



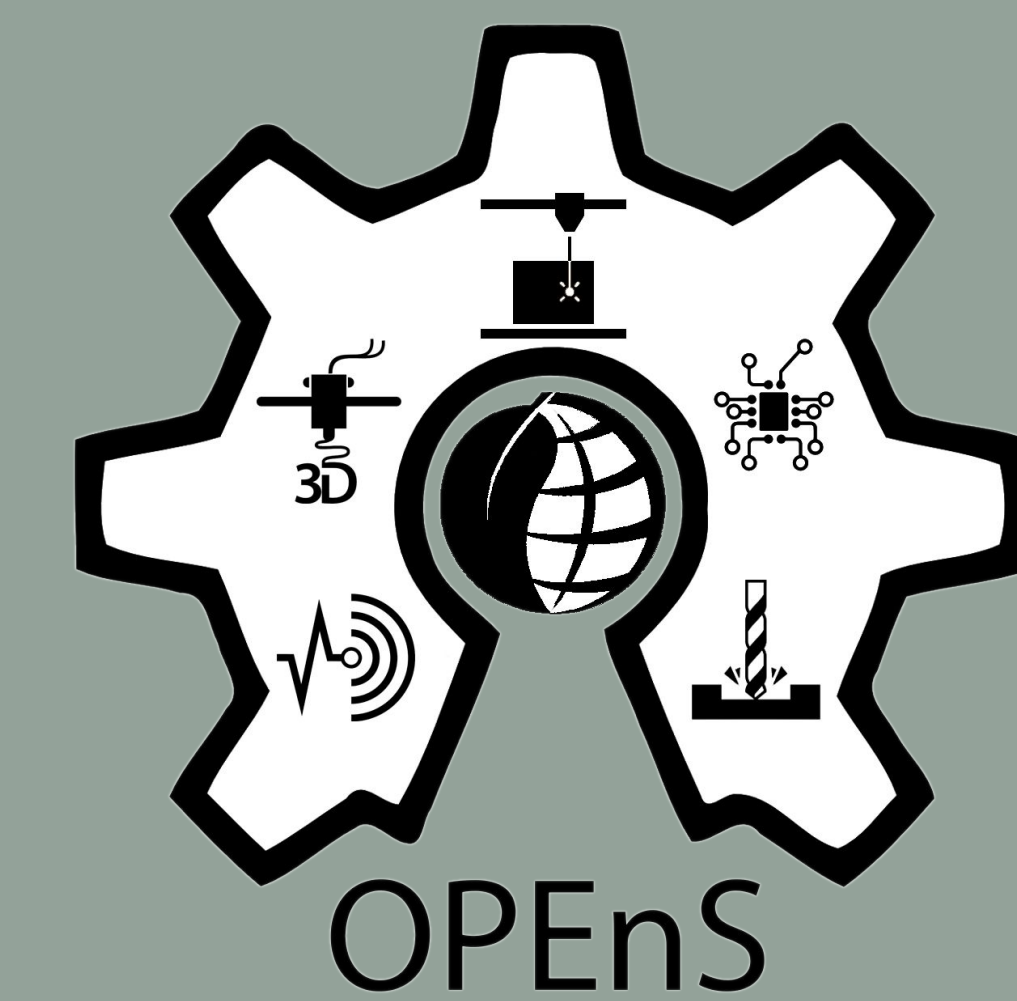
Oregon State
University

eDNA Sampler

A Field Programmable and Customizable Auto-sampler for eDNA

