Robots for Little Falls Watershed Water Quality Monitoring

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Little Falls Watershed Alliance
Education - Action - Stewardship

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Kick Robotics
Autonomous Environmental Robots for Good

DEPARTMENT OF ENVIRONMENTAL PROTECTION
MONTGOMERY COUNTY • MARYLAND

CBTRUST
Chesapeake Bay Trust

LITTLE FALLS WATERSHED ALLIANCE
EDUCATION - ACTION - STEWARDSHIP

Thanks to our partners

- This project is made possible by funding from the Montgomery County Water Quality Protection Fund.

MONTGOMERY PARKS
M-NCPPC

THE SEAL OF MONTGOMERY COUNTY, MARYLAND
1775

Note: actual locations for robots and housing are still pending approval

What are we doing?

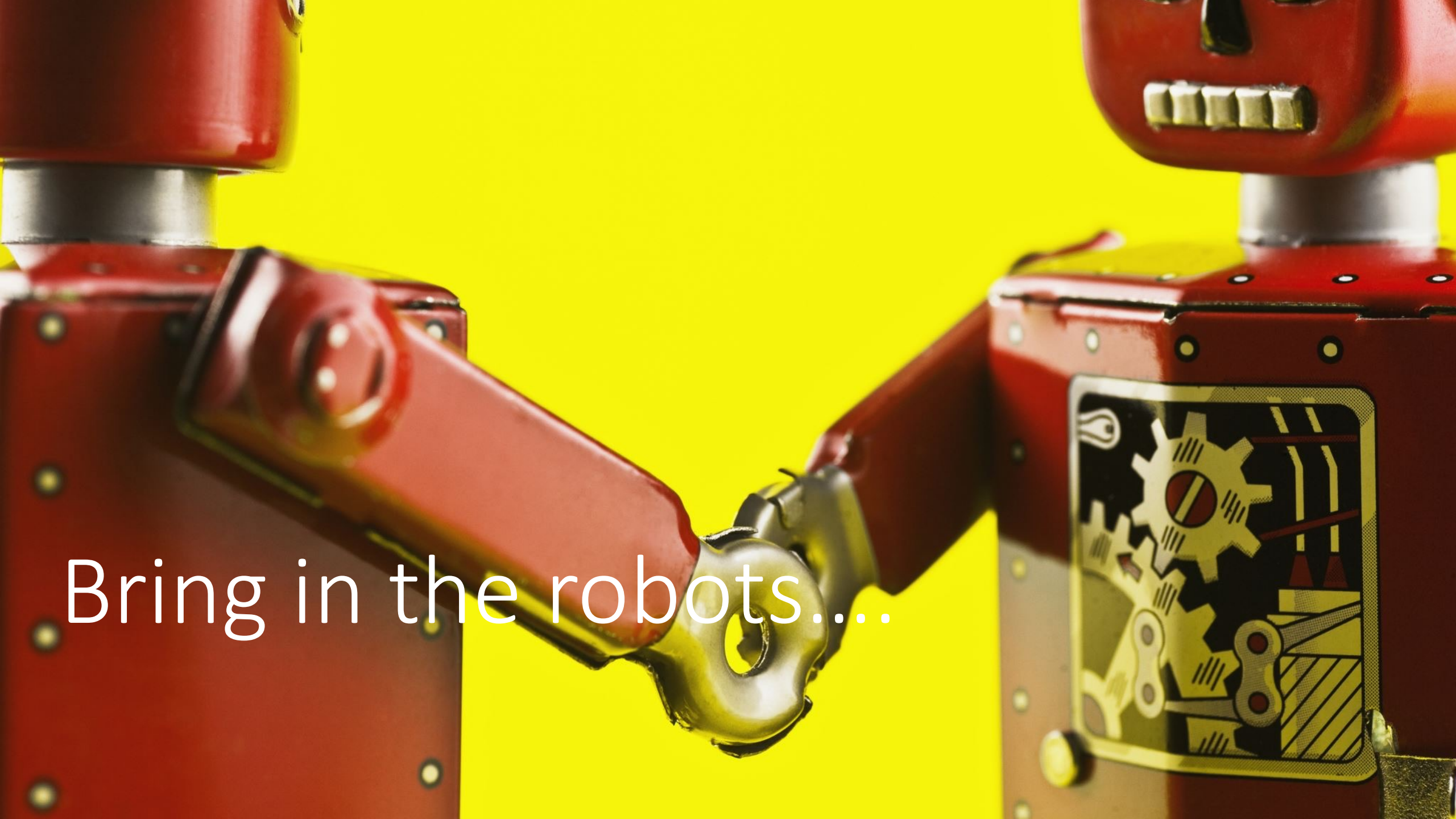
We will use Robots to monitor the Little Falls Watershed water quality!

How is water quality measured today?

How will the robots do it?

