

Implementing location-based data for a targeted approach to volunteer retention and recruitment at Blue Water Baltimore

Penn State University – World Campus

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Introduction

Blue Water Baltimore (BWB) is a leading environmental non-profit organization working in Baltimore City and Baltimore County, Maryland. The organization was founded in 2011 and has five programs that work toward the mission of restoring the quality of Baltimore’s rivers, streams, and Harbor to foster a healthy environment, a strong economy and thriving communities. BWB has collected programmatic location-based data for over a decade and has not yet developed a method for visualizing or analyzing the data. A description of each BWB program and its associated data is provided in Table 1 below. Combining this data in a web map will give BWB the ability to visualize historical work and plan future work. One key problem to be addressed by this project is that the organization has a difficult time recruiting volunteers for their tree planting events. This project creates a targeted, location-based approach for soliciting volunteers with the goal of increasing the rate of return for those volunteers.

Table 1: BWB programs and associated data

Program	Description	Location-Based Data
Waterkeeper	The Waterkeeper team is responsible for collecting water samples and testing for a list of parameters at 51 sites in Baltimore’s Waterways. This team also monitors BWB’s pollution reporting hotline and works with local agencies to remediate pollution events.	51 water quality monitoring sites
Advocacy	The Advocacy team works closely with the Waterkeeper team to hold polluters accountable. This may involve taking polluters to court. This team also advocates for local, state, and federal legislation in support of environmental protection.	Known Polluters Community Events
Eco-Literacy	The Eco-Literacy team is responsible for running educational events for all ages. These events cover topics like the urban water cycle, common pollutants in our water ways, and native plants can be used for stormwater management.	Community Events

Restoration	The Restoration team organizes and implements community tree plantings and tree giveaways for residents in partnership with local government organizations. This team also facilitates Green Stormwater Infrastructure projects and runs workshops for green teams at various organizations. Additionally, the Restoration team is responsible for managing volunteers to maintain projects over time.	Tree Plantings Tree Giveaways Green Stormwater Infrastructure (GSI) Projects Volunteer Addresses
Nursery	Herring Run Nursery is BWB’s retail native plant nursery. This program sells plants native to the Chesapeake Bay Watershed to spread the word about the benefits of native plants for the local ecosystem. All funds raised by the nursery become unrestricted funds for BWB. This program manages a team of volunteers and works with community partners to design and install conservation landscaping projects.	Nursery Location Consultation Service Volunteer Addresses

Literature Review

Recruiting Volunteers

It is common for organizations that rely on volunteer support to struggle with recruitment (M. Hager & J. Brudney, 2011; S. Compion et al., 2022). Many factors can contribute to this challenge, from organizational management to individual motivations. Hager and Brudney (2011) hypothesize that non-profits with less diversity of volunteer jobs struggle to recruit. BWB offers volunteer opportunities with several of the programs listed above, and the program with the greatest need and least success with recruitment is the Restoration Program. The opportunities provided within this program are homogeneous – Tree Plantings and Tree Maintenance/Pruning. From January 1, 2024 through May 31, 2024 the Restoration Team posted 30 volunteer opportunities on the BWB website. According to the organization’s database, these events alone require a total of 1,059 volunteers to complete all the scheduled work. As of April 21, 2024, 382 volunteers have signed up for a future event or completed a past event in 2024 (Blue Water Baltimore, 2024-d). This data shows a sizable gap in fulfilling the volunteer requests.

Compion et al. (2022) and Hager & Brudney (2011) suggest a target approach to soliciting volunteers can lead to greater retention rates and a higher probability that volunteers will return. Inviting people who live close to the tree planting or pruning site to help will encourage a sense of community, which is key for retention (Hager & Brudney, 2011). Compion et al. (2022) further explain the motives people experience when choosing volunteer experiences. These motives may be altruistic (they want to do good for their community), utilitarian (they want to improve their work experience), or social (they want to connect with people in their community that have similar interests) (p. 474). A location-based approach to soliciting volunteers will improve BWB's success rate for recruitment and encourage residents to continue supporting BWB's work. Ohmer (2007) explains that a feeling of a sense of community is an integral part of the volunteer experience. Those who feel a connection to the people and issues at the local level feel that they can help meet each other's needs and continue to make the world a better place.

User-Friendly Experience

The useability of a web map service is critical to its success (Henzen, 2019; Resch, 2013). Interactive maps have become ubiquitous today as many people are familiar with platforms such as Google Maps, Apple Maps, Waze, and others. Replicating the feel of such interfaces improves the user experience, especially as it relates to any search functionality (Henzen, 2018, p. 3). The user experience must be considered at all stages of the project, from the initial proposal to the finished project. (Resch, 2013, p. 1019).

