

# **Central Oahu Watershed Management Plan Community Meeting #1**

December 11, 2014

# Agenda

- Background and Overview of the Oahu Water Management Plan
- Central Oahu Watershed Profile
- Watershed Issues
- Next Steps

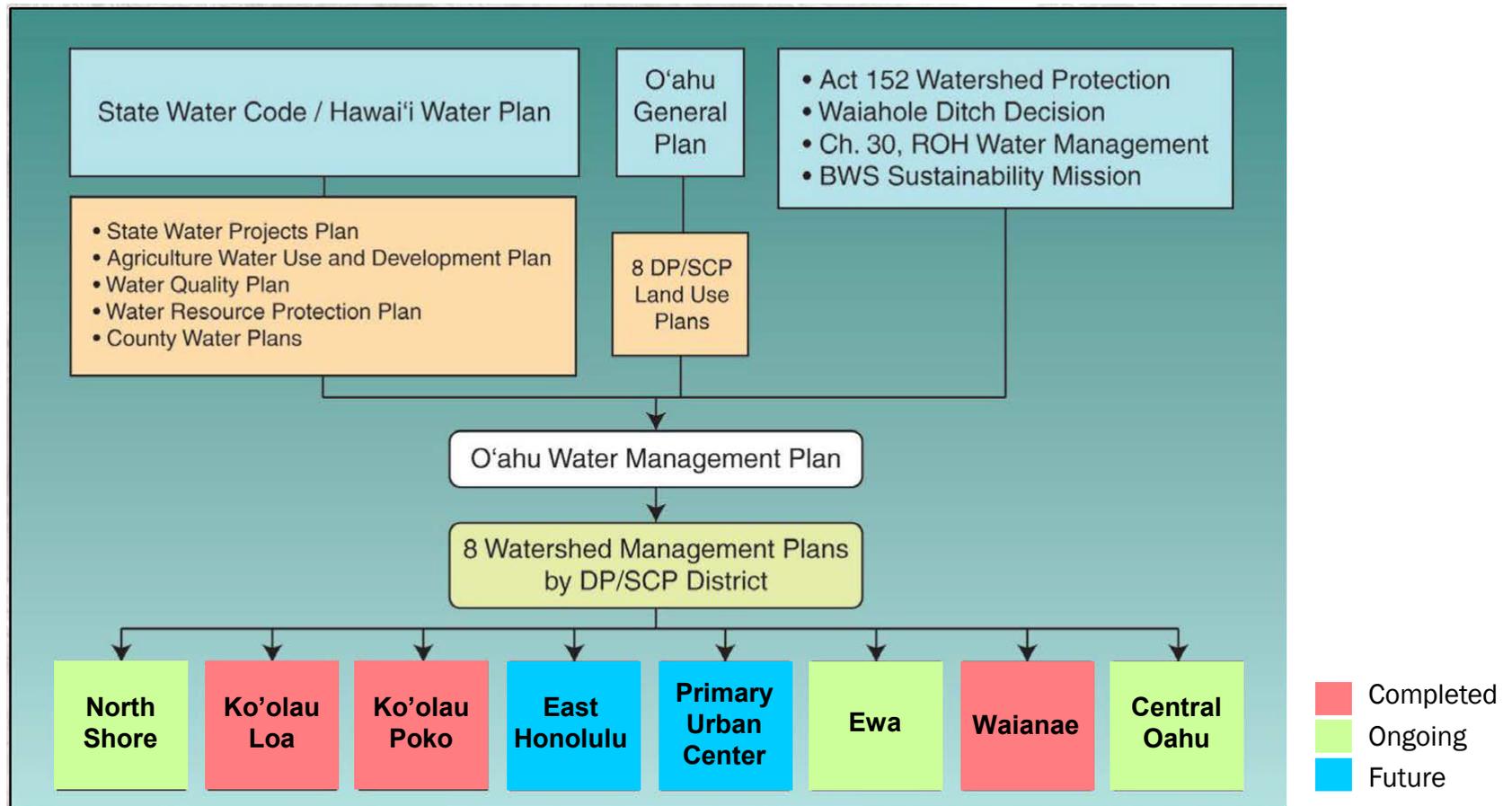
# Water Resource Strategies

- Watershed Management
  - Protect Forested Recharge Areas
  - Control Invasive Species
  - Source Water Protection
- Water Conservation
  - Resource
  - Demand-Side Management
  - Infrastructure Efficiency
- Natural and Alternative Water Supplies
  - Groundwater
  - Surface water
  - Recycled and brackish non-potable
  - Desalination
    - Brackish and Seawater
  - Renewable Energy – Energy Efficiency



# Background

## Oahu Water Management Plan



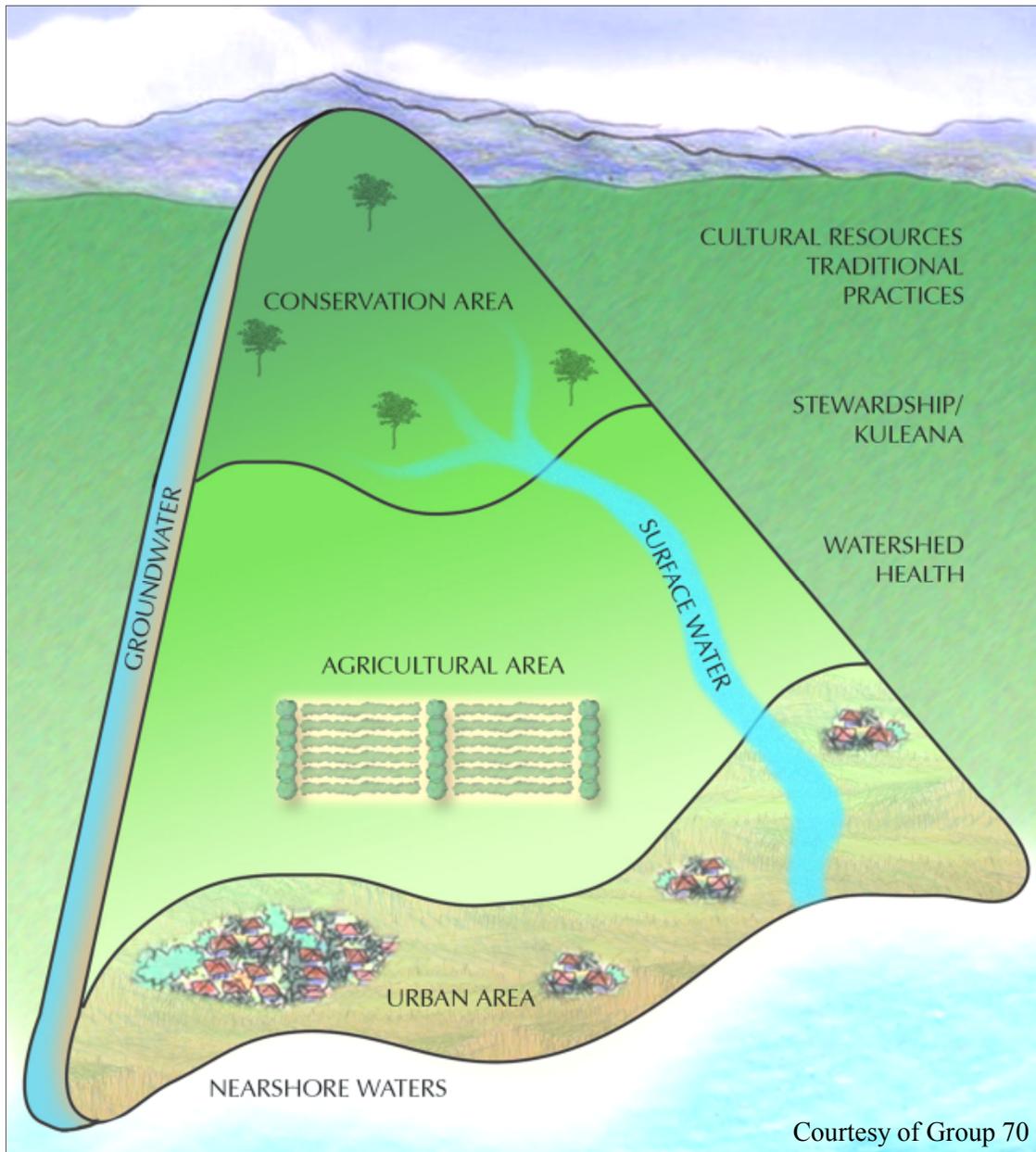
# Goal of the Oahu Water Management Plan:

To formulate an environmentally holistic, community-based, and economically viable watershed management plan that will provide a balance between:

- The preservation and management of Oahu's watersheds; and
- Sustainable ground water and surface water use and development to serve present users and future generations

## Key Planning Principles:

- Community participation and consultation
- Holistic management of watershed resources
- Alignment with important State and City policies and programs
- Action oriented: Implementation of important watershed management programs
- Ahupua'a management principles



# Watershed Management Applying the Ahupua`a Concept

# Oahu Water Management Plan

## Objectives:

1. Promote sustainable watersheds
2. Protect and enhance water quality and quantity
3. Protect Native Hawaiian rights and traditional customary practices
4. Facilitate public participation, education, and project implementation
5. Meet future water demands at reasonable costs

# Central Oahu Sub-Objective Development



# Central Oahu Watershed Management Plan (COWMP) Overview

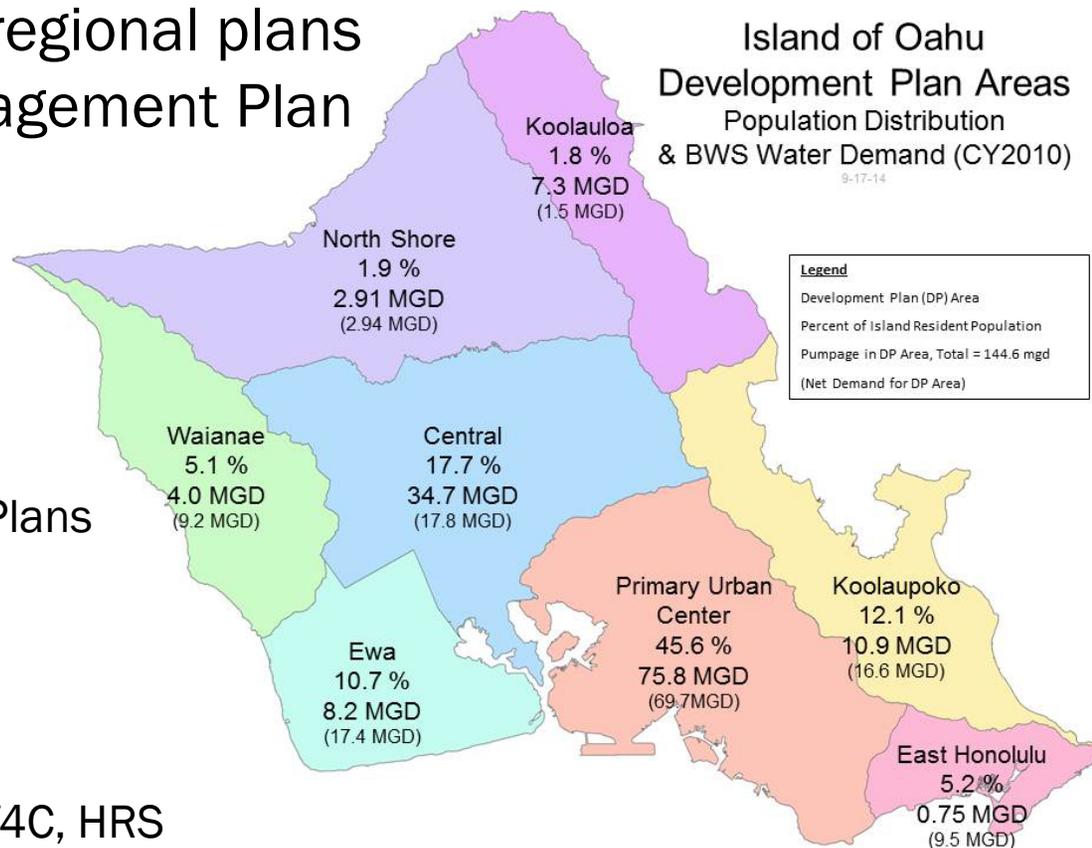
COWMP is one of eight regional plans of the Oahu Water Management Plan

## Guiding plans:

- Hawaii Water Plan
- City Development Plans and Sustainable Communities Plans

## Authority:

- State Water Code Chapter 174C, HRS
- City and County of Honolulu Ordinance Chapter 30, ROH



# Central Oahu Watershed Management Plan Contents:

## Chapters

### Executive Summary

1. Oahu Water Management Plan Overview
2. Central Oahu Watershed Profile
3. Water Use and Projected Demand
4. Plan Objectives and Water Supply and Watershed Management Projects and Strategies
5. Implementation

## Appendices

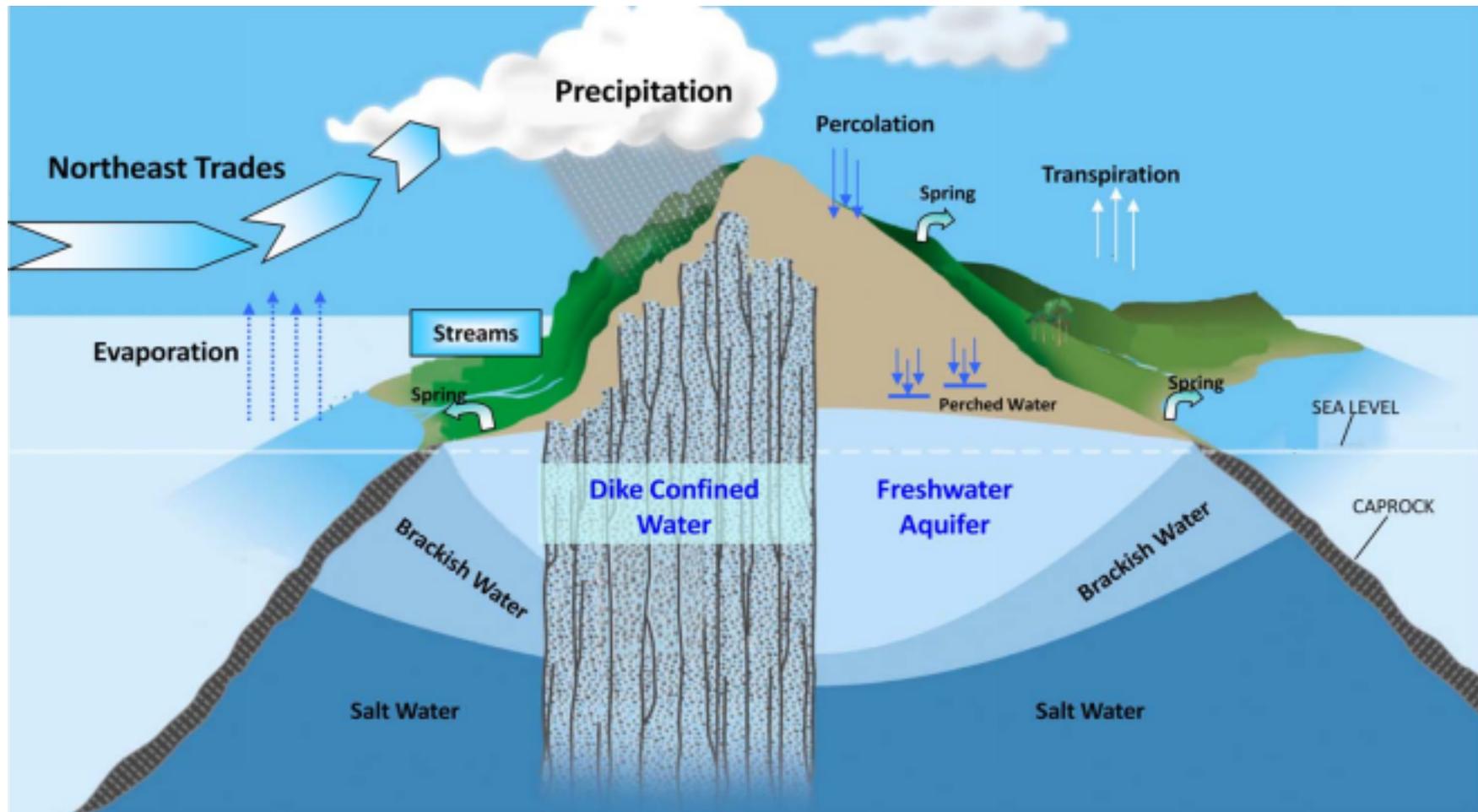
- A. Oahu Watershed Management Plan Framework
- B. Plans, Policies, Guidelines, and Controls
- C. Oahu Water Use Permit Index
- D. Overview of Oahu Hydrogeology
- E. Water Use and Demand – Methodology
- F. Neighborhood Board Endorsements