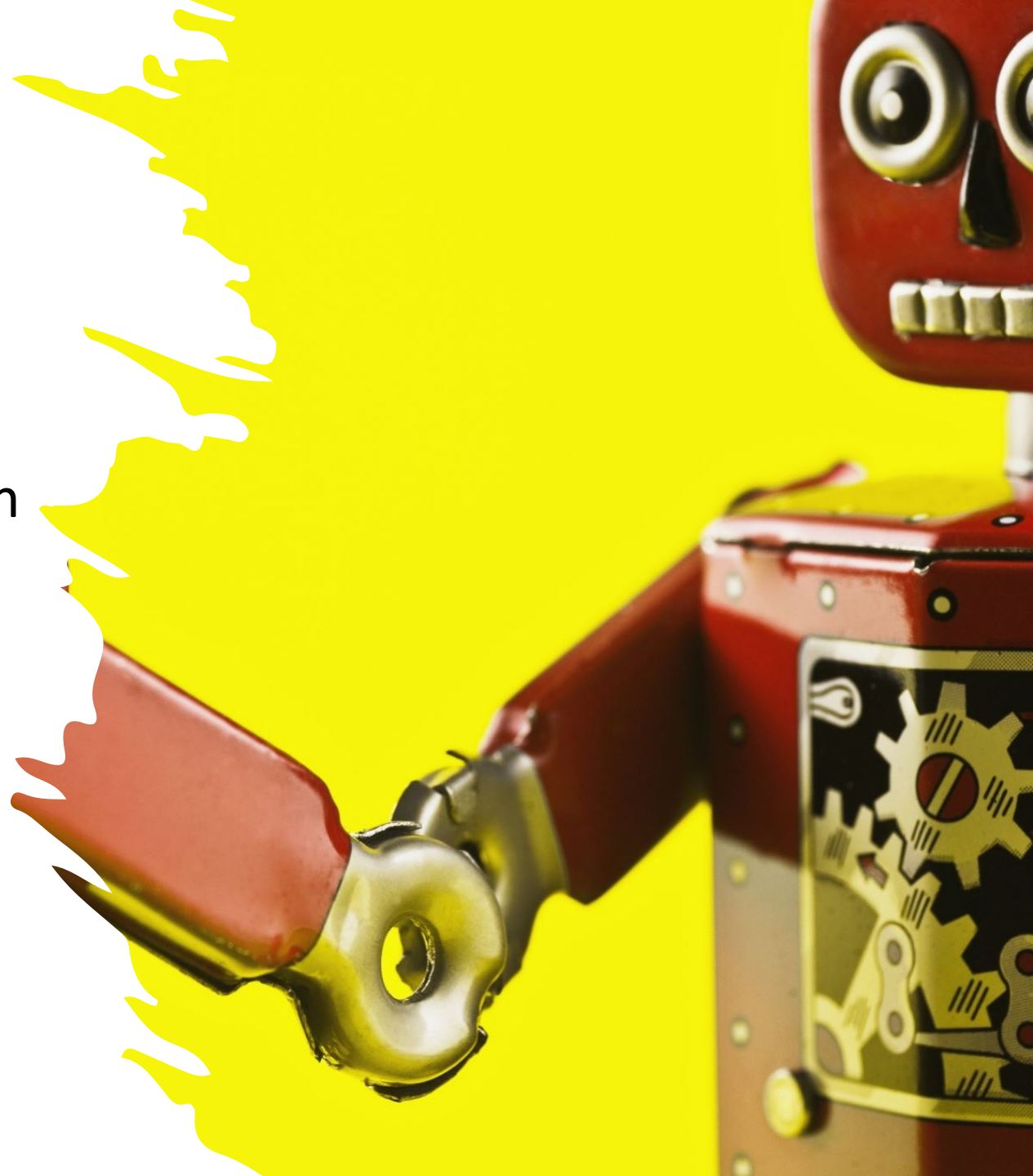
We will use Robots with water sensors to monitor the water quality!

- pH
- Dissolved Oxygen
- Turbidity
- Temperature
- Total Dissolved Solids
- Water level and flow


Bring in the robots….

Why use robots?

- Little Falls Watershed water quality is important enough to be monitored often
- Robots are good at doing things that are manually redundant and hazardous
- Robots never get tired
- Robots are cool!



