



SECTION 3. STATE PROFILE

2018 HMP UPDATE CHANGES

- ❖ The 2013 HMP did not include a State Profile section. Information from several sections of the 2013 HMP was aggregated into the new State Profile including portions of the 2013 HMP Land Use and Development Chapter and Risk Assessment Chapter.
- ❖ All data presented was updated as appropriate including demographic information and land use and development statistics.
- ❖ Sections were added and expanded to provide additional context for understanding mitigation and risk within the State and to frame the Risk Assessment presented in Section 4 of the 2018 HMP Update.
- ❖ All mapping was updated using the best available data.

3.1 Geographic Overview

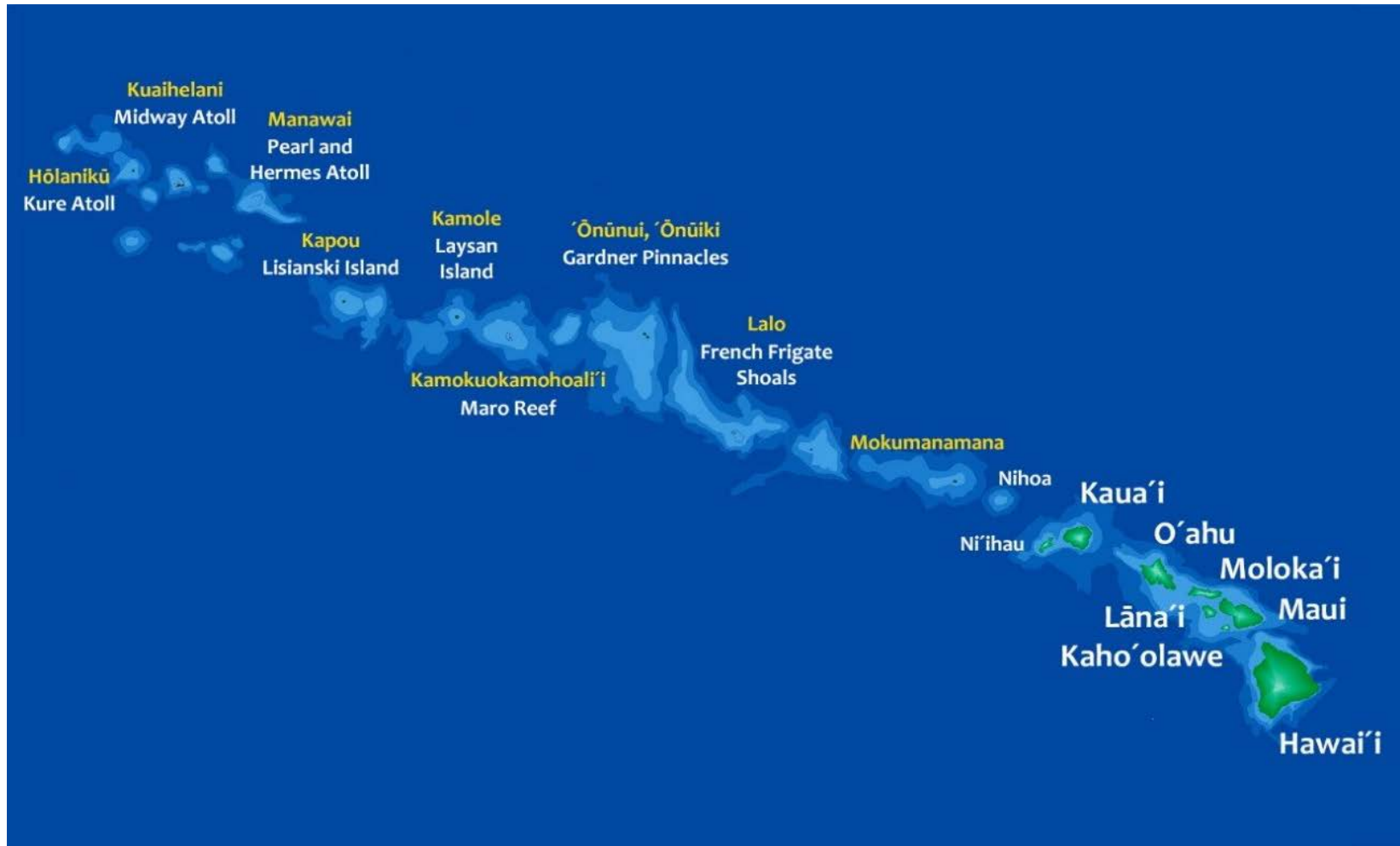
The Hawaiian Archipelago, located about 2,400 miles southwest of the continental United States, is comprised of 132 volcanic islands, atolls, reef, and shoals extending in an east-to-west direction across the northern Pacific Ocean between 19 and 22 degrees north latitude (Juvik and Juvic 1998, as cited in the 2013 HMP). The Hawaiian Islands cover 10,932 square miles, with eight main islands located at the southeastern end of the island chain: Ni'ihau, Kaua'i, O'ahu, Moloka'i, Lāna'i, Kaho'olawe, Maui, and Hawai'i. The remaining islands, atolls, and shoals are known as the Northwestern Hawaiian Islands and form part of the Papahānaumokuākea Marine National Monument created in June 2006 (State of Hawai'i HMP 2013). The general features of the State can be seen in Figure 3.2-1 3-1.

3.2 Historic Overview

The Hawaiian Islands were first settled approximately 1,500 years ago when Polynesians traveled more than 2,000 miles by canoe, from the Marquesas Islands to the Island of Hawai'i (Hawai'i Tourism Authority 2018). Hawaiian society was highly stratified with the mō'i, or king, acting as the highest authority and ali'i, or chiefs, below this highest level. Ancient Hawaiians divided land using the ahupua'a system, a complex land division system where whole islands, or moku, were divided into smaller, wedge-shaped segments running from the mountain crest to the shore (Hawai'iHistory.org 2018). The first westerners to arrive in the Islands was Captain James Cook and his crew in 1778. Not long after in 1810, King Kamehameha conquered all other rulers and the entire archipelago was united into one kingdom. In 1820 Christian missionaries arrived followed by traders and whalers who brought diseases that devastated the Native Hawaiian populations (Smithsonian.com 2007). The first sugar plantation was established on the Island of Kaua'i in 1835 and agriculture became a dominant part of the Hawaiian economy. In 1893 Queen Lili'uokalani was placed under house arrest and the overthrow of the Kingdom of Hawai'i began resulting in the annexation of the Islands of Hawai'i by the United States in 1898. On August 21, 1959, following a popular vote, Hawai'i became the 50th state of the United States of America.



Figure 3.2-1. General Features of the State of Hawai'i



Source: Hawai'i Climate Change Mitigation and Adaptation Commission, 2017



3.3 Political Divisions

Politically, the State of Hawai'i is divided into five counties: County of Kaua'i, City and County of Honolulu, County of Maui, County of Kalawao, and County of Hawai'i. The County of Kaua'i encompasses the Islands of Kaua'i and Ni'ihau. The City and County of Honolulu includes the Island of O'ahu and the Northwestern Hawaiian Islands. The County of Maui consists of the Islands of Moloka'i (with the exception of the Kalaupapa peninsula which constitutes the County of Kalawao), Lāna'i, Kaho'olawe, and Maui. Lastly, the County of Hawai'i has jurisdiction over the Island of Hawai'i (State of Hawai'i HMP, 2013). For the 2018 HMP Update, the County of Kalawao statistics are included with the County of Maui's.

3.4 Physical Setting

The following sections describe the geography, topography, and climate of the State of Hawai'i.

3.4.1 Geography and Topography

The following sections provide a brief overview of the geography and topography of each of the State's counties. The information is presented here and throughout the 2018 HMP Update, in general, from the westernmost County to the easternmost.

COUNTY OF KAUA'I

The County of Kaua'i is situated northwest of the Island of O'ahu, separated by the Kaua'i Channel. Known as the Garden Isle, the Island of Kaua'i is the northernmost and geologically oldest of the major Hawaiian Islands. The County of Kaua'i includes the Island of Ni'ihau (73 square miles) and the tiny uninhabited islets of Ka'ula and Lehua. These islands are volcanic in origin, although there are currently no active volcanoes in the county. The circular Island of Kaua'i rises three miles from the ocean floor and is roughly 550 square miles (County of Kaua'i HMP 2015).

In the center of the Island of Kaua'i is Kawaikini Peak, rising 5,170 feet, and Mount Wai'ale'ale, rising 5,080 feet. Mount Wai'ale'ale is the rainiest spot on earth, averaging 460 inches of rain a year, and contributes to this island's nickname—the Garden Island. Many streams flow from these mountains to the sea through canyons in the volcanic rock. Waimea Canyon has colorful rock walls that are 2,857 feet high. Rugged cliffs along the northwestern coast make it impossible to build a road around the whole island. The Island of Ni'ihau, nicknamed "The Forbidden Island," is a private island owned by the Robinson family of Kaua'i. The island is semi-arid with a dry climate, although several lakes provide fresh water (County of Kaua'i HMP 2015).

CITY AND COUNTY OF HONOLULU

The City and County of Honolulu consists primarily of the Island of O'ahu but also includes the Northwestern Hawaiian Islands, with the exception of Midway Atoll, which is administered by the U.S. Fish and Wildlife Service (County of Honolulu HMP 2012). The Northwestern Hawaiian Islands consist largely of uninhabited low-lying atolls and islets. The Island of O'ahu consists of the remains of two shield volcanoes: the Ko'olau Volcano on the east side of the island and the Wai'anae Volcano on the west side of the island. The valley between the mountains of these two extinct volcanoes consists of a fertile, rolling plain that supported both sugar and pineapple plantations



in the past. Those industries have now been largely replaced by residential development and diversified agriculture. A most notable landmark is the 760-foot extinct volcanic crater, known as Diamond Head, located on the southeastern end of the island at the end of world-famous Waikiki beach (State of Hawai'i HMP 2013).

COUNTY OF MAUI

The Island of Maui is the second largest island in the Hawaiian Archipelago, covering 727 square miles. It was formed 1.3 million to 0.7 million years ago by two volcanic cones: Haleakalā on the east side of the island, with a current elevation of 10,023 feet; and Pu'u Kukui (Mauna Kahalawai) on the west side, with a current elevation of 5,788 feet. Haleakalā, which last erupted in 1790, is a dormant volcano that could erupt in the next 100 years. A relatively flat isthmus of sand joins the two cones. East Maui is geologically younger than West Maui, as apparent by the absence of deeply incised canyons and extensive areas of volcanic lava and cinders on the southwestern slopes of Haleakalā. The lands more suitable for agriculture, including the gentle slopes of central Maui and tablelands of West Maui, resulted from alluvial deposits and the decomposition of basaltic materials (County of Maui HMP 2015).

The Island of Moloka'i is the fifth largest of the main Hawaiian Islands, covering approximately 260 square miles. It is 38 miles long and 10 miles wide and has approximately 100 miles of shoreline. It was formed primarily by the coalescence of two shield volcanoes 1.8 million to 1.3 million years ago: the East Moloka'i Volcano (also known as Kamakou) and the West Moloka'i volcano (also known as Mauna Loa) (County of Maui HMP 2015).

The Island of Lāna'i is the sixth largest of the main Hawaiian Islands, with an area of 141 square miles. The island was formed from a single shield volcano that last erupted about 1.3 million years ago. A low-lying basin in the center of the island is what is left of the volcano's caldera (County of Maui HMP 2015).

The smallest of the main Hawaiian Islands, Kaho'olawe has a land area of 45 square miles. It was formed by a single volcano that underwent shield and post-shield stages. The highest point on the island is a crater Pu'u 'O Moa'ula Nui, at 1,483 feet above sea level (County of Maui HMP 2015).

COUNTY OF HAWAII'I

The Island of Hawai'i is the southeastern most island in the Hawaiian Archipelago. At approximately 4,028 square miles, the Island of Hawai'i, also known as the "Big Island", is larger than all the other islands combined and continues to grow as a result of ongoing eruptions. The Island of Hawai'i was formed from the coalescence of five volcanoes—Kohala, Mauna Kea, Hualālai, Mauna Loa, and Kīlauea. These five dominant mountains create wind acceleration zones on the island (County of Hawai'i HMP 2015).

3.4.2 Climate

The following sections provide a general overview of the climate in the State of Hawai'i and how the El Niño-Southern Oscillation cycle effects climate conditions in the State.

GENERAL OVERVIEW OF THE CLIMATE OF THE STATE OF HAWAII'I

The following description of the climate of the State of Hawai'i was extracted and condensed, in part, from the National Weather Service (NWS) National Oceanic and Atmospheric Administration's (NOAA) website. According to the website, it is a condensed chapter on the State of Hawaii's climate from the Second Edition (University of



Hawai'i Press, 1983) of the "Atlas of Hawai'i." The author is the late Saul Price, former Hawai'i State Climatologist and Staff Meteorologist for the NWS Pacific Region (NWS 2018).

Air, Ocean Temperatures and Seasons

The climate of the State of Hawai'i can be generally characterized as including mild temperatures throughout the year, moderate humidity, persistence of northeasterly trade winds, significant differences in rainfall within short distances, and infrequent severe storms. For most of the State, there are only two seasons: "summer" (*kaui*), between May and October, and "winter" (*ho'oilo*), between October and April. The State of Hawaii's longest and shortest days are about 13½ hours and 11 hours, respectively, compared with 14½ and 10 hours for Southern California and 15½ hours and 8½ hours for Maine. Uniform day lengths result in small seasonal variations in incoming solar radiation and, therefore, temperature.

Like the ambient air temperatures, ocean temperatures differ slightly between the seasons with about 6 degrees of fluctuation, from a low of 73 degrees Fahrenheit (°F) or 74°F between late February and March to a high near 80°F in late September or early October. Because the State of Hawai'i is more than 2,000 miles from the nearest continental land mass, air that reaches it, regardless of source, spends enough time over the ocean to moderate its initial harsher properties. For example, Arctic air that reaches the State of Hawai'i during the winter may have a temperature increase by as much as 100°F during its passage over the waters of the North Pacific. The State of Hawaii's warmest months are August and September. Its coolest months are February and March, reflecting the seasonal lag in the Pacific Ocean's temperature.

