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The Role of Science in Water-Resource Management in Hawaii and the Pacific

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U.S. Department of the Interior
U.S. Geological Survey

SUNDAY 10/6/13 >> HONOLULU STAR-ADVERTISER

Who needs the U.S. Geological Survey? Defining what's essential, what's not

With respect to water resources, USGS real-time rainfall, streamflow, and reservoir water-level monitoring was deemed essential
– Gov't shutdown, 2013

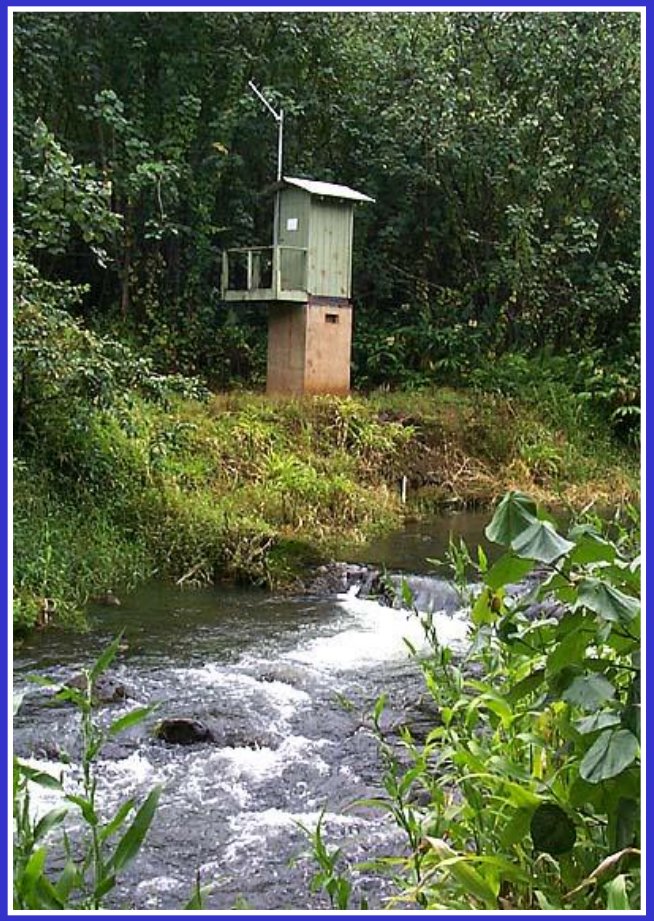
Presentation Overview

- Priority water-related issues and needs for additional scientific information
- Challenges addressing policy questions
- Strengthening the scientific basis for water-resource management decisions

USGS Water Mission

- Provide information to manage, protect, and enhance water resources
- Address water-related hazards
- Non-regulatory role
- Provide information that is reliable, impartial, and timely

Hydrologic Data Collection



- Surface water, groundwater, water quality, and rainfall data
- Nationally consistent methods and online database (NWISWeb)
- 25 Federal, State, and local agencies provide funding to USGS PIWSC

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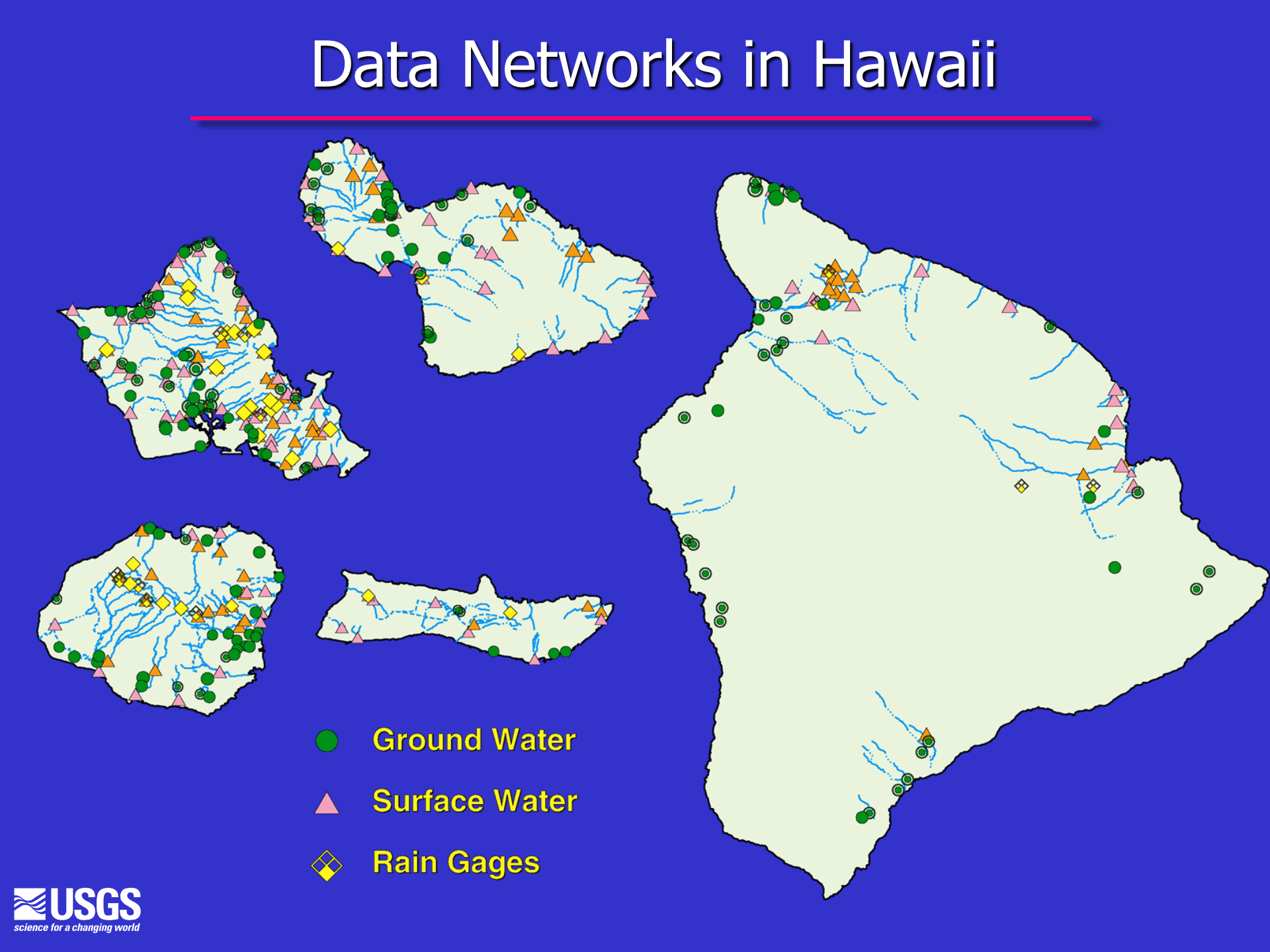
Data Networks in Hawaii