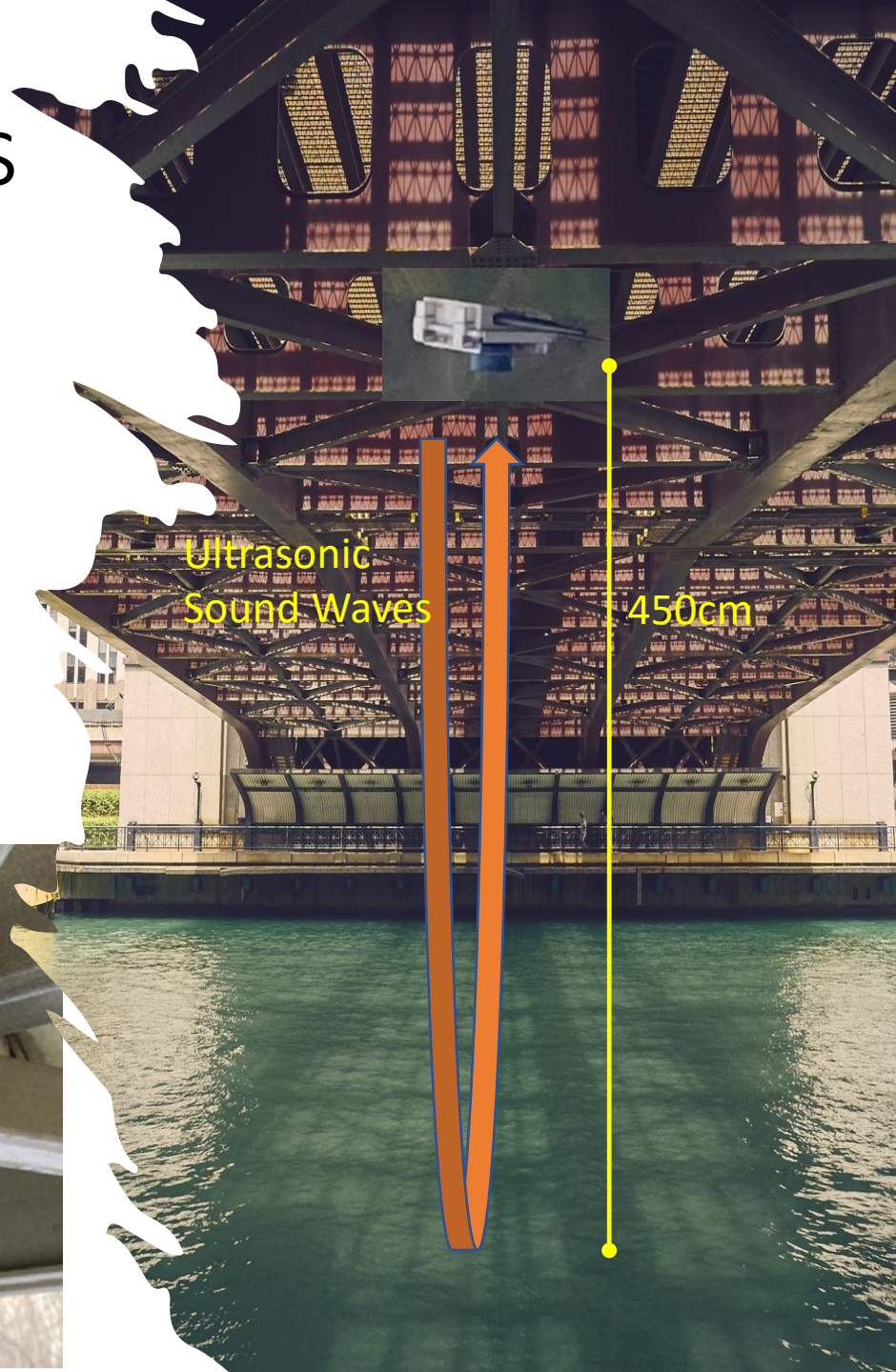
Let’s start building the Sensors

Step 1 – Build water level sensors

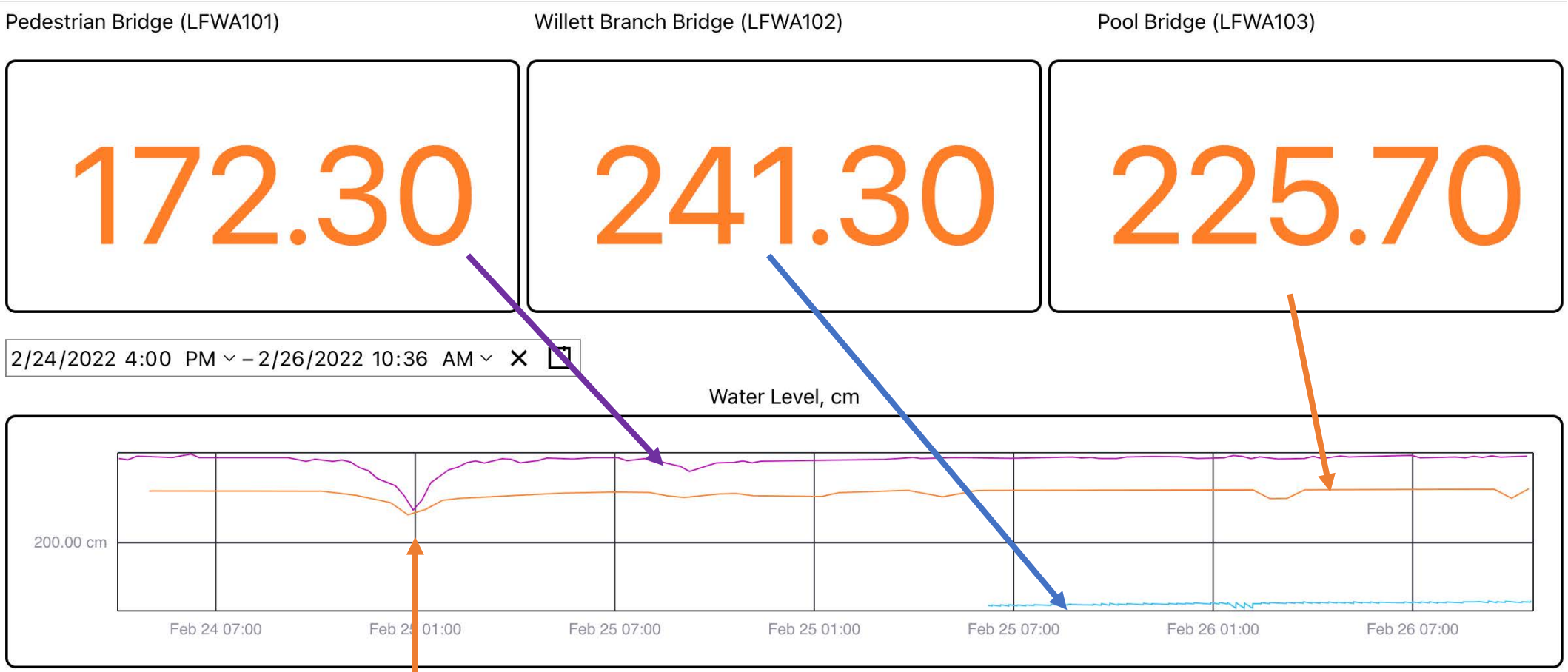
- Build solar powered sensors that sit under bridges to monitor water levels
- Detect rise after rainfall

