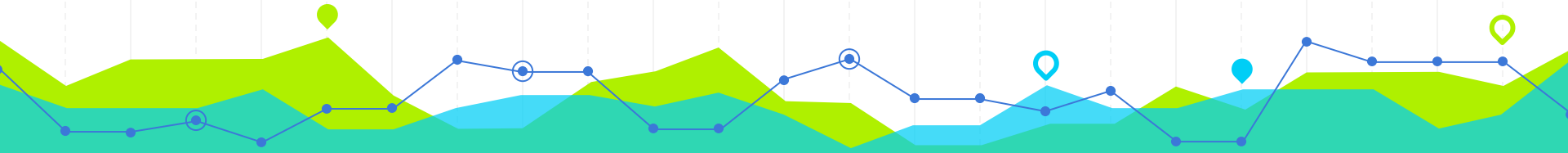
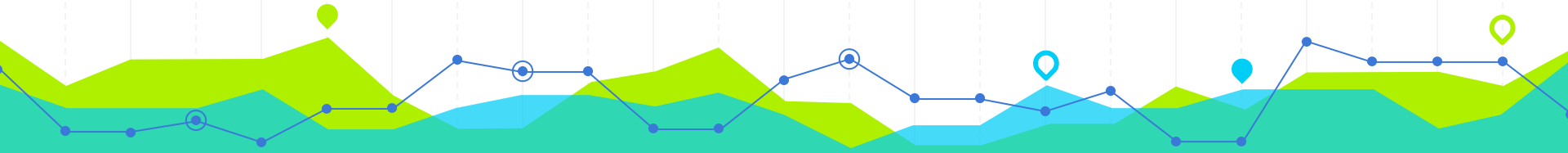


Understanding the Bay: Visualization of CBIBS Data

By: Travis Gopaul



Internship

About the Organization

1

About NOAA

- Help shape international ocean, fisheries, climate, space and weather policies.
- Mission
  - To understand and predict changes in climate, weather, oceans and coasts
  - To share that knowledge and information with others
  - To conserve and manage coastal and marine ecosystems and resources
- NOAA Fisheries