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NWIS Mapper: hi.water.usgs.gov

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Pacific Islands Water Science Center

home | information/data | studies | publications | recent conditions | drought | flood | about | contact

Search the Pacific Islands WSC: Google™ Custom Se Go

DATA CENTER

Current conditions data
- Streamflow
- Groundwater
- Water quality
- Rainfall
- Lake/Reservoir

Historical data
- Streamflow
- Groundwater
- Water quality
- Rainfall
- Annual data reports
- Duration hydrographs
- Instantaneous Data Archive (IDA)

USGS WaterWatch
- Current streamflow

Water Resources of the Pacific Islands

Aloha! Welcome to the USGS Web page for the water resources of Hawaii and the Pacific area. This is your direct link to water-resource information and products for the State of Hawaii, the U.S. Territories of Guam and American Samoa, the U.S. Commonwealth of the Northern Mariana Islands, the Republic of Palau, the Republic of the Marshall Islands, and the Federated States of Micronesia.

Current Streamflow Conditions in Hawaii

Saturday, October 19, 2013 13:30ET

USGS

Explanation - Percentile classes							
Low	<10 Much below normal	10-24 Below normal	25-75 Normal	76-90 Above normal	>90 Much above normal	High	Not ranked

Quick Links to Current Conditions Data:
- Streamflow
- Groundwater
- Water Quality
- Rainfall
- All

Quick Links to Tools:
- NWISMapper--map-based search tool
- USGS WaterNow--on-demand current conditions sent to mobile phone or email
- USGS WaterAlert--receive alert when user-defined threshold is exceeded

Featured Publications

Search our publications

Hydrogeology Journal, 2013 (accessed Jan. 15. 2013)
Estimating Hydraulic Properties from Tidal Attenuation in the Northern Guam Lens Aquifer

National Water Information System: Mapper

Sites | Map

Search

Surface-Water Sites

Active Sites
- Any data
- Instantaneous data
- Daily data
- Water-quality data
- Peak data
- Measurements
- Annual Report