Water Level Sensor

Solar Panel

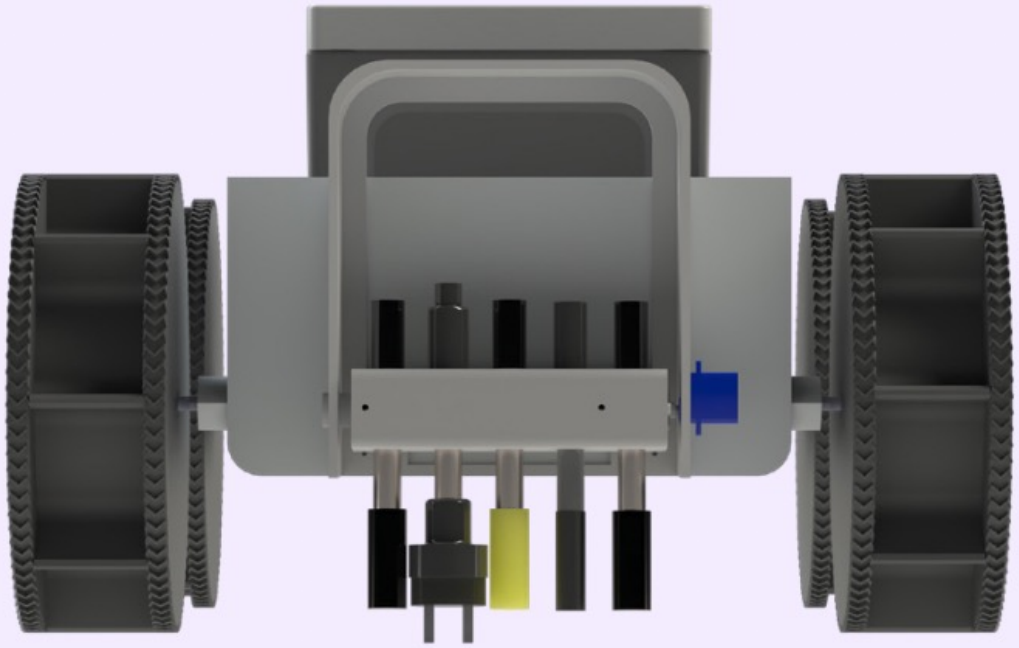


See the water levels in real-time on the LFWA website



- Dip in lines show that the distance between bridge and water decreases
- Which means the water is rising!

- Water levels rise during and after rainfall
- Higher potential for runoff during these times



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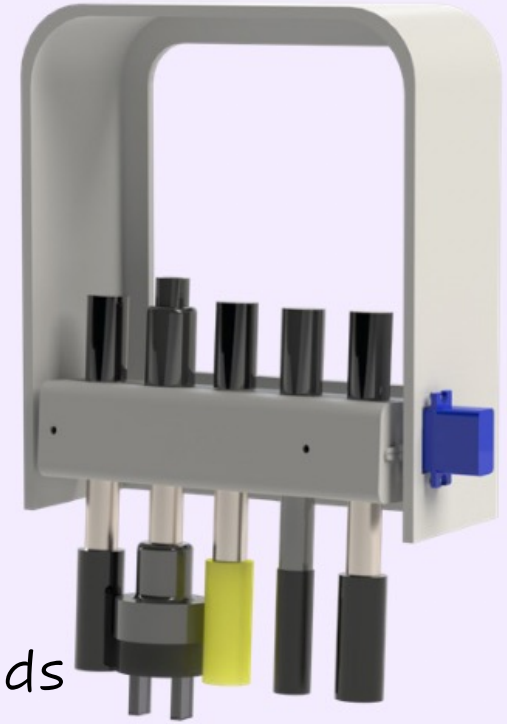
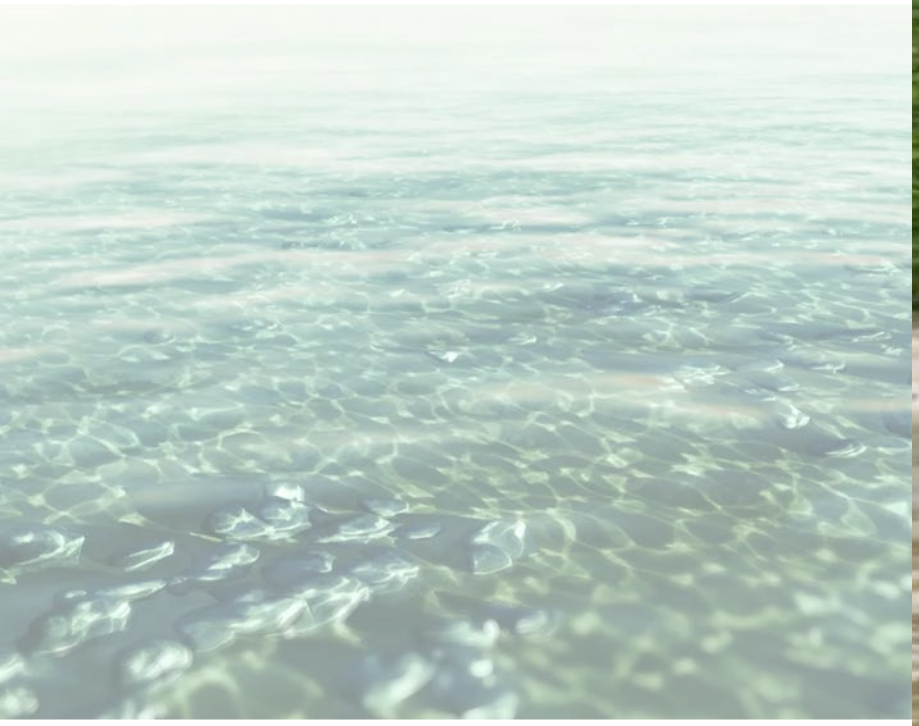


