

Tewksbury Flooding and Green Infrastructure Survey

Survey Results

Tewksbury Municipal Vulnerability Preparedness Action Grant



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Prepared by the Merrimack River Watershed Council

April 22, 2022

Table of Contents

| | |
|---|----|
| 1. Introduction and Background..... | 4 |
| 1.1. The MVP Grant Program & Steering Committee | 4 |
| 1.2. Survey Development & Distribution..... | 5 |
| 2. Survey Results | 6 |
| 2.1. Flooding..... | 6 |
| 2.1.1. Regular Flooding..... | 6 |
| 2.1.2. Extreme Event Flooding | 10 |
| 2.2. Green Infrastructure | 13 |
| 2.3. Affordable Housing | 15 |
| 2.4. Community Profile | 16 |
| 3. Next Steps..... | 20 |
| 4. APPENDICES | 21 |
| 4.1. Appendix A: Survey | 21 |
| 4.2. Appendix B: Survey Distribution | 40 |

Table of Figures

Figure 1: Surveys submitted by date 6
 Figure 2: Survey results for if regular flooding occurs (left) and location (right) 7
 Figure 3: Survey results for kind of regular flooding 7
 Figure 4: Survey results for frequency of regular flooding..... 7
 Figure 5: Survey results for duration of regular flooding 8
 Figure 6: Survey results for depth of regular flooding..... 8
 Figure 7: Survey results for type of damage or difficulties caused by regular flooding 9
 Figure 8: Survey results for main source of regular flooding 9
 Figure 9: Survey results on the opinion of changes in frequency (left) and severity (right) of flooding10
 Figure 10: Survey results for if extreme event flooding occurred (left) and location (right)10
 Figure 11: Survey results of when extreme event flooding occurred11
 Figure 12: Survey results for kind of extreme event flooding11
 Figure 13: Survey results for duration of extreme event flooding.....11
 Figure 14: Survey results for depth of extreme event flooding.....12
 Figure 15: Survey results for type of damage or difficulties caused by extreme event flooding12
 Figure 16: Survey results for main source of flooding for extreme event flooding.....13
 Figure 17: Survey results for affordable housing in Tewksbury15
 Figure 18: Survey results for type of affordable housing15
 Figure 19: Survey results for intent for affordable housing properties16
 Figure 20: Ages of respondents17
 Figure 21: Race of respondents.....17
 Figure 22: Ethnicity of respondents.....17
 Figure 23: Gender of respondents.....18
 Figure 24: Income of respondents.....18
 Figure 25: Education level of respondents.....19
 Figure 26: Language of respondents19
 Figure 27: Connection to Tewksbury of respondents.....19

Table of Tables

Table 1: Survey results for green infrastructure priorities14
 Table 2: Survey results for green infrastructure values14

1. INTRODUCTION AND BACKGROUND

Through a Municipal Vulnerability Preparedness Action Grant (MVP) provided by the Commonwealth of Massachusetts, the Town of Tewksbury is investigating different ways to reduce climate impacts on town infrastructure, natural features, and vulnerable populations. As part of this effort, the Town is evaluating municipally-owned parcels, with an emphasis on vacant parcels, for incorporation of nature-based solutions/green infrastructure. The objective of this evaluation is to identify opportunities to retain and infiltrate stormwater on-site to reduce the frequency and intensity of flooding within the Merrimack, Concord and Shawsheen River Watersheds, in the town of Tewksbury.

As part of this effort to identify where flooding occurs across the town, the Tewksbury Flooding and Green Infrastructure Survey was created so residents and those who commute to or through Tewksbury could provide the project team with more information on where flooding occurs, as well as the intensity, frequency, and the impacts this flooding has on their lives. These data were then incorporated into hydrologic and hydraulic models in different parts of the town to identify new flooding hotspots and provide additional data points for model calibration. The models are being used to assess flooding issues now and under climate change, and to identify potential solutions. The flooding results were also made available to the town in the format of an exploratory map, and Excel spreadsheet, so that the town may continue to use the data beyond this project to identify and resolve flooding issues.

This survey also served as a public engagement tool, sharing information and gathering opinions on green infrastructure and affordable housing in the town. This information, the flooding data, and demographic data collected during this survey are presented in this report and will continue to help inform the remaining activities of this MVP grant as well as short-term and long-term planning for climate resilience.

1.1. THE MVP GRANT PROGRAM & STEERING COMMITTEE

The MVP grant program provides support for cities and towns in Massachusetts to begin the process of planning for climate change resiliency and implementing priority projects. The Town of Tewksbury was awarded an MVP Action Grant in 2021 and is using it to develop a stormwater analysis on municipal and vacant Town-owned parcels that could be used for nature-based solutions and flood storage, while considering opportunities for affordable housing and regional benefits. The project's goals include reducing stormwater flooding town-wide through the use of nature-based solutions and providing regional watershed benefits, including for residents outside of Tewksbury. Tasks include:

- analyzing Town-owned vacant parcels and impervious areas
- identifying nature-based solutions that offer benefits to climate vulnerable populations, and
- conducting creative, accessible, and inclusive community engagement.

To conduct these activities, project partners formed an MVP Steering Committee, which promotes coordination of the different town offices, local partners, and technical and community engagement specialists to achieve all the goals and objectives of the MVP grant. The organizations in the technical committee are:

- The Town of Tewksbury
- Tewksbury Department of Public Works
- Tewksbury Conservation Commission
- Tewksbury Housing Authority
- Tewksbury Open Space and Recreation Plan Committee
- Weston & Sampson
- Merrimack River Watershed Council

1.2. SURVEY DEVELOPMENT & DISTRIBUTION

The MVP Steering Committee developed an online survey to collect information about where flooding occurs, as well as collect quantitative and qualitative data about flooding, green infrastructure, and affordable housing. The survey platform Survey123 from ArcGIS was selected due to its ability to easily capture and export spatial information as well as other types of data. It was also user friendly and very customizable, meeting the needs of the survey development team.

The survey was drafted by the Merrimack River Watershed Council with support from Weston & Sampson to ensure the survey results could be incorporated in their models. After this, the survey was reviewed by the MVP Steering Committee for ease of use and to ensure the proper language was used for green infrastructure and affordable housing. The final survey was translated into Spanish. The final survey is included in Appendix A.

The survey went public on Friday, January 14 and closed on Friday, March 25, 2022. It was announced through press releases in eight local newspapers in the Tewksbury region in English and Spanish. Hard copies of the survey were left at four locations in Tewksbury: the Tewksbury Development Office, the Town Clerk and Town Manager's office, Senior Center, Housing Authority, and Library. In addition, flyers about the survey were posted at 26 locations around Tewksbury, and 935 residents and 56 businesses who live in the 500-year flood zone were mailed postcards asking them to complete the survey. Posts about the survey were also shared on social media through the Facebook and Instagram accounts from the Town of Tewksbury, Tewksbury Department of Public Works, and Merrimack River Watershed Council. MVP Steering Committee members shared the announcement within their networks via email and social media. More specific information on the distribution of the survey, as well as copies of the distribution materials can be found in Appendix B.

2. SURVEY RESULTS

Overall, there were 123 responses submitted to the Tewksbury Flooding and Green Infrastructure Survey. All of these responses were submitted online, with no hard copy surveys returned. Most responses were recorded in the first week of the survey, when there were heavy rainstorms in the area causing flooding (likely encouraging people to complete the survey). There was another group of responses around February 7, 2022 from another email blast to the Town of Tewksbury website (Figure 1).

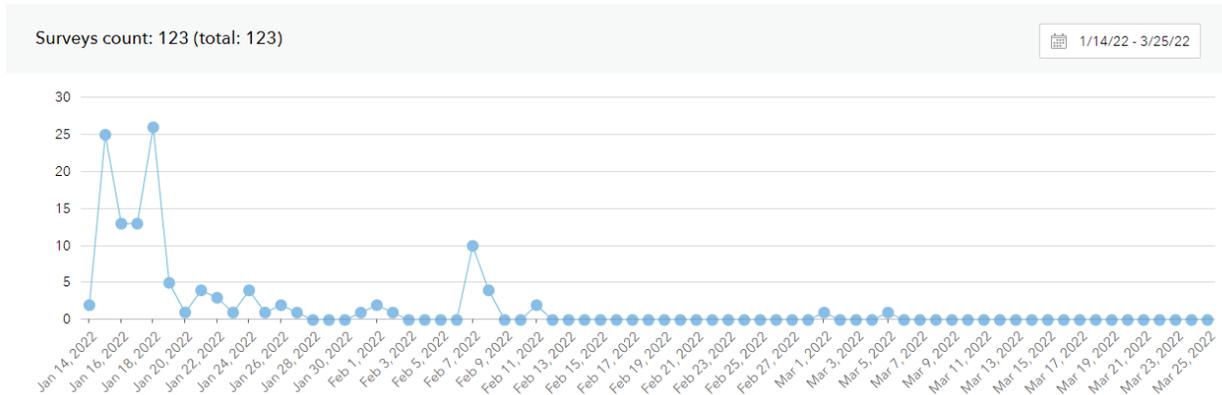


Figure 1: Surveys submitted by date

The survey contained four sections on different topics: flooding, green infrastructure, affordable housing, and community profile (demographics). The results from each section are detailed below.

2.1. FLOODING

The flooding section was divided into two sections: regular flooding (for example, after every rain event) and extreme event flooding (for example, during and after large rain events such as the Mother's Day Flood in 2006). The specific details for each type of flooding are elaborated below. Note that for many categories, respondents could choose more than one option.

2.1.1. REGULAR FLOODING

Out of 123 respondents, 106 (86%) said they experience regular flooding (Figure 2). Of those who responded, most (42%) said they saw a road or a bridge flood, followed by an outside area of their property (38%). Others had a house or business flood (16%), saw a public place flood (2%), or another type of flooding (2%) (Figure 3). This type of flooding happened, with 26% saying flooding occurs after every rain event, 23% after short, heavy rains, 25% after a full day of rain, 24% during the snowmelt period, and 1% saying it occurred during other times (Figure 4).

