



Town of Carrboro

Town Hall
301 W. Main St.
Carrboro, NC 27510

Meeting Agenda Town Council



Tuesday, May 5, 2020

7:00 PM

Council Chambers - Room 110

7:00-7:10

A. POETRY READING, RESOLUTIONS, PROCLAMATIONS, AND ACKNOWLEDGEMENTS

1. [20-202](#) PORCH 10TH Anniversary Proclamation

7:10-7:15

B. ROLL CALL

7:15-7:20

C. REQUESTS FROM VISITORS AND SPEAKERS FROM THE FLOOR

Comments are limited to three minutes per speaker. If you wish to make a public comment during an online meeting, please contact the Town Clerk's office via email at publiccomment@townofcarrboro.org or by phone at (919) 918-7310 no later than 5PM on Monday.

7:20-7:30

D. CONSENT AGENDA

1. [20-201](#) Approval of Minutes from April 14, 2020
2. [20-161](#) Construction Contract Authorization for the Stream Restoration Project at Public Works
PURPOSE: The purpose of this item is for the Town Council to authorize the Town Manager to execute a construction contract for the Public Works Stream Restoration Project.

Attachments: [Resolution for Stream Restoration Construction](#)
[Engineer's Recommendation of Award Carrboro](#)
[Engineer's Tabulation of Bids Carrboro](#)

E. OTHER MATTERS

7:30-7:50

1. [20-199](#) Update from Chief Schmidt on COVID-19

7:50-8:20

2. [20-200](#) Facial Cover Resolution

Attachments: [Resolution Recommending the Use of Facial Covering.docx](#)

8:20-9:20

3. [20-134](#) Toms Creek RainReady Pilot Project

PURPOSE: The purpose of this item is for the Council to receive a report from the Center for Neighborhood Technology regarding their RainReady study.

Attachments: [Attachment A - Resolution 05-05-2020](#)
[RainReady Final Report](#)
[SWAC Review of Discussion Feb 13th Meeting](#)
[Staff Intro Presentation](#)
[CNT Presentation 050520](#)

9:20-10:20

4. [20-198](#) Reconsideration of Human Services Funding for Diaper Bank of NC, Exchange Club's Family Center of Alamance County, and Club Nova for Fiscal Year 2020-2021.

PURPOSE: The purpose of this item is for the Carrboro Town Council to reconsider human services funding allocations for the Diaper Bank of NC, Exchange Club's Family Center of Alamance County, and Club Nova.

Attachments: [Attachment A Resolution HS 5.5.20.docx](#)
[Attachment B FY20-21 Human Services Recommendations % Change](#)

F. MATTERS BY COUNCIL MEMBERS



Town of Carrboro

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301 W. Main St.
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Agenda Item Abstract

File Number:20-202

Agenda Date: 5/5/2020

File Type:Agendas

In Control: Board of Aldermen

Version: 1

PORCH 10TH Anniversary Proclamation



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Agenda Item Abstract

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Approval of Minutes from April 14, 2020



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Agenda Item Abstract

File Number:20-161

Agenda Date: 5/5/2020

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TITLE:

Construction Contract Authorization for the Stream Restoration Project at Public Works

PURPOSE: The purpose of this item is for the Town Council to authorize the Town Manager to execute a construction contract for the Public Works Stream Restoration Project.

DEPARTMENT: Public Works, Finance

CONTACT INFORMATION: Randy Dodd, Stormwater Utility Manager 919-918-7341; Joe Guckavan, Public Works Director, 919 918-7427; Ben Schmadeke, Capital Project Manager, 919 918-7424; Arche McAdoo, Finance Director, 919-918-7439; Cary McNallan, Budget and Contracts Specialist, 919-918-7301

INFORMATION: Following on Hurricane Florence, staff have been pursuing a stream restoration project at Public Works because of the hazardous situation associated with the unstable banks, expanding stream channel, and nearby fuel tanks and buildings. The preliminary engineering for this project, authorized per a project ordinance on June 18, 2019, has been completed by Jennings Environmental. A modification of the project ordinance to allocate an additional \$265k for construction was approved on March 10, 2020. A construction bid was advertised on March 19, including advertisement through the State for Historically Underutilized Businesses (HUBs), and a bid opening held on April 16th. 5 proposals were reviewed, (including 2 proposals from HUBs [North State Environmental, Carolina Environmental, both women owned]), and the bid results tabulated (attached). It is recommended that the project be awarded to North State Environmental as the lowest cost responsive and responsible bidder.

Public Works staff continue to pursue FEMA Public Assistance funding for the project. The Public Assistance process does not obligate funding in advance, but is rather on a reimbursal basis. Therefore, Town funding is needed up front and is at risk until approved through the Public Assistance process. The Public Assistance process is time limited, so there is time sensitivity in approving this request to maximize the potential for federal funding support. There is also time sensitivity associated with moving into construction as soon as possible given the approaching tropical storm season. Staff will move forward with executing the contract and initiating work upon Council approval.

FISCAL & STAFF IMPACT: The construction contract bid amount is \$139,759.98. Staff time for project coordination/oversight and pursuit of Public Assistance funding will also be needed.

Agenda Date: 5/5/2020

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RECOMMENDATION: Staff recommends that the Council adopt the resolution (Attachment A) authorizing the Town Manager to enter into a construction contract.

**A RESOLUTION FOR CONTRACT AWARD FOR
STREAM RESTORATION AT PUBLIC WORKS SITE**

WHEREAS, the Town Council of Carrboro has adopted a Capital Project Ordinance appropriating \$345,000 for design and construction of stream restoration at the Public Works Facility; and

WHEREAS, the Town has procured bids for construction using a formal bid process; and

WHEREAS, sealed bids were undertaken in compliance with state and federal procurement requirements, including outreach to Historically Underutilized Businesses (HUB), and;

WHEREAS, North State Environmental has been identified as the lowest responsive and responsible bidder, with a construction bid of \$139,759.98.

NOW THEREFORE, BE IT RESOLVED BY THE TOWN COUNCIL OF THE TOWN OF CARRBORO THAT:

1. The construction contract for stream restoration at the public works site is awarded to North State Environmental for an amount not to exceed \$139,759.98;
2. The Town Manager is authorized to enter into a construction contract with North State Environmental for the amount specified in 1 above; and,
3. The term of the construction contract shall not exceed 13 months including warranty period.
4. This resolution is effective immediately.

This the 5th day of May in 2020.

MEMORANDUM

Date: April 20, 2020

To: Randy Dodd
Town of Carrboro

From: Greg Jennings, PhD, PE, President
Jennings Environmental PLLC

Subject: Engineer's Recommendation of Award
UT Morgan Stream Restoration Project



This memo documents the bidding process for the UT Morgan Stream Restoration project and includes my recommendation of award. Five sealed bids were opened on the bid deadline of April 16, 2020. All five bidder were determined by Town staff to be responsible and responsive.

The attached Bid Tabulation verifies that North State Environmental is the Apparent Low Responsible Bidder with a total bid of \$139,759.98.

The bid tab submitted by this bidder is complete and all required documents were included with the bid submission. The total price is within the project budget and is reasonable based on the engineer's opinion of probable cost.

It is my recommendation that the City award the contract to North State Environmental, Inc.

Jennings Environmental PLLC
 Engineers Tabulation of Bids
 Owner: Town of Carrboro, NC

Engineer: Gregory D. Jennings, PE
 Engineer Signature: *Gregory D. Jennings*



Project: Carrboro Public Works -- UT Morgan Creek Restoration

Bid Date: 16 April 2020

Apparent Low Responsive Bidder: **North State Environmental**

					North State Environmental		Fluvial Solutions		Carolina Wetlands		Backwater		Carolina Environmental	
Item #	PSP #	Description	QTY	Unit	Unit Price (\$)	Amount Bid (\$)	Unit Price (\$)	Amount Bid (\$)	Unit Price (\$)	Amount Bid (\$)	Unit Price (\$)	Amount Bid (\$)	Unit Price (\$)	Amount Bid (\$)
1	1.1	Mobilization	1	LS	\$9,863.00	\$ 9,863.00	\$14,000.00	\$ 14,000.00	\$10,000.00	\$ 10,000.00	\$2,587.50	\$ 2,587.50	\$10,527.00	\$ 10,527.00
2	1.2	Construction Survey	1	LS	\$1,912.00	\$ 1,912.00	\$4,500.00	\$ 4,500.00	\$6,000.00	\$ 6,000.00	\$2,492.05	\$ 2,492.05	\$2,573.68	\$ 2,573.68
3	1.3	As-Built Survey	1	LS	\$3,083.00	\$ 3,083.00	\$4,000.00	\$ 4,000.00	\$13,000.00	\$ 13,000.00	\$2,957.80	\$ 2,957.80	\$3,000.00	\$ 3,000.00
4	1.4	Pole Barn Demolition	1	LS	\$843.00	\$ 843.00	\$7,500.00	\$ 7,500.00	\$3,000.00	\$ 3,000.00	\$1,560.09	\$ 1,560.09	\$2,707.37	\$ 2,707.37
5	2.1	Chain Link Fence Demolition	70	LF	\$11.00	\$ 770.00	\$10.00	\$ 700.00	\$14.00	\$ 980.00	\$17.71	\$ 1,239.70	\$8.29	\$ 580.30
6	2.2	Clearing and Grubbing	0.14	AC	\$25,857.00	\$ 3,619.98	\$15,000.00	\$ 2,100.00	\$21,071.43	\$ 2,950.00	\$38,888.68	\$ 5,444.42	\$9,386.32	\$ 1,314.08
7	2.3	Significant Tree Removal (12" - 24" DBH)	7	EA	\$2,143.00	\$ 15,001.00	\$750.00	\$ 5,250.00	\$1,015.00	\$ 7,105.00	\$305.01	\$ 2,135.07	\$2,095.79	\$ 14,670.53
8	2.4	Temporary Construction Entrance	1	EA	\$1,306.00	\$ 1,306.00	\$10,000.00	\$ 10,000.00	\$1,500.00	\$ 1,500.00	\$1,775.08	\$ 1,775.08	\$2,584.00	\$ 2,584.00
9	2.5	Construction Safety Fence	220	LF	\$2.00	\$ 440.00	\$2.50	\$ 550.00	\$2.00	\$ 440.00	\$2.47	\$ 543.40	\$2.50	\$ 550.00
10	2.6	Temporary Pump Around System	1	LS	\$5,000.00	\$ 5,000.00	\$7,500.00	\$ 7,500.00	\$15,000.00	\$ 15,000.00	\$9,106.00	\$ 9,106.00	\$6,360.00	\$ 6,360.00
11	3.1	Stream Channel and Floodplain Excavation	1	LS	\$6,000.00	\$ 6,000.00	\$37,500.00	\$ 37,500.00	\$33,815.00	\$ 33,815.00	\$11,627.84	\$ 11,627.84	\$10,829.47	\$ 10,829.47
12	4.1	Boulder Riffle	1	EA	\$17,006.00	\$ 17,006.00	\$25,000.00	\$ 25,000.00	\$26,165.00	\$ 26,165.00	\$21,181.30	\$ 21,181.30	\$16,370.26	\$ 16,370.26
13	4.2	Boulder Cross-Vane	3	EA	\$7,844.00	\$ 23,532.00	\$10,000.00	\$ 30,000.00	\$20,527.45	\$ 61,582.35	\$8,848.84	\$ 26,546.52	\$13,708.40	\$ 41,125.20
14	4.3	Pool Stabilization	60	TN	\$80.00	\$ 4,800.00	\$200.00	\$ 12,000.00	\$145.45	\$ 8,727.00	\$62.42	\$ 3,745.20	\$49.96	\$ 2,997.60
15	4.4	Boulder Wall	80	LF	\$136.00	\$ 10,880.00	\$500.00	\$ 40,000.00	\$397.00	\$ 31,760.00	\$318.13	\$ 25,450.40	\$177.88	\$ 14,230.40
16	4.5	Boulder Wall with Geolift	75	LF	\$150.00	\$ 11,250.00	\$650.00	\$ 48,750.00	\$560.00	\$ 42,000.00	\$307.10	\$ 23,032.50	\$163.83	\$ 12,287.25
17	5.1	Flexamat (Or Equiv.)	130	SY	\$119.00	\$ 15,470.00	\$200.00	\$ 26,000.00	\$90.00	\$ 11,700.00	\$108.21	\$ 14,067.30	\$87.76	\$ 11,408.80
18	5.2	Erosion Control Matting - Coir 700g	550	SY	\$6.00	\$ 3,300.00	\$7.00	\$ 3,850.00	\$8.00	\$ 4,400.00	\$2.91	\$ 1,600.50	\$5.00	\$ 2,750.00
19	5.3	Temporary Seeding	680	SY	\$0.25	\$ 170.00	\$1.00	\$ 680.00	\$3.25	\$ 2,210.00	\$2.41	\$ 1,638.80	\$1.00	\$ 680.00
20	5.4	Permanent Seeding	680	SY	\$0.80	\$ 544.00	\$2.00	\$ 1,360.00	\$4.00	\$ 2,720.00	\$2.05	\$ 1,394.00	\$2.50	\$ 1,700.00
21	5.5	Plantings	350	STEMS	\$3.00	\$ 1,050.00	\$16.00	\$ 5,600.00	\$10.65	\$ 3,727.50	\$6.04	\$ 2,114.00	\$6.97	\$ 2,439.50
22	6.1	Chain Link Fence Installation	70	LF	\$56.00	\$ 3,920.00	\$35.00	\$ 2,450.00	\$30.00	\$ 2,100.00	\$52.42	\$ 3,669.40	\$47.99	\$ 3,359.30
Total Bid						\$139,759.98		\$289,290.00		\$290,881.85		\$165,908.87		\$165,044.74



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Agenda Item Abstract

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Update from Chief Schmidt on COVID-19



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Agenda Item Abstract

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Facial Cover Resolution

RESOLUTION RECOMMENDING THE USE OF FACE-COVERING WHEN IN A
PUBLIC PLACE AND UNABLE TO MAINTAIN A DISTANCE OF AT LEAST SIX (6)
FEET FROM ANOTHER PERSON AND WHEN UTILIZING PUBLIC OR PRIVATE
TRANSPORTATION FOR HIRE

WHEREAS, on March 10, 2020, North Carolina Governor Cooper issued EXECUTIVE ORDER 116, declaring a STATE OF EMERGENCY for the entire State of North Carolina to coordinate Response and Protective Actions to Prevent the Spread of COVID-19; and

WHEREAS, on March 13, 2020, Mayor Lavelle proclaimed the existence of a state of emergency in the Town of Carrboro to reduce the risk of exposure to our town employees, community members and visitors and limit the spread of the COVID-19 pandemic; and

WHEREAS, on March 20, 2020, to mitigate the impacts of COVID-19 and continue to “SHELTER-INPLACE,” Mayor Lavelle issued a COVID-19 proclamation declaring the INITIAL GUIDANCE FOR CARRBORO RESIDENTS REGARDING COVID-19; and

WHEREAS, on March 20, 2020, the Orange County North Carolina Board of Commissioners and the Town of Chapel Hill, both, issued a STAY-AT-HOME ORDERS; and

WHEREAS, on March 27, 2020, to slow the spread of COVID-19, Governor Cooper of the State of North Carolina issued EXECUTIVE ORDER 121, declaring a STAY-AT-HOME order beginning on March 30, 2020 and in effect until April 29, 2020; and

WHEREAS, on April 23, 2020, Governor Cooper of the State of North Carolina issued EXECUTIVE ORDER 135 to extend until May 8, 2020, North Carolina’s Stay At Home (Executive Order 121); and

WHEREAS, many individuals who contract COVID-19 display no symptoms or have mild symptoms and may not be aware they carry and can spread the virus and persons without symptoms can transmit the virus and because evidence shows the disease can easily spread, without appropriate precautions public places can facilitate transmissions of the virus; and

WHEREAS, on March 17, 2020, the New England Journal of Medicine reported that the novel coronavirus SARS-CoV-2 can survive in the air of confined spaces for several hours in fine aerosol particles; and

WHEREAS, the New England Journal of Medicine report authors found that the coronavirus that causes COVID-19 can be detected up to three hours after it is airborne and can lead to human infection throughout that time period; and

WHEREAS, it remains unknown, and at best uncertain, if COVID-19 is generally transmitted by airborne particles and how long the COVID-19 remains infectious in air droplets; and

WHEREAS, airborne, aerosol respiratory droplets may easily be emitted by uncovered face, nose and mouth talking, spitting, coughing and sneezing.

THEREFORE, the Carrboro Town Council resolves that it is recommended that, without profiling or bias, any individual over the age of five (5) and able to medically tolerate a face-covering shall cover their nose and mouth with cloth face-covering or mask when in a public place and unable to maintain a distance of at least six (6) feet from another person.

THEREFORE, the Carrboro Town Council resolves that it is recommended that any person utilizing public or private transportation carriers or for-hire vehicles, who is over the age of five (5) and able to medically tolerate a face-covering, shall wear a face-covering or a mask over their nose and mouth during any such trip. Any person who is operating such a public or private transport, shall likewise wear a facecovering or mask which covers the nose and mouth while there are any passengers in such vehicle.

BE IT RESOLVED that the Town shall promote and make publicly available COVID face-covering educational outreach, including through its website, on how face-covering or masks may be fashioned from materials commonly found in most homes, information on keeping coverings clean and ways to donate face-coverings and masks and materials that may be used to make these items.

BE IT RESOLVED that through the establishment of a clear policy of recommending and requesting the use of a face-covering or mask over the nose and mouth when in a public place and unable to maintain a distance of at least six (6) feet from another person, we hope to limit the spread and mitigate the impacts of the COVID-19 disease, save lives, promote and ensure the health and safety of our town and county residents, public service employees, transit operators, and businesses.

BE IT FURTHER RESOLVED that the Carrboro Town Council requests the Orange County Board of Commissioners, Chapel Hill Town Council, and Hillsborough Board of Commissioners consider passing resolutions recommending the use of face-covering when in a public place and unable to maintain a distance of at least six (6) feet from another person.

This, the 28th day of April 2020.



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Agenda Item Abstract

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Agenda Date: 5/5/2020

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TITLE:

Toms Creek RainReady Pilot Project

PURPOSE: The purpose of this item is for the Council to receive a report from the Center for Neighborhood Technology regarding their RainReady study.

DEPARTMENT: Public Works

CONTACT INFORMATION: Randy Dodd, Stormwater Utility Manager, 919 918-7341; Heather Holley, Stormwater Specialist, 919 918-7426.

INFORMATION: The Center for Neighborhood Technology (CNT) has completed their RainReady study which was initiated to provide the Town with recommendations for expanding residential scale resilience efforts in consideration of more frequent intense rain events. CNT has completed a neighborhood survey, provided a presentation for a public meeting, worked with staff and the Stormwater Advisory Commission to pursue the work and prepare a report, and will be providing a presentation summarizing their findings. The study used the upper Toms Creek watershed as the geographic area for data gathering to support a more focused and neighborhood scale undertaking and given the flooding and drainage impacts that have been experienced along upper Toms Creek. While the findings are based on work in this area, the intent has been to pilot efforts that can also be of benefit on a town wide basis. The Stormwater Advisory Commission has participated in the study and prepared input (see attachment). More information on stormwater and flood related concerns in this watershed are available at <https://www.townofcarrboro.org/1227/Toms-Creek>.

FISCAL & STAFF IMPACT: There is no fiscal impact associated with the Council receiving this report. There will be fiscal and staff impacts in implementing the recommendations, with the details pending future work, and direction.

RECOMMENDATION: It is recommended that the Council accept the Center for Neighborhood Technology report and presentation and adopt the attached resolution.

ATTACHMENT A

A RESOLUTION ACCEPTING THE CENTER FOR NEIGHBORHOOD RAINREADY STUDY AND DIRECTING STAFF TO WORK WITH THE STORMWATER ADVISORY COMMISSION AND PROVIDE A REPORT ON IMPLEMENTING THE RECOMMENDATIONS IN THE STUDY.

WHEREAS, the Council approved support from the Center for Neighborhood Technology (CNT) to prepare a study based on their RainReady program in September of 2019, using the upper Toms Creek neighborhood as a pilot study area; and

WHEREAS, CNT has completed the study which included a neighborhood survey, community presentation, participation and review by the Stormwater Advisory Commission, and has prepared a report and presentation.

NOW, THEREFORE BE IT RESOLVED by the Carrboro Town Council that the Council accept the pilot study, and direct staff to continue to work with the Stormwater Advisory Commission to pursue the recommendations provided in the study.

This is the 5th day of May in the year 2020.

RainReady Carrboro

Carrboro, North Carolina

Pilot Study



PREPARED FOR THE TOWN OF CARRBORO, NORTH CAROLINA

PREPARED BY CENTER FOR NEIGHBORHOOD TECHNOLOGY

APRIL 2020

Contents

Executive Summary.....	4
Introduction	6
Climate	6
Geology	6
Land use and development	6
Stormwater infrastructure.....	7
The Path Forward.....	7
Pilot Study: Upper Toms Creek	9
Existing Conditions	10
Flooding.....	10
Socioeconomics	12
Housing	12
Grey and Green Infrastructure	13
Solution: Small-Scale Distributed Green Infrastructure	14
Policy and Regulations	17
Community Engagement	17
Resident Survey.....	18
Stormwater Advisory Commission Public Meeting	21
Program Recommendations	24
Outreach and Education	24
Community Partnerships	25
Policy and Regulations	27
Program Design Considerations	27
Limitations.....	27
Alternatives	28
Financing and Funding	28
Anticipated Revenue.....	28
Other Financing and Funding Options.....	29
Affordability	30
Program Eligibility	33
Metrics and performance indicators	34

Timeline and Implementation	34
Short-term (1 year)	35
Mid-term (2 – 4 year).....	35
Long-term (5+ year)	35
Data	36
Limitations.....	36
Appendices.....	37
Appendix A: Resident Survey Responses	38
Appendix B: Presentation to Stormwater Advisory Commission Public Meeting	39
Appendix C: Acronym List	40
Appendix D: Glossary of Terms.....	41
Appendix E: Implementation Resources.....	49
Appendix F: Questions/Suggestions for Further Consideration by Town Staff and Board.....	1

Executive Summary

Carrboro is vulnerable to the pervasive, impacts of urban flooding. Urban flooding occurs when homes, yards, or streets are inundated with water from heavy rains, potentially damaging property and making travel difficult and dangerous. It can include impacts ranging from water entering living space or seeping through foundation walls to erosion to undesirable ponding of water. In Carrboro, flooding can generally be attributed to the following primary factors:

- Climate
- Geology
- Land Use and Development
- Stormwater Infrastructure

CNT evaluated Upper Toms Creek, an area of approximately 284 acres (“the study area”), for constraints and opportunities regarding distributed “green infrastructure” on residential property. Green infrastructure is defined as any stormwater management technique or practice that reduces runoff volume through preserving, restoring, utilizing, or enhancing the natural ecosystem processes of water infiltration, evapotranspiration, and reuse. Approaches include green roofs, trees and tree boxes, rain gardens, vegetated swales, porous and permeable pavements, dry wells, rain barrels, and cisterns.¹ Distributed green infrastructure implements a series of smaller-scale installations across an area such as a neighborhood, rather than one large installation for the area.

According to a previous engineering study, a location for a single large-scale public project that would offer significant flood mitigation benefits was not able to be identified. In fact, there are significant constraints to further consideration of such projects.² Nevertheless, individual property owners can realize benefits through green infrastructure projects within their yards. The benefits could accrue across properties, especially if enough residents do so, distributing green infrastructure throughout the study area. Therefore, the Town may wish to implement distributed green infrastructure across residential properties.

- An estimated one-third of residential land within the study area could be improved with green infrastructure. This could be increased by selecting shade-tolerant green infrastructure.
- Soil types range from moderately well drained to poorly drained. Soil will need to be amended to improve drainage for new green infrastructure treatments.
- Green infrastructure can provide community-wide benefits, including runoff reduction for all residents.
- Green infrastructure improvements will be complementary to other stormwater, watershed, and floodplain management efforts. Specific insurable structures, especially those built in the regulatory floodplain, could benefit from a suite of possible approaches (e.g., buyout/relocation, elevation, building floodproofing, large/watershed scale engineering projects) to mitigate flood risk.

¹ See Glossary of Terms, Appendix D of this report.

² Sungate Design Group. (2016). Tom’s Creek Flood Study: Preliminary Hydrological Report.

<https://www.townofcarrboro.org/DocumentCenter/View/6434/Toms-Creek-2016-EngineeringFlood-Study>

This report contains specific recommendations to support the development of a distributed residential green infrastructure program for the purpose of stormwater runoff reductions. Recommendations address the following areas:

- Enhanced community outreach and education;
- Development of new community partnerships;
- Financing and funding options;
- Affordability;
- Program eligibility requirements;
- Program metrics and performance indicators; and
- Program development and implementation timeline

A RainReady future for Carrboro is within reach. While this study was prompted by the problems of urban and overbank flooding, the path ahead will build upon—and strengthen in turn—the community’s unique strengths, or assets. By bringing flooding challenges and solution opportunities into the light, creating venues for collaboration, and outlining a clear roadmap for implementation, this study aims to support the community’s path towards flood resiliency.

Introduction

Carrboro is vulnerable to the pervasive impacts of urban flooding. Urban flooding occurs when homes, yards, or streets are inundated with water from heavy rains, potentially damaging property and making travel difficult and dangerous. It can include impacts ranging from water entering living space or seeping through foundation walls to erosion to undesirable ponding of water.

In Carrboro, flooding can generally be attributed to the following primary factors:

- Climate
- Geology
- Land Use and Development
- Stormwater Infrastructure

Climate

Flooding is an increasingly pressing issue due to changes in precipitation patterns, characterized by more high-intensity storms.

According to the National Climate Assessment (i.e., a report compiled by a team of over 300 experts) heavy downpours have been increasing nationally, especially over the last three to five decades.³ North Carolina-based researchers have confirmed these findings for North Carolina.⁴ These more frequent heavy storms place a heavy burden on the local drainage system, which must manage larger and faster volumes of water than in the past.

Geology

Soils in some areas have limited infiltration capacity.

Limited soil infiltration capacity is due both to local geology and historical land use resulting in loss of topsoil and compaction. In areas of the Piedmont physiographic region, soil horizon is thin, and soils generally have lower permeability. Soil types in the Upper Toms Creek study area consist of loams, silt loams, and sandy loams, with slopes between 0 and 12% and a range of soil hydrologic groups from moderately well drained to poorly drained.⁵ Where better soils are found these locations are often along watercourses where the streams have re-worked the composition.

Land use and development

Flooding is exacerbated by historical and current patterns of land development.

Historical and ongoing land development in Carrboro contributes to flooding and impacts water quality. These days, rainwater that falls within Carrboro is more likely to hit an impervious surface, such as a street,

³ USGCRP. (2018). 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (Eds.)]. *U.S. Global Change Research Program*, 1515 pp. doi: 10.7930/NCA4.2018.

⁴ Kunkel, K.E., Easterling, D.R., Ballinger, A., Bililign, S., Champion, S.M., Corbett, D.R., Dello, K.D., Dissin, J., Lackmann, G.M., Luettich Jr., R.A., Perry, L.B., Robinson, W.A., Stevens, L.E., Stewart, B.C., & Terando, A.J. (2020). North Carolina Climate Science Report, North Carolina Institute for Climate Studies. Retrieved from https://ncics.org/pub/nccsr/NC%20Climate%20Science%20Report_FullReport_Final_March2020.pdf

⁵ USDA Natural Resources Conservation Service. (nd.) Web Soil Survey. <https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>

rooftop, or parking lot, than a permeable surface, like a forest, field, or wetland than in the past. The result is an increase in stormwater runoff, which is rainwater or snowmelt that flow over land, impervious surfaces (such as paved streets, parking lots, and rooftops), or highly compacted soils (such as lawns), and must be managed by local drainage systems.

The Piedmont bioregion around Carrboro is known for its natural biodiversity, meaning the variety of different ecosystems, habitats, and species. This made for abundant hunting, fishing, and trading for Indigenous people, as well as early explorers and settlers. Today, however, this biodiversity and local ecosystems are compromised and threatened.

During preindustrial colonial settlement, much of Carrboro's forests were cut for timber and conversion to farmland. The postindustrial extension of a railroad corridor to the University of North Carolina, and subsequent production of railroad ties and opening of a mill, further transformed the local landscape. Starting after World War II, open areas were first gradually and then more rapidly replaced by impervious surfaces to support mostly residential development but also some commercial lands. The Town adopted the Land Use Ordinance in 1980; there have been a series of amendments that have added stormwater and floodplain management requirements over the past four decades that have mitigated more recent development impacts, but a good deal of development (particularly areas closer to downtown) predates these stormwater and floodplain management provisions.

Today, Carrboro's land use and development patterns include the subdivision of land and location of some buildings in lower lying, flood prone areas; buildings with living and accessory space (e.g., split-levels and basements) constructed "below grade" (i.e., underground) or "at grade" (i.e., at ground level); land conversion to impervious and less pervious surfaces; and, as mentioned, development in many areas that preceded federal, state, and local regulation and supporting analyses and standards.

While impervious surfaces, like rooftops and roads, are byproducts of our human need for shelter, transportation, and commerce, they prevent the natural processes of infiltration (water soaking into the ground), interception (water being absorbed in woody vegetation before reaching the ground) and evapotranspiration (water evaporating back into the atmosphere through plants and trees). Consequently, rain—instead of being used as a valuable resource and asset— becomes stormwater runoff and is treated as a liability, a waste product that contributes to local flooding and environmental issues.

Stormwater infrastructure

Undersized and older infrastructure in some areas increases the risk of drainage and flooding problems.

There are several challenges to improving inadequate stormwater infrastructure, including (but not limited to) the high costs for both design and construction as well as legal constraints associated with the work sometimes needed across public and private properties.

The Path Forward

A RainReady future for Carrboro is within reach. While this study was prompted by the problems of urban and overbank flooding, the path ahead will build upon—and strengthen in turn—the community's unique strengths, or assets. In fact, Carrboro possesses the foundational community assets, strengths, and know-how necessary to mitigate flooding and achieve broader community goals.

By bringing flooding challenges and solution opportunities into the light, creating venues for collaboration, and outlining a clear roadmap for implementation, this study aims to support the community's path towards flood resiliency.

Two concepts will permeate this entire report:

Gray infrastructure refers to the traditional way that utilities move stormwater from one place to another — using a centralized network of pipes, pumps, tanks, and reservoirs — to prevent flooding and reduce runoff pollution.

Green infrastructure refers to manmade features — for example, using decentralized rain gardens, bioswales, and stormwater parks — that emulate the natural process whereby stormwater is filtered and absorbed into the earth where it falls.

Green infrastructure strategies alone may not solve all of the different flooding problems experienced by residents of the study area or throughout Carrboro. However, an effective and efficient solution will strategically integrate both strategies into a comprehensive approach.

We have organized our recommendations in this study into a framework for action across scales and institutions.

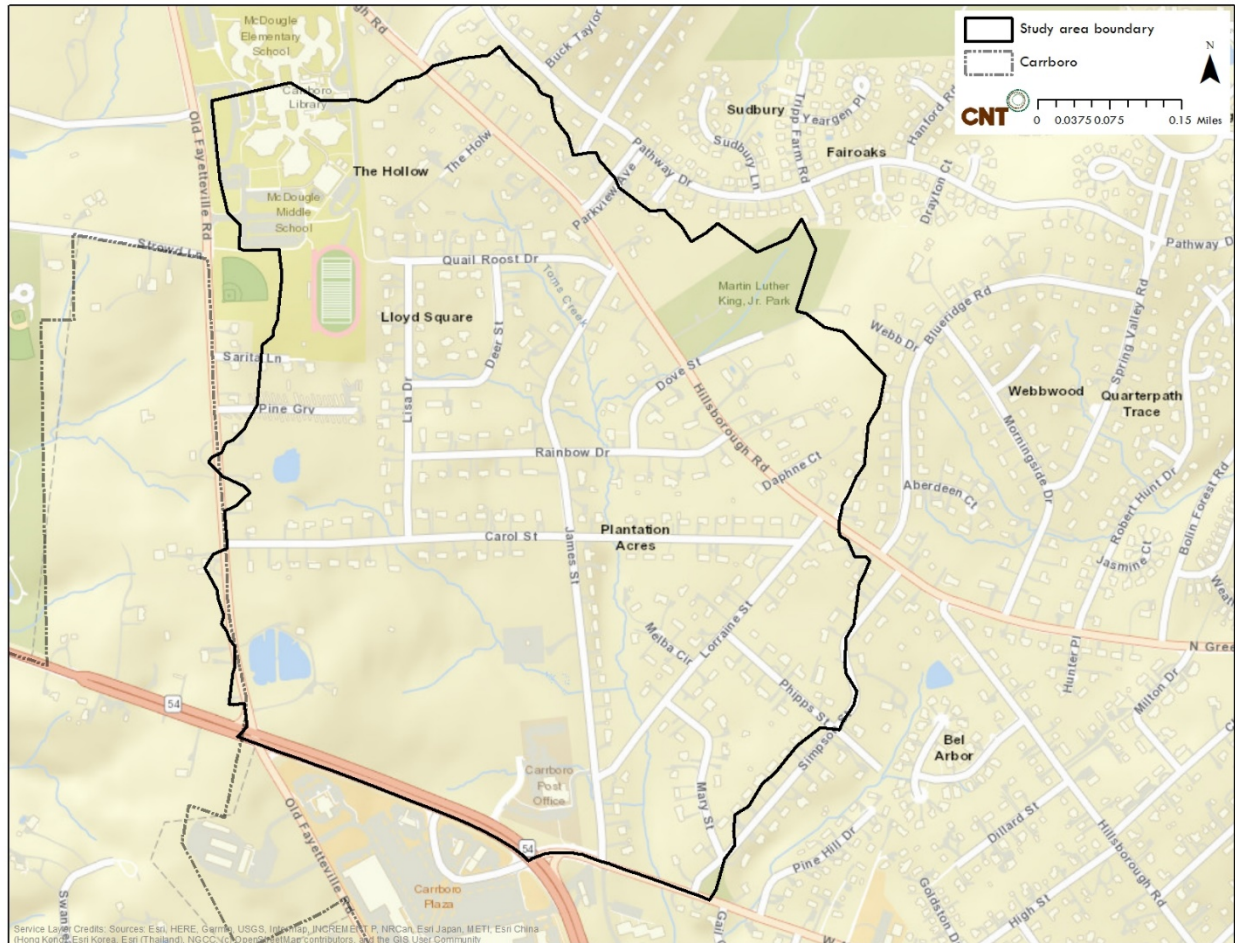
- Reorient the community. Many residents experience non-structural flooding (e.g., yard flooding) and would benefit from a range of options that can be pursued by the Town. For buildings located in known severe flooding areas, such as natural floodplains, the Town should continue to support property owners seeking assistance from federal programs.
- Repair or replace, as needed, existing stormwater infrastructure through the Town's operations and capital improvement planning process. In 2017, the Town approved the creation of a Stormwater Utility, which is supporting ongoing stormwater program needs. Opportunities can be coordinated with stormwater management projects that address federal and state water quality regulatory requirements associated with watershed restoration, protection and restoration of Jordan Lake, and the Town's NPDES Phase II permit.
- Retrofit the landscape. Existing stormwater infrastructure should be enhanced with green infrastructure, by converting underutilized impervious and less pervious surfaces into natural landscapes, installing concentrated and integrated green and grey infrastructure, and restoring natural areas. The Town has already begun this process. For example, the popular Farmers Market/Town Commons has incorporated permeable pavement. Dr. Martin Luther King Jr. Park recently incorporated a constructed wetland and multiple cisterns to support both retention and infiltration. In addition, some Carrboro residents have already invested in nature-based stormwater management solutions on their own property. CNT's survey of Carrboro residents indicated that interest in these solutions continues and would benefit from additional support from the Town.