# Regional Hydrogeology



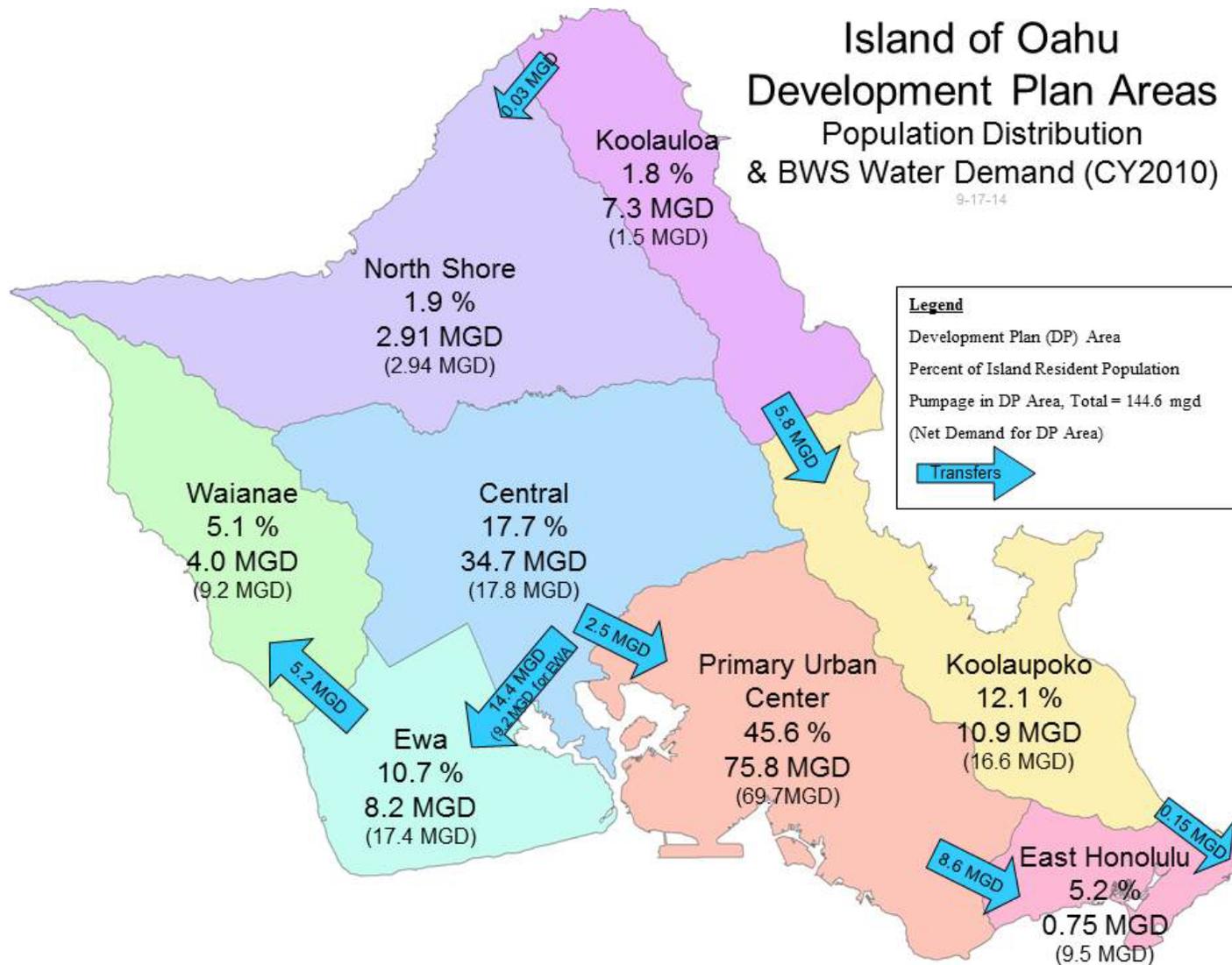
- Basal aquifers – Honolulu, North, and Central Oahu
- High-level dikes – Crests of Waianae and Koolau Mountains
- Caprock – Confines the basal water from leaking into the ocean