Project Overview

Needs Assessment

In any given year, BWB plants about 1,000 trees in Baltimore City and County. These projects are typically grant funded and rely on the support of volunteers in the community to get the trees planted and maintained under the direction of the Restoration Team. The Restoration Team has voiced concern about the ability to recruit volunteers for these events. It is their goal to increase the number of returning volunteers to establish a greater pool of experienced helpers. BWB keeps track of all volunteer events and residents who have volunteered in their Salesforce database. This location-based information can be used to strengthen the community feel of volunteering events by inviting people who live near future planting and maintenance sites. The organizational need is for a tool that can create a list of e-mail addresses for past volunteers who live in close proximity that could be invited to future events in need of more assistance. This mapping tool will be for internal staff use only. Two staff, one on the Restoration Team and one on the IT team have access

to the backend of the web map for data management. Both staff members have experience working with Esri products, therefore minimal training will be needed. Anyone leading volunteer events at BWB will be able to access the front end of the volunteer locator map.

Data

Water Quality Monitoring Stations

(Blue Water Baltimore, 2024-c)

Excel Spreadsheet

BWB is a Waterkeeper organization that monitors water quality at 51 sites in Baltimore's rivers, streams, and harbor. The Baltimore Harbor Waterkeeper program of BWB has collected over 146,000 readings over 15 years. This work is the heart of the organization and all other programs at BWB work towards improving water quality. Data collected by the waterkeeper team is available online at www.baltimorewaterwatch.org. It is important that the locations of our monitoring sites are present on all maps created for the organization from a communications perspective, to drive home the role of BWB as a water quality organization above all else. Latitude and longitude coordinates are provided in the spreadsheet that can be exported directly from the website. These locations have been converted to a point layer in ArcGIS Pro.

Tree Plantings

(Blue Water Baltimore, 2024-a)

Point Shapefile

The restoration team of BWB has documented 12,802 trees planted from 2005 to present with points in an ArcGIS shapefile. This information will be useful to build a relationship with volunteers as a trusted organization in the community. At the start of each volunteer event BWB explains the work of the organization, they will now be able to include data in this introduction relating to how many trees have been planted in a specific radius of the planting site.

Volunteer Addresses

(Blue Water Baltimore, 2024-b)

Excel Spreadsheet

BWB has addresses for 3,863 contacts with Baltimore City and County that have attended a volunteer event in the past. The spreadsheet has address information which has been converted into point data in ArcGIS Pro. This layer will allow for a targeted approach to volunteer communications.

Baltimore Neighborhoods

(Baltimore City Open Data, 2023)

Polygon Shapefile

Baltimore City has 279 neighborhoods and there is a strong sense of identity and community within those neighborhoods. This layer has been included so that staff can identify the neighborhoods where the tree planting or maintenance event is planned. This information will be used in selecting the area for the targeted solicitation of volunteers as well as in the communications associated with the event.

Methodology

Data Collection and Map Formatting

All data used for this project were first uploaded to a map project in ArcGIS Pro. Volunteer addresses were exported from BWB's Salesforce account as an excel spreadsheet. This spreadsheet was then Geolocated in ArcGIS Pro version 3.2 and converted to a point layer. The Water Quality Monitoring Sites layer was converted from a spreadsheet to a point layer using the XY table to point tool in ArcGIS Pro. The Tree Planting layer was downloaded from the BWB files sharing system, SharePoint as a shapefile and added to the map. The Baltimore Neighborhoods layer was downloaded from Baltimore City's Open Data Portal and added to the map. All attribute tables were reviewed for data accuracy.

Web Map

After all data was added to the map in ArcGIS Pro, it was downloaded as a web map in my account for Penn State University. This map was opened and reviewed to ensure that symbology and layers carried over accurately. Adjustments to symbology needed to be made because there were discrepancies in what symbols were supported in the online platform.

Esri Experience Builder

The final product is an interactive map that can export a list of volunteers within a set distance of a proposed volunteer event. This interactive map was created using Esri's Experience Builder, which can create custom programs without the need for coding and has default layouts that are user-friendly. To increase usability a search feature has been added to the upper left of the map. Usability testing has shown that maps that work similarly to Google Maps will have a higher rate of being used over time. This search feature includes auto-complete suggestions, creates a point where the search result is located, and zooms to the location.

Hardware/Software Requirements

Table 2: Hardware and Software requirements for ArcGIS Pro (Esri, n.d.-a); Browser requirements for ArcGIS Dashboards (Esri, n.d.-b)

Type	Item	Supported and recommended
Hardware	CPU	Minimum: 2 cores, simultaneous multithreading
		Recommended: 4 cores
		Optimal: 10 Cores
	Platform	x64
	Storage	Minimum: 32 GB of free space
		Recommended: 32 GB or more of free space on a solid-state drive (SSD)
	Memory/RAM	Minimum: 8 GB
		Recommended: 32 GB
		Optimal: 64 GB or more
Dedicated graphics memory	Recommended: 4 GB or more	
Visualization cache	Up to 32 GB of space	
Screen Resolution	Minimum: 1024x768	
	Recommended: 1080p or higher	
Software	Microsoft .NET	Minimum: Microsoft .NET Desktop Runtime 6.0.5 or later, using a Windows x64 installer
ArcGIS Dashboards	Browsers	Google Chrome version 115 and later Microsoft Edge version 115 and later Mozilla Firefox version 117 and later Safari version 16 and later
ArcGIS Dashboards	Mobile devices	Safari on iOS version 16 and later Chrome on Android

Results

The resulting product is a tool that allows BWB staff to target volunteers based on location. The program has been released to the Restoration Team and their feedback has been positive. This interactive map can be viewed [here](#). To ensure the map stays accurate over time and captures data of new tree plantings and new volunteer addresses, one staff person on the Restoration Team will be responsible for adding new tree planting data to the existing layer in the web map via ArcGIS Online. One IT staff person will be responsible for exporting new volunteers from Salesforce monthly, geocoding those addresses and adding

them to the existing volunteer address layer in ArcGIS Online. Image 1 shows a screenshot of the final product. Numbered features are outlined below.

