



HAWAII STATE
DEPARTMENT
OF HEALTH



**2018 JOINT GOVERNMENT
WATER QUALITY CONFERENCE
KONA, HAWAII
AUGUST 21, 2018**



**INTERAGENCY
COLLABORATIONS:
ASSESSING PESTICIDE
OCCURRENCE AND DISTRIBUTION
IN HAWAII**

**FENIX GRANGE
HAZARD EVALUATION AND EMERGENCY RESPONSE OFFICE
HAWAII STATE DEPARTMENT OF HEALTH**

A Little History



Public debate, changing landscapes and land uses, county regulations, lawsuits, conflicts and widely differing perceptions about impacts of large agribusiness operations on health of local communities and ecosystems.

Are currently used pesticides moving off site at levels of concern?

CWB surface water monitoring program does not routinely monitor for pesticides

USGS Studies on Oahu



Ground-Water Quality and its Relation to Land Use on Oahu, Hawaii, 2000–01

U.S. Department of the Interior
U.S. Geological Survey
Water-Resources Investigations Report 03-4305



Distribution of volatile organic compound mixtures in ground water.

NATIONAL WATER-QUALITY ASSESSMENT PROGRAM



Water Quality on the Island of Oahu Hawaii, 1999–2001



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

Circular 1239

2000-2001 USGS Studies on Oahu



Study on Oahu showed a clear connection between land use and pesticide detections in streams and ground water

Urban areas and agricultural areas had very different “fingerprints”

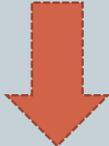
Residues of pesticides used on sugar cane, pineapple and golf courses detected in ground water and surface water

Multiple household pesticides detected in urban streams

Initial Collaboration 2013



Sharing expertise and digging up resources

- DOH HEER Office and Clean Water Branch \$25K
 - Department of Agriculture \$25K
 - USGS Training, Technical Support and Laboratory Analyses \$45K in kind
- 
- 2013-14 Statewide WQ Snapshot Pilot Study

2013-14 Pilot Study Design



- 24 locations
- Compared land uses with differing pesticide uses
- Small perennial streams or water bodies
- Winter sampling, dry period
- One time “snapshot” sampling– not representative of average conditions or other times of year
- Looked for broad range of currently used pesticides– 136 different compounds in water, 121 in sediments
- Very low detection limits

Key Findings Statewide



- Atrazine in 23 of 24 locations tested
- Lots of trace level detections, few near benchmarks
- No currently used pesticide exceeded water quality standards
- No currently used pesticide exceeded drinking water standards.
- Clear land use fingerprints
- Urban streams and large agriculture

Key Findings Hawai'i Island



- Fewer pesticides detected on Hawaii Island (range 5-7) v. Oahu and Kauai (up to 20)
- Four Hamakua Coast streams
 - Atrazine at all sites consistent with historic use
 - Alia Stream also had atrazine in sediments
 - Kapehu Stream had two fungicides in sediment and 1 in water
- Two anchialine ponds on Kona side adjacent to golf courses
 - One trace detection of insecticide chlorpyrifos

Pilot Study Data Gaps and Findings



- Snapshot approach affected comparability and lack assessment of impacts over time
- Flow conditions not considered
- Sampling did not consider application periods
- Lack of perennial streams/suitable sites for key ag areas on Oahu and Maui
- Limited glyphosate sampling detected widespread, low concentrations - ubiquitous, but not a risk
- Sediment data less helpful than water samples

Evolution 2015 -18



- DOH & DOA chose ongoing collaboration
- Kauai Joint Fact Finding Group expanded focus
- 2016 & 2017 Legislatures funded work through 2019
- Expanded WQ partnership
 - USGS experts: primary study design, mgmt and field ops
 - DOA Pesticides provides focus areas, pesticides of concern
 - HEER provides toxicology and study design assistance
- Trends by site, land use, flow conditions, pesticide regs
- Follow up sampling where exceedances occur
 - ✓ Add assessments over time



Pesticide-Monitoring Program of Surface Waters in the State of Hawai'i

Steve Anthony, Director
USGS Pacific Islands Water Science Center

Briefing to the Hawai'i State Legislature
December 11, 2017

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



This information is preliminary or provisional and is subject to revision. It is being provided to meet the need for timely best science. The information has not received final approval by the U.S. Geological Survey (USGS) and is provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the information.

