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## SECTION 3. STATE PROFILE

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### 2023 HMP Update Changes

- ❖ All data presented was updated as appropriate, including demographic information and land use and development statistics.
- ❖ Sections for socially vulnerable populations and community lifelines 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 2023 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 composed of 132 volcanic islands, atolls, reef, shoals, and seamounts stretching over 1,500 miles from the Island of Hawai'i in the southeast to Kure Atoll in the northwest (NOAA 2021). The Hawaiian Islands cover 6,422 square miles of land, with eight main islands located at the southeastern end of the island chain: Ni'i'hau, 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 (DLNR 2019). The general features of the State can be seen in Figure 3.2-1. Given the State's relative isolation and dependency on imported goods and services, mitigation takes on added importance.

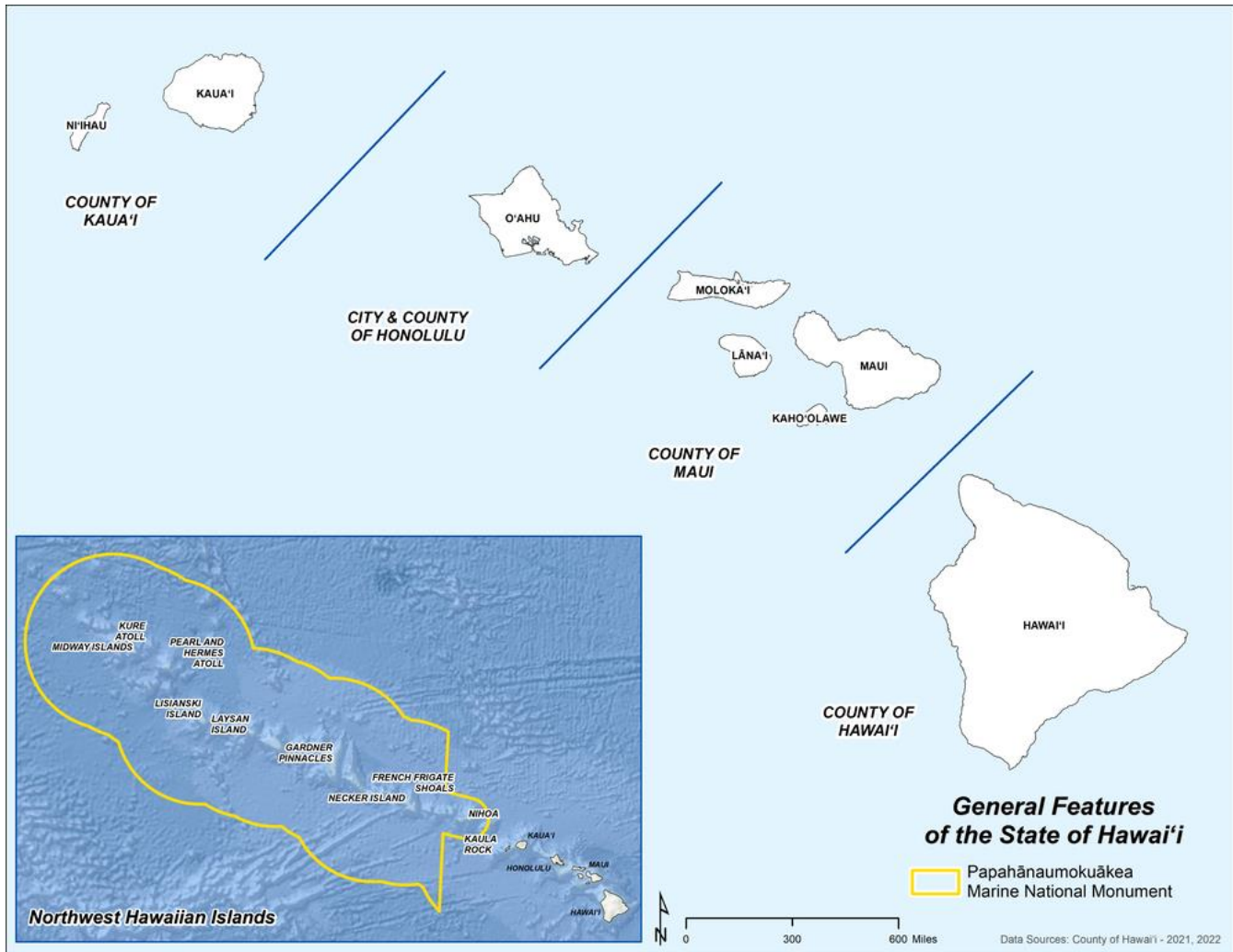
### 3.2 HISTORIC OVERVIEW

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 2022). 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, called ahupua'a (NPS 2019). The first westerners to arrive in the Islands were 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. 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 50<sup>th</sup> state of the United States of America (Hawai'i Tourism Authority 2022).





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



### 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'i'hau. 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 (Office of Hawaiian Affairs 2016). For the 2023 HMP Update, the County of Kalawao statistics are included with the County of Maui's statistics.

### 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 throughout the 2023 HMP Update is typically presented from the westernmost part of the State, County of Kaua'i, to the easternmost, County of Hawai'i.

#### 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 Island, 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 3 miles from the ocean floor and is roughly 550 square miles (County of Kaua'i 2021).

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 location on Earth, averaging 460 inches of rain per 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 (University of Massachusetts 2018). The Island of Ni'ihau, nicknamed "The Forbidden Island," is a privately owned island. The island is semi-arid with a dry climate, although several lakes provide fresh water (NASA 2020).

#### 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 (City & County of Honolulu 2020). 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 (Hawai'i Tourism Authority 2017). The Hawai'i Emergency Management Agency (HI-EMA) emergency operations center is located within Diamond Head due to its relatively protected surroundings.

#### COUNTY OF MAUI

The Island of Maui is the second largest island in the Hawaiian Archipelago, covering 772 square miles. It was formed 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 future; its eruptive history indicates it could erupt every 200 to 500 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 2020).

The Island of Molokaʻi is the fifth largest of the main Hawaiian Islands, covering approximately 261 square miles. It has 88 miles of coastline and is the most rural of the Hawaiian Islands, often being referred to as the “Last Hawaiian Island”. It was formed primarily by the coalescence of two shield volcanoes 1.8 million to 1.3 million years ago: the East Molokaʻi Volcano (also known as Kamakou) and the West Molokaʻi Volcano (also known as Mauna Loa) (County of Maui 2020).

The Island of Lānaʻi 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 (Smithsonian Institution 2013). Lānaʻi is one of the driest of the inhabited main Hawaiian Islands, as it lies within the rain shadow of Maui’s West Maui mountains (County of Maui 2020).

The smallest of the main Hawaiian Islands, Kahoʻolawe is 11 miles long, 7 miles wide, with an area of about 45 square miles (County of Maui 2020). It was formed by a single volcano that underwent shield and post-shield stages; the island itself is the exposed top of a shield volcano. The highest point on the island is a crater Puʻu ʻO Moaʻula Nui, at 1,483 feet above sea level (Hawaiian Volcano Observatory 2004).

## COUNTY OF HAWAIʻI

The Island of Hawaiʻi is the southeasternmost island in the Hawaiian Archipelago. At approximately 4,028 square miles, the Island of Hawaiʻi, 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 Hawaiʻi was formed from the coalescence of five volcanoes—Kohala, Mauna Kea, Hualālai, Mauna Loa, and Kīlauea (County of Hawaiʻi 2020). Two of the five volcanoes have erupted in the past year. Mauna Loa erupted from November to December 2022, and Kīlauea began erupting in January of 2023 (NPS 2023a) (NPS 2023b).

As the geologically youngest island, Hawaiʻi Island’s landforms have not been weathered to the extent of the other islands. Thus, rainfall runoff flows in narrow V-shaped stream valleys without broad floodplains or sheet flows in relatively undefined drainageways, especially in the drier leeward areas. The relatively immature reef development and related lack of white sandy beaches is also characteristic of the youthful geologic age of this island (County of Hawaiʻi 2020).

### 3.4.2 CLIMATE

The following sections provide a general overview of the climate in the State of Hawaiʻi and how the El Niño-Southern Oscillation cycle affects climate conditions in the State.

## GENERAL OVERVIEW OF THE CLIMATE OF THE STATE OF HAWAIʻI

The following description of the climate of the State of Hawaiʻi 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 Hawai'i'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 2019).

### *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 Hawai'i'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 Hawai'i'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 Hawai'i'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 Hawai'i'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 Hawai'i's tallest peaks do get their share of winter blizzards, ice, and snow. Highest temperatures may reach 90°F or higher. 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.