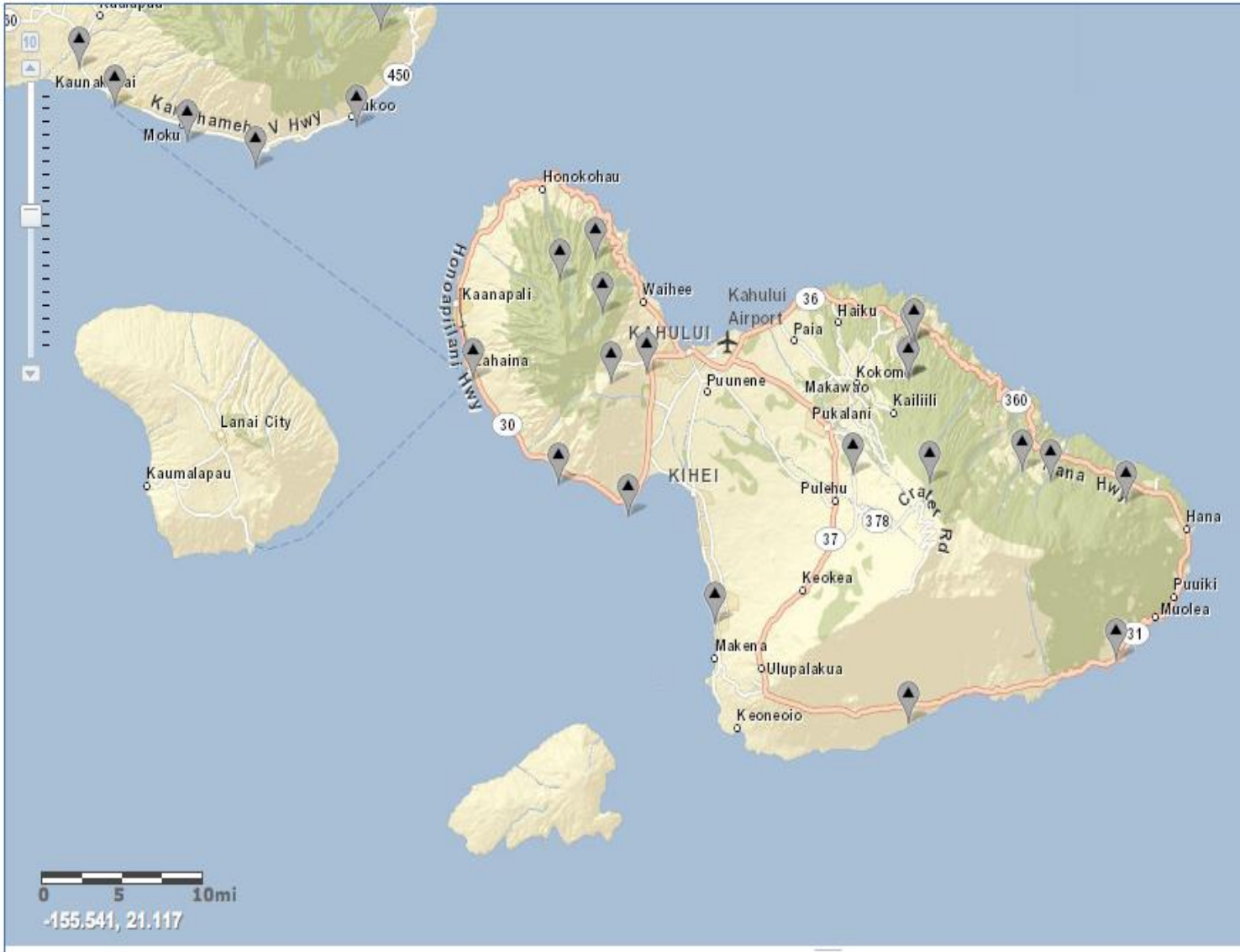
Inactive Sites
- Any data
- Instantaneous data
- Daily data
- Water-quality data
- Peak data
- Measurements
- Annual Report

Groundwater Sites

Springs

Atmospheric Sites

Other Sites



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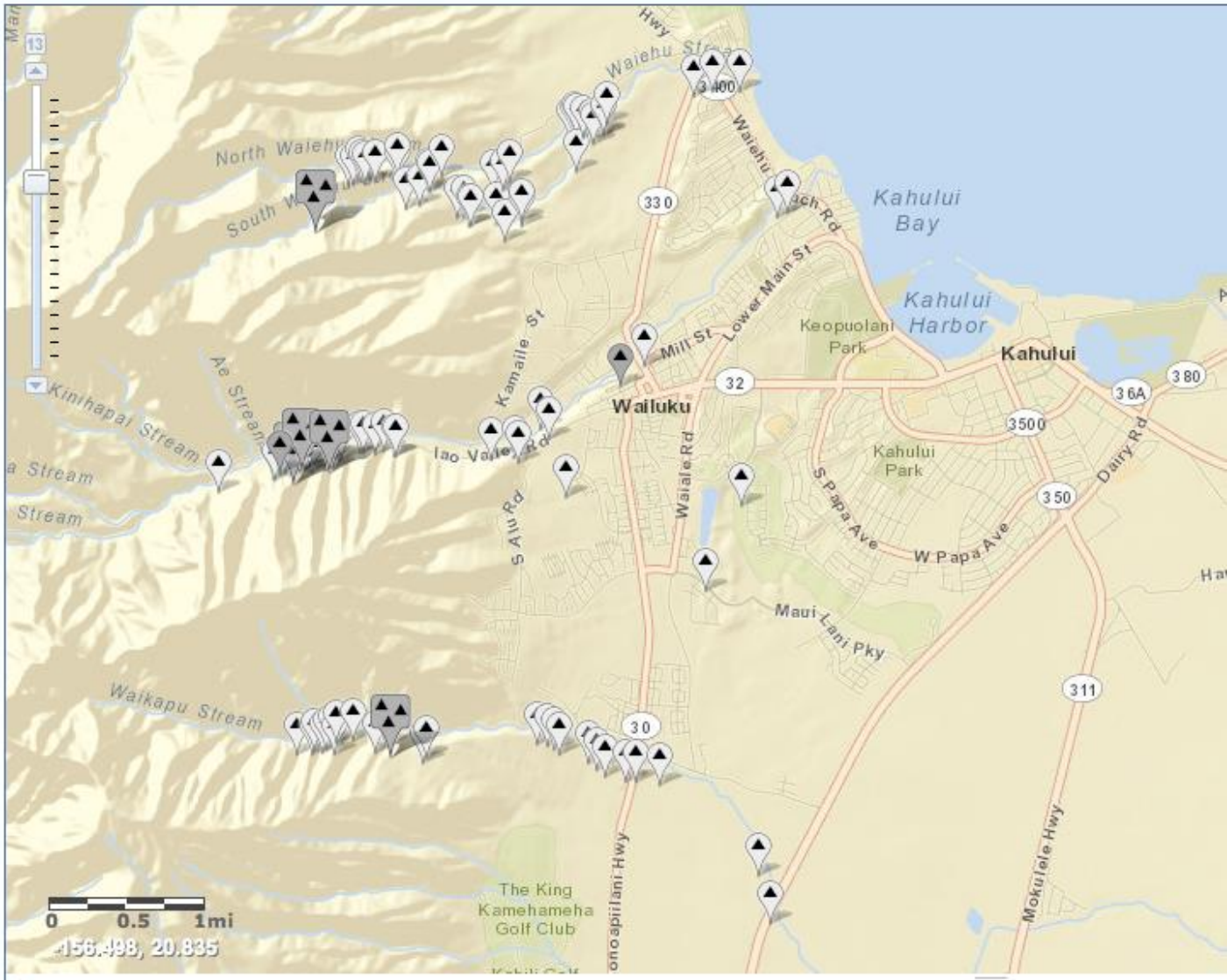

