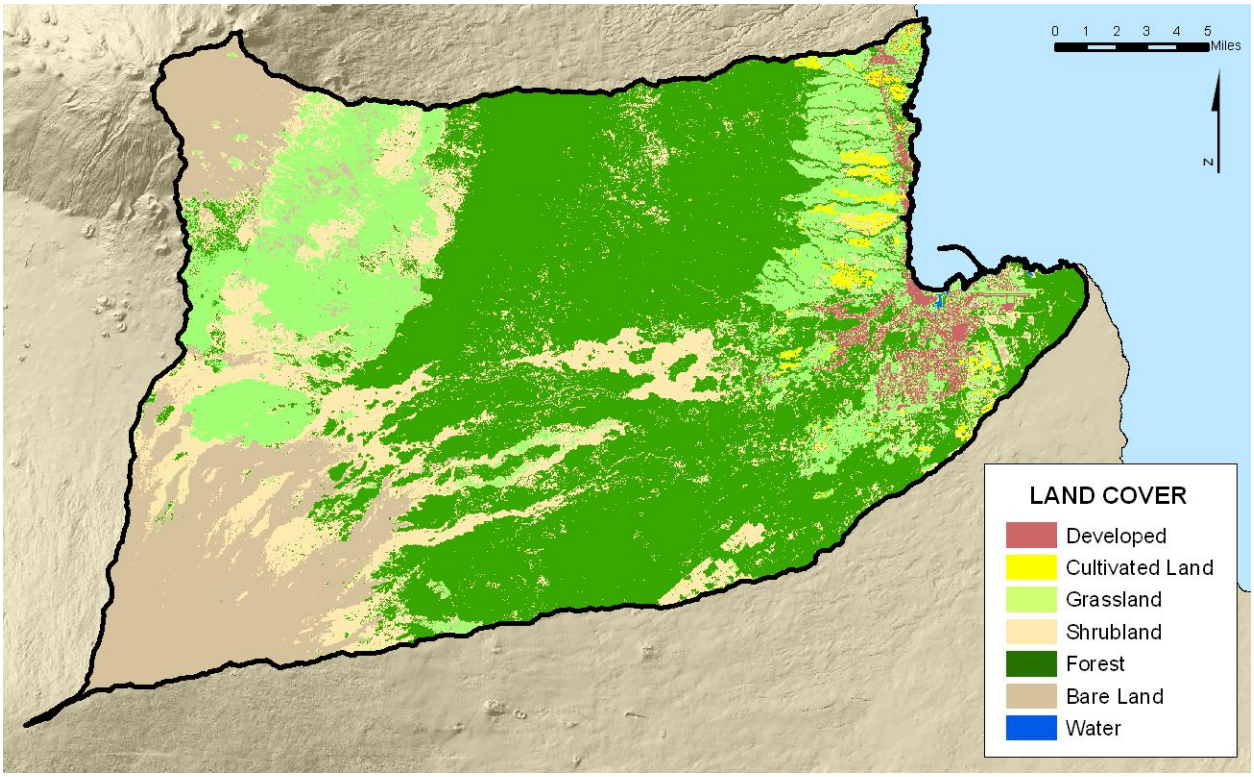


The total capacity of developed well systems within the Hilo watershed is estimated to be nearly 65 mgd, with most facilities being part of Hilo Water System operated by the Hawai`i County Department of Water Supply (DWS). The Hilo Water System serves 13,134 connections and is the largest of 24 separate systems maintained by DWS on the island. Most agricultural water used within the Hilo watershed is obtained through the DWS Hilo Water System.

LAND COVER

Land cover characterization is available through NOAA's Coastal Change Analysis Program (C-CAP), which is a nationally standardized database of land cover and land change information developed using remotely-sensed imagery. The most recent C-CAP analysis for the island of Hawai`i is based on 2001 imagery (NOAA Coastal Services Center 2001).

Land cover in the Hilo watershed reflects the natural landscape of its topographic and climatic variations. The C-CAP data classifies 48% of the Hilo watershed as evergreen forest, with most of the remaining land classified as scrub/shrub, grassland, or bare land. It is important to note, however, that these land cover classifications do not distinguish whether the landscape is actively managed for human use. Greater detail regarding land use in the Hilo watershed is presented in the Socio-Economic Description on pages 10 to 14.

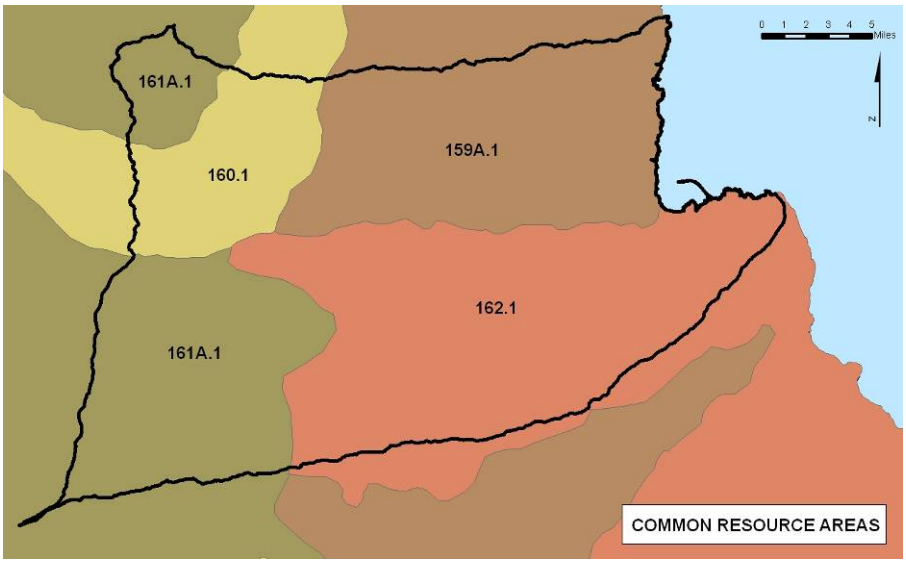


Land cover types in the Hilo watershed.

Land Cover	Acres	Percentage
Developed	5,720	2%
Cultivated Land	3,218	1%
Grassland	48,562	16%
Shrubland	53,053	18%
Forest	143,095	48%
Bare Land	47,305	16%
Water	93	0.03%
Grand Total	301,047	100%

COMMON RESOURCE AREAS

A Common Resource Area (CRA) is a geographical area defined by NRCS as having similarities in landscape condition, soil, climate, human considerations, and other natural resource factors. It is considered a subdivision of the NRCS Major Land Resource Area (MLRA) region map delineation. CRAs are given a unique identifier derived from the MLRA symbol followed by a dot and a numeric code.



The Hilo watershed contains four CRAs generally distinguished by land slope and soil. They are described in the following table.

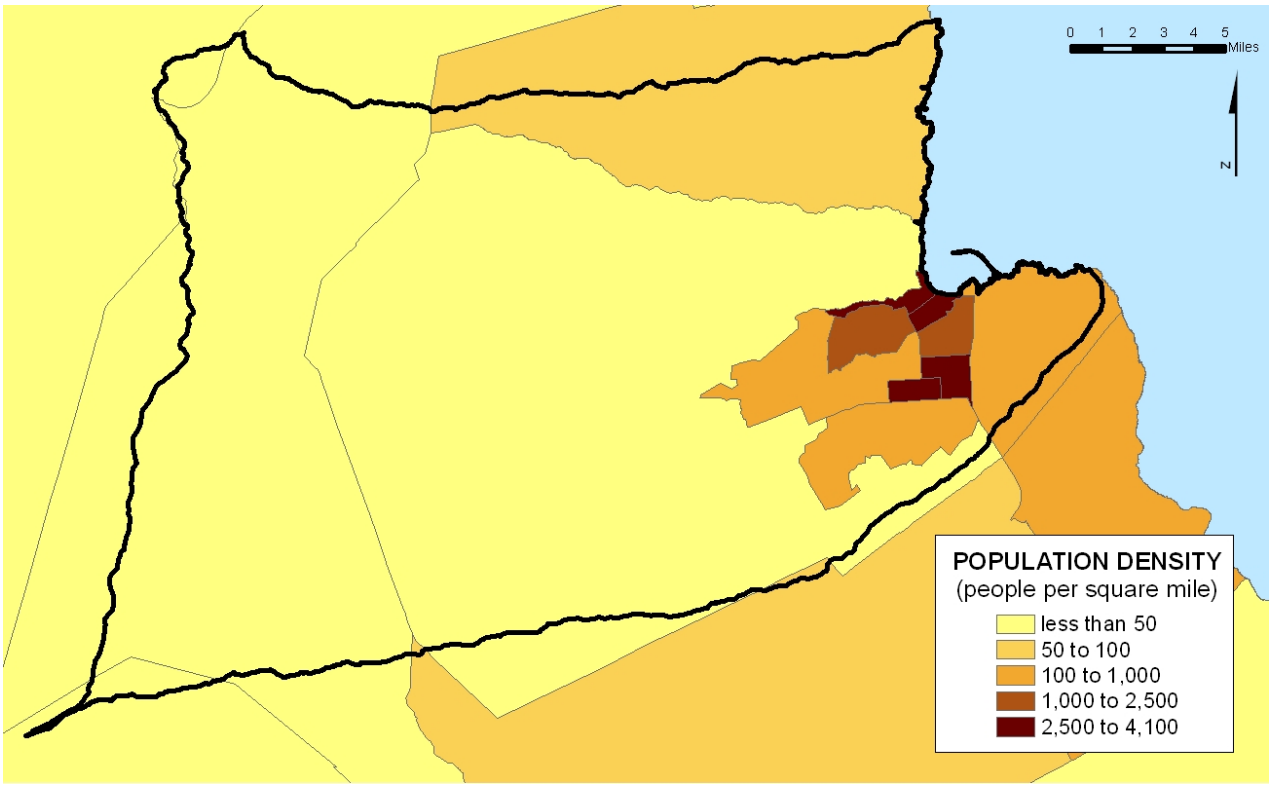
CRA ID	CRA Name	National CRA Description
159A.1	Hawai`i humid and very humid volcanic ash soils on low and intermediate rolling mountain slopes	This unit is characterized by forests, grasses, forbs and shrubs on rolling mountain slopes. Climate is warm to cool tropical, humid and very humid. Soils are deep to very deep, fine textured volcanic ash soils. Major land uses are grazing, cropland (horticultural) and forestry.
160.1	Hawai`i subhumid and humid intermediate and high mountain slopes	This unit is characterized by grasses, shrubs and trees on intermediate to high mountain slopes. Climate is cool to warm tropical, subhumid to humid. The slopes are gently sloping to hilly. Soils are deep, medium and fine textured volcanic ash soils. Major land uses are grazing and some irrigated truck crops.
161A.1	Hawai`i and Maui lava flows and rock outcrops	This unit is characterized by drought tolerant grasses, forbs and shrubs on lava flows. Climate is warm to cold tropical, arid and semiarid. The slopes are undulating lava flows to steep cinder cones. Soils are in fractures on lava flows and are moderately deep to very deep cinders on cones. Major land uses are watershed, grazing, military and resort development along the coast.
162.1	Hawai`i (Hilo, Pahoa) humid and very humid organic soils on lava flows	This unit is characterized by rainforests, grasses, ferns and shrubs on undulating to very steep lava flows. Climate is warm to cool tropical, humid and very humid. Soils are shallow and organic. Major land uses are grazing, ornamentals, orchards and urban.

The CRA designation of a project location is a key component in accessing appropriate guidance documents contained within the NRCS electronic Field Office Technical Guide (eFOTG). The guidance documents describe numerous Resource Management Systems (RMSs) and conservation practices which can form the basis of conservation plans meeting specific land use goals of a land owner.

SOCIO-ECONOMIC DESCRIPTION

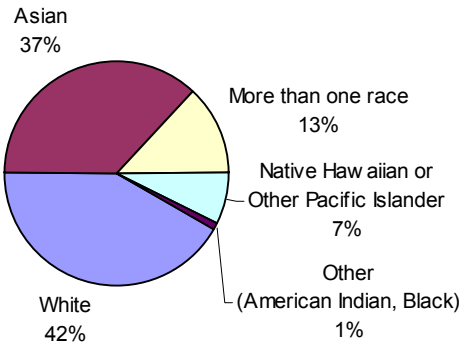
POPULATION AND DEMOGRAPHICS

The 2000 Census recorded the population in the Hilo watershed at slightly more than 49,000 people. Population density varies greatly throughout the Hilo watershed, with 1,000 to 4,000 people per square mile in the census tracts of Hilo's core urban area, but less than 10 people per square mile in the census tracts of the upland areas. Population growth is moderate, having increased 12% between 1980 and 2000 (US Census Bureau 2000).



The median household income for the Hilo division of Hawai`i County was roughly $39,000 in 2000. Top employers in Hawai`i County include the state, county and federal governments, collectively providing about 18% of all jobs on the island. In 2002, a reported 2,400 jobs in Hawai`i County derived wages and salary from agriculture, representing about 4% of county-wide labor force (County of Hawaii 2008).

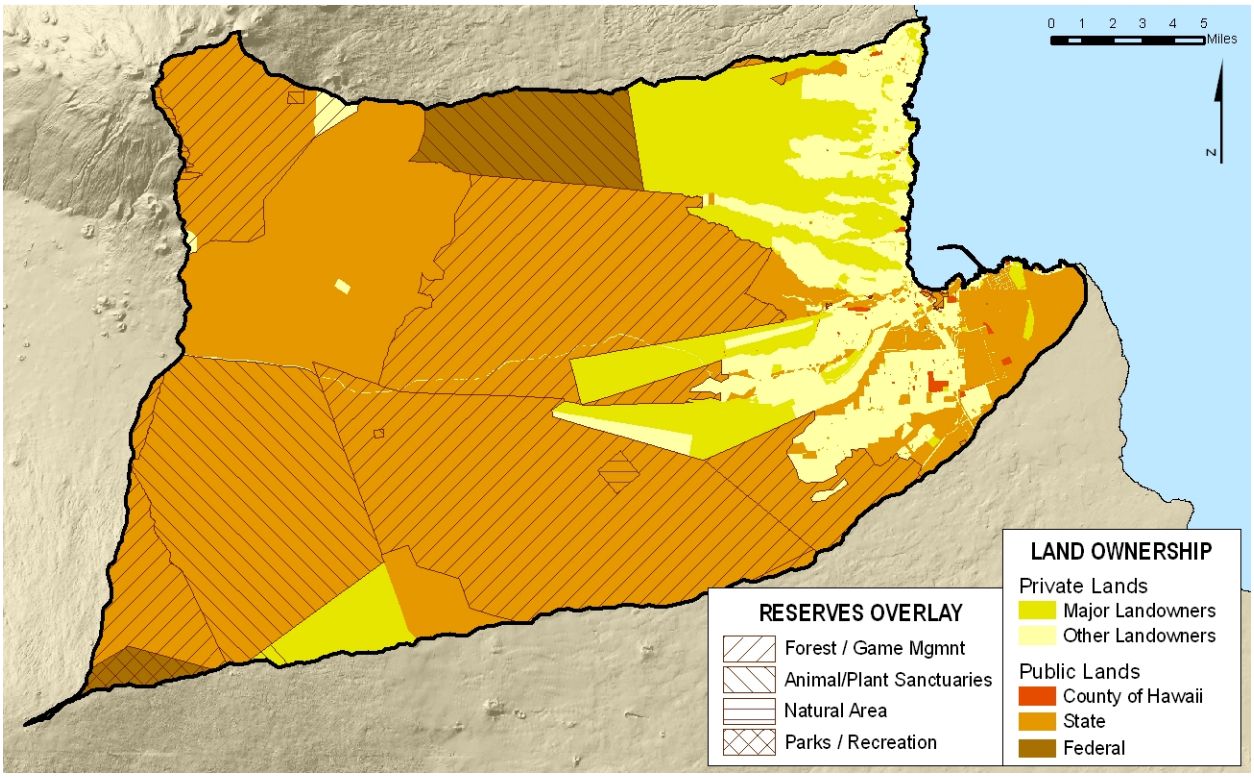
Hawai`i has a diversity of ethnic groups, and that diversity carries over into the community of farm operators. Of the 4,655 Hawai`i County farm operators reported in the 2002 Census of Agriculture, there were nearly equal numbers of white and Asian operators, as well as a significant component of mixed race operators. Seven percent of Hawai`i County operators reported their ethnicity as Native Hawaiian or Other Pacific Islander (USDA NASS 2004).