Terrain

The State of Hawaii's mountains significantly influence every aspect of its weather and climate. The endless variety of peaks, valleys, ridges, and broad slopes, gives the State of Hawai'i a climate that is different from the surrounding ocean, as well as a climatic variety within the islands. The mountains obstruct, deflect, and accelerate the flow of air. When warm, moist air rises over windward coasts and slopes, clouds and rainfall are much greater than over the open sea. Leeward areas, where the air descends, tend to be sunny and dry. In places sheltered by terrain, local air movements are significantly different from winds in exposed localities. Since temperature decreases with elevation by about 3°F per thousand feet, the State of Hawaii's mountains, which extend from sea level to nearly 14,000 feet, contain a climatic range from the tropic to the subarctic.

The climate of the State of Hawai'i can be defined by what it has and by what it does not have. It does not have the extremes of cold winters and summer heat waves, and it usually does not have hurricanes and hailstorms. However, the State of Hawaii's tallest peaks do get their share of winter blizzards, ice, and snow. Highest temperatures may reach into the 90s°F. Thunderstorms, lightning, hail, floods, hurricanes, tornadoes, and droughts are not unknown. However, these phenomena are usually less frequent and less severe than their counterparts in continental regions.

The highest temperature ever recorded in the State of Hawai'i was 100°F at Pahala (elevation 870 feet) on the Island of Hawai'i on April 27, 1931. The lowest ever recorded was 12°F on Mauna Kea (elevation 13,770 feet), also on the Island of Hawai'i, on May 17, 1979.



Rainfall

Over the ocean near the State of Hawai'i, rainfall averages between 25 and 30 inches a year. The islands receive as much as 15 times that amount in some places and less than one third of it in others (see Figure 3.4-1). This is caused mainly by orographic or mountain rains, which form within the moist trade wind air as it moves from the sea over the steep and high terrain of the islands. Over the lower islands, the average rainfall distribution resembles closely the topographic contours. Amounts are greatest over upper slopes and crests and least in the leeward lowlands. On the higher mountains, the belt of maximum rainfall lies between 2,000 to 3,000 feet and amounts decrease rapidly with further elevation. As a result, the highest slopes are relatively dry.

Another source of rainfall is the towering cumulus clouds that build up over the mountains and interiors on sunny calm afternoons. Although such convective showers may be intense, they are usually brief and localized. Hawaii's heaviest rains come from winter storms between October and April. While the effects of terrain on storm rainfall are not as great as on trade wind showers, large differences over small distances do occur, because of topography and location of the rain clouds. Differences vary with each storm.

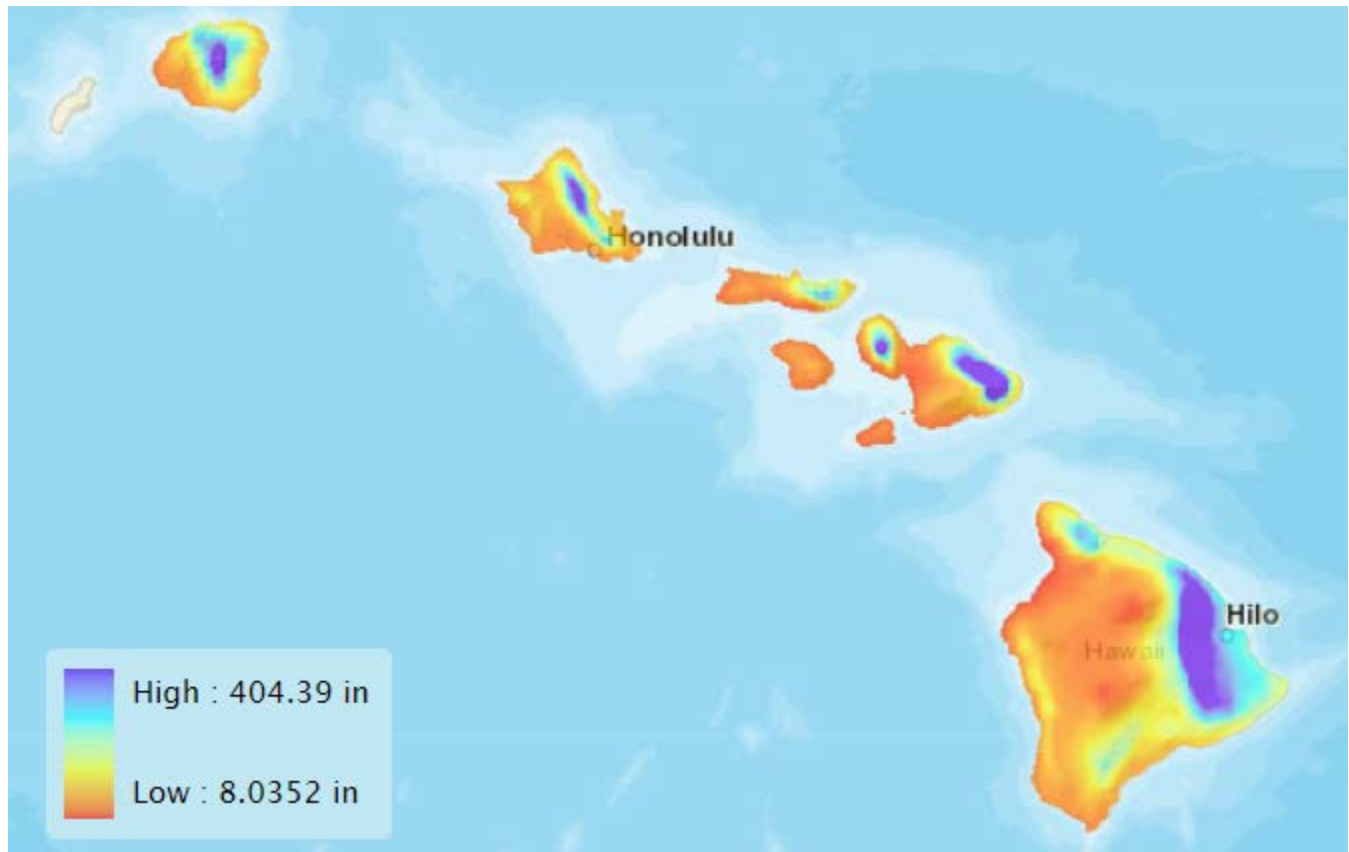
Frequently, the heaviest storm rains do not occur in areas with the greatest average rainfall. Relatively dry areas may receive, within a day or a few hours, totals exceeding half of their average annual rainfall.

The leeward and other dry areas obtain their rainfall mainly from a few winter storms. Therefore, their rainfall is usually seasonal and, their summers are dry. In the wetter regions, where rainfall comes from both winter storms and trade wind showers, seasonal differences are much smaller.

At the opposite extreme, drought is not unknown in the State of Hawai'i, although it rarely affects an entire island at one time. Drought may occur when there are either no winter storms or no trade winds. If there are no winter storms, the normally dry leeward areas are hardest hit. A dry winter, followed by a normally dry summer and another dry winter, can have serious effects. The absence of trade winds affects mostly the windward and upland regions, which receive a smaller proportion of their rain from winter storms.



Figure 3.4-1. Annual, Average Rainfall in Hawai'i



Source: Image from Giambelluca et. al. 2014

EL NIÑO AND LA NIÑA EFFECTS ON THE STATE OF HAWAII'S CLIMATE

El Niño and La Niña are opposite phases of what is known as the El Niño-Southern Oscillation (ENSO) cycle. The ENSO cycle is a scientific term that describes the fluctuations in temperature between the ocean and atmosphere in the east-central Equatorial Pacific (approximately between the International Date Line and 120 degrees West). La Niña is sometimes referred to as the cold phase of ENSO and El Niño as the warm phase of ENSO. These deviations from normal surface temperatures can have a large impact on ocean processes, global weather, climate, and influences on extreme weather (NOAA 2017).

El Niño and La Niña episodes typically last 9 to 12 months, but some prolonged events may last for several years. While the frequency of events can be quite irregular, El Niño and La Niña events occur on average every two to seven years. Typically, El Niño occurs more frequently than La Niña (NOAA 2017).

El Niño

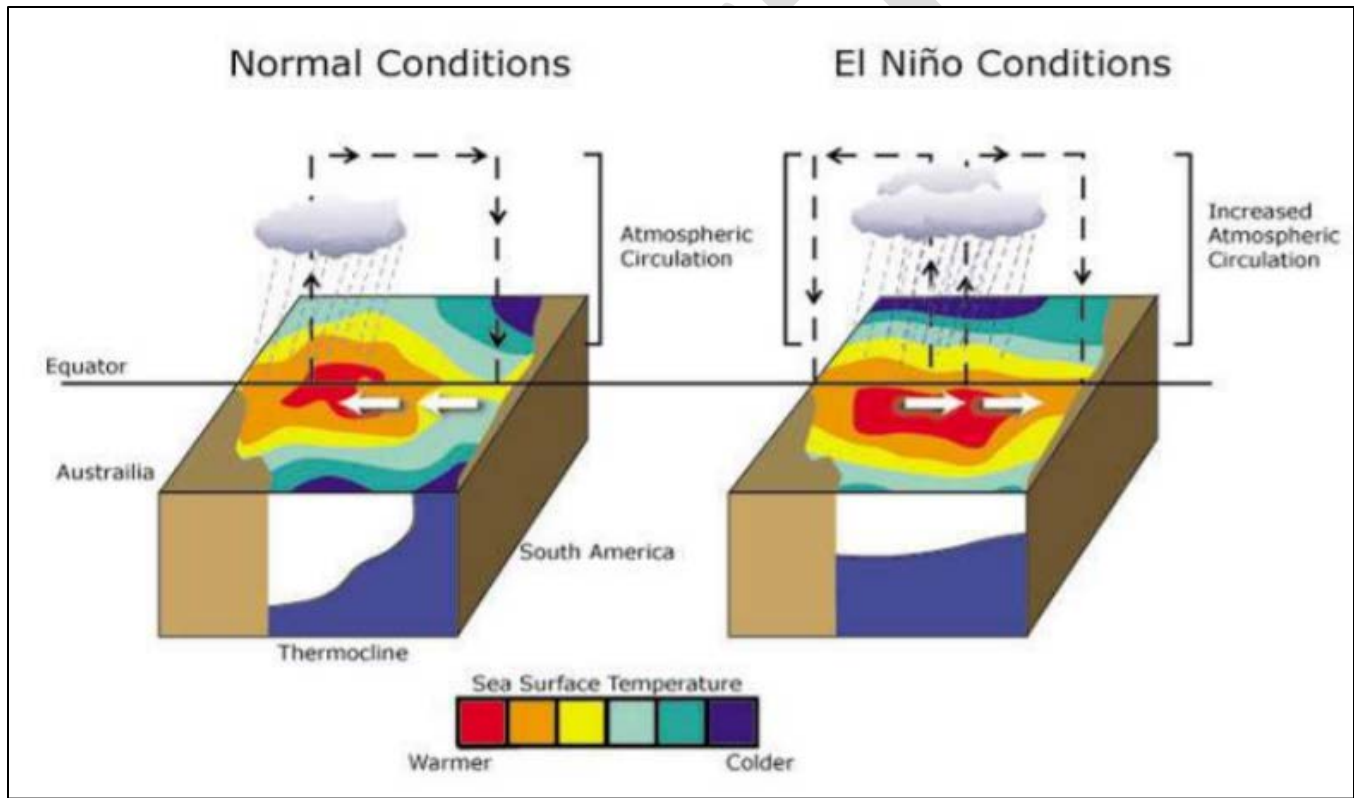
El Niño refers to the large-scale, ocean-atmosphere climate interaction linked to a periodic warming in sea surface temperatures across the central and east-central Equatorial Pacific. It brings increased rainfall to the east Pacific Basin; however, drought occurs at locations west of the Pacific Basin, such as in Australia. El Niño is typically responsible for destructive flooding in the East Pacific and drought in the West Pacific, sometimes associated with devastating brush fires in Australia. Observations of conditions in the tropical Pacific are considered essential for



the prediction of short-term (a few months to 1 year) climate variations. To provide necessary data, NOAA operates a network of buoys which measure temperature, currents and winds in the equatorial band. These buoys daily transmit data which are available to researchers and forecasters around the world in real time (NOAA 2017; Hawai'i State HMP 2013).

Figure 3.4-2 illustrates the difference between normal conditions and El Niño conditions. In normal conditions, the trade winds blow from east to west pushing warm surface waters toward Asia, piling it up in the western Pacific. During El Niño conditions, the trade winds weaken and the warm surface water moves eastward. This reduces the upwelling of cold water off the coast of South America. The climate impacts of El Niño show up mostly during the winter months over North America.

Figure 3.4-2. Normal Conditions vs El Niño Conditions



Source: NOAA Date Unknown
 Note: NOAA National Oceanic and Atmospheric Administration

During El Niño, the State of Hawai'i typically experiences more rain in the beginning of the season then rapidly less; causing a drier wet season. Trade winds are weaker and occasional the State will experience westerly winds. Sea level is near to slightly above normal, causing high run-up from distant swells. Ocean temperatures are much warmer at and below the surface. Lastly, El Niño increases the risk of storms forming closer to and moving towards the islands (NOAA Date Unknown). Other significant impacts include increased risk of wildfires associated with drought; coastal erosion with changes in sea level and storm impacts; coral reef bleaching (coral reefs protect islands from waves and storm impacts); loss of plants, agriculture, and degradation of habitat; and, landslides associated with heavy rainfall (Hawai'i State HMP 2013).



La Niña

La Niña episodes represent periods of below-average sea surface temperatures across the east-central Equatorial Pacific. It occurs after El Niño as the warmer ocean fuels an intensification and southward shift of the jet stream. Eventually, the trade winds pick up again and can become stronger than normal. When this occurs, the trade winds blow the warm water back into the western Pacific. This restarts the upwelling of cool water towards the surface in the eastern Pacific, known as La Niña. La Niña brings unusually cold conditions to the tropical Pacific and displaces the jet stream northward. In the tropics, ocean temperature variations in La Niña also tend to be opposite to those of El Niño. (NOAA 2017).

During La Niña, rainfall in the State of Hawai'i tends to be near or above normal during the winter months. The rainy season usually lasts longer into the spring. The State may receive above normal rainfall not only during the wet season of January through March, but during a strong La Niña period the excess wetness may continue through May in many locations (Hawai'i Guide 2018).

3.5 Demographics

The following sections discuss demographic information for the State of Hawai'i.