This report will recommend a series of options for the Town of Carrboro to partner with residents in support of the proliferation of distributed green infrastructure throughout the community.

Pilot Study: Upper Toms Creek

CNT evaluated the study area, Upper Toms Creek, an area of approximately 284 acres, for constraints and opportunities regarding distributed green infrastructure on residential property.

Figure 1. Upper Toms Creek Study Area



Existing Conditions

Flooding

The Town of Carrboro has experienced significant severe weather events that have included tropical storms, hurricanes, and other intense storms. For example, one of the worst recent storms was an intense non-tropical storm in June 2013 that resulted in a calculated rate of 4.4 inches of rain per hour.⁶

CNT reviewed available flood history claims and resident data for the pilot study area. CNT reviewed National Flood Insurance Program (NFIP) claims for the years 2011 to 2016, Federal Emergency Management Agency (FEMA) disaster relief claims for the years 2011 to 2016, and the citizen-reported data collected by the Town of Carrboro for the years 2012 to 2018. Note that citizen-reported data does not refer to insurable structures; many of these citizen reports relate to yard flooding. Table 1 summarizes flood insurance claims, flood disaster payouts, and citizen-reported flooding events. Figure 1 illustrates the location of flooding claims and self-reported events in the study area.

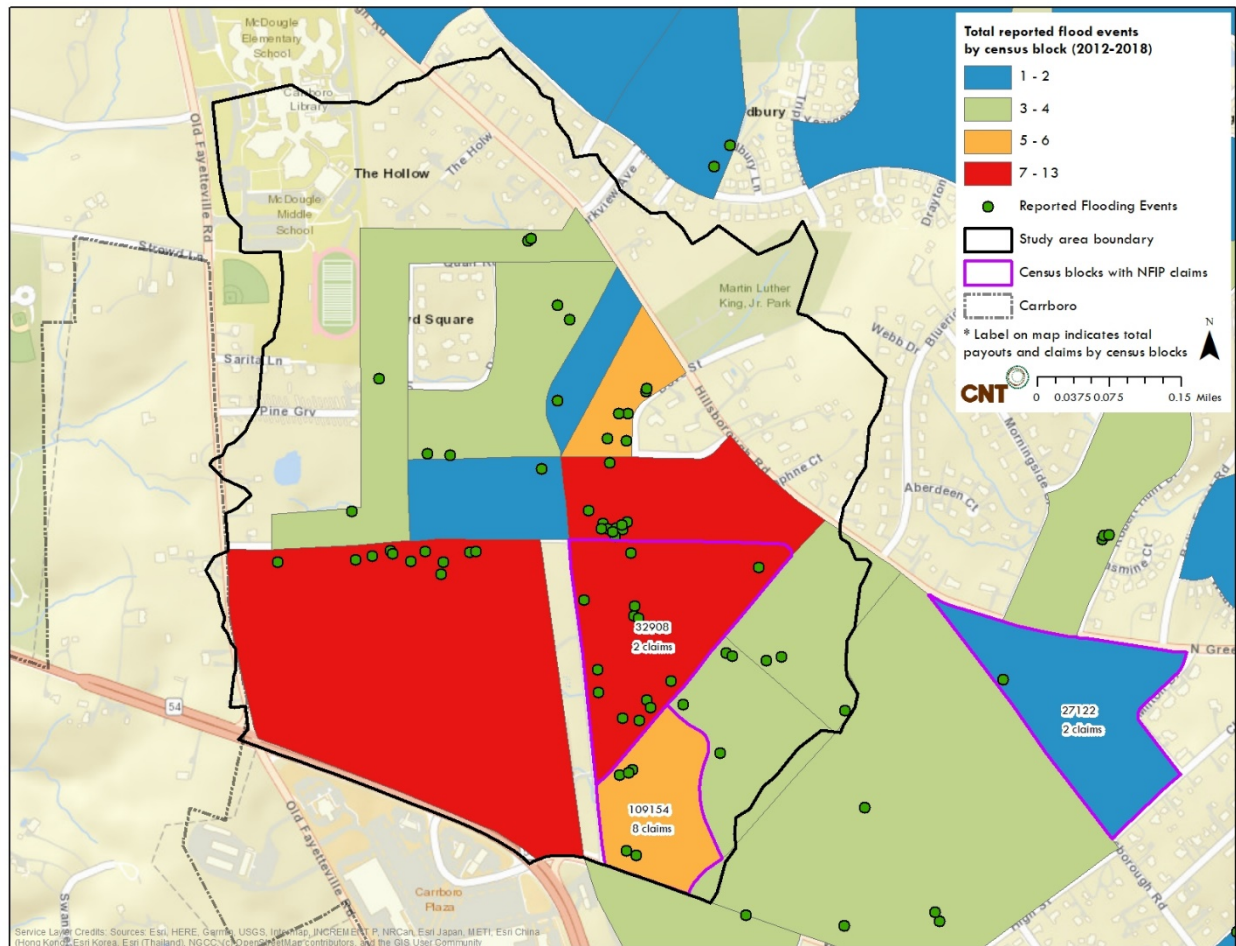
Table 1. Flood Claims, Payouts, and Citizen-Reported Flooding Events in Carrboro, North Carolina

NFIP Claims - 2011 to 2016 (census block level)		
	Study Area	Carrboro
Total Claims	10	12
Total Payouts	\$142,062	\$169,184
FEMA Disaster Relief - 2011 to 2016 (Zip code level)		
Zip code	27510	27516
Claims - Housing Assistance	9	
Payouts - Housing Assistance	\$13,086	
Claims - Other Need Assistance	5	
Payouts - Other Need Assistance	\$0	
Claims - Public Assistance	5	
Payouts - Public Assistance	\$26,081 ⁷	
Self-reported flooding events - 2012 to 2018 (census block level)		
	Study Area	Carrboro
Total count	63	110

⁶ Sungate Design Group. (2016).

⁷ Carrboro staff report that as of March 2020, \$58,932 has been received by Carrboro for Hurricane Florence recovery, and the Town is pursuing additional funds.

Figure 2. Reported Flooding Events in Upper Toms Creek Study Area, 2012 to 2018



CNT also reviewed a summary of the neighborhood site visit surveys conducted by the Town of Carrboro in 2013 and 2016. The following themes were identified in the resident responses.

- “Typical” storm damage could extend into entranceways and crawl spaces. This type of storm damage included yard ponding, impacts to an ancillary structure, home entrance, crawl space, street, driveway, and/or personal property, and mosquitoes.
- Some resident surveys cited the 2013 flood as the worst storm damage they had experienced, and included floodwater entering the dwelling. Flood damage included appliances and equipment, ancillary structure, wall/fence, lower level/basement/crawl space, vegetation, and mosquitoes.
- Flooding causes cited by residents included the condition of culverts (not maintained, not cleaned, or inadequate); insufficient detention; residents removing trees; impacts in riparian areas; and poor grading. Residents also cited larger issues such as increased development and climate change resulting in more intense rain events.
- Residents proposed several corrective measures such as grey infrastructure, natural resource management, land use strategies, and green infrastructure. Grey infrastructure recommendations included re-engineering the culverts, and increased maintenance and cleaning of culverts, sewers,

drainage ditches, and private stormwater grates. Natural resource management solutions included re-engineering and cleaning the stream, and promoting the benefits of trees and discouraging tree removal. Land use recommendations included regulating development, revising the infill ordinance, and stormwater planning for the watershed. Some residents reported implementing runoff reduction measures at their home, including some green infrastructure measures.

Socioeconomics

Within the Town of Carrboro, the median household income is \$56,773, and seventeen percent of households are below the federal poverty line. Relative to the town's overall demographics, the study area (pop. 1,304) has fewer people of color, fewer foreign born, and fewer low-income households. The study area has relatively more elderly residents and fewer youth, as compared to the town's total population. Finally, some residents report speaking English "less than very well," indicating a need to evaluate translation services for government services and programs. Table 2 summarizes socioeconomic data for the study area and the Town of Carrboro.

Table 2. Population Data, Carrboro, North Carolina, 2017

	Study Area	Carrboro
White	82%	64%
Hispanic or Latino	5%	10%
Asian	6%	9%
Black or African American	3%	13%
Two or More	3%	4%
American Indian or Alaskan Native	>1%	>1%
Other	1%	>1%
Households Below Poverty Line	7%	17%
Under 19 years old	17%	22%
65+ years old	17%	8%

Source: U.S. Census, American Community Survey, Carrboro, North Carolina, 2017

Housing

Most housing in the study area is single-family. While most homes in the study area are owner-occupied, nearly a third are renter-occupied. Accessory structures (sheds and carports) represent about one-quarter of all building structures and could have a significant impact on drainage pathways and impervious surface in the study area. Table 3 summarizes housing data for the study area and the Town of Carrboro.

Table 3. Housing Data, Carrboro, North Carolina, 2017

	Study Area	Carrboro
Owner Occupied Homes	70%	42%
Renter Occupied Homes	30%	58%
Single-Family Housing (SFH)	67.9%	65.8%
Multifamily Housing (MF)	1.8%	8.3%
Shed/Carport	25.4%	15.3%
Garage	2.2%	2.3%
Year Built: Single-Family Housing		
Pre-1940	0%	3%
1940 – 1969	23%	16%
1970 – 1999	55%	51%
2000-2019	11%	23%
No Year	10%	7%
Year Built: Multifamily Housing		
Pre-1940	0%	3%
1940 – 1969	75%	15%
1970 – 1999	25%	19%
2000-2019	0%	5%
No Year	0%	58%

Source: U.S. Census, American Community Survey, Carrboro, North Carolina, 2017

Grey and Green Infrastructure

Grey infrastructure was evaluated in the “Tom’s Creek Flood Study: Preliminary Hydrologic Report” and “Addendum.”⁸ The hydrological model analyzed four alternatives for flood risk reduction for buildings, calibrated to the 2013 storm event (4.4 inches per hour). Relevant findings as they relate to this study include:

- Most structures “experiencing flooding in this study were built in the natural floodplain.”⁹ Twenty-one buildings and one detached garage/dwelling were located within the 100-year floodplain of Toms Creek within the study area. Two of these houses were reported to have finished basements, and others are split level homes with some finished area below or at grade.
- Alternatives 1, 2 and 3 proposed upgrading culverts in various configurations. According to the hydrologic model, implementing these alternatives would mitigate flooding upstream but increase flooding impacts downstream.
- Alternative 4 proposed adding additional detention/infiltration at McDougle School or another large open space. There are currently two properties with permitted Stormwater Control Measures in the study area, McDougle School and Lloyd Square. These sites provide stormwater management

⁸ Sungate Design Group. (2016).

⁹ Ibid.



















(treatment and peak flow reduction) for 22 acres (less than 10% of the total area). According to the model, no individual site could be identified with enough available land for needed stormwater treatment could be identified.

Solution: Small-Scale Distributed Green Infrastructure

According to the 2016 study, feasible individual large-scale infrastructure installations were not able to be identified. Nevertheless, the Town may wish to implement small-scale distributed green infrastructure across residential and/or right-of-way properties. Currently, the study area is approximately twenty percent impervious, and will be twenty-six percent impervious when fully built out.

- An estimated one-third of residential land within the study area could be improved with green infrastructure. This assumes that vegetated green infrastructure will be installed outside of building footprints and tree canopy, though careful plant selection will allow for green infrastructure in low-sunlight areas under tree canopy.
- Soil types in the study area consist of loams, silt loams, and sandy loams, with slopes between 0 and 12% and a range of soil hydrologic groups from moderately well drained to poorly drained. Soil for many or most projects will need to be amended to improve drainage for new green infrastructure treatments.
- Green infrastructure improvements can be planned and designed to be complementary to other stormwater, watershed, and floodplain management efforts. Specific insurable structures, especially those built in the regulatory floodplain, will require a suite of approaches (e.g., buyout/relocation, elevation, building floodproofing, large/watershed scale engineering projects) to mitigate flood risk.
- Green infrastructure can provide community-wide benefits, including runoff reduction for all residents. Figure 3 presents the many co-benefits associated with green infrastructure.

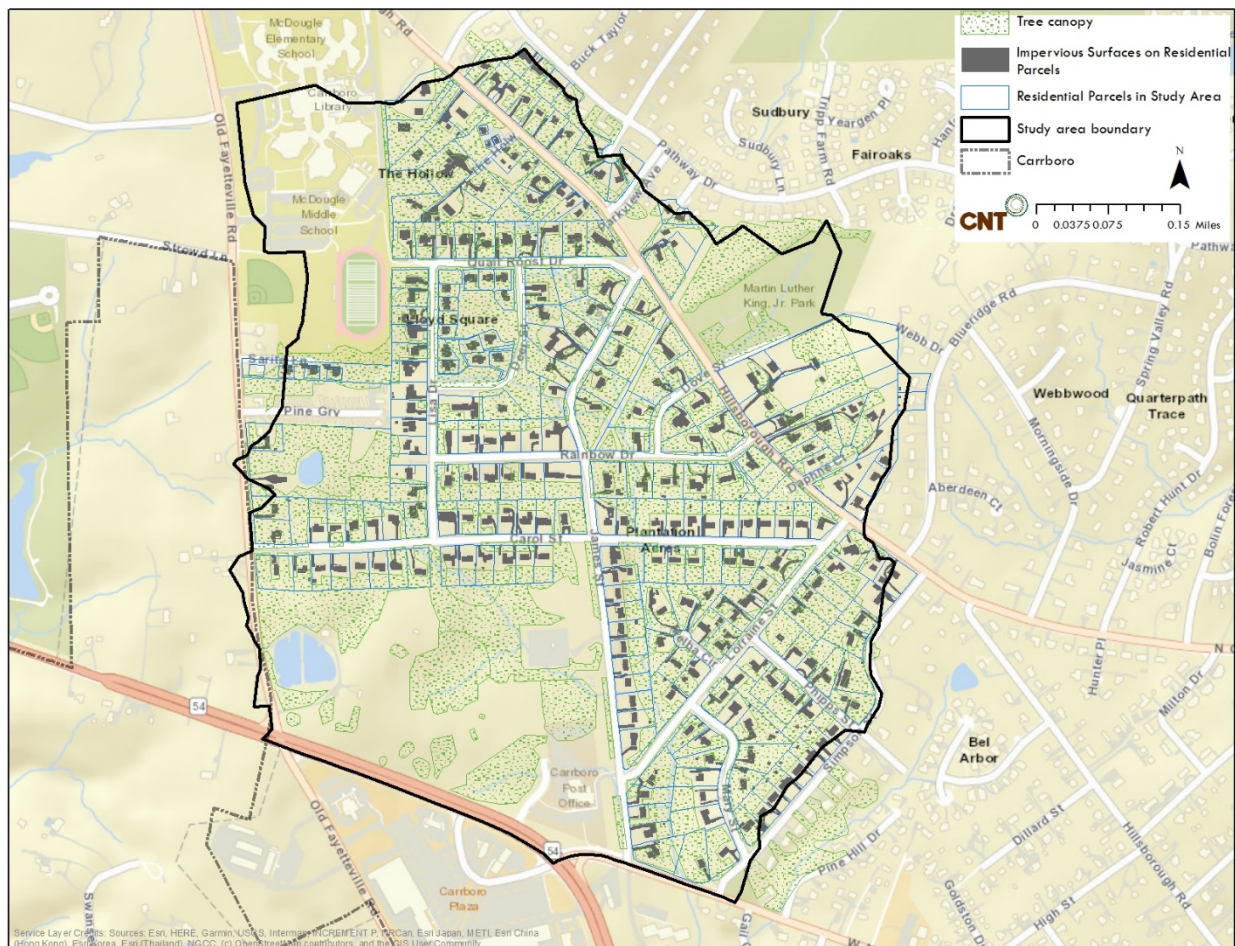
Figure 3. Green Infrastructure Practices and Benefits (Source: CNT (2010) The Value of Green Infrastructure)

Benefit	Reduces Stormwater Runoff				Improves Community Livability								Yes	Maybe	No			
	Reduces Water Treatment Needs	Improves Water Quality	Reduces Grey Infrastructure Needs	Reduces Flooding	Increases Available Water Supply	Increases Groundwater Recharge	Reduces Salt Use	Reduces Energy Use	Improves Air Quality	Reduces Atmospheric CO ₂	Reduces Urban Heat Island	Improves Aesthetics				Increases Recreational Opportunity	Reduces Noise Pollution	Improves Community Cohesion
Practice																		
Green Roofs	●	●	●	●	○	○	○	●	●	●	●	●	○	●	○	○	○	●
Tree Planting	●	●	●	●	○	○	○	●	●	●	●	●	○	●	○	○	○	●
Bioretention & Infiltration	●	●	●	●	○	○	○	○	●	●	●	●	○	●	○	○	○	○
Permeable Pavement	●	●	●	●	○	○	●	○	●	●	●	○	○	●	○	○	○	○
Water Harvesting	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○

Yes
 Maybe
 No

Figure 4 illustrates areas of opportunity to install vegetated green infrastructure within residential parcels in the study area. The gray areas are impervious surfaces on residential parcels, and include building footprints, driveways, and parking lots. Tree canopy is shown in green. Shade-tolerant green infrastructure could be installed under some tree canopy areas.

Figure 4. Opportunity Areas to Install Residential Green Infrastructure in Upper Toms Creek



Policy and Regulations

Overview

The Town of Carrboro joined the National Flood Insurance Program (NFIP) in 1976, adopted a land use ordinance (LUO) in 1980, and adopted a drainage policy in 1984. The LUO stormwater and flooding provisions have been revised periodically and regularly since the original adoption. In 2017, the FEMA flood map was revised. In 2017 and 2018, a Stormwater Utility and rate structure, Advisory Commission, and Enterprise Fund were established.

There appears to be broad policy and administrative level interest to use Stormwater Utility revenue to fund some type of residential assistance. The Town Council recently approved a rate increase and an additional residential tier, increasing the Utility's revenue by approximately 20%. The increased revenue is slated to support multiple new services and include additional staffing. However, based on conversations with Town staff, one legal consideration is that the Town must ensure that a residential stormwater assistance program does not violate the public purpose doctrine.

Public Purpose Doctrine

In North Carolina, the Public Purpose Doctrine (PPD) "requires that all public funds, no matter what their source, be expended for the benefit of the citizens of a unit generally, and not solely for the benefit of particular persons or interest."¹⁰ The State's Supreme Court has permitted interpretation of the doctrine to be determined on a case by case basis, but they have set forth two guiding principles to support decision-making: the tax-revenue supported activity must be related to the work carried out by the specific unit of government which expended the tax revenue, and must benefit the public at large, and not individuals or special interests.¹¹

Community Engagement

The Town of Carrboro has conducted flooding-related outreach and education with homeowners and other stakeholders in a variety of ways. In 2013, Town staff visited Plantation Acres/Tom's Creek sites and met with homeowners to better understand the impacts of the flooding event that took place that June. In August 2016, four teams of Town staff visited a total of 28 properties within the study area and conducted in-depth interviews with homeowners to build a more comprehensive understanding of flooding impacts over time. In June 2019, Town staff held a community meeting to provide a Toms Creek Watershed Update, discussing flooding history, current conditions, and ongoing efforts by the Town to address flooding. Since 2013, the Board of Aldermen/Town Council have had many agenda items that have focused on flooding along Toms Creek. The Town maintains a Toms Creek website with information on flooding and resources for the community.

In 2019 and 2020, CNT, in partnership with Town staff, conducted a resident survey and a presentation to the Stormwater Advisory Commission and community members.

¹⁰ Millonzi, K. (2010, Jan. 7). A Look at North Carolina's Constitutional Public Purpose Requirement. Retrieved from <https://canons.sog.unc.edu/a-look-at-north-carolina%E2%80%99s-constitutional-public-purpose-requirement/>

¹¹ Ibid.

Resident Survey

A 28-question flooding survey was distributed to residents in the late fall of 2019. The survey was available online and on paper. The goals of the survey were to understand residents' perspective on flooding, runoff reduction and green infrastructure. Questions addressed the following:

- Flooding impacts and concerns,
- Knowledge of flood risks and solutions,
- Attitudes towards green infrastructure,
- Familiarity with home renovation projects,
- Desired type of assistance, and
- Ability to invest in building-scale runoff reduction measures.

The survey was available in English, and the Town website was updated to indicate that other languages could be accommodated upon request. The survey was available to the general public, and targeted communications were made to the Upper Tom's Creek community through a newsletter, email blast, social media, signs placed within the neighborhood, and the Town website. In December 2019, Town staff, Stormwater Advisory Commission members, and an elected official canvassed the Upper Toms Creek community with door-to-door visits, to invite residents to complete the survey. Survey responses were collected from late November 2019 through early January 2020. The Town received 82 surveys completed online, and 1 survey completed on paper. A full report of all responses is included as Appendix A.

Flooding impacts

More than half of respondents were at least moderately worried about the impact of flooding on their property. The top three kinds of flooding respondents report they currently experience include: 1) persistent yard ponding (65%); 2) overflowing from a creek or water body (42%); and 3) water entering a crawl space, basement, garage or shed (40%). Very few reported currently experiencing water flowing under doors and/or windows or seeping through walls (4% each). Only about 14% of those responding to the question indicated that a normal rain event causes flooding on their property, while 97% said that an intense rain event did so, and 79% said that a hurricane or tropical storm did so.

More than half of respondents (62%) have put money into addressing, repairing, or replacing flood-damaged property since moving into their home. They reported spending an average¹² of about \$6,300 (\$3,000 median) in total.

Flood mitigation and runoff reduction knowledge

Almost 90% of respondents either acknowledged a gap in their understanding or implied that they still had more to learn about strategies for reducing the risk of flooding on their property. Over 60% of respondents have had flooding problems for at least one year. These could include issues such as water entering their home, crawl space, basement, garage, or shed from a creek or the street, or persistent yard ponding. A cross tabulation analysis suggested that respondents who experience flooding still acknowledge a gap in understanding or a need for help.

¹² Two outlying responses were removed

Investment in flood mitigation and runoff reduction

About two-thirds of survey respondents reported they would be willing to invest in their homes to reduce the risk of flooding. On average,¹³ they say they are willing to invest about \$4,500 (\$2,000 median). CNT notes that the amount that respondents are willing to invest seems to be in line (or exceeds) the amount that respondents have already invested in repairs or otherwise addressing the problem.

Flood mitigation and runoff reduction behaviors and preferences

The survey asked respondents to differentiate between wet and dry flood-proofing strategies. Wet flood-proofing strategies allows flood waters to flow through the building in a managed way, while dry flood-proofing prevents the entry of flood waters. The benefit of wet flood-proofing is that it can reduce the stresses of flooding on the home during a flood and therefore the likelihood of structural damage.¹⁴

When asked about wet flood-proofing, about half of all respondents indicated that they were not interested in water resistant building materials or elevating or removing building mechanicals, while around 10% had already done so, leaving the remaining respondents unaware of such solutions or open to them if technical and/or financial assistance were provided. This is not surprising, as individuals often prefer to avoid water incursion. As such, more reported having implemented dry flood-proofing solutions, such as sealing cracks in foundation walls, altering entryways, or flood-proofing building mechanicals or being open to doing so with assistance.

Survey respondents reported the following flood mitigation and runoff reduction behaviors:

- More than 13% of respondents reported they already purchase NFIP flood insurance, an important risk management strategy.
- More than two-thirds (72%) of respondents said they have already repaired gutters and downspouts, a basic first step to reduce flooding in the home.
- About 24% of respondents indicated they already have a sump pump and 54% were not interested in pursuing one when asked about plumbing solutions to flooding.
- About 40% of respondents already harvest rainwater using a cistern or rain barrels; 45% have a dry well or French drain.

¹³ Four outlying responses were removed.

¹⁴ Federal Emergency Management Agency. (n.d.). Wet Floodproofing. In *Homeowner's Guide to Retrofitting* (p.109-114). Retrieved from <https://www.fema.gov/pdf/rebuild/mat/sec6.pdf>

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do this if I had both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Rainwater harvesting (Cistern/Rain barrels) Count Row %	25 39.7%	6 9.5%	5 7.9%	10 15.9%	14 22.2%	3 4.8%	63
Rain garden Count Row %	10 16.4%	3 4.9%	8 13.1%	18 29.5%	13 21.3%	9 14.8%	61
Dry well or French drain Count Row %	29 44.6%	3 4.6%	4 6.2%	12 18.5%	12 18.5%	5 7.7%	65
Disconnecting downspouts from the storm sewer system Count Row %	14 23.3%	0 0.0%	3 5.0%	4 6.7%	18 30.0%	21 35.0%	60

Preferences for a resident assistance program

- About 47% of respondents indicated that they would be interested in a rain garden if they had either technical (13%) or financial (5%) assistance or both (30%).
- About 43% of respondents said they would regrade their property if they had either technical (16%) or financial (6%) assistance or both (21%).

Most respondents reported not being interested in taking more drastic measures to mitigate flooding on their property, such as elevating their building or demolishing a basement or other structure. A small number of homeowners (4 properties) have sought assistance from the Town to pursue these types of solutions through federal assistance programs.

Attitudes towards green infrastructure

The final two survey items were intended to help the Town understand if people believe natural solutions are effective. About two-thirds of respondents reported that the natural solutions identified throughout the survey, such as rain gardens and dry wells, are good strategies for managing neighborhood flooding.

About half of those simply wanted to understand them better. In general, respondents' perceptions of their neighbors' attitudes align with their own thoughts about natural solutions to runoff reduction.

23. Using natural solutions, such as those previously mentioned, is a good strategy for managing neighborhood flooding.

Value		Percent	Responses
Yes, When can we start		36.4%	24
Yes, but let's understand it more		30.3%	20
I'm not sure		13.6%	9
No, what we have works		7.6%	5
No, it's not a viable solution		12.1%	8
Totals: 66			

Stormwater Advisory Commission Public Meeting

In February 2020, CNT and Town staff offered a presentation at a Stormwater Advisory Commission meeting and discussion with members and the public. Included as Appendix B, the presentation provided a broad overview of urban flooding, natural solutions available to address the problem, and the results of the resident survey. Example solutions drawn from a community driven planning process and a municipal cost sharing program were offered for discussion. A video and transcription of the presentation and facilitated discussion are available at <http://www.townofcarrboro.org/1227/Toms-Creek>.

In summary, the comments fell within the following themes.

- Location of flooding
- Factors contributing to flooding
- Solution scale, funding, and assistance

A summary of resident comments, and subsequent responses compiled from CNT's communications with the Stormwater Advisory Committee and Town staff, follows.

Location of flooding

- Comment: Residents asked if flooding was only a problem in the areas surrounding Toms Creek.
- Response: Flooding is also a concern in other areas in Carrboro; Stormwater Division staff indicate that flooding has been more pervasive and problematic along Toms Creek. Flooding has been an issue to some degree in most cities throughout North Carolina.

- Comment: Residents asked about the relative benefit of placing green infrastructure on homes in different locations, for example: upstream versus down.
- Response: Town Stormwater Division staff note that the main channel, including the upper end of Tom's Creek, is fed by small tributaries, flow through ditches, swales and pipes, and overland flow from higher land that is upslope from the channel. Lot level practices at these upslope properties can slow and reduce the volume of runoff. Town Stormwater Division staff indicate that most houses and properties are at an adequate elevation to experience only localized ponding from uneven drainage. The homeowner might choose to address that ponding using lot level practices that retain and infiltrate the runoff, but they may also simply regrade to release the water faster. Even at the upper end of the Toms Creek channel, the manner in which runoff is addressed impacts flooding along the channel.

Factors contributing to flooding

- Comment: Residents had specific comments and concerns related to historical development patterns and climate change. One resident noted that Plantation Acres was so named because it was a farm. Farming and development have eroded the natural soil mix, leaving mostly clay at the surface.
- Response: This is a concern for many urban and urbanizing areas across the country. This issue is sometimes addressed at the local government level through local land use and development regulations that limit impermeable surface area and require other stormwater best management practices.
- Comment: Several residents expressed concern based on perceptions that recent developments might further exacerbate the flooding problem.
- Response: Town Stormwater Division staff note that a planned commercial development (the Lloyd property) shows the developer will go beyond the on-site requirement by insuring that the peak flow rate will be controlled at up to the 100 year storm rather than the 25 year storm, as currently required in the Land Use Ordinance.
- Comment: Several residents commented that the frequency and degree of the flooding they experience has increased in the last 5-10 years.
- Response: These comments are in line with the data and analysis available to describe the impacts of climate change in Carrboro, North Carolina and in many similar regions that show an increase in the frequency and intensity of rain events.
- Comment: Some residents wondered if best management practices, such as retention ponds and culverts, previously installed would not be able to keep pace with the acceleration of rain resulting from climate change.
- Response: These concerns reflect nationwide concerns about the climate resilience of infrastructure and regulations in the face of climate change.

Solution scale, funding, and assistance

The remaining discussion focuses on the residential cost sharing model that CNT has piloted in northeast Illinois, specifically about scale, funding, and assistance, and the potential for Town financial support for green infrastructure in the study area.

- Comment: Several residents expressed concern that green infrastructure solutions, such as rain gardens and bioswales at the scale of most yards in the study area, would not likely reduce overbank flooding in or near the floodplain.
- Comment: Some residents wanted to discuss larger, engineered gray infrastructure solutions, assuming they would be more effective.
- Comment: Some residents were excited about the range of solutions implied in the presentation: ranging from the individual lot level to public rights-of-way and combinations thereof.
- Comment: Some residents were excited about the prospect of financial support, feeling that it aligns with other efforts to promote racial equity and social progress in the community. Residents' proposals included reviewing options for needs-based financial support provided on a sliding scale. They also proposed providing the ability to make larger investments if homeowners would be willing to make larger contributions.
- Comment: One resident pointed out that the cost of living is rising in Carrboro and therefore any solutions should be reviewed so that they do not add additional tax burdens to those already struggling to remain in the community.

Program Recommendations

Outreach and Education

The following approach is recommended for future outreach and education. It should be noted that some residents report speaking English “less than very well”; program materials should be translated to allow all residents to participate in the program.

- 1) Use non-technical language to communicate the multi-faceted nature of flooding in Tom’s Creek. Communications should distinguish between distinct audiences experiencing different types of flooding.
 - a. Audience A – Residents who experience flooding of their primary residence located in the natural floodplain. This may produce extreme flooding, especially in intense rain events. Communications for this audience should be targeted for federal assistance programs that offer solutions such as elevating homes or relocation.
 - b. Audience B – Residents with homes adjacent to the natural floodplain, who are concerned that future flooding could become severe. Appropriately designed green infrastructure, complementing Town stormwater infrastructure investment, has potential to provide benefits, but the size of the project may be cost prohibitive or conflict with homeowner preferences.
 - c. Audience C – Residents who are not near a natural floodplain but may experience yard ponding or other non-structural flooding. Green infrastructure can offer meaningful mitigation benefits, if well designed, constructed and maintained.
- 2) Create a brief, non-technical communications piece describing all of the Town’s previous efforts to address flooding in the Tom’s Creek area. Presentations to the Stormwater Advisory Commission and materials compiled on the Town website show that significant work has been done. It would be beneficial to consolidate all these materials and present in an easy to understand format.
- 3) Emphasize that the ultimate solution will require active participation from homeowners. Regardless of the type of flooding and appropriate solution, homeowners will need to take an active approach to identify and understand why flooding may be happening on their properties. Once they have this understanding, they will be better equipped to identify the appropriate solution. Owners of rental properties may need additional messaging that compares the cost of improvements to the cost of water damage, and notes benefits such as retention of tenants, to help owners understand the benefit to their building portfolio.
- 4) Identify local champions to support program development and serve as a liaison with residents. Several residents who participated in public meetings and the survey have already pursued green infrastructure solutions and seen meaningful results. Neighbors need to hear their stories.
- 5) Consider program delivery through an avenue such as has been pursued in other RainReady communities, where a “RainReady Home Assessor” is available to interested residents for an initial one-on-one site visit to assess opportunities for the property, help the homeowner with understanding and identification of options, and provide recommendations for moving forward.

- 6) Cultivate neighborhood capacity. There are a variety of community groups interested in both the environmental and social aspects of building resilience. In addition to the formal Stormwater Advisory Commission, the Town and neighborhoods could benefit from resident-driven hyperlocal groups to circulate information and build cohesion around different solutions.

Community Partnerships

Cultivating new partnerships with local organizations will be essential to the launch of a new stormwater program for residents. Partnership may involve compensation for services rendered, or the mutual exchange of non-monetary support.

Some nearby public schools have installed green infrastructure on their properties and incorporated it into their curriculum. District sustainability coordinators, science teachers, or student environmental clubs may be able to support ongoing maintenance of green infrastructure. Students could be trained and potentially receive community service credit, which is a requirement for graduation or simply an attractive line on a college resume. McDougale School is a potentially good school campus for piloting, given the location at the headwaters of the Upper Toms Creek watershed.

Nearby institutions of higher education host environmental science departments, research institutions, and extension projects, some of which may be able to support technical assistance to homeowners. A local community college, which offers a training program for the installation and maintenance of green infrastructure, could be an implementation partner.

Resident-led watershed conservation groups can serve as a peer exchange and leadership development model. Facilitated discussion between existing groups and residents in flooding areas provides a way to build neighborhood capacity to pursue a range of solutions.

There are a variety of local environmental non-profit organizations, several of which have technical expertise to support property assessment or the design or maintenance of green infrastructure. It is likely that expanded services through any of these organizations will require expanded capacity and funding. CNT recommends convening as many of these partners as possible to brainstorm possible partnership opportunities and identify key organizational supports for program recommendations.

It is also worth considering coordination with, and prequalification of, local companies such as landscape designers and installers to assist with program delivery.

Finally, given the historical context of flooding in specific neighborhoods, it may be beneficial to work with a local center for conflict resolution or mediation. Trained mediators can help surface solutions when ongoing discussions have been difficult for a variety of reasons.