LAND OWNERSHIP

Private lands comprise 24% of the Hilo watershed, covering nearly 72,000 acres concentrated in the lower elevations of the watershed. More than half of these lands are classified as having Major Landowners, each with greater than 500 acres total holdings on the Big Island. Major Landowners with the greatest acreage in the Hilo watershed include Hawai`i Forest Preservation LLC, Kamehameha Schools, and Hawai`i Forest Products. More than 32,000 acres are owned by other landowners outside the Major Landowner classification (County of Hawaii, Data Systems GIS 2006).

Seventy-one percent of the Hilo watershed is owned by the State of Hawai`i, with an additional 5% under public ownership by the federal government or Hawai`i County. Most of the public lands are part of the Hawai`i system of reserves that includes forest reserves, natural area reserves, and parks. More than 44,200 acres of State-owned land, or 15% of the watershed, is managed by the Department of Hawaiian Homelands.



Ownership	Acres	Percentage
Private Lands	**71,693**	**24%**
Major Landowners	39,239	13%
Other Landowners	32,453	11%
Public Lands	**229,311**	**76%**
Hawai`i County	654	0.2%
State of Hawai`i	213,872	71%
Federal Government	14,785	4.9%
Total	**301,004**	**100%**

LAND USE DISTRICTS AND ZONING

Land use in Hawai`i is highly regulated by a dual system of state and county laws. Additionally, some federal laws, such as those for wetland protection, may govern land use on state, county and private lands. Federal lands (such as the portion of Volcanoes National Park that lies within the Hilo watershed) are not regulated by state and county land use laws.

All non-federal land in Hawai`i is classified into one of four classifications: Conservation, Agricultural, Rural, and Urban. Boundaries were initially set in 1961 by the State Land Use Commission (LUC), a body of nine members appointed by the Governor.

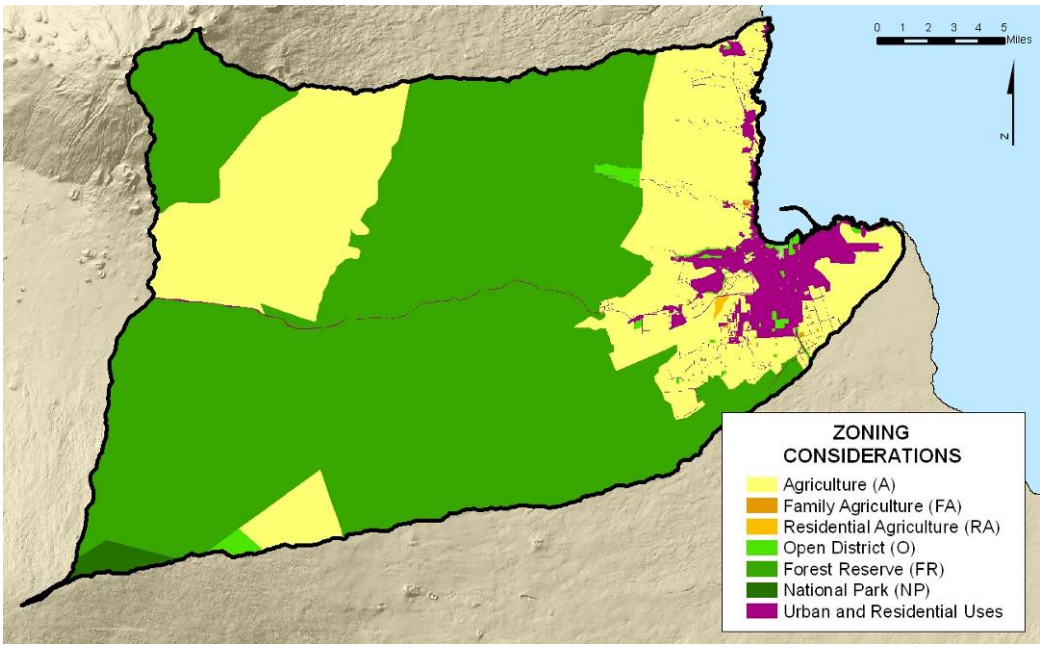
Conservation land is regulated by the State Board of Land and Natural Resources (BLNR), with the exception that the County has concurrent permitting authority within the defined Special Management Areas extending from the shoreline inland. Only a very limited range of uses are allowed on Conservation lands, and most of these require a Conservation District Use Permit (CDUP) from the BLNR. Conservation lands in the Hilo watershed include 198,266 acres of land classified as Forest Reserve, based on the most recent Hawai`i County zoning layer (County of Hawai`i 2007).

Agricultural District land is administered by each local county within the framework of the State land use law. Development on these lands is usually limited to agriculture uses, which can include mills and other processing facilities, and a special permit process potentially allows other reasonable uses. Hawai`i County has additionally defined Family Agricultural Districts (FA) and Residential and Agricultural Districts (RA) that have conditions relating to certain activities. The most recent Hawai`i County zoning layer identifies 86,777 acres of agriculture lands, with only 251 of these acres falling within the FA or RA subset.

Rural Districts as defined by the State are generally similar to Agricultural Districts, except for certain standards relating to golf courses, lot size and single-family dwellings. There are no lands classified as Rural District within the Hilo watershed.

Urban Districts are administered exclusively by the local county, and their land use is controlled through the county zoning process. The Hilo watershed has nearly 12,000 acres laying in defined zones and subzones governing land use activities for residential, commercial, industrial, resort, and other urban-related uses.

As a final note, the Hawaiian Homes Commission has ultimate control over lands administered by the State Department of Hawaiian Home Lands and leased to native Hawaiians.



AGRICULTURAL LAND USE

Agriculture production in the Hilo watershed has undergone significant change in recent decades in response to the decline of the sugar industry. Hawai`i County reported more than 3.6 million tons of sugarcane production in 1976 but only 81,000 tons in 1996, by which time most of the former sugarcane lands had been converted to other uses (County of Hawaii 2008).

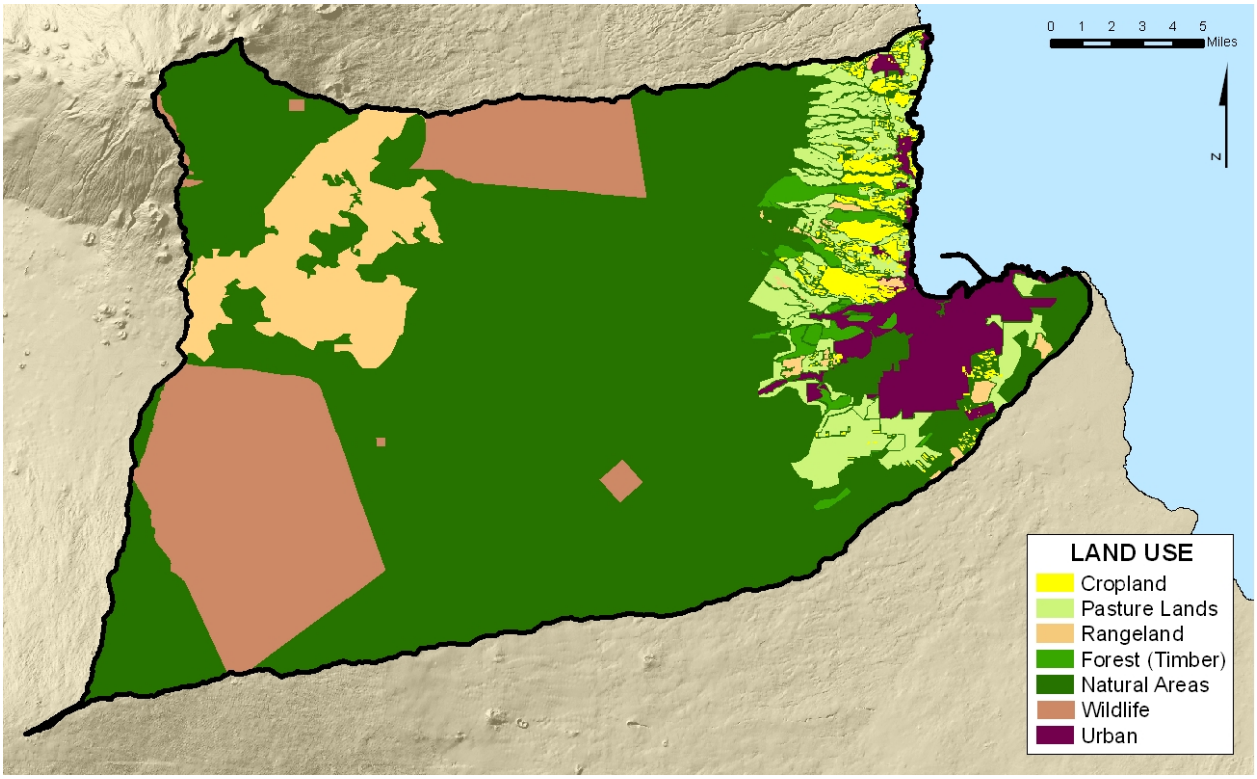
Today, the Hilo watershed and the rest of Hawai`i County are experiencing a growing trend toward diversified agriculture. The primary products coming out of the watershed are orchard products that include macadamia nuts, papayas, coffee, and bananas. Truck crops include sweet potato, cucurbits, corn, melons, cucumber, leafy vegetables, strawberries, cabbage, herbs and solanaceous crops. Specialty crops include cut flowers, herbs, dryland taro, and root ginger.

There are an estimated 550 farms in the Hilo watershed, using 2002 Agricultural Census data compiled by zip code and adjusted for area within the watershed. The market value of all agricultural product sales in Hawai`i County in 2002 was $187,736,000. Estimated market value for sales originating from Hilo watershed farms is more than $32,000,000 annually (USDA NASS 2004).

Farms in the Hilo watershed are generally small: approximately 86% of farms are between 1 and 49 acres in size, 12% are between 50 and 99 acres, and 1% are greater than 1,000 acres. Additional statistics from the agricultural census indicate the approximate levels of participation for Hilo watershed farms and noted in the table below.

Farmland Product or Activity	Farm Count
Vegetables, melons, potatoes, sweetpotatoes	65
Fruits, tree nuts, and berries	213
Nursery, greenhouse, floriculture and sod	177
Cropland idle or used for soil-improvement	120
Cropland on which all crops failed / abandoned	30
Permanent pasture and rangeland	96
Permanent pasture and rangeland >100 acres	26
Woodland	28

For the purposes of this Hilo Rapid Watershed Assessment, land use was classified into categories that conform to NRCS conservation planning procedures and common cost-share programs. The agricultural land use covering the greatest area of the Hilo watershed is rangeland, comprising roughly 22,000 acres (7% of the watershed) located primarily in the upper elevations. Pasture lands cover over 15,000 acres, and cropland comprises nearly 5,700 acres. Approximately 75% of Hilo watershed cropland is in orchards, with more than 3,000 acres in macadamia nut production and 1,000 acres in fruit trees. The remaining cropland predominantly produces truck crops, with smaller amounts of row crops and nursery products.



Land Use Classification	Acres	Percentage
Cropland	5,689	2%
Pasture Lands	15,292	5%
Rangeland	22,313	7%
Forest (for Timber)	3,601	1%
Natural Areas	179,972	60%
Wildlife	48,730	16%
Urban / Unclassified	25,451	8%
Total	301,047	100%

Forest land use under NRCS definition are lands where the primary use is timber production. In the Hilo watershed, there are roughly 3,600 acres that are either tree plantations planted on both State and private lands, or weedy forest on State land with remnant, valuable native trees.

Nearly 49,000 acres of the Hilo watershed lie within public lands specifically designated for protection of native plant and animal communities. These lands have been classified under the NRCS land use definition of Wildlife. The remaining 60% of the watershed is classified as Natural Area. These lands include over 125,000 acres of forest reserve land that are not used primarily for timber production and are hence essentially "natural", as well as land within parks and recreation areas.

RESOURCE CONCERNS

Key resource concerns in the Hilo watershed are reviewed in the following sections, arranged in the standard NRCS groupings of Soils, Water, and Plants and Animal Resources. Air quality issues are present on Hawai'i as a result of volcanic emissions, but they are not addressed in this RWA due to the inability to affect their levels.

NRCS Field Offices hold meetings at least once a year to discuss current issues with their Local Work Group, a citizen advisory group commonly comprised of experienced producers and leaders in the agriculture industry. The East Hawai'i Local Work Group members identified and prioritized four resource concerns for 2008:

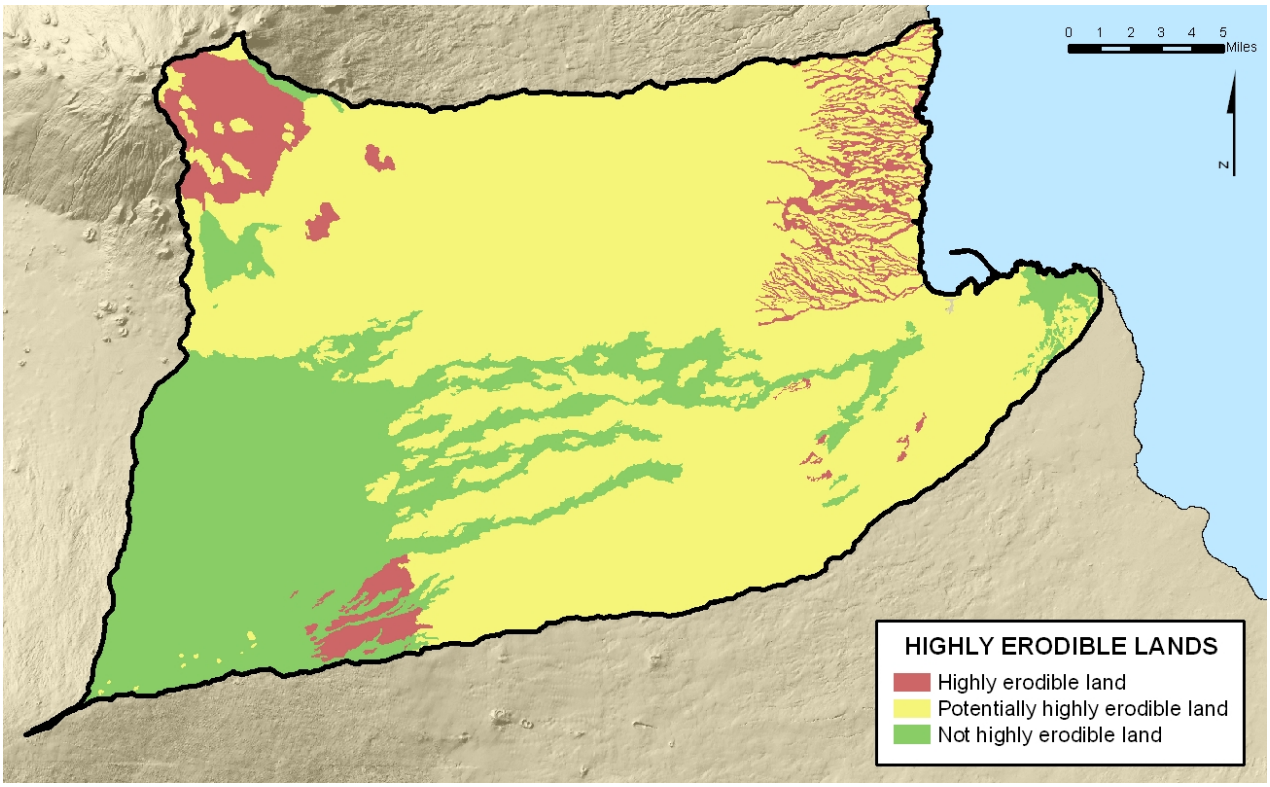
1. Soil erosion / sedimentation
2. Insufficient water supply for irrigation and livestock
3. Noxious weeds
4. Pesticide / nutrient contamination of ground or surface waters

The discussion of resource concerns in the following subsections provides an overview of area–wide conditions in the Hilo watershed, placing an emphasis on the priority concerns. The common mechanism for NRCS to work towards improving resource conditions involves development of conservation plans with private landowners. While the priority concerns may guide a strategy for recruiting landowner participation, it is the site-specific conditions of each conservation plan that determines the ability to address all, some, or none of the priority concerns.

SOIL RESOURCES

Soil Erosion

NRCS has defined three classes to assess the potential for water-induced soil erosion: Class 1 is defined as highly erodible land (HEL), while Classes 2 and 3 signify land which is potentially highly erodible and not highly erodible, respectively. Areas in the Hilo watershed at high risk for water-induced soil erosion include steeply sloping land forms such as stream banks and gulch areas in the higher rainfall zones near the coast. High mountain areas associated with vitrand soils are also generally susceptible to high soil erosion. Most of the primary agricultural areas of the watershed are at moderate to high risk of erosion. GIS analysis indicates nearly 22,000 acres, or 7% of the Hilo watershed, is classified as HEL; 66% is classified as potentially highly erodible, and the remaining 27% is not highly erodible land (Soil Survey Staff 2008).