CBIBS

Chesapeake Bay Interpretive Buoy System

Weather Station

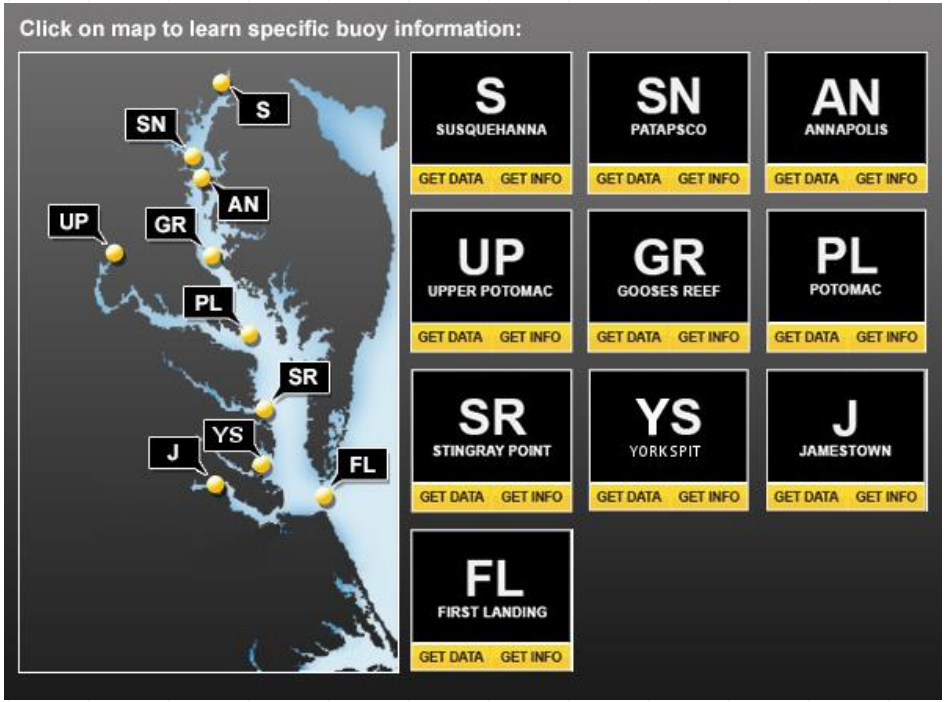
Solar Panels

On Board Computer

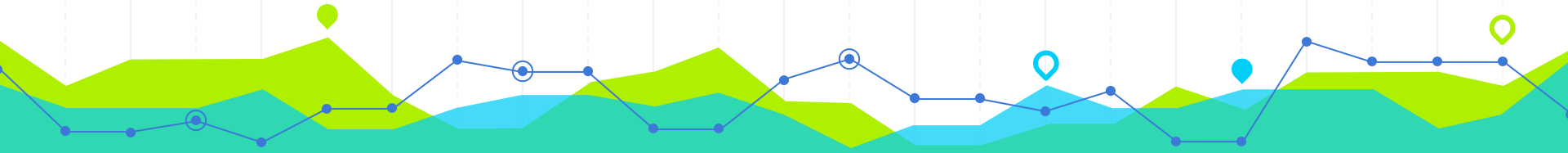
Water Quality Monitor (left) and Acoustic Current Profiler (right)

More Info: https://buoybay.noaa.gov/

- Gather real-time weather and environmental data
- Current active locations: Jamestown, York Spit, Gooses Reef, Potomac, Annapolis, Stingray Point



https://buoybay.noaa.gov/locations



Internship

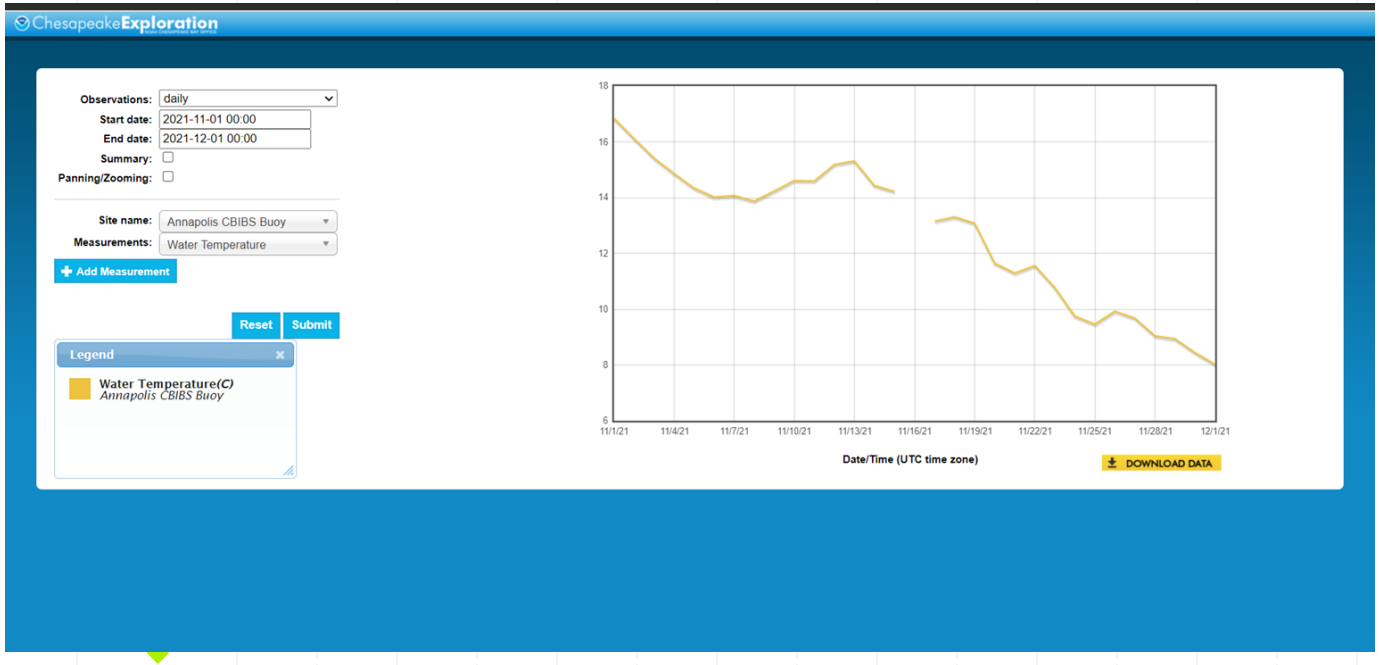
Position Overview & Objectives

2

Position OVERVIEW

- Data Visualization Intern
- Update capabilities of a data visualization application for CBIBS

