Rochester Heights Focus Area Plan

Executive summary: This focus area plan was developed to help inform water quality and flooding improvement projects and stormwater control for Rochester Heights Creek that benefit the local community and the larger Walnut Creek Watershed. To develop this plan, the project team performed various activities: used the Watershed Action Planning (WAP) tool to develop goals and select stormwater retrofit opportunities; conducted a community survey to better understand flooding and gauge level of interest in seeing improvement projects in the neighborhood; conducted GIS watershed modeling to understand stormwater flow; stream walks to identify water quality and flooding threats and potential restoration projects; and tours of Biltmore Hills Park to identify green stormwater infrastructure (GSI) sites. The community survey found that nuisance flooding is a concern of most downstream residents, and that they support improvement projects within the neighborhood. The findings suggest that improvement efforts should occur in the upstream section of the creek and the southern reaches of the focus area to be most effective at reducing flows. Project examples: GSI projects in Biltmore Hills Park and low-impact stream restoration projects where there is severe erosion in the creek. Further, if future development is planned within this focus area, it is critical that the plans address already high stormwater flows by including appropriate and effective SCM's. Engaging and meaningful community engagement is crucial. The goals of the the Rochester Heights Focus Area are 1) Rochester Heights Creek is a stable stream with less erosion and reduced flows, 2) Reduced impacts that common rainstorms have on neighbors living along Rochester Heights Creek, and 3) RHC neighbors are engaged in events, projects and notices related to RHC and the Walnut Creek Watershed.

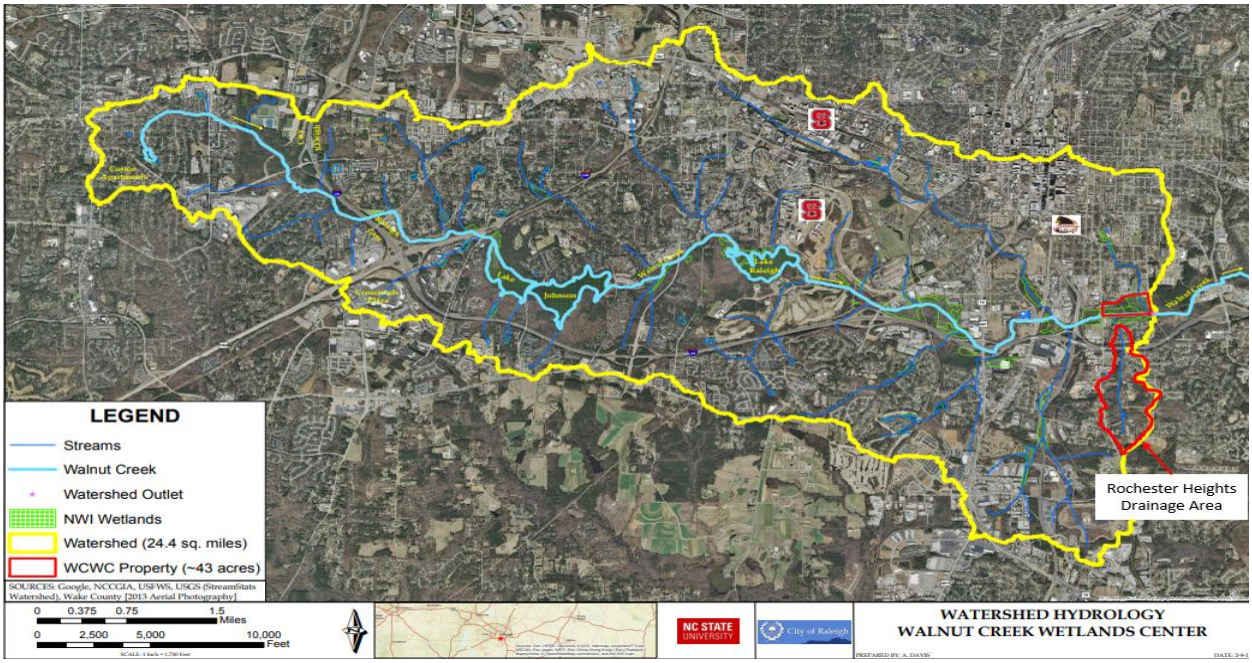


Figure 1. Walnut Creek Watershed. Rochester Heights focus area is highlighted in red.

Rochester Heights Focus Area

The Rochester Heights Focus Area (Figure 2) is located in Southeast Raleigh, and is a focus area within the Walnut Creek Watershed (image 1). The watershed is around 1.15 sq. km. The main stream within this watershed is Rochester Heights Creek (1.75 km long). The creek flows

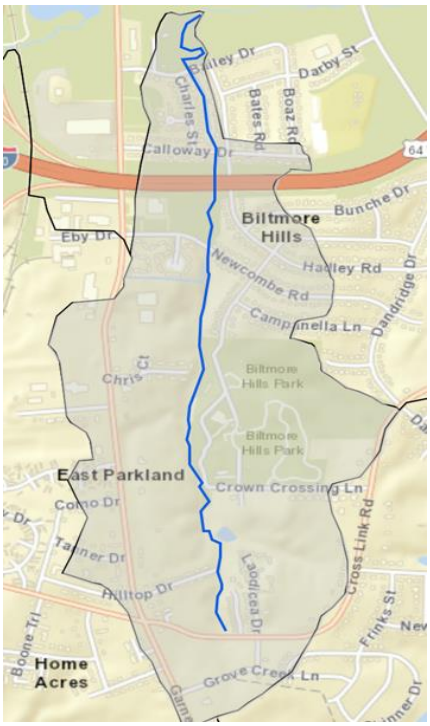


Figure 2. Rochester Heights drainage area and focus area (darker grey shape). Rochester Heights Creeks (blue line) flows through the middle.

north through private and public property before its confluence with Walnut Creek near Bailey Drive and Garner Road.

