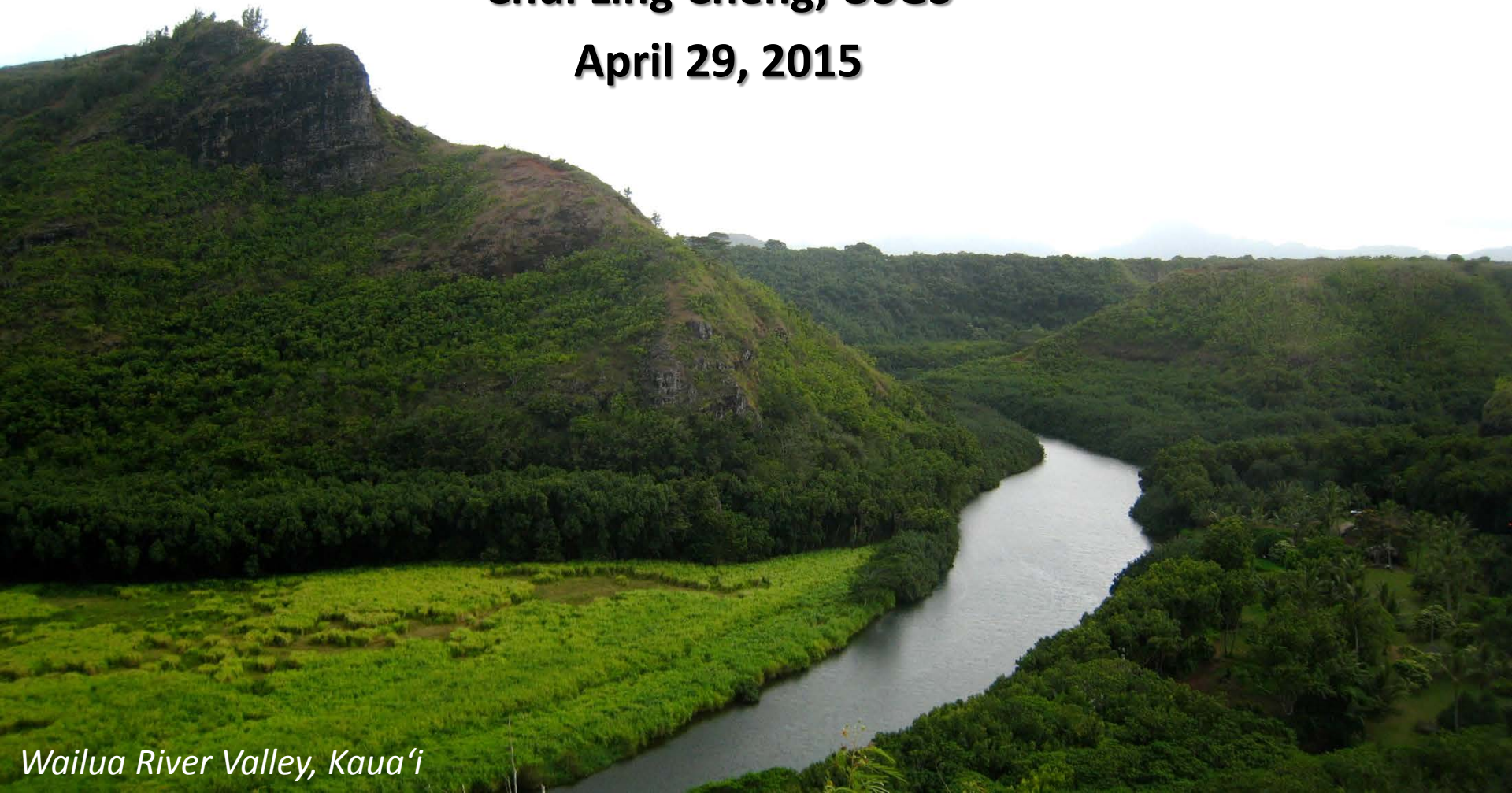
Streamflow availability during low-flow conditions, Southeast Kaua‘i

Chui Ling Cheng, USGS

April 29, 2015



Wailua River Valley, Kaua‘i

Goals

1. **Quantify surface-water availability for selected stream locations**
   - Natural (unregulated) flow
   - Express as flows below the median flow (Q_{50} flow)

2. **Quantify the magnitude of GW/SW interaction at selected stream reaches**
   - Conduct seepage runs to determine streamflow gains and losses
   - Determine whether streams support mauka to makai flow

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Instream flow standard (IFS)

Off-stream uses

- Domestic water supply
- Agricultural use
- Municipal use

Instream uses

- Traditional Hawaiian practices
- Conveyance of water supplies
- Fish and wildlife habitat
- Ecosystem maintenance
- Recreation
- Aesthetics
- Water quality

