



Overview of USGS Water-Quality Programs in Hawai'i

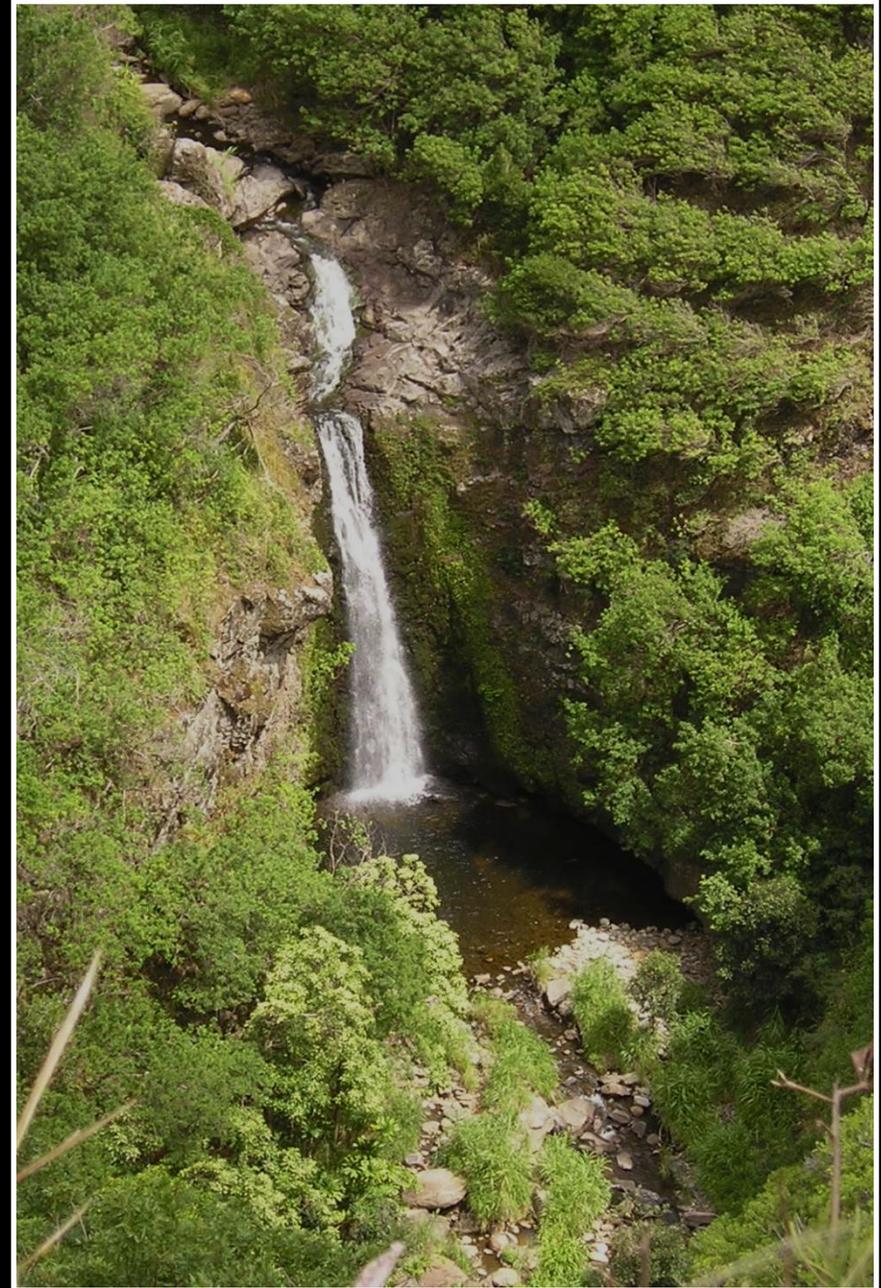
Steve Anthony, Director

USGS Pacific Islands Water Science Center

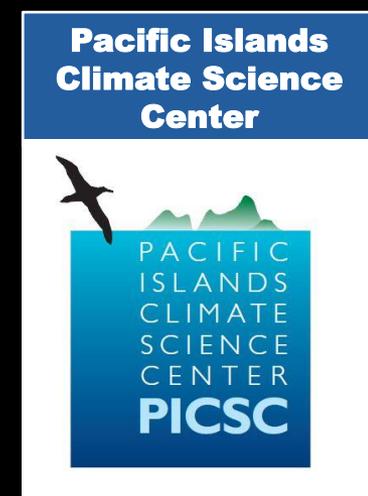
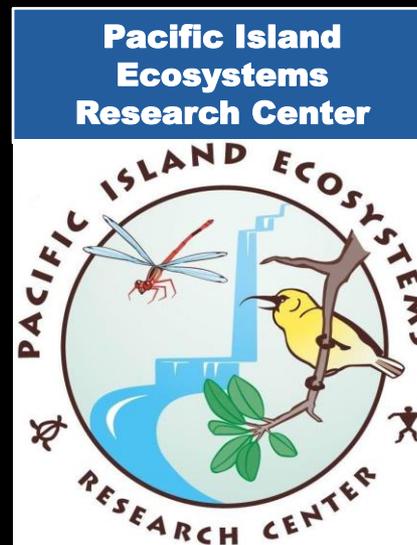
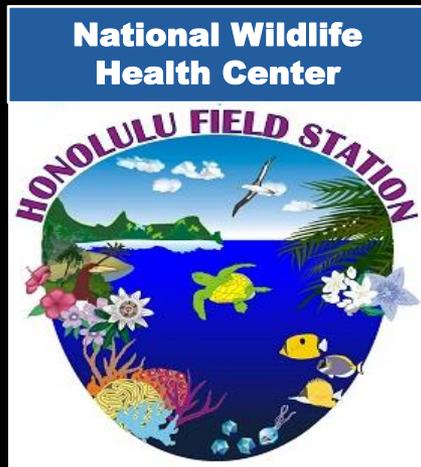
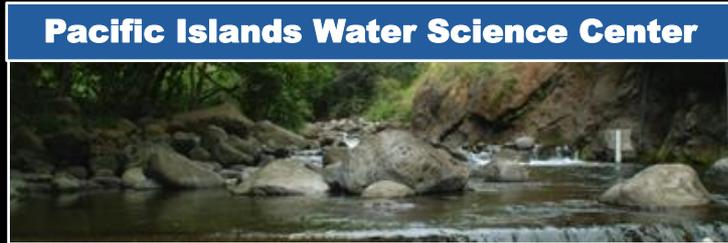
Briefing for the Hawai'i Ocean Resources
Management Plan Coordinated Working Group

October 4, 2018

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



USGS – Hawai‘i



USGS Pacific Islands Water Science Center

- Geographic scope – State of Hawai'i and USAPI
- Funding – \$5.8M in Federal fiscal year 2018
 - 25 Federal, State, County and private entities (\$4.2M)
 - USGS Cooperative Matching Funds (\$1.1M)
 - USGS Water Programs (\$0.5M)