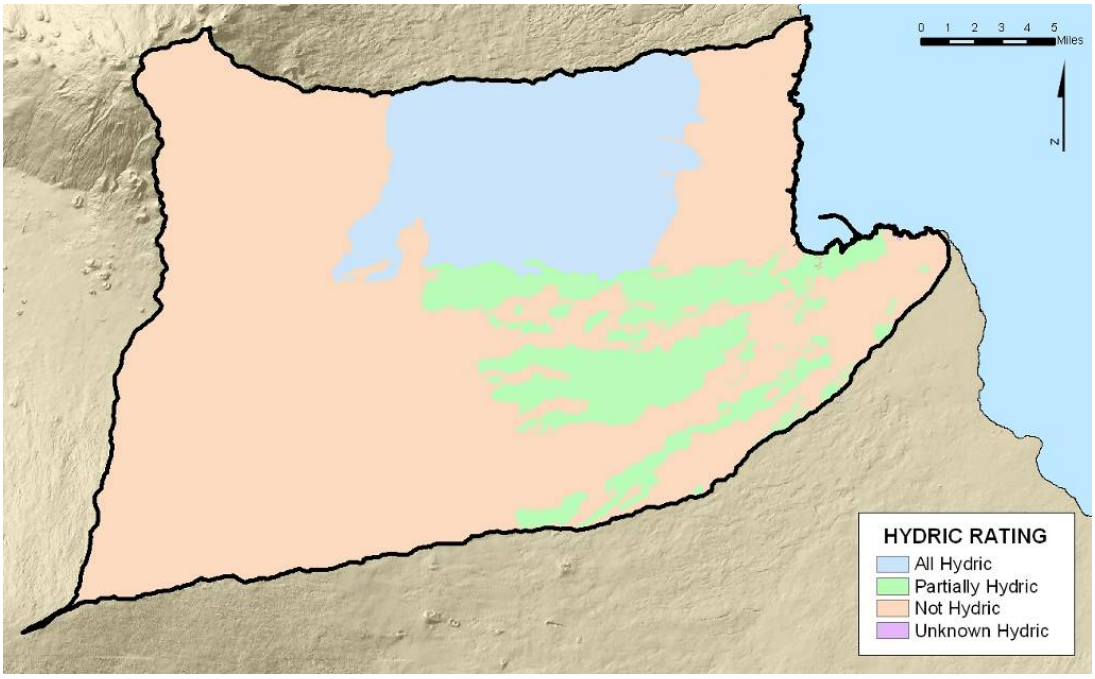


Farmers who grow sugarcane or other defined agricultural commodities on HEL lands are required to maintain an approved conservation system in order to be eligible for certain USDA benefits and programs. Proposed conservation plans on Class 2 lands (potentially HEL) are required to complete a field check of slope-length and gradient to confirm the soil erosion classification. A useful worksheet for completing the classification can be downloaded from the PIA Technical Resources website http://www.pia.nrcs.usda.gov/technical/, after following links to the agronomy folder inside the Pacific Islands Area and Hawaii Technical Notes ftp site.

The NRCS Local Work Group has identified soil erosion and sedimentation as the highest priority resource concern in East Hawai'i. Kapue, Honoli`i and Mā`ili streams in particular have reported turbidity levels exceeding state water quality standards. Lack of monitoring data throughout the watershed, however, currently precludes any reliable estimates of sediment loading originating from agriculture lands as compared to other sources, such as the steep slopes of upland headwaters and lowland gulches.

Hydric Soils

Hydric soils commonly are soils that are wet for extended periods of time, due to either a shallow groundwater table or frequent surface water inundation that remains ponded on the soil surface. The ponded water or saturated conditions frequently lead to development of anaerobic conditions in the upper part of the soil column, and the growth and reproduction of hydrophytic (water-loving) vegetation. Hydric soils are identified in the field by examining soil to a depth of about 20 inches and observing the presence of certain propertiesfeatures. GIS analysis of soil survey data indicates that 18% of lands in the Hilo watershed are classified as All Hydric and 12% are Partially Hydric. The remainder are classified as Not Hydric, except for 24 acres whose rating is still considered Unknown.



The presence of hydric soils has both management and potential regulatory implications. Because of their water levels, hydric soils are often more difficult to manage than non-hydric soil, particularly for construction of roads and buildings, but also for agriculture. Hydric soils are also a potential indicator of the presence of wetlands in the area, although the presence of hydric soils does not automatically make an area a wetland. The determination of a wetland must be done on a site-specific basis and requires the collective identification and documentation of hydric soil properties, predominance of hydrophytic vegetation, and indicators of wetland hydrology. If wetlands do exist, any proposed impacts to the wetlands may require compliance with federal, state or local wetland regulatory laws and/or agency compliance.

Wetlands provide a number of important landscape functions and benefits, and their preservation is generally a goal of natural resources management. NRCS activities relating to wetlands fall under the scope of three regulatory areas:

- The Food Security Act of 1985: NRCS can provide assistance to determine/delineate wetlands and wetland exemption categories on agricultural lands.
- Section 404 of the Clean Water Act: NRCS may inform cooperators/landowners of the potential need for a “404” permit.
- Wetland Protection Policy (executive order 11990): NRCS follows the National Environmental Policy Act of 1969 (NEPA) sequencing steps to avoid, minimize, or mitigate wetland loss as a condition for providing assistance to private landowners.

Agricultural Lands of Importance to the State of Hawai`i

The Agricultural Lands of Importance to the State of Hawai`i (ALISH) classification system was compiled in 1977 as part of a national effort to inventory important farmlands. Work in Hawai`i was completed by the State Department of Agriculture (DOA 1977), with assistance from the USDA Natural Resources Conservation Service (then the Soil Conservation Service) and the University of Hawai`i College of Tropical Agriculture. The effort classified all lands into one of three categories, except for lands excluded from the inventory for the following practical reasons:

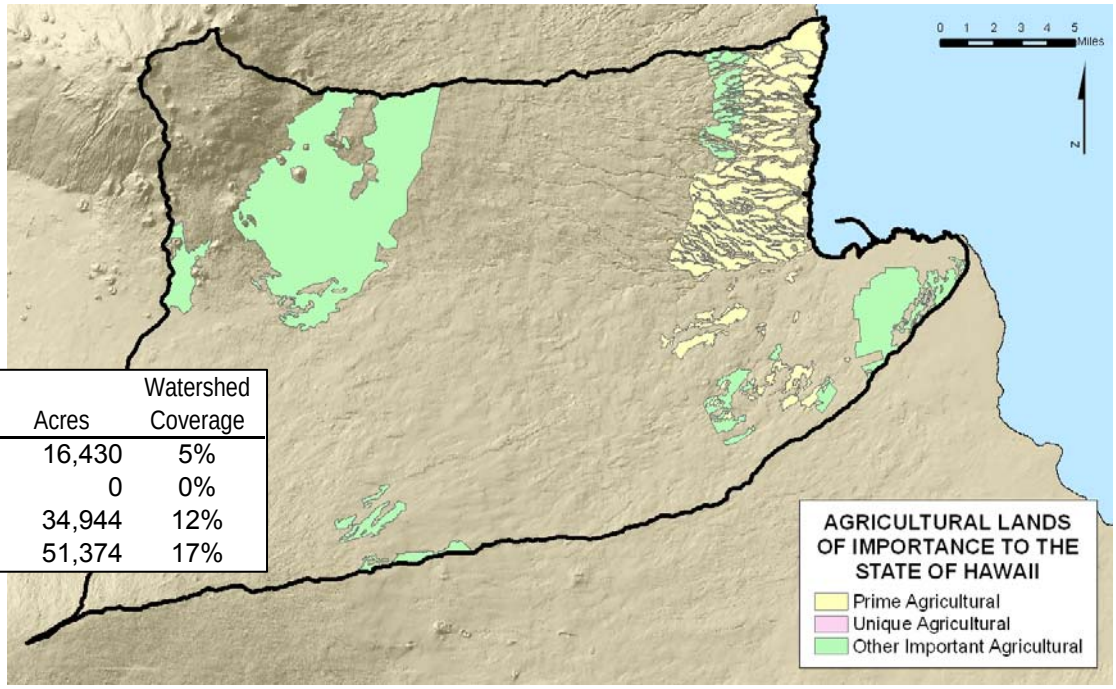
- natural or artificial bodies of water over ten acres
- lands with slopes in excess of thirty five percent
- developed urban lands over ten acres
- public use lands, including forest reserves
- military installations except undeveloped areas over ten acres.

The three categories of land identified in Hawaii's ALISH system are very similar to categories defined by NRCS for the national inventory. A general description of each ALISH land type classification is noted below, with the name of the analogous national classification.

- Prime Agricultural Lands – Land which has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed according to modern farming methods. This classification is identical to the national NRCS classification Prime Farmlands.
- Unique Agricultural Lands – Land that has a special combination of soil quality, location, growing season, moisture supply, and is used to produce sustained high quality and of high quality yields of a specific crop when treated and managed according to modern farming methods. Similar to the national NRCS classification Unique Farmlands.
- Other Important Agricultural Lands – Land other than Prime or Unique Agricultural Land that is also of statewide or local importance to agricultural use. Similar to the national NRCS classification Additional Farmland of Statewide and Local Importance.

Geospatial data files and a more detailed description of the criteria used to classify lands in each category is available at http://hawaii.gov/dbedt/gis/alish.htm

ALISH Classification	Acres	Watershed Coverage
Prime	16,430	5%
Unique	0	0%
Other	34,944	12%
Total ALISH	51,374	17%



WATER RESOURCES

Water Quality

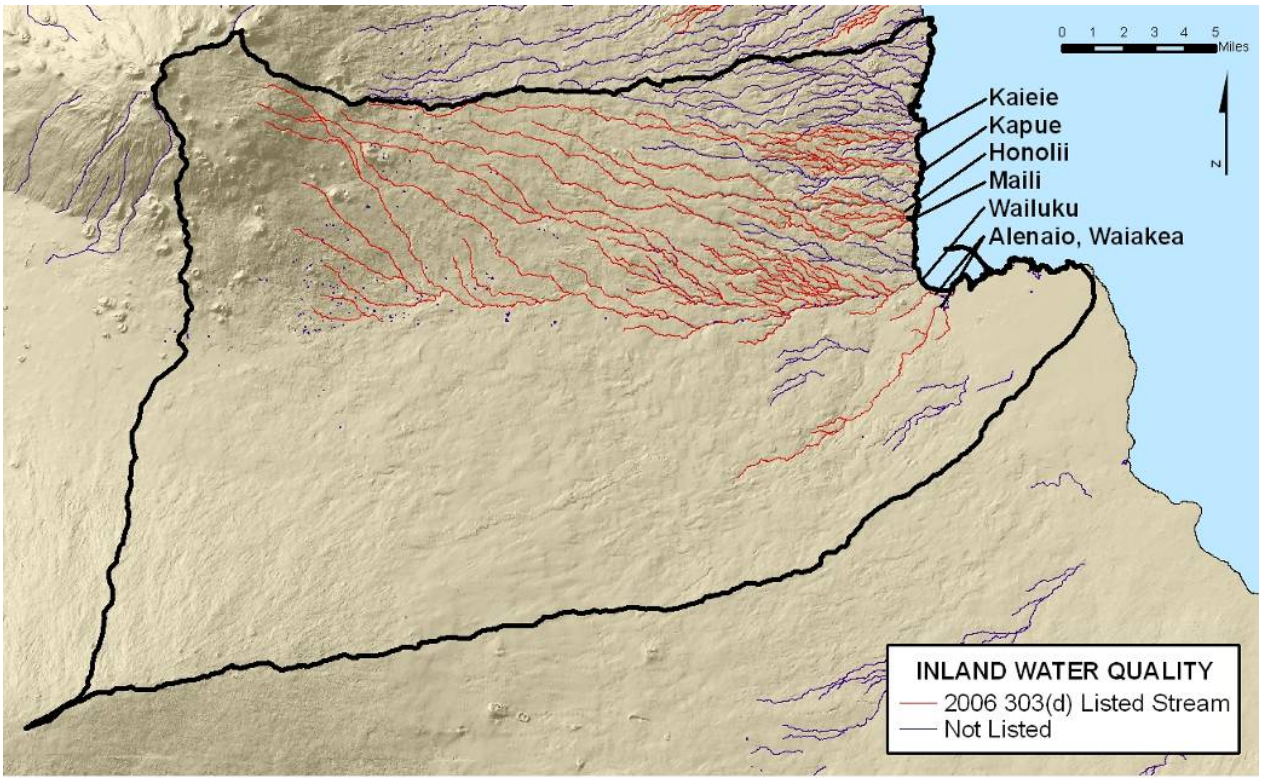
The Hawai`i Water Quality Standards (HAR 11-54) provide the State Department of Health the authority to protect the quality of both inland and marine waters. The Standards establish maximum contaminant levels for different classes of water bodies, with a different set of criteria for each of the wet and dry seasons (spanning November 1 through April 30 and May 1 through October 31, respectively). Maps displaying the locations of water body classes for each island (DOH 1987) are available through a DOH website included in the references listing on page 31.

The marine waters off the Hilo watershed are designated as Class A -1 (also known as Class A - Restrictive) inside the Hilo Bay breakwater, and Class A -2 (or Class A - Open Coastal) outside the breakwater. The objective of Class A waters is to protect their use for recreational purposes and aesthetic enjoyment, and any discharges must be treated to meet criteria established for the specific class. The Hawai`i Water Quality Standards also define Class AA marine waters, which have an objective that they remain in their natural pristine state as nearly as possible. A marine area of Class AA water occurs beyond Leleiwi Point, at the southern boundary of the Hilo watershed coastline.

Most of the stream reaches of the inland waters in the Hilo watershed are designated as Class 2 waters. The objective of Class 2 waters is to protect aquatic life propagation and support, as well as human uses for recreation, agricultural and industrial water supply, shipping, and navigation. Any discharges to Class 2 waters must be treated to criteria compatible with these objectives. Class 1 waters, on the other hand, have an objective of remaining in their natural state as nearly as possible. It is not permitted to discharge any wastes to Class 1 waters, and activities which have the potential to produce demonstrable increases in nonpoint source contamination are prohibited as well. Some of the larger areas classified as Class 1 waters within the Hilo watershed include a drainage area of the Wailuku River above its confluence with Kahoama and Kalohewahewa streams; reaches of Honoli`i Stream within the Hakalau National Wildlife Refuge; and reaches of the Wailoa River within the Wailoa River State Recreation Area.

The Hawai`i Department of Health reports to the US Environmental Protection Agency (EPA) every other year on the status of surface water quality throughout the state. A part of the report is the Clean Water Act Section 303(d) list, which identifies all water bodies that do not meet the State's water quality standards. The most recent report, the 2006 State of Hawai`i Water Quality Monitoring and Assessment Report (DOH 2008), identifies seven streams and one estuary within the Hilo watershed as being on the 303(d) list. The map on the following page shows the location of the listed streams; the listed estuary occurs at the junction of the Alenaio and Waiākea Rivers and is commonly called the Wailoa River. According to Hawai`i law, the impairment classification of a 303(d)-listed stream applies to the entire stream network sharing the same land use classification, rather than to specific stream segments as occurs in the mainland United States. As a result, there may be stream reaches in Hawai`i that are in compliance with all water quality standards, yet they are classified as an impaired, 303(d)-listed due to conditions elsewhere in the larger stream system.

Streams on the 303(d) list are monitored during the dry and wet seasons. The potential contaminants for which these streams are monitored include total nitrogen (N), nitrate/nitrite (NO_3 + NO_2), total phosphorus (P), turbidity, and total suspended solids (TSS). For the listed streams in the Hilo watershed, the 2006 report indicates that most water quality criteria for potential contaminants were "attained" for a monitoring cycle spanning the six year period prior to the report. The only parameters that did not meet water quality criteria attainments were dry season turbidity in the Kapue, Honoli`i and Mā`ili Streams, and dry season nitrate-nitrite levels in Wailuku Stream.



Streams that are on the 303(d) list are required by EPA to have a Total Maximum Daily Load (TMDL) Plan prepared by the Hawai`i Department of Health. A completed TMDL Plan may restrict contaminant discharge into the stream system. A TMDL Plan is currently being prepared for the Waiākea and Alenaio streams. The remaining listed streams have been given a TMDL Priority rating of Low.

