URBAN FLOODING ANALYTICS AND TOOLS AT CNT

For: National Academy workshop on Urban Flooding in Chicago

Sept. 19, 2017

Peter Haas – Center for Neighborhood Technology

CNT

ABOUT CNT

- CNT is a national hub for research, strategies and solutions to help cities use resources more efficiently and equitably.
- We believe addressing problems like poverty, climate change and urban sprawl starts with making neighborhoods, cities and regions work better.

CNT

ABOUT CNT

- Our main areas of impact are:
  - Economic Development and Poverty Reduction
  - Climate Resilience
  - Urban Analytics

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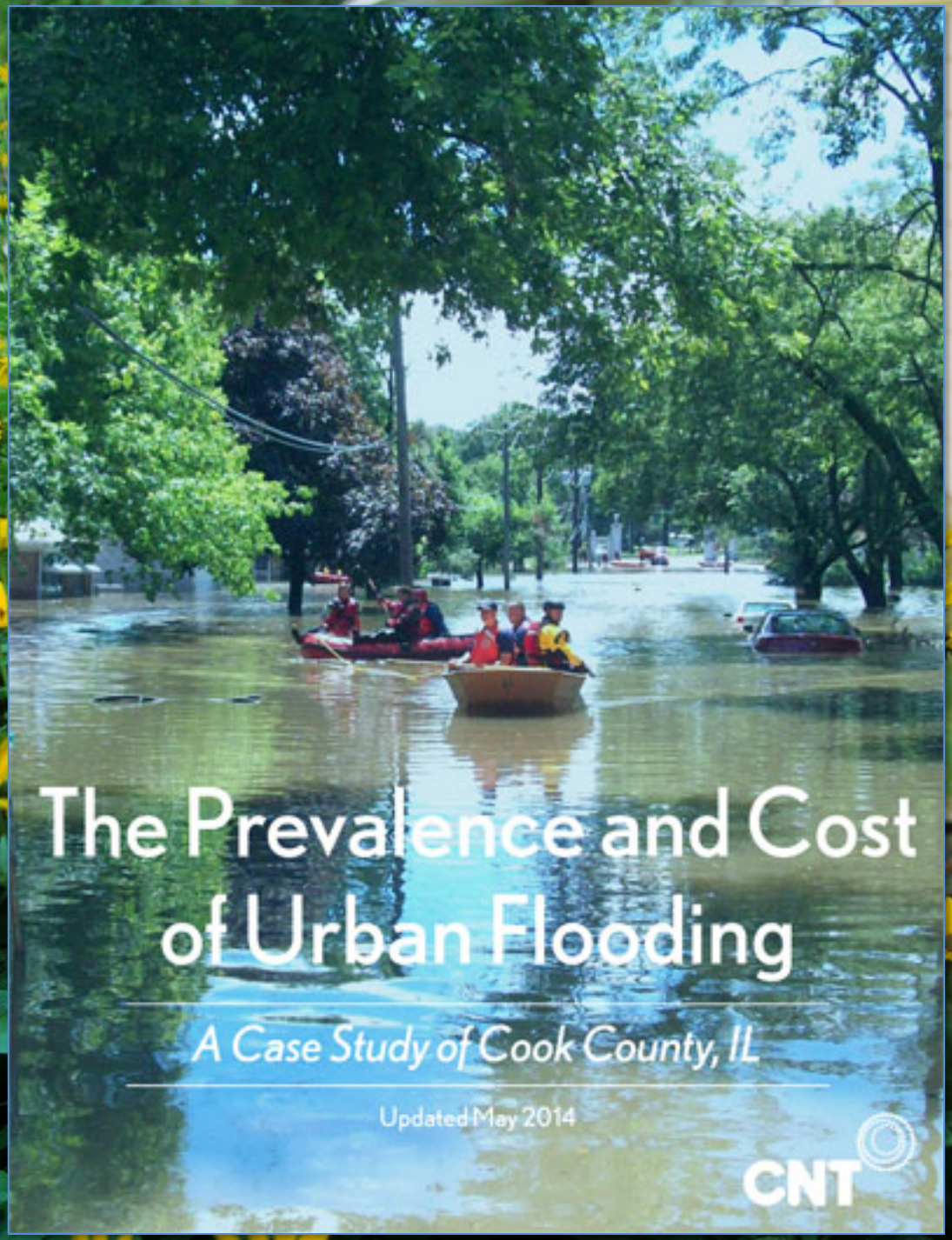