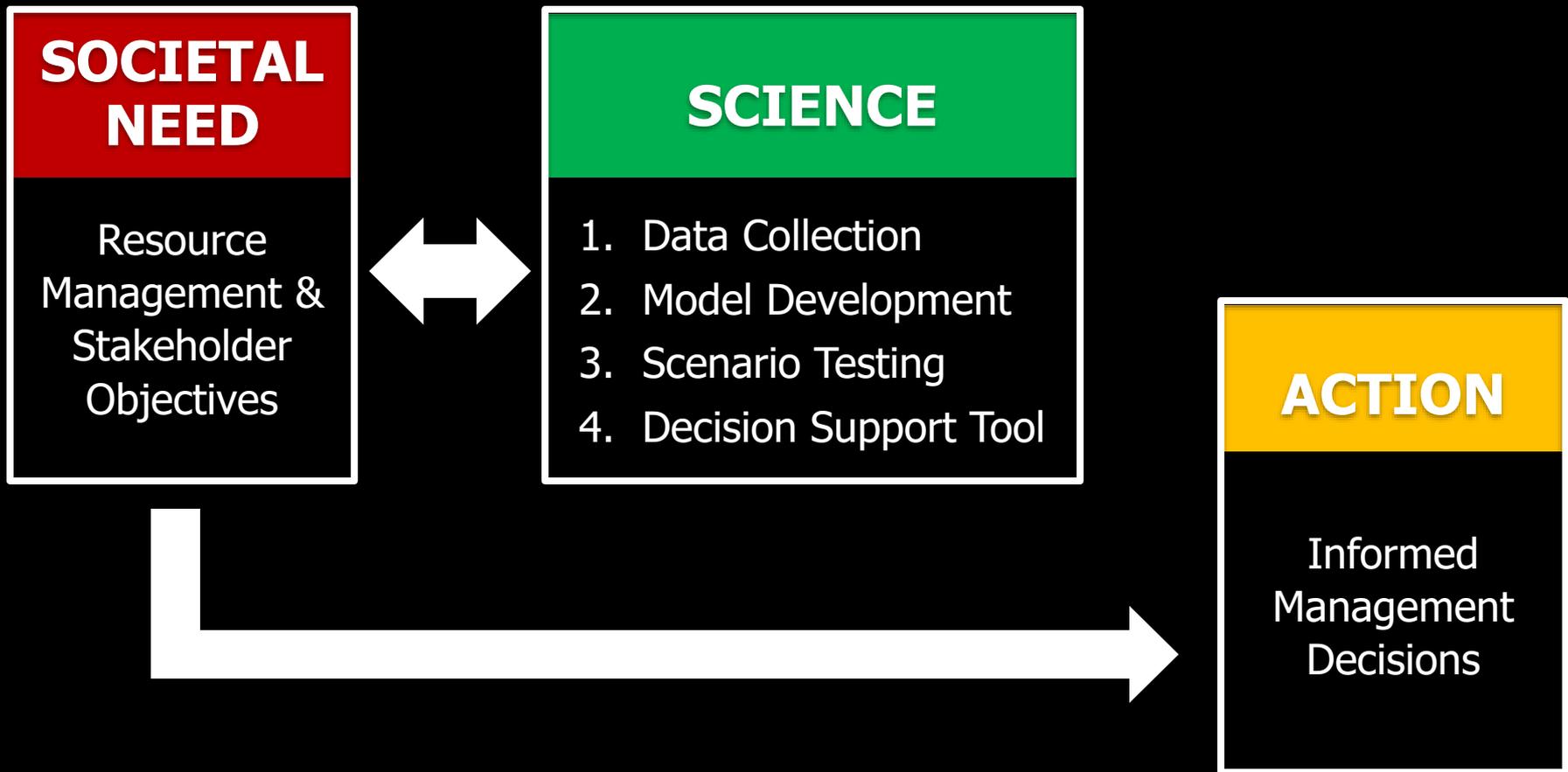


Collocated with NOAA at Inouye Regional Center on Ford Island

USGS Water Mission

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

Process for Developing Actionable Science



Hydrologic Data Collection

- USGS has been collecting hydrologic data in Hawai'i since the early 1900s
 - Reference sites to assess effects of climate change on water availability
 - Water-resource management sites to assess effects of land- and water-use change
 - Flood-alert and peak-streamflow sites to help protect life and property
- NWISWeb – online database that provides access to USGS rainfall, streamflow, groundwater, and water-quality data