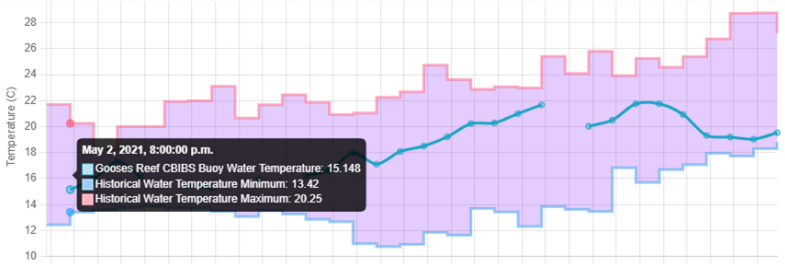
Original Application



CBIBS API sends data to PostGres database

- Stores hourly, daily, weekly, monthly averages
- Less rigorous QC

Scripts send Quality Controlled data to SQLite database



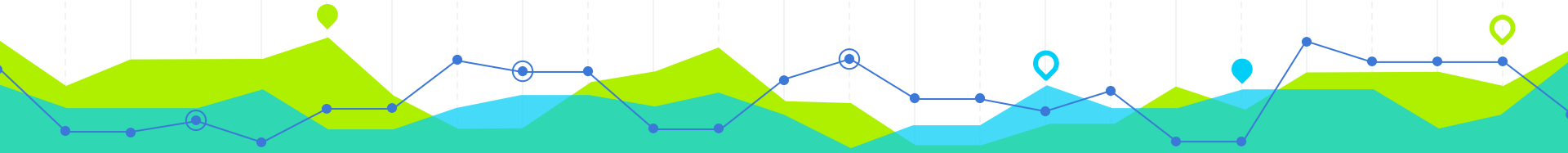
- Historical values
- Rigorous QC

- Graph app pulls data from both DB
- Can display average values w/ historical minimums and maximums

Project Objectives

- Update tool for NOAA’s education team that would support and enhance their programs
  - Chart historical data with current data

- Educators, students and the public as intended end users



Internship Project

Approach and Process

3

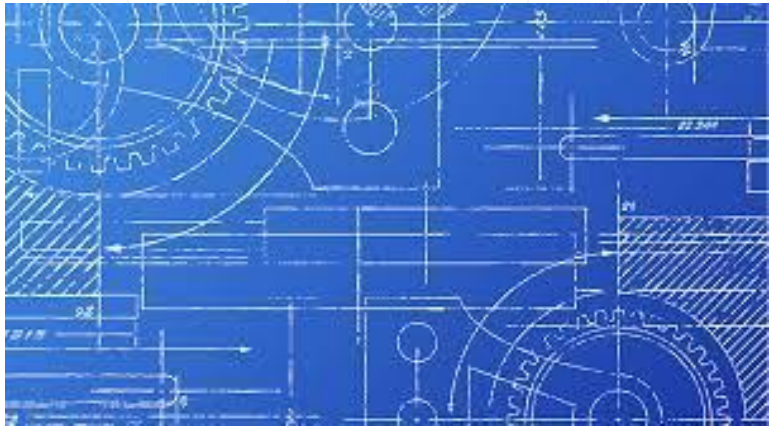
Approach & PROCESS

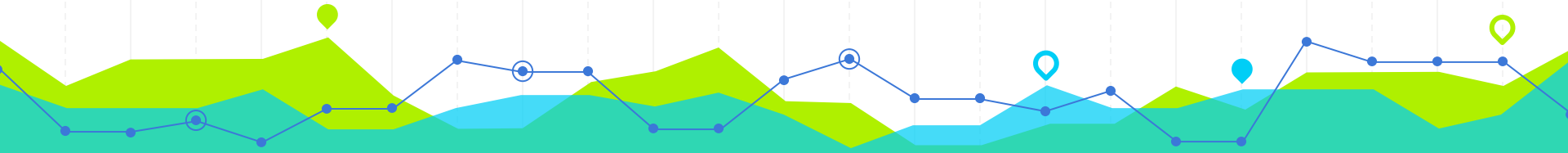
- Close Collaboration with Education team
  - Well defined project requirements

