

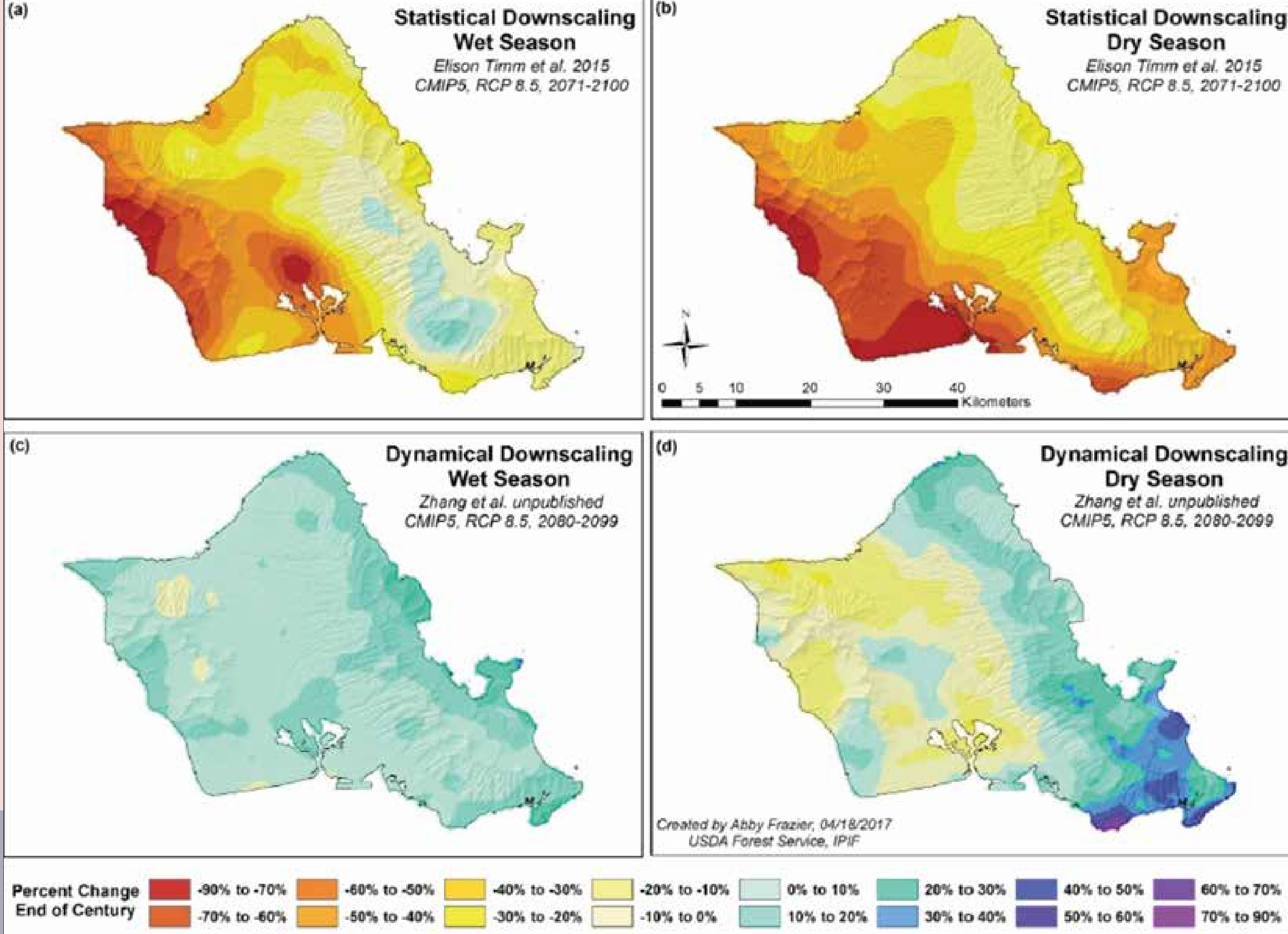
Critical Water Resource Issue:

CLIMATE CHANGE

Why it's important to watershed health:

Climate change is expected to impact Hawai'i's land, climate, and people in many ways over the coming decades. Impacts such as sea level rise, coastal flooding and erosion, and saltwater intrusion into aquifers and drainage systems are expected to impact coastal areas. Other impacts such as increased storms and wildfire hazards, impacts to rainfall, and temperature increases will have statewide effects on Hawai'i's lands and watersheds.

2100 O'AHU RAINFALL SCENARIOS



Special Areas of Concern:

IMPACTS TO RAINFALL & DRINKING WATER SUPPLY:

- Precipitation on O'ahu has been decreasing over the past 30 years.
- Statistical and dynamical downscaling models show different rainfall projections for the end of the century.
- Both models indicate the Leeward side of the Island generally becomes drier as the Windward side becomes rainier.

GREATER FREQUENCY & INTENSITY OF STORMS will increase Wai'anae's vulnerability to damaging winds, flooding, wave action, and other storm-related impacts. Sudden heavy rainfall over a short period of time, referred to as "rain bombs", along with consecutive wet days and consecutive dry days have become more common. This causes significant flooding and impacts to drainage in both agricultural and urban settings.

IS THIS WATER RESOURCE ISSUE A PRIORITY TO YOU? WHY OR WHY NOT?