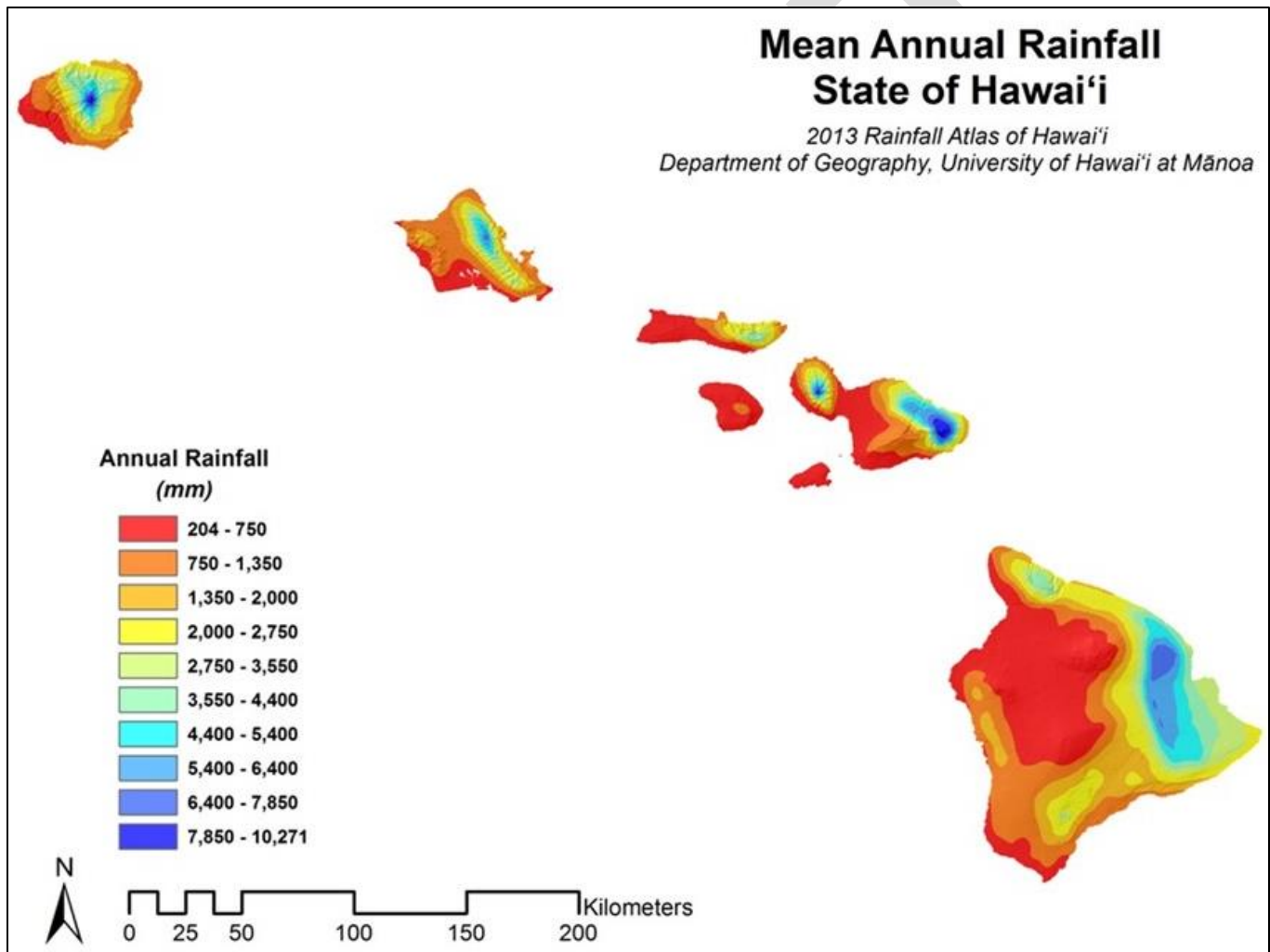




### Rainfall

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 closely resembles 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.

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



Source: (Giambelluca, et al. 2013)

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. Hawai'i'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 rainstorms 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.

## 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 2009).

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 2 to 7 years. Typically, El Niño occurs more frequently than La Niña (NOAA 2009).

### *El Niño*

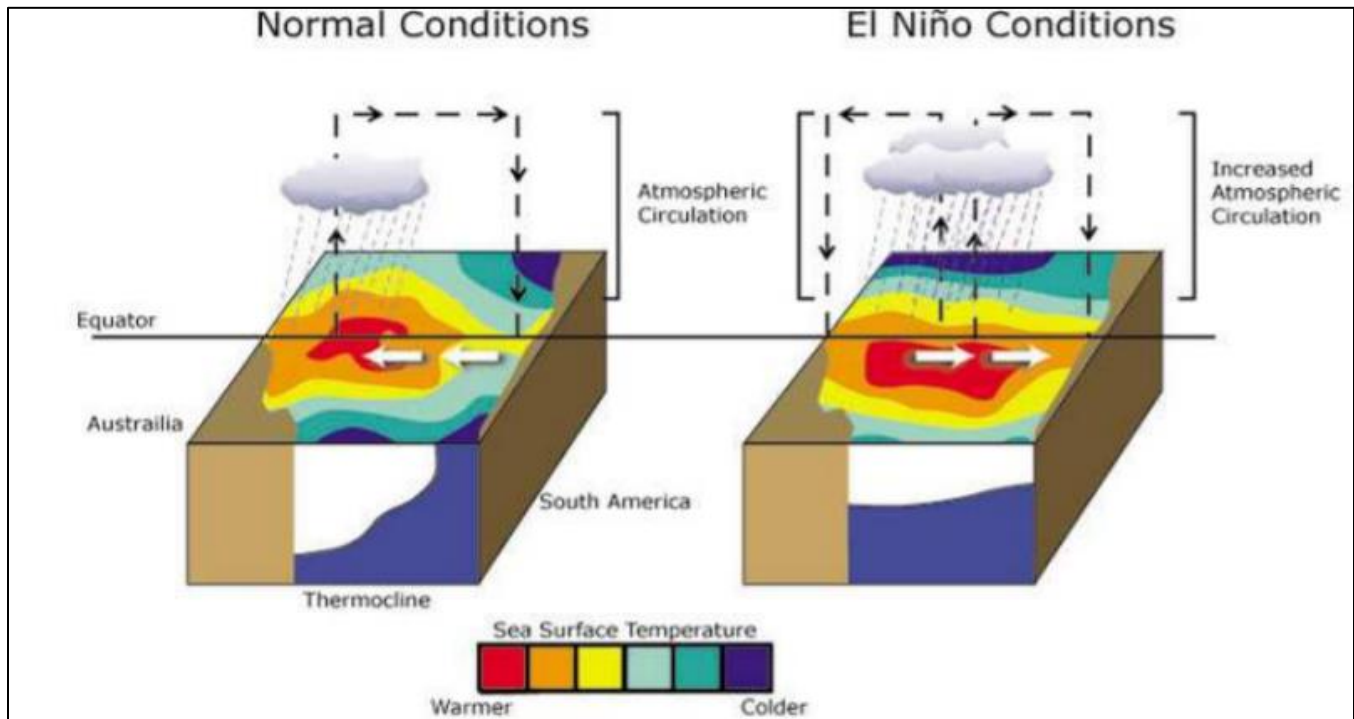
El Niño refers to the large-scale, ocean-atmosphere climate interaction linked to a periodic warming in sea surface temperatures across the central and east-central Equatorial Pacific. It brings increased rainfall to the East Pacific Basin and drought at locations west of the Pacific Basin, such as in 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 transmit data daily which are available to researchers and forecasters around the world in real time (NOAA n.d.).

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 2015

During El Niño, the State of Hawai‘i typically experiences more rain in the beginning of the season and then rapidly less, causing a drier wet season. Trade winds are weaker, and occasionally the State will experience westerly (or Kona) 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. 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 (NOAA 2015).

### 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 toward 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 (National Geographic 2022).

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 (Guide of US 2023).





## 3.5 DEMOGRAPHICS

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

### 3.5.1 RESIDENT POPULATION

#### TOTAL 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 the 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 2020 estimates, the State of Hawai'i has a resident population of 1,455,271 people. The majority of the population is concentrated on the Island of O'ahu (City and County of Honolulu), with a total of 1,016,508 residents. Between 2010 and 2020, the State of Hawai'i's resident population increased by 6.6% (Hawai'i DBEDT 2022). Resident population figures by county are shown in Table 3.5-1.

*Table 3.5-1. Resident Population by County, 1990 to 2020*

| County                      | Resident Population |                  |                  |                  | % Change (2010 to 2020) |
|-----------------------------|---------------------|------------------|------------------|------------------|-------------------------|
|                             | 1990                | 2000             | 2010             | 2020             |                         |
| County of Kaua'i            | 51,177              | 58,463           | 67,091           | 73,298           | +9.3%                   |
| City and County of Honolulu | 836,231             | 876,156          | 953,207          | 1,016,508        | +6.6%                   |
| County of Maui              | 100,504             | 128,241          | 154,924          | 164,836          | +6.4%                   |
| County of Hawai'i           | 120,317             | 148,677          | 185,079          | 200,629          | +8.4%                   |
| <b>Total <sup>a</sup></b>   | <b>1,108,229</b>    | <b>1,211,537</b> | <b>1,360,301</b> | <b>1,455,271</b> | <b>7.7%</b>             |

Source: Hawai'i DBEDT 2022

Note: a. These estimates include military personnel stationed or homeported in the State. The U.S. Department of Defense estimates that there are 25,394 active-duty military in the State as of December 2022. 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 was 264,747 visitors as of December 2022 (Department of Business, Economic Development & Tourism 2023). This means that the de facto population is 18.2% greater than the resident population. Additional discussion on tourism can be found in Section 3.5.8.

Population projections indicate that the statewide population is expected to increase by approximately 220,000 by 2045, representing a 0.5% growth rate per year over the projected period. The Neighbor Island counties are projected to have higher population growth than Honolulu County during the projected period, with these Neighbor Island counties projected to increase by 34.9% by 2045. Table 3.5-2 shows population projections for each county until 2045.



**Table 3.5-2. Resident Population Projections by County, 2025 to 2045**

| County                      | Resident Population |                 |                  | Average Annual Growth Rate (2025-2035) |
|-----------------------------|---------------------|-----------------|------------------|--|
|                             | 2025                | 2035            | 2045             |  |
| County of Kaua'i            | 78,000              | 84,300          | 90,000           | 6.8%                                   |
| City and County of Honolulu | 1,032,700           | 1,062,100       | 1,073,800        | 1.1%                                   |
| County of Maui              | 181,600             | 197,800         | 211,500          | 6.9%                                   |
| County of Hawai'i           | 222,400             | 248,500         | 273,200          | 9.9%                                   |
| <b>Total</b>                | <b>1,514,700</b>    | <b>1,592,70</b> | <b>1,648,600</b> | <b>6.2%</b>                            |

Source: Hawai'i DBEDT 2022

## SOCIALLY VULNERABLE POPULATION

For the 2023 HMP Update, the Social Vulnerability Focus Group identified the 2018 statewide Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC) as the best available dataset to identify areas where mitigation efforts can be prioritized to benefit socially vulnerable populations. At the time of the direction and analysis, the 2020 SVI updates had not been made public. Updated residential population data compiled from the Census Bureau was integrated into the 2018 SVI analysis. See Section 4.1 (Risk Assessment Overview) for more information on how the SVI was used to determine hazard risk to socially vulnerable populations. An overview of the socially vulnerable population for the 2023 HMP indicates that more than 22% of the State's population has an SVI greater than 0.8 (see Table 3.5-3). The County of Kaua'i contains the smallest percentage of socially vulnerable populations at about 15%.