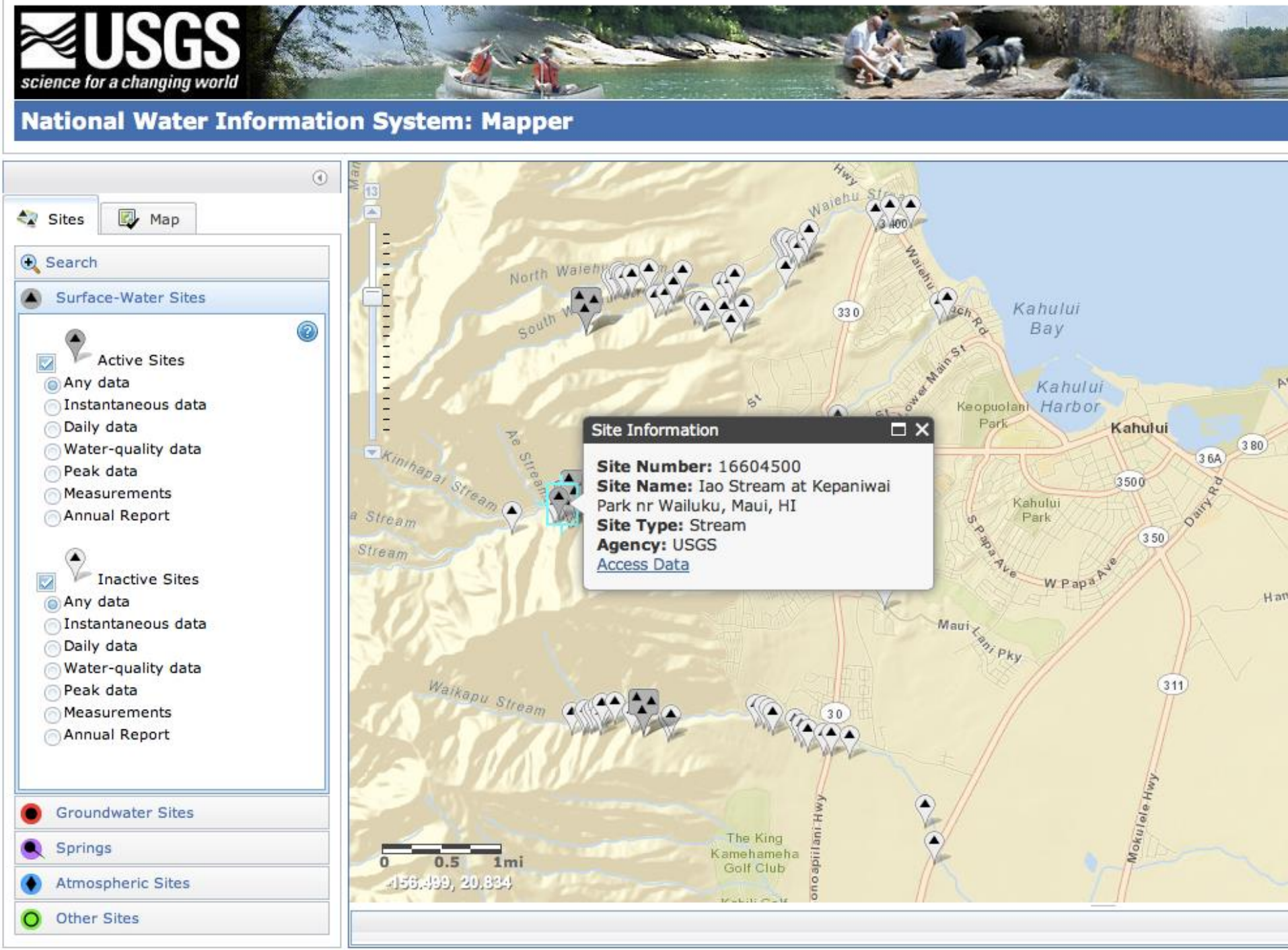
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Measurements
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Groundwater Sites
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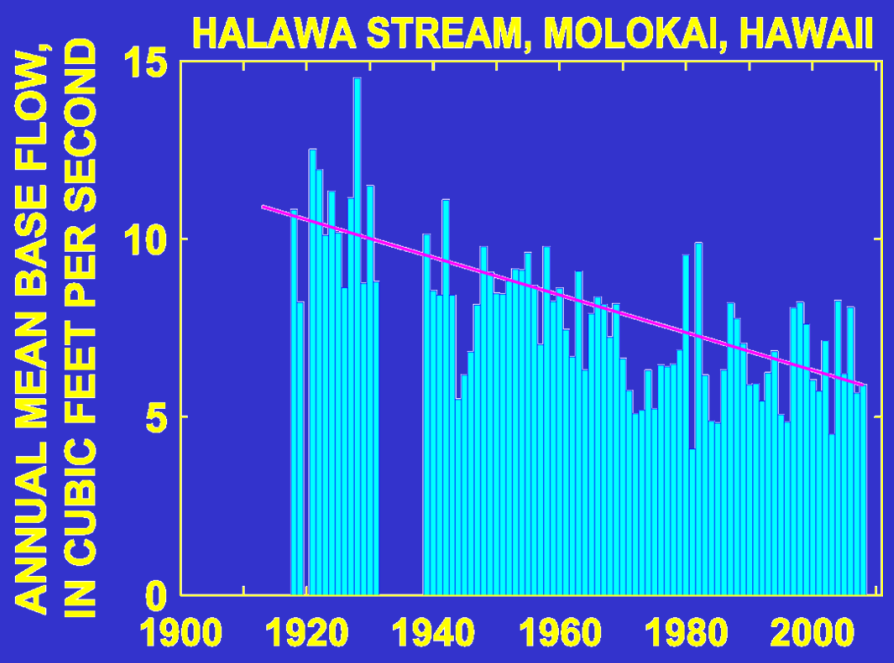
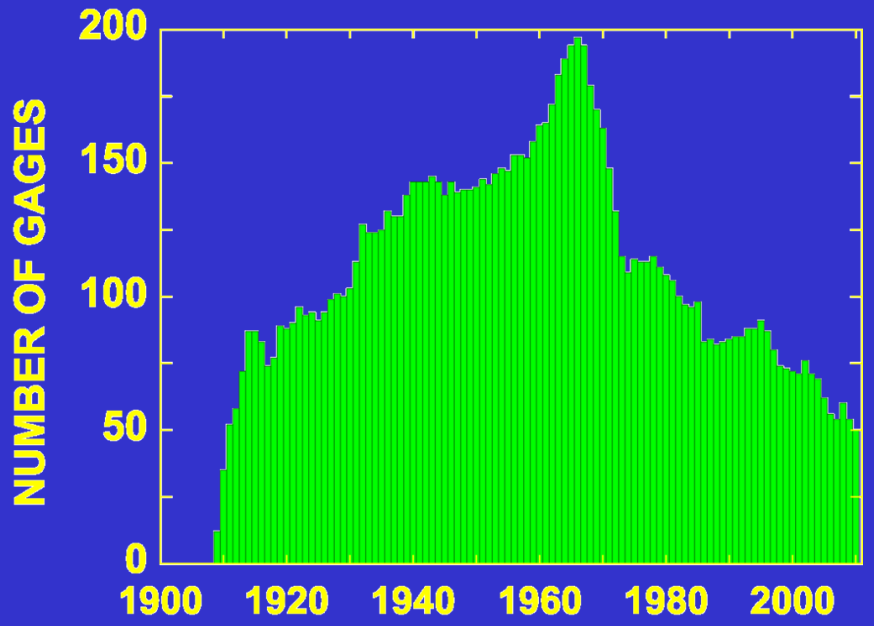
Other Sites
Site Information
Site Number: 16604500
Site Name: Iao Stream at Kepaniwai Park nr Wailuku, Maui, HI
Site Type: Stream
Agency: USGS
Access Data
Kahului Bay
Kahului Harbor
Kahului
Keopuolani Park
Kahului Park
Waiehu Stream
North Waiehu
Kinihapai Stream
Waikapu Stream
Maui Lani Pky
W Papa Ave
S Papa Ave
Dairy Rd
Mokulele Hwy
The King Kamehameha Golf Club
0 0.5 1mi
-156.499, 20.834