The Prevalence and Cost of Urban Flooding
A Case Study of Cook County, IL
Updated May 2014
CNT

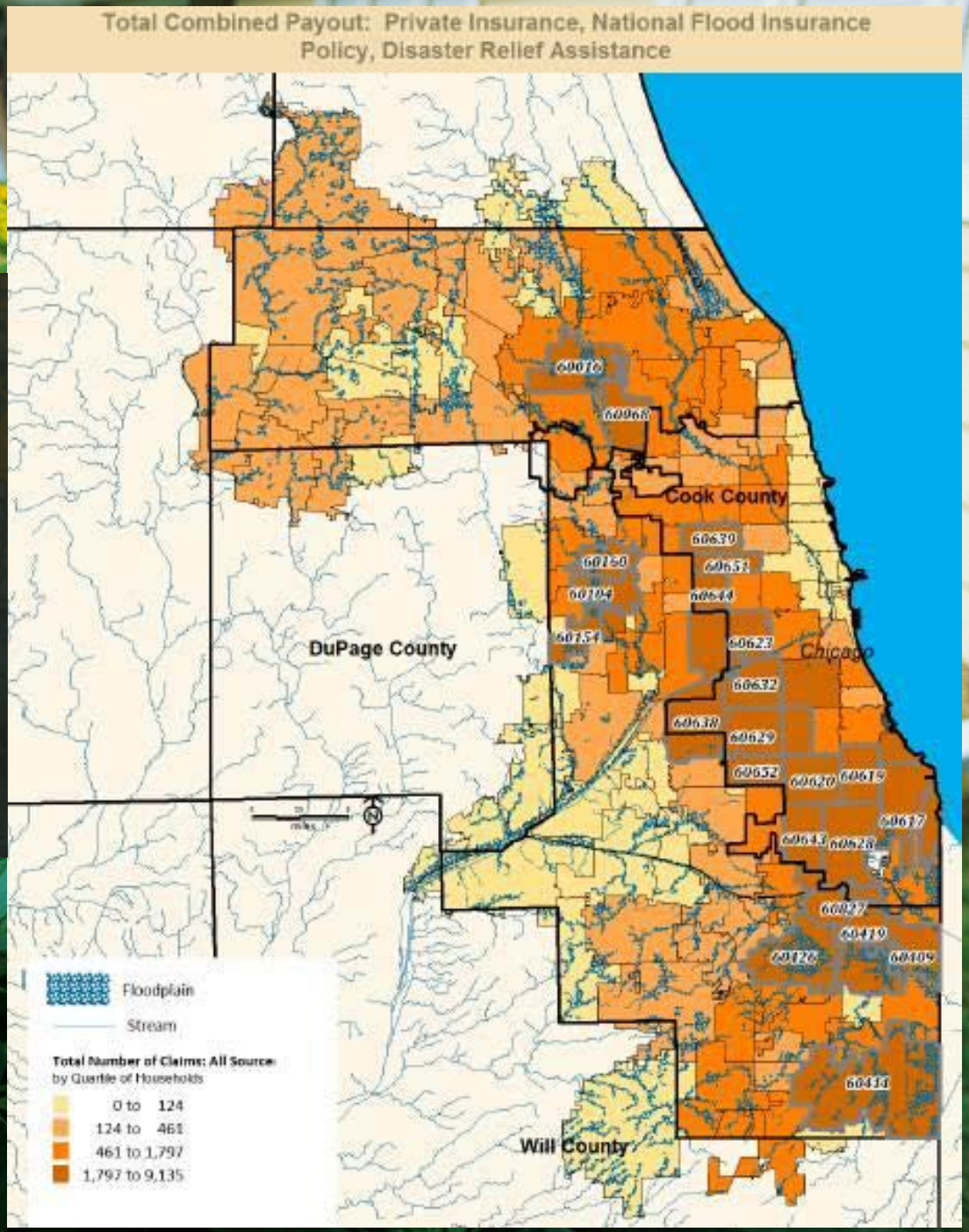
Prevalence and Cost

- ~~Mapped floodplains~~
- Flood damage insurance claims paid out
- 2007 – 2011, Cook County, IL, aggregated by zip code