Step 2 – Attach low-cost water quality sensors

Where will they live?

Our Watershed can be a little challenging for our robots…



Let’s start building the robots

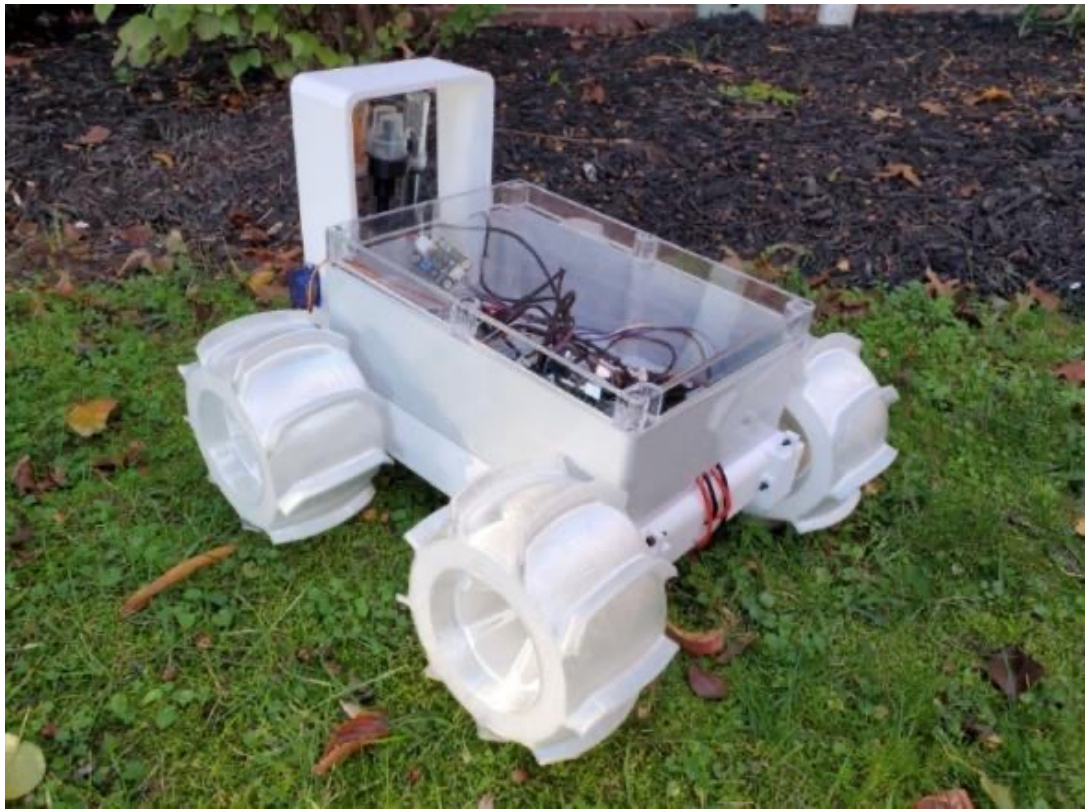
It all starts with designs, prototypes and a lot of testing…

Step 3: Build an amphibious robot (“Aquabot”)