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

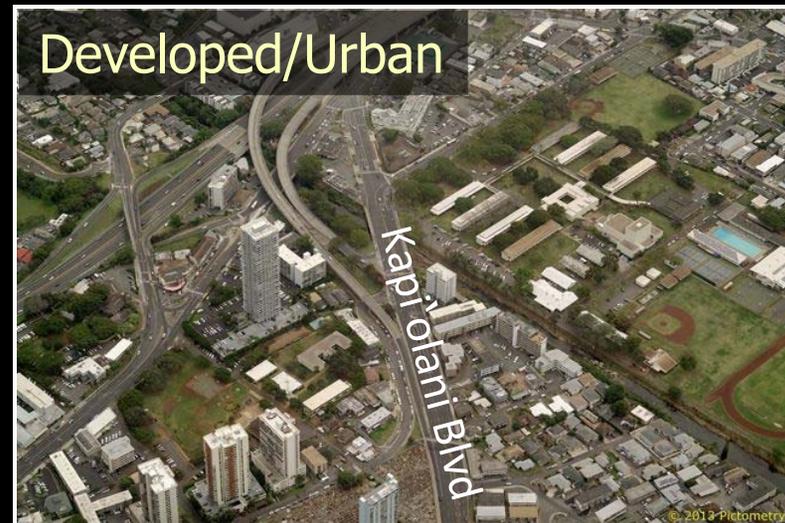
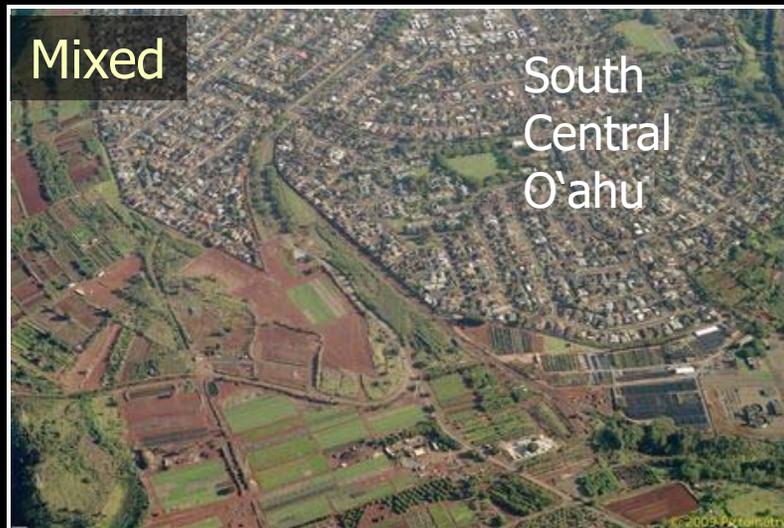
Program Objectives and Initial Scope

- Collaborative effort with HDOA and HDOH
- Assess the occurrence and distribution of current-use pesticides in surface water in Hawai'i
- Collect water samples at targeted sites on Kaua'i and O'ahu, and eventually other islands, using nationally consistent protocols
- Provide quality-assured sample results to HDOA and public through USGS online data repository
- Compare results to established Federal and State human-health and aquatic-life benchmarks

Program Objectives and Initial Scope—cont.



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



Program Objectives and Initial Scope—cont.

