



# A RainReady Nation

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*Protecting American Homes and  
Businesses in a Changing Climate*

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# **A RainReady Nation**

Protecting American  
Homes and Businesses  
in a Changing Climate



**PREPARED BY  
THE CENTER FOR NEIGHBORHOOD TECHNOLOGY**

**JANUARY 2015**

## ABOUT CNT

RainReady is an initiative of the Center for Neighborhood Technology (CNT). As an award-winning innovations laboratory for urban sustainability, CNT is dedicated to taking on big challenges, starting in small places. CNT helps make neighborhoods, cities, and regions work better, for everyone.

## ACKNOWLEDGEMENTS

RainReady is inspired by individuals and communities asking us “what can we do?” We have responded by working with them to design practical, innovative, and affordable strategies.

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# Executive Summary

## **WE ALL DESERVE TO LIVE IN HOMES AND NEIGHBORHOODS SAFE FROM HEAVY RAIN.**

Yet as ever more destructive storms pummel our towns and cities, we are increasingly confronted by flooded homes and businesses, disruption of municipal services, overflowing streams and rivers, and compromised drinking water. Destructive weather events cost tens of billions of dollars every year across the United States.<sup>1</sup>

Although most current flood control programs focus on overflowing rivers, our research found that more than half of all damage claims in the study area were in towns and cities nowhere near designated floodplains.<sup>2</sup> Clearly, the problem of urban flooding must be better understood before it can be tackled!

In 2012, CNT started working with insurance companies, large and small businesses, state and federal agencies, municipalities, and individuals to better understand the scale and impact of flooding. Working directly with affected homeowners, we learned of the toll that repeated flooding has taken on their lives, their finances, and their health.

We also identified barriers to flood victims getting help, and of the inequity of that help. Working with residents from a few of the worst impacted communities, we designed and tested strategies and services, using simple technologies, to mitigate the impacts. From this, CNT's **RainReady<sup>SM</sup>** initiative was born.

Drawing on lessons learned from analogous models in the energy and transportation sectors, our RainReady solutions are designed to:

- **Offer flood prevention and mitigation services to communities and individuals most in need**
- **Attract a range of investment partners, including insurance companies, banks, and the real estate sector**
- **Stimulate consumer demand for improved, flood-resistant buildings**
- **Create useful, productive jobs for the low- and semi-skilled**
- **Enhance the resiliency of towns and cities in the face of climate change.**



By coordinating information, technology, finance, and private sector contracting, RainReady will assure homeowners that their investment in rain readiness will pay off. At the same time, it will bring financial returns to companies and industries – including insurance, real estate, and information services – interested in protecting current assets and developing markets for new goods and services.

RainReady is poised to make significant economic, climate, employment, and community impacts by offering a visionary program of neighbors embracing simple and low-cost technologies to help all Americans get ready for our changing weather.

# Protecting Homes + Communities

Elizabeth Rafferty's South Side Chicago home flooded four times in two years, causing an estimated \$75,000 in damage.<sup>3</sup> At one point, her basement filled with five feet of murky sewage water in less than an hour. That was the day Rafferty found the family's large oak dining room table crashing into the basement walls and the clothes dryer bobbing upside down in the water.

The losses have grown with every flood. Carpets and tiling have needed replacement, as did the entire basement bathroom. The clothes washer and dryer and water heater had to be replaced. The furnace has been replaced twice. After one flood, larvae in the sewage hatched, and thousands of enormous horseflies swarmed through her basement.

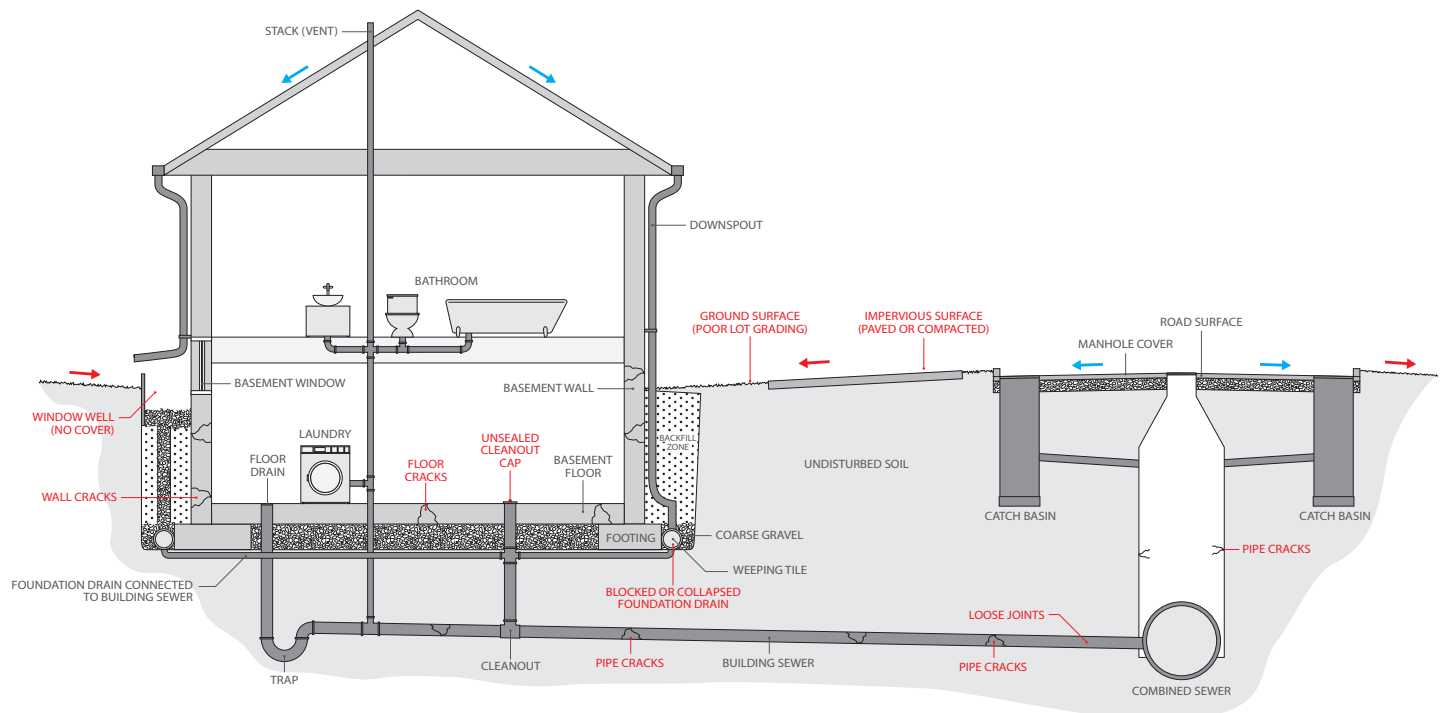
Bad luck sometimes creates bad luck. Rafferty's flood insurance was canceled after her third flood.