**Table 3.5-3. Socially Vulnerable Population by County**

| County                      | Total Population | Socially Vulnerable Population | Percent of Total Population |
|-----------------------------|------------------|--------------------------------|-----------------------------|
| County of Kaua'i            | 71,949           | 11,149                         | 15.5%                       |
| City and County of Honolulu | 979,682          | 224,567                        | 22.9%                       |
| County of Maui              | 167,093          | 35,284                         | 21.1%                       |
| County of Hawai'i           | 201,350          | 45,257                         | 22.5%                       |
| <b>Total</b>                | <b>1,420,074</b> | <b>316,257</b>                 | <b>22.3%</b>                |

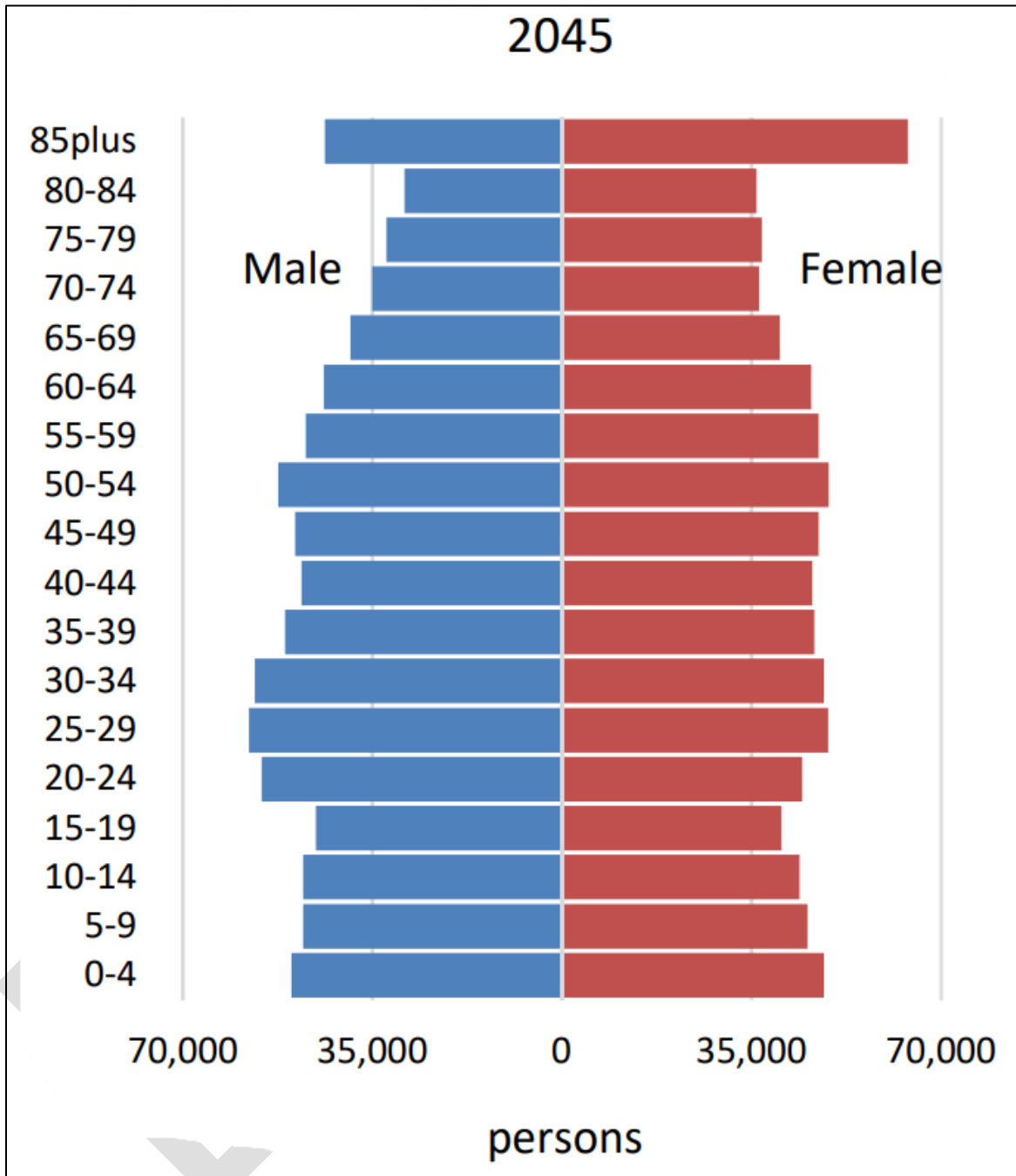
### 3.5.2 AGE DISTRIBUTION

The residents of the State of Hawai'i have a median age of 39.7 as of 2020, which is slightly older than the national average of 38.6. Women in Hawai'i have a median age of 41.1, which is slightly older than the median age of men (38.5). As of 2020, 18.8% of the population is now over the age of 65, and the single largest age group is 30–34 years old (Hawai'i DBEDT 2022). By 2045, the share of the population aged 65–74 is projected to decrease to 38.4% of total elderly population, while the population aged 85 years and over is projected to increase its share to 27.4% (Hawai'i DBEDT 2018). The age distribution of the projected population for 2045 is shown in Figure 3.5-1.





Figure 3.5-1. State of Hawai'i 2045 Projected Population Distribution by Age and Gender



Source: (Hawai'i DBEDT 2018)

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.



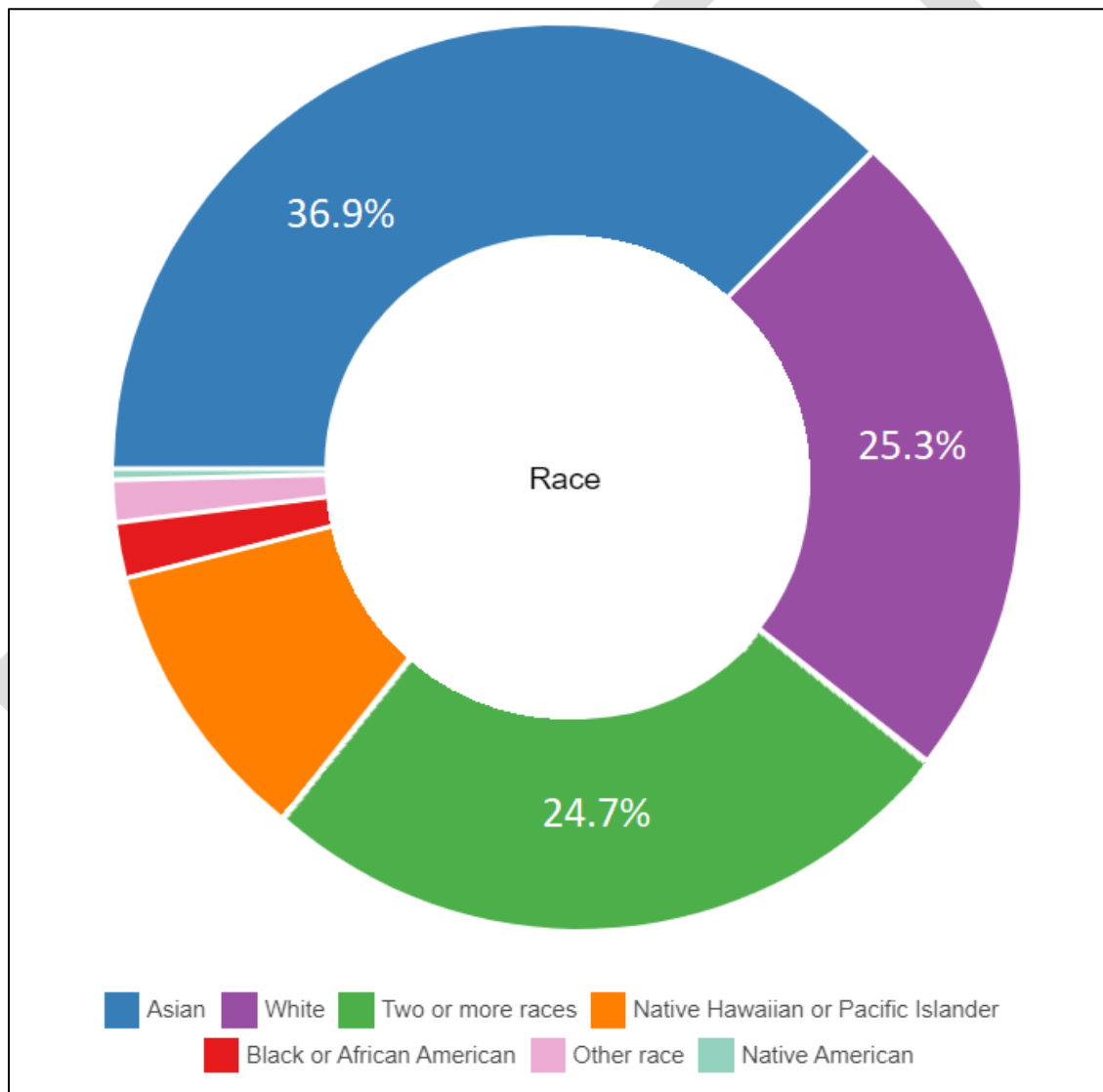


Children under 14 are also particularly vulnerable to disaster events because of their young age and dependence on others for basic necessities. Very young children may additionally be vulnerable to injury or sickness; this vulnerability can be worsened during a natural disaster because they may not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

### 3.5.3 RACE, PLACE OF BIRTH, AND LANGUAGE

According to the 2020 U.S. Census, persons of Asian descent make up the largest proportion of the population in the State of Hawai'i at 36.9%, followed by White residents (25.3%) and residents of two or more races (24.7%) (Hawai'i DBEDT 2022). Native Hawaiians and Pacific Islanders account for 10.5% of the total population (Figure 3.5-2). Table 3.5-4 shows the racial distribution by county.

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



Source: Hawai'i DBEDT 2022





**Table 3.5-4. 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            | 23,217         | 384                       | 220                                | 22,696         | 6,938                                | 729             | 19,063            | 73,247           |
| City and County of Honolulu | 201,564        | 25,178                    | 2,494                              | 429,491        | 103,982                              | 25,897          | 237,561           | 1,026,167        |
| County of Maui              | 54,194         | 1,120                     | 569                                | 48,176         | 18,459                               | 3,421           | 38,629            | 164,568          |
| County of Hawai'i           | 65,306         | 1,458                     | 995                                | 44,271         | 24,088                               | 4,586           | 59,754            | 200,458          |
| <b>Total</b>                | <b>344,281</b> | <b>28,140</b>             | <b>4,278</b>                       | <b>544,634</b> | <b>153,467</b>                       | <b>34,633</b>   | <b>355,007</b>    | <b>1,464,440</b> |

Source: American Community Survey 2021; American Community Survey 2021; American Community Survey 2021; American Community Survey 2021

According to the 2021 Hawai'i State Date Book, approximately 81.7% of the State population was born in the United States, with about 53.3% born in Hawai'i. Of the 18.3% of foreign-born residents, approximately 10.7% are U.S. Citizens. More than 44% of residents born outside of the United States were born in the Philippines, followed by Japan at 9.2% and China at 7.3% (Hawai'i DBEDT 2022).

