WATER FOR LIFE

Safe, dependable, and affordable water now and into the future

Board of Water Supply
City and County of Honolulu

Stakeholder Advisory Group Meeting #3

Board of Water Supply
City & County of Honolulu

Wednesday, September 16, 2015

WATER FOR LIFE
Safe, dependable, and affordable water now and into the future

Board of Water Supply
City and County of Honolulu

Dave Ebersold
Facilitator

PUBLIC COMMENTS ON AGENDA

Meeting #3 Objectives

- Review and accept Meeting #2 notes.
- Discuss opportunities for input during development of the Water Master Plan.
- Learn more about and share your ideas regarding water supply, demand, and conservation on O‘ahu.

WATER FOR LIFE

Safe, dependable, and affordable water now and into the future

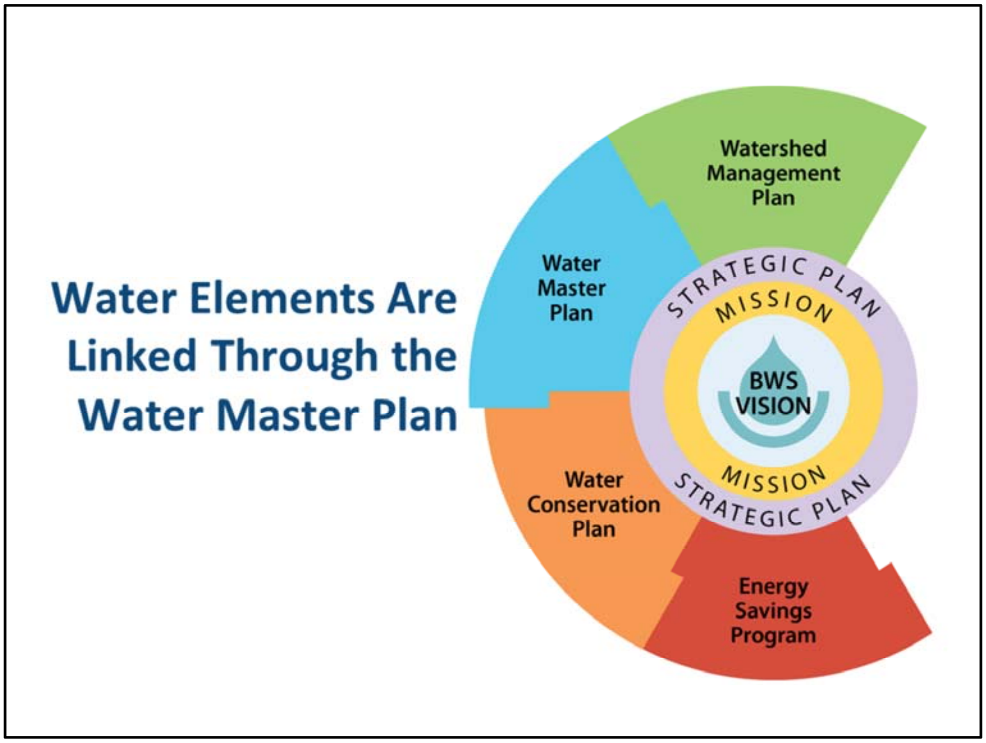
Board of Water Supply

Action

- Accept Notes from Stakeholder Advisory Group Meeting #2 on July 21, 2015

David Ebersold
Facilitator

STAKEHOLDER INPUT TO THE WATER MASTER PLAN



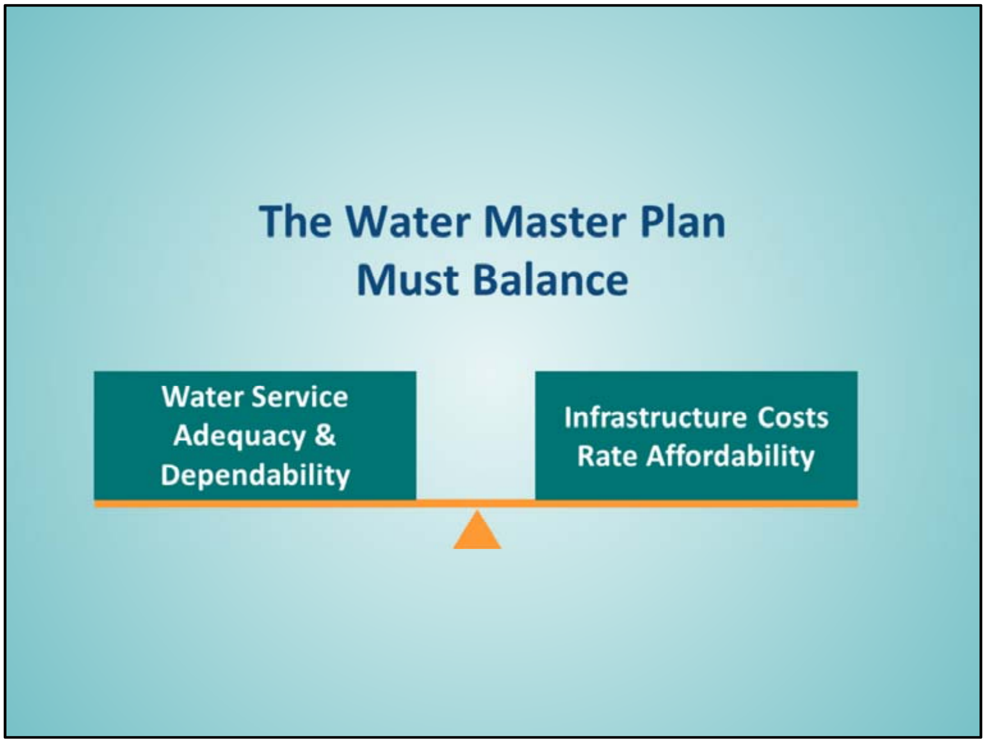
We talked about the BWS's Vision and Mission at our first meeting.

The BWS has a Strategic Plan that describes the things that they want to do to achieve their Mission.

There are a number of initiatives underway that align with the Strategic Plan:

- Watershed Management Plans
- Water Conservation Plan
- Energy Savings Program

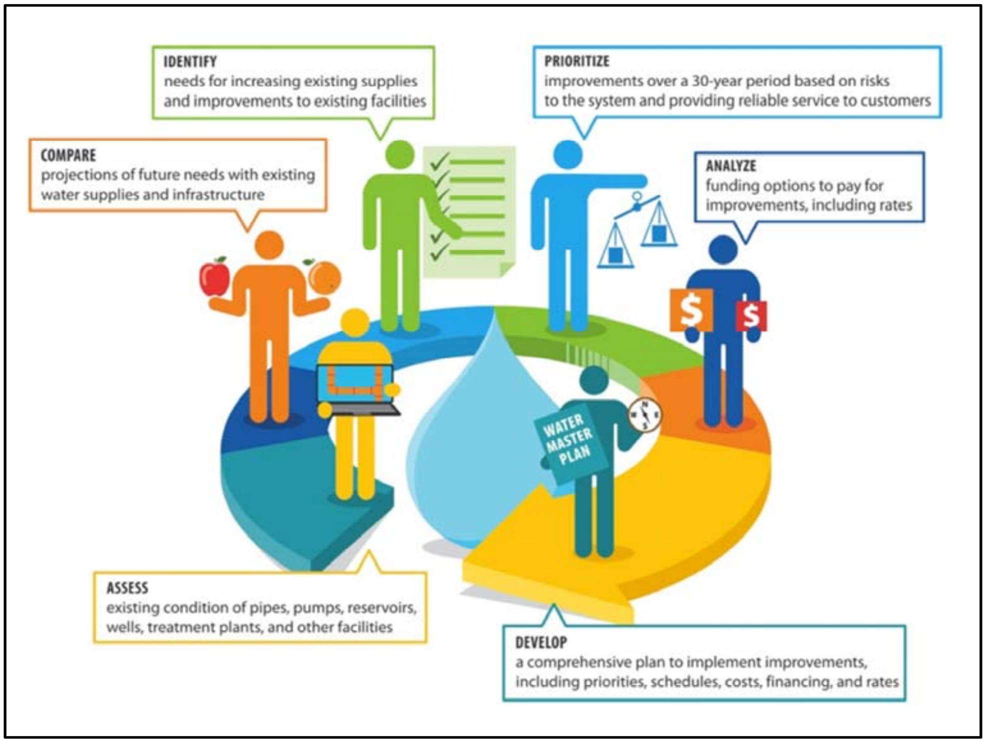
The Water Master Plan occupies a unique place in that it ties together the Watershed Management Plan and Water Conservation Plan.



What’s so important about the linkage is that it needs to balance water service adequacy and dependability with infrastructure costs and rate affordability.

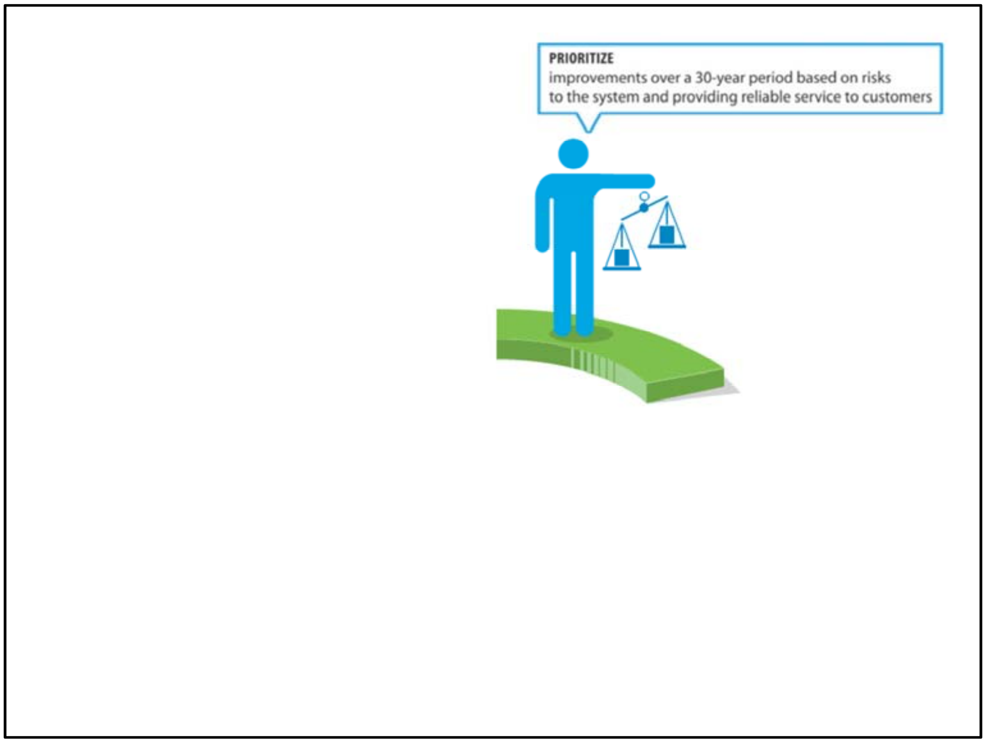
That’s not simple and is one of the primary reasons this Stakeholder Advisory Group was brought together: To grapple with this issue.

We know where we want to go, but how do we get there?



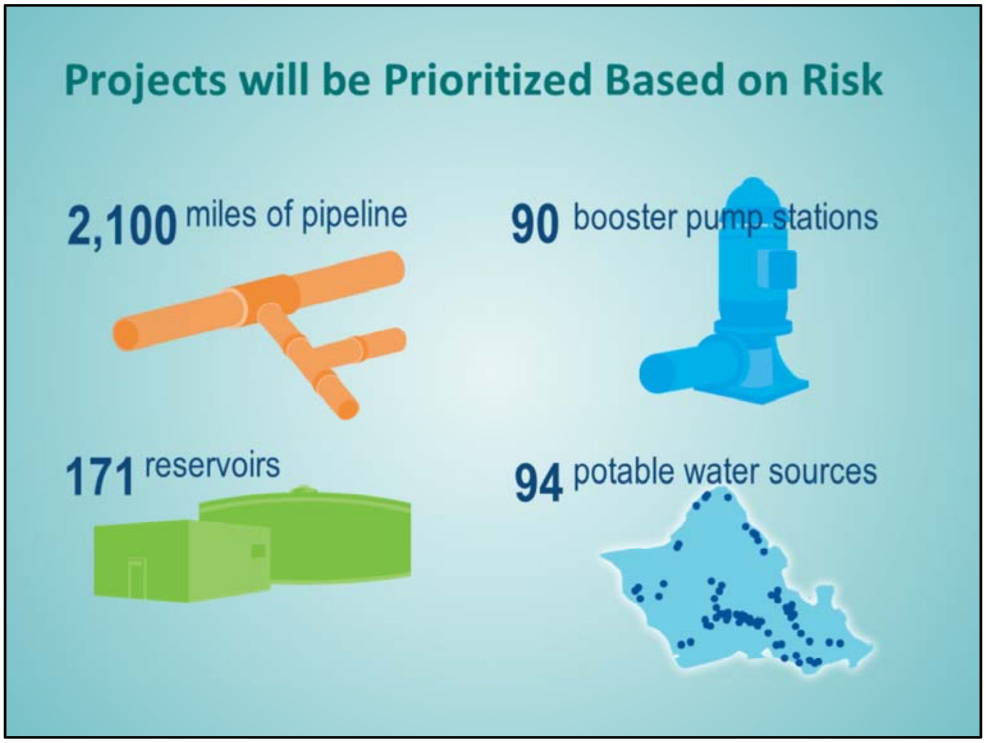
During our first meeting, Jon Toyoda, the Consultant Project Manager for the Water Master Plan, talked about the major steps in developing the Water Master Plan:

- Assess
- Compare
- Identify
- Prioritize
- Analyze
- Develop



A big part of “how do we get there” happens through prioritization.

The BWS will prioritize improvements over a 30-year period based on risks to the system and providing reliable service to customers.



We expect the assessment to result in a few thousand projects for the BWS to complete over the 30-year planning period, across all of the types of infrastructure. It is not possible to work on all of the projects at once, so there needs to be a method for making decisions about which ones should be done first and which can wait.

Using risk gives us an objective way to do this.

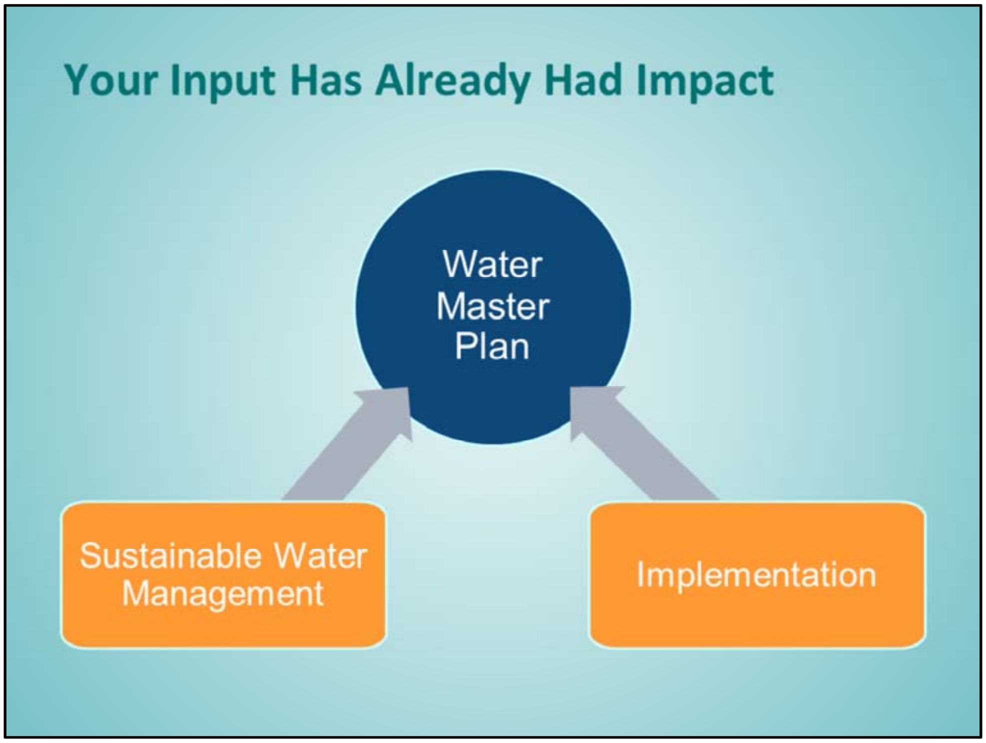
Risk is evaluated for each major component of the water system, for example, a pump station or reservoir.

We estimate the probability of failure of each component based on the expected life of the facility, information from the condition assessment, and performance.

We also evaluate the consequences that would take place if that failure occurs. For example, if a pipeline breaks and causes a service outage to a hospital, emergency services, or a major hotel, that could be very serious.

To set the level of risk for each component, we multiply the likelihood of failure by the consequence of failure. The elements with the highest risk score take priority for funding and installation.

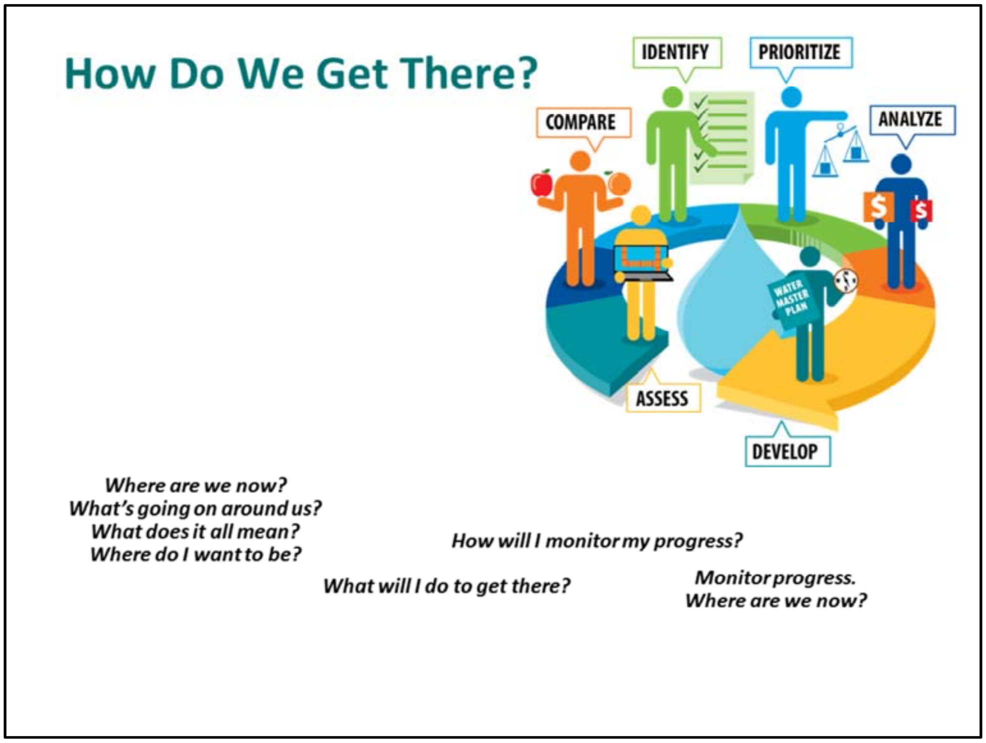
Each member of the Stakeholder Advisory Group brings his or her own community values and thoughts about what's important. What we've seen already is that if the Water Master Plan just addressed water infrastructure, that's not enough for you.