All of the aquifers on the island of Hawai`i are listed as vulnerable to contamination due to the porous volcanic substrata connection to groundwater. Groundwater contamination is a special resource concern because nearly all drinking water in Hawai`i comes from groundwater sources. Five wells and three springs sampled recently in the Hilo watershed contained detectable levels of one or more contaminants found in many herbicides, including atrazine and isophorone. None of the detected levels, however, exceed federal or state drinking water standards established for protection of public health. More information regarding the wells, clustered primarily in areas of former Pepeekeo Sugar Mill and Hilo Coast Power Company facilities, can be found in the 2005 Groundwater Contamination Maps for the State of Hawai`i (DOH 2006).

The NRCS Local Work Group has identified two priority resource concerns in East Hawai`i that relate to water quality: soil erosion / sedimentation (previously discussed in the Soil Erosion section), and pesticide / nutrient contamination of ground or surface waters. Proactive measures throughout the watershed to optimize chemical application rates and reduce or eliminate agricultural runoff will be key factors towards reducing the concern for surface water and groundwater contamination.

Water Quantity

Agricultural water in the Hilo watershed is primarily obtained through the county Department of Water Supply (DWS). As a pumped source, the DWS supply is facing greatly increased risk of price increase in response to rising energy costs. Customers located at the highest elevation of

the supply systems may experience limited or fluctuating availability during periods of high demand, while those located outside the DWS service have no access to the supply.

Opportunities for development of surface water irrigation supplies are extremely limited. The southern portion of the watershed has very few established water courses that could serve to divert water, and the intermittent flow of most northern watershed streams significantly reduces diversion effectiveness.

The NRCS Local Work Group has identified insufficient water supply for irrigation and livestock as the second highest priority resource concern in East Hawai'i. Improved conditions may be feasible through installation of new irrigation systems, measures to improve irrigation efficiency of existing systems, and on-site water collection and containment facilities.

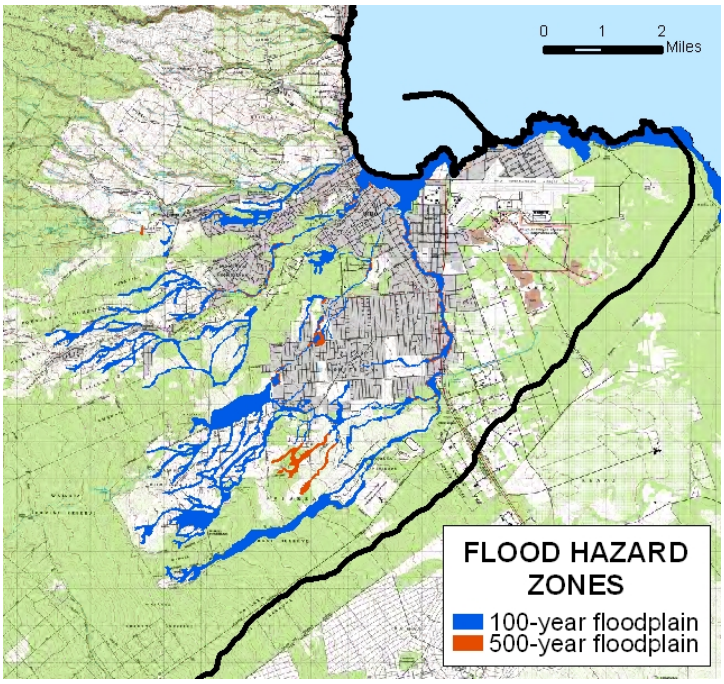
Water Hazards

The Hilo watershed is subject to flooding from rainstorms, high waves, and tsunamis. Rainstorm-generated floods are the most common of the three natural causes. Most rainstorm floods occur between November and May as the result of large-scale storm systems. High, wind-generated waves caused by unusual storm conditions can result in flooding along the shoreline. Tsunamis, also known as tidal waves, have also caused extensive flooding and damage along coastal regions. Since 1819, at least 39 tsunamis are known to have reached the Hawaiian Islands (DLNR 2003).

Flooding in the Hilo watershed is more prevalent in the newer geology of the Mauna Loa shield than in the older geology of the Mauna Kea volcanic shield. In the Mauna Kea lavas, generally located to the north of the Wailuku River, the eroded coastline has abrupt cliffs 30 to 80 feet high that are broken by deep stream channels. Usable land areas have a ground slope of six to twelve per cent. Runoff is quickly concentrated and confined to well-developed gullies and gulches with ample capacity to contain flood water. Flooding problems in this area are primarily caused by local water runoff from former sugar cane fields situated above the communities and at road and highway crossings cutting across smaller drainageways.

The major part of Hilo town located south of the Wailuku River is prone to flooding, as it is situated on the relatively young shield of Mauna Loa. Due to the young geology, the stream channels are not well defined and do not have the capacities to handle floodwater. Flood problems in the Alenaio, Waiākea, and Palai Stream watersheds are compounded by the loss of forest due to urban development and the prevalence of lava tubes that unpredictably shunt flood water from place to place.

Problem flooding in the urbanizing areas of Hilo has appeared to have increased in frequency and intensity in the past few decades. The map to the right identifies the floodplain delineation from the Flood Insurance Rate Maps published by the Federal Emergency Management Agency (FEMA 2005).

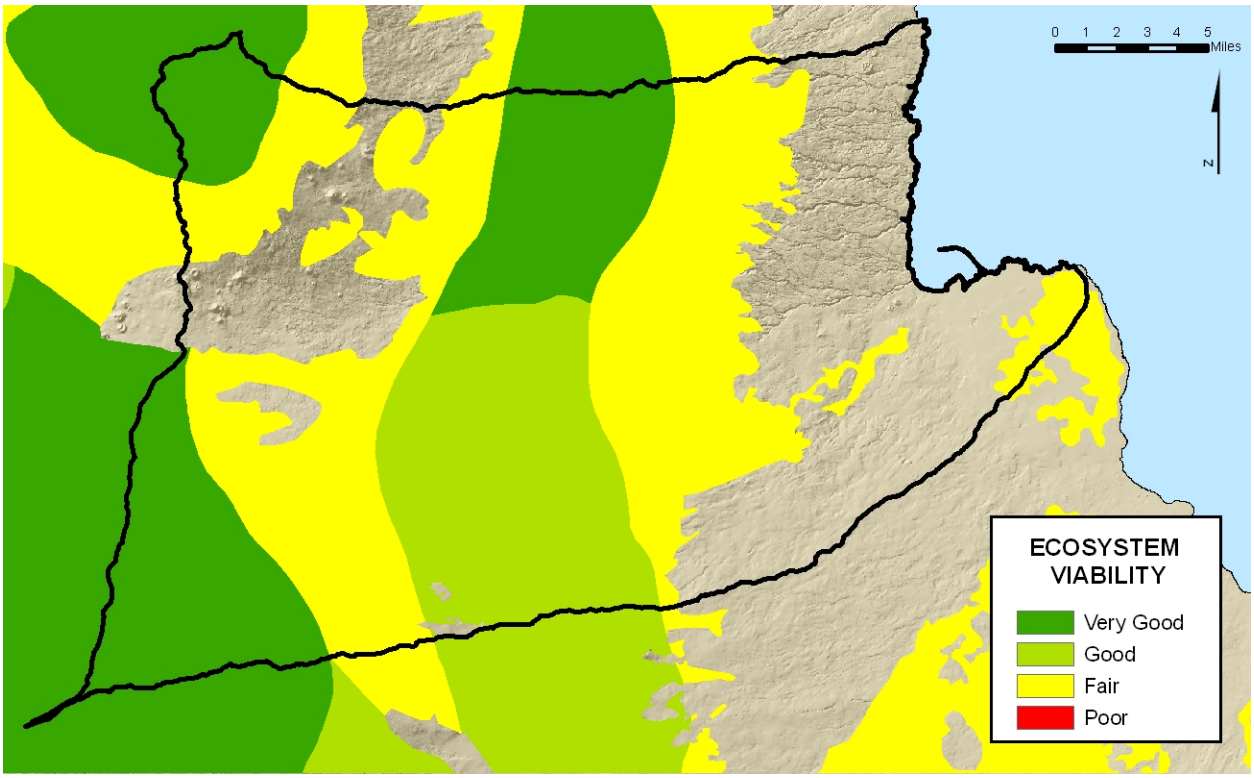


PLANT AND ANIMAL RESOURCES

Ecological Integrity and Viability

The Hilo watershed, like most of the state of Hawai`i, has lost many of its native ecosystems, and those that remain are threatened by invasive species, development, natural disasters, and climate change. Based on data compiled by The Nature Conservancy of Hawai`i, approximately 70% of the Hilo watershed has retained its native-dominated ecological systems. The remaining area, mainly in the lowland and coastal portions of the watershed where most anthropogenic activity occurs, is dominated by non-native ecosystems (TNC 2008).

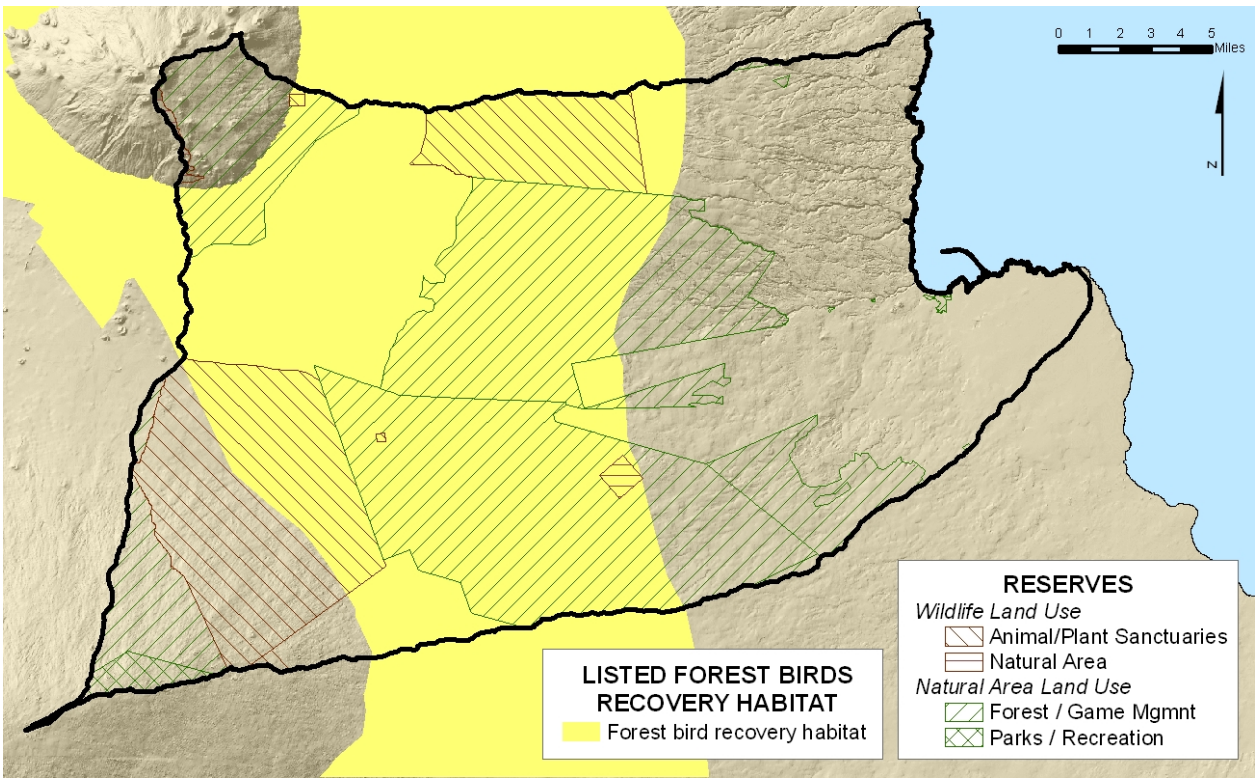
TNC has rated the ecological viability of the native-dominated systems using an assessment methodology that considers three criteria: ecosystem size, condition, and landscape context. Analysis of the viability data suggests 35% of the land within the Hilo watershed has fair ecosystem viability, 16% has good viability, and 30% has very good viability. None of the native-dominated land within the Hilo watershed received an assessment rating of poor. More information regarding the assessment criteria is available in the TNC report, whose on-line link is included in the reference section of this RWA profile.



Most of the native forests in the Hilo watershed are threatened by feral ungulates and the invasive plants that follow them. Converting native forests to alternative uses diminishes the forests ability to support native wildlife. The presence of avian malaria-carrying mosquitoes at elevations below 3,000 feet means that most native forest birds are restricted to higher elevations. As threats such as the invasive coqui frogs, ‘ōhi‘a rust and other diseases spread, the health and function of native ecosystems will suffer.

Recovery Habitat

The US Fish and Wildlife Service has created maps delineating recovery habitat for Hawaiian forest birds (USFWS 2006). Four forest bird species have recovery habitat lying within the Hilo watershed: ʻĀkiapōlāʻau *(Hemignathus munroi)*, Palila *(Loxioides bailleui)*, ʻAkepa *(Loxops coccineus coccineus)*, and Hawaiʻi Creeper *(Oreomystis manna)*. Though the recovery habitat designation does not carry with it any associated regulatory restrictions, it does identify potential areas where recovery actions could take place for the conservation of these species.



There are several areas of the Hilo watershed that have been set aside for protection of native plants and animals. The name and type of these reserve areas are noted in the list below, and they have been classified as Wildlife land use for the purposes of this RWA. These wildlife reserve areas are managed by the DLNR Division of Forestry and Wildlife, with the exception of Hakalau, which is managed by the US Fish and Wildlife Service.

Reserve Name	Reserve Type / Function
Hakalau Forest National Wildlife Refuge	National Wildlife Refuge
Keauhou Cooperative Nēnē Sanctuary	Bird Sanctuary
Kīpuka `Āinahou Nēnē Sanctuary	Bird Sanctuary
Upper Waiākea Bog Sanctuary	Plant Sanctuary
Wailuku Silversword Sanctuary	Plant Sanctuary
Mauna Kea Ice Age Natural Area Reserve	Natural Area Reserve
Waiākea 1942 Lava Flow Natural Area Reserve	Natural Area Reserve

Threatened and Endangered Species

The US Congress passed the federal Endangered Species Act (ESA) in 1973 to protect and recover imperiled species and the ecosystems upon which they depend. The ESA is administered both by the US Fish and Wildlife Service (USFWS), which has primary responsibility for terrestrial and freshwater organisms, and by the National Marine Fisheries Service (NMFS), which is chiefly responsible for marine organisms. Under the ESA, species may be listed as either endangered or threatened. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future. Additionally, the USFWS maintains a list of "candidate" species for which there is sufficient information to warrant a proposed listing, but on which USFWS is precluded from acting due to higher listing priorities (USFWS 2008).

Sixteen animal species and 24 plant species have been observed within the Hilo watershed that are listed under the federal ESA, according to the December 2005 database of the Hawai'i Biodiversity and Mapping Program (HBMP 2005). The map on page 26 identifies distinct point locations where rare animal and plant species have been observed, along with areas where the abundance of observations is too great to show with a single point. The map also indicates whether the data represents a current or historical sighting, where current is defined as the twenty-year period since 1988. The scientific and common names of the protected species are listed in the following two tables, along with their federal listing status and sighting classification.

T&E Animal Species in the Hilo Watershed

***Species Type* / ESA Listing Status / Common Name**	**Scientific Name**	**Species Sightings**	
		Recent	**Pre-1988**
Invertebrates			
Endangered			
Blackburn's Sphinx Moth	*Manduca blackburni*		●
Candidate			
Pacific Megalagrion Damselfly	*Megalagrion pacificum*	unknown	
Orange-black Megalagrion Damselfly	*Megalagrion xanthomelas*	●	
Terrestrial Mammals			
Endangered			
Hawaiian Hoary Bat	*Lasiurus cinereus semotus*	●	●
Birds			
Endangered			
Hawaiian Duck or Koloa	*Anas wyvilliana*	●	●
Hawaiian Goose or Nēnē	*Branta sandvicensis*	●	●
Hawaiian Hawk or 'Io	*Buteo solitarius*	●	●
Hawaiian Crow or 'Alalā	*Corvus hawaiiensis*	extinct in the wild	
Hawaiian Coot or 'Alae Ke'oke'o	*Fulica alai*	●	
'Ākiapōlā'au	*Hemignathus munroi*	●	●
Palila	*Loxioides bailleui*	●	●
Hawai`i 'Akepa	*Loxops coccineus coccineus*	●	●
Hawai`i Creeper	*Oreomystis mana*	●	●
'Ō'ū	*Psittirostra psittacea*		●
Hawaiian Dark-Rumped Petrel or 'Ua'u	*Pterodroma sandwichensis*		●
Threatened			
Newell's Shearwater or 'A'o	*Puffinus auricularis newelli*	●	

A state list of threatened and endangered species is maintained by the Division of Fish and Wildlife, within Hawaii's Department of Land and Natural Resources. In some instances, species listings apply to single islands rather than the entire state, reflecting the uniqueness of Hawaii's varied and isolated island ecosystems. For the Big Island, there are no species listed by the state government that are not already listed by the federal government.