3.5.1 Resident Population

Knowledge of the composition of the population, how it has changed in the past and how it may change in the future is needed to make informed decisions. Information about population is a critical part of planning because it directly relates to needs such as housing, industry, stores, public facilities and services, and transportation. According to 2016 estimates, the State of Hawai'i has a resident population of 1,428,557 people. The majority of the population is concentrated on the Island of O'ahu (City and County of Honolulu) with a total of 992,605 residents. Between 2010 and 2016, the State of Hawai'i's resident population increased by 5.0% (State of Hawai'i Data Book 2016). Resident population figures by county are shown in Table 3.5-1.

Table 3.5-1. Resident Population by County, 1990 to 2016

County	Resident Population				% Change (2010 to 2016)
	1990	2000	2010	2016	
County of Kaua'i	51,177	58,463	67,091	72,029	+7.4%
City and County of Honolulu	836,231	876,156	953,207	992,605	+4.1%
County of Maui ^a	100,504	128,241	154,924	165,474	+6.8%
County of Hawai'i	120,317	148,677	185,079	198,449	+7.2%
Total^b	1,108,229	1,211,537	1,360,301	1,428,557	5.0%

Source: 2016 State of Hawai'i Data Book

Notes:

a. Includes the County of Kalawao, which had 147 people in 2000, 90 in 2010, and 88 in 2016.

b. These estimates include military personnel stationed or homeported in the State. The U.S. Department of Defense estimates that there are 43,540 active duty military in the State as of March 2018. Additional military personnel who are not stationed or homeported in the State but are currently ported or otherwise present in the State are not included.

The de facto population of the State of Hawai'i is much larger than the resident population due to the substantial number of visitors in the State on any given day. The statewide average daily visitor population is 217,675 visitors as of 2016. This means that the de facto population is 15.2% greater than the resident population. Additional discussion on tourism can be found in Section 3.6.3.



Population projections for the State indicate that the statewide population is expected to increase by approximately 280,000 by 2040 representing a 19.6% increase over 2016 population estimates. More than a third of this increase is expected to be in the County of Hawai'i, which has the largest projected increase for both total people and the percent of current population. Table 3.5-2 shows population projections for each county until 2040.

Table 3.5-2. Resident Population Projections by County, 2020 to 2040

County	Resident Population			% Change (2016 to 2040)
	2020	2030	2040	
County of Kaua'i	75,640	84,380	93,020	29.1%
City and County of Honolulu	1,003,710	1,052,130	1,086,710	9.5%
County of Maui ^a	181,020	207,310	232,860	40.7%
County of Hawai'i	220,880	258,510	296,320	49.3%
Total	1,481,240	1,602,340	1,708,920	19.6%

Source: 2016 State of Hawai'i Data Book

Note: a. Includes the County of Kalawao

3.5.2 Age Distribution

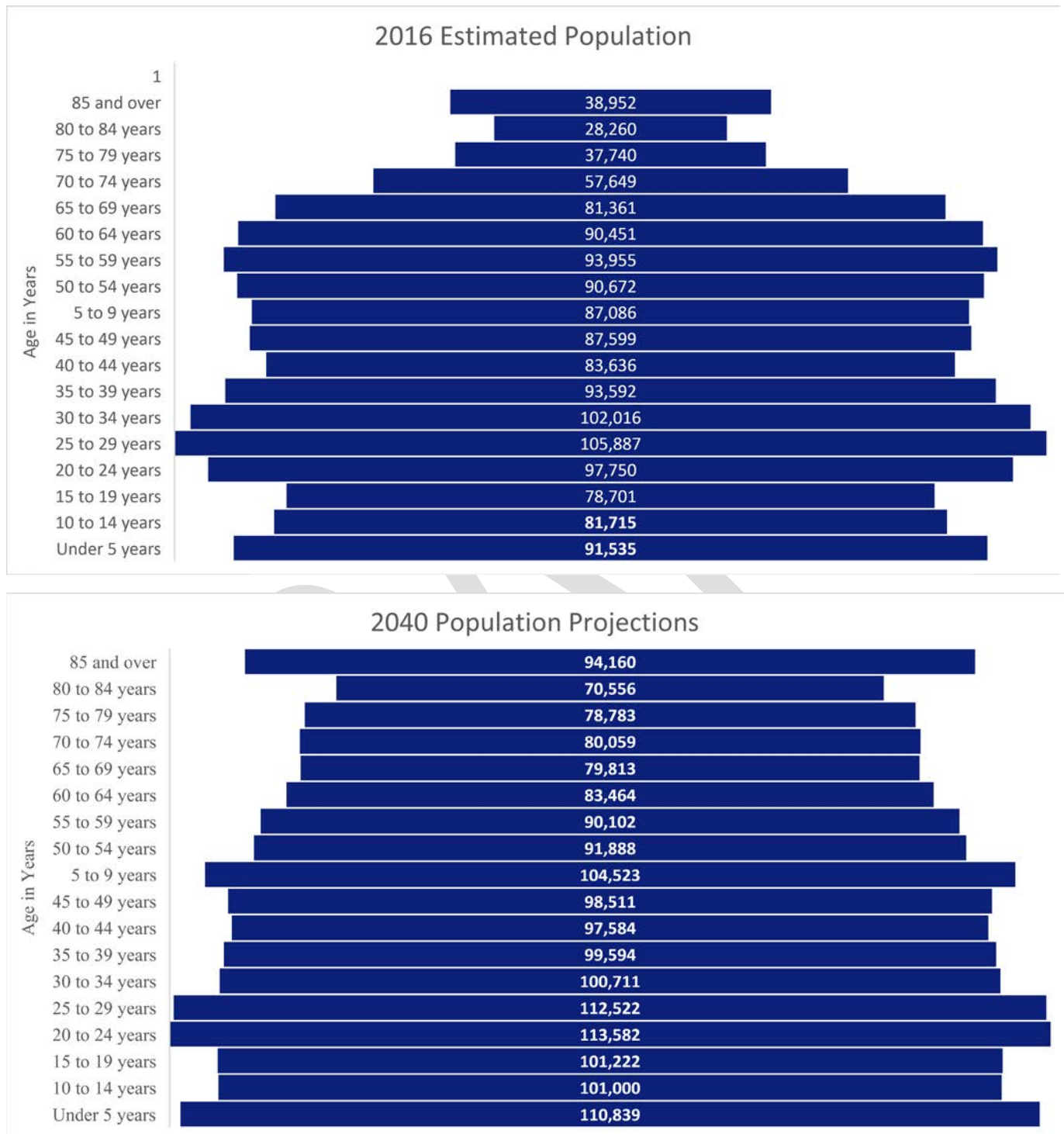
The residents of the State of Hawai'i have a median age of 38.6 as of 2016, which is slightly older than the national average of 37.9. Women in Hawai'i have a median age of 40.4, which is slightly older than the median age of men (37.0). As of 2016, 17.1% of the population is now over the age of 65 and the single largest age cohort is 15 to 29 years old (State of Hawai'i Data Book 2016). By 2040, population projections suggest that 23.6% of the total population of the State will be 65 years or older and 18.5% of the total population will be 14 years or younger (State of Hawai'i Data Book 2016). The age distribution of the estimated population for 2016 and the projected population for 2040 are shown in Figure 3.5-1.

As a group, the elderly are more apt to lack the physical and economic resources necessary for response to hazard events and are more likely to suffer health-related consequences making recovery slower. Elderly residents living in their own homes may have more difficulty evacuating their homes and could be stranded in dangerous situations. This population group is more likely to need special medical attention, which may not be readily available during natural disasters due to isolation caused by the event.

Children under 14 are also particularly vulnerable to disaster events because of their young age and dependence on others for basic necessities. Very young children may additionally be vulnerable to injury or sickness; this vulnerability can be worsened during a natural disaster because they may not understand the measures that need to be taken to protect themselves from hazards.



Figure 3.5-1. State of Hawai'i 2016 Estimated Population and 2040 Projected Population Distribution



Source: Hawai'i State Data Book 2016



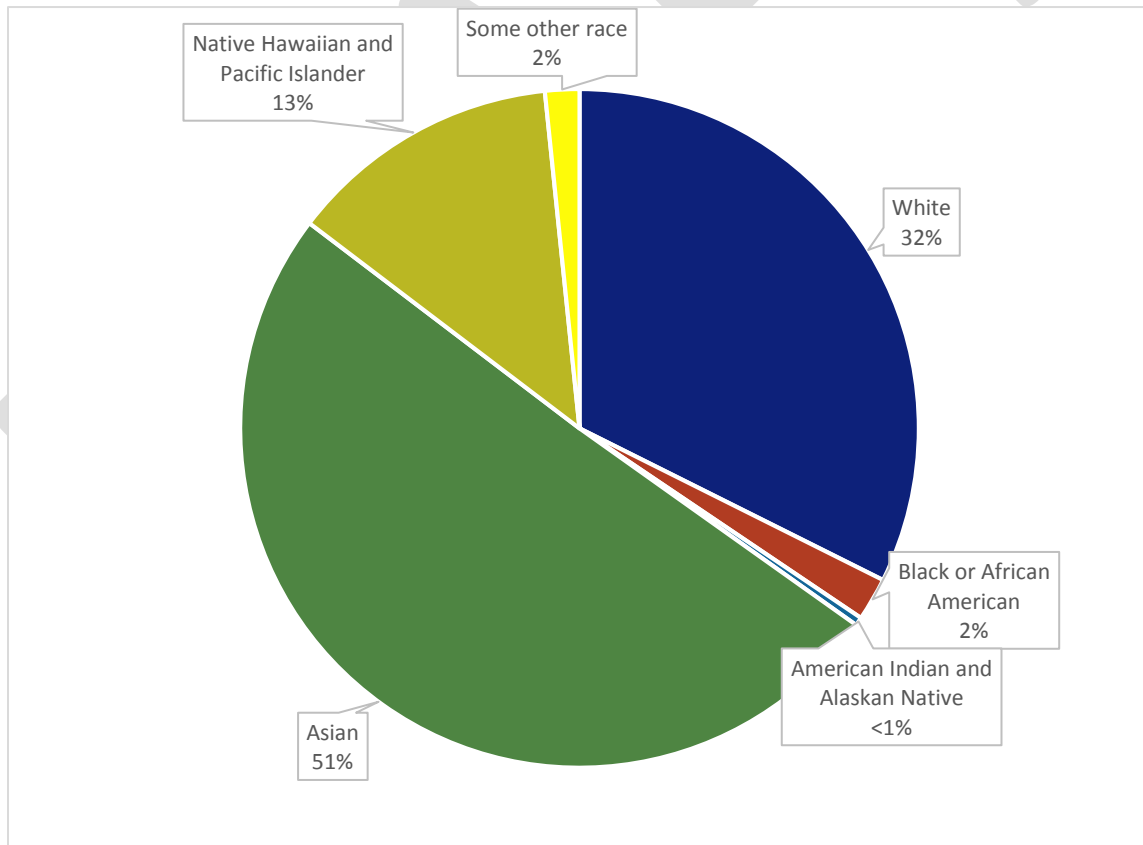
3.5.3 Race, Place of Birth, and Language

According to the 2010 U.S. Census, persons of Asian descent make up the largest proportion of the population in the State of Hawai'i at 38.6% followed by White residents (24.7%) and residents of two or more races (24.7%) (State of Hawai'i Data Book 2016). Native Hawaiians and Pacific Islanders account for 9.9% of the total population. Table 3.5-3 shows the racial distribution by county.

Approximately 82.3% of the State population was born in the United States with about 53.8% born in Hawai'i. Of the 17.7% of foreign-born residents, approximately 10.1% are U.S. Citizens. More than 45% of residents born outside of the United States were born in the Philippines, followed by Japan at 9.3%, and China at 7.4% (State of Hawai'i Data Book 2016).

Approximately 331,000 of State of Hawai'i residents, a third of all residents over the age of five, speak a language other than English at home. About 20% of these residents, almost 63,000, speak English less than well. Pacific Island languages are the most common language spoken other than English, followed by Tagalog and Japanese (Hawai'i State Data Book 2016). Understanding the language that residents speak is important in ensuring that risk and emergency information is effectively communicated to the population.

Figure 3.5-2. Racial Distribution in the State of Hawai'i



Source: State of Hawai'i Data Book 2016



Table 3.5-3. Racial Distribution of the State of Hawai'i Population by County

County	White	Black or African American	American Indian and Alaskan Native	Asian	Native Hawaiian and Pacific Islander	Some other race	Two or more races	Total
County of Kaua'i	22,159	278	254	21,016	6,060	608	16,716	67,091
City and County of Honolulu	198,732	19,256	2,438	418,410	90,878	10,457	213,036	953,207
County of Maui	53,360	870	603	44,602	16,095	3,052	36,342	154,924
County of Hawai'i	62,348	1,020	869	41,050	22,389	2,868	54,535	185,079
Total	336,599	21,424	4,164	525,078	135,422	16,985	320,629	1,360,301

Source: State of Hawai'i Data Book 2016

3.5.4 Persons with Disabilities or with Access and Functional Needs

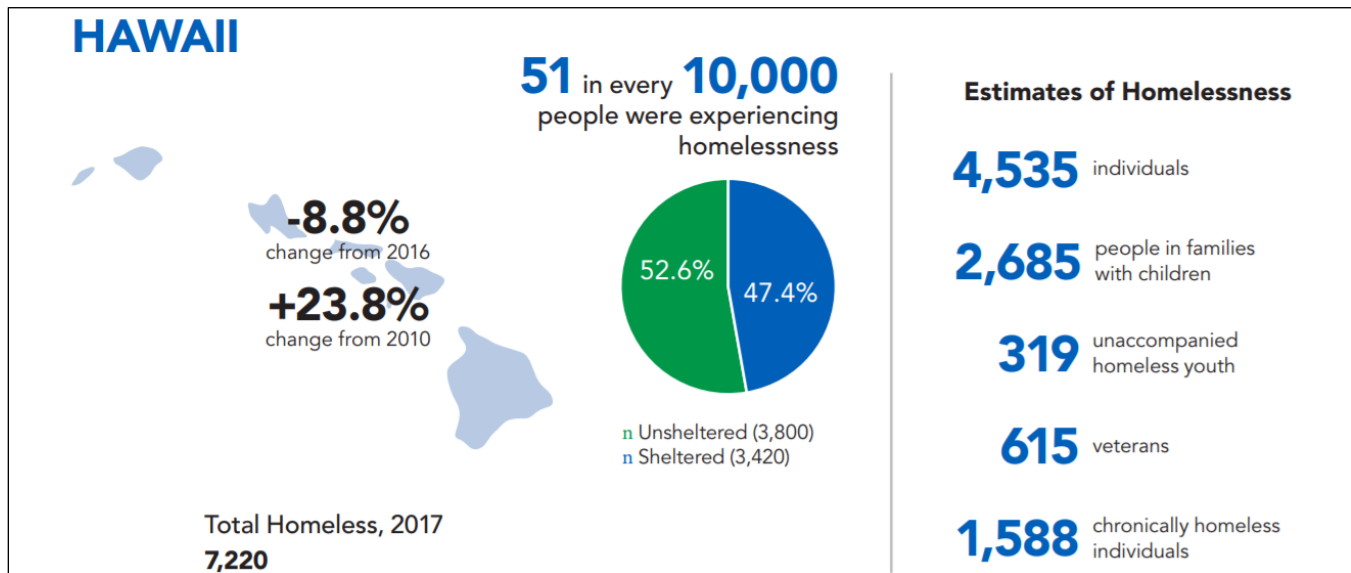
The 2010 U.S. Census estimates that 54 million non-institutionalized Americans with disabilities or with access and functional needs live in the U.S. This equates to about one in five persons. This population is more likely to have difficulty responding to a hazard event than the general population. State and local government is the first level of response to assist these individuals, and coordination of efforts to meet their access and functional needs is paramount to life safety efforts. It is important for emergency managers to distinguish between functional and medical needs in order to plan for incidents that require evacuation and sheltering. Knowing the percentage of population with a disability allows emergency management personnel and first responders to have personnel available who can provide services needed by those with access and functional needs. According to the American Community Survey 2016 estimates, persons with disabilities make up approximately 11% of the total civilian non-institutionalized population of the State of Hawai'i (American Community Survey 2016). The likelihood of having a disability varies by age with an estimated 3% of the population under 18 years old, to 8% of people 18 to 64 years of age, and 35% of those 65 and older.