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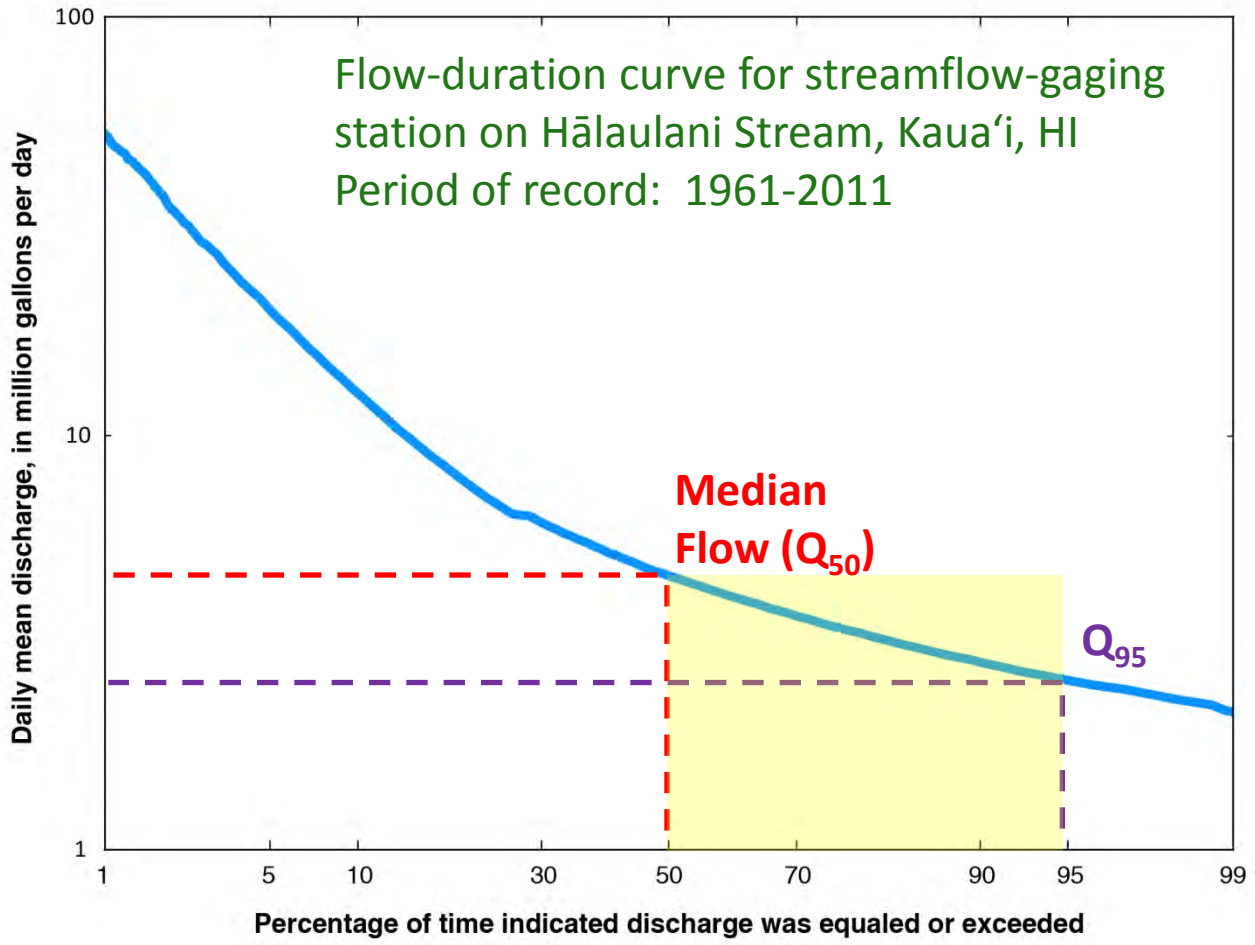
Surface-water availability

Water availability is oftentimes characterized with duration discharges



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Measurement sites used in low-flow studies

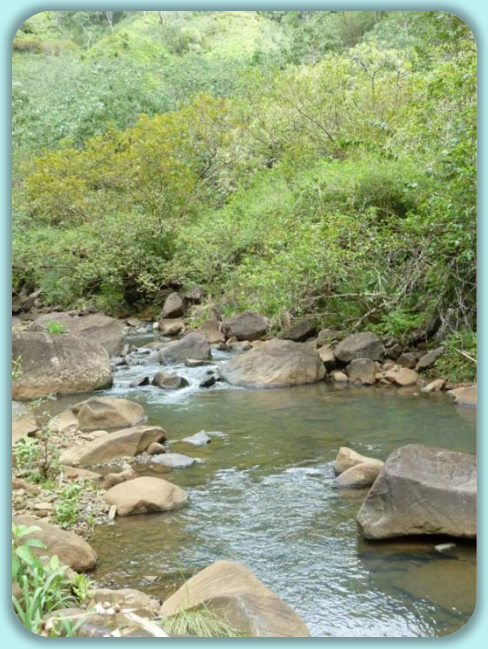
CONTINUOUS RECORD

Provides continuous record of discharge at a particular location

NF Wailua River, Kaua'i

PARTIAL RECORD

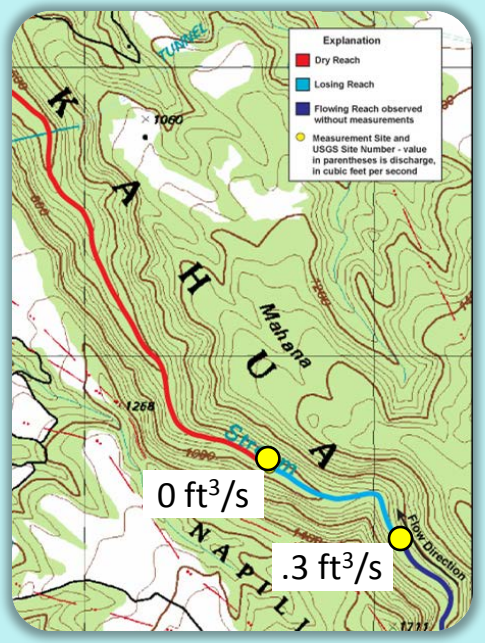
Discharge measurements made repeatedly at a particular location during low-flow periods



