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Pesticide-Monitoring Program of Surface Waters in the State of Hawai‘i—Progress and Plans for Hawai‘i Island

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Hilo, Hawai‘i
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USGS Pacific Islands
Water Science Center

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

USGS Pacific Islands Water Science Center

- About 35 employees
- Non-regulatory role
- Provides impartial data and analyses to help regulators, managers, and stakeholders:
  - manage and protect water resources
  - address water-related hazards

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Pesticide-monitoring program of surface water in Hawai‘i

- Collaborative effort with HDOA and HDOH
- Assess the occurrence and distribution of current-use pesticides in surface water in Hawai‘i

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Program's scope and initial objectives

Collect water samples for pesticide analysis at targeted sites on Kaua'i, O'ahu, Maui, and Hawai'i Island

Dry-weather sample

Storm sample

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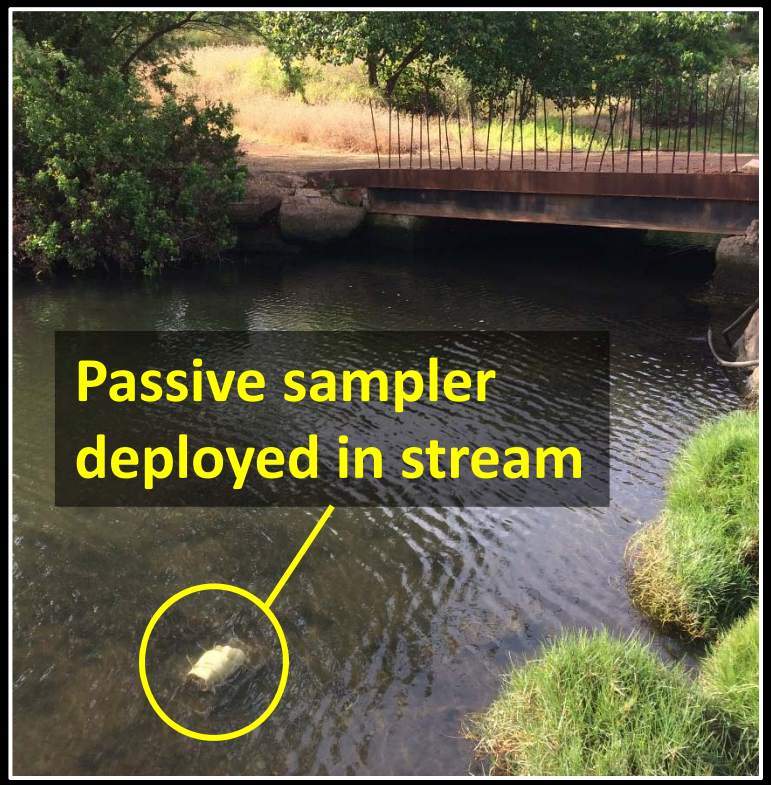
Program's scope and initial objectives —*cont.*

Use passive samplers to detect pesticides over prolonged periods (weeks) at targeted sites on Kaua‘i, O‘ahu, Maui, and Hawai‘i Island



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Program's scope and initial objectives —*cont.*

Questions to answer for each site:

- Which current-use pesticide compounds are present in surface water?
- How do concentrations of pesticides in water compare with Hawai‘i and Federal water-quality standards and benchmarks?