# Regional Hydrology

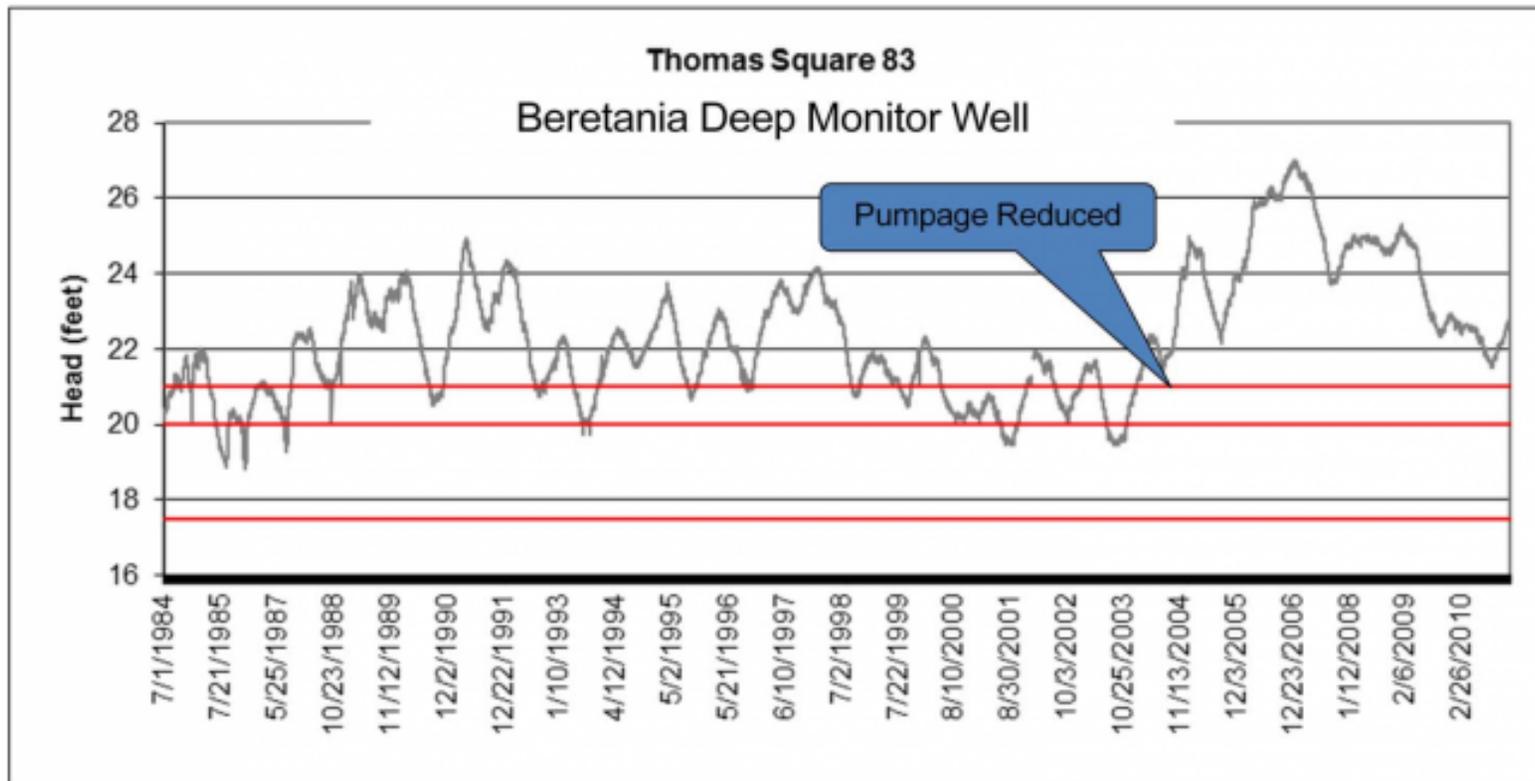




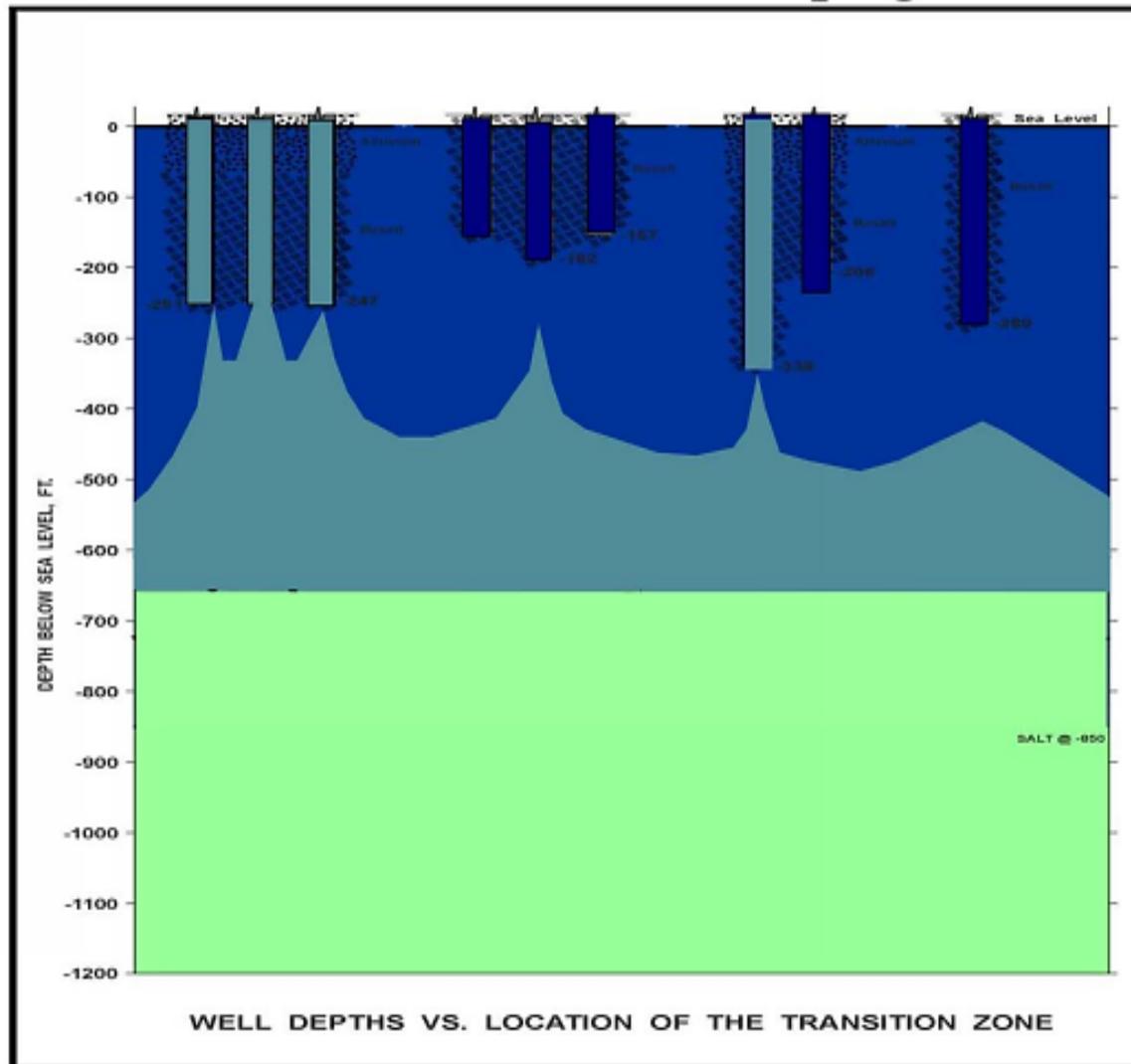
# Potable Water Demand

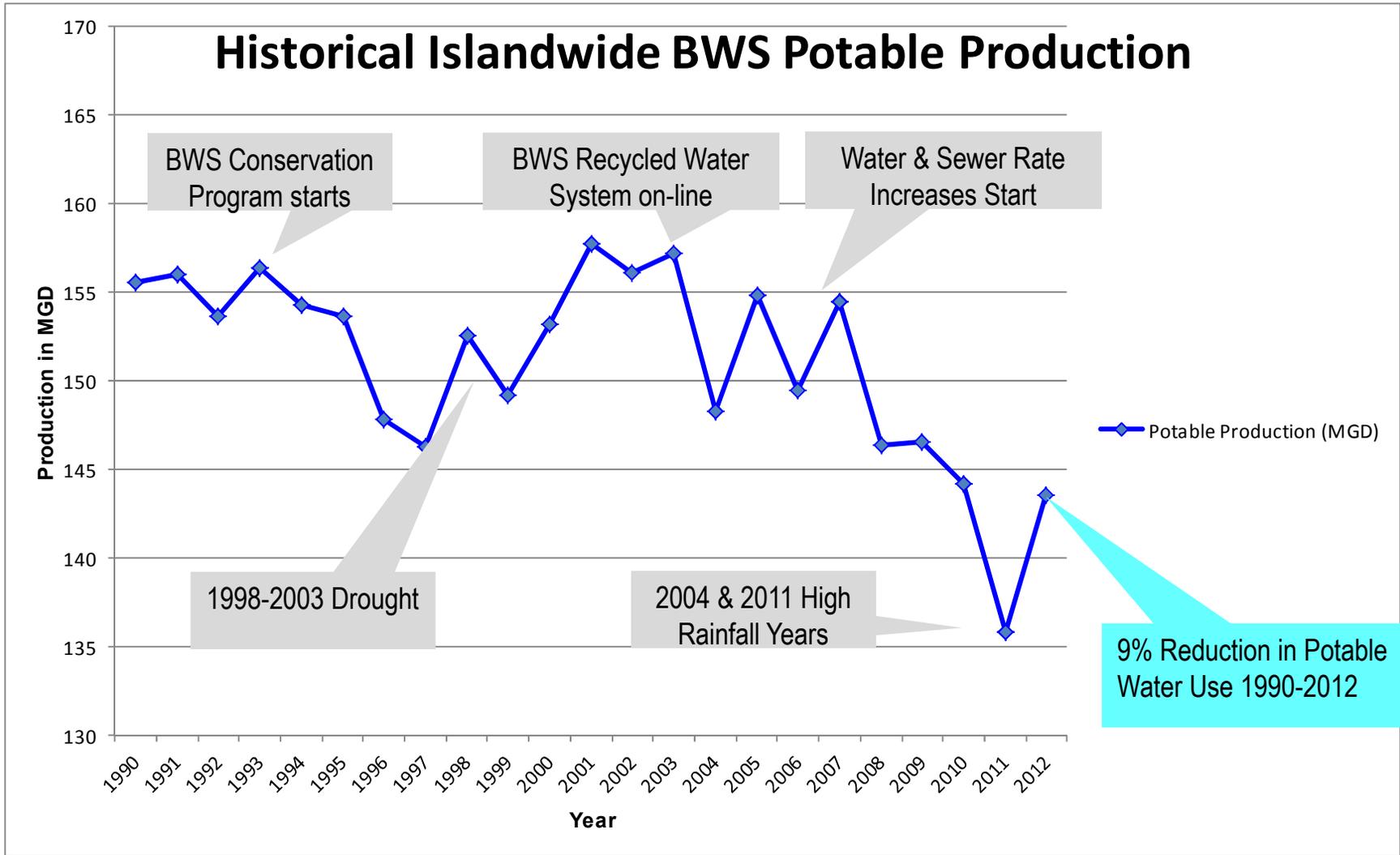


# BWS Monitors Head and Manages Pumping

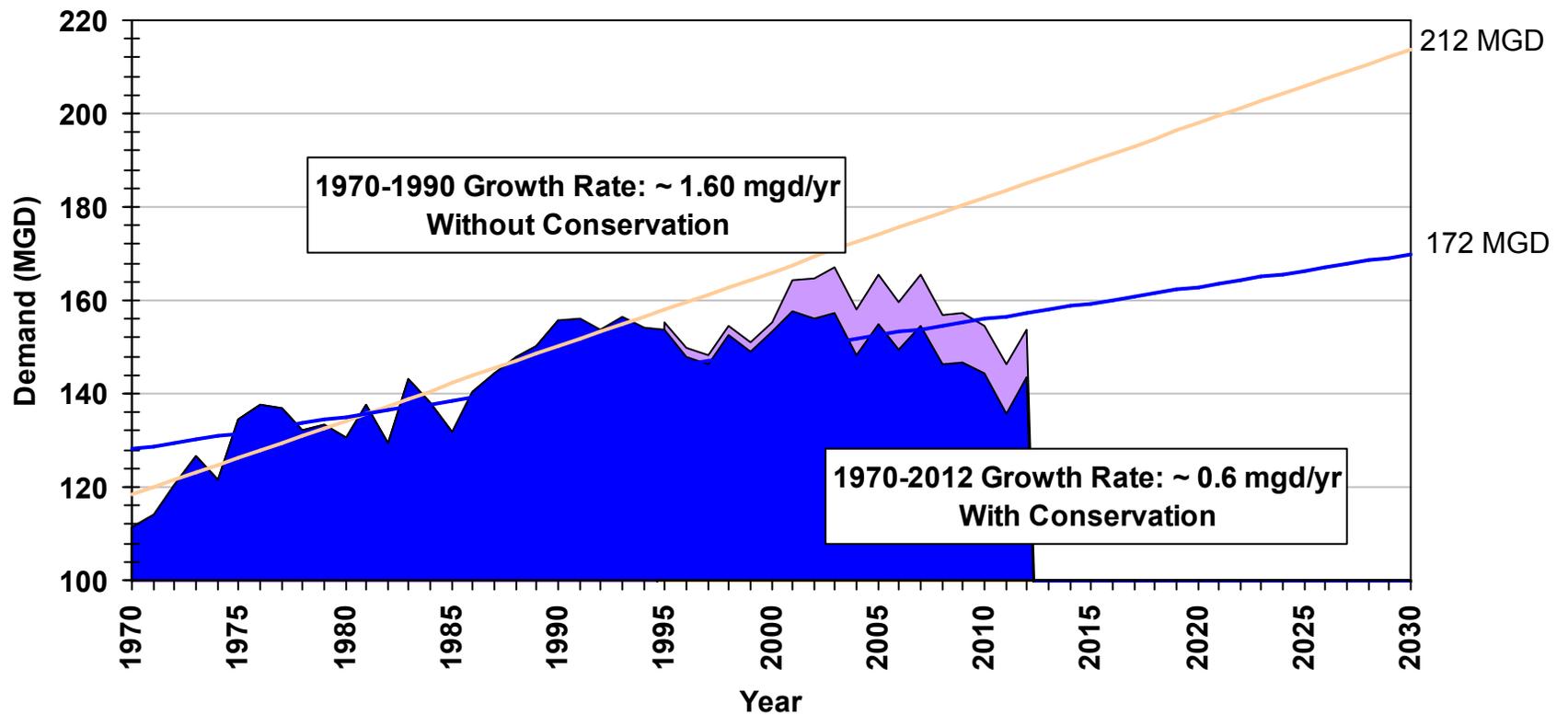


# Well Upconing Due to Loss of Recharge and Concentrated Pumping





# BWS Potable Water System Demand Projections Historical Potable & Nonpotable Water Use

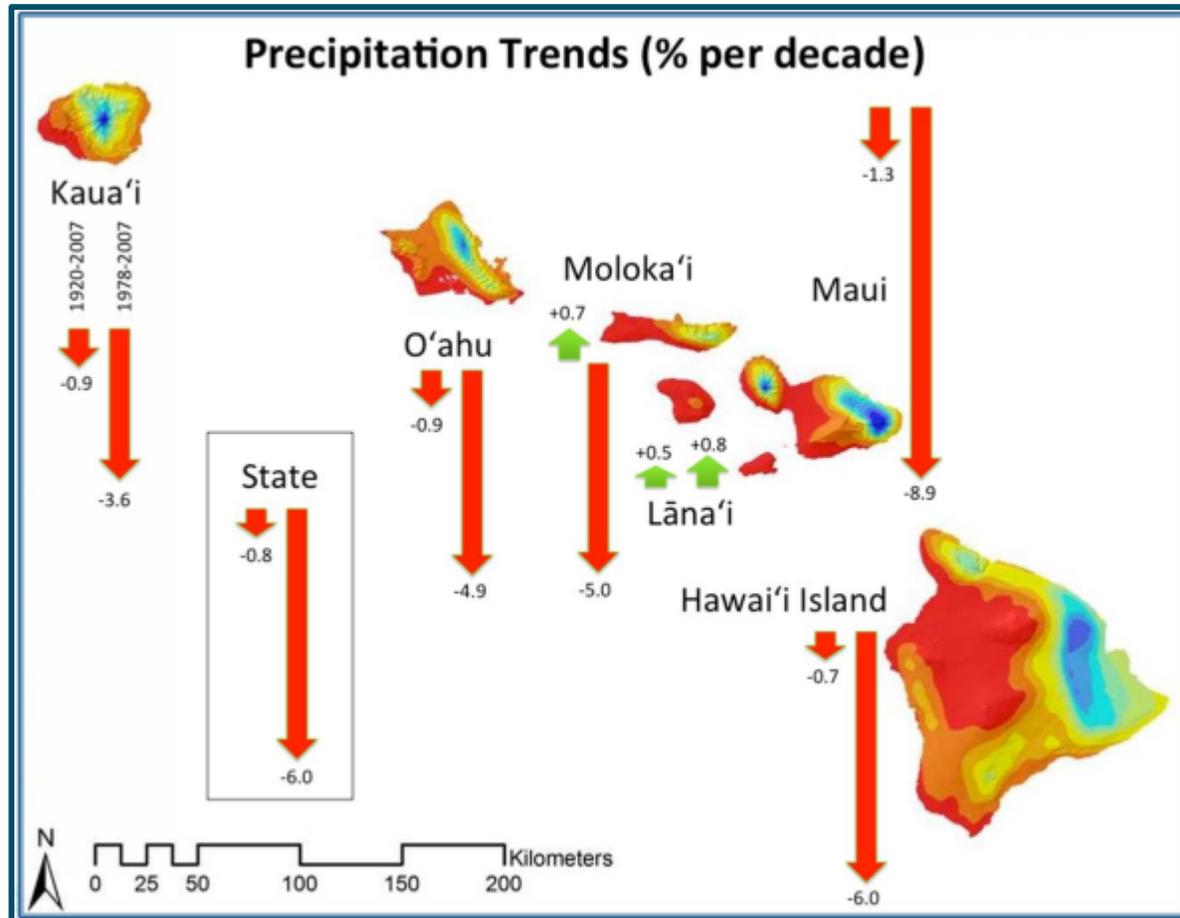


Blue = potable water  
Purple = recycled and non-potable production

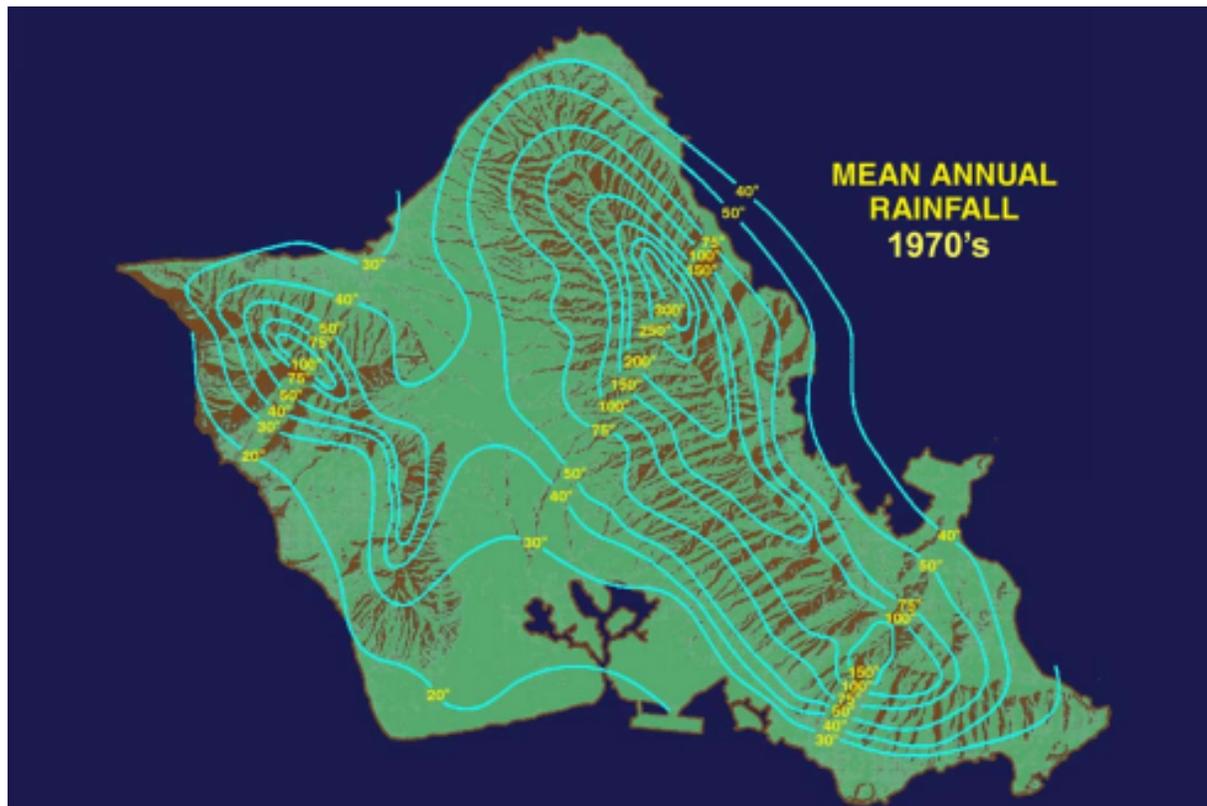
# Hawaii's Climate is Changing

- Rainfall (-15%) and stream discharge have decreased
- Air temperature is increasing (0.3°F/decade)
- Rainstorm intensity has increased (+12%)
- Sea surface temperature is rising (0.22°F/decade)
- Ocean has grown more acidic
- Sea level is rising

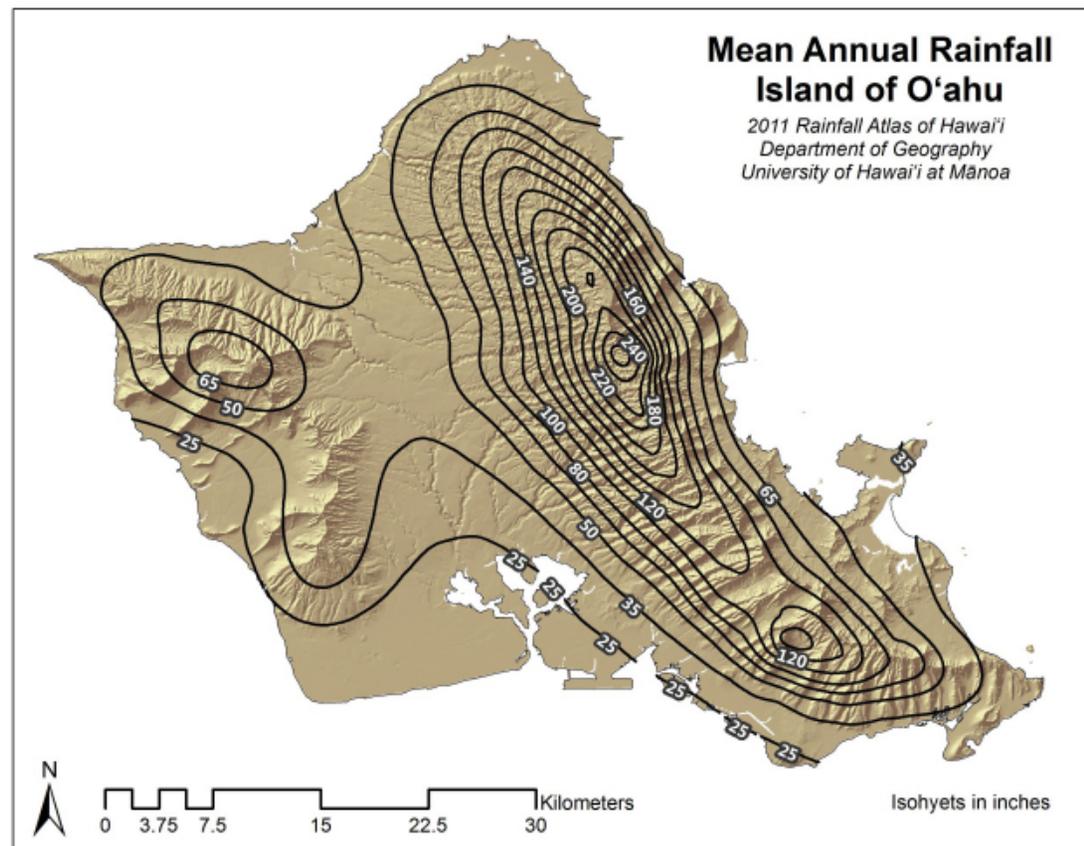
# Precipitation Trends



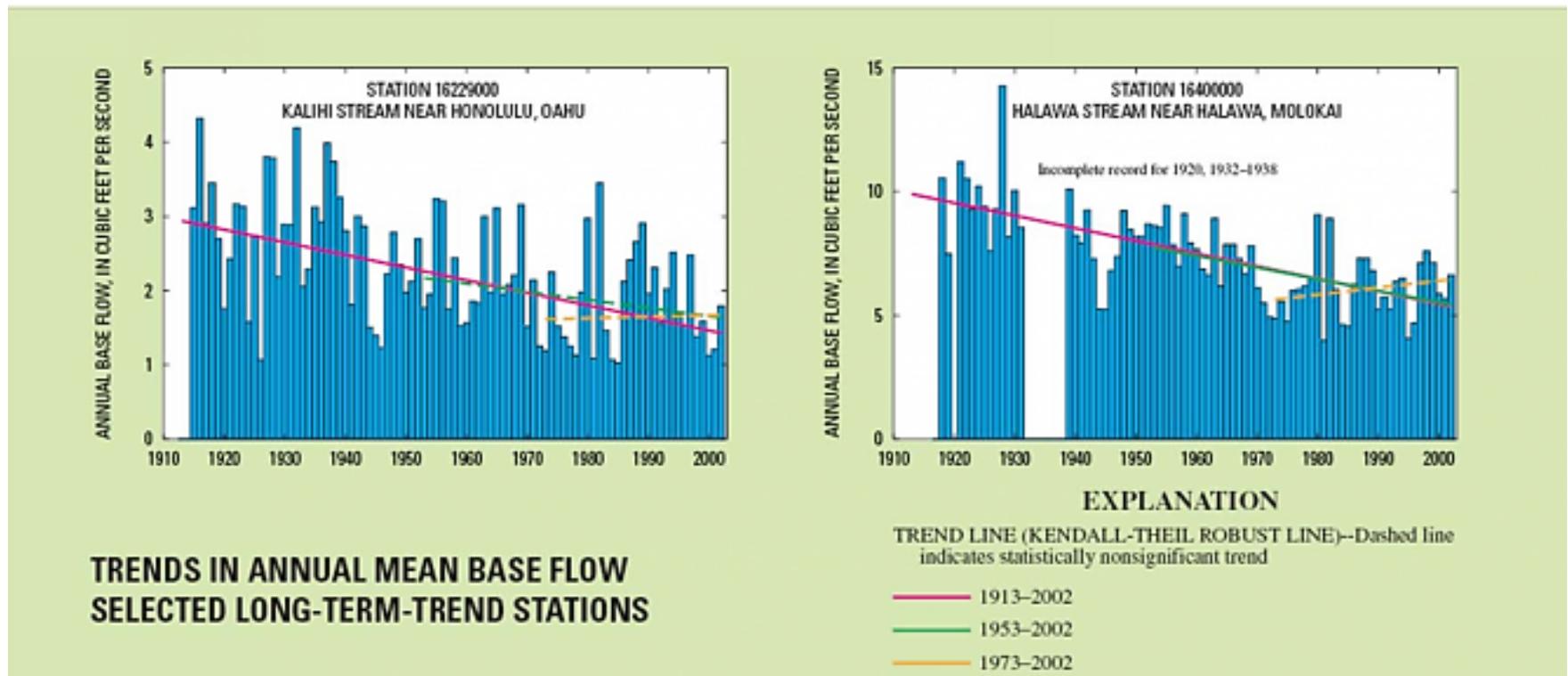
# Mean Annual Rainfall (1970's)