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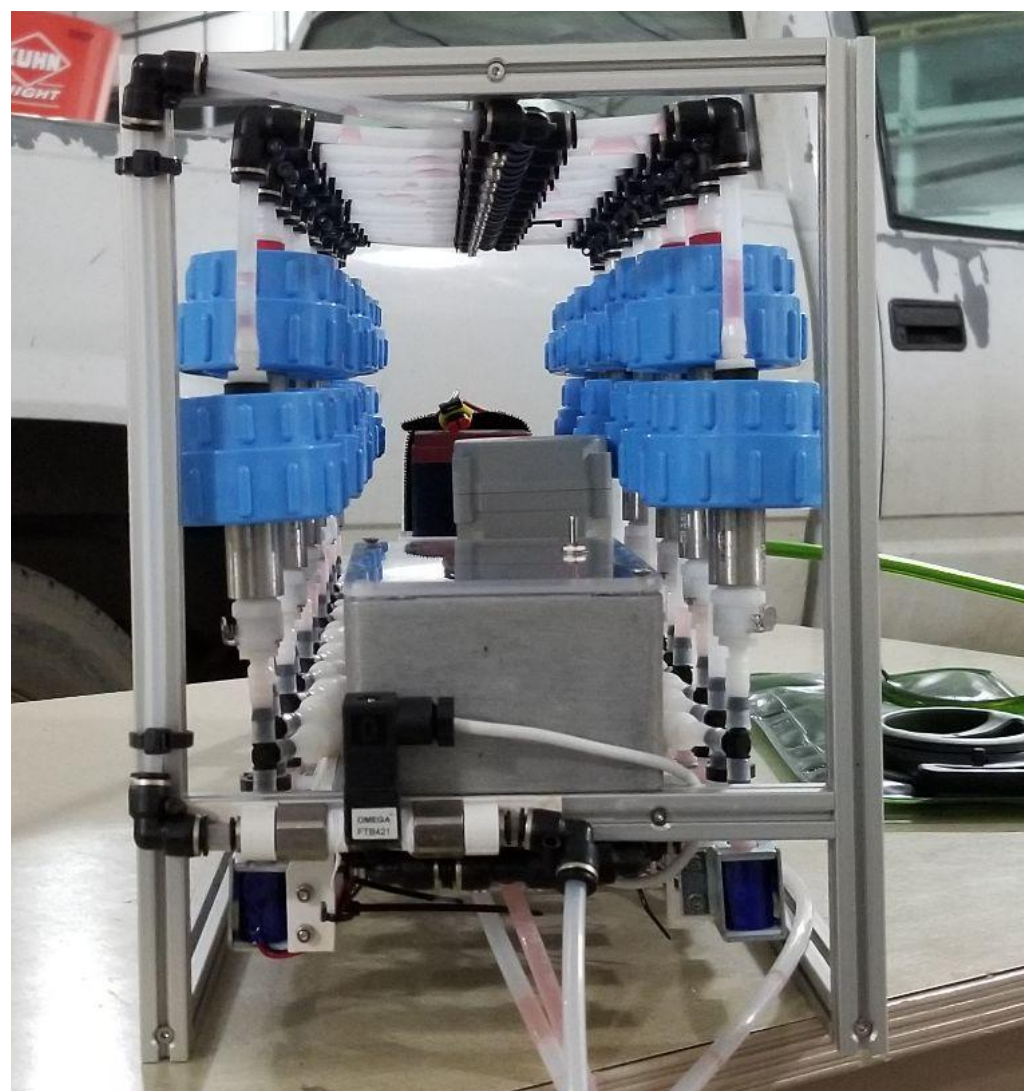


ABSTRACT AND PURPOSE:

