Summary Report: User Survey for the Stevens Flood Advisory System (SFAS)

Philip Orton, Stevens Institute of Technology

Laura Kerr, Stevens Institute and New Jersey Sea Grant

Hannah Eisler Burnett and Jessica Kuonen, New York Sea Grant

Survey period: 3/25/2024 to 4/8/2024

Summary and Highlights

The Stevens Flood Advisory System (http://Stevens.edu/SFAS) is an ensemble total water level forecast system run by the Stevens Institute of Technology since 2016. An anonymous survey was created and completed by 351 (23%) users out of about 1500 SFAS users who were invited to take it. Those invited are advanced users who are signed up to receive flood watch and advisory emails and may not reflect all the website's users, nor those who use information secondhand after it is shared by other users, which is common. These users are seeking information on flood forecasts very frequently, with most respondents (about 83%) using SFAS at least a few times per month and 40% ten times or more per month. Ease of use was rated highly by respondents, with 86% rating it extremely easy or somewhat easy to understand SFAS displays. About half of respondents indicated that the SFAS email alerts are "great", "excellent", "perfect" or otherwise not in need of improvement. Respondents were primarily (92%) non-Hispanic white, college educated (87%), middle- or high-income (although 28% preferred not to say), over 50 years old (81%), and a majority (67%) were male.

The 99 respondents who share the information with their community or use it for government operations are aware of the forecasts affecting on-the-order-of 100000 people (at least 64890 people, and as many as several hundred thousand). Common response activities include closing flood gates or storm surge barriers, moving cars to higher elevation, closing roads, protecting industrial equipment, preparing facilities to accommodate floodwaters, situational awareness, moving items in ground-level garages and spaces off the floor, triggering OEM activities, and issuing PR notices to the public. SFAS forecasts presently extend 4.5 days into the future, and 18% would like to have more advance notice of a coming flood (i.e. longer lead time forecasts of 5-7 days).

For 225 users that consult SFAS for their own personal household decisions only, common response activities to a forecast flood include sharing with others (84%), adjusting schedule (71%), moving a vehicle to higher ground (58%), applying flood protections to home (31%). About half of these users are flooded several times per year or more (51%). Of these users, only 8% would like to see longer-duration forecasts.

Common requests for improvement include graphical interactivity (e.g. mouse-over shows numbers on time series plot), an app, text message notifications, altered email alerts (e.g. having user-selected alert thresholds), a guide or training slide deck, flood mapping, and an easier sign-up system for email alerts (on each station's page) and more SFAS stations. Nearly all of these features are already available on one or more NOAA websites or will be in the coming 2-4 years (e.g. forecast mapping), which supports the need for SFAS website and products upgrades.

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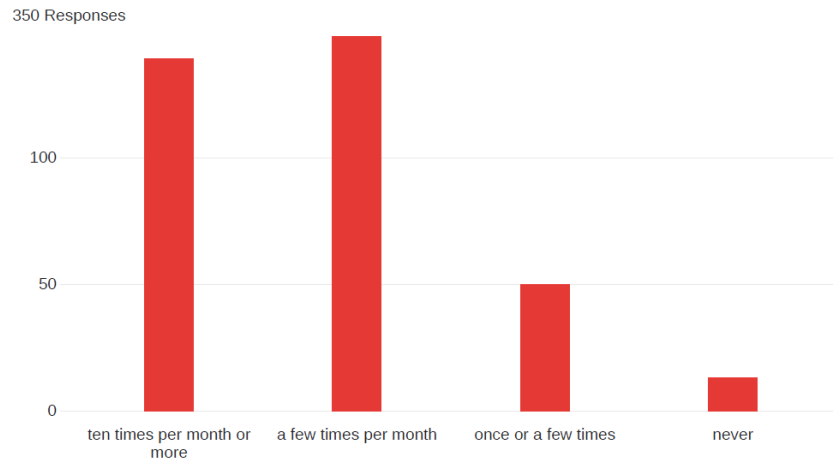
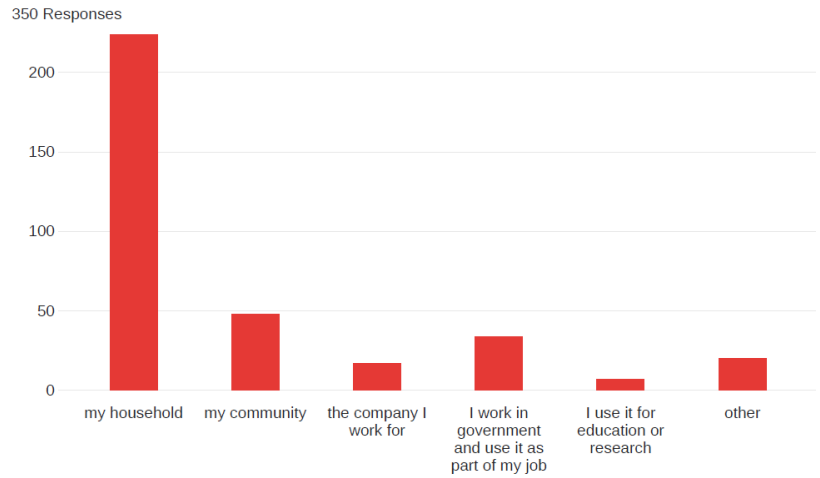
Survey Results