3.5.5 Persons Experiencing Homelessness

As of 2017, there are estimated to be 7,220 persons experiencing homelessness in the State of Hawai'i (see Figure 3.5-3; U.S. HUD 2017). This represents a decrease of 701 people statewide, nearly a 9% decrease, from 2016 estimates. This is the first time that homelessness counts have decreased in eight years; however, the number of persons experiencing homelessness increased by approximately 16% over the performance period of the 2013 HMP from 6,246 in 2012 (Department of Human Services, 2017; Department of Human Services 2012). According to the U.S. Department of Health and Human Services, people experiencing homelessness have limited resources and are likely to have previously experienced traumatic events. As a result, such persons may be more at risk to adverse physical and psychological reactions after a disaster event than the general population (U.S. Department of Health and Human Services, 2018). In addition, many persons experiencing homelessness are unsheltered and may be particularly vulnerable to some hazard events due to inadequate shelters (for example, tents), exposure to the elements, and residing in high hazard risk areas, such as along creeks and streams.



Figure 3.5-3. Persons Experiencing Homelessness Estimates in the State of Hawai'i, 2017



Source: U.S. HUD, 2017

3.6 Economy

The following sections provide information on the Hawai'i State Economy including employment and industry income and tourism.

3.6.1 Employment and Industry

After a natural hazard event, economic resiliency helps to drive and expedite recovery. An understanding of the major employers and economic sectors whose losses or inoperability would impact the community and its ability to receive from a disaster is essential.

According to the 2016 Hawai'i State Data Book, there are 664,180 employed civilians in the State. Of these employees, the largest proportion (20.4%) are employed in the educational, health and social services fields. Other notable fields include: arts, entertainment, recreation, accommodation and food services (16.6%); retail (11.8%); and professional, scientific, management, administrative and waste management services (10.4%). High proportions of employment in retail, arts, entertainment, recreation, accommodation and food services reflect the state's strong tourism economy (State of Hawai'i Data Book 2016).

It is expected that the State of Hawaii's future growth will be primarily related to the rate of expansion of the economies of the United States mainland and Japan. These two economies are the sources of the State of Hawaii's tourism demand and the main export markets for the State's goods and services (State of Hawai'i HMP 2013).

3.6.2 Income

In the United States, individual households are expected to use private resources to prepare for, respond to and recover from disasters to some extent. This means that households living in poverty or experiencing financial difficulties are automatically disadvantaged when confronting hazards. A household that experiences financial



difficulties may find it hard or impossible to invest in other areas that can increase safety and resilience. Necessary structural and mechanical improvements, modern technology to access information, vehicles to improve mobility and evacuation procedures, among other investments may not be possible. Additionally, low-income residents typically occupy more poorly built and inadequately maintained housing. Mobile or modular homes, for example, are more susceptible to damage in earthquakes and floods than other types of housing. Furthermore, residents below the poverty level are less likely to have insurance to compensate for losses incurred from natural disasters. This means that residents below the poverty level or experiencing financial difficulties have a great deal to lose during an event and may be the least prepared to deal with potential losses.

The median household income for the State of Hawai'i in 2016 is \$71,977 and the unemployment rate is 5.5%. Approximately 10.8% of residents are considered below the poverty line, 4.2% receive Supplemental Security Income, 3.5% receive cash public assistance, and 11.6% receive food stamps and SNAP benefits (American Community Survey 2016). Table 3.6-1 shows the median income and population below the poverty level in each county.

Table 3.6-1. Income Statistics in the State of Hawai'i by County

County	Median Household Income	Population Below Poverty Level in the Past 12 Months	
		Percent	Number
County of Kaua'i	\$68,224	9.6%	6,915
City and County of Honolulu	\$77,161	9.5%	94,297
County of Maui ^a	\$68,777	9.8%	16,216
County of Hawai'i	\$53,936	18.7%	37,110
Average/Total	\$71,997	10.8%	154,284

Source: 2012-2016 American Community Survey 5-year estimates

Notes:

a. Median household income estimates do not include the County of Kalawao, which is estimated to be \$65,625. Population below poverty level does not include the County of Kalawao, which is estimated to be 12.9%.

3.6.3 Tourism

In addition to the resident population, the State of Hawai'i receives high volumes of tourists throughout the year that contribute to the needs for public infrastructure and services. Table 3.6-2 below shows the average daily visitors by county in 2016 (State of Hawai'i Data Book 2016). Average daily visitors increased statewide over the performance period of the 2013 HMP by 15% from an average of 182,531 daily visitors from 2009 to 2012, to an average of 210,176 daily visitors from 2013 to 2016 (Hawai'i State Data Book 2016). According to the Hawai'i Tourism Authority (2016), 2016 set a new record for the number of visitors in the State with 8,934,277 visitors.

Visitors to the State are not reflected in official population estimates, such as the U.S. Census' American Community Survey. When the 2016 average daily visitor rate is included in population estimates, the actual population in the State at any given time increases by 14.7%. The City and County of Honolulu has the greatest number of average daily visitors; however, visitors contribute to the greatest increase in actual population in the County of Maui with a 36.2% increase. This is followed by the County of Kaua'i at 34.5%, the County of Hawai'i at 16.0%, and the City and County of Honolulu at 10.2%.



Table 3.6-2. Average Daily Visitors by County

County	2016		
	Total	Domestic	International
County of Kaua'i	24,842	22,755	2,088
City and County of Honolulu	101,006	57,552	43,454
County of Maui	59,982	50,564	9,418
County of Hawai'i	31,845	27,082	4,763
TOTAL	217,675	157,953	59,723

Source: 2016 State of Hawai'i Data Book

3.7 State Assets and Critical Facilities

The following sections provide information on state assets and critical facilities within the State. The vulnerability of state assets and critical facilities to the identified hazards of concern are discussed in Section 4 (Risk Assessment).

3.7.1 State-Owned or Leased Buildings

The State of Hawai'i owns and/or leases buildings in all of its counties. Statewide, there are 6,634 state-owned or leased buildings with a total estimated replacement value of more than \$27.6 billion (see Table 3.7-1). The majority of these facilities, 57%, are located in the City and County of Honolulu. A breakdown of the number and replacement cost value of state-owned or leased buildings by state agency can be found in Section 4.0 (Risk Assessment Overview). The location of these buildings can be seen in Appendix X (Map Atlas).

Table 3.7-1. Number and Replacement Cost Value of State Facilities by County

County	Total Number of State Buildings ^a		Total Replacement Cost Value ^b	
	Number	Percent	Dollar Value	Percent
County of Kaua'i	570	8.6%	\$1,067,278,062	3.9%
City and County of Honolulu	3,752	56.6%	\$18,548,040,469	67.0%
County of Maui ^c	879	13.2%	\$2,983,348,758	10.8%
County of Hawai'i	1,433	21.6%	\$5,095,297,885	18.4%
Total	6,634	100%	\$27,693,965,174	100%

Source: Hawai'i State Risk Management Office 2017

Notes:

- a. Not all identified facilities included sufficient information to be geocoded; therefore, the vulnerability assessment results provided for each hazard in Section 4.0 will show a discrepancy in the total number and replacement cost value of facilities. For more information, please see Section 4.0.
- b. Total replacement cost value represents both structure and contents. For more information, please see Section 4.0.
- c. Includes the County of Kalawao.

3.7.2 State Roads

The State of Hawai'i Department of Transportation Highways Division is charged with maintaining the state highway system, which amounts to more than 1,096 miles of road statewide. The length and percent of total state roads by county is shown in Table 3.7-2. Refer to Appendix X (Map Atlas) which includes a map of each island and the major roads under the State's jurisdiction.

**Table 3.7-2. State Highway System by County**

County	Total Length (Miles)	Percent of Total State Mileage
County of Kaua'i	378.7	34.5%
City and County of Honolulu	375.3	34.2%
County of Maui ^a	104.0	9.5%
County of Hawai'i	238.6	21.8%
Total	1,096.5	100.0%

Source: State of Hawai'i SDOT State Routes GIS Layer

Notes:

a. Includes the County of Kalawao

GIS Geographic Information System

SDOT State Department of Transportation

3.7.3 Critical Facilities

In 2017 a collaborative planning effort was conducted with county, state, federal, private sector and non-governmental organizations to address temporary emergency power planning requirements outlined in the *2015 Hawai'i Catastrophic Hurricane Plan*. The results of this effort were memorialized in the *Makani Pahili 2017 Emergency Power Prioritization Workshop Series Report* and included the definition and identification of critical facilities within the State. Critical facilities were defined as "those structures from which essential services and functions for victim survival, continuation of public safety actions, and disaster recovery are performed or provided" and more than 1,500 facilities statewide were identified. The database of identified facilities served as the basis for the critical facility assessment in this 2018 HMP Update.

Each critical facility identified in the State was assigned to a core category so that discussion and vulnerability could be aggregated. The facility type assigned to each core category can be found in Appendix X (State Profile and Risk Assessment Supplement). Table 3.7-3 shows the State's critical facilities by core category and replacement cost value. Mass Care Support Service and Water Waste, and Wastewater Systems account for almost half (45%) of all critical facilities in the State. Table 3.7-4 shows the State's critical facilities by county. More than half (53%) of the State's critical facilities are located in the City and County of Honolulu. The location of these facilities can be seen in Appendix X (Map Atlas).

Table 3.7-3. Critical Facilities by Core Category and Replacement Cost Value

Facility Core Category	Total Number of Critical Facilities ^a	Total Replacement Cost Value ^{a, b}
Commercial Facilities	60	\$206,894,206
Communications	142	\$552,061,935
Emergency Services	149	\$1,017,628,710
Energy	91	\$2,623,607,668
Food & Agriculture	39	\$829,869,410
Government Facilities	103	\$416,789,890
Healthcare & Public Health	193	\$3,399,521,375
Mass Care Support Services	353	\$11,497,547,155
Transportation Services	61	\$1,897,249,920
Water, Waste, & Wastewater Systems	351	\$10,906,318,080
Total	1,542	\$33,347,488,348



Source: Hawai'i State Risk Management Office 2017

Notes:

- a. Not all identified facilities included sufficient information to be geocoded; therefore, the vulnerability assessment results provided for each hazard in Section 4 will show a discrepancy in the total number and replacement cost value of facilities. For more information, please see Section 4.0.
- b. Total replacement cost value represents both structure and contents. For more information, please see Section 4.0.

Table 3.7-4. Critical Facilities by County

County	Total Number of Critical Facilities ^{a, d}		Total Replacement Cost Value ^{a, b, d}	
	County	Percent	Dollar Value	Percent
County of Kaua'i	167	10.8%	\$2,859,152,410	8.6%
City and County of Honolulu	794	51.5%	\$19,235,387,455	57.7%
County of Maui ^c	311	20.2%	\$6,286,051,833	18.9%
County of Hawai'i	270	17.5%	\$4,966,896,651	14.9%
Total	1,542	100.0%	\$33,347,488,348	100.0%

Source: Hawai'i State Risk Management Office 2017

Notes:

- a. Not all identified facilities included sufficient information to be geocoded; therefore, the vulnerability assessment results provided for each hazard in Section 4 will show a discrepancy in the total number and replacement cost value of facilities. For more information, please see Section 4.0.
- b. Total replacement cost value represents both structure and contents. For more information, please see Section 4.0.
- c. Includes the County of Kalawao.
- d. There is overlap between the state building and critical facility dataset including 36 records in the County of Kaua'i, 206 records in the City and County of Honolulu, 78 records in the County of Maui, and 59 records in the County of Hawai'i.

3.7.4 Commercial Harbors

The State of Hawai'i has 10 commercial harbors located on six islands that are vital to the economic wellbeing of the State. Almost all imported goods arrive in the State via island ports. Table 3.7-5 lists the commercial harbors by county and the tons of cargo that pass through each harbor where estimates are available. Honolulu Harbor serves as the distribution hub for the State meaning that inter-island cargo distribution branches out from Honolulu Harbor (Hawai'i State Department of Transportation No Date).

It should be noted that harbors, themselves, are not listed as critical facilities within the definition utilized for this 2018 HMP Update; however, the facilities that make harbors operational (e.g., pump stations, support facilities, communications sites, etc.) are included in the critical facility database.

Table 3.7-5. Commercial Harbors in the State of Hawai'i

County	Harbor	Waterborne Commerce (tons) ^{a,b}
County of Kaua'i	Nāwiliwili	1,929,000
	Port Allen	Not available
City and County of Honolulu	Honolulu	13,832,000
	Kalaeloa	Not available
	Barbers Point	10,570,000
County of Maui	Kahului	3,720,000
	Kaunakakai	Not available
	Kaumalapau	Not available
County of Hawai'i	Hilo	2,130,000



	Kawaihae	1,995,000
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Source: Hawai'i State Data Book 2016

Notes:

- a. Excludes cargo carried by Army and Navy Vessels and cargo in transit.
- b. Tons reported are for the year 2015.