Your input has already led to an important change. The BWS is adding these two new sections to the Water Master Plan:

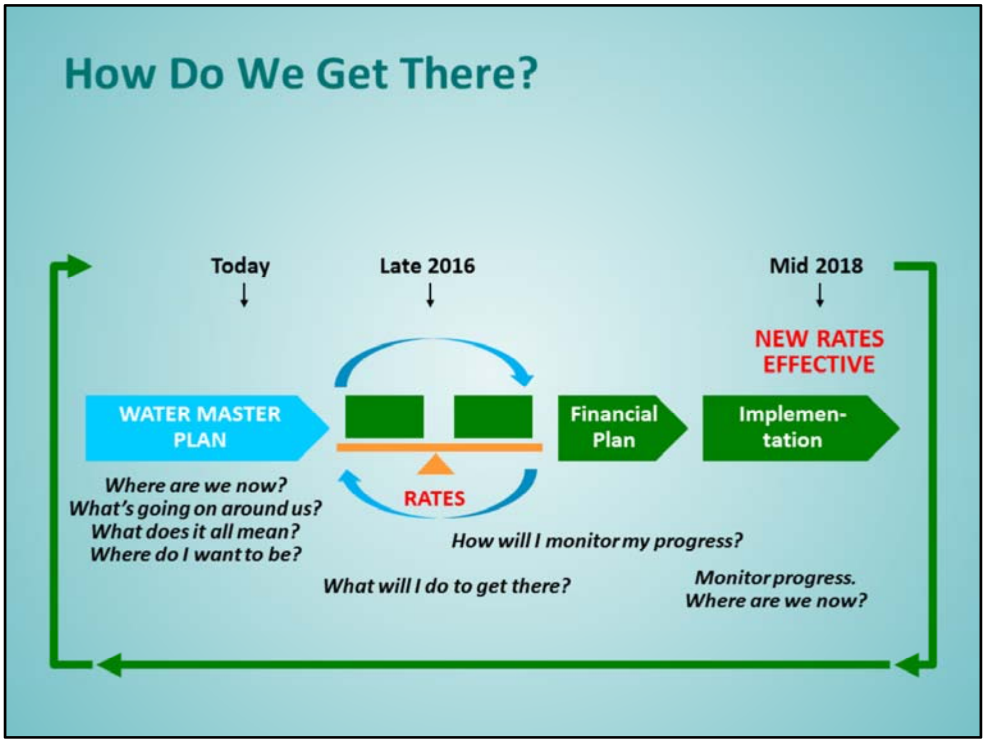
- Sustainable Water Management
- Implementation: the softer things that need to happen other than facilities engineering.

Based on the conversations we had during the last meeting, we wanted to identify other places where stakeholders could provide meaningful input.



Looking at this illustration of steps in the Water Master Plan leads us to ask some questions:

- Where are we now?
- Where are we going?
- What's going on around us?
- Where do I want to be?
- What will I do to get there?
- How will I monitor progress and learn?



The technical evaluations of the WMP began approximately two years ago. The BWS plans to receive a draft from the technical team in summer 2016. For different types of facilities, the process of assessing, comparing, identifying etc. is proceeding at different rates, and all of it is taking place concurrently.

To produce the initial draft WMP and the corresponding capital improvement plan, the WMP team will make some initial assumptions, such as holding current levels of funding steady for programs related to conservation and watershed protection, in addition to funding new capital improvement projects. This will provide a baseline for stakeholders to use in comparing various alternatives.

Over these next few months as the WMP team continues its work, you'll learn the results of condition assessments and supply evaluations regarding where we are now.

Today, we'll be talking about demand forecasting and what the BWS is doing to evaluate climate change to better understand what's going on around us. As the WMP team completes its hydraulic modeling and system analyses, you'll receive the information to help you understand the results and what it all means. In a future meeting, we will bring back the draft WMP objectives for you to develop a group consensus regarding where/what you think the BWS should be relative to its water system.

Then we’ll tackle the issue of water rates and the balance between your aspirations for the water system and the realities of what it will cost. The group will focus on issues of affordability and the tradeoffs associated with various rates and rate structures. Along with providing recommendations regarding water rates, we’ll ask for recommendations for monitoring progress and, as time goes on, we’ll share what that monitoring is telling us. With that information in hand, the BWS will then again ask the question “Where are we now?”

At our last meeting, we set out to develop a group of draft objectives to answer the question of: “Where or what do we want to be”?

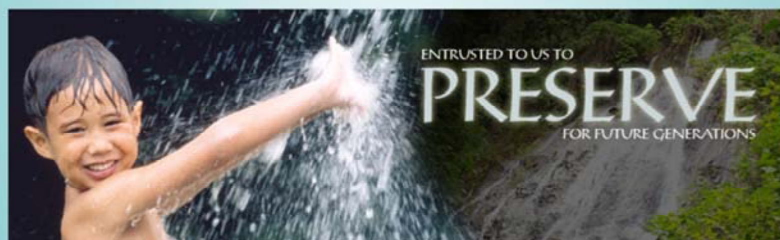
Before we come back to these objectives, we are going to present additional technical information on water supply and demand in today’s meeting. Then we will come back to the objectives at our next meeting.

WATER FOR LIFE

Safe, dependable, and affordable water now and into the future

Board of Water Supply

Mahalo! Questions & Answers



WATER FOR LIFE

Safe, dependable, and affordable water now and into the future

Board of Water Supply

City and County of Honolulu

Barry Usagawa, P.E.

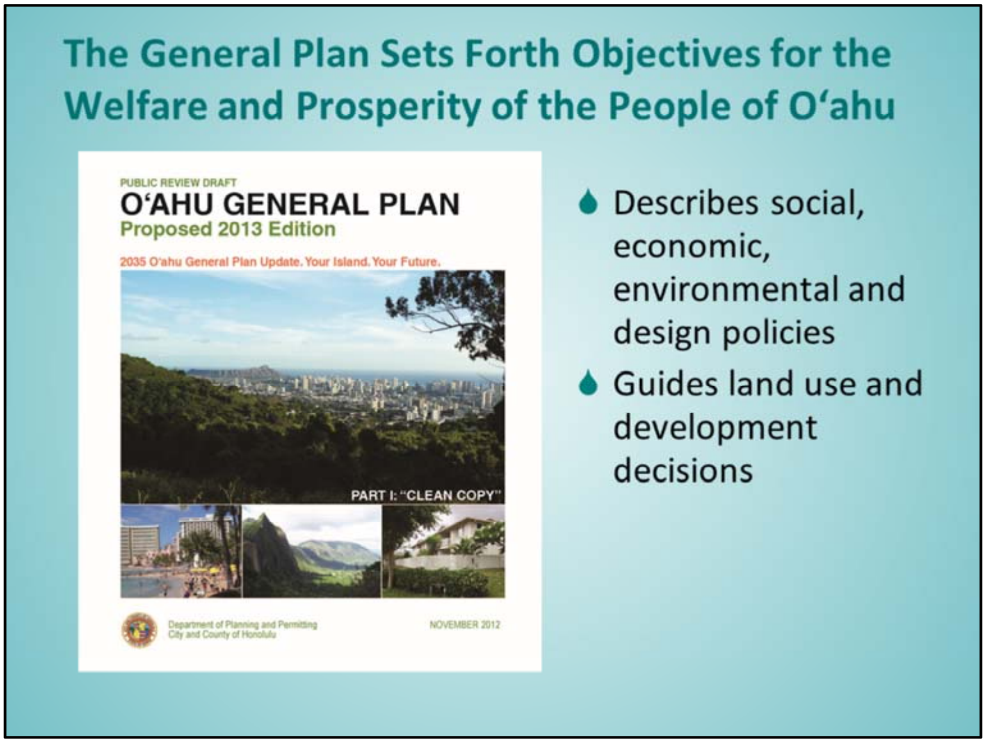
Board of Water Supply Water Resources Program Administrator

WATER SUPPLY AND DEMAND

There are 3 considerations regarding water demand and supply on O‘ahu:

1. Water demands
2. Trends affecting water
3. Water availability and supplies

We will begin by discussing water demands.



The City and County of Honolulu's General Plan:

- Is a statement of O'ahu's long-range objectives.
- Is prepared for the welfare and prosperity of the people of O'ahu.
- Describes social, economic, environmental and design policies to guide land use and development decisions.

It Guides Land Use and Development Decisions to Influence 11 Areas of Concern

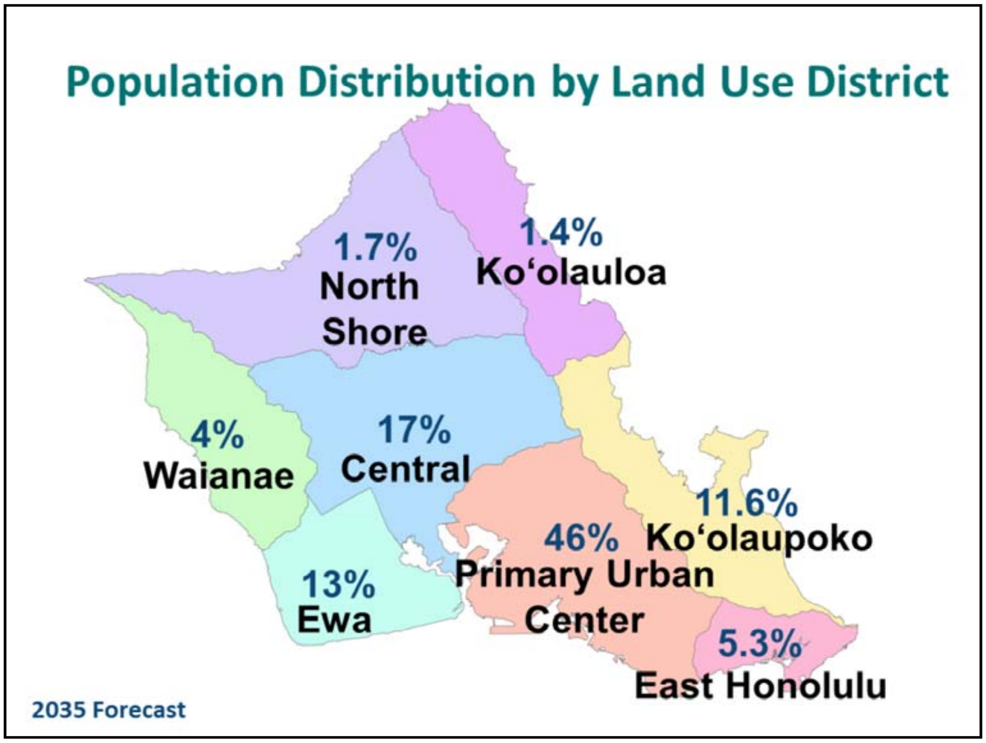
- Population
- Economy
- Natural Environment
- Housing
- Transportation & Utilities
- Energy
- Physical Development and Urban Design
- Public Safety
- Health and Education
- Culture and Recreation
- Government Operations and Fiscal Management

The General Plan is the first component of a 3-tier, charter-mandated planning system that includes:

1. General Plan
2. Development Plans and Sustainable Communities Plans
3. Implementing Ordinances, including Land Use Ordinances, and Capital Improvement Plans (CIP)

It Establishes Objectives for Population Distribution by Considering

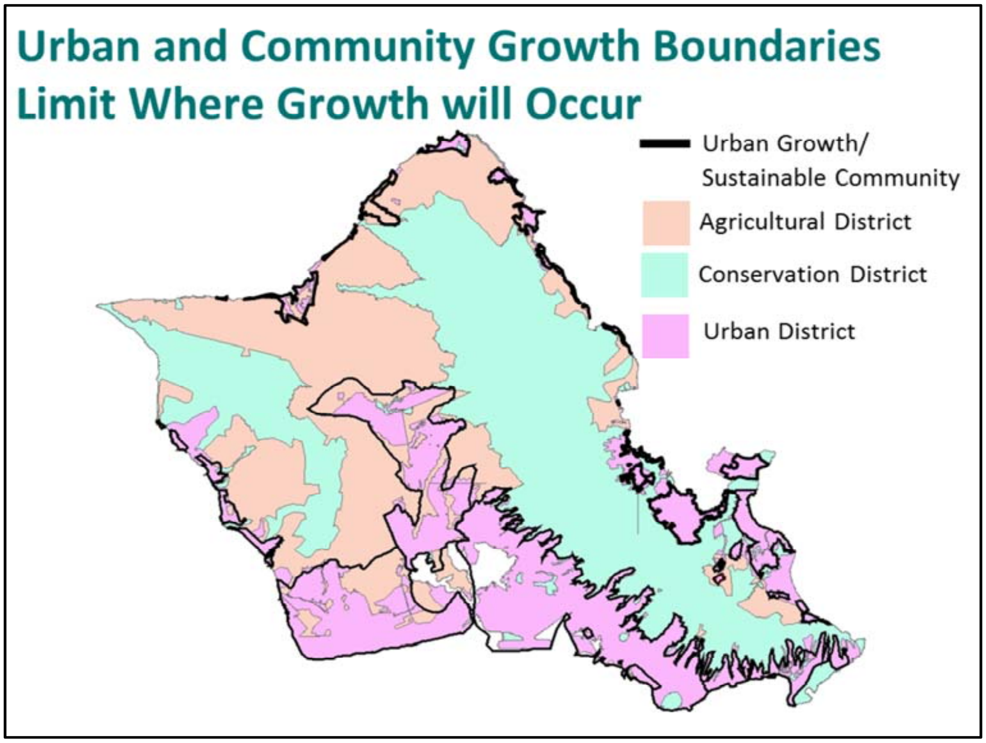
- Limited natural resources
- Minimizing social, economic and environmental disruptions



This map illustrates the 2035 population percentage forecast of each land use district.

Currently, O‘ahu’s resident population is almost 1 million.

Directed growth policies direct urban growth to south O‘ahu to keep rural areas rural.



This map shows O'ahu's urban and community growth boundaries on State Land Use Districts of urban, agricultural and conservation lands.

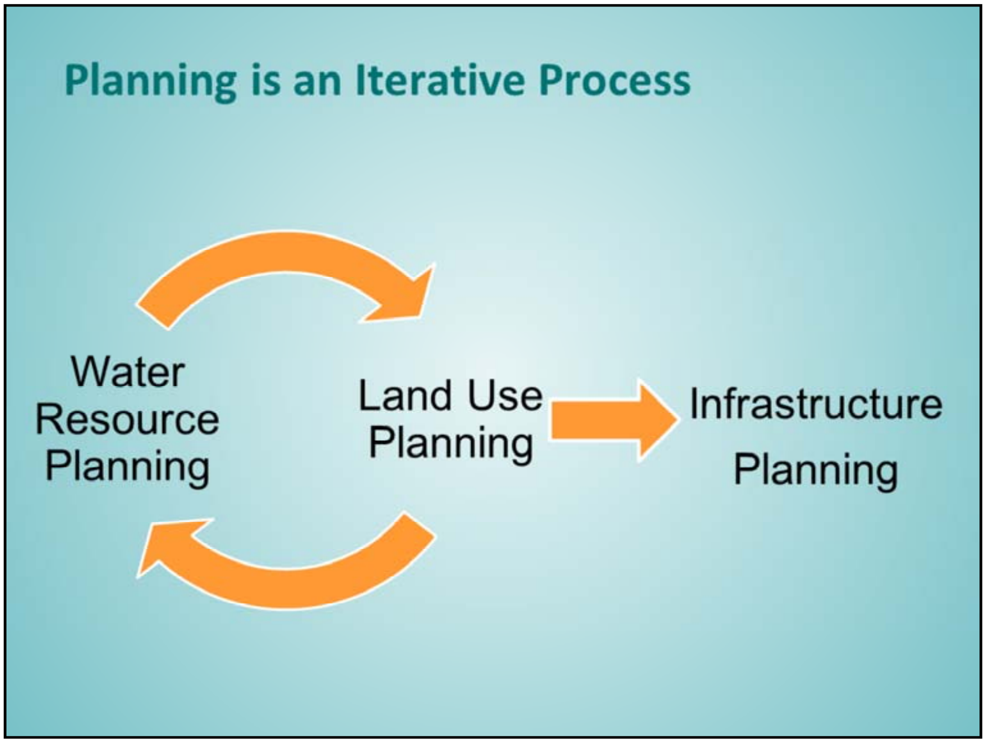
Healthy watersheds are essential.

Stable Land Use Districts and boundaries:

- Protect agriculture and conservation lands
- Contain urban growth
- Guide watershed protection, use and development

Explicit consideration of water resources includes:

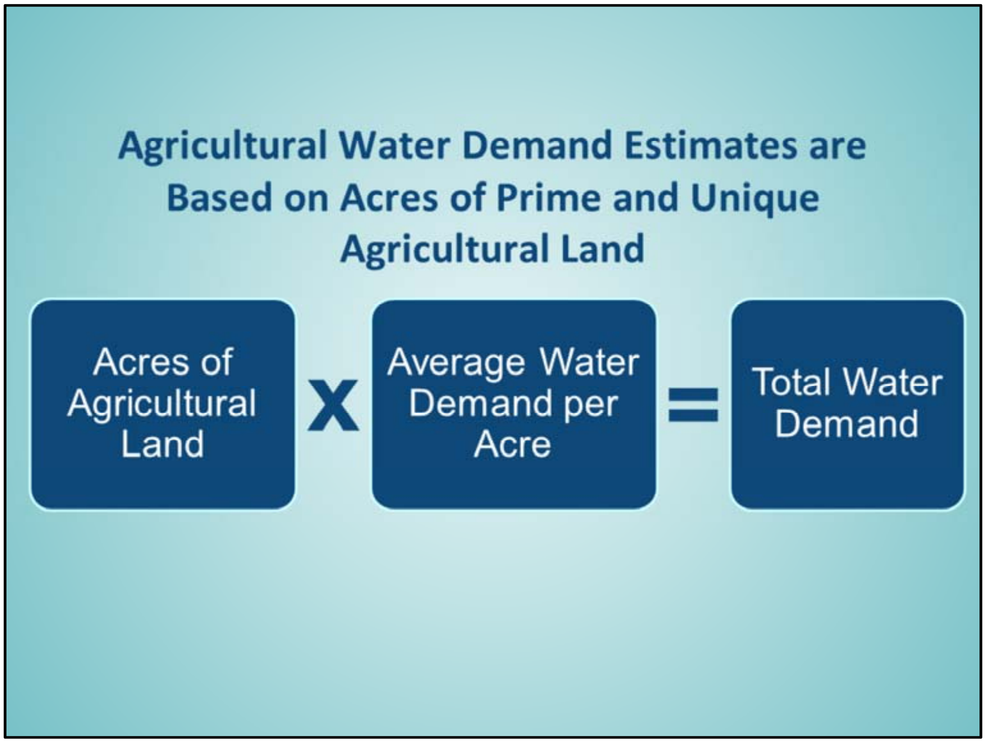
- Water supply is available for all uses
- There is adequate water supply before land use approval
- Prime recharge areas and drinking water sources are protected



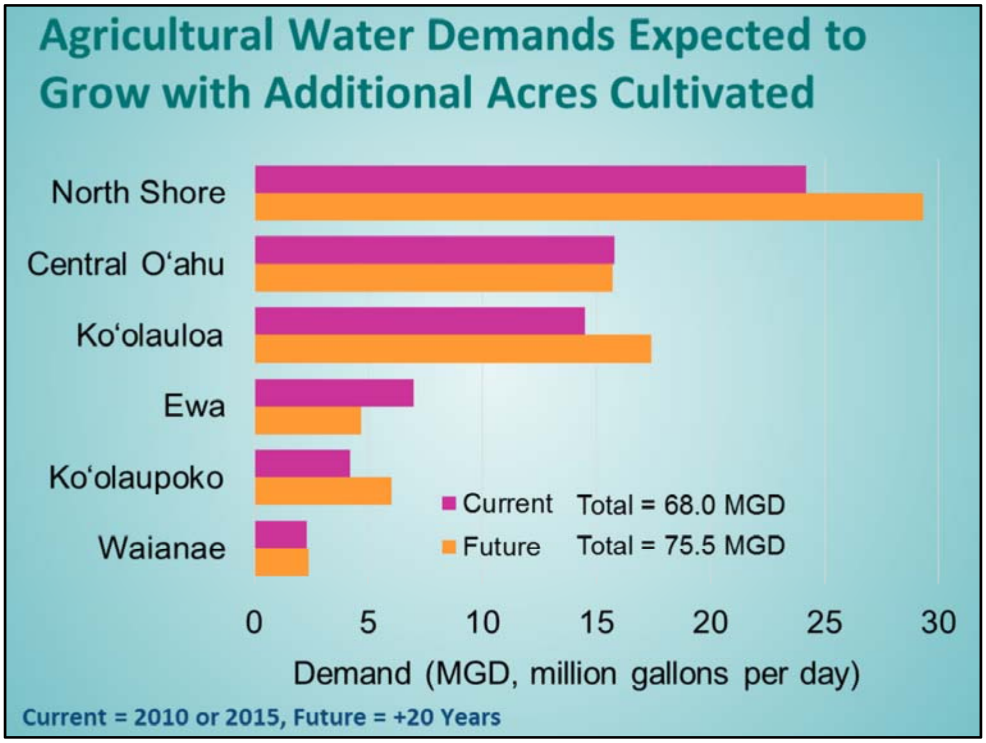
Land Use Planning directs infrastructure planning (roads, drainage, water and wastewater).