Like much of Raleigh, parts of this watershed were used for agricultural purposes for many years. Following WWII, Rochester Heights neighborhood was built in the 50's as the first African-American neighborhood in Raleigh. In the 70's, I-40 was constructed through the middle of Rochester Heights, thus splitting the neighborhood into two different neighborhoods- now known as Rochester Heights and Biltmore Hills. This drainage area is located in the furthest downstream section of the larger Walnut Creek watershed. As a result, during big rains, stormwater runoff from upstream communities and from downtown Raleigh surpass the capacity of the Walnut Creek Wetlands to absorb the water, and thus cause overflow and flooding in the northeastern section of the Rochester Heights neighborhood. Both extreme (flooding that damages the home) and nuisance (briefly restricts day-to-day activities) flooding events have, and continue to, negatively impact residents. This flooding is especially grave for residents living along Rochester Heights Creek (RHC) in the downstream section in the Rochester Heights neighborhood, where 13 residential properties are within the 100-year floodplain of Walnut Creek (Figure 3). Hurricane Fran did the most recent damage, where FEMA bought out five homes, and others were greatly impacted.

Rochester Heights Creek Watershed Planning Background

In recognition of the environmental and social concerns within this watershed, various groups and individuals are working to help foster positive change for both human and natural communities. One of the groups is the Walnut Creek Wetland Community Partnership (WCWCP), a partnership that provides a communication hub for residents, community stakeholders and academic government leaders to collaborate on sustainable management of the Walnut Creek Wetlands. WCWCP has developed and implemented various projects over the years. The development of this mini-watershed plan is supported and guided by this partnership. Another project supported by the partnership was a community survey conducted in 2016. An NCSU graduate student conducted a survey that discussed flooding and stormwater concerns, as well as trust in local government. The survey results, along with conversations with residents over the years, confirmed that the area along RHC experiences some of the worst flooding in the two neighborhoods. It became evident that a watershed plan would be crucial to help address some of these long-standing concerns.

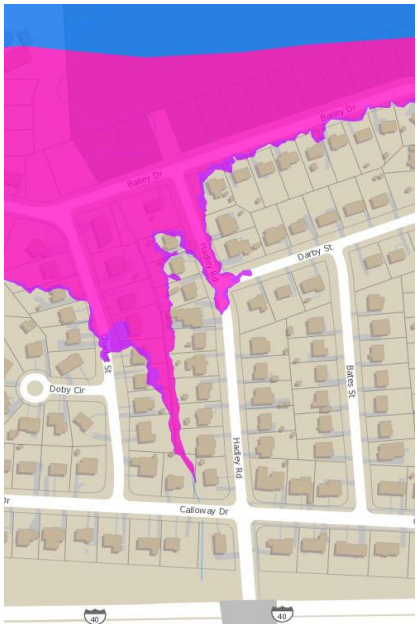


Figure 3. Walnut Creek 100-year floodplain. Rochester Heights Creek flows between Charles St. and Hadley Rd.

Focus Area Plan Development Activities

In order to best capture the situation of the Rochester Heights Creek drainage area, the project team conducted various activities.

- Watershed Action Planning (WAP) tool
    - Used the WAP tool to develop goals, strategies, objectives; identify stormwater retrofit opportunities; and contribute to the larger watershed planning effort
- Community Survey
    - Developed and implemented a survey for residents along the RHC to determine flooding intensity and patterns, interest in small and large scale projects, and other interests related to the environment and neighborhood
- GIS Watershed Modeling
    - Krissy Hopkins with USGS conducted some GIS modeling efforts to help better understand how water is moving throughout the watershed
- Stream walk (upstream and downstream)
    - We walked the stream to 1) determine its current state, and 2) identify potential projects to improve stream health and reduce flow
    - NCSU, WRRI, Kris Bass Engineering, Design Workshop, NCDWR
- Green Stormwater Infrastructure (GSI) tour in Biltmore Hills Park
    - Walked with the COR Stormwater and Kris Bass to identify potential GSI sites

Environmental and Social Concerns along Rochester Heights Creek

Photo credit: Grace Fullmer

Rochester Heights Creek can be divided into two different sections: upstream and downstream.

Upstream description: The upstream section starts from Cross Link Road and ends where I-40 divides the two neighborhoods. This section flows through both private and public property (Biltmore Hills Park) that is greatly composed of a mixed-pine forest. It is suggested that the upstream section was most likely moved to the west slightly when Biltmore Hills Park was constructed, disconnecting it from its original floodplain. Many sections of the stream don't have adequate native vegetation to hold in the streambank, and erosion is present.

<u>Environmental Concerns:</u>

- Stormwater runoff from Biltmore Hills Park, Crown Crossing Lane, and from some of the neighborhoods on the western side of the tributary
- Erosion of streambanks
- Sedimentation
- Disconnection from floodplain
- Some invasive species identified

<u>Social Concerns:</u>

- Upstream development impacts downstream residents
- Must engage neighbors living next to potential GSI/stream stabilization projects before implementation

Downstream description: The downstream section runs through the backyards of private properties. This section is highly channelized with some areas filled with debris (branches and trash). All the runoff from Biltmore Hills Park, the section of I-40 located within the drainage area, Calloway Street, Charles Street, and the west side of Bailey Drive flows untreated into Rochester Heights Creek. Most of the backyards do not have streambank supporting vegetation, and consist of lawn grass that grows to the edge of the streambanks. The lack of proper vegetation is causing erosion and degradation of backyards.