Anahola Stream, Kaua'i

SEEPAGE RUN

Nearly concurrent discharge measurements made at several locations along a stream



Honokahua Stream, Maui

Study objectives

Quantify streamflow characteristics above existing diversions

Quantify streamflow gains and losses along the main stream channel

Hanapēpē River, Kauaʻi

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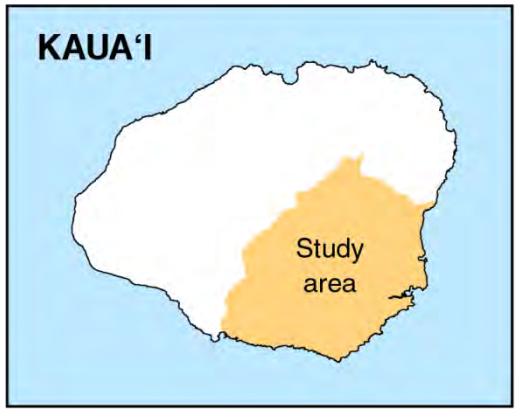
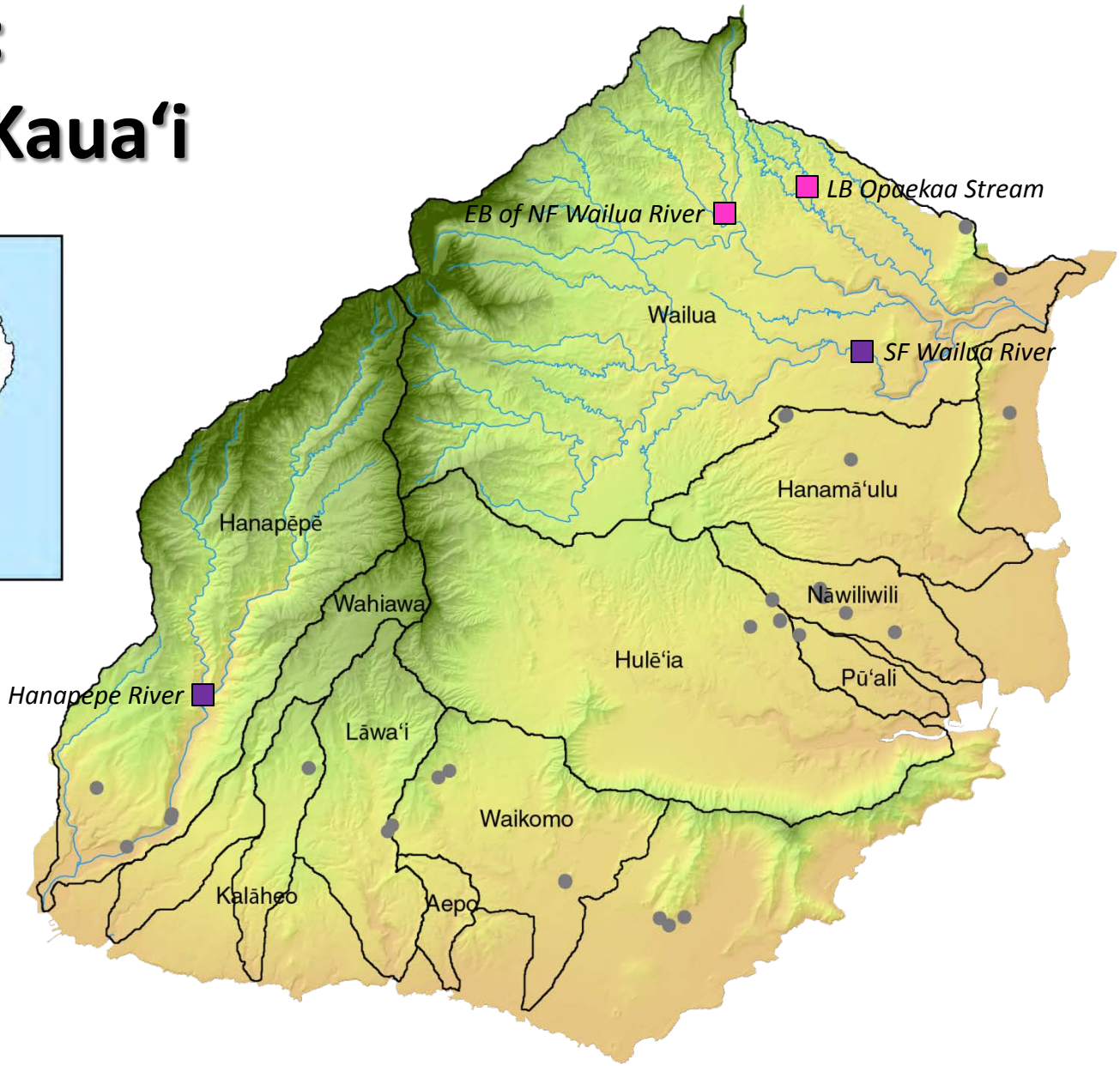
Study area: Southeast Kaua‘i