Municipal coordination

If the Town pursues a program supporting green infrastructure on private, residential properties, interdepartmental coordination will be imperative. When rolling out small grant programs, in which municipal funds reimburse homeowners for a portion of a green infrastructure project, there tend to be a few key functions that municipalities play: funding, application review, permit review, and reimbursement.

- Funding: Depending on organizational structure, funding typically comes from the Public Works department, via a water and sewer fund or Stormwater Utility. For Carrboro, since Orange Water

and Sewer Authority (OWASA) is a separate water and sewer (only) utility, it may work best for the Town to consider providing some funding from the Stormwater Enterprise Fund, as administered by Stormwater Utility staff.

- Application review: The Town will want to ensure that a program applicant meets the minimum criteria for participation as determined by the Town. Those criteria should ensure that those most impacted by the kind of flooding that green infrastructure can mitigate are able to participate in the program and not create any unnecessary burdens of documentation or administration. It should be underscored that this aspect of program delivery will require staff resources.
- Permit review: Depending on local ordinances and protocol, the Town may want to conduct some level of permit review before approving the installation of green infrastructure. In general, the goal would be to ensure that the project will benefit the homeowner and impose no adverse impacts on neighbors or the community at large. It should be noted that this process has the potential to limit program benefits for several reasons. Homeowners and landscape designers alike may be intimidated by the technical and legal language of a permit application. Typical projects -involving rain gardens, bioswales, and/or dry wells- can be completed in 1-2 days. So, requiring mid-work inspections (typically to verify design specifications before a trench is filled-in) can cause homeowner costs to increase dramatically if a work crew needs to stop work and wait for an inspector. The Town will also need to review its permitting policies as they pertain to landscaping projects overall: would the installation of a rain garden require a permit if there were no program? If not, CNT recommends avoiding any requirement for permit review.
- Reimbursement: The Town will need to assemble appropriate documentation to verify the homeowner has adhered to all program specifications and then pay the homeowner the appropriate amount.

While two or three of the above roles may reside within the Stormwater Division of the Department of Public Works, at least one will reside within some other department. For example, Police may need to take on the scofflaw review aspect of application review, the Planning Department may take on permit review, and the Finance Department may be responsible for reimbursement. These are not recommendations; the Town will need to determine the most effective and efficient division of labor given its current policies and procedures. However, it will be important that most staff involved have a basic understanding of green infrastructure, its design, purposes, and benefits.

Policy and Regulations

Through discussions with Town staff and as mentioned above, the development of a cost-share program is of interest to the Town.

Program Design Considerations

A practical means of addressing the Public Purpose Doctrine could be to design the program so that investments in distributed green stormwater infrastructure across multiples homes demonstrates a stormwater management benefit to a municipal drainage system. For example, the number of gallons of stormwater diverted from the municipal drainage system by green infrastructure installations could be estimated from published infiltration values and established methods of calculation. The specific ways and means used to demonstrate the benefit must be accepted by the Town.

If the program is designed in such a way to avoid violation of the PPD, the question of how the Town will apportion its share of the cost of the project must be addressed. Currently, the Stormwater Utility Fee is collected on the property tax bill, collected by the Orange County Property Tax office. One method might be to provide eligible property owners a credit on the stormwater fee for their property tax bill. Another might be to engage a nonprofit partner to administer the cost-share program and provide participating property owners with the credit in real time, as the projects are completed. According to the Town Attorney, there do not appear to be any legal concerns regarding the mechanism by which property owners would receive payment from the Town.

Limitations

Structural Improvements

According to Town staff, the legal basis, fiscal capacity, and policy direction are barriers for the Town to fund projects like property acquisition, elevating structures to reduce flood risk, building private floodwalls, or other projects that solely benefit an individual property owner.

Funding of Maintenance

Additionally, the Town cannot support the maintenance of projects on private property. This is the sole responsibility of the property owner. This highlights the potential problem of ensuring that the Town's initial investment in well-engineered stormwater projects is maintained such that it continues to perform to the standard necessary to benefit a broader community. There are some options to avoid infrastructure failures due to poor maintenance. Carrboro could require property owners to submit proof of annual maintenance and an infiltration test, as a part of an application renewal for a utility fee credit (if such a credit program existed – see the next section, *Alternatives*, for more information). The Town could also establish maintenance easements that either allow a municipality to install and maintain stormwater management projects on private property, as in the case of [Charlotte, North Carolina](#) and [other municipalities](#), or require that property holders agree to the proper operations, maintenance, and performance evaluation of the project, as in the case of Detroit, Michigan.

- The City of Charlotte's Stormwater Services Department has developed a stormwater easement program, which enables the Department to access private property for the purpose of installing and subsequently repairing stormwater drainage projects on private property.¹⁵ The project types

¹⁵ City of Charlotte. (n.d.). Easements – Frequently Asked Questions. Retrieved from <https://charlottenc.gov/StormWater/Projects/Pages/Easements.aspx>

are determined by the Department, and tend toward storm drainage pipes, culverts, and bank stabilization efforts, as opposed to small scale green stormwater infrastructure. Maintenance of the stormwater control measures is funded, in part, by fees paid by the property owner.¹⁶ The model may be amended and applied to different contexts. Learn more about Charlotte's program [here](#).

- The City of Detroit has established a green infrastructure capital partnership program, through which the City's Sewer and Water District funds green infrastructure projects on non-residential private property. Any property owners participating in the green infrastructure capital partnership program must agree to a long-term maintenance easement, which requires that projects be operated and maintained for 20 years post-completion of the project, even in the event of title transfer.¹⁷ The City has the right to enter the property to inspect the integrity and functionality of the project, over the life of the agreement. Though this approach focuses on non-residential private property, it does help ensure the integrity of the green infrastructure over the long run. Learn more about Detroit's model [here](#), and read the easement [here](#).

It is important to note that Charlotte and Detroit are larger urban centers than Carrboro. These examples provide a starting point for how a smaller municipality like Carrboro might structure such an easement with a private property holder, to ensure that green infrastructure investments are properly maintained, and to give governments the authority to spend capital on private property.

Alternatives

A program design option that would avoid triggering the PPD would be to instead implement a Stormwater Utility fee reduction program. The fee reduction would be available to homeowners who implement techniques that reduce imperviousness/runoff on-site (e.g., de-paving, impervious disconnection, permeable pavement installation, and rain gardens or bioswales). Traditionally, the financial incentive to property owners to implement these types of projects on private property is a percentage reduction in the stormwater fee. In order to ensure the functionality of the project over the long term, the Town might require an annual proof of maintenance form and an infiltration test before applying the fee reduction in subsequent years.

Financing and Funding

In order to establish a successful stormwater management cost share program, the Town of Carrboro will need a dedicated source of revenue to cover the Town's share of the cost of the projects. If the Town-raised revenue is insufficient to cover the cost of the program, it may need to explore other financing and funding options, such as state revolving loan funds and traditional municipal bonds.

Anticipated Revenue

CNT's current understanding is that the Town's Stormwater Utility, established in 2017¹⁸, would likely be expected to cover the full extent of the Town's contribution for a residential green infrastructure assistance

¹⁶ City of Charlotte. (2020.) Storm Water Services – Current Storm Water Services Fees. <https://charlottenc.gov/StormWater/Fees/Pages/CurrentFees.aspx>

¹⁷ City of Detroit. (n.d.). Capital Partnership Program. Retrieved from <https://detroitmi.gov/departments/water-and-sewerage-department/stormwater-management-and-drainage-charge/capital-partnership-program>

¹⁸ Town of Carrboro. (n.d.). Stormwater Utility. Retrieved from <https://www.townofcarrboro.org/1136/Stormwater-Utility>

program. In November of 2019, the Town Board agreed to review an increased utility rate structure that would raise about 20% additional revenue annually. The Board approved the rate increase in January 2020, and the increased revenue could help support a “residential assistance program,” among many other services and activities.¹⁹ According to Article III in Chapter 18-10 of the Town, the Stormwater Utility funds may not be used for any purpose other than the stormwater program activities.²⁰

Other Financing and Funding Options

If revenue collected via the Stormwater Utility falls short of covering the costs of the residential green infrastructure program, the Town might consider other options to either fund or finance the effort.

Clean Water State Revolving Loan Fund

The Clean Water State Revolving Funds (CWSRF) program provides an ongoing source of capital for investments that create a direct financial savings or revenue stream. Once the fund is established, new projects are paid for with funds repaid by borrowers. The CWSRF is a 30-year-old program and has provided nearly 40,000 loans totaling \$120 billion for water infrastructure projects, though funding levels have decreased over the years.²¹ States administer the program under federal parameters, must provide 20% state matching funds to federal dollars, and must provide loans at or below market rate. Funds can also be used to refinance debt, provide loan guarantees, and in some cases give subsidies or grants to projects.²² North Carolina’s CWSRF program offers 0% interest loans for green projects and has developed a Wastewater Reserve program that sets aside a portion of the state’s federal allocation for grants and low-interest loans for planning, design, and construction of critical water infrastructure for economically disadvantaged communities. Eligible municipalities may receive up to \$3 million for three years of work (presumably covering a multi-year project, involving planning, design, and construction). The state also awards funds to study the potential benefits of merging existing local water infrastructure systems to be more efficient.²³

Uniquely, in 2013, North Carolina’s General Assembly established a program in which a certain amount of Community Development Block Grant (CDBG) funds for infrastructure are transferred to the Division of Water Infrastructure to administer, in order to accelerate investments in public water and sewer infrastructure in communities with majority Low and Moderate Income (LMI) households. The maximum

¹⁹ Town of Carrboro. (n.d.). Carrboro Stormwater Utility Rate Structure FAQs. Retrieved from <https://www.townofcarrboro.org/DocumentCenter/View/6918/FAQsLinks>

²⁰ Town of Carrboro. (n.d.). Stormwater Management Utility. Retrieved from <https://townofcarrboro.org/DocumentCenter/View/4631/Chapter-18---Stormwater-Management-Utility?bidId=>

²¹ Environmental Protection Agency. (n.d.). “Clean Water State Revolving Fund (CWSRF).” Retrieved from https://19january2017snapshot.epa.gov/cwsrf_.html

²² Environmental Protection Agency. (n.d.). “Learn about the Clean Water State Revolving Fund (CWSRF).” Retrieved from <https://www.epa.gov/cwsrf/learn-about-clean-water-state-revolving-fund-cwsrf>

²³ North Carolina Department of Environmental Quality. (n.d.). “Merger/Regionalization Feasibility Grants.” <https://deq.nc.gov/about/divisions/water-infrastructure/i-need-funding/mergerregionalization-feasibility-grants>

grant through this program is \$2 million.²⁴ It is unclear whether this award can be bundled with the Wastewater Reserve program or be used to pay back a traditional State Revolving Fund (SRF) loan.

Orange Water and Sewer Authority (OWASA) has made use of the State's revolving loan fund for a variety of water and sewer infrastructure investments, but because they do not manage stormwater, Carrboro has an opportunity to explore whether the Clean Water SRF is a good option to expand the projects and impact that its Stormwater Utility revenue can support.

Municipal Bonds to Support Distributed Infrastructure (invoking GASB 62 rules)

Traditionally, municipal bonds pay for large-scale centralized capital assets (like wastewater treatment plants, water supply distribution systems, etc.), and not distributed infrastructure systems, like permeable pavement, trees, constructed wetlands, or even site-scale bio-infiltration projects. However, recent guidance issued about the Government Accounting Standards Board Rule 62 (GASB 62) makes it easier to use bonds to cover the costs of distributed infrastructure on private property. GASB 62 allows distributed infrastructure projects to be considered a capital asset by utilities, thus allowing public agencies to consider private property programs to be capital investments rather than operational expenses. From a report issued by Earth Economics and WaterNow Alliance: "If distributed infrastructure is ... considered as a capital project, then the spending can be bond-financed to recover the costs over 20 or 30 years rather than collecting it all in a single year. In that case, the impact to rates would be minimal, because it is spread over such a long-time span."²⁵

Affordability

Some program participants are likely to need financial assistance to incentivize stormwater management improvements. In addition, some households may not be able to afford the initial payment to the contractor, prior to reimbursement from the Town.

In defining the (un)affordability of a service or good, it must examine more than the impact that any one bill/cost might have on household income. Instead, residual income, or income levels remaining after all critical expenses have been accounted for (e.g., energy, water, transportation, and housing) must be the baseline.

Households that earn 40% of the average median income (AMI), \$22,629.00 and even those earning 60% AMI (\$33,943.80) would be unlikely to be able to pay for a stormwater management improvement investment. Based on available local utility billing information, and the Index, housing and transportation costs are by far the biggest expense that Carrboro residents face. At the 40% AMI level, the cost of housing

²⁴ North Carolina Department of Environmental Quality. (n.d.). "Community Development Block Grant - Infrastructure." Retrieved from <https://deg.nc.gov/about/divisions/water-infrastructure/i-need-funding/community-development-block-grant-infrastructure>

²⁵ Earth Economics & WaterNow Alliance. (2018). Go Green: Muni Bond Financing for Consumer Rebates and other Distributed Water Investments. Retrieved from https://static1.squarespace.com/static/561dc6e4b039470e9afc00/t/5b846a7988251bb8342ebb22/1535404668641/GoGreen_EarthEconomics_Web.pdf

and transportation already exceeds the monthly household income, so no amount of subsidization on utility bills will improve affordability. However, Carrboro might still consider affordability options in a future resident green infrastructure assistance program.

- **Duke Energy's Helping Home Fund**

Duke's Helping Home Fund provides free assistance to income-qualified customers (at or below 200 percent of the federal poverty level) to improve residential energy efficiency. The Home Fund completely covers the costs of an energy assessment, health, and safety repairs (up to \$3k), appliance replacement (refrigerators, washing machines, etc. up to \$2k), and heating and cooling systems (up to \$800). The assistance is open to owner- and renter-occupied residences, and to apartment dwellings with owner approval.²⁶

The Town might consider setting aside a certain percentage of its residential assistance program funds as grant funds to support the community's neediest households.

- **Orange Water and Sewer Authority's (OWASA) Care to Share Program**

OWASA cannot legally reduce rates or provide bill assistance to low-income customers. However, OWASA does endeavor to lower sewer and water bills through a concerted outreach effort to educate their customers on leak detection and conservation techniques. OWASA also administers its Care to Share program, which encourages customers to make donations on their bills to support neighbors in-need to pay their water and sewer bills.²⁷ The funds are collected, administered by the Inter-Faith Council for Social Services, and can be used to reduce monthly bills, but not to fund conservation/leak prevention practices/products.

The Town might consider investigating the viability of adding a donation option to its Stormwater Utility bill (i.e., property tax bill) to jumpstart a program that could either reduce Stormwater Utility fees or feed a pot of grant funds for low-income individuals interested in the resident green infrastructure assistance program.

- **Establishing a Credit Program**

Currently, Carrboro's Stormwater Utility does not have a residential credit program in place. A credit, or reduction of the utility fee following installation of a stormwater management project, could prove an effective incentive to encourage residential property owners throughout the community to install green stormwater infrastructure projects that would improve both on-site and community-wide stormwater management outcomes, if the details can be navigated.

In 2019, The University of North Carolina, Chapel Hill's Environmental Finance Center issued a report, "The Stormwater Finance Landscape: Where We've Come from and Where We've Yet to Go", looking at the state of stormwater financing in North Carolina, paying particular attention to the efficacy and creativity of stormwater utilities' ability to cover stormwater management capital expenses.²⁸ The report noted that 52% of respondents to a webinar poll indicated they planned to

²⁶ Duke Energy's Helping Home Fund. (n.d.). Retrieved from <https://www.duke-energy.com/home/billing/special-assistance>

²⁷ Help My Neighbor. (n.d.). Retrieved from <https://www.owasa.org/help-my-neighbor/>

²⁸ The University of North Carolina, Chapel Hill's Environmental Finance Center. (2019). The Stormwater Finance Landscape: Where We've Come from and Where We've Yet to Go. Retrieved from https://efc.sog.unc.edu/sites/default/files/2019/NC%20Stormwater%20Landscape_Final%20Draft_0.pdf

pay for stormwater capital improvements using stormwater fees; and 61% of respondents indicated interest in implementing or modifying a fee credit program in the future. To support this interest, more work needs to be done to understand the administrative burden of overseeing a credit program, and how to best structure credits to ensure ease of participation and economic outcomes.

Rental housing can present a specific challenge known as the “split incentive,” where improvements to manage stormwater onsite are paid for by one party but the stormwater management benefits are realized by the other party. A Stormwater Utility credit, issued to the building owner if they commit to installing green infrastructure and hiring a landscaping company to perform maintenance, could help overcome this challenge.

Program Eligibility

The Town should define the program participation requirements in coordination with community priorities, Town goals and initiatives, and an assessment of administrative and financial feasibility. The following table provides some options for program eligibility requirements.

Building Types
<ul style="list-style-type: none">• Owner-occupied single-family homes• Owner-occupied two-to-four-unit homes

Site-specific green infrastructure measures should be developed by a qualified landscape designer who develops customized plan to improve site drainage. The landscape plan should account for characteristics such as site soils, access to sunlight, existing drainage pathways, and the owner's ability to maintain the installation. Some of these measures require installation by a licensed contractor.

Green Infrastructure Measures
<ul style="list-style-type: none">• Impervious surface removal or disconnection• Rain garden• Bioswale• Permeable pavement, so long as site-specific criteria and maintenance commitments are met• Cistern(s)• Dry well, so long as site-specific soil infiltration criteria are met• Green roof• Stormwater planter• Other green infrastructure measures, as approved by the program administrator

Landscaping Measures Not Eligible for Grant
<ul style="list-style-type: none">• Tree removal• New impermeable surfaces• Regrading and drainage improvements not tied to eligible green infrastructure measure

Eligible Costs
<ul style="list-style-type: none">• Materials• Labor• Town permit fees, if required

The Town should develop the minimum criteria for participation as determined by the Town. Those criteria should ensure that those that will most need and will benefit from green infrastructure will be able to participate without undue restrictions or administrative burden.

Program Applicants
<ul style="list-style-type: none">• Permanent Town resident• Willing to disconnect downspouts and sump pumps from municipal storm sewer system• No outstanding Town obligations or building code violations• Willing to maintain grant-funded measures according to the term specified by the grant agreement• Willing to participate in short program evaluation surveys

Metrics and Performance Indicators

Selection of appropriate indicators is a context-specific process that should be undertaken carefully. Metrics should be selected based on data availability, quality and measurability; relevance to the organization; ease of understanding by stakeholders; and alignment with existing initiatives, such as the Town's published and forthcoming community plans. In addition, indicators used for policy decisions should have a transparent methodology, be ethical, actionable, cost-effective, and be able to differentiate between net impacts and shifted impacts.²⁹ Finally, indicators should be compatible with the Town's existing tools and tracking processes. Some potential metrics and performance indicators are listed below.

Options for Metrics and Performance Indicators

Program Uptake

- Number of total program applicants
- Number of waitlisted applicants
- Average length of applicant waitlist time
- Number of program participants
- Number of green infrastructure landscape designs prepared
- Number of green infrastructure installations completed

Stormwater Impact

- Types of green infrastructure installed
- Square footage of green infrastructure installations completed
- Program participant survey results
 - Participant experience
 - Performance of green infrastructure during rain events
- Estimated gallons of stormwater retained/detained by green infrastructure

Economic Impact

- Private investment leveraged for green infrastructure investment
- Cost efficiency per gallon for installed green infrastructure
- Number of local hires for green infrastructure maintenance and construction
- Dollar amount spent at local businesses, to construct and maintain green infrastructure projects

Additional metrics to measure the impact other community priorities, including public health outcomes, increased economic development, and safe transportation infrastructure, can be found at CNT's report *Green Values Strategy Guide: Linking Green Infrastructure Benefits to Community Priorities*.³⁰

²⁹ See Svensson, N. (2006); Haghshenas, H. & Vaziri, M. (2012); and Dobranskyte-Niskota, A. et al. (2007) for a review of the selection of environmental performance indicators.

³⁰ CNT. (2020). *Green Values Strategy Guide: Linking Green Infrastructure Benefits to Community Priorities*. Retrieved from <https://www.cnt.org/publications/green-values-strategy-guide-linking-green-infrastructure-benefits-to-community>

Timeline and Implementation

Short-term (1 year)

- Coordinate program activities with the Carrboro Comprehensive Plan Update.
- Include residential green infrastructure/runoff reduction program piloting and coordination in new Stormwater staff person job responsibilities
- Establish regular cross-departmental meetings to coordinate planning and projects, identify shared funding sources, explore workforce development opportunities, and ensure successful program launch. A quarterly meeting schedule is recommended.
- Identify key community public, private, and nonprofit partners, formalize partnerships, and initiate community education and engagement efforts.
- Develop enhanced communication materials.
- Amend Land Use Ordinance to explicitly exempt native landscaping from “nuisance vegetation” code protocols.
- Budget for, design and pilot small-scale residential green infrastructure program. Determine best approach (e.g., by whom, using what available resources, for whom, and with what desired outcomes) for pilot scale program delivery.
- For buildings located in known severe flooding areas, such as natural floodplains, continue to support property owners seeking assistance from federal programs.

Mid-term (2 – 4 year)

- Continue enhanced community education and engagement materials.
- Investigate financing and funding options.
- Use lessons learned from pilot to tune and launch Town-wide residential green infrastructure assistance program.
- Continue larger stormwater program development and integrate other efforts with the residential program.
- Coordinate stormwater management projects that address federal and state water quality regulatory requirements associated with the Town’s NPDES Phase II permit.
- For buildings located in known severe flooding areas, such as natural floodplains, continue to support property owners seeking assistance from federal programs.

Long-term (5+ year)

- Evaluate program success, including financing and funding and program sustainability.

Data

Limitations

This report is informed by analysis of publicly available census data, flooding data, and land use data; a review of existing reports provided by the Town; and by the results of a resident survey. This report reflects the understanding provided to CNT over the course of several discussions with municipal staff, commission members, and residents. Beyond these data, the report does not include any additional data collection or analysis performed by CNT. This report does not represent an engineering study, nor include any engineering modeling or analysis.

Appendices

Appendix A: Resident Survey Report

Appendix B: Presentation to Stormwater Advisory Commission Public Meeting

Appendix C: Acronym List

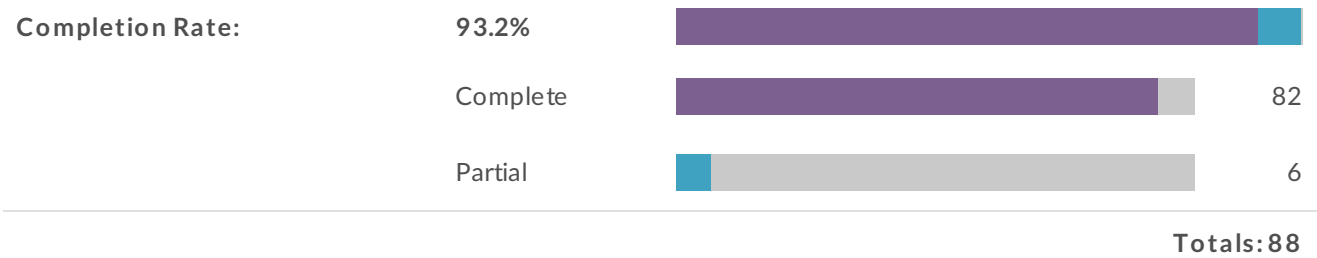
Appendix D: Glossary of Terms

Appendix E: Implementation Resources

Appendix A: Resident Survey Responses

Report for RainReady Carrboro Community Survey

Response Counts



1. What is your address?

Address



Apartment number

No data: No responses found for this question.

City

carrboro carrboro
chapel hill
carrboro

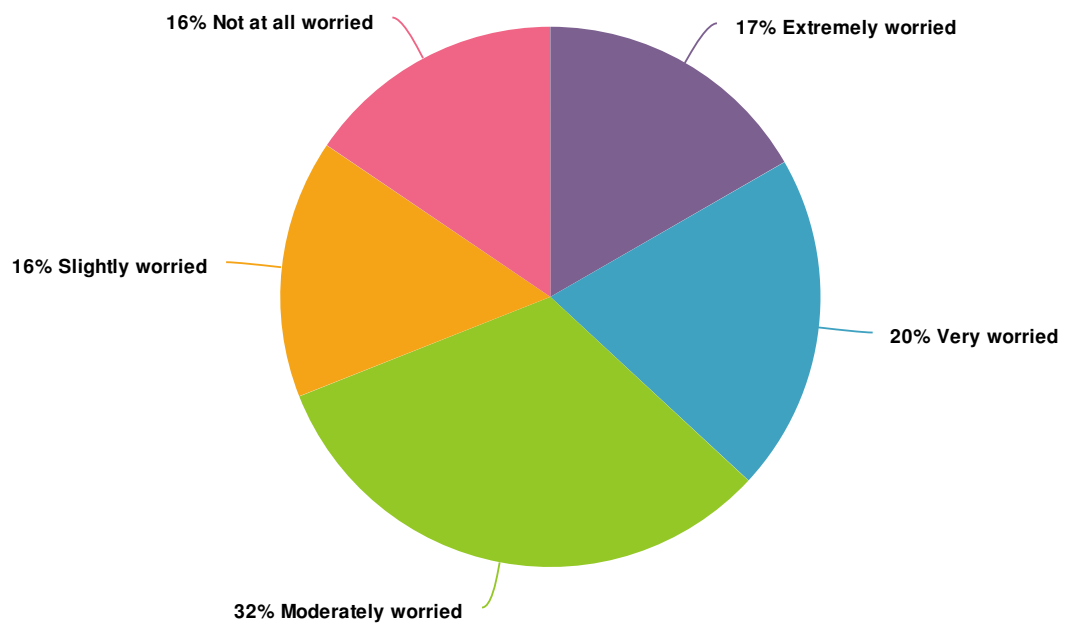
State


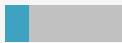



carrboro north
carolina
nc n.c

ZIP code

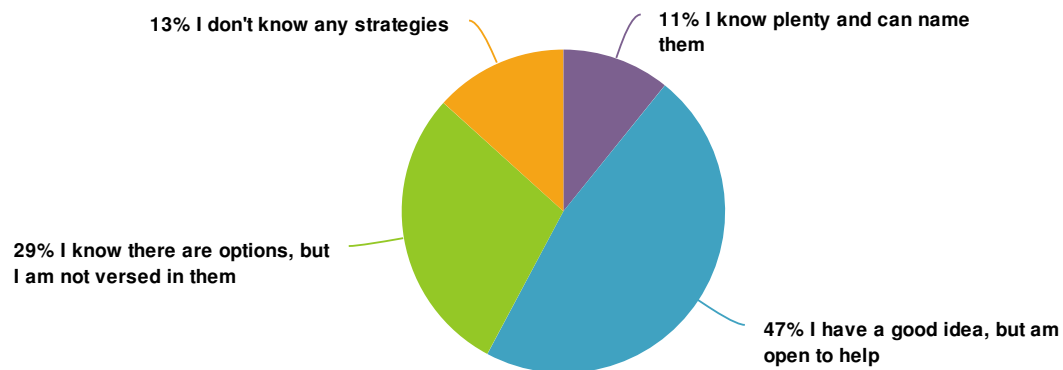
3 1 2





2. How worried are you about the impact of flooding on your property?



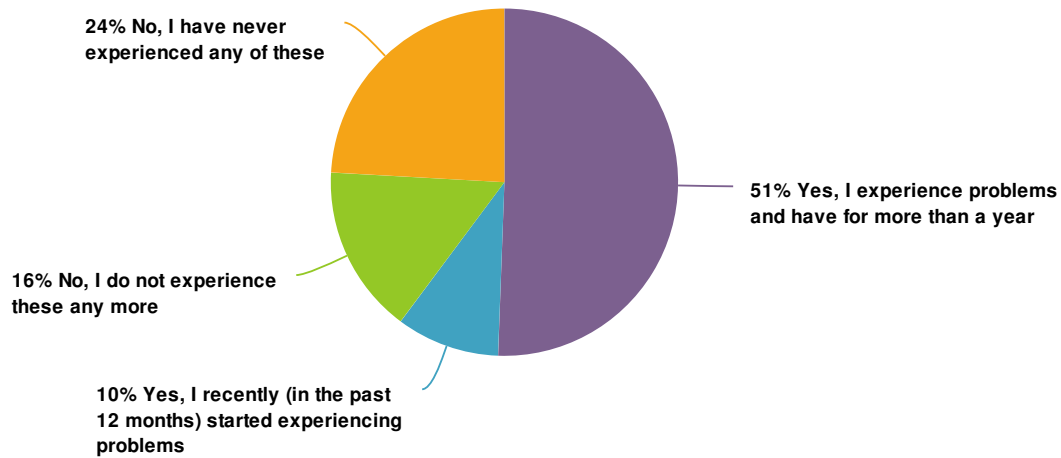
Value		Percent	Responses
Extremely worried		16.7%	14
Very worried		20.2%	17
Moderately worried		32.1%	27
Slightly worried		15.5%	13
Not at all worried		15.5%	13
Totals: 84			





3. How much do you know about strategies for reducing the risk of flooding at your home?



Value		Percent	Responses
I know plenty and can name them		10.8%	9
I have a good idea, but am open to help		47.0%	39
I know there are options, but I am not versed in them		28.9%	24
I don't know any strategies		13.3%	11
Totals: 83			

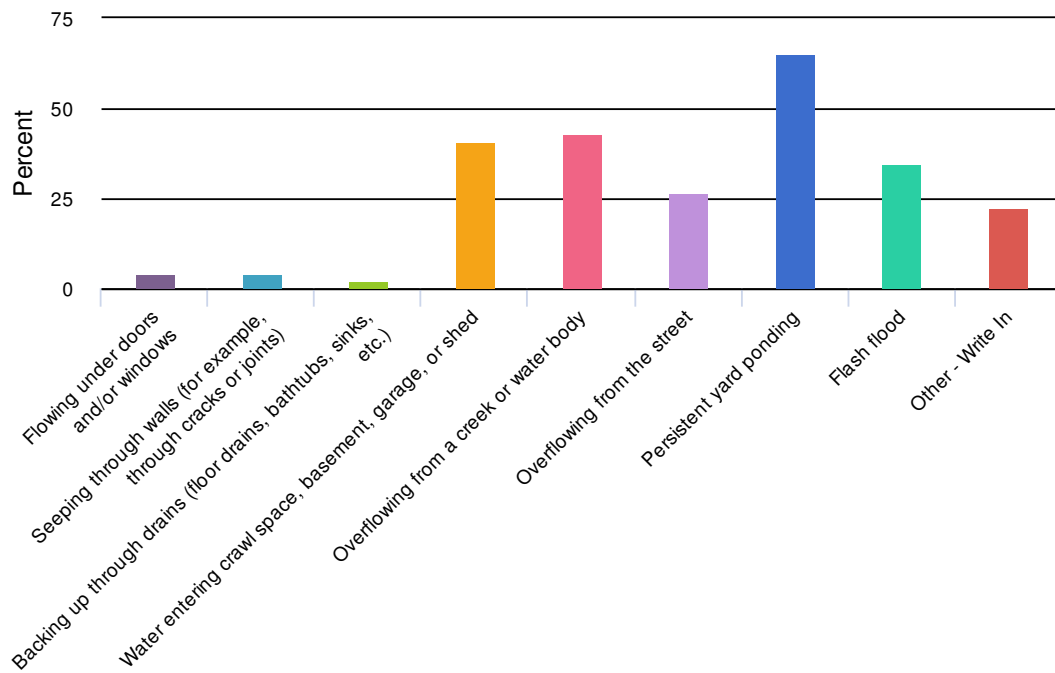
4. Do you experience flooding on your property? This could include issues such as water entering your home, crawl space, basement, garage, or shed from a creek or the street, sewage backup, or persistent yard ponding.