Collect samples during different flow conditions



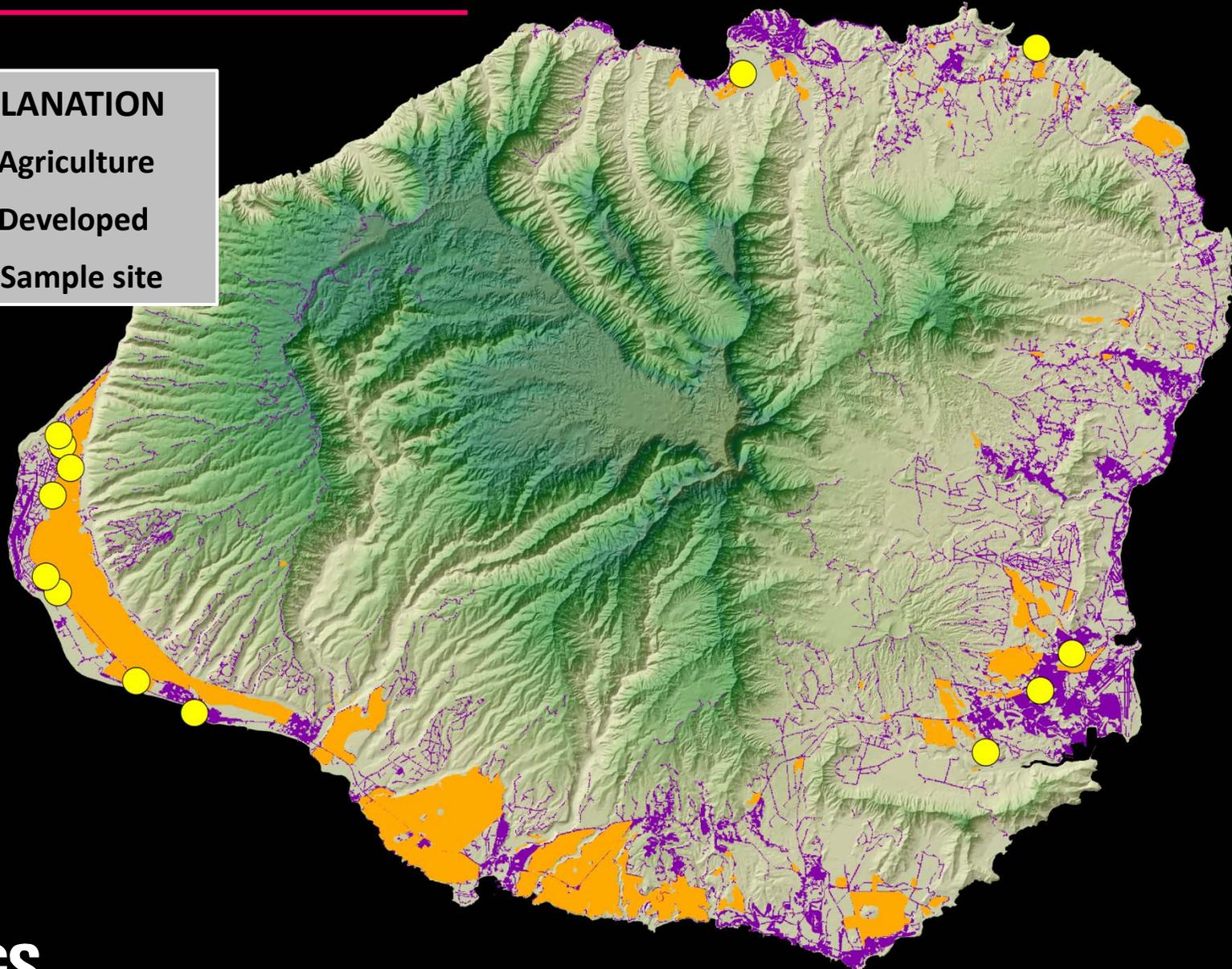
2016-17 Samples Collected at 35 Sites

- 13 sites on Kaua`i and 22 sites on O`ahu
- Streams, ditches, a wetland, and coastal ocean
- Downstream or nearby areas with:
 - Agriculture (16 sites)
 - Developed/Urban land use (6 sites)
 - Mixture of agriculture and developed (13 sites)

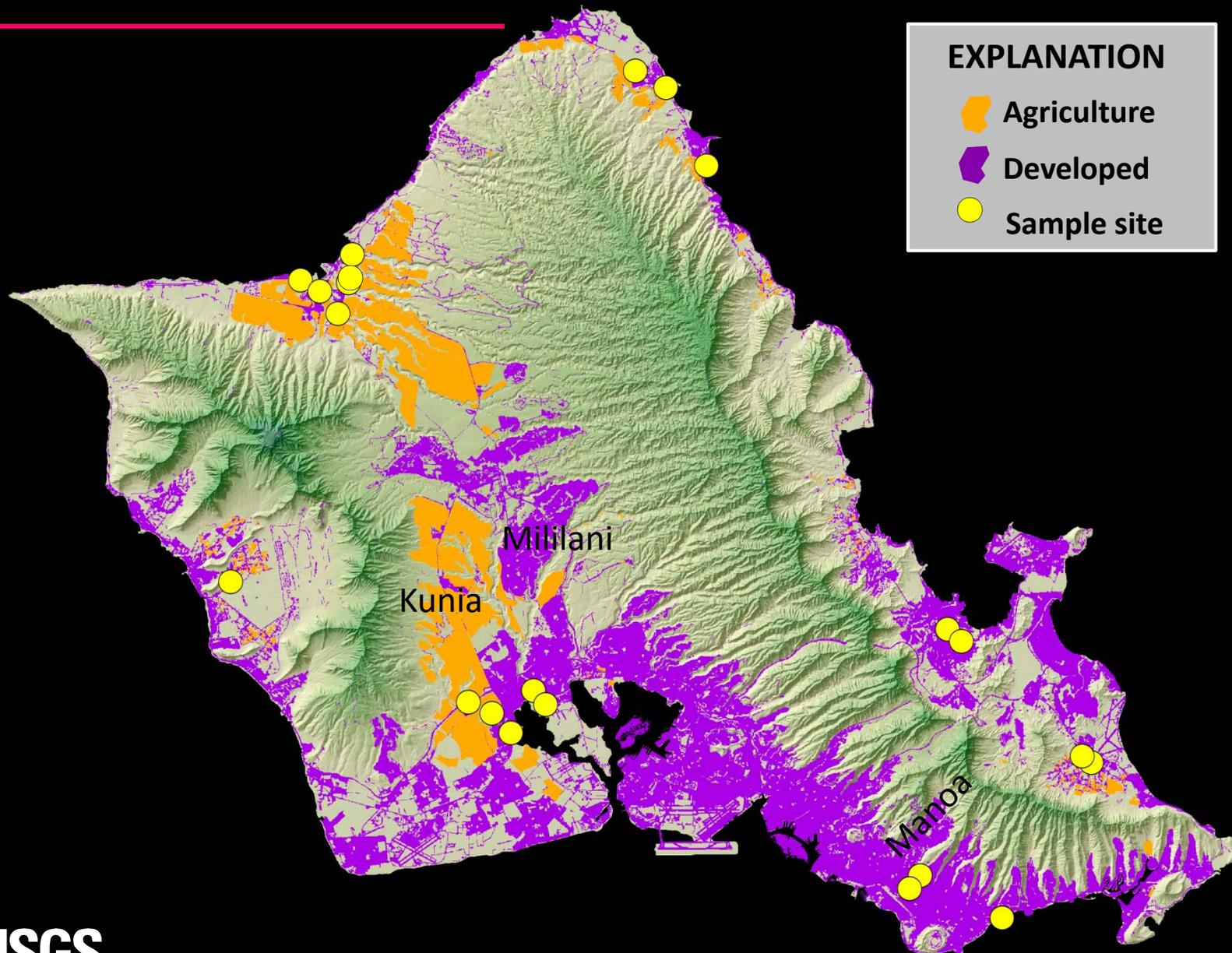
13 Sites on Kaua'i

EXPLANATION

-  Agriculture
-  Developed
-  Sample site



22 Sites on O'ahu



51 Samples Collected

32 discrete samples

- 14 high flow
- 18 low flow

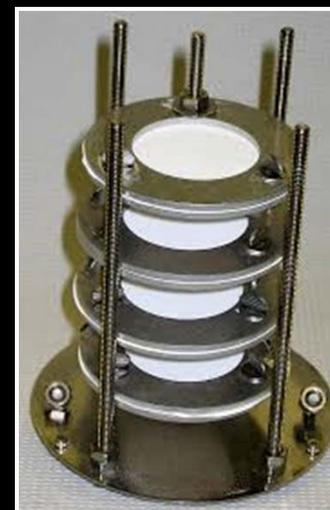


12 accumulation samplers
(passive samplers)