- Can work on land and water
- Solution: Aquabot and Aquabot Mini

Aquabot Version 1

3D printed tires that are buoyant and provide propulsion

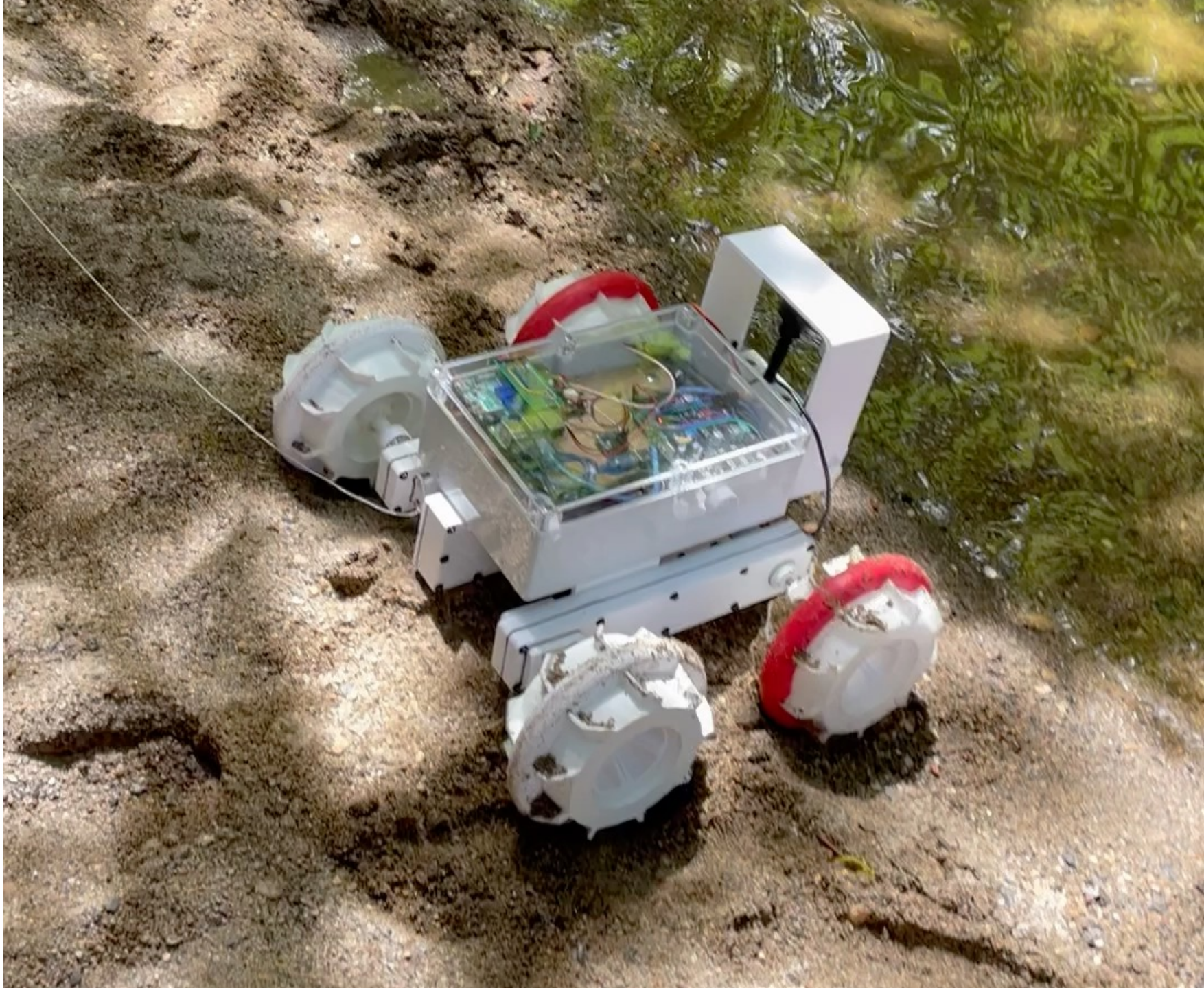


Travels on land, floats and travels in water

Challenges:

- Each tire takes 2-3 days to print
- Tires don’t provide adequate traction in watershed
- Tire paddles don’t provide enough propulsion to handle current

Maiden test voyage



Aquabot Version 2

Half boat, half vehicle

Propulsion is good, floats well, good maneuverability

Challenges:

- Tires still not rugged enough for Watershed terrain
- 3D printed hull need more durable material
- Hull and tires take over a week to 3D print