Land Use Planning must also consider water resource planning to address protection, conservation and use.

The process is iterative. The City's development and sustainable communities plans, by ordinance, must be updated with the City's watershed management plans, in tandem.



Agricultural water demand is estimated by aerial maps of agricultural acres multiplied by an average water demand per acre.



There are large tracts of agricultural lands in the Ewa, Central O‘ahu, North Shore, Ko‘olauloa, Ko‘olaupoko and Waianae districts.

The 2004 Agricultural Water Use Development Plan (AWUDP) estimated that of the 49,500 acres of prime agriculture lands on O‘ahu, 11,000 acres are in monocrop cultivation.

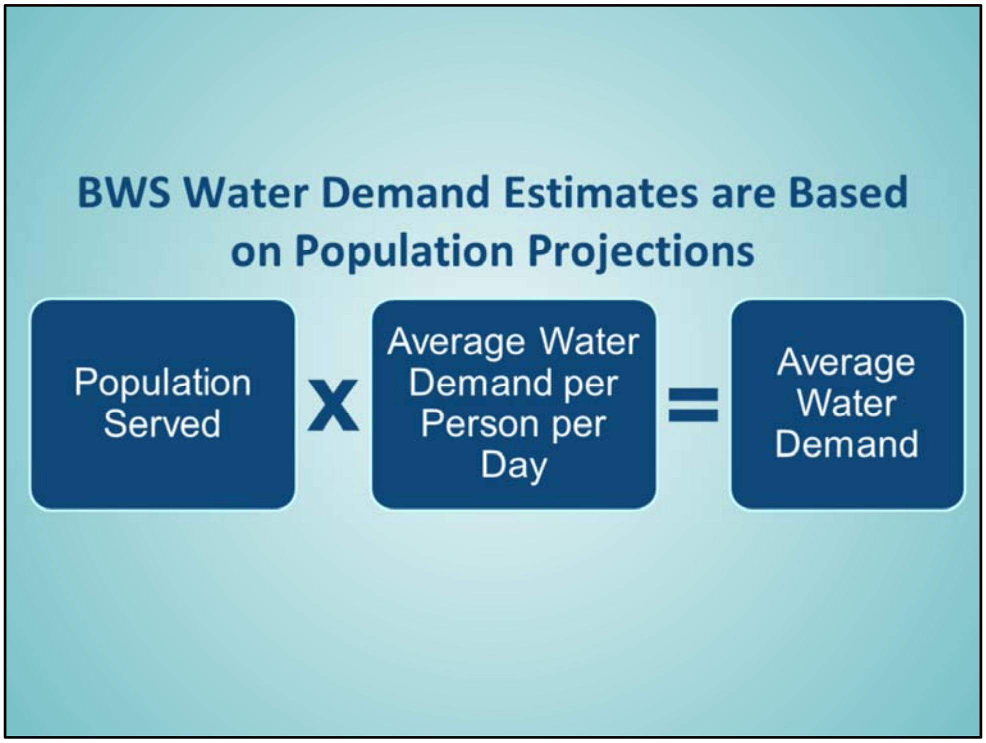
The remaining 38,500 acres are idle and available for cultivation.

Agricultural water demands are the most probable demand scenarios for agriculture from Watershed Management Plans for Ko'olau Loa (2030), Ko'olau Poko (2030), Waianae (2030) and North Shore (2035). Central O‘ahu (2035) and Ewa (2035) are from calculations for watershed management plans under development. Loi Kalo water demand is not included.

Current demands, shown above, were established at the time each regional Watershed Management Plan was prepared.

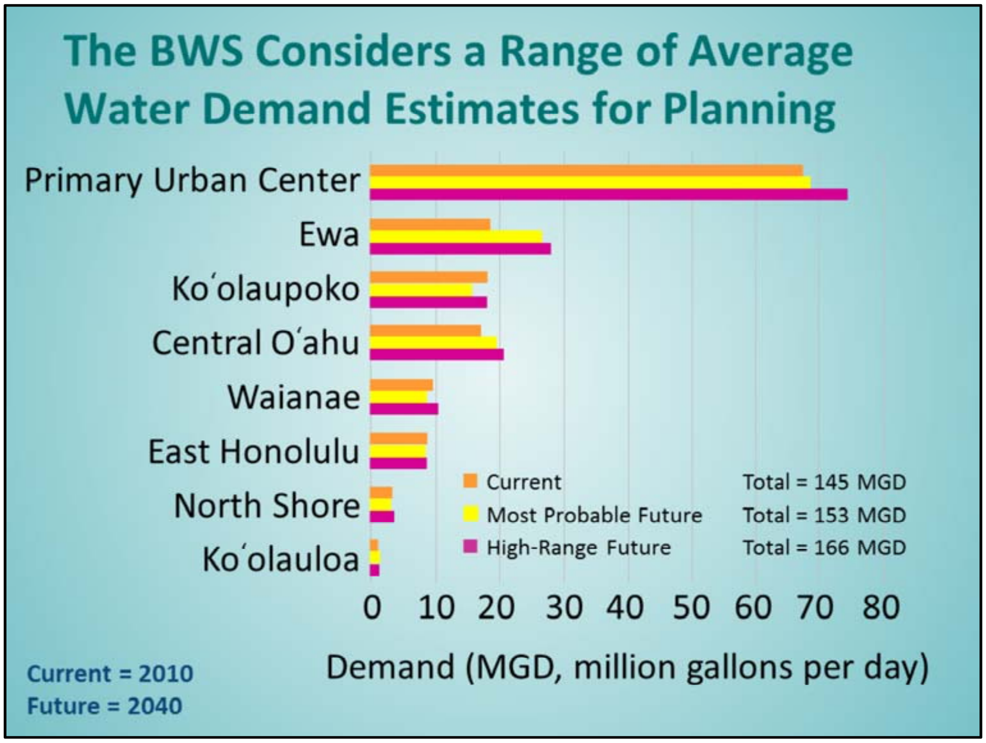
Future is the most probable water demand 20 years from **Current**. The pace of growth is estimated through a Department of Planning and Permitting (DPP) projection of agricultural jobs and a ratio of agricultural jobs to cultivated acres, and is unique to the type of agriculture in each region.

It is based on the projected use of agricultural lands within a 2030 and 2035 horizon.



The BWS's water demand estimates for residential use are based on the population served.

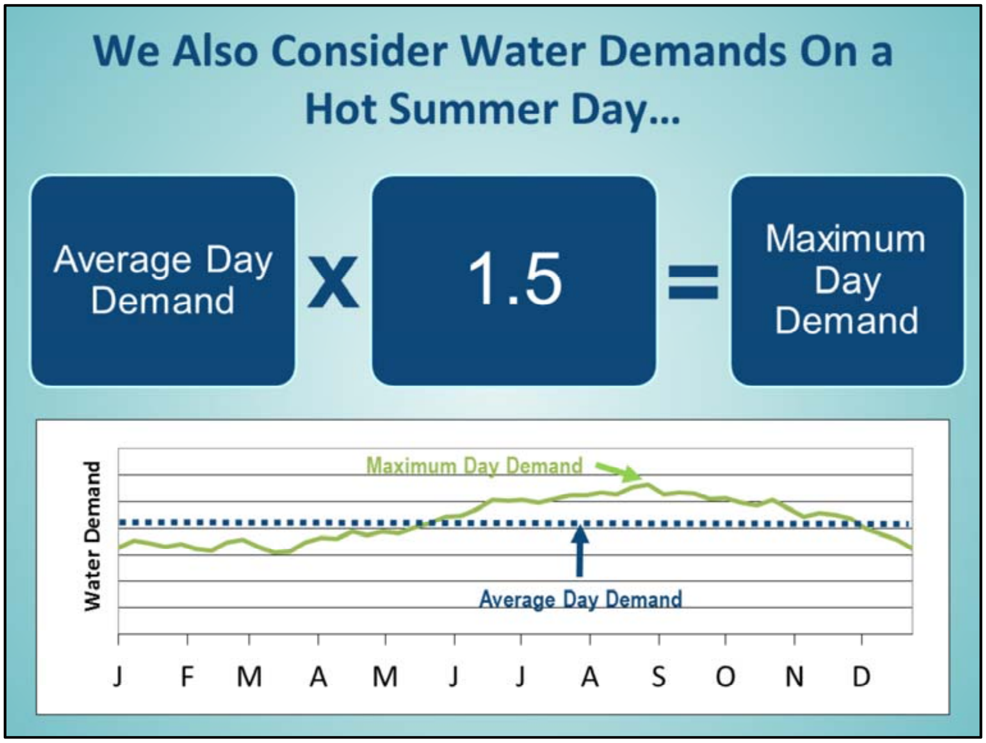
The BWS population served is calculated from census and DPP projections of resident population accounting for residents absent and visitors present, called de facto population. Then private and military populations, which have their own water sources, are deducted to arrive at the BWS population served.



To consider variations and uncertainties in population forecasting, a range of water demands is provided:

1. The **Most Probable Future** water demand is based on DPP forecasts of population and current conservation trends.

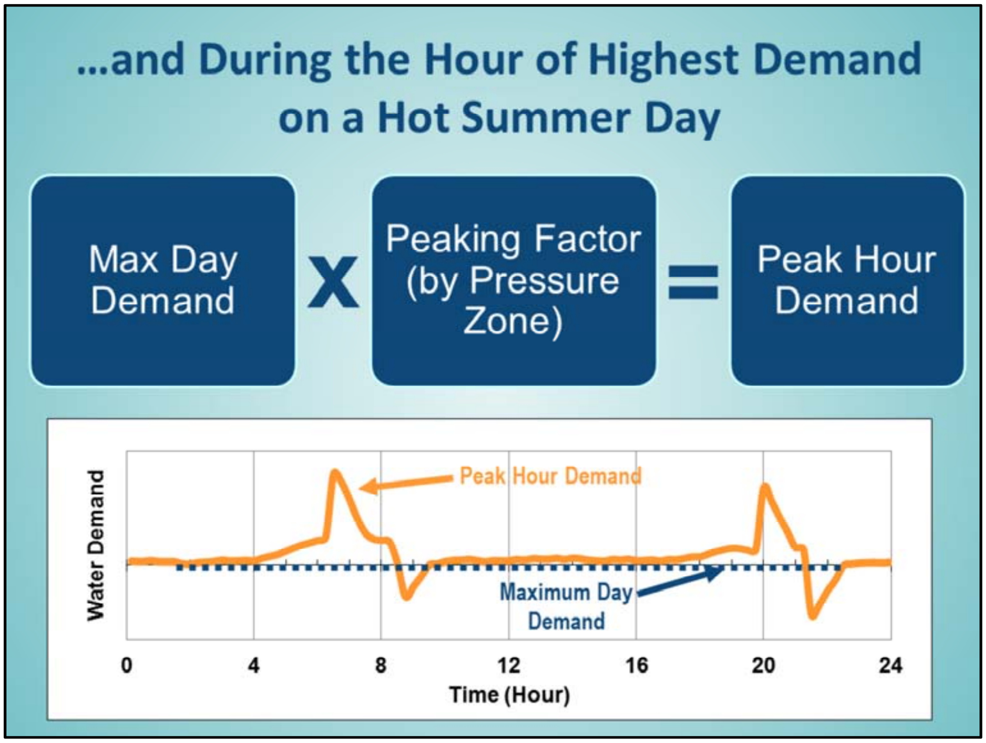
2. The **High-Range Future** water demand assumes less water conservation per person than in the "most probable" projections.



In addition to analyzing the system under Average Day Demand conditions, we also look at Maximum Day Demand to simulate high water use on a hot summer day.

Water demand fluctuations are primarily due to weather conditions.

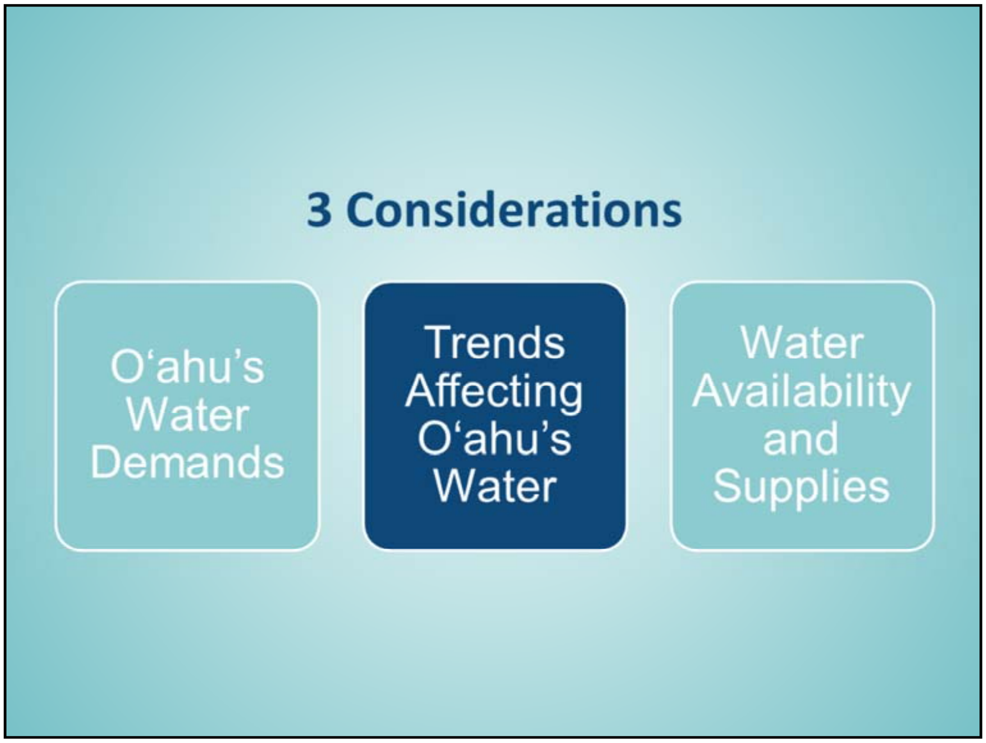
The difference between the high summer demand and the low winter demand can be attributed to irrigation and other outdoor uses.



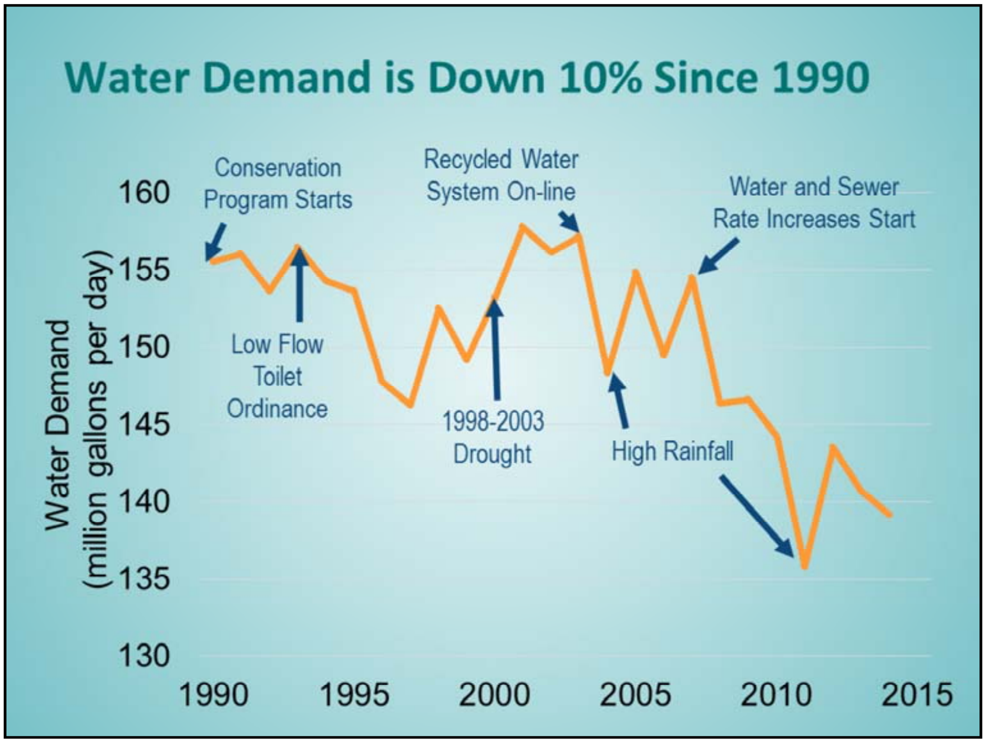
We also look at Peak Hour Demand to assess demand during the periods of highest water use on a hot summer day, which normally occurs in the morning before people leave for work (4 am – 9 am) and in the evening when they return (5 pm - 9 pm).

Peak Hour Demand is met through water storage in reservoirs and with additional pumps.

Peak Hour Demand places the most stress on the water system (pumps, pipes and reservoirs). It can result in a reduction in water pressures, increased pipe flow velocities and pressure spikes that contribute to a reduced pipe life and some main breaks.



Now we will talk about trends affecting O'ahu's water supply.



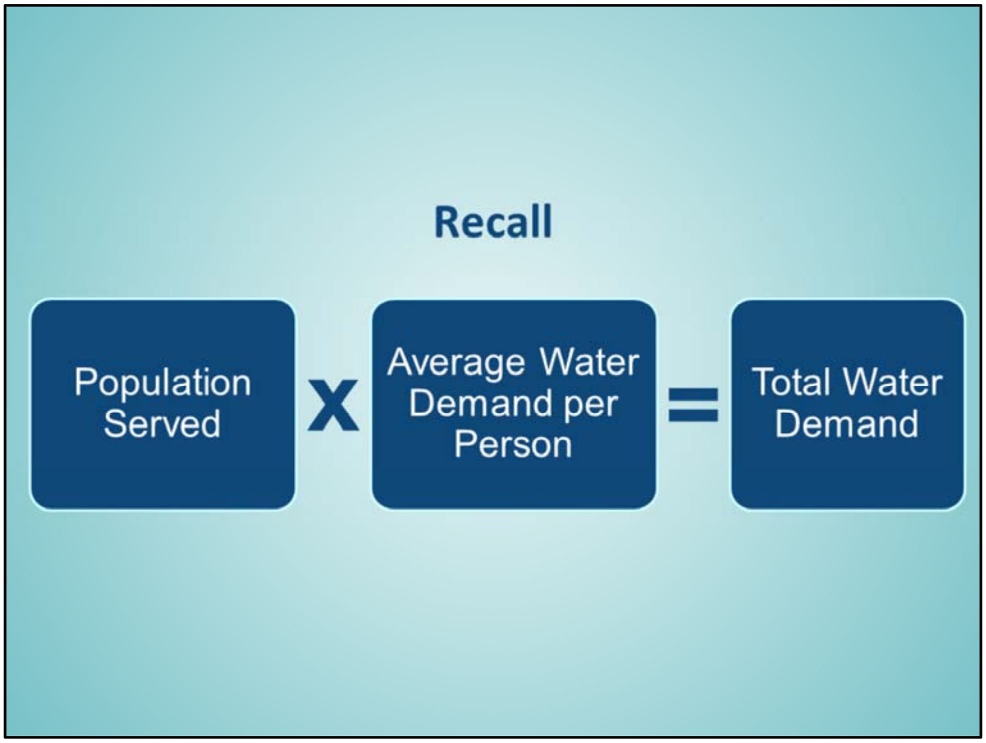
O‘ahu's potable production has dropped 10% from 1990-2012, and conservation is the key reason.