3.8 Land Use and Development

44 CFR §201.4(d):[The State] Plan must be reviewed and revised to reflect changes in development

Land use and development patterns are major factors that influence risk to natural hazards. Major areas of concern are where the built environment interests hazard risk areas. Understanding how past, current, and projected development patterns have or are likely to increase or decrease risk in hazard areas is a key component to understanding the State's overall risk to its hazards of concern. The following sections discuss changes in development over the performance period of the 2013 HMP, current land use and development trends, and projected changes in development. Additional discussion on land use and development can be found in Section 5 (Capability Assessment) of the 2018 HMP Update.

3.8.1 Changes in Development Over the Performance Period of the 2013 HMP

The State of Hawai'i experienced changes in development over the performance period of the 2013 HMP. Unfortunately, there is no statewide system that tracks where this development has occurred or its location in hazard areas. The current county local hazard mitigation plans were reviewed and do not report that significant changes in development have been occurring at the county level. Because there are no statewide systems for tracking changes in development, permits issued at the local level and changes in land use classification for taxable parcels are used to generally establish and discuss trends.

NUMBER OF BUILDING PERMITS AND NEW RESIDENTIAL CONSTRUCTION

According to the State of Hawai'i Data Book, between 2013 and 2016 there were estimated to be 105,886 building permits issued within the State of Hawai'i as shown in Table 3.8-1. Issuance of building permits increased over the performance period of the 2013 HMP by 14% (12,876 permits) over the previous 4-year period (2009 to 2012). The overall distribution of these permits by construction type (e.g. residential, commercial, etc.) is unknown. More than three-quarters of all building permits issued were issued by the City and County of Honolulu.

Table 3.8-1. Building Permits Issued by County, 2013 to 2016

County	Building Permits Issued ^a					
	2013	2014	2015	2016	Total	% of Total
County of Kaua'i	158	187	199	229	773	0.7%
City and County of Honolulu	26,568	18,541	20,146	16,983	82,238	77.7%
County of Maui	1,200	1,267	1,280	1,178	4,925	4.7%
County of Hawai'i	4,320	4,811	5,426	3,393	17,950	17.0%
Total	32,246	24,806	27,051	21,783	105,886	100.0%

Source: Hawai'i State Data Book 2016

- a. Includes residential, hotel, non-residential and additions and alterations permits. Other types of permits such as for demolitions are not included.



The American Community Survey (2012 to 2016) estimates that there are 530,289 housing units in the State of Hawai'i. More than half of these units are believed to have been built before 1980. According to the U.S. Census Bureau's Building Permits Survey, there were more than 1,900 permits issued for new residential construction between 2014 and 2017 amounting to almost 16,000 new residential units. Approximately 57% of the total units were single-family construction. About 73% of the permits and 57% of units were issued in the City and County of Honolulu. In addition to new construction, there were estimated to be 833 housing units demolished in 2015 and 2016 (2014 and 2017 estimates are unavailable) amounting to an average annual demolition rate of 417 units (Hawai'i State Data Book 2016).

The American Community Survey (2012 to 2016) indicates that there are approximately 452,030 occupied housing units and 78,259 vacant housing units in the State of Hawai'i amounting to an average household size of three persons per unit. The 2040 population projections indicate that the State's population is expected to increase by 280,363 persons over the next 22 years. Assuming the average household size, average demolition rate, and occupancy rate remain constant, approximately 116,300 new housing units would need to be constructed by 2040 in order to accommodate the projected population. This amounts to an approximate, annual average construction rate of 5,300 units per year. This means that average annual new residential construction would need to increase by a third when compared to construction during 2014 to 2017.

Table 3.8-2. New Residential Construction by County, 2014 to 2017

County	New Residential Construction									
	2014		2015		2016		2017		Total	
	Permits	Units	Permits	Units	Permits	Units	Permits	Units	Permits	Units
County of Kaua'i	31	192	7	205	15	172	17	312	70	881
City and County of Honolulu	583	1,578	568	3,833	62	1,658	191	1,968	1,404	9,037
County of Maui	34	338	28	502	34	567	58	861	154	2,268
County of Hawai'i	76	958	77	882	86	978	47	894	286	3,712
Total	724	3,066	680	5,422	197	3,375	313	4,035	1,914	15,898

Source: SOCDs Building Permits Database 2018
 Note: SOCDs State of the Cities Data Systems

LAND USE CLASSIFICATION OF TAXABLE PARCELS

The City and County of Honolulu Department of Budget and Fiscal Services publishes annual, statewide summaries of real property records by land use class. Table 3.8-3 shows the changes in land use class over the performance period of the 2013 HMP (fiscal years 2013-2014 to 2016-2017). Drawing statewide conclusions from this data is difficult, as land use classes differ among the counties; subdivision of parcels may indicate changes in number of classifications although total land area in each class may not have changed; and some land use classes were introduced during the performance period. The following general observations can be made from this dataset:

- More than half of the taxable parcels in the State are classified as "Residential" (including Residential A, which is a City and County of Honolulu classification for residential property that meets certain parameters including an assessed value of \$1 million or more). When these classifications are combined, the percent of total parcels in this classification remained steady over the performance period of the 2013 HMP.



- The number of taxable parcels classified as “Agricultural/Native Forest” decreased by more than 1,400 parcels statewide.
- The number of taxable parcels classified as “Hotel Resort” increased by more than 2,300 statewide, now accounting for 4% of total parcels.

A detailed table can be found in Appendix X (State Profile and Risk Assessment Supplement).

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Table 3.8-3. Change in Land Use Classes from Fiscal Year 2013-2014 to 2016-2017

Land Use Class ^a	City and County of Honolulu		County of Maui		County of Hawai'i		County of Kaua'i		Statewide	
	FY16-17 % of Total	Change in Total Parcels ^b	FY16-17 % of Total	Change in Total Parcels ^b	FY16-17 % of Total	Change in Total Parcels ^b	FY16-17 % of Total	Change in Total Parcels ^b	FY16-17 % of Total	Change in Total Parcels ^b
Residential	88%	(3,525)	14%	29	15%	266	25%	(1,583)	55%	(4,813)
Residential A ^{c, d, e}	4%	10,808	0%	-	0%	-	0%	-	2%	10,808
Apartment ^d	0%	-	13%	463	7%	(250)	0%	-	4%	213
Commercial	2%	265	4%	195	1%	25	3%	76	2%	561
Industrial	1%	127	1%	15	1%	18	1%	43	1%	203
Agricultural/Native Forest	1%	91	12%	213	47%	(1,240)	7%	(492)	15%	(1,428)
Vacant Agricultural ^d	0%	(22)	0%	-	0%	-	0%	-	0%	(22)
Conservation/Preservation	0%	48	2%	13	1%	20	1%	(26)	1%	55
Hotel/Resort	3%	1,826	16%	1,168	0%	(79)	10%	(566)	4%	2,349
Homeowner ^d	0%	-	36%	(352)	27%	1,059	0%	-	12%	707
Homestead ^d	0%	-	0%	-	0%	-	32%	233	2%	233
Public Service ^d	0%	(12)	0%	-	0%	-	0%	-	0%	(12)
Time Share ^d	0%	-	3%	108	0%	-	0%	-	0%	108
Affordable Rental ^d	0%	-	0%	-	1%	294	0%	-	0%	294
Commercialized Residential ^d	0%	-	0%	51	0%	-	6%	1,981	0%	2,032
Vacation Rental ^d	0%	-	0%	-	0%	-	10%	(244)	1%	(244)
Residential Investor ^d	0%	-	0%	-	0%	-	1%	289	0%	289
Commercialized Home Use ^d	0%	-	0%	-	0%	-	5%	1,734	0%	1,734
Total	100%	9,606	100%	1,903	100%	113	100%	(578)	100%	11,044

Source: City and County of Honolulu 2018

Notes:

- a. The following land use classes were excluded from the table as no parcels were included in these classes: Improved Residential, Unimproved Residential, and Single Family.
- b. Numbers in parenthesis are negative numbers.
- c. Land Use Class did not exist in Fiscal Year 13-14.
- d. Land Use Class is only applicable to three or fewer counties. Nontaxable parcels are not included.



3.8.2 Current Land Use and Development

The following sections discuss the State Land Use Classification System, county land use planning, and general building stock in the State. Additional information on land use and development is included in Section 5.

STATE LAND USE CLASSIFICATION SYSTEM

The State Land Use Law (Chapter 205, Hawai'i Revised Statutes) is unique in the history of the State of Hawai'i land use planning. Originally adopted by the State Legislature in 1961, the Land Use Law establishes an overall framework of land use management within the State. The statewide land use classifications established in the State Land Use law are administered by the Land Use Commission (LUC), which is composed of nine members appointed by the Governor and confirmed by the State Senate (one member appointed for each of the counties except the County of Kalawao and five members appointed at large). The State Land Use Law classifies the lands within the State of Hawai'i into one of four Districts: Urban, Rural, Agricultural, and Conservation (State of Hawai'i HMP, 2013).

The Urban District generally includes lands characterized by “city-like” concentrations of people, structures, and services. This district also includes vacant areas for future development. Jurisdiction of this district lies primarily with the respective counties. Generally, lot sizes and uses permitted in the Urban District area are established by the respective county through ordinances or rules (State of Hawai'i HMP 2013).

Rural Districts are composed primarily of small farms intermixed with low-density residential lots with a minimum size of one-half acre. Jurisdiction over Rural Districts is shared by the Commission and county governments. Permitted uses include those relating or compatible to agricultural use and low-density residential lots. Variances can be obtained through the special use permitting process (State of Hawai'i HMP 2013).

The Agricultural District includes lands for the cultivation of crops, aquaculture, raising livestock, wind energy facility, timber cultivation, agricultural-support activities (i.e., mills, employee quarters, etc.) and land with significant potential for agricultural uses. Golf courses and golf-related activities may also be included in this district, provided the land is not in the highest productivity categories (A or B) of the Land Study Bureau's detailed classification system. Uses permitted in the highest productivity agricultural categories are governed by statute. Uses in the lower-productivity categories—C, D, E or U—are established by the Commission and include those allowed on A or B lands as well as those stated under Section 205-4.5, Hawai'i Revised Statutes (State of Hawai'i HMP 2013).

Conservation Districts are comprised primarily of lands in existing forest and water reserve zones and include areas necessary for protecting watersheds and water sources; scenic and historic areas; parks, wilderness, open space, and recreational areas; habitats of endemic plants, fish, and wildlife; and all submerged lands seaward of the shoreline. The Conservation District also includes lands subject to flooding and soil erosion. Conservation Districts are administered by the State of Hawai'i Board of Land and Natural Resources and uses are governed by rules promulgated by the State of Hawai'i Department of Land and Natural Resources' (DLNR) Office of Conservation and Coastal Lands (OCCL) and Land Division (State of Hawai'i HMP, 2013).

As of 2016 the Conservation and Agricultural District classifications account for the vast majority of land area in the County of Hawai'i, 49% and 46% respectively. In all four counties, conservation and agricultural land districts are predominant, with rural land use districts representing the smallest land area. Statewide, urban land use



districts account for only 5% of the total land area; however, more than half the total acreage in the Urban District is in the City and County of Honolulu. Since 2013, statewide land use classifications have mostly remained static. A total of 261 acres statewide were reclassified from the Agricultural District to the Urban District (OP 2017). Table 3.8-4 summarizes the area of current land uses by county. Figure 3.8-1 through Figure 3.8-4 show the land use district classifications for each county.

Section 4 includes an assessment of each state land use district’s exposure to each hazard of concern with a defined spatial extent and location.

Table 3.8-4. Land Use District Classification by County

County	Total Land Area	Square Miles							
		Agricultural		Conservation		Rural		Urban	
		Total	% of Total	Total	% of Total	Total	% of Total	Total	% of Total
County of Kaua'i	630	299.1	47.5%	305.8	48.5%	2.2	0.3%	23.3	3.7%
City and County of Honolulu	601	189.2	31.5%	248.4	41.3%	0	0.0%	163.2	27.2%
County of Maui ^b	1,176	610.1	51.9%	508.8	43.3%	12.6	1.1%	44.1	3.8%
County of Hawai'i	4,028	1,844.4	45.8%	2,093.3	52.0%	1.4	0.0%	89.0	2.2%
TOTAL	6,435	2,942.8	45.7%	3,156.3	49.0%	16.1	0.3%	319.7	5.0%

Source: State Land Use District Boundaries for the Eight Main Hawaiian Islands, State Land Use Commission 2016

Notes:

- a. Total area for each county calculated using State Land Use District boundaries downloaded from State of Hawai'i GIS Program Geospatial Data Portal. The total area may differ slightly between this and other calculations due to slight differences in the shoreline geography.
- b. Includes the County of Kalawao GIS Geographic Information System

COUNTY LAND USE PLANNING

The counties in Hawai'i administer and enforce land uses in all State Land Use Districts, aside from the Conservation District. County zoning generally establishes acceptable uses, density and arrangement of urban, rural, and agricultural district lands, but must be consistent with state policy laws and regulations. All counties have general plans and zoning codes (sometimes called land use ordinances). These plans and codes are updated and administered at the county level and there is no statewide system for assessing whether county-level changes in zoning allow for increased development in hazard risk areas.