Most respondents (about 83%) use SFAS at least a few times per month and 40% ten times or more per month – users are seeking information on flood forecasts very frequently.

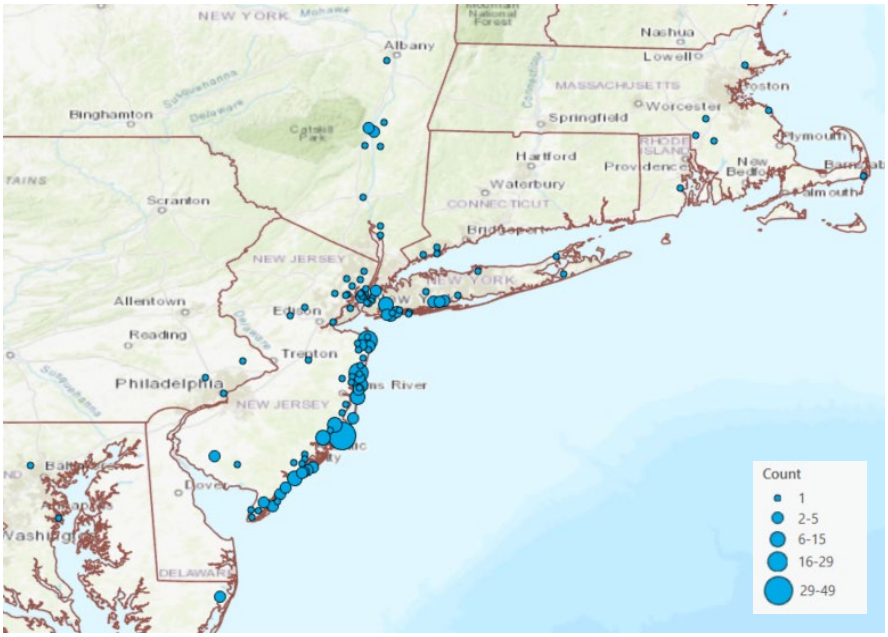


About 65% of respondents primarily use SFAS to help their household prepare for flooding, while about 28% use it for their community or from a company or government position.



About half of respondents indicated that the SFAS email alerts are “great”, “excellent”, “perfect” or otherwise not in need of improvement.

The zip codes of respondents are shown in the map below, and demonstrate that New Jersey users are most numerous, followed by New York. There are a small number of users in Massachusetts, Connecticut, Maryland, and other areas.