- In the late 1980's, O‘ahu was reaching our water system capacity, but THEN, a couple of things happened:
  - The Japanese investment bubble burst spiraling Hawai‘i into an economic downturn.
  - The Water Conservation Program ramped up (1990).
  - O‘ahu Sugar Co. closed in 1995 freeing up unused agriculture water for new potable water sources.

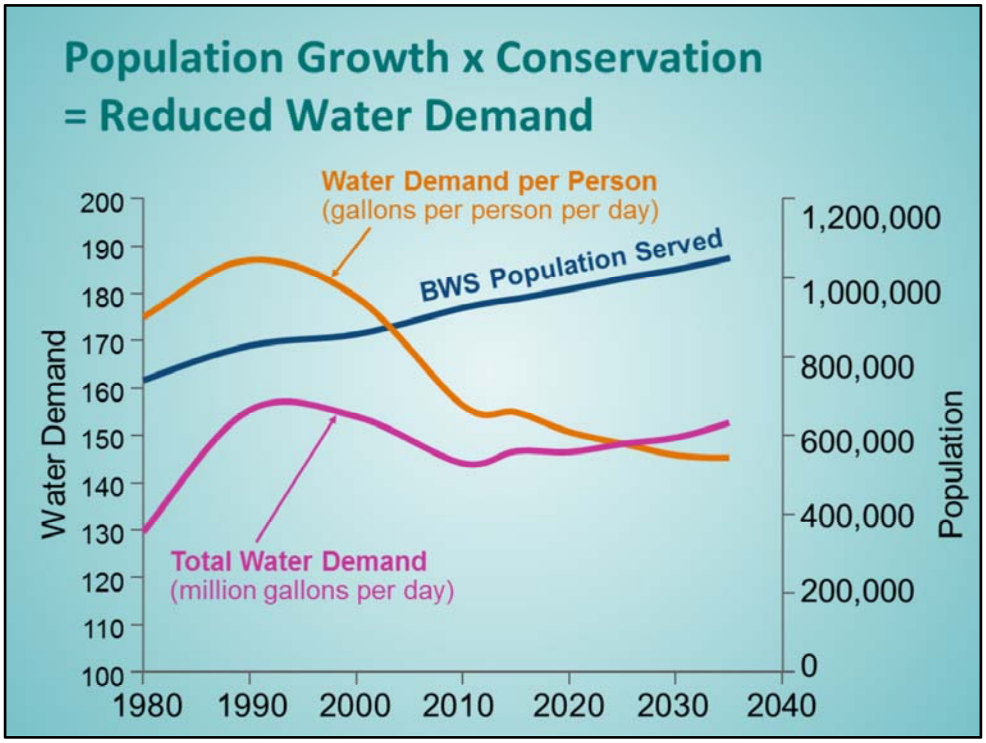
- Along this timeline:
  - The BWS water conservation program began in 1990.
  - City Council passed the low flow toilet ordinance in 1993, which mandated the immediate change out of all non-residential toilets from the 3-5 gallons/flush to 1.6 gallons/flush, and water demand dropped. BWS and the Department of Environmental Services (ENV) created a limited time $100 toilet rebate for residential toilets.
  - In 1997, El Niño started a 6-year drought and water demand increased.
  - The BWS Honouliuli Water Recycling Facility started and further dropped

water demand in Ewa.

- In 2005, water rates were increased (1st time in 11 years) and provided the economic incentive for more conservation.
- Drought and high rainfall still affect water use, but successful conservation programs have mitigated drought impacts.
- O‘ahu water demand dropped 10% 1990-2014. As a result, more system capacity became available.



How we calculate water demand depends on two factors: Population Served and Average Water Demand Per Person.



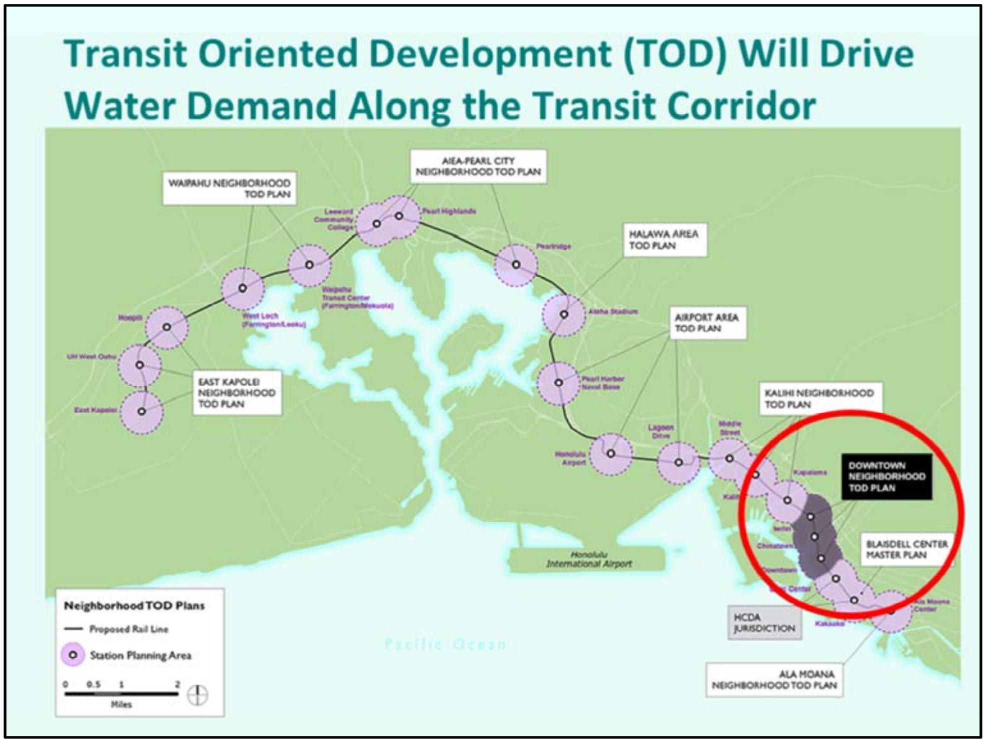
The population served by the BWS has steadily increased from 740,000 in 1980 to 922,000 in 2010 and is forecasted to reach 1,071,000 in 2035.

Through conservation, water demand has decreased since 1990 from 187 gals/capita [person] day (gpcd) to 180 gpcd in 2000 to 157 gpcd in 2010. We anticipate the downward trend to continue, although at a lower rate, dropping to about 145 gpcd in 2035. This will only occur with dedicated conservation programs going forward.

The increase in water demand from 1980 to 1990 reversed and has continued to drop through 2015. There is a conservation saturation point and once it is reached, we expect water demand to start increasing. Eventually demand will increase at the same rate as population increase, but at a much lower level. The forecasted most probable water demand is about 153 million gallons per day (mgd) in 2015.

The effort we've made to reduce water use through conservation has helped us:

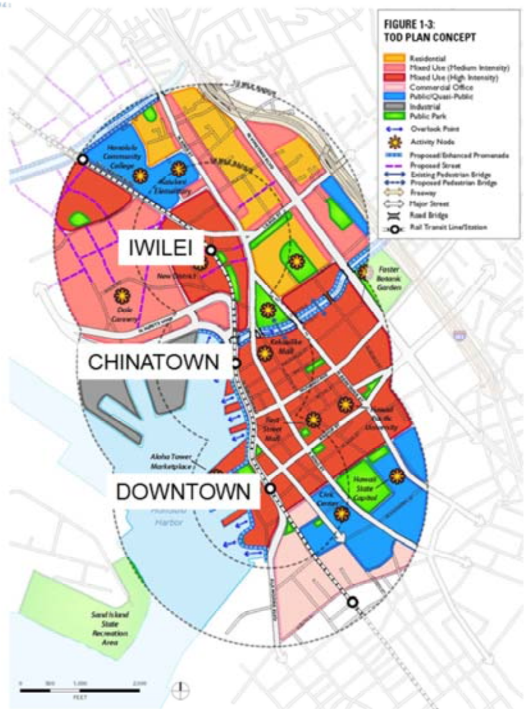
- Preserve our precious water supply.
- Reduce the need for infrastructure.



Let’s look at one example of directed population growth, Transit Oriented Development.

TODs around the new rail line will increase water demand in southern O‘ahu.

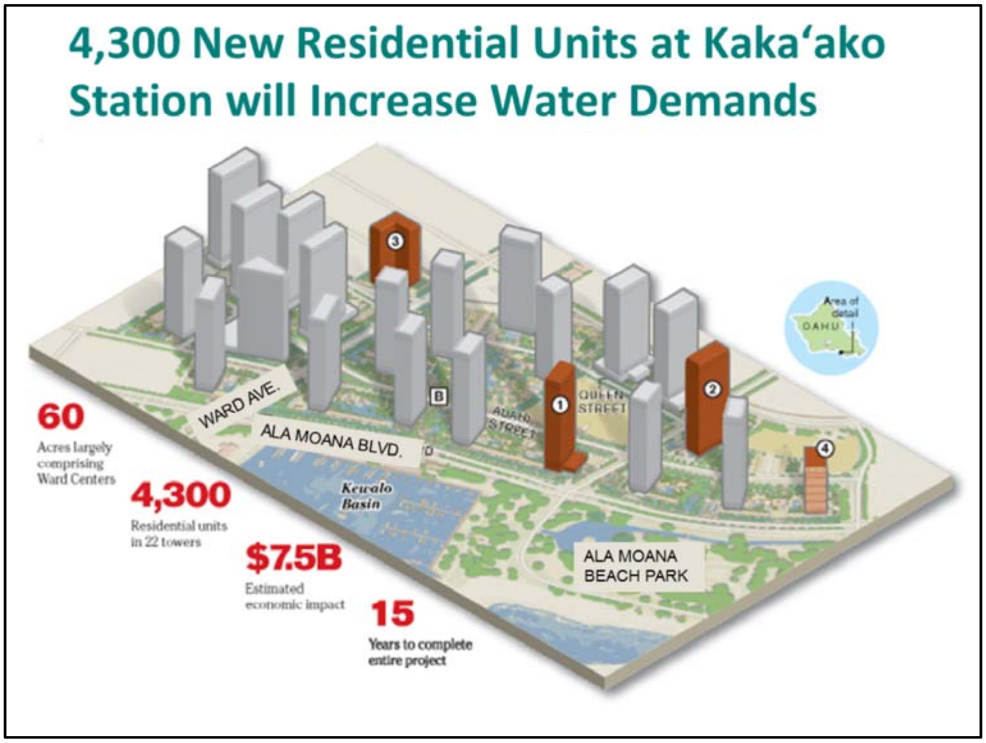
The next slide zooms in on the area circled in this slide around Downtown.



Each TOD area is about a ½ mile radius around each station

TOD in the urban core will result in increased density of various mixed uses and high rise residential developments.

Note that in Iwilei, the warehouses of today are envisioned to become high rises and mixed uses.



In another example, Kaka'ako is a major growth area for high rise development and could be as dense as Waikiki with a similar water demand.

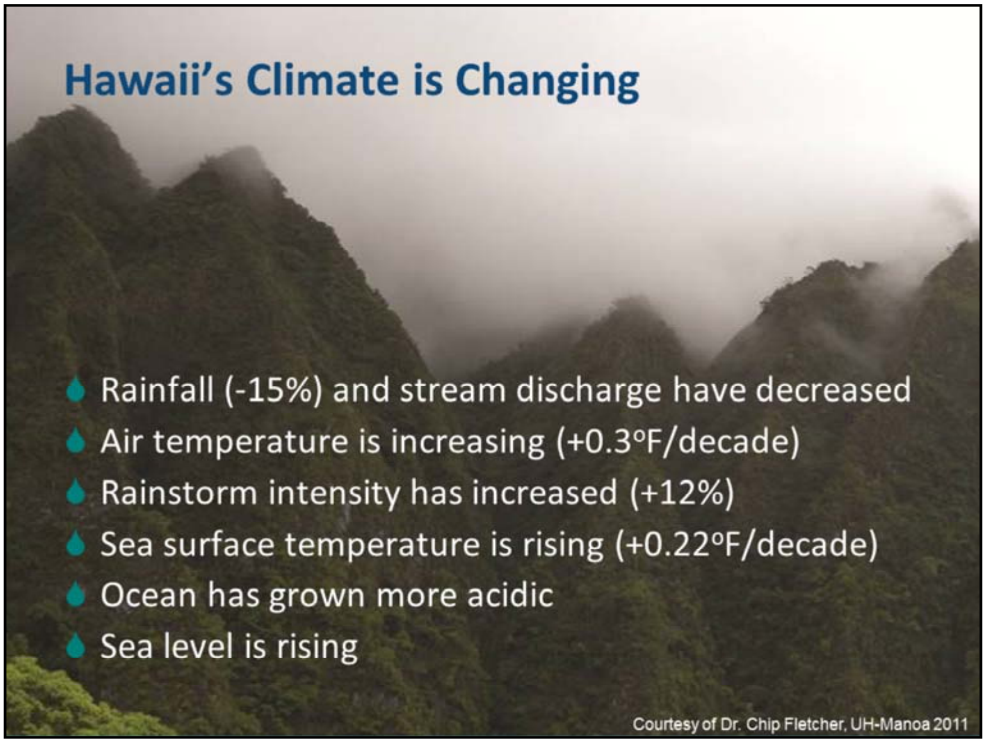
It is important to note that Honolulu experienced a 15 million gallons per day (mgd) decrease (from 85 mgd to 70 mgd) in water demand from 1990-2015 due to conservation savings. These savings will help to accommodate the additional water demands of TOD.

Water demand per person and by residential unit decreases in high rise developments due to less irrigation and outdoor use per residential unit. They are also highly water efficient.

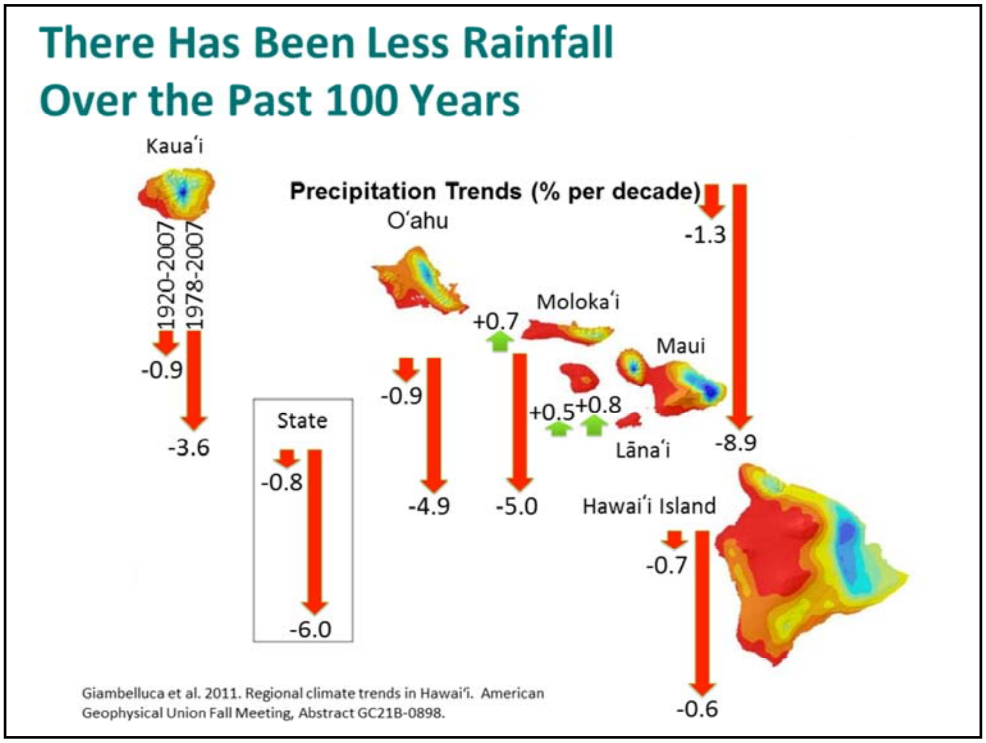
The red Xs show main breaks in the Kaka'ako water system.

Many of the pipelines were installed in 1930-40s and are aging.

As more high rise developments are constructed and water use in Kaka'ako increases, the water system will become more stressed and more main breaks are anticipated. Therefore, the BWS Capital Improvement Plan (CIP) will be replacing a number of pipelines, but developers should share in this cost. The BWS has required some large developments to replace the aging pipelines fronting their project, given the additional stress the added population will put on the system.



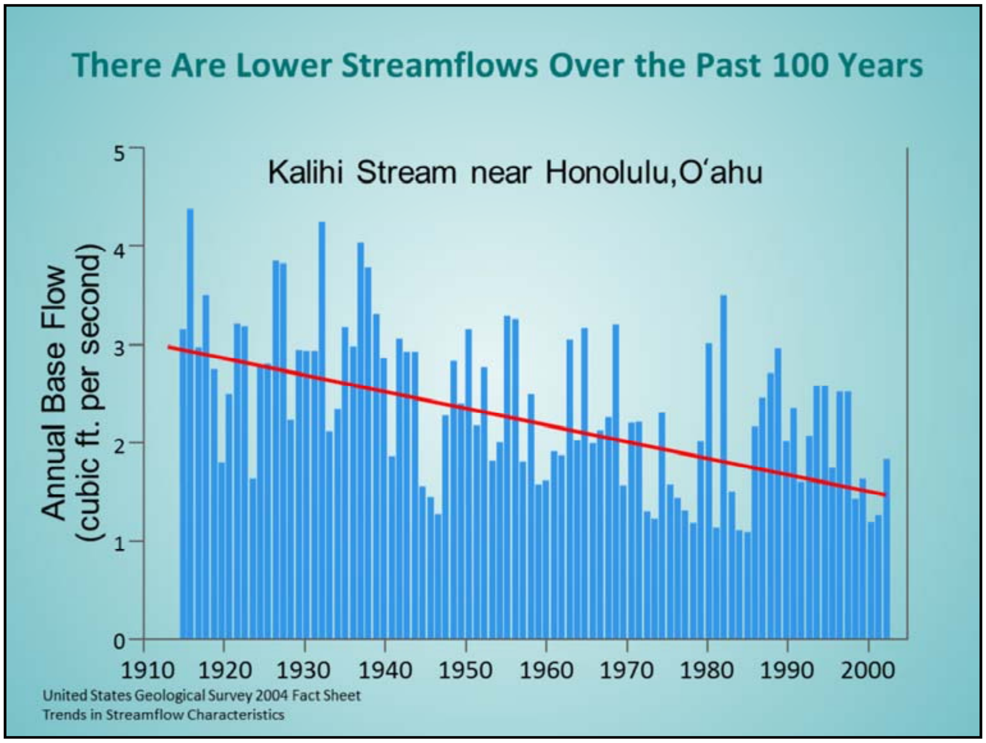
The next major trend impacting our water supply is climate change.



Rainfall has decreased on most islands.

The rate of rainfall decrease has accelerated over the last 3 decades, except for Lanai.

Less rainfall means decreased streamflows, reduced recharge to aquifers, and a changing environment that we must consider.

