Wai Sampling Procedures

About this resource:
This protocol was developed as part of a 2022-2025 Collaborative Research project titled *Wetland Water and ʻIke (WAI): Improving Understanding of Hydrology to Inform Management Decisions.* The protocol provides methodologies for sampling water quality and stream flow, allowing Heʻeia NERR staff, other NERR staff, any interested researchers or students to replicate the project's methods.

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About the project:
This resource was developed through a 2022-2025 Collaborative Research project titled *Wetland Water and ʻIke (WAI): Improving Understanding of Hydrology to Inform Management Decisions.*

This project performed an in-depth characterization of surface and groundwater flow throughout Heʻeia to inform biocultural restoration and future groundwater management. Building on previous conceptual understandings, the project team measured surface and groundwater flow within Heʻeia. The project's collaborative process was essential to this work and included the convenings of a project advisory group and intended users (named Hui WAI). Iterative Hui WAI meetings shaped the project from its beginning to end, through the codevelopment of the proposal and research methods to its culminating workshops, and outputs. This process enhanced communication and relationships among investigators, resource managers, educators and helped build collective knowledge of the ways wai links biocultural restoration projects at partner sites.

The many outputs from this work include a dataset describing above and belowground hydrology and water quality in Heʻeia; a consolidated web-based access point to multiple real-time data streams; workshops that promoted intergenerational transfer of ʻike (knowledge); and, a set of educational programs tailored for partner sites. These resources provide ʻike (knowledge) to inform comprehensive and collaborative management of wai in the Heʻeia ahupuaʻa.

This webpage provides more information about the project.

Wai Sampling Procedures

Site selection:

1. Go to the GPS point
2. Select site based on needs for flow meter measurement and any apparent groundwater inputs.
3. Take GPS point of exact sampling spot [if not already recorded previously]
    a. Name site number plus SAMP
    b. Name site number plus FLOW
4. Set up the pump for sampling
5. Sample surface first

Sampling

1. No gloves/filter
    a. YSI-record time
    b. Radon-
        i. record time
        ii. 300mL boston round glass bottle for springs, 2L soda bottle for surface
        iii. No headspace, minimum exposure to air
    c. H&O
        i. Clear 20mL scintillation vials
        ii. Rinse x3
        iii. No headspace
        iv. fill from bottom, 3 complete overflows

Radon

H&O

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2. **GLOVES AND FILTER ON** when sampling
    a. Nutrients
        i. 2 replicates in 60mL centrifuge tubes
        ii. Rinse x3
    b. δ15N
        i. 1 rep, 60mL centrifuge tubes
        ii. Rinse x3
    c. CEC
        i. amber vial
        ii. CLEAN hands, no touch with tube/filter
        iii. Rinse x3

Nutrients and δ15N

CECs

3. CFCs
    a. Copper tubes, gloves, hold tubes on (3 people ideal)
    b. 480 mL boston round bottles with foil lined caps
        i. Do not touch or scratch caps, if cap is compromised in any way use a new cap
    c. No headspace
    d. Tape lid closed clockwise with electric tape

CFCs

Beginning of day:

1. Put PH probe on YSI
2. Ice in backpack cooler
3. Bring:
    a. Cooler backpack with sample packets
    b. Sampling backpack: YSI, data sheets, sharpies, gps
    c. For springs: Pump, push point, CFC tubing, CFC bottles, electric tape
    d. For streams: Flow meter, transect tape, measuring stick

YSI

Protocol for using the YSI ProDSS:

1. Hold power button (green) to turn on
2. Remove YSI ProDSS probe from calibration cup
3. Place YSI ProDSS probe in water to be sampled
4. Wait ~3 minutes and watch for values to stabilize
    - Turbidity usually takes longest
5. Press “ENTER” on handheld to log sample
6. Return YSI ProDSS probe to calibration cup
7. Hold power button to turn off

Radon

1. Immerse bottle fully in the water and capping vial under water, if possible
2. No need to filter collected water, **critical to NOT leave any headspace**

H&O isotopes

1. Sampler wear gloves and rinse 20 mL scintillation vials 3 times before filling
2. Immerse vial fully in the water and capping vial under water
3. No need to filter collected water, **critical to NOT leave any headspace (only a tiny bubble, 0.5 cm or less, is ok)**

Nutrients

1. Collect 2 replicate samples per site into 60 ml round plastic
2. Filter through the micro fiber glass filter 0.7um
3. Rinse 3 times with sample water, and then collect sample.
4. Store bottle in cooler, and store frozen at -20C back in the lab

Micronutrients (Contaminants of Emerging Concern, or CECs)

1. Sampler wear gloves and avoid touching the vial or lid with the syringe or filter
    a. *****Minimize the time water is held within the syringe - fill and empty immediately within minutes**
    b. *****Make sure the filtering contraption has not been touched with bare hands (hands will have residues of hand sanitizers, coffee, hand creams, medication the person may have touched etc), same goes for handling the syringe in gloves -one should not rub their face in gloves etc.**

2. Open up the new syringe packet, and collect water into the syringe, and attach the filter holder containing the GF/F filter.
3. Use filtered water to rinse the vial 3 times, and fill the 40 mL amber vials almost full with a little headspace
4. Store sample in cooler, then store **in fridge** back in the lab

Flow Meter

1. Select measurement cross section
    a. Flow directions at each measurement point across the stream are parallel to the bank and perpendicular to the cross section
    b. The streambed is stable and free of large rocks, weeds and protruding obstructions that cause turbulents
2. Construct a dam to even out flow if needed
3. Follow prompts in flow meter-select 20 stations for small <0.5m widths, 25 for widths from 0.5-1m, and 30 for >1m
4. Photograph cross section, record observations of stream bed, sketch cross section
5. Record data on data sheet for each station
6. When the stream profile is completed, the meter automatically calculates the total flow-record
7. For accurate measurements, stand to the side of the instrument so as to not obstruct flow, stand out of stream if possible

Protocol for using the YSI ProDSS:

8. Hold power button (green) to turn on
9. Remove YSI ProDSS probe from calibration cup
10. Place YSI ProDSS probe in water to be sampled
11. Wait ~3 minutes and watch for values to stabilize
    - Turbidity usually takes longest
12. Press “ENTER” on handheld to log sample
13. Return YSI ProDSS probe to calibration cup
14. Hold power button to turn off

Things to keep in mind when using YSI ProDSS:

1. Keep YSI ProDSS probe in calibration cup with tap or DI water filled to first line when not in use
2. YSI ProDSS Handheld is **NOT waterproof** - Keep YSI ProDSS handheld dry, especially the charging port at the top
    - Handheld can be kept in zip-tied ziplock bag
3. Connections between YSI ProDSS probe and sensors are dry connections **(NOT waterproof)**
4. pH sensor can stay on YSI ProDSS probe in calibration cup for a day, but in general, pH sensor should be removed and stored separately when not in use
    - Remove pH sensor and place in pH 4 solution bottle w/ rubber stopper (make sure sensor face is fully submerged)
    - Place connection plug into empty port

When you are done using the YSI ProDSS:

- Gently clean the surface to make sure there is no residual mud or dirty water in the calibration cup or on the sensors
    - Do not attempt to clean the sensor faces, but let the He‘eia NERR technician know so that a trained tech can clean the sensors
- Return the sonde to He‘eia NERR technician and let them know of anything unusual that you noticed while using the instrument.