- Working with supervisor to understand CBIBS system
  - Environmental observations
  - Time series data
  - Sensor technology
  - Code base

Approach & PROCESS

- Learn existing code structure
  - PHP, JavaScript, HTML/CSS
  - Current graphing package - Flot.js
- Create data wrappers for SQLite database
- Research and update to supported JS package - Chart.js



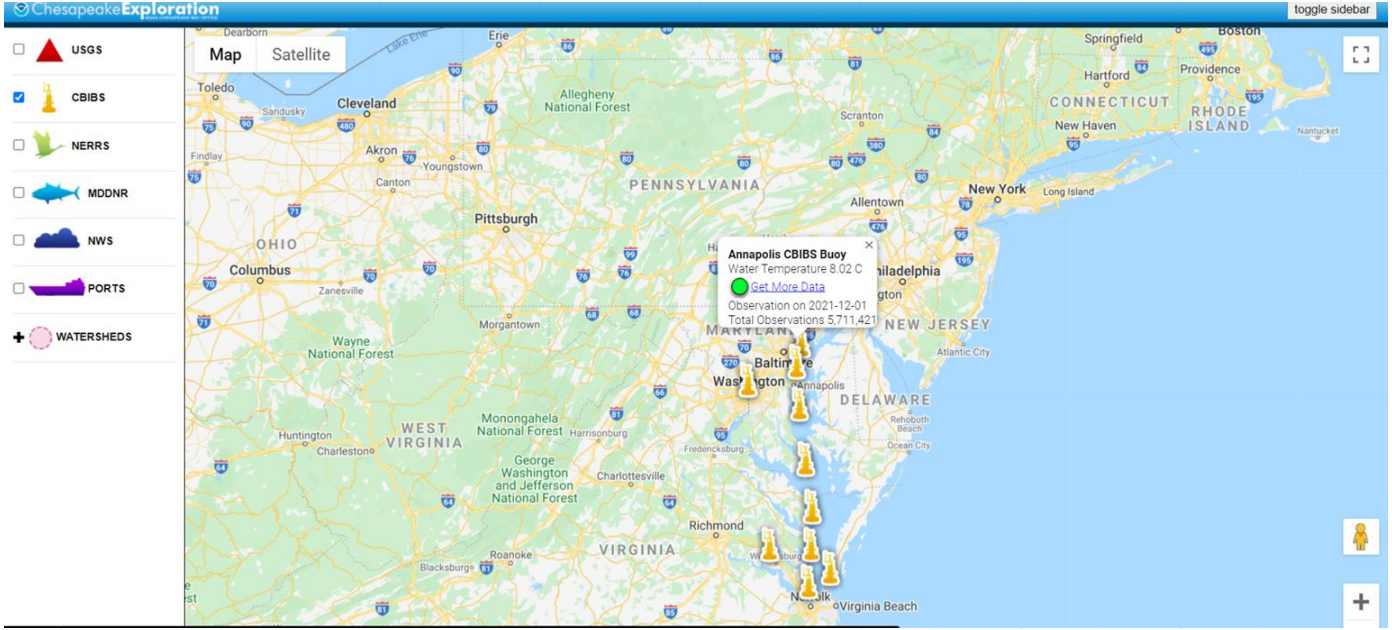


Internship Project

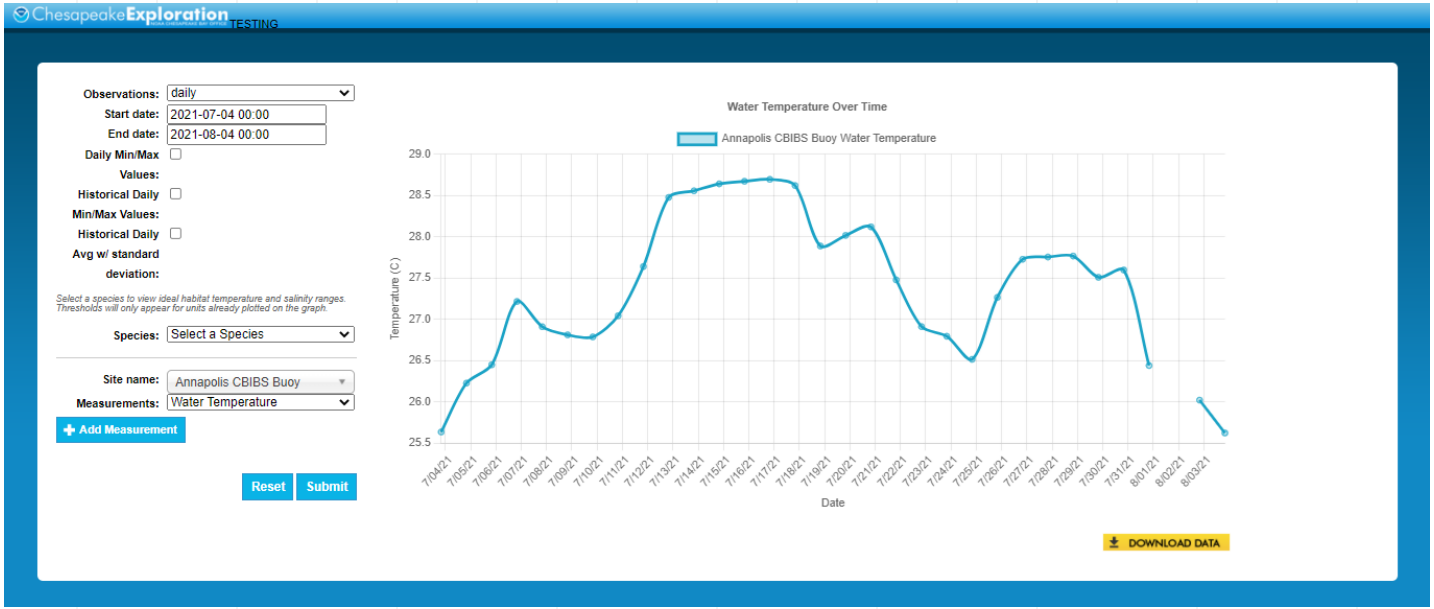
Results

4

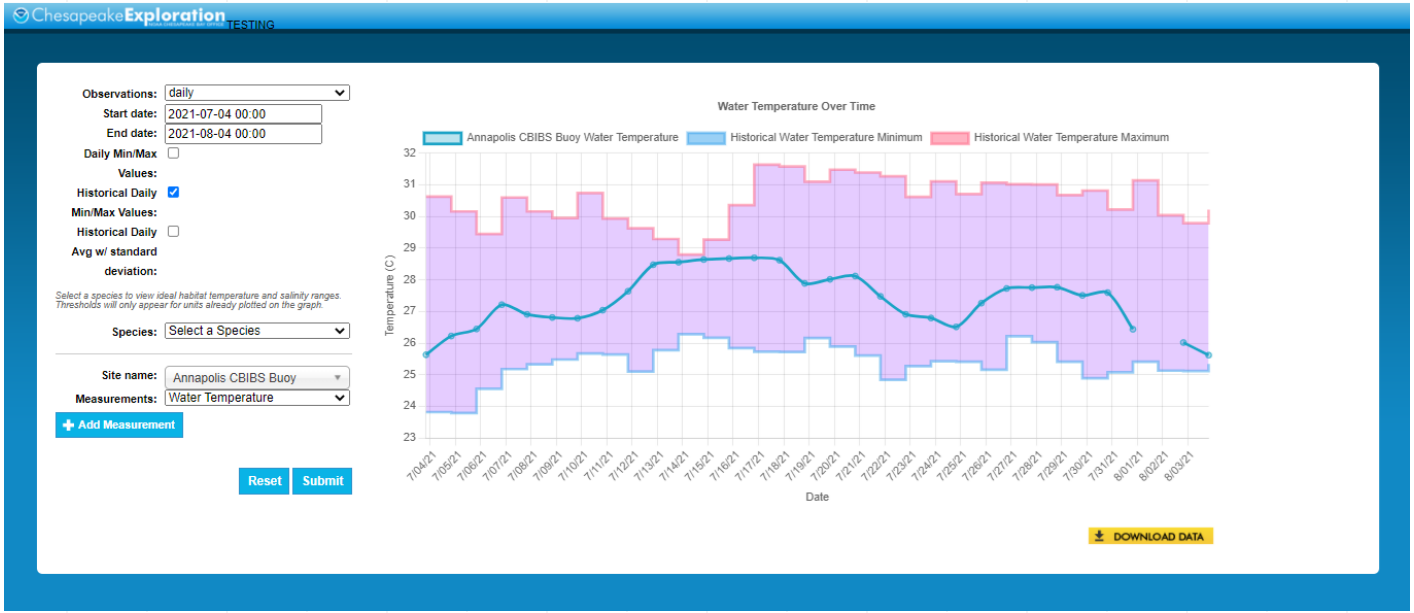
Results


ChesapeakeExploration
toggle sidebar
USGS
CBIBS
NERRS
MDDNR
NWS
PORTS