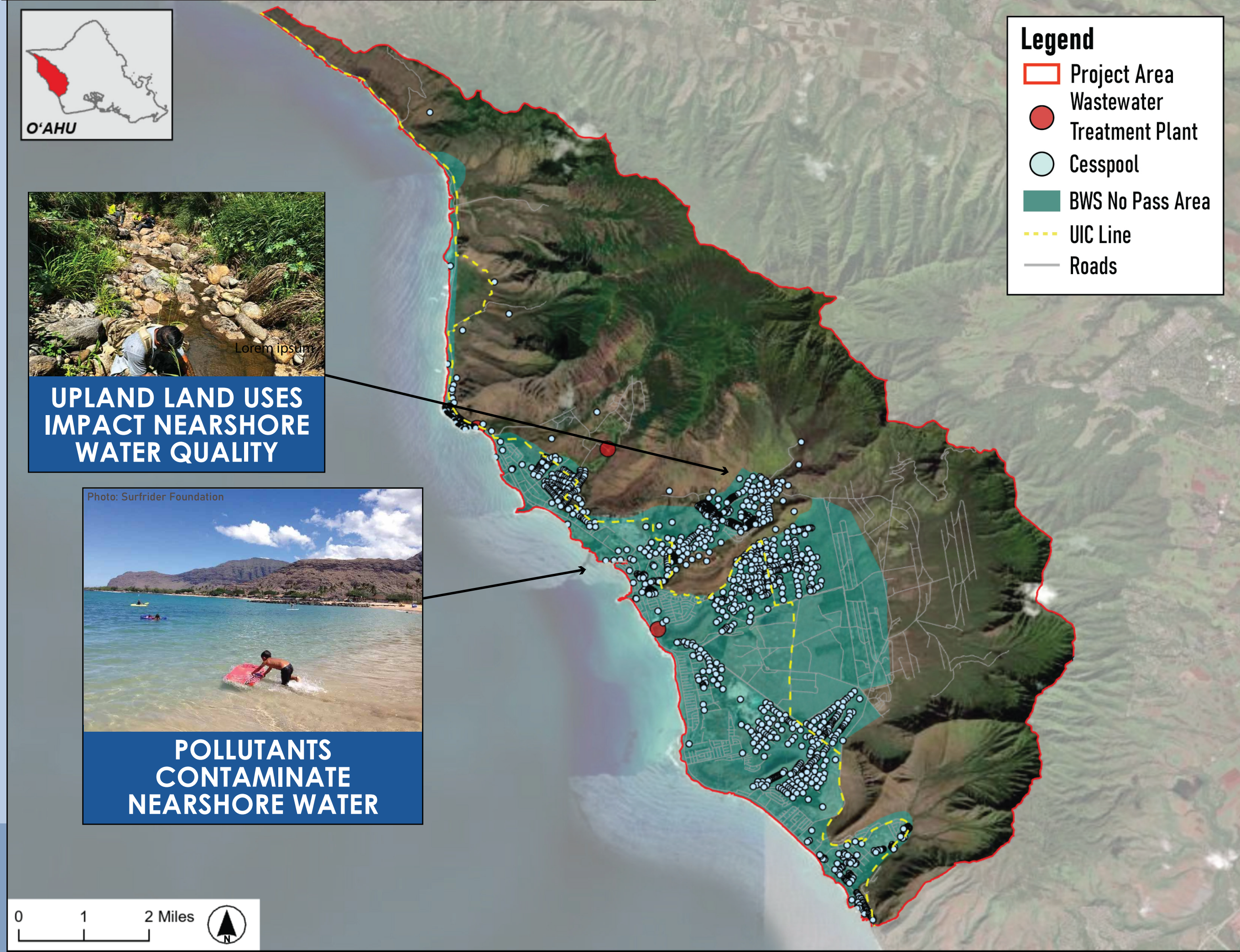
HOW DO YOU THINK THIS WATER RESOURCE ISSUE IS OR SHOULD BE ADDRESSED?

Critical Water Resource Issue: NEARSHORE & STREAM WATER QUALITY

Why it's important to watershed health:

The topography of watersheds in Hawai'i result in rainfall and surface runoff draining into streams and urban areas before reaching surface waters. Runoff transfers the pollutants and sediments from impervious surfaces and human activities in upland areas to nearshore waters. Pollutants which enter streams and near shore waters degrade water quality and damage fragile marine ecosystems, which are critical to watershed health.

NEARSHORE WATER QUALITY HAZARDS



Special Areas of Concern:

PŌKAʻĪ BAY

- Originally named Malaea, Pōkaʻī Bay was traditionally a coconut grove beside one of the oldest fishing villages on Oʻahu, also providing sandalwood, kalo & sugar.
- Today Pōkaʻī Bay faces high levels of bacteria, viruses, protozoa, or parasites.

Streams & nearshore waters are polluted by:

- RUNOFF** generated from urban, residential, and agricultural areas.
- UPLAND EROSION** transfer sediment and pollutants downstream.
- ILLEGAL DUMPING** of dredging materials and other substances that contribute to health and environmental hazards.
- PUBLIC FACILITIES** such as shower rinse-off and fecal bacteria from toilet plumbing that infiltrate the sand and ocean.
- SEWAGE SPILLS & CESSPOOLS** that allow untreated wastewater to infiltrate streams, oceans, and groundwater supply.

IS THIS WATER RESOURCE ISSUE A PRIORITY TO YOU? WHY OR WHY NOT?

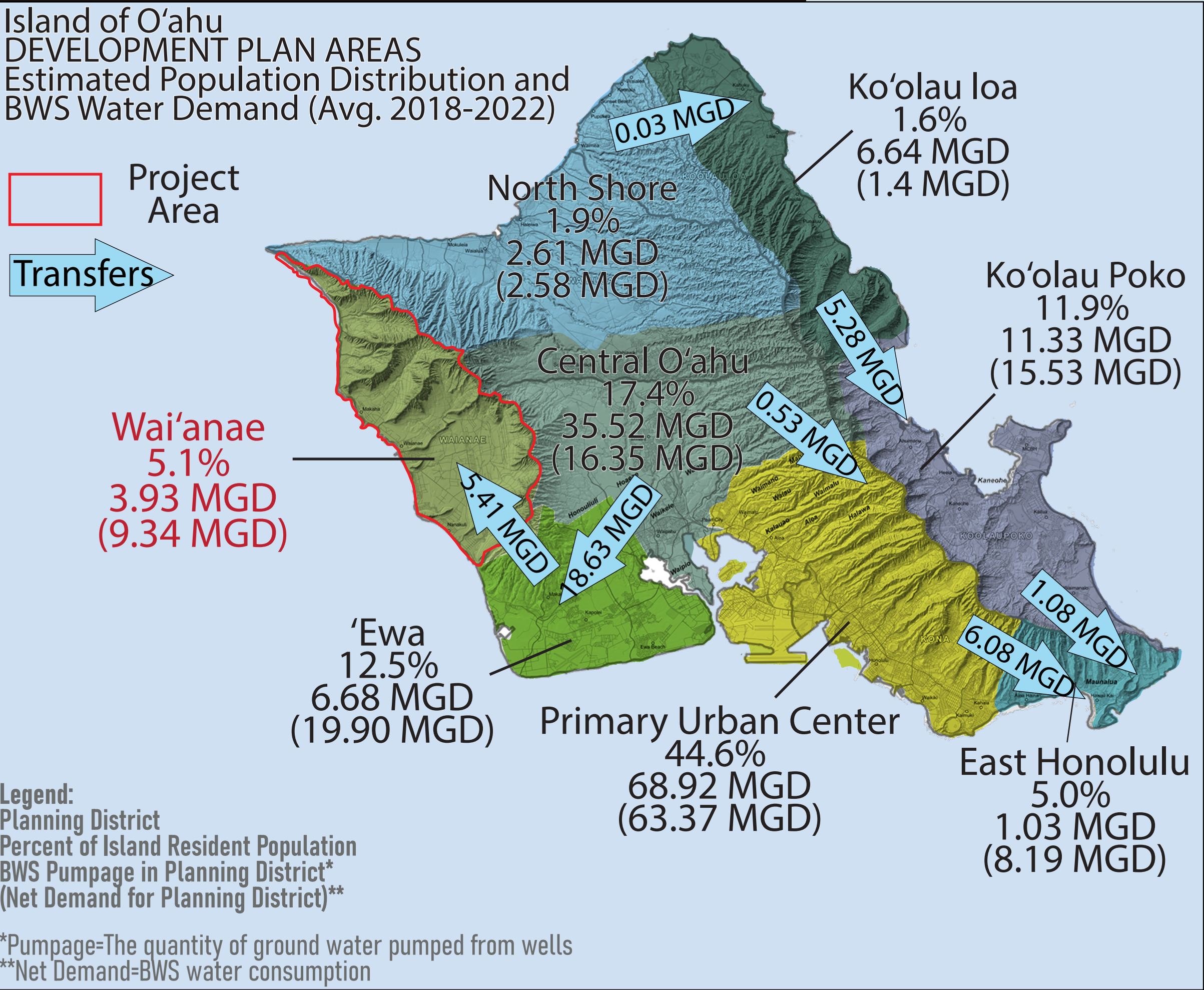
HOW DO YOU THINK THIS WATER RESOURCE ISSUE IS OR SHOULD BE ADDRESSED?