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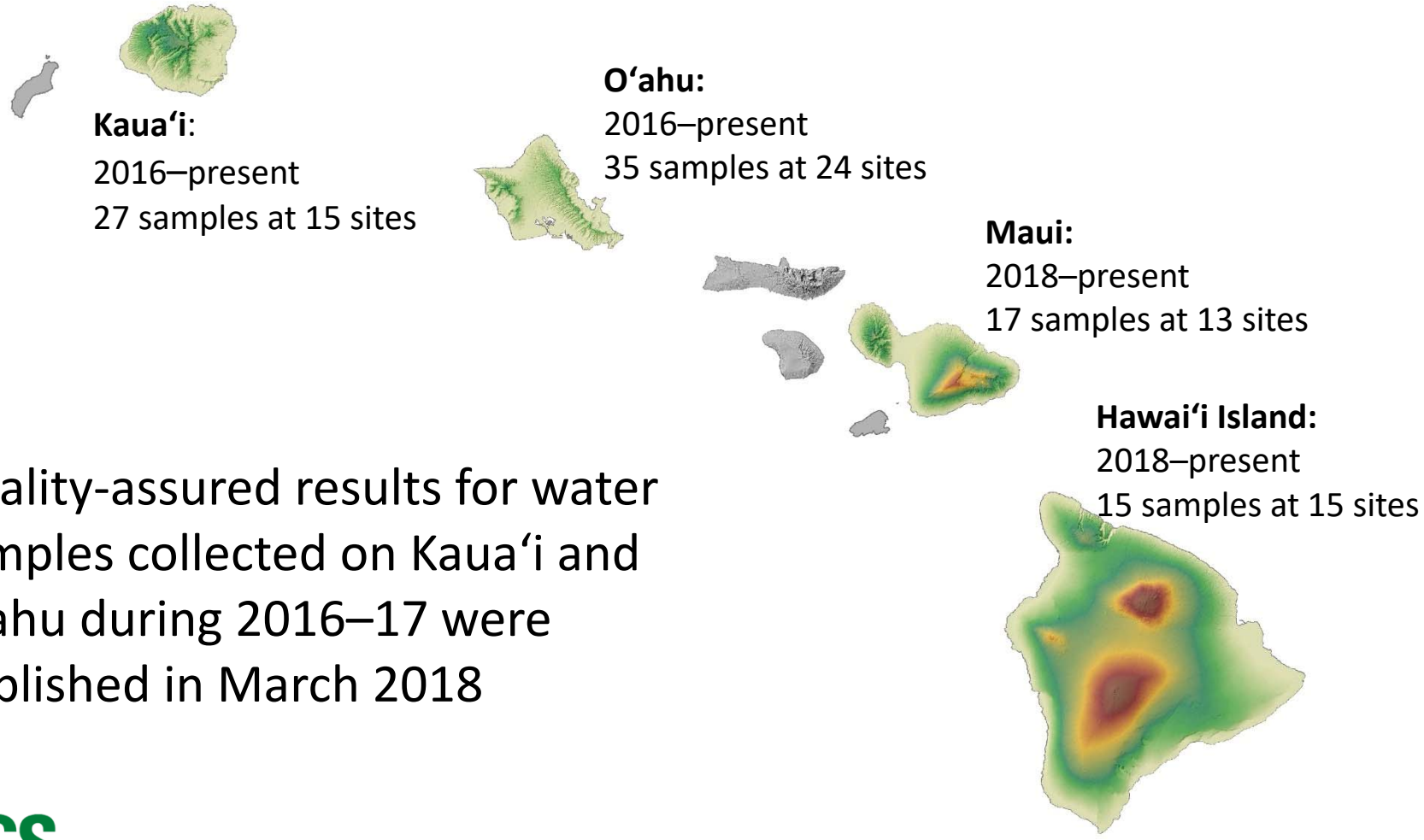
Program's monitoring efforts to date



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

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

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Summary of pesticide results for Kauaʻi and Oʻahu water samples, 2016–17

- Water at most monitoring sites contained multiple pesticide compounds
- No Hawaiʻi 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 Oʻahu
  - Flubendiamide and simazine in one stream on Oʻahu