7 quality-control samples

- blanks
- replicates
- spikes



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:



2017 Findings

- Most samples contained a mixture of multiple pesticides
 - 0 to 33 pesticides detected per discrete sample
 - 2 to 51 pesticides detected per accumulation sampler
 - 37 pesticides and 24 pesticide degradates were detected at least once
- Concentrations of detected pesticides were low:
 - All were below current human-health benchmarks
 - Nearly all were below current aquatic-life benchmarks
 - Fipronil detected in 100% of developed land use category sites -- use as a termiticide and pet treatment
- Note: Some detected pesticides have no human-health or aquatic-life benchmarks

2017 Findings

Number of pesticide detections by use group and flow condition

245 detections total, out of 7,200 pesticide-compound results from laboratory

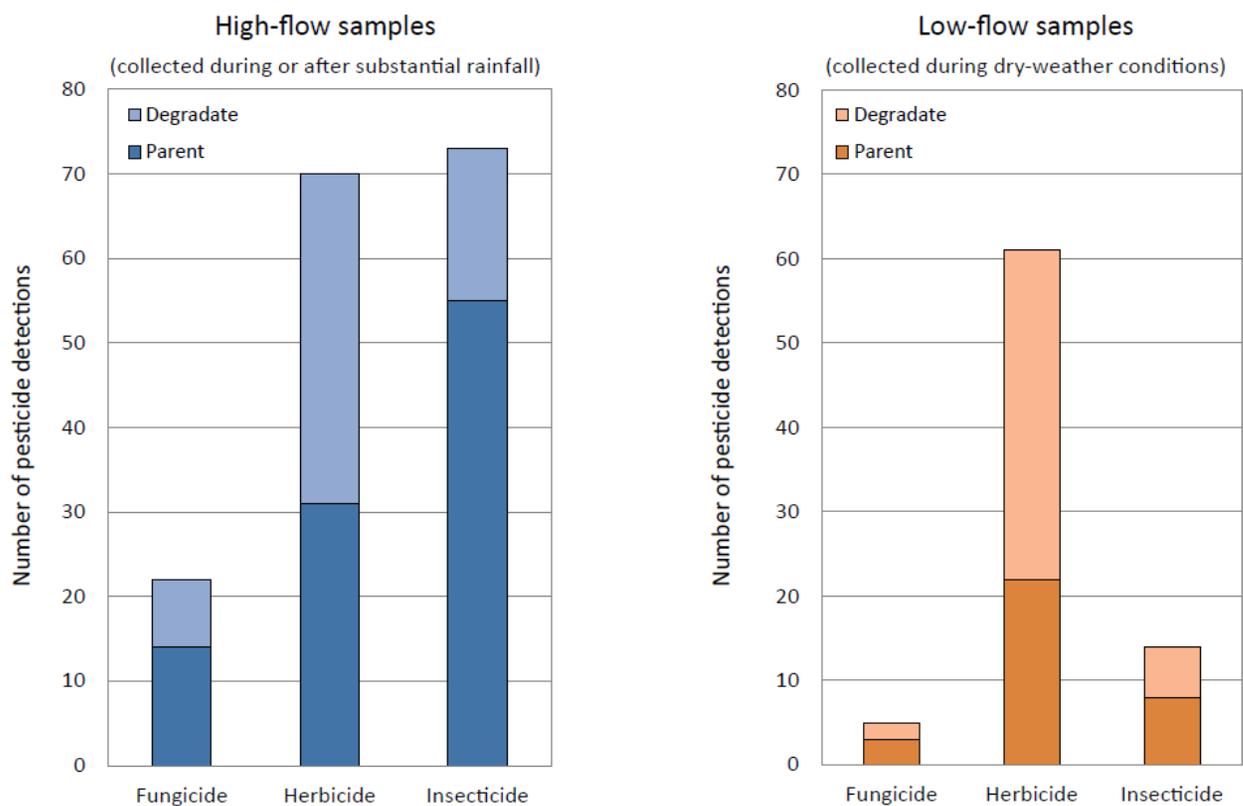


Figure 4. Number of pesticides detected by use group and flow condition in all 32 discrete water samples collected on Kaua'i and O'ahu, Hawai'i, between November 2016 and April 2017.