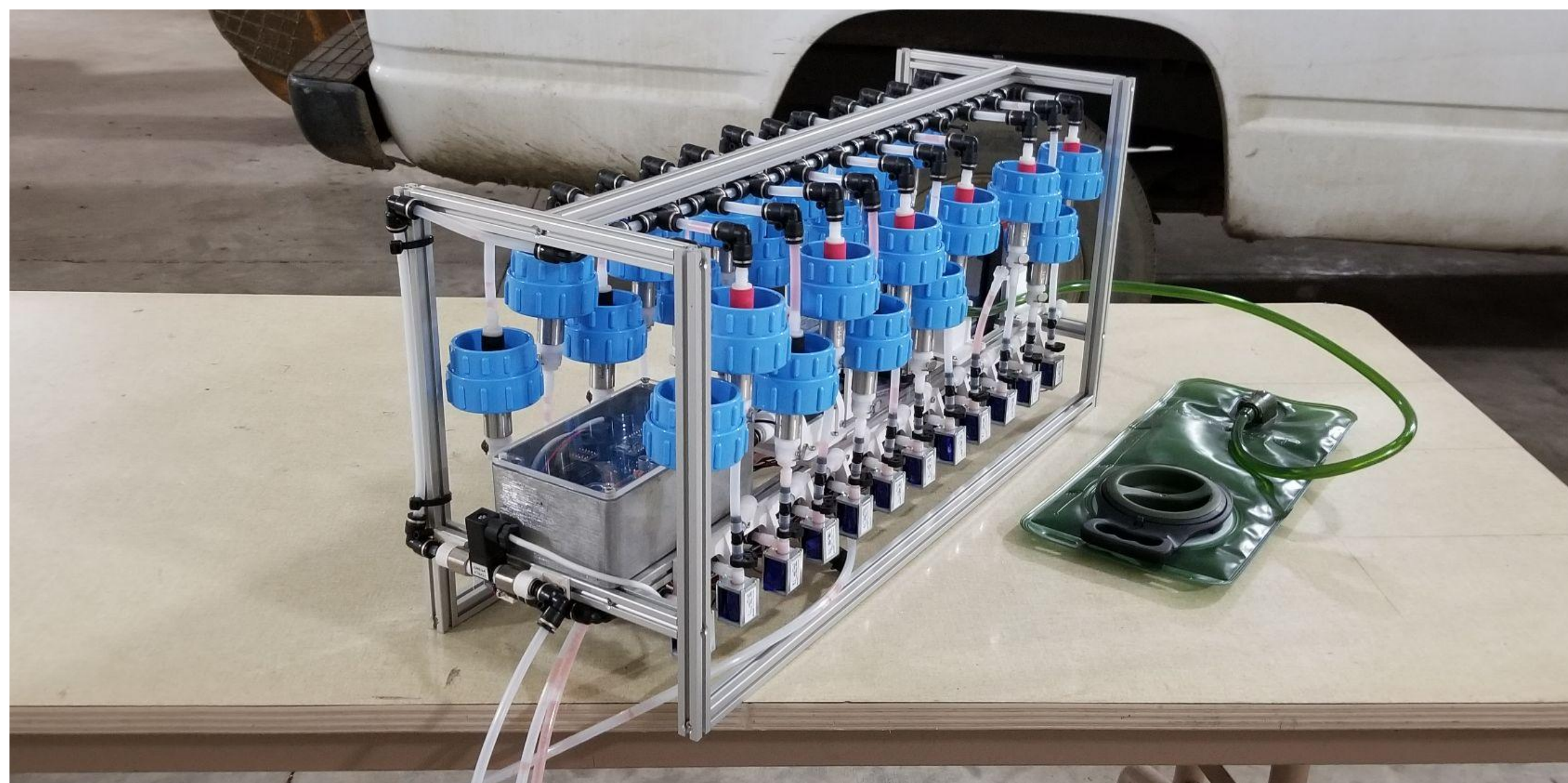
Organisms leave traces of DNA in their environments (eDNA). eDNA provides sensitive, non-invasive, detection and quantitation of resident species. Current eDNA sampling consists of manually filtering water, which is labor and cost-intensive for remote locations.

This project aims to provide an eDNA sampler that is:

- **Affordable**
- **Open-sourced**
- **Remotely deployable**
- **Fully automated**
- **Customizable alternative**
- **Wirelessly programmable**
- **Power conserving for longer deployment**