Test Run Aquabot 2a

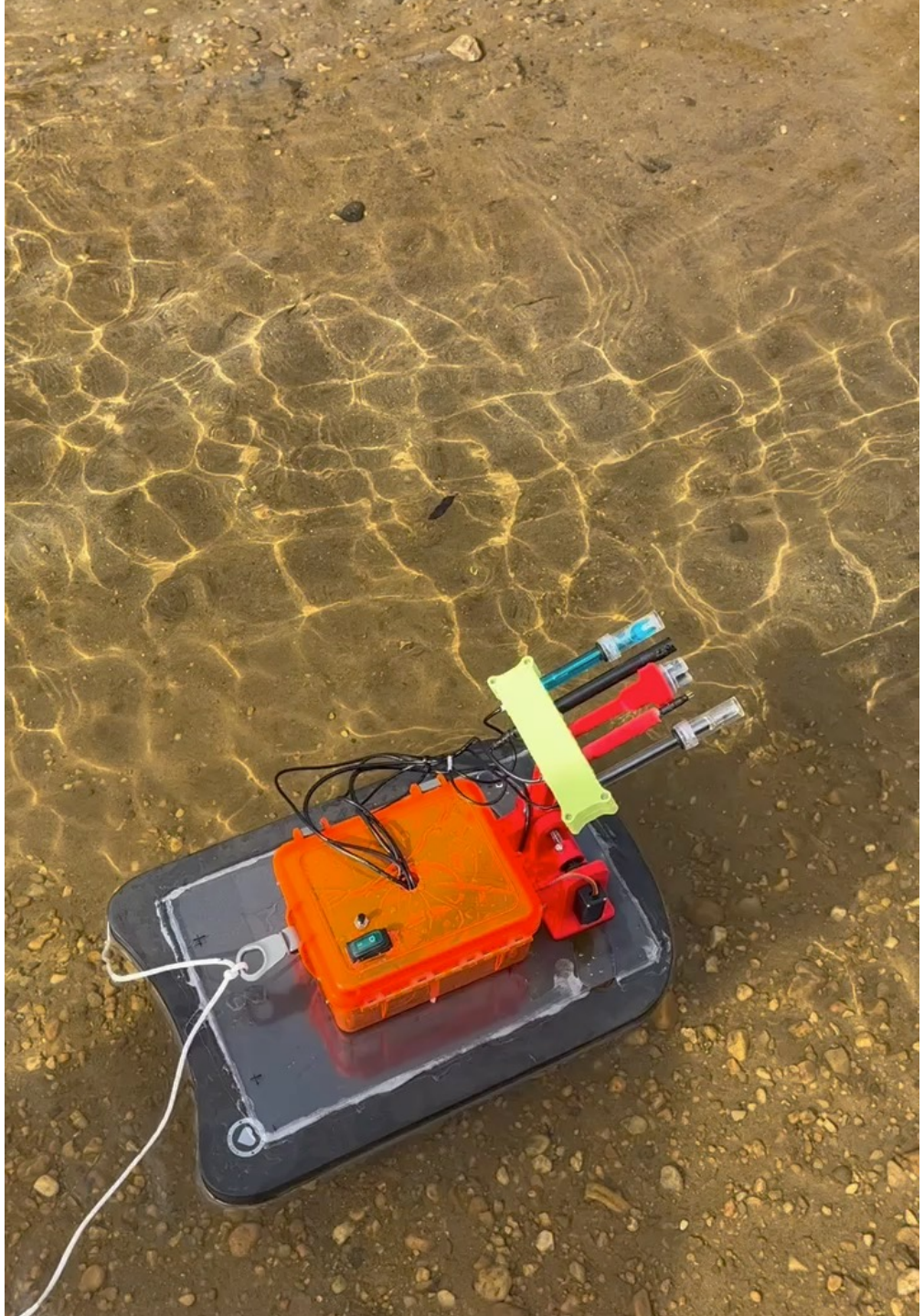
Test Run
Aquabot 2b
(with propellers)

Final Versions (4 Locations!)

- Aquabot

Rugged design, excellent terrain handling

- Aquabot Mini



Lightweight, easy to manufacture

This is a community project!

Thank You!

