Enhancing the Citizen Scientist Experience through Responsive Web Design

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Introduction

Citizen science uses members of the general public to conduct scientific data collection on behalf of professional researchers. The use of citizen scientists has enabled the simultaneous collection of large datasets that would have otherwise been uncollectible.

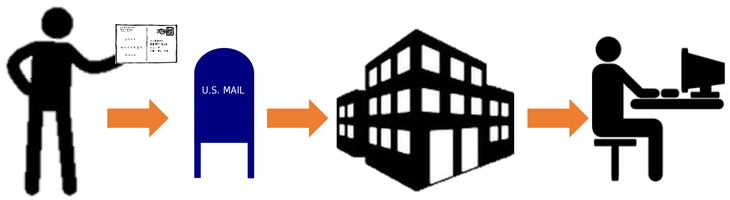
At UNO, the Nebraska Watershed Network (NWN) is "a student-driven organization that strives to promote water quality awareness through outreach, education, and research"[1]. The NWN utilizes citizen scientists to test Nebraska's surface water for chemical contamination and nutrients across large geographical regions over long periods of time. Previous data collection strategies involved using a number of data acquisition tools including Instagram, email, and postcard mailings. We believe by providing technological tools to the citizen scientists, we will increase their interest, commitment, and participation levels in projects.

NWN has partnered with the Public Health Informatics Research lab to develop a database and web portal application using responsive web design technology. Responsive web design technology is an approach that allows the information technology application to respond to the user's behavior and environment based on screen size, platform, and orientation.

The main focus of the NWN's testing has been the chemical atrazine. Atrazine is a common herbicide prevalent in agriculture runoff and has been shown to have detrimental effects on wildlife in concentrations. This season's research will also include sampling for nitrite, nitrate, and phosphate.

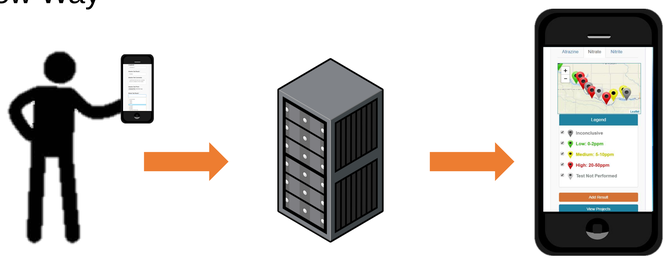
Old Way vs. New Way

Old Way

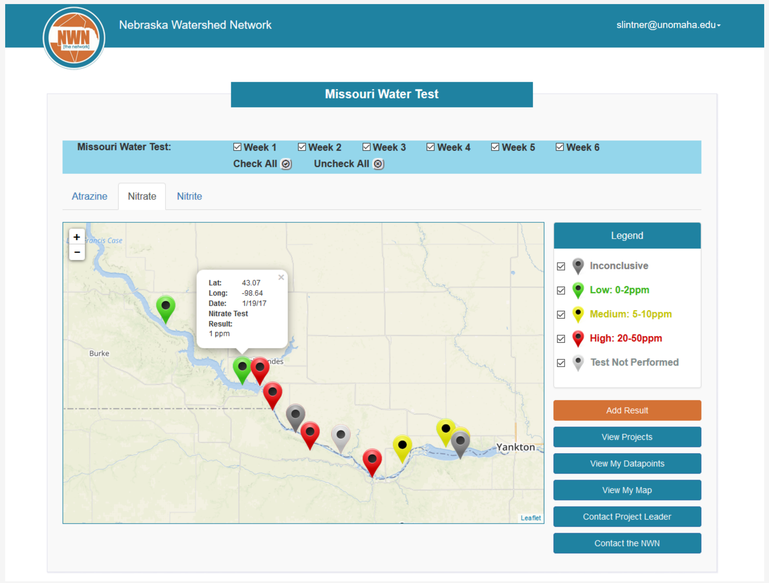


Record Results on a Postcard | Mail Test Results | Results Received by NWN | Results Manually Entered into Spreadsheet