Rafferty is one of millions of homeowners across America affected by urban flooding. The term *urban flooding* is defined as "the inundation of property in a built environment, particularly in more densely populated areas, caused by rain overwhelming the capacity of drainage systems, such as storm sewers."<sup>4</sup>

Flooding in urban areas can affect neighborhoods and homes in several ways:

- **Water backup through floor drains, tubs, toilets, and sinks**
- **Seepage through foundation walls and basement floors**
- **Stormwater entering buildings through windows, doors, or other openings**
- **Ponding of stormwater in yards and public rights-of-way**
- **Overflow from rivers, streams, and coastal areas**

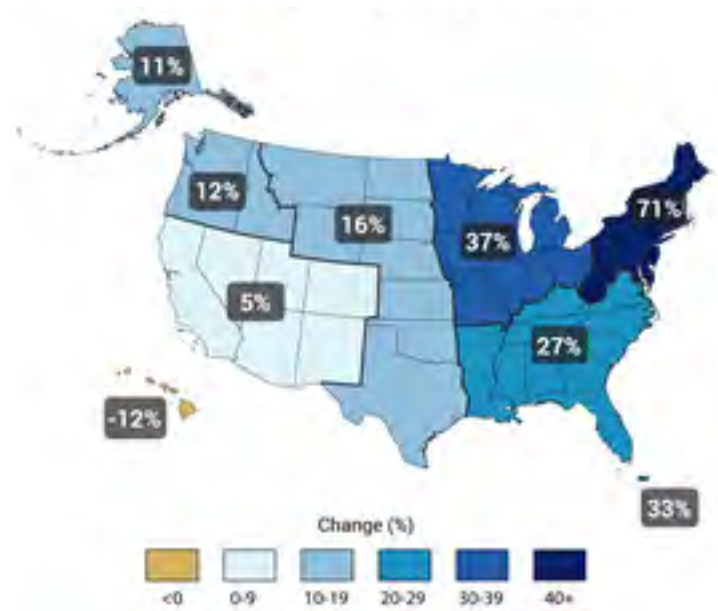
**FIGURE 1:**  
Types of urban flooding that can affect a typical residence  
(Credit: Modified from Institute for Catastrophic Loss Reduction 2009)



**FIGURE 2:**  
Observed change in very heavy  
precipitation in the United States

As cities, towns, and suburbs have developed to accommodate increasing population, more impervious surfaces (roads, roofs, parking lots, driveways, alleys, sidewalks, and patios) have led to increased stormwater runoff, and natural drainage systems have been replaced with man-made sewer and stormwater infrastructure.<sup>5</sup> In many cities, this infrastructure is aging, poorly maintained, and undersized. As a result, even after modest events, stormwater can overflow with devastating effects.<sup>6</sup>

Intense storm and rain events put additional strain on these inadequate drainage systems. The 2014 National Climate Assessment Report confirms that there have been major increases in precipitation across most of the country over the last 54 years, and projects even more frequent and intense rain events in the future.<sup>7</sup>



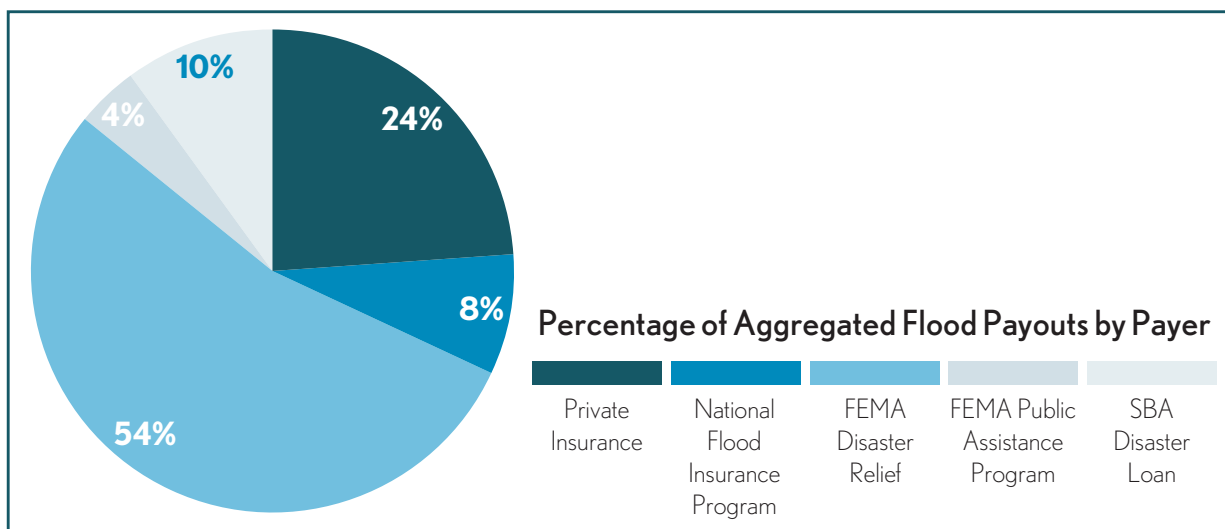
# Impacts on Homes + Businesses

Property owners, taxpayers, and insurance companies are paying the price of this flooding. CNT's study *The Prevalence and Cost of Urban Flooding* focused on Cook County, Illinois and found that:<sup>8</sup>

- **Flooding is chronic and systemic.** Over 181,000 claims were submitted across 97% of Cook County ZIP codes, and claims were submitted in each of the five study years (2007-2011). The average payout per claim was \$4,272, with total claims amounting to \$773 million over the five years examined.
- **There is no correlation between damage payouts and the floodplains.** When all types of claims are aggregated, some of the Cook County ZIP codes with the highest concentration of payouts (number and value) have no land area within federally designated floodplains.
- **Flood insurance is not carrying the burden of damage payouts.** Claims paid by the federal government's National Flood Insurance Program – the only formal flood insurance program – represent just 8% of total payouts.
- **Claims were paid across all income groups.** However, residents in 67% of the 27 ZIP codes with the highest concentrations of damage earn below the average median household income for Cook County.

In an online survey of property owners affected by flooding in Cook County, we found that:

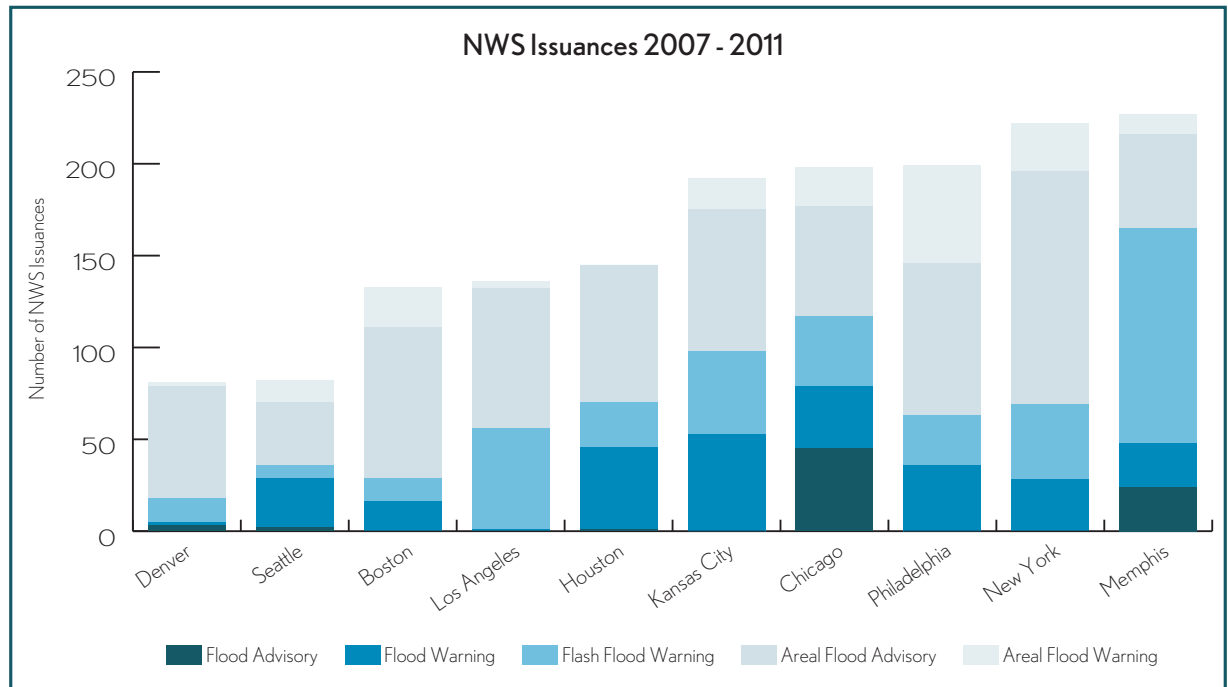
- **Flooding is often repetitive.** 70% of the online survey respondents reported that they had flooded three or more times in the last five years. 20% had flooded 10 or more times.
- **Costs can be in the hundreds of thousands of dollars.** Estimated losses included damage to the property structure, lost valuables, and lost wages and other income. Not surprisingly, the cost estimates given by property owners varied significantly. For example, the estimated total cost (in dollars) of damages to property structure varied from \$200 to \$100,000.
- **There are multiple personal health and economic impacts on property owners.** 84% of respondents suffered stress, 13% experienced ill health, 41% lost the use of part of their property, 63% lost valuables, and 74% lost hours of work to clean up.
- **There are no clear solutions for property owners.** 76% of online survey respondents had invested in measures to prevent future flooding, but only 6% believed that the investment had solved their flooding problem.