Long-term Monitoring is Critical for Assessing Effects of Climate Change on Water Resources

- Statistically significant downward trends in natural groundwater discharge (base flow) detected at all 7 long-term stations in Hawaii
- Declines in base flow are consistent with declining rainfall
- Further declines in the number of streamflow gages in Hawaii will make it difficult to assess effects of climate change on groundwater resources





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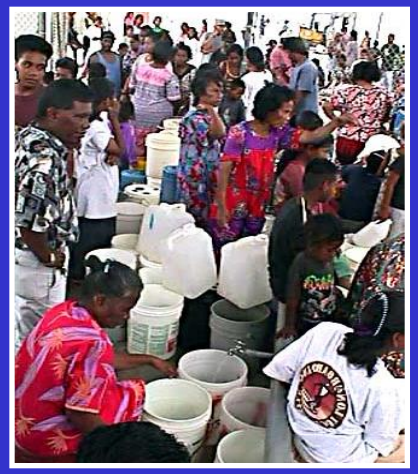
Water Related Issues

- Climate variability
- Groundwater availability
- Quantity and variability of streamflow
- Water quality related to land use

Photograph by Carl Evensen, UH



FEMA photograph by Angel Santiago

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Climate Variability

- Because of their small size and limited storage of water, islands are particularly sensitive to variations in climate
- Effects on water supplies can be severe for islands that depend on rainfall or surface-water runoff
- Atolls and some high islands in the Pacific are extremely vulnerable

Majuro Atoll, RMI

Saltwater inundation, Chuuk, FSM

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Rainfall/Runoff Modeling: Fena Reservoir, Island of Guam

- Monthly status of reservoir stage and storage
- Model prediction of reservoir stage and storage using ENSO rainfall forecast (6 month) and current reservoir stage

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Groundwater Availability

- Exploratory drilling
- Data collection
- Water budgets
- Modeling to assess resource sustainability

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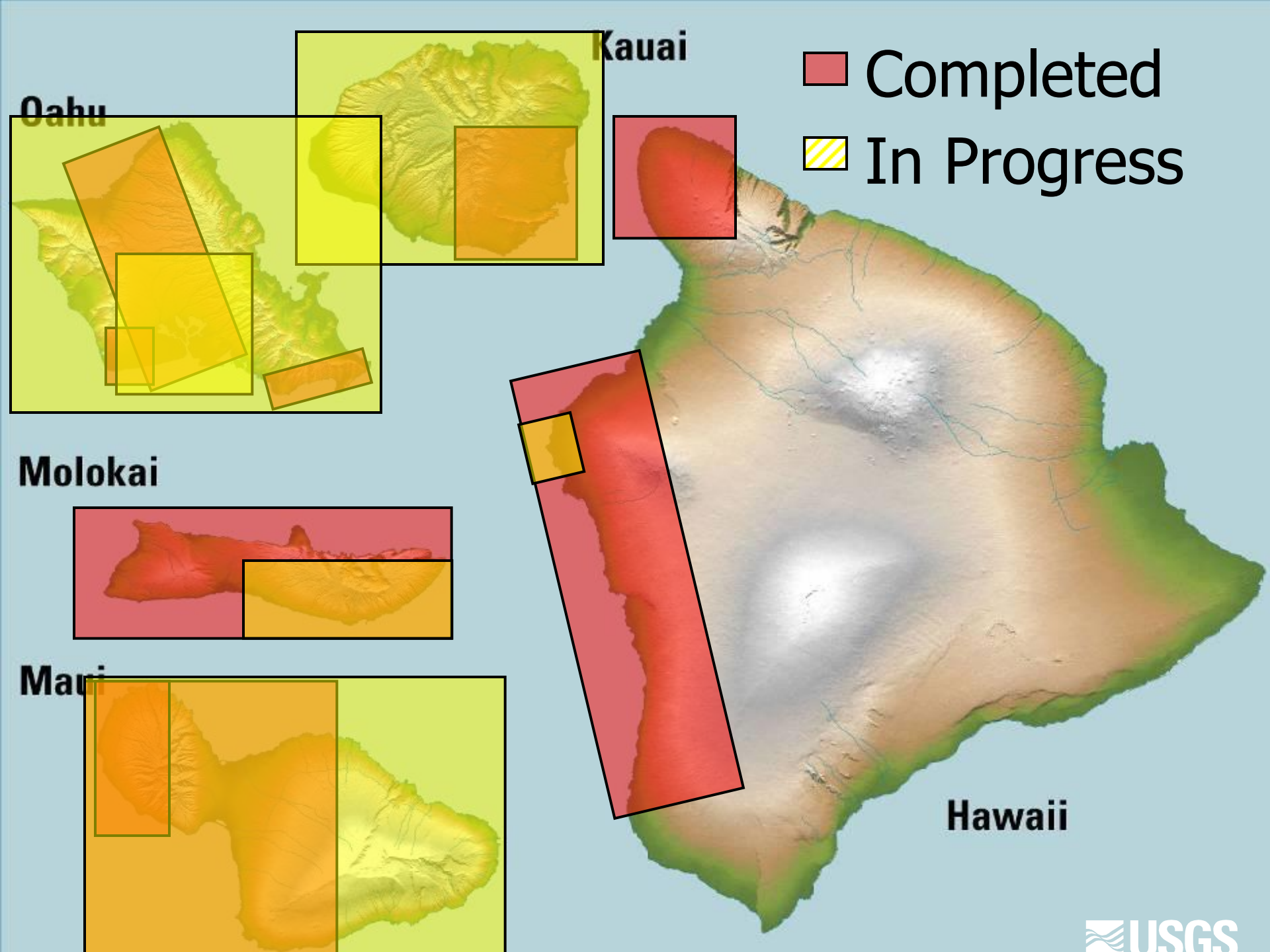
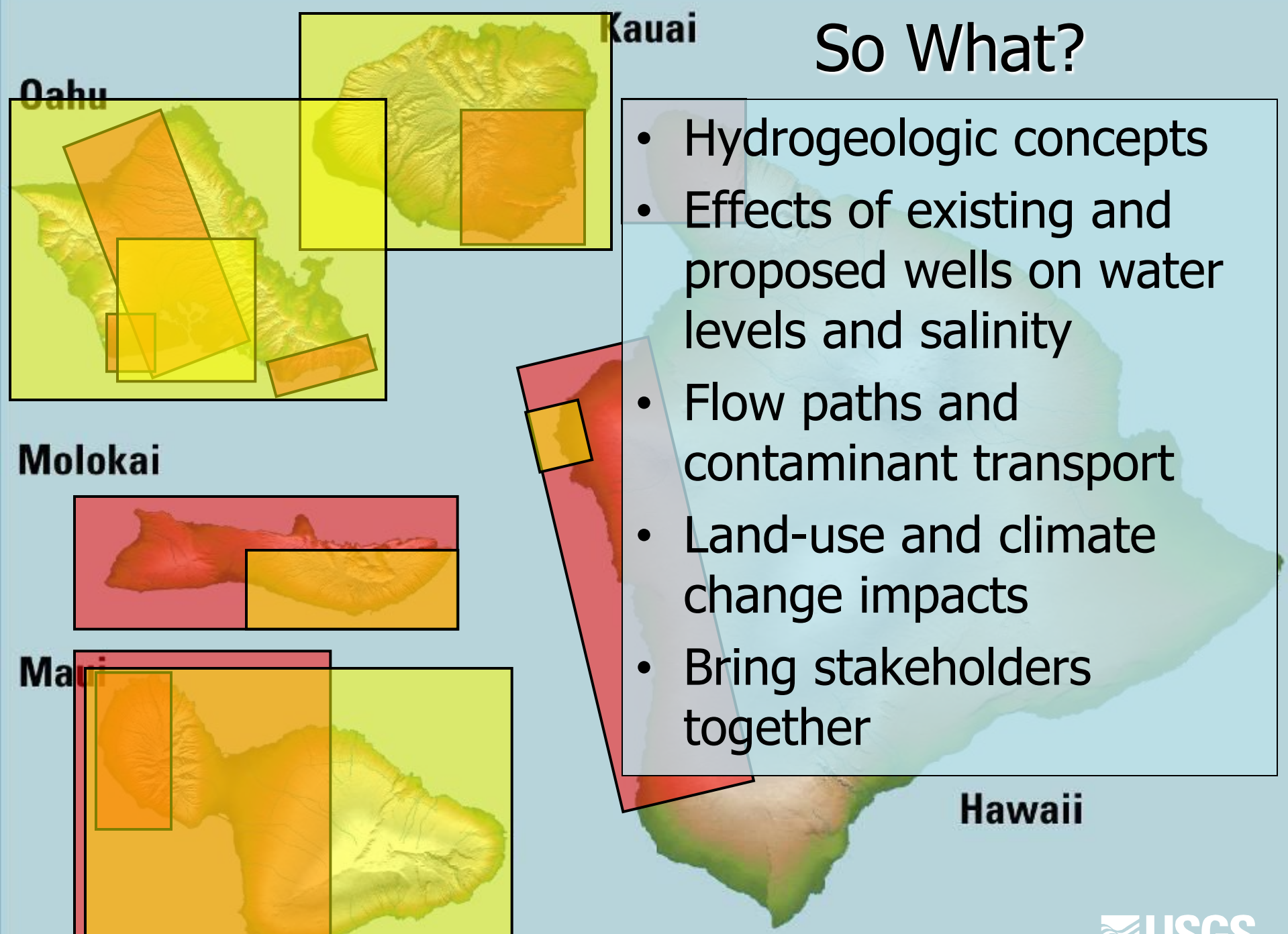