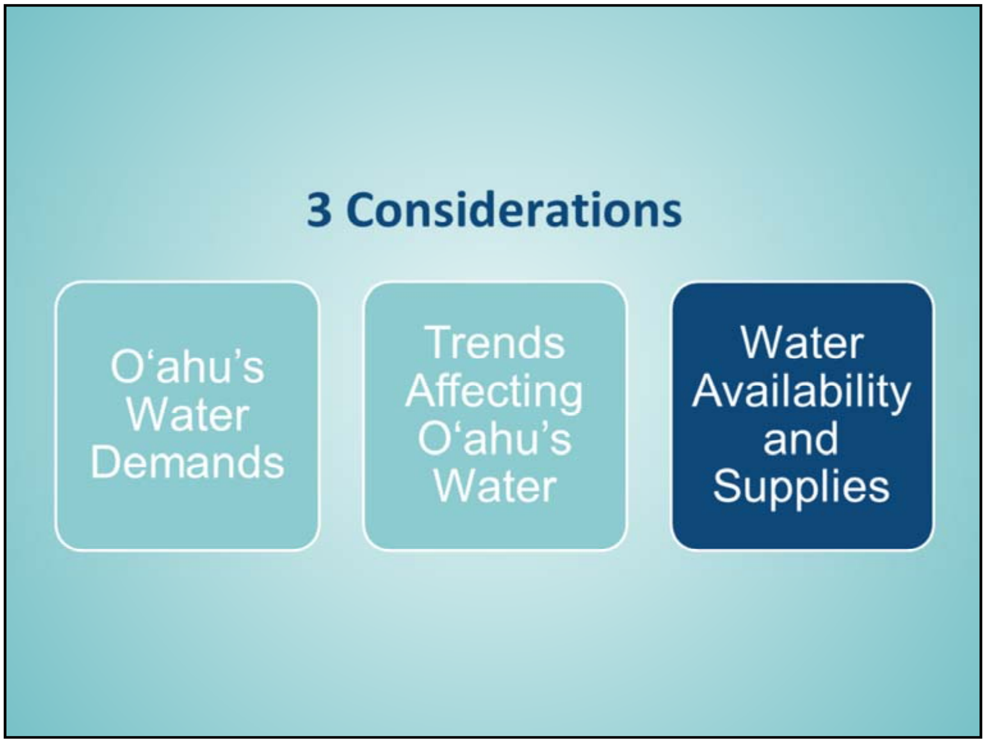


According to a United States Geological Survey (USGS) 2004 Fact Sheet, there is a trend of decreasing base flows in Kalihi Stream (1913 – 2002).

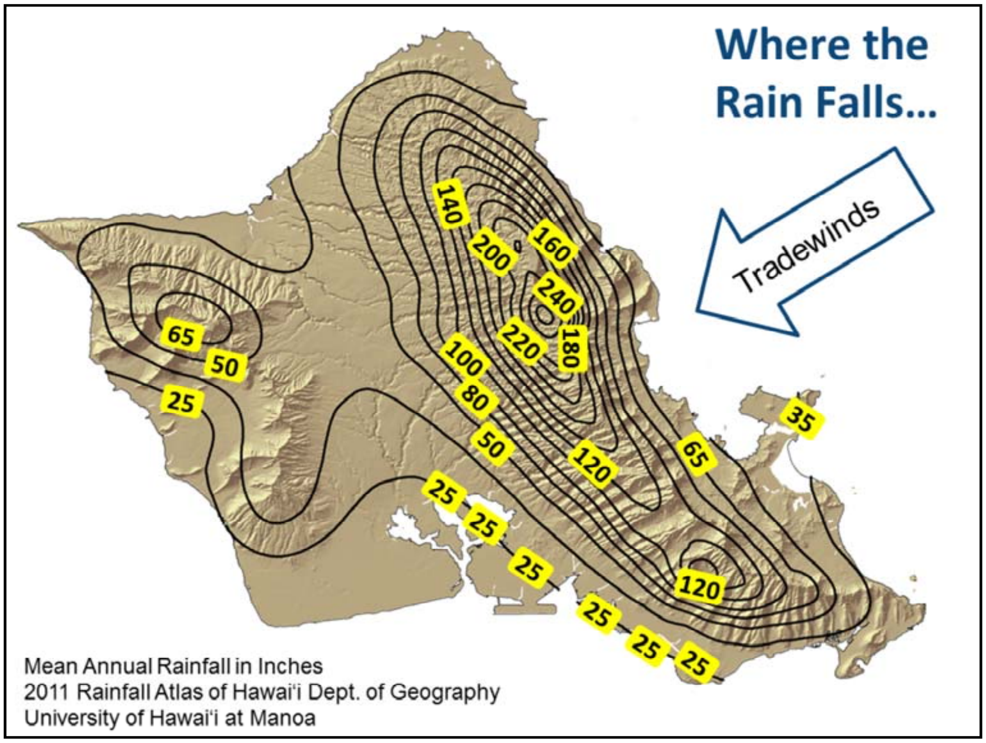
USGS suggests a direct correlation between streamflow and rainfall in selected streams.

Kalihi Stream does not have water sources above the stream gage, so the data indicate that storage is replenished by rainfall. Pumping groundwater does not impact stream flow.

Due to limited data, USGS is unable to indicate if the decreasing trend will continue or if it is a part of a longer term hydrologic cycle, meaning it may plateau or increase in time.



Now we’ll talk about trends affecting water supply availability.

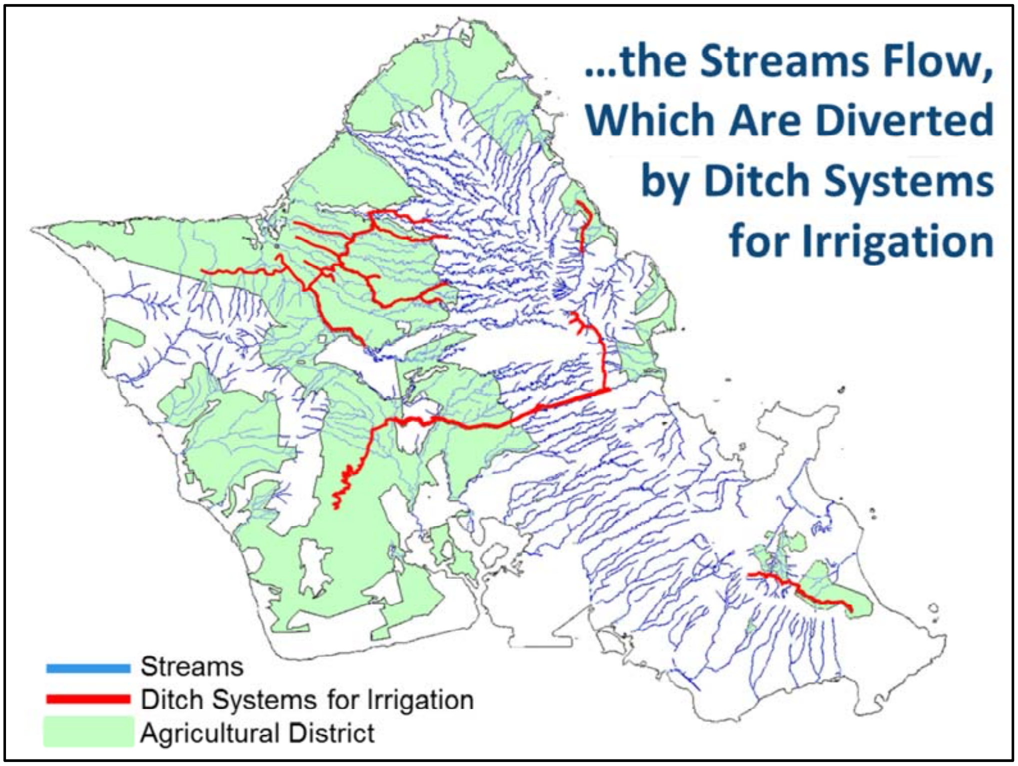


We provided a similar rainfall isohyet map (lines of equal annual rainfall) in our first Stakeholder Advisory Group meeting. This one has more recent data from 2011 and is part of a rainfall atlas by Tom Giambelluca of University of Hawai'i.

The decreasing rainfall trend over the last 30 years is evident when we compare annual rainfall amounts:

- Wahiawa/Kahana/Punalu'u dropped from 300" to 240"
- Manoa/Palolo dropped from 150" to 120"
- Mt. Kaala in Waianae dropped from 100" to 65"

Where the rain falls, the streams flow.



On this map, streams are overlaid on the 4 major agricultural ditch systems serving State Agricultural District zoned lands.

- Waiahole Ditch (15 mgd) is supplied by groundwater tunnels in the Koʻolau mountains.
- Wahiawa Ditch (20 mgd) is supplied by Kaukonahua Stream, Wahiawa Reservoir and combines R-1 recycled water from Schofield and Wahiawa Wastewater Treatments Plants.
- Waimanalo Ditch (1.5 mgd) is supplied by stream diversions in Maunawili Valley and the Waimanalo Well I.
- Punaluʻu Ditch (7 mgd) is supplied by a stream diversion.

2004 was a wet year and the total USGS gaged surface water was about 400 mgd. 2010 was a dry year and surface water dropped to 187 mgd.

- Streams are highly variable, seasonally and year to year.
- Instream Flow Standards are not established by Hawaiʻi Commission on Water Resource Management yet.
- Agriculture is highly dependent on surface water and only relies on groundwater as a backup or where no perennial stream flow exists.
- Streams have variable water quality and would require treatment and higher levels of chlorine disinfection if used for drinking.

- Streams provide for habitat and traditional and customary cultural uses.

To plan for an increase in agriculture production, what water sources are needed to support agriculture’s growth?

- A combination of groundwater and surface water.
- No new stream diversions are planned, but additional water is available through reducing ditch losses.

More efficient ditch systems mean taking only what is needed and leaving the rest in the stream for habitat and other uses.

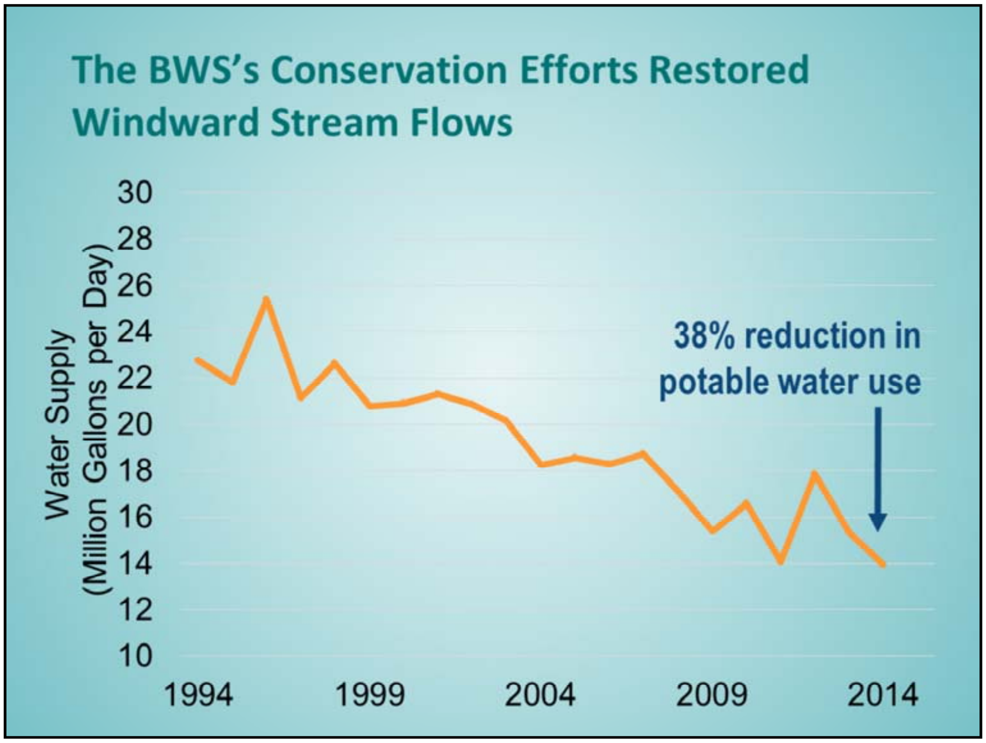
Kamehameha Schools renovated their Punalu‘u Stream Diversion structure, adding a grated intake that diverts half of the stream flow into a distribution pipe laid in the existing open ditch system.

The pipe significantly reduced water losses, decreased maintenance costs, and pressurized the water.

The renovated structure added 2 fish ladders on the edges.

An astronomical clock device shuts a valve at dusk, when water is not needed, so water is not diverted when o‘opu larvae float down the middle of the stream. The fish ladders allow migration of o‘opu recruits past the diversion for spawning.

This structure provides a water conservation and environmentally sensitive model for other ditch systems.



Through successful conservation and water loss control efforts, the BWS's Windward source production has decreased by 38% from 1990-2014.

The BWS planning policy tries to keep most of Windward water on Windward for two primary reasons:

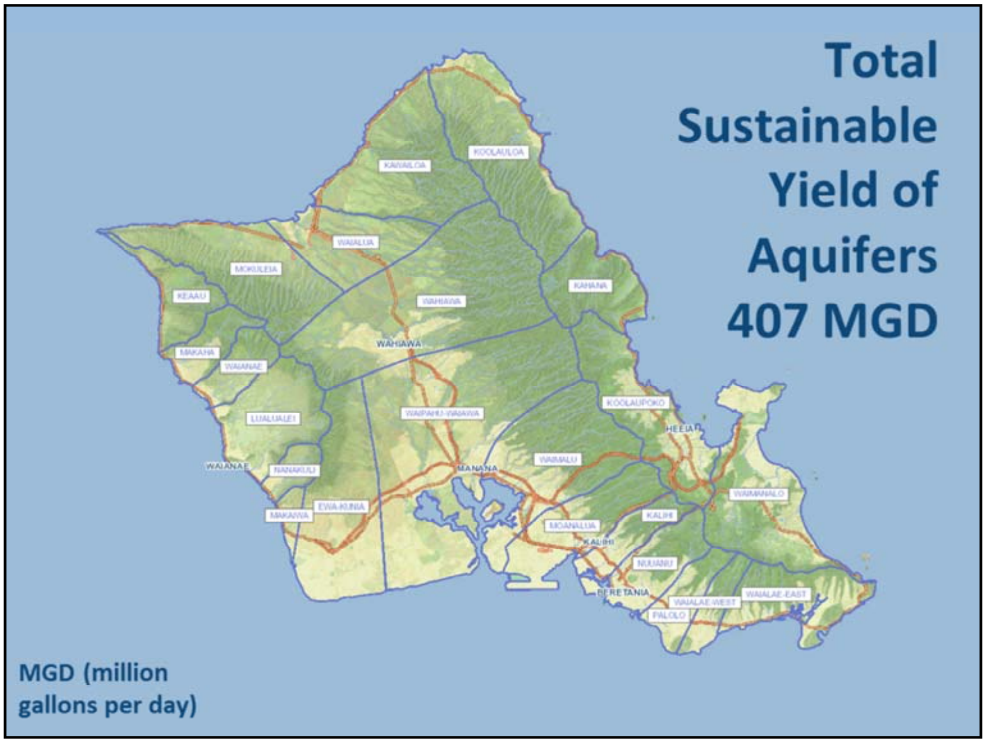
1. The dike aquifers of Koʻolaupoko, Waimanalo and Kahana hold a smaller volume of groundwater than the basal aquifers of Pearl Harbor and Honolulu. Less water use maintains higher groundwater levels to mitigate drought. In 2008, Windward Oʻahu experienced a low groundwater situation due to low rainfall. This strategy allowed the BWS to get through the drought.

2. Windward dike sources interact with the streams. Stream flows can decrease with increased groundwater withdrawals. Reduced water use allows more Windward stream flows to support agriculture, habitat in streams and nearshore waters, and supports native Hawaiian traditional and customary water rights associated with surface water.

These are the natural hydro-geological aquifer systems on Oʻahu consisting of high-level dikes and basal aquifers.

The significant areas of caprock, shown in light blue above, hold back or dam the freshwater from leaking too fast into the ocean. Areas of caprock contain coral deposits and sediments from higher sea levels in Oʻahu's geologic history.

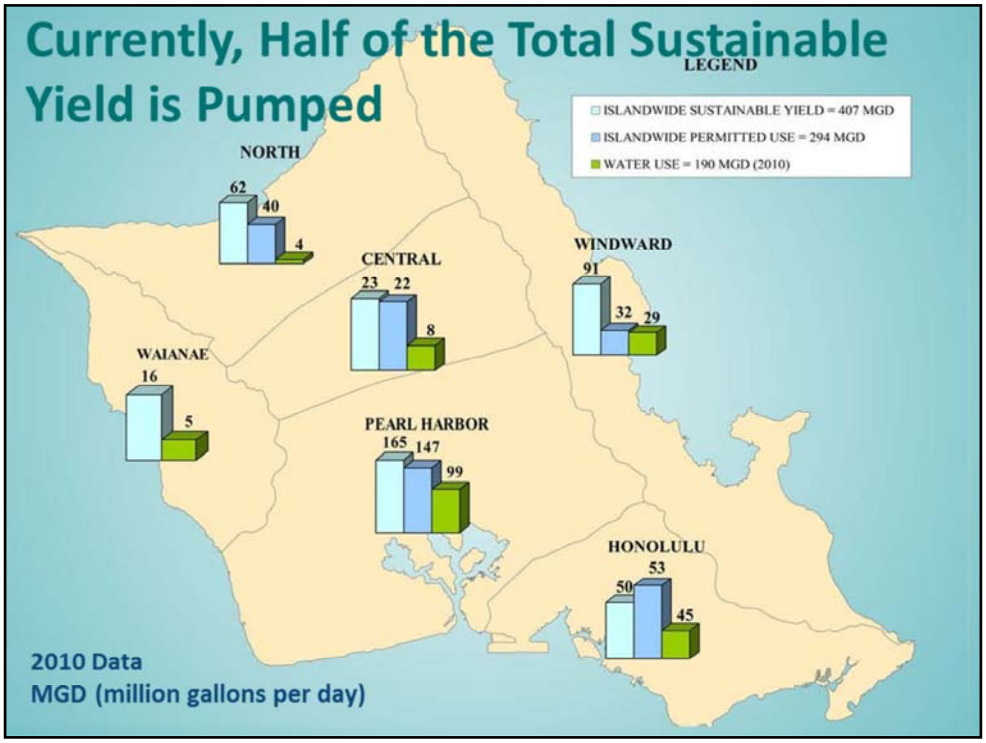
Light blue areas, shown above, were previously under sea water. There is enough ice on the planet that if it all melted it could raise sea levels 216 feet from present levels, according to the National Geographic.



The island's natural aquifers are divided into "Aquifer Systems" by the State Commission on Water Resource Management (CWRM).

Each aquifer has a mathematically calculated sustainable yield. The State CWRM issues permits to each well, so that overall groundwater pumping does not exceed the sustainable yield.

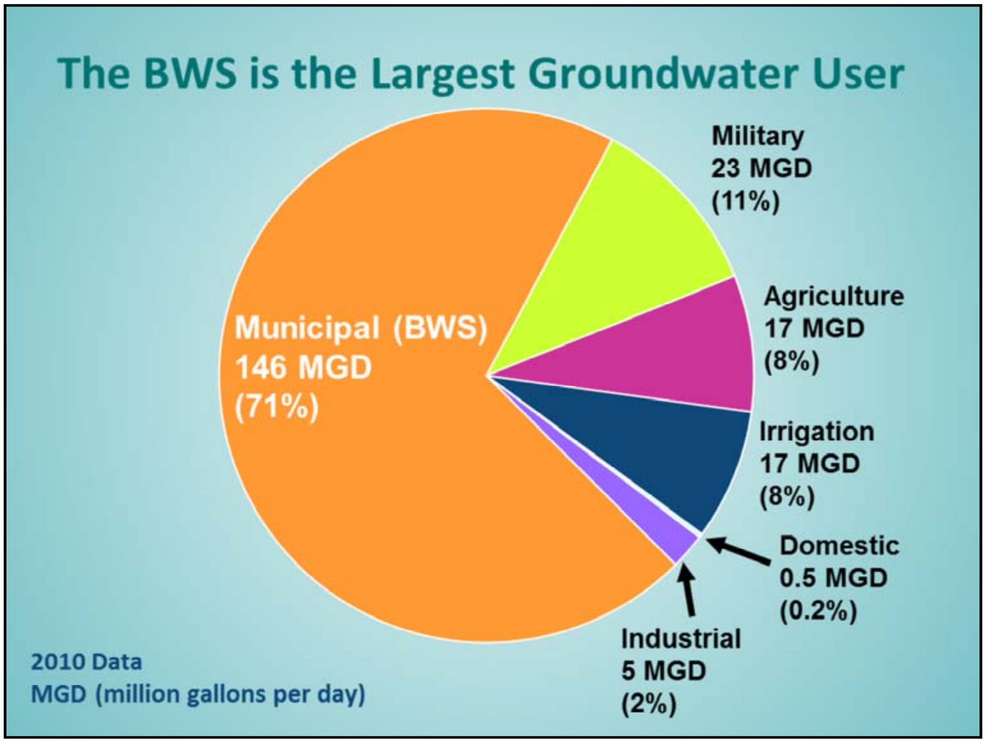
The total sustainable yield for O'ahu is 407 mgd, not including the Waiahole Ditch.



