## Abstract Draft 2:

Environmental DNA, eDNA, is an ideal way of researching aquatic environments to determine what species are present in an area the biodiversity of an area, and if any invasive or endangered species are present. Traditional sampling of environmental DNA (eDNA) consists of manually filtering water, which is labor and cost-intensive for remote locations. Furthermore, commercialized solutions are either expensive or require a field operator to function. We have built an eDNA capable of autonomous multi-sampling for a greatly reduced price compared to existing technologies. Our PolyWAG eDNA sampler system is a water sampling device that collects DNA samples via 47mm filter and provides a non-invasive, safe and autonomous means of eDNA collection. The sampler can hold 24 filters and is designed to be easily replaced and reusable. A browser application is used for real-time monitoring, scheduling tasks, and data logging for time, pressure, flow, and filtered volume. Additionally, the sampler design is openly published, modular and is constantly being tested to help us optimize our software and hardware to give us the best results. The 9-step sampling sequence helps reduce cross contamination significantly. Our machine can be deployed for an extended period. It is completely autonomous and costs around $6000.

## Past Abstracts: Organisms leave traces of DNA as they move through their environments. The extraction of these DNA traces is known as environmental DNA (eDNA). eDNA provides scientists and researchers a non-invasive, rapid, cost-effective and sensitive way to detect and quantify species. Traditional eDNA sampling consists of manually filtering water, which is labor and cost-intensive for remote locations. Furthermore, commercialized solutions are expensive and require a field operator. This eDNA sampler project aims to provide an affordable, open-sourced, remotely deployable, fully automated, and customizable alternative. The PolyWAG (Water Acquired Genomics) system can run up to 24 inline filter units with support for different conditions including pressure, time and volume limit. The pumps deliver maximum 400mL/min with solenoid valves separating each inline filter to minimize cross-contamination. At the end of each sample, the desired stabilizing solution can be injected to fully submerge the filter for preservation. An optional river depth sensor can provide a proxy for flow to correct eDNA concentrations to allow for improved quantification of organisms. Data acquired during operation including water depth, pressure, temperature, and flow rate will be stored on microSD card in CSV format, which allows easier data export and analysis. A web application provides an intuitive UI for in-field programming, real-time sensor updates, scheduling tasks, and manual operations. We present data from multiple tests showing the length of the preservation period and the contamination level between samples. The PolyWAG system is estimated to be $3000 each, with add-on river depth sensor and 10ah 12V battery.

## Abstract Draft 1:

Scientists are always looking for quick, cost-effective, accurate and ideally non-invasive ways of researching specific environments and species. Environmental DNA, eDNA, is an ideal way of researching aquatic environments and species. eDNA can be used to determine what species are present in an area the biodiversity of an area, and if any invasive or endangered species are present. Traditional sampling of environmental DNA (eDNA) consists of manually filtering water, which is labor and cost-intensive for remote locations. Furthermore, commercialized solutions are either expensive or require a field operator to function. The PolyWAG eDNA sampler system is a water sampling device that collects DNA samples via 47mm filter holders and provides a non-invasive, safe and autonomous means of eDNA collection. The sampler can hold 24 filter holders and they are designed to be easily replaced and reusable. A browser application is used for real-time monitoring, scheduling tasks, and data logging for time, pressure, flow, and filtered volume. In addition, the sampler design is openly published, modular and is being constantly tested to help us optimize our software and hardware to give us the best results. Having worked on multiple iterations of the sampler, we have decided to go with a 9-step sampling sequence that helps reduce cross contamination significantly. As a result, we have a machine that can be deployed for an extended period, while being completely autonomous in terms of sampling at a cost around $6000 per sampler.

## References:

[1] - <https://www.usgs.gov/special-topics/water-science-school/science/environmental-dna-edna#overview>

[2] - <https://oceanexplorer.noaa.gov/technology/edna/edna.html>