Kauai
Oahu
Completed
In Progress
Molokai
Hawaii
USGS



So What?

- Hydrogeologic concepts
- Effects of existing and proposed wells on water levels and salinity
- Flow paths and contaminant transport
- Land-use and climate change impacts
- Bring stakeholders together

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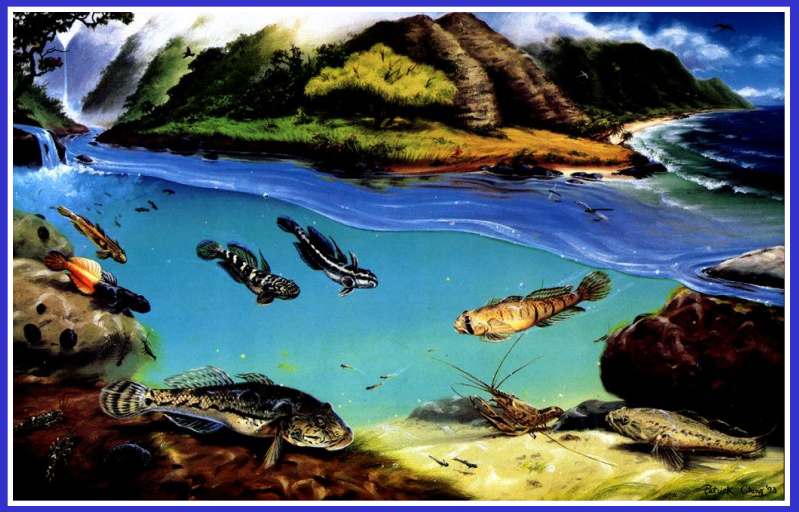
Quantity and Variability of Streamflow

- Flooding hazard
- Diversion for water supply
- Aquatic ecology



From Hawaii State Department of Land and Natural Resources, http://state.hi.us/dlnr/dar/streams.html, Oct. 2013

