FloodAware.net: Community-Based Automated Information for Urban Flooding
NSF Award No. 1831475
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IRG 2017/2018

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Community Partners

Arizona Department of Transportation
City of Flagstaff
City of Phoenix
City of Tucson
City of Atlanta
Coconino County Flood Control District
Flood Control District Maricopa County
Friends of the Rio de Flag
JE Fuller
National Weather Service
Pima County Regional Flood Control District
Private Property Owners
Salt River Project
Tucson Water
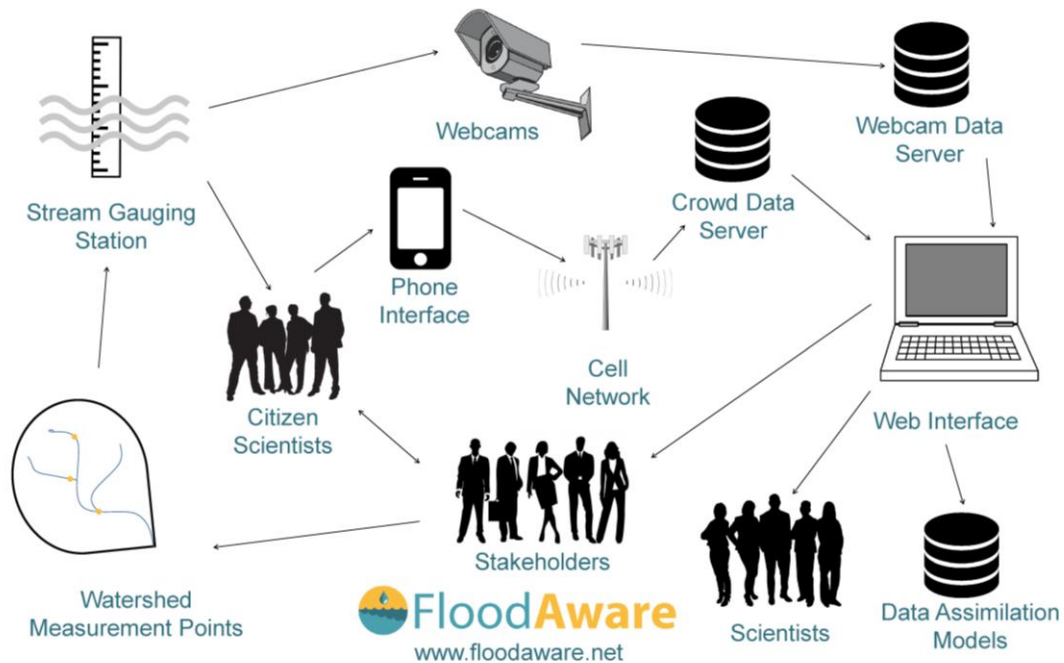US Forest Service
US Geological Survey
Watershed Management Group
Woodson Engineering

Project Overview

Integrated Flood Stage Observation Network (IFSON)

Stream Gauging Station • Webcams • Webcam Data Server • Crowd Data Server • Phone Interface • Cell Network • Web Interface • Citizen Scientists • Stakeholders • Scientists • Data Assimilation Models • Watershed Measurement Points

FloodAware
www.floodaware.net

- FloodAware is a multi-university and multi-city project to provide communities with real-time insights into roadway flooding, and opportunities for reducing risk.
- FloodAware integrates urban cameras, sensors, social media and direct citizen reporting into a comprehensive dynamic flood monitoring network, combining these data streams to drive real-time modeling and prediction of imminent flooding, and keeping both authorities and citizens apprised of current and expected flooding risks.

Project Overview

Use-Inspired Research

Problem

Urban flooding remains a major public health threat in the US, and across the worldwide. In Arizona, for example, the fall monsoon season routinely leads to deaths and destruction, including drivers having to be rescued from their flooded cars. Yet, little to no real-time information exists notifying the public of flood risks or how to protect themselves from these risks.