Trenton
Philadelphia
Hamilton
Toms River
Vineland
Cape May
Delaware Bay
Atlantic
Wharton State Forest
Warren Grove Range
Joint Base McGuire-Dix Lakehurst
Brendan T. Byrne State Forest
Burlington
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Cumberland
Salem
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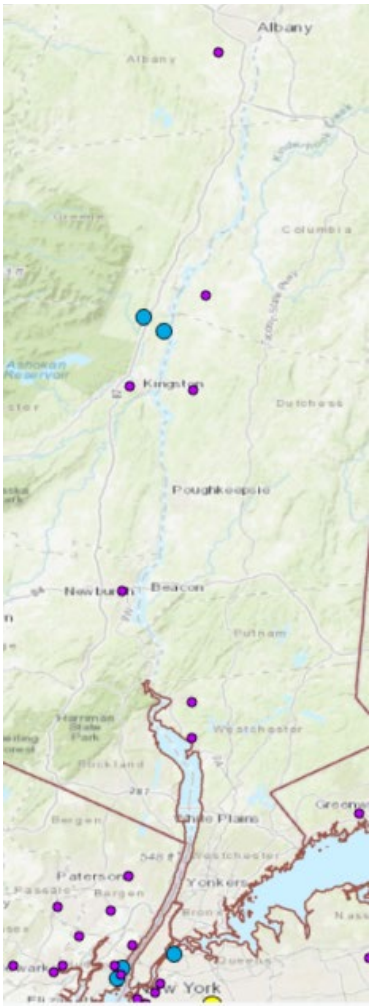
Montgomery
Mercer
Monmouth
Middlesex
Somerset


Albany
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White Plains
Putnam
Westchester
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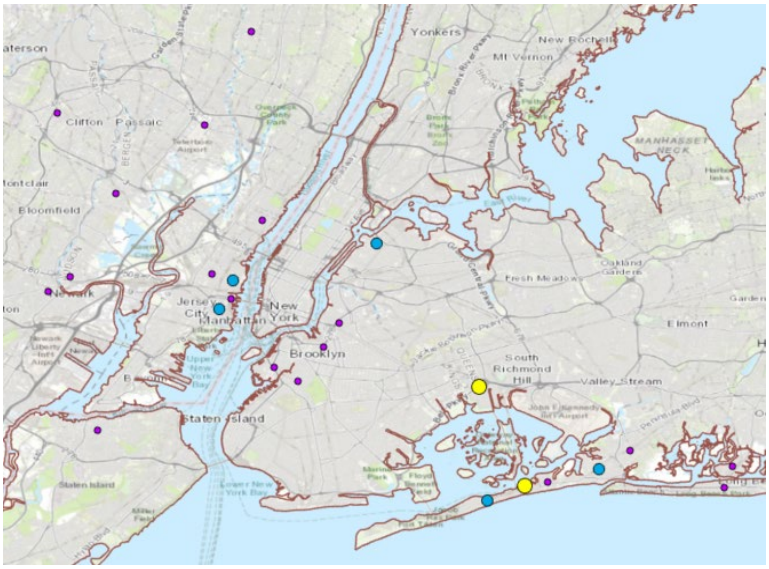
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Mt Vernon
Clifton
Passaic
Bloomfield
Newark
Jersey City
New York
Manhattan
Brooklyn
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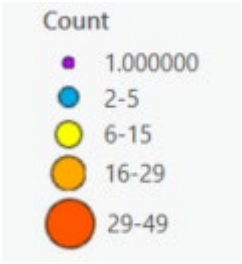
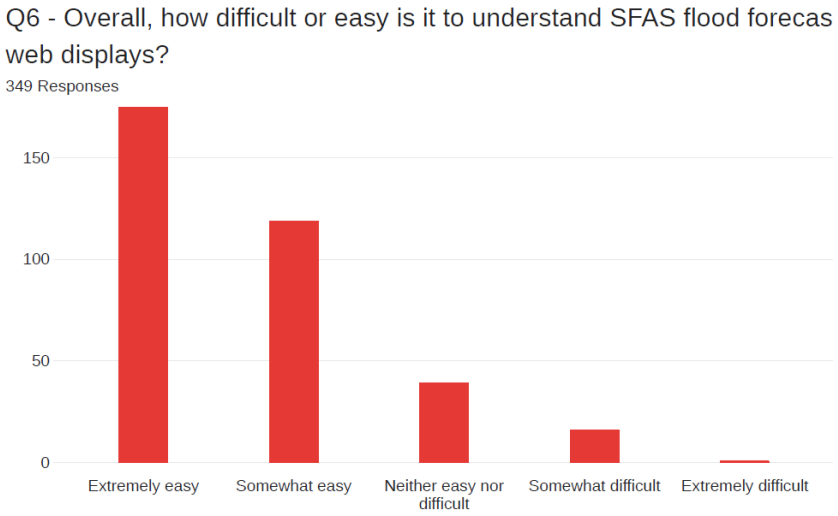
Elmont
Valley Stream
South Richmond Hill
Fresh Meadows
MANHASSET NECK