# Mean Annual Rainfall (2011)

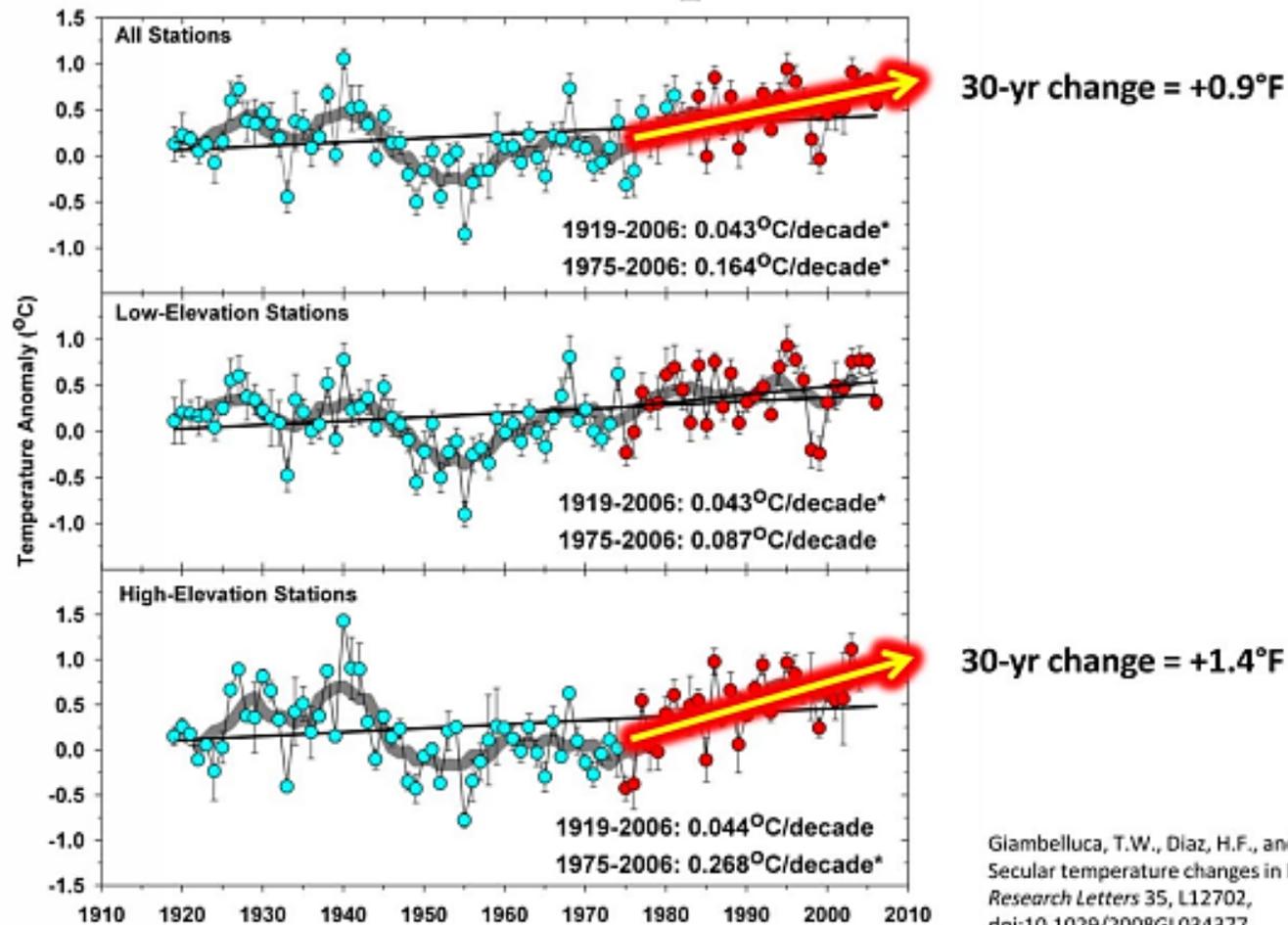


# USGS Trends in Annual Mean Stream Base Flow (1913-2002)



Suggests a direct correlation between streamflow and rainfall in selected streams

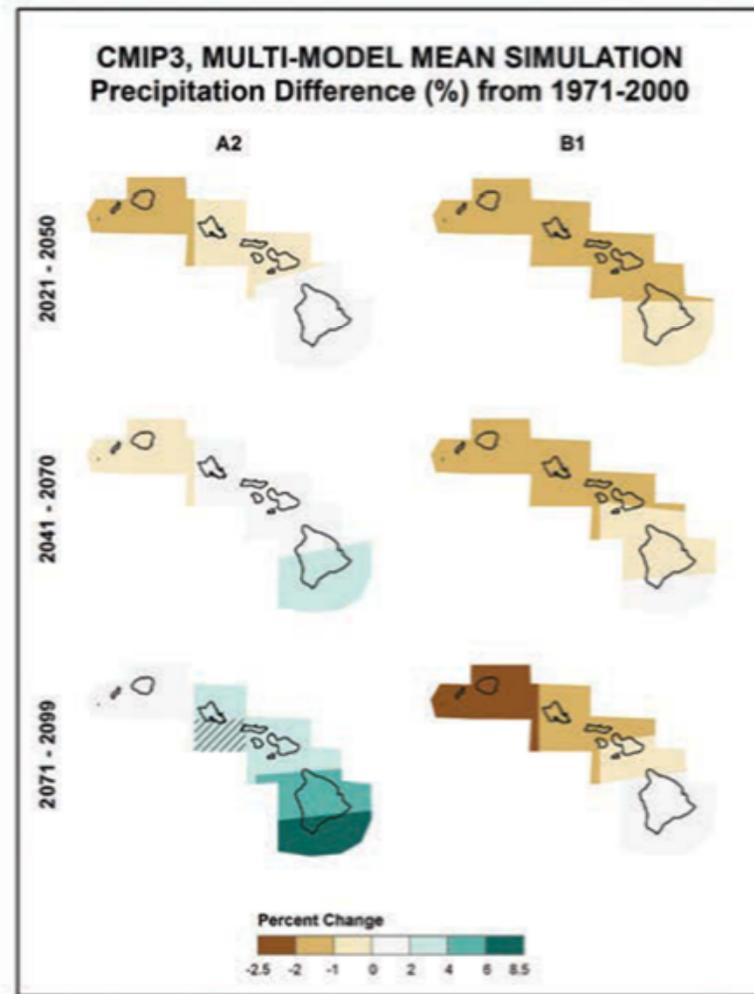
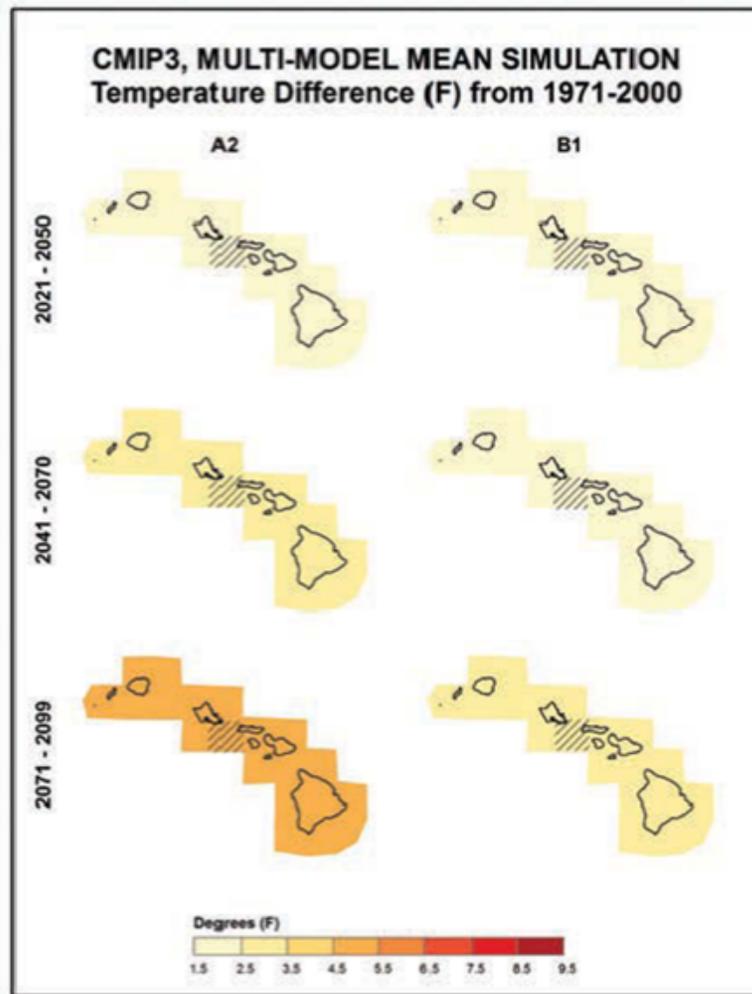
# Hawaii Temperature Index



Giambelluca, T.W., Diaz, H.F., and Luke, M.S.A. 2008. Secular temperature changes in Hawai'i. *Geophysical Research Letters* 35, L12702, doi:10.1029/2008GL034377.

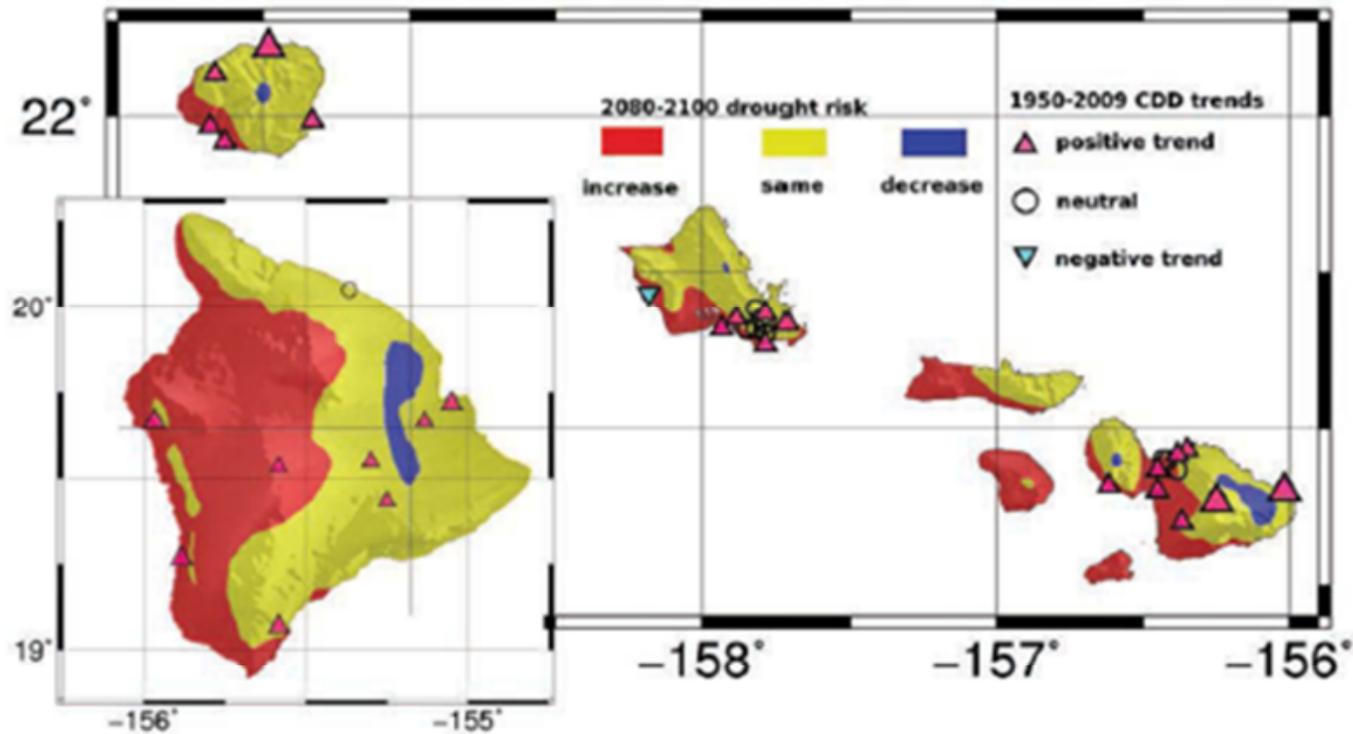
# Hawaii Climate Simulations

2012 Pacific Islands Regional Climate Assessment (PIRCA) Report: Climate Change and Pacific Islands: Indicators and Impacts.



# Hawaii Climate Change

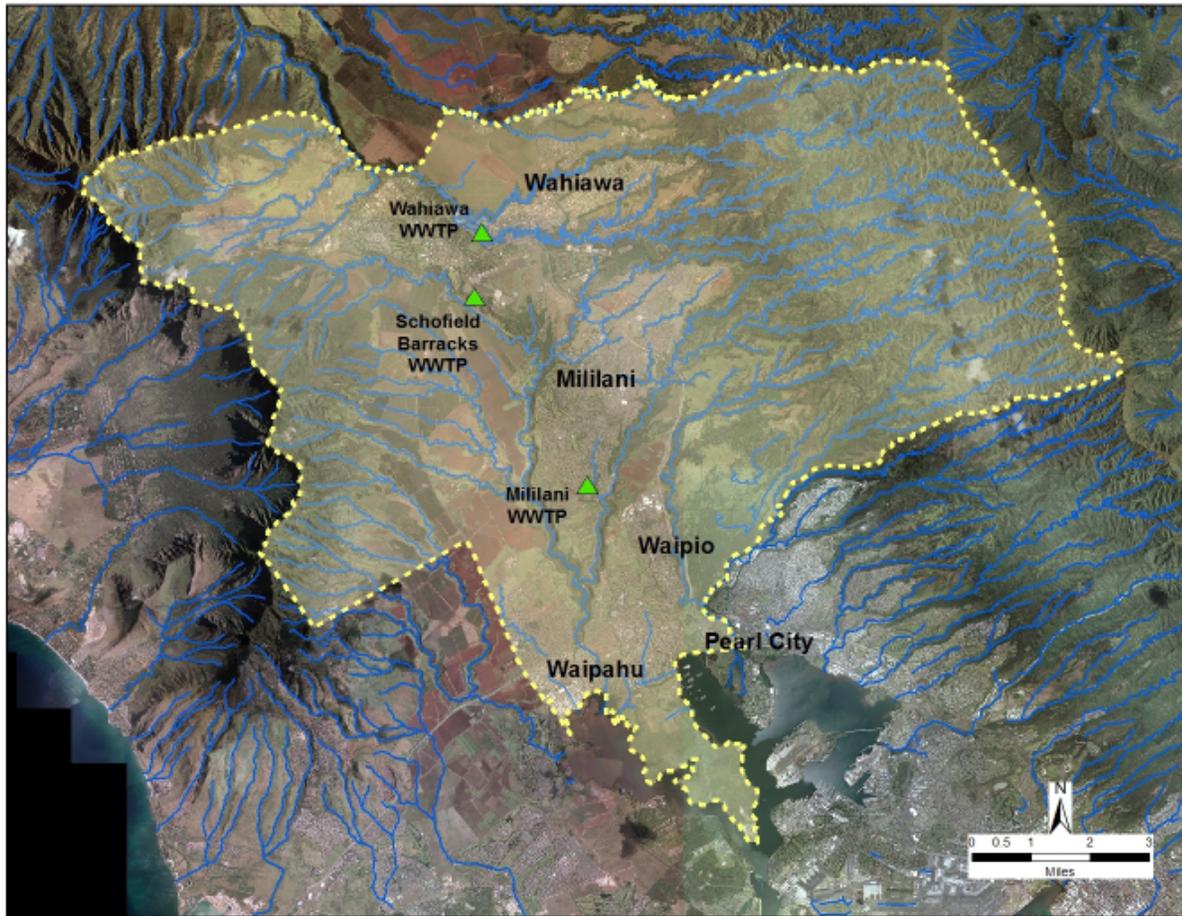
2012 PIRCA Report: Climate Change and Pacific Islands: Indicators and Impacts.



**Figure 2-16** All four major Hawaiian Islands (O'ahu, Kaua'i, Maui, and Hawai'i Island) have experienced increasing winter drought since the 1950s, defined by a longer annual maximum number of consecutive dry days. Background colors highlight changes in the number of low-precipitation months during the wet season (November–April) based on statistically downscaled climate change scenarios from six models of the IPCC AR4 report for years 2080–2100. (Figure courtesy of Oliver Elison Timm.)