Do you experience regular flooding at this location?

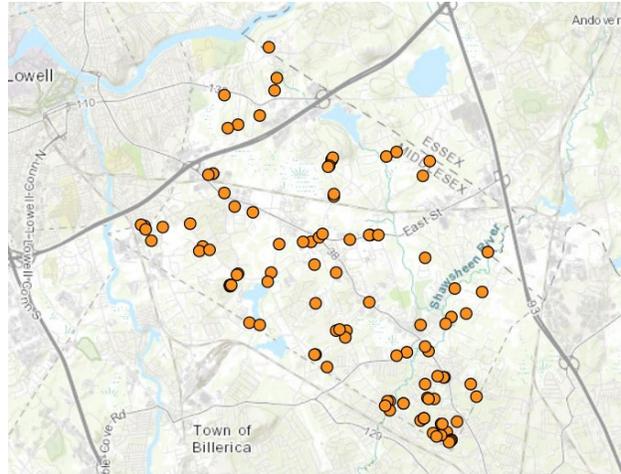
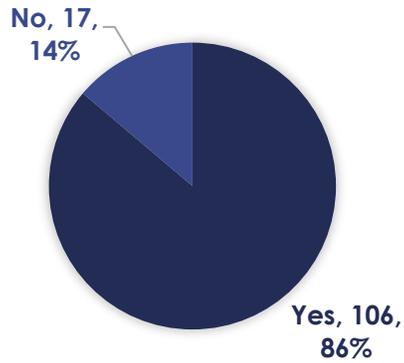


Figure 2: Survey results for if regular flooding occurs (left) and location (right)

What kind of flooding do you regularly experience?

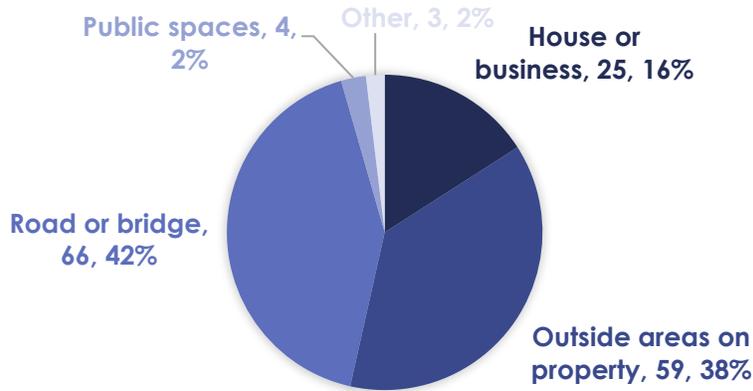


Figure 3: Survey results for kind of regular flooding

How often do these floods occur?

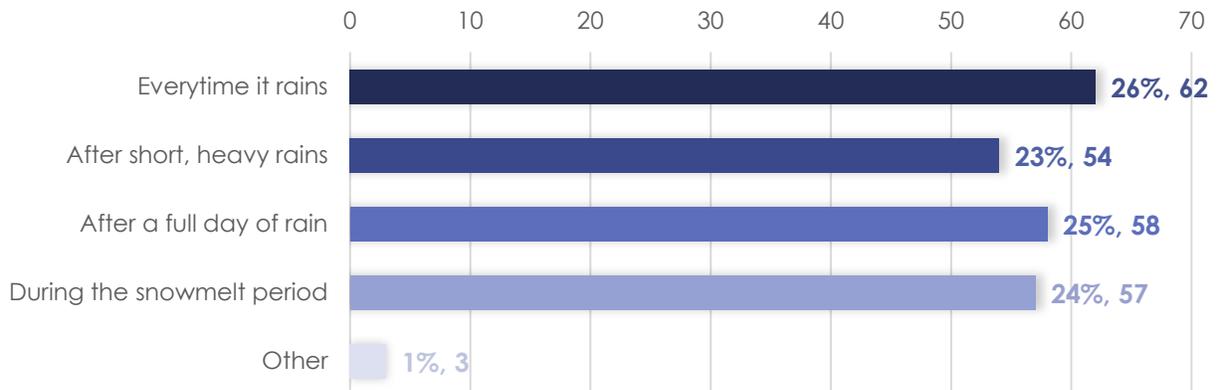


Figure 4: Survey results for frequency of regular flooding

The most frequent duration of flooding was a few days (41%), while others lasted about 1 day (26%) or a few hours (12%). There was a significant number of responses where flooding lasted longer than 1 week (12%) (Figure 5). Most flooding events had a flooding depth of between 1 and 6 inches (54%) or between 6 and 12 inches (34%) (Figure 6).

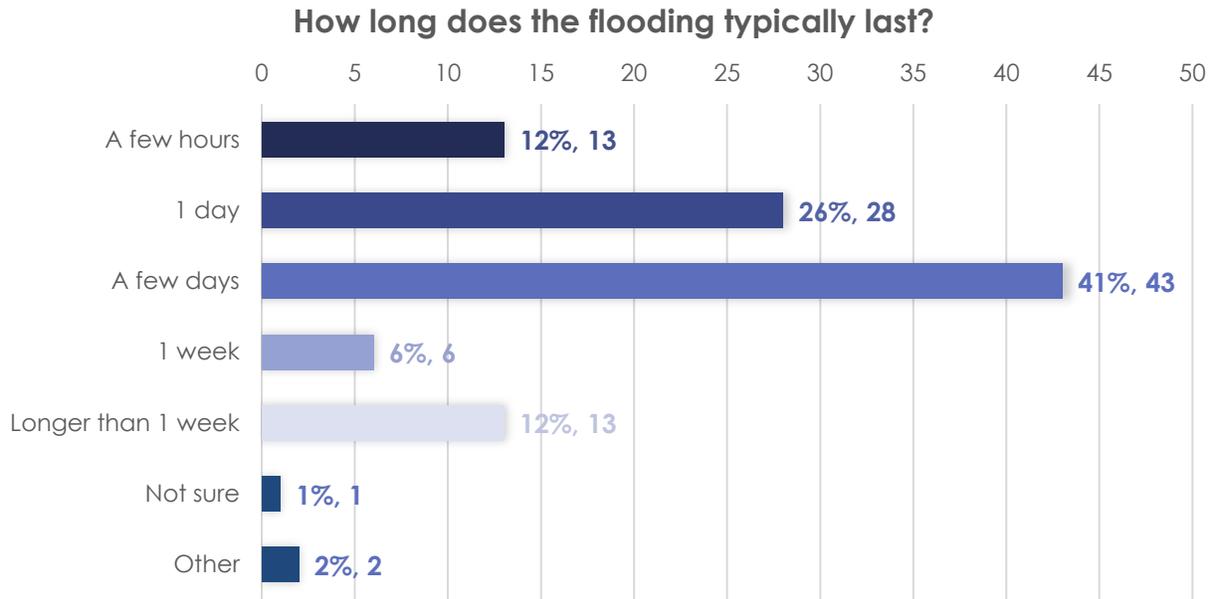


Figure 5: Survey results for duration of regular flooding

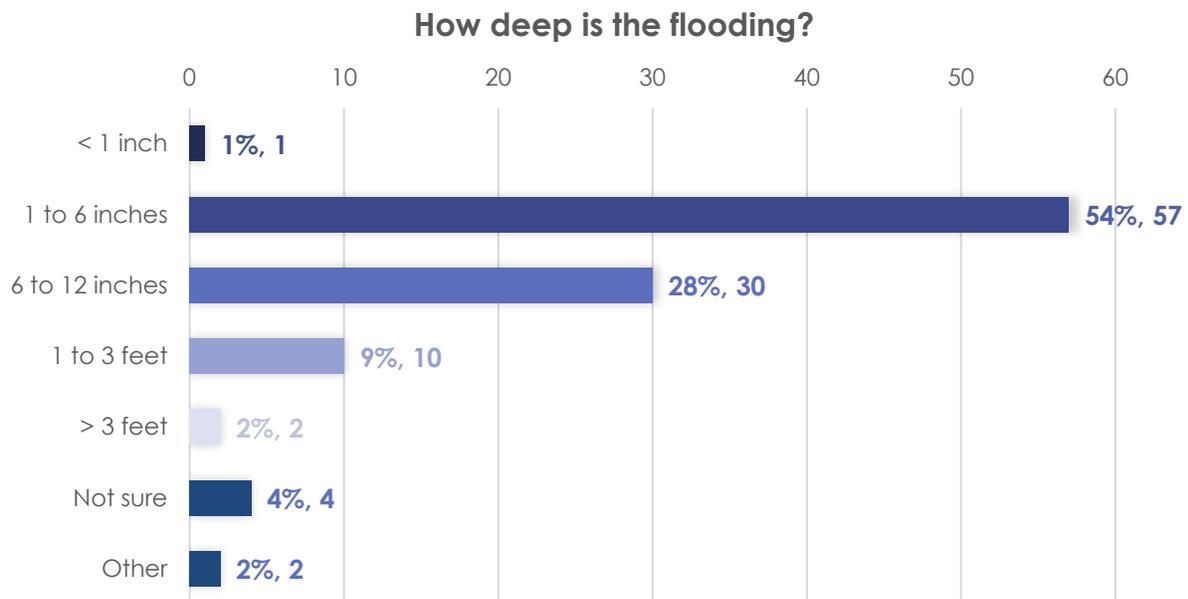


Figure 6: Survey results for depth of regular flooding

Regular flooding caused a variety of damage or difficulties in the lives of the respondents, with damage to outside areas of their property (25%) and difficulties traveling by car (23%) being the most common. Other less common issues were damage to public property (16%) and structural or cosmetic damage to a home or business (12%) (Figure 7).