Figure 3.8-1. State Land Use District Classifications and Hawaiian Home Lands in the County of Kaua'i

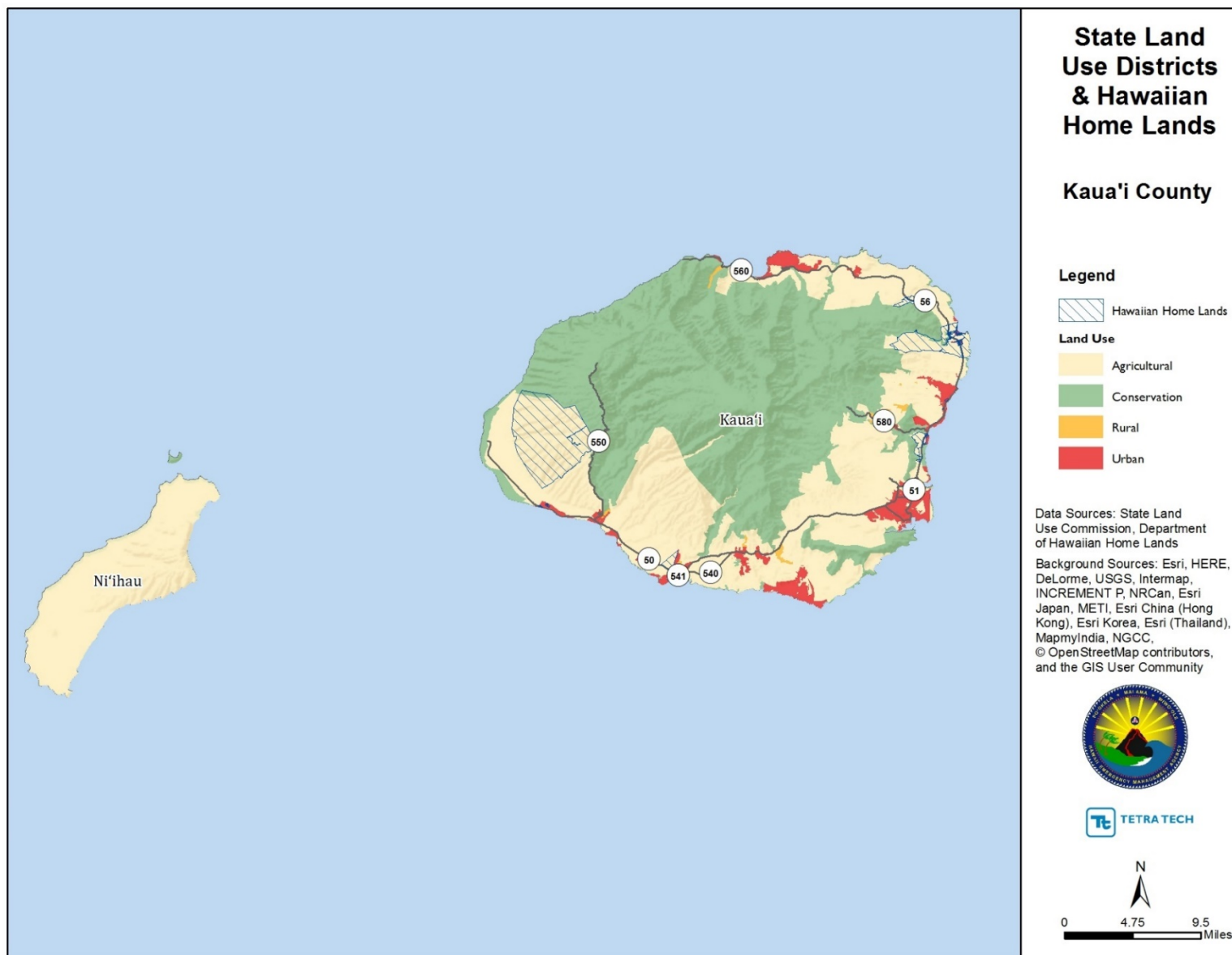




Figure 3.8-2. State Land Use District Classifications and Hawaiian Home Lands in the City and County of Honolulu

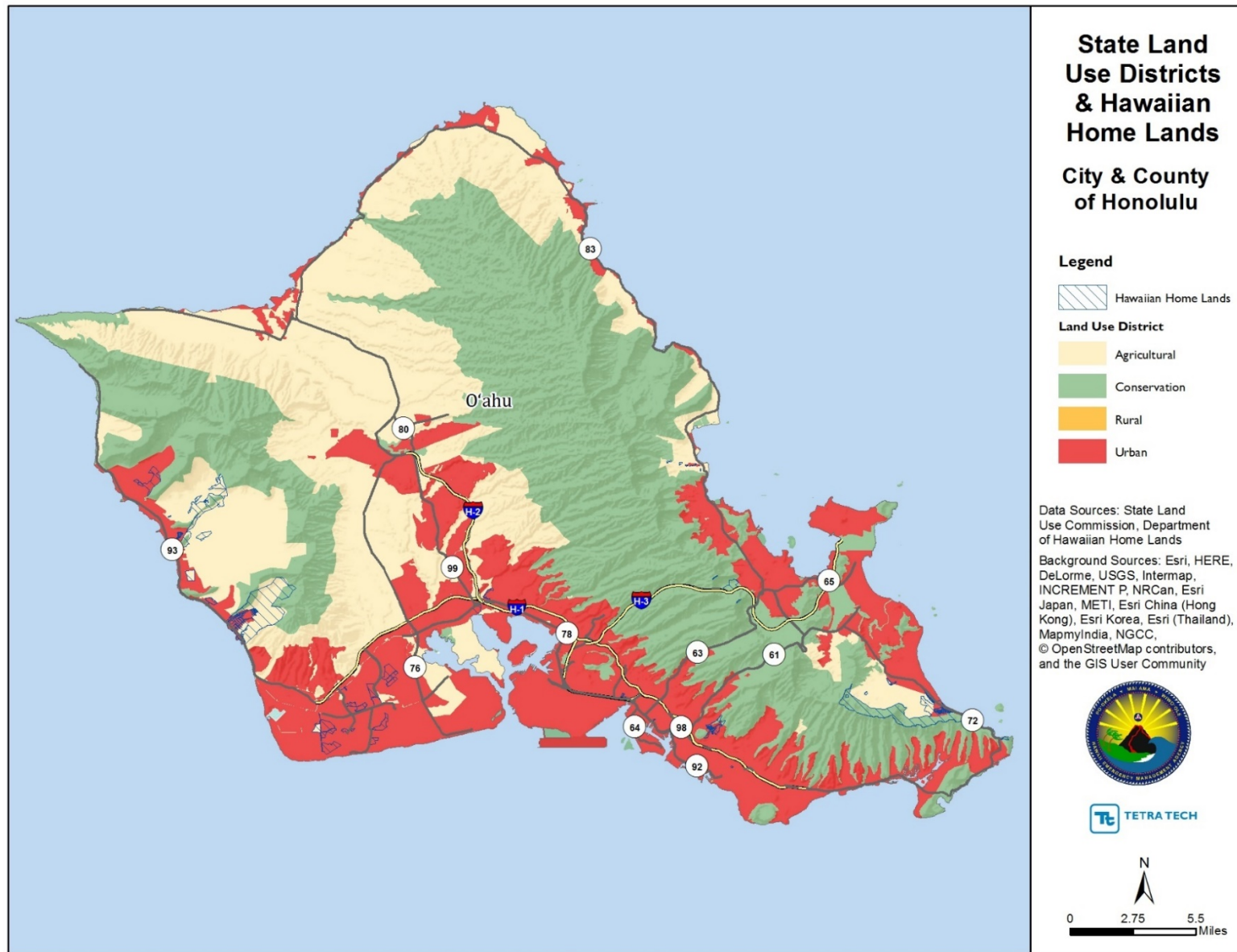




Figure 3.8-3. State Land Use District Classifications and Hawaiian Home Lands in the County of Maui

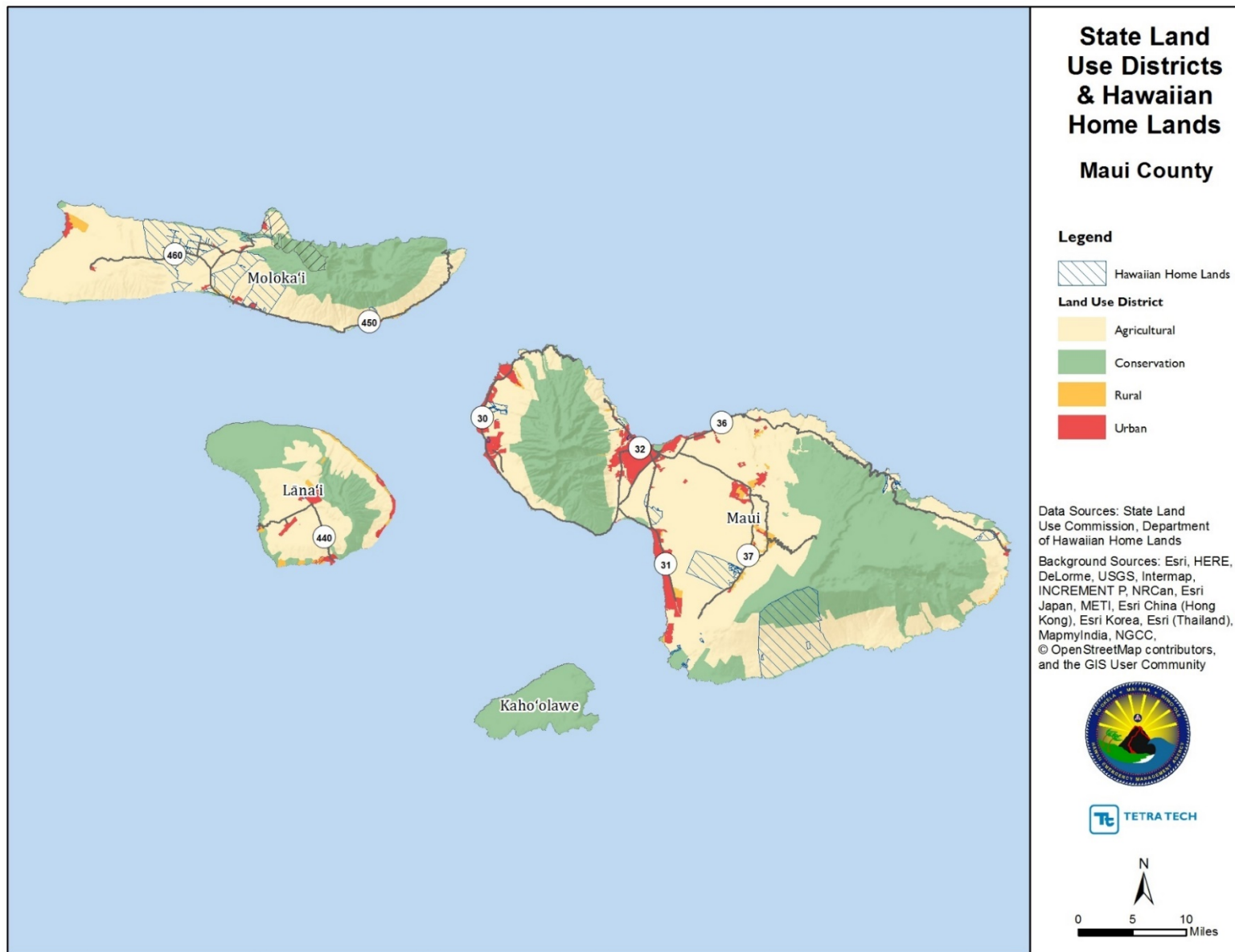
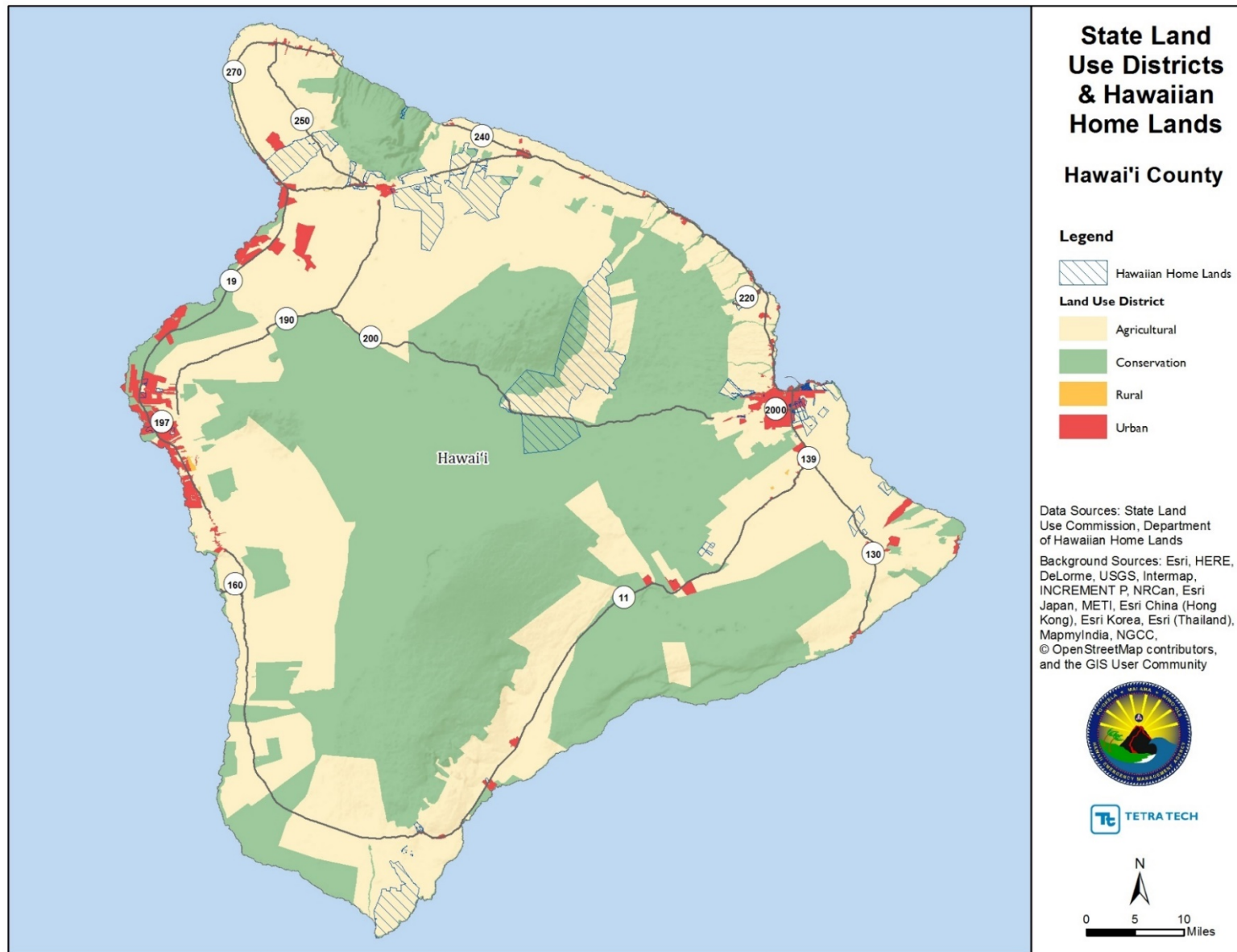




Figure 3.8-4. State Land Use District Classifications and Hawaiian Home Lands in the County of Hawai'i





GENERAL BUILDING STOCK

Residential, commercial, industrial, and other structures in the State make up the State’s general building stock. Understanding where structures are located, their value, and their potential for damage is a critical component of understanding the State’s overall risk to the hazards of concern. Damages to the general building stock can have far reaching consequences to recovery efforts and can help planners understand where mitigation efforts will be cost effective and have the greatest potential for reducing risk to lives and property. The vulnerability assessment conducted for each hazard of concern in Section 4.0 includes an assessment of impacts to the State’s general building stock.