<u>Environmental Concerns:</u>

- Lack of streambank stability
- Erosion of backyards
- Sedimentation
- High flows from upstream stormwater
- Trash in the stream and along streambanks
- Mowing practices of residents
- Stormwater runoff from I-40, Charles Street and Fitzgerald Drive

<u>Social Concerns:</u>

- Extreme and nuisance flooding from Rochester Heights Creek and Walnut Creek overflowing due to runoff from downtown Raleigh and further upstream
- Lack of knowledge regarding proper streambank care (i.e. mowing, trash, rip rap)
- Lack of capacity to address backyard issues (gutters, drainage, etc.)
- Proper and adequate engagement of residents
    - Are residents aware of current/ongoing projects?
    - Have they been engaged/communicated with regarding work done in stream?

Photo credit: Grace Fullmer

Watershed Plan - Goals, Strategies and Objectives

1. **Rochester Heights Creek is a stable stream with less erosion and reduced flows**
    a. *Strategy 1*: Reduce the amount and velocity of stormwater entering the RHC
        i. Objective 1a: Establish a baseline flow using data from Theo's work
        ii. Objective 1b: Define the peak flow reductions needed in RHC
        iii. Objective 1c: Identify activities and projects that will help reduce flows
    b. *Strategy 2*: Implement GSI projects
        i. Objective 2a: Engage the City of Raleigh (stormwater and parks department), private residences and other necessary stakeholders to identify potential projects
        ii. Objective 2b: Prioritize GSI projects using GIS and SCITS
        iii. Objective 2c: Develop an implementation plan for prioritized projects
        iv. Objective 2d: Search for and secure funding for selected projects
    c. Strategy 3: Implement stream restoration projects within RHC
        i. Objective 2a: Identify potential projects along the stream (up and downstream) in the field and by talking with property owners
        ii. Objective 2b: Identify the needs for each project and prioritize
        iii. Objective 2c: Develop stream restoration implementation plans
    d. Strategy 4: Identify retrofits for ineffective stormwater infrastructure
        i. Objective 4a: Perform field work to identify ineffective infrastructure

ii. Objective 4b: Use GIS to calculate which infrastructure locations are the most important in terms of water flow
iii. Objective 4c: Collaborate with necessary stakeholders (COR Stormwater) to identify possible retrofit opportunities
iv. Objective 4d: Develop a plan for the retrofits

2. **Reduced impacts that common rainstorms have on neighbors living along Rochester Heights Creek**
   a. *Strategy 1:* Follow and complete the strategies and objectives for Goal 1
   b. *Strategy 2*: Monitor effectiveness of each project
      i. Objective 2a: Develop a monitoring plan including stream monitoring (flow levels, water quality, etc.) and in person conversations
      ii. Objective 2b: Continue to engage residents about flooding, stormwater and RHC concerns
3. **RHC neighbors are engaged in events, projects and notices related to RHC and the Walnut Creek Watershed**
   a. Strategy 1: Develop activities/events for residents to engage
      i. Objective 1a: Ask residents what activities they would be interested in
      ii. Objective 1b: Plan those activities and continue to make adjustments overtime and as interest is better defined
      iii. Objective 1c: Continue asking residents what they want/need in terms of programming or communications
   b. Strategy 2: Be active in sharing information with people who express interest
      i. Objective 2a: Develop a diverse platform for communication for individual interests
      ii. Objective 2b: Be consistent with engagement

Community Survey

The project team developed a survey to administer to residents who live along RHC. The survey was designed to build a better understanding of flooding intensity, frequency and location, as well as resident's interest in adding a landscape feature to their yard, interest in large-scale GSI projects, and their engagement experience regarding neighborhood projects. Individuals who participated in the survey received $5 as a thank you.

The project team surveyed individuals three separate times to reach as many people as possible. The initial goal was to survey all 36 properties along the creek. Overtime, the team shifted the focus on the properties in the downstream section of the creek. This was done for a few reasons, 1) these properties experience the highest degree of flooding and we wanted to gain a clear picture of this, 2) to allocate available funds for small-scale projects in this area due to reason 1, and 3) there was limited time to survey and we wanted to ensure the people who are most affected were offered an opportunity to share their story. We were able to survey a total of 11 individuals, eight of which were downstream and three upstream. Below you will find a brief discussion of the results.

Project Goals
All survey participants approved of the suggested watershed plan goals. Some mentioned the interest in seeing more greenery in the neighborhoods, trash clean-ups within the creek but also the entire neighborhood, and the interest in a continued effort to improve upon the creek.

Flooding
The residents in the upstream section of the creek did not report any flooding in their backyards, front yards, driveways, or homes, and they haven't observed any noticeable property loss due to

eroding streambanks. In this section the properties are about 0.5 miles from Walnut Creek, are at a higher elevation than the downstream properties, and the backyards are around 25 ft. from RHC- creating a large buffer between the homes and the creek.

Downstream residents reported an average of 4 (high flooding) for backyard flooding, an average of 2.5 (some flooding) for front yard flooding, 1.5 (little to no flooding) for driveway flooding, no road flooding, and 2 residences reported home flooding in the crawl space, as well 2 residents commented that they have observed extreme backyard property loss as a result of RHC and that they have observed the stream flowing out of the streambanks (usually doesn't last too long). The characteristics of this section of RHC- stormwater flows, channelization, lack of streambank vegetation, and the geography (flows directly through backyards, flows 0.5-1.5 feet below top of the streambank, and close proximity to Walnut Creek)- explain why these properties experience the greatest issues with stormwater and flooding. During a 3.5 inch rain in late February, a resident took a video of their and their neighbors 100% flooded backyard. The video showed the water flowing toward Walnut Creek, suggesting that one cause of flooding in this area may be increased flows in RHC from further stormwater further upstream, instead of Walnut Creek backing up. We can suggest that it is a combination of the two, and that future GSI/stream restoration efforts need to address both concerns.

Importance of Addressing Flooding Concerns
Nine respondents said that it is very important to them to address flooding concerns, with one respondent saying it is somewhat important. It is important for not only those who experience it, but also those who want the best for their neighbors and the larger community.

