

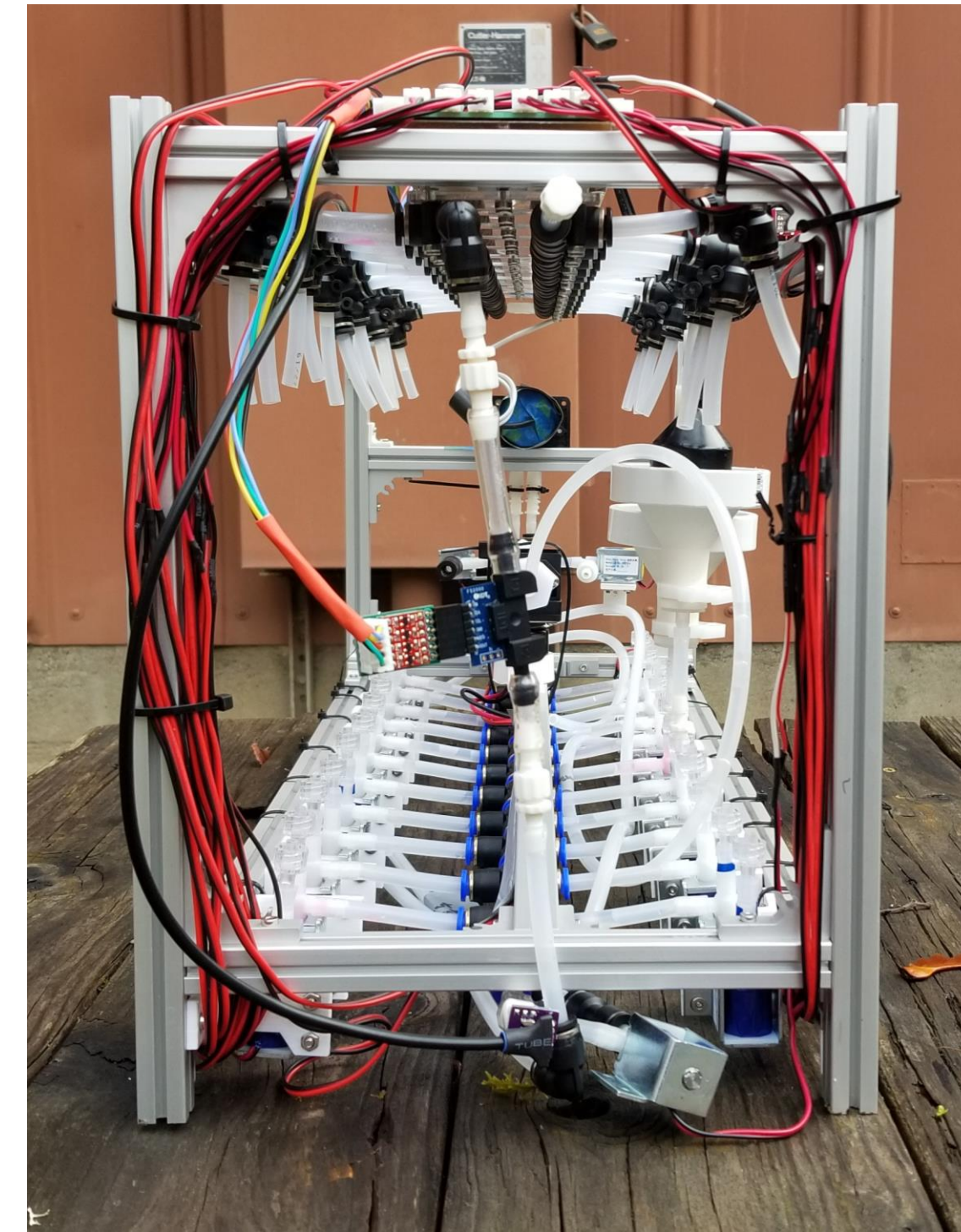
ABSTRACT AND PURPOSE:

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:

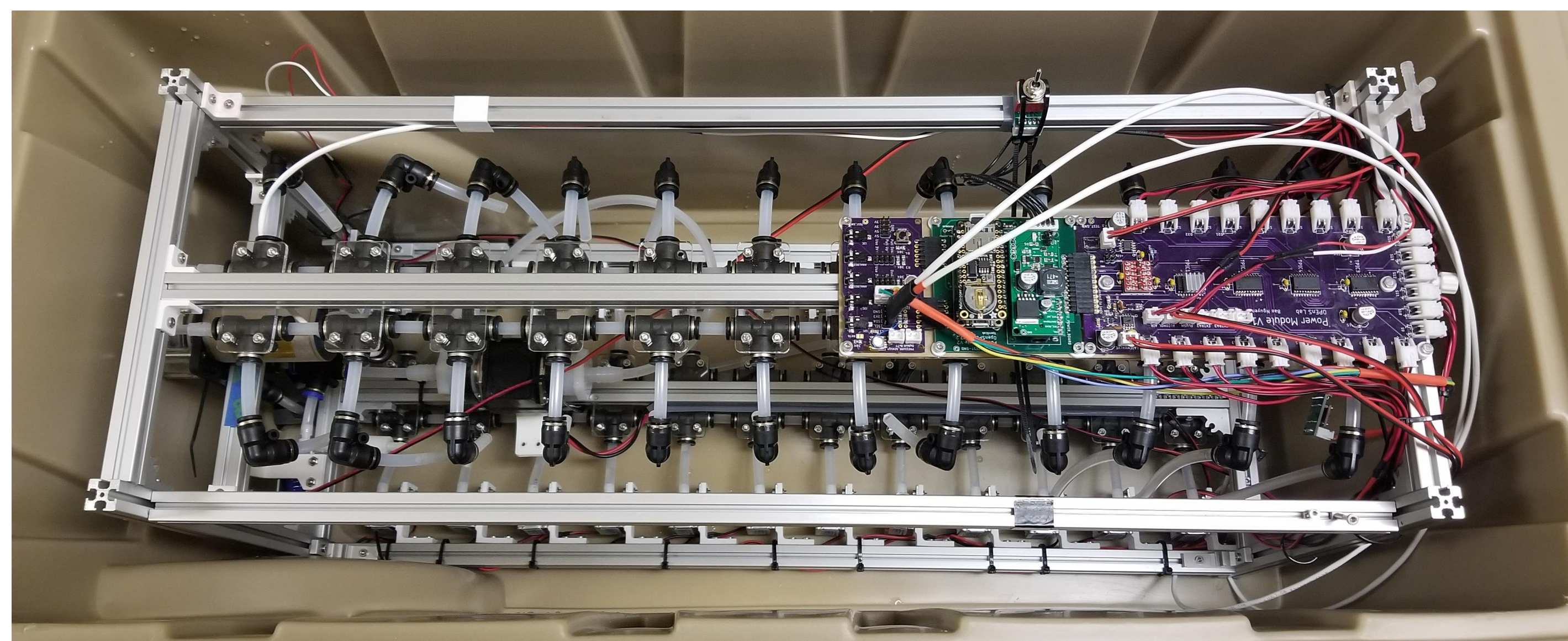
- **Affordable**
- **Open-sourced**
- **Remotely deployable**
- **Fully automated**
- **Customizable alternative.**