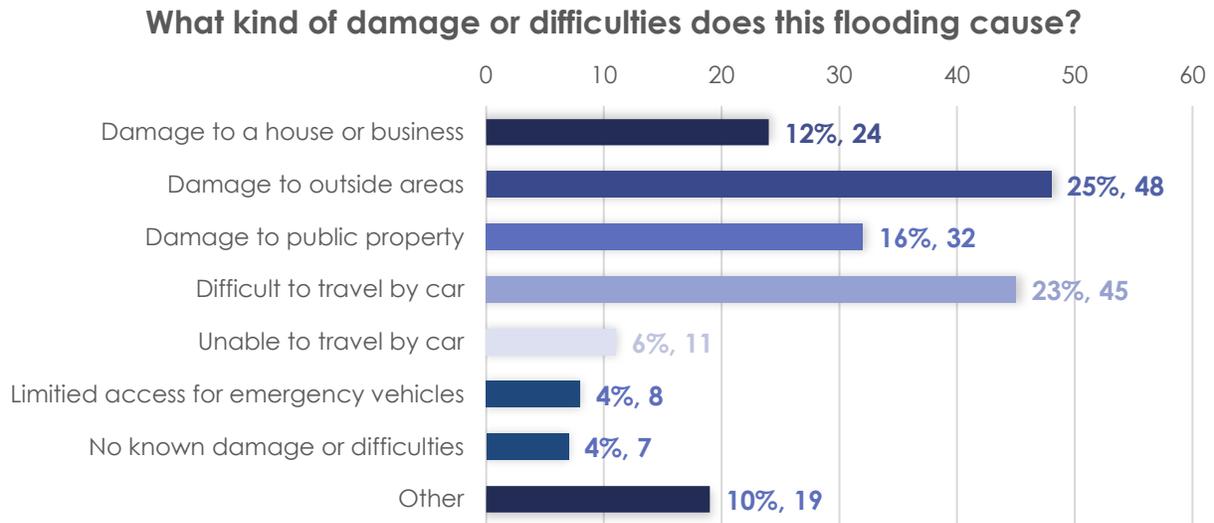


Figure 7: Survey results for type of damage or difficulties caused by regular flooding

The main source of the flooding according to respondents was most commonly the backing up of road drains (40%) or issues with too much water in the soil (17%) or seepage from groundwater (16%). Flooding from water bodies, such as rivers and ponds, were not as common (10% and 2%, respectively) (Figure 8).

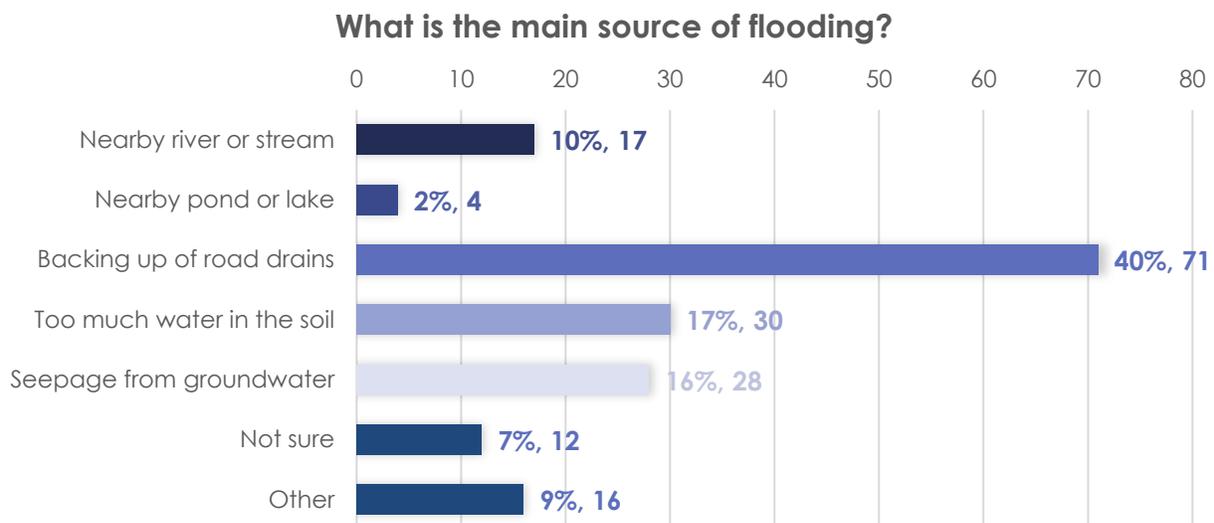


Figure 8: Survey results for main source of regular flooding

When asked about their opinion on changes in flooding over time based on their personal experience, 67% of respondents thought the flooding was getting more frequent and 58% thought it was getting more severe in nature.

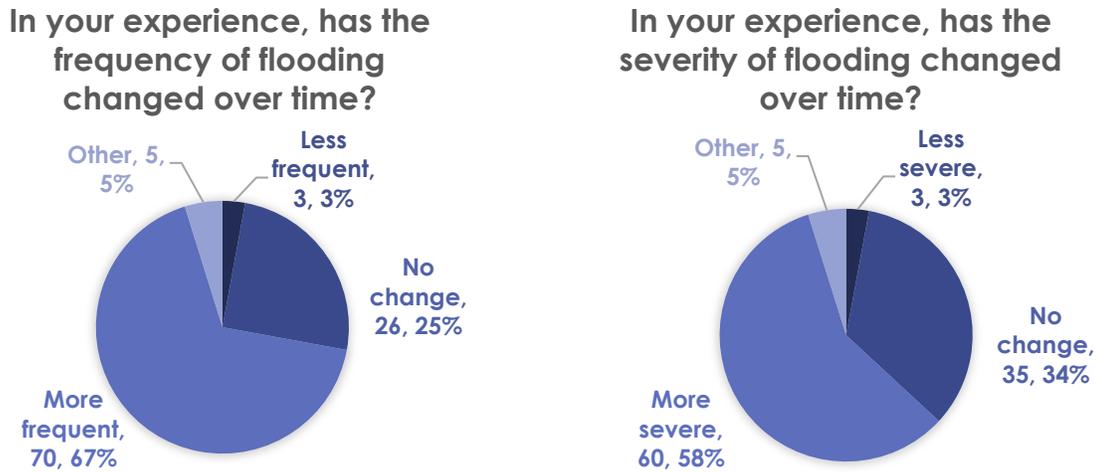


Figure 9: Survey results on the opinion of changes in frequency (left) and severity (right) of flooding

2.1.2. EXTREME EVENT FLOODING

Out of 123 respondents, 57 (46%) said they experience extreme event flooding (Figure 10). Most extreme events occurred in 2022 and 2021, with 2010 and 2006 (the year of the Mother's Day flood) also being memorable years for extreme flooding events. This could also be that multiple events occurred over time, but most respondents chose the most recent event (Figure 11). Most flooding occurred on the outside areas of a property (40%), on a road or bridge (33%), or in a house or business (24%) (Figure 12). The vast majority of this type of flooding lasted a few days (54%), but ranged from less than 1 hour (2%) to longer than one week (12%) (Figure 13).

Have you experienced extreme event flooding at this location?

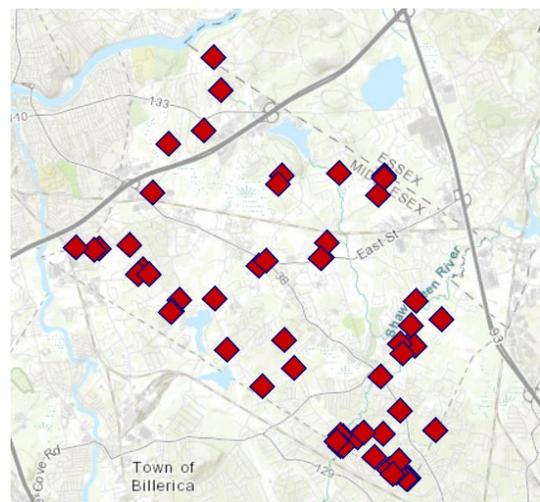
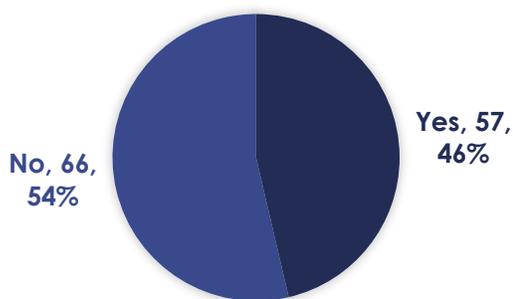


Figure 10: Survey results for if extreme event flooding occurred (left) and location (right)

What was the year of the extreme flooding event?

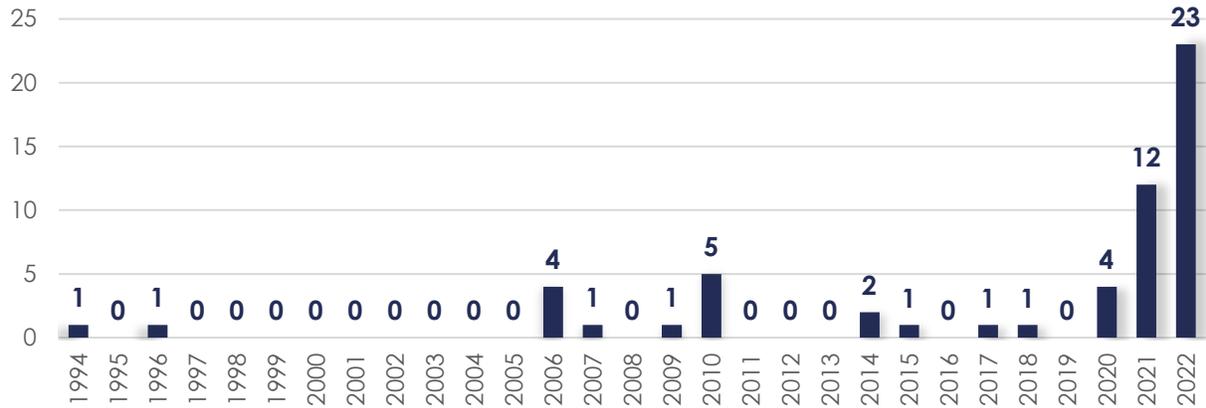


Figure 11: Survey results of when extreme event flooding occurred

What kind of flooding did you experience?