Count
1.000000
2-5
6-15
16-29
29-49

About 10% of respondents provided ideas for how SFAS email alerts could be improved, with common suggestions being: 1) reduce excessive alerts (no more than 1/day or 2/day; maybe a twice-daily roundup), add a new SFAS station (e.g. Avalon, Tivoli Bays/Turkey Point tide gauge, Toms River/Barnegat tide gauge, Eastern Long Island/GSB/Peconics, more Ocean County, Stamford USACE, North Wildwood, Navesink and Shrewsbury, all USGS stations), send watches between 1 and 4 days prior to a flood (there are currently none), have user-selected alert thresholds, alerts for minor and major flooding are the same, including more information in emails, add more structure to email text for easy reading, send an update if forecast gets downgraded, add a text messaging option, and adding social media share links. Many other suggestions were provided.

About 4% of users have had training, though a third of those received it from a neighbor or friend, suggesting a non-specialist. Others received it from an OEM, NWS, Stevens or a colleague at their company.

The ease-of-use was rated highly (51% said extremely easy, 35% somewhat easy), though again, the respondents were recipients of email notifications and more likely to be experienced users and not a sampling of all SFAS website users.



While 90% of respondents gave an answer to their favorite thing about SFAS (it would take hours to convert these into statistics), only about 15% of users listed a least favorite thing. These responses included visualization limitations (e.g. date range max is 5 days!), excess complexity, user interface, lack of spatial specificity (stations), guide to using SFAS (e.g. variables and datums), uncertainty is too large (e.g. for zips 08008, 12401), tighten uncertainty (perhaps meaning smaller or user-selected confidence interval), flood thresholds aren't accurate for a given site (zip 11211), forecast error (zip 08752),

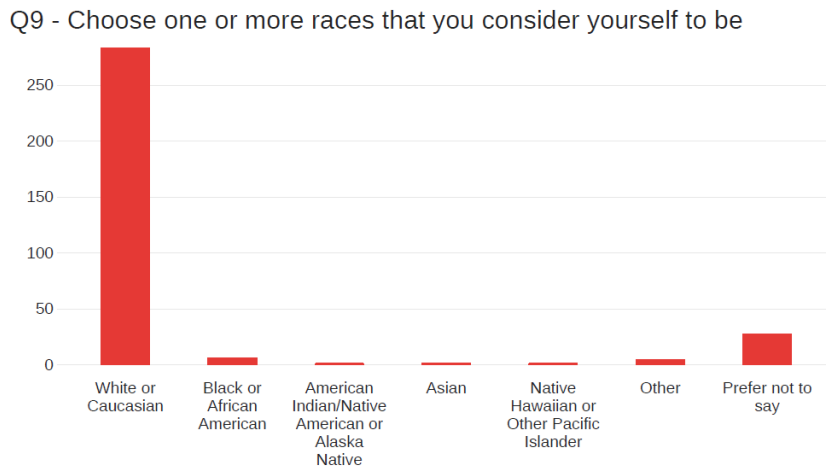
About a quarter of respondents gave suggestions for improvements they would like to see for the SFAS website, including an app, graphical interactivity (e.g. mouse-over to see numeric values), complexity reduction (e.g. don't use military time on plots), access to numeric data (even if just the

