

# NRC497MS & PUBPADM 497MS

## Applications in Do-It-Together, Environmental Monitoring Technologies: A “Flipped”, Service Learning, TBL, *Open Science* “Makerspace” Course

### DIY Water Quality Monitoring

Jennifer Dargin, Mark Hagemann

**Objective:** Create an open-source water quality monitoring device that is inexpensive, reliable, and able to withstand inclement weather conditions.

**Mission:** Once the device is made and shows promising results, we will use it to monitor conditions of the Tan Brook, a local watershed that runs through the UMass campus.

**How?**

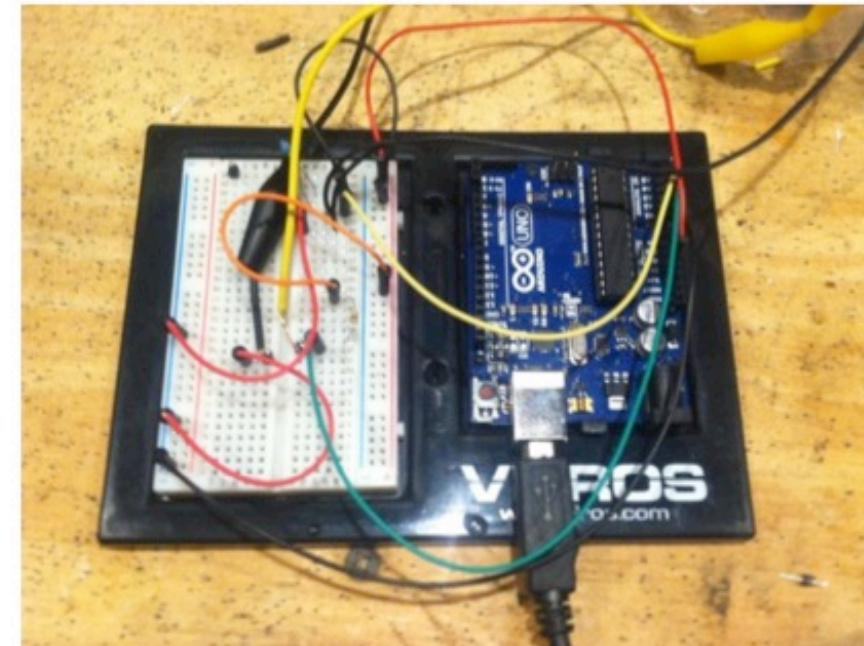
- Arduino Uno
- Following the ‘Riffle-ito’ design

**Current Functions:**

- Temperature (Celsius) & Conductivity

Thermistor: Adafruit

Conductivity Probe: Stainless steel screws



**Next Steps:**

1. Adding an SD card for data-logging, with possibility of using Ethernet or Wifi Shield
2. Water-proof the housing
3. Trial runs



### SALOR

Submersible Autonomous Liquid Oxygen Recorder

Daniel Smoliga, Leif Dickison, Thais Correia

### The Problem

Fertilizer, sewage, and detergent runoff in lakes, rivers, and oceans overstimulates plant matter growth. These bodies of water are said to be *eutrophic*.

This is an extreme disturbance to aquatic environments and often leads to the death of fish and other animals.

53% of lakes in North America alone are eutrophic.\*

\*L.E.C. Lake Biwa Research Institute [Eds]. 1988-1993 Survey of the State of the World's Lakes. Volumes I-IV. International Lake Environment Committee, Otsu and United Nations Environment Programme, Nairobi.

SALOR is an Arduino-based, mini submarine equipped with an HD camera and oxygen sensor that can detect plant matter in lakes.

SALOR also employs a smart algorithm to detect whether the algae growth is anthropogenic, caused by fertilizer runoff for example, or naturally part of the lake's cycle.

This information will be relayed in realtime to our website via SMS, so you can monitor these changes in plant growth.

### GPS dog collar

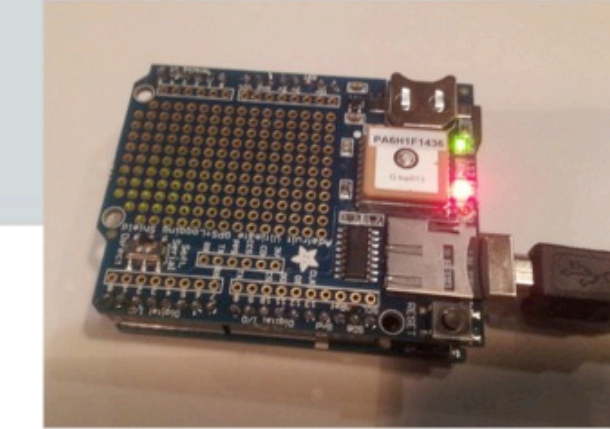
Open source GPS

Build on Arduino

Uses open source code (Adafruit libraries)

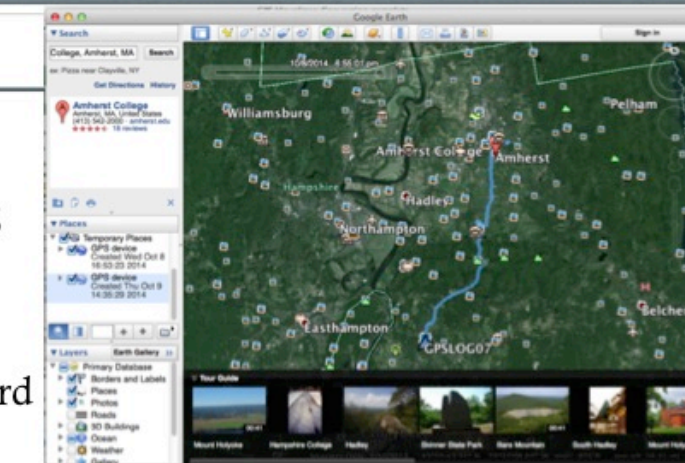
Main objective:

Make a battery efficient GPS for wild animals tracking



### Building stages

- Stage 1:
- Make it log to an SD card
- Stage 2:
- Add internet connection. For simultaneous logging ( wild animals tracking)
- Stage 3:
- Achieve battery efficiency



### DIY Hydroelectric Generator (HG)

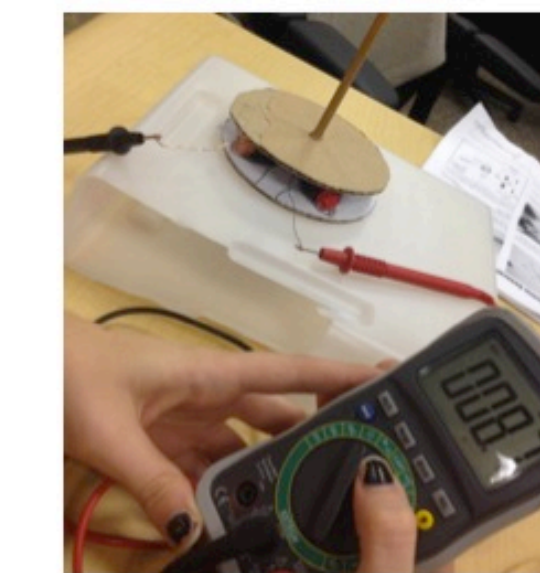
Team: Ella Holmes & Emma Romeo

**Curiosity turned into creation.** Our first step in developing an understanding of electricity and the fundamentals of the Maker Movement.

**Objective:** Measure tidal changes in local environments using existing technologies that run using a hydroelectric generator we develop.



### Goals



- Step 1: build a HG [Complete]
- Step 2: advance existing model
- Step 3: 3D design and print turbine
- Step 4: tailor to specific field situations
- Step 5: use to power an arduino sensor while measuring tidal changes

### Autonomous Recording Unit

Brett Bailey, Department of Environmental Conservation

**Objective:** Create an autonomous recording unit for long term use outdoors to record vocalizations of a diverse avian community in the tropical forests of Belize.

**Mission:** Use Arduino to record audio in 30-60 minute intervals relative to local time of sunrise and sunset while logging additional environmental data. Interface with a low cost olympus audio recorder to insure high quality audio recording.

**Current Priorities:**

- Reliable Clock/Timing Performance
- Low power consumption

**Next Steps:**

- Temperature & Humidity Sensors
- Data-logging
- LED status codes
- Decibel monitor



### Pollution-to-Solution: Detecting Air Pollution in Springfield

Liz Pongrantz and Dan Smoliga

**Objective:**

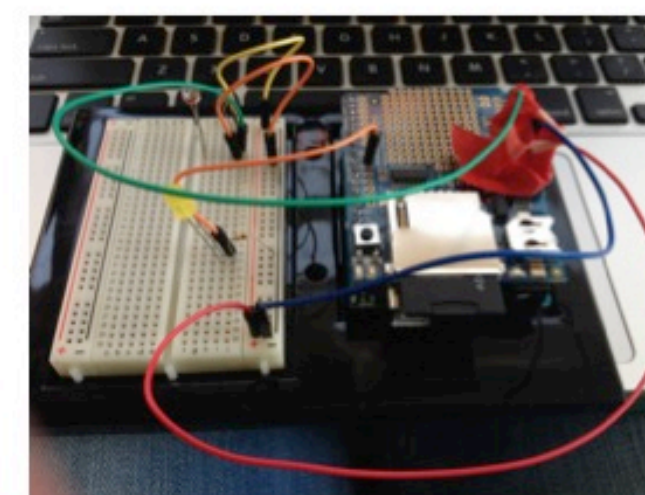
We are working with the Pioneer Valley Asthma Coalition. The coalition is concerned that ozone and nitrogen dioxide may be resulting in the onset of asthma as well as exacerbating asthma, which leads to attacks. The Coalition is particularly interested in determining if idling cars and buses are contributing to unhealthy air for students and faculty at schools.

**Methods:**

- Purchased a sainsmart ozone sensor module, an adafruit data logging shield and an arduino kit.
- Soldered the data logging shield onto the arduino.
- Set the date and time on the data logger
- Test the light resistor that came with the arduino kit
- Developing a GIS on asthma rates in Springfield

**Next Steps:**

- Set up Arduino as a data logger device to record ozone
- Figure out power supply issues
- Deploy sensors in Springfield and relate to the geography of asthma



**Objective:** Use a helium balloon to do invasive and city planning mapping.

**Mission:** There are 2 missions the first is to get images from the balloon of a local invasive species in Westfield and input this into Arc GIS to create a map of the invasive. The second, is to get a map of downtown Amherst to help the town see and possible places to put a parking lot for the new apartment building.

**How?** Using a helium filled 5 foot balloon attached is a 3D printed camera rig that has two cameras one that shoots in infrared and the other in RGB.



### DIY Balloon Aerial Photography

Alexandra Ferland / Tony Volpini