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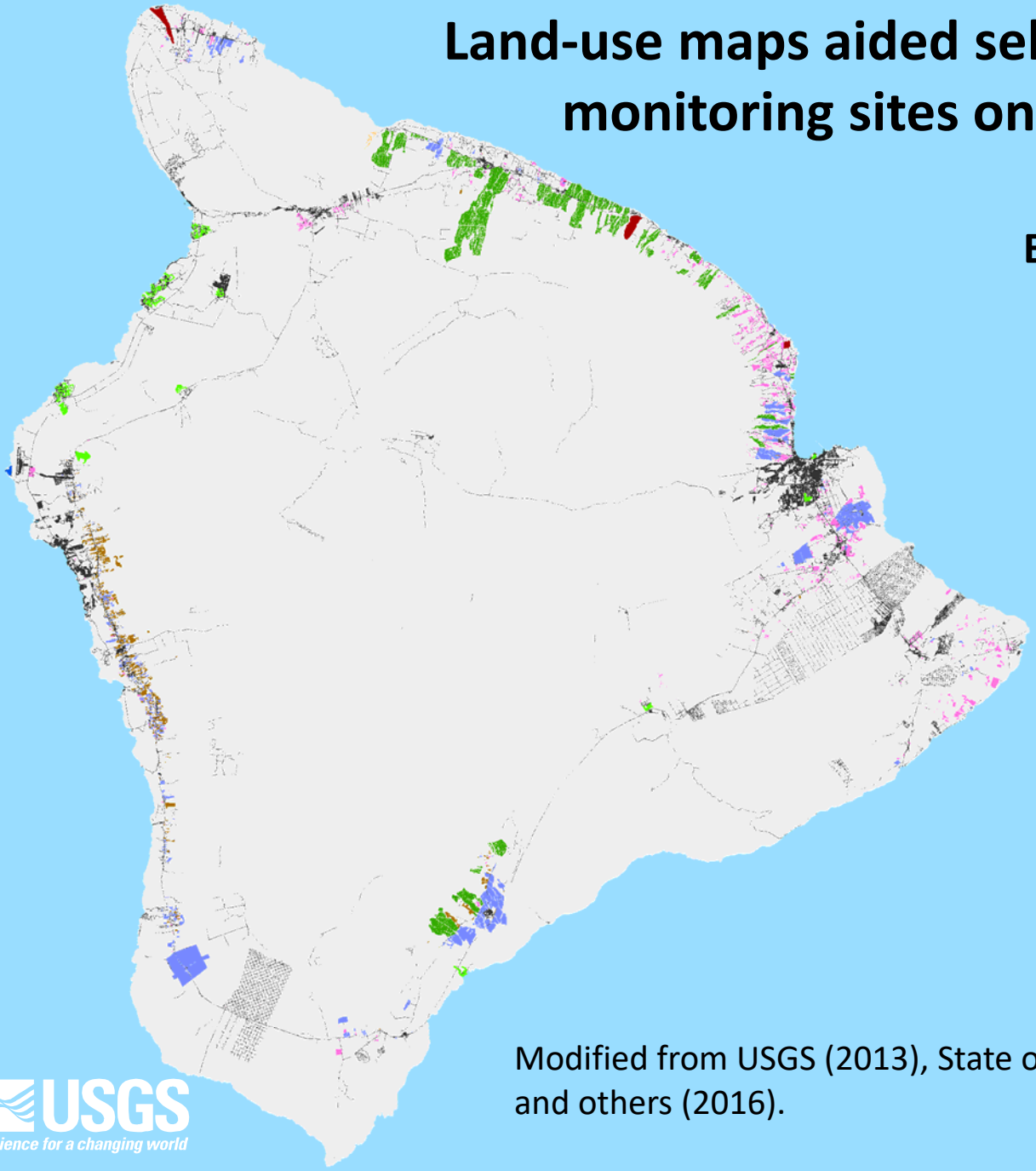
From Johnson and Kennedy (2018), available at https://doi.org/10.5066/F7BG2N79

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).