Value		Percent	Responses
Yes, I experience problems and have for more than a year		50.6%	42
Yes, I recently (in the past 12 months) started experiencing problems		9.6%	8
No, I do not experience these any more		15.7%	13
No, I have never experienced any of these		24.1%	20

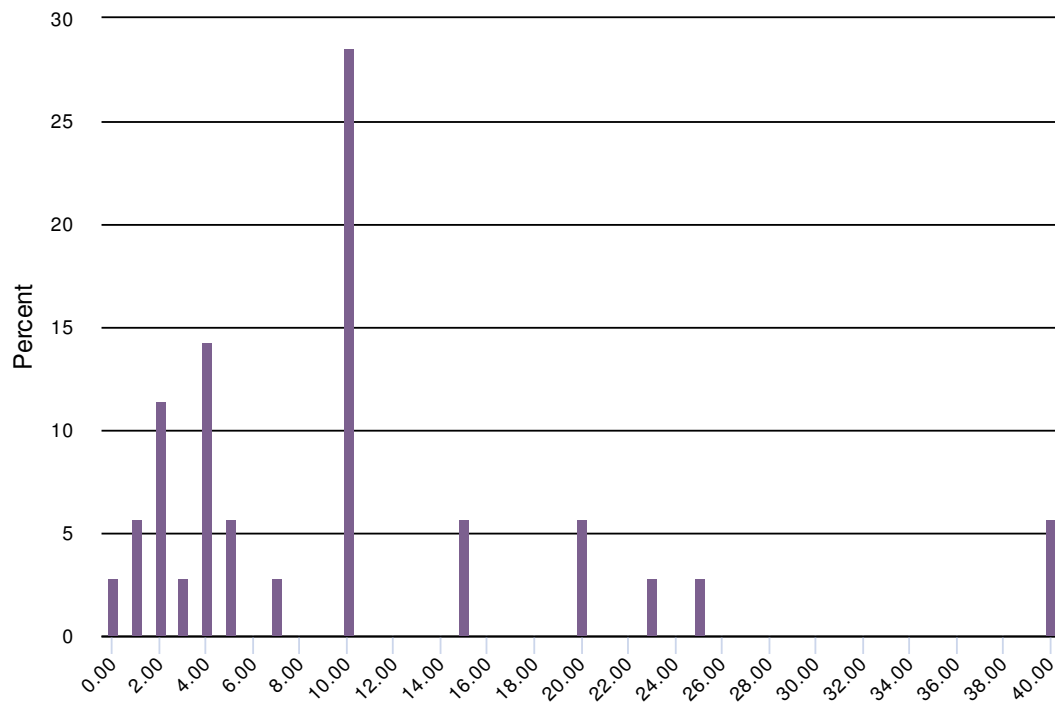
Totals: 83

5. What kind of flooding do you currently experience?

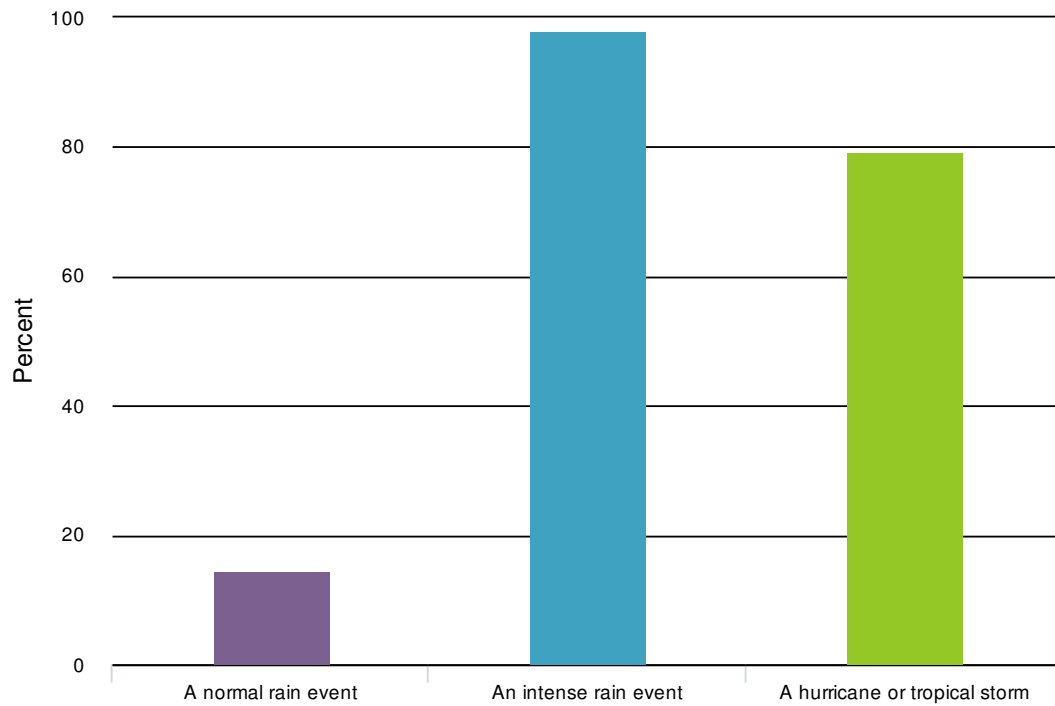


Value		Percent	Responses
Flowing under doors and/or windows		4.1%	2
Seeping through walls (for example, through cracks or joints)		4.1%	2
Backing up through drains (floor drains, bathtubs, sinks, etc.)		2.0%	1
Water entering crawl space, basement, garage, or shed		40.8%	20
Overflowing from a creek or water body		42.9%	21
Overflowing from the street		26.5%	13
Persistent yard ponding		65.3%	32
Flash flood		34.7%	17
Other - Write In		22.4%	11

6. In the past five years, how often has your property flooded?

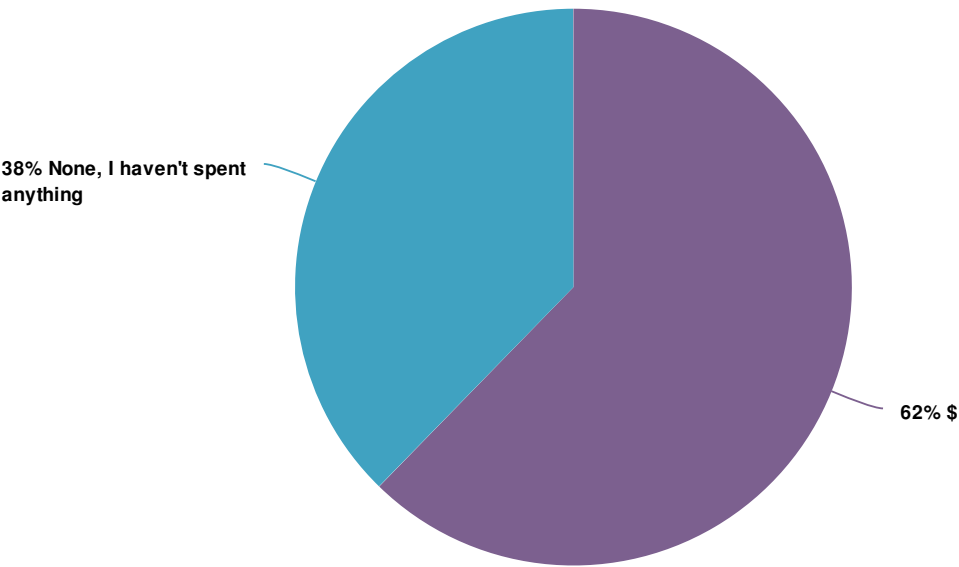


7. What kind of weather causes flooding at your property?



Value		Percent	Responses
A normal rain event		14.6%	7
An intense rain event		97.9%	47
A hurricane or tropical storm		79.2%	38

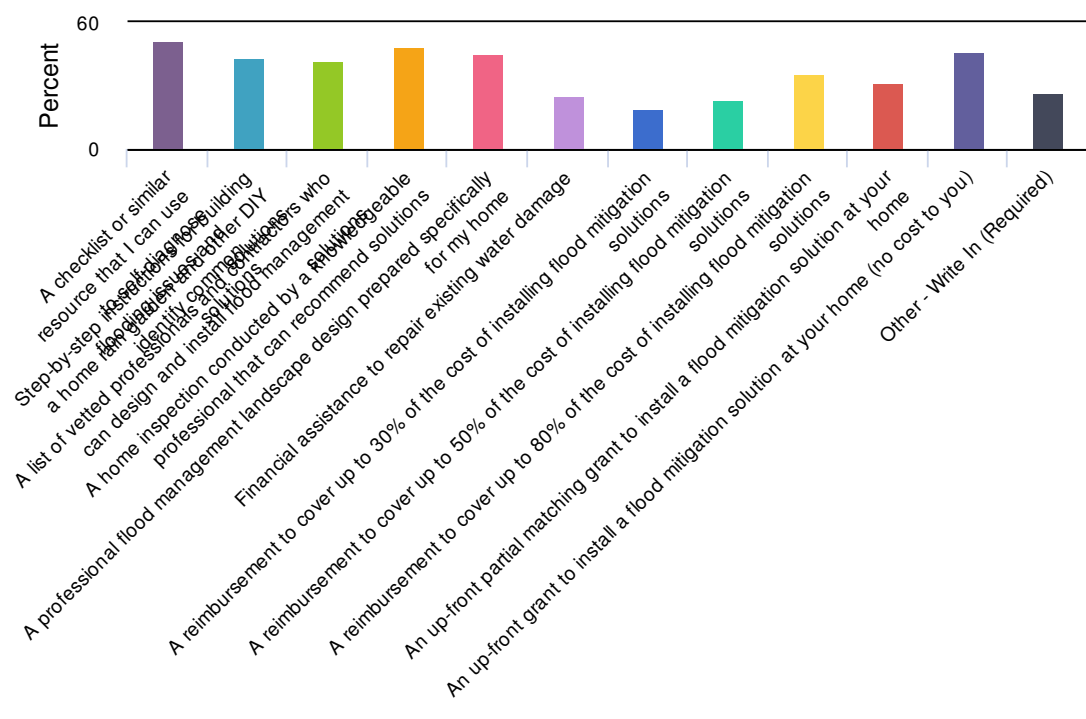
8. How much have you spent on addressing repairing or replacing flood-damaged property, since you have lived at your home?



Value		Percent	Responses
\$	<div><div></div><div></div></div>	62.3%	38
None, I haven't spent anything	<div><div></div><div></div></div>	37.7%	23

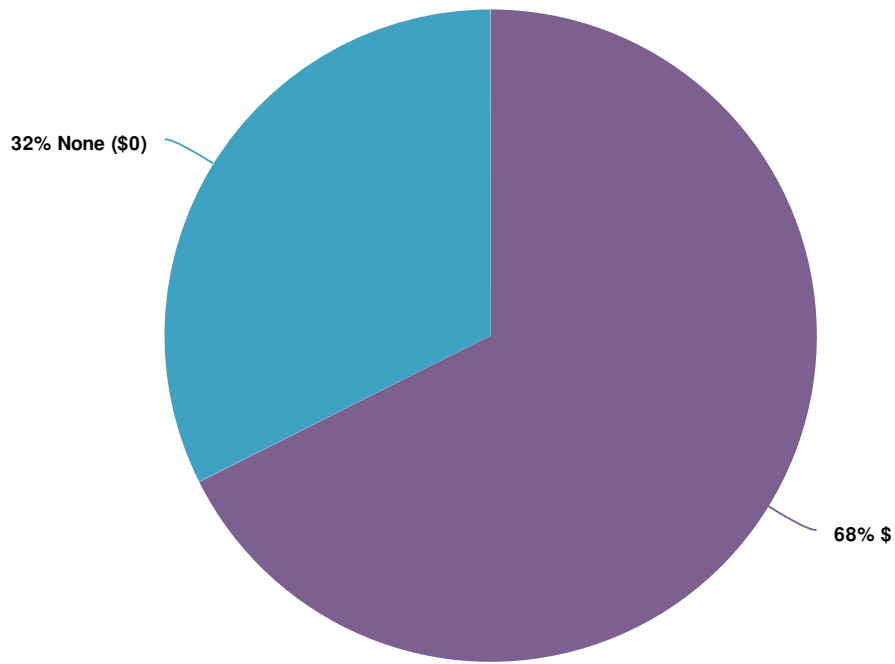
Totals: 61

9. What does flooding assistance look like to you?



Value		Percent	Responses
A checklist or similar resource that I can use to self-diagnose flooding issues and identify common solutions		51.2%	42
Step-by-step instructions for building a home rain garden and other DIY solutions		43.9%	36
A list of vetted professionals and contractors who can design and install flood management solutions		41.5%	34
A home inspection conducted by a knowledgeable professional that can recommend solutions		48.8%	40
A professional flood management landscape design prepared specifically for my home		45.1%	37
Financial assistance to repair existing water damage		25.6%	21
A reimbursement to cover up to 30% of the cost of installing flood mitigation solutions		19.5%	16
A reimbursement to cover up to 50% of the cost of installing flood mitigation solutions		23.2%	19
A reimbursement to cover up to 80% of the cost of installing flood mitigation solutions		35.4%	29
An up-front partial matching grant to install a flood mitigation solution at your home		31.7%	26
An up-front grant to install a flood mitigation solution at your home (no cost to you)		46.3%	38
Other - Write In (Required)		26.8%	22

10. How much would you be willing to invest in your home to reduce the risk of flood damage?



Value		Percent	Responses
\$	<div><div></div><div></div></div>	67.6%	48
None (\$0)	<div><div></div><div></div></div>	32.4%	23

Totals: 71

11. Home maintenance and insurance solutions

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Regrading around my property Count Row %	21 33.3%	4 6.3%	10 15.9%	13 20.6%	14 22.2%	1 1.6%	63
Repairing gutters and downspouts Count Row %	50 72.5%	5 7.2%	3 4.3%	4 5.8%	7 10.1%	0 0.0%	69
Repairing/improving the drainage ditch on my property Count Row %	27 42.9%	6 9.5%	4 6.3%	17 27.0%	9 14.3%	0 0.0%	63
Purchasing NFIP flood insurance Count Row %	8 13.6%	6 10.2%	1 1.7%	6 10.2%	25 42.4%	13 22.0%	59
Totals Total Responses							69

12. In the past year, approximately how much have you spent on home maintenance and insurance solutions?

Re-grading my yard, driveway or walkways

builder house sweat
years 1500.00
bit 5 1 610
9 3 4 2 8
4,000 7 equity
3 months

Gutter and downspout repair

house needed
2,000 200.00 12
years 9 4 610
11 5 1 27 13
8 3 1 month
bit 500.00 4000.00

Drainage ditch repair/improvement

years
1month 6 sweat
75 1,700
town 3 1 2 house
3500.00 4 2 years
equity

13. Natural solutions

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Rainwater harvesting (Cistern/Rain barrels) Count Row %	25 39.7%	6 9.5%	5 7.9%	10 15.9%	14 22.2%	3 4.8%	63
Rain garden Count Row %	10 16.4%	3 4.9%	8 13.1%	18 29.5%	13 21.3%	9 14.8%	61
Dry well or French drain Count Row %	29 44.6%	3 4.6%	4 6.2%	12 18.5%	12 18.5%	5 7.7%	65
Disconnecting downspouts from the storm sewer system Count Row %	14 23.3%	0 0.0%	3 5.0%	4 6.7%	18 30.0%	21 35.0%	60

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do this if I had both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Replacing concrete or asphalt with vegetated area or a porous (permeable) material Count Row %	14 23.3%	2 3.3%	3 5.0%	10 16.7%	27 45.0%	4 6.7%	60
Improving the soil in my yard to better hold and infiltrate water and/or planting more trees and shrubs Count Row %	18 27.7%	7 10.8%	12 18.5%	21 32.3%	5 7.7%	2 3.1%	65
Totals Total Responses							65

14. Approximately how much have you spent on natural solutions?

Disconnecting downspouts

200.002 weeks
free 1 sewer
system 3 2 storm
required equity
tied sweat

Rain barrel

100.00 3 7 8 4 10
200.00 11 10 6 2 oak
9 5 recycled

Cistern

catch gravel
nope 0 stone
owner

Rain garden

10,000 bamboo
3 0 2
1
4

Dry well

basin clay
1 limited

French drain

builder consultation
1000.00 6 200.00
cost 75 4 18 drain
11 3 0 2 9 owner
12 6,000 3days planning
equity italian

Replacing concrete/asphalt with vegetated areas, or porous material

purchase sweat walks
asphalt concrete
pain 1 house
included 2 price
equity ars
driveways

15. Plumbing solutions

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do this if I had both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Sewage backflow prevention device (check valve, backwater valve, or overhead sewer) Count Row %	5 7.7%	2 3.1%	3 4.6%	6 9.2%	23 35.4%	26 40.0%	65
Sump pump Count Row %	16 23.9%	0 0.0%	2 3.0%	6 9.0%	36 53.7%	7 10.4%	67
Totals Total Responses							67

16. Approximately how much have you spent on plumbing solutions to prevent flooding?

Sewage backflow prevention device

3 year
102

Sump pump

preexisting remember
100.00 2000.00
work 5 cost
1024 3 part
french approx
drain

Other

encapsulation
approx pipes
owas's 0 worried
18000.00
crawl space

17. Dry flood-proofing solutions, to keep water out of your home

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do this if I had both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Altering entryway to prevent water from entering under door Count Row %	11 17.7%	3 4.8%	3 4.8%	3 4.8%	36 58.1%	6 9.7%	62
Sealing cracks and openings in foundation and walls Count Row %	18 29.0%	5 8.1%	7 11.3%	7 11.3%	21 33.9%	4 6.5%	62
Flood-proofing building mechanicals Count Row %	10 15.9%	6 9.5%	5 7.9%	10 15.9%	11 17.5%	21 33.3%	63
Totals Total Responses							63

18. Approximately how much have you spent on dry flood-proofing solutions, to keep water out of your home?

Altered entryway to prevent water from entering under door

150.00
0₁²

Sealed cracks and openings

0₂¹₄³

Flood-proofed building mechanicals

15,000
3 1 2
bid

Other

killing mounted sealed
3,300 basement
gravel 1 gas units
house 3 2 home
floods ditch water
tankless spent heater
wall

19. Wet flood-proofing solutions, to manage water in your home

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do this if I had both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Water-resistant building materials (such as mold-resistant dry wall) Count Row %	5 8.2%	6 9.8%	4 6.6%	6 9.8%	31 50.8%	9 14.8%	61
Storm (flood) vents Count Row %	3 4.9%	3 4.9%	4 6.6%	4 6.6%	21 34.4%	26 42.6%	61
Elevating or removing building mechanicals and valuables from flood-prone areas Count Row %	6 10.0%	6 10.0%	6 10.0%	6 10.0%	31 51.7%	5 8.3%	60
Totals Total Responses							61

20. Approximately how much have you spent on wet flood-proofing solutions?

Water-resistant building materials

lots
1⁰ 2

Storm (flood) vents

1⁰

Elevating or removing building mechanicals and valuables

0
kidding

Other

No data: No responses found for this question.

21. Other solutions to mitigate your property from flooding

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do this if I had both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Elevating my building Count Row %	5 7.9%	2 3.2%	1 1.6%	4 6.3%	46 73.0%	5 7.9%	63
Demolishing my basement, garage, shed, or other building Count Row %	3 4.9%	0 0.0%	1 1.6%	2 3.3%	51 83.6%	4 6.6%	61
Totals Total Responses							63

22. Approximately how much have you spent on other solutions to mitigate your property from flooding?

Elevating building

0

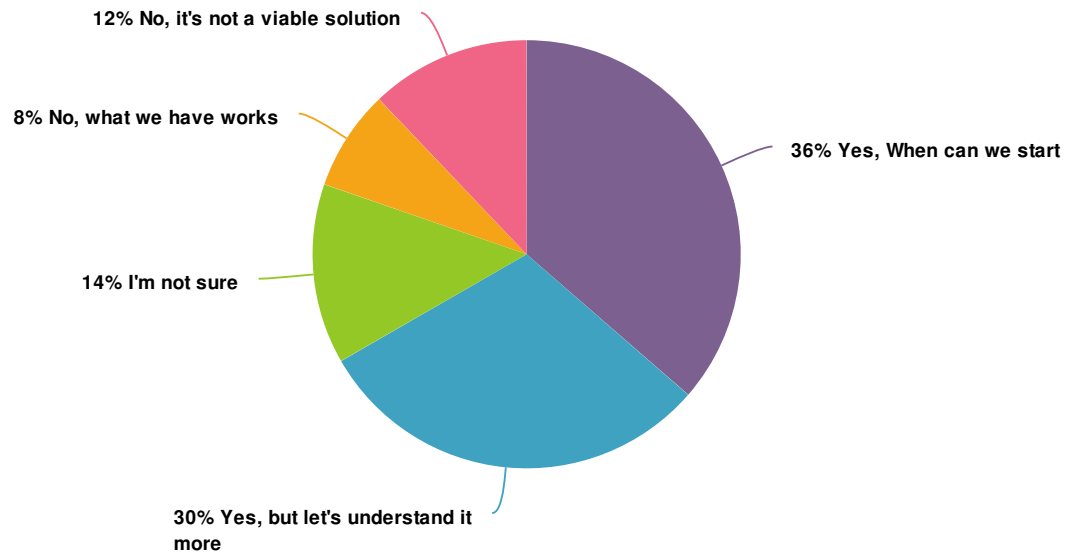
Demolishing basement, garage, shed, or other building

500.00

Other

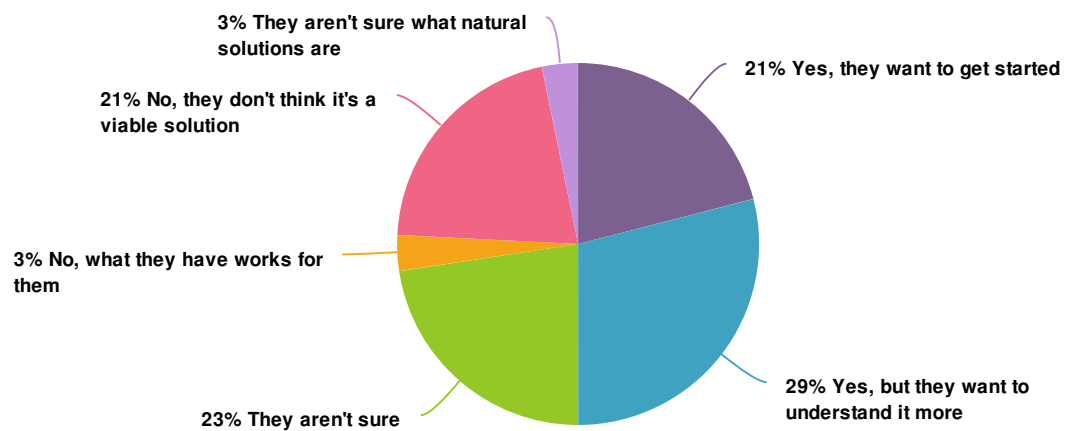
groundput
shed 0 removed
elevated







23. Using natural solutions, such as those previously mentioned, is a good strategy for managing neighborhood flooding.



Value		Percent	Responses
Yes, When can we start	<div><div></div><div></div></div>	36.4%	24
Yes, but let's understand it more	<div><div></div><div></div></div>	30.3%	20
I'm not sure	<div><div></div><div></div></div>	13.6%	9
No, what we have works	<div><div></div><div></div></div>	7.6%	5
No, it's not a viable solution	<div><div></div><div></div></div>	12.1%	8
Totals: 66			

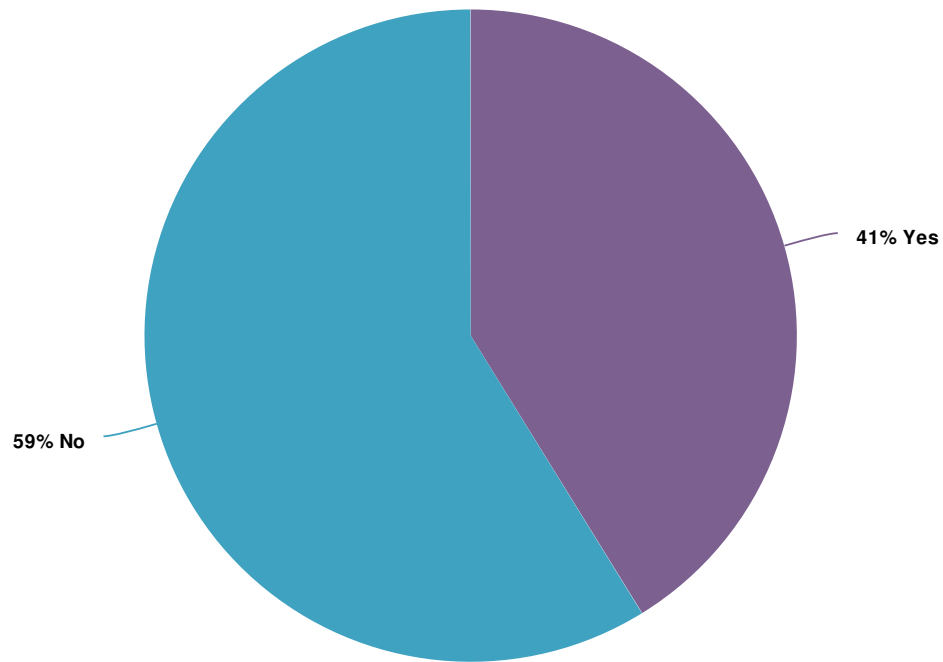
24. My neighbors think using natural solutions, such as those previously mentioned, is a good strategy for managing neighborhood flooding.



Value		Percent	Responses
Yes, they want to get started		21.0%	13
Yes, but they want to understand it more		29.0%	18
They aren't sure		22.6%	14
No, what they have works for them		3.2%	2
No, they don't think it's a viable solution		21.0%	13
They aren't sure what natural solutions are		3.2%	2

Totals: 62

25. Would you like to be contacted for an interview about flooding in your home and community?



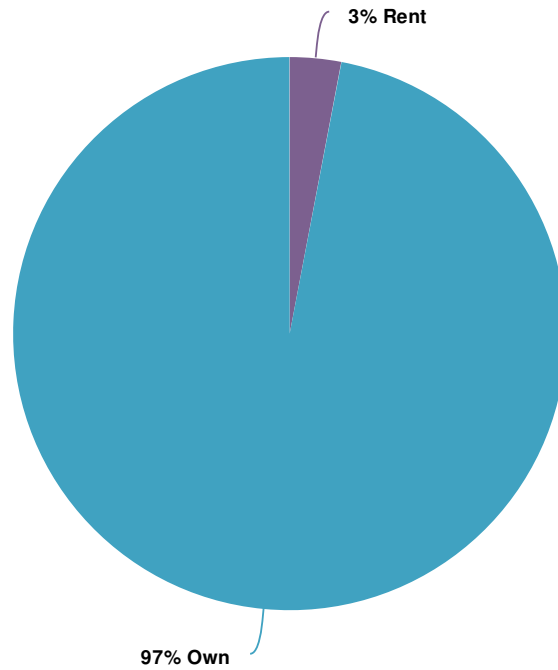
Value		Percent	Responses
Yes	<div><div></div><div></div></div>	41.2%	28
No	<div><div></div><div></div></div>	58.8%	40
Totals: 68			

26. [OLD VERSION] Please provide your contact information.

No data: No responses found for this question.

27. Please provide your contact information. Type "N/A", if you don't want to provide or don't have an answer to the following:

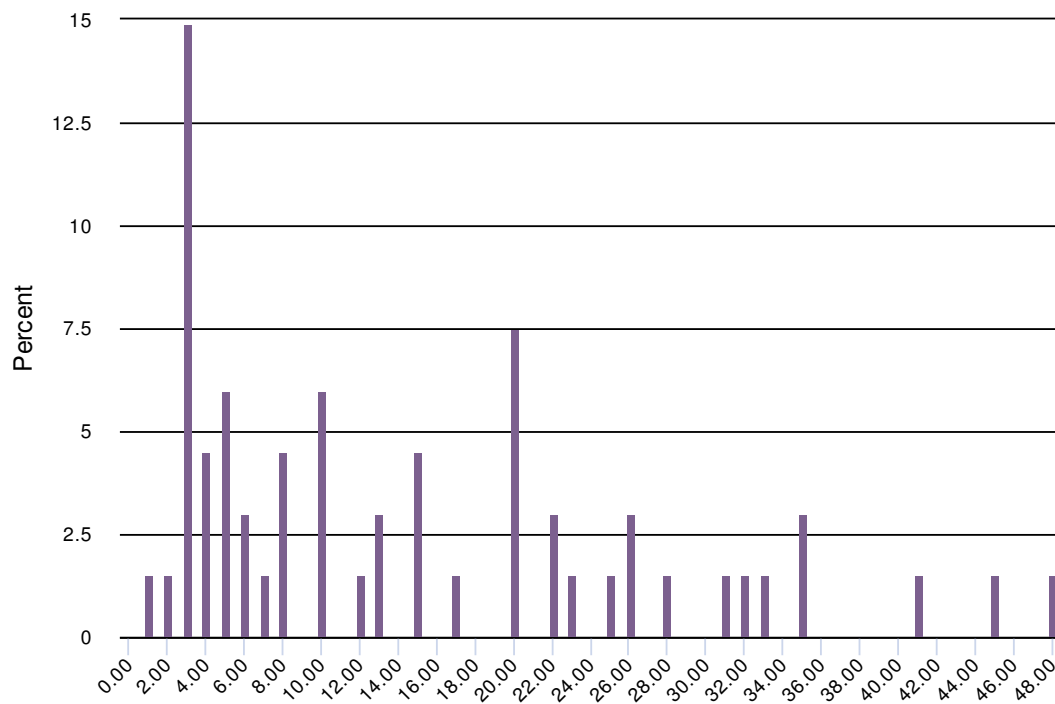
28. Do you rent or own your property?



Value		Percent	Responses
Rent	<div><div></div></div>	3.0%	2
Own	<div><div></div></div>	97.0%	64

Totals: 66

29. How long have you lived at your property?



Appendix B: Presentation to Stormwater Advisory Commission Public Meeting



RainReady – Carrboro, NC

Resident Survey Results

Stormwater Advisory Commission Meeting – 2/13/2020

Center for Neighborhood Technology



CNT

resilient, sustainable and livable cities for everyone

CNT's mission is to make cities work for everyone. CNT works at the intersection of environmental sustainability, social equity, and technology—with particular attention on creating efficient and affordable solutions for low-income communities and communities of color.

“Urban Flooding” Defined

Occurs when homes, yards or streets, are inundated with water from heavy rains or snow melt, damaging property, making travel difficult and dangerous. It also results from sewer water backing up through pipes into basements, and from water seeping through foundation walls.

Hierarchy for Stormwater Management



AVOID IT

Avoid stormwater runoff by protecting open space



SINK IT

Catch and sink runoff by adding porous paving, trees, and rain gardens to urban areas



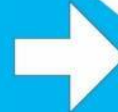
HOLD IT

Hold runoff temporarily through detention basins in parks, golf courses, reservoirs, etc.

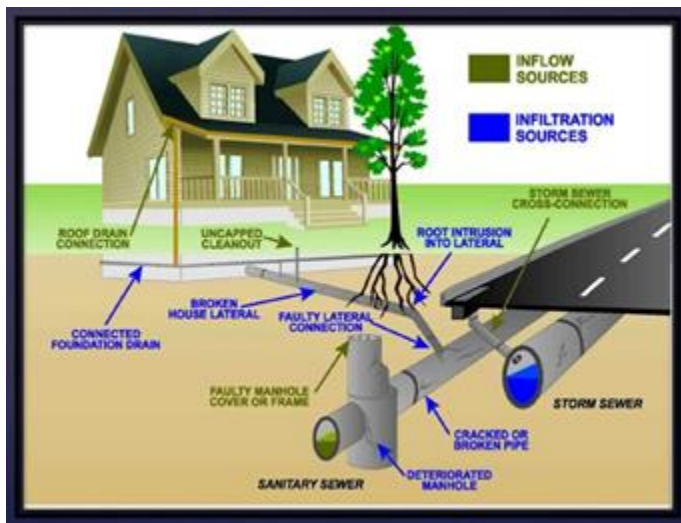


SEND IT

Send runoff to treatment facilities using pipes, tunnels, and ditches



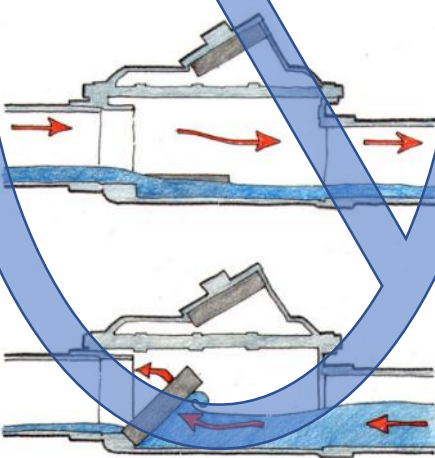
Some of the Problems



Building-Scale Grey Infrastructure

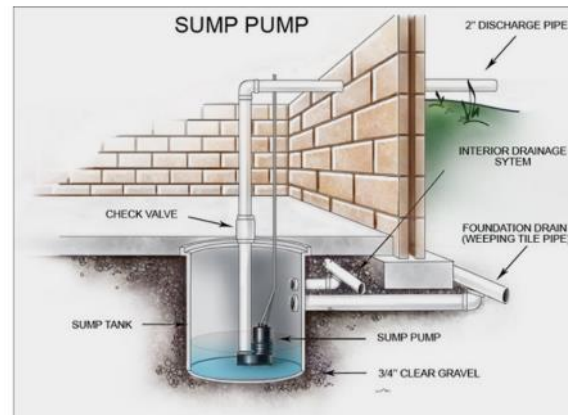
Backwater Valve

- One-way swinging valve that closes when sewage from mainline threatens to back up
- Caution: during storm events, the valve will prevent water from leaving your building so no don't flush!



Sump Pump

- Reduces basement flooding via seepage by pumping foundation drain water or pooled water on the floor out of basement
- Caution: backup with battery-power so you don't flood during power outage



Foundation Crack Repair

- Reduce seepage and mold by sealing cracks in your foundation using an epoxy injection
- Caution: focus on cracks that are horizontal or near L-shaped sections on your walls, not hairline fractures



Permeable Pavement

- Allows rainwater to percolate through pavers, preventing run off from roads, parking lots, sidewalks
- Rainwater either filters back into subsoils or is held in underground storage before reentering the sewers
- Helps solve **overland flooding** and possibly **basement backups** if enough pavers are installed



Bioinfiltration

- Includes rain gardens, bioswales, planter boxes, larger scale basins
- Usually a depressed area into which rainfall is either conveyed or falls and filters back into subsoils or is held in underground storage before reentering the sewers
- Provides water quantity and quality improvements
- Helps solve overland flooding and possibly basement backups if enough bioinfiltration systems are installed

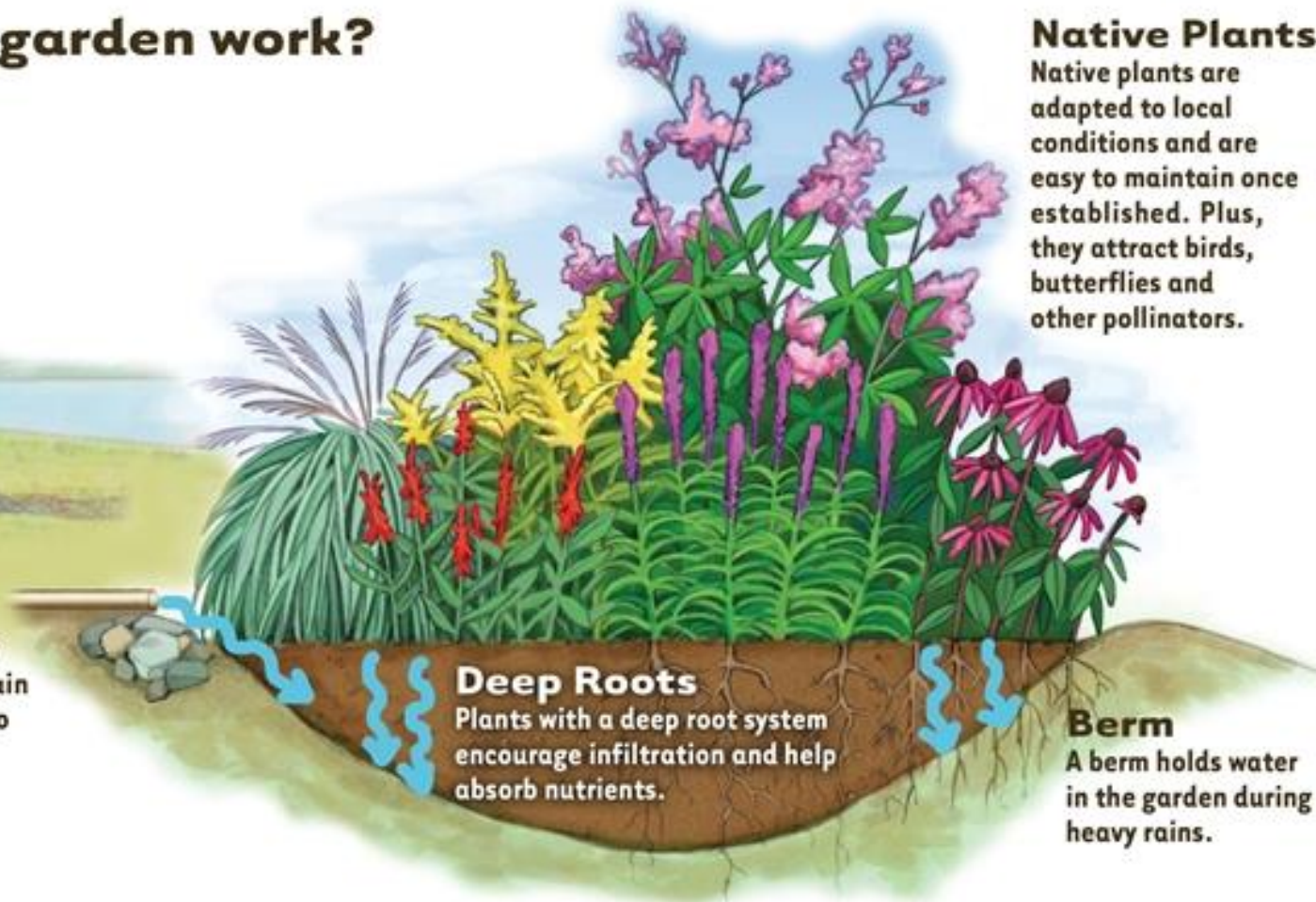


How does a rain garden work?