**FIGURE 3:** Percentage breakdown of the payouts for flood damage made by different payers, aggregated by ZIP code, 2007-11, Cook County, IL



**FIGURE 4:**  
The number of flood warnings and advisories issued by the National Weather Service between 2007 and 2011 in the respective counties of 10 geographically diverse U.S. cities



Our research suggests that urban flooding is widespread in the United States. Of the 30 stormwater departments and utilities that responded to our survey of the Great Lakes region (serving 330 municipalities with a population of approximately 19.7 million people), all routinely receive flooding complaints, with 80% characterizing the annual number of complaints as being medium or large.<sup>9</sup>

Our analysis of flood warnings and advisories issued by the National Weather Service when flooding is imminent or in progress in the respective counties of 10 geographically diverse cities – including New York City; Los Angeles; Chicago; Philadelphia; Houston; Kansas City, Kansas; and Memphis, Tennessee – found that residents in each city experience intense rain and flash flooding. In total, residents faced 1,615 flood warnings during a five-year period.

Ironically, our analysis shows that even cities struggling with the impacts of drought, such as Los Angeles and Houston, also suffer from urban flooding.<sup>10</sup>

There are considerable economic, health, safety, and environmental consequences of urban flooding: chronically wet houses are linked to an increase in respiratory problems, and insurance rates and deductibles may rise to compensate for repeated basement flooding claims.<sup>11</sup> Industry experts estimate that wet basements can lower property values by 10–25% and are cited among the top reasons for not purchasing a home.<sup>12</sup> According to the Federal Emergency Management Agency (FEMA), almost 40% of small businesses never reopen their doors following a flooding disaster.<sup>13</sup> Between 2006 and 2010, the average commercial flood claim made to the NFIP was more than \$85,000.<sup>14</sup>

# Inadequate Response

Given the scale and breadth of the problem affecting homeowners and businesses across the U.S., launching a national coordinated response should be a priority. However, there are several challenges:

- **The problem is hidden.** Even when flooding is visible in the neighborhood, its impacts within the building are not. People often feel uncomfortable sharing their experiences with flooding. Furthermore, homeowners are concerned about the implications for the value of their property if it is known to be affected by flooding.
- **The risks of flooding are mischaracterized and misunderstood.** The flood insurance rate maps (FIRMS) prepared by FEMA focus on the areas that flood when river banks overflow, i.e. the floodplains. This means that the maps correlate level of risk to a property's proximity to the floodplains. Government mitigation programs also focus on these mapped areas, even though the problem is much more widespread and often caused by other conditions and events.

- **The problems are both highly localized and regional.** In some cases, the origins of the problems are local, and homeowners and businesses are flooding themselves. For example, this can happen when the runoff from a house's own roof or driveway floods the property. In other cases, the problems originate from upstream communities when stormwater runoff feeds into rivers and creeks to flood downstream communities. Tackling each of these problems requires action at both local and regional levels of government.
- **There's a responsibility gap.** FEMA deals with federal disasters. Although it is involved in insurance and mitigation, this work is mainly focused on floodplain flooding. Similarly, the U.S. Army Corps of Engineers focuses on riverine and coastal flooding. The U.S. Environmental Protection Agency focuses on the water quality impacts of stormwater runoff. State and local agencies generally follow the lead of their federal counterparts, in a large part because they receive much of their funding from those federal agencies. Without any one agency having complete authority, affected communities are falling through the cracks, left tackling the problem without guidance, funding or support.



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- **The situation is getting worse quickly.** The combination of increasingly intense rainfall events and proliferation of impervious surfaces has left residents, elected leaders and agencies facing entirely new challenges without a clear historical reference or compass for how to deal with them.<sup>15</sup> Traditional engineered infrastructure solutions can be slow to deliver and are often considered unaffordable.

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- **Addressing urban flooding requires coordinated action across individual private properties and in the public rights of way.** While public sewers may be poorly maintained and undersized, private property owners unwittingly contribute to the problems: stormwater runoff originates on the roofs and driveways of homes, and contributes to overloaded sewer systems. Dealing with these diverse problems requires community-scale implementation that includes participation from private property owners, some of whom may not themselves be affected.

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- **Lack of funding.** All solutions will cost money. While residents and other property owners pay for their drinking water via utility fees, it is not typically the case that they pay utility fees for stormwater services. This means that municipalities may lack dedicated, sustained long-term funding to cover the costs of managing stormwater.

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Rounding out this long list of problems for flood victims is the **lack of any coordinated voice to advocate on their behalf.** Without this voice, and without the information, data and organization to make their case, appropriate government agencies and elected officials are unable or unwilling to adequately respond to the problem. Instead, flood victims are often left feeling like they are paying the price for damage done by other people's stormwater runoff.

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Flood victims in Chatham and Rogers Park, Chicago



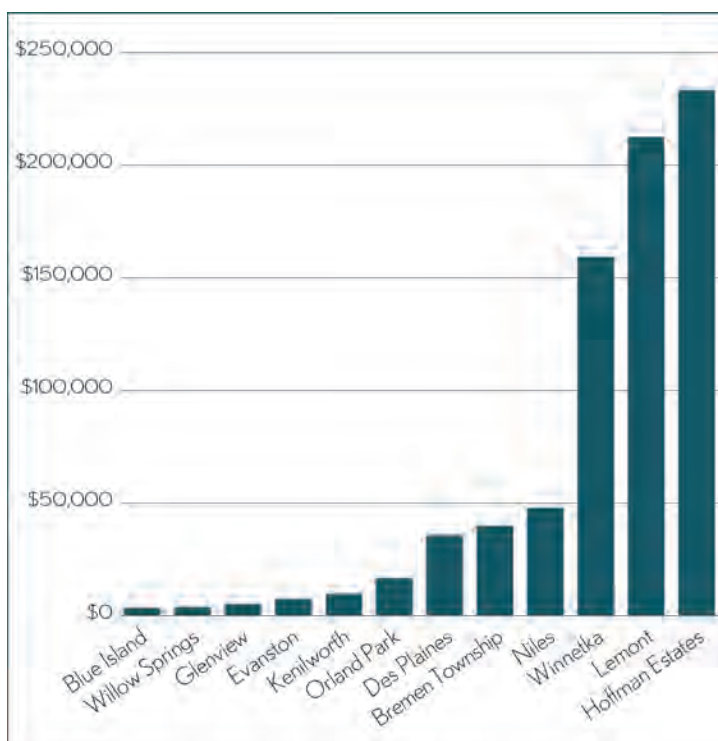
# Who is Affected vs. Who Gets Help

## The Case of Cook County, IL

The Village of Kenilworth, in Cook County, IL, is one of Chicago's most affluent suburbs and one of the wealthiest communities in the United States. Kenilworth has a population of 2,500. The average home sale price is approximately \$1 million.<sup>16</sup> However, its residents suffer from severe urban flooding, including raw sewage that backs up into basements.