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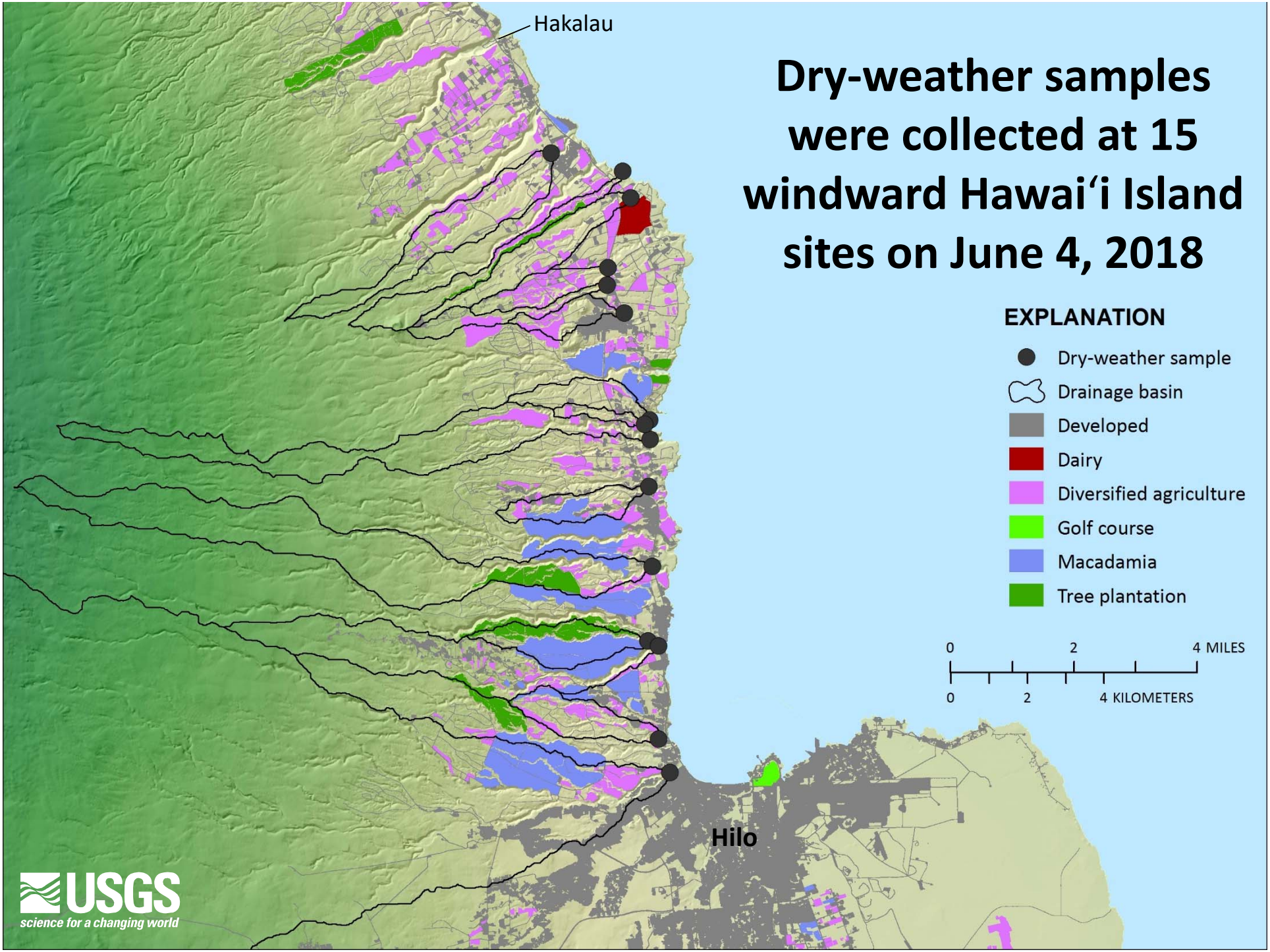
Hakalau
Hilo
Dry-weather samples were collected at 15 windward Hawai‘i Island sites on June 4, 2018
EXPLANATION
Dry-weather sample
Drainage basin
Developed
Dairy
Diversified agriculture
Golf course
Macadamia
Tree plantation
0
2
4 MILES
0
2
4 KILOMETERS
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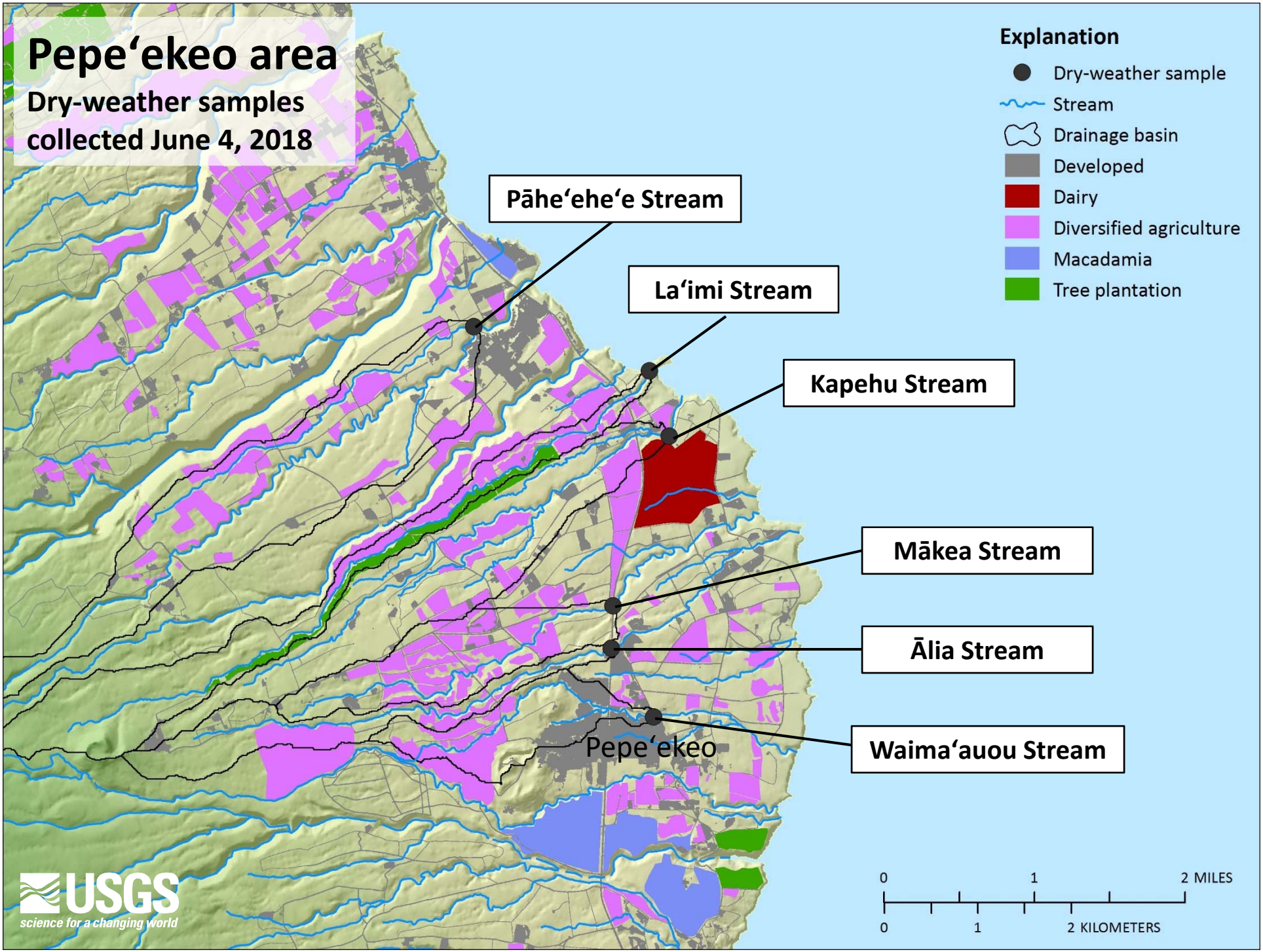