Approximately 347,961 of State of Hawai'i residents, just under a third of all residents over the age of 5, speak a language other than English at home. Over 40% of these residents (43.8%), approximately 152,407, speak English less than well. Pacific Island languages are the most common language spoken other than English, followed by Tagalog and Japanese (Hawai'i DBEDT 2022). Understanding the language that residents speak is important in ensuring that risk and emergency information is effectively communicated to the population. This applies to both residents and visitors, as discussed in Section 3.5.8 below.

### 3.5.4 PERSONS WITH DISABILITIES OR WITH ACCESS AND FUNCTIONAL NEEDS

The 2020 U.S. Census estimates that over 42 million non-institutionalized Americans with disabilities or with access and functional needs live in the U.S. 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 the 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 12% of the total civilian non-institutionalized population of the State of Hawai'i (U.S. Census Bureau 2022). The likelihood of having a disability varies by age, with an estimated 3% of the population under 18 years old, to 8.7% of people 18–64 years of age, and 31.5% of those 65 and older.

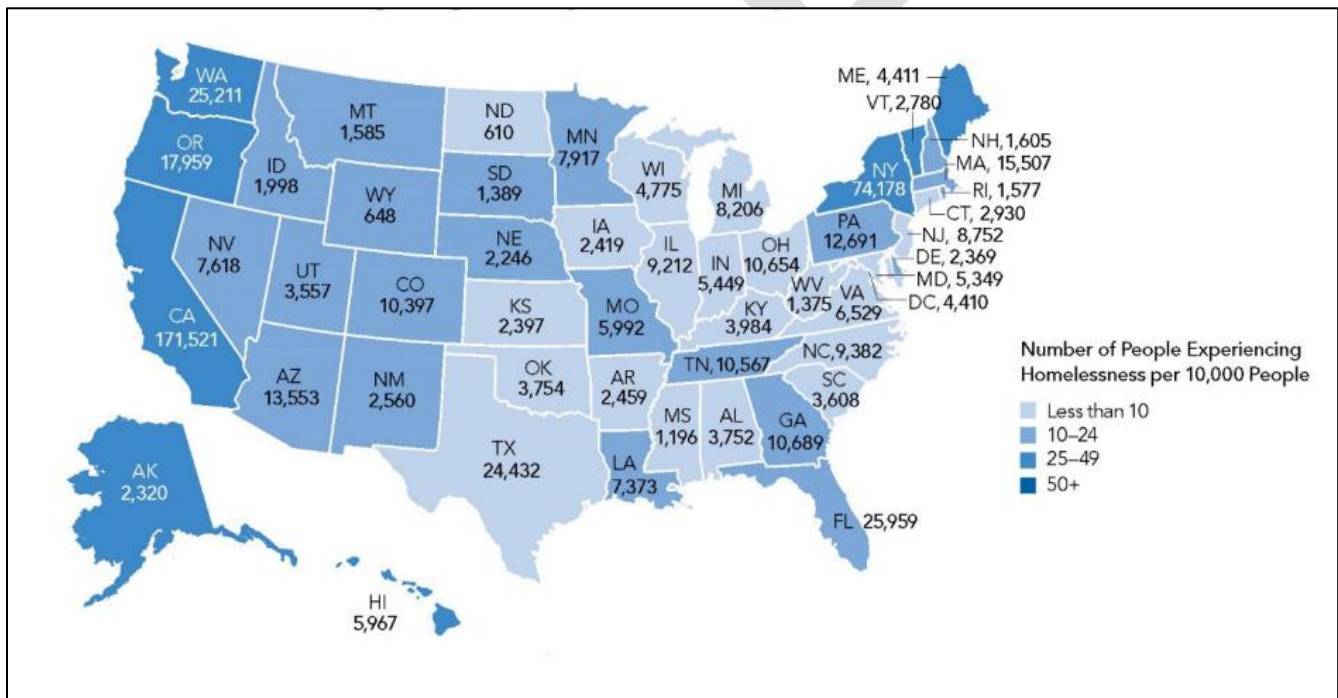




### 3.5.5 PERSONS EXPERIENCING HOMELESSNESS

As of 2022, there are estimated to be 5,967 persons experiencing homelessness in the State of Hawai'i (see Figure 3.5-3) (U. S. Department of Housing and Urban Development 2022). This represents a decrease of 21% statewide from the 2017 estimates in the previous plan. The COVID-19 pandemic placed unprecedented levels of strain on the lives of all residents of Hawai'i, but those experiencing homelessness were disproportionately affected due to their lack of access to basic needs such as food, water, shelter, and medicine. 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 2021). In addition, many persons experiencing homelessness are unsheltered and may be particularly vulnerable to some hazard events due to inadequate shelters, exposure to the elements, and residing in high hazard risk areas, such as along creeks and streams. Persons experiencing homelessness may not be adequately alerted via established warning systems to seek adequate shelter.

Figure 3.5-3. Persons Experiencing Homelessness, Estimates by State 2022





According to the 2021 Hawai'i State Data Book, there are 671,768 full-time employed civilians in the State of Hawai'i and a total of 751,000 full-time and part-time workers. The largest portion of employees (21.6%) are employed in the educational, health, and social services fields. Other notable fields include arts, entertainment, recreation, accommodation and food services (16.2%), retail (11.6%), and professional, scientific, management, administrative and waste management services (10.9%). High proportions of employment in retail, arts, entertainment, recreation, accommodation, and food services reflect the State's strong tourism economy (Hawai'i DBEDT 2022). These estimates do not include military populations. The U.S. Department of Defense estimates that there are 41,008 active-duty military in the State as of March 2022 (Hawai'i Defense Economy 2022).

The State of Hawai'i's future growth will be primarily related to the rate of expansion of the economies of the United States mainland and Asia. These two economies are the sources of the State of Hawai'i's tourism demand and the main export markets for the State's goods and services (Observatory of Economic Complexity 2022).

### 3.5.7 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 2021 is \$83,173, and as of September 2022, the unemployment rate in Hawai'i has significantly decreased to 3.4% (Hawai'i DBEDT 2022). Approximately 11.2% of residents are considered below the poverty line, 5.2% receive Supplemental Security Income, 3.4% receive cash public assistance, and 12.4% receive food stamps and SNAP benefits (U.S. Census Bureau 2022). Table 3.5-5 shows the median income and population below the poverty level in each county.

*Table 3.5-5. 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            | \$86,287                | 9.1%   | 6,665          |
| City and County of Honolulu | \$92,600                | 8.6%   | 87,304         |
| County of Maui <sup>a</sup> | \$88,249                | 9.5%   | 15,633         |
| County of Hawai'i           | \$68,399                | 13.8%  | 27,664         |
| <b>Total</b>                | <b>\$83,884</b>         | <b>10.25%</b>  | <b>137,266</b> |

Source: American Community Survey 2021

Notes: a. Median household income estimates do not include the County of Kalawao, which is estimated to be \$79,583. Population below poverty level does not include the County of Kalawao, which is estimated to be 20.9%.





### 3.5.8 TOURISM

In addition to the resident population, the State of Hawai'i normally receives high volumes of tourists throughout the year that contribute to the needs for public infrastructure and services. Due to the COVID-19 pandemic, Hawai'i experienced some of the highest unemployment rates in the United States after a streak of historically low unemployment rates due to the sharp decrease in tourism. With virtually all flights canceled from March 2020 to mid-October 2020, the State of Hawai'i was drastically impacted and did not see relatively normal visitor rates return until June of 2021. The COVID-19 Delta variant would come along soon after, bringing new travel restrictions and further unpredictability in visitor rates. In 2021, Hawai'i welcomed nearly 6.8 million visitors, marking a 253% increase in visitor arrivals from 2020. Table 3.5-6 below shows the average daily visitors by island in 2021 (Hawai'i DBEDT 2022). Average daily visitors drastically increased statewide in 2021 compared to 2020, demonstrating up to a +183.1% positive change (Lāna'i) in daily visitor rates when compared to the previous year.

Table 3.5-6. Average Daily Visitors by Island

| County   | Island   | 2021    |          |               |
|----------|----------|---------|----------|---------------|
|          |          | Total   | Domestic | International |
| Honolulu | O'ahu    | 73,693  | 70,941   | 2,752         |
| Maui     | Maui     | 54,866  | 53,209   | 1,656         |
|          | Moloka'i | 500     | 498      | 2             |
|          | Lāna'i   | 644     | 640      | 4             |
| Kaua'i   | Kaua'i   | 19,194  | 19,026   | 168           |
| Hawai'i  | Hawai'i  | 30,041  | 29,587   | 454           |
| Total    |          | 178,938 | 173,901  | 5,037         |

Source: Hawai'i DBEDT 2022

Visitors to the State are not reflected in official population estimates, such as the U.S. Census' American Community Survey. The Island of O'ahu has the greatest number of average daily visitors at 73,693; 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% (Hawai'i DBEDT 2022).

## 3.6 STATE ASSETS, COMMUNITY LIFELINES, AND CRITICAL FACILITIES

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

### 3.6.1 STATE BUILDINGS

The State of Hawai'i owns and/or leases buildings in all of its counties. Statewide, there are 6,095 State-owned or leased buildings with a total estimated replacement value of more than \$26.1 billion (see Table 3.6-1). The majority of these facilities, roughly 67%, 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 4.1 (Risk Assessment Overview). The location of these buildings can be seen in Appendix D (Map Atlas).