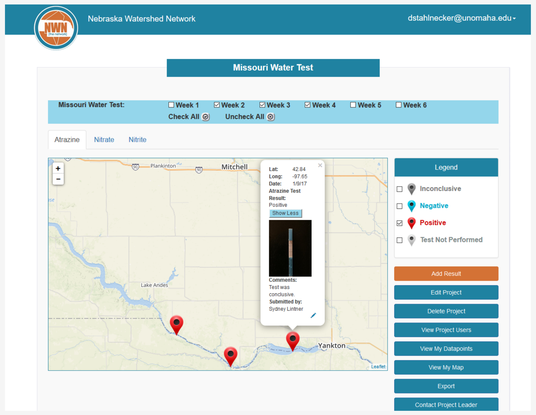
New Way



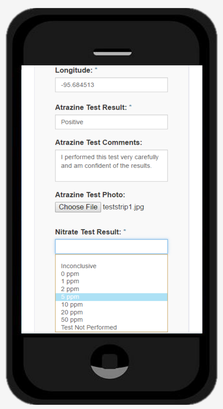
Enter Results on Smartphone | Data Received in Database | Results Immediately Displayed



Missouri Water Test Project Map with Nitrate Tab Selected and No Filtering Used – Citizen Scientist View



Missouri Water Test Project Map with Atrazine Tab Selected and Filtered to Show Only Data Points with a Positive Atrazine Test Result Conducted During Week 2, 3, or 4 – Administrator View



Inputting Test Results for a Data Point from a Smartphone-sized screen

References

[1]University of Nebraska Omaha. (n.d.). Aquatic Toxicology Laboratory. Retrieved from http://www.unomaha.edu/college-of-arts-and-sciences/aquatic-toxicology-lab/

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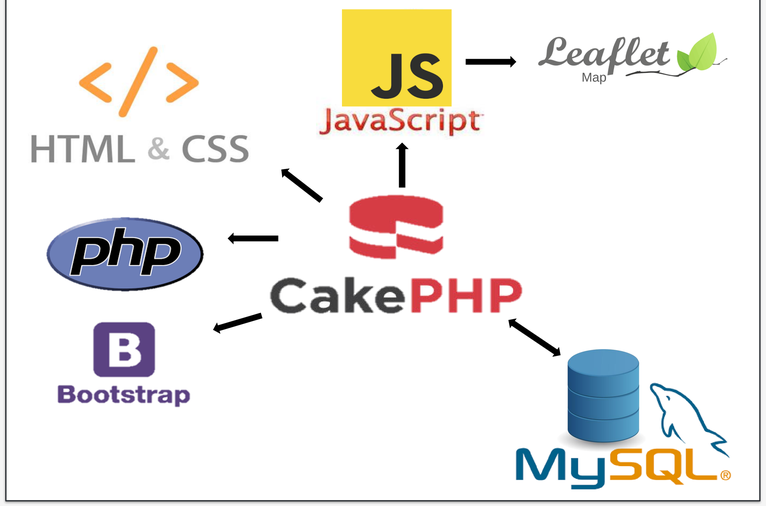
Technology

All of the NWN project's technological components are open source software.

- CakePHP – application framework that allows for easy interaction with the database
- MySQL - database system
- PHP - server-side script that integrates with the framework
- JavaScript - creates the dynamic content within a user's browser
- Bootstrap - front-end framework that enables a webpage to dynamically size itself to fit smaller screens
- HTML & CSS – webpage language and styling



Conclusion

Using responsive web design technology provides several benefits:

- Citizen scientists can use their smartphones to enter test results *immediately* while still in the field.
- Citizen scientists can immediately *view* their newly entered data points on a responsive map.
- Citizen scientists can view other citizen scientists' data points for the same project for comparison.
- Citizen scientists may experience an overall sense of connectivity and satisfaction in the spring NWN Nebraska watershed testing.

We hope through this project citizen scientists will engage more in future NWN projects and become stronger environmental advocates.

The next step in the responsive web design technology project is to measure citizen scientists' engagement during the watershed testing this spring.

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