

# Moon Star PH Testing



TEAM MOONSTAR – UNITY REED HIGH SCHOOL – MANASSAS VIRGINIA – USA

## Abstract

Our project uses a Seaperch ROV (Remotely Operated Vehicle) that we built to collect water samples from the middle of lakes and ponds for pH testing. We thought this would be interesting because most people just test water from the shore, but that might not show what's really going on in the whole lake. Our tests showed that the pH is different in the middle compared to the shore, which was interesting and proves our idea was worth trying.

## Background & Motivation

We picked this project because we were learning about water quality in science class and noticed that all the samples were just taken from the edge of water. That seemed not practical to us! What if the water in the middle is totally different? No one would know because it's hard to get to. We thought it would be worth a try to use our Seaperch to solve this problem. Plus, there's been some news about water quality issues in some local ponds, so we wanted to see if we could help figure out what's going on. Our hypothesis was that the water in the middle of lakes and ponds would have different pH levels than the water at the edges. We thought this because runoff from land and people throwing things in the water probably affects the edges more than the middle.

## ROV

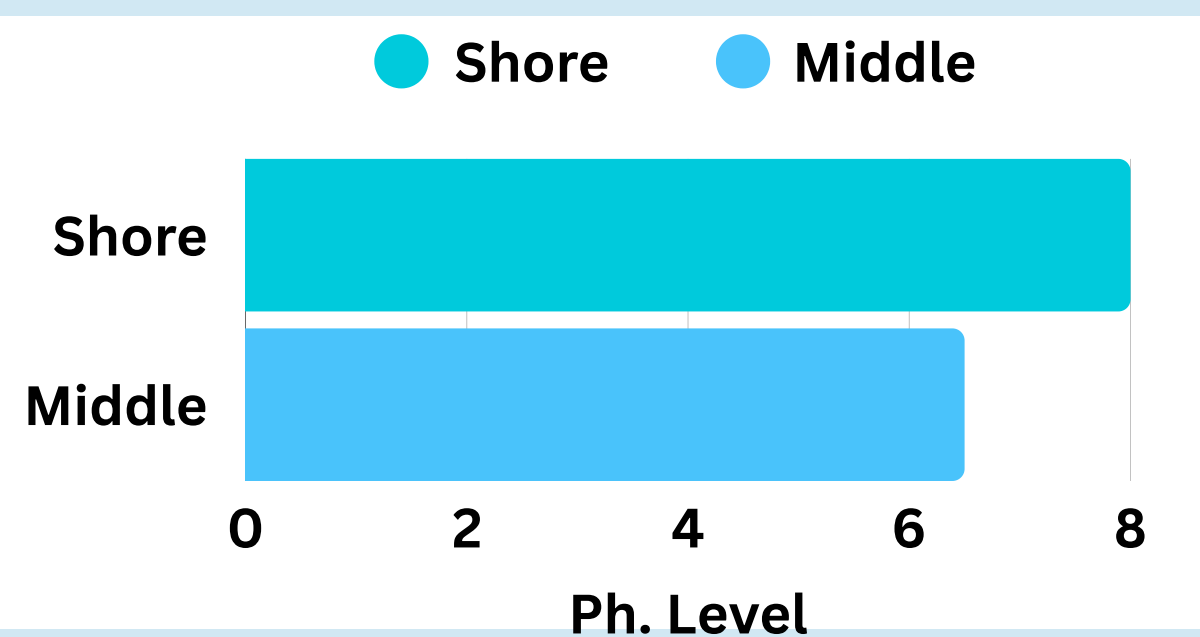


## Methodology

First, we built our Seaperch ROV using the kit we were given. The basic construction was straightforward but then came the fun part - modifying it to collect water samples! We built the basic Seaperch frame with PVC pipes, then added a special attachment we designed to hold our water collection system. We used flexible PVC tubing to create a way to suck up water samples and added a small pump we found at the hardware store to pull water into our container. We spray-painted our ROV bright yellow so we could see it in the water. We tested it first in our school pool to make sure it worked, then fixed a bunch of problems. The first pump wasn't strong enough, and our container leaked. Finally, we took it to some local ponds for real testing. We had to change our design a few times because our first idea didn't work great. Originally, we thought we could just open a container underwater to collect samples, but it was hard to control. The pump system worked way better.

## Results

Here's what we found out: The pH in the middle of ponds was usually about 0.5 lower than at the shore. That's a pretty big difference when you're talking about pH. We also tried getting samples from different depths and found that deeper water had more stable pH readings. The surface water pH changed more throughout the day. When we tested in early spring after some rain, the differences were even bigger. We think that's because rain washes stuff into the water at the edges. Our ROV worked well. We could get samples from about 50 meters out from shore, which was farther than we expected. The most surprising thing was how consistent the differences were. Every single pond we tested showed this pattern, which was extremely interesting and not what our science teacher expected. This shows that if you're only testing water from the shore, you're not getting the full picture of what's happening in a lake or pond.



## Conclusion

Our Seaperch ROV project proved that getting water samples from the middle of ponds is super important if you want to know what's really going on with water quality. The pH differences we found were big enough that they could affect what kinds of plants and animals can live in different parts of the water. This project was eye-opening for us and for our science class. We learned a ton about engineering, water science, and how to fix things when they break. The best part was seeing how something we built could help solve a real-world problem.

## Nect Steps

Here's what we want to do next with our project: We want to add more sensors to our ROV so it can measure other stuff like temperature and oxygen levels at the same time. We also want to make it so our ROV can collect multiple samples in one trip because right now we must bring it back each time. Testing the same ponds in different seasons would be cool to see how things change throughout the year. We'd love to create maps showing how water quality is different across entire ponds. Maybe we could work with local environmental groups to help them test more water bodies around our area. We're super excited about these ideas, especially adding more sensors because then we could collect way more data each time we use our ROV.

We really want to thank Mr. Consatoza and Mr. Hruska, our awesome teachers who helped us when we got stuck and let us use the workshop after school. Thanks to Unity Reed High School for letting us work on this project. The Seaperch program was useful for providing the ROV kit that started this whole thing. For references, we used the Seaperch website where we got ideas for modifications, our science textbook for pH testing methods, and the Virginia water quality website that showed us what normal pH ranges should be.ere.