T&E Plant Species in the Hilo Watershed

ESA Listing Status / Scientific Name	Common Name	Species Sightings	
		Recent	Pre-1988
Endangered			
Adenophorus periens	palai lā‘au		●
Argyroxiphium kauense	Ka‘ū silversword	●	●
Argyroxiphium sandwicense subsp. *sandwicense*	Mauna Kea silversword or ‘āhinahina	●	
Asplenium peruvianum var. *insulare*		●	●
Clermontia lindseyana	‘ōhā wai	●	●
Clermontia peleana subsp. *peleana*	‘ōhā wai	●	●
Clermontia pyrularia	‘ōhā wai		●
Cyanea platyphylla	‘akū‘akū		●
Cyanea shipmanii	hāhā	●	●
Cyrtandra giffardii	ha‘iwale		●
Cyrtandra tintinnabula	ha‘iwale		●
Ischaemum byrone	Hilo ischaemum		●
Phyllostegia racemosa		●	●
Phyllostegia velutina		●	
Plantago hawaiensis	laukahi kuahiwi	●	●
Stenogyne angustifolia			●
Candidate			
Calamagrostis expansa	reedgrass	●	
Christella boydiae			●
Cyanea tritomantha	‘aku‘aku		●
Gardenia remyi	nānū		●
Joinvillea ascendens subsp. *ascendens*	‘ohe	●	●
Microlepia strigosa var. *mauiensis*	palapalai	●	
Phyllostegia floribunda			●
Ranunculus hawaiensis			●

In addition to those species listed by the federal and state government as threatened or endangered, the State of Hawai`i has put together Hawaii's Comprehensive Wildlife Conservation Strategy (CWCS) (Mitchell et al. 2005). The CWCS document identifies "Species of Greatest Conservation Need" for both flora and fauna of Hawai`i. All native animals are considered species of greatest conservation need by the State of Hawai`i, so any native animals found in the Hilo watershed are included. Plants were included using the following criteria:

1) plant species federally listed as threatened, endangered, or as a candidate for listing;
2) plant species identified as Plant Extinction Prevention (PEP) plants (i.e., plants with less than 50 individuals extant);
3) plant species identified as important elements of native habitats;
4) endemic aquatic plants; and
5) endemic terrestrial and aquatic algae.

A plant species was considered an important element of native habitat if it was a dominant or co-dominant member of an identified natural community as defined by the *Manual of the Flowering Plants of Hawai`i*, or if there was evidence that the plant was known to act as either a host, a food source, or habitat for native wildlife. Complete lists of species of greatest conservation need for Hawai`i are available on the web; the list for plants can be found at:

www.state.hi.us/dlnr/dofaw/cwcs/files/NAAT%20final%20CWCS/Appendices/Appx%20B%20Flora%20SGCN%20NAAT%20final%20!.pdf,

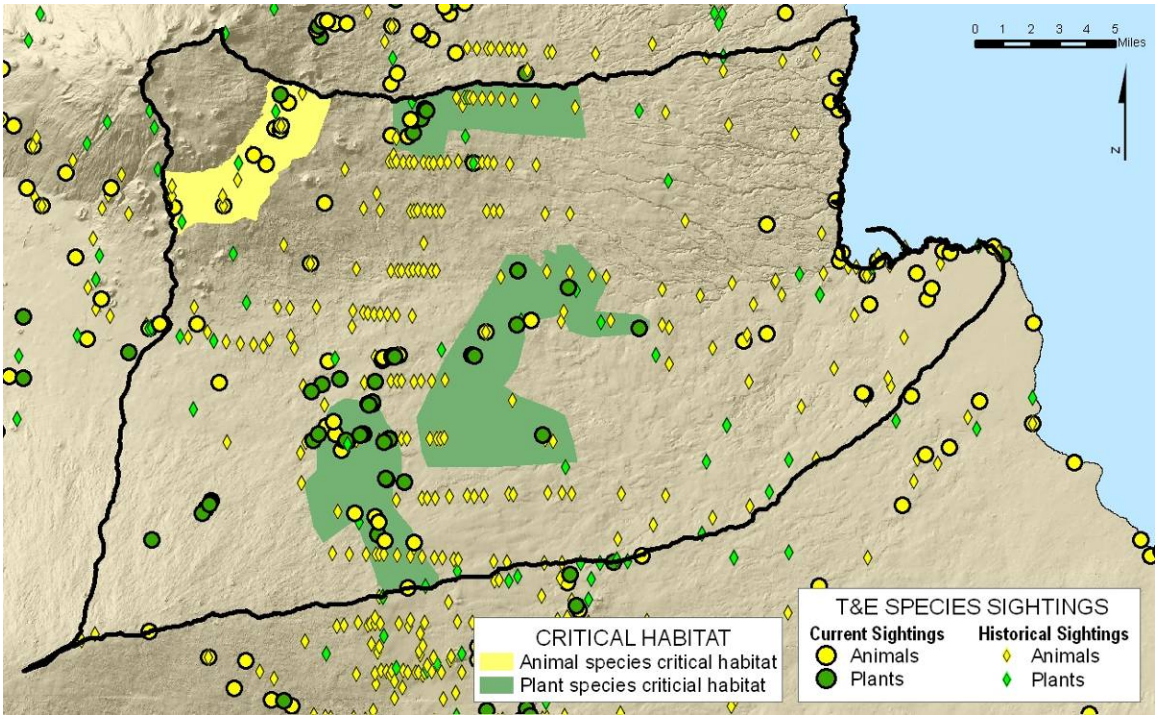
while the list for animals is at:

www.state.hi.us/dlnr/dofaw/cwcs/files/NAAT%20final%20CWCS/Appendices/Appx%20A%20Animal%20SGCN%20NAAT%20final%20!.pdf

Critical Habitat

Critical Habitat is land designated by the US Fish and Wildlife Service (USFWS) or by NOAA Marine Fisheries as habitat necessary for the recovery of a listed species. Land areas designated as critical habitat are afforded the same protection under the ESA as are listed species; that is, any action funded or permitted by a federal agency must be analyzed for its effect on the designated critical habitat. The effects determination must fall into one of three classifications: “no effect,” “may affect but not likely to adversely modify,” or “may affect and likely to adversely modify”. Actions for which it is determined they “may affect and likely to adversely modify” the habitat require a formal consultation and a biological opinion from the agency which designated the habitat (USFWS or NOAA).

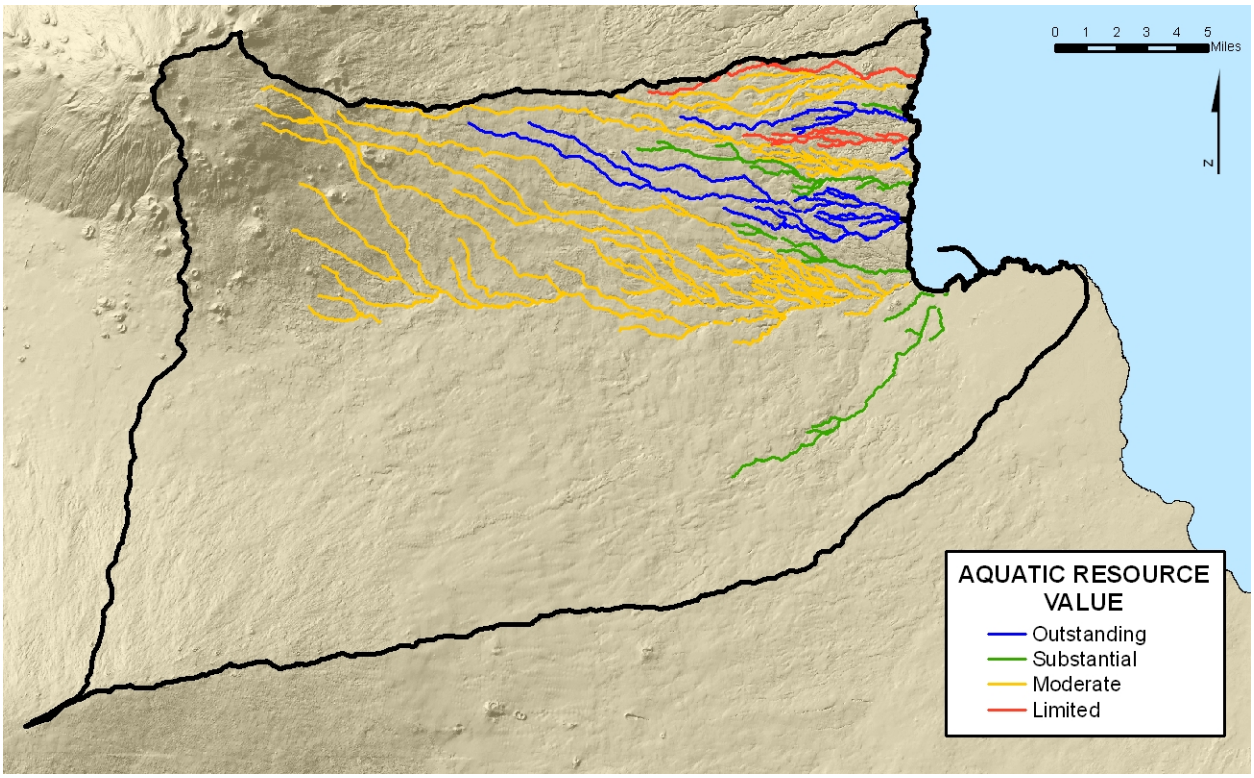
The Hilo watershed has designated critical habitat for one animal species (Palila) and 12 plant species (*Argyroxiphium kauense, Clermontia lindseyana, Clermontia peleana, Clermontia pyrularia, Cyanea platyphylla, Cyanea shipmanii, Cyanea stictophylla, Cyrtandra giffardii, Cyrtandra tintinnabula, Phyllostegia hawaiiensis, Phyllostegia racemosa,* and *Phyllostegia velutina*) (USFWS n.d.). There is also proposed critical habitat for two animal species (*Drosophila mulli* and *Drosophila ochrobasis*).



Critical habitat designation includes specification of the "primary constituent elements", which are features such as elevation, soils, rainfall, and associated native plant species that make up the habitat. Threats to the habitat are also enumerated. When management of critical habitat is considered, or when an effects analysis is done for ESA section 7 consultation, it is generally the management of or effects to the primary constituent elements that are evaluated.

Aquatic Resources

The Hawai`i Stream Assessment (CWRM 1990) appraised perennial streams in the state for water supply, water quality, and natural resource value. One of the indices upon which the streams were rated was aquatic resource value. The aquatic resource rating was based on the absence and abundance of indicator native aquatic organisms, evidence of spawning, and alterations to stream conditions. Streams in the Hilo watershed received rankings of Outstanding, Substantial, Moderate, and Limited; there was no presence of the ranking categories Without and Unknown in the watershed.



Noxious and Invasive Plants

Many plants introduced to Hawai'i have the ability to displace native plants, especially in areas where there is the added pressure of soils being disturbed through human or ungulate activity. In many cases, native landscapes that are displaced by non-native vegetation become less diverse ecosystems, which in turn have been shown to affect soil moisture, sediment and nutrient retention, wildfire resiliency, and native species habitat. Eradication of invasive plants can be exceedingly difficult because the seeds of some plants may persist in the soil for years, requiring diligent management for years following initial removal.

The NRCS Local Work Group has identified noxious weeds as one of four priority resource concerns in East Hawai'i. The 2008 Noxious Weed List compiled by the LWG is provided below. Conservation plans involving active management of these species may be eligible for financial assistance through NRCS programs.

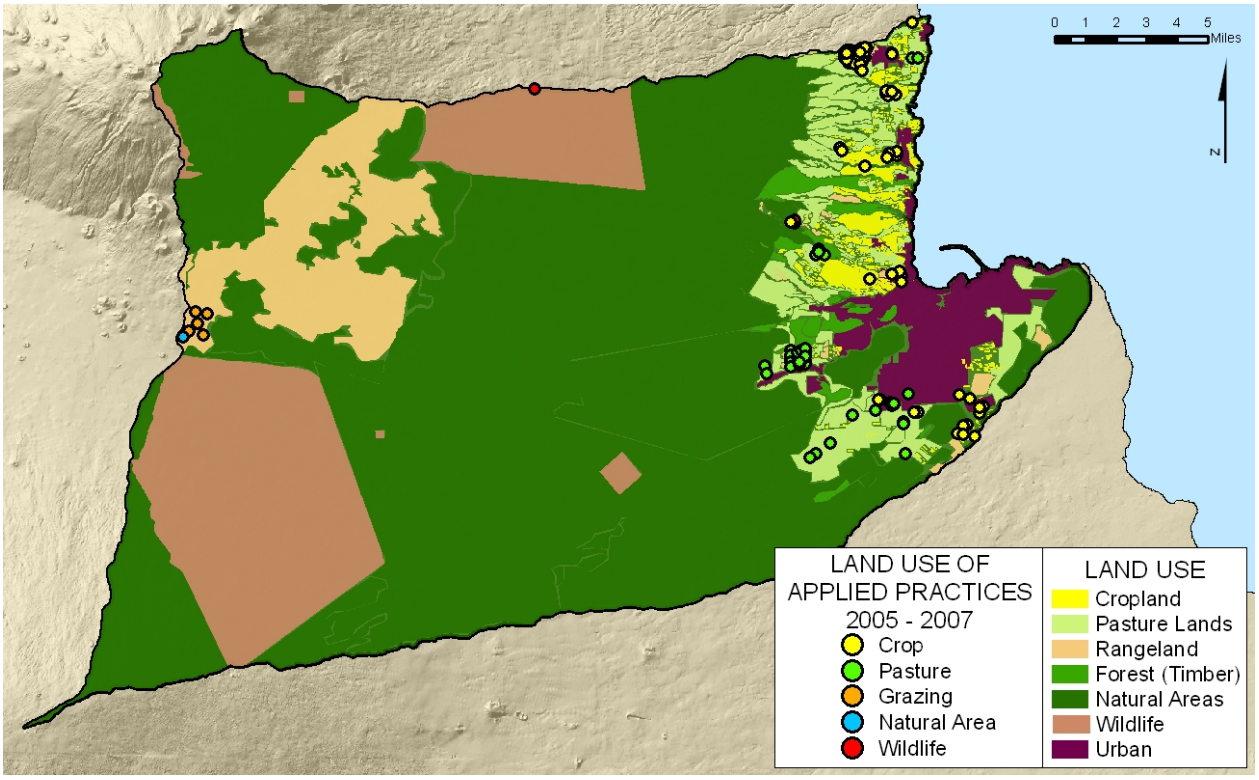
Noxious Weed List

1. Albizia *(Paraserianthes falcataria)*
2. Black Wattle *(Acacia mearnsii)*
3. Broomsedge *(Adnropogon virginicus)*
4. Coffee Senna *(Cassia occidentalis)*
5. Catsclaw *(Caesalpinia decapetala)*
6. Christmasberry *(Schinus terebinthifolius)*
7. Fiddlewood or Juniper Berry *(Citharexylum caudatum)*
8. Firetree or Faya Tree *(Myrica faya)*
9. Gorse *(Ulex europaeus)*
10. Guava *(Psidium guajava)*
11. Indian Fleabane or Sourbush *(Pluchea species)*
12. Ironwood *(Casuarina species)*
13. Koster's Curse *(Clidemia hirta)*
14. Lantana *(Lantana camara)*
15. Madagascar Fireweed *(Senecio madagascariensis)*
16. *Melastoma* species
17. *Rubus* species
18. Silver Oak *(Grevillea robusta)*
19. Waiawi or Strawberry Guava *(Psidium cattleianum)*
20. Ginger

OPPORTUNITIES FOR ADDRESSING RESOURCE CONCERNS

Many public and private landowners and governmental agencies are making efforts to protect resources in the Hilo watershed. As an arm of the US Department of Agriculture, NRCS is especially effective providing farmers and other land managers with technical assistance relating to increasing resource protection while enhancing the productivity of agricultural lands. In some cases, NRCS is able to provide financial cost-share assistance for project development through federally-funded Farm Bill programs.