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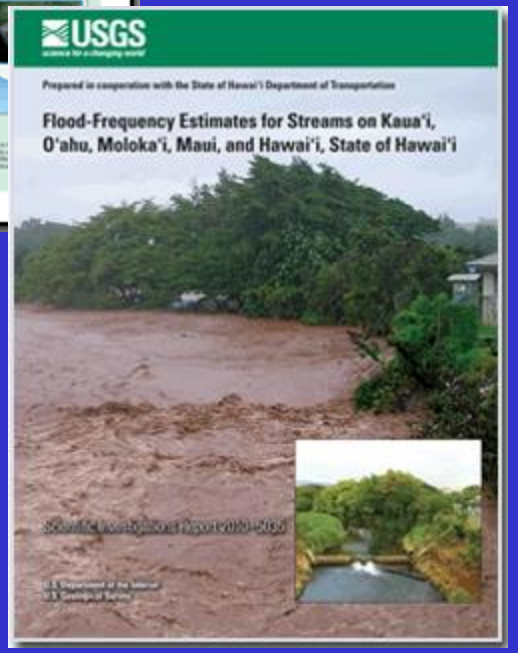
Flood Frequency Estimates – StreamStats

- Regional regression equations for estimating frequency and magnitude of peak flows at any location on a stream
- Hawaii StreamStats - provides a simple, fast, and reproducible method to estimate flows
- Useful for emergency management, planning, and public works agencies
- Cooperator: Hawaii Dept. of Transportation



Effects of Surface-Water Diversions

- Effects of diversions on streamflow, recharge, physical habitat, and temperature, central Maui
- Information needed to develop instream flow standards
- Cooperators: CWRM, MDWS, MOED, and OHA

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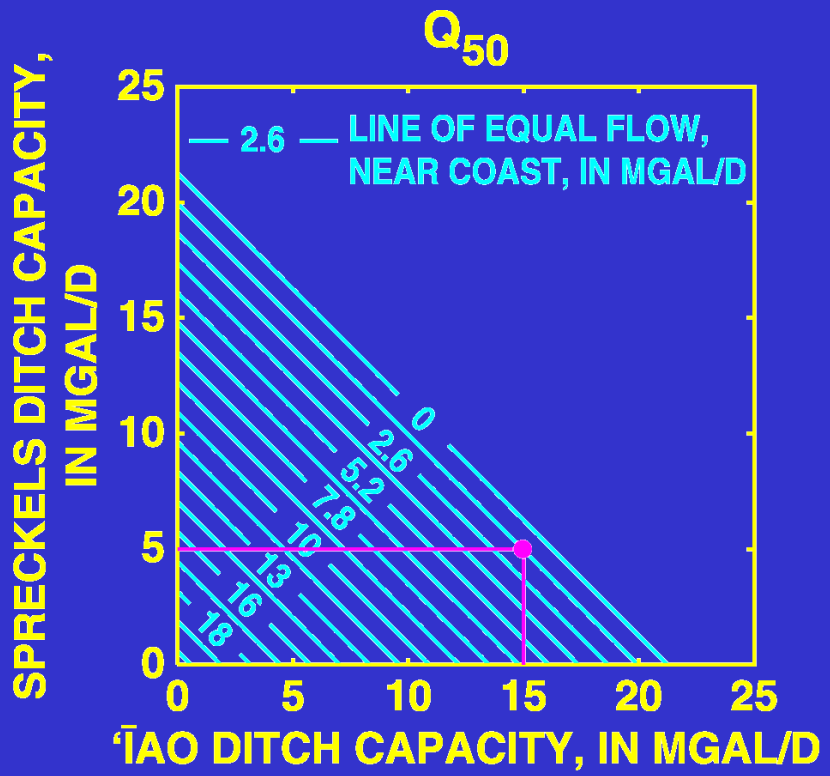
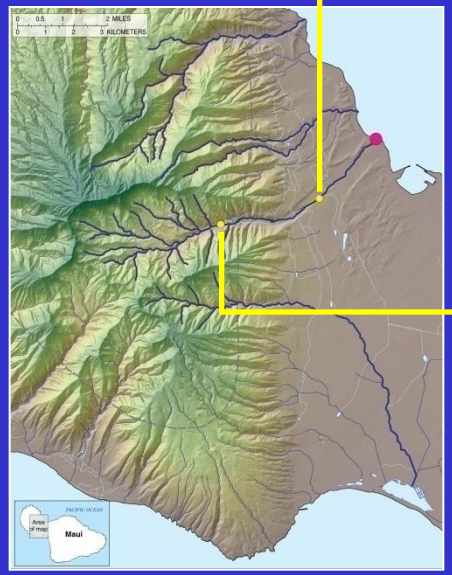
Effects of Diversions on Streamflow





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Land-Use Change

Plantation Agriculture

Diversified Agriculture

Suburban Development

Driver for water-use and water-quality changes

Challenges of Addressing Policy Questions

- Scientific analysis often complex and difficult to understand
- Scientists fear their objectivity might be questioned and their information will be misused
- Scientific input may not fully address decision maker's needs
- Scientific information may not be complete or timely enough
- Scientists often disagree

Strengthening the Scientific Basis for Water-Resource Management Decisions

- Establish regular channels of communication with stakeholders
- Integrate cultural, social, economic, and environmental factors when appropriate
- Use scientifically accepted methods (incl. peer review)
- Be clear about assumptions, limitations, and uncertainty
- Ensure equal and timely release of information
- Provide clear, understandable, and actionable information

Questions?