Gutters & Down Spouts

Assist with directing rain water from your roof to your rain garden.



Deep Roots

Plants with a deep root system encourage infiltration and help absorb nutrients.

Native Plants

Native plants are adapted to local conditions and are easy to maintain once established. Plus, they attract birds, butterflies and other pollinators.

Berm

A berm holds water in the garden during heavy rains.







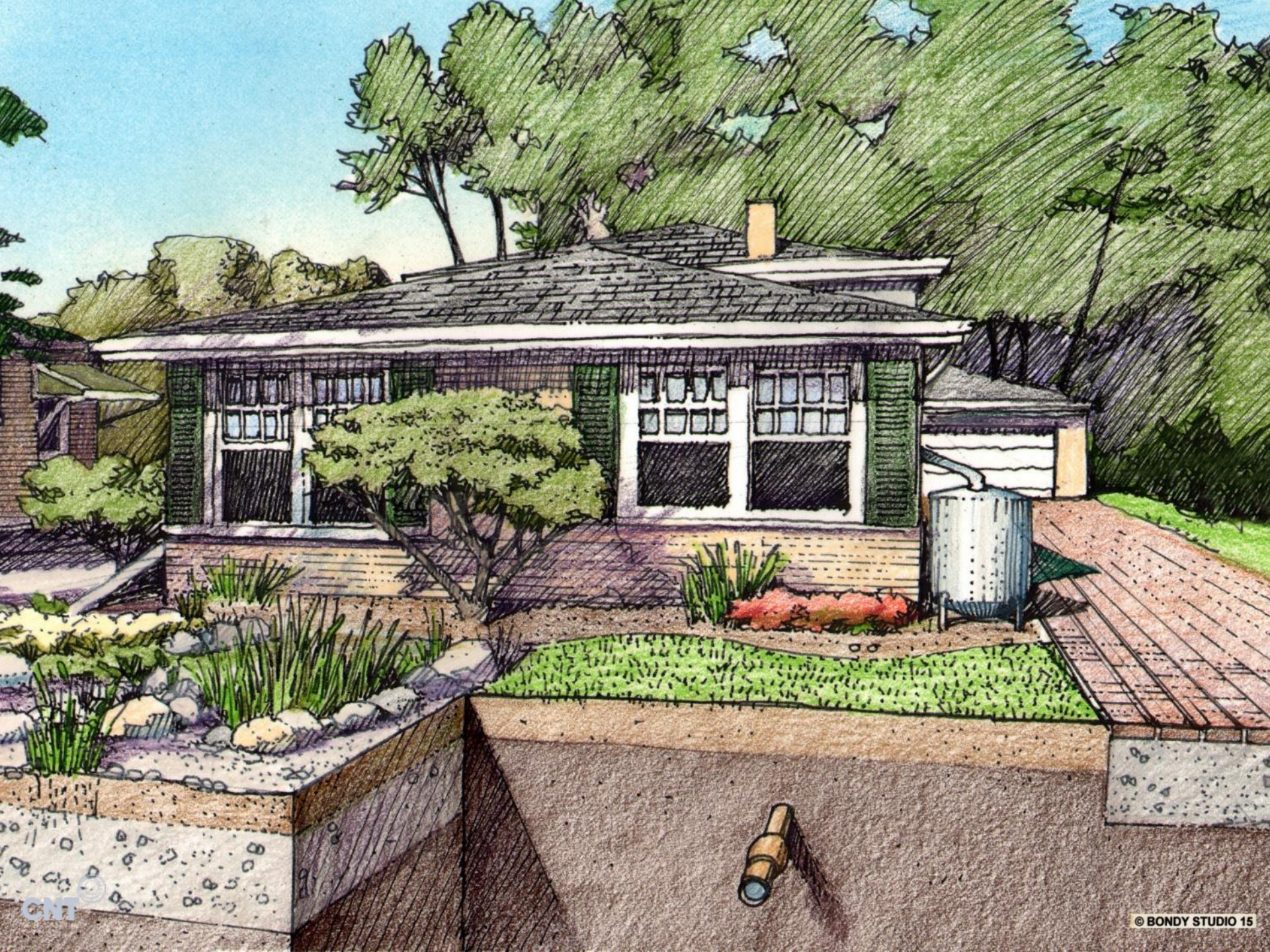




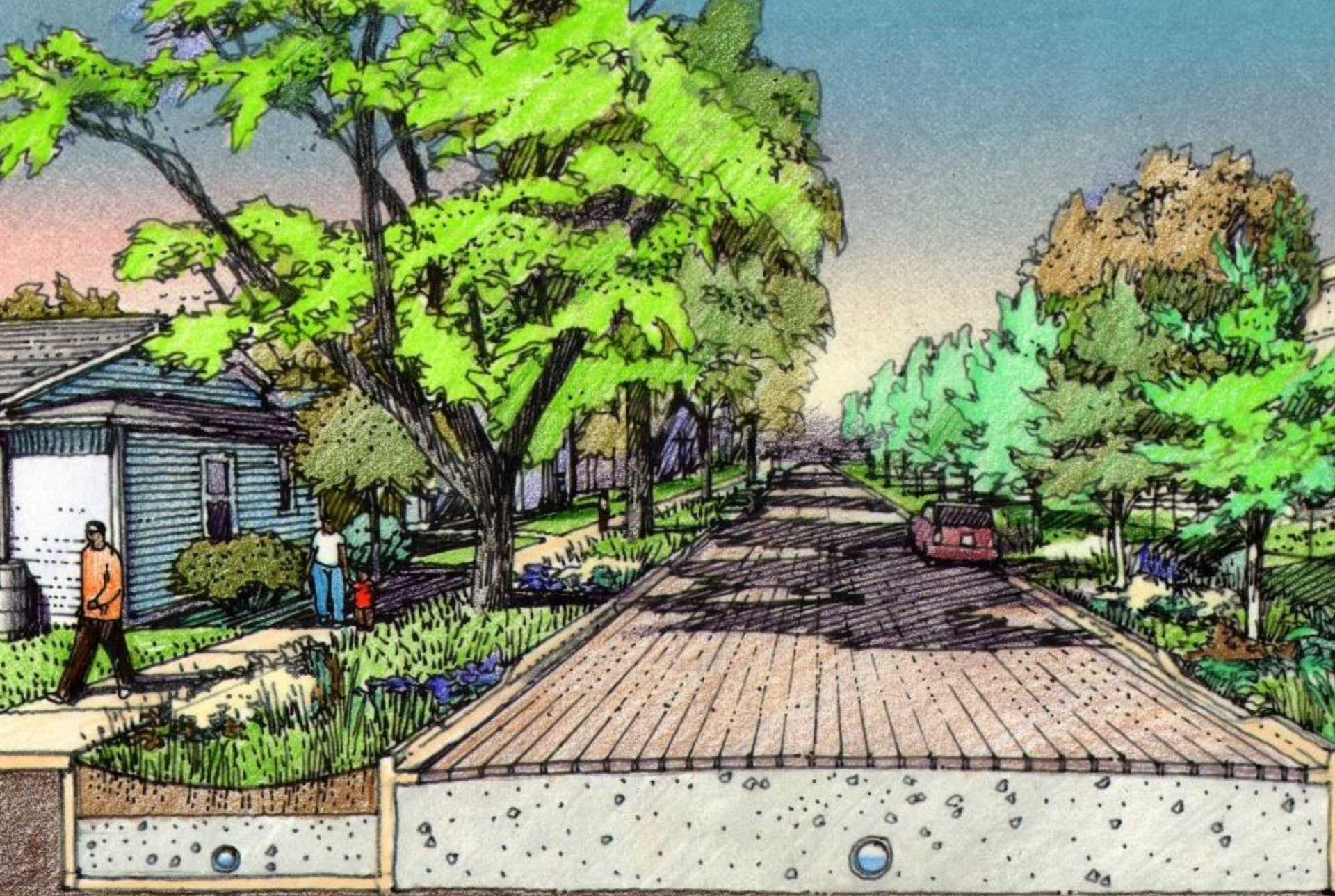
Street Trees

- Incredibly effective sinks. Tree canopy slow rainfall; tree roots, when given space to grow drink tremendous amounts of rainwater
- Street trees should vary in species to avoid blight/disease
- Helps solve overland flooding and possibly basement backups if trees are installed at strategic location
- Caution: when trees are planted in parkways, their root structure can sometimes grow into a sewer or water line, causing a water loss or sewer backup situation



























Green Infrastructure and “Co-benefits”

Benefit	Reduces Stormwater Runoff					Increases Available Water Supply	Increases Groundwater Recharge	Reduces Salt Use	Reduces Energy Use	Improves Air Quality	Reduces Atmospheric CO ₂	Reduces Urban Heat Island	Improves Community Livability					Improves Habitat	Cultivates Public Education Opportunities
	Reduces Water Treatment Needs	Improves Water Quality	Reduces Grey Infrastructure Needs	Reduces Flooding									Improves Aesthetics	Increases Recreational Opportunity	Reduces Noise Pollution	Improves Community Cohesion	Urban Agriculture		
Practice																			
Green Roofs	●	●	●	●	○	○	○	●	●	●	●	●	◐	●	◐	◐	●	●	
Tree Planting	●	●	●	●	○	◐	○	●	●	●	●	●	●	●	●	◐	●	●	
Bioretention & Infiltration	●	●	●	●	◐	◐	○	○	●	●	●	●	●	◐	◐	○	●	●	
Permeable Pavement	●	●	●	●	○	◐	●	◐	●	●	●	○	○	●	○	○	○	●	
Water Harvesting	●	●	●	●	●	◐	○	◐	◐	◐	○	○	○	○	○	○	○	●	



Planning

A resident-driven, community-wide stormwater management planning service

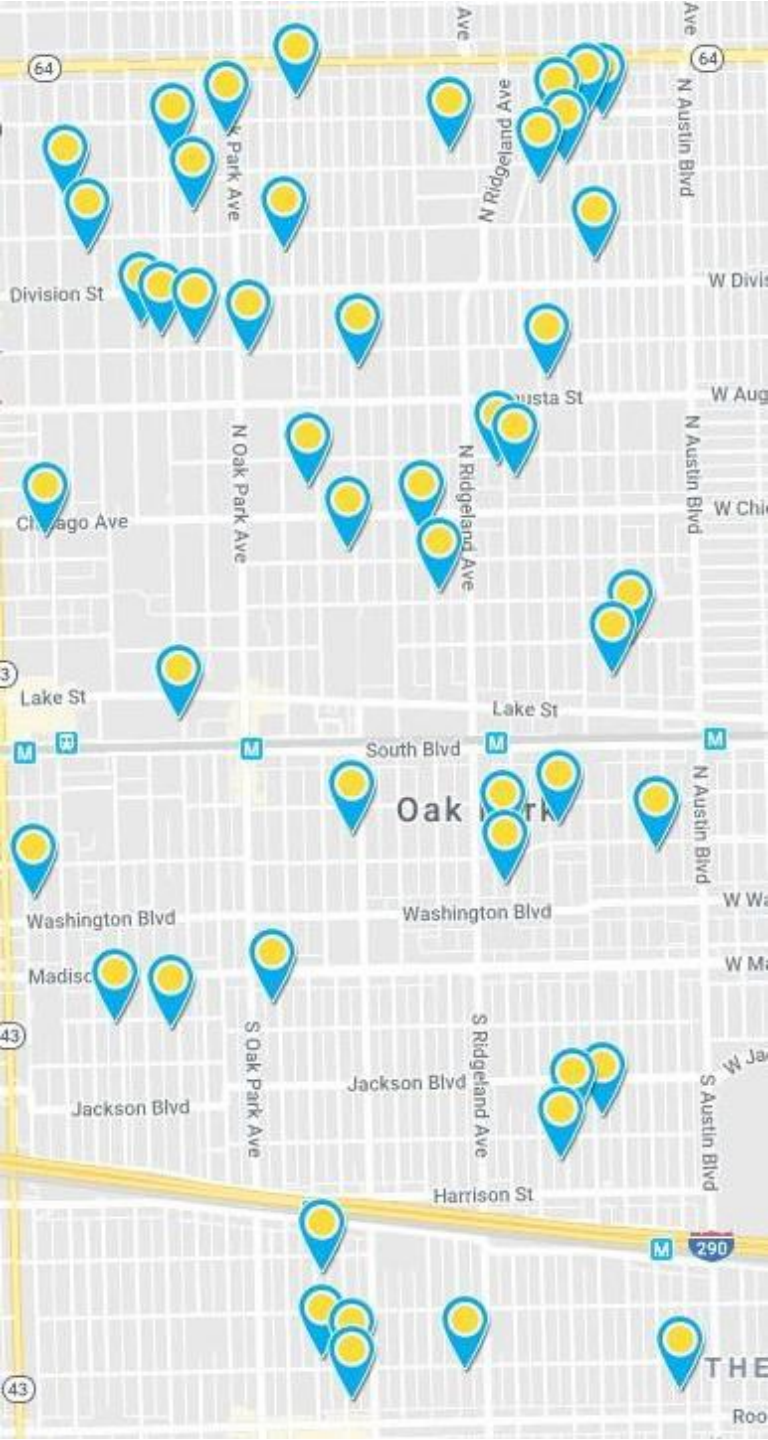
Assistance Program

A “one-stop shop” home
flood risk management
service

Customized Solutions

- Regrading
- Downspout disconnection
- Dry wells
- Rain gardens
- Backwater valves
- Porous paving





RainReady Oak Park (IL)

Completed Installations

- 36 Rain Gardens or Bioswales
- 4 Dry Wells
- 6 Depavings

Stormwater Management

Estimated **724,000** gallons of rain
diverted from Oak Park's sewer system

My RainReady

Virtual Home Assessment Tool

A woman wearing a white sleeveless top, a blue patterned skirt, and a straw hat is holding a large yellow umbrella. She is standing on a sidewalk in front of a two-story brick house with white-trimmed windows. A white spherical outdoor light is visible on a pole near the house.

My RainReady

Enter your address to start the online assessment of your home flooding risks

Enter your address to begin

Go

Note: My RainReady does not collect or share any information about you or your building.

My RainReady

Your Location

Map Satellite

Linden Ave, Oak Park, IL 60302, USA ✕

Year Built: 1925
Land Square Feet: 6250
FEMA flood risk: Minimal Risk

Do your neighborhood streets flood when it rains?

☐ Yes ☐ No ☒ I don't know

Tip: Take a look at your street when it next rains, and take photographs. Look to see if it is flooding in areas where there is a street sewer grate. This might help identify the cause of the street flooding. The sewer grate could be clogged with litter or leaves. If the sewer grates are clear, but street flooding still occurs, your municipality may have installed restrictor valves in the street's sewer inlet. The purpose of these devices is to slow the flow of water entering the sewer system. This reduces the risk of sewage and stormwater runoff backing up into your basement.

- Parcel-specific data
- Guided flood risk questionnaire
- Flood protection tips for homeowners
- Customized recommendations report based on questionnaire answers
- Freely available to all
- Web: myrainready.cnt.org

Group Tours and Education



CNT Carrboro Project Scope



Process

- Gather Existing Conditions
 - Review public data
 - Survey Residents
 - Interview Town Staff
- Recommend Program Design
 - Develop retrofit templates
 - Estimate costs and benefits
 - Identify engagement needs
 - Define priority targets
 - Identify evaluation measures
 - Conduct case study



A photograph of a white, single-story house with a red door and dark shutters. The house has a brick chimney and a small porch with a white railing. The house is surrounded by trees and a lawn with fallen leaves. A semi-transparent white banner is overlaid across the middle of the image, containing the text "Resident Survey Results" in green.

Resident Survey Results

Survey Goals

- Understand
 - flooding impacts and concerns,
 - knowledge of flood risks and solutions,
 - attitudes towards green infrastructure,
 - familiarity with home renovation projects,
 - desired type of assistance, and
 - ability to invest in building-scale flood mitigation measures.

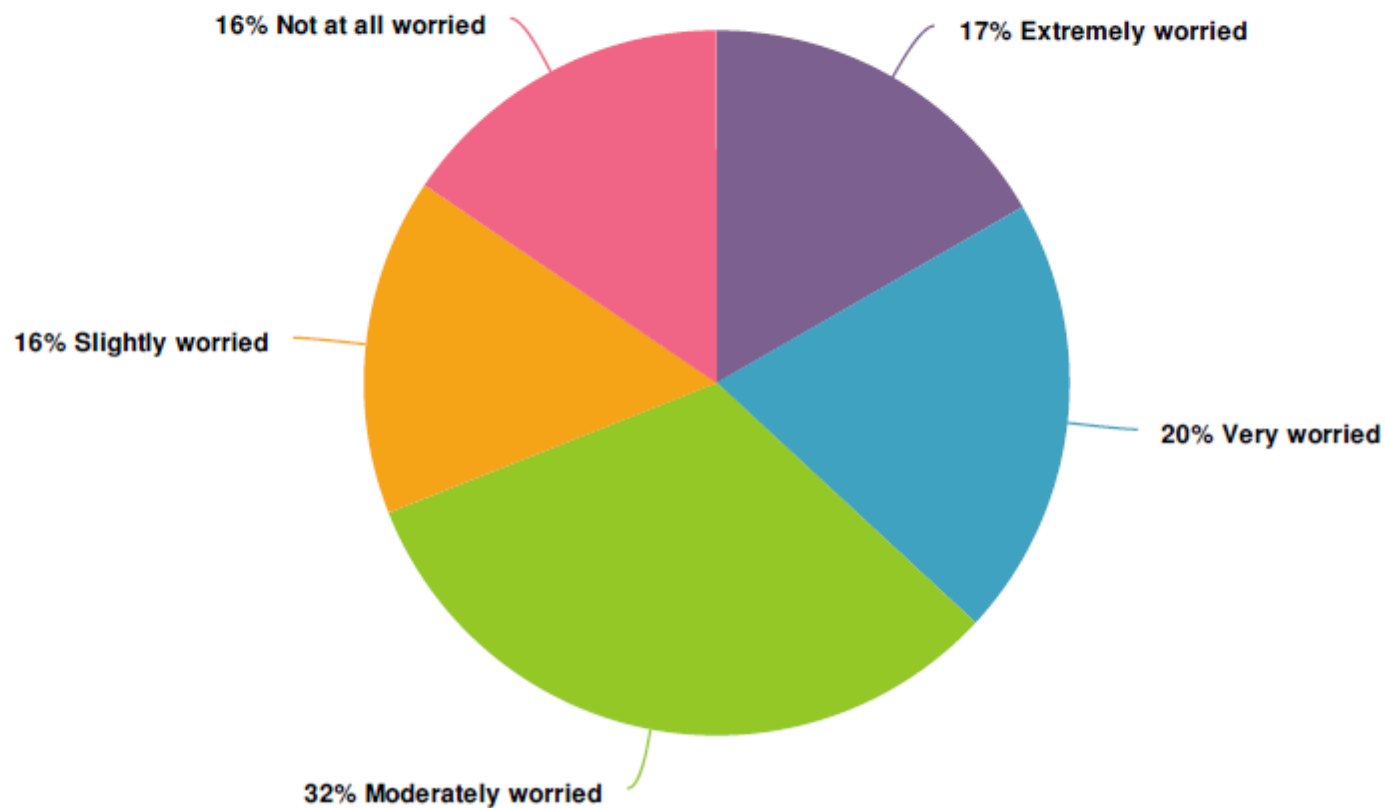


Survey Methods

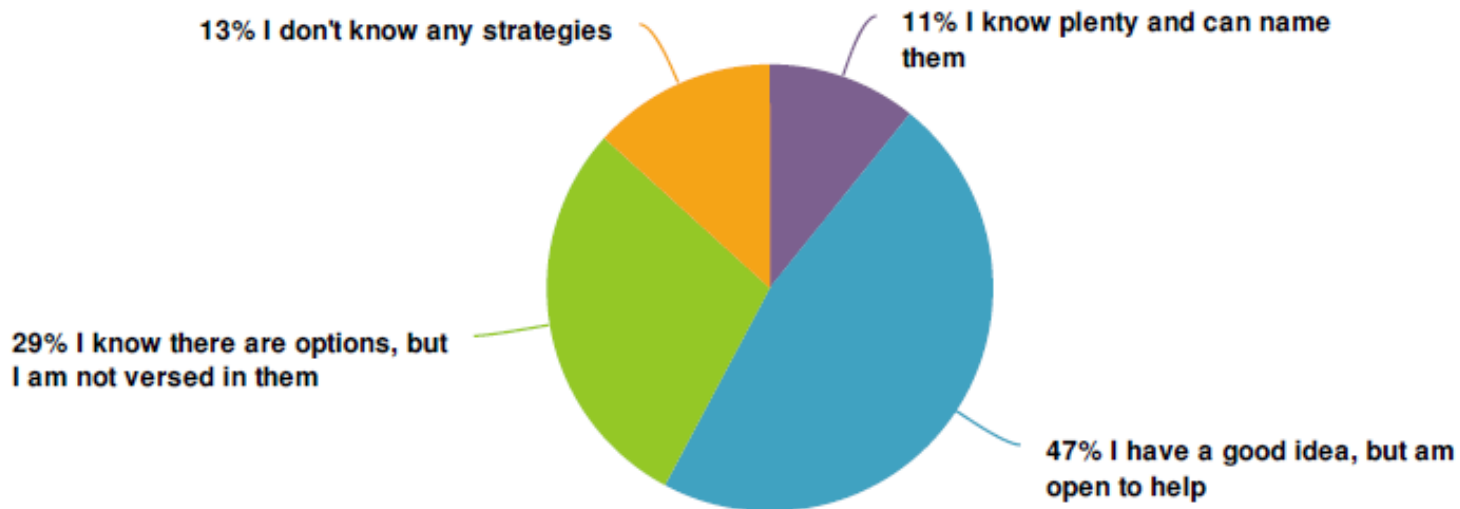
- Online or on paper
- Fielded December—January, 2020
- Town staff went door-to-door to bolster response
- 28 questions
- 83 people completed (1/3 of households in study area [watershed above Main Street])



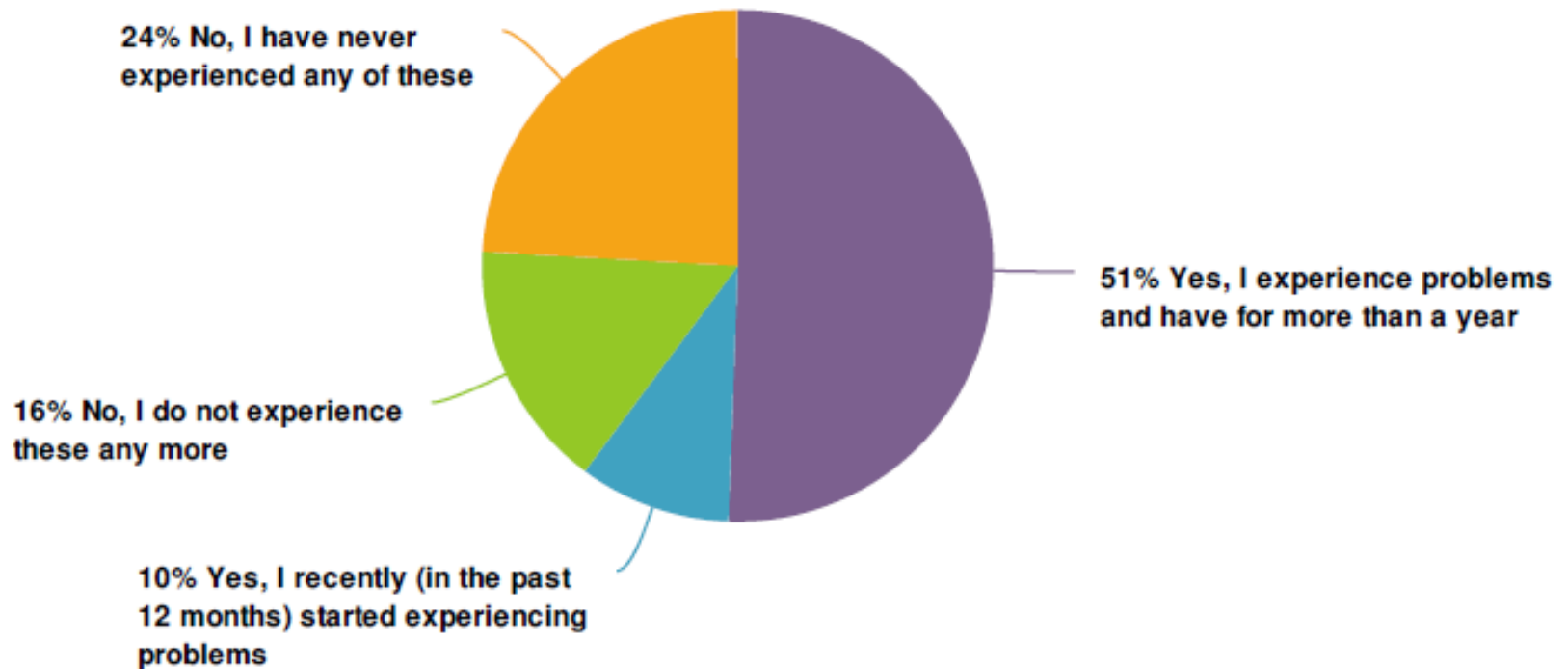
2. How worried are you about the impact of flooding on your property?



3. How much do you know about strategies for reducing the risk of flooding at your home?












4. Do you experience flooding on your property? This could include issues such as water entering your home, crawl space, basement, garage, or shed from a creek or the street, sewage backup, or persistent yard ponding.






	No, I have never experienced any of these	No, I do not experience these any more	Yes, I recently (in the past 12 months) started experiencing problems	Yes, I experience problems and have for more than a year
I don't know any strategies	6	0	0	5
I know there are options, but I am not versed in them	5	2	3	14
I have a good idea, but am open to help	7	8	4	21
I know plenty and can name them	2	3	1	2



5. What kind of flooding do you currently experience?

Value		Percent	Responses
Flowing under doors and/or windows		4.1%	2
Seeping through walls (for example, through cracks or joints)		4.1%	2
Backing up through drains (floor drains, bathtubs, sinks, etc.)		2.0%	1
Water entering crawl space, basement, garage, or shed		40.8%	20
Overflowing from a creek or water body		42.9%	21
Overflowing from the street		26.5%	13
Persistent yard ponding		65.3%	32
Flash flood		34.7%	17
Other - Write In		22.4%	11

7. What kind of weather causes flooding at your property?

Value		Percent	Responses
A normal rain event		14.6%	7
An intense rain event		97.9%	47
A hurricane or tropical storm		79.2%	38

8. How much have you spent on addressing repairing or replacing flood-damaged property, since you have lived at your home?

Value		Percent	Responses
\$		62.3%	38
None, I haven't spent anything		37.7%	23

Totals: 61

AVERAGE* \$6,308







MEDIAN \$3,000

*two outliers were removed


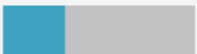
9. What does flooding assistance look like to you?

Value		Percent	Responses
A checklist or similar resource that I can use to self-diagnose flooding issues and identify common solutions		51.2%	42
Step-by-step instructions for building a home rain garden and other DIY solutions		43.9%	36
A list of vetted professionals and contractors who can design and install flood management solutions		41.5%	34
A home inspection conducted by a knowledgeable professional that can recommend solutions		48.8%	40
A professional flood management landscape design prepared specifically for my home		45.1%	37
Financial assistance to repair existing water damage		25.6%	21

9. What does flooding assistance look like to you?

Value		Percent	Responses
A reimbursement to cover up to 30% of the cost of installing flood mitigation solutions		19.5%	16
A reimbursement to cover up to 50% of the cost of installing flood mitigation solutions		23.2%	19
A reimbursement to cover up to 80% of the cost of installing flood mitigation solutions		35.4%	29
An up-front partial matching grant to install a flood mitigation solution at your home		31.7%	26
An up-front grant to install a flood mitigation solution at your home (no cost to you)		46.3%	38
Other - Write In (Required)		26.8%	22

10. How much would you be willing to invest in your home to reduce the risk of flood damage?

Value		Percent	Responses
\$		67.6%	48
None (\$0)		32.4%	23

Totals: 71

AVERAGE* \$4,529

MEDIAN* \$2,000

*four responses recoded to be read as numbers

11. Home maintenance and insurance solutions

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do this if I had both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Regrading around my property Count Row %	21 33.3%	4 6.3%	10 15.9%	13 20.6%	14 22.2%	1 1.6%	63
Repairing gutters and downspouts Count Row %	50 72.5%	5 7.2%	3 4.3%	4 5.8%	7 10.1%	0 0.0%	69
Repairing/improving the drainage ditch on my property Count Row %	27 42.9%	6 9.5%	4 6.3%	17 27.0%	9 14.3%	0 0.0%	63
Purchasing NFIP flood insurance Count Row %	8 13.6%	6 10.2%	1 1.7%	6 10.2%	25 42.4%	13 22.0%	59
Totals Total Responses							69

13. Natural solutions

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Rainwater harvesting (Cistern/Rain barrels) Count Row %	25 39.7%	6 9.5%	5 7.9%	10 15.9%	14 22.2%	3 4.8%	63
Rain garden Count Row %	10 16.4%	3 4.9%	8 13.1%	18 29.5%	13 21.3%	9 14.8%	61
Dry well or French drain Count Row %	29 44.6%	3 4.6%	4 6.2%	12 18.5%	12 18.5%	5 7.7%	65
Disconnecting downspouts from the storm sewer system Count Row %	14 23.3%	0 0.0%	3 5.0%	4 6.7%	18 30.0%	21 35.0%	60

15. Plumbing solutions

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Sewage backflow prevention device (check valve, backwater valve, or overhead sewer) Count Row %	5 7.7%	2 3.1%	3 4.6%	6 9.2%	23 35.4%	26 40.0%	65
Sump pump Count Row %	16 23.9%	0 0.0%	2 3.0%	6 9.0%	36 53.7%	7 10.4%	67
Totals Total Responses							67

17. Dry flood-proofing solutions, to keep water out of your home

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do this if I had both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Altering entryway to prevent water from entering under door Count Row %	11 17.7%	3 4.8%	3 4.8%	3 4.8%	36 58.1%	6 9.7%	62
Sealing cracks and openings in foundation and walls Count Row %	18 29.0%	5 8.1%	7 11.3%	7 11.3%	21 33.9%	4 6.5%	62
Flood-proofing building mechanicals Count Row %	10 15.9%	6 9.5%	5 7.9%	10 15.9%	11 17.5%	21 33.3%	63
Totals Total Responses							63



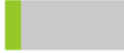
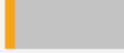

19. Wet flood-proofing solutions, to manage water in your home

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do this if I had both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Water-resistant building materials (such as mold-resistant dry wall) Count Row %	5 8.2%	6 9.8%	4 6.6%	6 9.8%	31 50.8%	9 14.8%	61
Storm (flood) vents Count Row %	3 4.9%	3 4.9%	4 6.6%	4 6.6%	21 34.4%	26 42.6%	61
Elevating or removing building mechanicals and valuables from flood-prone areas Count Row %	6 10.0%	6 10.0%	6 10.0%	6 10.0%	31 51.7%	5 8.3%	60
Totals Total Responses							61







21. Other solutions to mitigate your property from flooding

	I've done this.	I would do this if I had financial assistance.	I would do this if I had technical assistance.	I would do both financial & technical assistance.	I'm not interested in this.	I don't know what this is.	Responses
Elevating my building Count Row %	5 7.9%	2 3.2%	1 1.6%	4 6.3%	46 73.0%	5 7.9%	63
Demolishing my basement, garage, shed, or other building Count Row %	3 4.9%	0 0.0%	1 1.6%	2 3.3%	51 83.6%	4 6.6%	61
Totals Total Responses							63

23. Using natural solutions, such as those previously mentioned, is a good strategy for managing neighborhood flooding.

Value		Percent	Responses
Yes, When can we start		36.4%	24
Yes, but let's understand it more		30.3%	20
I'm not sure		13.6%	9
No, what we have works		7.6%	5
No, it's not a viable solution		12.1%	8
			Totals: 66

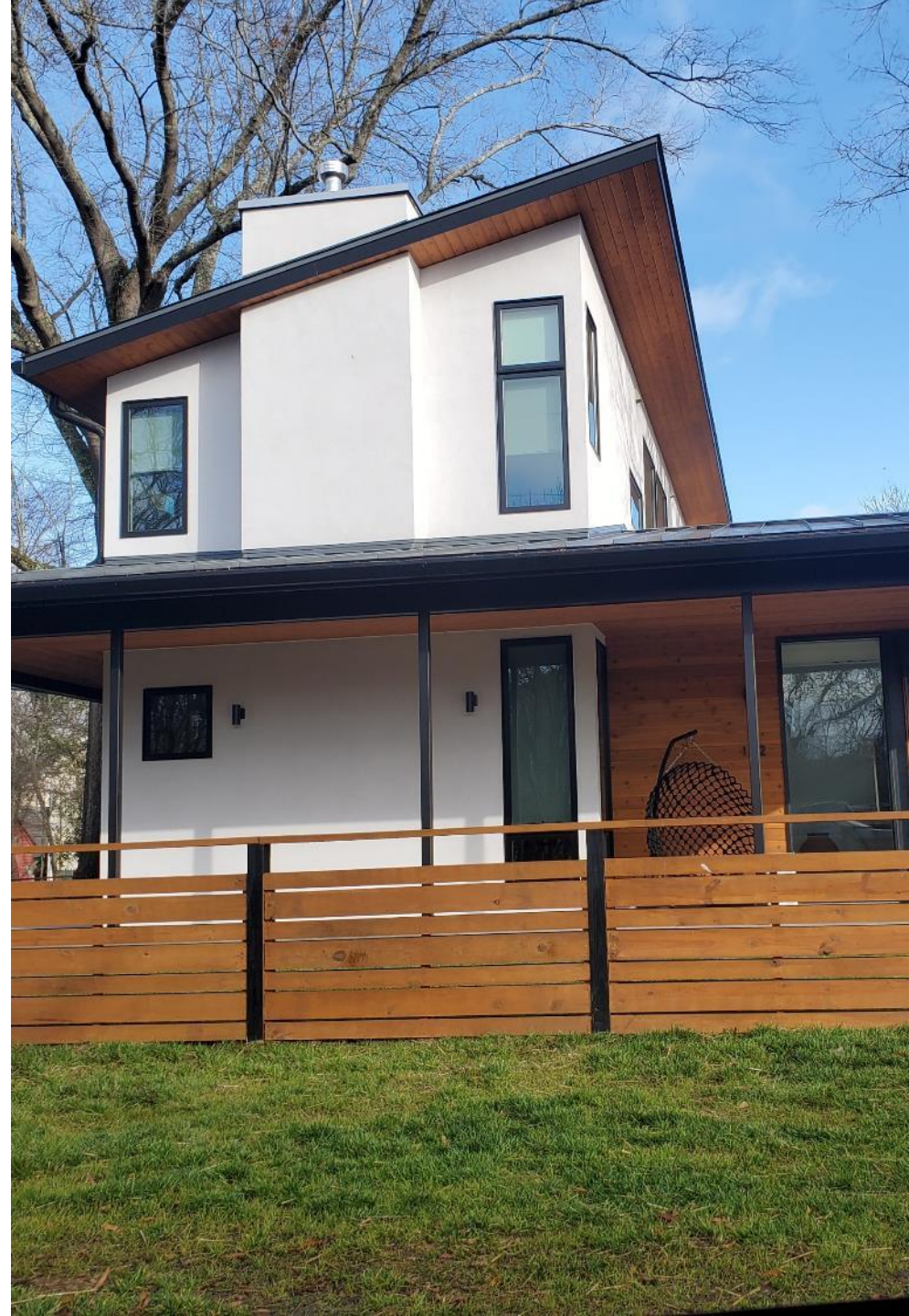
24. My neighbors think using natural solutions, such as those previously mentioned, is a good strategy for managing neighborhood flooding.