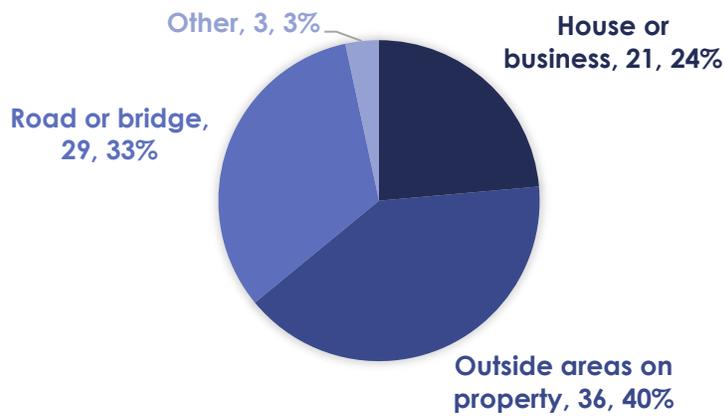


Figure 12: Survey results for kind of extreme event flooding

How long did the flooding last?

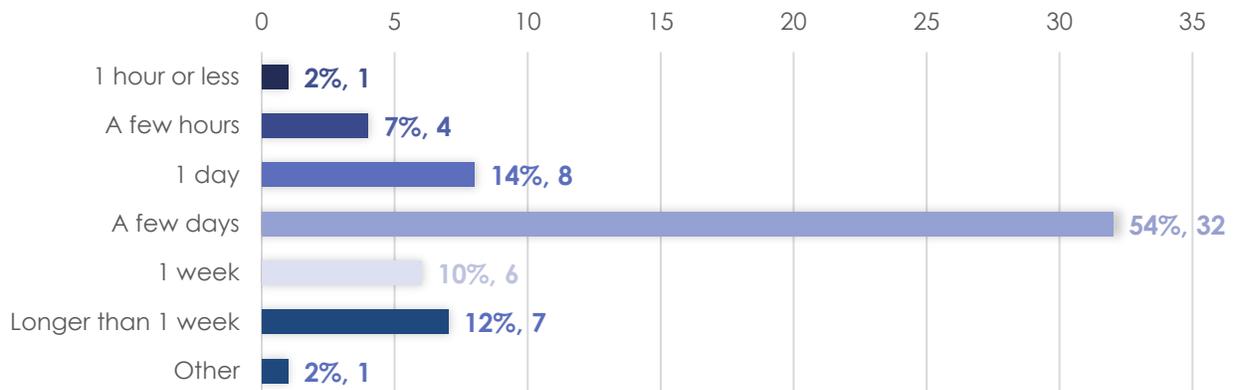


Figure 13: Survey results for duration of extreme event flooding

The most common extreme event flooding depth was between 6 and 12 inches (40%) and 1 and 6 inches (33%). It was also common that flooding depth was 1 to 3 feet deep (21%) (Figure 14). The extreme event flooding most commonly caused difficulties to travel by car (25%) and damage to outside areas of properties (24%). Damage to a house or business and damage to public property also occurred frequently (18%) (Figure 15).

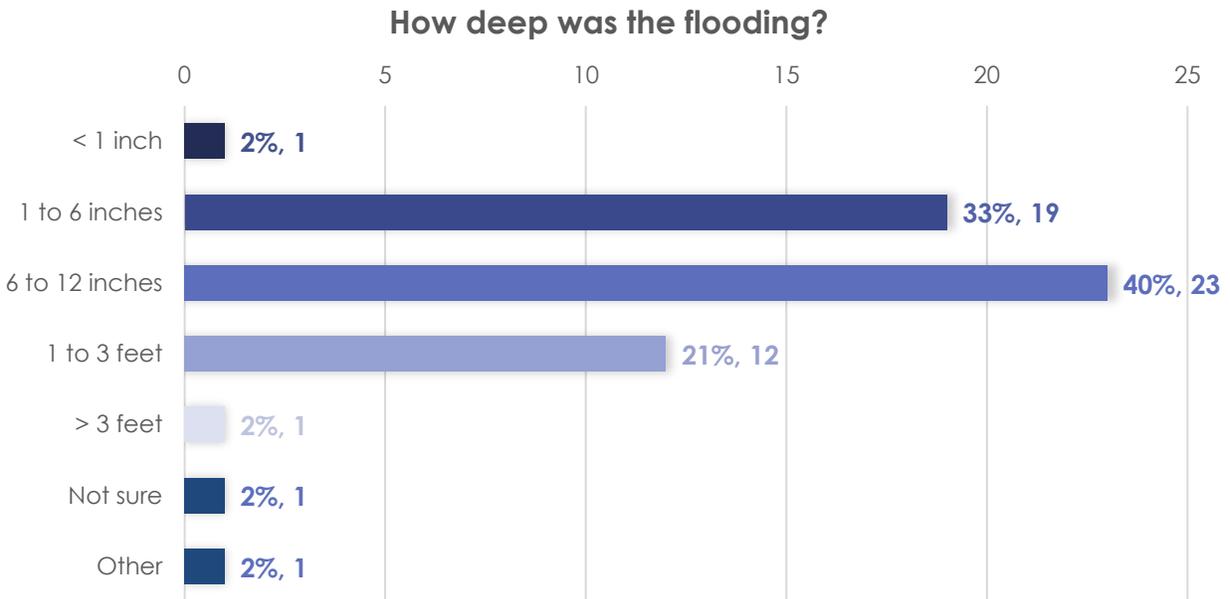


Figure 14: Survey results for depth of extreme event flooding

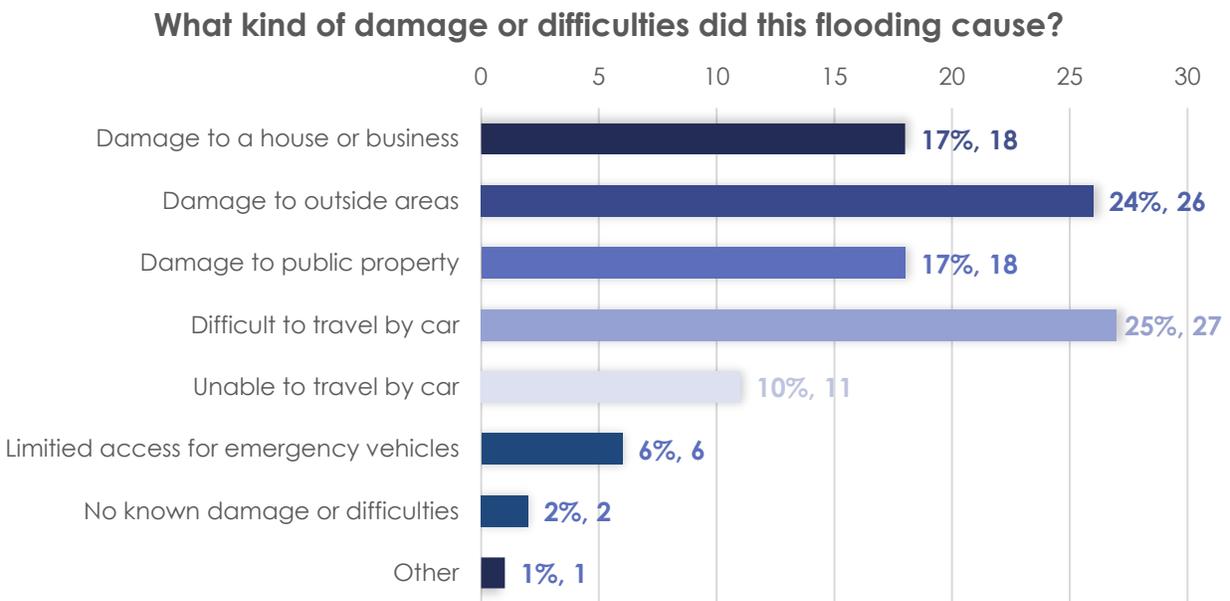


Figure 15: Survey results for type of damage or difficulties caused by extreme event flooding

Similar to regular flooding, the backing up of road drains was the most common source of flooding that respondents identified (33%). However, nearby rivers or streams was the second most common source (22%), followed by too much water in the soil, causing ponding or pooling (18%) (Figure 16).

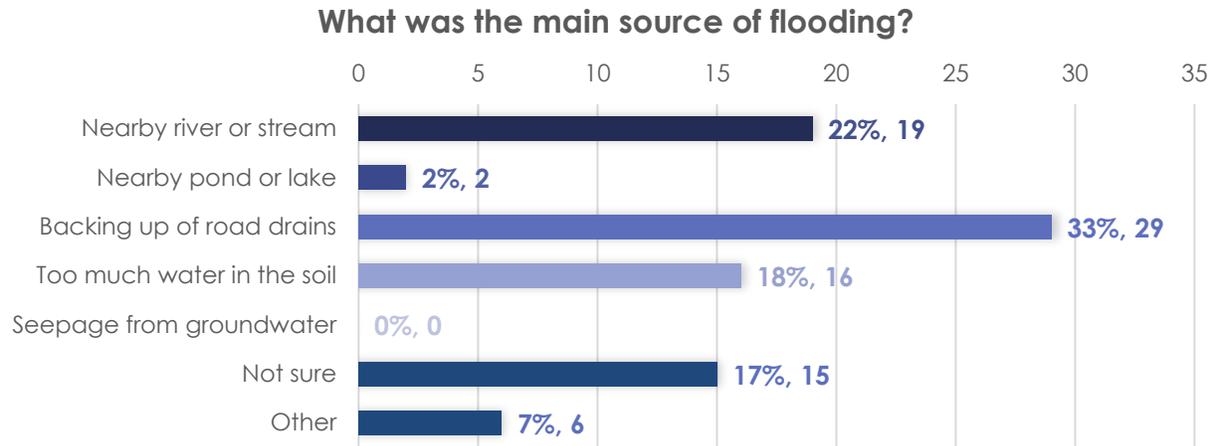


Figure 16: Survey results for main source of flooding for extreme event flooding

In summary, many respondents identified both regular flooding and extreme event flooding relatively well-distributed throughout town. The survey responses provided an additional focus area for the engineering team to incorporate in their modeling analysis, and data to improve the calibration of their models. However, the models could not cover every flooding location in the survey. The survey responses may provide information for the town to do further investigation and mitigation beyond the scope and timeline on this project.