Interest in Adding Landscape Feature to Yard
Most respondents (9) expressed interest (3-5) in adding a landscape feature to their yard. The most common interests were rain barrels, rain gardens and streamside plantings. Only three people were interested in tree plantings, suggesting that this isn't the best idea for this neighborhood. Most of the homes already have disconnected downspouts. As well, while a lot of the homes are mowing up to the streambank edges, there wasn't interest in learning about best mowing practices (educational brochures were passed out discussing best mowing practices).

We re-engaged the residents interested in backyard projects and decided not to go forward with this effort for a few reasons, 1) those who expressed interest and whose properties are accessible for this work were renters, 2) we were concerned about project upkeep after installation, 4) overall we believe it is not the right time to move forward with these projects, but maybe in the future and with property owner support and with more funding.

Large-Scale Projects
Every respondent was very interested in seeing large-scale GSI and stream stabilization projects in Biltmore Hills Park. Once again suggesting strong support and interest in addressing the flooding and stormwater issues in the drainage area.

Adequatley Engaged
Respondents were asked if they have been engaged in or have heard of neighborhood projects in the past. 4 respondents said yes, and 6 said no. Those who said yes commented on hearing about the Bailey Drive Gateway project. Those who said no did not express any frustration about not being engaged, but rather commented that they simply hadn't heard of anything.

Future Engagement

Around half of the respondents commented that they are interested in being engaged in the future through either receiving information through email, flyers or texting, or through hands-on workshops. Some expressed interest in activities for youth and families.

Discussion
Overall respondents were interested in talking about the current status of the neighborhood and what they would like to see in the future. It can be suggested that it is important to residents to develop and implement projects that positively contribute to neighborhood wellbeing both socially and environmentally. As the initial survey in 2016 concluded, flooding is mostly occurring in the downstream section of the RHC, and the upstream properties are not as affected, if at all. Some of those who live in the neighborhood are interested in being involved with this work by contributing to their properties, or by engaging with future events. As funding becomes available and if interest still exists with residents, those interested in doing projects on their property should be engaged in the future. Finally, it will be important to continue engaging these individuals.

GIS Watershed and Flow Modeling

Three GIS models were developed for the Rochester Heights Creek drainage area. The models discuss hydrology, elevation and stormwater infrastructure. See Appendix for models

- *Flow Accumulation Model*: Highlights drainage patterns within the watershed.
    - Identifies the main stream channels
        - The more purple the drainage flow line is the higher flow volume, the lighter blue the lower flow volume. Help to identify where potential SCM projects could be installed.
            - Potential SCM sites:
                - Biltmore Hills Park (public property)- Three strong flow lines in the north, central and south
                - Stem south of Biltmore Hills Park and east of Cross Link Road (needs more investigation)
                - Stem off of Garner road and south of Chris Court (needs more investigation)
    - Identifies where flow is concentrating on the sides of streets
        - Street side SCM projects if community agrees (all survey respondents approved of roadside projects in the neighborhood)
            - Suggestions (upstream to downstream):
                - Cross Link Road (to the east of Garner Road) - COR
                - Garner Road (various locations throughout the drainage area) - NCDOT
                - Crown Crossing Lane (north side) - COR
                - Newcombe Road - COR
                - Hadley Road (section south of I-40) - COR
                - Calloway Drive (east and west) - COR

- Landscape Openness: Uses Digital Elevation Modeling (DEM) to calculate the approximate degree of openness (suggesting incision) present within the flow lines. This model was cross-referenced with site visits to Rochester Heights Creek.
    - Identifies potential areas where erosion might be occurring
        - Much of the upstream section did have severe incision.

        - The downstream section is moderately incised. Lack of proper vegetation holding the streambank in place to prevent further erosion.
    - Calculates the elevation differences of properties in relation to the stream
        - The section between the northern boundaries of the park and the south side of I-40 (severe degree of openness) is characterized by a steep slope (25 feet) between the creek and the surrounding properties. This area was not considered to be greatly eroded.
        - The downstream section (Rochester Heights) of the creek is at a lower elevation than the upper (Biltmore Hills). Here the creek generally flows about 1 foot below the surrounding properties

- Stormwater: Map of where stormwater infrastructure exists within the drainage area.
    - Highlights areas where and how stormwater is entering Rochester Heights Creek

- Before and After: Compares two images of the drainage area over 70 year period
    - The images show a variety of new developments, including the two neighborhoods; areas of old agriculture that has now been turned back into forest; and the construction of I-40
    - Overall, development has altered the drainage area drastically, with new impervious areas accounting for stormwater issues.

- Rochester Heights Creek Flow Data
    - It takes 0.2 inches of rainfall to trigger a detectable rise in the creek (see Appendix)
    - Time it takes for the stream to rise and fall- the greater the rainfall intensity the greater the rise rate in the stream. During a 1.27 inch rainfall, the stream rose 1.3 feet in 15 minutes and lasted 45 minutes
    - Range of responses for different sized rainfall events (see box plot in appendix)

Gallery of Projects

View this Story Map for a tour of potential project sites and their descriptions.

Conclusion

The activities carried out in the development of this plan have 1) engaged existing partnerships with the local community, local governments, and NGO's; 2) developed a deeper understanding of community sentiments, needs and wants in relation to flooding and stormwater concerns and projects to help mitigate them; and 3) identified potential SCM projects to help address stormwater concerns. Along those lines, momentum continues to be built within the Rochester Heights and Biltmore Hills neighborhoods, and residents are looking forward to seeing projects in the ground and are hoping to see change.