Table 3.8-5. General Building Stock in the State of Hawai'i by County

County	Replacement Cost Value ^{a, b}	
	Dollars	Percent of Total
County of Kaua'i	\$33,326,392,000	13.7%
City and County of Honolulu	\$164,787,212,000	67.9%
County of Maui ^c	\$13,287,882,000	5.5%
County of Hawai'i	\$31,320,693,000	12.9%
TOTAL	\$242,722,179,000	100.0%

Source: Hazus v4.2

Notes:

a. Replacement cost value includes estimates for both structural components and contents.

b. Replacement cost value does not include any development that has occurred in the State since 2010.

c. Includes the County of Kalawao.

3.8.3 Projected Changes in Development

Just as there is no statewide system for tracking where development occurred over the performance period of the 2013 HMP, there is also no statewide system for tracking where development is likely to occur over the performance period of the 2018 HMP Update. A review of available data in the State identified three datasets that could be used to generally discuss where development may occur. The following sections provide information on these areas. The hazard exposure for each area is discussed is assessed in Section 4 (Risk Assessment).

COMMUNITY DEVELOPMENT DISTRICTS

The Hawai'i Community Development Authority (HCDA) establishes community plans in Hawaii’s Community Development Districts. Districts are designated in order to plan for the future development of underutilized urban areas in the State (HCDA 2018). As of 2018, there are three community development districts in the State: Kaka’ako, Kalaeloa and He’eia. All districts are located in the City and County of Honolulu and are a combined 7.4 square miles. These districts are described in the *Hawai'i Community Development Authority 2017 Annual Report* as follows (HCDA 2017):

- **Kaka’ako**—The Kaka’ako Community Development District consists of 600 acres of land. HCDA’s goal is to use sound planning to encourage use of Kaka’ako land supporting the legislative intent of a mixed-use district where residential, commercial, industrial, and public uses would complement each other. HCDA has improved infrastructure and public facilities in the district to attract development to increase housing opportunities for all segments of the community.



- Kalaeloa**—The Kalaeloa Community Development District encompasses approximately 3,700 acres of land within the former Naval Air Station Barbers Point. The legislature designated the district in 2002, to facilitate the redevelopment of the area in accordance with the Barbers Point Naval Air Station reuse plan. HCDA has been working on various projects to bring infrastructure improvements to the district, including projects to bring firm energy to Kalaeloa. Facilitating the redevelopment of Kalaeloa is a complex undertaking. There are several challenges to development because of the existing infrastructure, and lack thereof. For example, there are 20 miles of roadways that do not meet city or state standards, drainage in parts of the district is inadequate and the electrical system is not reliable. The HCDA has partnered with the Hawai'i State Energy Office, U.S. Department of Energy and Sandia National Laboratories to plan, analyze and design a micro-grid to provide reliable energy throughout the 3,700-acre district and help the State of Hawai'i meet its clean energy goals.
- He'eia**—The He'eia Community Development District was created in 1991, when the HCDA acquired approximately 400 acres of land in He'eia on the windward side of O'ahu as part of a land exchange with the Estate of Bernice Pauahi Bishop. HCDA facilitates culturally appropriate agriculture, education, and natural resource restoration and management in alignment with the Honolulu Board of Water Supply's Ko'olaupoko Watershed Management Plan and the City and County of Honolulu's Ko'olaupoko Sustainable Communities Plan. In January 2010, the HCDA and Kāko'o 'Ōiwi, a community-based nonprofit corporation entered into a 38-year lease. Kāko'o 'Ōiwi's primary mission is to restore the He'eia wetlands into a working agricultural and cultural district.

Figure 3.8-6 shows the location of the Community Development Districts in the State of Hawai'i, as all Community Development Districts are located in the City and County of Honolulu.

ENTERPRISE ZONES

The Enterprise Zones Partnership Program gives state and county benefits to companies in an effort to stimulate business activity, job preservation, and job creation in areas where they are most appropriate or most needed (Business Development and Support Division 2018). Each county is able to select up to six zones that, after approval by the Governor, exist for 20 years. As of 2018, there are 20 zones statewide comprising more than 2,843 square miles. Figure 3.8-5 through Figure 3.8-8 shows the location of the Enterprise Zones in each of the counties. Table 3.8-6 shows the square miles per county as well as the percent of the county's total land area.

Table 3.8-6. Area of Enterprise Zones by County

County	Enterprise Zones (Square Miles)	Percent of Total County Land Area
County of Kaua'i	252.3	40.0%
City and County of Honolulu	288.3	48.0%
County of Maui	1,016.7	86.5%
County of Hawai'i	1,286.6	31.9%
TOTAL	2,843.9	44.2%

Source: State of Hawai'i GIS

Note:

Total area for each county was calculated using coastline spatial layer downloaded from State of Hawai'i GIS Program Geospatial Data Portal.

GIS Geographic Information System



MAUI DEVELOPMENT PROJECTS

The County of Maui maintains a database of development projects on the Island of Maui that have come to the attention of the Department of Planning. These projects include three categories as defined below:

- **Committed**—These projects have inclusion in the Maui Island Plan Growth Boundaries and generally have conforming Community Plan and zoning entitlements.
- **Maui Island Plan and Community Plan**—These projects have inclusion in the Maui Island Plan Growth Boundaries and the appropriate urban or rural Community Plan designations but not the conforming zoning entitlements to proceed.
- **Maui Island Plan Only**—These projects do have inclusion in the Maui Island Plan Growth Boundaries but do not have the appropriate Community Plan designation nor zoning to proceed.

It should be noted that these projects are not a complete picture of development projects within the County of Maui and are at varying stages of development. Some of these projects may never be started or be realized, or the project specifics may change over time. In total, the parcels on which these projects are located account for more than 27.6 square miles on the Island of Maui as shown on Figure 3.8-7.



Figure 3.8-5. Projected Development Areas in the County of Kaua'i

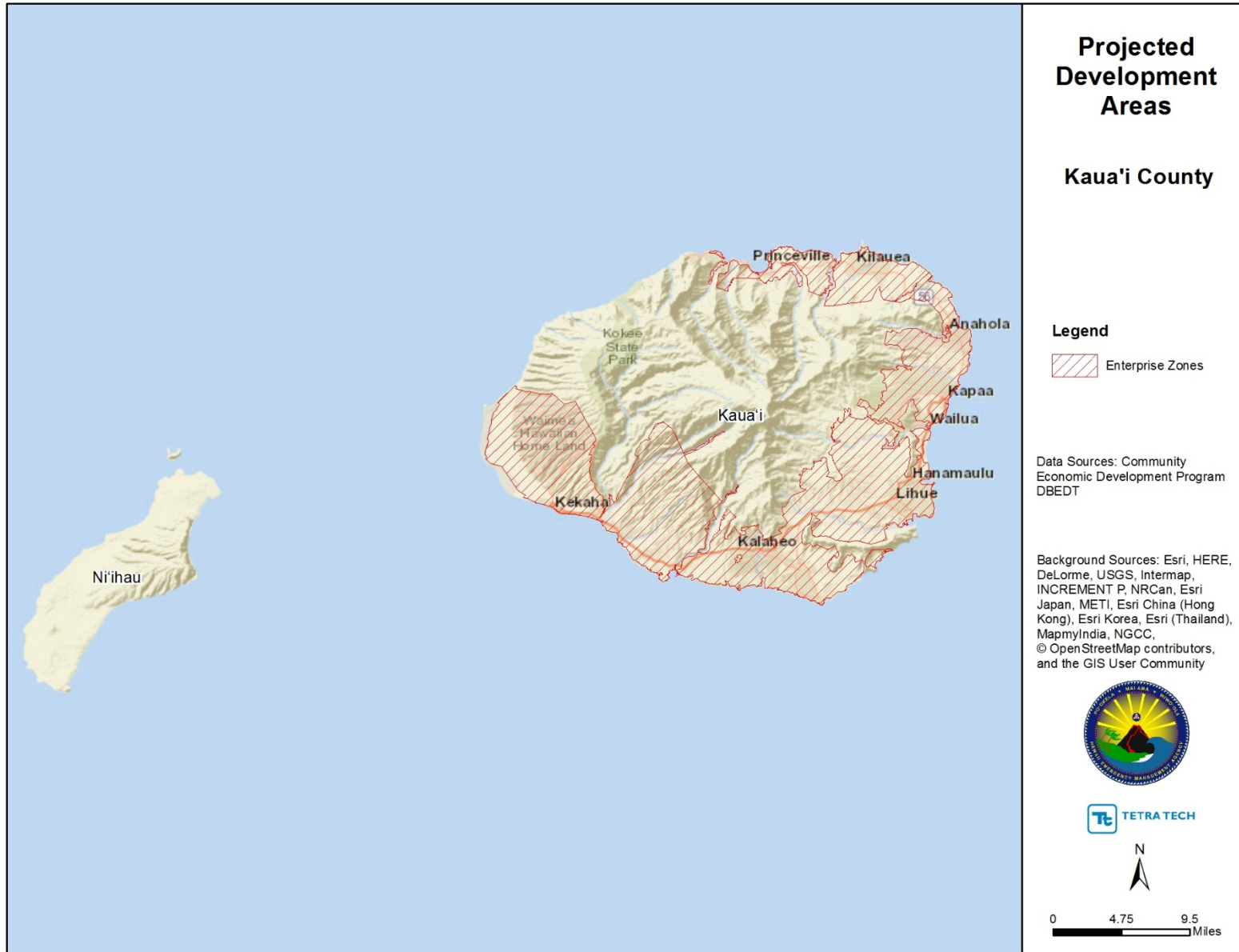




Figure 3.8-6. Projected Development Areas in the City and County of Honolulu





Figure 3.8-7. Projected Development Areas in the County of Maui

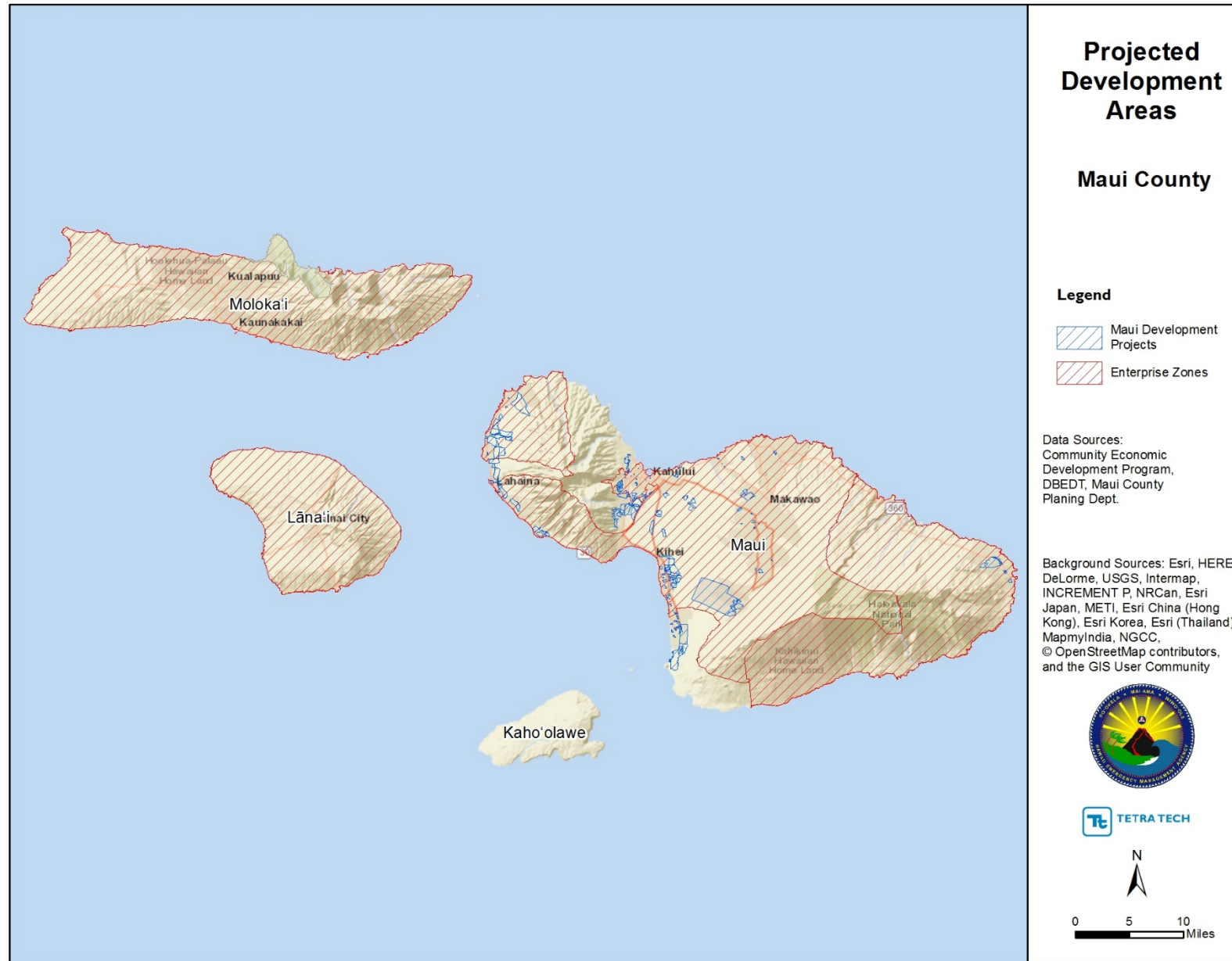
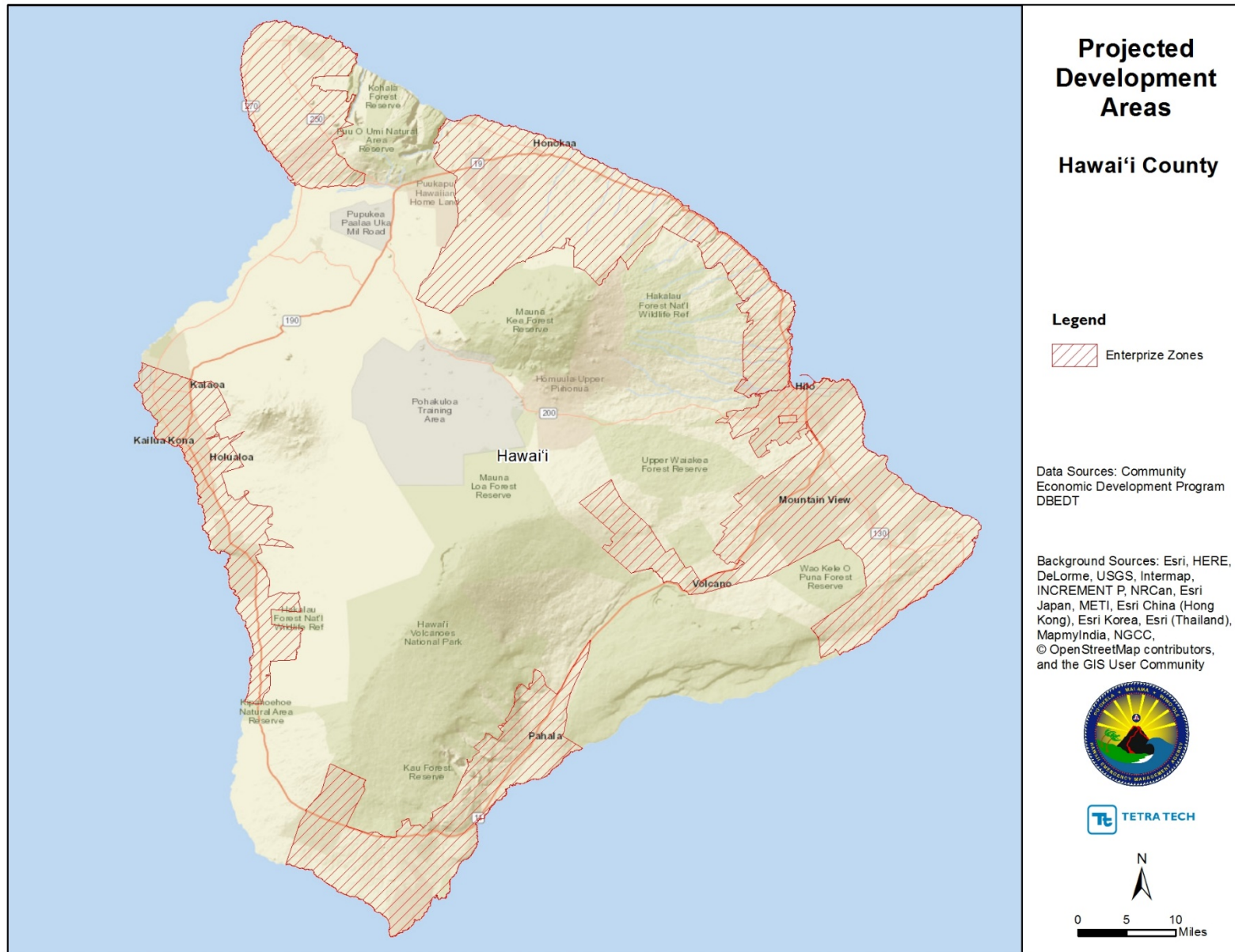