Some flooding issues identified by respondents may be improved with green infrastructure, but an important result is that backing up of road drains is a commonly identified source for flooding, which may suggest maintenance of existing infrastructure may also be an important solution. It is particularly interesting that in terms of the timing of extreme flooding events, most responses indicated extreme flooding that occurred in the last two years. This may be due to climate change causing more extreme storms that cause more flooding, or may also be that people's memories of flooding are only from the recent past.

2.2. GREEN INFRASTRUCTURE

The green infrastructure part of the survey shared information about what green infrastructure is, some examples of how it can be implemented, asked how respondents prioritized flood management improvements, and how much they value different benefits of green infrastructure.

For flood management improvements, "prevent flooding of homes and businesses" was the response with the greatest number of respondents who consider it a "high priority" (103 responses, 84%), followed by "reduce flooding in the streets so vehicles can pass" (87, 71%) and then "protect built infrastructure" (82, 67%). "Reduce the cost of flood-

related disasters" (77, 63%) was fourth, and "promote flooding in natural areas" had the fewest "high priority" responses (62, 50%). See Table 1 below with the full breakdown of results.

When asked about how much they value different benefits of green infrastructure, "improve local water quality" and "improve local air quality" had the highest number of "high value" responses, with 94 (76%) and 82 responses (67%), respectively. The values with the least number of "high value" responses were "provide local jobs" (51 responses, 41%) and "is aesthetically pleasing" and "reduce local temperatures", both with 52 responses (42%). See Table 2 below with the full breakdown of results.

Table 1: Survey results for green infrastructure priorities

| | High priority | Moderate priority | Low priority | No opinion |
|--|----------------------|--------------------------|---------------------|-------------------|
| Prevent flooding of homes and businesses | 103 | 15 | 0 | 5 |
| Reduce flooding in the streets so vehicles can pass (including emergency vehicles) | 87 | 25 | 8 | 3 |
| Protect built infrastructure, such as roads, bridges, culverts, power lines, sewer lines, etc. | 82 | 30 | 8 | 3 |
| Reduce the cost of flooding-related disasters | 77 | 29 | 4 | 13 |
| Promote flooding in natural areas (such as green spaces or floodplain areas) | 62 | 32 | 13 | 16 |

Table 2: Survey results for green infrastructure values

| | High value | Moderate value | Low value | No opinion |
|--|-------------------|-----------------------|------------------|-------------------|
| Improve local water quality | 94 | 18 | 7 | 4 |
| Improve local air quality | 82 | 30 | 7 | 4 |
| Increase local property values | 73 | 26 | 14 | 10 |
| Create outdoor community spaces like parks | 67 | 34 | 14 | 8 |
| Increase green space | 66 | 39 | 11 | 7 |
| Reduce traffic and street noise | 64 | 35 | 15 | 9 |
| Create more places for recreation | 62 | 40 | 12 | 9 |
| Improve climate resiliency | 60 | 38 | 13 | 12 |
| Reduce local temperatures | 52 | 36 | 24 | 11 |
| Is aesthetically pleasing | 52 | 47 | 16 | 8 |
| Provide local jobs | 51 | 47 | 15 | 10 |

Overall, 105 people (85%) said there should be more public outreach about green infrastructure, split almost equally between more information about green infrastructure in general and about green infrastructure planning in Tewksbury specifically.

2.3. AFFORDABLE HOUSING

The affordable housing section of the survey gave a short description of the current situation in Tewksbury and described how this effort will help identify new areas for affordable housing in areas with a low risk of flooding. Then a short series of questions were asked about their opinions about affordable housing and types of housing that should be offered in Tewksbury.

When asked whether respondents wanted to see more affordable housing in Tewksbury, an equal number of people responded yes and no (44 responses each, 36%), while slightly fewer had no opinion on the subject (35 respondents, 28%) (Figure 17). As there are many residents who do not want to see more affordable housing in Tewksbury, these results suggest that in order for affordable housing development to be successful and to prevent resistance from residents, more education and outreach will be important.

Would you like to see more affordable housing built in Tewksbury?

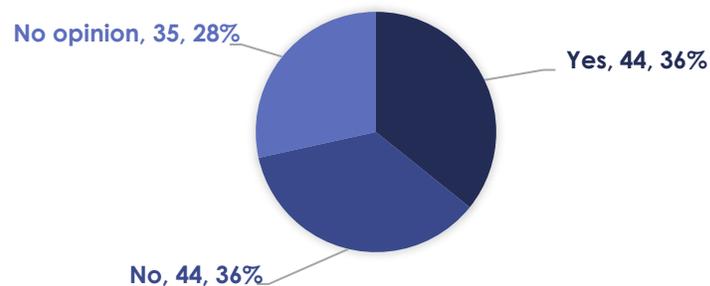


Figure 17: Survey results for affordable housing in Tewksbury

When asked what type of affordable housing should be offered, "single family houses" had the greatest number of respondents (62, 50%), followed by "no opinion" (43, 35%), duplexes (27, 22%), and "multi-unit apartments" and "other" (9 each, 7%) (Figure 18).

What type of affordable housing would you like to see?

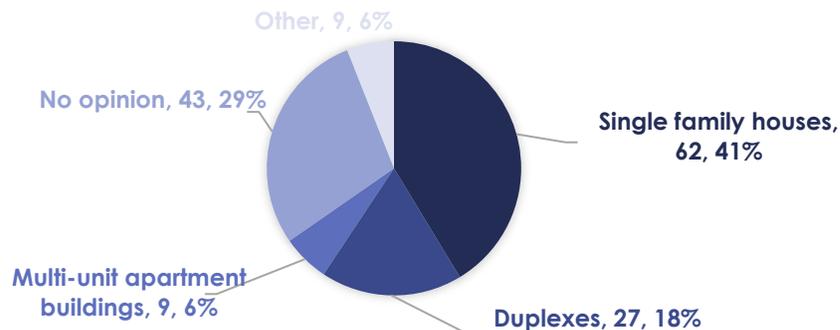


Figure 18: Survey results for type of affordable housing

When asked about the intention of affordable housing properties, most respondents said “home ownership” (53, 43%), followed by “a mix of both” (37, 30%), “no opinion” (26, 21%), and “rental” (7, 6%) as the least favorable option (Figure 19).

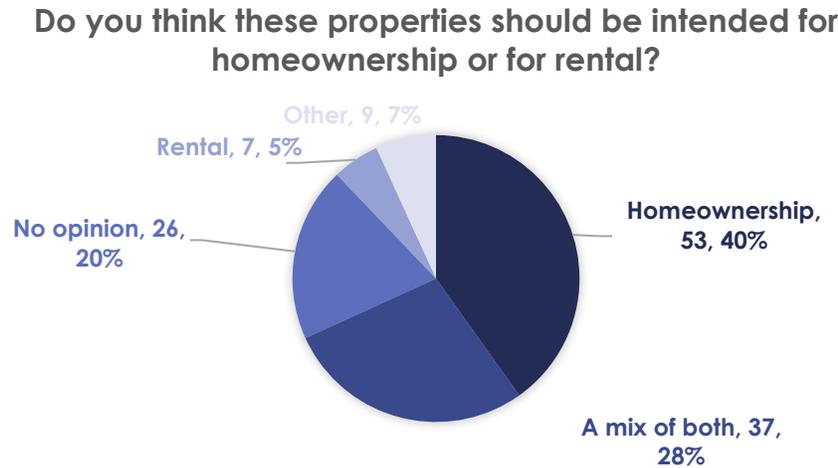


Figure 19: Survey results for intent for affordable housing properties

2.4. COMMUNITY PROFILE

The Community Profile section included demographic questions that allowed us to better understand who is being affected by flooding in Tewksbury. Questions included those on age, race, ethnicity, income, education, language, and their connection to Tewksbury. The questions in this section were optional, so these results are only representative of those respondents who chose to answer these questions.

The average respondent to this section was a middle aged (45-54), white/Caucasian female with at least a bachelor’s degree, made over \$100,000 a year, and whose primary language is English.

One goal of the MVP grant is to ensure the project is engaging minority or underserved audiences as well. To compare our results to the demographic profile in Tewksbury, data from the most recent US Census in Tewksbury¹ has been included in each section. The data show that the survey results were about equal to or slightly below the percentages from the US Census, indicating that there is room for improvement on reaching out to these communities.

There was a good representation based on age, with representation from all age groups except for those under 18 years of age. The most respondents were between the ages of 45 and 54 (36, 30%), followed by those between 55 and 64 (23 responses, 19%) and over 65 (17 responses, 14%) (Figure 20). In Tewksbury, 18% of people are over the age of 65.