Front View



Top View

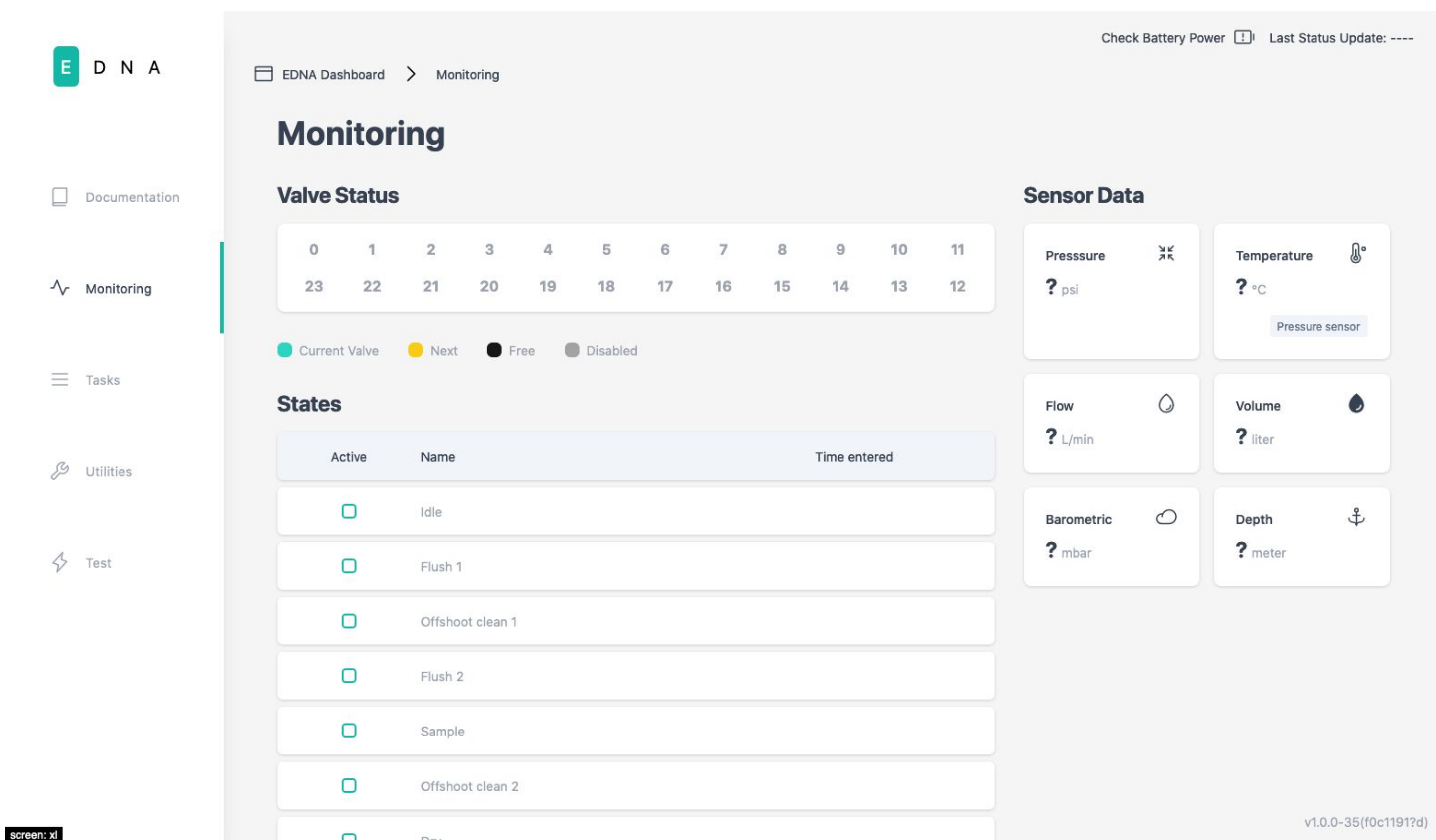
DEVELOPMENT

- Web-based UI
- Custom PCB for easy replacement/upgrade
- Component Testing Rig
- Custom 70 um pre-filter
- Turbidity testing
- Field Testing

FEATURES

- 24+ inline replaceable and reusable filter units
- Sleep mode enabled ($\approx 130\mu A$)
- 150mL/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 80QT Wheeled Cooler which retains ice for up to 10 days

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

Features:

- Responsive design across different screen sizes
- Real time status updates
- Ability to set the onboard real-time clock automatically
- Password protected
- Reads from sensors on samplers
- Triggered sampling sequence

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

SAMPLING PROCESSES

Samples are collected in **10 steps**:



- Prefilter/Intake clear- Runs pump in reverse to dislodge pre filter/remove inlet water
- Water Flush: Flushes the main line
- Offshoot Clean: Remove offshoot water
- Water Flush: Flushes the main line
- Sample: Pushes water through main line as well as through the filter
- Preserve Flush: Saturates the main line with preservative
- Preserve: Inject alcohol into filter housing
- Water Flush: Flushes the main line of ethanol and potential preserved DNA
- Air Flush: Removes water from outtake line (no freezing)
- Idle: OFF/Sleep