- *Municipal wells*

USGS streamflow-gaging station currently in operation

- *Natural flow*
- *Regulated flow*

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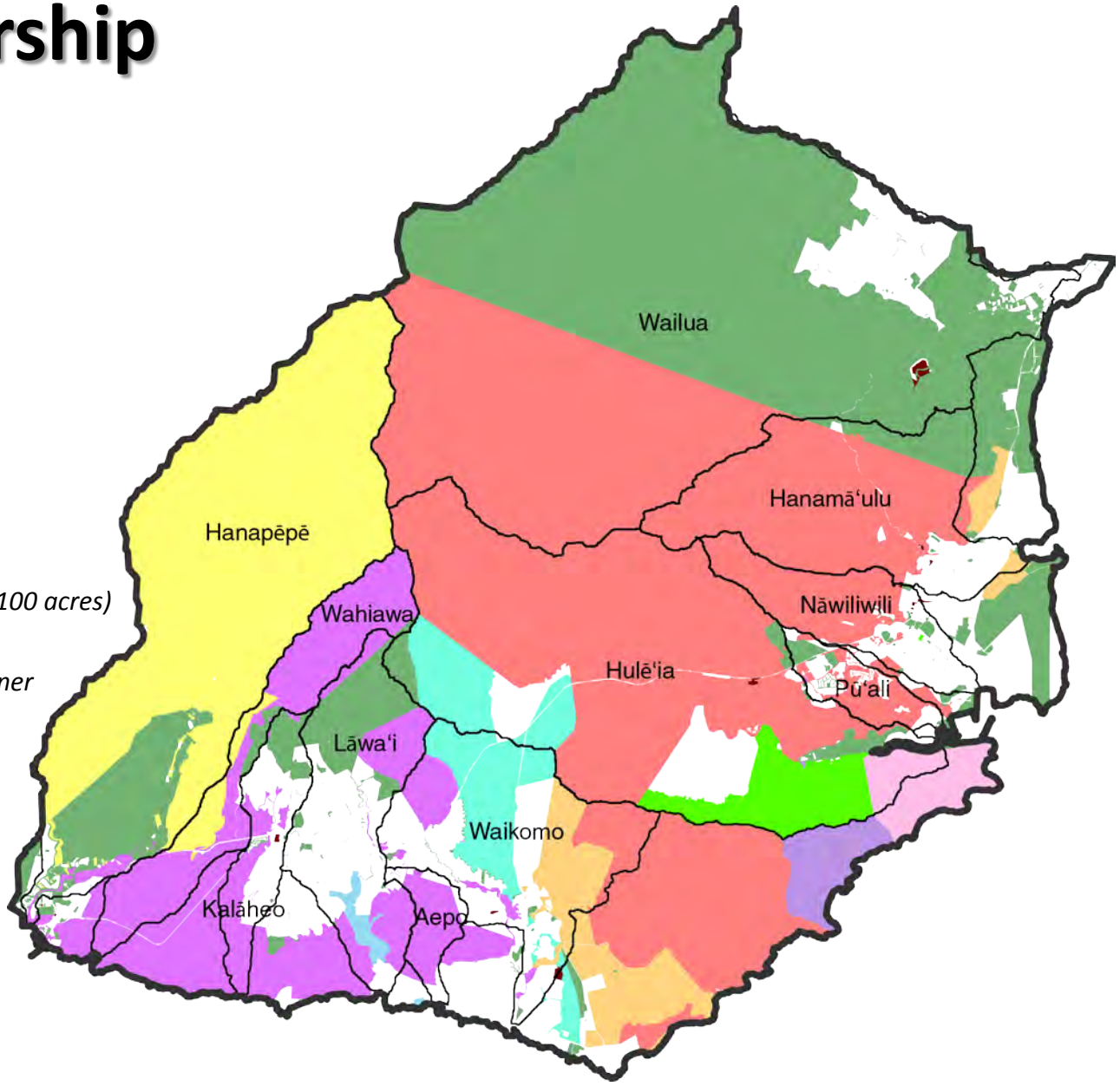
Land ownership

- *Government*
- *Grove Farm*
- *Robinson Family*
- *Alexander & Baldwin*
- *E.A. Knudsen Trust*
- *Visionary LLC*
- *W.H. Rice*
- *D.R. Campion*
- *Share No.1*
- *Nat'l Trop. Bot. Garden*
- *Small private landowners (< 100 acres)*

White areas indicate landowner information unavailable



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Study approach: Objective 1

Step 1: Collect data
Establish low-flow partial-record stations and measure discharge during independent low-flow periods

Step 2: Select index station
Identify the continuous-record station with discharge that best correlates with concurrent discharge at each low-flow partial-record station

Step 3: Compute low-flow characteristics
Estimate duration discharges at low-flow partial-record stations using streamflow data from index station