Fifty miles south, still in Cook County, the 2,700 residents of the Village of Ford Heights are also victims of urban flooding. Ford Heights residents are some of the poorest in the United States, with half the population below the poverty line.<sup>17</sup> In 2002, flooding was reported to affect an estimated 40% of the homes there.<sup>18</sup>

Although the residents of these two very different communities in Cook County are equally impacted by flooding, CNT's analysis of insurance data demonstrates the challenges stormwater agencies face when seeking to allocate funding to those most in need.<sup>19</sup>



- **Who is suffering?** The Cook County ZIP codes with the highest number of insurance damage payouts have median household incomes below the county average.
- **Who is receiving funding to mitigate the flooding problems?** In 2013, the publicly funded Metropolitan Water Reclamation District (MWRD) received 600 requests from municipalities for funding for localized flood alleviation projects, 12 of which were deemed suitable for approval.<sup>20</sup> CNT's analysis of these projects, found that almost 64% of the estimated \$24.2 million in funding will benefit residents in ZIP codes with above-average median household incomes, and 34% will benefit residents in ZIP codes with incomes below the average. Conscious of the disparity, MWRD has launched a proactive program of outreach, engineering and financial assistance to support affected communities across the county (see Figure 6).
- **Our analysis also found** a large disparity in the per-property cost of the 12 projects approved in 2013. While the average per-property cost of a project is \$12,500, the cost ranges from \$3,646 per property in the Village of Blue Island (green infrastructure to benefit 400 properties) to \$233,333 in Hoffman Estates (a 48-foot diameter storm sewer to benefit six structures). (see Figure 5).<sup>21</sup> The variation in the per-property expenditure suggests a widespread challenge when tackling urban flooding: the lack of robust, property-level data concerning its nature, scale, cost, and frequency, and thus an absence of commonly accepted parameters and standards for directing scarce mitigation resources. How much are we willing to pay per property to alleviate flood damage and on what basis do we decide this?

**FIGURE 5:** The estimated cost per structure benefiting of projects listed as "under design" in 2014 by the Metropolitan Water Reclamation District (MWRD)





# A Market Opportunity

The flip side to the problem of urban flooding is the potential for upgrading millions of homes, businesses, streets, and neighborhoods with landscaping, building, interior design and technological improvements. These upgrades – or RainReady<sup>SM</sup> improvements – can offer both immediate and long-term returns on investment, stimulate consumer demand for improved home and building standards, enhance property values, reduce energy use, and green neighborhoods.<sup>22</sup>

Making these upgrades requires new services and products, along with the associated research investment. Plus, it will generate jobs for landscapers, gardeners, nursery workers, plumbers, paving contractors, maintenance and repair workers, engineers, architects, planners, and interior designers.

To better understand this market opportunity, CNT has worked closely with flood victims and communities in the Chicago region to understand their needs and priorities. In 2012, we carried out 15 qualitative interviews with affected residents.<sup>23</sup> In 2013-2014, we organized and filmed three community events where victims were able to tell their stories to elected officials.<sup>24</sup> During these two years, we also worked with residents to test and refine flood mitigation solutions, and government programs and policies aimed at supporting them.

The services and approaches we are developing are based on lessons learned from analogous programs used in energy and transportation sectors – specifically energy efficiency retrofitting and Complete Streets programs. Both offer residents and communities popular and pragmatic ways of upgrading homes and neighborhoods for improved quality of life.

RainReady has three core components: RainReady<sup>SM</sup> Home, RainReady<sup>SM</sup> Community, and RainReady<sup>SM</sup> Alert.

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## TEN CORE PRINCIPLES CHARACTERIZE THE RAINREADY APPROACH:

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- 1 EASILY IMPLEMENTABLE AND REPLICABLE SERVICES**  
We work to ensure that our programs can be widely and quickly adopted by towns and cities across America.
- 2 MARKET-BASED APPROACHES**  
RainReady meets the needs of individual property owners and leverages local and private investment for wider public gain.
- 3 COMMUNITY-WIDE EFFORTS**  
We bring efficiency savings by serving the whole community and addressing the multifaceted mix of flooding problems that residents face.
- 4 EVIDENCE-BASED PLANS**  
The investments we recommend are prioritized based on a robust analysis of the risks property owners face.
- 5 AFFORDABLE AND FAIR PROGRAMS**  
RainReady solutions can benefit everyone, wealthy and poor.
- 6 MULTI-TIERED SOLUTIONS**  
Flooding problems occur at many levels, and thus action is needed at all levels – from individual residents to municipalities, regions, states and the nation.
- 7 NO NEGATIVE DOWNSTREAM IMPACTS**  
Our solutions are designed to avoid pushing stormwater runoff into neighboring homes.
- 8 NATURE-BASED SOLUTIONS**  
We advocate using green infrastructure as often as possible, since it brings wider benefits to the community than large-scale, engineered fixes.
- 9 FISCAL FAIRNESS AND TRANSPARENCY**  
All property owners generate stormwater runoff, so everyone should help pay for the services managing it.
- 10 PREVENTATIVE MEASURES**  
We promote the adoption of zoning ordinances, permits, and incentives to encourage development consistent with RainReady practices.

# RainReady Home



A RainReady Home with a landscape upgrade

## The Offering

**RainReady Home** is a home upgrade, complete with a property assessment, construction oversight and upfront financing. Improvements can include downspout disconnection, re-grading, foundation crack sealing, porous paving, rain gardens, and backwater valves. Landscape improvements are prioritized. For properties affected by basement backups and seepage, the home upgrade package averages between \$3,000-5,000. These costs will be higher for properties affected by overland flooding (refer to Figure 1 for more information on the different types of urban flooding).

The risk assessment includes an examination of the property's basement and foundation for damages, an inspection of building sewers for blockages or breaks, and an assessment of the yard, gutters and downspouts.

