Flood Control Warning System

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Abstract (Summary Slide)

My research question is “why do we need to prepare for flash floods?”

I chose to do this research because my community can be prone to flash flooding and it provides critical information that can protect property and save lives. I collected data from Mescalero Apache Tribal Offices. The data showed the data showed that the water has no signs of contamination and no signs of flooding.

Research Question/Hypothesis

My research question is “Why do we need to prepare for flash floods?” My hypothesis is “ Preparing for a flash flood can help you protect yourself, and you’ll know what to expect.” I am interested in researching this topic because my community is vulnerable to flooding and it provides important information that can protect property and save lives. Taking the proper precautions will also help save millions of dollars.

Background Information for Research

I decided to do this research because my community can be prone to flash flooding and it provides critical information that can protect property and save lives. Measuring a river's flow rate can yield reliable information, for a variety of purposes like hydrology, ecology, flood warning, and recreational safety. Currently, measuring the flow rate of remote river areas is a very hands on process. Surveyors need to hike out to the river of interest carrying their equipment, set it up, take measurements, disassemble it and hike back. Because of the effort required to collect a measurement, it's only done periodically for certain rivers. Without continuous monitoring, many of the insights that the flow rate provides are lost. This project aims to solve this problem by making flow rate data easier to collect and more readily available to the users who need it.

Research Methods (Data Sources - where you got the data)

My plan for data collection is to build a flow meter that collects data from rivers and streams. My plan will produce data to test water levels and look for signs of contaminations. The study site is located at Mescalero Apache Tribal Offices. I collected data one time a day, two days a week. I collected data by setting up the warning system in the river. As more water enters the sensor the wheel spins faster, and this rate of spin can be used to calculate how many liters of water flow through the sensor per minute. The Pi runs a Python script where ever minute a flow rate measurement is collected from the sensor and, using the cellular connectivity provided by the modem and SIM card. Soracom Harvest allows for easy real-time visualization of the incoming data. The console displays a live graph showing updated data values as they stream in. Users can monitor how the data changes over a selected window of time. A CloudWatch alarm is configured to monitor when the flow rate surpasses a critical value and automatically sends out an email notification to any subscribed users letting them know that the alarm has been triggered.

Research Methods (Data Use-what data did you use)

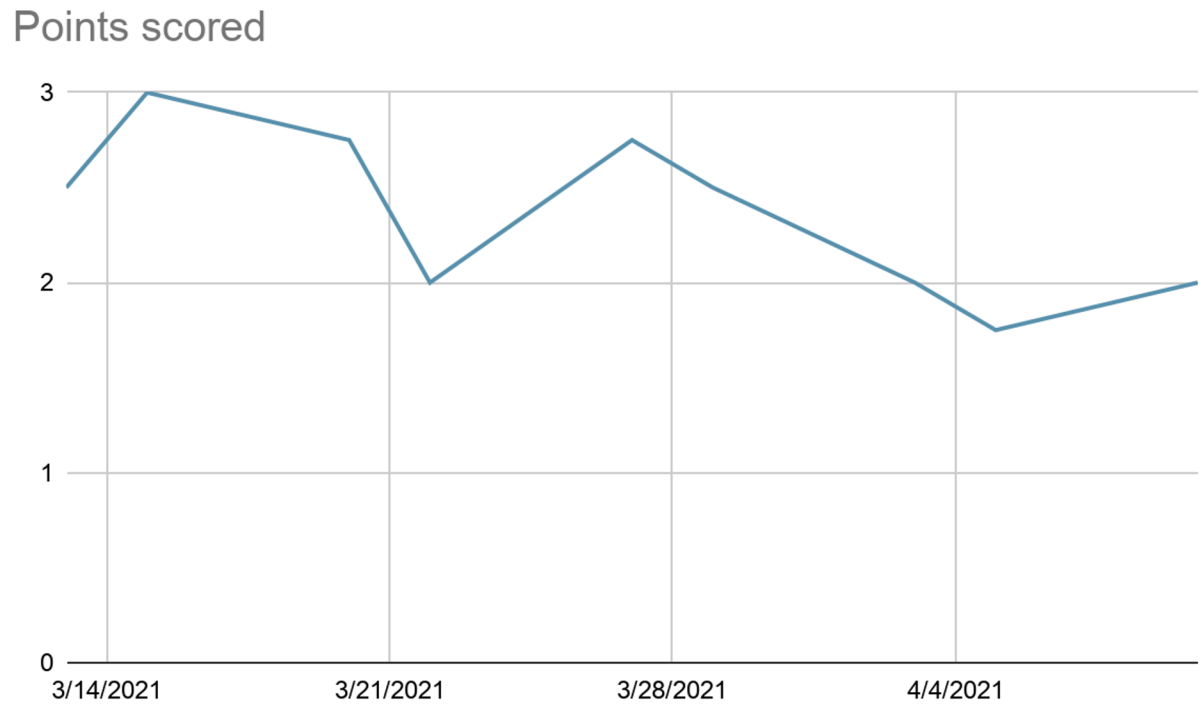
Data Used

Describes what data you used and why

I measured the water level and took the temperature. Took samples of the water to test for nitrate, phosphate, coliform, turbidity, dissolved oxygen, and pH level. The water measured at 2.25 feet and was 60 degrees celsius. The water tested negative for coliform, had a pH level of 7, a 0 JTU, dissolved oxygen measured at 8 ppm, nitrate at 5 ppm, and phosphate at 1 ppm. There are no signs of flooding or water contamination. I tested the water to see if water levels would rise and flooding contaminates the water.

Data Visualizations (graphs/charts/tables)

My data shows that the water levels didn't exceed over three feet. Anything higher than three feet would mean possible flooding.



Data Analysis - what is the story

My results show that there is no water contamination and no signs of flooding. The warning system is easy to set up and to take down, the materials are a low cost, and the tests are accurate. The data results shows that it is easy to do and anybody can do it. The lack of high water levels suggest that there will be no flooding. Continuous testing will have to be done to make sure there is enough time to prepare for a flood.