**Table 3.6-1. Number and Replacement Cost Value of State Buildings by County**

| County                      | Total Number of State Buildings <sup>a</sup> |             | Total Replacement Cost Value (structure and contents) |             |
|-----------------------------|--|-------------|---|-------------|
|                             | Number                                       | Percent     | Dollar Value  | Percent     |
| County of Kaua'i            | 531  | 8.71%       | \$990,850,824   | 3.79%       |
| City and County of Honolulu | 3,472  | 56.96%      | \$17,393,945,915                                      | 66.59%      |
| County of Maui              | 831  | 13.63%      | \$3,097,491,689                                       | 11.86%      |
| County of Hawai'i           | 1,261  | 20.69%      | \$4,638,567,141                                       | 17.76%      |
| <b>Total</b>                | <b>6,095</b>                                 | <b>100%</b> | <b>\$26,120,855,568</b>                               | <b>100%</b> |

Source: State of Hawai'i Risk Management Office 2017

### 3.6.2 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 1,100 miles of road statewide. The length and percent of total State roads by county is shown in Table 3.6-2. Refer to Appendix D (Map Atlas), which includes a map of each island and transportation assets in each county, including the major roads under the State's jurisdiction.

**Table 3.6-2. State Highway System by County**

| County                      | Total Length (Miles) | Percent of Total State Mileage |
|-----------------------------|----------------------|--------------------------------|
| County of Kaua'i            | 103.7                | 9.40%                          |
| City and County of Honolulu | 374.9                | 33.97%                         |
| County of Maui              | 245.9                | 22.28%                         |
| County of Hawai'i           | 379.2                | 34.36%                         |
| <b>Total</b>                | <b>1,103.70</b>      | <b>100.00%</b>                 |

Source: State of Hawai'i Department of Transportation 2022

### 3.6.3 COMMUNITY LIFELINES AND 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 community lifeline and critical facility assessment in this 2023 HMP Update.

Each community lifeline identified in the State was assigned to one of seven community lifeline categories and critical facilities that could not be categorized by lifeline were listed as an additional critical facility category so





that discussion and vulnerability could be aggregated. The facility type assigned to each category can be found in Appendix F (State Profile and Risk Assessment Supplement). Table 3.6-3 shows the State’s community lifelines and critical facilities by category and replacement cost value. Safety and Security accounts for over one-third (35%) of all community lifelines in the State. Table 3.6-4 shows the State’s community lifelines and critical facilities by county. More than half (53%) of the State’s community lifelines and critical facilities are located in the City and County of Honolulu. The general location of these facilities can be seen in Appendix D (Map Atlas).

**Table 3.6-3. Community Lifelines and Critical Facilities by Category and Replacement Cost Value**

| Facility Category    | Total Number of Community Lifelines | Total Replacement Cost Value (structure and contents) | Additional Critical Facilities |                              |
|----------------------|-------------------------------------|---|--------------------------------|------------------------------|
|                      |                                     |   | Count                          | Total Replacement Cost Value |
| Communications       | 188                                 | \$776,797,683   |                                |                              |
| Energy               | 89                                  | \$3,093,949,530                                       |                                |                              |
| Food, Water, Shelter | 345                                 | \$11,847,189,588                                      |                                |                              |
| Hazardous Material   | 12                                  | \$436,474,800   | 106                            | \$447,698,794                |
| Health and Medical   | 193                                 | \$4,606,713,364                                       |                                |                              |
| Safety and Security  | 486                                 | \$38,164,188,232                                      |                                |                              |
| Transportation       | 56                                  | \$2,039,091,600                                       |                                |                              |
| <b>Total</b>         | <b>1,369</b>                        | <b>\$60,964,404,797</b>                               | <b>1,475</b>                   | <b>\$61,412,103,591</b>      |

Source: HI-EMA 2017

**Table 3.6-4. Community Lifelines and Critical Facilities by County**

| County                      | Total Number of Facilities <sup>a</sup> |                | Total Replacement Cost Value (structure and contents) <sup>a</sup> |                |
|-----------------------------|---|----------------|--|----------------|
|                             | County                                  | Percent        | Dollar Value   | Percent        |
| County of Kaua’i            | 138                                     | 9.36%          | \$3,420,500,143  | 5.57%          |
| City and County of Honolulu | 783                                     | 53.08%         | \$22,973,873,078   | 37.41%         |
| County of Maui              | 284                                     | 19.25%         | \$28,244,157,982   | 45.99%         |
| County of Hawai’i           | 270                                     | 18.31%         | \$6,773,572,388  | 11.03%         |
| <b>Total</b>                | <b>1,475</b>                            | <b>100.00%</b> | <b>\$61,412,103,591</b>  | <b>100.00%</b> |

Source: HI-EMA 2017

Note: a. 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.

### 3.6.4 COMMERCIAL HARBORS

The State of Hawai’i has nine commercial harbors located on six islands that are vital to the economic well-being of the State. Almost all imported goods arrive in the State via island ports. Table 3.6-5 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 Department of Transportation n.d.).





Harbors are not listed as community lifelines or critical facilities within the definition utilized for this 2023 HMP Update; however, the facilities that make harbors operational (e.g., pump stations, support facilities, communications sites, etc.) are included in the community lifeline database.

**Table 3.6-5. Commercial Harbors in the State of Hawai'i, 2021**

| County                      | Harbor        | Waterborne Commerce (tons) <sup>a</sup> |
|-----------------------------|---------------|---|
| County of Kaua'i            | Nāwiliwili    | 723,000                                 |
|                             | Port Allen    | 88,000                                  |
| City and County of Honolulu | Honolulu      | 9,596,000                               |
|                             | Barbers Point | 3,717,000                               |
| County of Maui              | Kahului       | 1,833,000                               |
|                             | Kaunakakai    | 83,000                                  |
|                             | Kaunapali     | 73,000                                  |
| County of Hawai'i           | Hilo          | 1,163,000                               |
|                             | Kawaihae      | 1,068,000                               |

Source: Department of Business, Economic Development & Tourism 2021

Notes: a. Excludes cargo carried by Army and Navy Vessels and cargo in transit.

## 3.7 LAND USE AND DEVELOPMENT

**Element S7 and 44 CFR § 201.4(d):** The risk assessment shall reflect changes in development, including a summary of recent development and potential or projected development in hazard-prone areas on state and local government risk assessments. Changes in development include changes in land use and the built environment, population demographics, vulnerability of State assets, and development that could impact jurisdictions most threatened by identified hazards.

Land use and development patterns are major factors that influence risk to natural hazards. Major areas of concern are where the built environment intersects 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 2018 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 2023 HMP Update.

### 3.7.1 CHANGES IN DEVELOPMENT OVER THE PERFORMANCE PERIOD OF THE 2018 HMP

The State of Hawai'i experienced changes in development over the performance period of the 2018 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 2018 and 2021, there were estimated to be 77,996 building permits issued within the State of Hawai'i as shown in Table 3.7-1. Issuance of building permits decreased over the performance period of the 2018 HMP by 26% (27,890 permits) over the previous 4-year period (2013 to 2016). 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 3.7-1. Building Permits Issued by County, 2018 to 2021

| County                      | Building Permits Issued <sup>a</sup> |               |               |               |  | Total         | % of Total  |
|-----------------------------|--------------------------------------|---------------|---------------|---------------|--|---------------|-------------|
|                             | 2018                                 | 2019          | 2020          | 2021          |  |               |             |
| County of Kaua'i            | 232                                  | 176           | 161           | 167           |  | 736           | 0.9%        |
| City and County of Honolulu | 13,835                               | 16,405        | 15,182        | 14,328        |  | 59,750        | 77.76%      |
| County of Maui              | 1,232                                | 1,307         | 1,039         | 1,351         |  | 4,929         | 6.3%        |
| County of Hawai'i           | 3,514                                | 3,186         | 3,042         | 2,839         |  | 12,581        | 16.2%       |
| <b>Total</b>                | <b>18,813</b>                        | <b>21,074</b> | <b>19,424</b> | <b>18,685</b> |  | <b>77,996</b> | <b>100%</b> |

Source: DBEDT 2021

Note: 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 (2017 to 2021) estimates that there are 556,937 housing units in the State of Hawai'i. More than half of these units are believed to have been built before 1980 (American Community Survey 2021). According to the 2021 State of Hawai'i Data Book, there were more than 17,000 new residential units constructed between 2018 and 2021. Approximately 52% of the total units were single-family construction. About 57% of units were issued in the City and County of Honolulu. In addition to new construction, there were estimated to be 1,781 housing units demolished between 2018 and 2021, amounting to an average annual demolition rate of 445 units (DBEDT 2021).

The American Community Survey (2017 to 2021) indicates that there are approximately 478,413 occupied housing units and 78,524 vacant housing units in the State of Hawai'i, amounting to an average household size of three persons per unit (American Community Survey 2021). The 2040 population projections indicate that the State's population is expected to increase by 255,415 persons over the next 17 years. Assuming the average household size, average demolition rate, and occupancy rate remain constant, approximately 85,138 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 5,008 units per year. Table 3.7-2 lists new private residential construction during the performance period of the 2018 HMP.





**Table 3.7-2. New Private Residential Construction by County, 2018 to 2021**

| County                      | New Private Residential Construction |              |              |              |               |
|-----------------------------|--------------------------------------|--------------|--------------|--------------|---------------|
|                             | 2018                                 | 2019         | 2020         | 2021         | Total         |
| County of Kaua'i            | 364                                  | 179          | 169          | 213          | 925           |
| City and County of Honolulu | 2,589                                | 2,306        | 1,516        | 3,825        | 10,236        |
| County of Maui <sup>a</sup> | 840                                  | 654          | 526          | 940          | 2,960         |
| County of Hawai'i           | 1,051                                | 757          | 933          | 1,006        | 3,747         |
| <b>Total</b>                | <b>4,844</b>                         | <b>3,896</b> | <b>3,144</b> | <b>5,984</b> | <b>17,868</b> |

Source: DBEDT 2021

Note: Numbers include single-family units, duplex units, and apartment units. The number of duplex and apartment units were not available in 2019 or 2020 for the County of Hawai'i. Statistics for 2022 were not available at the time this plan was published.

### 3.7.2 CURRENT LAND USE AND DEVELOPMENT

The following sections discuss the State Land Use District 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 DISTRICTS

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 (LUC 2018).

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 (LUC 2019).

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 (LUC 2019).

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 (LUC 2019).





Conservation Districts are composed 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 administrated 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 (LUC 2019).