¹ QuickFacts Tewksbury town, Middlesex County, Massachusetts
<https://www.census.gov/quickfacts/tewksburytownmiddlesexcountymassachusetts>

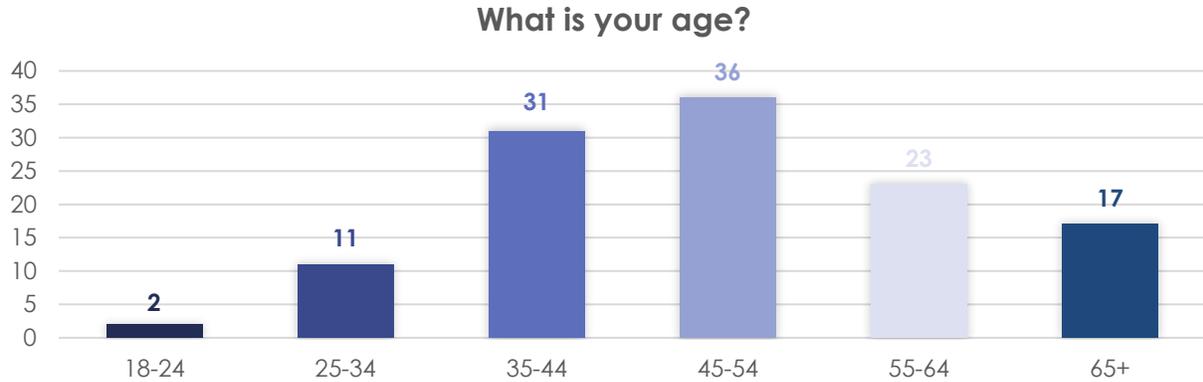


Figure 20: Ages of respondents

The vast majority of respondents were white (109, 89%), with only 8 respondents (7%) identifying as American Indian/Alaskan Native, Asian, or Black/African American (Figure 21). And 6 respondents (5%) identified as Hispanic, Latino, or of Spanish origin (Figure 22). In Tewksbury, 92% of the population is white/Caucasian and 2% are Hispanic or Latino. Note that respondents could select more than one race so the percentages may not equal 100%.

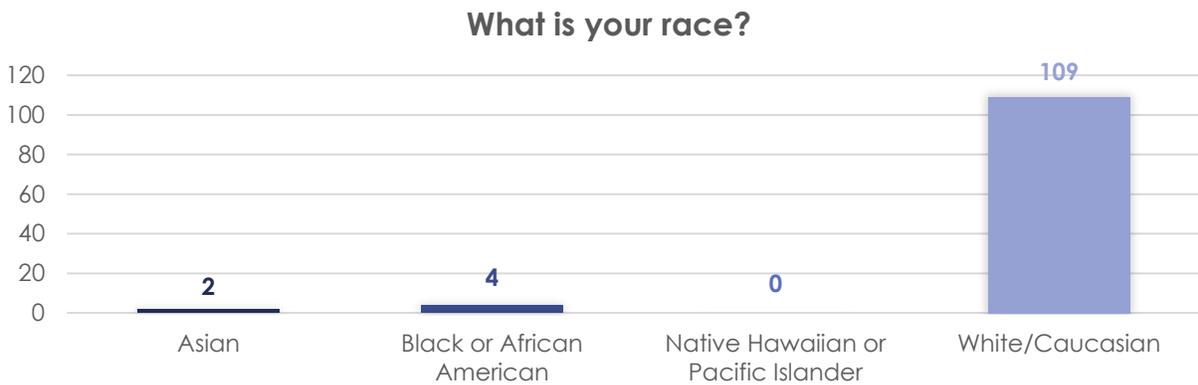


Figure 21: Race of respondents

Are you of Hispanic, Latino, or Spanish origin?

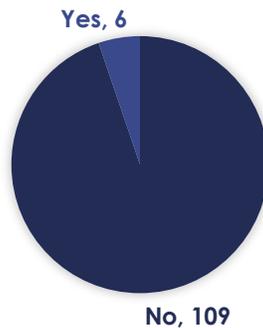


Figure 22: Ethnicity of respondents

Females made up the majority of responses (70, 57%), followed by males (45 (37%), and non-binary or other with 2 responses (2%) (Figure 23). In Tewksbury, 54% of the population is female.

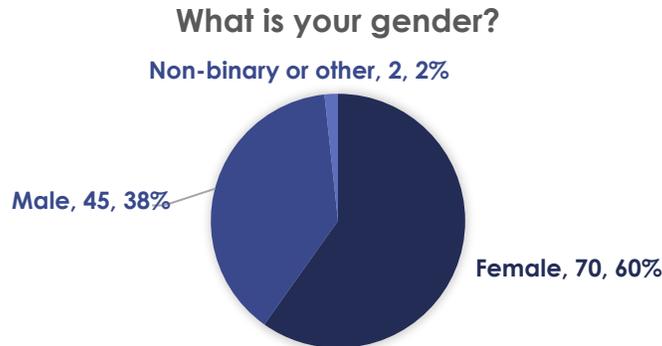


Figure 23: Gender of respondents

For income, 73 respondents (59%) made more than \$100,000 per year, 18 respondents (15%) making between \$75,001 and \$100,000, 13 respondents (11%) making between \$50,001 and \$75,000 per year. Only 4 respondents (4%) made less than \$50,000 per year (Figure 24). In Tewksbury, the median household income is about \$104,000 per year with 4% of the population living below the poverty line (making less than \$27,750 for a family of four²).

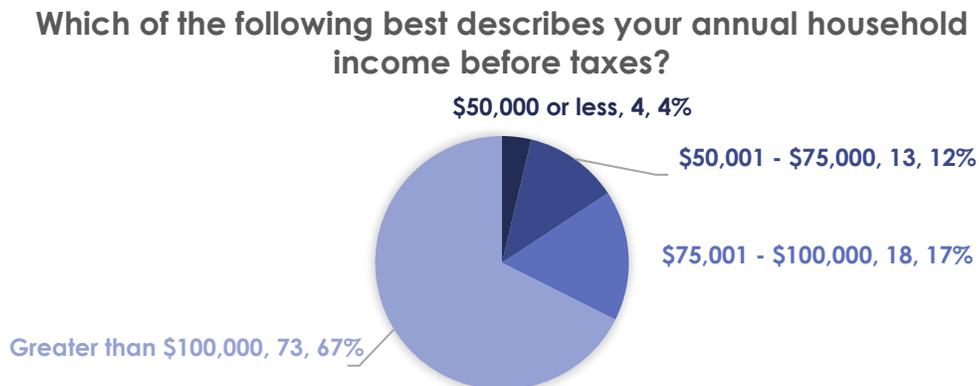


Figure 24: Income of respondents

All respondents had graduated from high school, with the majority having obtained a bachelor's (36, 29%), a master's (32, 26%), or a professional degree (7, 6%) (Figure 25). In Tewksbury, 95% of residents have a high school degree or higher and 38% have a bachelor's degree or higher.

² Federal Poverty Guidelines – 2022

<https://www.masslegalservices.org/content/federal-poverty-guidelines-2022>

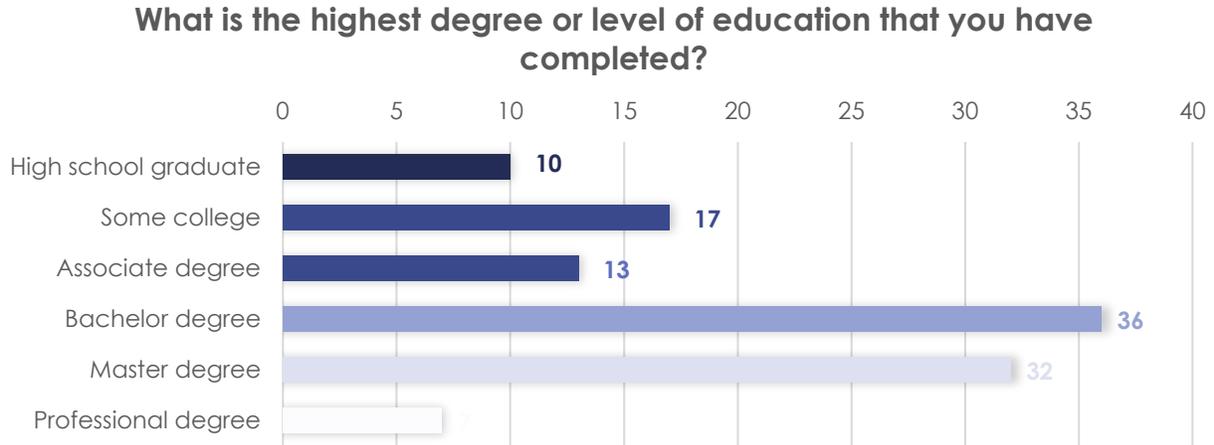


Figure 25: Education level of respondents

English is the primary language spoken at home for 97% of respondents (119 responses), with Spanish (4, 3%), Portuguese (2, 2%), Mandarin (1, 1%), and Greek (1, 1%) also spoken at home (Figure 26). Note that respondents could select more than one language so the percentages may not equal 100%. In Tewksbury, 9% of people speak a language other than English at home.

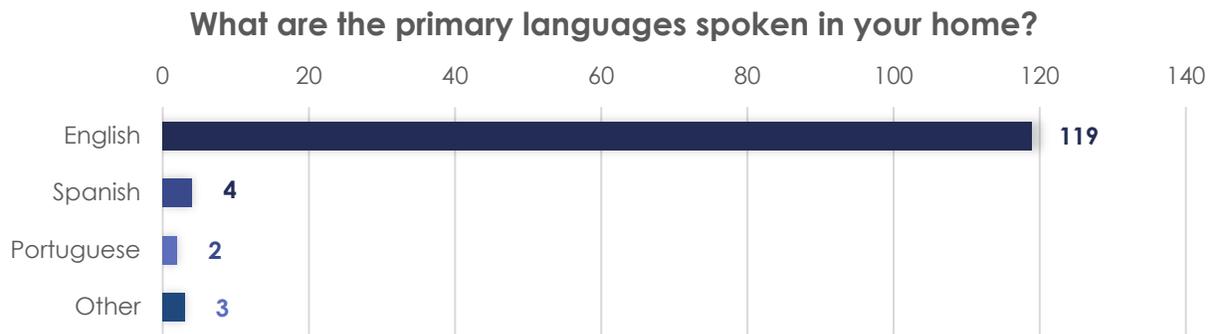


Figure 26: Language of respondents

For most respondents, they lived in Tewksbury but worked somewhere else (75, 61%), while many others both worked and lived in Tewksbury (37, 30%). The “other” responses (8, 6.5%) indicated they are living in Tewksbury but retired or visit occasionally (Figure 27).