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



Rear View

Top View



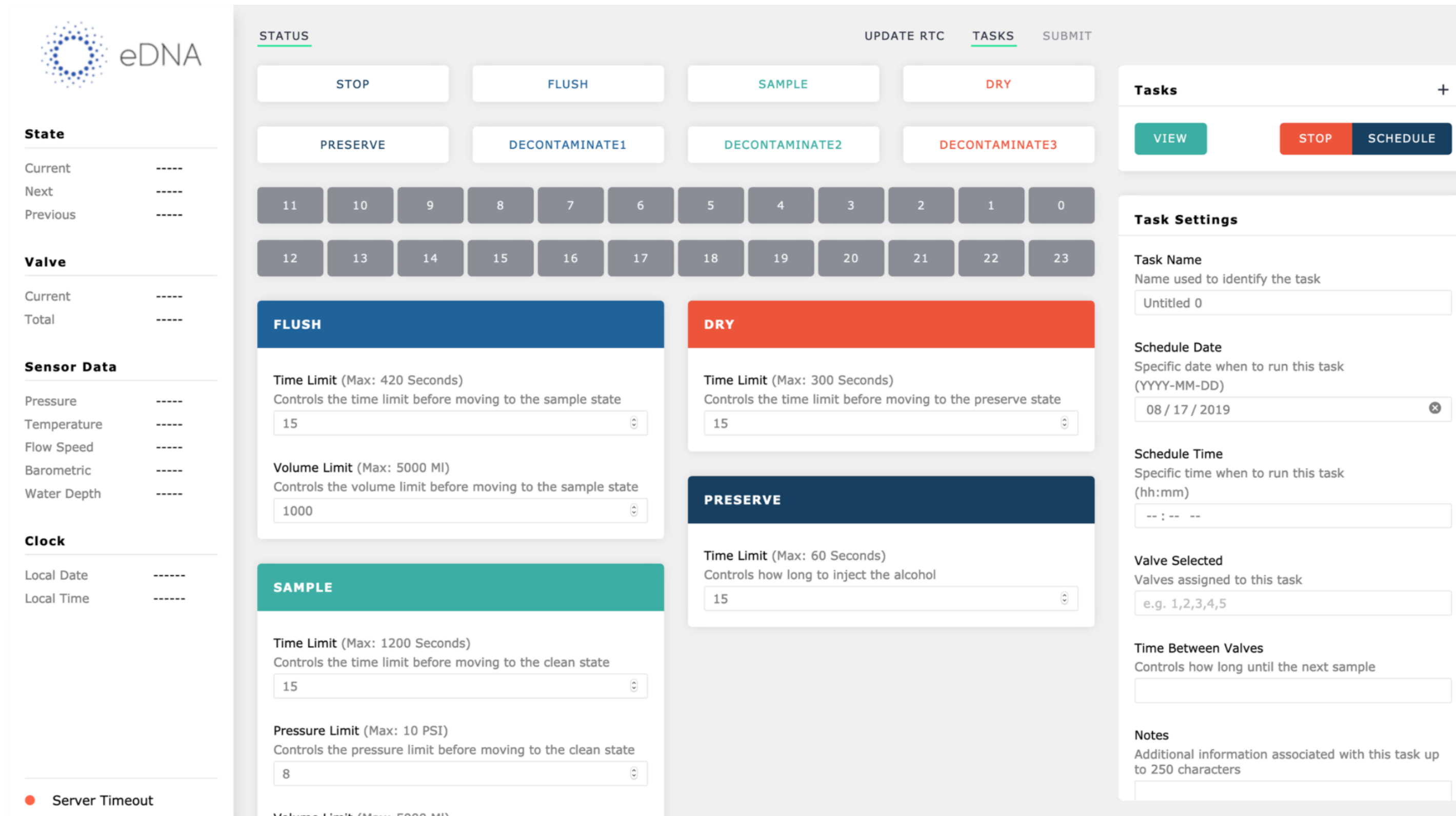
DEVELOPMENT

- 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