The base map is State CWRM “Aquifer Sectors” that contain a number of aquifer systems.

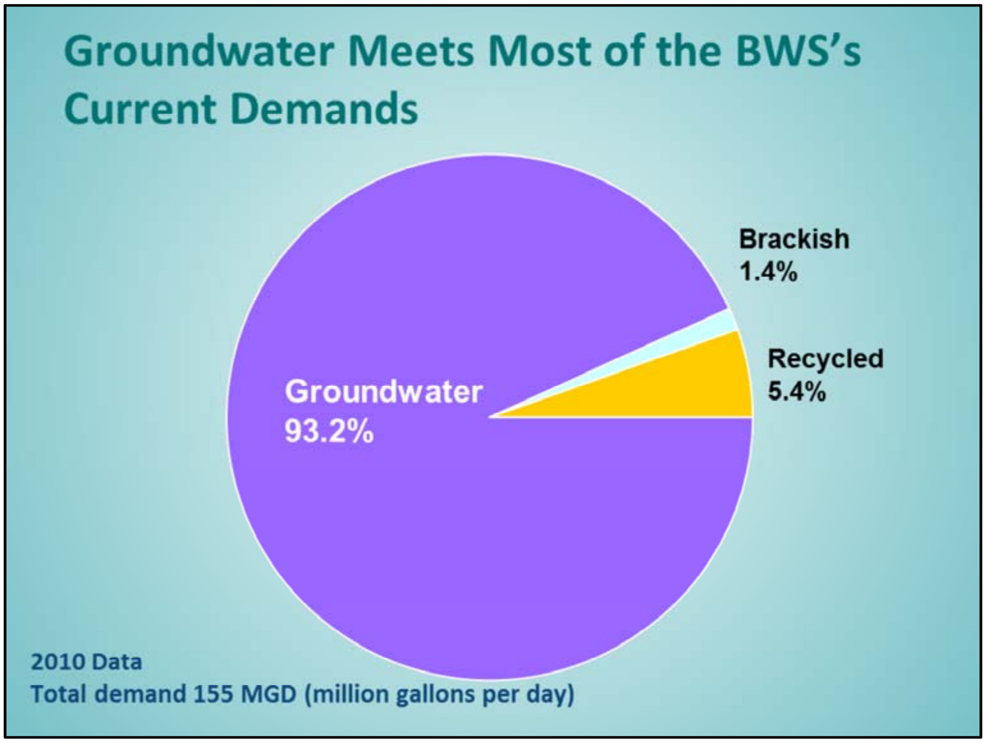
- The left bar (light blue) is sustainable yield, totaling 407 mgd in 2010.
- The middle bar (blue) is permitted use, which totaled 294 mgd in 2010 (excludes Waianae, which is not a “Designated Water Management Area”).
- The right bar (green) is pumped groundwater, totaling 190 mgd in 2010.

By inspection:
- Honolulu’s water use is close to sustainable yield.
- Pearl Harbor has available sustainable yield from the closing of the Oʻahu Sugar Co. in 1995.
- There is available sustainable yield in Central, North Shore and Koʻolauloa for additional agriculture as the City General Plan does not plan major urban growth there.
- The sustainable yields in Waianae and Windward (Kahana, Koʻolaupoko and Waimanalo) are not readily recoverable due to the many dike systems. The BWS’s exploratory wells in these areas experienced low yields or impact streams.



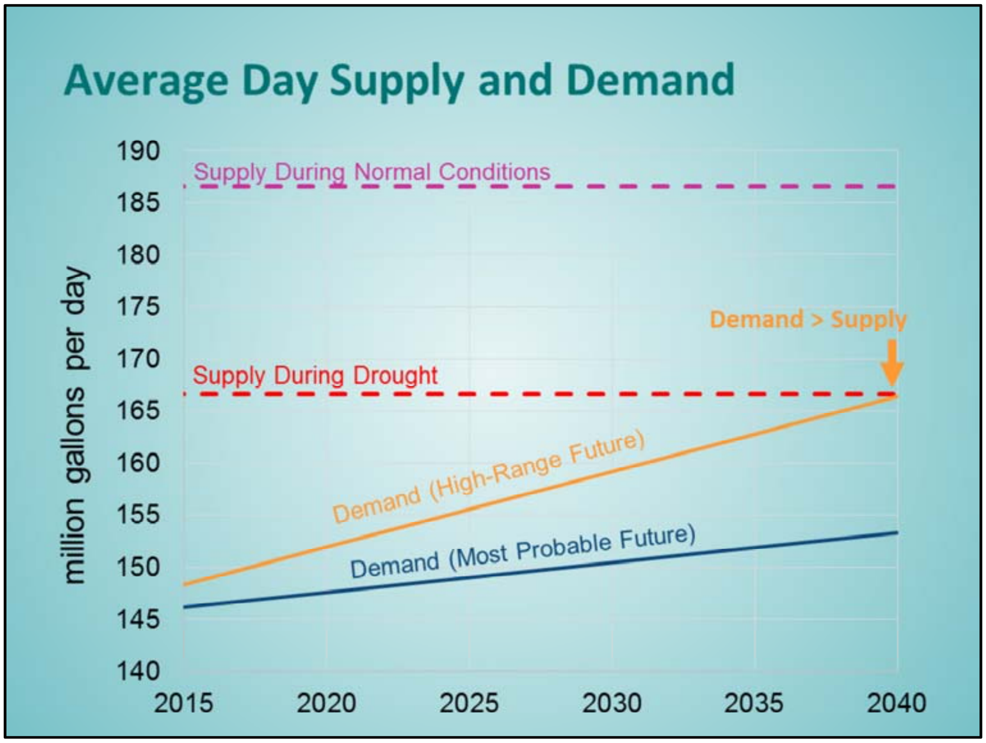
This pie chart shows water use by CWRM categories, provided by CWRM for 2010.

- The BWS is the largest water user on O'ahu.
- Military is 2nd.
- Agriculture uses mostly surface water and supplements with groundwater and includes the Waiahole Ditch.
- Irrigation is mostly for urban uses, such as golf courses and common areas like Kapolei Village and Ewa by Gentry Homes, with private wells.
- Irrigation and Industrial include Includes Ewa Caprock Brackish aquifer.



The BWS diversified water systems consist of groundwater for potable use only.

The BWS supplements high quality potable groundwater with brackish wells and recycled water for irrigation and industrial process needs.

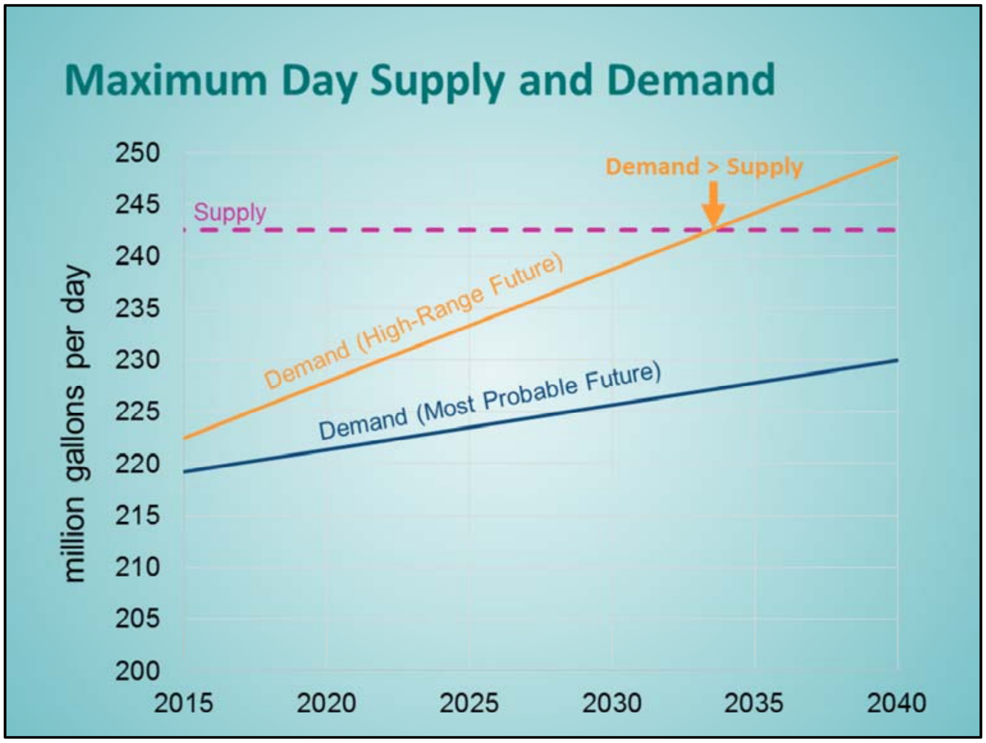


This graph of average day demand and system capacity is for the entire BWS water system. Each water system demand and capacity varies.

Most Probable Future demand and High-Range Future demand projections are within the BWS assessed drought yield estimate (based on data from the 1998-2003 drought).

Supplies under normal rainfall conditions are about 20 million gallons per day (mgd) higher.

BWS sources can accommodate projected average-day demands.

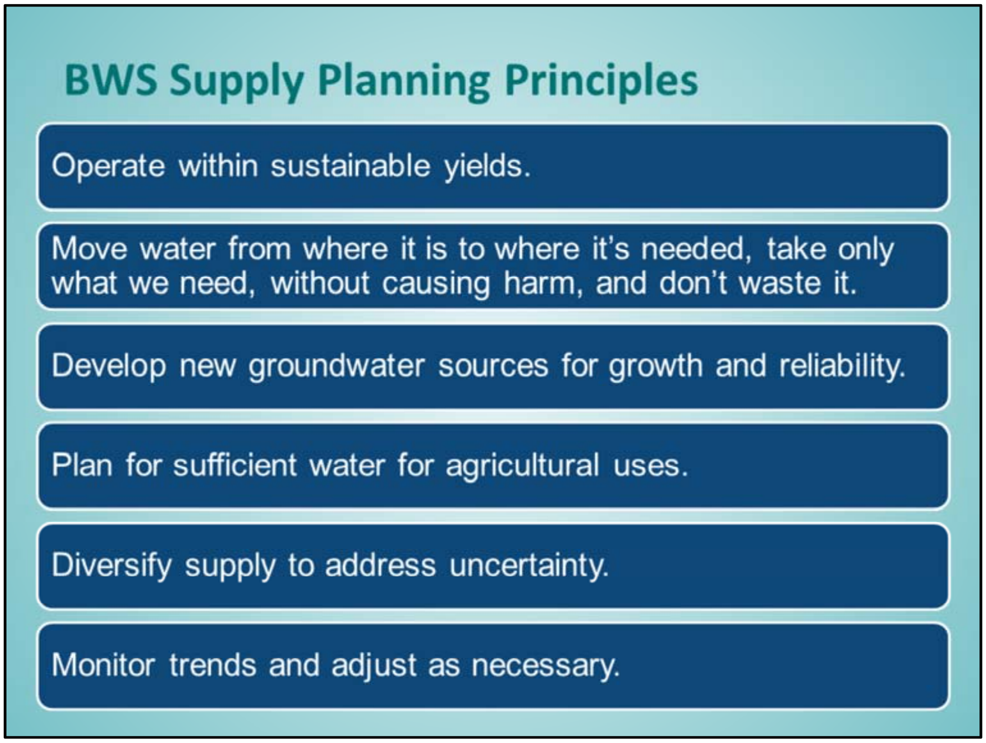


This graph of Maximum Day Supply and Demand is the total of all of the BWS's water systems. Each water system's demand and supply capacity varies.

Maximum Day Demand is used to assess water system capacity (pumps, pipes, reservoirs and treatment systems).

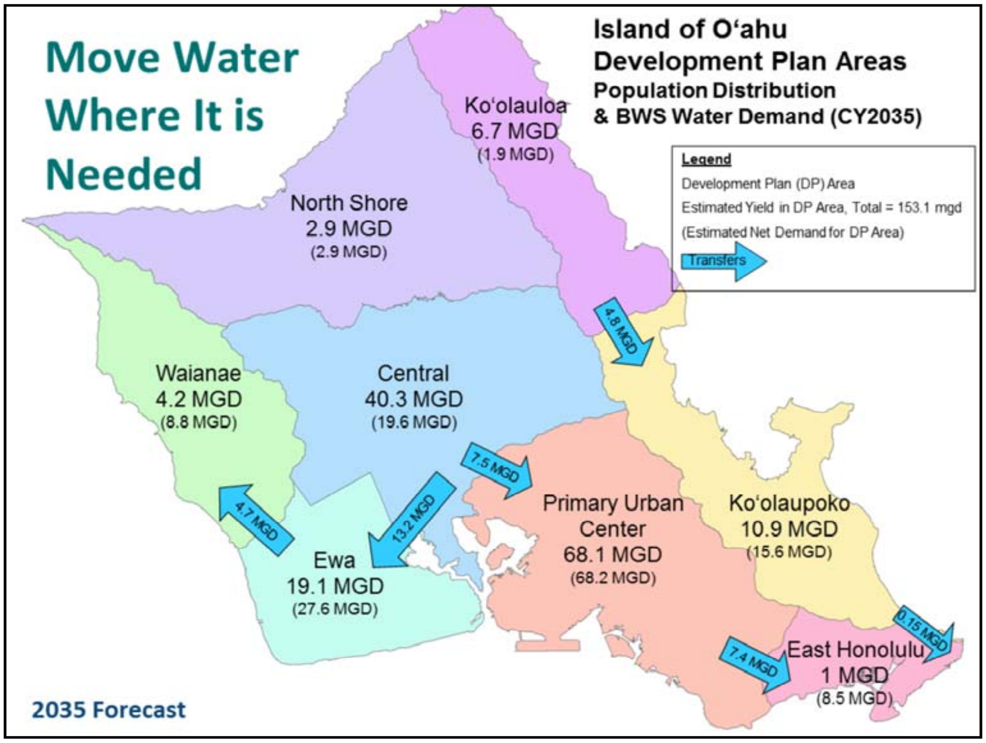
Most Probable Future demand is within the BWS pump capacities.

However, the High-Range Future demand projection could exceed the pump capacities before 2035.



These are our water supply planning principles.

The following slides will illustrate some examples.



Arrows are 2035 forecast of water demands of 153 mgd and show water transfers between land use districts. This forecast includes 2.0 mgd of desalination in Ewa.

The numbers that are not in parentheses represent the BWS production from all sources within the land use district.

The numbers within the parentheses show the water demand in each land use district.

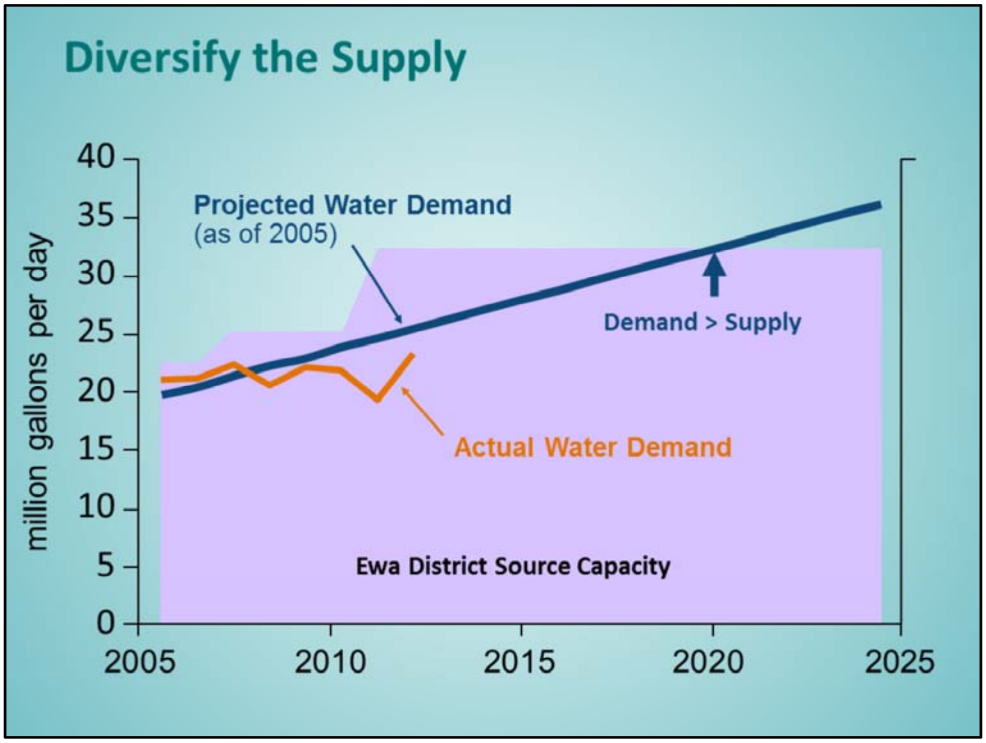
The balance is either transferred to adjacent districts or made up by transfers from adjacent districts.

This graphic illustrates examples of BWS Water Supply Planning Principles:

- Operate pumps within the sustainable yield.
- Move water to where it’s needed.
- Plan BWS sources with explicit consideration for agricultural needs and protect streams that are impacted by pumping.
  - Transfers from Windward Oʻahu to Honolulu are kept small as a drought mitigation for Windward dike aquifers and to protect stream flows that could be affected by groundwater pumping.
  - North Shore will not be connected to South Oʻahu to ensure the

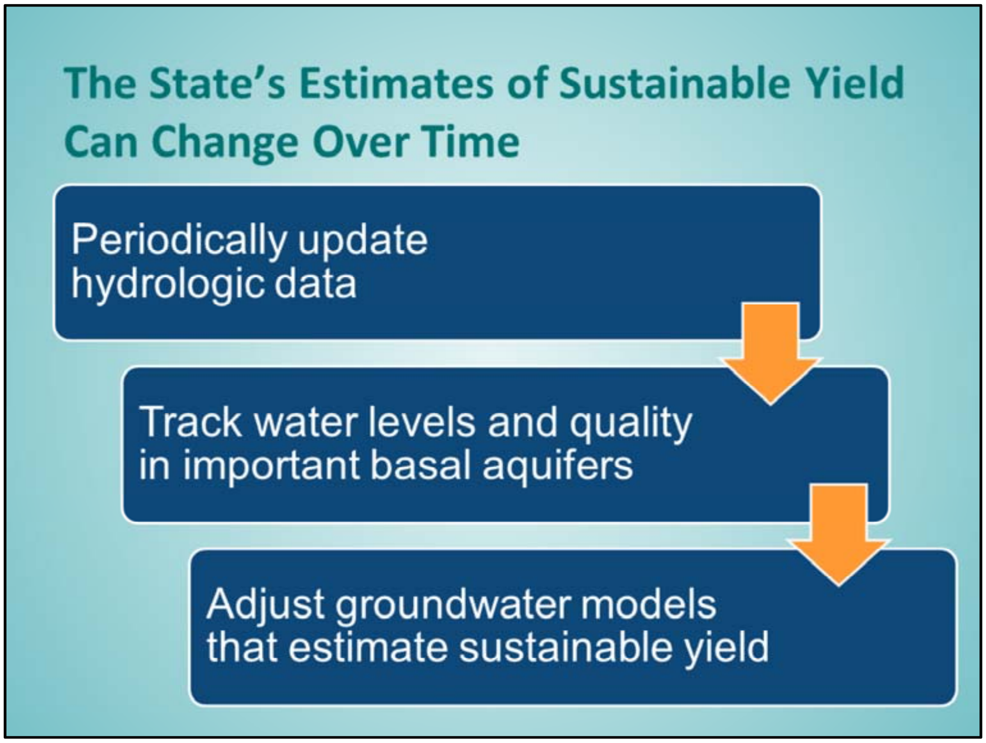
groundwater supplies are available to support North Shore agriculture.