Hydrologic Studies – Focus Areas

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

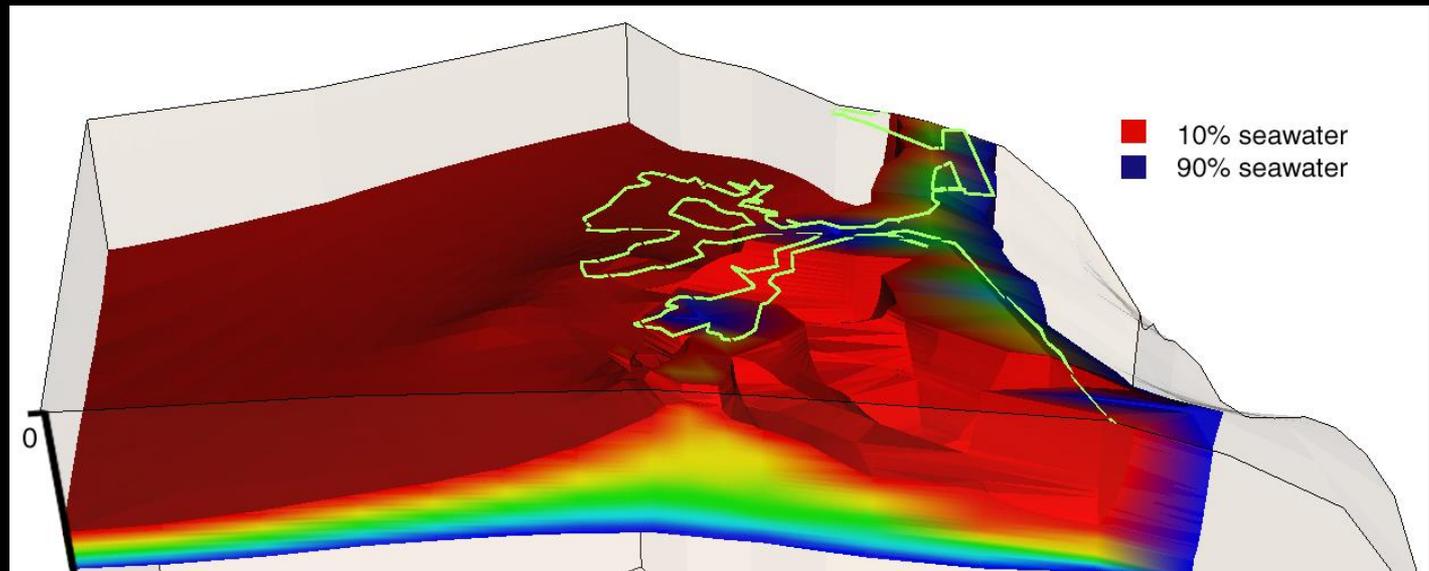


Climate variability and change is an overarching theme



Groundwater Availability

- Water budgets for estimating impacts of climate and land-use change on groundwater recharge
- Numerical groundwater models for estimating changes in salinity, and groundwater discharge to streams and nearshore ecosystems



Quantity and Variability of Streamflow

- Low-flow availability studies designed to provide estimates of natural low-flow characteristics needed to define instream-flow standards
- Watershed-modeling studies designed to assess the effects of climate and land-cover change on streamflow

