



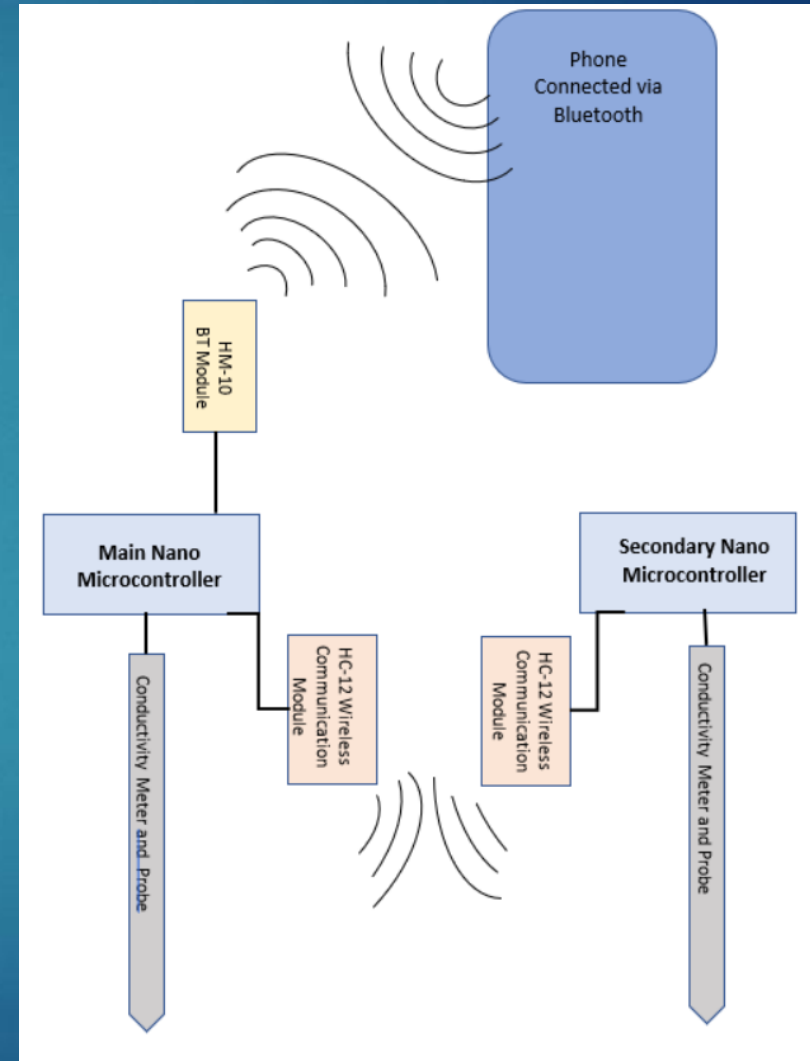
# USDA Forest Service – Steam Velocity Measuring Device

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# Problem Statement

Develop Bluetooth technology that can communicate wirelessly with 2 or more conductivity probes to measure small stream velocity. The readout of the probes, probe settings, and software be accessible from a tablet or smart phone.



# Project Requirements

## OPERATING ENVIRONMENT

Velocity range – 2 L/min to approx. 4 cfs

Stream Width – Sample in USDA lab to Paradise Creek

Required Probe Separation – 6 stream widths

Physical Property Used for Measurement – water conductivity

## USER FRIENDLINESS

Remote Operation - would prefer wireless system that reads as far as 100ft away from probes

Versatile Probe Support System – may be used by operator for balance in rough terrain

Display – available to user on tablet or other wireless device

Set Up – Once users arrive at the sampling site, can be up and running reliability with 20 minutes

Transportability – can be easily carried ¼ mile by one person (less than 20 lbs)

Packaging – all components fit within single waterproof carrying case, plus a couple of hand-held poles