# Central Oahu Watershed Profile

## Overview of Central Oahu



### Population:

168,520 people

*(2010 Census Data)*

### District Size:

70,921 acres

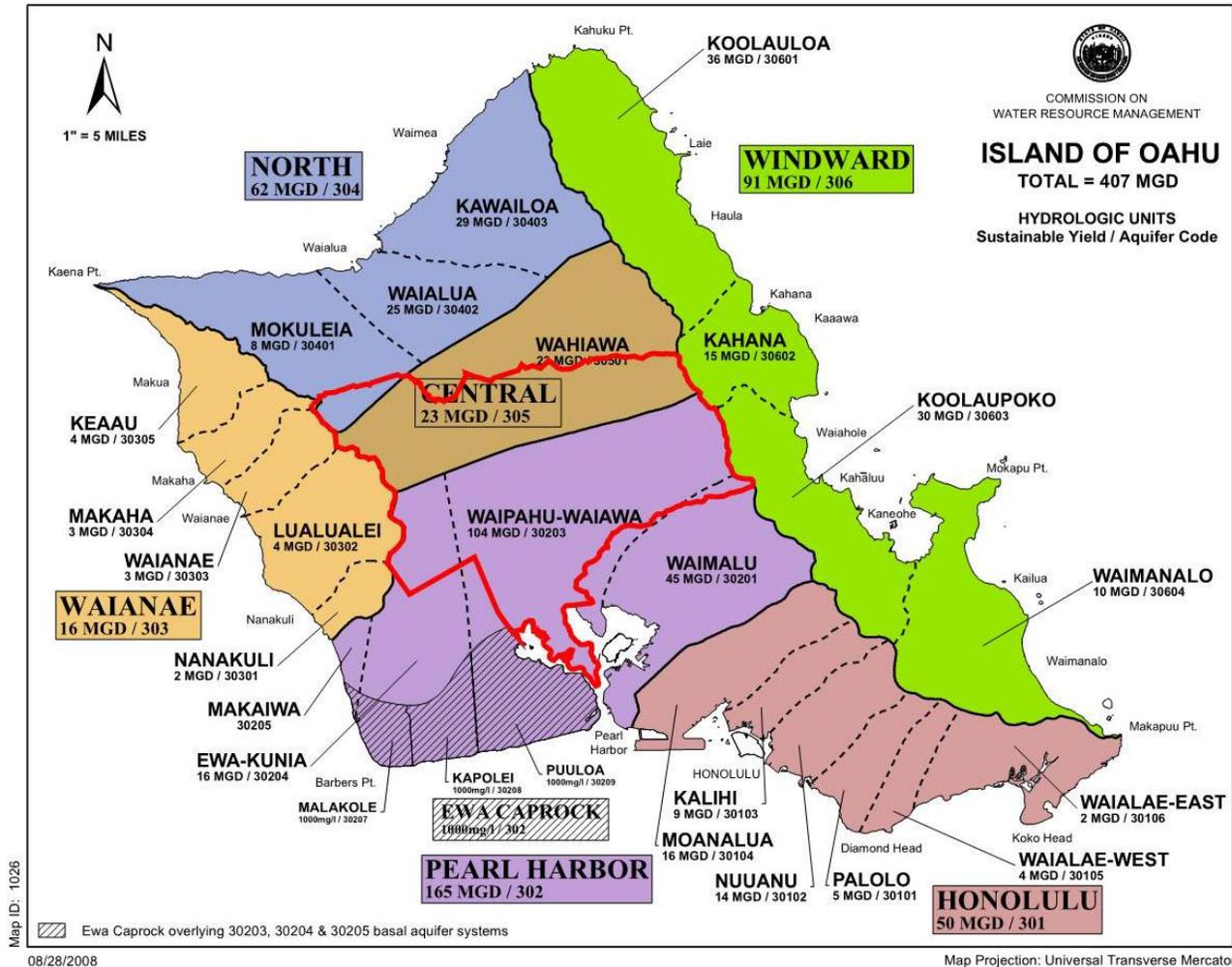
Agricultural: 29,783 ac. (42%)

Conservation: 25,645 ac. (36%)

Urban: 15,493 ac. (22%)

# Central Oahu Watershed Profile

## Ground Water Supply - Aquifers

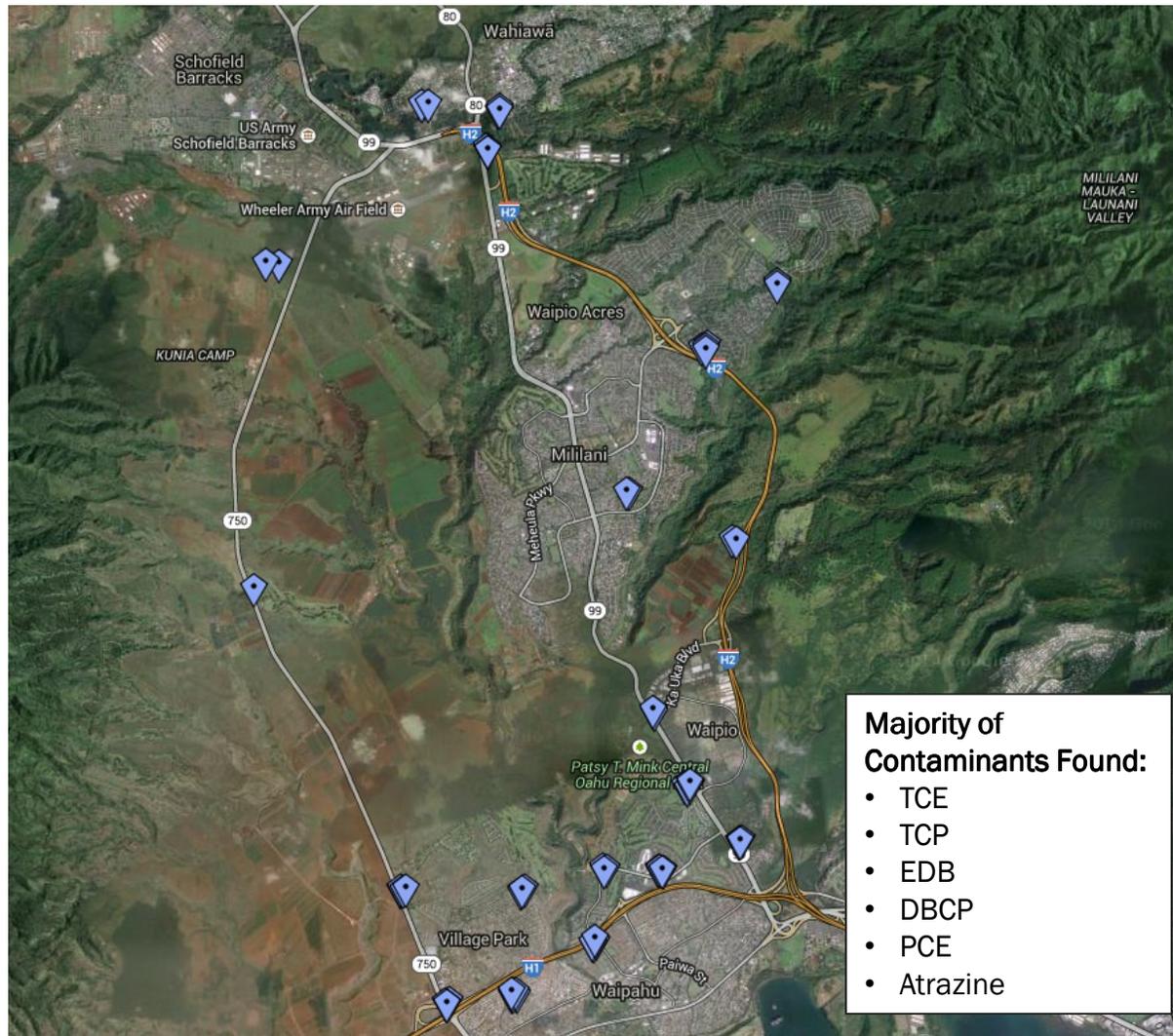


# Central Oahu Watershed Profile

## Ground Water Supply - Aquifers

<b>Aquifer System</b>	<b>Sustainable Yield (SY) (mgd)</b>	<b>Permitted Use (mgd)</b>	<b>SY Available (mgd)</b>	<b>12-MAV (mgd) as of 12/31/13</b>	<b>SY Minus Pumpage (mgd)</b>
<b>Waimalu</b>	45	46.951	-1.951	34.449	10.551
<b>Waipahu-Waiawa</b>	104	84.856	19.144	47.776	56.224
<b>Ewa-Kunia</b>	16	15.045	0.955	12.043	3.957
<b>Wahiawa</b>	23	22.663	0.337	8.958	14.042
<b>Mokuleia</b>	8	8.314	-0.314	0.359	7.641
<b>TOTAL</b>	<b>196</b>	<b>177.829</b>	<b>18.171</b>	<b>103.585</b>	<b>92.415</b>

# DOH Ground Water Contamination Map (2014)



Google maps. DOH Groundwater Contamination Viewer.

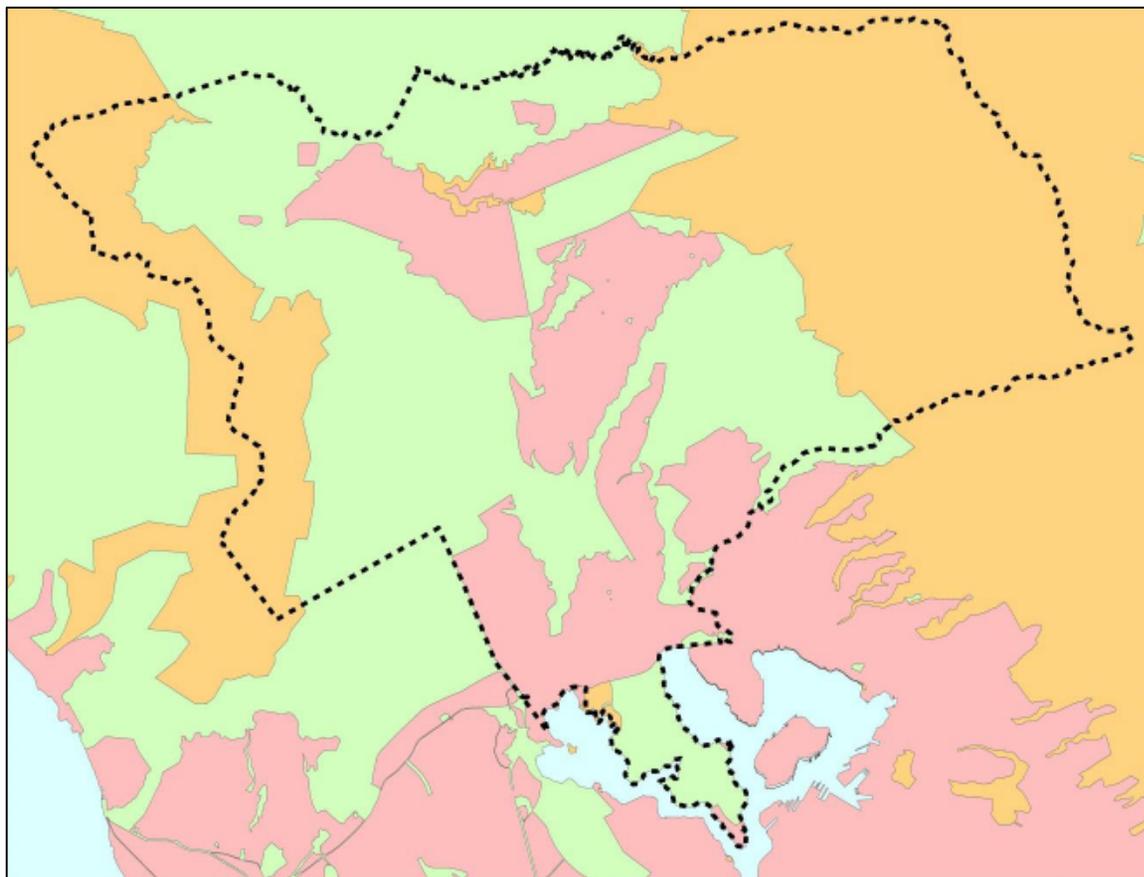
# Central Oahu Watershed Profile

## Groundwater Quality

- BWS regularly tests for about 100 chemical and bacterial contaminants
- There has been pollutant detection in aquifers beneath agricultural fields in Central Oahu
- Water is treated with granular activated carbon (GAC)
- Residual agricultural chemicals from sugarcane and pineapple cultivation, such as TCP and DBCP, are found in some Central Oahu wells
- TCE was also found at Schofield

# Central Oahu Watershed Profile

## State Land Use Classifications (2014)



### LEGEND

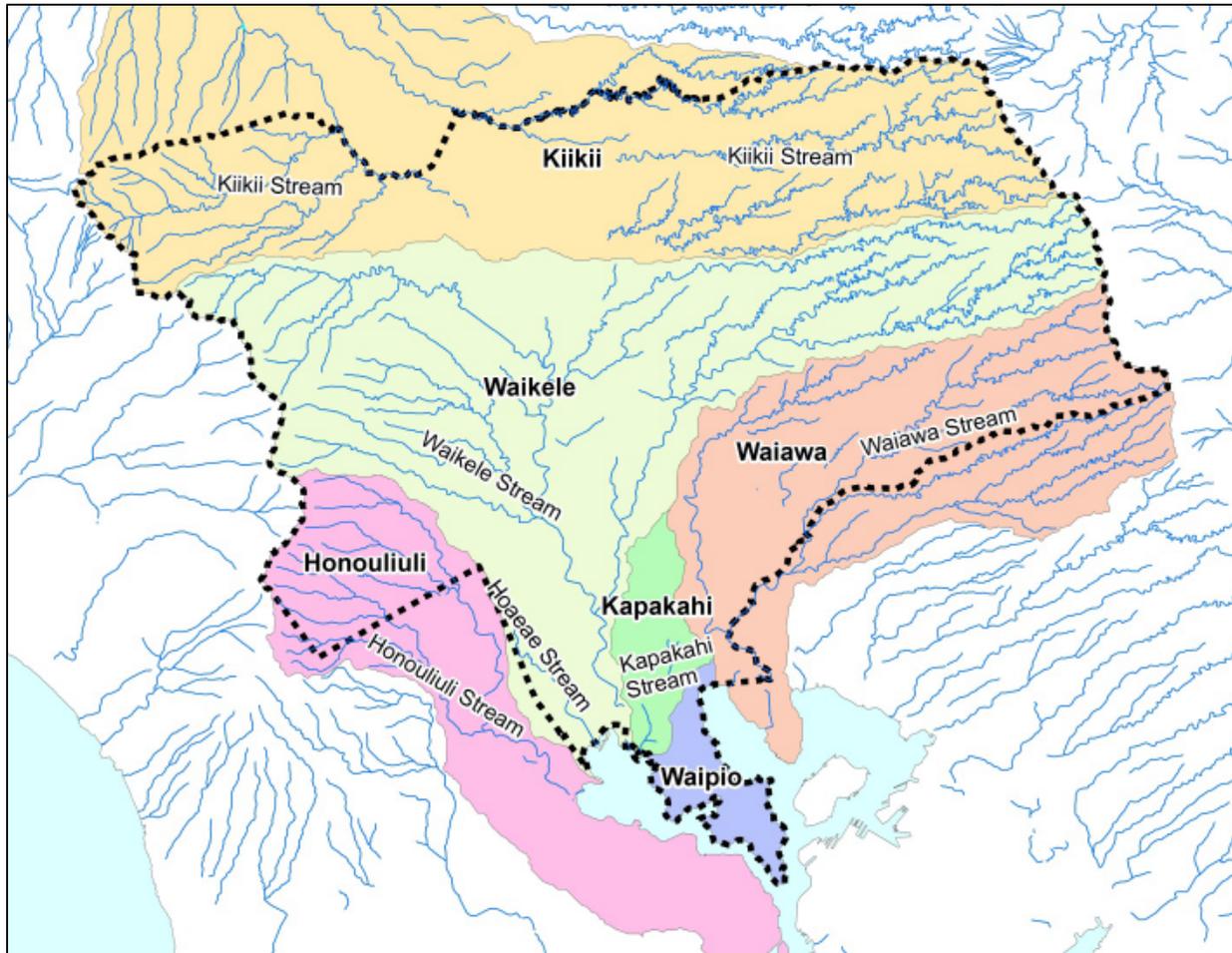
-  Agricultural
-  Conservation
-  Rural
-  Urban
-  Central Oahu Development Plan Area

70,921 total acres

- Agricultural: 29,783 ac. (42%)
- Conservation: 25,645 ac. (36%)
- Urban: 15,493 ac. (22%)

# Central Oahu Watershed Profile

## Surface Water



### Watersheds:

- Kiiikii
- Waikele
- Honouliuli
- Waiawa
- Kapakahi
- Waipio

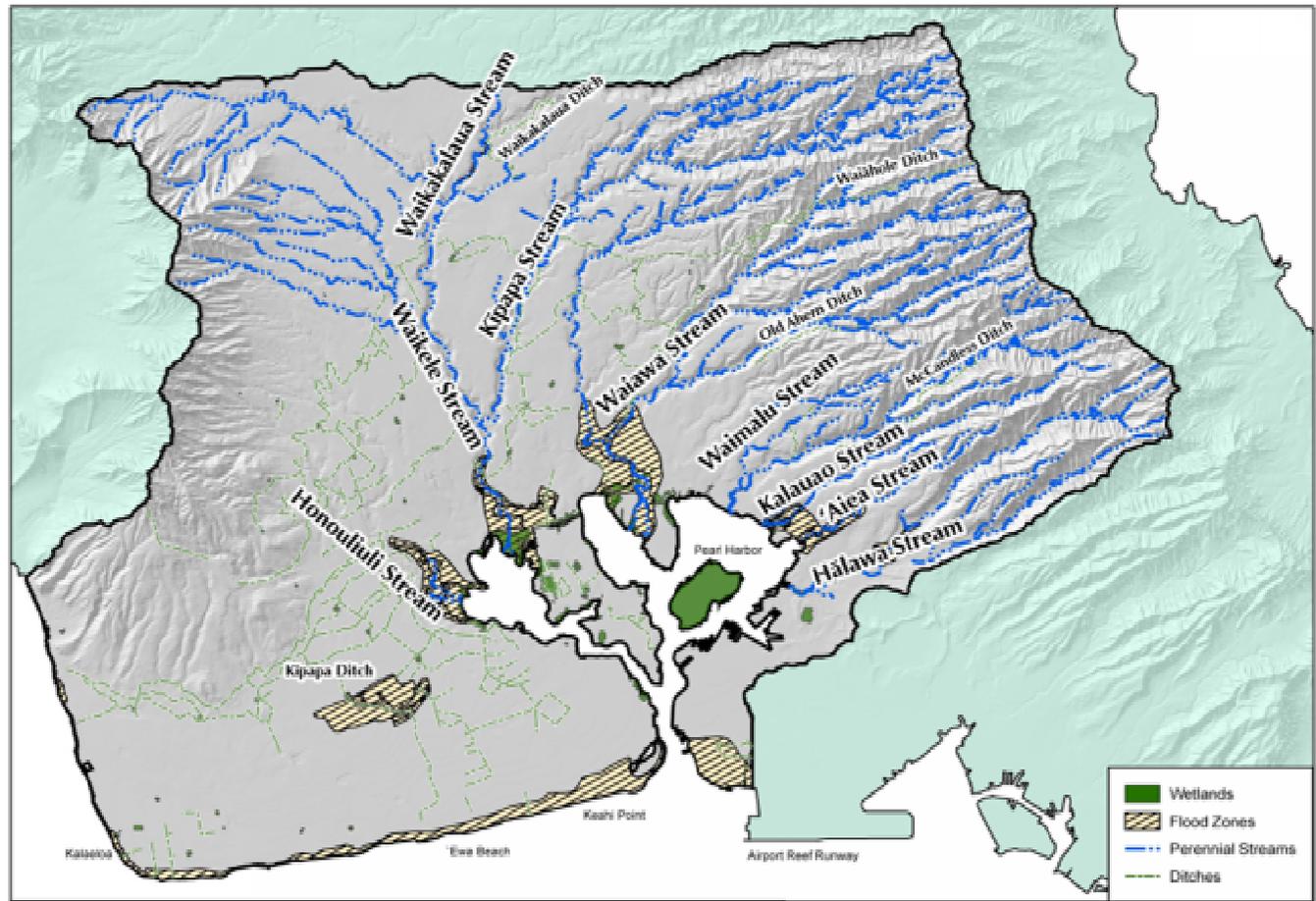
### Streams:

- Honouliuli Stream
- Waikele Stream
- Kipapa Stream
- Waiawa Stream
- Kiiikii Stream
- Kapakahi Stream

# Central Oahu Watershed Profile

## Stormwater and Flooding

The Central Oahu Watershed Study (2007) states that flooding is a problem in low-lying parts of Waipahu and the lower reaches of Waiawa Stream.