Pepeʻekeo area
Dry-weather samples
collected June 4, 2018
Explanation
Dry-weather sample
Stream
Drainage basin
Developed
Dairy
Diversified agriculture
Macadamia
Tree plantation
Pāheʻeheʻe Stream
Laʻimi Stream
Kapehu Stream
Mākea Stream
Ālia Stream
Waimaʻauou Stream
Pepeʻekeo
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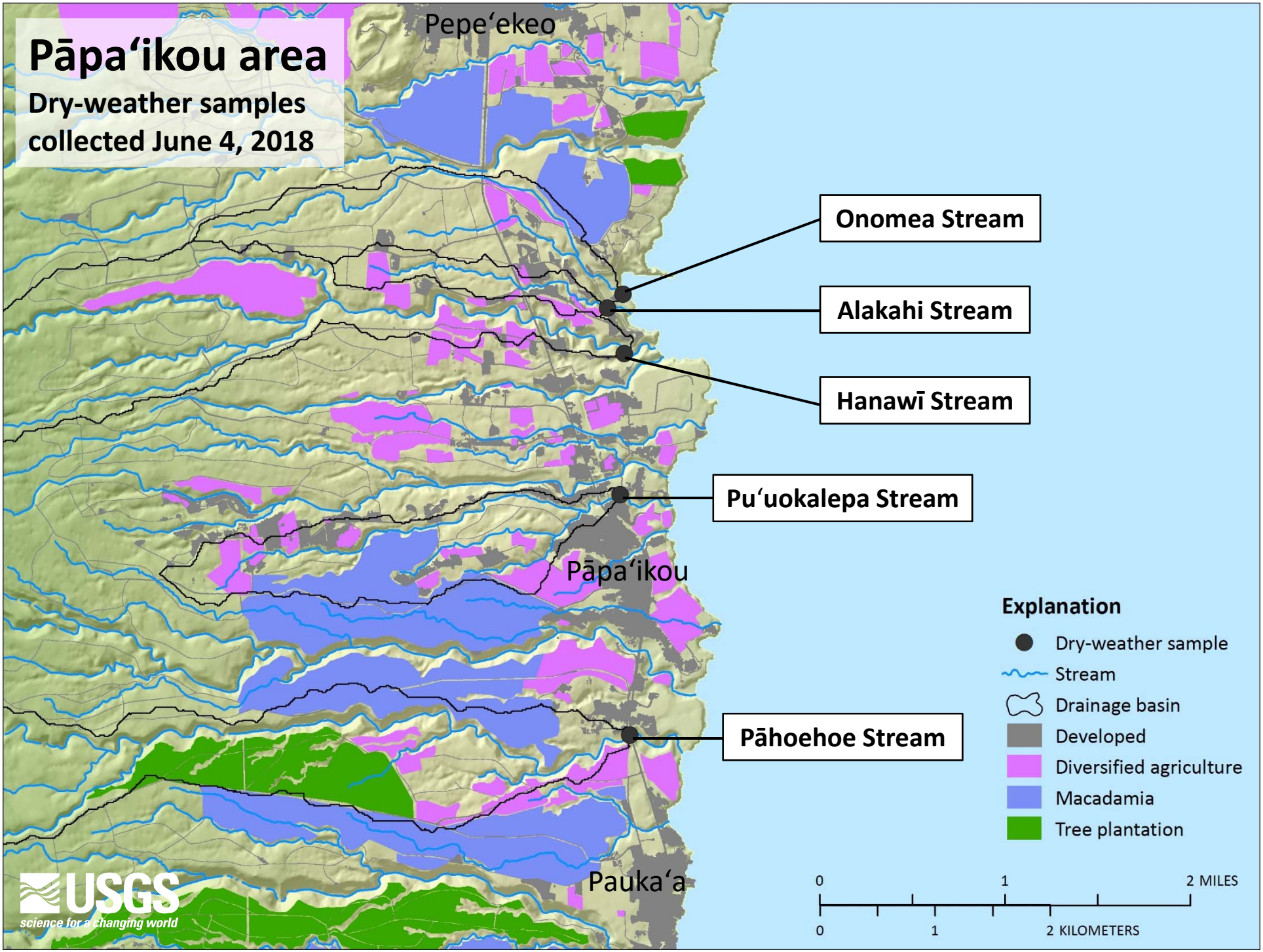
0
1
2 MILES
0
1
2 KILOMETERS