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

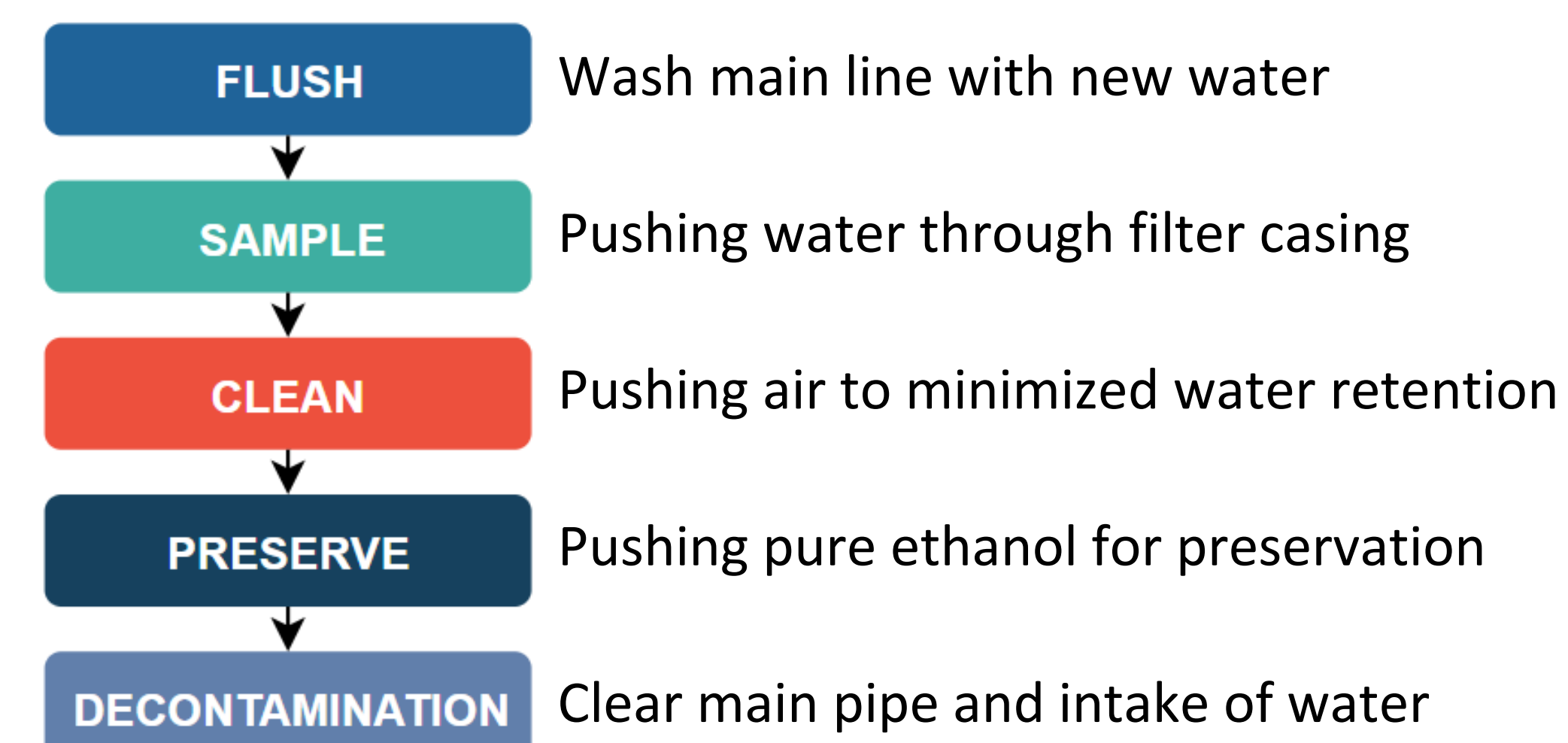
Task scheduling:

- 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**:

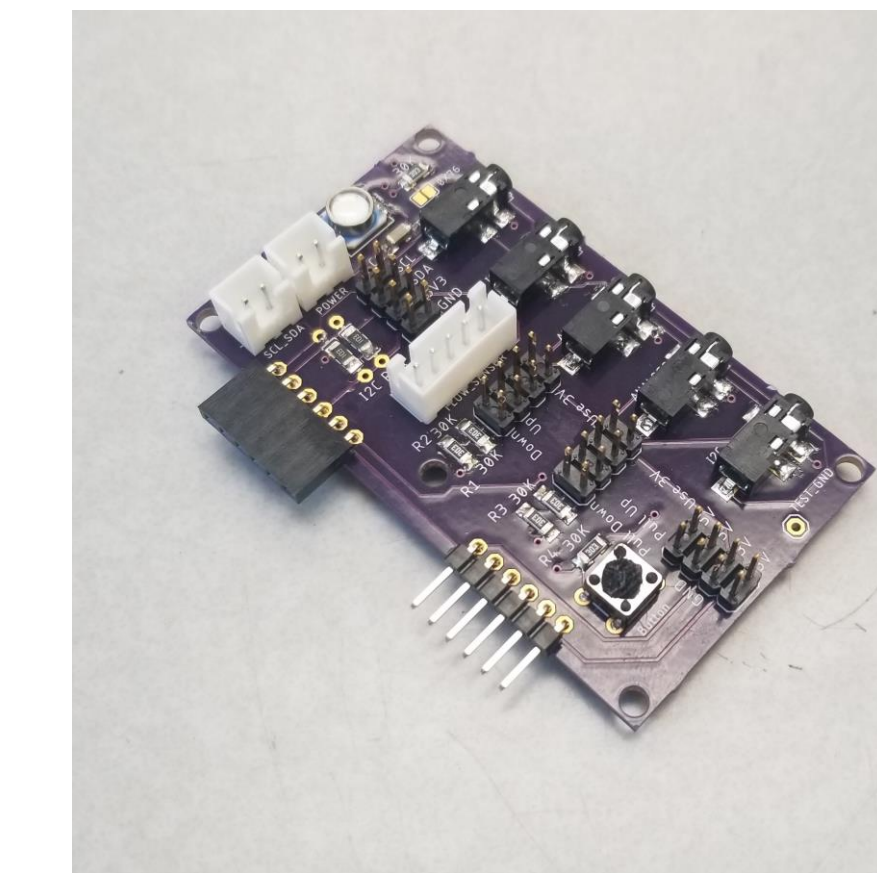


Internal of Filter Casing

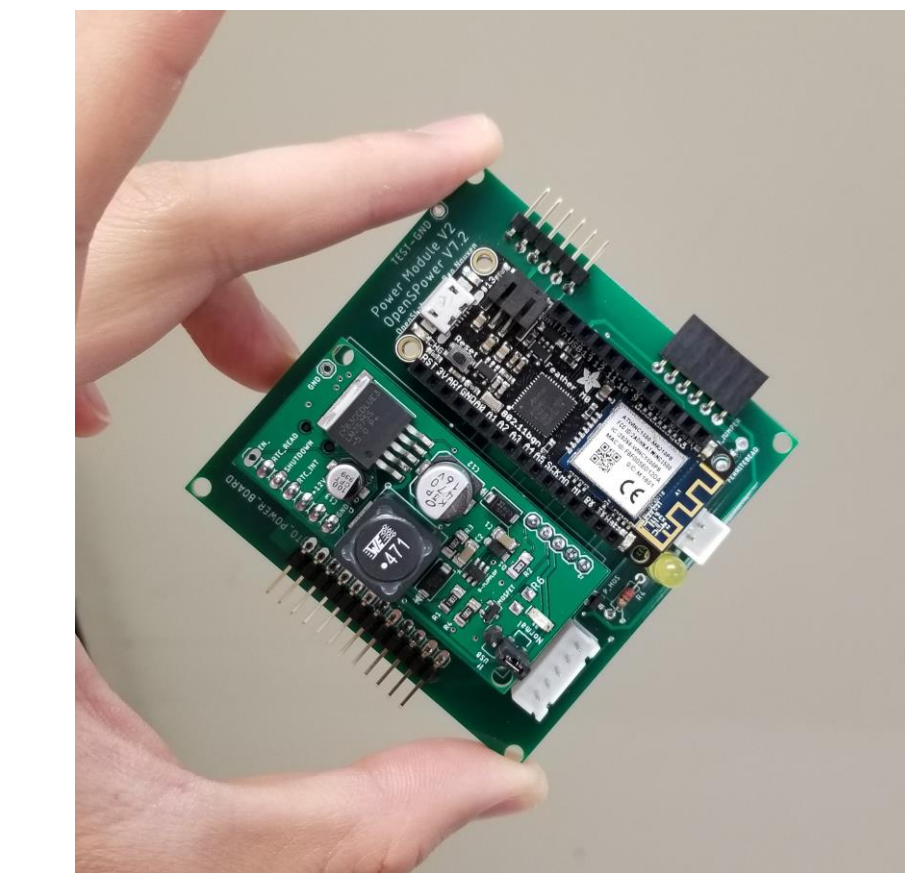


Filter Casing Unit

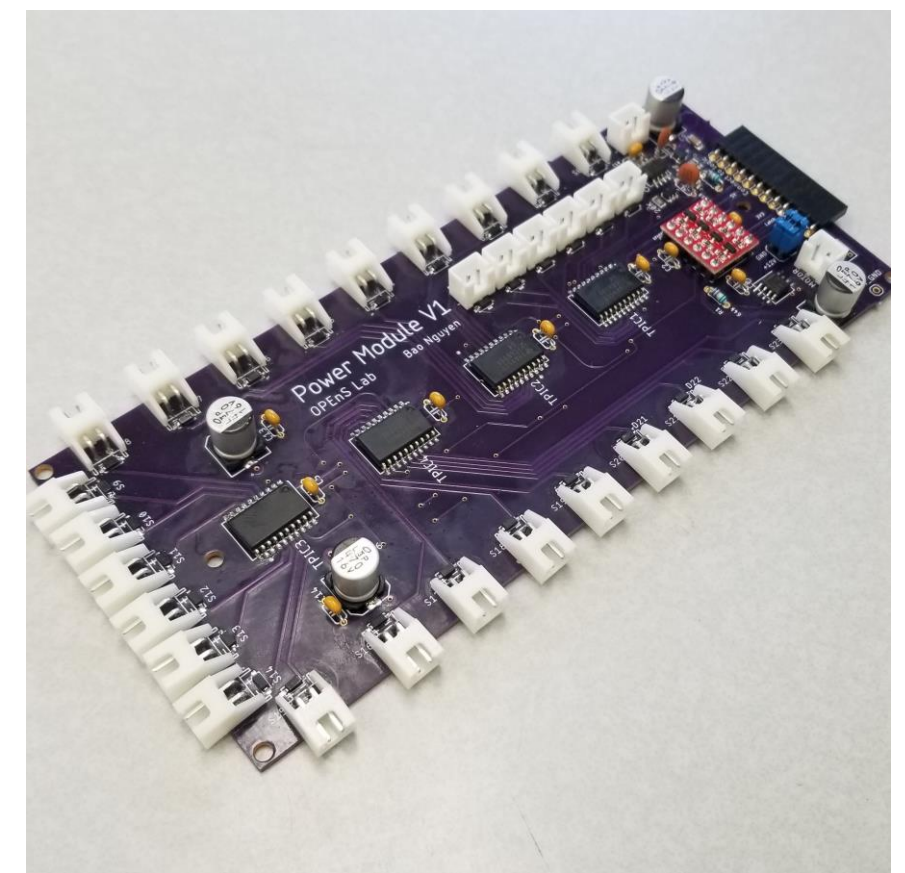
ELECTRONICS



Sensor Module



Logic Module



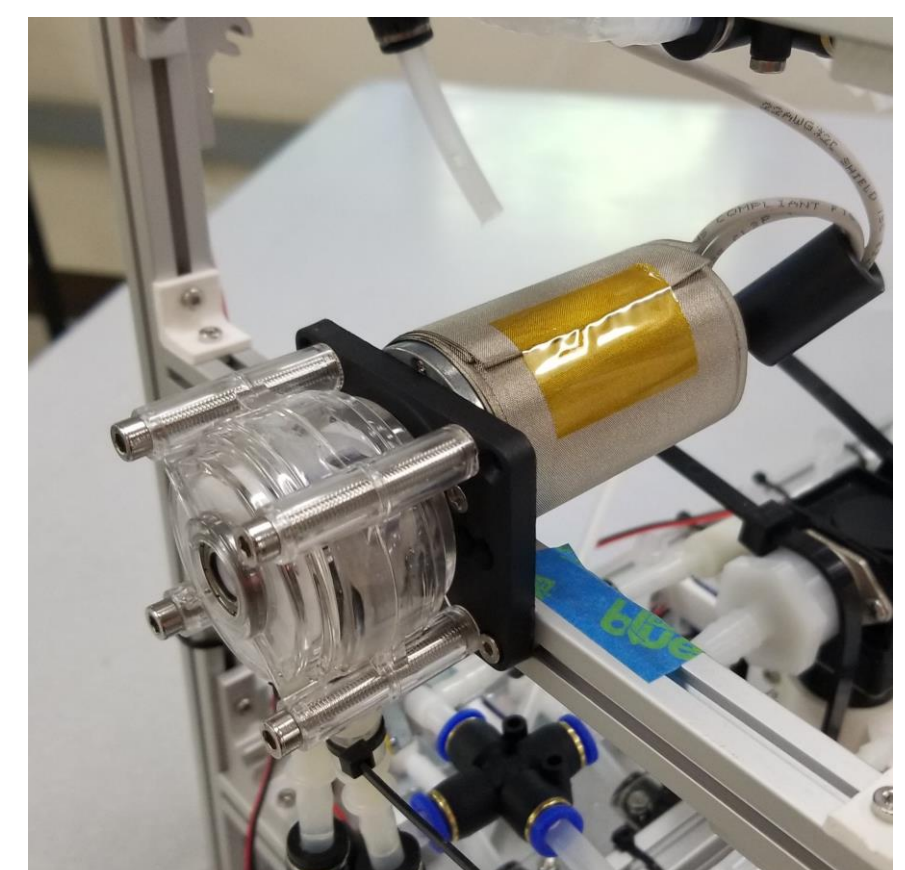
Power Module



Inline Pressure Sensor



LiFePO₄ battery



Shielded motor



Solenoid Latch Valve

CROSS-CONTAMINATION TEST

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

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OpenSlab Website



eDNA GitHub



*OpenSampler Project



eDNA Project