2017 Findings

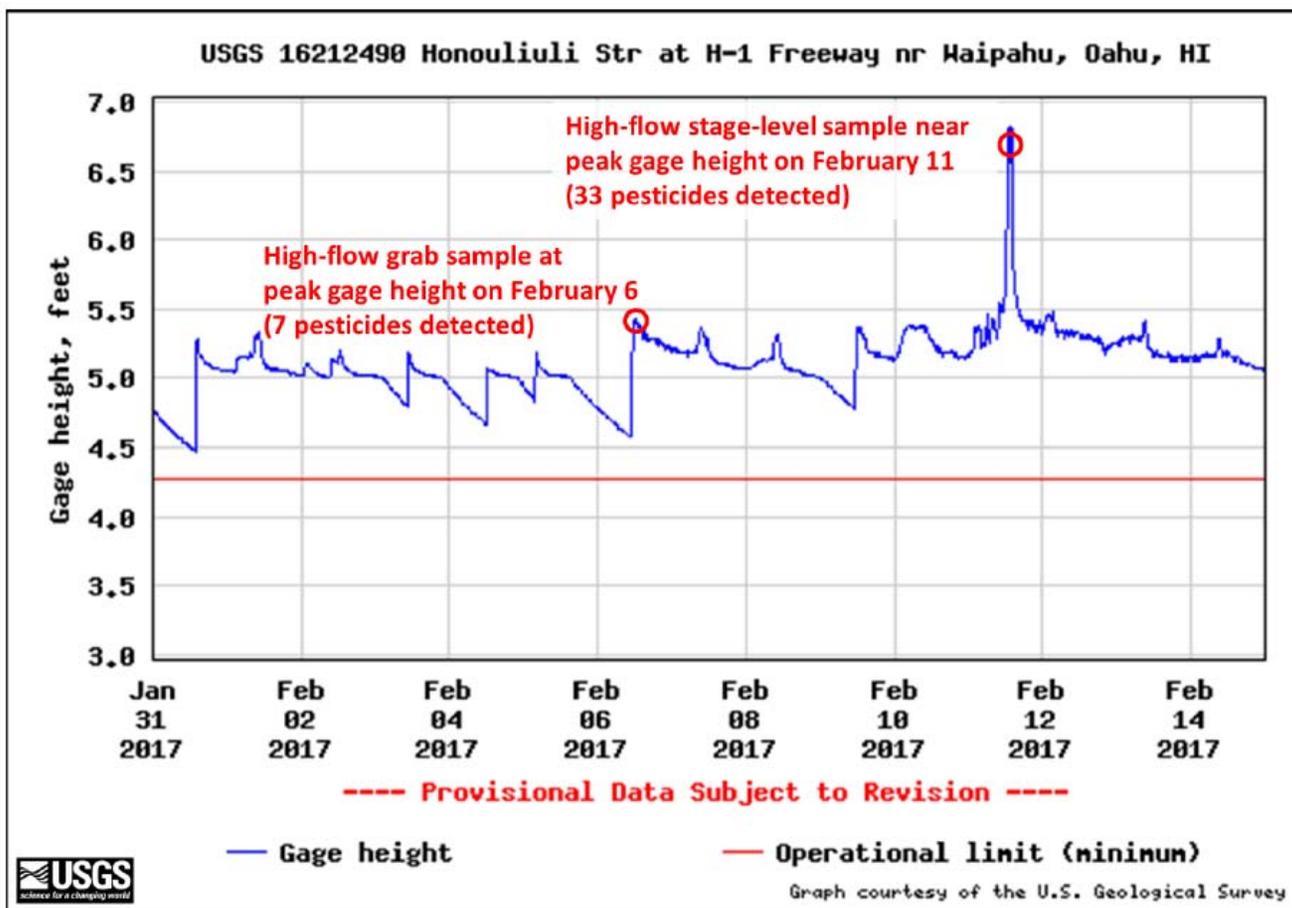
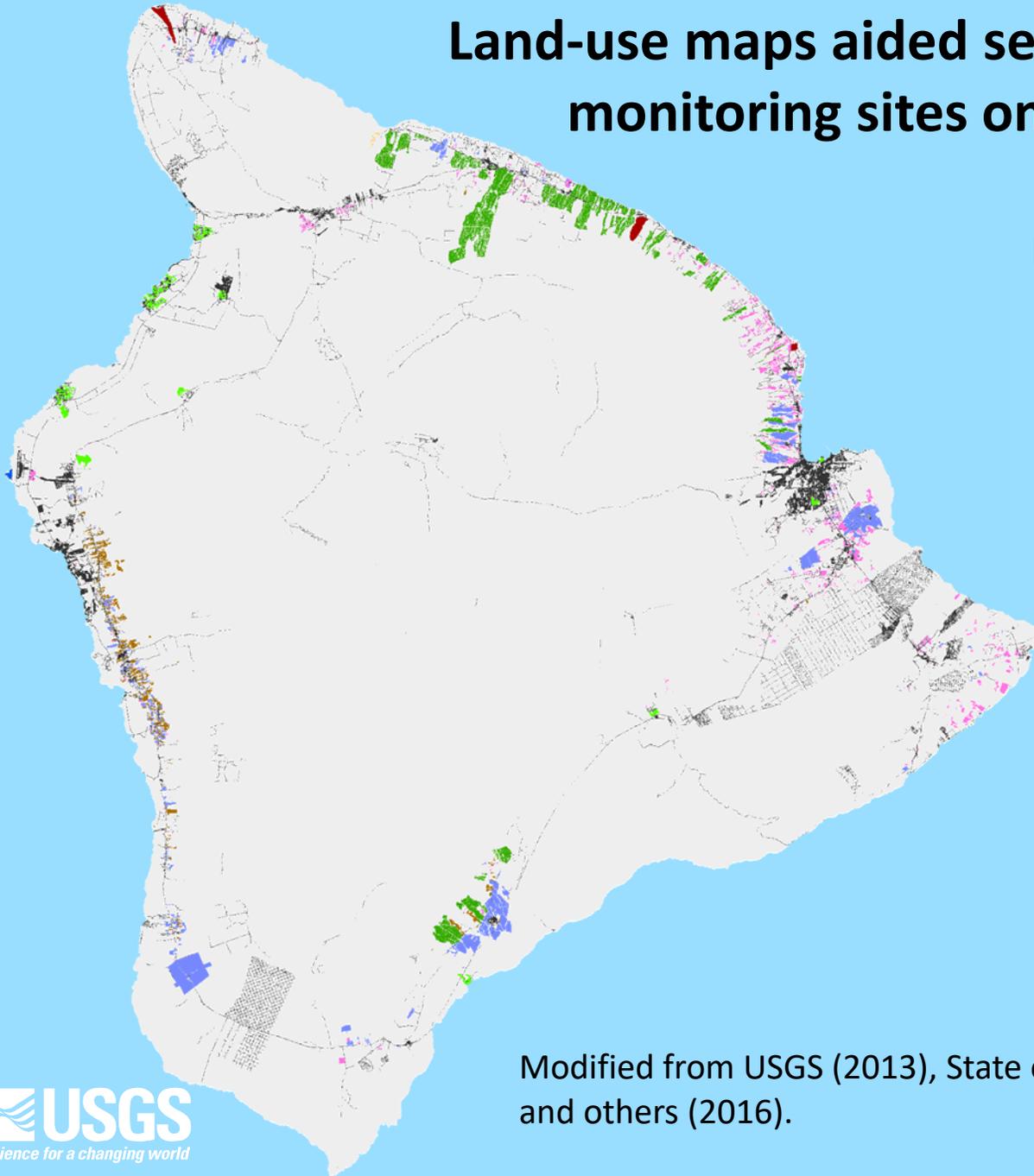