Value		Percent	Responses
Yes, they want to get started		21.0%	13
Yes, but they want to understand it more		29.0%	18
They aren't sure		22.6%	14
No, what they have works for them		3.2%	2
No, they don't think it's a viable solution		21.0%	13
They aren't sure what natural solutions are		3.2%	2

Totals: 62

Conclusions

- Respondents report a baseline of understanding
- Most people have a desire to learn more and take action
- 2/3 are interested in pursuing natural solutions
- There is an interest, overall, in receiving some support or pursuing a community approach.



Discussion



Discussion Questions

- Are any of the survey results surprising to you?
- Based on what you've heard, are there any conclusions that you would add? Modify?
- Would anyone in the room like to share their flooding experience?
- Based on these survey results, and your personal experience with Carrboro, what sort of residential assistance program would you recommend for the town?
- How can we work on the problem together?



Appendix C: Acronym List

CDBG - Community Development Block Grant

CIP - Capital Improvement Program

CNT - Center for Neighborhood Technology

CRS - Community Rating System

SRF – (Clean Water) State Revolving Fund

FEMA - Federal Emergency Management Agency

GI - Green Infrastructure

GSI – Green Stormwater Infrastructure

LID - Low Impact Development

MS4 - Municipal Separate Storm Sewer System

NOAA - National Oceanic and Atmospheric Administration

NRCS - Natural Resources Conservation Service (formerly SCS)

O&M - Operations and Maintenance

P3s - Public-Private Partnerships, Public-Public Partnerships

ROW - Right-of-Way

SCM – Stormwater Control Measure

SWCD - Soil and Water Conservation District

USACE - U.S. Army Corps of Engineers

USEPA - U.S. Environmental Protection Agency

Appendix D: Glossary of Terms

This study includes a number of broad concepts and specific terms. Some regulations and federal agencies use very specific definitions for regulatory purposes. In those cases, we have used the regulatory definition.

Adverse Impacts: Any deleterious impact on water resources or wetlands affecting their beneficial uses including recreation, aesthetics, aquatic habitat, quality, and quantity.

Adaptation: Adjustment in response to actual and expected climate change, and/or effect to reduce harm or take advantage of opportunities.

Aquifer: Geologic formation(s) that is water-bearing. A geological formation or structure that stores and/ or transmits water, such as to wells and springs. Use of the term is usually restricted to those water-bearing formations capable of yielding water in sufficient quantity to constitute a usable supply for people's uses.

Asset: A useful and desirable building, resource, or quality.

Base Flood: The flood having a 1% chance of being equaled or exceeded in any given year. The base is also known as the 100-year frequency flood event.

Base Flood Elevation (BFE): The elevation of the crest of the base flood in relation to mean sea level.

Basement: That portion of the building having its floor subgrade (below ground level) on all sides.

Bedrock: Solid rock that underlies the soil and fragmented rock.

Biodiversity: The variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems.

Building: A walled and roofed structure principally above ground, including manufactured homes, prefabricated buildings, and gas or liquid storage tanks. The term also includes recreational vehicles and travel trailers installed on a site for more than 180 days per year.

Buffer: An area of predominantly deeply rooted native vegetated land adjacent to channels, wetlands, lakes, or ponds for the purpose of stabilizing banks and reducing contaminants, including sediments, in stormwater that flows to such areas.

Bypass Flows: Stormwater runoff from upstream properties tributary to a property's drainage system, but not under its control.

Catchment: A catchment is an area of land that drains to a particular point. All runoff within a given catchment will flow down to the same outlet.

Channel: Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainage way that has a definite bed and bank or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

Channel Modification: Alteration of a channel by changing the physical dimensions or materials of its bed or banks.

Climate Change: Refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer.

Compensatory Storage: An artificially excavated, hydraulically equivalent volume of storage within the floodplain used to balance the loss of natural flood storage and flow conveyance capacity when artificial fill or structures are placed within the floodplain. The uncompensated loss of natural floodplain storage and conveyance capacity can increase off-site floodwater elevations and flows.

Conflict Resolution: A process to resolve disputes.

Depressional Storage: The volume contained below a closed contour, the upper elevation of which is determined by the invert of a surface gravity outlet.

Design Storm: A rainfall event of specified size and return frequency (e.g., a storm that occurs only once every 2 years) that is used to calculate the runoff volume and peak discharge rate.

Detention Basin: A facility constructed or modified to provide for the temporary storage of stormwater runoff and the controlled release by gravity, through infiltration, or by pump of this runoff at a prescribed rate during and after a flood or storm.

Development: Any man-made change to real estate, including construction, reconstruction, repair, or placement of a building or any addition to a building, installing a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer on a site for more than 180 days; drilling, mining, installing utilities, construction of roads, bridges, or similar projects; demolition of a structure or redevelopment of a site; clearing of land as an adjunct of construction; construction or erection of levees, walls, fences, dams, or culverts, or channel modification; filling, dredging, grading, excavating, paving, or other non-agricultural alterations of the ground surface; storage of materials; deposit of solid or liquid waste; any other man-made activity that might change the direction, height, or velocity of flood or surface water, including extensive vegetation removal; and substantial improvement of an existing building. Development does not include routine maintenance of existing buildings and facilities such as re-roofing or re-surfacing of roads when there is no increase in elevation, or gardening, plowing, and similar agricultural practices that do not involve filling, grading, or construction of levees.

Downspout: Pipe to carry rainwater from a roof to a drain or to ground level.

Drainage Area: The land area above a given point where precipitation will contribute to runoff flow.

Drainage Basin: Land area where precipitation runs off into streams, rivers, lakes, and reservoirs. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Large drainage basins, like the area that drains into the Mississippi River, contain thousands of smaller drainage basins. Also called a "watershed."

Drainage Study: See Stormwater Management Study.

Dry Basin: A detention basin designed to drain completely after temporary storage of stormwater flows and to normally be dry over the majority of its bottom area.

Discharge: Discharge is another term for streamflow; it is the measured volume of water that moves past a point in a stream in a given amount of time. Discharge is usually expressed in cubic feet per second.

Downspout: A vertical pipe that carries rain and snow melt from gutters on the edges of the roof to either the foundation drain and sewer system (if the downspout remains connected) or to the surface of the property (if the downspout has been disconnected).

Easement: Grant or reservation by a landowner for the use of such land by others for a specific purpose or purposes, and which must be included in the conveyance of land affected by such easement.

Ecosystem: Any natural unit or entity including living and non-living parts that interact to produce a stable system through cyclic exchange of materials

Effluent: Discharge or emission of a liquid or gas.

Erosion: The process in which a material is worn away by a stream of liquid (water) or air, often due to the presence of abrasive particles in the stream.

Flood: A general and temporary condition where water partially or completely overflows land that is normally dry. This overflow typically comes from inland or tidal waves or from an unusual and rapid accumulation of water runoff from any source. For purposes of identifying urban flooding areas, flooding also includes yard ponding, basement backups and foundation seepage related to stormwater events, but unrelated to river overflows.

Flood Fringe: The portion of the floodplain outside of the regulatory floodway.

Flood Insurance Rate Map (FIRM): A map prepared by FEMA that depicts the Special Flood Hazard Area (SFHA) within a community. This map includes insurance rate zones and floodplains and may or may not depict floodways.

Flood Map: Maps showing the geographic extent of possible flooding. Maps are informed by hydrologic and hydraulic modelling, and can be produced to show the possible flooding that would arise from rainfall of a given intensity.

Floodplain: Relatively flat and normally dry land typically adjacent to a body of water with ground surface elevations at or below the base flood elevation (BFE: the 100-year frequency flood elevation) that is covered by water during a flood.

Flood-proofing: Any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, and structures and their contents.

Flood Protection Elevation (FPE): The elevation of the base flood or 100-year frequency floods plus 1 foot of freeboard at any given location in the Special Flood Hazard Area (SFHA).

Flood Risk: A combination of the likelihood of a flood occurring and the consequence of the flood when it does occur.

Flow Path: A route designated by people to direct the flow of rain and snow melt runoff over the land in a controlled manner.

Floodway: See Regulatory Floodway.

Foundation drain: An underground pipe that runs along the bottom of a home's foundation and helps keep the basement free of excess moisture from groundwater.

Freeboard: An increment of height added to the BFE, groundwater table, or 100-year design water surface elevation to provide a factor of safety for uncertainties in calculations, unknown local conditions, wave action, non-stationary climate, and unpredictable effects such as those caused by ice or debris jams.

Green Infrastructure: Any stormwater management technique or practice that reduces runoff volume through preserving, restoring, utilizing, or enhancing the natural ecosystem processes of water infiltration, evapotranspiration, and reuse. Approaches may include green roofs, naturalized detention facilities, trees and tree boxes, rain gardens, vegetated swales, vegetated buffers, wetlands, infiltration planters, porous and permeable pavements, porous piping systems, dry wells, vegetated median strips, reforestation/ revegetation, rain barrels, cisterns, and protection and enhancement of riparian buffers and floodplains.

Grey Infrastructure: Man-made constructions often composed of concrete and metals, to carry people or services from one place to another. Examples are sewers, roads, bridges, pipes, etc. While grey infrastructure is highly durable, its construction and maintenance costs are high. Due to safety regulations, all work must be completed by skilled, licensed engineers and/or laborers.

Grey Water: Wastewater from clothes washing machines, showers, bathtubs, hand washing, lavatories and sinks.

Groundwater: Water that is located beneath the ground or pavement surface.

Gutter: Hang from the perimeter of the roof, funneling rain and snow melt off the roof and into downspouts.

Habitat: The physical environment in which a certain organism prefers to live.

Hydrograph: A hydrograph is a graph that shows changes in discharge or river stage over time. The time scale may be in minutes, hours, days, months, years, or decades.

Hydrology: The scientific study of the water of the earth, its occurrence, circulation and distribution, its chemical and physical properties, and its interaction with the environment, including its relationship to living things.

Hydric Soil: A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part.

Hydrologic and Hydraulic Calculations: Engineering analysis which determines expected flood flows and flood elevations based on land characteristics and rainfall events.

Hydrologically Disturbed: An area where the land surface has been cleared, grubbed, compacted, or otherwise modified to alter stormwater runoff, volumes, rates, flow direction, or inundation duration.

Impermeable: See Impervious.

Impervious: Not allowing water to pass through.

Impervious Area: Land cover such as, but not limited to, non-porous asphalt or asphalt sealants, non-porous concrete, roofing materials except rooftops designed to reduce runoff, and gravel surfaces used as roadways or parking lots that prevent infiltration.

Impervious Surfaces: Structures such as roads, sidewalks, driveways and parking lots that are made of compacted material like concrete, asphalt, brick, stone, etc. These surfaces do not allow water to pass through them vs. soil that “absorbs” water and allows it to pass through.

Infiltration: The passage or movement of water in the soil. Flow of water from the land surface into the subsurface.

Integrated Water Management (IWM): A water management approach which considers all components of the water cycle as a whole to maximize social, environmental and economic outcomes. It achieves this through the coordinated management of drainage, flooding, waterways, water supply, and sewerage services.

Inundation: The submergence of land by water. See Flood.

Land Cover: The physical material at the surface of the earth. Land covers include grass, asphalt, trees, bare ground, water, etc.

Lateral Line: The sewage pipe that transports water used inside a building to the municipal sanitary sewer system in the street.

Mitigation: Measures necessary to minimize the negative effects that stormwater drainage and development activities might have on the public health, safety, and welfare. Examples of mitigation include compensatory storage, soil erosion and sedimentation control, and channel restoration.

Nature-based Solutions (Green Infrastructure): An approach to water management that protects, restores, or mimics the natural water cycle.

Natural: When used in reference to channels, those formed by the existing surface topography of the earth prior to man-made changes. A natural stream tends to follow a meandering path; its floodplain is not constrained by levees; the area near the bank has not been cleared, mowed, or cultivated; the stream flows over soil and geologic materials typical of the area with no substantial alteration of the course or cross-section of the stream caused by filling or excavating. A modified channel may regain some natural characteristics over time as the channel meanders and vegetation is re-established. Similarly, a modified channel may be restored to more natural conditions by man through regrading and revegetation.

Non-structural Solutions: Any non-physical measure used to reduce the consequences of flooding. This includes community education programs, training, insurance, and development controls, warning and emergency systems, and emergency response.

Open Channel: A conveyance system with a definable bed and banks carrying the discharge from field tiles, surface drainage, and/or storm sewer system. It does not include grassed swales within farm fields under agricultural production, which are ephemeral.

One Hundred-Year (100-yr) Event: A rainfall, runoff, or flood event having a 1% chance of occurring in any given year.

Ordinary High-Water Mark: The point on the bank or shore up to which the presence and action of surface water is so continuous so as to leave a distinctive mark such as by erosion, destruction, or prevention of terrestrial vegetation, predominance of aquatic vegetation, or other easily recognized characteristics.

Outfall: The place where a sewer, drain, or stream discharges; the outlet or structure through which reclaimed water or treated effluent is finally discharged to a receiving water body.

Overland Flooding: Flooding that occurs when water flows over the surface of public and private property. It can enter homes and buildings through windows and doors.

Overland Flow Path: A design feature of the major stormwater system which carries flows in excess of the minor stormwater system design capacity in an open channel or swale, or as sheet flow or weir flow over a feature designed to withstand the particular erosive forces involved.

Peak Flow: The maximum flowrate of water at a given point in a channel or conduit.

Permeability: The ability of a material to allow the passage of a liquid, such as water, through rocks. Permeable materials, such as gravel and sand, allow water to move quickly through them, whereas impermeable materials, such as clay, don't allow water to flow freely.

Permeable: See Pervious.

Pervious: Allowing water to pass through.

Post-development: Refers to conditions that reasonably may be expected or anticipated to exist after completion of the land-disturbing activity on a specific site or tract of land.

Precipitation: Rain, snow, hail, sleet, dew, and frost.

Redevelopment: Any human-induced activity or change to an existing developed property (including, but not limited to, demolition, grading, paving, excavation, dredging, fill, or mining; alteration, subdivision, or change in land use or practice; building; or storage of equipment or materials) undertaken by private or public entities that affects the volume, flow rate, drainage pattern, or composition of the site stormwater runoff on the previously developed land. The term does not include maintenance.

Regulatory Floodplain: Lands subject to inundation by the base flood. Floodplains are identified on enumerated panels and index of Flood Insurance Rate Maps (FIRMS) prepared by FEMA.

Regulatory Floodway: The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations. For streams and other watercourses where FEMA has provided Base Flood Elevations (BFEs) but no floodway has been designated, the community must review floodplain development on a case-by-case basis to either ensure that increases in water surface elevations do not occur, or identify the need to adopt a floodway if adequate information is available.

Retention/Detention Facility: A retention facility stores stormwater runoff without a gravity release. A detention facility provides for storage of stormwater runoff and controlled release of this runoff during and after a storm.

Regional Catchment: A catchment, often including several local catchments (or subcatchments), larger than 60 hectares (ha) or greater in size. In some rural areas, due to historical agreements, councils manage flood and drainage infrastructure for areas up to 200 ha. in size.

Runoff: The water or drainage derived from melting snow or rain falling on the land surface, flowing over the surface of the ground, or collected in channels or conduits.

Recurrence Interval: The average number of years between floods of a certain size is the recurrence interval or return period. The actual number of years between floods of any given size varies a lot because of the naturally changing climate.

Reservoir: A pond, lake, or basin, either natural or artificial, for the storage, regulation, and control of water.

Resilience: The capacity of individuals, communities, institutions, businesses, and systems within a community to survive, adapt, and grow under stress and shocks.

Risk Assessment: The process used to determine the level of risk at a particular location by quantifying both likelihood and impact of floods. Flood managers use this process to determine management priorities.

Riverine Flooding: Occurs when runoff from storms exceeds the capacity of a river or creek and overflows onto surrounding land.

Runoff: Water from melting snow or rain falling on the land, flowing over the ground, or collected in channels or conduits.

Sedimentation: (1) The combined processes of soil erosion, entrainment, transport, deposition, and consolidation. (2) Deposition of sediments.

Sewer: A system of underground pipes that collect and deliver wastewater to treatment facilities or streams.

Sewer Grate; Sewer Inlet: Also known as “catch basin,” “inlet,” or “storm sewer inlet.” Opening in the surface of the street that allows stormwater runoff to enter the underground municipal sewer system.

Slope: The ratio of the change in elevation over distance.

Special Flood Hazard Area (SFHA): Areas on the FIRMs, as well as urban flooding areas, where floodplain management regulations must be enforced.

Stormwater: Runoff from the surface of the land resulting from precipitation or snow or ice melts.

Stormwater Drainage System: All means, natural or man-made, used to convey stormwater to, through, or from a drainage area to the point of final outlet from a property. The stormwater drainage system includes, but is not limited to, any of the following: conduits and appurtenance features, canals, channels, ditches, streams, culverts, streets, storm sewers, detention basins, swales, and pumping stations.

Stormwater Flooding: Occurs when runoff from storms exceeds the capacity of our drains and pipes and overflows onto surrounding properties. Overland flooding can happen very quickly. Floods that rise very rapidly are often known as ‘flash floods.’ Stormwater flooding is sometimes referred to as ‘overland flooding.’

Stormwater Management: A system of vegetative, structural, non-structural, and educational measures that control the volume, rate, and pollutants of stormwater.

Stormwater Management Permit (SWM Permit): An approval shall be issued by the enforcement officer prior to the approval of a building permit. Issuance of a storm water management permit signifies conformance with provisions of this ordinance.

Stormwater Management Study (SWM Study): Set of drawings or other documents submitted as a prerequisite to obtaining a stormwater management approval, which contains all information and specifications of drainage systems and environmental features proposed after the development of a property.

Stormwater Pollution Prevention Study (SWPPP): A site-specific, written document that identifies potential sources of stormwater pollution at the construction site, describes practices to reduce pollutants in stormwater discharges from the construction site (reduction of pollutants is often achieved by controlling the volume of stormwater runoff), and identifies procedures the operator will implement to comply with the terms and conditions of a construction general permit.

Stormwater Runoff; Runoff: This is rainfall that collects on streets, sidewalks, roofs, and parking lots and runs off impermeable surfaces. It is cleaner than sanitary sewage, but can be contaminated with animal waste, salt and other pollution.

Storm Sewer: A closed conduit for conveying collected stormwater.

Surface Water: Water that is on the Earth’s surface, such as in a stream, river, lake, or reservoir.

Swale: A grassy, shallow ditch-like depression used to direct stormwater flows.

Televising: This is a method for visually inspecting a sewer line. It helps assess sewer line conditions and can reveal blockages, or other damage.

Tributary: A smaller river or stream that flows into a larger river or stream. Usually, a number of smaller tributaries merge to form a river

Urban Flooding: Occurs when homes, yards or streets are inundated with water from heavy rains or snow melt, damaging property, and making travel difficult and dangerous. It also results from sewer water backing up through pipes into basements, and from water seeping through foundation walls.

Urban Infill/Consolidation: The development of higher- density residential and commercial properties in existing urbanized areas of the city.

Volume Control Storage: The volume of storage required to detain a specified amount of runoff from the new impervious area of development on the site.

Vulnerability: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed; its sensitivity; and its adaptive capacity.

Wet Basin: (1) A detention basin designed to maintain a permanent pool of water after the temporary storage of stormwater runoff. (2) The top of the water surface in the saturated part of an aquifer.

Water Table: The upper limit of a free water surface in a saturated soil or underlying material.

Watershed: All land drained by, or contributing water to the same stream, lake, stormwater facility, or draining to a point.

Wetland: Areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season. Wetlands can be natural or man-made constructions. If man-made, they are often referred to as constructed wetlands.

Program Design

Program:	Raleigh Rainwater Rewards (NC)
Administrator	City of Raleigh (Local Government)
Description:	This program provides funding for projects that capture and clean rainwater before it goes into storm drains and local waterways. Residents can receive up to 90 percent reimbursement for a project.
Link:	https://raleighnc.gov/projects/content/PWksStormwater/Articles/StormwaterQualityCostShareProgram.html

Program:	RainReady Oak Park (IL)
Administrator	Center for Neighborhood Technology (Non-Profit)
Description:	Since 2017, the Village of Oak Park (Illinois) has partnered with a local nonprofit to offer a program that reduce urban flooding risks using green infrastructure such as residential rain gardens. The program utilized the RainReady Home model, designed by CNT. This approach provides homeowners with independent, integrated home assessments identifying flood risks and solutions, and offers customized landscape designs to reduce onsite drainage issues while reducing stormwater runoff to the municipal sewer system.
Link:	https://www.cnt.org/projects/rainready-oak-park

Program:	Home Preparedness Assessment Program (Boulder, CO)
Administrator	APTIM (Private Sector)
Description:	In 2017, The HPA program offered participants a free one-hour in-home consultation in which a professional advisor recommended home improvements that would help residents respond to flood, fire, and drought. Additionally, homeowners could receive a cash rebate that would cover the first \$500 of repairs or improvements. The rebates covered mostly non-green infrastructure building improvement solutions. The program was quickly oversubscribed, and used one-time federal funding.
Link:	https://www.adaptationclearinghouse.org/resources/case-study-boulder-colorado-eyes-home-preparedness-assessment-program.html?preview=true

Program:	Clean Water Hero Program (OR)
Administrator	Clean Water Services (Water Utility)
Description:	This program provides up to three hours of on-site technical assistance from a stormwater design expert, to help residents create a sustainable stormwater landscape that will reduce polluted runoff from your property and maintain the health of local waterways. County residents can also receive free plants each fall for their property.
Link:	https://www.cleanwaterservices.org/for-residents/community-resources/outside/in-your-yard/

Funding and Financing: Federal Resources

Source:	Community Development Financial Institutions (CDFI) Fund
Program:	New Markets Tax Credit Program (NMTC)
Mechanism:	Tax Credit
Description:	The NMTC Program incentivizes community development and economic growth through the use of tax credits that attract private investment to distressed communities.
Eligible Applicants:	Businesses
Eligible Activities:	Activities to Support Livelihoods and Employment, Capital Projects
Link:	https://www.cdfifund.gov/programs-training/Programs/new-markets-tax-credit/Pages/default.aspx

Source:	Corporation for National and Community Service (CNCS)
Program:	AmeriCorps State and National Grants
Mechanism:	Grants
Description:	The mission of CNCS is to improve lives, strengthen communities, and foster civic participation through service and volunteering. Through AmeriCorps, Senior Corps, the Social Innovation Fund, and the Volunteer Generation Fund, CNCS has helped to engage millions of citizens in meeting community and national challenges through service and volunteer action.
Eligible Applicants:	Educational Institutions, Nonprofits Organizations, Local Governments, States, Tribal Governments
Eligible Activities:	Activities to support livelihoods and employment, Capital Projects; Activities to Ensures Social Stability, Security and Justice; Activities to Empower a Broad Range of Stakeholders
Link:	https://www.nationalservice.gov/build-your-capacity/grants/funding-opportunities/2017/ameri-corps-state-and-national-grants-fy-2017

Source:	Federal Emergency Management Agency (FEMA)
Program:	Hazard Mitigation Grant Program (HMGP) from Hazard Mitigation Assistance (HMA)
Mechanism:	Grants
Description:	The HMGP provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. Authorized under Section 404 of the Stafford Act and administered by FEMA, HMGP was created to reduce the loss of life and property due to natural disasters. The program enables mitigation measures to be implemented during the immediate recovery from a disaster.
Eligible Applicants:	States, Local Governments, Nonprofit Organizations, Tribal Governments
Link:	http://www.fema.gov/hazard-mitigation-grant-program

Source:	US Army Corps of Engineers (USACE)
Program:	Section 205: Small Flood Risk Management Projects
Mechanism:	Grants
Description:	The Small Flood Risk Management Project program provides local flood risk management by the construction or improvement of flood control works or non-structural measures. The types of studies and/or projects are tailored to be site specific. Typical flood risk management projects may include levees, floodwalls, impoundments, pumping stations, and channel modifications as well as non-structural measures. Non-structural measures reduce flood damages by changing the use of floodplains or by accommodating existing uses to the flood hazard. Examples include flood proofing, relocation of structures, and flood warning and preparedness systems. The Corps of Engineers oversees design, and construction of flood risk management projects in close coordination with the project sponsor.
Eligible Applicants:	Non-Federal Sponsors
Eligible Activities:	Activities to Meet Basic Needs
Link:	http://www.mvr.usace.army.mil/Business-With-Us/Outreach-Customer-Service/Flood-Risk-Management/Section-205/

Source:	US Army Corps of Engineers (USACE)
Program:	Section 206: Aquatic Ecosystem Restoration
Mechanism:	Grants
Description:	The Corps of Engineers can carry out aquatic ecosystem restoration and protection projects. Such projects generally include manipulation of the hydrology in and along bodies of water, including wetlands and riparian areas. A project is adopted for construction only after a detailed investigation determines that the project will improve the quality of the environment and is in the best interest of the public.
Eligible Applicants:	Non-Federal Sponsors
Eligible Activities:	Activities to Enhance and Provide Protective Natural & Man-Made Assets
Link:	http://www.mvr.usace.army.mil/Business-With-Us/Outreach-Customer-Service/Ecosystem-Restoration/Section-206/

Source:	US Army Corps of Engineers (USACE)
Program:	Section 219: Environmental Infrastructure Program
Mechanism:	Technical Assistance
Description:	The Environmental Infrastructure Program, also known as Section 219 of the 1992 Water Resources Development Act (WRDA), as amended, authorizes the Corps to assist non-federal interests in carrying out water-related environmental infrastructure and resource protection and development projects. Such assistance may be in the form of technical, planning, and/or design assistance for water supply and storage, treatment and distribution system, and wastewater treatment systems including treatment plants.
Eligible Applicants:	Non-Federal Sponsors
Eligible Activities:	Activities to Meet Basic Needs
Link:	http://www.usace.army.mil/Missions/Civil-Works/Project-Partnership-

Source:	US Department of Agriculture (USDA)
Program:	US Forest Service - Urban and Community Forestry Program
Mechanism:	Grants
Description:	<p>The Urban and Community Forestry Program responds to the needs of urban areas by maintaining, restoring, and improving urban forest ecosystems on more than 70 million acres. Through these efforts, the program encourages and promotes the creation of healthier, more livable urban environments across the nation.</p> <p>The Urban and Community Forestry Program provides technical, financial, research, and educational services to local government, nonprofit organizations, community groups, educational institutions, and tribal governments. The program is delivered through its legislative partners, the state forestry agencies in 59 states and US territories. Three national themes provide a framework for this work:</p> <ul style="list-style-type: none"> - Conserve working forest landscapes, - Protect forests from harm, and - Enhance benefits associated with trees and forests.
Eligible Applicants:	Local Governments, Nonprofit Organizations, Educational Institutions
Eligible Activities:	Activities to Enhance and Provide Protective Natural & Man-Made Assets
Link:	https://www.fs.fed.us/managing-land/urban-forests/ucf

Link:	https://www.hudexchange.info/programs/bedi/
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Source:	US Department of Housing and Urban Development (HUD)
Program:	Capacity Building for Sustainable Communities (in partnership with the EPA)
Mechanism:	Grants
Description:	The Capacity Building for Sustainable Communities Program will identify intermediary organizations that can provide capacity building support for communities engaged in planning efforts that support community involvement and integrate housing, land use, land cleanup and preparation for reuse, economic and workforce development, transportation, and infrastructure investments. Each grantee will be expected to deliver capacity building support to communities across the United States.

Eligible Applicants:	Nonprofit Organizations, Local Governments, States, Tribal Governments, Businesses
Eligible Activities:	Activities to Promote Leadership and Effective Management
Link:	https://portal.hud.gov/hudportal/HUD?src=/program_offices/economic_development/capacity-building

Source:	US Department of Housing and Urban Development (HUD)
Program:	Choice Neighborhoods Initiative Implementation Grant
Mechanism:	Grants
Description:	<p>Choice Neighborhoods Implementation Grants support the implementation of comprehensive neighborhood revitalization plans that are expected to achieve the following three core goals:</p> <ol style="list-style-type: none"> 1. Housing: Replace distressed public and assisted housing with high-quality mixed-income housing that is well- managed and responsive to the needs of the surrounding neighborhood. 2. People: Improve educational outcomes and intergenerational mobility for youth. 3. Neighborhood: Create the conditions necessary for public and private reinvestment in distressed neighborhoods to offer the kinds of amenities and assets, including safety, good schools, and commercial activity, that are important to families' choices about their community. <p>To achieve these core goals, communities must develop and implement a comprehensive neighborhood revitalization strategy, or "Transformation Study." The transformation Study can be developed through the Choice Neighborhoods Initiative Planning Grant.</p>
Eligible Applicants:	Local Governments, Businesses
Link:	https://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/ph/cn/grants

Source:	US Department of Housing and Urban Development (HUD)
Program:	Choice Neighborhoods Initiative Planning Grant
Mechanism:	Grants
Description:	<p>Choice Neighborhoods Planning Grants support the development of comprehensive neighborhood revitalization plans which focus on directing resources to address three core goals: Housing, People, and Neighborhoods. To achieve these core goals, communities must develop and implement a comprehensive neighborhood revitalization strategy, or Transformation Study. The Transformation Study will become the guiding document for the revitalization of the public and/or assisted housing units while simultaneously directing the transformation of the surrounding neighborhood and positive outcomes for families.</p>
Eligible Applicants:	Local Governments, Businesses, Nonprofit Organizations, Tribal Governments
Link:	https://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/ph/cn/grants

Source:	US Department of Housing and Urban Development (HUD)
Program:	Community Development Block Grant (CDBG): Disaster Recovery Program
Mechanism:	Grants

Description:	HUD provides flexible grants to help cities, counties, parishes, and states recover from presidentially declared disasters, especially in low- and moderate-income areas.
Eligible Applicants:	States, Local Governments, Tribal Governments
Eligible Activities:	Activities to Meet Basic Needs
Link:	https://portal.hud.gov/hudportal/HUD?src=/hudprograms/disaster-recovery

Source:	US Department of Housing and Urban Development (HUD)
Program:	Community Investment Cash Advances Programs (CICA)
Mechanism:	Grants
Description:	The CICA programs of the twelve FHLBs offer funding, including low-cost, long-term funds for member financial institutions to use to provide financing for projects that are targeted to certain economic development activities. These activities include commercial, industrial, manufacturing, social service, infrastructure projects, and public facility projects.
Eligible Applicants:	FHL Bank Members (must have Community Lending Study)
Eligible Activities:	Activities to Foster Economic Prosperity
Link:	https://portal.hud.gov/hudportal/documents/huddoc?id=19564_FederalHomeLoan.pdf

Source:	US Department of Housing and Urban Development (HUD)
Program:	Section 108 Loan Guarantee Program
Mechanism:	Grants
Description:	Section 108 of the Housing and Community Development Act of 1974 provides for a loan guarantee component of the Community Development Block Grant (CDBG) Program. The Section 108 Loan Guarantee Program (Section 108) provides communities with a source of financing for economic development, housing rehabilitation, public facilities, and other physical development projects, including improvements to increase their resilience against natural disasters. The funds can be used by a designated public entity to undertake eligible projects, or, alternatively, can be loaned to a third-party developer to undertake the projects. This flexibility makes it one of the most potent and important public investment tools that HUD offers to local governments.
Eligible Applicants:	States, Local Governments, Tribal Governments
Eligible Activities:	Activities to Foster Economic Prosperity
Link:	https://www.hudexchange.info/programs/section-108/section-108-program-eligibility-requirements/#overview

Source:	US Environmental Protection Agency (EPA)
Program:	Office of Water - Urban Waters Small Grants Program
Mechanism:	Grants
Description:	As part of the urban waters movement, the program helps communities, especially underserved communities, connect to their waterways and engage in restoration to improve water quality and revitalize their neighborhoods.
Eligible Applicants:	States, Local Governments, Tribal Governments, Educational Institutions, Nonprofit Organizations
Eligible Activities:	Activities to Empower a Broad Range of Stakeholders
Link:	https://www.epa.gov/urbanwaters/urban-waters-small-grants

Source:	US Forest Service (USFS)
Program:	Community Forest Program
Mechanism:	Grants
Description:	Establish community forests that provide continuing and accessible community benefits.
Eligible Applicants:	Local Government, Nonprofit Organizations
Eligible Activities:	Activities to Enhance and Provide Protective Natural & Man-Made Assets
Link:	http://www.fs.fed.us/cooperativeforestry/programs/loa/cfp.shtml

Funding and Financing: State Resources

Source:	Community Development Block Grant (CDBG)
Program:	Community Development Assistance Program (CDAP)
Mechanism:	Grants
Description:	The Community Development Assistance Program (CDAP), known nationally as the Community Development Block Grant (CDBG) program, provides federal funding for a variety of community-based projects. Communities with populations of 50,000 or less can apply for CDAP-Economic Development grant funding to assist private business in retaining or creating full-time, permanent jobs. Grant funds may also be used for improvements to public infrastructure that directly supports a company in the local community.
Eligible Applicants:	Local Governments (of a population of 50,000 or less)
Eligible Activities:	Activities to Foster Economic Prosperity
Link:	http://www.iira.org/rdrg/community-development-assistance-program-cdap/

Source:	North Carolina Division of Water Resources (DWR)
Program:	Clean Water State Revolving Fund (CWSRF)
Mechanism:	Grants
Description:	The CWSRF program is a federal-state partnership that provides communities a permanent, independent source of low-cost financing for a wide range of water quality infrastructure projects, including: <ul style="list-style-type: none"> - Wastewater treatment, - Stormwater management, - Non-point source pollution control, and - Watershed and estuary management.
Eligible Applicants:	Local Governments, Businesses, Nonprofit Organizations
Eligible Activities:	Activities to Meet Basic Needs; Activities to Enhance and Protect Natural & Man-Made Assets
Link:	https://www.epa.gov/cwsrf

Funding and Financing: Charitable Resources

Source:	Wells Fargo
Program:	Corporate Giving Program
Mechanism:	Grants
Description:	Organizations serving Illinois are encouraged to contact their local Wells Fargo to submit a grant proposal.
Eligible Applicants:	Nonprofit Organizations
Eligible Activities:	Activities to Promote Cohesive and Engaged Communities; Activities to support livelihoods and employment; Capital Projects
Link:	https://www.wellsfargo.com/about/corporate-responsibility/community-giving/

Source:	Captain Planet Foundation
Program:	Captain Planet Foundation Grants
Mechanism:	Grants
Description:	Captain Planet Foundation will accept small grant requests for amounts between \$500 – \$2,500. Preferential consideration is given to applicants who have secured at least 50% matching or in-kind funding for their projects. Projects with matching funds or in-kind support are given priority because external funding is a good indicator of the potential for long-term sustainability of the activities. Captain Planet Foundation may choose to fund a portion of the project budget that best fits within the foundation guidelines or contact an applicant for further discussion. Grants from the Captain Planet Foundation are intended to: provide hands-on environmental stewardship opportunities for youth; serve as a catalyst to getting environment-based education in schools; inspire youth and communities to participate in community service through environmental stewardship activities.
Eligible Applicants:	Nonprofit Organizations, Educational Institutions with annual budgets of less than \$3 million

Eligible Activities:	Activities to Support Livelihoods and Employment; Capital Projects; Activities to Promotes Cohesive and Engaged Communities; Activities to Enhance and Protect Natural & Man-Made Assets
Link:	http://captainplanetfoundation.org/apply-for-grants/

Source:	Union Pacific Foundation
Program:	Community-Based Grant Program
Mechanism:	Grants
Description:	Strong interest in promoting program effectiveness among nonprofits. Majority of grants go to help nonprofit organizations build capacity by helping new or existing programs reach more people or reach them more effectively. Particularly interested in community and civic organizations and health and human services. Will not be the sole funder of an initiative.
Eligible Applicants:	Nonprofit Organizations
Eligible Activities:	Activities to Promote Cohesive and Engaged Communities; Activities to Ensure Public Health Services
Link:	https://www.up.com/aboutup/community/foundation/grants/index.htm

Appendix F: Questions and Suggestions for Further Consideration by Town Staff and Board

In Policy and Regulations: Public Purpose Doctrine

- In response to sentence on pg. 19 “In North Carolina, the Public Purpose Doctrine (PPD) “requires that all public funds, no matter what their source, be expended for the benefit of the citizens of a unit generally, and not solely for the benefit of particular persons or interest.”
 - **The Board asks:** Are the Tom’s Creek-area homeowners too specific of a group? Will it be necessary to show that flooding in Tom’s Creek perpetuates through the watershed? Does the PPD allow for pilot areas to receive funding first?
 - **The Board suggests:** The Town would be on safer ground adopting a specific policy and objective criteria for projects that qualify for stormwater assistance. If funds were directed based on income, (or excluding based on income) would that run afoul of the special interest prohibition? Would having the SWAC declare a program or project to be in the public interest help resolve some potential issues?