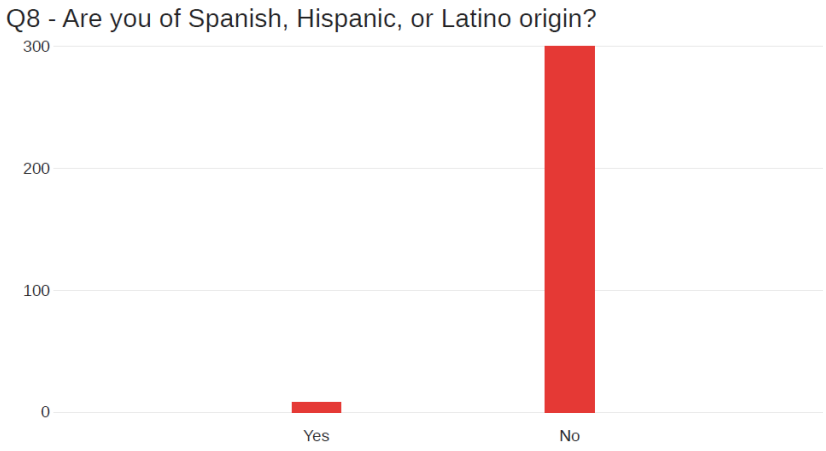
peak via mouse-over), new website and user experience, a guide or training slide deck providing explanation of how to use the tool and what the various fields and graphs mean (including the different models, datums, …), improving Long Beach Island (Barnegat Bay), mapping or way to integrate data with ArcGIS, add a model timestamp, sign up for a station's emails on that station's page.

Demographics

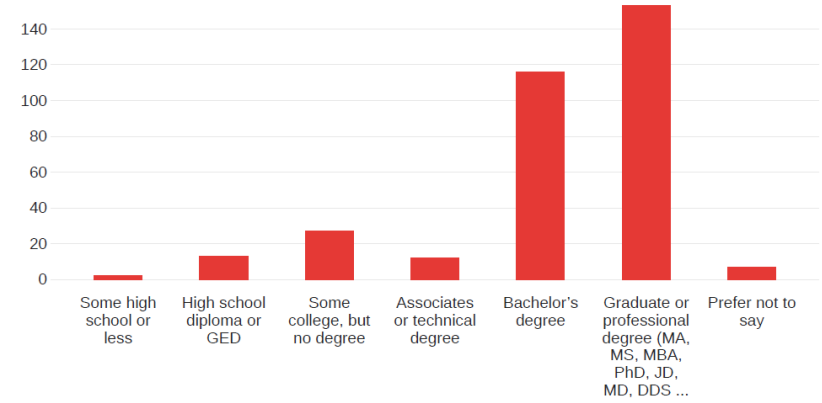
Respondents were primarily (92%*) non-Hispanic white, college educated (87%*), middle- or high-income (although 28% preferred not to say), over 50 years old (81%), and a majority (67%*) were male.

* omitting a small number of respondents (<10%) who preferred not to say (8% for race, 2% for education, 2% for identity)