Suggestions for the Future

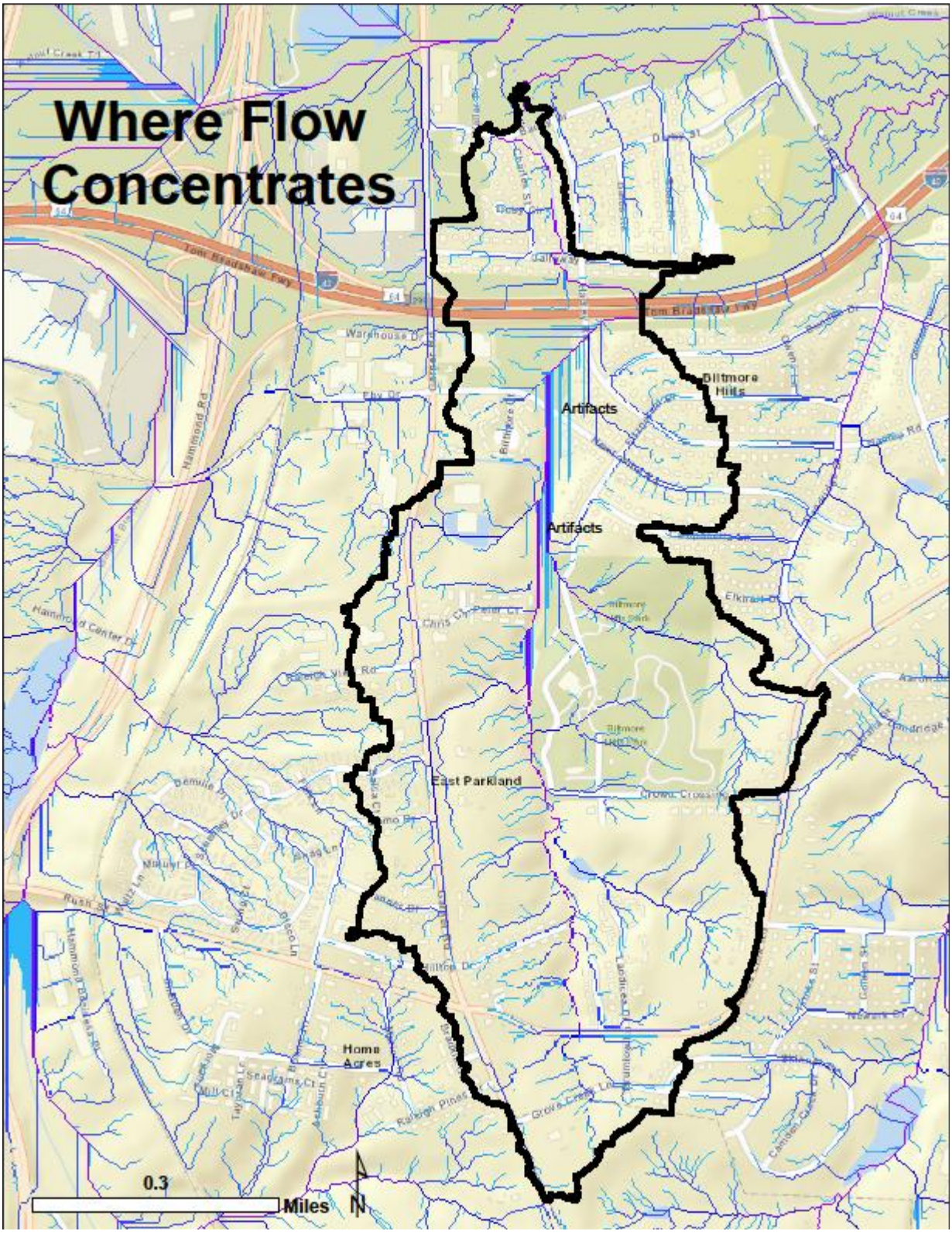
1) Stormwater Control Measures
    a) To effectively reduce the impacts of stormwater in this focus area, it is critical to implement SCM and stream restoration projects as suggested in this plan. Suggestions- Seek and secure funding to implement SCMs and stream

stabilization projects in Biltmore Hills Park and on surrounding private properties (as they agree)
    i) Collaborate with the City of Raleigh Stormwater and Parks and Recreation departments, Kris Bass Engineering, WCWCP, and other stakeholders that will help implement these projects.
    ii) As funding opportunities become available, collaborate with the appropriate partners to apply for project implementation
        (1) Exploration- What will the impacts of the new tennis courts be, and what will need to happen once they are built to address an increase in stormwater flows entering Rochester Heights Creek?
b) Build relationship with the ALPHA THETA OMEGA Chapter of ALPHA KAPPA Sorority in Raleigh
    i) Offer an educational opportunity to learn more about Rochester Heights Creek, the flooding and stormwater concerns that occur throughout the drainage area, and the benefits of upstream projects can help downstream neighbors
    ii) Collaborate with Barbara Doll to implement a stream stabilization project
    iii) Collaborate with NCDOT to do retrofits along Garner Road, specifically on the Omega property (2501 Garner Rd.) with the stormwater outlet and the incised drainage flow line