Community Engagement

The project team is working with city (infrastructure managers), community, and national (NWS) partners to develop the technologies. The work initially focused on Phoenix, Flagstaff, and Tucson (AZ) but has expected to include efforts in New York City, Atlanta, and Portland. Engagement occurs both directly in involving stakeholders in the research development process, but also through outreach activities (webinars, workshops, and educational programs) that drive knowledge co-generation processes.

Fundamental Research Contributions

Technological Advancements

- Developed specialized solar-powered, cellular-connected camera systems
- Established a cloud-based server and automated data collection
- Produced draft models of urban hydrology and hydraulics for two pilot regions in Arizona
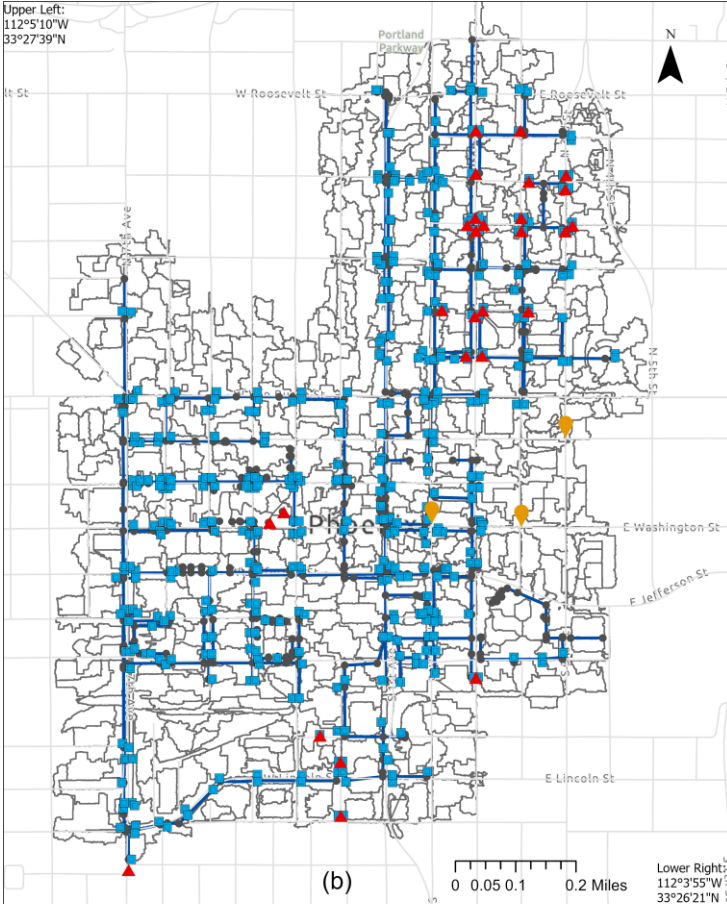- Created web and mobile communication platforms

Social Science Advancements

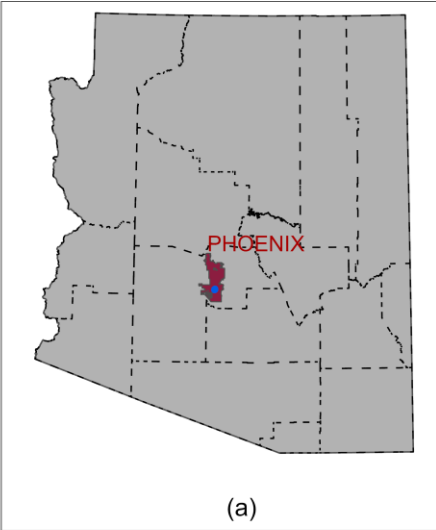- Integrated citizen science projects, such as CrowdHydrology and Mobile Hydrology

Project Update

Camera Installations

Hydrologic Modelling

Project Evolution

Community engagement has been pivotal to steering the research direction and framing. Community partners at different scales have provided different types of insights.

Input from state (e.g., Arizona DOT) and federal (e.g., NWS) agencies has resulted in a clearer understanding of the conditions that create vulnerability and how flood risk is communicated. We have leveraged these insights to prioritize the locations we monitor and structure how we store data and ultimately process to communicate to the public and first responders.