Figure 11. Graph of gage height (stream stage) measured at Honouliuli Stream at H-1 Freeway near Waipahu, O'ahu, Hawai'i (site 16212490) when high-flow samples were collected on February 6 and 11, 2017.

Land-use maps aided selection of pesticide-monitoring sites on Hawai'i Island

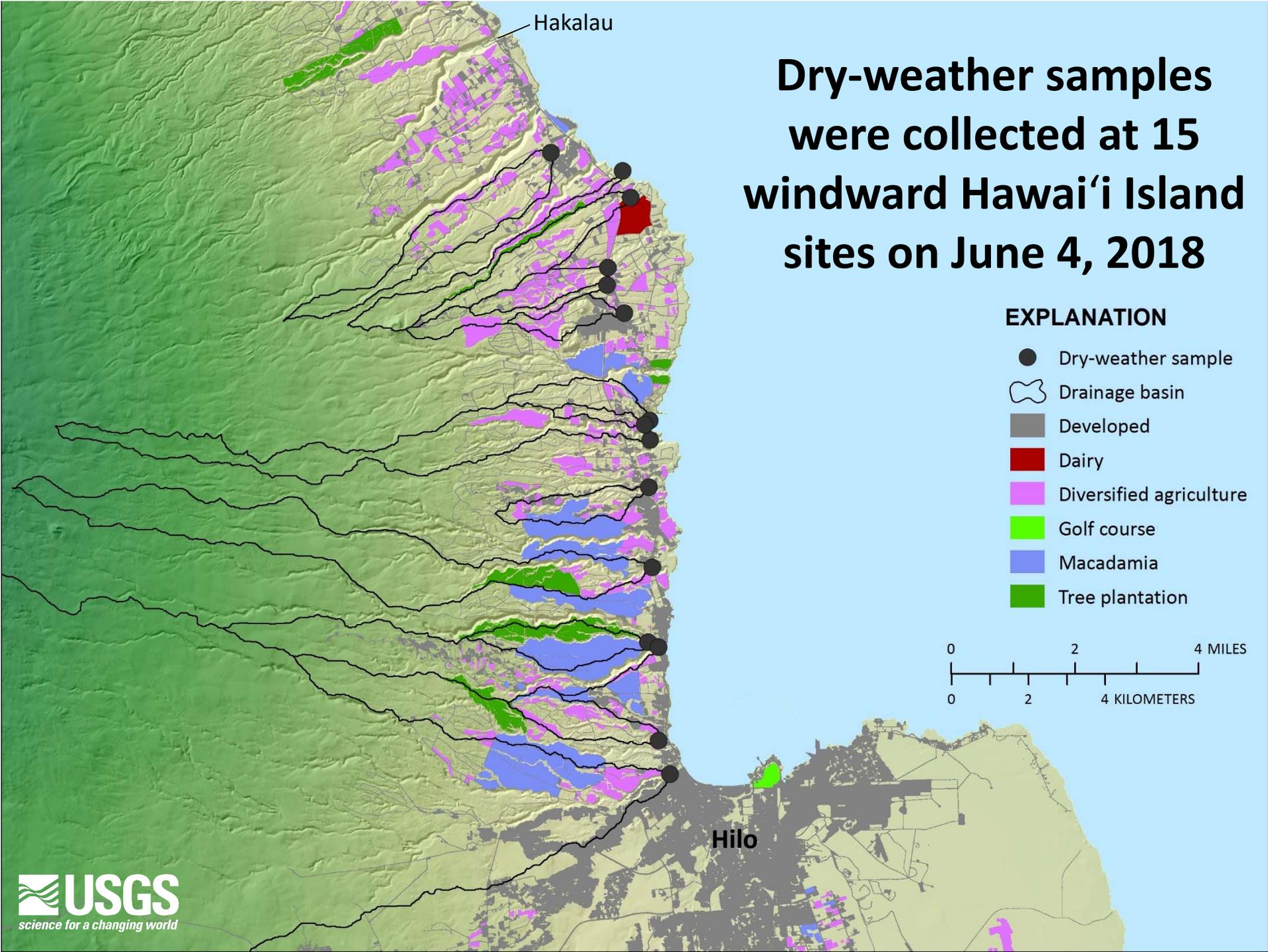
EXPLANATION

-  Aquaculture
-  Coffee
-  Dairy
-  Developed
-  Diversified agriculture
-  Golf course
-  Macadamia
-  Taro
-  Tree plantation