# Project Requirements (Continued)

## DURABILITY

Must be suitable for use in all weather conditions, including rain/sleet/snow

Streams sometimes are full of sediment and that can interrupt testing

Cannot break in such a way that the devices pollute the environment

Batteries can support field operation for 10 hours w/o recharging

## SOFTWARE

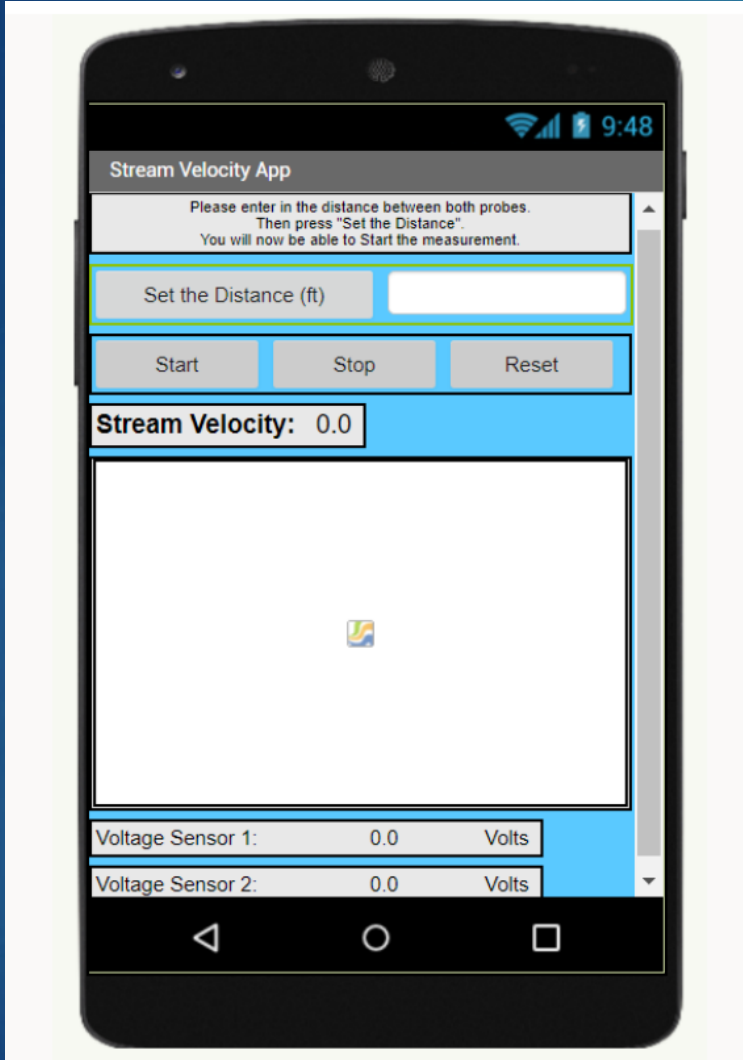
Velocity Calculation – Probe separation divided by time between Peak to Peak concentrations

Reliability - Integration of peak with 5% offset

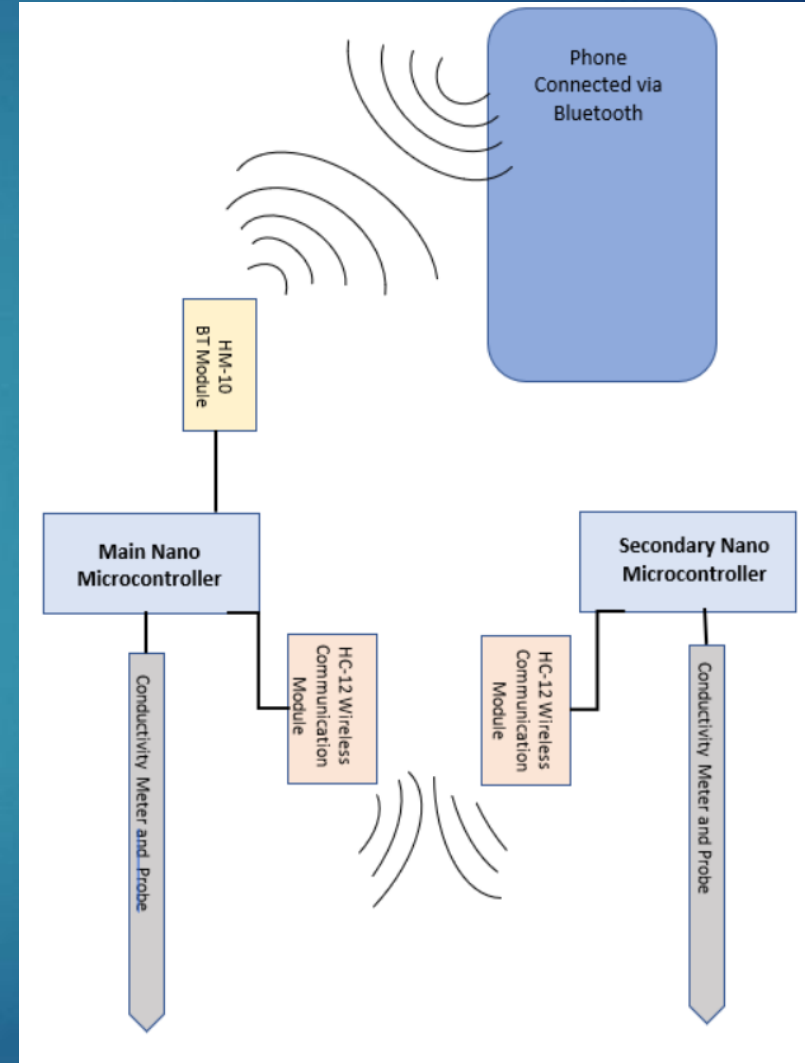
Data Logging – DAQ that runs on batteries equipped with Excel-like tool