Input from city stakeholders (including Phoenix, Flagstaff, Tucson and more recently Atlanta and New York) has provided us with insights into how local citizens become exposed to flooding, at the intersection of travel behavior, infrastructure design, and rain events. We've used these insights to steer how we communicate risk in our IFSON platform, and also in how we develop our hydrology models.

Evaluating Project Impact on Communities

The project is directly addressing the dearth of knowledge and insights available to communities on the risks of local flooding. In partnership with local communities we've developed the sensing (camera), analytics, storage, and communication technologies necessary to provide real-time insights to communities. We've done this in direct partnership with communities to ensure that the appropriate information is captured and effectively communicated.
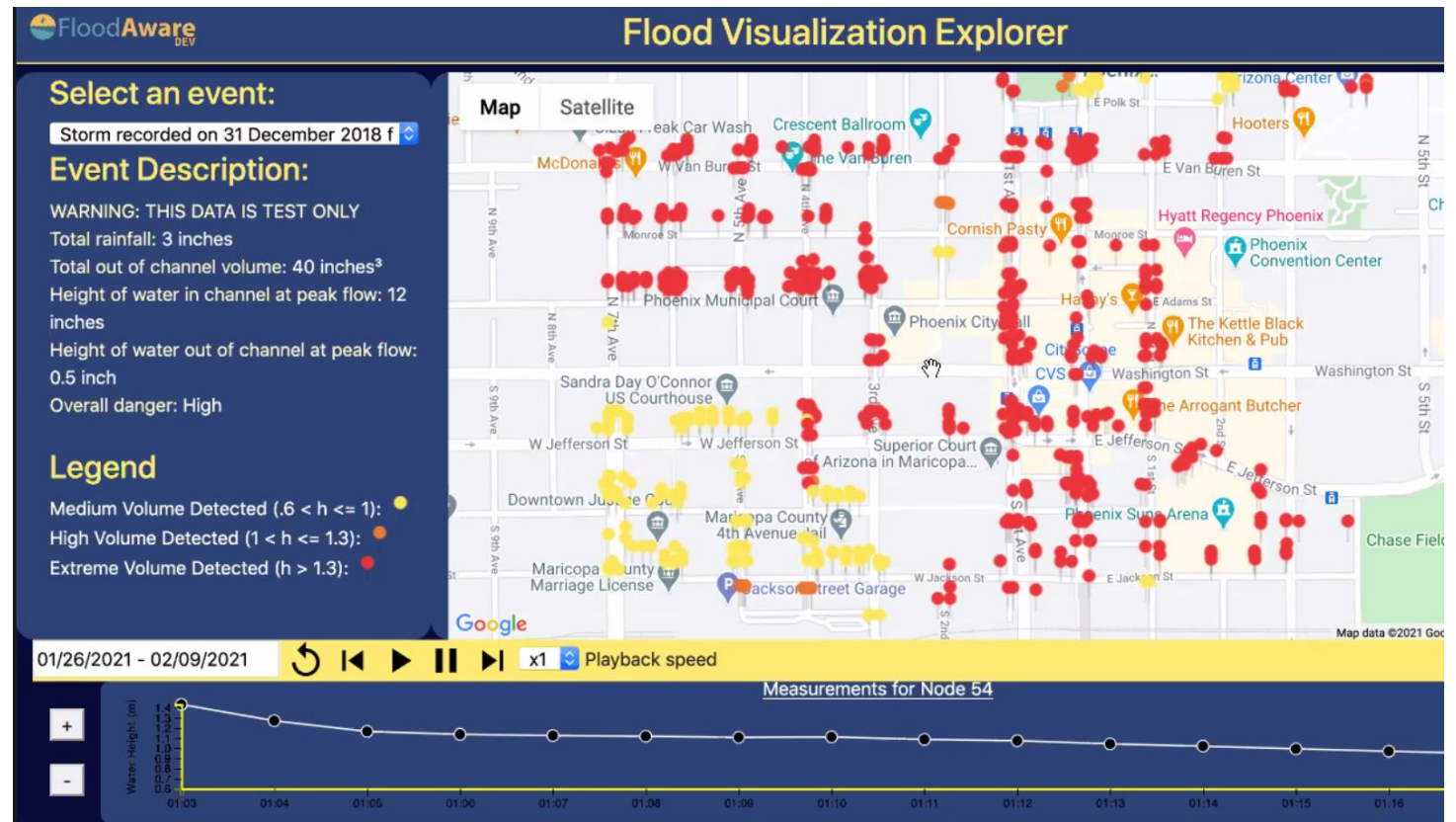
Community Platform