In Policy and Regulations: Program Design Considerations

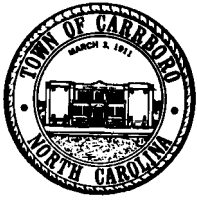
- In response to sentence on pg. 29 “The ways and means used to prove the benefit as well as the benefit itself are not necessarily important must be legally defensible.”
 - **The Board asks:** Does the PPD statute list approved mechanisms for proving a PPD permissible benefit?
- In response to clause on pg. 29 “e.g., a third-party modeling or engineering study...”:
 - **The Board suggests:** Would have to be a modeling study. An engineering study (paired watershed design, measuring stream flow) would be expensive and might be inconclusive given variability in rainfall over very short distances. Environmental data is extremely noisy.

In Policy and Regulations: Limitations – Structural Improvements

- In response to sentence on pg. 29 “According to Town staff, the legal basis, fiscal capacity, and policy direction are barriers for the Town to fund projects like property acquisition...”
 - **The Board suggests:** “Purchasing several adjacent parcels could allow the town to use the land for a water quality project, which would make it a public purpose.

In Program Eligibility: Landscaping Costs Not Eligible for Grant

- In response to category on pg. 35 “Private construction services hired by the homeowner”
 - **The Board suggests:** Unless there is capacity by NGO organizations, some of these Eligible Measures need to be planned or designed by an experienced practitioner. Permeable pavement needs to be installed properly to function, and should be done by an experienced contractor - absolutely need to make exception for permeable pavement, perhaps an exception for contractors that have sought Town approval and demonstrated knowledge and successful experience.



TOWN OF CARRBORO

Stormwater Advisory Commission

301 West Main Street, Carrboro, North Carolina 27510

R E C O M M E N D A T I O N

THURSDAY, APRIL 9, 2020

Review of Discussion at the February 13th RainReady Presentation

Motion was made by Dickson and seconded by Paul that the Stormwater Advisory Commission of the Town of Carrboro has reviewed the community discussion at the February 13th RainReady presentation and provides the report presented below.

VOTE:

AYES: (Cox, Dickson, Joca, O'Connor, Paul)

ABSENT/EXCUSED: ()

NOES: ()

ABSTENTIONS: ()

Randall C Dodd

(for Chair)

4/11/2020

(Date)

Summary of Comments at CNT Presentation in their Toms Creek Neighborhood Survey

This is a summary of comments made by town residents at a public meeting, together with responses prepared by the Town of Carrboro Stormwater Advisory Commission (SWAC). The Carrboro SWAC was established 2 years ago and is composed of volunteer fellow Carrboro residents with expertise and/or interest in helping guide the Town's Stormwater Program. We present this summary and response in the spirit of collaboration, as fellow citizens similarly concerned about controlling stormwater runoff and its effect on our community and its natural resources.

The public meeting was held on February 13, 2020 to review and accept comments on work by a consultant. The Center for Neighborhood Technology (CNT) has been retained by the Town to engage residents residing in the upper Toms Creek watershed (above Main Street) and to explore understanding and interest on lot level solutions regarding localized flooding. Although upper Toms Creek was selected as the project focus, the intent is to apply results and lessons learned throughout Carrboro. CNT provided a presentation focusing on scope of their work and the results of a survey of neighborhood residents in the study area. The lot level solutions being explored by CNT are part of a broader plan to address stormwater runoff throughout the Town of Carrboro. The Town has been developing, and will continue to develop, stormwater solutions for streets, roads, parking lots, and the other public properties within its domain. The development of the Stormwater Utility will continue to help position the Town to improve stormwater management town-wide, including in the Toms Creek neighborhood. However, the SWAC wants to emphasize that stormwater is everyone's responsibility. Often, a substantial amount of stormwater runoff comes from our own personal property (e.g., roofs, driveways, compacted lawns, etc.). CNT was asked to address what individual lot owners can do to reduce the impacts they are experiencing as well as their contribution to broader challenges, while the Town continues its own efforts with its own property. This is only one example of the many ways in which the Town is helping to solve stormwater problems.

Audience members had many questions and comments about CNT's work following the February 13th presentation by CNT staff on a resident survey regarding interest in lot level stormwater solutions. The meeting was videotaped to capture both the presentation and ensuing discussion. CNT is using information gathered to further inform the report they are preparing for the Town regarding these lot level solutions.

However, many comments were made at the meeting that were outside the scope of CNT's work. Responding to these comments would likely have resulted in long discussions that did not relate to the work undertaken by CNT. Because the time for CNT to answer questions was limited, an effort was made to simply note comments that were beyond CNT's scope. Members of the Carrboro SWAC have reviewed the video made of the meeting, as well as contemporaneous notes made during the meeting, to try to capture all of the comments and questions posed by attendees that were not addressed during the audience follow up.

Below is a summary of these comments, together with discussion prepared by the Carrboro SWAC. There were nine commenters. Comments from various commenters have been grouped together for simplicity of discussion/response into the following categories: Location of flooding, historic causes, factors contributing to flooding, climate change, development, solution funding and homeowner assistance, solution scale, and specific solutions.

Location of flooding

Is flooding only happening in Toms Creek? Are there other basins in Carrboro similarly affected by runoff, or is this unique to Toms Creek? (RES9)

Flooding is a concern throughout Carrboro, including further downstream along Toms Creek and in the Bolin Creek and Morgan Creek watersheds. Flooding has been an issue to some degree in cities and towns throughout North Carolina. Up until passage of the National Flood Insurance Act of 1968, there were limited regulations on development in floodplains, and houses were built without regard to either location within the floodplain or finished floor elevation with respect to the elevation for the 100-year flood. After passage of the Act, local governments were required to prohibit development in the floodway, and to require structures to be elevated with the finished floor at least two feet above the elevation of the 100-year flood. Carrboro joined the National Flood Insurance Program in 1976.

Certainly, other factors contribute to changes in flooding over time. Some of the more important of these factors are briefly discussed further below.

Flooding is occurring upstream (along the channel) and is not just an issue of upstream runoff impacting downstream property owners. (RES1)

This comment followed a question by a member of the SWAC about how to engage residents who are not being impacted by flooding but whose runoff is contributing to impacts. The main channel of Toms Creek, including the upper end of the channel, is being fed by small tributaries, flow through ditches, swales, and pipes, and overland flow from land that is upslope from the channel. Lot level practices at these upslope properties can slow runoff and reduce the volume of runoff.

Houses that are away from the channel may be at a high enough elevation to experience only localized ponding from uneven drainage. The homeowner might choose to address that ponding using lot level practices that retain and infiltrate the runoff, but they may also simply regrade to release the water faster, exacerbating downstream flooding. Even at the upper end of the Toms Creek, the manner in which stormwater is addressed at contributing properties impacts downstream flooding.

Ultimately, the entire community benefits from proper stormwater management, whether you live right on a creek or not, because proper management: helps our neighbors, sets an example for the communities upstream of OUR drinking water to protect that water quality, protects our common downstream water resources (e.g., Jordan Lake and ultimately coastal North Carolina), and protects the common town resources (roads, bridges, etc.) that our tax dollars support.

Historic causes

One hundred years ago, Plantation Acres would not have had any trees, that is why it is “Plantation” Acres. (The land) was likely plowed continuously, and the topsoil has been eroded off these high areas. In my yard on a rainy day if you dig six inches down you get to dry clay, so the neighborhood that we live in is prone to runoff. (RES9)

We see this in our yards as well. The process of soil loss began in the Colonial period when virtually the entire area east of the Appalachians was logged for shipbuilding and other purposes. On top of the loss of forest cover, early farming practices resulted in a massive loss of topsoil throughout the United States with drastic consequences (e.g. dust bowl), eventually leading to efforts to educate and support farmers’ efforts to control soil loss (e.g. establishment of Soil and Water Conservation Districts).

Maintaining forest cover is one of the best things we can do to help, but natural processes take an extraordinarily long time to achieve recovery. Areas on clay soil that are maintained in forest cover for more than fifty years have been shown to still have fairly

shallow topsoil, indicating that much longer timelines may be required for natural processes to reestablish a deep soil horizon.

This is a concern in many areas of the country. Research is underway to explore various ways of amending soils to improve water retention and infiltration.

Preventing soil loss is essential for restoring topsoil so that they can act as sponges to absorb rainwater. Homeowners that are experiencing erosion can request guidance from professionals with expertise in stormwater management and ecosystem restoration.

Factors contributing to flooding

Trees/lawns: She has lived in her house for 40 years and while there have been some issues with runoff and flooding in the past, it was not bad until the last 10 years. Concerned that waters coming from more places, she has a friend on Mary Street and they're getting runoff from Phipps and Simpson that they never had until the last ten years. There are new people coming in and cutting down trees on their lot in order to have lawn. Lawns are not appropriate for this watershed; we need to have a better ethic and have people leave trees on their property. (RES7)

Trees and forests have many benefits including improved air quality, reduced air temperatures in summer, reduced heating and cooling costs, increased property values, habitat for wildlife, and recreation and aesthetic value.

Trees also have a major impact on reducing runoff. Anyone who has stood under a tree to avoid getting wet at the beginning of a heavy summer rain shower has experienced the ability of tree canopy to intercept rainfall, a portion of which never reaches the ground. Tree roots and leaf litter both help to break up heavy soils and create soil conditions that promote the infiltration of rainwater into the soil. In forests, trees take up much of the rainwater, releasing it into the atmosphere through evapotranspiration. Trees reduce the amount of runoff, and they also help to slow down and temporarily store runoff, which further promotes infiltration, and decreases flooding and erosion downstream.

Maintaining tree canopy and understory vegetation are necessary to promote natural processes that will restore natural watershed function. The Town is developing guidance for homeowners to promote the care, preservation, and retention of trees, among other practices. The Town cannot prevent people from removing trees on private property, but a widespread educational campaign about the benefits of trees (especially native canopy trees and especially compared to turf) could prevent, or at least decrease, the practice of trading out trees for lawn.

Climate change:

Flooding has increased in the last 15 years. (RES1)

She has lived in her house for 40 years and while there have been some issues with runoff and flooding in the past, it was not bad until the last 10 years. Concerned that waters coming from more places, she has a friend on Mary Street and they're getting runoff from Phipps and Simpson that they never had until the last ten years. (RES7)

Concerned that it seems we've been having greater (than 100-year) floods (RES7)

It should be understood that we live in a time period where we have been experiencing a lot more rain with more frequent and heavier storms. (RES9)

In my neighborhood in Plantation Acres the houses were built in the 1970s, the neighborhood is largely built out, and there are areas where rain is coming not from the street but from behind houses and flowing in-between houses, trenching over and overflowing streets, and that is coming

from impervious surfaces, it is from increased rainfall. This goes to the point you (CNT) made earlier about urban flooding, localized flooding versus stream overbank flow. (RES9)

Because of the increase in rainfall and the changes in rain patterns, the retention ponds may not be working as well as they have in the past. (RES9)

The 15-year period began with two major droughts that occurred between 2005 to 2007. Annual rainfall during this early period was 13 to 57% below the 30-year average.

*For the last six years of this 15-year period, annual rainfall has been **above** the 30-year average. Even more significant than average rainfall, the **frequency** of major storms has been more than double the average. However, the most significant change from 15 years ago is that the **intensity** of major storms has increased.*

The increase in storm intensity means more rain is falling in a shorter period of time. The higher average rainfall results in wetter overall conditions, with soil more often being saturated and therefore unable to absorb more water. The increase in the frequency of major storms means all of this is happening more often.

Eastern North Carolina has experienced even more severe conditions, with locations experiencing storms that exceed a 1,000-year recurrence interval, based on current standards.

Design standards currently in use throughout the state have been established based on long-term records. Local governments and researchers have acknowledged the urgent need to update statewide design standards to reflect recent data, particularly rainfall data from the last nine years.

Development

Town did two things in the last 15 years that increased flooding. One was to install sidewalks in the neighborhood, which increased runoff. (RES1)

Sidewalks provide for pedestrian safety. Sidewalks are located within the corridor of existing roadways, and the additional impervious area is relatively small. In some locations, a ditch may have been piped as part of the sidewalk construction. The cumulative impact of these changes is likely to be small compared to the impact of changes in storm frequency and intensity.

Municipal projects are undertaken based on available knowledge at the time. Certainly, if the project were initiated today, additional measures would have been considered during planning and design.

Town also allowed a forest to be developed (15 houses) that produced twice as much runoff. Going forward Council is allowing new commercial development (Lloyd Farms property). Don't keep taking out green; don't keep allowing development. (RES1)

It is a misconception that the Town "allowed" development. Property owners have a right to develop their property in accordance with existing zoning and applicable development codes.

The residential development in question was required by code to manage stormwater runoff so as not to increase peak flow for the 1-year, 2-year, 5-year, 10-year, and 25-year design storm events. The commercial property at Lloyd Farm had a right to develop that property to meet this same set of standards; however, because the developer wanted to rezone part of the property, the Town was able to negotiate the inclusion of a requirement to also manage peak flow from the 100-year storm. Given the alternative of developing to

a lower standard under existing zoning, the SWAC supported the rezoning with the condition of managing the peak flow for the 100-year design storm.

Ask developers at the Shops at Lloyd's farm to include permeable pavement and to include rain gardens, bioswales, and similar measures? I'm very concerned about their ability to actually mitigate runoff for the hundred-year flood as they are planning to do. (RES7)

The site does not have the appropriate topography to store runoff from the 100-year storm in a detention pond. The engineered alternative would be to use underground storage of stormwater in chambers underneath parking areas. Underground storage is one of the most expensive approaches to stormwater management and is even more expensive when it is in a location that must also be designed for traffic loading. During the review of the rezoning request, SWAC recommended, and the developer's design engineer agreed to consider, including cisterns and/or blue/green roofs, rain gardens, permeable pavement, and other green practices. Use of the recommended green practices is likely to reduce costs, as well as improve performance.

Concerned about the development that has been approved across from McDougale School in the Hollow that is in this watershed. (RES7)

This project drains mostly or at least in part to Bolin Creek.

General concern about the sewer line running along the creek. (RES5)

Many sewer lines have been built close to creeks in urban areas. Over the last few decades we have learned about ways of protecting water quality and restoring aquatic life in our streams. One of the most important and cost-effective measures for such protection is through stream buffers: maintaining stream-side zones in an unmanaged, natural state with trees and shrubby/woody vegetation that help to filter runoff and to anchor the creek banks against erosion.

The goal of establishing vegetated stream buffers conflicts with the regulatory requirement that sewer easements be maintained in a manner that allows the utility to inspect, maintain, and repair the sewer line. Maintenance of sewer easements is typically done by mowing and/or removal of trees and other woody vegetation.

New sewer easements are now required to be located further away from streams, such that the area mowed to maintain access is outside a zone adjacent to the streambank that is required to be maintained in woody vegetation (trees and shrubby plants). The regulations that now protect stream buffers also provide that existing sewer easements and other existing uses are grandfathered, unless and until they are significantly modified/replaced.

It is anticipated that over time, vegetated buffers can become established along the banks of Toms Creek. Certainly, if any efforts were undertaken to modify the channel, federal and state permits to authorize the work would include requirements to establish a vegetated woody buffer to the extent practicable.

Solution funding and homeowner assistance

Consider asking a survey question about whether people are willing to pay higher fees in order to do large projects (e.g. replacing culverts and building retention ponds) as part of the solution. (RES8)

Housing affordability is a major problem, the possibility of financial assistance is huge, and we're pleased that it is being mentioned. The assistance should be needs-based. Because the meeting is on a Thursday night, the people most likely to need financial assistance may not have been able to attend (i.e. don't assume lack of interest in assistance based on attendance). (RES2)

SWAC members agree that equity, affordability and environmental justice need to be considered where appropriate throughout the development of the stormwater program. Affordability is a high priority especially in the development of Stormwater Utility rates and in development of a residential assistance program.

The SWAC also acknowledges that additional funding will be needed as the program develops over time to address all of the regulatory requirements and community priorities envisioned for the stormwater program. The Stormwater Utility is still relatively new, but the program needs to develop in a measured way. In 2019, Town Council identified additional priorities for the stormwater program that included flooding. The SWAC supported these priorities and also supported the recent increase in Stormwater Utility rates to begin addressing them.

The rate increase included development of rates for a high tier for residential lots with larger amounts of impervious cover. The SWAC had wanted to include more tiers in the residential rate structure during the initial establishment of the utility, but concerns over the quality of lot level data did not allow it at that time. Town staff have made it a priority to verify and correct data so that over time additional residential tiers can be added, and the residential rate structure can become more progressive.

Similarly, when a residential assistance program is developed, the SWAC recognizes the importance of supporting the needs of low- and middle-income families.

Solution scale

All these lot level solutions that you're coming up with are wonderful but just doing these is not going to fix the problem. (RES1)

The (CNT) study is only about individual measures that people could take and does not consider bigger solutions. (RES5)

There's a constellation of challenges here, it is individual, lot level, neighborhood level, subdivision level, town level - this is an ecosystem problem. I appreciate that the purview for this study was at the lot level and you've come up with some interesting things to look at that have not been talked about before. (RES2)

The SWAC acknowledges that lot level solutions will not eliminate flooding in Toms Creek. Flooding problems in urban areas were not created overnight and these problems are not going to be solved overnight. A comprehensive program will be required, involving measures taken at many scales, including individual, lot level, neighborhood level, and watershed. The higher the level, the higher the cost, and the longer the timeline for implementation.

The intent of the CNT study is to explore strategies at the lot level so that progress can begin right away, not only in upper Toms Creek, but throughout Carrboro. Appropriate lot level practices that address issues a homeowner is having with local drainage can also begin to reduce downstream impacts as well. It is important to promote and implement lot level measures throughout the watershed, particularly in upland areas as discussed above. The preponderance of single family residential land use in Carrboro (and in upper Toms Creek) requires attention at a lot level

Specific Solutions

My neighborhood is already very green. It is a very green neighborhood with plantings and gardens, etc., you should see the gardens. (RES1) This is a very green neighborhood. (RES5)

Gardening and green stormwater practices are not the same. Many people would say a neighborhood looks “green” simply because it has abundant lawns and large trees. A truly “green” neighborhood is one in which large canopy trees and native perennials thrive, stormwater runoff is captured and cleaned, plant and animal pests are controlled by other plants and animals instead of herbicides and pesticides, and leaves are left in place to protect soil, return nutrients to the trees and shrubs that shed them, and provide insect habitat. We see many “green” neighborhoods that fit that description in color only, not in practice.

That said, experience has taught us that avid gardeners are our BEST audience to target for adopting green stormwater practices. They take great enjoyment out of nature and growing things. They care about protecting the environment. If they use fertilizers, they use only organic, slow-release types, and they never apply phosphorus unless a soil test shows a deficiency. They pay attention to any areas of bare soil, providing seed and mulch to prevent erosion.

Gardeners will better understand the need to select an appropriate lot level solution for their soils and their problem. Gardeners will better understand the need to prevent soil erosion, and that a rain garden can be clogged and ruined if located downslope of eroding clay soils.

The greenest gardeners install cisterns to collect rooftop runoff to use in their gardens. They address issues with ponding by using rain gardens or bioswales, both of which include extensive soil amendment to promote water retention and infiltration. If they live along a stream channel, they may have live-staked the stream bank to establish woody vegetation to anchor the bank against the erosive power of storm flow.

Why can't we do permeable pavement? What are the trade-offs? Durability, cost versus what we're doing today? (RES6)

We agree that permeable pavement should be used more widely. Permeable pavement is generally placed over granular material that can store rainwater. This means that when permeable pavement is used on low permeability soils, it can still store and slowly release stormwater runoff. Regardless of the underlying soil, location is extremely important. Permeable pavement is most suitable and cost-effective for areas where traffic is less frequent and where traffic wheel loading is limited (e.g. do garbage trucks or dump trucks use the road?), with ideal locations being overflow areas in parking lots, and residential driveways. When located on frequently used areas of parking lots, permeable pavement must be designed to a higher traffic loading standard, and it must be maintained much more frequently. When used on public roadways the design must meet still higher standards.

Another aspect of location that must be considered is the potential hazard from clogging due to soil tracked on vehicle wheels or carried by stormwater runoff. Clay in local soils increases the hazard from clogging. Maintenance involves street sweeping with a vacuum sweeper as frequently as every two months, and running the sweeper very close to the pavement and at very slow speeds. Power washing has been shown to restore heavily clogged pavement under some conditions and may be required periodically.

Permeable pavement is part of the solution, but it is not a panacea. It is generally impractical to adopt permeable pavement for wide use in roadway construction in the Piedmont region of North Carolina, where the benefit is limited by the low permeability of underlying soils, and where clay soil carried on tires (track out) or by stormwater runoff will quickly clog the permeable spaces (interstices) within the pavement. However, with

appropriate location and design permeable pavement can be an effective component of efforts to mitigate the impacts of stormwater runoff in our area.

How about digging the creek deeper, wider? (RES1)

The (CNT) survey does not consider things like culverts, detention ponds and larger efforts that previous comments from the community have discussed. (RES5)

We agree with the need to consider large-scale measures, in addition to others discussed above. These will be expensive. To be cost-effective, large scale measures need to be planned carefully, coordinated with other measures likely to be taken, and implemented as part of a comprehensive systems approach. Some of the large-scale measures mentioned would be considered as part of such a systems approach.

However, it should be recognized that some of the specific measures mentioned are not likely to be considered. For example, dredging, straightening, and widening the creek would result in permanent environmental damage. Dredging is neither “green” nor consistent with Carrboro’s responsibility and desire to restore and protect the environment.

In the 1950s and earlier, it was common to dig creeks wider and deeper to get rid of water more quickly. This practice is more formally referred to as “stream channelization.” The US Army Corps of Engineers used to implement these projects with congressional authorization. With increasing awareness of the impacts of pollution generally, and the adverse impacts of channelization specifically, the mission of the Corps has changed to one of environmental protection. Even work on short sections of stream channel require permits from the Corps; before the Corps can issue a permit, state regulators must certify that the project will not harm water quality.

Straightening and dredging a stream channel permanently damages aquatic habitat and permanently reduces the potential for aquatic life support. For example, Ellerbe Creek in Durham was channelized in the late 1950s. Over the last two decades the city and state have implemented multiple projects on segments of Ellerbe Creek, spending millions to implement stream restoration projects to restore a more natural channel, and help improve water quality and aquatic life support.

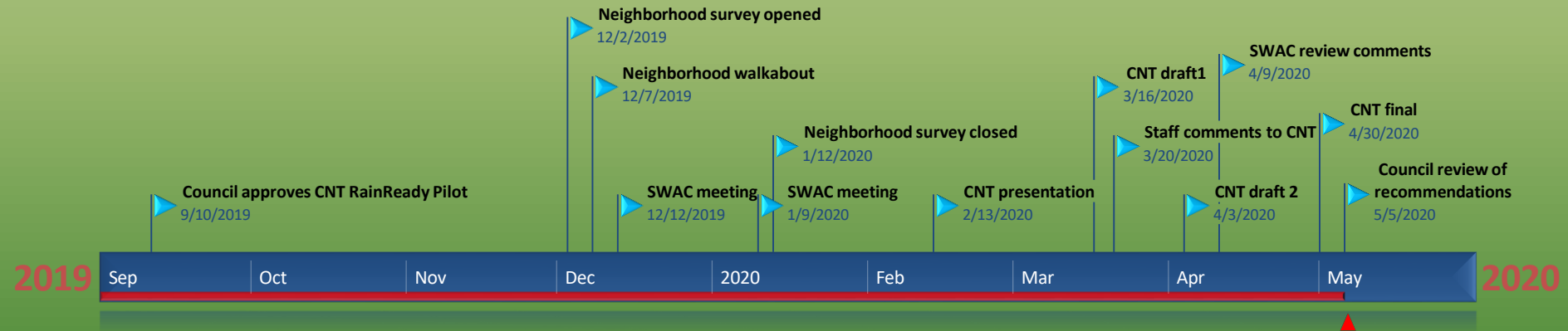
Similarly, enlarging culverts at road crossings simply moves the flooding problem downstream. For Carrboro homeowners to be eligible to buy flood insurance, the Federal Emergency Management Agency requires the Town to provide documentation to state and federal regulators for any project or work on streams and stream culverts demonstrating that the project will NOT make downstream flooding worse.

As indicated by one commenter, flooding in Toms Creek is an ecosystem or watershed scale problem. Many different approaches at different scales will be needed to address existing issues.

Members of the Town of Carrboro Stormwater Citizens Advisory Commission understand that residents who did not experience flooding 15 years ago are frustrated at the increase in flooding in Toms Creek. The Town is pursuing funding from the Federal Emergency Management Agency to either elevate, or buy and remove, houses that are experiencing costly damage from repeated flooding. However, many properties along Toms Creek are experiencing flooding that does not reach the foundation of the home, but which nevertheless may affect homeowners in other ways such as their ability to enter and leave their property during a storm. The Town cannot fix these watershed-wide problems alone; it needs to work in partnership with homeowners and at a lot level to have successful, long term solutions to flooding issues. The SWAC supports development and

promotion of these lot level solutions as well as stormwater solutions for streets, roads, parking lots, and other public property.

CNT Project Timeline





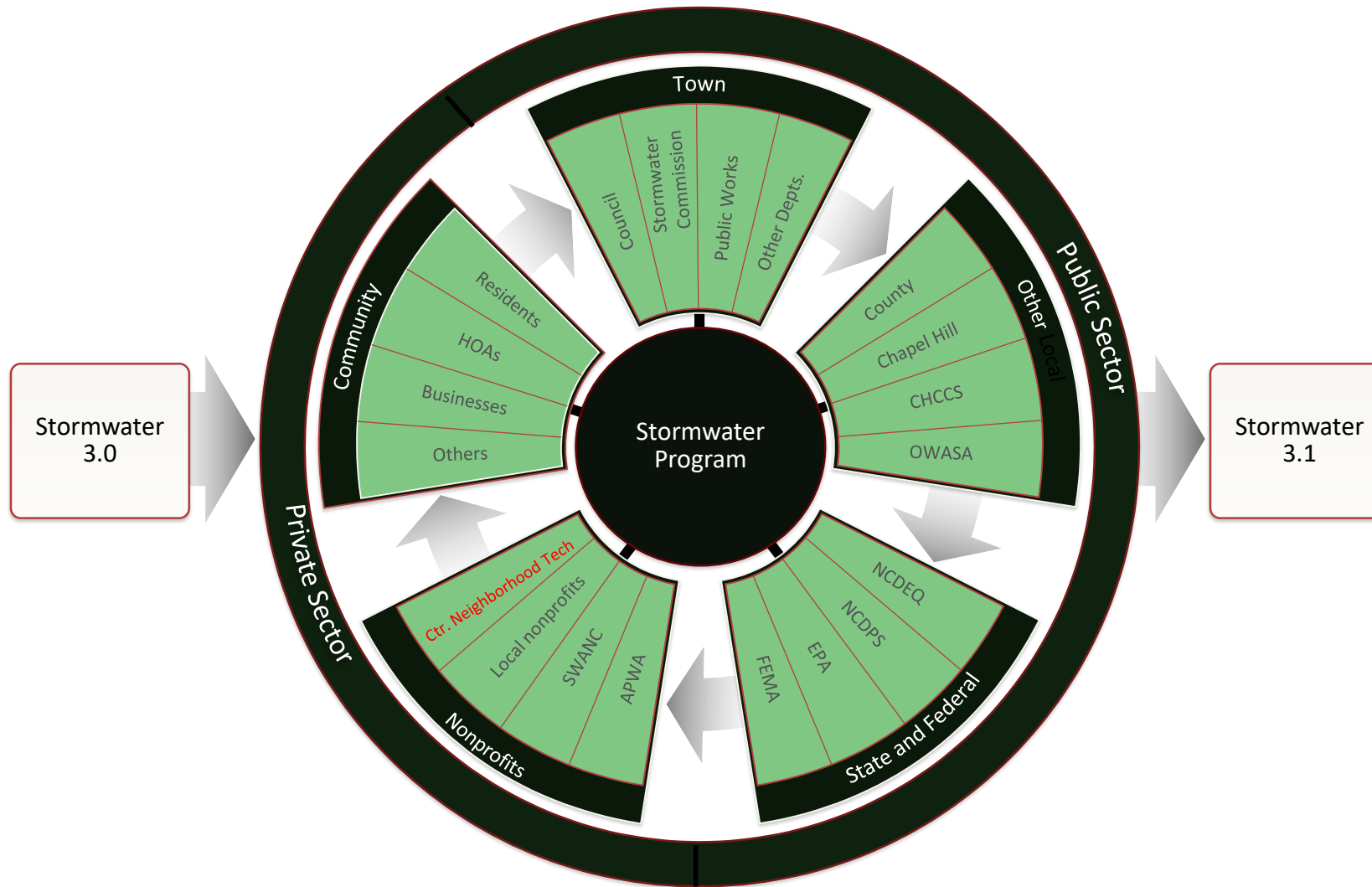
Flood Resilience Toolkit

Floodplain Management Tools:

- Federal mitigation grants for homeowners
- Federal public assistance grants
- Enforcement of flood provisions in LUO
- Community engagement and collaboration

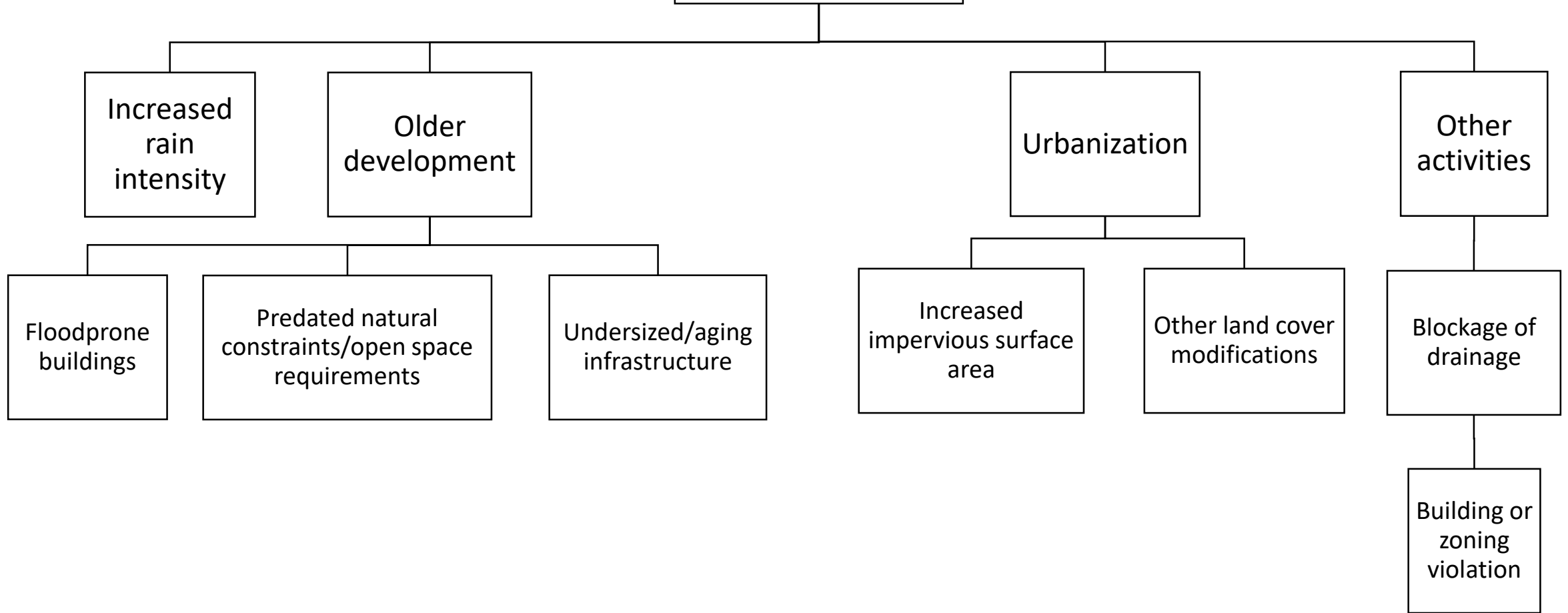
Stormwater Management Toolkit

- Expansion of green infrastructure (private and public)
- Grey infrastructure rehabilitation and replacement
- Maintenance and inspection (private and public)
- Community engagement and collaboration



Stakeholders and Partners

Causes of Flooding





RainReady – Carrboro, NC

Town Council Presentation – 5/5/2020



CNT

resilient, sustainable and livable cities for everyone

CNT's mission is to make cities work for everyone. CNT works at the intersection of environmental sustainability, social equity, and technology—with particular attention on creating efficient and affordable solutions for low-income communities and communities of color.