Study Findings:

- Claims in 97% of zip codes
- Most suffered repetitive losses
- Average pay-out: $4,272
- Total pay-out: At least $773,772,151

Majority of claims outside any designated floodplain!



State of Illinois
Illinois Department of Natural Resources

REPORT FOR THE

Urban Flooding Awareness Act

JUNE 2015

CNT

IDNR UFAA STUDY

Illinois Flood Insurance Claims Data:

- 2007-2014
  - Total Claims Paid: 353,603
  - Percent of Counties Represented: 99%
  - Total Paid: $2.319 Billion
  - Percent of Claims Outside Floodplain: 92.3%

Tool Background

- Started in 2003-ish
- Developed the Green Values™ Calculator
- City of Chicago customized: Chicago Green Values™ Calculator
- USEPA commissioned: The National Green Values™ Calculator (2009)
- Primary audiences:
  - Developers – to learn how to meet local storm water goals
  - Municipal leaders – to demonstrate the benefits
  - Academics – to educate the next generation
- All rolled up into the: Green Values® Stormwater Toolbox

http://greenvalues.cnt.org

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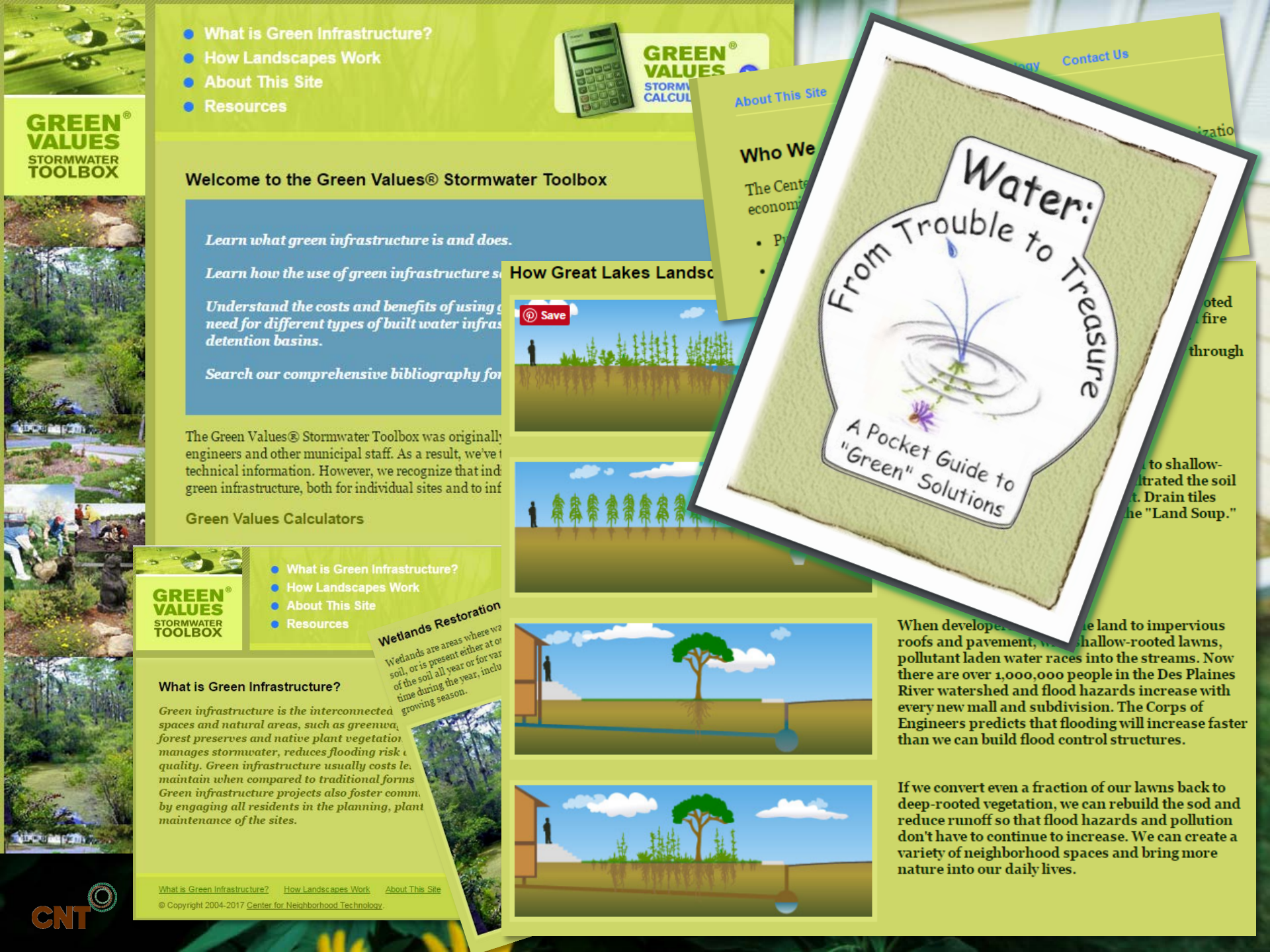
GREEN® VALUES STORMWATER TOOLBOX
What is Green Infrastructure?
How Landscapes Work
About This Site
Resources
GREEN® VALUES STORMW CALCUL
Welcome to the Green Values® Stormwater Toolbox
Learn what green infrastructure is and does.
Learn how the use of green infrastructure s
Understand the costs and benefits of using g need for different types of built water infras detention basins.
Search our comprehensive bibliography for
The Green Values® Stormwater Toolbox was originally engineers and other municipal staff. As a result, we've t technical information. However, we recognize that indi green infrastructure, both for individual sites and to inf