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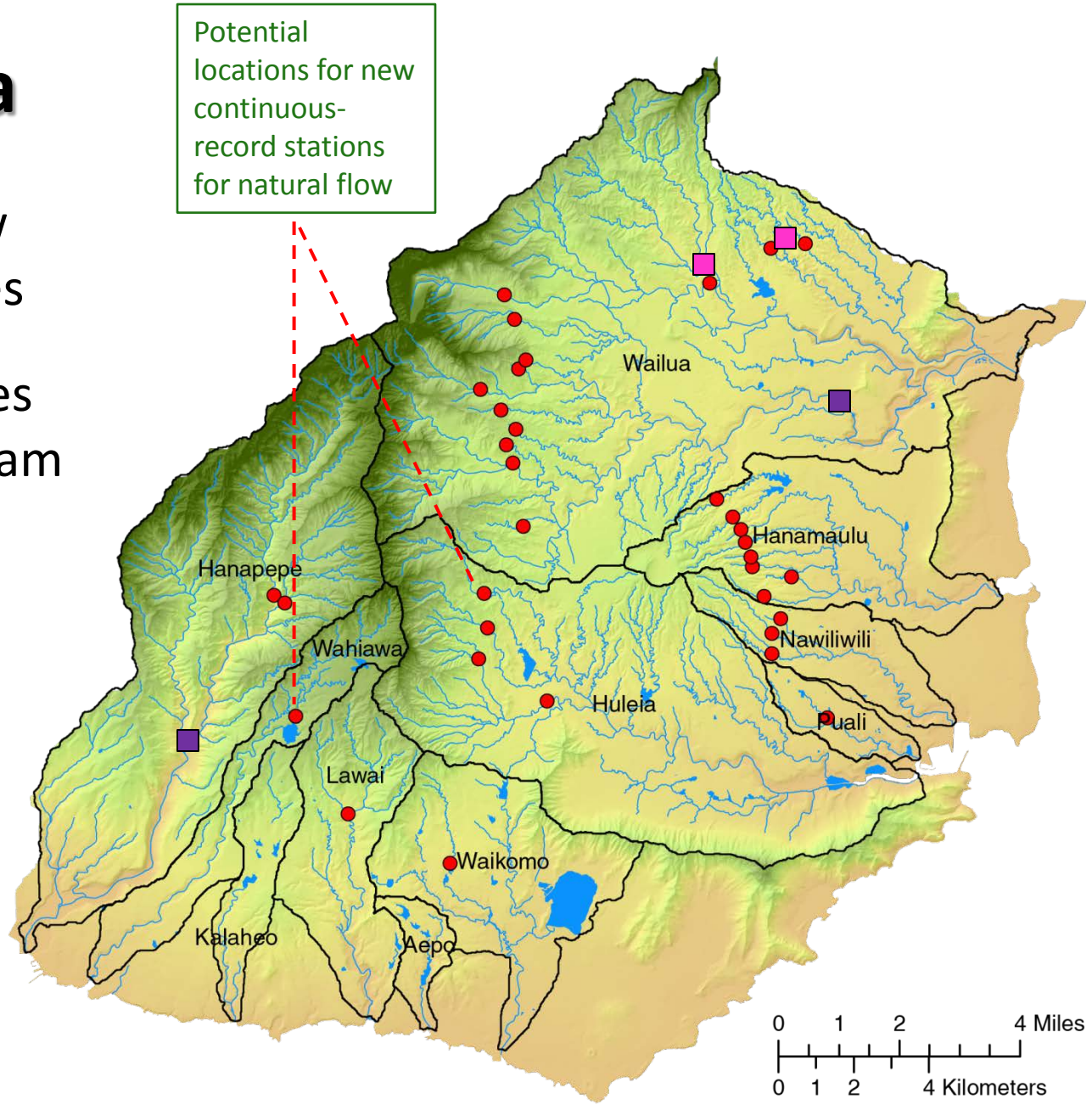
Collect Data

Establish low-flow partial-record sites

Measurement sites are mainly upstream from diversions

Measure flow during low-flow periods



● *Potential partial-record sites*

USGS streamflow-gaging station currently in operation

■ *Natural flow*

■ *Regulated flow*

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Study approach: Objective 2

- Reconnaissance survey to select measurement sites based on:
  - Tributary inflows
  - Diversions
- Determine gains and losses along measured reaches of the streams

Timeline and funding summary

	2015			2016				2017				2018				2019	
	Jun	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun
Research																	
Field work																	
Analyses																	
Report																	

Approximate cost of study: $707,000

USGS cost share $212,100 (30%)

Other partners share $494,900 (70%)

- CWRM share $390,000
- Kauai share $100,000?

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Deliverables

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Prepared in cooperation with the State of Hawai'i Department of Hawaiian Home Lands