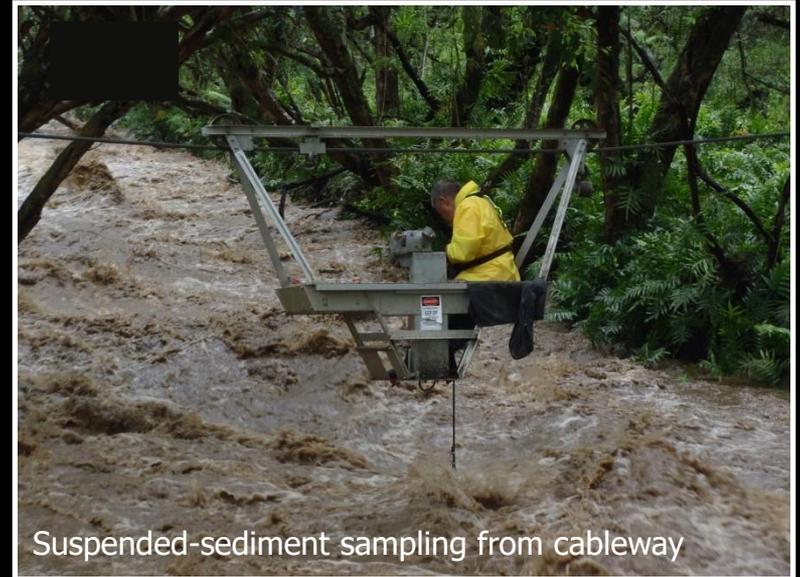


Water Quality Related to Land Use

- Suspended-sediment and nutrient monitoring of streams on O'ahu
- Pesticide monitoring of surface water in the State of Hawai'i
- Development of a source-tracking toolbox for identifying sources of nutrients and wastewater constituents in water



Diversified agriculture and suburban development



Suspended-sediment sampling from cableway

Suspended-Sediment and Nutrient Monitoring of Streams on O'ahu

- Collaborative effort with City and County of Honolulu, Department of Facilities Management, Storm Water Quality Branch
- Collect streamflow, suspended-sediment, turbidity, nutrient, and total suspended solids information
- Needed to evaluate source allocations developed as part of the Total Maximum Daily Loads (TMDLs) analysis undertaken by the State of Hawai'i Department of Health

Watersheds with Suspended-Sediment and Nutrient Monitoring Sites on O'ahu

- Ala Wai, Waimānalo, Kāwā, and Kāne'ōhe watersheds (8 sites)
- Honouliuli, and Kalo'i watersheds (3 sites)
- Waikele watershed (3 sites)
- Kaukonahua watershed (4 sites)

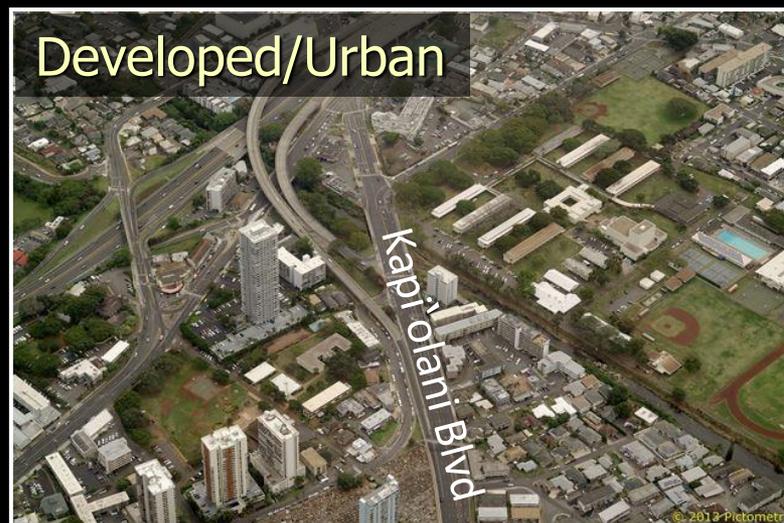
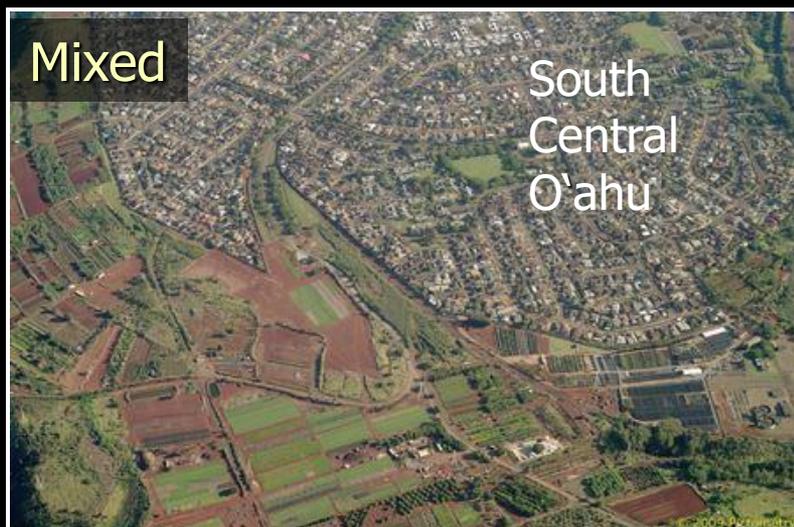
Pesticide-Monitoring of Surface Water in the State of Hawai'i