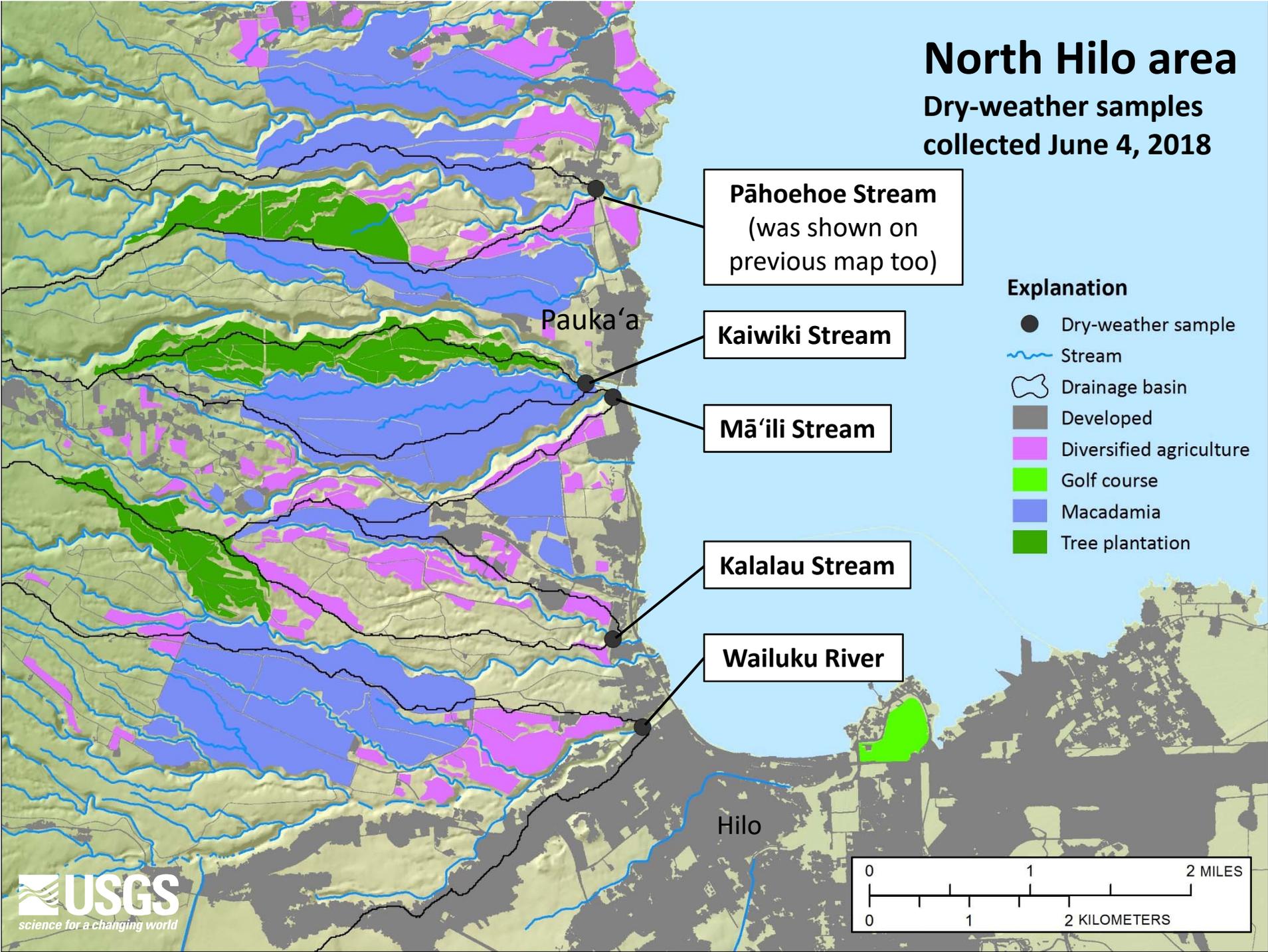
Modified from USGS (2013), State of Hawai'i (2014), and Melrose and others (2016).

Dry-weather samples were collected at 15 windward Hawai'i Island sites on June 4, 2018