Critical Water Resource Issue: WATER SUPPLY, DEMAND & CONSERVATION

Why it's important to watershed health:

Over half of Wai'anae's water supply is sourced by the Pearl Harbor aquifer outside of Wai'anae. Further, population in the region is expected to increase, with considerable population growth and development is anticipated for other parts of O'ahu. This, and the uncertainty around climate change impacts to water supply make water conservation and recycling critical to a sustainable future water supply for Wai'anae and the Island.

BWS WATER DEMAND (AVERAGE 2018-2022)



Special Areas of Concern:

AGRICULTURAL LAND has among the highest per capita water demand due to the need for irrigation, as well as activities such as washing produce.

COMMERCIAL & URBAN DEVELOPMENT also has relatively high per capita water demand due to large building footprints and need for water for industrial activities/irrigation. It is therefore crucial to assess infrastructure capacity and consult with the Wai'anae community before considering development in the moku.

PONO WATER STEWARDSHIP is vital to sustain current agriculture, urban and cultural practices. With district population projected to increase, and the ongoing effects of climate change, pono water stewardship is critical to keep Wai'anae residents in Wai'anae and ensure sufficient yet equitable water supply, access, and use for this generation and beyond.

IS THIS WATER RESOURCE ISSUE A PRIORITY TO YOU? WHY OR WHY NOT?

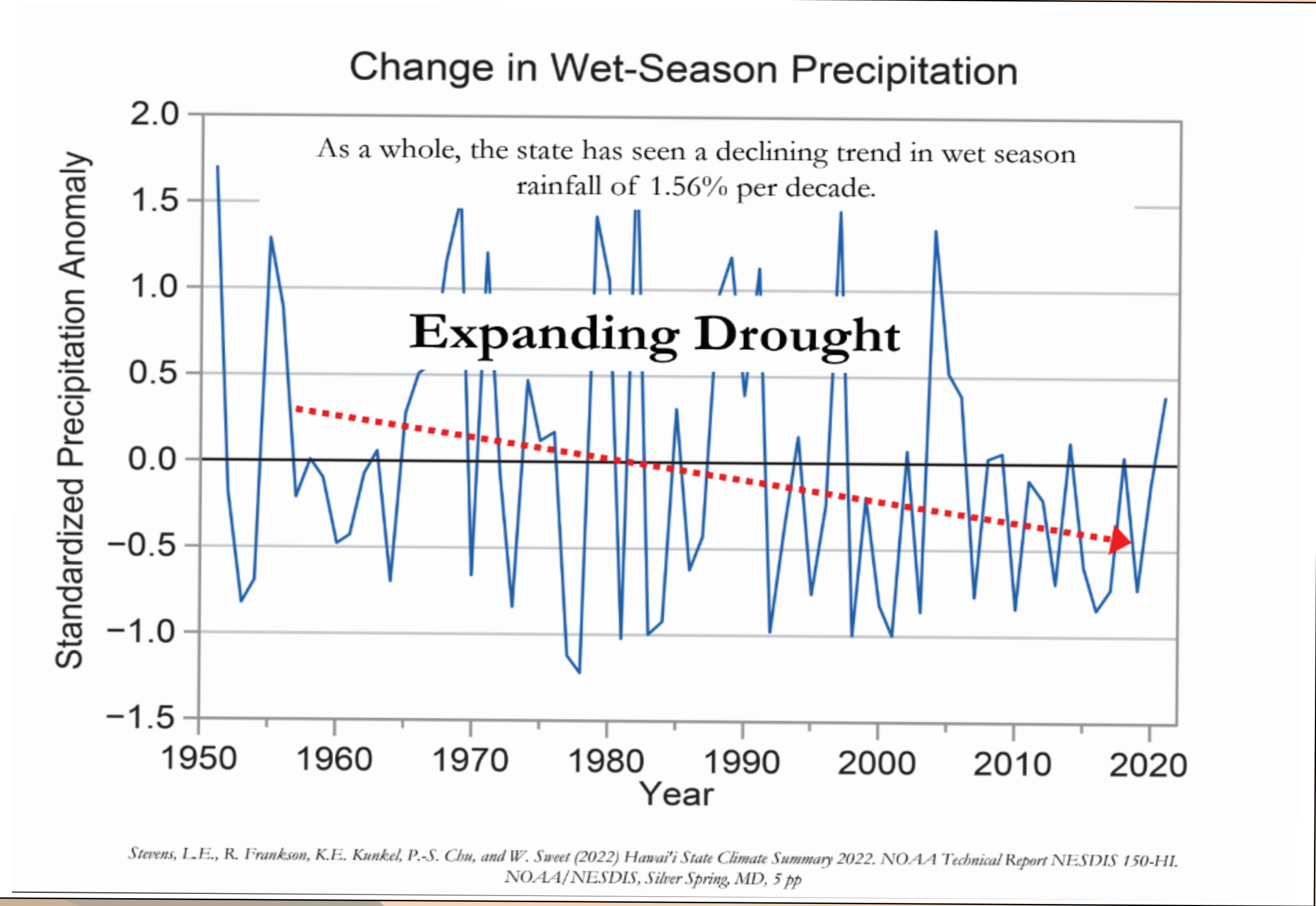
HOW DO YOU THINK THIS WATER RESOURCE ISSUE IS OR SHOULD BE ADDRESSED?

Critical Water Resource Issue: DROUGHT, WILDFIRES AND OTHER NATURAL DISASTERS

Why it's important to watershed health:

From 2006 to 2016, wildfires burned an average of 20,000 acres per year statewide, with some years reaching close to 45,000 acres. Wildfires impact watershed health by destroying native forests, changing soil chemistry, eroding topsoil and leaving some areas denuded and unable to support vegetation, and decreasing groundwater recharge, among others. Human ignitions coupled with an increasing amount of nonnative, fire-prone grasses and shrubs and a warming, drying climate have greatly increased the wildfire, drought and natural disasters problem.

WAI'ANAE RISK FROM WILDFIRES



Special Areas of Concern:

- More than 99% of known wildfires are caused by human activities.
- 400% increase in wildfire on O'ahu since 1960s.
- Hurricanes are intensifying faster, becoming larger, stronger, slower and wetter.
- Increased drought results in dry soil and winds.

The Hawai'i Wildfire Management Organization mapped wildfire incidents from 2000-2012. Certain areas of the Wai'anae district had wildfires, including:

WAI'ANAE MOUNTAIN RANGE particularly in the mauka areas near Mākaha, Wa'ianae, Mā'ili, and Nānākuli with less density of wildfire incidents compared to the shoreline areas.