## The Key Elements of the RainReady Home Service

Assessment Phase	What CNT Offers
Assessment of Property Flood Risk	<ul style="list-style-type: none"><li>• An experienced team of assessors trained to identify the full range of possible flood risks and present an action plan</li><li>• A full property flood assessment, including inspection of the home, building sewer, and landscape for previous flood damages and signs of exposure to flood risk</li><li>• A customized flood assessment report detailing the property's reported history of flooding, any observations of flood risk, and a list of prioritized investment measures<ul style="list-style-type: none"><li>» Prioritized investment measures include landscaping, plumbing, and building foundation work. Where feasible, landscaping options are prioritized</li><li>» Primary recommendations are intended to address significant flooding risk areas, such as those that may threaten occupant health or building safety</li><li>» Secondary recommendations are intended to address less significant flooding risk areas that affect the owner's ability to use the property</li></ul></li><li>• Support from our team to ensure that the owner(s) understand their property flood risk and investment strategy</li></ul>
Bid Solicitation + Review	<ul style="list-style-type: none"><li>• Bid assistance and contractor oversight when an owner decides to move forward from the assessment process to upgrade his/her property<ul style="list-style-type: none"><li>» Our team solicits bids from a pre-qualified pool of contractors on the measures the owner has elected to pursue. This rigorously vetted contractor pool is subject to ongoing quality assurance checks</li></ul></li><li>• Independence from contractors and any conflicts of interest with our contractor pool, which allows our team to provide objective and fair reviews for property owners as they make important decisions about their investment(s)</li></ul>
Construction Oversight	<ul style="list-style-type: none"><li>• An experienced team of construction managers provides oversight during the construction process to ensure that work is completed to specifications in a manner that meets the owner's needs and reduces the risk of repeat flooding</li></ul>



## Progress Thus Far

RainReady Home has been designed in partnership with CNT’s affiliated nonprofit, Elevate Energy, and is based on their successful energy efficiency upgrade programs.

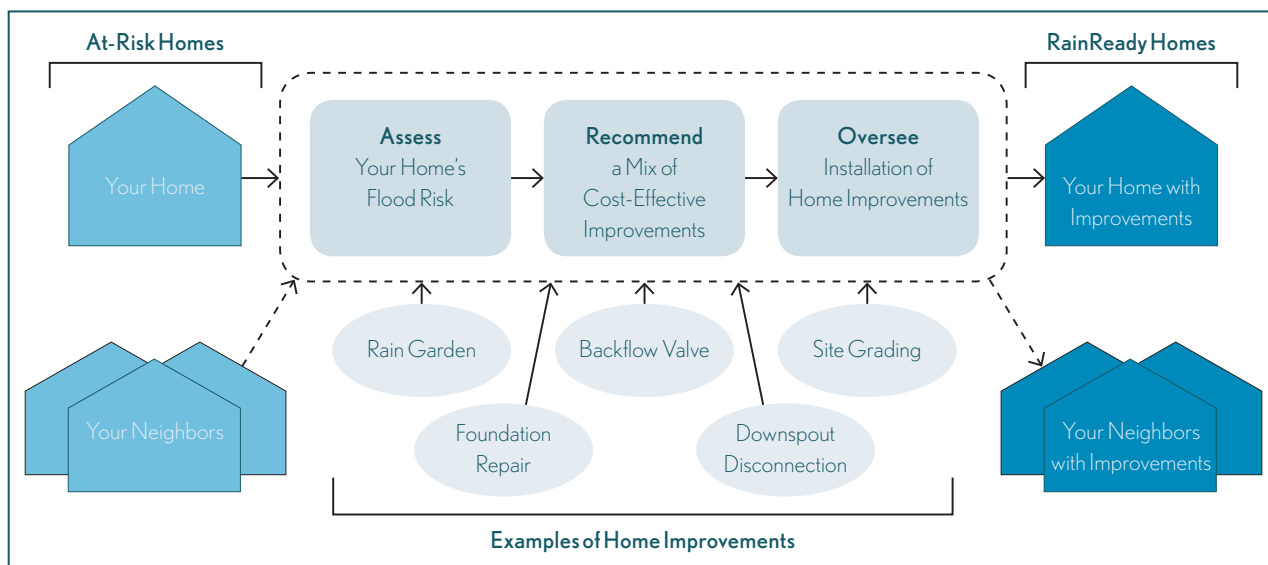
With Elevate’s help, CNT has designed and is currently testing a prototype home upgrade service, with a focus on properties affected by sewer backups and seepage. To date, we have assessed the risks of over 30 properties in the city of Chicago and identified appropriate home improvements.

Chicago resident Lori Burns, for example, lost an estimated \$17,000 due to flood damage in her two properties. We made a video illustrating her story, which was also picked up in the *Washington Post*.<sup>25</sup> Through RainReady Home, she was able to install a suite of coordinated plumbing and landscape solutions for just under \$5,000.

Dejan Bajic and Marcela Bernal experienced damage from seepage after moving into their home in 2012. Through RainReady Home, they regraded the area outside their home and installed a rain garden at a cost of \$1,700. They have not suffered flooding or seepage since.<sup>26</sup>



CNT’s RainReady team helped Dejan Bajic and Marcela Bernal stop seepage in their home by regrading their property and installing a rain garden



**FIGURE 7:** A diagram summarizing the process flow for the RainReady Home service



## What We Have Learned

Our experience suggests that:

- The RainReady Home service is unique because it offers homeowners independent advice from a single point of contact.
- Landscape solutions (e.g. green infrastructure) are relevant to most home upgrades and provide the additional benefits of reducing negative downstream and upstream impacts.
- The service requires highly skilled assessment staff with knowledge of landscaping, plumbing, and building solutions.
- Building a pool of high-quality and skilled contractors to upgrade properties is a challenge.
- Home upgrades will need regular repair and maintenance, particularly with increasingly intense rain events.
- Homeowners with financial constraints may be juggling their flooding concerns with other issues, such as the need for an efficient heating system. The more these services are coordinated, the more likely there will be efficiency savings.

A RainReady home with a permeable walkway and rain garden

## Next Steps

In 2015-2016, we will expand with a goal of 200 assessments and 50 completed upgrades. The majority of these upgrades will occur in coordination with RainReady Community (see next page). Funding will initially come from foundations, municipal/utility sources, and property owners.



# RainReady Community

Recognizing that urban flooding problems are generated by stormwater runoff from roads, parking lots, yards, and roofs across neighborhoods, RainReady Community is an extension of RainReady Home. Participating neighborhoods receive an in-depth, community-wide RainReady plan. In addition to home upgrades, the plan proposes flood prevention measures that extend to streets, parkways, forest lands, and public spaces. These preventive measures include the use of porous paving, rain gardens, bioswales, and trees. The cost of each measure varies.

## Who Benefits

- Homeowners who want to protect their properties and benefit from community upgrades
- Stormwater utilities that have a legal obligation to manage stormwater and are subject to legal action from the Environmental Protection Agency if they fail
- Municipalities that seek to help homeowners and the utilities manage stormwater, but lack the financial and human resources to execute these programs at community scale

## Progress Thus Far

CNT is currently designing and testing a prototype RainReady Community planning process. The service includes a step-by-step process for carrying out a community needs assessment and identifying preventative solutions. We have been working with two communities: Midlothian in the south suburbs of Chicago, and Chatham, a neighborhood on Chicago's Southwest Side.

- **Midlothian:** Several hundred residents in the Village of Midlothian are routinely affected by overbank flooding from Natalie and Midlothian Creeks. In addition, residents are affected by sewer backups. The Village has an active resident action group, Floodlothian Midlothian, which has been supporting the RainReady Community design process.<sup>28</sup>
- **Chatham:** Although there are no floodplains in the neighborhood of Chatham, research by CNT found that Chatham ZIP codes (60619 and 60620) have some of the highest flood damage payouts in Cook County. Between 2007 and 2011, urban flooding has resulted in 16,400 claims and \$44 million in payouts.<sup>29</sup> While flooding through floor drains is the most prevalent problem, residents face a wider mix of problems including seepage, flooding through windows and doors, and yard flooding.