North Hilo area

Dry-weather samples collected June 4, 2018

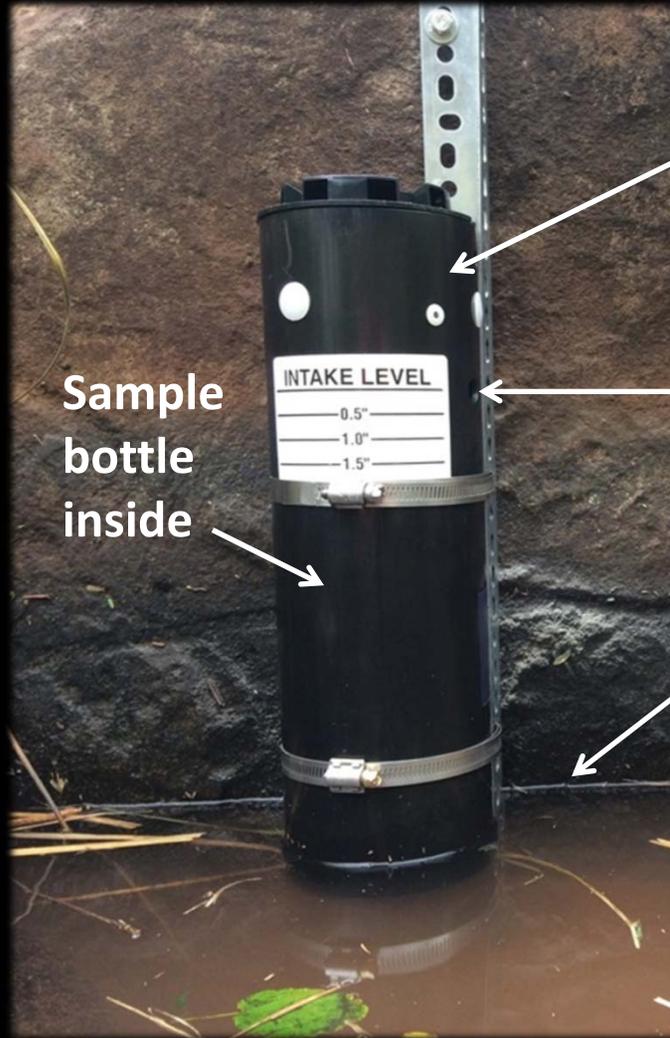


Laboratory analyses for pesticides

- Each sample is being analyzed at a USGS laboratory for 225 current-use pesticide compounds
 - 123 herbicides and degradates
 - 87 insecticides and degradates
 - 15 fungicides and degradates
- Pesticides can be detected at trace levels (parts per trillion), commonly 10 to 10,000 times lower than water-quality standards
- Laboratory results not yet available for dry-weather samples collected on windward Hawai'i Island in 2018

Collecting storm samples

Deploy stage-level samplers at some sites



Bottle container secured to boulder on stream bank

Sample bottle inside

Intake

Stream stage during dry-weather conditions

Stage-level sampler tested in stream on O'ahu, Feb 11, 2017

Stage-level sampler

Flow direction



Feb 11, 10:45

**Sampler intake
not submerged**



Feb 11, 11:45

**Sampler intake
nearly submerged**



Feb 11, 12:45

Sampler intake submerged



Retrieved Feb 11, 16:00



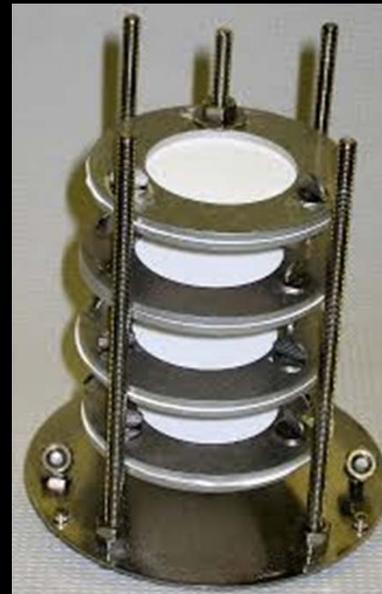
Future plans for windward Hawai'i Island —*cont.*

Deploy passive, accumulation-type samplers at most wadeable sites for several weeks

Passive sampler



Membrane discs inside sampler absorb pesticides



Kona side Mid-August Update

- 4 Low flow samplers collected:
 - Anchialine pool at Pu'uhonua o Hōnaunau National Historical Park
- 2 Anchialine pools and one fishpond at Kailua-Kona Resorts
- 3 storm stage-level samplers deployed:
 - - Drainage culvert near Honaunau,
 - - Drainage channel near Kealakekua Bay
 - - Waiaha Stream near Kailua-Kona

Plans for Hawai'i Island results

- Analyze all water samples and passive samplers for 225 current-use pesticide compounds
- Publish quality-assured results
- Results will include water-quality standards:
 - Hawai'i toxicity standards
 - Federal standards and benchmarks

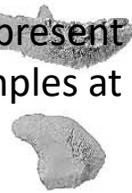
Program's monitoring efforts to date



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

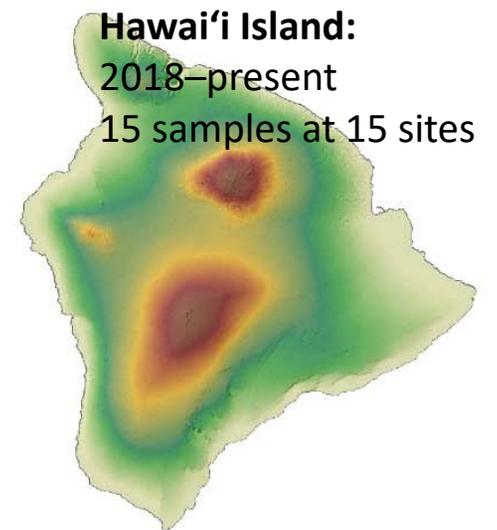


O'ahu:
2016–present
35 samples at 24 sites



Maui:
2018–present
17 samples at 13 sites

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



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

Next steps

Analyze pending results for dry-weather samples collected at

- 15 sites on Big Island in June 2018
- 5 sites on Maui in May 2018
- 15 sites on O'ahu in May and July 2018

Complete initial (phase 1) sampling at each targeted site

- Get a dry-weather sample if water is present and is mostly fresh
- Get a storm sample if possible
- Deploy passive sampler if feasible and logical

Continue follow-up (phase 2) sampling at sites where

- Chlorpyrifos was detected
- Other pesticides of concern to DOA and DOH are detected?
- Pesticide concentrations exceeded or were within 10 percent of Hawaii or Federal water-quality standards

Release results for passive samplers deployed 2015 - 2017

Mahalo to our Collaborators!



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