- Collaborative effort with the State of Hawai'i Department of Agriculture and Department of Health
- Assess the occurrence and distribution of current-use pesticides in surface water in Hawai'i
- Collect water samples at targeted sites
- Provide quality-assured sample results through USGS online data repository
- Compare results to established Federal and State water-quality standards and aquatic-life benchmarks

Scope and Initial Objectives



Collect samples at targeted sites that receive runoff from different types of land uses



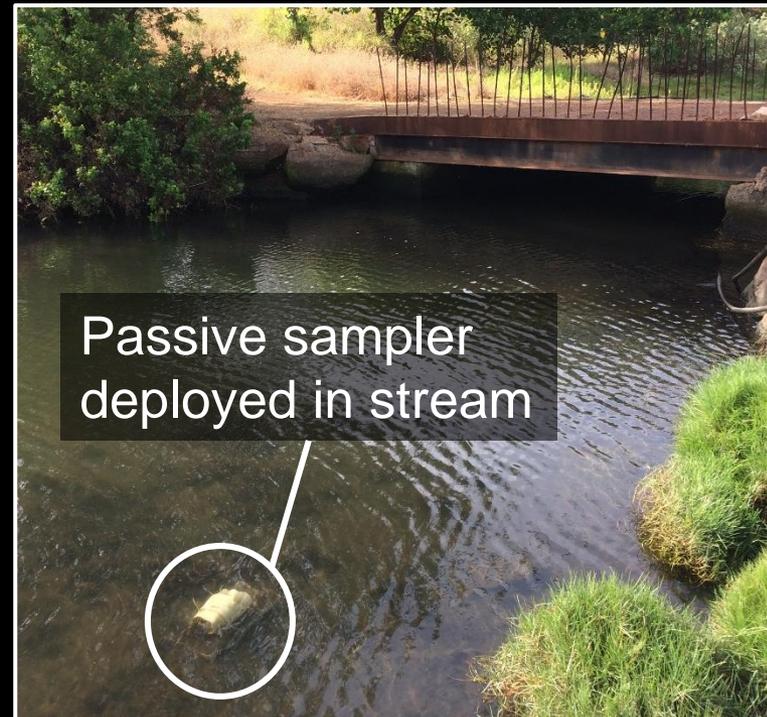
Scope and Initial Objectives – Cont.

Collect samples during different flow conditions



Scope and Initial Objectives – Cont.

Deployment of passive samplers in perennial streams to understand the consequences of prolonged pesticide exposure to aquatic life



Laboratory Analyses for Pesticides

- Samples analyzed at USGS National Water-Quality Laboratory
- 225 current-use pesticides
 - 123 herbicides
 - 87 insecticides
 - 15 fungicides
- Pesticides can be detected at trace levels (parts per trillion), commonly 10 to 10,000 times lower than human-health and aquatic-life benchmarks

1 part per trillion =
~1 water drop in 12 of these:



Questions to Answer

- Which current-use pesticide compounds are present in surface water at each site?
- How do concentrations of pesticides in surface water compare with Federal and State water-quality standards and aquatic-life benchmarks?