Availability and Distribution of Low Flow in Anahola Stream, Kaua'i, Hawai'i

Scientific Investigations Report 2012–5264

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

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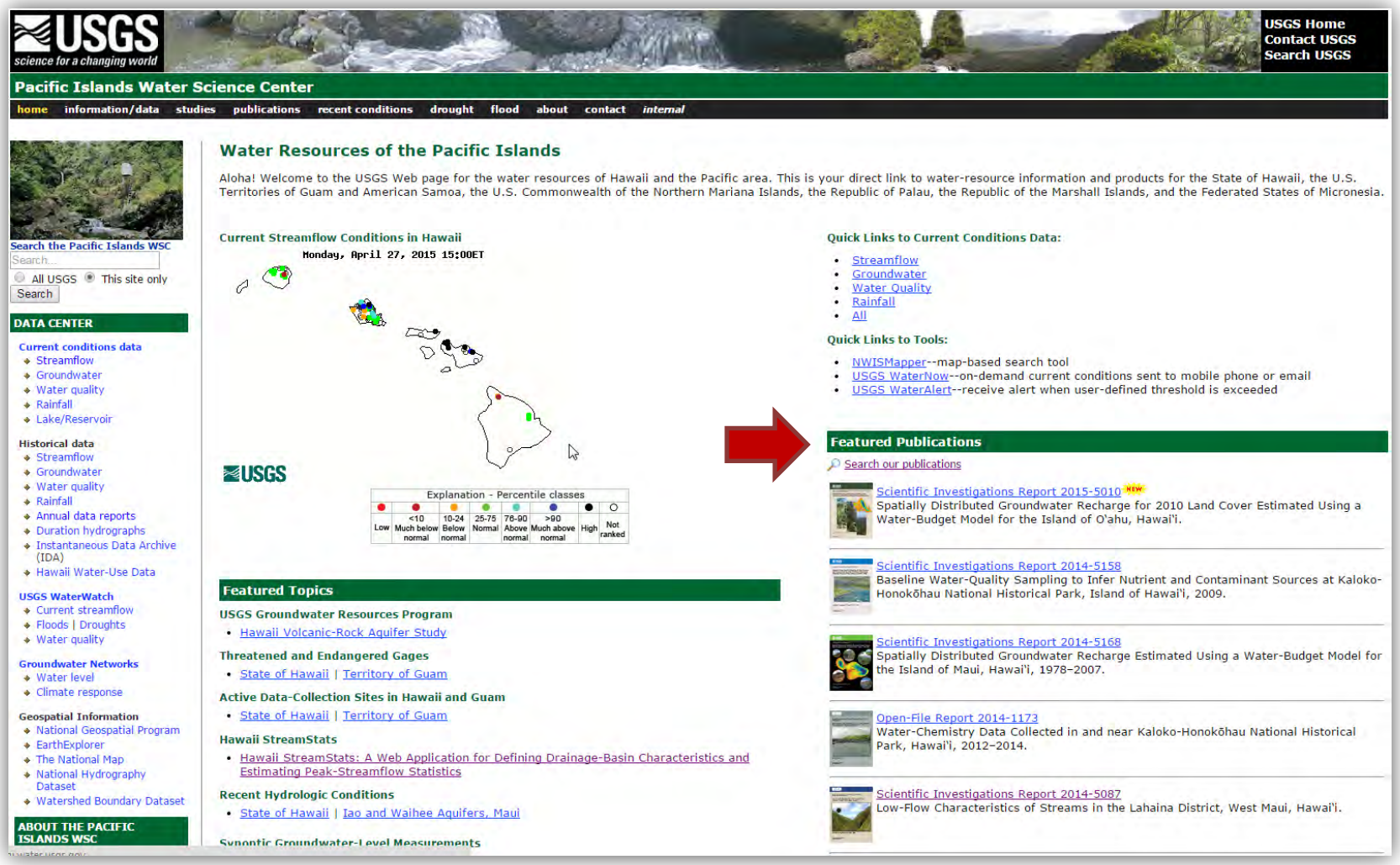
Prepared in cooperation with the State of Hawai'i Commission on Water Resource Management