In the three year period spanning 2005 to 2007, NRCS worked with stakeholders to implement 329 conservation practices in the Hilo watershed. The map below identifies the general location along with the specific land use classification of each project.



The land use category receiving the greatest number of conservation practices was cropland, followed by pasture lands and rangeland. The EQIP Farm Bill program was able to provide financial assistance for 45% of these applied practices, while 55% of the practices received technical assistance alone.

Land Use Classification	2005-2007 Applied Practices							
	Acres Treated		Practice Application Count					
	Total	Avg Ac/Yr	CTA-GNRL	CTA-GLC	EQIP	WHIP	Total	Percentage
Crop / Orchard / Nursery	546	182	144	0	50	0	194	59%
Pasture	469	156	3	16	92	0	111	34%
Rangeland / Grazed Range	598	199	0	3	6	0	9	3%
Industrial Forest	0	0	0	0	0	0	0	0%
Natural Area / Wildlife	25,284	8,428	14	0	0	1	15	5%
Urban / Unclassified	NA	NA	-	-	-	-	0	0%
Total (acres or count)	26,897	8,966	161	19	148	1	329	-
Total (as percentage)	-	-	49%	6%	45%	0%	-	100%

Specific practices installed in the Hilo watershed during the 2005-2007 period are listed in the table below, noting the total count of unique locations as well as the total measure for each land use. The table also provides an indication of which practices may be most effective at addressing the four priority resource concerns identified by the 2008 East Hawai`i Local Work Group. Practices given a rating of high effectiveness are those classified by NRCS as having a Conservation Practice Physical Effects (CPPE) value of 3, 4 or 5, while practices with CPPE values of 1 or 2 are rated as moderately effective.

Conservation Practice	Count of Practice Applications 2005-2007	Applied Amount				High (●) and Moderate (○) Effectiveness			
		Crop	Pasture	Grazed Range	Nat.Area / Wildlife	Soil erosion / sedimen-tation	Insufficient water supply	Noxious weeds	Pesticide / nutrient contamination
Brush Management (314), ac	28	13	123			●	●	●	
Conservation Cover (327), ac	38	207			2	●	●	●	○
Conservation Crop Rotation (328), ac	1	3				●	●	●	●
Contour Orchard (331), ac	4	20				●	○		●
Cover Crop (340), ac	44	385				●	●	●	○
Critical Area Planting (342), ac	2	0				●	●	●	○
Diversion (362), ft	1	282				○	○		
Fence (382), ft	32		56,446	2,787	179,483			●	
Field Border (386), ft	34	66,448				○	●	●	○
Filter Strip (393), ac	25	113					●	●	●
Firebreak (394), ft	1				62,032		●		
Grassed Waterway (412), ac	3	0					●	●	○
Irrigation System, Microirrig. (441), ac	1	3					●	○	●
Irrigation Water Management (449), ac	1	3					●	○	●
Land Clearing (460), ac	1	7					●		
Mulching (484), ac	1	6				●	●	●	○
Nutrient Management (590), ac	2	7	2				●		●
Pasture and Hay Planting (512), ac	13		47			●	●	●	○
Pest Management (595), ac	28	84		492	55,382	●	●	●	
Pipeline (516), ft	11	950	7,025	275			○		
Prescribed Grazing (528), ac	17		258	271		●	●	●	○
Terrace (600), ft	8	5,145				●	○		○
Tree/Shrub Establishment (612), ac	1				3,235	●	●	●	○
Tree/Shrub Site Preparation (490), ac	1				3,235	○	●		○
Upland Wildlife Habitat Mgmt (645), ac	1				25,272	●	●	●	
Use Exclusion (472), ac	1				10	○	●	●	○
Watering Facility (614), no	18		17	3			○		
Windbreak/Shltrblt Estab. (380), ft	11	15,657	261			○	●	●	○

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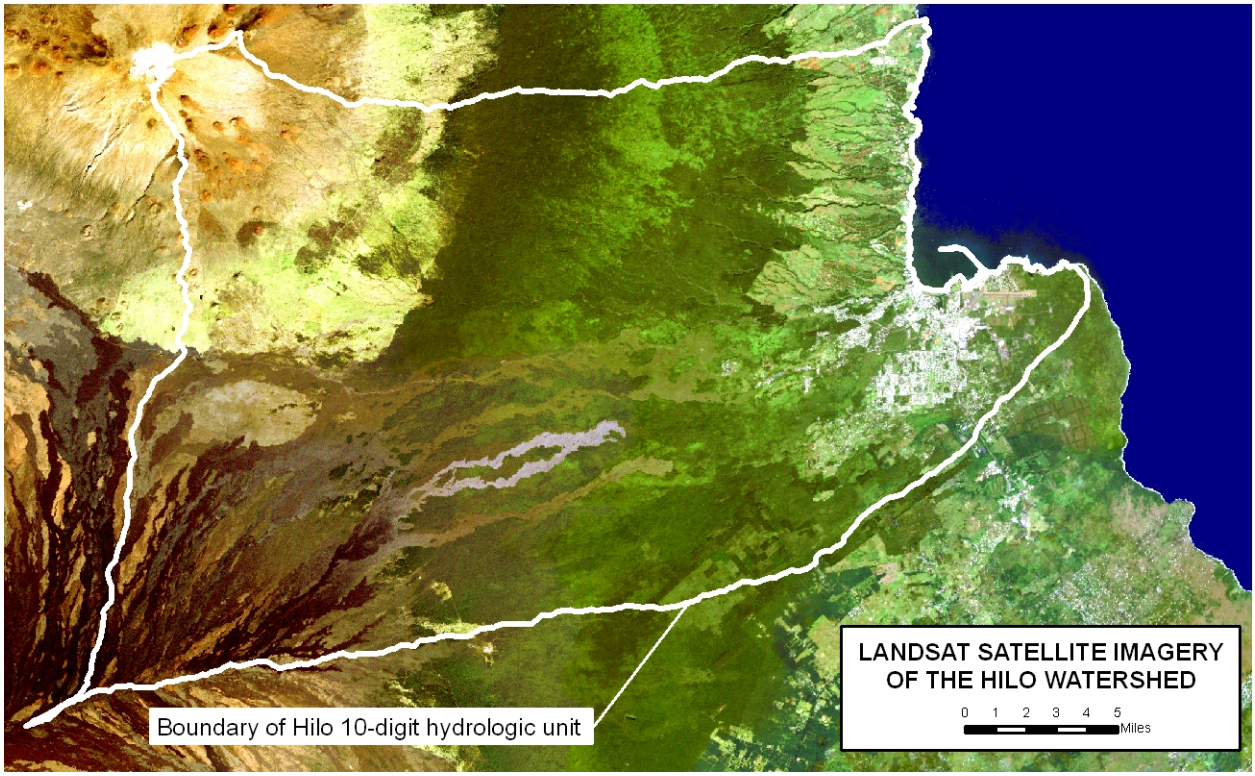
RAPID WATERSHED ASSESSMENT

HILO WATERSHED, HAWAI`I

HYDROLOGIC UNIT CODE (HUC) – 2001000003



PART 2: ASSESSMENT OF CONSERVATION OPPORTUNITIES

This Rapid Watershed Assessment (RWA) was compiled by the US Department of Agriculture Natural Resources Conservation Service (NRCS) to assist local land managers, planners, and others in evaluating opportunities to implement conservation and resource protection measures within the Hilo watershed. This document is the second component of a two-part assessment:

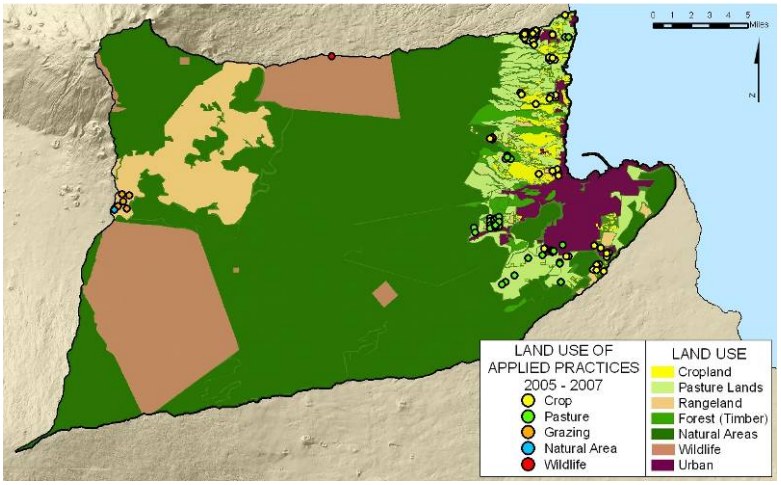
- Part 1, the **Watershed Profile**, is an overview of geographic and social attributes within the watershed, and it summarizes current natural resource conditions that are particularly relevant to management of agricultural and natural lands. A synopsis of NRCS-backed activities completed between 2005 and 2007 provides an indication of resource protection progress as well as prospects for future partnerships in various land-use categories.
- Part 2, the **Assessment of Conservation Opportunities,** provides initial estimates of installation quantities and associated costs for specific measures having strong potential to be implemented during the coming five-year time frame of 2009-2013. The assessment focuses on measures commonly applied by agricultural producers at the management unit level, for which NRCS may be able to provide technical or financial assistance.

An electronic version of this Hilo RWA is available through the NRCS Pacific Islands Area (PIA) web site at http://www.pia.nrcs.usda.gov/technical/rwa.html. Additional Rapid Watershed Assessments completed in Hawai`i, American Samoa and Micronesia can also be found at the site.

ASSESSMENT APPROACH AND ASSUMPTIONS

This five-year opportunity assessment is based largely on conceptualizations of land treatment systems for major land use categories in the watershed. Each system is comprised of approved NRCS conservation practices and management strategies that address identified resource concerns in the watershed. Three levels of land treatment system have been defined:

- Resource Management Systems (RMSs) are packages of interrelated practices and measures meeting all of the soil, water, air, plant and animal resource concerns typically seen within that specific land use in the watershed.
- Progressive Systems are an intermediate treatment level incorporating many, but not all, of the practices or application rates necessary to achieve RMS certification.
- Baseline Systems describe land units with zero or low levels of conservation treatment.



The land treatment systems were defined by local resource experts familiar with current production methods and operations. Consideration was given to the Conservation Practice Physical Effects (CPPE) ratings for individual components and for the total system, adjusted for the amount of practice implementation relative to the RMS. The same group estimated treatment level proportions for each land use category, both for the existing 2008 condition and for conditions in 2013. Assumptions regarding typical application rates, average land unit size, and cost-share potential drew largely from a review of the 329 conservation practices implemented in the Hilo watershed between 2005 and 2007, segregated by land use category.

Land Use Classification	Watershed Area (acres)	2005-2007 Applied Practices							
		Acres Treated		Practice Application Count					
		Total	Avg Ac/Yr	CTA-GNRL	CTA-GLC	EQIP	WHIP	Total	Percentage
Crop / Orchard / Nursery	5,689	546	182	144	0	50	0	194	59%
Pasture	15,292	469	156	3	16	92	0	111	34%
Rangeland / Grazed Range	22,313	598	199	0	3	6	0	9	3%
Industrial Forest	3,601	0	0	0	0	0	0	0	0%
Natural Area / Wildlife	228,702	25,284	8,428	14	0	0	1	15	5%
Urban / Unclassified	25,451	NA	NA	-	-	-	-	0	0%
Total (acres or count)	301,047	26,897	8,966	161	19	148	1	329	-
Total (as percentage)	100%	-	-	49%	6%	45%	0%	-	100%

Land treatment costs over the coming five years have been estimated on the basis of the calculated difference between existing and future practice quantities. These costs have been allocated into two categories, USDA Investment and Cooperator Investment, based on additional information and assumptions that include the following:

- Beginning and Limited Resource Farmers (BLR farmers) receive on average 36% of all EQIP program payments made to farms within the Hilo Field Office service area.
- USDA pays approximately 47% of the total costs of practices involving capital assets, based on review of installed quantities in the Hilo watershed from 2005 to 2007. The value reflects the local prevalence of practices that do not have a cost-share allowance, as well as the affect of differing cost-share payments to standard and BLR farmers.

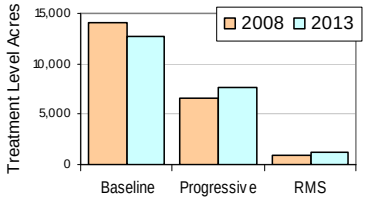
- Practices involving management activities (including vegetative control) assume a 3-year period in which USDA pays 100% of the costs, followed by two years of payment by the producer.
- NRCS resources in the Pacific Islands Area expend approximately $0.67 in Technical Assistance for every $1.00 paid to Financial Assistance, based on PIA budget records for August 2007. This "TA to FA ratio" of 67% is considerably greater than the national average of 20%. Factors contributing to the difference include the diversity of conditions and smaller size of operations common throughout Hawai`i; higher travel and administrative costs associated with the geographic separation of Hawaii's five main islands; and the remoteness from mainland activities and supplies.
- Total costs for the five-year time frame have been adjusted to present value costs using an assumed rate of return of 4.88%.

Participation in voluntary resource conservation programs is influenced by a multitude of factors, including some with significant variation in Hawai`i: farm ownership versus leasing; inter-generational transfer versus beginning farmer; education level; and immigrant status. NRCS ability to provide timely technical assistance may also affect participation. For the purposes of this Rapid Water Assessment, participation rates are estimated based on the five-year projection of land treatment acres relative to the total acres eligible for treatment.

SUMMARY OF LAND USE ASSESSMENTS

The following pages assess conservation opportunities for four major land use groups in the Hilo watershed: cropland, pasture, timber, and natural areas. Each assessment provides a brief overview of land treatment conditions and resource concerns for the specific land use. Estimated practice quantities and implementation costs reflect anticipated activities on lands eligible for NRCS cost-share programs. Costs for infrastructure improvements, resource inventories, emergency response, or public lands construction are not within the scope of this analysis.

Results of the individual land use assessments suggest roughly 1,650 acres in the Hilo watershed may undergo conservation treatment over the next five years. This effort represents a participation rate of 8%, based on an estimated 21,620 acres of land eligible for cost-share programs. Approximately 41% of eligible lands will at Progressive or RMS treatment levels.



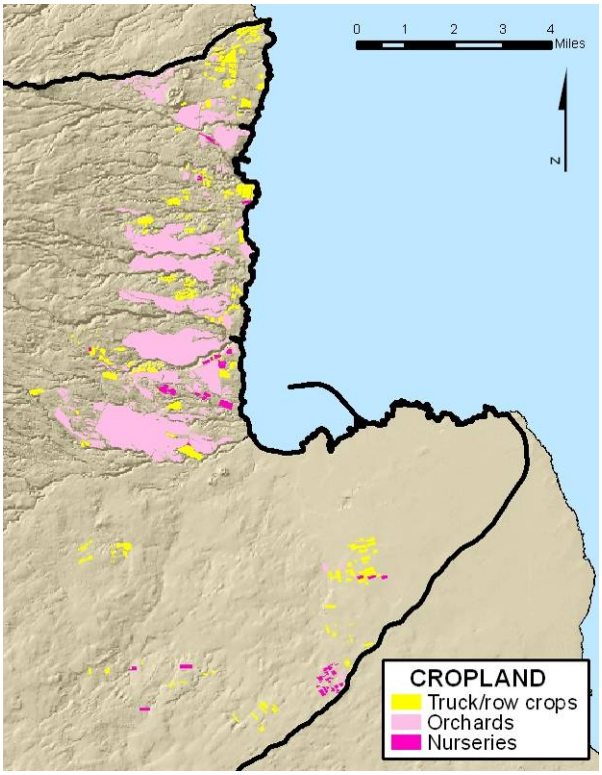
Over $4.1 million in funding resources is necessary to achieve these land treatment opportunities. Recent participation in cost-share programs suggests the cooperating land managers are willing to invest nearly $1.5 million, while USDA will need to contribute $2.6 million. This level of treatment will require roughly 2.2 full-time equivalents in staff resources each year for five years, in order to achieve the full array of the planning, design, and reporting services that accompany conservation plan implementation.