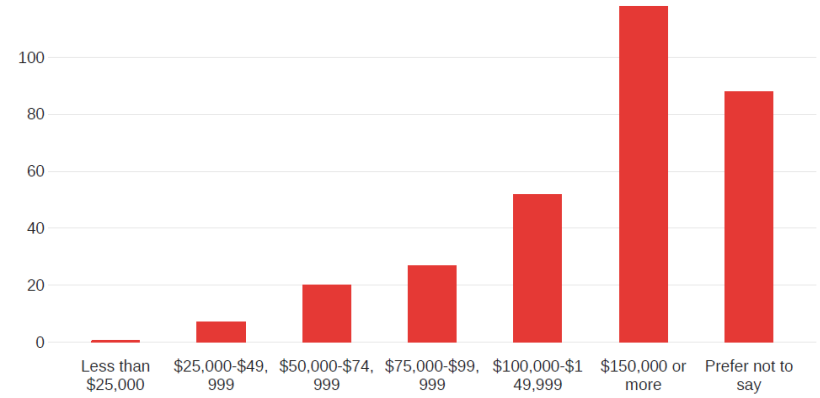




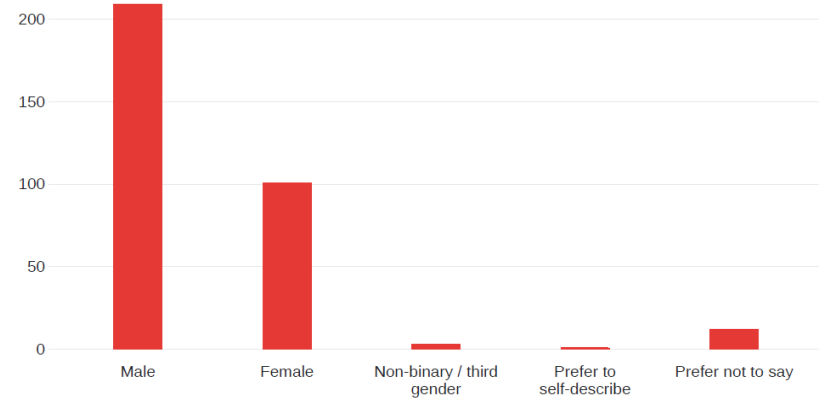
Q10 - What is the highest level of education you have completed?

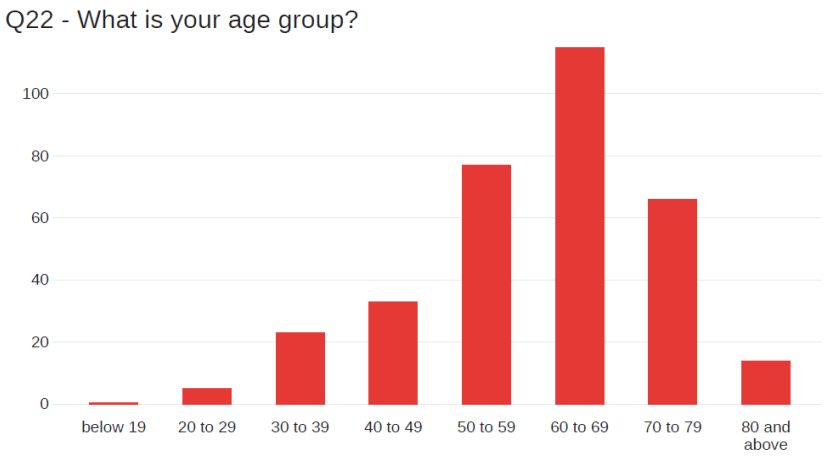


Q11 - What is your total annual household income before taxes?