Anticipated Outcomes & Success Measures for the Next Year

Arizona State University
- Increase data collection in Phoenix through deployed project technologies
- Advance hydrological model forecasting capabilities
- Integrate data collection with modelling

Northern Arizona University
- Refine web application interface and develop mobile application
- Continue hardware development and expand pilot testing
- Improve social media mining
- Integrate data collection with modelling
- Develop special interest group of stakeholders

University of Arizona
- Deploy cameras and engage in citizen science data collection

Michigan Technological University
- Enhance Mobile Hydrology image processing software

University at Buffalo
- Manage CrowdHydrology platform
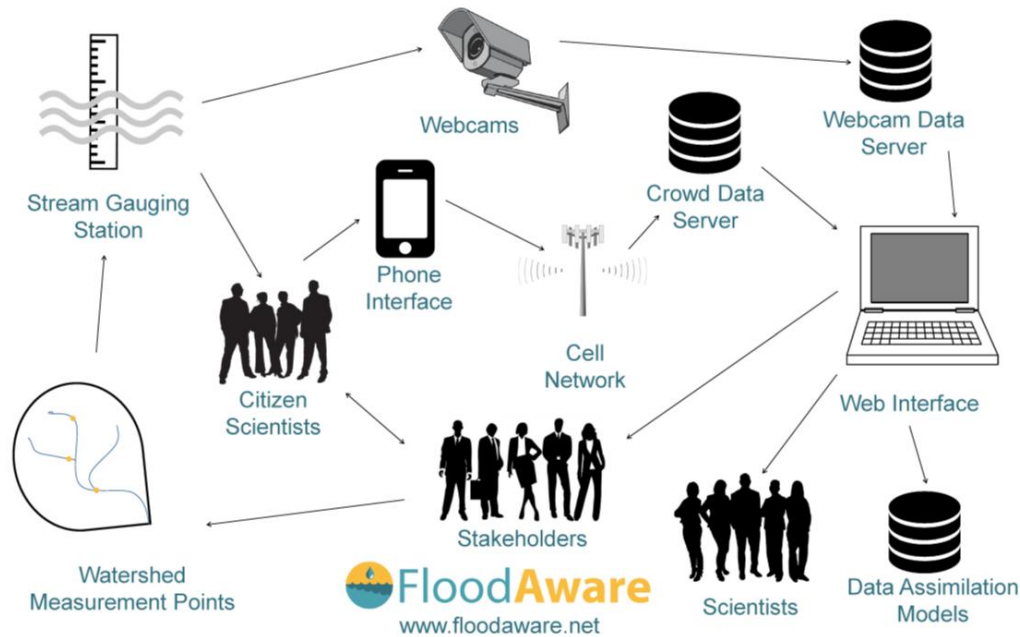- Assess citizen science participation and data quality

Community-Based Automated Information for Urban Flooding

Integrated Flood Stage Observation Network (IFSON)

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Project Vision

FloodAware is a multi-university project to explore the Smart City vision by developing and testing a real-time flood detection, reporting, and communication technologies for cities and local communities.

FloodAware integrates urban cameras, sensors, social media and direct citizen reporting into a comprehensive dynamic flood monitoring network, combining these data streams to drive real-time modeling and prediction of imminent flooding, and keeping both authorities and citizens apprised of current and expected flooding risks.

Use-Inspired Research

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- In September 2020, we held a national virtual workshop towards knowledge co-generation between the research team and community partners. Participants included federal (USGS), state (Arizona), local (Phoenix, Flagstaff), and community stakeholders.

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Social Science Advancements
- Integrated citizen science projects, such as CrowdHydrology & Mobile Hydrology