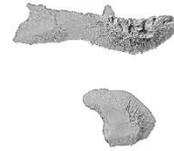
Progress, 2016–present



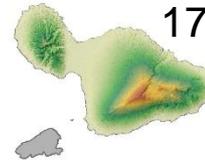
Kaua'i:
2016–present
27 samples at 15 sites



O'ahu:
2016–present
35 samples at 24 sites



Maui:
2018–present
17 samples at 13 sites



Hawai'i Island:
2018–present
15 samples at 15 sites

Quality-assured results for water samples collected on Kaua'i and O'ahu during 2016–17 were published in March 2018

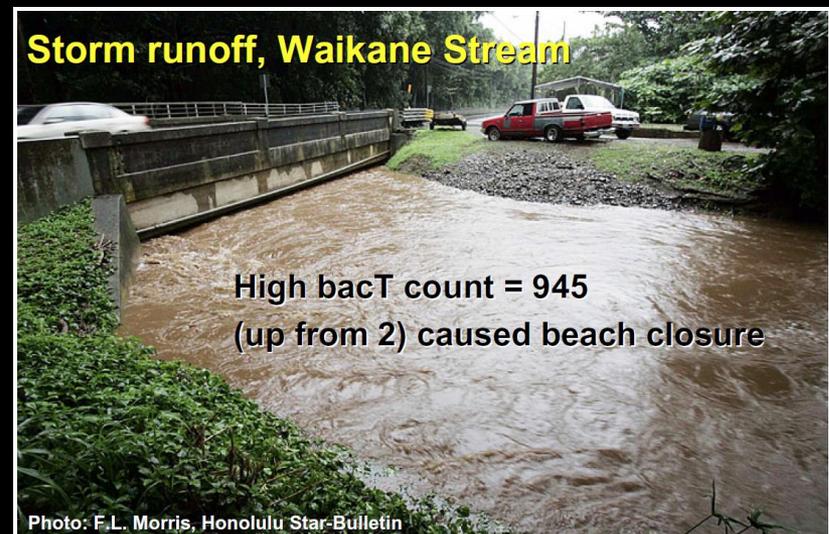
Summary of Pesticide Results for Kaua'i and O'ahu Water Samples, 2016–17

- Water at most sites contained multiple pesticide compounds
- On average, high-flow samples had nearly three times as many pesticides detected than low-flow samples
- No Hawai'i toxicity standards were exceeded
- No Federal human-health standards or benchmarks were exceeded
- Federal aquatic-life benchmarks were exceeded in a few instances:
 - Imidacloprid in three streams on O'ahu
 - Flubendiamide and simazine in one stream on O'ahu

From Johnson and Kennedy (2018), available at <https://doi.org/10.5066/F7BG2N79>

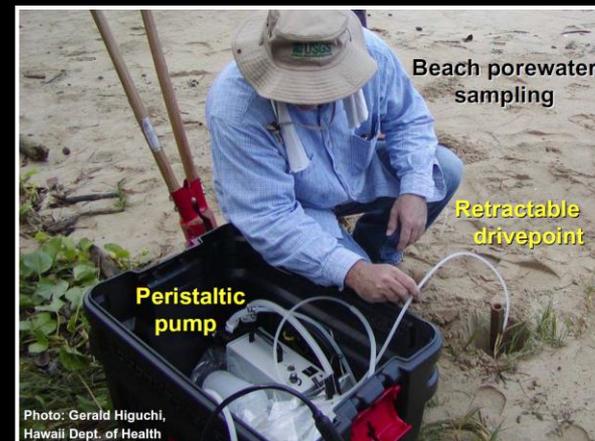
Source-Tracking Toolbox for Identifying Sources of Nutrients and Wastewater Constituents in Water

- State of Hawai'i Department of Health periodically detects high bacteria counts and nutrients at beach monitoring sites, and continues to ask if human wastewater is also present at these sites



Tiered Strategy

- USGS is developing a tiered strategy that progresses from least expensive reconnaissance mapping to more expensive and potentially more diagnostic laboratory analyses
 - Trolling instrument surveys of water temperature and salinity
 - Reconnaissance-level water sampling for fabric brighteners
 - Targeted sampling for multiple chemical tracers: nutrients, stable isotopes of nitrogen and oxygen in dissolved nitrate, and pharmaceutical and wastewater compounds



Mahalo to Our Current Funding Partners