Process

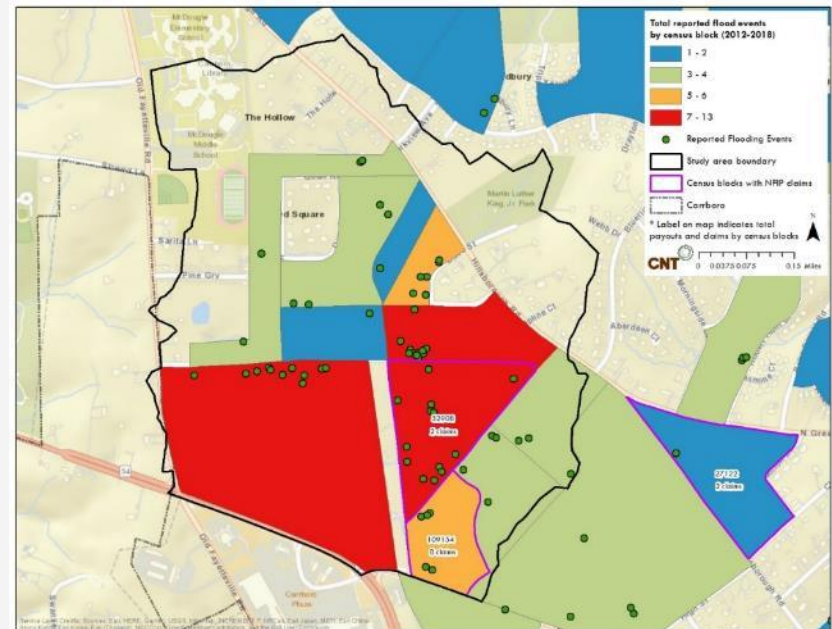
- Gather Existing Conditions
 - Review public data
 - Survey Residents
 - Interview Town Staff
- Recommend Program Design
 - Develop retrofit templates
 - Estimate costs and benefits
 - Identify engagement needs
 - Define priority targets
 - Identify evaluation measures
 - Conduct case study

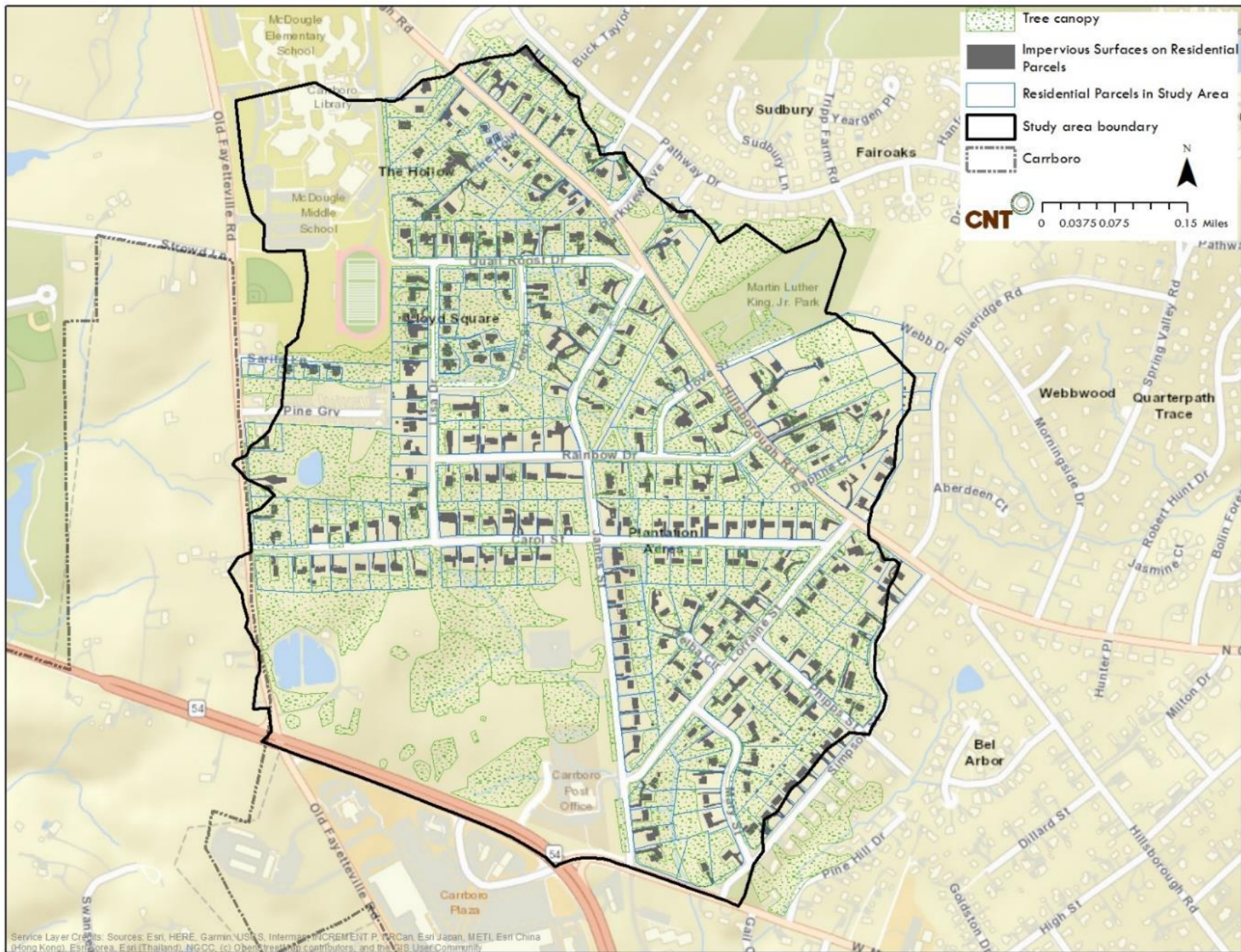


Existing Conditions

In Carrboro, flooding can generally be attributed to the following primary factors:

- Climate
- Geology
- Land Use and Development
- Stormwater Infrastructure



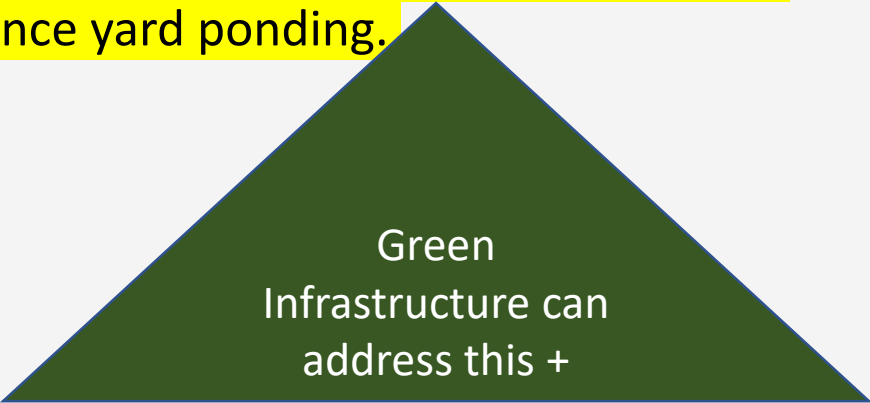


Survey Results

- Note that these are suggestive and not scientific

Lived Experience

- More than 1/2 of respondents were at least moderately worried about the impact of flooding on their property.
- Over 60% of respondents have had flooding problems for at least one year.
- Most respondents overall and about half of those who experience flooding, still acknowledge a gap in understanding or the need for help.
- Flooding from creeks overtopping their banks accounts for about 40% of respondents' flooding issues as they see them, but 65% of respondents indicate that they currently experience yard ponding.



Green
Infrastructure can
address this +

Respondents will
contribute and are
interested in green
infrastructure

Survey Results

Resident Responses to Flooding

- More than half of respondents have invested in some kind of flood mitigation strategy. Reported costs are in line with what we've seen (median \$3,000, adjusted average \$6,308).
- More than 2/3 of respondents have repaired gutters and downspouts, which are the basic first steps.
- Two thirds of respondents are willing to invest some amount of money to reduce their risk of flood damage (median \$2,000, average \$2,000).
- While survey responses would suggest that rain barrels, cisterns, and french drains have been the most popular solutions thus far, almost 50% indicated they would pursue a rain garden with some assistance.

Program Recommendations

Outreach and Education

- 3 Audiences
- Clear, non-technical summary of past efforts
- Solution involves homeowner participation
- Identify local champions
- Consider offering assessments

Community Partnerships

- Public Schools
- Higher Ed Institutions
- Resident-led conservation groups
- Environmental Non-profits
- Local Businesses - landscapers, nurseries, etc.
- Conflict Resolution Center



Audience A

- Homes in floodplain with extreme Flooding
- Solutions: elevating homes or relocation
- Could (some already do) benefit from federal disaster funding

Audience B

- Homes adjacent to floodplain
- Concerns about severity of future flooding
- Solutions: green and gray infrastructure

Audience C

- Homes not near floodplain
- Experience yard ponding or non-structural flooding
- Solutions: green infrastructure can offer meaningful benefits



Program Recommendations

Policy and Regulations

- Public Purpose Doctrine
- Limitations to support structural improvements
- Town cannot support maintenance on private property

Financing and Funding

- Stormwater utility could contribute but may not be enough
- State Revolving Loan Fund
- CDBG
- Municipal Bonds (GASB 62 rules)
- Affordability



Program Recommendations

Program Eligibility

- Building Types
 - Owner occupied
 - SFD or 2-4-unit buildings
- Eligible Green Infrastructure Measures
 - Depaving
 - Rain gardens
 - Bioswales
 - Rain Barrels/cisterns
 - Dry wells
 - Others
- Eligible Applicants
 - Town residents
 - Disconnect downspouts
 - Others
- Eligible Costs
 - Labor and Materials
 - Permit fees
 - Some exceptions

Short Term (1 Year)

- Town Staff and SWAC designs, pilots, coordinates small-scale residential green infrastructure program
- Establish interdepartmental coordination
- Identify key partners
- Develop Communications Materials
- Amend LUO to exclude native vegetation from nuisance
- Budget for pilot
- Continue to support owners in floodplains seeking federal support

Mid Term (2-4 Year)

- Continue community education and engagement.
- Investigate financing and funding options.
- Use lessons learned from pilot to launch Town-wide residential green infrastructure assistance program.
- Continue larger stormwater program development.
- Coordinate stormwater management projects that address federal and state water quality regulatory requirements.
- Continue to support owners in floodplains seeking federal support

Long Term (5+ Year)

- Evaluate program success, including financing and funding and program sustainability.

What informs these recommendations? (background)



Hierarchy for Stormwater Management



AVOID IT

Avoid stormwater runoff by protecting open space



SINK IT

Catch and sink runoff by adding porous paving, trees, and rain gardens to urban areas



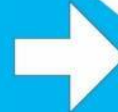
HOLD IT

Hold runoff temporarily through detention basins in parks, golf courses, reservoirs, etc.



SEND IT

Send runoff to treatment facilities using pipes, tunnels, and ditches

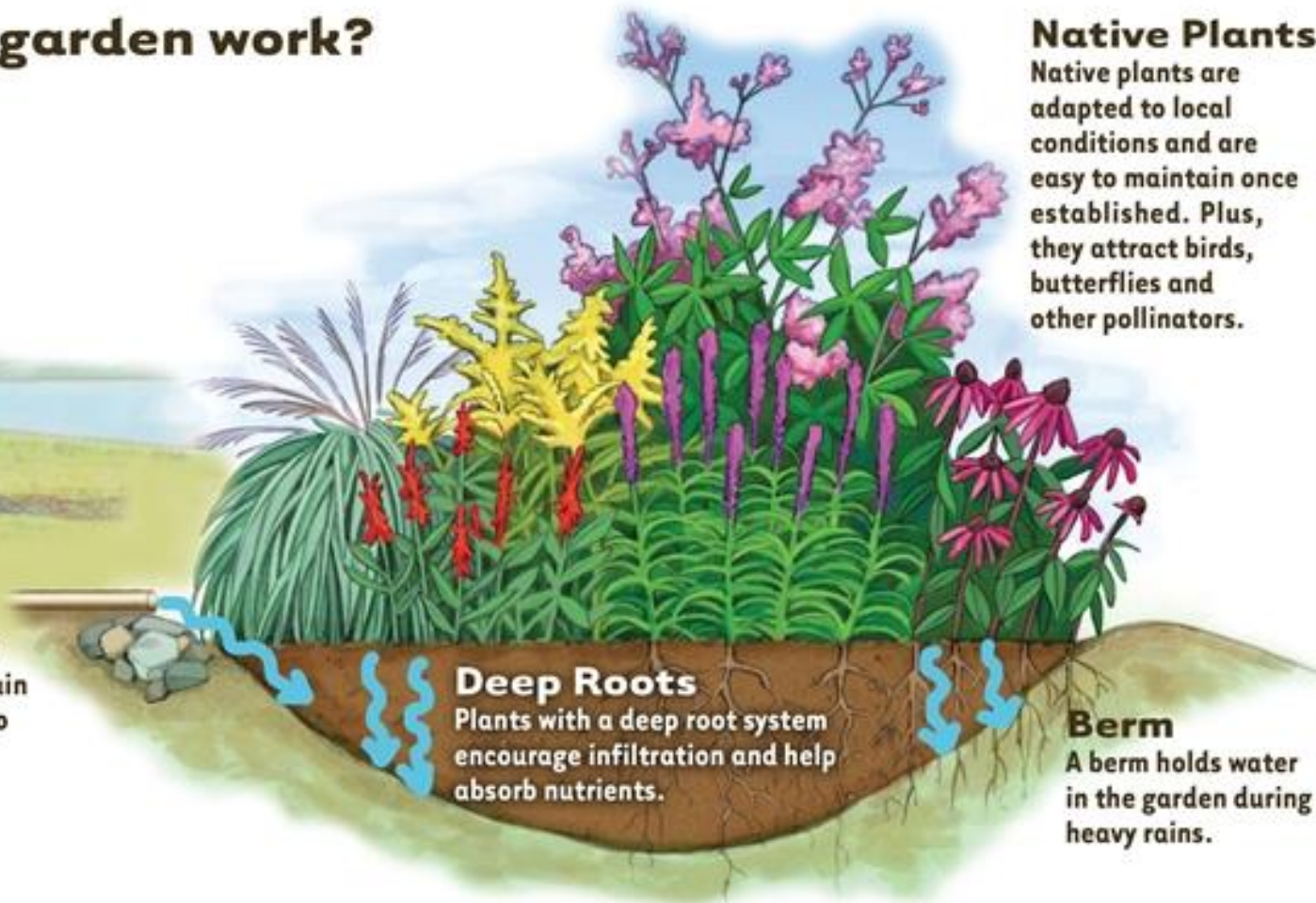


How does a rain garden work?



Gutters & Down Spouts

Assist with directing rain water from your roof to your rain garden.



Deep Roots

Plants with a deep root system encourage infiltration and help absorb nutrients.

Native Plants













































































































Native plants are adapted to local conditions and are easy to maintain once established. Plus, they attract birds, butterflies and other pollinators.

Berm

A berm holds water in the garden during heavy rains.



Green Infrastructure and “Co-benefits”

Benefit	Reduces Stormwater Runoff				Increases Available Water Supply	Increases Groundwater Recharge	Reduces Salt Use	Reduces Energy Use	Improves Air Quality	Reduces Atmospheric CO ₂	Reduces Urban Heat Island	Improves Community Livability					Improves Habitat	Cultivates Public Education Opportunities
	Reduces Water Treatment Needs	Improves Water Quality	Reduces Grey Infrastructure Needs	Reduces Flooding								Improves Aesthetics	Increases Recreational Opportunity	Reduces Noise Pollution	Improves Community Cohesion	Urban Agriculture		
Practice																		
Green Roofs																		
Tree Planting																		
Bioretention & Infiltration																		
Permeable Pavement																		
Water Harvesting																		



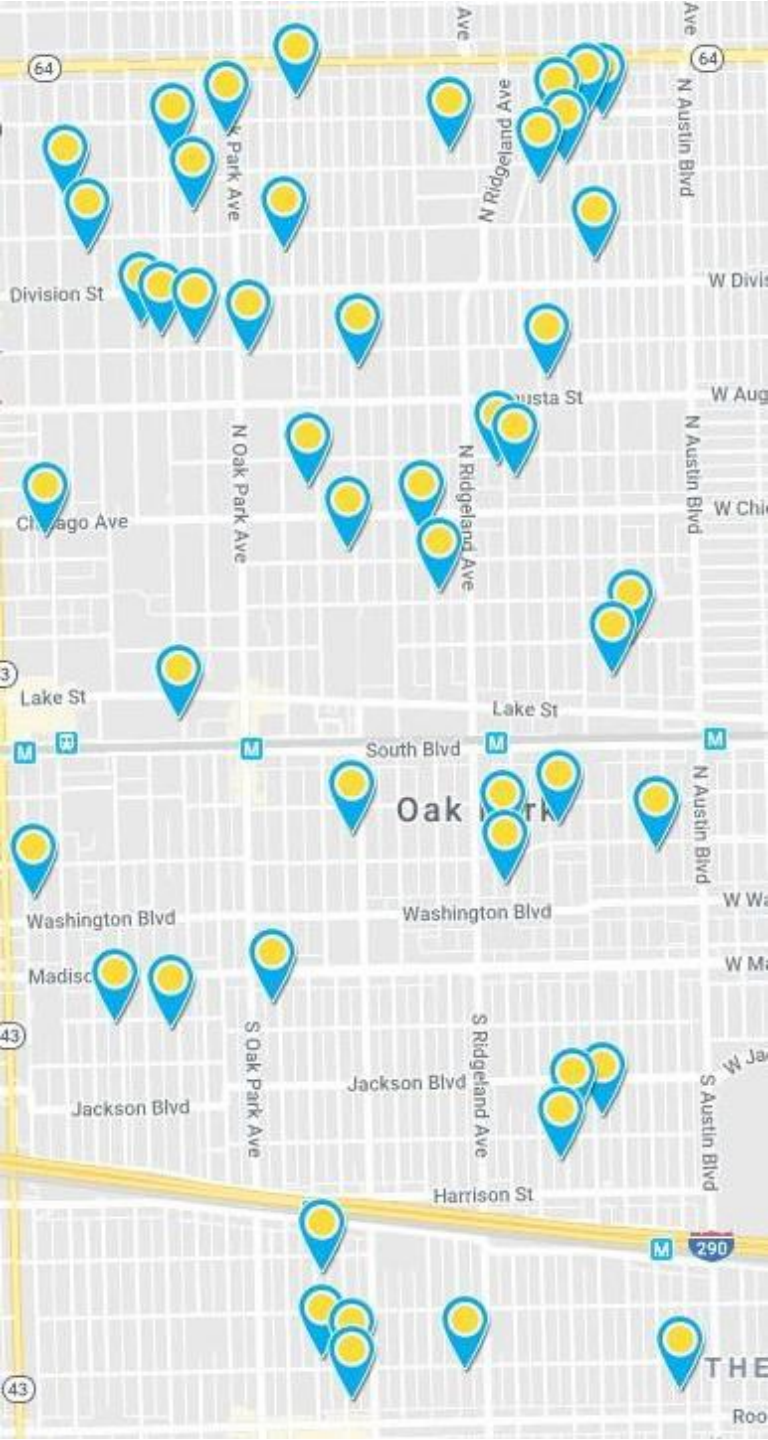
Yes



Maybe



No



RainReady Oak Park (IL)

Completed Installations

- 36 Rain Gardens or Bioswales
- 4 Dry Wells
- 6 Depavings

Stormwater Management

Estimated **724,000** gallons of rain
diverted from Oak Park's sewer system

Questions?

drewwilliams-clark@cnt.org



Town of Carrboro

Town Hall
301 W. Main St.
Carrboro, NC 27510

Agenda Item Abstract

File Number:20-198

Agenda Date: 5/5/2020

File Type:Agendas

In Control: Board of Aldermen

Version: 1

TITLE:

Reconsideration of Human Services Funding for Diaper Bank of NC, Exchange Club's Family Center of Alamance County, and Club Nova for Fiscal Year 2020-2021.

PURPOSE: The purpose of this item is for the Carrboro Town Council to reconsider human services funding allocations for the Diaper Bank of NC, Exchange Club's Family Center of Alamance County, and Club Nova.

DEPARTMENT: Housing and Community Services and Finance

CONTACT INFORMATION: Anne-Marie Vanaman, Management Assistant, 919-918-7321, amvanaman@townofcarrboro.org <<mailto:amvanaman@townofcarrboro.org>> Rebecca Buzzard, Housing and Community Services Director, 919-918-7438, rbuzzard@townofcarrboro.org <<mailto:rbuzzard@townofcarrboro.org>> and Arche McAdoo, Finance Director, 918-7439.

INFORMATION: At the April 28, 2020 Carrboro Town Council meeting, the Council approved funding for 47 of 49 applications for FY20-21 Human Services Funding. The Human Services Advisory Commission's recommended allocations is provided in Attachment B.

Council Members did not approve funding for the Diaper Bank and Exchange Club's Family Center of Alamance County and requested staff provide more information regarding the two.

Diaper Bank

The Diaper Bank of NC provides access to personal hygiene products for diapering, menstruation and adult incontinence to low-income households. Products are distributed through community partners in order to encourage access of additional beneficial services. The Diaper Bank requested \$5,000 for FY20-21 to support the purchase of diapers and other personal hygiene products, the salary of their distribution coordinator and the expansion of a program to provide menstruation products to teens in the Chapel Hill-Carrboro School system. Teachers report that students often miss school because they do not have these necessary products. The Human Services Advisory Commission supported their request, noting both the necessity of these products and their high cost, and underscored the importance of the Diaper Bank's mission. The Human Services Advisory Commission recommended funding their request at \$3,500.

Agenda Date: 5/5/2020

File Type:Agendas

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Version: 1

Staff contacted Michelle Old, Executive Director of Diaper Bank, to discuss operations in Orange County during COVID-19 and its potential impact next fiscal year. Diaper Bank distributes products through two systems: closed systems, such as clinics or programs with an established client base; and open systems, with community partners who provide more walk-in assistance. In Orange County, Diaper Bank's open system partner is the Compass Center.

COVID-19 affected the operations of its distribution partners so the Diaper Bank moved rapidly to ensure products are available to people who need them. Orange County DSS is distributing the products Compass Center would normally receive, and the Diaper Bank has added all locations of the Orange County Health Department to its distribution list. In addition, they are in talks with IFC about providing them with products.

Ms. Old reported that Orange County distribution has risen 300% since COVID began and that demand is so high they have had to purchase more diapers than usual because donations from manufacturers have not been adequate due to consumer hoarding.

COVID-19 will not prevent their proposed activities next fiscal year. If schools are closed, Old said they will find a way to provide products to students.

Exchange Club's Family Center of Alamance County

The mission of the Exchange Club's Family Center of Alamance County is to prevent and treat child abuse and neglect and to address complex trauma. They offer 9 programs and a 24-hour crisis line to families in 7 counties, including Orange County. The Exchange Club requested \$1,500 to help support the Parent Aide program which is an evidence-based program providing home visitation for 6-18 months for families who are at -risk or if abuse has occurred. Participants in the Parent Aide program receive education, coaching, support, life skills and advocacy. Funds will be used to support personnel costs.

The Parent Aide program is projected to benefit 4 Carrboro individuals in FY20-21. They estimate the cost per individual to be \$640.42, or a total of \$2,561.68 for the Carrboro residents. They have operated the Parent Aide program in Orange County for 13 years and receive referrals from the court systems, DSS, CPS, and others.

The Human Services Advisory Commission recommended \$500 in funding for FY20-21. This recommendation was based on their support of the mission and concern for children sheltering in place for extended periods of time with their caregivers during COVID-19.

Staff contacted Sarah Black, Executive Director of the Exchange Club's Family Center of Alamance County, to learn how the Parent Aide program is being conducted during the pandemic. Considered essential employees, the Parent Aide program staff have used telehealth and social distancing visits, when safe to do so and all parties are comfortable. Their staff use gloves and masks and operate 6 feet or greater apart from clients in the visits. Clients also wear masks and information is transferred through plastic bagging. However, they plan to

Agenda Date: 5/5/2020

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transition to all social distancing visits due to their concerns about the safety of the children who might be at greater risk for child abuse because of the stress of the situation of being at home.

Club Nova

Also at the April 28, 2020 Town Council meeting, the Council heard a request from Karen Dunn of Club Nova during the public comments portion of the meeting. Club Nova is requesting their Human Services funding be restored to its FY18-19 level of \$20,000. (Club Nova received \$19,000 in FY19-20.) Council directed staff to identify \$4,000 in funds and bring back the item for consideration. The Human Services Advisory Commission recommended \$16,000 for Club Nova in 2020-21.

FISCAL & STAFF IMPACT: Should the Council decide to approve funding for Diaper Bank of NC and the Exchange Club's Family Center of Alamance County; and increase funding for Club Nova, there will be no fiscal impact on the current year 2019-20 budget. Rather funding will be included in the Manager's Recommended Budget for FY 2020-21.

RECOMMENDATION: Staff recommends the Council consider approving these changes and amend the Human Services Advisory Commission funding recommendations for FY 2020-21. A resolution approving these Human Services funding recommendations is provided as Attachment A.

**A RESOLUTION AMENDING FUNDING OF HUMAN SERVICES GRANTS FOR
FISCAL YEAR 2020-2021**

May 5, 2020

WHEREAS, the Town Council for the Town of Carrboro on April 28, 2020 approved funding 47 Human Services Grants to be awarded in FY 2020-21; and

WHEREAS, the Council requested more information before considering funding allocations for the Diaper Bank of NC and the Exchange Club's Family Center of Alamance County; and

WHEREAS, the Diaper Bank of NC had been recommended for funding in the amount of \$3,500 and the Exchange Club's Family Center of Alamance County had been recommended for funding in the amount of \$500 by the Human Services Advisory Commission; and

WHEREAS, Club Nova had been recommended for funding in the amount of \$16,000 by the Human Services Advisory Commission; and

WHEREAS, Club Nova has requested that this funding be increased by \$4,000 to restore funding to their FY18-19 funding level;

WHEREAS, funding for human service agencies are included in the Town Manager's recommended budget;

NOW THEREFORE, THE CARRBORO TOWN COUNCIL hereby authorizes the following changes to Human Services Grants for FY 2020-21 approved by the Town Council on April 28, 2020:

Section 1. Funding in the amount of \$3,500 is authorized for the Diaper Bank of NC;

Section 2: Funding in the amount of \$500 is authorized for the Exchange Club's Family Center of Alamance County.

Section 3. Funding for Club Nova shall be increased from \$16,000 to \$20,000.

Section 4: The Town Manager is directed to include the above actions in the Manager's Recommended Budget for FY 2020-21.

Section 5: This resolution is effective July 1, 2020.

FY20-21 Human Services Recommendations, Sorted by % Change from Previous Award

Agency	Received FY2020	Requested FY2021	Recommended FY2021	% Change from previous award	Comments	% Funded of total amount requested
Triangle BikeWorks	\$ 2,700.00	\$ 5,000.00	\$ -	-100%	Deferred grant to agency in greater need.	0%
Pathways to Change	\$ 1,800.00	\$ 1,540.00	\$ 500.00	-72%		32%
OE Enterprise, INC	\$ 3,600.00	\$ 4,000.00	\$ 1,500.00	-58%		38%
Duke Hospice	\$ 3,400.00	\$ 4,000.00	\$ 1,500.00	-56%		38%
Chapel Hill Training & Outreach-Kidscope	\$ 2,250.00	\$ 3,000.00	\$ 1,000.00	-56%		33%
CH-Carrboro Public School Foundation	\$ 1,000.00	\$ 2,400.00	\$ 500.00	-50%		21%
Book Harvest	\$ 900.00	\$ 1,200.00	\$ 500.00	-44%		42%
Farmer Foodshare	\$ 900.00	\$ 2,500.00	\$ 500.00	-44%		20%
Friends of the Robert and Pearl Seymour Center	\$ 900.00	\$ 2,500.00	\$ 500.00	-44%		20%
Hope Renovations	\$ 900.00	\$ 16,500.00	\$ 500.00	-44%		3%
Big Brothers Big Sisters of the Triangle, Inc.	\$ 3,600.00	\$ 5,000.00	\$ 2,125.00	-41%		43%
Rebuilding Together of the Triangle, Inc.	\$ 5,000.00	\$ 5,000.00	\$ 3,000.00	-40%		60%
Orange Co Partnership for Young Children	\$ 5,400.00	\$ 6,000.00	\$ 3,500.00	-35%		58%
Orange Co Literacy Council	\$ 4,500.00	\$ 6,000.00	\$ 3,000.00	-33%		50%
Dispute Settlement Center of Orange County	\$ 7,200.00	\$ 10,000.00	\$ 5,000.00	-31%		50%
Art Therapy Institute	\$ 5,400.00	\$ 10,000.00	\$ 4,000.00	-26%		40%
The ARC of the Triangle	\$ 5,400.00	\$ 7,500.00	\$ 4,000.00	-26%		53%
Volunteers for Youth, Inc.	\$ 2,700.00	\$ 3,250.00	\$ 2,000.00	-26%		62%
Child Care Services Assoc.	\$ 5,850.00	\$ 7,500.00	\$ 4,625.00	-21%		62%
A Helping Hand	\$ 2,700.00	\$ 6,000.00	\$ 2,250.00	-17%		38%
Club Nova Community Inc.	\$ 19,000.00	\$ 22,000.00	\$ 16,000.00	-16%		73%
Senior Care of Orange	\$ 900.00	\$ 1,500.00	\$ 775.00	-14%		52%
Marion Cheek Jackson Ctr for Saving/Making HX	\$ 6,300.00	\$ 9,000.00	\$ 5,500.00	-13%		61%
El Futuro, Inc	\$ 8,000.00	\$ 8,500.00	\$ 7,000.00	-13%		82%
Triangle Disability Awareness	\$ 4,500.00	\$ 13,000.00	\$ 4,125.00	-8%		32%

FY20-21 Human Services Recommendations, Sorted by % Change from Previous Award

Agency	Received FY2020	Requested FY2021	Recommended FY2021	% Change from previous award	Comments	% Funded of total amount requested
Orange County Dept on Aging(Senior Lunch Progr	\$ 4,500.00	\$ 6,450.00	\$ 4,250.00	-6%		66%
Boomerang Youth, Inc.	\$ 3,150.00	\$ 10,000.00	\$ 3,000.00	-5%		30%
Community Empowerment Fund	\$ 2,700.00	\$ 3,000.00	\$ 2,600.00	-4%		87%
Town of Chapel Hill Police Dept.	\$ 9,000.00	\$ 10,000.00	\$ 8,875.00	-1%		89%
Bridge II Sports	\$ -	\$ 2,500.00	\$ -	0%		0%
Compass Center	\$ 9,000.00	\$ 11,000.00	\$ 9,000.00	0%		82%
Orange County Living Wage	\$ 500.00	\$ 1,000.00	\$ 500.00	0%		50%
WCOM-LP Radio(Public Gallery of Carrboro)	\$ 1,000.00	\$ 1,500.00	\$ 1,000.00	0%		67%
Transplanting Traditions Community Farm, Inc.	\$ 5,400.00	\$ 7,500.00	\$ 5,500.00	2%	Note increased request amount	73%
Orange Co Rape Crisis Center	\$ 16,000.00	\$ 20,000.00	\$ 16,500.00	3%		83%
PORCH, Inc.	\$ 4,500.00	\$ 5,600.00	\$ 4,750.00	6%	Note increased request amount	85%
TABLE	\$ 9,000.00	\$ 15,000.00	\$ 9,500.00	6%	Note increased request amount	63%
Chapel Hill - Carrboro Meals on Wheels	\$ 13,500.00	\$ 18,000.00	\$ 15,000.00	11%	Note increased request amount	83%
Charles House Assoc.	\$ 900.00	\$ 1,500.00	\$ 1,000.00	11%		67%

FY20-21 Human Services Recommendations, Sorted by % Change from Previous Award

Agency	Received FY2020	Requested FY2021	Recommended FY2021	% Change from previous award	Comments	% Funded of total amount requested
El Centro Hispano	\$ 18,000.00	\$ 25,000.00	\$ 20,000.00	11%	Note increased request amount	80%
Planned Parenthood South Atlantic	\$ 900.00	\$ 1,000.00	\$ 1,000.00	11%	Received their full request	100%
Refugee Community Partnership	\$ 5,400.00	\$ 9,000.00	\$ 7,000.00	30%	Note increased request amount	78%
IFC for Social Service(Food for the Summer)	\$ 1,350.00	\$ 2,000.00	\$ 2,000.00	48%	Received their full request	100%
RENA-Rogers Eubanks Neighborhood Assoc.	\$ 10,000.00	\$ 35,000.00	\$ 18,000.00	80%	Note increased request amount	51%
IFC for Social Service	\$ 11,000.00	\$ 25,000.00	\$ 20,000.00	82%	Note increased request amount	80%
EmPOWERment Inc.	\$ 8,100.00	\$ 34,000.00	\$ 20,875.00	158%	AHSRF/HS issue - \$16,000 from AHSRF Last year	61%

FY20-21 Human Services Recommendations, Sorted by % Change from Previous Award

Agency	Received FY2020	Requested FY2021	Recommended FY2021	% Change from previous award	Comments	% Funded of total amount requested
Piedmont Health Services	\$ 8,100.00	\$ 30,000.00	\$ 21,750.00	169%	Note increased request amount; includes \$750 from Triangle Bikeworks	73%
Diaper Bank of NC	\$ 900.00	\$ 5,000.00	\$ 3,500.00	289%	Note increased request amount	70%
Exchange Club Family Center of Alamance	\$ -	\$ 1,500.00	\$ 500.00	N/A		33%