Estimated Opportunities and Costs, 2009-2013

Land Use	Acres Treated	Participation	Total Present Value Costs		Annual Staffing Need (Full-Time Equivalents)
			Cooperating Land Manager Investment	USDA Technical and Financial Investment	
Cropland / Orchards	560	12%	$690,000	$1,068,000	0.9
Pasture	880	9%	$290,000	$542,000	0.4
Industrial Forest	120	12%	$331,000	$596,000	0.5
Natural Area / Wildlife	90	2%	$185,000	$427,000	0.4
Total	1,650	11%	$1,496,000	$2,633,000	2.2

CROPLAND

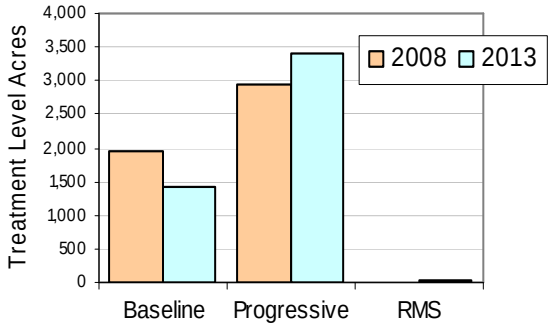
Three quarters of the 5,700 acres of cropland in the Hilo watershed is in macadamia nut and fruit orchards, with an array of truck crops and nursery products coming from the remaining quarter. There is estimated conservation opportunity on 4,880 acres, reflecting the small private holdings making up 61% of cropland ownership along with a portion of lands leased from major landowners or operated by large producers.



The primary resource concerns for Hilo cropland is typically:

- Soil Erosion - Sheet and Rill
- Water Quality - Excessive Suspended Sediment in Surface Water
- Water Quality - Excessive Nutrients and Organics in Surface Water
- Plant Condition - Productivity, Health and Vigor

The baseline condition for most Hilo cropland consists of nominal amounts of windbreak and conservation cover, yielding CPPE system ratings of 0 for all resource concerns (see first table on next page). RMS systems will typically achieve a CPPE system rating to 5 by incorporating contour orchards and terracing; pest and nutrient management; grassed waterways and critical area plantings; as well as implementing additional conservation cover and windbreaks. Progressive systems commonly conduct all the same practices as an RMS system, but at considerably lesser amounts. At present, 60% of Hilo cropland is estimated to have adopted a sufficient number of conservation practices to qualify as Progressive systems. There are no known examples of RMS systems.



Between 2005 and 2007, NRCS helped address resource concerns by facilitating the installation of 194 conservation practices on 546 acres of cropland. The EQIP program provided funding assistance for 26% percent of the applied cropland practices, and the remaining 74% were implemented through the CTA program.

In the coming five years, NRCS sees opportunity to treat approximately 560 acres of cropland, with 49 of those acres fully developed to the RMS level. The total budget needed to achieve this progress is $1.8 million, based on estimated quantities of construction materials and management activities (see middle and lower tables on next page). USDA investment would provide approximately $1.1 million, including technical assistance for planning, design and program administration at a rate equivalent to 0.9 full-time staff each year. The effort will result in a Progressive or RMS rating for 71% of all cropland in the watershed.

Opportunities 2009-2013	
Treatment Acres	560
Participation	12%
Present Value Costs	(millions)
USDA Investment	$1.1
Private Investment	$0.7
Total	$1.8

Treatment Level System Composition and CPPE Rating for Conservation Practices and Systems

Conservation Practice / Treatment Level System	TREATMENT LEVEL			CPPE RATING BY RESOURCE CONCERN				COST-SHARE POTENTIAL		
	Baseline	Progres-sive	RMS	Soil Erosion - Sheet and Rill	Water Quality - Excessive Suspended Sediment in	Water Quality - Excessive Nutrients and Organics in	Plant Condition - Productivity, Health and Vigor	EQIP	WHIP	WRP
Conservation Practice										
Contour Orchard (331)		X	X	3	3	3	1	X		
Conservation Cover (327)	X	X	X	5	3	2	4	X	X	X
Pest Management (595)		X	X	3	3	0	5	X	X	X
Nutrient Management (590)		X	X	0	0	5	3	X		
Filter Strip (393)		X	X	0	5	5	5	X		
Grassed Waterway (412)		X	X	0	2	2	5	X		
Critical Area Planting (342)		X	X	5	4	2	5	X	X	X
Windbreak Estab. (380)	X	X	X	1	2	1	5	X	X	X
Field Border (386)		X	X	1	3	2	5			
Terrace (600)		X	X	5	3	2	2	X		
Diversion (362)		X	X	1	2	0	2	X		
Treatment Level System Rating										
Baseline	-	-	-	0	0	0	0	-	-	-
Progressive	-	-	-	0	0	0	1	-	-	-
RMS	-	-	-	5	5	5	5	-	-	-

Existing (2008) and Future (2013) Estimated Treatment Level Acreage and Practice Quantities

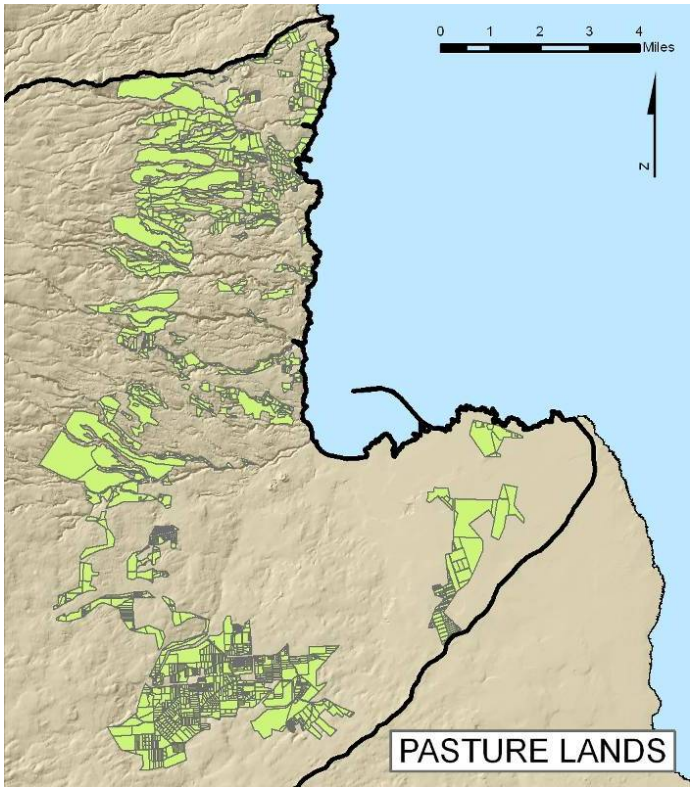
Area per Treatment Level / Conservation Practice Quantity		EXISTING CONDITIONS			FUTURE CONDITIONS			Installation Quantity
		Baseline	Progressive	RMS	Baseline	Progressive	RMS	
Area per Treatment Level	ac	1,951	2,927	0	1,415	3,415	49	560
Contour Orchard (331)	ac	0	73	-	0	85	5	17
Conservation Cover (327)	ac	366	823	-	265	960	37	73
Pest Management (595)	ac	0	1,098	-	0	1,281	49	232
Nutrient Management (590)	ac	0	1,098	-	0	1,281	49	232
Filter Strip (393)	ac	0	8	-	0	9	2	3
Grassed Waterway (412)	ac	0	58	-	0	67	8	17
Critical Area Planting (342)	ac	0	7	-	0	9	1	2
Windbreak Estab. (380)	ft	5,205	195,183	-	3,774	227,714	13,012	44,111
Field Border (386)	ft	0	836	-	0	976	186	325
Terrace (600)	ft	0	33,460	-	0	39,037	3,718	9,294
Diversion (362)	ft	0	3,346	-	0	3,904	1,115	1,673

Estimated Treatment Costs 2009-2013

Conservation Practice	USDA INVESTMENT				PRIVATE INVESTMENT		
	Capital Costs @ 47%	Mgmt Costs: Years 1-3	Technical Assistance @ 67%	Total Present Value Cost	Capital Costs @ 53%	Annual O&M + Mgt Costs	Total Present Value Cost
Contour Orchard (331)	$0	$5,122	$3,432	$8,093	$0	$1,707	$2,757
Conservation Cover (327)	$27,685	$0	$18,549	$46,234	$31,220	$1,767	$38,897
Pest Management (595)	$0	$156,411	$104,795	$247,111	$0	$52,137	$84,193
Nutrient Management (590)	$0	$86,895	$58,220	$137,284	$0	$28,965	$46,774
Filter Strip (393)	$1,279	$0	$857	$2,136	$1,442	$82	$1,797
Grassed Waterway (412)	$293,687	$0	$196,770	$490,457	$331,179	$12,497	$385,473
Critical Area Planting (342)	$873	$0	$585	$1,458	$984	$56	$1,226
Windbreak Estab. (380)	$45,197	$0	$30,282	$75,478	$50,966	$4,808	$71,855
Field Border (386)	$459	$0	$307	$766	$517	$10	$560
Terrace (600)	$29,137	$0	$19,522	$48,659	$32,857	$1,240	$38,243
Diversion (362)	$6,290	$0	$4,215	$10,505	$7,094	$2,677	$18,723
Total Estimated Costs	$404,607	$248,428	$437,533	$1,068,180	$456,259	$105,946	$690,498

PASTURE

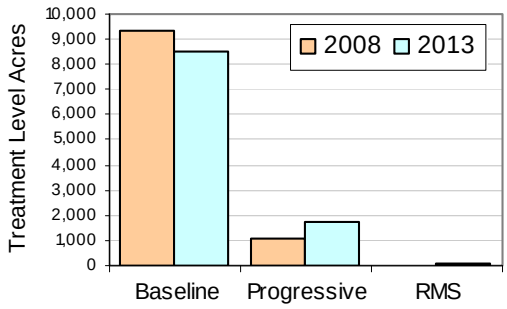
Hilo watershed land use includes more than 15,000 acres of pasture, all located in lower elevations of the watershed. This assessment evaluates the conservation opportunity on 10,400 acres, comprised predominantly of private lands with a smaller land-base. As in the past, some of the future opportunity is expected to involve lands leased from the State or from major landowners, or direct technical assistance to the large landowners.



Primary resource concerns for Hilo pasture lands are commonly:

- Soil Erosion – Sheet and Rill
- Plant Condition – Noxious and Invasive Plants
- Domestic Animals – Inadequate Stock Water
- Domestic Animals – Inadequate Quantities and Quality of Feed and Forage

Existing conditions for most Hilo pasture lands entails perimeter fencing, a single watering faculty, and nominal activity for prescribed grazing and brush management, yielding CPPE system ratings of 0. The addition of RMS practices for pest management, pasture planting, associated nutrient management, and wind breaks, as well adding additional cross fencing and watering facilities, raise the CPPE system ratings to 4 and 5 (see first table to the right).



Progressive systems have lesser amounts of the RMS practices, resulting in CPPE system ratings of 1. At present, 10% of Hilo pasture lands are estimated to have adopted sufficient number of conservation practices to qualify as Progressive systems. There are no known examples of RMS systems.

Between 2005 and 2007, NRCS helped address resource concerns by facilitating the installation of 111 conservation practices on 469 acres of pasture land. Eighty-three percent of the applied practices obtained funds through the EQIP program.

In the coming five years, NRCS sees opportunity to bring approximately 778 acres to the Progressive level and 104 acres to RMS, reflecting a participation rate of roughly 9%. Estimated quantities of construction materials and management activities suggest a need for $0.8 million to implement the practices. Approximately $0.5 million would derive from USDA sources, including technical assistance for planning, design and program administration activities equivalent to 0.4 full-time staff each year. The effort will result in a Progressive or RMS rating for 18% of all pasture in the watershed.

Opportunities 2009-2013	
Treatment Acres	882
Participation	9%
Present Value Costs	(millions)
USDA Investment	$0.5
Private Investment	$0.3
Total	$0.8

Treatment Level System Composition and CPPE Rating for Conservation Practices and Systems

Conservation Practice / Treatment Level	TREATMENT LEVEL			CPPE RATING BY RESOURCE CONCERN				COST-SHARE POTENTIAL		
	Baseline	Progres-sive	RMS	Plant Condition - Noxious and Invasive Plants	Soil Erosion - Sheet and Rill	Domestic Animals - Inadequate Stock Water	Domestic Animals - Inadequate Quantities of Feed	EQIP	WHIP	WRP
Conservation Practice										
Prescribed Grazing (528)	X	X	X	4	4	0	5	X		
Brush Management (314)	X	X	X	4	3	0	4	X	X	X
Pest Management (595)		X	X	5	3	0	4	X	X	X
Pasture/Hay Planting (512)		X	X	4	4	0	5	X		
Nutrient Management (590)		X	X	0	0	2	4	X		
Fence (382)	X	X	X	3	0	0	1	X	X	X
Windbreak/Shltr. Estab. (380)		X	X	4	1	0	1	X	X	X
Pipeline (516)	X	X	X	0	0	5	0	X	X	X
Watering Facility (614)	X	X	X	0	0	5	3	X		
Treatment Level System Rating										
Baseline	-	-	-	0	0	0	0	-	-	-
Progressive	-	-	-	1	0	1	1	-	-	-
RMS	-	-	-	5	4	4	5	-	-	-

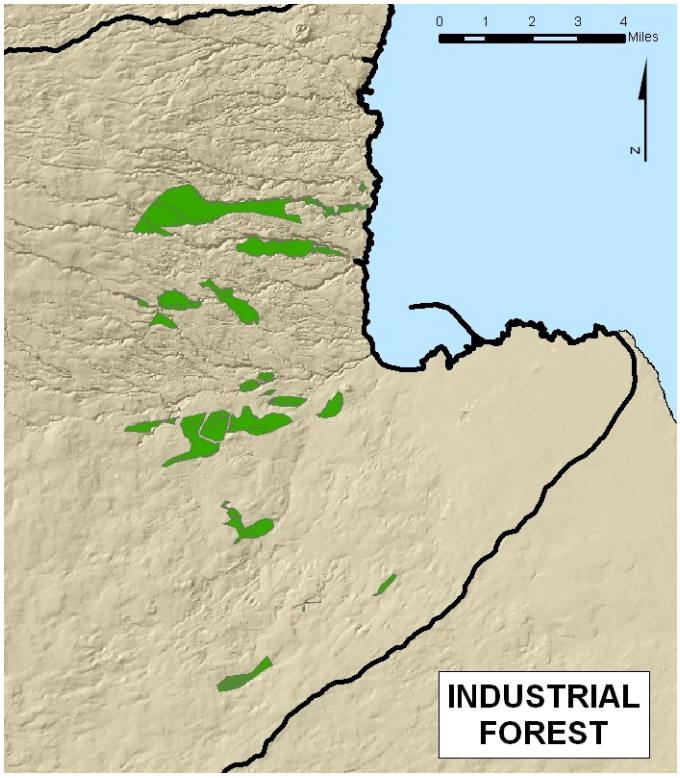
Existing (2008) and Future (2013) Estimated Treatment Level Acreage and Practice Quantities

Area per Treatment Level / Conservation Practice Quantity		EXISTING CONDITIONS			FUTURE CONDITIONS			Installation Quantity
		Baseline	Progressive	RMS	Baseline	Progressive	RMS	
Area per Treatment Level	ac	9,335	1,037	0	8,506	1,763	104	882
Prescribed Grazing (528)	ac	467	259	-	425	441	104	244
Brush Management (314)	ac	78	131	-	71	222	44	128
Pest Management (595)	ac	0	56	-	0	95	19	58
Pasture/Hay Planting (512)	ac	0	49	-	0	83	33	67
Nutrient Management (590)	ac	0	49	-	0	83	33	67
Fence (382)	ft	174,270	48,408	-	158,780	82,294	19,363	37,759
Windbreak/Shltr. Estab. (380)	ft	0	1,210	-	0	2,057	2,420	3,268
Pipeline (516)	ft	65,351	32,676	-	59,542	55,549	7,261	24,325
Watering Facility (614)	no	292	58	-	266	99	13	28

Estimated Treatment Costs 2009-2013

Conservation Practice	USDA INVESTMENT				PRIVATE INVESTMENT		
	Capital Costs @ 47%	Mgmt Costs: Years 1-3	Technical Assistance @ 67%	Total Present Value Cost	Capital Costs @ 53%	Annual O&M + Mgt Costs	Total Present Value Cost
Prescribed Grazing (528)	$0	$28,520	$19,108	$45,058	$0	$9,507	$15,352
Brush Management (314)	$0	$106,052	$71,055	$167,549	$0	$35,351	$57,086
Pest Management (595)	$0	$39,069	$26,176	$61,724	$0	$13,023	$21,030
Pasture/Hay Planting (512)	$26,067	$0	$17,465	$43,531	$29,394	$1,664	$36,623
Nutrient Management (590)	$0	$25,118	$16,829	$39,684	$0	$8,373	$13,521
Fence (382)	$79,859	$0	$53,506	$133,365	$90,054	$3,398	$104,818
Windbreak/Shltr. Estab. (380)	$3,348	$0	$2,243	$5,591	$3,775	$356	$5,323
Pipeline (516)	$21,608	$0	$14,477	$36,086	$24,367	$919	$28,361
Watering Facility (614)	$5,595	$0	$3,748	$9,343	$6,309	$357	$7,860
Total Estimated Costs	$136,477	$198,759	$224,608	$541,931	$153,899	$72,948	$289,973

INDUSTRIAL FOREST

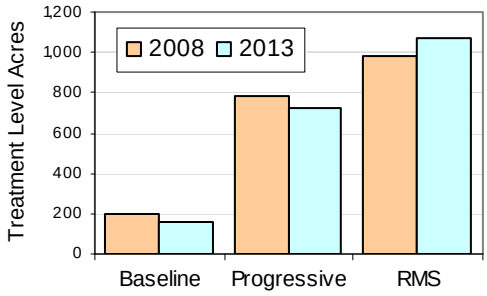


The Hilo watershed has approximately 3,600 acres of forested land covered by exotic hardwoods or native koa stands appropriate for timber production. An estimated 1,955 acres has strong potential for conservation treatment, reflecting 1,200 acres of private holdings along with an assumed portion of lands leased from major landowners or operated by large producers.