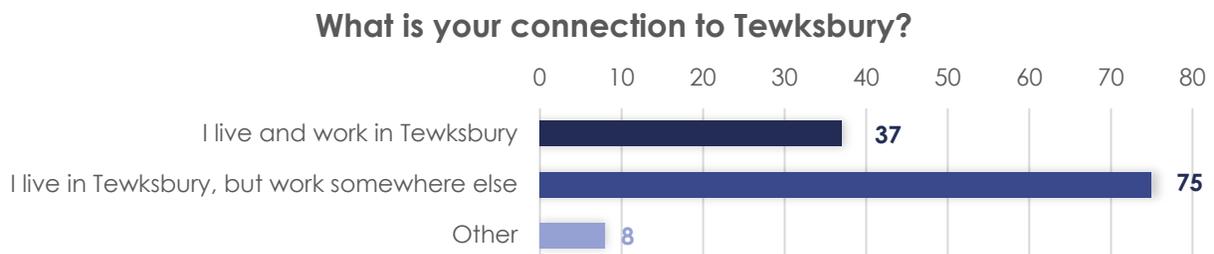


Figure 27: Connection to Tewksbury of respondents

3. NEXT STEPS

The Tewksbury Flooding and Green Infrastructure Survey was created to provide the project team with more information on where flooding occurs, as well as the intensity, frequency, and the impacts this flooding has on their lives. These data have already been incorporated into hydrologic and hydraulic models in different parts of the town to identify new flooding hotspots and provide additional data points for model calibration.

More information about this project can be found on the town's Hazard Mitigation and Climate Resilience Planning webpage, Tewksbury-ma.gov/flooding.

4. APPENDICIES

4.1. APPENDIX A: SURVEY

Welcome to the Tewksbury Flooding and Green Infrastructure Survey

The Town of Tewksbury has been awarded a Municipal Vulnerability Preparedness (MVP) Action Grant to develop a stormwater analysis on Town-owned lands, emphasizing opportunities on vacant parcels that could be used for nature-based solutions and flood storage, while also considering opportunities for affordable housing.

This survey is intended to provide the Project Team with a better understanding of regular and extreme flooding events in order to improve flooding models, identify residents' priorities for green infrastructure, and show how this analysis can help support affordable housing. The results of these efforts will be presented in future public meetings and outreach efforts. This survey should take about 15 minutes to complete.

Thank you for being a part of this effort and we look forward to receiving your input on this survey.

Sincerely,
The Tewksbury MVP Project Team

If you have any questions or comments about this survey, please contact Lauren Zielinski from the Merrimack River Watershed Council at lauren@merrimack.org

Location of Flooding

Where in Tewksbury do you experience flooding most often?

Please list an address, cross section, or short description of the location.

Type of Flooding

This survey will collect data on two different types of flooding: regular flooding (for example, after every rain event) and extreme event flooding (for example, during and after large rain events such as the Mother's Day Flood in 2006).

Do you experience regular flooding at this location?*

Yes (please continue to the next page)

No (please skip to page 7)

Regular Flooding

Please answer the following questions to the best of your ability using your own personal experience with regular flooding in Tewksbury. Consider the flooding events that you encounter most frequently to answer the questions below at location you indicated at the beginning of the survey.

What kind of flooding do you regularly experience?* *Check all that apply.*

- Flooding of my house or business
- Flooding of the outside areas of my property (front yard, back yard, driveway, parking lot, etc.)
- Flooding of a road or bridge that I use on a regular basis
- Flooding of a public space, such as a park
- Other: _____

How often do these floods occur?* *Check all that apply.*

- Every time it rains
- After short, heavy rains (e.g., after a summer thunderstorm)
- After a full day of rain
- During the snowmelt period in the spring
- Not sure
- Other: _____

How long does the flooding typically last?*

- 1 hour or less
- A few hours
- 1 day
- A few days
- 1 week
- Longer than a week
- Not sure
- Other: _____

How deep is the flooding?*

- Less than 1 inch
- Between 1 inch and 6 inches
- Between 6 inches and 12 inches
- Between 1 foot and 3 feet
- Greater than 3 feet
- Not sure
- Other: _____

What kind of damage or difficulties does this flooding cause?* *Check all that apply.*

- Structural or cosmetic damage to my house or business
- Damage to the outside areas of my property
- Damage to public property or infrastructure
- Difficulties traveling by car (an alternate route is available around the flooded area)
- Unable to travel by car (no alternative route is available around the flooded area)
- Limited ability of emergency services to access my area
- No known property damage or difficulties
- Other: _____

What is the main source of the flooding?* *Check all that apply.*

- Nearby river or stream
- Nearby pond or lake
- Backing up of road drains or excess water from the street
- Too much water in the soil, forming pools or puddles
- Seepage from high groundwater levels
- Not sure
- Other: _____

If the flooding comes from a water body, please list the name of the water body.

For example, Shawsheen River or Ames Pond:

In your experience, has the *frequency* of the flooding changed over time?

- Flooding has become more frequent
- Flooding has become less frequent
- No noticeable change in the frequency of flooding
- Other: _____

In your experience, has the *severity* of the flooding changed over time?

- Flooding has become more severe
- Flooding has become less severe
- No noticeable change in the severity of flooding
- Other: _____

Do you know if the Town of Tewksbury is aware of the regular flooding in your area?*

- Yes
- No
- Unsure

Would you like to share any photos of the regular flooding with the Project Team?

Photos can provide a better understanding of the extent of flooding, which can help the Project Team improve the models being built. If so, please email them along with the address to lauren@merrimack.org.

Do you have any other comments or concerns related to regular flooding in your area?

Would you like to talk more about the regular flooding you experience?

More detail helps us improve our analysis and potential solutions to these issues. Would you be willing to speak with one of our project team members in more detail about your experience with regular flooding if we have follow-up questions? If so, please leave your email and/or phone number in the line below.

Type of Flooding

This survey will collect data on two different types of flooding: regular flooding (for example, after every rain event) and extreme event flooding (for example, during and after large rain events such as the Mother's Day Flood in 2006).

Do you experience extreme event flooding at this location?*

- Yes (please continue to the next page)
- No (please skip to the Green Infrastructure section, page 11)

Extreme Event Flooding

Please answer the following questions to the best of your ability using your own personal experience with extreme flooding in Tewksbury. Consider a flooding event from extreme weather that is most memorable for you (like the flooding in July 2021 or the Mother's Day Flood in 2006) at location you indicated at the beginning of the survey.

***What was the date of the extreme event flooding?**

If you don't know the exact date, please provide your best guess.

What kind of flooding did you experience?* *Check all that apply.*

- Flooding of my house or business
- Flooding of the outside areas of my property (front yard, back yard, driveway, parking lot, etc.)
- Flooding of a road or bridge that I use on a regular basis
- Flooding of a public space, such as a park
- Other: _____

How long did the flooding last?*

- 1 hour or less
- A few hours
- 1 day
- A few days
- 1 week
- Longer than a week
- Not sure
- Other: _____

How deep was the flooding?*

- Less than 1 inch
- Between 1 inch and 6 inches
- Between 6 inches and 12 inches
- Between 1 foot and 3 feet
- Greater than 3 feet
- Not sure
- Other: _____

What kind of damage or difficulties did this flooding cause?* *Check all that apply.*

- Structural or cosmetic damage to my house or business
- Damage to the outside areas of my property
- Damage to public property or infrastructure
- Difficulties traveling by car (an alternate route is available around the flooded area)
- Unable to travel by car (no alternative route is available around the flooded area)
- Limited ability of emergency services to access my area
- No known property damage or difficulties
- Other: _____

What was the main source of the flooding?* *Check all that apply.*

- Nearby river or stream
- Nearby pond or lake
- Backing up of road drains or excess water from the street
- Too much water in the soil, forming pools or puddles
- Seepage from high groundwater levels
- Not sure
- Other: _____

If the flooding came from a water body, please list the name of the water body below.

For example, Shawsheen River or Ames Pond

Do you know if the Town of Tewksbury is aware of the extreme event flooding that occurred in your area?*

Yes

No

Unsure

Would you like to share any photos of the extreme event with the Project Team?

Photos can provide a better understanding of the extent of flooding, which can help the Project Team improve the models being built. If so, please email them along with the address to lauren@merrimack.org.

Do you have any other comments or concerns related to extreme event flooding in your area?

Would you like to talk more about the extreme event flooding you experience?

More detail helps us improve our analysis and potential solutions to these issues. Would you be willing to speak with one of our project team members in more detail about your experience with extreme event flooding if we have follow-up questions? If so, please leave your email and/or phone number in the line below.

Green Infrastructure

The MVP Project Team is also assessing opportunities to build green infrastructure to help address flooding concerns. The Town will explore opportunities to capture runoff from large impervious surfaces like parking lots and roads in flood prone areas and move it to green spaces where it can slowly infiltrate into the ground. Using these methods, rainfall can be captured and stored, reducing the amount of flooding in Tewksbury.

What is Green Infrastructure?