Q&A

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Extra

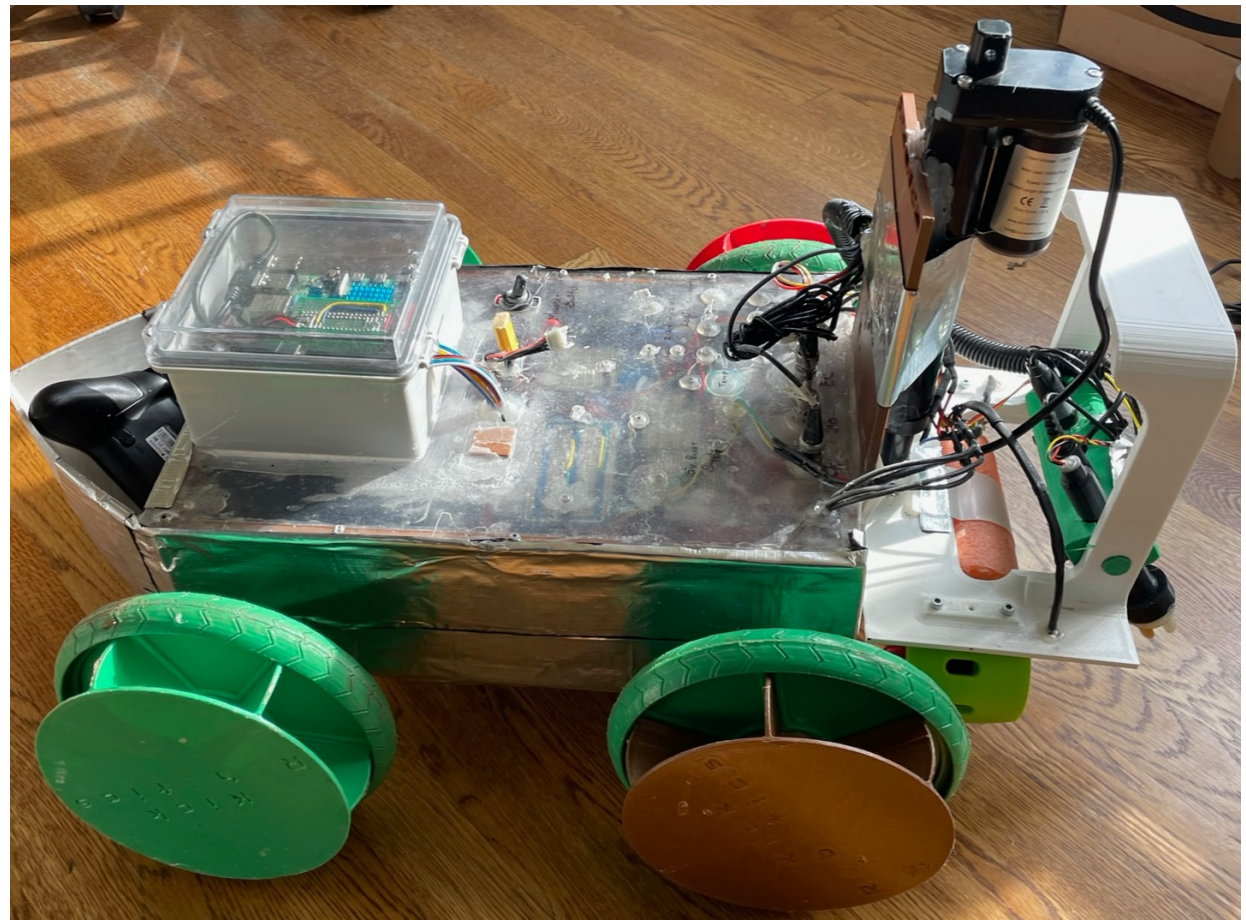
The goal is not so simple…

Get the sensors into the water, take the readings and publish to the cloud

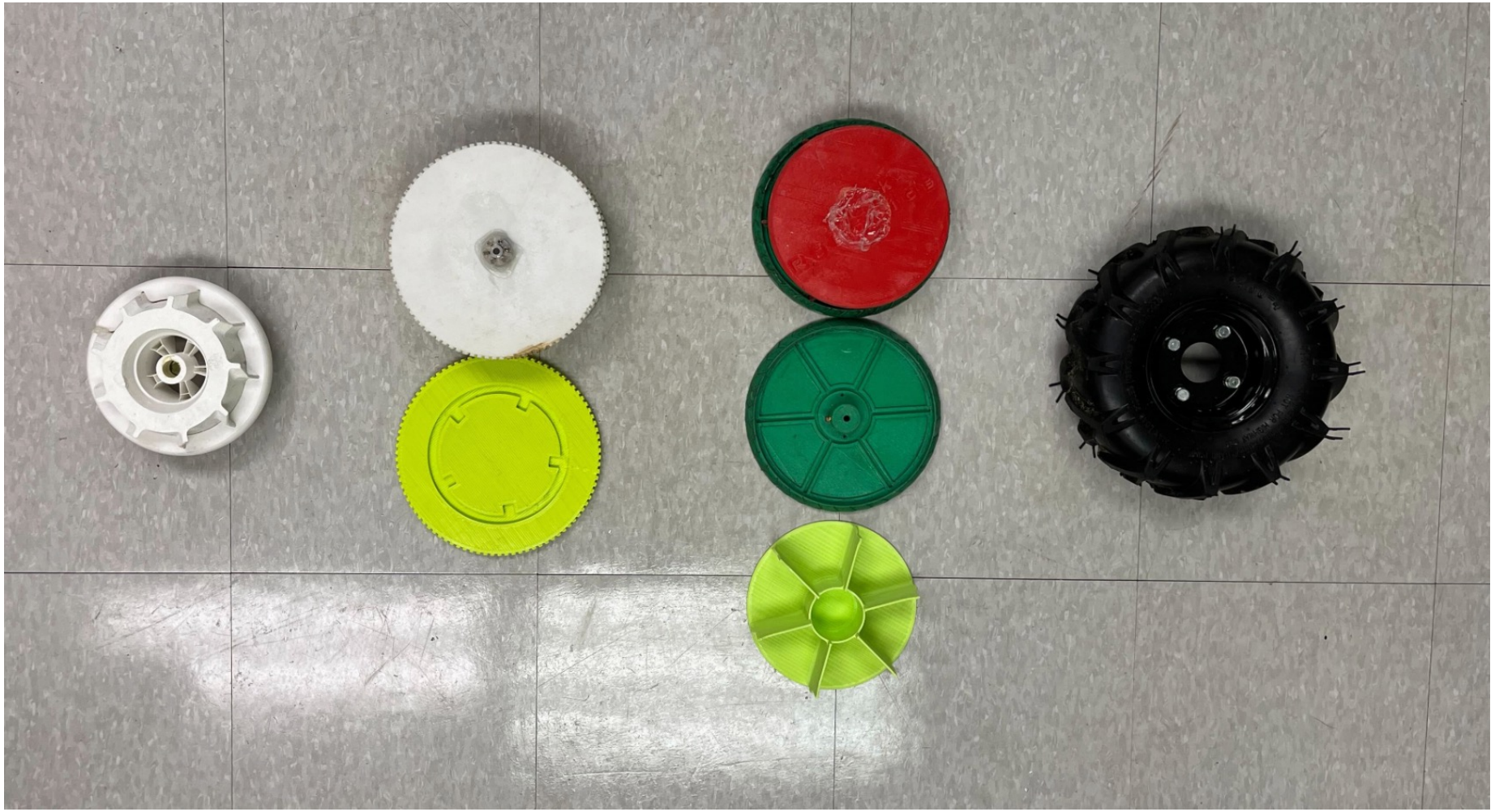
Why are we doing it?

- *Understanding the health of the the Little Falls Watershed is important!*

- *Use technology to help us monitor faster and more often*



Better Tires



Challenge 2: Robots need a place to live and charge

- Effect: Do they live close or far from the water?
- Solution: Robots need to be amphibious

Challenge 2 : Robots need a place to live and charge… But where?