Q23 - How do you describe yourself? - Selected Choice



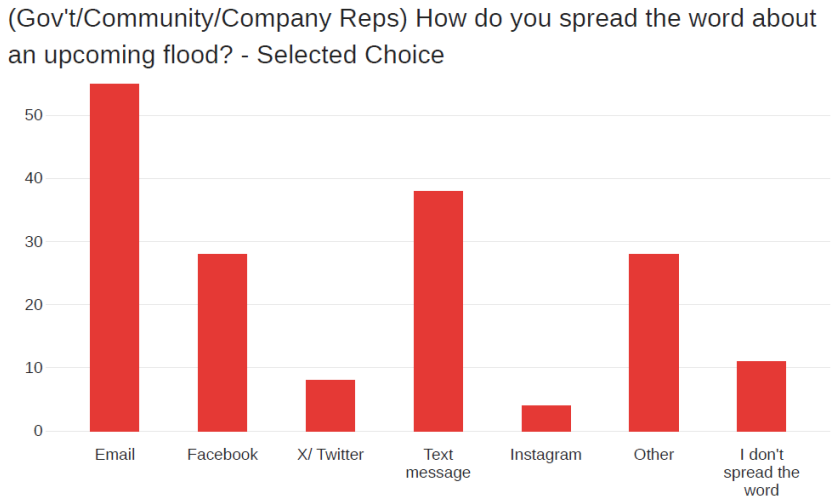


Branches of survey for different types of users

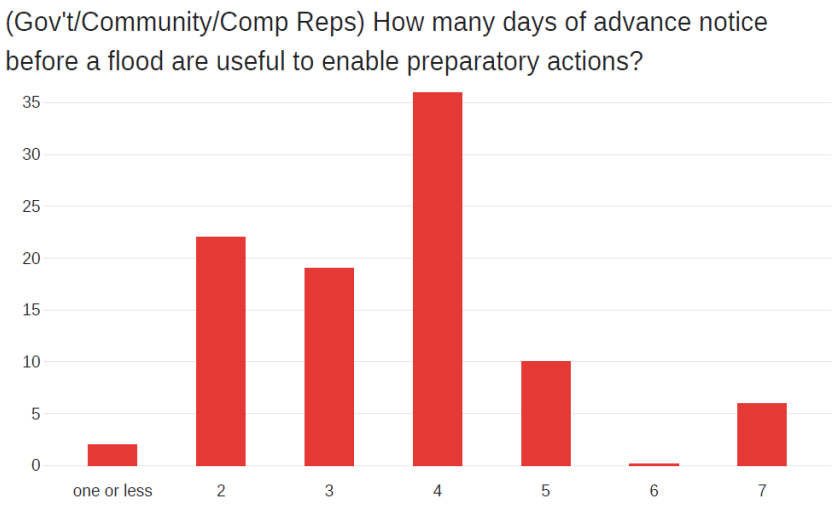
Apart from the above questions asked of all survey-takers, different types of users received different questions.

Government/ company / community representatives

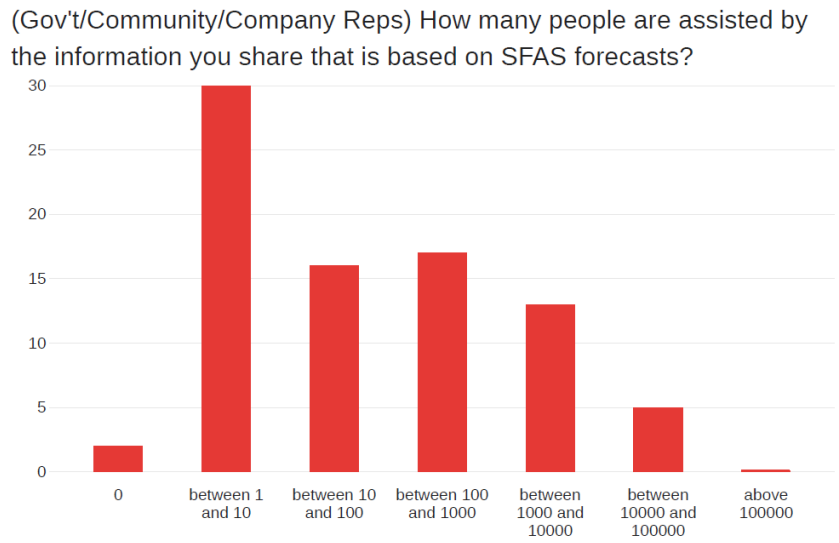
Of this group, 94% spreads the word of a flood. These users leverage a wide range of tools including (in order of preferred choice) email, text message, Facebook, "other", X/Twitter, and Instagram.



These users tend to prefer a range from 2-4 days of advance notice, with modal response of 4 (the present forecast lead time is 4.5 days). However, a modest number (18%) would like to have 5, 6 or even 7 days of advance notice of a coastal flood.



The community, company and government users share SFAS information widely, with 5 users sharing to 10000-100000 people, 13 to 1000-10000 people, 17 to 100-1000 people, 16 to 10-100 people, and 30 to 1-10 people. Taking the lower bound of each range, a minimum estimate of users that receive SFAS forecast information secondhand is 50000 + 13000 + 1700 + 160 + 30 = 64890 people. More simply put, the forecasts affect on the order of 100000 people.



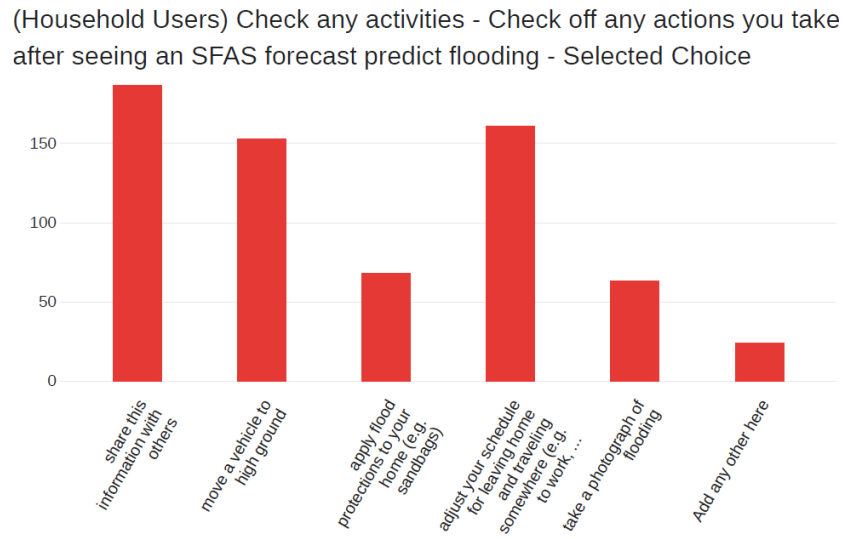
Examples of users inferred from details of responses included: A city and/or its OEM which triggers “Sandbagging, road closures, installing flood gates, program cancellations, rerouting, etc” (affecting 10000-100000 people), and the USACE office at Stamford who uses SFAS to help decide when to close its storm surge barrier protecting downtown Stamford CT (100-1000 people).

