

PolyWAG : eDNA Sampler A Field Programmable and Customizable Auto-sampler for eDNA

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ABSTRACT AND PURPOSE:

Organisms leave traces of DNA in their environments (eDNA). eDNA provides sensitive, non-invasive, detection and quantitation of resident species. Current eDNA sampling consists of manually filtering water, which is labor and cost-intensive for remote locations.

This eDNA sampler project aims to provide:

- Affordable
- Open-sourced
- **Remotely deployable**
- Fully automated
- **Customizable alternative.**

The full sampler is estimated to be **\$1500 for** parts and \$1500 for labor.



Top View



DEVELOPMENT

- Push-to-connect tubing
- Modular PCBs for easy replacement/upgrade
- WiFi enabled with Browser Application
- Internal pressure sensor for stop condition
- Flow sensor for filtered volume
- Reusable filter casing

FEATURES

- 24+ inline replaceable and reusable filter units
- Sleep mode enabled (≈130uA)
- 350mL/min flow rate
- Openly published, modular design
- Browser app for real-time monitoring, scheduling tasks, and manual operation
- Data logging: time, pressure, flow, filtered volume, and water temperature
- Fits in Pelican's 80QT Wheeled Cooler which retains ice for up to 10 days
- Option: Data-logged river depth sensor to flow-weight eDNA data

Rear View

BROWSER-BASED APPLICATION



A graphical user interface was a key element of the design. This browser-based interface eliminates errors that may arise from manipulating the on-board electronics via user changes in programming.

- In person wireless communication within 30 feet via 2.4GHz WiFi
- Endpoints open to third-party developers

Feature:

- Responsive design across different screen sizes
- Realtime status updates
- Ability to set the onboard real-time clock automatically
- Log file viewer
- Password protected

Task scheduling:

- Option to schedule a task to be executed at a later date and time
- Ability to assign multiple filters to run automatically after one another
- Manual operation

SAMPLING PROCESSES

The filter casing is designed for 47mm disc filters. After each use, the whole casing can be submerged in diluted bleach to remove DNA residue, before placing a new filter for reuse.

Samples are collected in **5 steps**:



Wash main line with new water

Pushing water through filter casing

Pushing air to minimized water retention

Pushing pure ethanol for preservation

Clear main pipe and intake of water

UPDATE RTC TASKS SUBMIT	
DRY	Tasks +
DECONTAMINATE3	VIEW STOP SCHEDULE
2 1 0	Task Settings
21 22 23	Task Name Name used to identify the task
	Untitled 0
econds) before moving to the preserve state	Schedule Date Specific date when to run this task (YYYY-MM-DD)
	08/17/2019
	Schedule Time Specific time when to run this task (hh:mm) :
conds) ect the alcohol	Valve Selected Valves assigned to this task
	e.g. 1,2,3,4,5
	Time Between Valves Controls how long until the next sample
	Notes Additional information associated with this task up to 250 characters

ELECTRONICS



Sensor Module



Inline Pressure Sensor



Internal of Filter Casing





Filter Casing Unit



We are performing a cross-contamination test with Rhodamine dye and fluorometer measurements. Further DNA cross-contamination tests are scheduled to quantify any cross-sample contamination. A solution heavily infused with DNA and cell tissue of one species will be drawn into the sampler, followed by taking two samples with de-ionized water. The degree of cross contamination will be quantified following DNA amplification of all the samples.

ACKNOWLEDGMENTS

This work is supported by the USDA, National Science Foundation, and Open Sensing Lab

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Logic Module



Power Module



LiFePO₄ battery



Solenoid Latch Valve

CROSS-CONTAMINATION TEST





OpenSlab Website



*OpenSampler Project



eDNA GitHub



eDNA Project

Shielded motor