- Diversify supply to address uncertainties like drought from climate change.
    - In Ewa, a directed growth area, recycled water and desalination are planned to reduce reliance on transfers from Central Oʻahu (Pearl Harbor aquifer) and ensure sufficient groundwater supplies for urban and agriculture.



Ewa-Waianae water production is increasing due to the city's directed growth policies. Ewa used about 16 mgd in 2012. This will increase to 27 mgd in 2035. About 5 mgd is transferred to Waianae.

The current average day capacity of the Ewa-Waianae sources is 33 mgd. When production approaches 33 mgd, the BWS will need to have desalination or additional Pearl Harbor wells developed.



One of the major uncertainties with climate change is a reduction in rainfall that would cause sustainable yields to decrease over time.

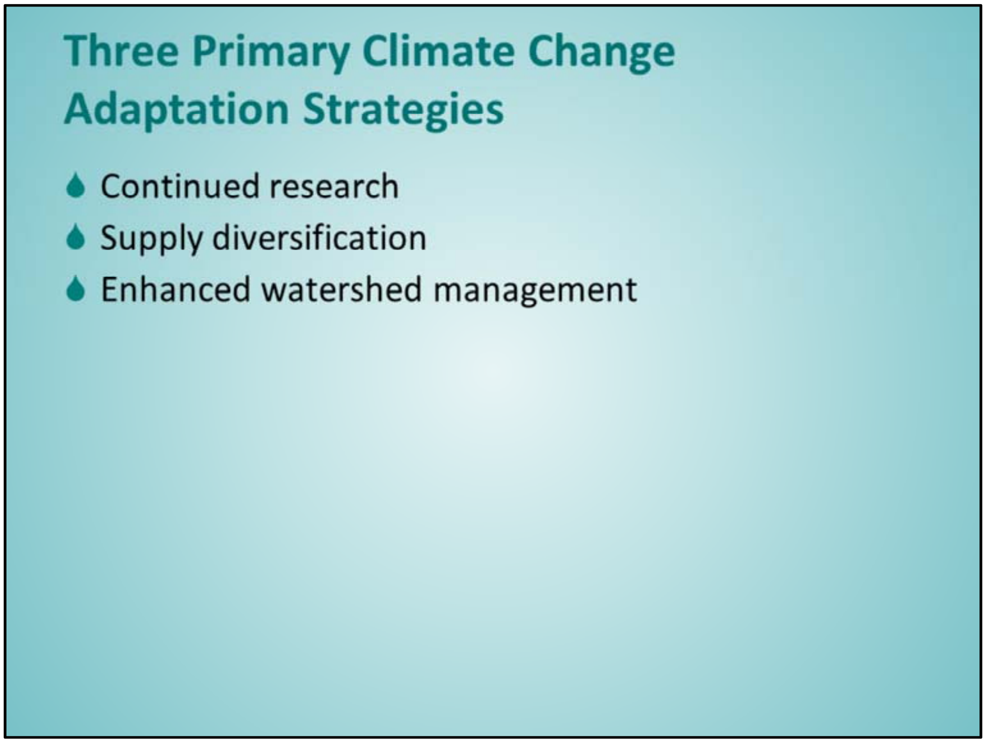
Sustainable yields are based on the best available information of hydrologic factors, but have acknowledged limitations in estimating rainfall distribution; vegetative transpiration; overland runoff; aquifer leakage to the ocean and to the brackish transition zone; and recharge to the various dike, basal, perched and caprock aquifers.

Adapting to these changes necessitates discrete actions:

- Periodically update information on rainfall, evapo-transpiration, runoff, leakage, and recharge to reflect current hydrologic trends due to climate change.

- Construct deep monitor wells in important basal aquifers to provide the ability to monitor water levels, freshwater lens and transition zone thickness, and trends in response to pumping.

- Develop advanced numerical groundwater models to improve sustainable yield estimates. CWRM with BWS, USGS and University of Hawaiʻi are participating in various efforts dedicated to monitor key hydrologic indicators such as rainfall, evapo-transpiration, recharge, head, salinity, and transition zone trends, and also to reaffirm the adopted sustainable yields in key aquifer systems. The USGS is constructing a 3-dimensional solute transport groundwater model of the Pearl Harbor aquifer system, calibrated to deep monitor wells.



Because sustainable yields can decrease over time, there are 3 primary climate change adaptation strategies.

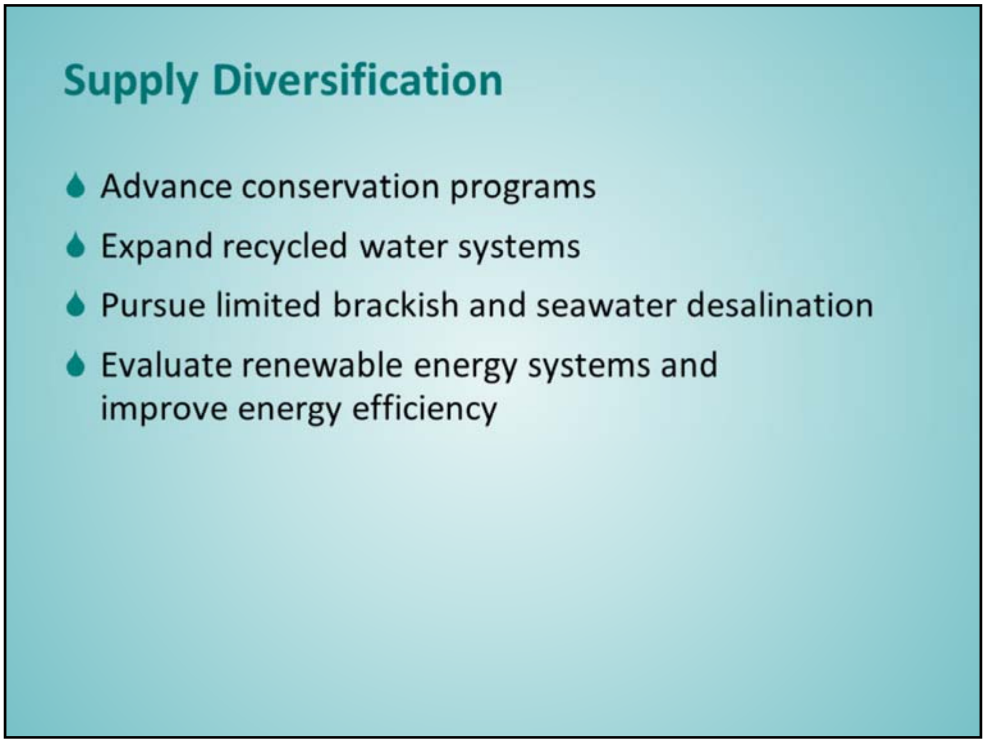
Continued Climate Research

- University of Hawai‘i:
  - climate model to forecast rainfall trends to 2061
  - quantify contribution of cold front-generated rainfall
- United States Geological Survey:
  - update O‘ahu recharge estimates and Pearl Harbor and Honolulu numerical groundwater model
- Water Research Foundation
  - identify water sources and systems vulnerable to severe drought and coastal inundation

There must be focused investment in priority watersheds that sustain drinking water sources.

Increasing directed funding to watershed partnerships (Department of Land and Natural Resources, Koʻolau and Waianae Mountain Watershed Partnerships, Oʻahu Invasive Species Committee) would be used for fencing and hoofed mammal removal.

University of Hawaiʻi is evaluating aquifer storage and recovery potential for storm water impoundment in Nuʻuanu Reservoir No. 4. to recharge the Kalihi and Nuʻuanu aquifers.



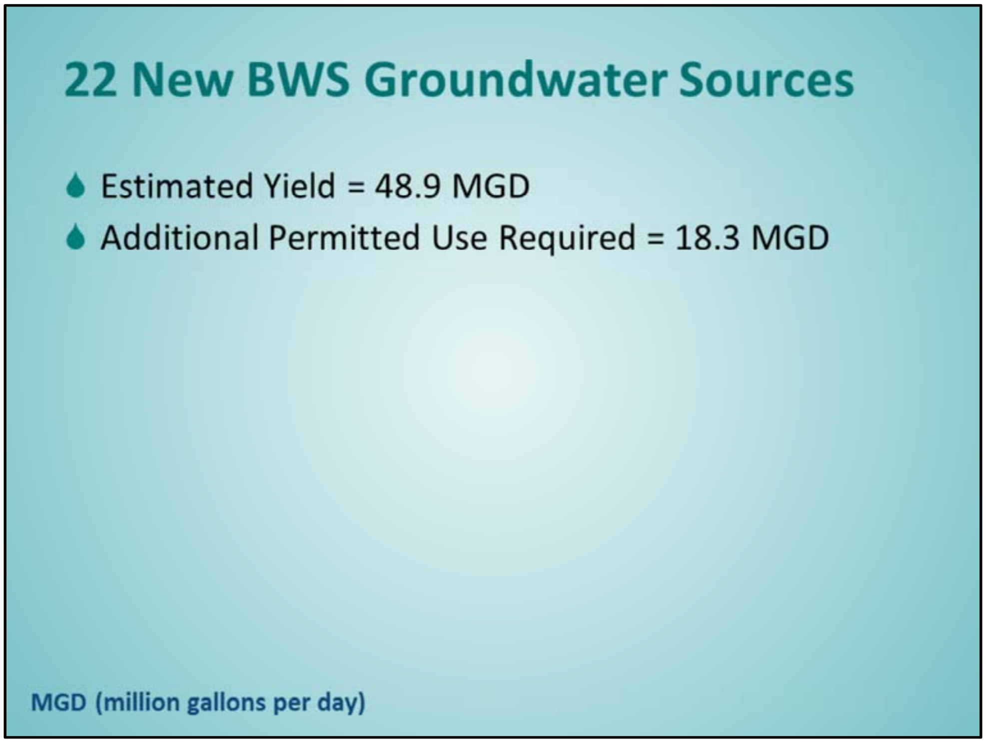
This lists some available approaches for the BWS to keep pace with growing water demand and reduce impact to the existing system. We could:

- Advance conservation programs to reduce demand and free-up existing water system capacity.

- Expand centralized and distributed recycled water systems in areas with limited groundwater, to mitigate drought.

- Pursue limited brackish and seawater desalination in Ewa to support growth, mitigate drought and reduce groundwater transfers from other districts.

- Investigate renewable energy systems and energy efficiency improvements for pumping and treatment plants.



With consideration of the uncertainties in demand forecasts, decreasing sustainable yields and climate change, the BWS has identified a combination of additional groundwater wells and alternative sources that can help us adapt to climate change over time.

- The BWS has installed most of the wells for current and future growth.

- Additional permitted use is needed for a portion of the sources.

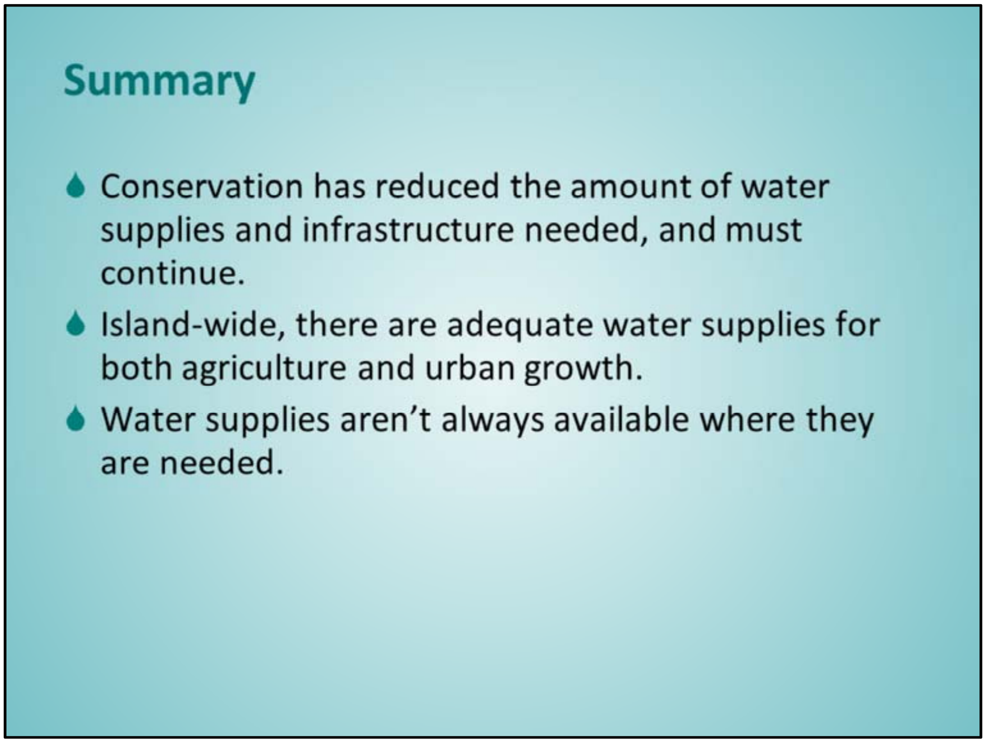
Alternative Sources: BWS and Others

Desalination (Potable)	Capacity (MGD)
Kapolei Brackish Desalination Plant	1.0
Kalaeloa Seawater Desalination Plant	1.0
Recycled Water	**Capacity (MGD)**
Wahiawā WWTP R-1	2.0
Schofield WWTP R-1	2.0
Honouliuli Recycled Water	12.0
Waianae Recycled Water (2)	1.0
Kahuku, Turtle Bay, Lāie Recycled Water	0.8
Waimānalo Recycled Water	0.7
Ala Wai Golf Course MBR	0.3
Mililani WWTP MBR	1.0
Nonpotable Water	**Capacity (MGD)**
Total Nonpotable	47.3
Total Alternative Resources	**68.5**

MGD (million gallons per day)

The BWS has identified a total of 68.5 mgd of alternative sources (BWS, State and Private) that will serve to diversify O‘ahu’s water system for urban and agricultural demand.

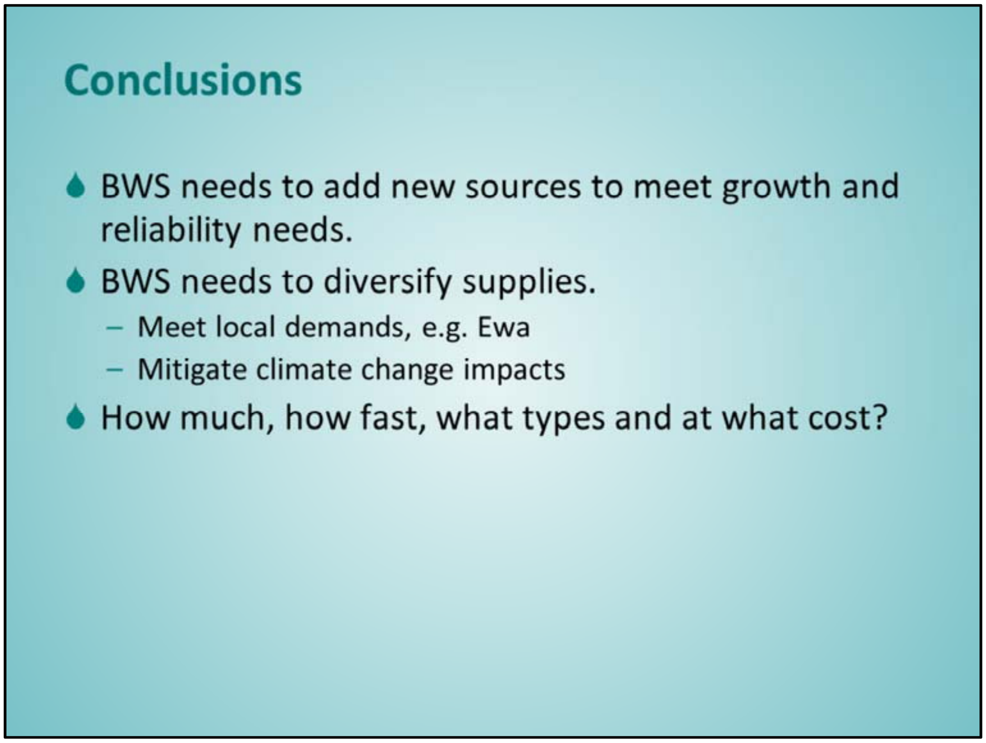
- Desalination and recycled water projects have been identified for future growth in Ewa.
- Recycled water sources, existing and planned, provide additional irrigation supply and reduce the use of groundwater, which will be conserved for drinking water purposes.
- 11 non-potable sources already serve existing uses.



Conservation has reduced the amount of water supplies and infrastructure needed, and this effort must be continued. Otherwise, more water sources will be needed, which means added infrastructure costs.

Currently, there are adequate water supplies for both agriculture and urban growth, island-wide.

Water supplies aren't always available where they are needed and transfers between regions will be necessary, but we will only move the amount that is needed without causing harm or wasting the water source.



To address uncertainties in demand forecasts, decreasing sustainable yields and climate change the BWS needs to:

- add new sources to meet growth and reliability needs
- diversify supplies
- meet local water needs, e.g. Ewa
- mitigate climate change impacts

In the BWS Water Master Plan, we will determine how much, how fast, what types of projects and at what cost.

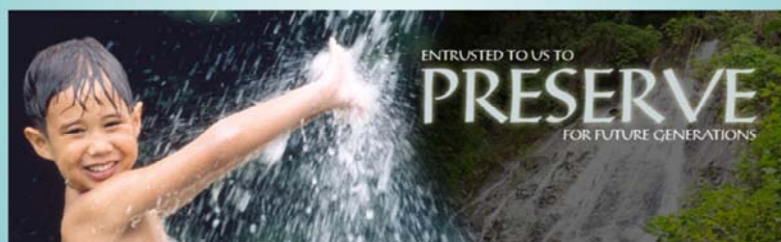
WATER FOR LIFE

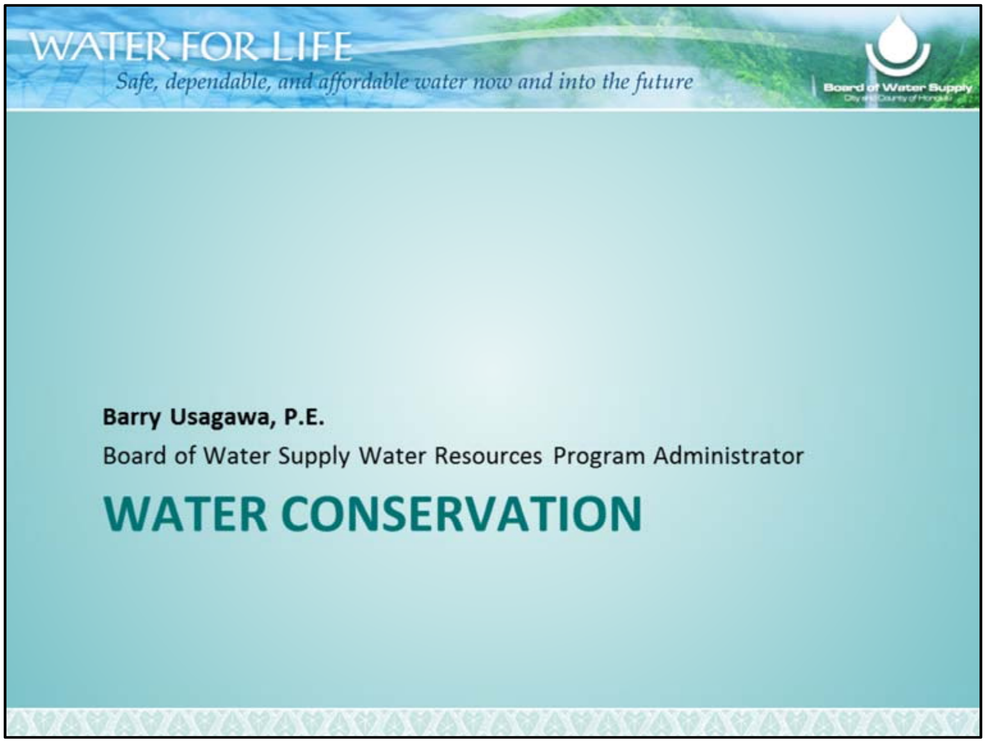
Safe, dependable, and affordable water now and into the future

Board of Water Supply

Mahalo!