The primary resource concerns for Hilo industrial forests are commonly:

- Soil Erosion - Sheet and Rill
- Plant Condition - Noxious and Invasive Plants
- Plant Condition - Productivity, Health and Vigor
- Soil Condition - Compaction

For the purposes of this assessment, the baseline condition for Hilo industrial forests is assumed to be an established stand of timber, generally untended since closure of the last mill in the Hilo area. An estimated 10% of watershed industrial forest land is in this condition, and it has a CPPE system rating of 0 for all resource concerns (see first table to the right). RMS treatment typically conducts practices for forest stand improvement and pest management; prepares new inventory through deep tillage, forest site preparation, and tree/shrub establishment; and controls water conditions through diversions and grassed waterways. Progressive treatment commonly implements all the same practices as an RMS system, at roughly half the fully-prescribed rate. System ratings for RMS treatment range from 3 to 5, depending on the resource concern, and they range from 1 to 3 for Progressive treatment. At present, 40% of Hilo industrial forest is estimated to be at the Progressive treatment level and 50% at the RMS level.



Industrial forest development is gaining momentum in Hawai`i. While there were no cases of industrial forest conservation plan development in the Hilo watershed between 2005 and 2007, NRCS foresees the opportunity to treat approximately 117 acres in the coming five years. An estimated 98 acres of that amount will convert Baseline or Progressive lands to the RMS level. The total budget needed to achieve this progress is $920,000, based on estimated quantities of construction materials and management activity. USDA investment would provide approximately $600,000, including technical assistance for planning, design and program administration at a rate equivalent to 0.5 full-time staff each year. The effort will result in a Progressive or RMS rating for 92% of all industrial forest in the watershed.

Opportunities 2009-2013	
Treatment Acres	117
Participation	12%
Present Value Costs	(millions)
USDA Investment	$0.6
Private Investment	$0.3
Total	$0.9

Treatment Level System Composition and CPPE Rating for Conservation Practices and Systems

Conservation Practice / Treatment Level System	TREATMENT LEVEL			CPPE RATING BY RESOURCE CONCERN				COST-SHARE POTENTIAL		
	Baseline	Progres-sive	RMS	Soil Erosion - Sheet and Rill	Plant Condition - Noxious and Invasive Plants	Plant Condition - Productivity, Health and Vigor	Soil Condition - Compaction	EQIP	WHIP	WRP
Conservation Practice										
Forest Stand Imp. (666)		X	X	-2	4	5	-2			X
Pest Management (595)		X	X	3	5	5	2	X	X	X
Forest Site Prep. (490)		X	X	-1	4	5	-1	X	X	X
Tree/Shrub Estab. (612)		X	X	5	4	5	2	X	X	X
Deep Tillage (324)		X	X	2	-1	3	5	X		
Grassed Waterway (412)		X	X	0	4	5	0	X		
Diversion (362)		X	X	1	0	2	0	X		
Treatment Level System Rating										
Baseline	-	-	-	0	0	0	0	-	-	-
Progressive	-	-	-	1	3	3	1	-	-	-
RMS	-	-	-	3	4	5	3	-	-	-

Existing (2008) and Future (2013) Estimated Treatment Level Acreage and Practice Quantities

Area per Treatment Level / Conservation Practice Quantity		EXISTING CONDITIONS			FUTURE CONDITIONS			Installation Quantity
		Baseline	Progressive	RMS	Baseline	Progressive	RMS	
Area per Treatment Level	ac	195	782	977	156	723	1,075	117
Forest Stand Imp. (666)	ac	0	391	977	0	362	1,075	68
Pest Management (595)	ac	0	391	977	0	362	1,075	68
Forest Site Prep. (490)	ac	0	391	977	0	362	1,075	68
Tree/Shrub Estab. (612)	ac	0	391	977	0	362	1,075	68
Deep Tillage (324)	ac	0	195	489	0	181	538	34
Grassed Waterway (412)	ac	0	23	59	0	22	65	4
Diversion (362)	ft	0	3,649	9,123	0	3,375	10,035	639

Estimated Treatment Costs 2009-2013

Conservation Practice	USDA INVESTMENT				PRIVATE INVESTMENT		
	Capital Costs @ 47%	Mgmt Costs: Years 1-3	Technical Assistance @ 67%	Total Present Value Cost	Capital Costs @ 53%	Annual O&M + Mgt Costs	Total Present Value Cost
Forest Stand Imp. (666)	$37,430	$0	$25,078	$62,507	$42,208	$0	$42,208
Pest Management (595)	$0	$46,182	$30,942	$72,961	$0	$15,394	$24,859
Forest Site Prep. (490)	$0	$164,201	$110,015	$259,418	$0	$54,734	$88,386
Tree/Shrub Estab. (612)	$47,559	$0	$31,864	$79,423	$53,630	$5,059	$75,611
Deep Tillage (324)	$983	$0	$659	$1,642	$1,109	$0	$1,109
Grassed Waterway (412)	$69,756	$0	$46,736	$116,492	$78,661	$2,968	$91,556
Diversion (362)	$2,401	$0	$1,609	$4,010	$2,708	$1,022	$7,147
Total Estimated Costs	$158,129	$210,382	$246,902	$596,454	$178,315	$79,177	$330,875

NATURAL AREA / WILDLIFE

The Hilo watershed includes more than 226,000 acres meeting the NRCS land use definitions of Natural Area or Wildlife. Much of this land lies within the system of reserves, sanctuaries and parks operated by state and federal agencies. This assessment evaluates the conservation potential on 3,400 acres of identified private lands along with 1,000 acres that reflect opportunity involving leased lands or direct technical assistance to State, local, and Adjusted Gross Income-excluded entities.

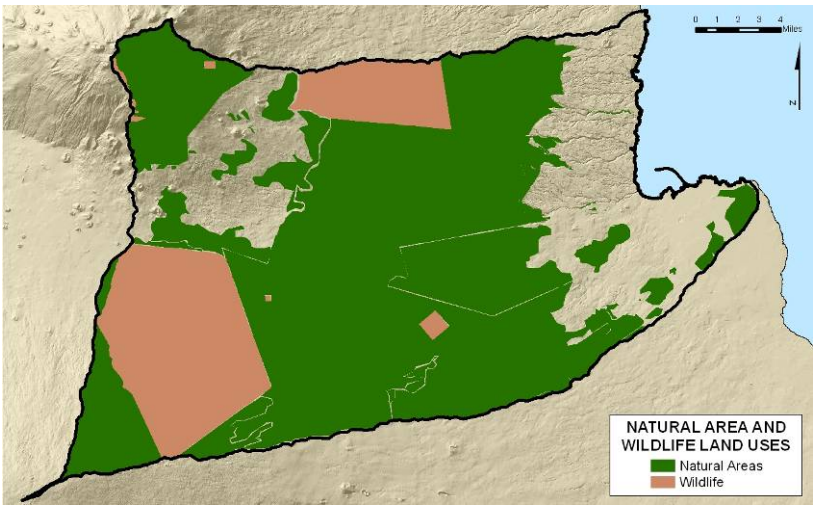
Primary resource concerns for Hilo lands dedicated to wildlife and natural area management are commonly:

Fish and Wildlife -

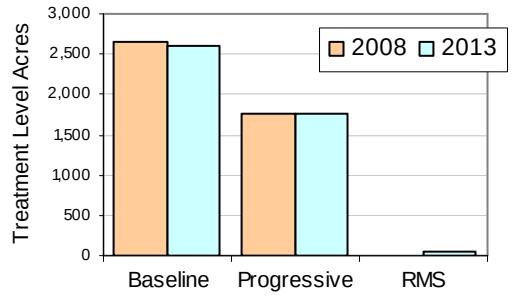
- T&E Species: Declining Species, Species of Concern
- Threatened and Endangered Fish and Wildlife Species

Plant Condition -

- T&E Plant Species: Declining Species, Species of Concern
- Plant Condition - Threatened and Endangered Plant Species



The baseline condition for most Hilo natural area and wildlife lands consists of nominal amounts of fencing, brush management and pest management. These practices reflect efforts to restrict movement of feral ungulates, limit encroachment of invasive plants such as gorse and waiawi, and reduce risk of wildfire; with these limited offenses, however, the baseline conditions yield CPPE system ratings of 0 for all resource concerns (see first table to the right). RMS systems will typically achieve a CPPE system rating to 5 by incorporating upland or wetland wildlife habitat management; restoration practices such as forest site preparation, tree/shrub establishment, and critical area planting; use exclusion, fuel breaks, and ponds. Progressive systems commonly implement all the same practices as an RMS system, but at considerably lesser amounts. At present, 40% of the natural area and wildlife lands in Hilo are estimated to have adopted sufficient number of conservation practices to qualify as Progressive systems. There are no known existing cases of RMS treatment, though there is progress being made towards plan completion.



Between 2005 and 2007, NRCS facilitated the installation of 15 conservation practices on natural area and wildlife lands, including a partnership effort providing technical assistance for practice implementation on 25,500 acres in the Hakalau refuge. In the coming five years, NRCS sees a more typical opportunity to treat 88 acres, half of it to the RMS level. Estimated quantities of materials suggest a need for $0.6 million to implement the practices. Approximately $0.4 million would derive from USDA sources, including planning, design and program administration activities equivalent to 0.4 full-time staff each year. The effort will result in a Progressive or RMS rating for 41% of the assessed natural area and wildlife lands.

Opportunities 2009-2013	
Treatment Acres	88
Participation	2%
Present Value Costs	(millions)
USDA Investment	$0.4
Private Investment	$0.2
Total	$0.6

Treatment Level System Composition and CPPE Rating for Conservation Practices and Systems

Conservation Practice / Treatment Level System	TREATMENT LEVEL			CPPE RATING BY RESOURCE CONCERN				COST-SHARE POTENTIAL		
	Baseline	Progres-sive	RMS	Fish / Wildlife Species: Declining / SOC	Threatened and Endangered Fish / Wildlife Species	Plant Species: Declining / SOC	Threatened and Endangered Plant Species	EQIP	WHIP	WRP
Conservation Practice										
Upland Wldlf HabMgmt (645)		X	X	5	5	5	5	X	X	X
Wetland Wldlf HabMgmt (644)		X	X	5	5	5	5	X	X	X
Brush Management (314)	X	X	X	3	3	3	0	X	X	X
Pest Management (595)	X	X	X	5	5	5	5	X	X	X
Forest Site Prep. (490)		X	X	0	0	0	0	X	X	X
Tree/Shrub Estab. (612)		X	X	5	5	5	5	X	X	X
Critical Area Planting (342)		X	X	0	0	1	1	X	X	X
Use Exclusion (472)		X	X	5	5	5	5			
Fuel Break (383)		X	X	3	3	3	3	X	X	X
Fence (382)	X	X	X	3	3	0	0	X	X	X
Pond (378)		X	X	5	5	0	0	X	X	X
Treatment Level System Rating										
Baseline	-	-	-	0	0	0	0	-	-	-
Progressive	-	-	-	3	3	3	3	-	-	-
RMS	-	-	-	5	5	5	5	-	-	-

Existing (2008) and Future (2013) Estimated Treatment Level Acreage and Practice Quantities

Area per Treatment Level / Conservation Practice Quantity		EXISTING CONDITIONS			FUTURE CONDITIONS			Installation Quantity
		Baseline	Progressive	RMS	Baseline	Progressive	RMS	
Treatment Level Acres	ac	2,651	1,768	0	2,607	1,768	44	88
Upland Wldlf HabMgmt (645)	ac	0	840	-	0	840	42	42
Wetland Wldlf HabMgmt (644)	ac	0	53	-	0	53	2	2
Brush Management (314)	ac	133	530	-	130	530	22	20
Pest Management (595)	ac	159	636	-	156	636	27	24
Forest Site Prep. (490)	ac	0	265	-	0	265	22	22
Tree/Shrub Estab. (612)	ac	0	265	-	0	265	22	22
Critical Area Planting (342)	ac	0	53	-	0	53	4	4
Use Exclusion (472)	ac	0	9	-	0	9	2	2
Fuel Break (383)	ac	0	44	-	0	44	11	11
Fence (382)	ft	74,244	247,480	-	73,006	247,480	12,374	11,137
Pond (378)	no	0	11	-	0	11	1	1

Estimated Treatment Costs 2009-2013

Conservation Practice	USDA INVESTMENT				PRIVATE INVESTMENT		
	Capital Costs @ 47%	Mgmt Costs: Years 1-3	Technical Assistance @ 67%	Total Present Value Cost	Capital Costs @ 53%	Annual O&M + Mgt Costs	Total Present Value Cost
Upland Wldlf HabMgmt (645)	$0	$56,674	$37,972	$89,539	$0	$18,891	$30,507
Wetland Wldlf HabMgmt (644	$0	$3,579	$2,398	$5,655	$0	$1,193	$1,927
Brush Management (314)	$0	$16,465	$11,032	$26,013	$0	$5,488	$8,863
Pest Management (595)	$0	$16,107	$10,792	$25,448	$0	$5,369	$8,670
Forest Site Prep. (490)	$0	$53,029	$35,529	$83,779	$0	$17,676	$28,544
Tree/Shrub Estab. (612)	$15,359	$0	$10,291	$25,650	$17,320	$1,634	$24,418
Critical Area Planting (342)	$1,757	$0	$1,177	$2,934	$1,981	$112	$2,468
Use Exclusion (472)	$0	$127	$85	$201	$0	$42	$68
Fuel Break (383)	$0	$73,975	$49,563	$116,872	$0	$24,658	$39,819
Fence (382)	$23,554	$0	$15,781	$39,335	$26,561	$1,002	$30,915
Pond (378)	$6,984	$0	$4,679	$11,663	$7,875	$297	$9,166
Total Estimated Costs	$47,654	$219,957	$179,299	$427,088	$53,737	$76,365	$185,367

NEXT STEPS

MOVING TOWARD STRATEGIC WATERSHED IMPLEMENTATION

Conservation implementation on a watershed scale is most effective when conducted as an inclusive partnership. Private and public landowners; residents, community organizations and special interest groups; local, state and federal agencies: all these groups are stakeholders in the resources of the watershed. Partnerships able to engage all of these groups in a local watershed planning process have the opportunity to develop a strategy that balances resource needs and community objectives with the availability of technical and financial assistance from a variety of sources.

This RWA was created with the intent of being one building block that might be used in development of a watershed implementation strategy. The RWA focuses on natural resource conditions and concerns expressed by members and professionals of the local agricultural community. Efforts are made to describe conservation opportunities that reflect the unique characteristics of the watershed, including its specific land uses, social context, and needs. As conditions change or new information is learned, NRCS may generate revised estimates of conservation opportunity for agriculture-related lands.

The information in this assessment, combined with information from other watershed partners, may serve as a starting point for discussions on how to focus efforts and allocate resources for the greatest overall benefit to watershed health. Logical next steps might involve partner collaboration to characterize existing watershed conditions in greater detail, as a means to better prioritize needs and define objectives. Moving through these steps, the partnership can be positioned to develop a watershed implementation strategy that encourages cooperative involvement and investment from a number of watershed stakeholders.