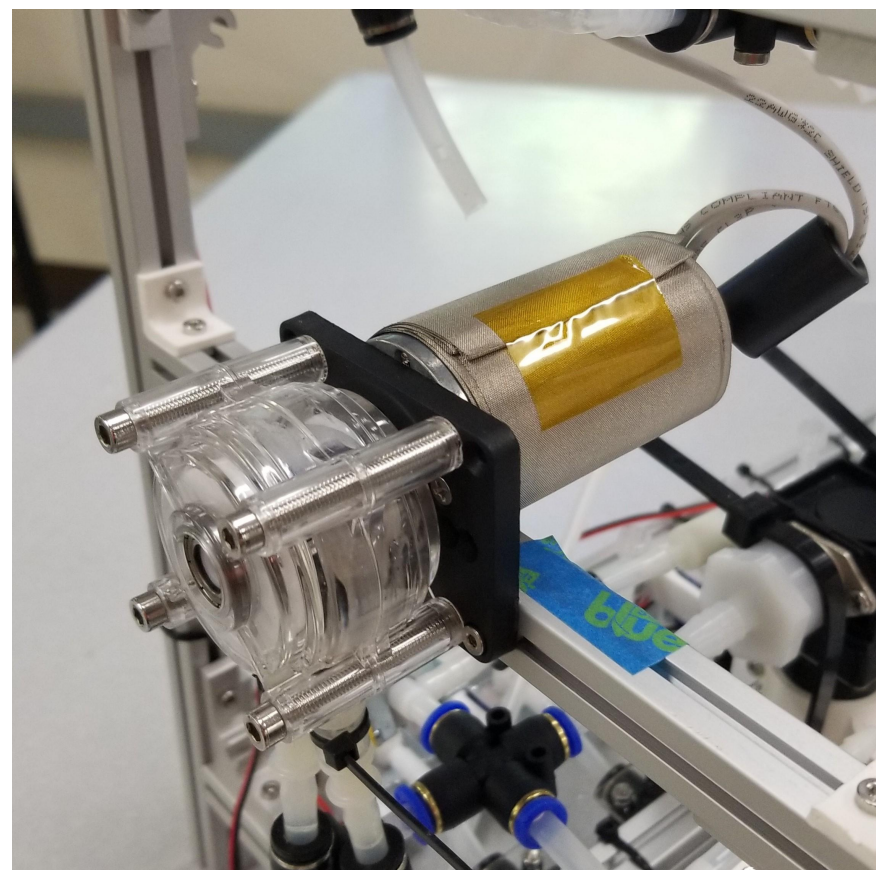
ELECTRONICS



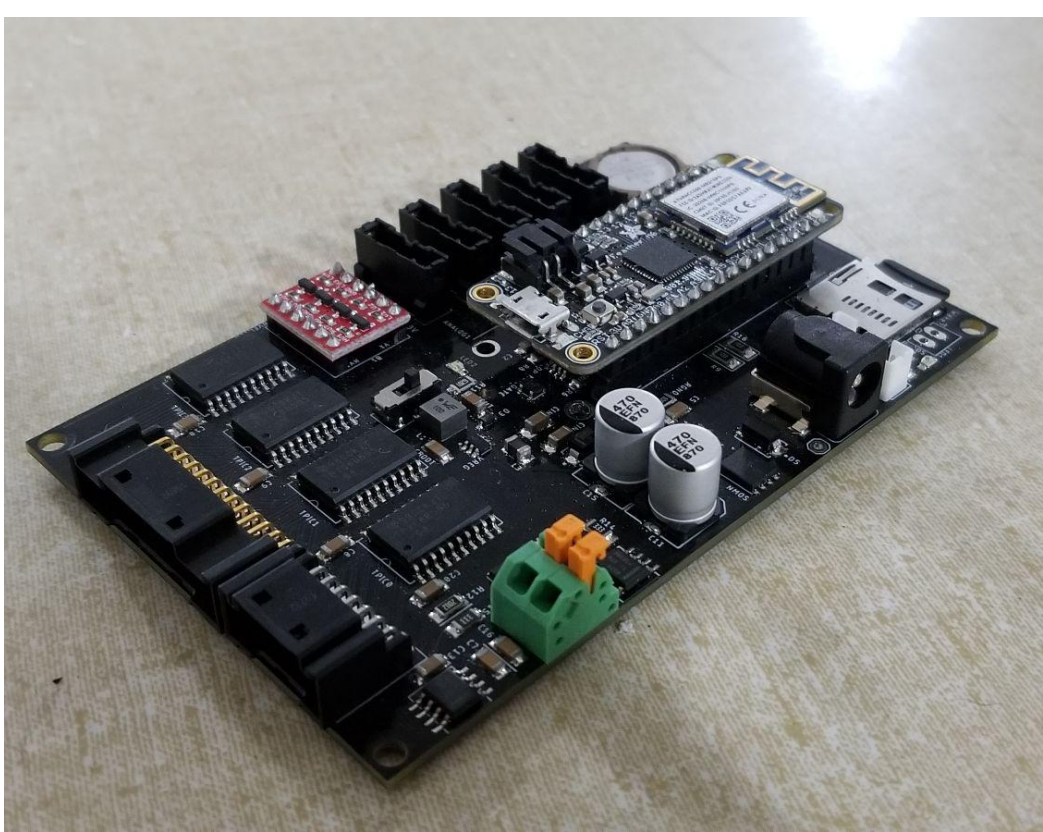
Inline Pressure Sensor



LiFePO₄ battery



Shielded motor



Logic Board

We have moved from a multiple logic board design over to a single logic board design. This has the benefit of reducing the overall footprint and allowed for the repositioning of the electronics box. The new position reduces the lengths of wires and eliminates the need to route wires on the side of the machine as was necessary in the previous version.

CROSS-CONTAMINATION Study

We are performing a cross-contamination test using Alaskan Sockeye Salmon DNA and DI water as a control. The DNA concentration levels for consecutive filters will be analyzed with PCR to determine the cross contamination levels between samples.



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OPeNSlab Website



eDNA GitHub



eDNA Project