URBAN AREAS along the valleys and coastal flats

COASTAL AREAS are at high risk from fires.

IS THIS WATER RESOURCE ISSUE A PRIORITY TO YOU? WHY OR WHY NOT?

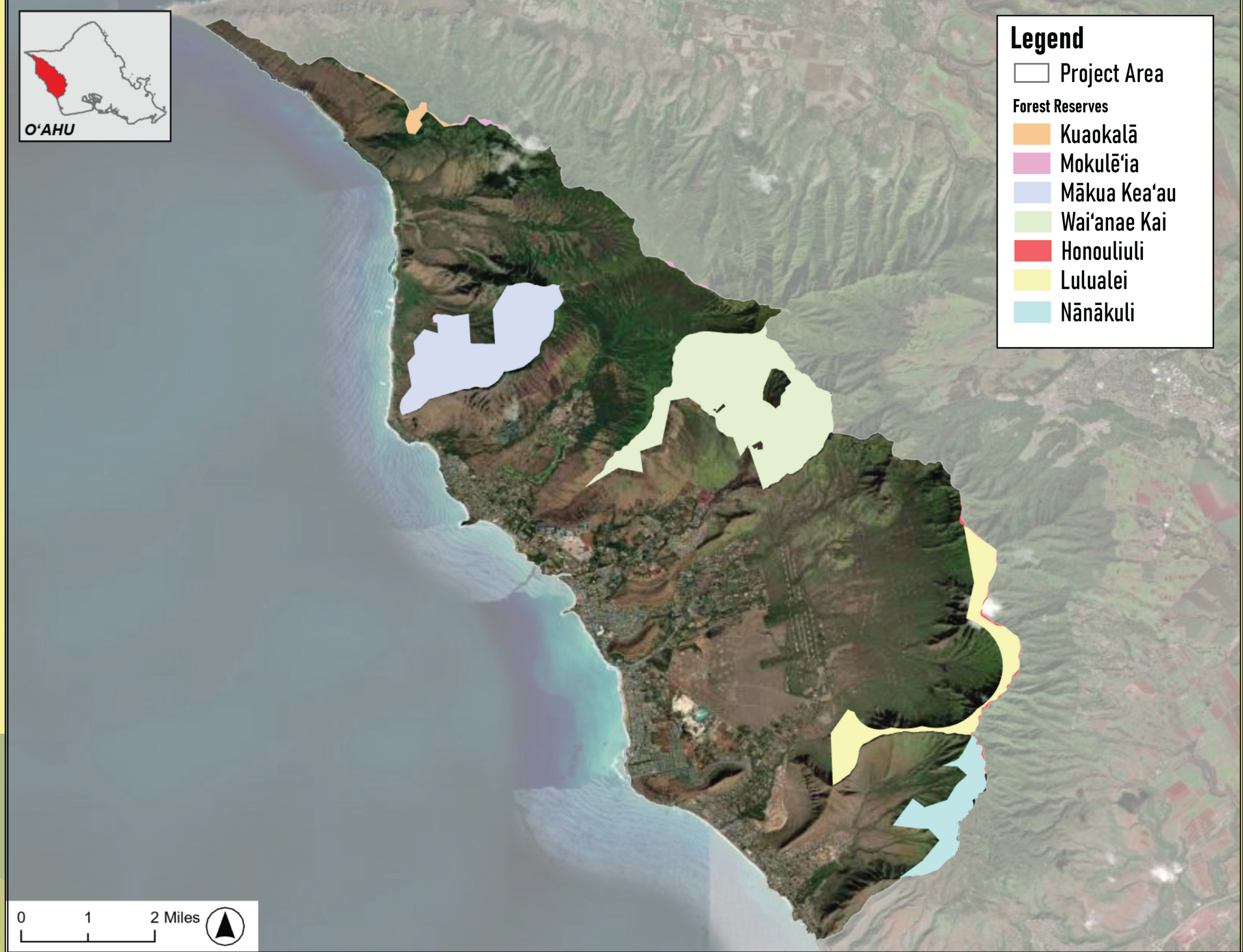
HOW DO YOU THINK THIS WATER RESOURCE ISSUE IS OR SHOULD BE ADDRESSED?

Critical Water Resource Issue: WATERSHED HEALTH

Why it's important to watershed health:

A watershed is an area of land, such as a mountain or valley, that collects rainwater and atmospheric moisture and drains into a common outlet. Rain is absorbed by vegetation and underground, and the rest flows into surface rivers and streams. A key component of a watershed's ability to collect rainwater is the existence of forests, which is largely impacted by the presence of invasive species.

WAI'ANAE FOREST RESERVES



Special Areas of Concern:

- WAI'ANAE MOUNTAINS, FOREST RESERVES & NATURAL AREA RESERVES:**
- The Wai'anae mountain range has six forest reserves: Kuaokalā Forest Reserve, Mokulē'ia Forest Reserve, Mākua Kea'au Forest Reserve, Wai'anae Kai Forest Reserve, Honouliuli Forest Reserve, and Lualualei Forest Reserve
 - Two Natural Area Reserves: Mt. Ka'ala and Pahole.
 - Native forests are home to many native species and highly valuable to native habitat conservation and watershed restoration.
 - Native forests are crucial for watersheds, providing hundreds of billions of gallons of fresh water annually. Protecting these environments from invasive species is essential for safeguarding water supply for future generations

IS THIS WATER RESOURCE ISSUE A PRIORITY TO YOU? WHY OR WHY NOT?