Specific responses on the question, “what types of actions do people take after you share information you learned on SFAS regarding an upcoming flood event” include:

Close flood gates (12401, 07739, 07760), close storm surge barriers (06902), move cars to higher elevation, close roads, bring in yard items, post warnings to avoid parking in the flood-prone areas, forward info to their community, prepare for a team to staff the hurricane barrier, speak with our reservoir control team who make the ultimate decision for staffing/operation, prepare for flooding, stage assets, warn public, develop an outreach strategy for our industrial community members, prepare the facilities to accommodate floodwaters, situational awareness, moving items in ground-level garages and spaces off the floor, spin up extra flood response units, notify OEM to prepares to open, begin issuing PR notices to the public, engineering team begins intensive analysis to determine the extent of the potential flooding threat, request sand bags, send warnings to area DPW's, program cancellations, plan for telework and not to come to the office, change our workplan to fit the places we will be able to go to, Emergency Planning and Response, protect our equipment, pay more attention to predicted storm, move items stored in garages and crawlspaces.

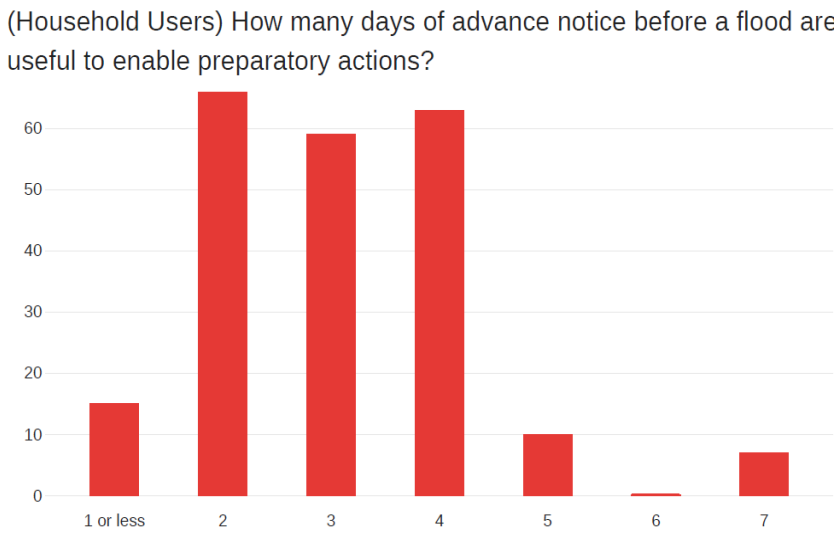
Household users

For users that consult SFAS for their own personal household decisions only, common response activities to a forecast flood include sharing with others (84%), adjusting schedule (71%), moving a vehicle to higher ground (58%), applying flood protections to home (31%) and take a photograph of flooding (28%).



Other actions taken (listed by 2 or more respondents) included moving things from flood prone areas (4), keeping an eye out (3), setting up pumps (2), and securing a boat (2).

For household users, again most respondents are satisfied with a 2-4 day advance notice of flooding, and only 8% would prefer longer (most often 5 or 7 days) advance notice.



For these households, the most common flood frequency is “several times per year” (38%). About half show this frequency or higher (several or “dozens” of floods) (51%) and the other half (49%) only see flooding about once per year or less.