# Central Oahu Watershed Profile

## Natural, Cultural, and Scenic Resources

### Cultural Resources

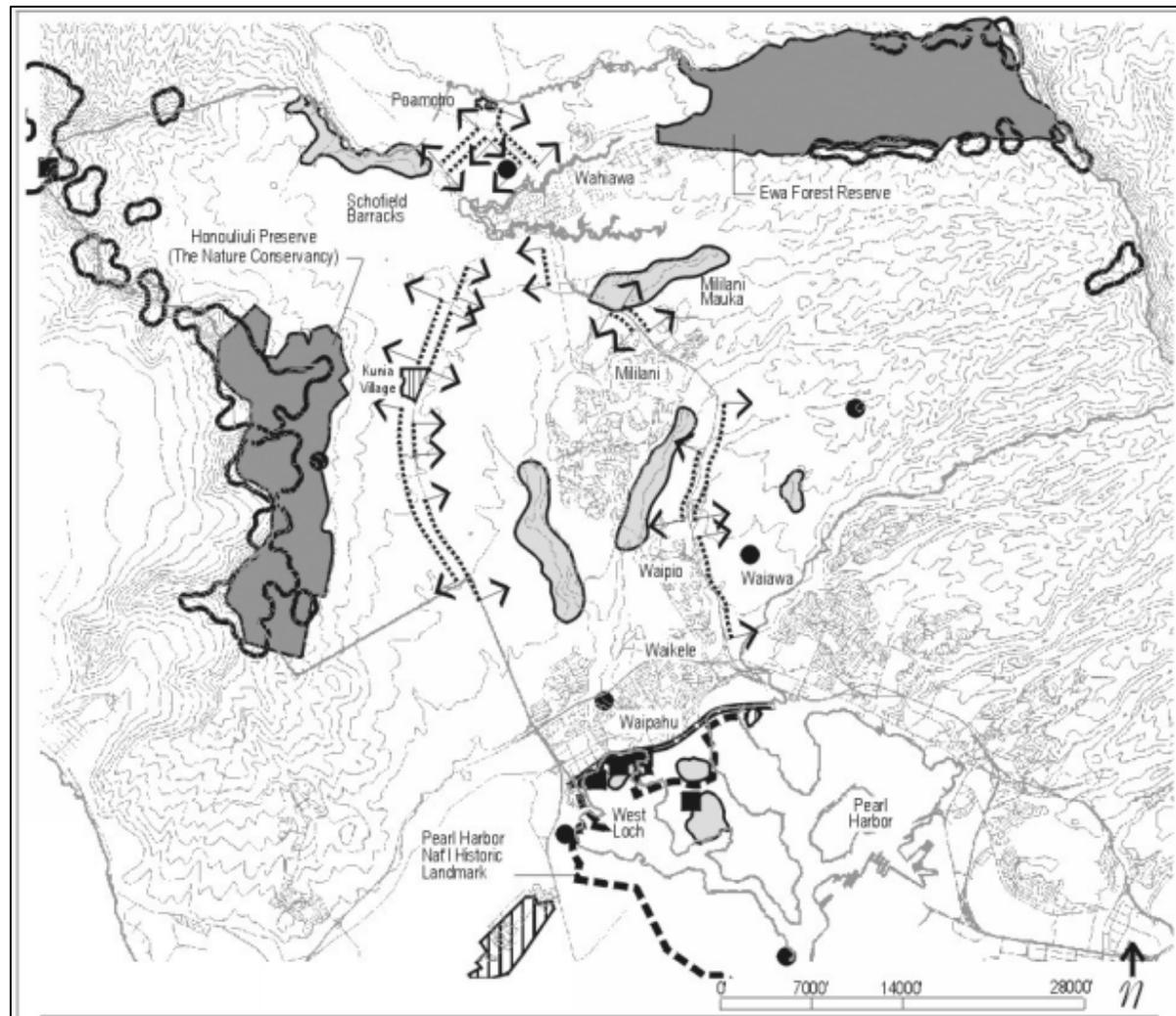
- Single and Concentrated Sites
- Dispersed Sites
- ▬ Historic Archaeological District
- ▨ Plantation Villages
- ▬ Historic Railway/Bikeway Corridor

### Natural Resources

- Rare/Endangered Native Species
- Natural Preserves/Wildlife Refuges
- Wetland/Waterbird Habitat

### Scenic Resources

- ↑↑ Panoramic Views



# Central Oahu Watershed Profile

## Brief History and Culture

- **Kukaniloko Birthstones:** First ancient site on Oahu to have been officially recognized, preserved, and protected.
- **Late 1800's:** Western development of Central Oahu
  - The Waipio ahupua'a was conveyed to William Jarrett, a high-ranking official in the Hawaiian government
  - Pearl City and Waipahu were settled by independent farmers and fishermen
  - Plantation villages were built around the Waipahu Sugar Mill
- **1913-1916:** Waiahole Ditch was built
- **1939-1944:** 3,000 acres of sugar cane lands were converted to military use
- **1950-1955:** 2,000 acres of sugar cane lands were converted to pineapple fields



# Central Oahu Watershed Profile

## Brief History and Culture

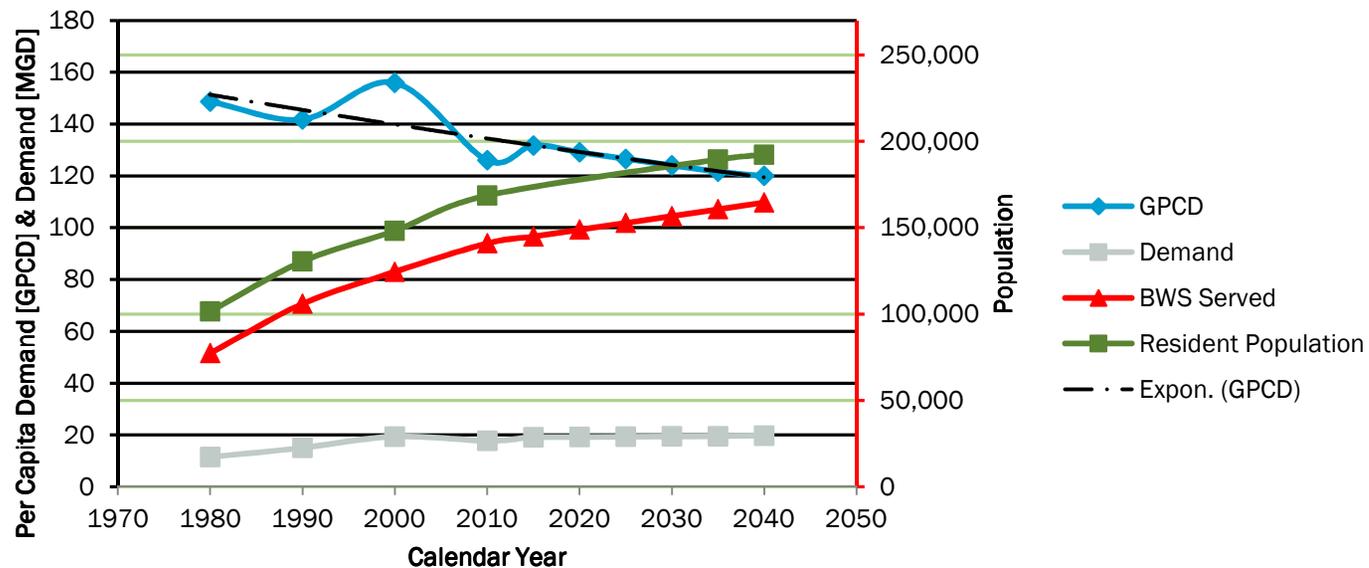
- **1960's**: the start of housing developments in Central Oahu
- **1968**: Mililani was built and was the first master-planned community in Hawaii
- **Since 1985**: 3,000 acres of land have since been taken out of agricultural production
- **1995**: The Oahu Sugar Company closed
- **2006**: Del Monte farms closed
  - Shift from monocrop farming - pineapple lands became used for diversified agriculture
- **Future**: Koa Ridge Makai development and proposed solar farms on the former Waiawa by Gentry and Royal Kunia lands

# Central Oahu Watershed Profile

## Population

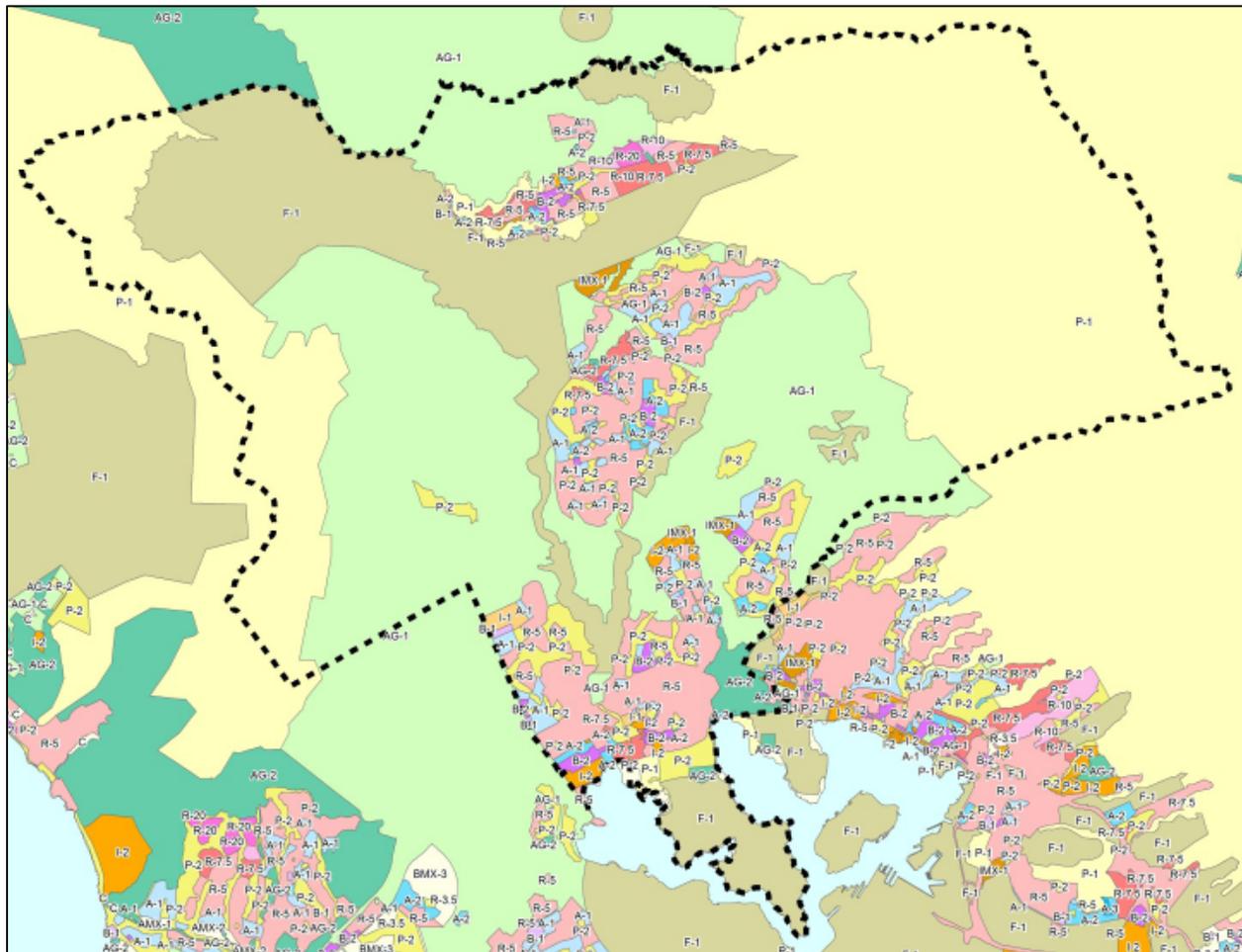
	1980	1990	2000	2010	Change (1980-2010)
Central Oahu District	101,494	130,474	148,208	168,520	67,026
Oahu Total	762,564	836,231	876,156	953,207	193,211
% of Oahu	13.3%	15.6%	16.9%	17.7%	

## Central Oahu BWS GPCD Trend



# Central Oahu Watershed Profile

## Central Oahu City Zoning Map (2010)

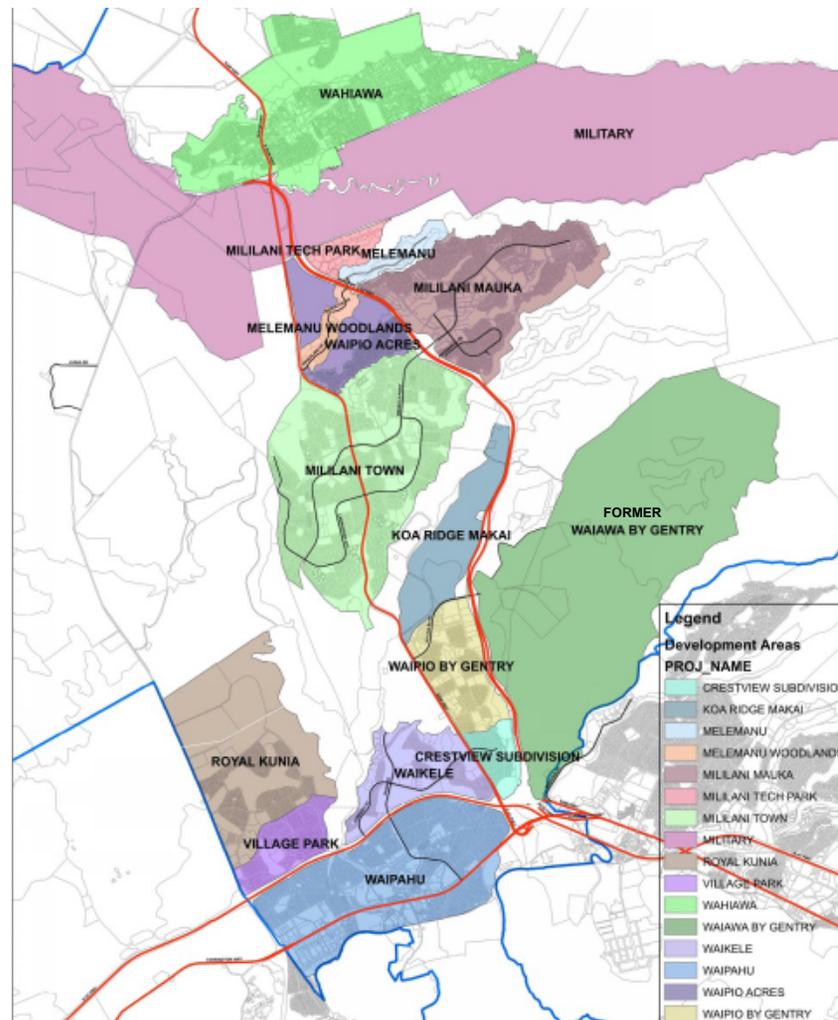


### Legend

- A-1 Low-density Apartment District
- A-2 Medium-density Apartment District
- A-3 High-density Apartment District
- AG-1 Restricted Agriculture District
- AG-2 General Agriculture District
- B-1 Neighborhood Business District
- B-2 Community Business District
- F-1 Federal and Military Preservation District
- I-1 Limited Industrial District
- I-2 Intensive Industrial District
- IMX-1 Industrial Mixed Use District
- P-1 Restricted Preservation District
- P-2 General Preservation District
- R-10 Residential District
- R-20 Residential District
- R-5 Residential District
- R-7.5 Residential District