WATERSHEDS
Map
Satellite
Annapolis CBIBS Buoy
Water Temperature 8.02 C
Get More Data
Observation on 2021-12-01
Total Observations 5,711,421
PENNSYLVANIA
OHIO
WEST VIRGINIA
VIRGINIA
MARYLAND
DELAWARE
NEW JERSEY
CONNECTICUT
RHODE ISLAND
Pittsburgh
Cleveland
Columbus
New York
Washington
Richmond
Virginia Beach

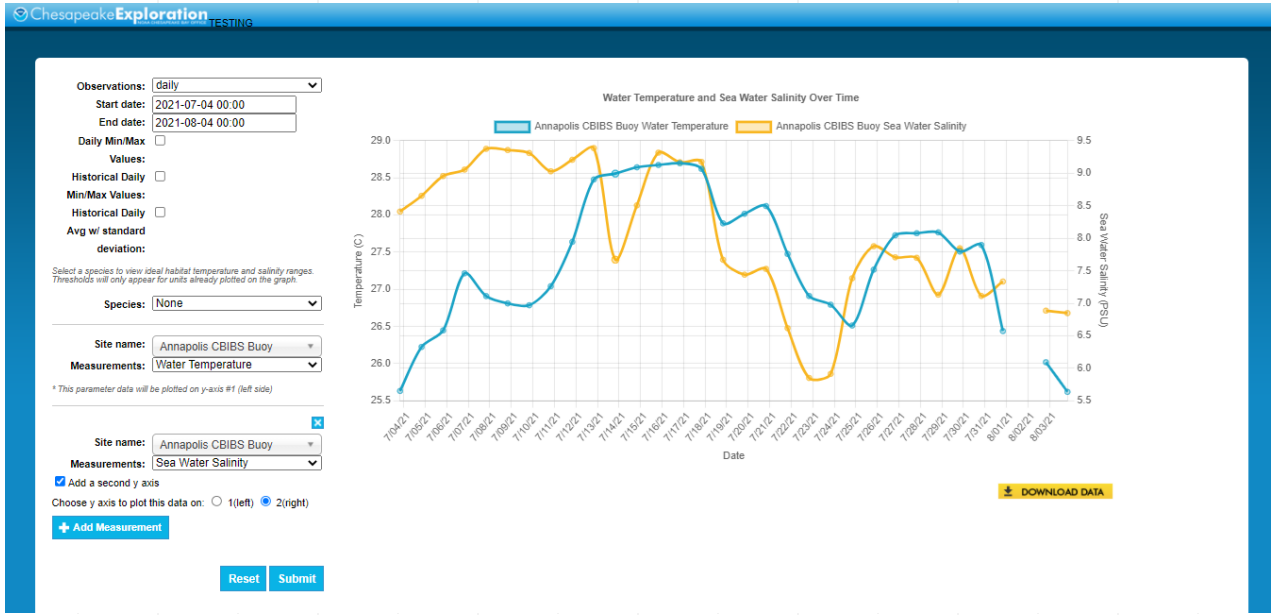
Results


ChesapeakeExploration
TESTING
Observations: daily
Start date: 2021-07-04 00:00
End date: 2021-08-04 00:00
Daily Min/Max Values:
Historical Daily Min/Max Values:
Historical Daily Avg w/ standard deviation:
Select a species to view ideal habitat temperature and salinity ranges. Thresholds will only appear for units already plotted on the graph.
Species: Select a Species
Site name: Annapolis CBIBS Buoy
Measurements: Water Temperature
Add Measurement
Reset
Submit
Water Temperature Over Time
Annapolis CBIBS Buoy Water Temperature
Temperature (C)
29.0
28.5
28.0
27.5
27.0
26.5
26.0
25.5
7/04/21
7/05/21
7/06/21
7/07/21
7/08/21
7/09/21
7/10/21
7/11/21
7/12/21
7/13/21
7/14/21
7/15/21
7/16/21
7/17/21
7/18/21
7/19/21
7/20/21
7/21/21
7/22/21
7/23/21
7/24/21
7/25/21
7/26/21
7/27/21
7/28/21
7/29/21
7/30/21
7/31/21
8/01/21
8/02/21
8/03/21
Date
DOWNLOAD DATA