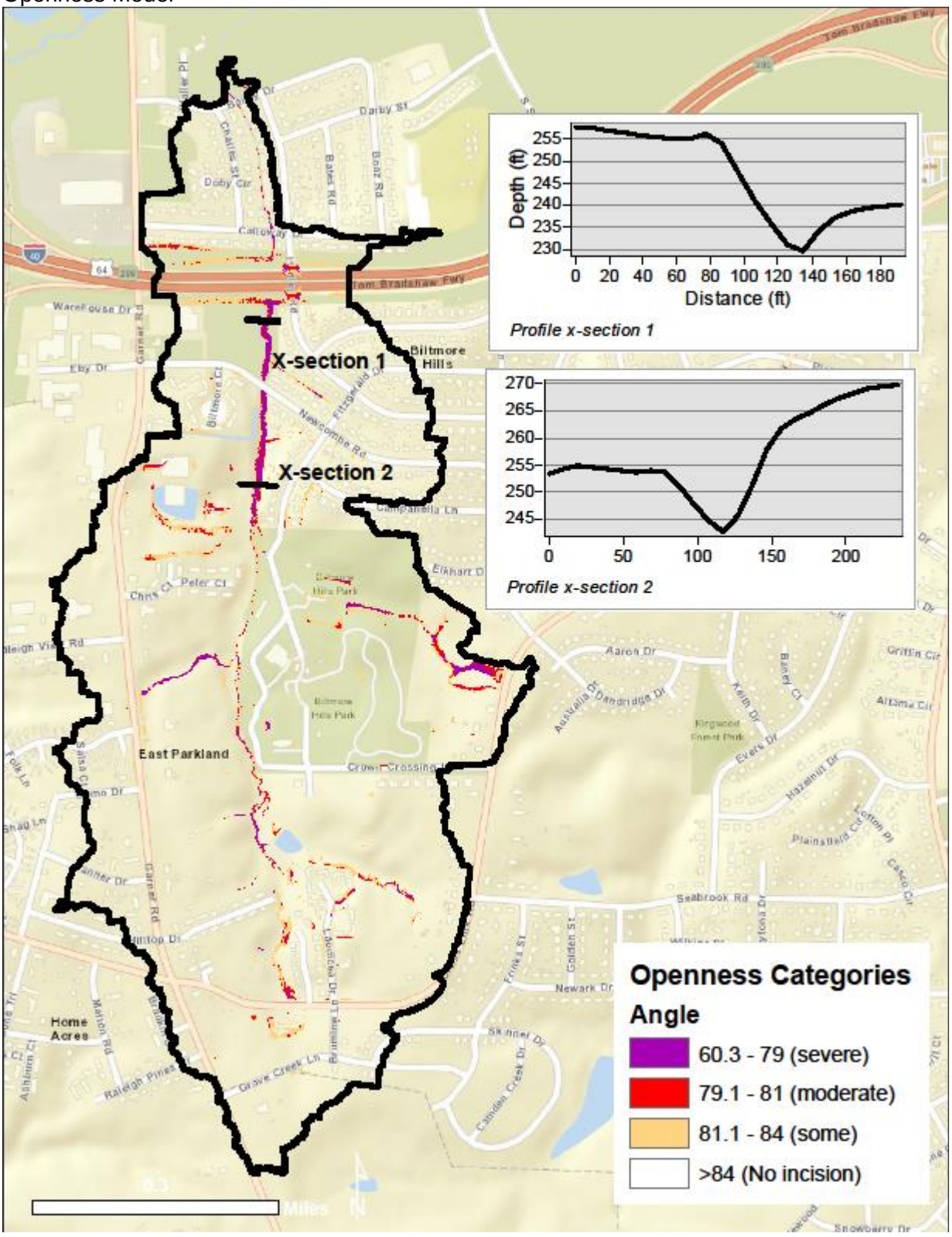
2) Approach and collaborate with future development in the drainage area to ensure a meaningful reduction of stormwater in development plans and to reduce buy-downs
    a) Collaborate with Partners for Environmental Justice, appropriate City departments, private properties
    b) Due to the need to reduce and slow down flows, stormwater buy-downs should not be allowed in this focus area
    c) Offer educational materials to the new developers of the history and current status of flooding and stormwater within the neighborhoods
3) Continue engagement of residents who live along RHC
    a) If upstream projects are implemented, how have they altered the effects of big rain events?
    b) For those who expressed interest in small-scale projects, are they still interested? Have they talked with their landlords?
        i) This is not as important, however, the conversations have been had, and could continue if more funding becomes available.
    c) Offer educational resources or engagement events for residents to continue learning about stormwater and flooding, and ways that they can become involved in efforts to reduce the impacts of big storms
        i) How have these educational offerings been received?
            (1) Are people interested/engaged and learning?