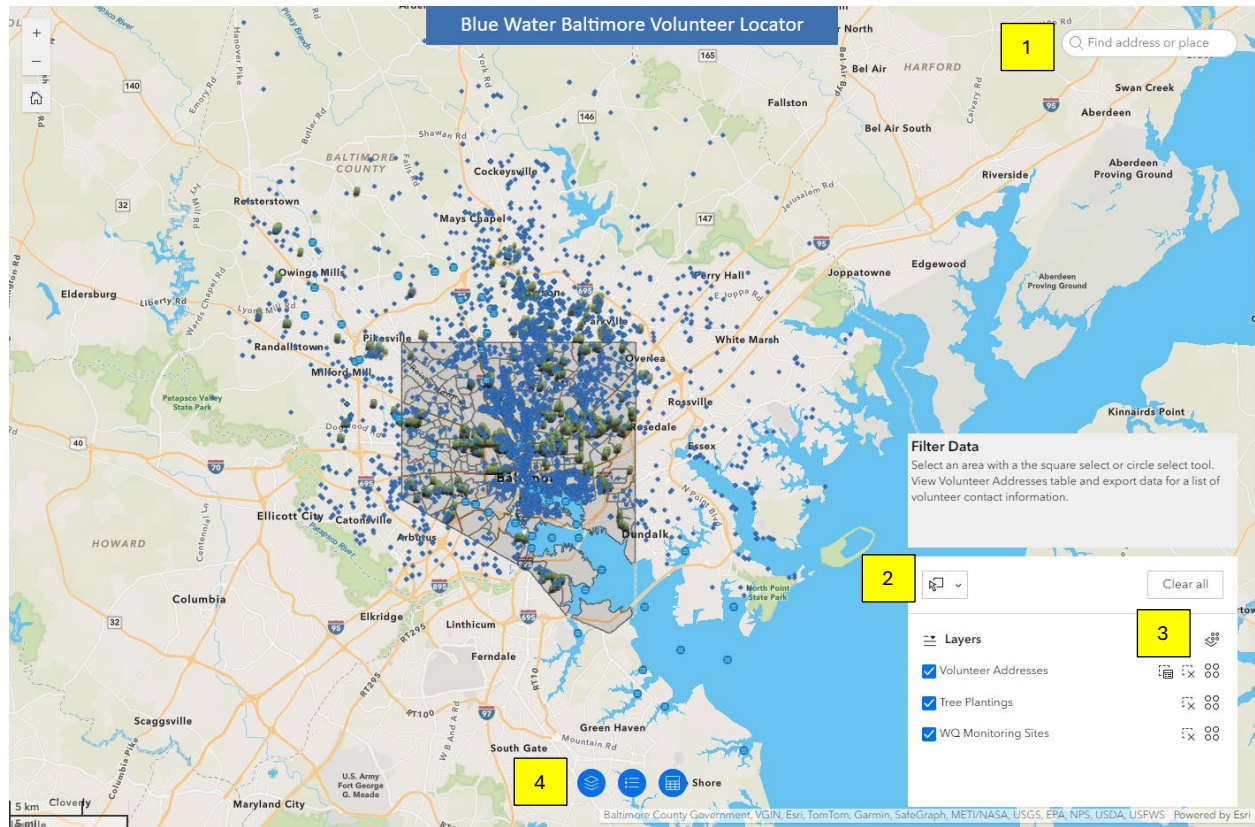


Image 1: Screenshot of BWB Volunteer Locator Map

In Image 1 above, the yellow boxes represent features of the user interface:

- 1 = Search functionality like that of Google Maps. Users can enter an address (e.g. future volunteer event) and the map will zoom to the location.
- 2 = The user can select a rectangle or circle tool to identify volunteers close to the volunteer event site.
- 3 = After the volunteer records are selected with the shape tool, a table with volunteer contact information can be exported by clicking the spreadsheet button
- 4 = Map layers can be turned on and off with the widget at the bottom of the screen.

Discussion and Conclusion

This project has been simplified from the original proposal to improve usability. A map that does too many things is often not used for any one thing that it can do. The map created for this project has a clear purpose and reasons for each layer included. Staff at BWB now have a way to quickly create a contact list for local volunteers to be solicited for events. People are more likely to attend an event if it supports their direct community. By building community those volunteers are more likely to return. One limitation to the project is that BWB is going through an organizational change as a new strategic plan is developed, so the inclusion of additional programmatic data has been left off for now. As the needs and goals of the organization are defined during the strategic planning process additional data and layers for each program may be added to the map.

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