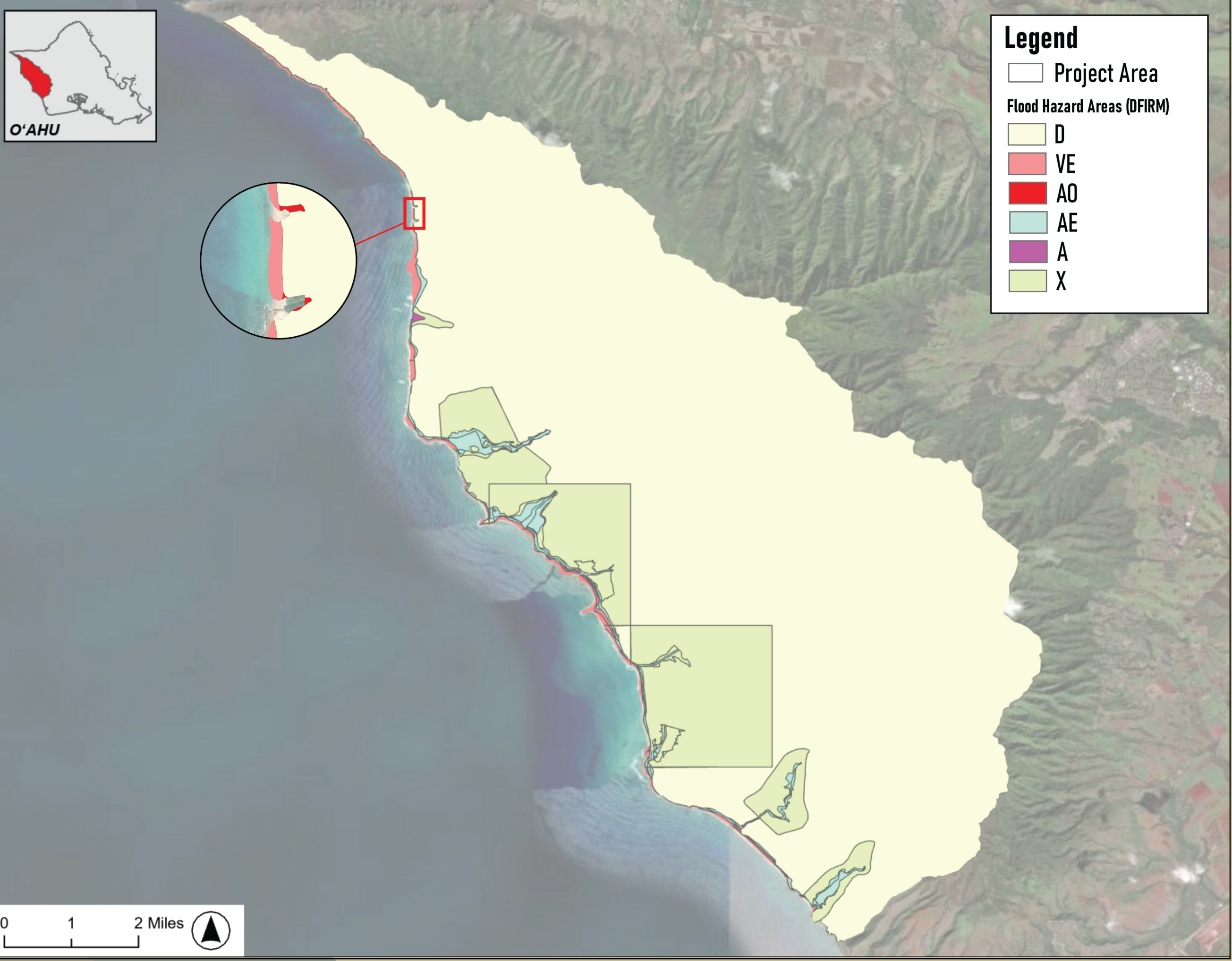
HOW DO YOU THINK THIS WATER RESOURCE ISSUE IS OR SHOULD BE ADDRESSED?

Critical Water Resource Issue: FLOODING AND DRAINAGE

Why it's important to watershed health:

While the Wai'anae area is relatively arid compared to other parts of O'ahu, it can experience heavy rainfall and falling debris due to trade winds from the windward side. This overwhelms stream channels, resulting in significant flooding of roads and properties. Additionally, the contribution of increased urbanization in low-lying areas combined with climate change contribute to greater flood risk.

WAI'ANAE FLOOD ZONES



Special Areas of Concern:

DRAINAGE WAY IMPROVEMENT AND MAINTENANCE plays a critical role in flood control and preventing runoff. Natural and channelized stream drainageways in Wai'anae are susceptible to clogging with debris.

FLOOD PRONE/REPETITIVE LOSS AREAS are locations that may be prone to repeated flooding, including:

COASTAL AREAS MAKAI OF FARRINGTON HIGHWAY are within the VE Hazard Zone, which have a 1% or greater chance of flooding & face additional storm wave hazards. Parts of the highway and makai area lies partially within the base flood plain.

IS THIS WATER RESOURCE ISSUE A PRIORITY TO YOU? WHY OR WHY NOT?

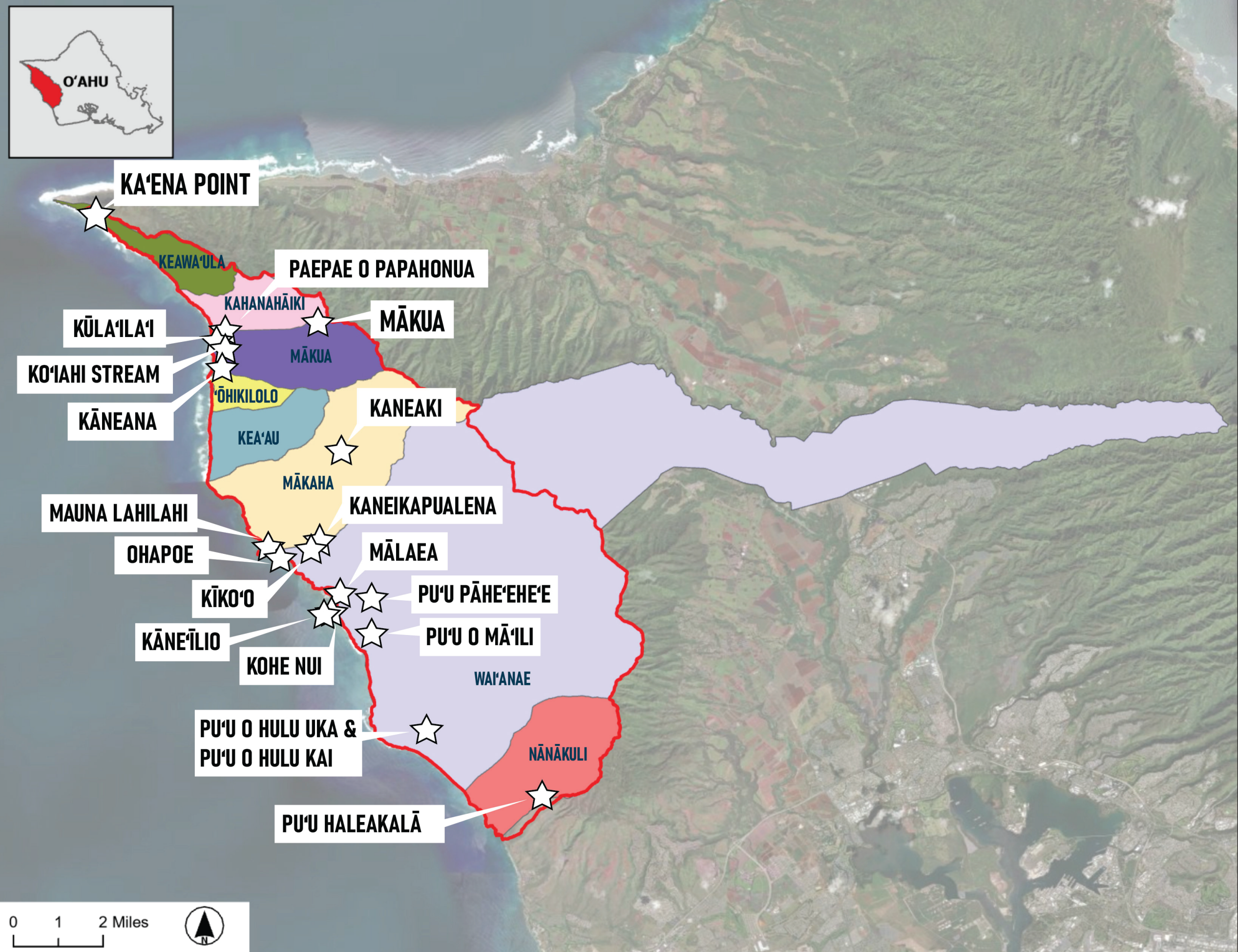
HOW DO YOU THINK THIS WATER RESOURCE ISSUE IS OR SHOULD BE ADDRESSED?