Low-Flow Characteristics of Streams in the Lahaina District, West Maui, Hawai'i

Scientific Investigations Report 2014–5087

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

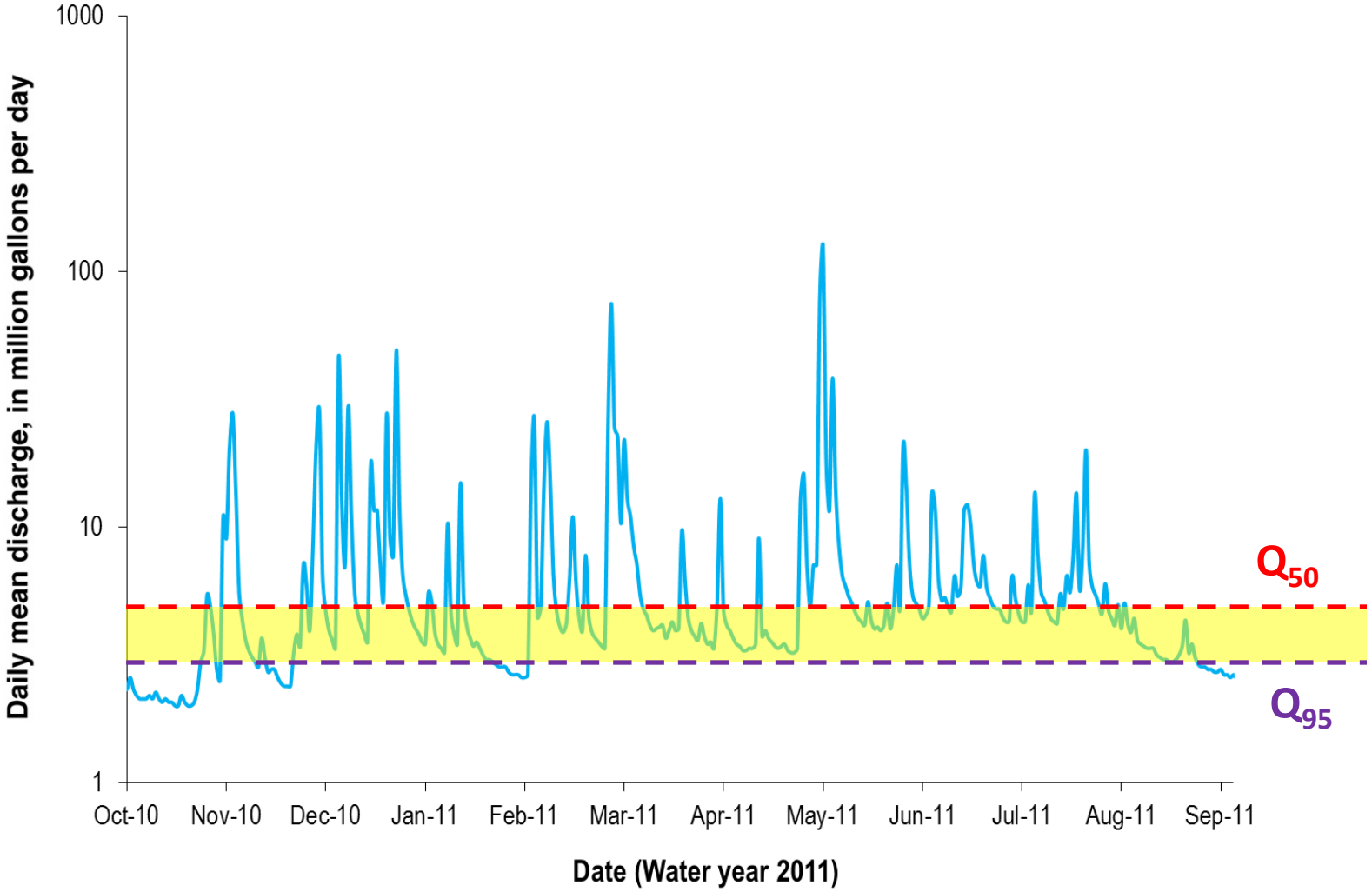
hi.water.usgs.gov




Questions
ccheng@usgs.gov

Low-flow statistics

Hydrograph of stream-gaging station on Hālaulani Stream, Kauaʻi, HI



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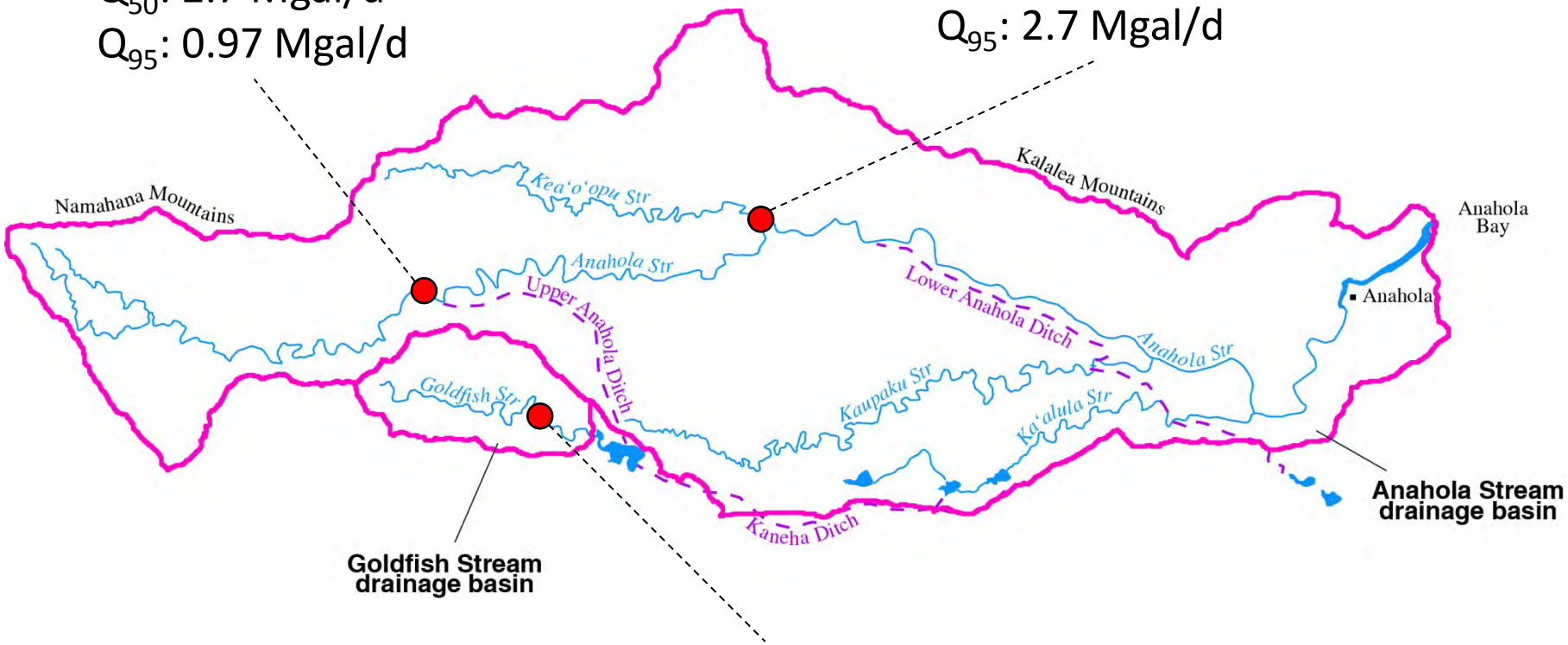
Flow statistics, Anahola Study