Figure 3.8-8. Projected Development Areas in the County of Hawai'i





3.9 Cultural Assets

3.9.1 Hawaiian Home Lands

Hawaiian Home Lands are intended to provide for the economic self-sufficiency of native Hawaiians through a homesteading program (University of Hawai'i 2015 as cited in Hawai'i Climate Change Mitigation and Adaptation Commission, 2017). Consistent with Native Hawaiian culture, Hawaiian Home Lands include areas from mauka to makai (from the mountain to the sea). These lands are developed and distributed to native Hawaiian beneficiaries by way of residential, agricultural, and pastoral leases for 99-year terms with lease payments of \$1.00 per year. Some parcels are designated for income-producing purposes and are generally leased for industrial, retail, or other uses.

Hawaiian Home Lands account for only a small percent of the total land area statewide and in each county. There are approximately 326 square miles in the State of which 58% (190 square miles) is in the County of Hawai'i. There are 93 square miles of Hawaiian Home Lands in the County of Maui, 32 square miles in the County of Kaua'i, and 11 square miles in the City and County of Honolulu. The location of Hawaiian Home Lands in each county can be seen in Figure 3.8-1 through Figure 3.8-4 above.

3.9.2 Other Cultural Assets

There are a wide array of cultural assets located on the Hawaiian Islands. The State Historic Preservation Division maintains an inventory of more than 38,000 historic sites in the State including historic and cultural resources, such as architecturally significant buildings and sites where significant historic events occur as well as sites that are culturally significant to Native Hawaiians, such as burial sites and fishponds. A location-based database of these assets was not available for use in the 2018 HMP Update. Future updates of the plan will strive to secure such a database so the risk and vulnerability of these important sites can be included in the vulnerability assessments conducted for each hazard of concern.

3.10 Natural Resources

The following sections discuss the extent and location of select natural resources in the State of Hawai'i including environmental resources and watershed partnerships. Areas where these resources, as well as those in conservation district lands discussed in Section 3.8.2, intersect with hazard risk areas as well as potential impacts are discussed in each of the vulnerability assessments presented in Section 4 of the 2018 HMP Update.

3.10.1 Environmental Resources

The State of Hawai'i contains an abundant array of onshore and offshore environmental resources, including many species that are endemic only to the Hawaiian Islands. Environmental resources should be considered in hazard mitigation planning because they are impacted by natural hazard events and can influence the way in which hazards impact the built environment. The exposure and vulnerability of the following environmental resources are discussed for each hazard of concern in this 2018 HMP Update:



- Critical Habitat**—Critical habitat is the term used in the Endangered Species Act to define those areas of habitat that are known to be essential for an endangered or threatened species to recover and that require special management or protection. According to the U.S. Fish & Wildlife Service, there are 79 animal species and 424 plant species believed or known to occur within the State that are listed as endangered or threatened (U.S. Fish & Wildlife Service 2018). As of 2017, there is critical habitat in each of the State’s counties, totaling more than 915 square miles.
- Wetlands**—Wetlands provide a multitude of benefits including habitat for fish and wildlife, groundwater recharge, flood reduction, water quality, food, and recreational opportunities. There are more than 4,150 square miles of wetlands in the State.
- Parks and Reserves**—There are a large number of beloved parks and reserves in the Hawaiian Islands that provide valuable recreational opportunities, economic benefits, and provide for the protection of natural and cultural resources. Statewide, there are more than 2,600 square miles of land designated as a park, preserve or reserve in the State.
- Reefs**—The marine waters of the State of Hawai'i include coral and artificial reefs, which provide habitat to a diverse array of species, provide economic opportunities for fishers and tourism activities, and buffer adjacent shorelines from wave action preventing erosion. Statewide there are approximately 55 square miles of reefs in the State’s offshore environment. The County of Maui has the largest share of the State’s reef system with almost half of the total acreage of reefs located in the county’s offshore environment.

Table 3.10-1 shows the total area of natural resources assessed in this plan by County. Locations of these environmental resources by county are available in Appendix X (Map Atlas).

Table 3.10-1. Square Miles of Environmental Resource Areas in the State of Hawai'i by County

Environmental Resource Area	Area in square miles				
	County of Kaua'i	City and County of Honolulu	County of Maui ^d	County of Hawai'i	Statewide
Critical Habitat ^a	90.4	121.2	263.2	440.4	915.2
Wetlands	47.3	14.8	109.7	88.2	260.0
Parks and Reserves	205.4	105.5	311.3	1,985.4	2,607.7
Reefs ^b	4.5	15.7	25.8	8.6	54.7
Total^c	347.6	257.2	710	2,522.6	3,837.6

Source: State of Hawai'i GIS Program Geospatial Data Portal

Notes:

- a. Critical area mileage includes the combined area of coverage of individual critical habitat areas.
 - b. Reefs include artificial and coral reefs.
 - c. Total square miles may be over reported as some environmental asset areas may overlap.
 - d. Includes the County of Kalawao.
- GIS Geographic Information System

3.10.2 Watershed Partnerships

According to the Hawai'i Association of Watershed Partnerships (HAWP), a watershed is an area of land, such as a mountain or valley, which collects rainwater into a common outlet. In the State of Hawai'i, the common outlet is ultimately the ocean. Some of the rain is absorbed by plants, some of it is absorbed underground, and the rest flows into surface rivers and streams. A critical component of a watershed’s ability to collect rainwater is the



existence of forests. Fog condensing on trees high up in watershed areas can increase rainfall collection and absorption by as much as 30% annually (HAWP 2018).

The Hawaiian equivalent of a watershed is the ahupua'a. In Hawaiian cultural tradition, an ahupua'a is a land division with the streams and valleys serving as boundaries. The size of the ahupua'a varies on different islands from as little as 100 acres to more than 100,000 acres. An ahupua'a includes the land from the mountains to the coast, and the coastal ocean extending out to and including the coral reef (HAWP 2018).

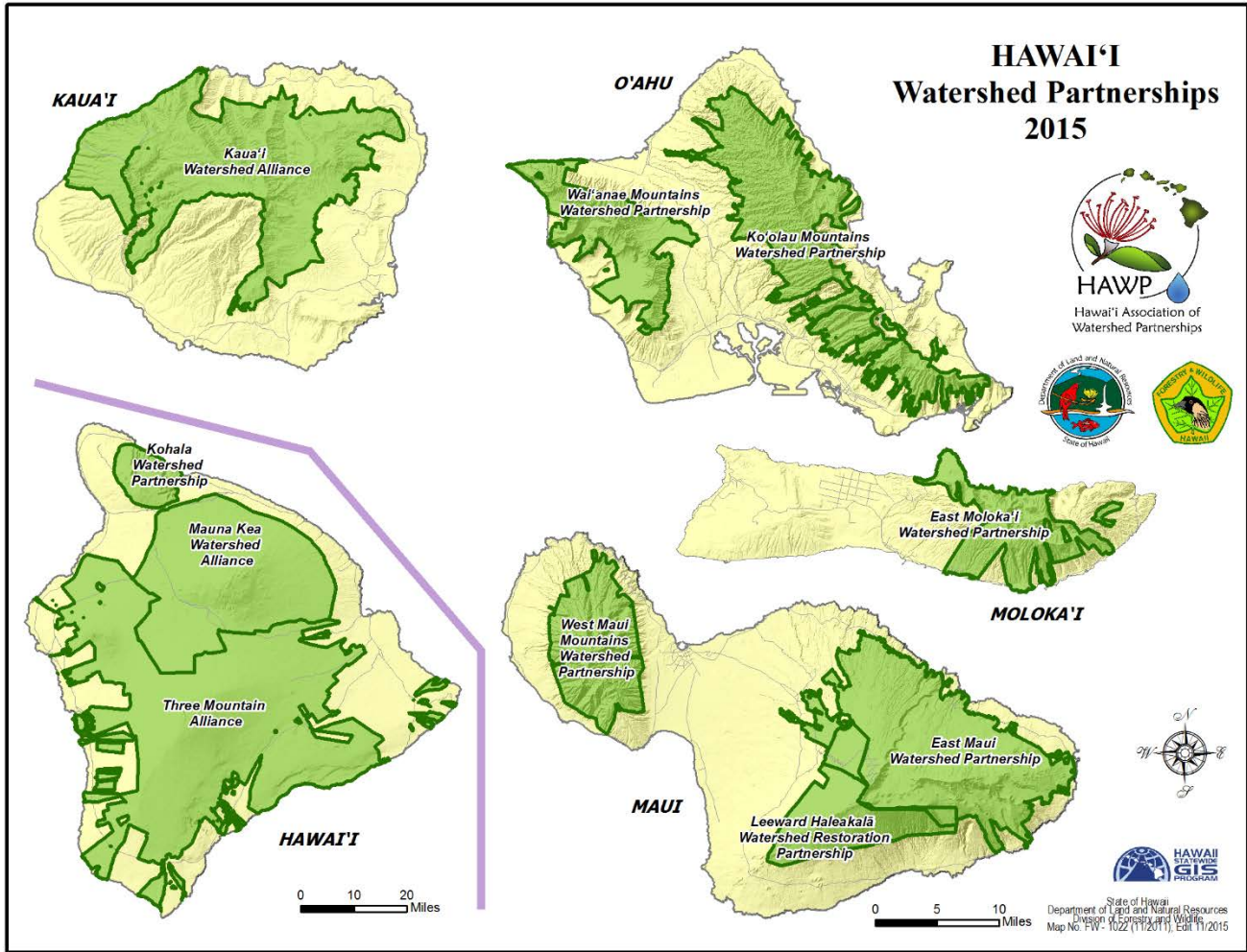
The State of Hawai'i has ten Watershed Partnerships on five of its islands. Hawaii's forested watersheds provide habitat, groundwater recharge, and other ecosystem services upon which the residents of the State of Hawai'i rely. Watershed partnership areas are those areas where public and private landowners who are committed to the common value of protecting forested watersheds engage in collaborative management. More than 3,131 square miles of the State's land area are located in a watershed partnership. Table 3.10-2 shows the total area of each watershed partnership and Figure 3.10-1 shows their locations (HAWP 2018).

Table 3.10-2. Watershed Partnerships in Square Miles by County

County	Watershed Partnership	Area (square miles)
County of Kaua'i	Kaua'i Watershed Alliance	225.0
	County Total:	225.0
City and County of Honolulu	Ko'olau Mountains Watershed Partnership	157.7
	Wai'anae Mountains Watershed Partnership	72.5
	County Total:	230.2
County of Maui	East Maui Watershed Partnership	186.7
	East Moloka'i Watershed Partnership	65.1
	Leeward Haleakalā Watershed Restoration Partnership	67.3
	West Maui Mountains Watershed Partnership	73.9
	County Total:	393.0
County of Hawai'i	Kohala Watershed Partnership	115.8
	Mauna Kea Watershed Alliance	400.4
	Three Mountain Alliance	1,767.3
	County Total:	2,283.5
State of Hawai'i Total:		3,131.8



Figure 3.10-1. Watershed Partnership Areas in the State of Hawai'i



Source: Hawai'i Association of Watershed Partners 2018