Critical Water Resource Issue: RESTORING AND MAINTAINING TRADITIONAL & CUSTOMARY PRACTICES

Why it's important to watershed health:

In *Ka Pa'akai O Ka 'Āina vs. Land Use Commission* (2000), the Hawai'i Supreme Court held that title to water resources is held in trust by the State for the benefit of its people and established the exercise of Native Hawaiian and traditional and customary practices as a Public Trust purpose. As Wai'anāe urbanized, many cultural sites and fishponds were either altered, damaged or destroyed for development or other purposes. Additionally, access to traditional subsistence activities were restrained and disrupted.

WAHIPANA IN WAI'ANAE AHUPUA'A: Any other cultural sites to add? Add below!



Special Areas of Concern:

KEEP WAI'ANAE, WAI'ANAE in the face of projected population growth and development pressures in the moku to preserve open spaces and steward resources.

PRESERVE & PROTECT CULTURAL SITES AND LANDSCAPES including loko i'a, lo'i, kai and community spaces of gathering and cultural education (please see and add to map).

- Various nonprofits & organizations support cultural and water-related efforts: Mālama Learning Center, Ka'ala Farms, Hoa 'Āina o Mākaha, Kingdom Pathways, MA'O Organic Farm, Nā Kama Kai, Kuleana Coral, & many others

MĀKUA VALLEY cultural access is limited and controlled by the current militarization and occupation of the land.

IS THIS WATER RESOURCE ISSUE A PRIORITY TO YOU? WHY OR WHY NOT?

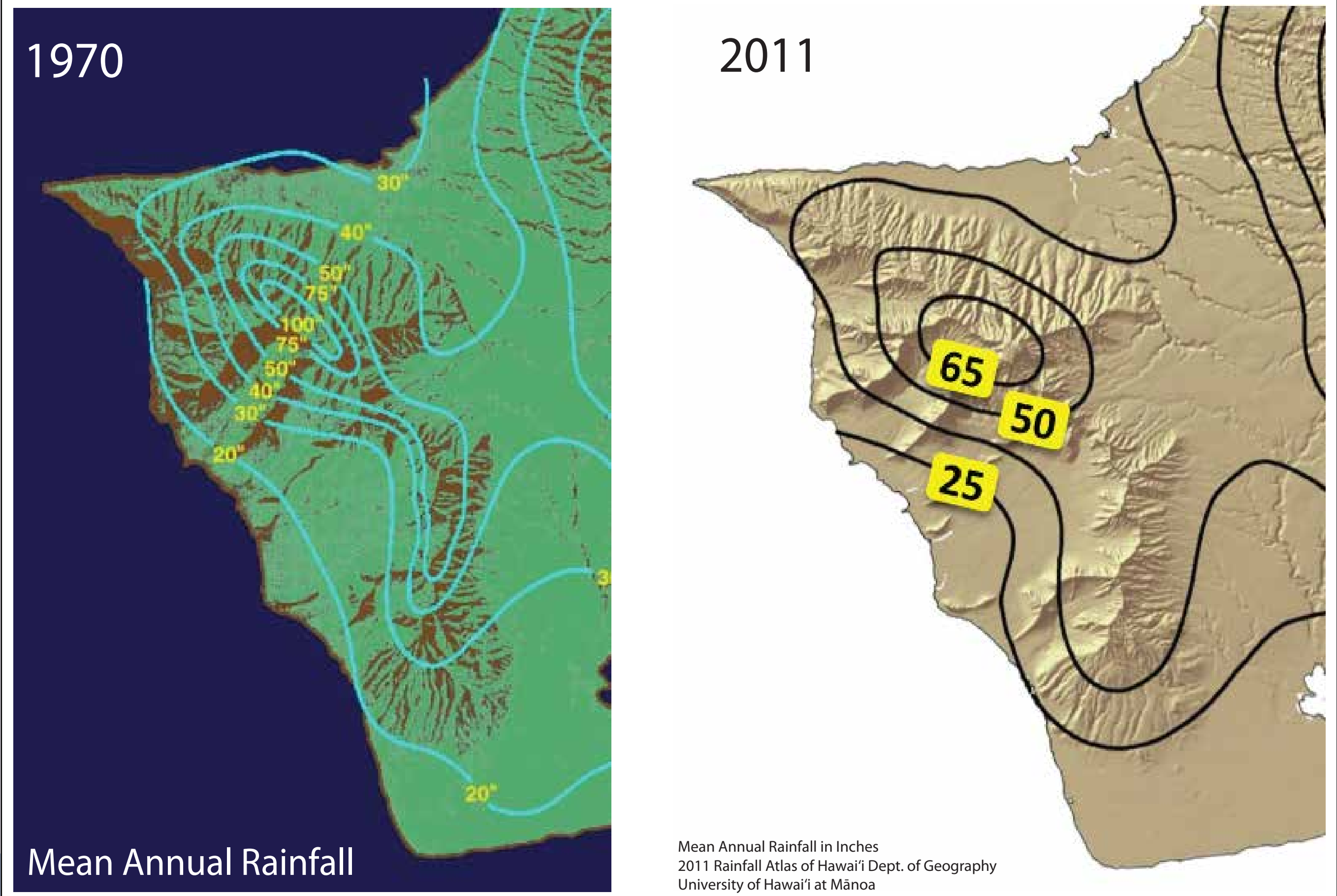
HOW DO YOU THINK THIS WATER RESOURCE ISSUE IS OR SHOULD BE ADDRESSED?

Critical Water Resource Issue: RAINFALL CAPTURE AND COLLECTION

Why it's important to watershed health:

Data from 1970's - 2011 show that mean annual rainfall at the summit of Mt. Ka'ala has decreased from 100" to 65" of rain per year. Additionally, rainfall modeling by University of Hawai'i projects that areas of Wai'anāe could get 70%-90% drier by year the 2100. With decreased rain and drier conditions, there is significant need to capture and collect rain.

1970-2011 Mean Annual Rainfall



Special Areas of Concern:

WAI'ANAE MOUNTAIN RANGE and native forests act as sponges, absorbing moisture and rain and directing it into the ground, which replenished the aquifers that supply water to homes and communities.

- Wai'anāe historically had a greater number of estuaries and wetlands until those natural resources were eventually replaced with landfills, real estate development, and canals.
- Native Hawaiian plants efficiently capture and retain water
- Low impact development (use of permeable surfaces) and green infrastructure (rain gardens, rain barrels, green roof systems) can help better capture rain.

IS THIS WATER RESOURCE ISSUE A PRIORITY TO YOU? WHY OR WHY NOT?