» *The RainReady website has videos of Chatham and Midlothian residents telling their flooding stories.*<sup>30</sup>



A RainReady street with bioswale to capture stormwater runoff



## What we have learned

Our work with homeowners and communities suggests that:

- Residents affected by flooding can be helpful in driving demand for solutions. Helping them set up Resident Action Groups can channel residents' concerns over flooding toward effective solutions.<sup>31</sup>
- There is no easy way to identify everyone at risk of urban flooding. Hydrological and sewer models can help identify riverine and sewer backups. These can be supplemented by complaint records, community mapping workshops, and property surveys.
- Property owners have knowledge of their risks but may be reluctant to share this information. However, they are more likely to share their knowledge if they believe immediate help is on the horizon.
- When identifying problem areas and potential solutions, it is important to get all the relevant agencies in the room. There is often a complex web of responsibilities and ownership of land and facilities that is best understood collectively.

CNT's  
RainReady  
team working  
with residents  
in Chatham,  
Chicago



## Next steps

In 2014, the Chicago District office of the Army Corps of Engineers won a national Silver Jackets competition to collaborate with CNT on the RainReady initiative.<sup>32</sup>

In 2015, CNT will work with the Army Corps of Engineers, an expert task force, and local resident groups to complete RainReady plans for Chatham and Midlothian. The plans will provide an overview of the flood risks within the communities, the costs to residents, and areas for implementing mitigation measures. It will summarize the opportunities for home upgrades and improvements in public rights-of-way, as well as advice on financing and installation.

CNT will reach out to communities across the Chicago region to build demand for RainReady Community services.

# RainReady Alert

**RainReady Alert** is a real-time flood warning system for homeowners and communities based on strategically placed micro-sensors in basements and other locations. The sensors create a dense, internet-based network that can be used to monitor and predict flooding events, generate dynamic maps of affected areas, send advisories to participants, and allow for timely action, such as preparing or evacuating the at-risk property.

## Progress Thus Far + Next Steps

CNT is establishing partnerships with several private-sector companies to develop and pilot the RainReady Alert platform. The first phase of development will involve testing the Alert system by working alongside residents, community leaders, and partner agencies in Midlothian and Chatham.



Backyard flooding in Chicago



# Policy + Regulatory Advocacy

We have four pillars to our policy work:

## 1) Research

We undertake or support research that reveals the prevalence and cost of urban flooding and its impacts on towns and cities

## 2) Community organizing

We help flood victims set up Resident Action Groups<sup>33</sup>

## 3) Policy development

We support legislation to help the victims of urban flooding

## 4) Advocacy

We work with flood victims to bring a united voice to press for change

We have helped draft and promote state and federal legislation advancing the study of urban flooding, which will examine:

- Prevalence and costs
- Causes
- The efficacy of existing flood mitigation programs
- Flood risk evaluation policies and techniques
- Mitigation strategies and technologies
- Flood control project funding
- Opportunities for improving the effectiveness of and participation in the National Flood Insurance Program and Community Rating System<sup>34</sup>

We anticipate this research will lead to a better understanding of urban flooding and ultimately recommendations for change. For example, improving policies, education, and regulatory programs could go a long way in giving homeowners and businesses the tools they need to prepare for and avoid flood damage. Similarly, developing innovative ways to evaluate flood risk and establish flood alert systems will give municipal leaders the information they need to assist in flood prevention and emergency response to hazardous conditions. This can direct them toward the most cost-effective flood mitigation practices, such as a local or regional scaling up of green infrastructure. Even if it is the last resort, there may also be innovative ways to improve the consistency and accessibility of flood damage insurance coverage.

In 2015-2016, we aim to establish partnerships in five or more cities across the U.S. to raise awareness of the risks to residents of urban flooding and the benefits of RainReady solutions.



Flood victims in Midlothian, IL advocating for action

# RainReady: Return on Investment

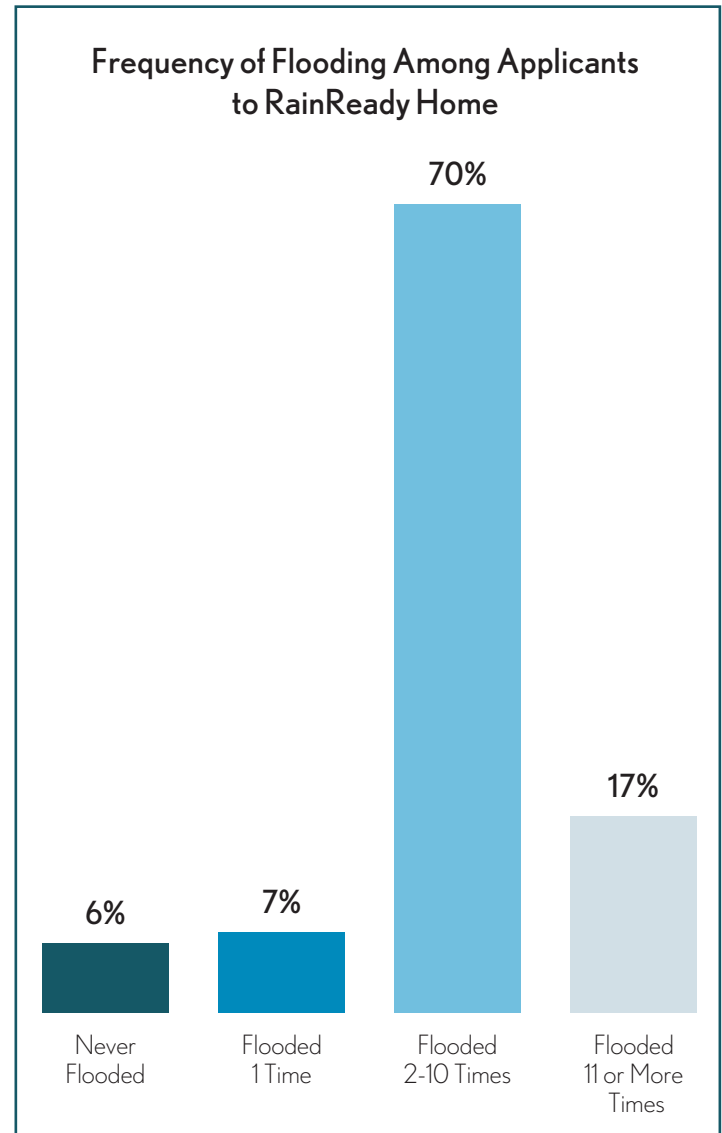
Urban flooding has both public and private costs, which occur at the individual and community scales. To be successful, RainReady strategies need to provide the mechanisms to facilitate widespread investment in individual properties and link them to the public sector and private business investment. Here are a few things that we know so far about financing RainReady based on our research in Cook County, IL:

**Urban flooding is expensive for all stakeholders, including homeowners; businesses; insurance companies; local, state, and federal governments; and taxpayers. As reported in CNT's *The Prevalence and Cost of Urban Flooding*:<sup>35</sup>**

- For the 181,000 claims paid out for urban flooding damage over five years in Cook County, the **average payout per claim was \$4,000.**
- There are other direct and indirect costs as well. In addition to property owners having to pay for damaged and destroyed property, they often suffer from severe stress, lost work hours, lost valuables (including heirlooms), lost use of property, injury and illness of one or more occupants, and lost business income. Our online survey of property owners affected by flooding in Cook County found that the **average estimated total cost of damage was \$6,000.**
- **Property owners affected by flooding are impacted repetitively.** For example, our research of 88 homeowners applying for RainReady Home upgrades in Chicago found that 87% report that their home has flooded more than once, and 17% estimate that their property has flooded more than 10 times (see Figure 8).