Q_{50}: 2.7 Mgal/d
Q_{95}: 0.97 Mgal/d

Q_{50}: 6.31 Mgal/d
Q_{95}: 2.7 Mgal/d



Q_{50}: 0.54 Mgal/d
Q_{95}: 0.23 Mgal/d

Partial-record sites

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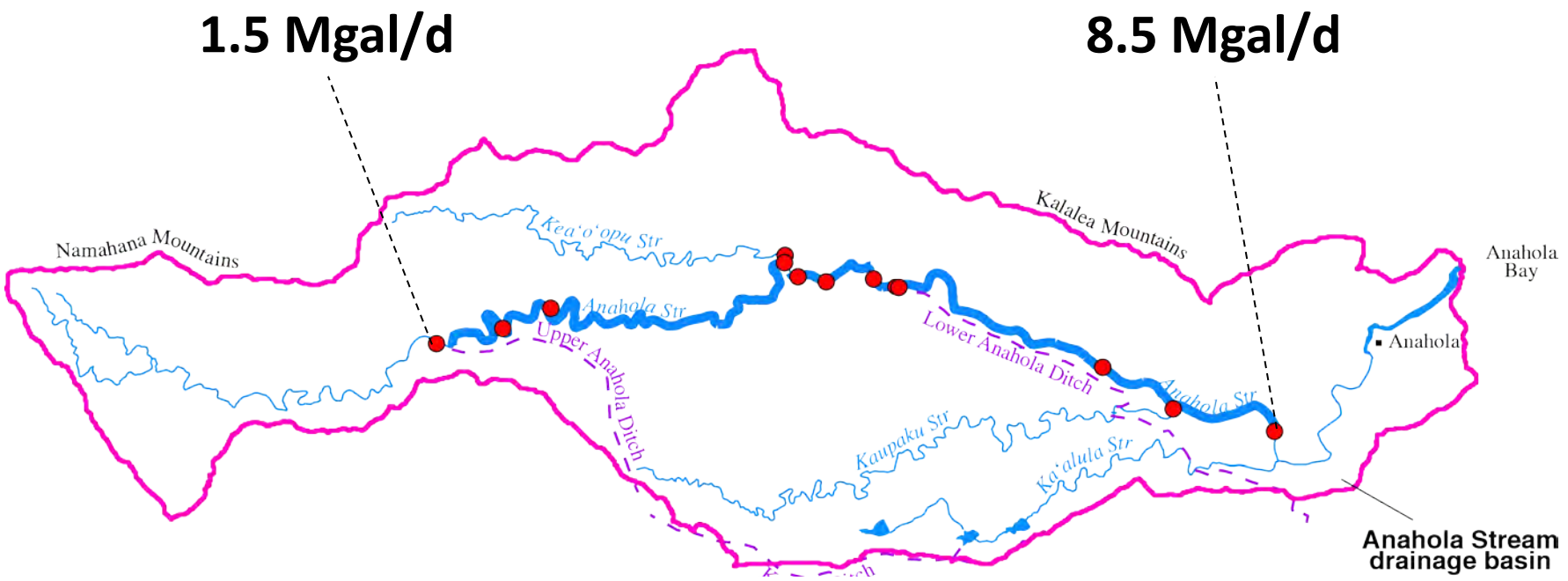
Seepage analysis, Anahola Stream



Wet season total seepage gain of about 7 Mgal/d

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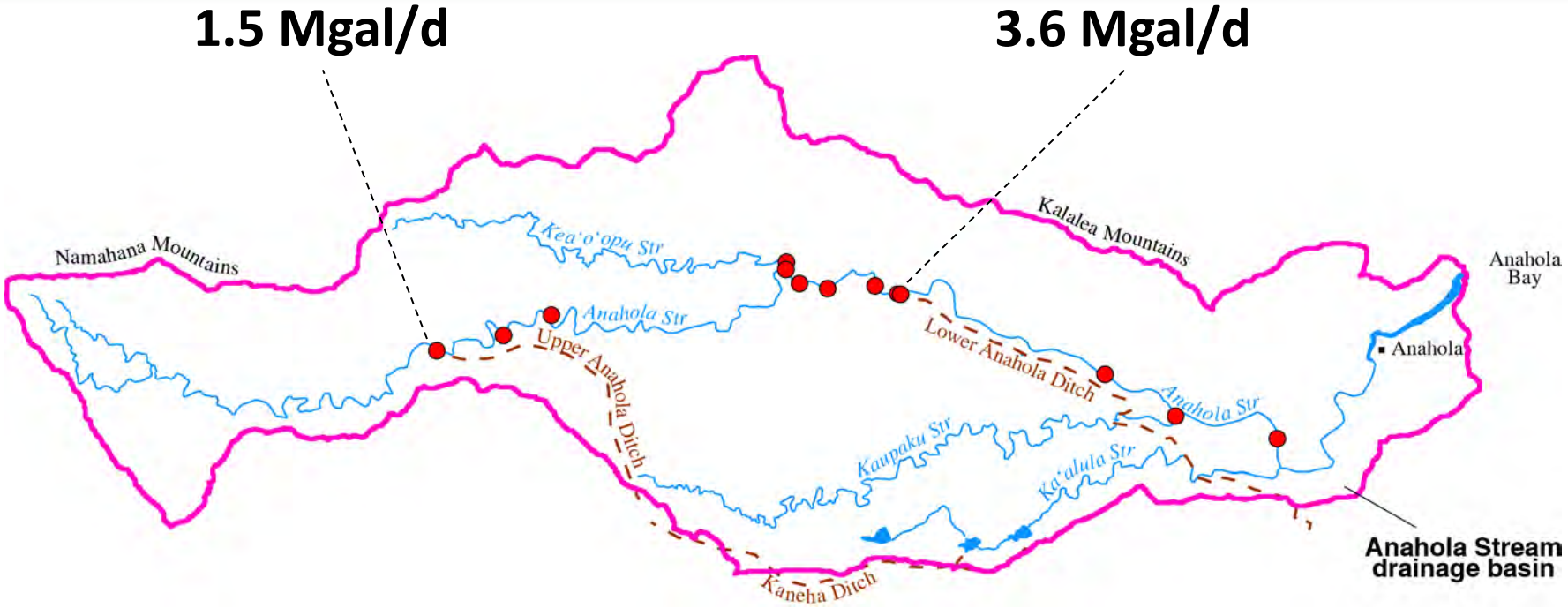
Flow reduction by diversion



The amount of flow left near the lower intake is about 2.1 Mgal/d (3.6 - 1.5 Mgal/d).

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