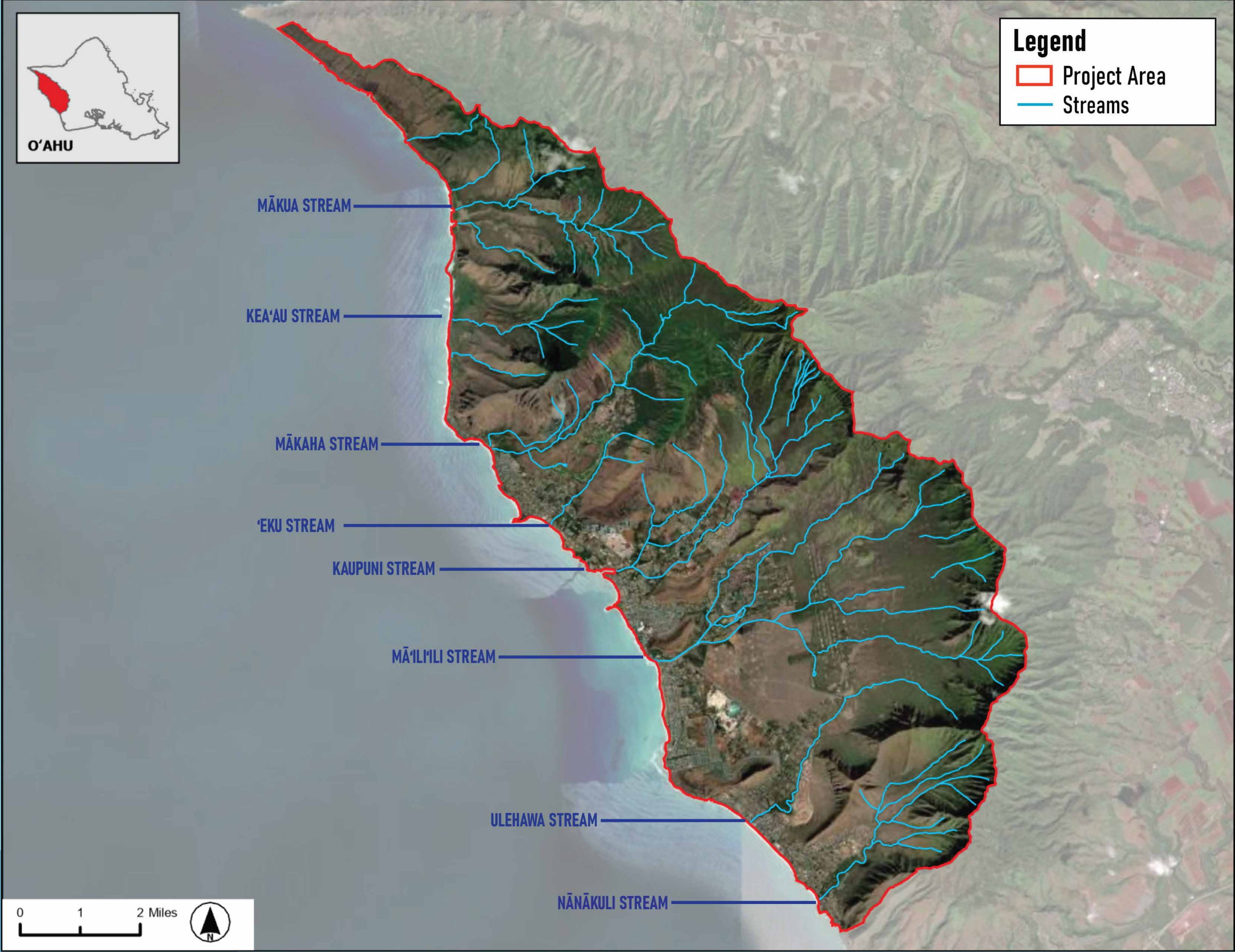
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Critical Water Resource Issue: GROUNDWATER AND SURFACE WATER

Why it's important to watershed health:

About 99% of Hawai'i's drinking water and half of the state's freshwater is provided by groundwater. Surface water resources are of significant economic, ecologic, and cultural importance, with streams supplying more than 50% of the irrigation water in Hawai'i and supporting traditional cultivation and gathering. Streams also affect the physical, chemical, and aesthetic quality of receiving waters, such as estuaries, bays, and nearshore waters.

WAI'ANAE STREAMS



Special Areas of Concern:

MĀKAHA STREAM does not have enough flow downstream to Mākaha Beach to protect federally endangered species in Mākaha.

- BWS is funding the Wai'anae Mountain Watershed Partnership to install fencing to protect native plants, control invasive species, and continue the BWS lo'i restoration project in Mākaha.

KAUPUNI STREAM was identified as an impaired body of water in the 2024 Department of Health (DOH) Water Quality and Monitoring Assessment Report.

- Since 2012, BWS fully discharges water from Plantation Tunnel #3 into Kaupuni Stream at approximately 300,000 gallons per day.

IS THIS WATER RESOURCE ISSUE A PRIORITY TO YOU? WHY OR WHY NOT?

HOW DO YOU THINK THIS WATER RESOURCE ISSUE IS OR SHOULD BE ADDRESSED?

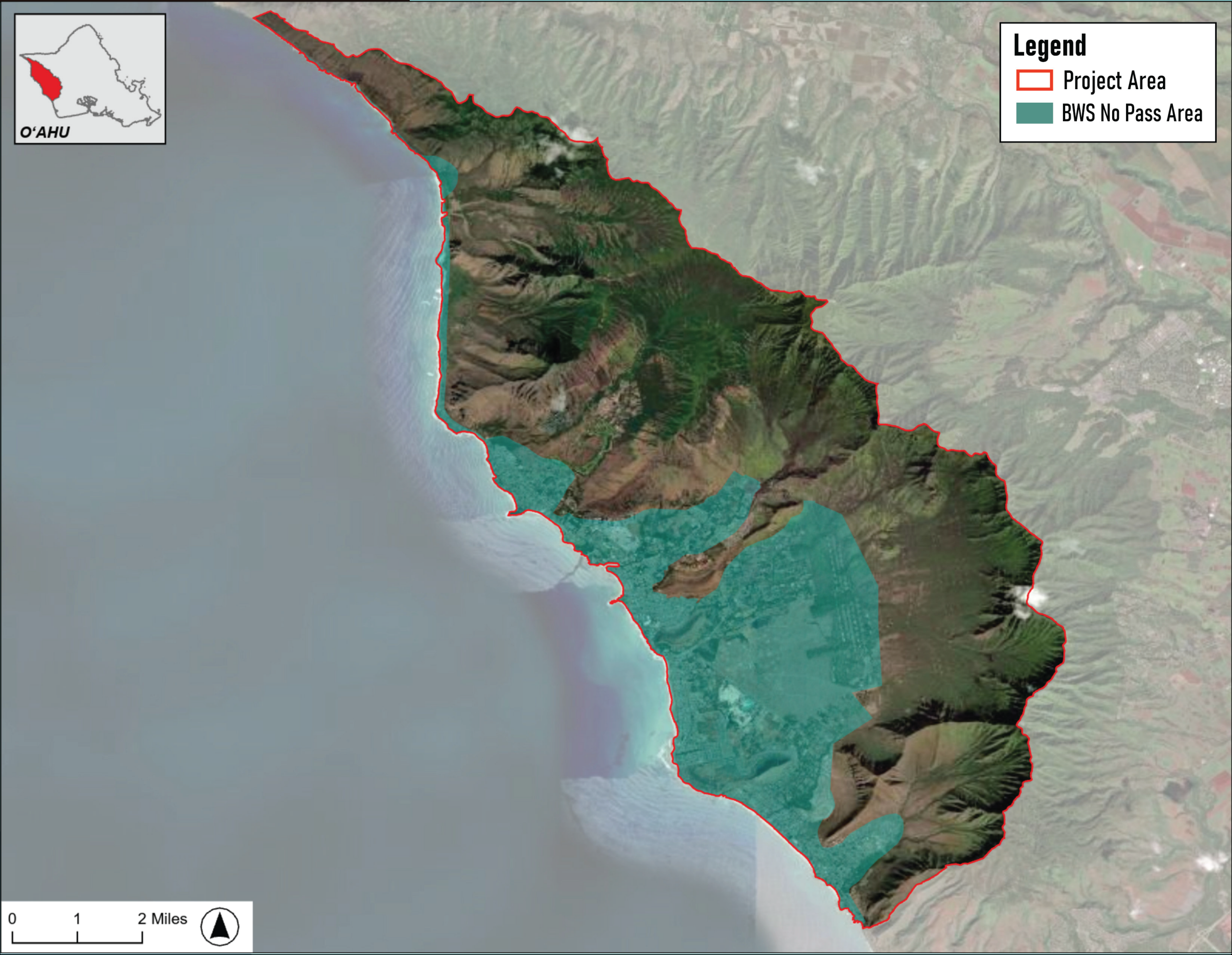
Critical Water Resource Issue:

ACCESS TO MAUKA LANDS

Why it's important to watershed health:

Some of the major mauka large land managers and owners in Wai‘anae include DHHL, the U.S. Military, the State of Hawai‘i, and BWS in Mākaha. Increased foot traffic and activities in sensitive mauka areas can lead to pollution and degradation of water quality. This is often overlooked, resulting in both trespassing and frustration surrounding accessibility to mauka lands for personal or cultural purposes.

BWS NO PASS ZONES



Special Areas of Concern:

MĀKAHA AND MĀKUA VALLEY

The issue of community access to Mākaha and Mākua lands along with other mauka areas presents a complex challenge for the BWS, which must balance the needs and desires of the community with the duty to protect water resources.

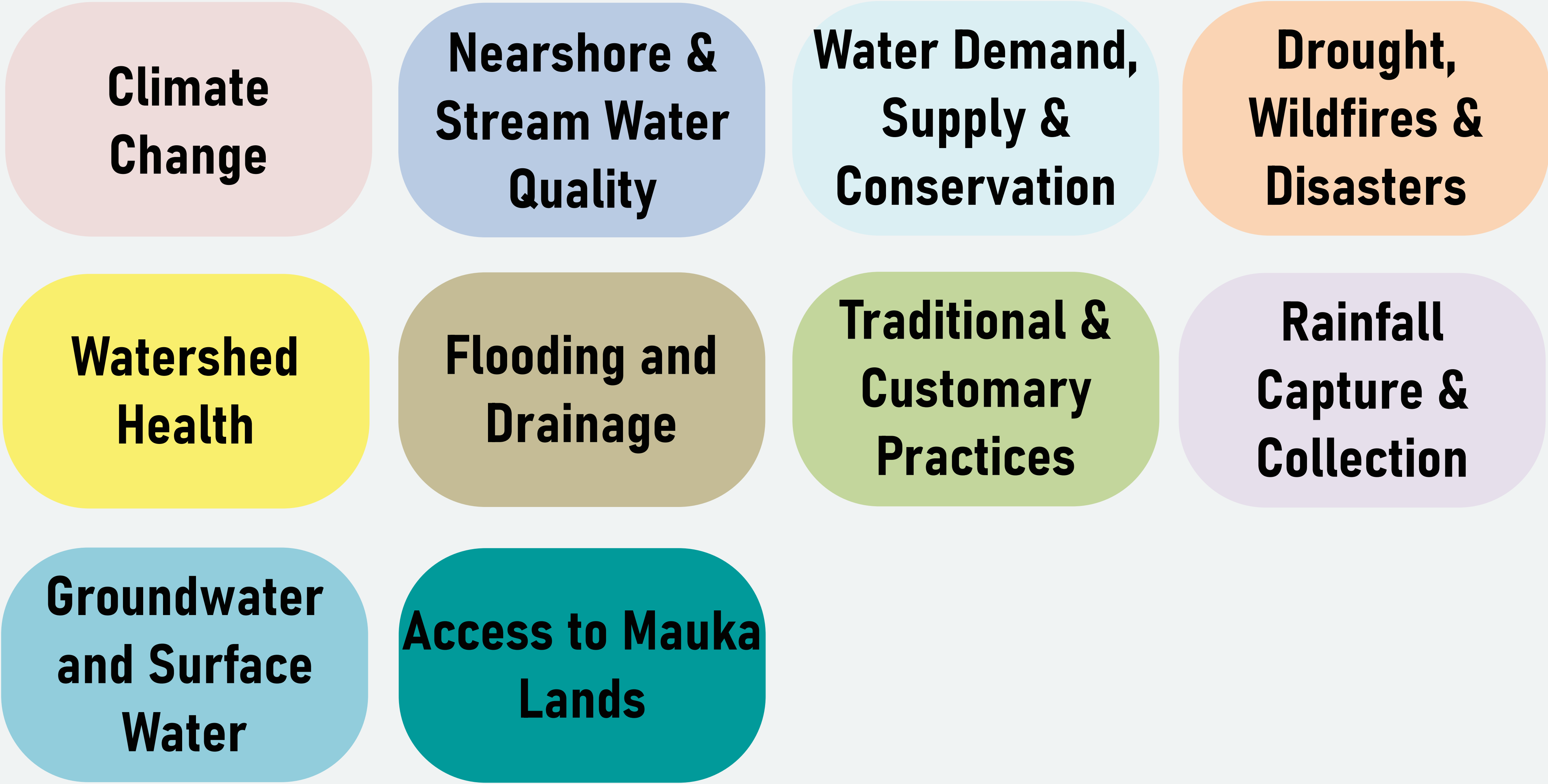
- For community members, access to mauka lands is important for engaging in traditional practices, natural resource gathering, and maintaining cultural identity
- BWS continues to work with local community members and organizations to address the needs and concerns and to respect access for traditional and cultural practices.

IS THIS WATER RESOURCE ISSUE A PRIORITY TO YOU? WHY OR WHY NOT?

HOW DO YOU THINK THIS WATER RESOURCE ISSUE IS OR SHOULD BE ADDRESSED?

WAI'ANAE WATERSHED MANAGEMENT PLAN (WWMP)

CRITICAL WATER RESOURCE ISSUES:



ARE THERE OTHER WATER RESOURCE ISSUES THAT ARE CRITICAL TO ADDRESS IN THE WWMP?