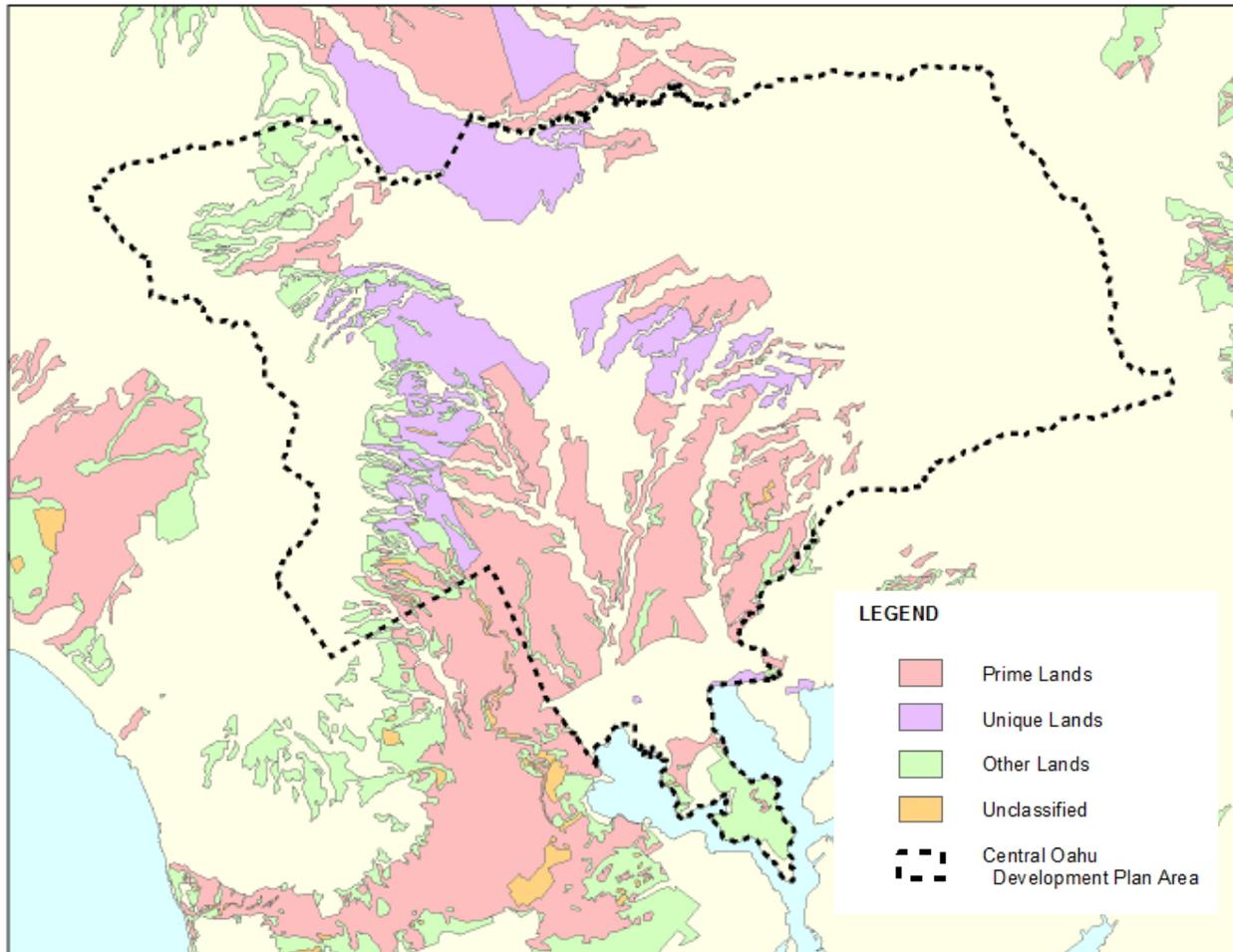
# Central Oahu Watershed Profile

## Master Planned Communities - Existing and Future



# Central Oahu Watershed Profile

## Agricultural Lands of Importance to the State of Hawaii (ALISH)

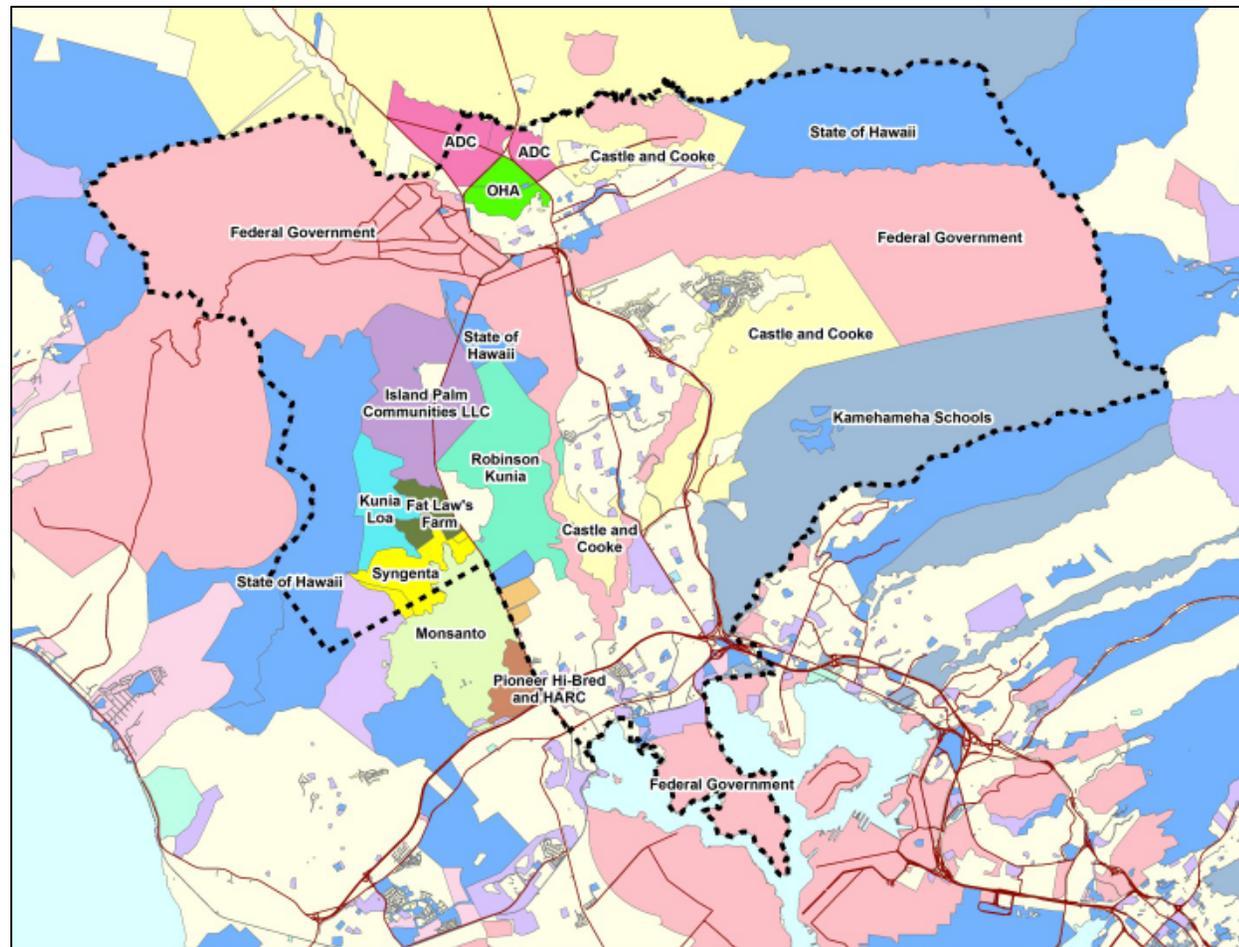


- Prime
  - Soils with best physical, chemical, and climatic properties for mechanized field crops
  - Excludes built-up land/urban, water bodies
- Unique
  - Land other than prime for unique high-value crops: coffee, taro, watercress, etc.
- Other
  - State or local important lands for production, not prime or unique; needing irrigation or requiring commercial production or management

(citation: "Agricultural Resource Lands in Hawaii" by Abbey Seth Mayer, State of Hawaii, Office of Planning - Sept 24, 2010)