As of 2022, the Conservation and Agricultural District classifications account for the vast majority of land area in the County of Hawai'i, 52% and 45%, 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. Table 3.7-3 summarizes the area of current land uses by county. Figure 3.7-1 through Figure 3.7-4 show the land use district classifications for each county.

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

**Table 3.7-3. State Land Use District Classification by County**

| County                      | Square Miles    |                 |              |               |              |             |             |              |             |
|-----------------------------|-----------------|-----------------|--------------|---------------|--------------|-------------|-------------|--------------|-------------|
|                             | Total Land Area | Agricultural    |              | Conservation  |              | Rural       |             | Urban        |             |
|                             |                 | Total           | % of Total   | Total         | % of Total   | Total       | % of Total  | Total        | % of Total  |
| County of Kaua'i            | 627.13          | 297.1           | 47.4%        | 304.3         | 48.5%        | 2.1         | 0.3%        | 23.6         | 3.8%        |
| City and County of Honolulu | 598.54          | 188.5           | 31.5%        | 247.6         | 41.4%        | 0.0         | 0.0%        | 162.5        | 27.1%       |
| County of Maui              | 1248.10         | 637.7           | 51.1%        | 552.4         | 44.3%        | 12.8        | 1.0%        | 45.2         | 3.6%        |
| County of Hawai'i           | 4038.18         | 1850.3          | 45.8%        | 2098.7        | 52.0%        | 1.4         | 0.0%        | 87.8         | 2.2%        |
| <b>TOTAL</b>                | <b>6511.95</b>  | <b>2,973.60</b> | <b>45.7%</b> | <b>3202.9</b> | <b>49.2%</b> | <b>16.3</b> | <b>0.3%</b> | <b>319.1</b> | <b>4.9%</b> |

Source: State Land Use Commission, Hawai'i Statewide GIS Program 2021; Honolulu County GIS 2022

## 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. Additional information on county land use planning tools can be found in Section 5 (Capability Assessment).





Figure 3.7-1. State Land Use District Classifications and Hawaiian Home Lands in the County of Kaua'i

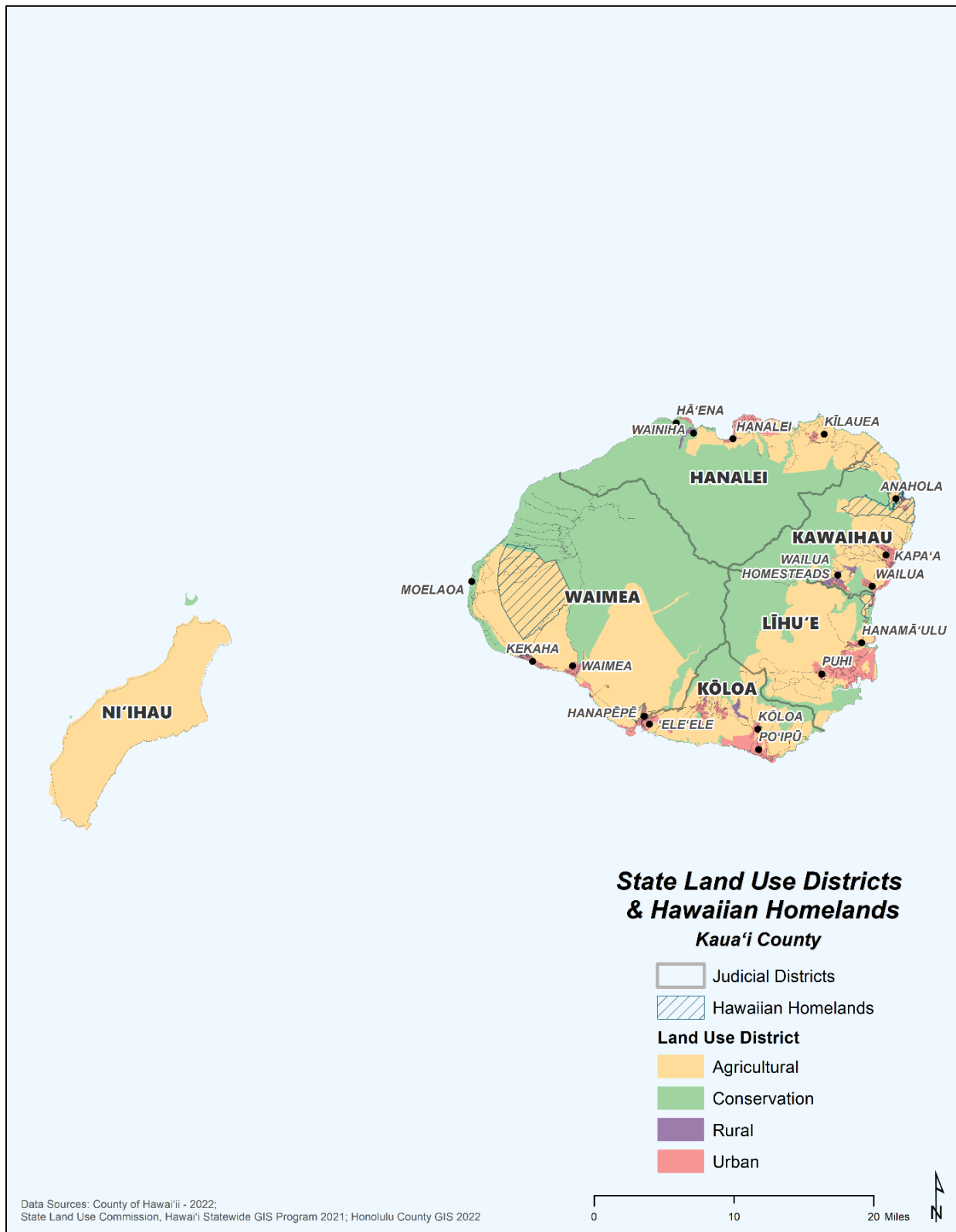




Figure 3.7-2. State Land Use District Classifications and Hawaiian Home Lands in the City and County of Honolulu

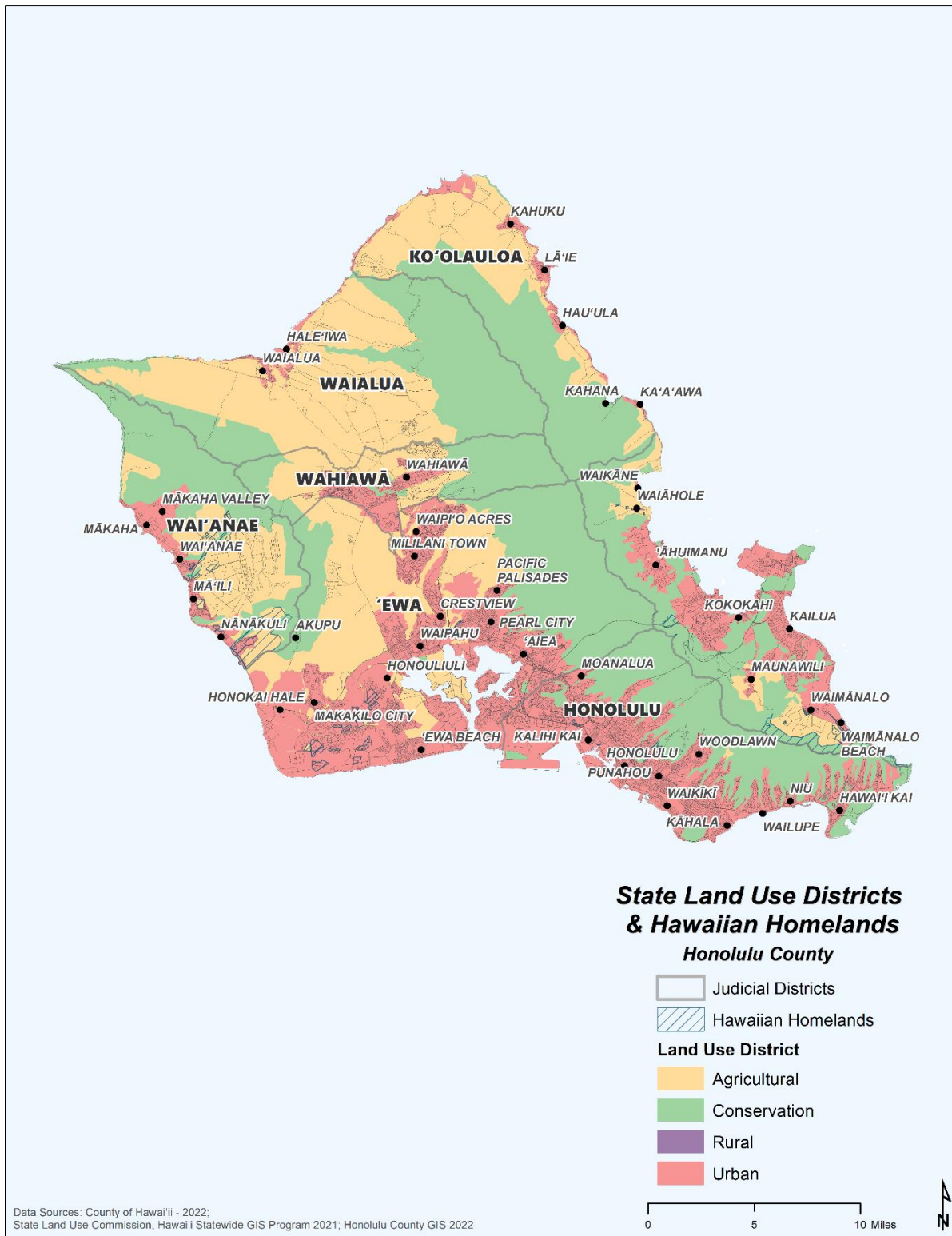




Figure 3.7-3. State Land Use District Classifications and Hawaiian Home Lands in the County of Maui