Pāpa‘ikou area
Dry-weather samples
collected June 4, 2018
Pepe‘ekeo
Onomea Stream
Alakahi Stream
Hanawī Stream
Pu‘uokalepa Stream
Pāpa‘ikou
Pāhoehoe Stream
Pauka‘a
Explanation
Dry-weather sample
Stream
Drainage basin
Developed
Diversified agriculture
Macadamia
Tree plantation
0
1
2 MILES
0
1
2 KILOMETERS
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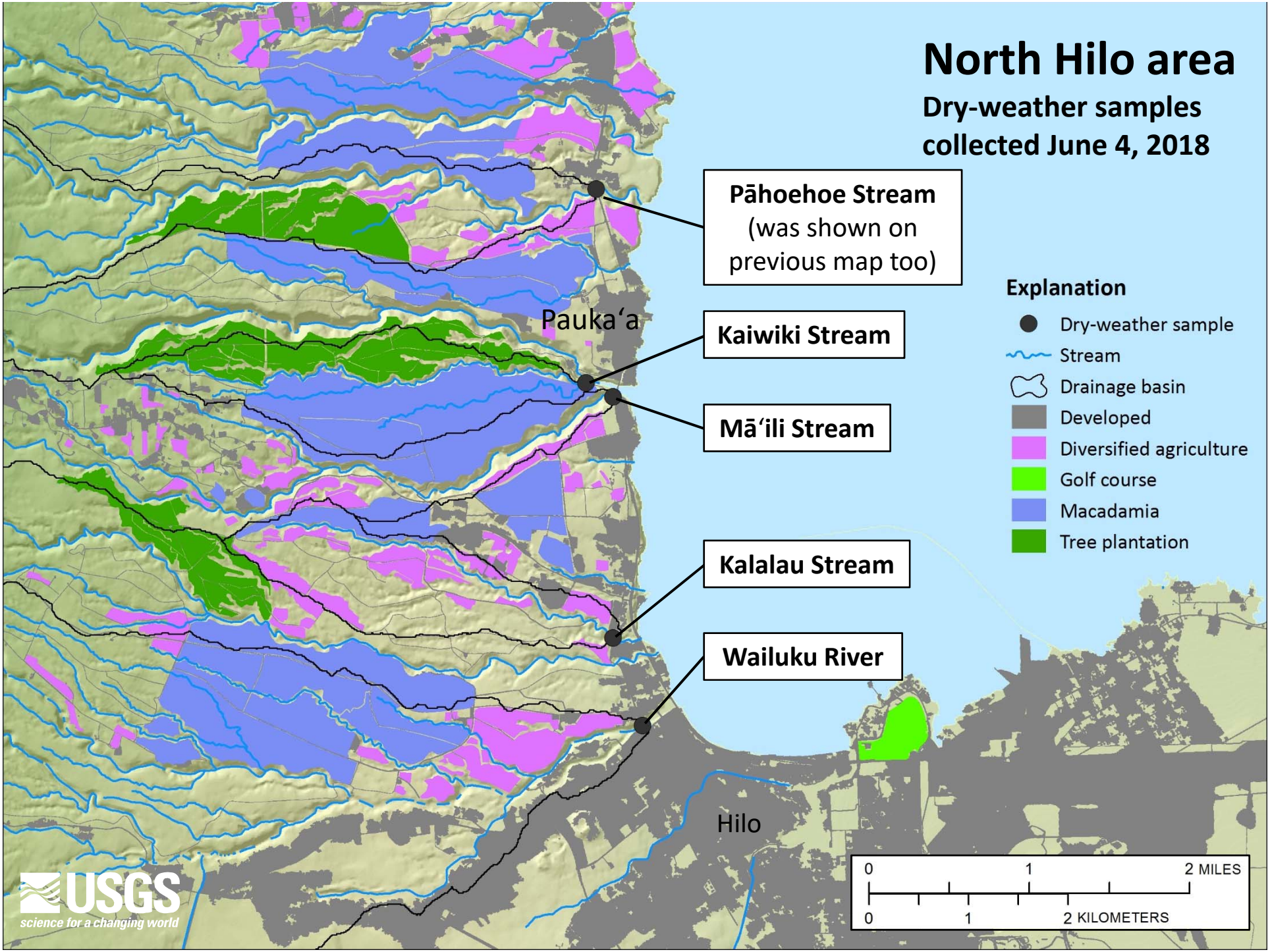
North Hilo area
Dry-weather samples
collected June 4, 2018
Pāhoehoe Stream
(was shown on
previous map too)
Kaiwiki Stream
Māʻili Stream
Kalalau Stream
Wailuku River
Pauka'a
Hilo
Explanation
Dry-weather sample
Stream
Drainage basin
Developed
Diversified agriculture
Golf course
Macadamia
Tree plantation
0
1
2 MILES
0
1
2 KILOMETERS
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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