Green Values Calculators
How Great Lakes Landsc
Save
GREEN® VALUES STORMWATER TOOLBOX
What is Green Infrastructure?
How Landscapes Work
About This Site
Resources
Wetlands Restoration
Wetlands are areas where wa soil, or is present either at or of the soil all year or for var time during the year, inclu growing season.
What is Green Infrastructure?
Green infrastructure is the interconnected spaces and natural areas, such as greenwa forest preserves and native plant vegetatio manages stormwater, reduces flooding risk quality. Green infrastructure usually costs le maintain when compared to traditional forms Green infrastructure projects also foster comm by engaging all residents in the planning, plant maintenance of the sites.
What is Green Infrastructure? How Landscapes Work About This Site
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About This Site
Contact Us
Who We
The Cente economi
Water: From Trouble to Treasure
A Pocket Guide to "Green" Solutions
oted fire through to shallow- ltrated the soil t. Drain tiles he "Land Soup."
When develope land to impervious roofs and pavement, w shallow-rooted lawns, pollutant laden water races into the streams. Now there are over 1,000,000 people in the Des Plaines River watershed and flood hazards increase with every new mall and subdivision. The Corps of Engineers predicts that flooding will increase faster than we can build flood control structures.
If we convert even a fraction of our lawns back to deep-rooted vegetation, we can rebuild the sod and reduce runoff so that flood hazards and pollution don't have to continue to increase. We can create a variety of neighborhood spaces and bring more nature into our daily lives.
CNT

