

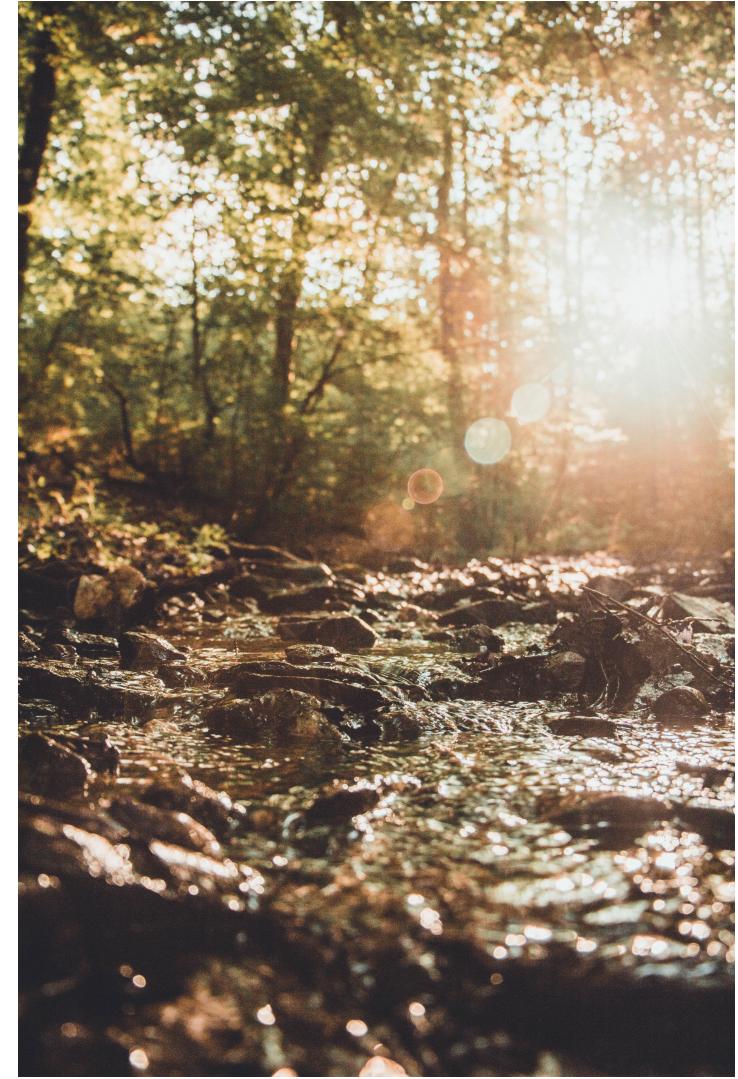
# Open-Source Stream Gauges

Anna Burton

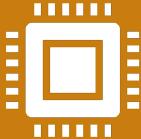


# Goal

inform the design  
of an **open-source**  
**stream gauge** that  
collects water  
height and  
discharge data for  
Lamprey Creek



# Major Engineering Problems



## Hardware requirements

sensors  
boards  
casing



## Software requirements

C++ in Arduino IDE  
MATLAB



How do we make this accessible to the community?

# Stream Gauge Velocity Sensors

## Mechanical Current Meter

- Measures water velocity
- Limited sensing range due to sizing based upon expected velocities
- Type AA handheld current meter = \$700-\$900



## Acoustic Doppler Profiler

- Uses Doppler Effect to determine water velocity
- Takes discharge measurements quickly
- “Contact for a quote” = \$\$\$



# What about open-source technologies?

There's a million options for water quality but good luck hunting for velocity sensing!!!

- G<sub>3/4</sub> water velocity sensor
  - \$6
  - Uses a mechanical rotor that activates a magnetic core, triggering a switch creating a pulse which is related to flow velocity
  - Range: 1-60 L/min
    - Previous study measured ~4 ft/s using this sensor
- HC-SR04 ultrasonic sensor
  - \$4.95
  - Uses sonar to determine distance
  - Range: 1"-13'



# Computing Hardware

## Arduino UNO Microcontroller

- \$15-\$22
- 14 digital input/output pins
- USB connection
- Power jack
- Most used and documented Arduino board



# Software

- Arduino IDE
- C++
- Let the coding begin!



# Community Science

How do we make this data **accessible** for researchers and **meaningful** for land managers?

- Telemetry devices for Arduino
  - Send data to a repository
  - OpEnS Lab github contains code to send data to google sheets
- Concerns
  - How do we send data from a field site?
  - What if tables in google sheets aren't the most accessible and meaningful?
    - Case study where sensors send texts when water passes a height threshold

# Feedback and Questions