Results


ChesapeakeExploration
TESTING
Observations: daily
Start date: 2021-07-04 00:00
End date: 2021-08-04 00:00
Daily Min/Max Values:
Historical Daily Min/Max Values:
Historical Daily Avg w/ standard deviation:
Select a species to view ideal habitat temperature and salinity ranges. Thresholds will only appear for units already plotted on the graph.
Species: Select a Species
Site name: Annapolis CBIBS Buoy
Measurements: Water Temperature
Add Measurement
Reset
Submit
Water Temperature Over Time
Annapolis CBIBS Buoy Water Temperature
Historical Water Temperature Minimum
Historical Water Temperature Maximum
Temperature (C)
Date
DOWNLOAD DATA

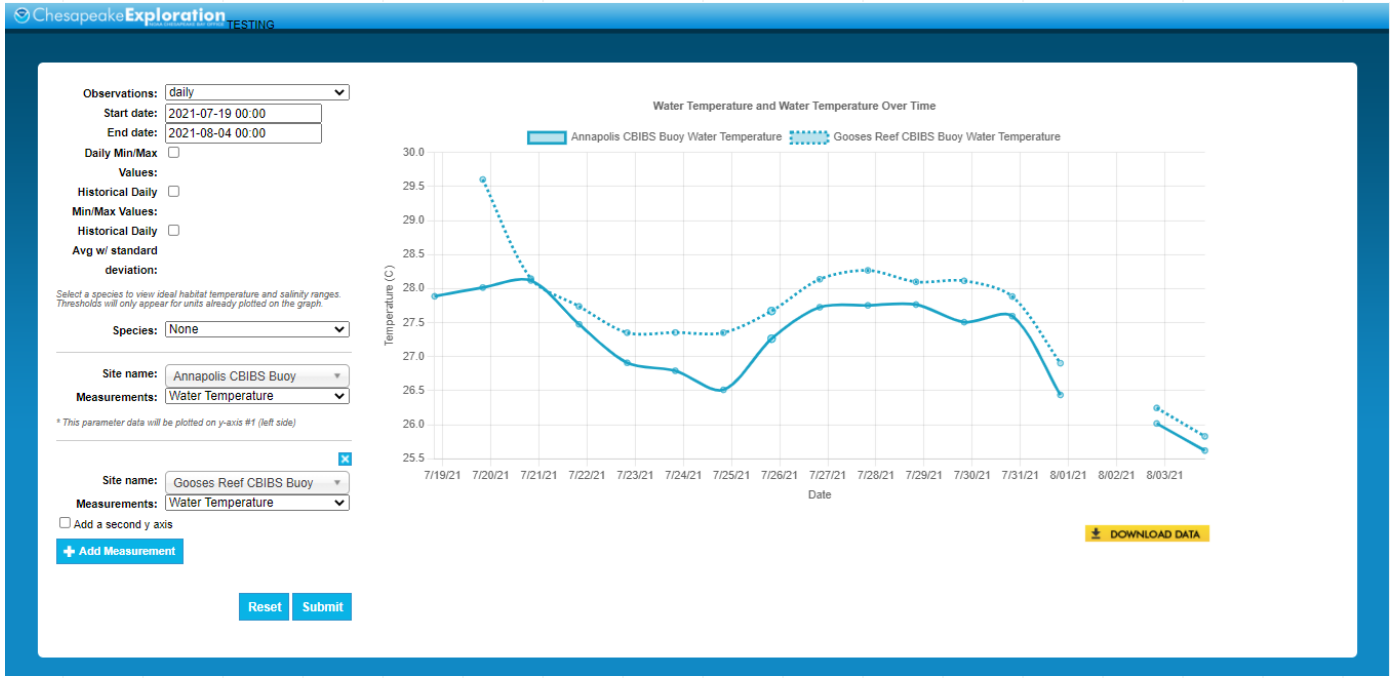
Results


ChesapeakeExploration TESTING
Observations: daily
Start date: 2021-07-04 00:00
End date: 2021-08-04 00:00
Daily Min/Max Values:
Historical Daily Min/Max Values:
Historical Daily Avg w/ standard deviation:
Select a species to view ideal habitat temperature and salinity ranges. Thresholds will only appear for units already plotted on the graph.
Species: None
Site name: Annapolis CBIBS Buoy
Measurements: Water Temperature
* This parameter data will be plotted on y-axis #1 (left side)
Site name: Annapolis CBIBS Buoy
Measurements: Sea Water Salinity
Add a second y axis
Choose y axis to plot this data on: 1(left) 2(right)
Add Measurement
Reset
Submit
Water Temperature and Sea Water Salinity Over Time
Annapolis CBIBS Buoy Water Temperature
Annapolis CBIBS Buoy Sea Water Salinity
Temperature (C)
Sea Water Salinity (PSU)
Date
DOWNLOAD DATA

Results

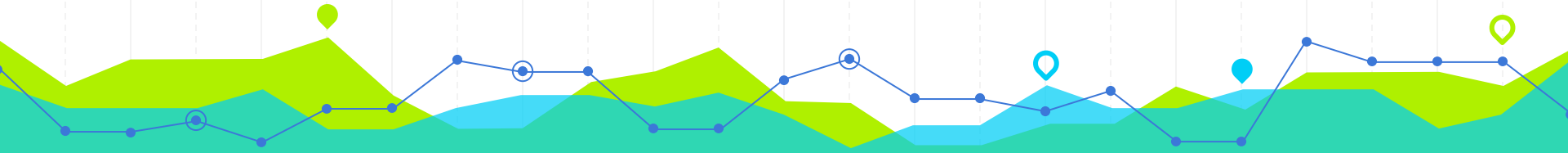

ChesapeakeExploration
TESTING
Observations: daily
Start date: 2021-07-04 00:00
End date: 2021-08-04 00:00
Daily Min/Max Values:
Historical Daily Min/Max Values:
Historical Daily Avg w/ standard deviation:
Select a species to view ideal habitat temperature and salinity ranges. Thresholds will only appear for units already plotted on the graph.
Species: American Oyster
Site name: Annapolis CBIBS Buoy
Measurements: Water Temperature
Add Measurement
Reset
Submit
Water Temperature Over Time
Annapolis CBIBS Buoy Water Temperature
American Oyster Temp. Upper Threshold: 23
American Oyster Temp. Lower Threshold: 15.5
Temperature (C)
Date
DOWNLOAD DATA

Results


ChesapeakeExploration
TESTING
Observations: daily
Start date: 2021-07-19 00:00
End date: 2021-08-04 00:00
Daily Min/Max Values:
Historical Daily Min/Max Values:
Historical Daily Avg w/ standard deviation:
Select a species to view ideal habitat temperature and salinity ranges. Thresholds will only appear for units already plotted on the graph.
Species: None
Site name: Annapolis CBIBS Buoy
Measurements: Water Temperature
* This parameter data will be plotted on y-axis #1 (left side)
Site name: Gooses Reef CBIBS Buoy
Measurements: Water Temperature
Add a second y axis
Add Measurement
Reset
Submit
Water Temperature and Water Temperature Over Time
Annapolis CBIBS Buoy Water Temperature
Gooses Reef CBIBS Buoy Water Temperature
Temperature (C)
30.0
29.5
29.0
28.5
28.0
27.5
27.0
26.5
26.0
25.5
7/19/21
7/20/21
7/21/21
7/22/21
7/23/21
7/24/21
7/25/21
7/26/21
7/27/21
7/28/21
7/29/21
7/30/21
7/31/21
8/01/21
8/02/21
8/03/21
Date
DOWNLOAD DATA

Results

- Additional Features
  - Historical average with standard deviation
  - Interactive display
  - Downloadable data



Internship

Experience and Insights

5

Experience & INSIGHTS

- Software development cycle
- Buoy system technology
- How computer science helps NOAA’s mission

Applicable COURSEWORK

- Database Design and Implementation
  - SQL queries
  - Web development - PHP
- Software Engineering
  - SCRUM
  - Working with clients (meetings!)