**RainReady can bring immediate relief and target those properties most in need:**

- **RainReady practices can be implemented quickly** (within weeks and months) to reduce the high and repetitive costs of flood damage. For highly localized flooding, such as property foundation seepage, RainReady practices may be the only effective solution.



**FIGURE 8:**  
The number of times that applicants to CNT's RainReady Home service in Chicago estimate that they have flooded, broken down by percentage

### RainReady solutions are cost effective:

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- Of the 31 home assessment reports analyzed by CNT, the **average cost of a home upgrade is estimated to be \$4,000**, ranging from \$1,500 to almost \$20,000. Typical measures recommended include regrading the landscape to take water away from the foundation, the installation of rain gardens and permeable paving to capture this runoff, and the disconnection of downspouts. The costs are based on upgrades for homes affected by seepage and drain backups; costs for alleviating damage in properties severely affected by riverine flooding can be higher.

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- CNT's analysis of funds approved by the Metropolitan Water Reclamation District (MWRD) for flooding projects in 2014 found that the estimated per-property cost of RainReady-type investments is under \$3,000 (mostly on the public rights-of-way). This is less than a quarter of the cost of traditional engineered solutions funded by MWRD like expanding storm sewers, which costs an average of \$14,000 per individual property benefited.

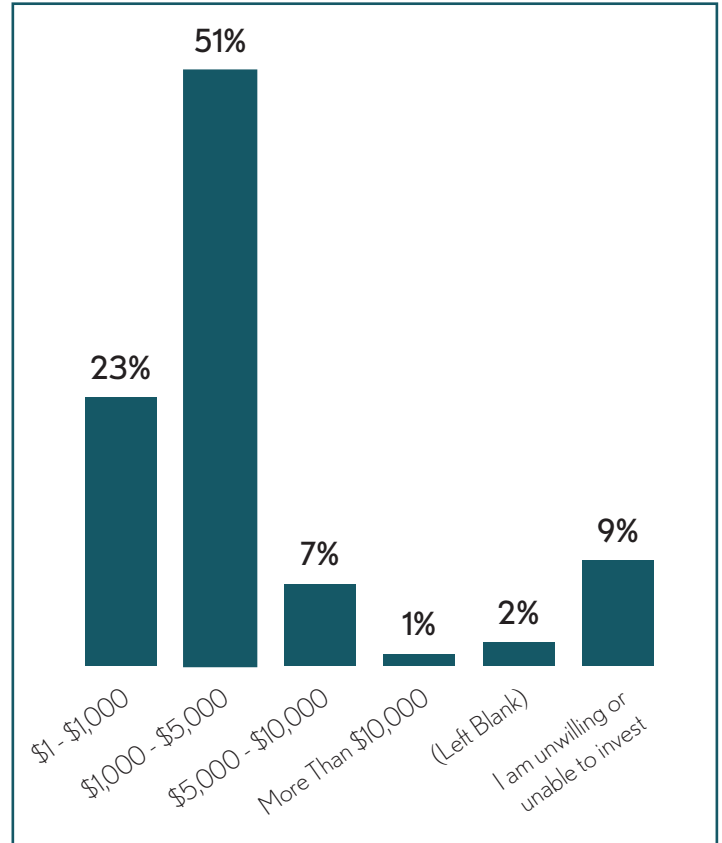
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- Similar examples exist of municipal RainReady-type programs with good cost-benefit ratios. For example, in its stormwater management plan, the Village of Winnetka, IL estimates that disconnecting 30 private sump pumps from the sewer system for \$150,000 (at a per-property cost of \$5,000) would have the same benefit as rehabilitating 40,000 feet of sanitary sewer for \$2 million.<sup>36</sup>

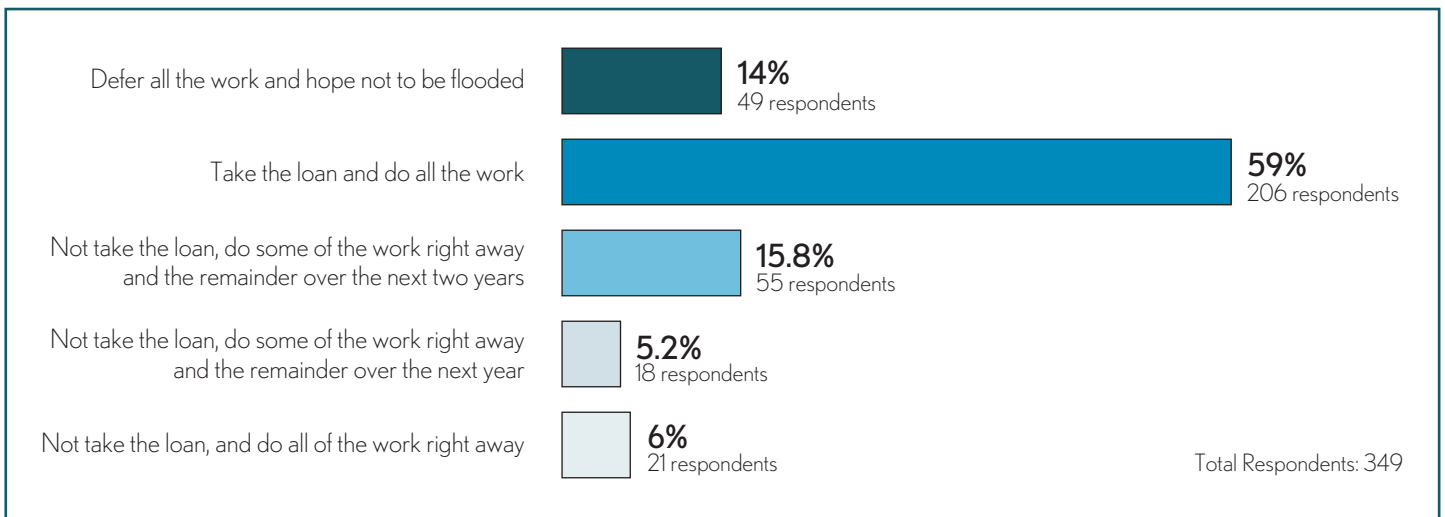


**Affected property owners express a willingness to pay for solutions:**

- Our survey of 88 homeowners applying to RainReady Home found that 23% are willing to pay up to \$1,000 to solve the problem, 51% say that they are willing to pay between \$1,000 and \$5,000, and 7% are willing to pay more than \$5,000 (see Figure 9). Significantly, approximately 60% of these applicants came from ZIP codes with below-average median household incomes.
- On a separate survey of 349 homeowners, 59% said that they would invest in \$5,000 worth of improvements needed to alleviate flooding if they could obtain a five-year, interest-free loan to do the work (see Figure 10).



**FIGURE 9:** The willingness to pay for property upgrades, based on applicants to CNT's RainReady Home service in Chicago



**FIGURE 10:** Survey of residents interested in RainReady Home services in Cook County, IL. Response to the question "If the assessment recommends \$5,000 worth of improvements and you could obtain a five-year interest-free loan to do the work, would you?"

