

1 Environmental DNA is DNA derived from mucus, feces, gametes, and carcasses  
2 [1]. Many things can be learned once this DNA is put through sequencing. eDNA  
3 can be used to determine what species are present in an area, the biodiversity of an  
4 area, and if any invasive or endangered species are present [2]. eDNA sampling  
5 provides scientists and researchers a non-invasive, rapid, cost-effective and  
6 sensitive way to detect and quantify species in many environments.  
7  
8 Traditional sampling of environmental DNA (eDNA) consists of manually filtering  
9 water, often requiring one or more researchers to be on location for days or weeks  
10 [3]. The filtration process manual filter of water varies depending on the researcher, but it is common  
11 to pull a sample of water with a bottle and pour that water into a funnel containing  
12 a filter. This can be connected to a vacuum pump to expedite the filtering process.  
13 After the sampling process is completed, the filters need to be preserved and the  
14 setup cleaned to avoid cross contamination between samples [3]. This process is  
15 labor intensive, cost intensive, and can be dangerous, especially for remote  
16 locations. While commercialized solutions to this problem exist, they either still  
17 require an operator to be on location or are very expensive. Smithroot's commercial  
18 solution offers a simplified process with additional data collection such as GPS  
19 location for a fair price, ~\$8000 [4]. A disadvantage The flaw of this solution is that it is not fully  
20 autonomous, still requiring an operator to be on location to use the device [4]. The is the which An alternative  
21 DOT Sampler is a fully autonomous solution that is capable of multiple samples  
22 (20+ samples) and is also submersible but comes at a cost of ~\$55,000 [5]. FF  
23 solution designed by the OPeNS Lab is the middle ground of these two solutions.

## **Hardware in Context**

24 While it is not submersible (limiting its potential sampling environments), it is  
25 capable of autonomous, multi-sample operations for extended periods of time  
26 (approximately one month) for the cost of \$6,000.

27

28 References:

29 [1] - [https://www.usgs.gov/special-topics/water-science-](https://www.usgs.gov/special-topics/water-science-school/science/environmental-dna-edna#overview)  
30 [school/science/environmental-dna-edna#overview](https://www.usgs.gov/special-topics/water-science-school/science/environmental-dna-edna#overview)

31 [2] - <https://oceanexplorer.noaa.gov/technology/edna/edna.html>

32 [3] –

33 [4] - <https://www.smith-root.com/edna/edna-sampler>

34 [5] - <https://www.nature.com/articles/s41598-023-32310-3>