Sampling Rate – 8 readings/sec with simultaneous sampling from two channels

# Concept Development – Electronics

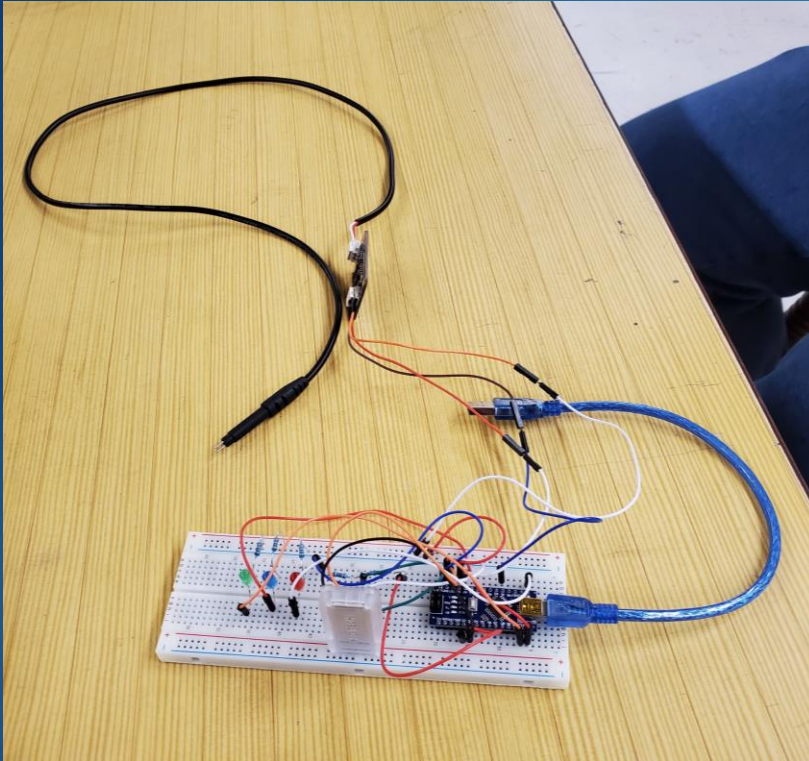


App Design

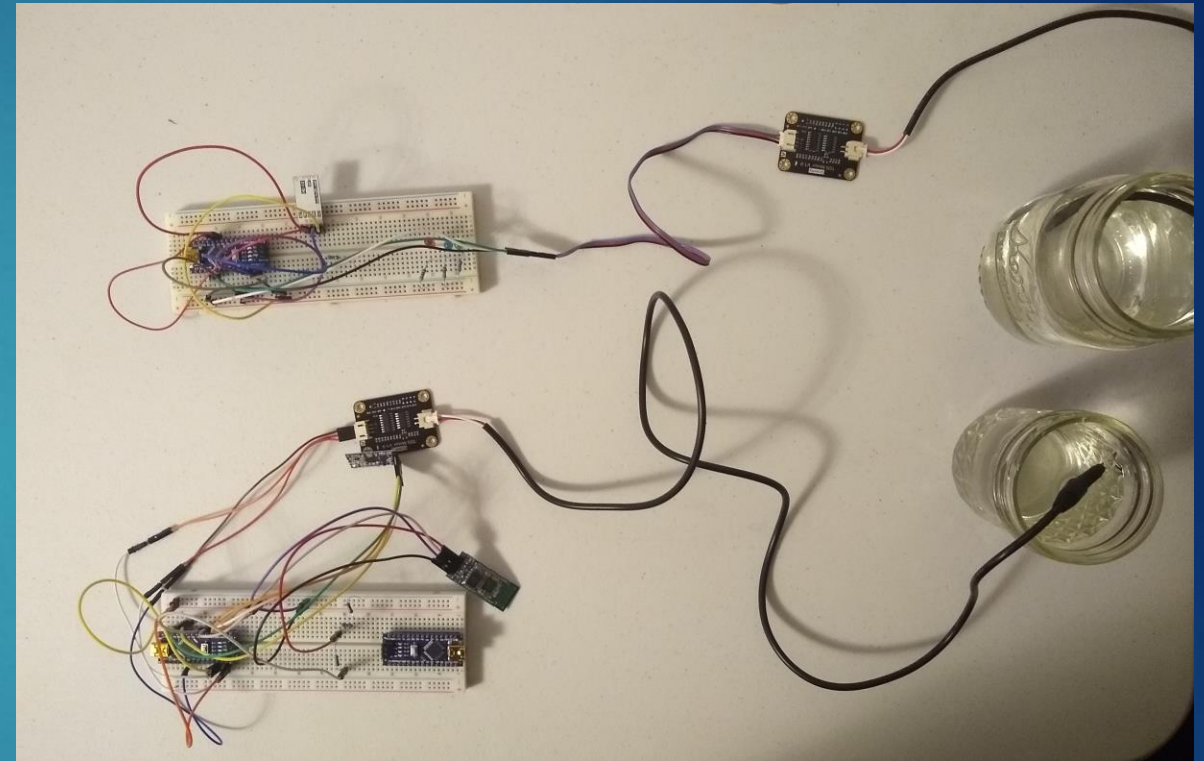


Circuit Diagram