## RainReady brings jobs:

- RainReady practices require labor, much of it low- and semi-skilled, including landscapers, gardeners, nursery workers, plumbers, paving contractors, and maintenance and repair workers. The emphasis on nature-based practices brings additional aesthetic, recreation, wildlife and water-quality benefits that in turn bring additional economic and social benefits.

In short: the costs of urban flooding are expensive to individuals and communities, and these costs are set to rise as a result of increasingly severe weather events. Upgrading our homes, businesses, and neighborhoods can be done quickly, and RainReady solutions are relatively cost effective. Homeowners affected by flooding have some willingness to pay for the cost of upgrading their properties, particularly if given access to interest-free loan funds. Furthermore, RainReady solutions bring much needed jobs, and wider economic and environmental benefits. It clearly makes economic sense to act.



Installing porous paving, a RainReady solution, in Chicago, IL



# Coordinating Investment in RainReady

America knows how to upgrade homes and neighborhoods. We did this in the 1920s and '30s when we brought electricity to homes and businesses across the country, and again in the 1950s and '60s with the massive rollout of cable TV. These upgrades have continued in the decades since as millions of homes and businesses have become upgraded for internet service and improved energy efficiency. Now, it's time for America to become RainReady.

The critical first steps in this process are to identify the products and services that people need and want, establish a means of coordinating their delivery, and secure the financial partners to support this. We also need a clear set of standards and protocols to ensure that the goods and services meet customers' needs. On the next page, we've listed partners that we think can play essential roles in RainReady. Together, these partners can create the coordinated services and investment needed for widespread deployment of RainReady solutions.



A RainReady apartment building



<b>Investor</b>	<b>Investment Mechanism</b>	<b>Return</b>
<b>Property owner</b>	<ul style="list-style-type: none"> <li>• Pays for RainReady property upgrades (coordinated through the municipality)</li> </ul>	<ul style="list-style-type: none"> <li>• Improves landscape and aesthetics</li> <li>• Increases property value</li> <li>• Reduces financial, health, and time burdens of repeat flood damage</li> </ul>
<b>Municipality</b>	<ul style="list-style-type: none"> <li>• Sets up a Rain Fund to provide financial assistance for the upfront costs of home upgrades and the full cost of upgrades in the public rights-of-way<sup>37</sup></li> <li>• Uses related public works projects, such as road repairs, to help pay for RainReady improvements</li> <li>• Establishes private-sector partnerships on behalf of residents, such as insurance discounts for private building sewer repair and replacement</li> <li>• Sets up a performance-based contract with a private-sector partner</li> <li>• Offers developers incentives for RainReady upgrades, such as reducing impervious surfaces by establishing parking space maximums instead of minimums</li> <li>• Matches job training/employment opportunities to RainReady upgrades</li> </ul>	<ul style="list-style-type: none"> <li>• Improves neighborhood aesthetics, water quality in local waterways, and recreational opportunities</li> <li>• Increases property values</li> <li>• Maintains the tax base by enhancing neighborhood appeal</li> <li>• Reduces municipal insurance premiums by reducing flooding risk</li> <li>• Stimulates housing market/economic development</li> <li>• Increases low- and semi-skilled employment opportunities</li> <li>• Reduces impact of flooding on roads and other public infrastructure</li> </ul>
<b>Insurance sector</b>	<ul style="list-style-type: none"> <li>• Provides premium discounts for customers adopting RainReady practices, like the RainReady Alert system</li> <li>• Offers new, income-generating insurance policies, such as partnering with cities to offer building sewer insurance riders</li> <li>• Establishes promotional partnerships with RainReady services</li> </ul>	<ul style="list-style-type: none"> <li>• Improves the economic health of existing customer base, making it more likely for people to renew their policies</li> <li>• Reduces damage claims from sewer backup policies and reduces risk of legal disputes</li> <li>• Diversifies insurance portfolio</li> </ul>
<b>Private-sector service, system suppliers + contractors</b>	<ul style="list-style-type: none"> <li>• Establishes promotional partnerships with RainReady services</li> </ul>	<ul style="list-style-type: none"> <li>• Directs sales by providing RainReady upgrades like technology platforms, sensors, plumbing, and landscaping supplies</li> <li>• Increases sales of indirectly related services, like interior design for RainReady basements</li> </ul>
<b>Banks + mortgage companies</b>	<ul style="list-style-type: none"> <li>• Establish promotional partnerships with RainReady services</li> <li>• Offer RainReady Home upgrade loans and/or lower mortgage interest rates for RainReady homes</li> </ul>	<ul style="list-style-type: none"> <li>• Improves economic health of existing customer base</li> <li>• Provides entry point for new customers and related policies</li> <li>• Reduces the risk of default/foreclosure</li> </ul>
<b>Real estate sector*</b>	<ul style="list-style-type: none"> <li>• Establishes partnerships with RainReady service providers to design certifications and rating programs for RainReady Homes</li> <li>• Establishes promotional partnerships with RainReady service providers</li> </ul>	<ul style="list-style-type: none"> <li>• Enhances value of home property, particularly if the Residential Real Property Disclosure Reports and/or C.L.U.E. reports reveal previous flooding</li> <li>• Drives consumer demand for related services like urban flooding risk assessments</li> </ul>
<b>County/state government</b>	<ul style="list-style-type: none"> <li>• Establishes loans for municipalities to support RainReady services, repaid via Rain Funds</li> <li>• Supports the assembly of RainReady services, financing partners, and certification/rating programs</li> <li>• Establishes land banks and enhanced protection for critical natural defenses like wetlands</li> </ul>	<ul style="list-style-type: none"> <li>• Brings regional aesthetic and recreational benefits, like when RainReady upgrades can be linked to parks and trails</li> <li>• Creates new low- and semi-skilled employment opportunities</li> <li>• Stimulates housing market and economic development</li> <li>• Reduces legal/statutory costs associated with Clean Water Act</li> <li>• Reduces disaster mitigation planning costs</li> </ul>
<b>Federal government</b>	<ul style="list-style-type: none"> <li>• Gives the legal authority to FEMA, U.S. Army Corps of Engineers, and EPA to tackle urban flooding</li> <li>• Makes FEMA's existing National Flood Insurance Program and its mitigation programs (such as the Community Rating System) more relevant to all communities</li> <li>• Establishes loans for municipalities to support RainReady services, repaid via Rain Funds</li> </ul>	<ul style="list-style-type: none"> <li>• Brings national aesthetic and recreational benefits, like when RainReady upgrades can be linked to national parks and trails</li> <li>• Reduces economic and social impacts of federal disasters on U.S. towns and cities</li> <li>• Stimulates housing market and economic development, including employment opportunities</li> <li>• Reduces costs associated with Clean Water Act violations</li> </ul>

\*including agents and brokers, home appraisers and inspectors, multiple listing services

# RainReady Together

The storms that are pummeling our towns and cities are likely to get worse.<sup>38</sup> This means more beds and sofas floating in raw sewage, more cars totaled, more beaches closed, more lost days of work, more misery, more bills.

But this destruction isn't inevitable. RainReady envisions a nation where homeowners and businesses can access cost-effective upgrades that will keep their properties safe and increase their property values. A nation where cities have new financing tools to stop flooding in their streets.

A nation where private-sector companies – realtors, home appraisers, insurance agents, bank managers, technology corporations, plumbers, landscapers, maintenance workers – provide the essential services to put RainReady plans into action.

RainReady is a visionary program that embraces simple, sustainable, and low-cost technologies to help get ready for the coming weather changes. We invite you to join us in making this vision a reality.

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Flood victims in Midlothian, IL holding a meeting





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