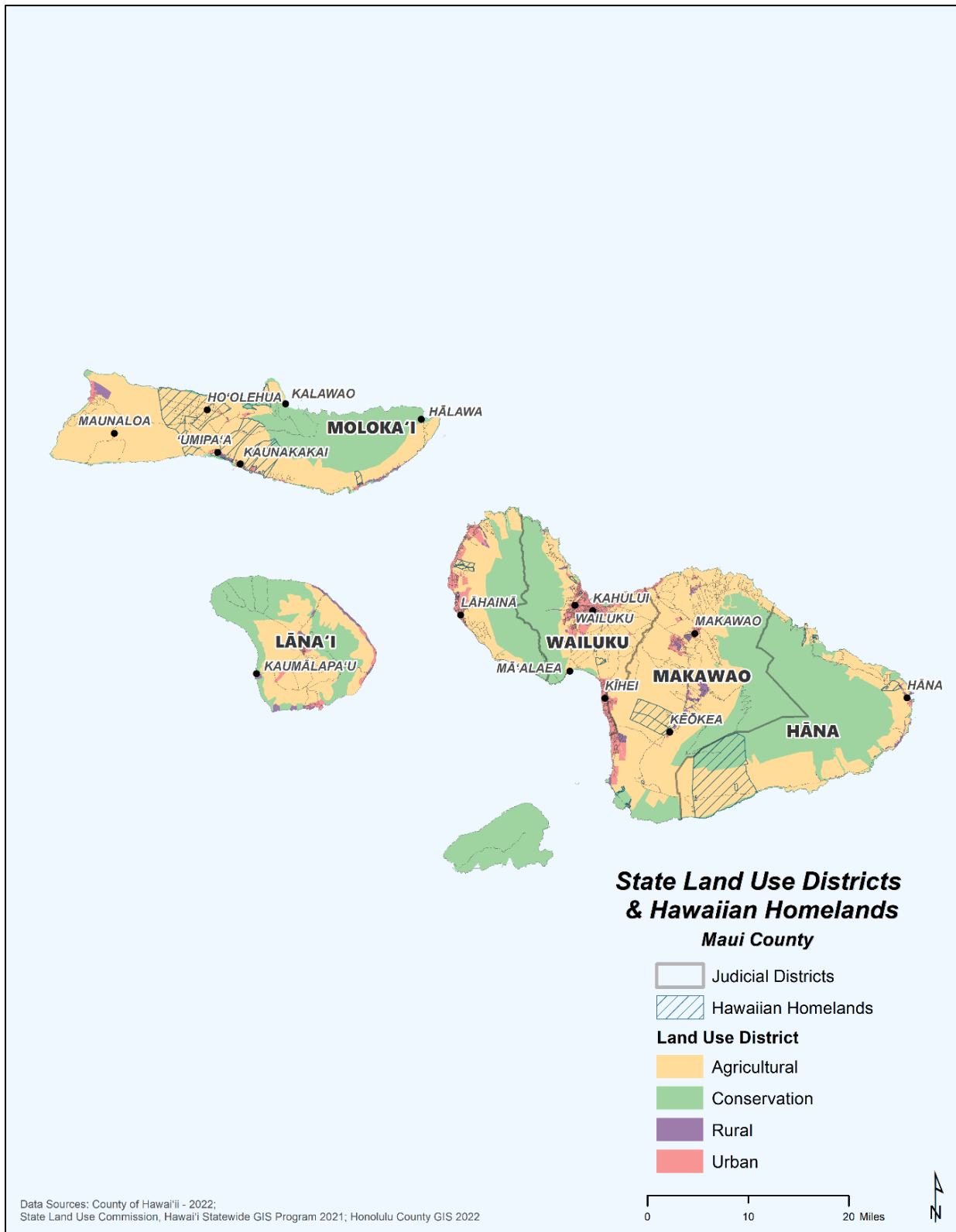
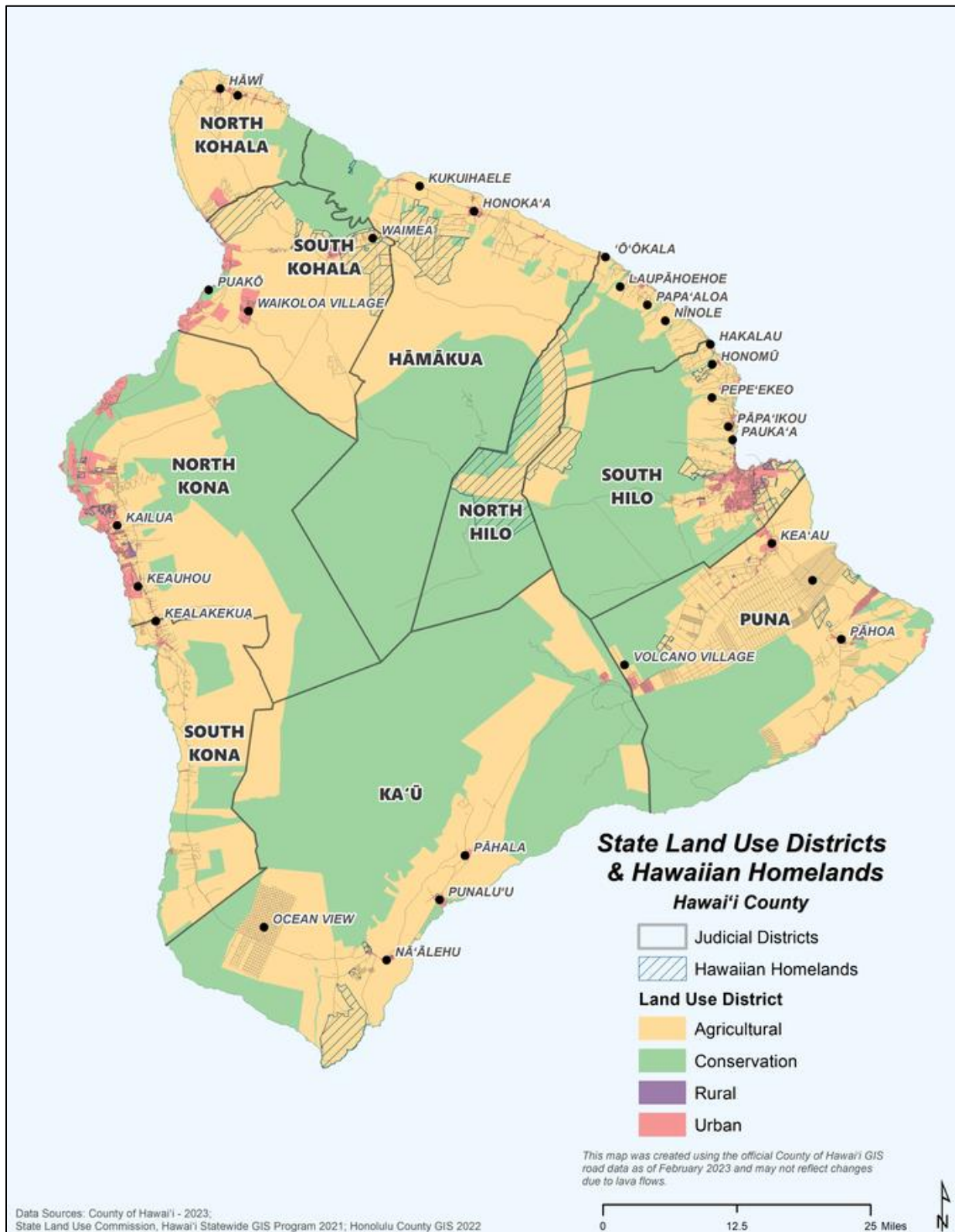




Figure 3.7-4. State Land Use District Classifications and Hawaiian Home Lands in the County of Hawai'i





## 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. General building stock and replacement cost value are listed in Table 3.7-4 for each county. The vulnerability assessment conducted for each hazard of concern in Section 4 includes an assessment of impacts to the State’s general building stock.

**Table 3.7-4. General Building Stock in the State of Hawai’i by County**

| County                      | Replacement Cost Value (structure and contents) <sup>a</sup> |                  |
|-----------------------------|--|------------------|
|                             | Dollars  | Percent of Total |
| County of Kaua’i            | \$24,246,497,228   | 6.51%            |
| City and County of Honolulu | \$239,152,051,766  | 64.19%           |
| County of Maui              | \$50,796,693,140   | 13.63%           |
| County of Hawai’i           | \$58,395,349,136   | 15.67%           |
| <b>Total</b>                | <b>\$372,590,591,270</b>                                     | <b>100.00%</b>   |

Source: NIYAM IT 2022; U.S. Army Corps of Engineers 2022

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

### 3.7.3 PROJECTED CHANGES IN DEVELOPMENT

Just as there is no statewide system for tracking where development occurred over the performance period of the 2018 HMP, there is also no statewide system for tracking where development is likely to occur over the performance period of the 2023 HMP Update. A review of available data in the State identified three spatial 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 in Section 4 (Risk Assessment).

#### COMMUNITY DEVELOPMENT DISTRICTS

The Hawai’i Community Development Authority (HCDA) establishes community plans in Hawai’i’s Community Development Districts. Districts are designated in order to plan for the future development of underutilized urban areas in the State (HCDA 2019). As of 2023, 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 2021 Annual Report* as follows (HCDA 2017); see detailed maps in Appendix D (Map Atlas):

- Kaka’ako**—The Kaka’ako Community Development District consists of over 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. The 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. In 2021, the Authority approved the first Community-Based Renewable Energy project that will allow the Department of Hawaiian Home Lands (DHHL) beneficiaries and other community residents to benefit from solar power savings, although they may not be able to put solar on their own rooftops.
- He'eia**—In 2011, Act 210 was signed into law establishing the He'eia Community Development District. The 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. In November 2021, Kāko'o 'Ōiwi completed the construction of 'Ōpūnui, a poi mill and certified kitchen within the He'eia CDD. 'Ōpūnui affords Kāko'o 'Ōiwi the ability to process kalo on-site and further secures its goal of providing farm-to-table produce for the community.

## 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. Each county is able to select up to six zones that, after approval by the Governor, exist for 20 years. As of 2021, there are 20 zones statewide comprising more than 2,800 square miles (DBEDT 2021). Appendix D (Map Atlas) shows the location of the Enterprise Zones in each of the counties. Table 3.7-5 shows the square miles per county as well as the percent of the county's total land area.