# Concept Development – Electronics

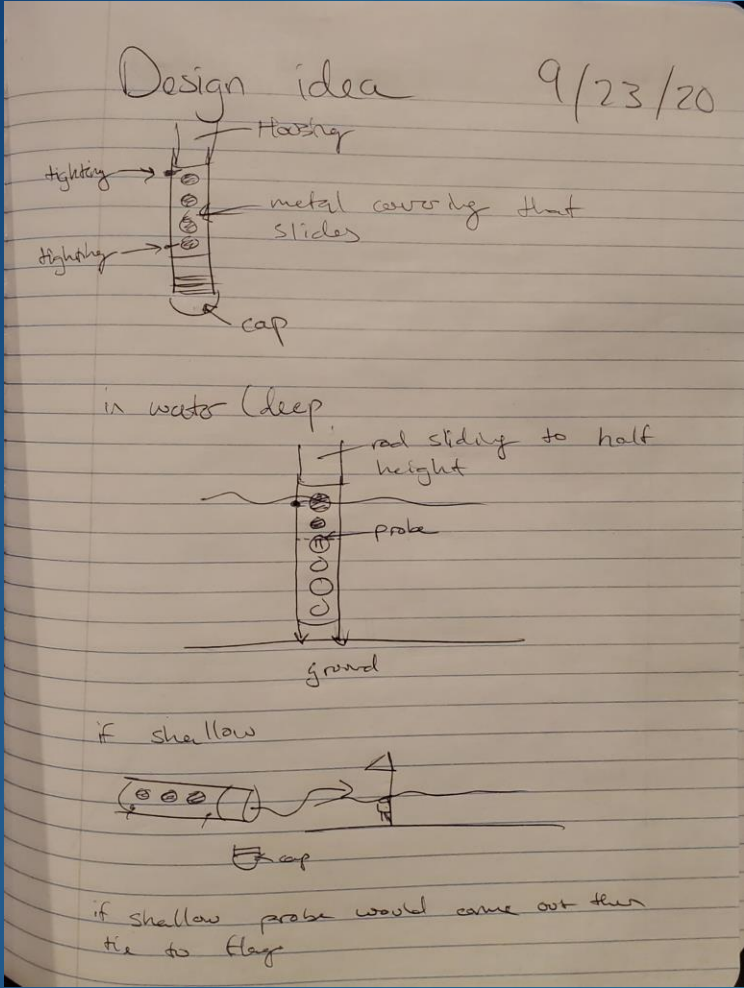


Single Probe System



Double Probe System

# Concept Development – Probe Stick



Initial Holder Design



SolidWorks 3D Model







Feedback / Questions?