Appendix

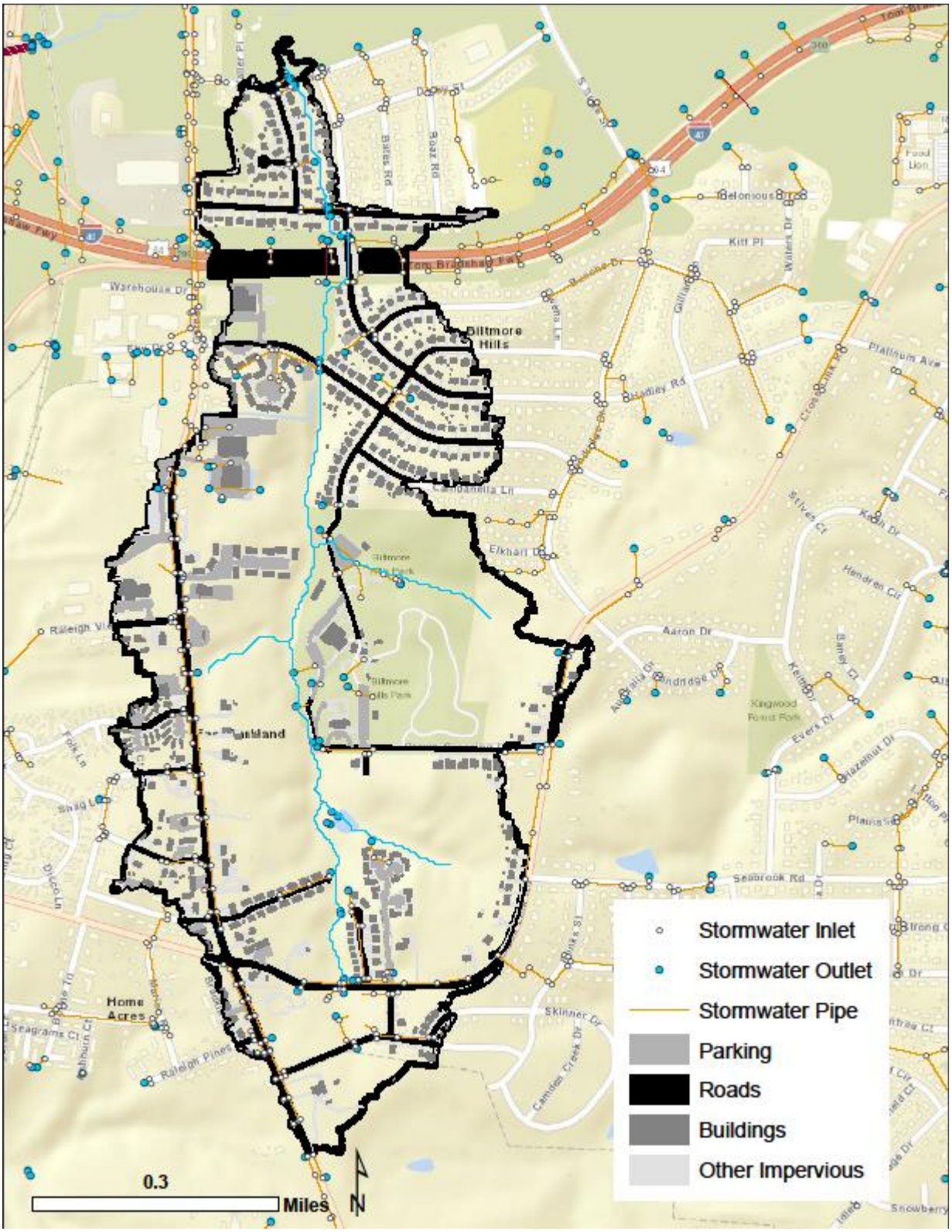
Flow Concentration



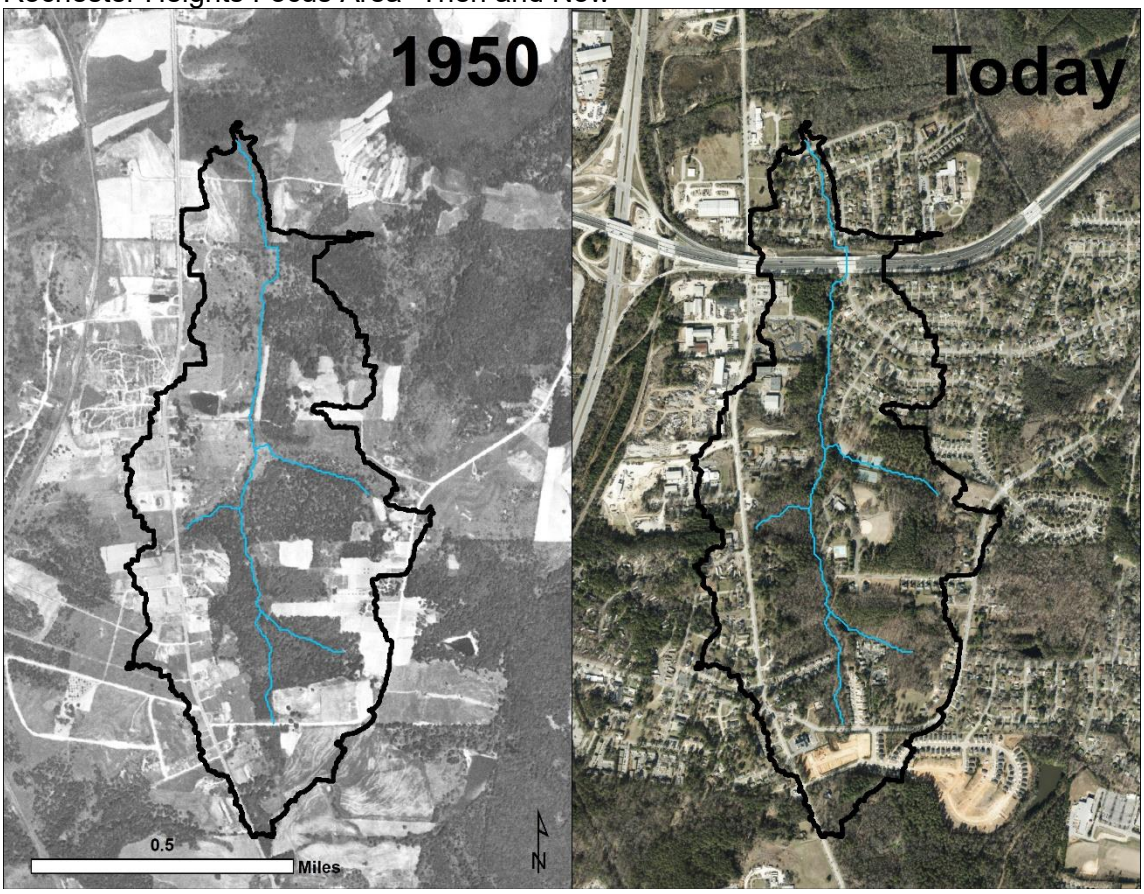
Openness Model



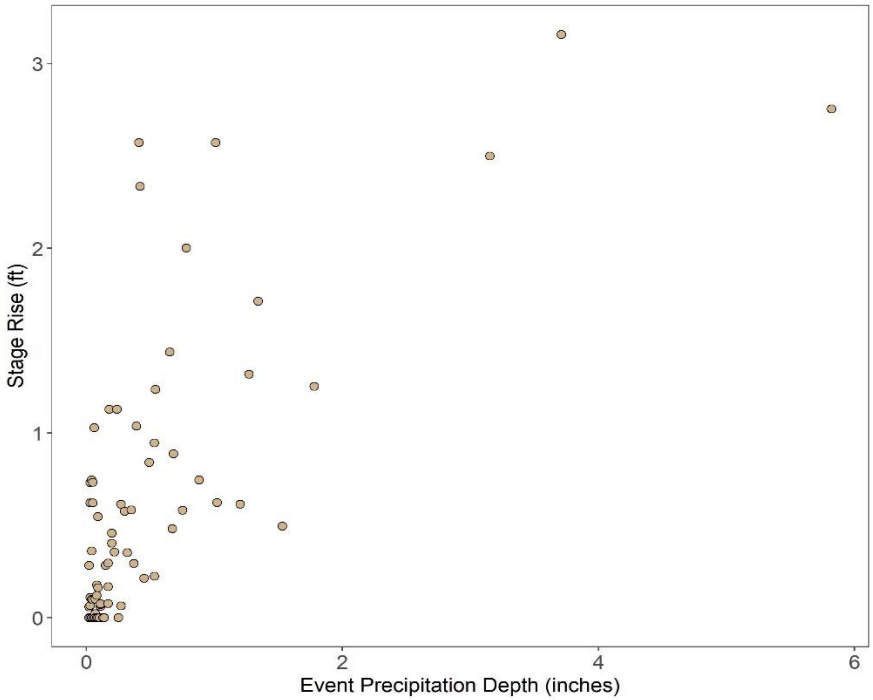
Stormwater Infrastructure

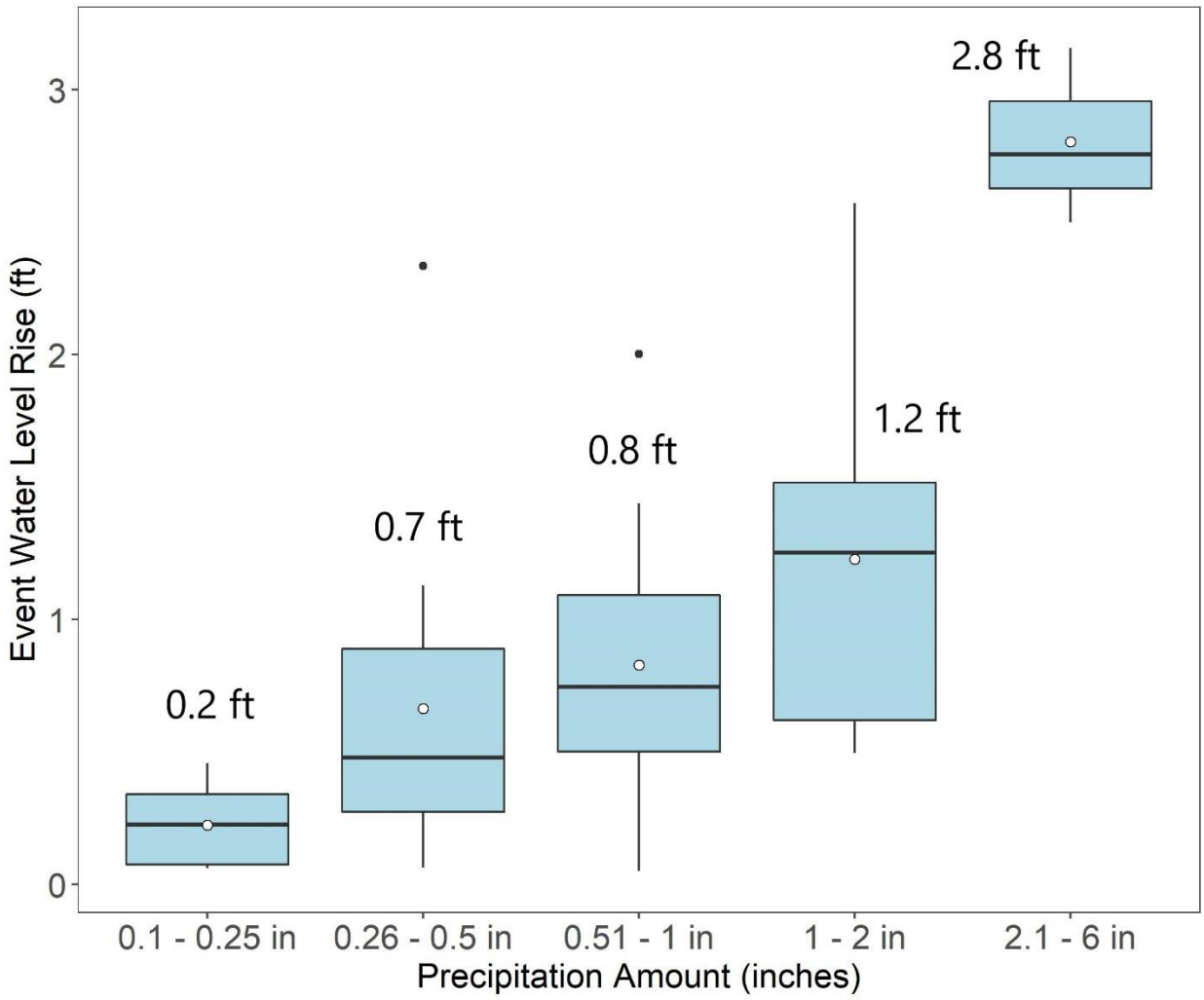


Rochester Heights Focus Area “Then and Now”



Amount of rainfall and the creeks response




Event Water Level Rise (ft)
3
2
1
0
0.2 ft
0.7 ft
0.8 ft
1.2 ft
2.8 ft
0.1 - 0.25 in
0.26 - 0.5 in
0.51 - 1 in
1 - 2 in
2.1 - 6 in
Precipitation Amount (inches)