*Table 3.7-5. Area of Enterprise Zones by County*

| County                      | Total Land Area<br>(Square Miles) | Enterprise Zones<br>(Square Miles) | Percent of Total County<br>Land Area |
|-----------------------------|-----------------------------------|------------------------------------|--------------------------------------|
| County of Kaua'i            | 624.3                             | 251.0                              | 40.2%                                |
| City and County of Honolulu | 598.6                             | 297.3                              | 49.7%                                |
| County of Maui              | 1176.3                            | 1059.8                             | 90.1%                                |
| County of Hawai'i           | 4039.6                            | 1274.9                             | 31.6%                                |
| <b>Total</b>                | <b>6438.8</b>                     | <b>2883.0</b>                      | <b>44.8%</b>                         |

Source: Community Economic Development Program, Department of Business, Economic Development, County Planning Departments 2021, U.S. Census Bureau 2021





## 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.

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 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. See detailed maps in Appendix D (Map Atlas).

## 3.8 CULTURAL ASSETS

### 3.8.1 HAWAIIAN HOME LANDS

Hawaiian Home Lands are intended to provide for the economic self-sufficiency of Native Hawaiians through a homesteading program (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 (DHHL 2020).

Hawaiian Home Lands account for only a small percent of the total land area statewide and in each county. There are approximately 337 square miles in the State, of which 57% (191 square miles) is in the County of Hawai'i. There are 103 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 3.7-1 through Figure 3.7-4 above.

### 3.8.2 OTHER CULTURAL ASSETS

There is 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. These cultural resources include architecturally significant buildings and sites where significant historic events occurred as well as sites that are culturally significant to Native Hawaiians, such as burial sites and fishponds. The Historic District covers 87% of the total cultural resource type land area and is the primary cultural resource district for each of the five Hawaiian Counties (see Table 3.8-1).



*Table 3.8-1. Cultural Resources by Source Type in Square Miles by County*

| Cultural Resource Site Type | Area in square miles |                             |                |                   |              |
|-----------------------------|----------------------|-----------------------------|----------------|-------------------|--------------|
|                             | County of Kaua'i     | City and County of Honolulu | County of Maui | County of Hawai'i | Statewide    |
| Archaeology                 | 17.5                 | 17.3                        | 24.9           | 31.1              | 90.9         |
| Burial Sensitivity Area     | 1.1                  | 0.1                         | 0.5            | 0.3               | 2.1          |
| Historic Building           | 0.4                  | 1.2                         | 0.5            | 0.6               | 2.7          |
| Historic District           | 68.2                 | 55.7                        | 190.9          | 534.6             | 849.4        |
| Historic Object             | 0.0                  | 0.0                         | 0.0            | 9.6               | 9.6          |
| Historic Structure          | 1.0                  | 0.9                         | 1.4            | 17.5              | 20.7         |
| <b>Total</b>                | <b>88.3</b>          | <b>75.2</b>                 | <b>218.1</b>   | <b>593.7</b>      | <b>975.4</b> |

## 3.9 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 3.7.2, intersect with hazard risk areas as well as potential impacts are discussed in each of the vulnerability assessments presented in Section 4 (Risk Assessment).

### 3.9.1 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 2023 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 2022, there is critical habitat in each of the State's counties, with critical habitats totaling more than 950 square miles. Critical habitat is not designated for every listed species.
- 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 3,600 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, offer economic benefits, and provide for the protection of natural and cultural resources. Statewide, there are more than 2,700 square miles of land designated as a park, preserve, or reserve in the State; the County of Hawai'i contains over 2,000 square miles of parks and reserves.





- 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 3.9-1 shows the total area of natural resources assessed in this plan by county. Locations of these environmental resources by county are available in Appendix D (Map Atlas).

**Table 3.9-1. 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 | County of Hawai‘i | Statewide     |
| <b>Critical Habitat <sup>a</sup></b> | 89.9                 | 120.9                       | 293.1          | 446.6             | 950.6         |
| <b>Wetlands</b>                      | 599.9                | 505.8                       | 1382.3         | 1148.8            | 3636.7        |
| <b>Parks and Reserves</b>            | 225.6                | 120.5                       | 408.6          | 2023.0            | 2777.7        |
| <b>Reefs <sup>b</sup></b>            | 4.5                  | 15.7                        | 26.0           | 8.6               | 54.8          |
| <b>Total <sup>c</sup></b>            | <b>919.9</b>         | <b>762.9</b>                | <b>2110.0</b>  | <b>3627.0</b>     | <b>7419.8</b> |

Source: U.S. Fish and Wildlife Service, Pacific Islands Office, 2022; U.S. Fish and Wildlife Service 2021; 2017; Hawai‘i State Department of Land and Natural Resources, Division of Forestry and Wildlife 2022; NOAA raster nautical charts 2020; State of Hawai‘i Department of Land and Natural Resources, Division of State Parks 2021

Note: 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.

### 3.9.2 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 2012).

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 2012).

The State of Hawai‘i has 12 Watershed Partnerships on five of its islands. Hawai‘i’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 (HAWP 2015). More than 3,177 square miles of the State’s land area are located in a watershed partnership. Table 3.9-2 shows the total area of each watershed partnership, and Figure 3.9-1 shows their locations.





**Table 3.9-2. Watershed Partnerships in Square Miles by County**

| County                         | Watershed Partnership   | Area (square miles) |
|--------------------------------|---|---------------------|
| County of Kaua'i               | Kaua'i Watershed Alliance   | 225.61              |
|                                | <b>County Total:</b>  | <b>225.61</b>       |
| City and County of Honolulu    | Ko'olau Mountains Watershed Partnership   | 160.62              |
|                                | Wai'anae Mountains Watershed Partnership  | 73.59               |
|                                | <b>County Total:</b>  | <b>234.21</b>       |
| County of Maui                 | East Maui Watershed Partnership   | 173.01              |
|                                | East Moloka'i Watershed Partnership   | 105.27              |
|                                | Lanai Forest and Watershed Partnership  | 14.84               |
|                                | Leeward Haleakalā Watershed Restoration Partnership   | 53.56               |
|                                | Overlap East Maui Watershed Partnership and Leeward Haleakalā Watershed Restoration Partnership | 13.72               |
|                                | West Maui Mountains Watershed Partnership   | 73.94               |
|                                | <b>County Total:</b>  | <b>434.34</b>       |
| County of Hawai'i              | Kohala Watershed Partnership  | 115.81              |
|                                | Mauna Kea Watershed Alliance  | 400.39              |
|                                | Three Mountain Alliance   | 1,767.20            |
|                                | <b>County Total:</b>  | <b>2,283.4</b>      |
| <b>State of Hawai'i Total:</b> |   | <b>3,177.56</b>     |

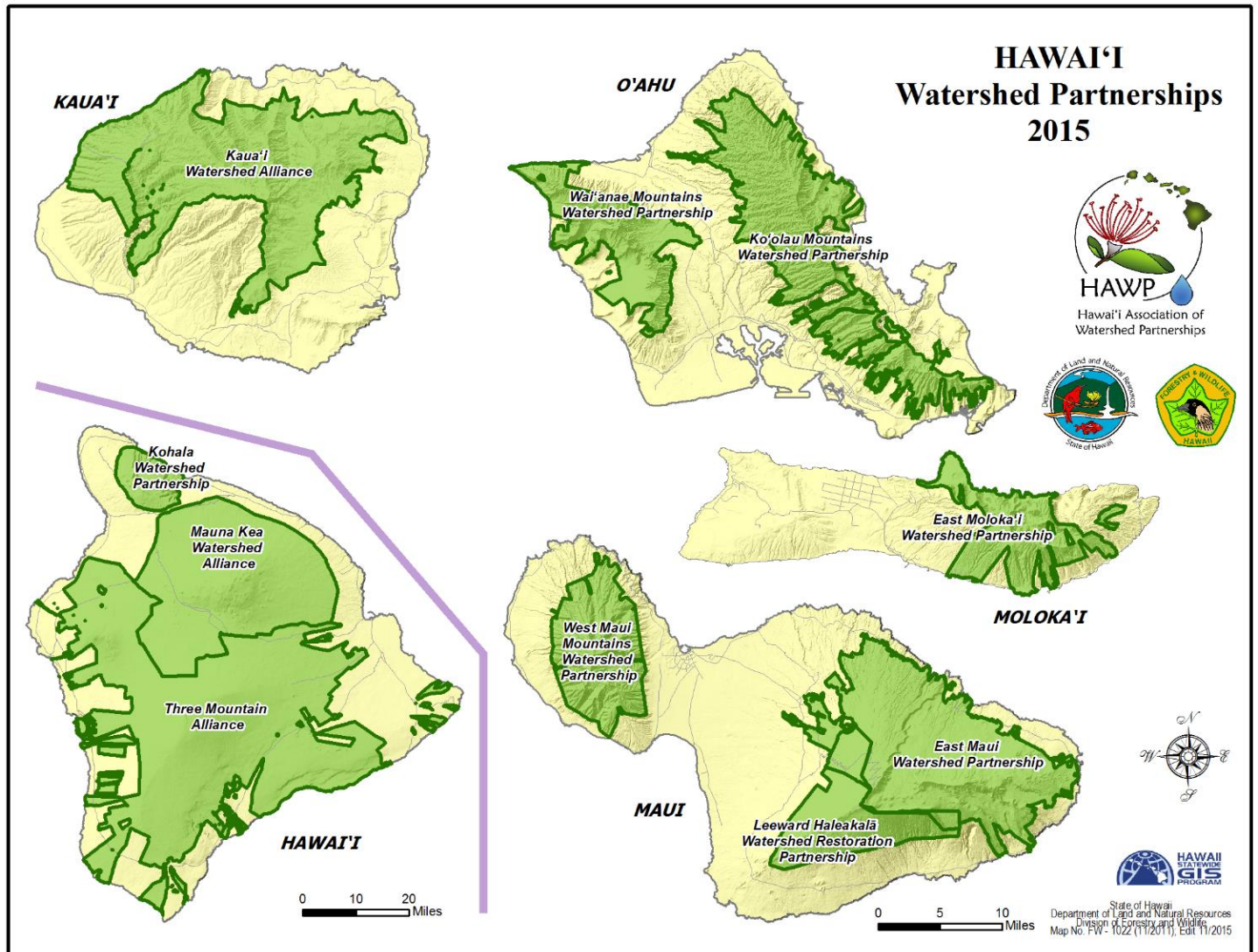
Source: Native Ecosystem Protection & Management Program, Division of Forestry and Wildlife, Department of Land and Natural Resources 2020

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Figure 3.9-1. Watershed Partnership Areas in the State of Hawai'i



Source: HAWP 2015