Questions & Answers




WATER FOR LIFE
Safe, dependable, and affordable water now and into the future
Board of Water Supply
Barry Usagawa, P.E.
Board of Water Supply Water Resources Program Administrator
WATER CONSERVATION

BWS Conservation Program has 5 programmatic areas:

1. **Leak detection, repairs and maintenance program**
   Water-loss control translates to efficiently delivering water to our customers, minimizing waste

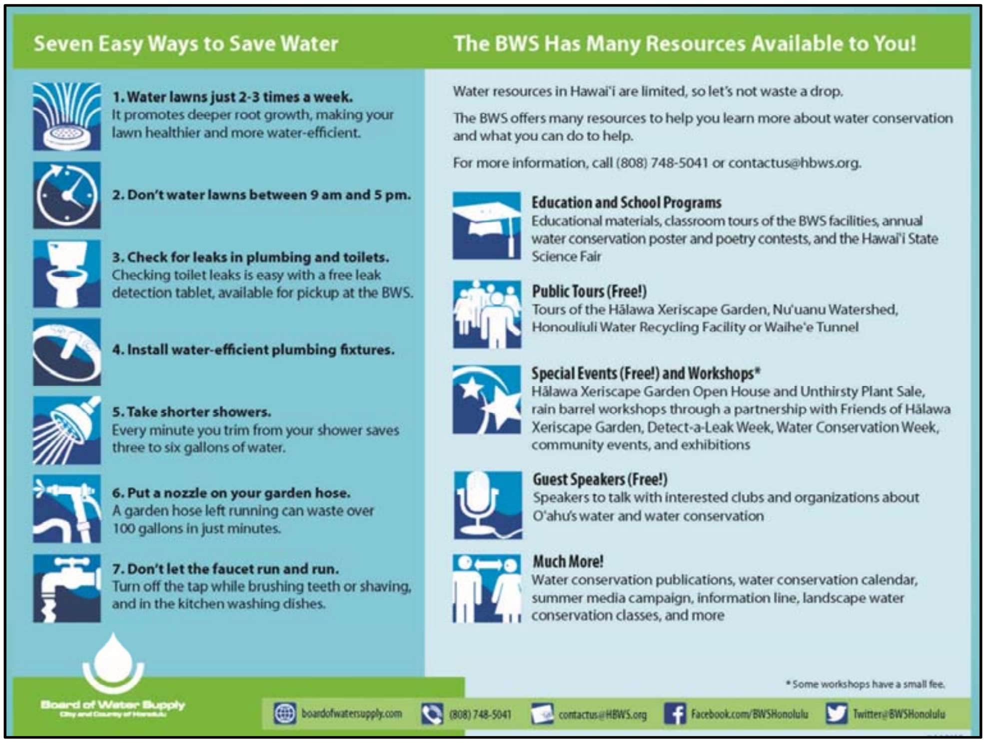
2. **Large water users program**
   Water audits and partnerships

3. **Water conservation regulatory program**
   Drought plans, low groundwater plan, plumbing codes for low flow fixtures

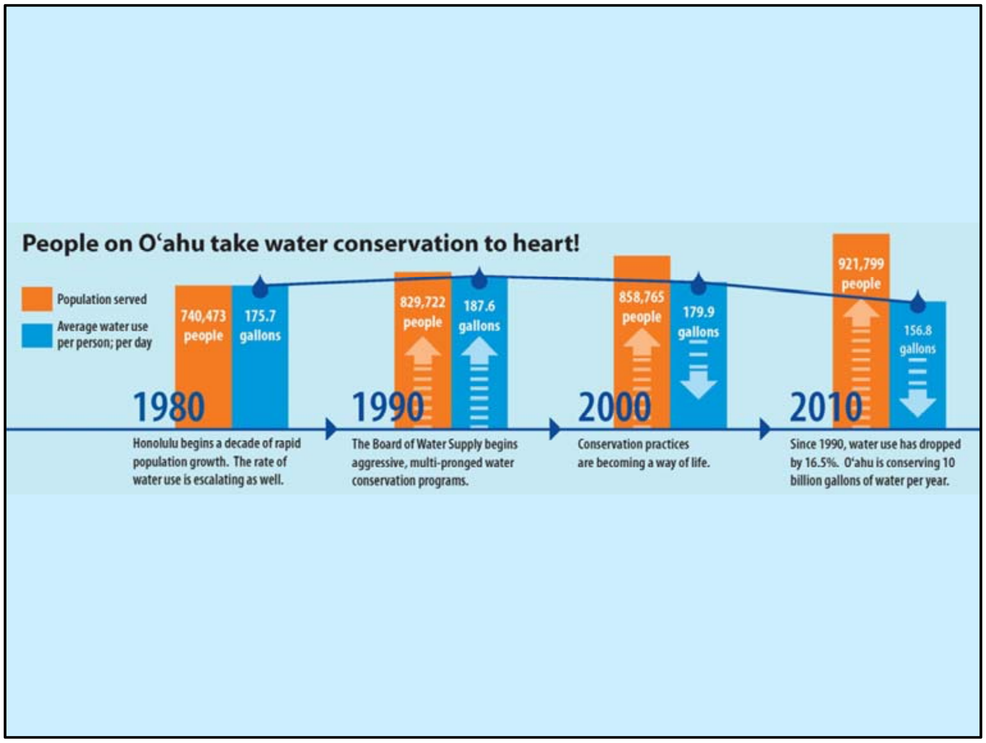
4. **Education and outreach program**
   Halawa Xeriscape Garden workshops and school education programs

5. **Developing new conservation opportunities**
   Residential rain catchments, storm water impoundments and recycled water

Together, these programs continue to build a stronger water conservation awareness and efficiency ethic for all water users on O‘ahu.

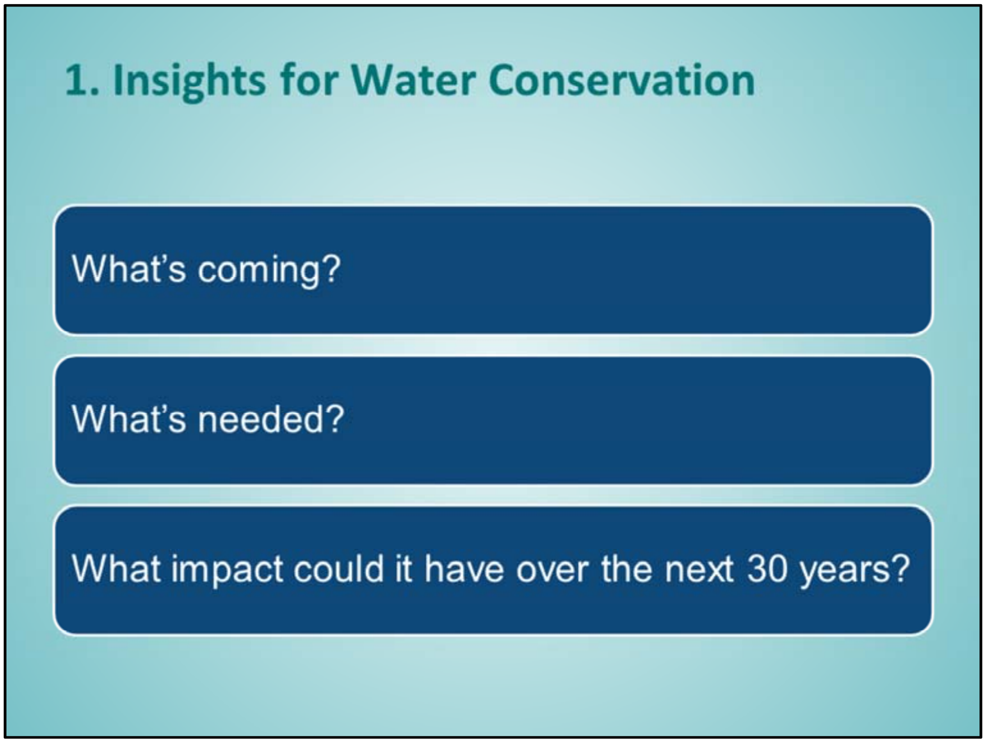


The BWS education and outreach program, led by our Communications Office, has a number of components to build conservation awareness and a water efficiency ethic for the public.



Conservation works.

Water demand on O'ahu has decreased, saving 10 billion gallons annually from 1990 to 2010 despite a steady population increase.



Changes in technologies and practices lead to water conservation successes in Hawai'i and nationwide.

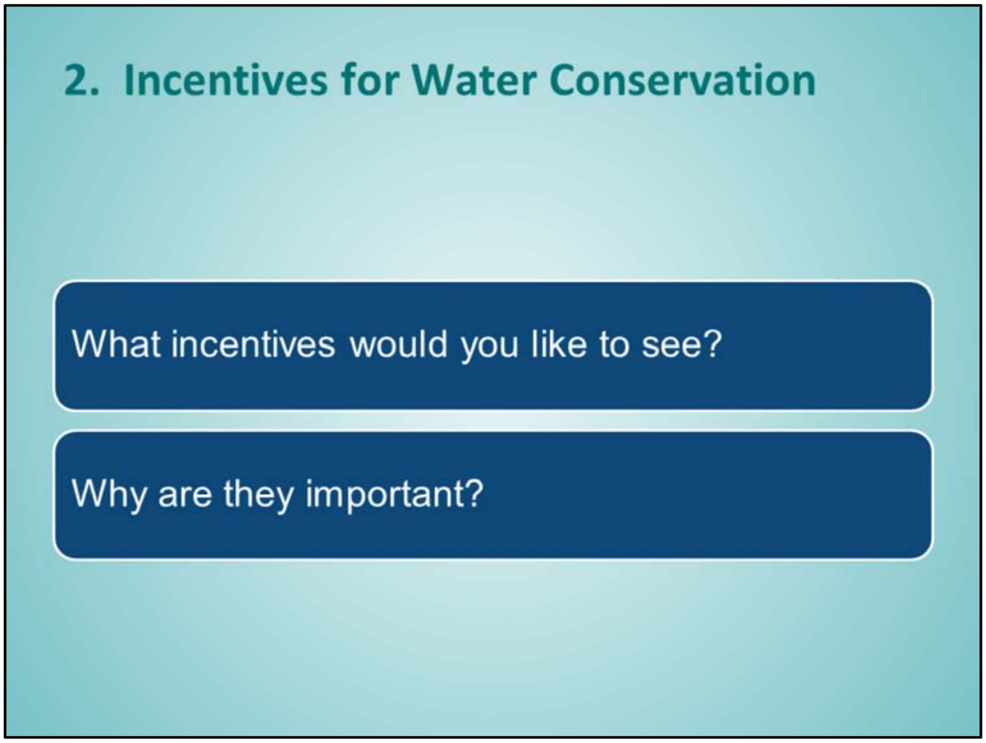
Each of you represents an area of interest with respect to water – restaurants, agriculture, travel/tourism, industry, development, etc.

Please advise us on what you see on the horizon with respect to water conservation and your area of work or interest or location on O'ahu.

What's coming?

What's needed?

What impact might it have on planning for water over the next 30 years?



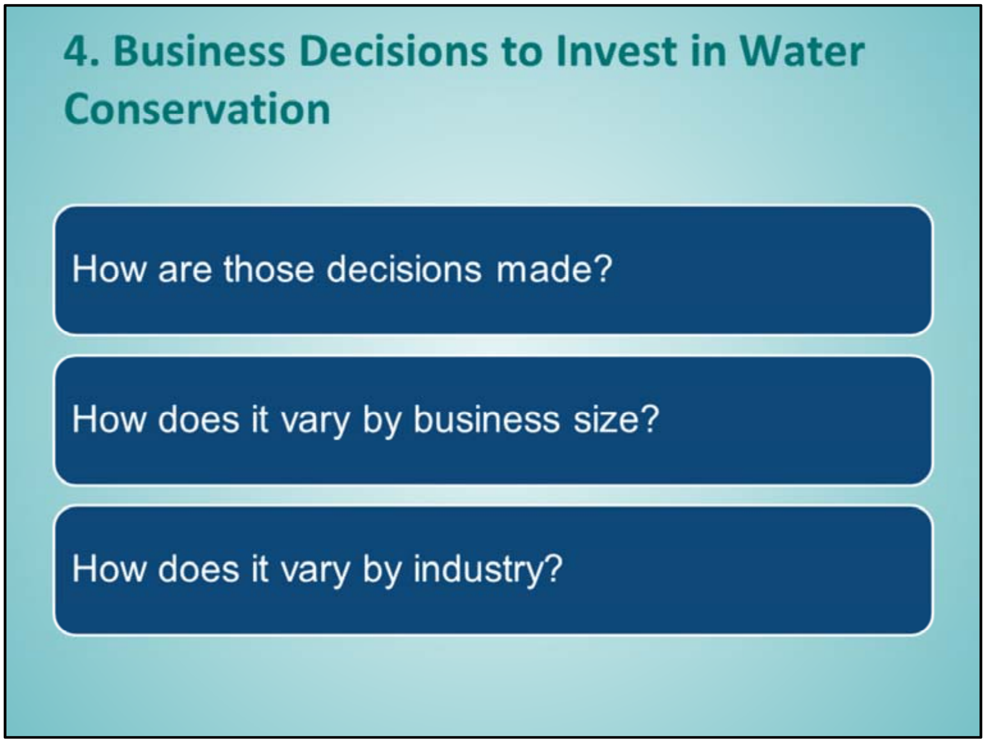
Incentives drive change.

Utilities often create incentive programs to get customers to change to more efficient, more conserving use of resources.

Please advise us on incentives you would like to see, and tell us why you think they are important.

3. Research or Pilot Programs to Increase Water Conservation

- What research could the BWS do?
- Why would it be important?
- Should the BWS do it on its own or should it include partners?



What goes into making business decisions about water conservation?

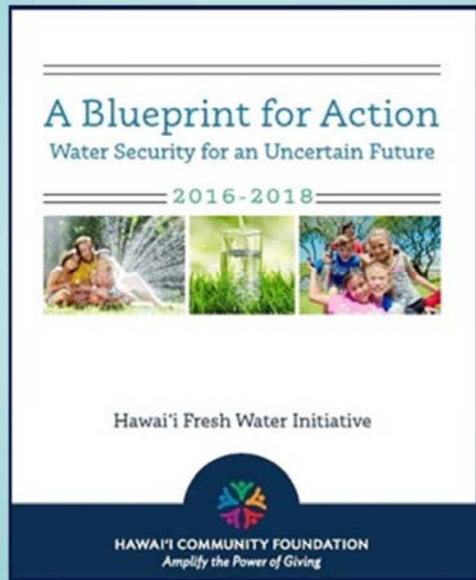
Examples of water conservation projects:
- water features
- pools
- fish ponds
- kitchen equipment
- chilled water air conditioners
- irrigation
- rain catchments/cisterns
- gray water reuse

Do large businesses and small businesses differ in their approaches?

What is unique to:
- agriculture
- land management
- large HOAs
- land developers
- construction
- travel
- restaurants

- golf
- food and beverage
- real estate
- military
- utilities

The Fresh Water Council's Blueprint



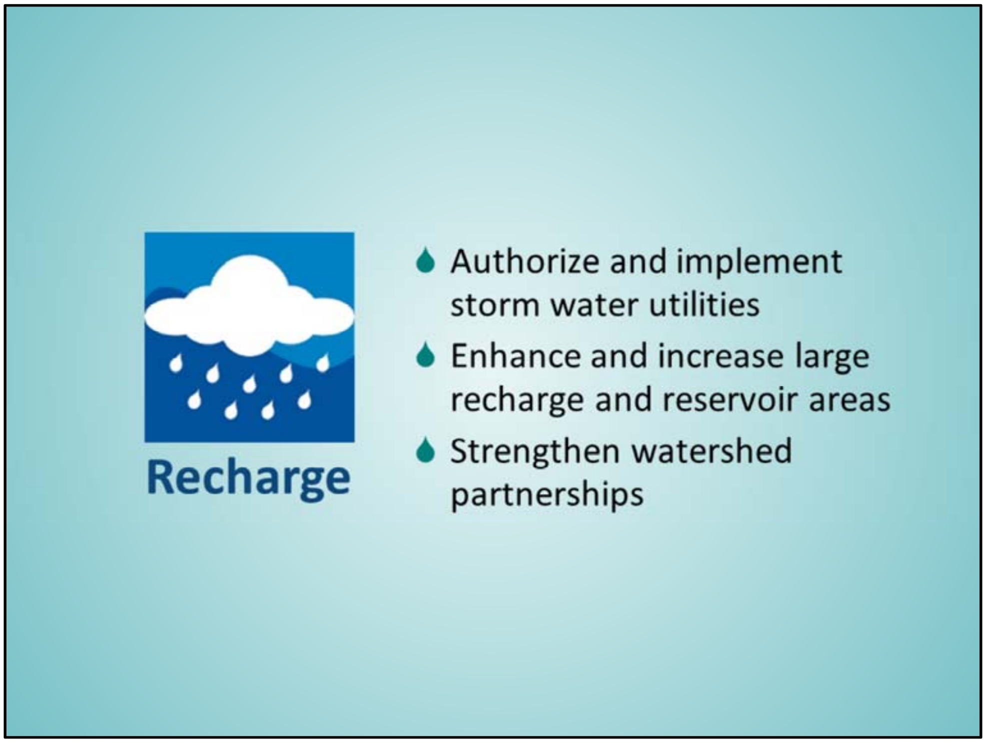
The Blueprint's Vision

Create 100 million gallons per day (mgd) in additional, reliable fresh water capacity for our islands by 2030.

The Blueprint's Strategies

Conserve

- Reduce potable water use on landscaped areas
- Encourage leak detection systems
- Improve agricultural efficiency


Recharge
Authorize and implement storm water utilities
Enhance and increase large recharge and reservoir areas
Strengthen watershed partnerships

Reuse

- Revise water reuse guidelines
- Revise gray water guidelines
- Increase water reuse for large landscaped areas

What are your thoughts regarding BWS's role to implement the strategies in the Blueprint?

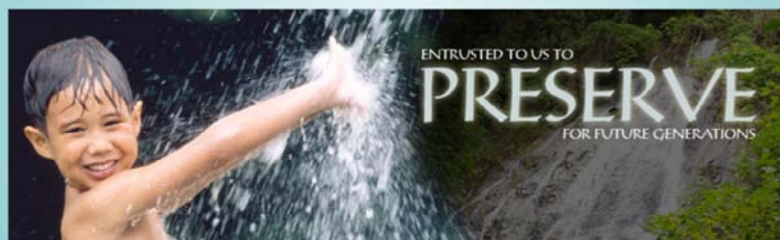
You can talk about implementing one of the 3 strategies or one of the actions for each strategy.

WATER FOR LIFE

Safe, dependable, and affordable water now and into the future

Board of Water Supply

Mahalo! **Questions & Answers**



WATER FOR LIFE

Safe, dependable, and affordable water now and into the future

Board of Water Supply

David Ebersold

Facilitator

SUMMARY AND NEXT STEPS

WATER FOR LIFE

Safe, dependable, and affordable water now and into the future

Board of Water Supply
City and County of Honolulu

Next Meeting Date

- Wed Nov 18, 4:00 - 6:30 pm

WATER FOR LIFE

Safe, dependable, and affordable water now and into the future

Board of Water Supply

Mahalo!