# Central Oahu Watershed Profile

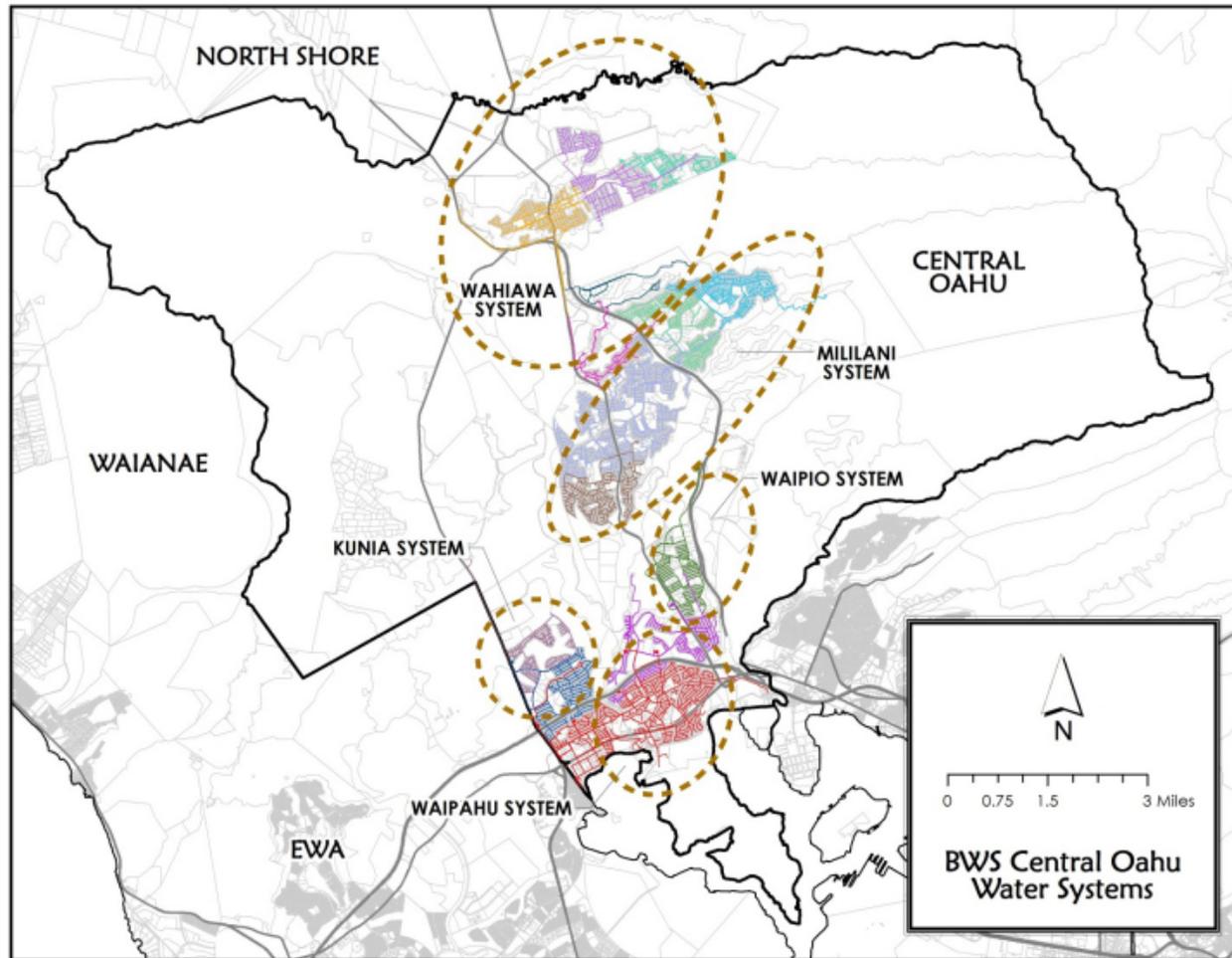
## Large Landowners



State Office of Planning GIS Website

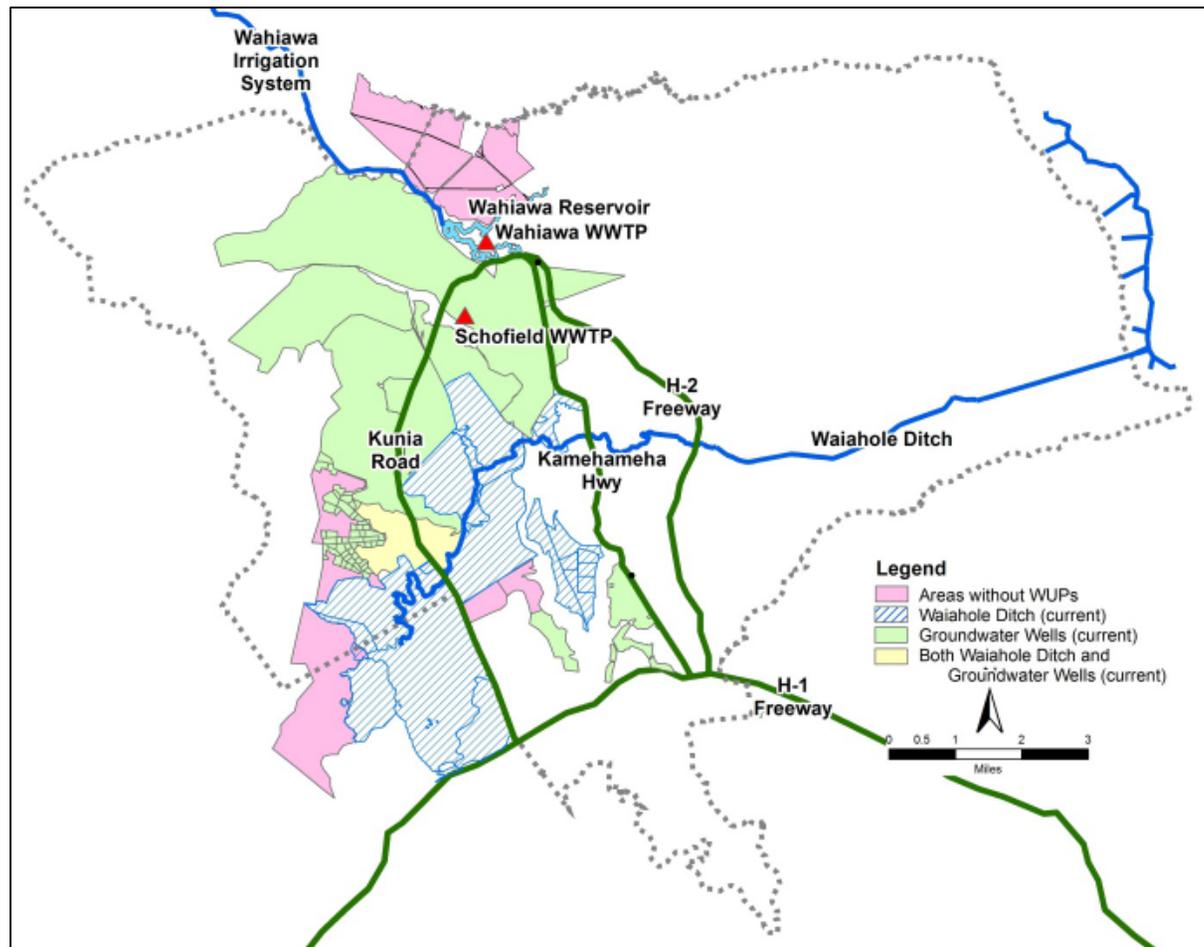
# Central Oahu Watershed Profile

## Water Infrastructure



# Central Oahu Watershed Profile

## Current and Future Non-Potable Water Demands



# Applicable Central Oahu Sustainable Community Plan Vision and Policies

## Vision:

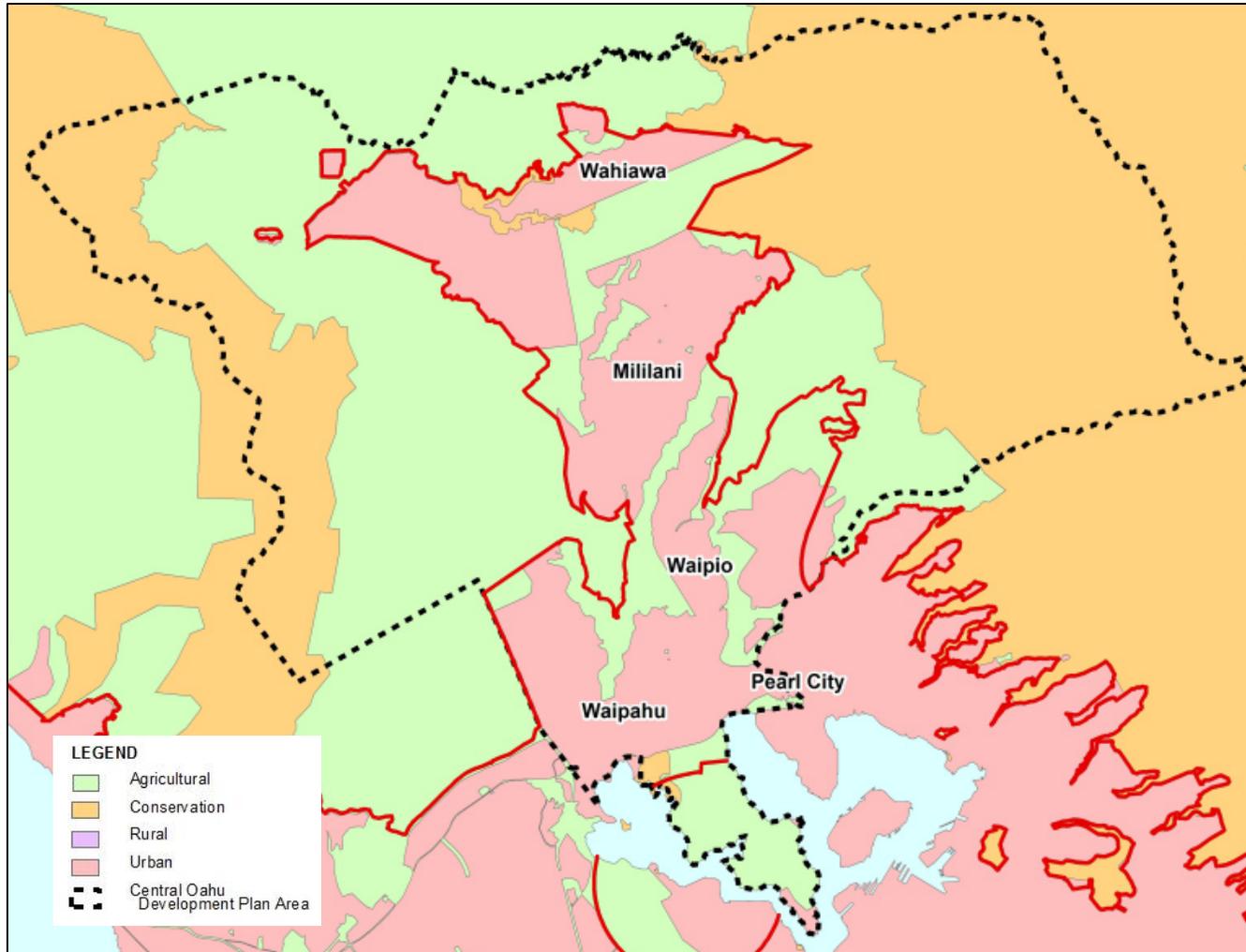
- Preservation, conservation, and enhancement of community resources
- Protect open space outside the Community Growth Boundary from development
- Efficient use of all water supplies through conservation measures , distribution system leak repair, and reclaiming non-potable water from wastewater, where feasible

## Policies:

- Protect prime watershed recharge areas and the Pearl Harbor potable aquifer which underlies the Central Oahu area
- Preserve natural gulches and ravines as drainageways and storm water retention areas
- Provide long range protection for prime agricultural lands and a sufficient water supply to meet diversified agricultural needs for Central Oahu
- Ensure adequacy of water supply before zoning approval of new residential or commercial developments
- Use of non-potable water for irrigation and other suitable uses to conserve the supply of potable water
- Protect water recharge areas above the 50-inch isohyet as recommended by the 2007 Central O'ahu Watershed Study Final Report (COWSFR)

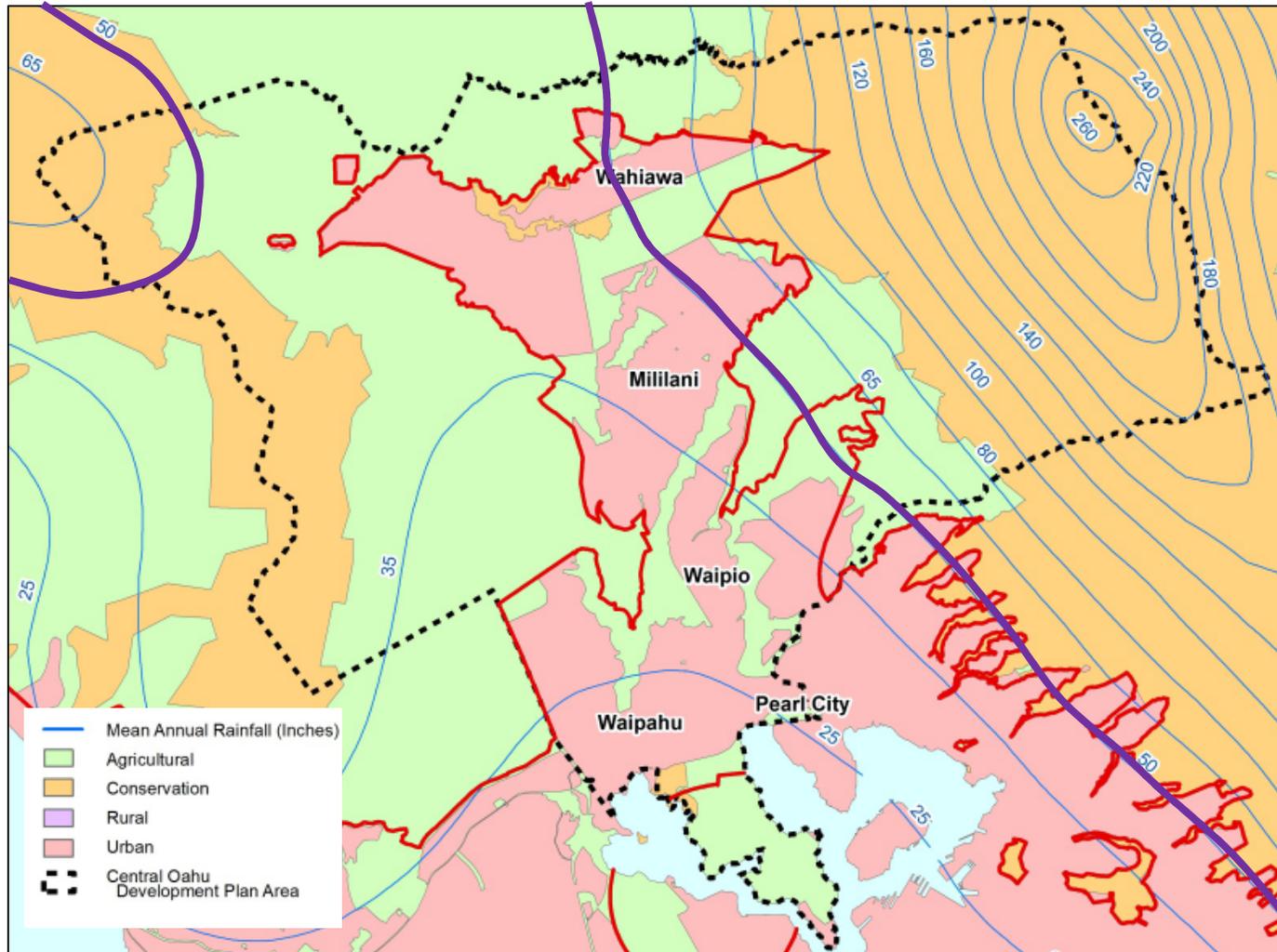
12/11/2014

# Sustainable Communities Plan Community Growth Boundary



12/11/2014

# 50-Inch Isohyet



State Office of Planning GIS Website and Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte, 2013: Online Rainfall Atlas of Hawai'i. *Bull. Amer. Meteor. Soc.* 94, 313-316, doi: 10.1175/BAMS-D-11-00228.1.

12/11/2014

# Stakeholders Consulted to Date

- 5 Neighborhood Boards
- Agribusiness Development Corporation
- Aqua Engineers
- U.S. Army
- Castle and Cooke
- Hawaii Department of Agriculture
- Hawaii Department of Health – Safe Drinking Water Branch and Wastewater Branch
- Office of Planning - Coastal Zone Management
- Department of Environmental Services
- U.S. Environmental Protection Agency
- Hawaii Agriculture Research Center
- Koolau Mountains Watershed Partnership
- Kunia Water Association
- Kunia Water Cooperative
- UH Water Resources Research Center and UH Sea Grant
- U.S. Geological Survey

# Central Oahu Watershed Preliminary Issues

## #1: Promote sustainable watersheds

- We need to preserve and restore native forest areas
- Enhance mitigation of invasive species
- Promote resource conservation and low-impact development concepts

## #2: Protect and enhance water quality and quantity

- We need to reduce sediment runoff into streams and the Pearl Harbor basin
- Programs are needed to ensure land uses will not negatively impact water quality
- Optimize pumpage to meet water system demands and avoid detrimental impact to the aquifer
- Evaluate aquifer sustainable yields (SY) as allocations and pumpage approach SY limits

12/11/2014

# Central Oahu Watershed Preliminary Issues

## #3: Protect Native Hawaiian rights and traditional and customary practices

- Incorporate traditional Hawaiian values and cultural practices into the modern context
- Plan for the enhancement of Native Hawaiian water rights and cultural and traditional uses
- Develop partnerships to restore significant archaeological, cultural, and historic sites, including protecting and restoring the Pearl Harbor coastal, estuarine, and marine habitat

## #4: Facilitate public participation, education, and project implementation

- Promote public participation in planning and implementation of watershed management projects and programs
- Foster community-government partnerships to help with plan implementation
- Increase public awareness and educational efforts regarding Central Oahu's potable and non-potable water supply and demand
- Establish watershed protection educational curriculum and programs on sustainability in area schools and organizations to educate future generations.

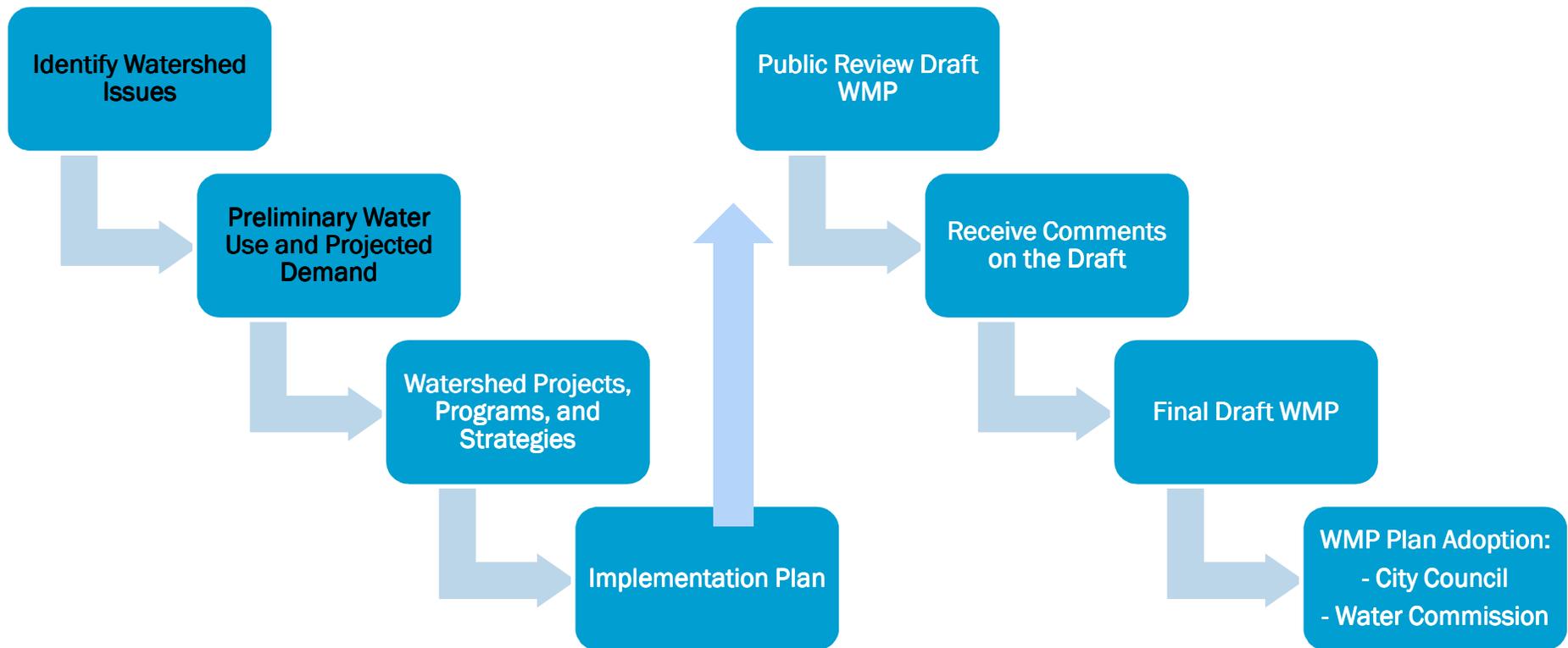
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# Central Oahu Watershed Preliminary Issues

## #5: Meet future water demands at a reasonable cost

- Explore options to diversify Central Oahu's municipal water supply
- Explore opportunities for using non-potable water for non-potable purposes (in lieu of using potable ground water)
- Promote appropriate demand-side management programs
- Maintain and improve BWS island-wide system reliability, adequacy, and efficiency
- Support alternate energy and/or energy efficiency projects to reduce conventional power generation costs for existing facilities
- Provide water for diversified ag

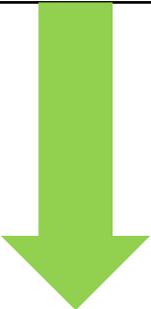
# Next Steps



# Feedback

- Did we capture your comments correctly?
- Are there other issues and concerns about water that the plan needs to consider?

# Overall COWMP Schedule

<b>Phase 1</b>	<ul style="list-style-type: none"> <li>· Conduct background research on Central Oahu’s water resource needs and issues</li> <li>· Develop Central Oahu-specific sub-objectives</li> <li>· Quantify current and future agricultural water supply and demands</li> <li>· Develop future (potable/non-potable) water use scenarios: low, mid, high, and ultimate</li> </ul>	 <p style="text-align: center;">Stakeholder and Public Outreach, including Community and Neighborhood Board Meetings</p> 
<b>Phase 2</b>	<ul style="list-style-type: none"> <li>· Identify water resource management strategies to address critical water resource issues</li> <li>· Research and document watershed management projects that address critical water related issues</li> </ul>	
<b>Phase 3</b>	<ul style="list-style-type: none"> <li>· Develop and compile Preliminary Draft COWMP</li> <li>· Present the Public Review Draft to the community/stakeholders for input</li> </ul>	
<b>Phase 4</b>	<ul style="list-style-type: none"> <li>· Compile and review comments from the Public Review Draft of the COWMP</li> <li>· Revise the Public Review Draft of the COWMP</li> <li>· Compile Final Draft of COWMP</li> </ul>	
<b>Phase 5</b>	<ul style="list-style-type: none"> <li>· Present the Final Draft COWMP to the (5) Neighborhood Boards for endorsement of the plan</li> <li>· CWRM Adoption Process</li> <li>· City Council Adoption Process</li> </ul>	

# Central Oahu Watershed Management Plan

**FOR MORE INFORMATION, PLEASE CONTACT:**

**Brown AND Caldwell**

**BROWN AND CALDWELL**

Contacts: Dean Nakano & Susan Mukai

Phone: 203-2673 & 203-2667

Email: [dnakano@brwncald.com](mailto:dnakano@brwncald.com)

Email: [smukai@brwncald.com](mailto:smukai@brwncald.com)



**HONOLULU BOARD OF WATER SUPPLY**

Contact: Barry Usagawa

Phone: 748-5900

Email: [busagawa@hbws.org](mailto:busagawa@hbws.org)