When rain falls on our roofs, streets, and parking lots, the water cannot soak into the ground as it should. If not managed well, it can lead to flooding, sewer overflows, and water pollution. Green infrastructure uses vegetation, soils, and other natural landscape features to manage wet weather impacts, reduce and treat stormwater at its source, and create sustainable and healthy communities.

Green infrastructure can include features such as rain gardens, bioswales, planter boxes and planting strips, urban tree canopies, natural areas (such as parks and wetlands), and permeable pavement, as well as techniques to redirect, capture, and store rainwater for irrigation and other uses, such as downspout disconnection and the use of rain barrels and cisterns.

Learn more on green infrastructure by reading "*Healthy Benefits of Green Infrastructure in Communities*" Factsheet from the US EPA.



Rain Garden



Bioswales



Planter Box



Urban Trees



Natural Areas



Permeable Pavement

The main goal of installing green infrastructure in Tewksbury will be to address the impacts of flooding. What are your priorities for improving flood management?

Please check one box per row.

| | Low priority | Moderate priority | High priority | No opinion |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| Reduce flooding in the streets so vehicles can pass (including emergency vehicles)* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Prevent flooding of homes and businesses* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Protect built infrastructure, such as roads, bridges, culverts, power lines, sewer lines, etc.* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Promote flooding in natural areas (such as green spaces or floodplain areas) to improve local ecosystems* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Reduce the cost of flooding-related disasters* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Do you have other flooding-related priorities for green infrastructure that aren't listed above?

Green infrastructure can provide other benefits beyond flood relief. How much do you value other potential benefits of green infrastructure? These considerations will be taken into account when deciding how different type of green infrastructure techniques will be designed.

Please check one box per row.

| | Low value | Moderate value | High value | No opinion |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| Improve climate resiliency* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Create outdoor community spaces like parks* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Increase green space* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Create more places for recreation* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Reduce traffic and street noise* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Reduce local temperatures* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Improve local air quality* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Improve local water quality* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Is aesthetically pleasing* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Provide local jobs* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Increase local property values* | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Are there other benefits related to green infrastructure that you think are important that aren't listed above?

Do you think there should be more public outreach and awareness about green infrastructure?*

- Yes, there should be more public outreach about green infrastructure in general
- Yes, there should be more public outreach about green infrastructure planning in Tewksbury
- No, I think the local community has a good enough understanding about green infrastructure

Are there any specifics topics related to green infrastructure you would like to learn more about?

Affordable Housing

The Town of Tewksbury and the Tewksbury Housing Authority are dedicated to providing adequate and affordable housing for Tewksbury residents. In the 2017 Tewksbury Housing Production Plan, it was estimated that applicants for affordable rental housing could wait between 5 to 10 years, sometimes longer, for a unit to become available. These applicants include elderly residents, persons with disabilities, veterans, and low-income families. In addition, every city and town in Massachusetts is required by state law to have 10% of their housing stock listed as affordable. As of the 2020 Census, Tewksbury had just under 10% of their housing stock listed as affordable, meaning that the Town is actively seeking out affordable housing development opportunities.

As part of the MVP grant, the Project Team will be assessing town-owned properties for potential sites of affordable rental housing which are located in areas with a low flood risk. This analysis will help guide development of future affordable housing opportunities so that these vulnerable populations can have an affordable place to live with reliable access to the facilities and services they rely upon.

In the questions below, please provide your opinion on how you would like to see affordable housing further developed in Tewksbury.

Would you like to see more affordable housing built in Tewksbury?*

- Yes
- No
- No opinion

What type of affordable housing would you like to see?* *Check all that apply.*

- Single family houses
- Duplexes
- Multi-unit apartment buildings
- No opinion
- Other: _____

Do you think these properties should be intended for homeownership or for rental?*

- Homeownership
- Rental
- A mix of both
- No opinion

Community Profile

We'd like to know more about you to better understand the populations which are most impacted by flooding in Tewksbury. All the questions in this section are optional.

What is your age?

- Under 18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65+

What is your race? *Check all the apply.*

- American Indian or Alaskan Native
- Asian
- Black or African American
- Native Hawaiian or Pacific Islander
- White/Caucasian

Are you of Hispanic, Latino, or Spanish origin?

- Yes
- No

What is your gender?

- Female
- Male
- Non-binary or other

Which of the following best describes your annual household income before taxes?

- \$12,500 or less
- \$12,501 - \$25,000
- \$25,001 - \$50,000
- \$50,001 - \$75,000
- \$75,001 - \$100,000
- Greater than \$100,000

What is the highest degree or level of education that you have completed?

- Less than grade 12
- High school graduate
- Some college
- Associate degree
- Bachelor degree
- Master degree
- Professional degree (for example, JD, MD, PhD, etc.)

What are the primary languages spoken in your home? *Check all that apply.*

- English
- Spanish
- Portuguese
- Other: _____

Where did you hear about this survey? *Check all that apply.*

- Town of Tewksbury website or email
- Postcard mailed to my address
- Flyer found around town
- Tewksbury Public Library
- Tewksbury Department of Community Development
- Tewksbury Senior Center
- Tewksbury Housing Authority
- Colleague, friend, or family member
- Social media
- Email or newsletter from another group: _____

What is your connection to Tewksbury?

- I live and work in Tewksbury
- I live in Tewksbury, but work somewhere else
- I work in Tewksbury, but live somewhere else
- I visit Tewksbury often, but live and work someplace else
- Other: _____

Do you want to stay involved or learn more about the project?

Please provide us with your email and we'll send out periodic updates on the project and inform you of upcoming public outreach events.

Thank you for participating in our survey!

Please return this survey to the Merrimack River Watershed Council to ensure we receive your response!

You may:

- Scan a copy of this survey and email it to Lauren at the Merrimack River Watershed Council:
lauren@merrimack.org
-
- Leave this completed survey at the place where you picked it up:
 - The Tewksbury Public Library: 300 Chandler St, Tewksbury, MA 01876
 - Department of Community Development: Town Hall, 1009 Main Street, Lower Level, Tewksbury, MA 01876
 - Senior Center: Senior Center: 175 Chandler Street, Tewksbury, MA 01876
 - Housing Authority Office: Saunders Cir, Tewksbury, MA 01876
-
- Mail this completed survey to the Merrimack River Watershed Council: 60 Island Street Suite 246 Lawrence, MA 01840

4.2. APPENDIX B: SURVEY DISTRIBUTION

Press release:

- Tewksbury Town Crier
- Lowell Sun
- Eagle Tribune
- Valley Patriot
- Rumbo News (translated to Spanish)
- Tewksbury Carnation
- Tewksbury Patch
- Tewksbury Advocate

Email lists:

- Merrimack River Watershed Council newsletter
- Lowell Parks and Conservation Trust newsletter
- Groundwork Lawrence newsletter
- OARS 3 Rivers newsletter
- Avis Andover
- Town of Andover
- Tewksbury Town Email list to all residents
- Tewksbury Public Library newsletter, Facebook page
- Housing Authority email list
- Council on Aging email list & newsletter
- Merrimack Valley Elderly Services email list
- Green Committee email list
- Department of Community Development email list
- Tewksbury Department of Public Works
- Wilmington Tewksbury Chamber of Commerce email list
- MVP Project email list
- Rep. Tram Nguyen's office
- Rep. David Robertson's office
- Sen. Barry Finegold's office

Locations with flyers:

- Community Development office
- Council on Aging
- Housing Authority
- Library
- Tewksbury Sports Club
- Laundromat
- Villa Roma Pizza
- Jon Ryan's Pub
- TJ Callahan's
- Pizza Mia
- Kyoto
- SpicIndya
- Cafe Sicilia

- Main Street Pizza and Seafood
- Raintree Cleaners
- Hobart's Country Store
- Lisa's Family Pizzeria
- Pizza Bar
- White Dove Pantry
- E-Market
- Donna's Donuts
- Aroma Joe's
- Tessi's Pizza
- Luna Rossa
- Al Fresca Market
- Dunkin Donuts

Flyer and postcard



bit.ly/TewksburyFloodingSurvey

HAVE YOU EXPERIENCED FLOODING IN TEWKSBURY?

The Town of Tewksbury and the Merrimack River Watershed Council are conducting a survey to better understand your experiences with flooding.

Your response will help us determine where to focus our future planning efforts

¿HA EXPERIMENTADO INUNDACIONES EN TEWKSBURY?

La ciudad de Tewksbury y el Consejo de la cuenca del río Merrimack quieren conocer sus experiencias con las inundaciones.

Su respuesta nos ayudará a determinar dónde enfocar nuestros futuros esfuerzos de planificación futuros

TAKE OUR SURVEY!

Scan the QR code above or visit bit.ly/TewksburyFloodingSurvey

Or pick up a hard copy at the Tewksbury Public Library, Department of Community Development, Senior Center, Housing Authority, or email lauren@merrimack.org

¡TOME LA ENCUESTA!

Escanee el código QR o visite bit.ly/TewksburyFloodingSurvey

Encuentre una copia impresa a la Biblioteca Pública de Tewksbury, el Departamento de Desarrollo Comunitario, el Centro de Mayores, la Autoridad de la Vivienda, o envíe un email a lauren@merrimack.org





MRWC
MERRIMACK RIVER
WATERSHED COUNCIL

**HAVE YOU EXPERIENCED
FLOODING IN TEWKSBURY?**

The Town of Tewksbury and the Merrimack River Watershed Council want to learn about your experiences with flooding, so we can find solutions.

TAKE OUR SURVEY!

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Or pick up a hard copy at the Tewksbury Public Library, Department of Community Development, Senior Center, Housing Authority, or email lauren@merrimack.org

**¿HA EXPERIMENTADO
INUNDACIONES EN TEWKSBURY?**

La ciudad de Tewksbury y el Consejo de la cuenca del río Merrimack quieren conocer sus experiencias con las inundaciones, para que podamos encontrar soluciones.

¡TOME LA ENCUESTA!

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