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Future plans for windward Hawai‘i Island

Collect storm samples at all 15 sites

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Collecting storm samples

Deploy stage-level samplers at some sites

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Stage-level sampler tested in stream on O‘ahu, Feb 11, 2017
Stage-level sampler
Flow direction
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Feb 11, 10:45
Sampler intake not submerged
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Feb 11, 11:45
Sampler intake nearly submerged
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Feb 11, 12:45
Sampler intake submerged
Retrieved Feb 11, 16:00
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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

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Passive-sampler results

- Indicate presence or absence of all pesticides analyzed by laboratory
- Are used to estimate average water concentrations for selected pesticides

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Use of passive samplers on Kaua‘i, O‘ahu, and Maui, 2015–17

- Deployed in streams, ditches, ponds, ocean, and groundwater observation wells
- Were used to detect
  - Pesticides and other organic contaminants
  - Wastewater-indicator chemicals
- Results and summaries are being compiled

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Plans for the Kona side of Hawai‘i Island

- Select monitoring sites
- Collect dry-weather samples at a few brackish pools and ponds
- Aim to collect storm samples from a few gulches that are typically dry

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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

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Questions?

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Presentation overview

Pesticide-monitoring program of surface water in Hawai‘i

- Scope and initial objectives
- Summary of published pesticide results for Kaua‘i and O‘ahu, 2016–17
- Progress for windward side of Hawai‘i Island
- Plans for windward and Kona sides of Hawai‘i Island

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