The National Green Values™ Calculator

- Released in 2009
- Funding: US EPA Office of Wetlands, Oceans, and Watersheds (OWOW), Assessment and Watershed Protection Division, Non-Point Source Branch
- USEPA was a primary partner, and very involved in the tool's development
- IDEA: define a property for development; look at how to implement green solutions for storm water management
- GOAL: allow users to make better landscaping decisions to address storm water volume control

http://ec2.greenvalues.cnt.org/national/calculator.php?s=2592

GREEN VALUES STORMWATER TOOLBOX

GREEN VALUES®
NATIONAL STORMWATER MANAGEMENT CALCULATOR

CNT

CALCULATOR

DISPLAY PRINTABLE FORMAT | CREATE A PERMANENT LINK | RESET VALUES

Getting Started | Lot Information | Predevelopment | Runoff Reduction Goal | Conventional Development | Green Improvements | Advanced Options

Getting Started

The National Green Values™ Calculator is a tool for quickly comparing the performance, costs, and benefits of Green Infrastructure, or Low Impact Development (LID), to conventional stormwater practices. The GVC is designed to take you step-by-step through a process of determining the average precipitation at your site, choosing a stormwater runoff volume reduction goal, defining the impervious areas of your site under a conventional development scheme, and then choosing from a range of Green Infrastructure Best Management Practices (BMPs) to find the combination that meets the necessary runoff volume reduction goal in a cost-effective way.

EPA Smart Growth

A few important points to keep in mind:

- The National GVC is currently focused on runoff volume reduction. It does not produce any peak flow results. Volume reduction in this context implies infiltration, evapotranspiration and reuse, and does not include detention in ponds or vaults. All runoff volume captured in BMPs is assumed to be kept on site.
- The National GVC is meant for a single site or a campus of buildings contained on a single site. If you are interested in looking at the performance and cost/benefit analysis of Green Infrastructure BMPs applied on a neighborhood or watershed scale, consider using the original GVC and/or some of the other stormwater tools provided below.

To get started, select a tab at the top to enter site information. Default values (that can always be changed by the user) are provided throughout the calculator, so you can begin on any step. However, we recommend starting on the Lot Information page and proceeding through each step. Below is a brief description of the information you can provide on each page:

- Lot Information
- Predevelopment
- Runoff Reduction Goal

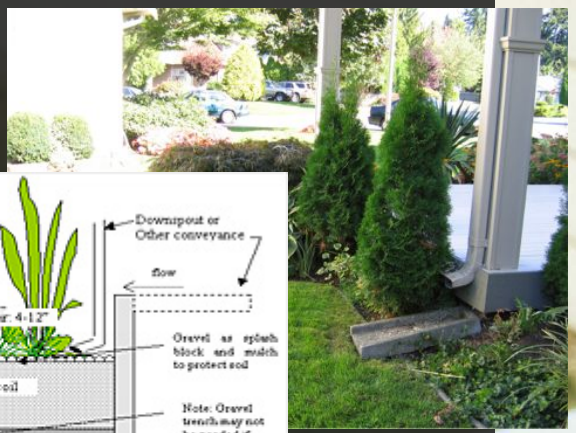
RESULTS

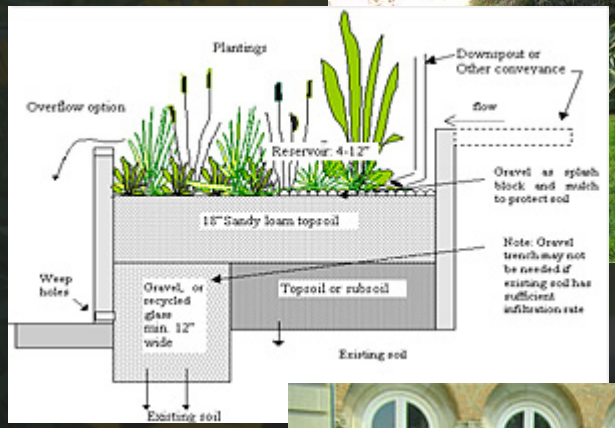
The Green Stormwater BMP(s) applied in this scenario **decrease** the site impermeable area by **42.9**% and capture **300**% of the runoff volume required. Compared to conventional approaches, the green practices in this scenario will **decrease** the total life-cycle construction and maintenance costs by **8**% (in net present value).

Volume Control | Coefficients and Runoff | Land Use | Costs | Benefits

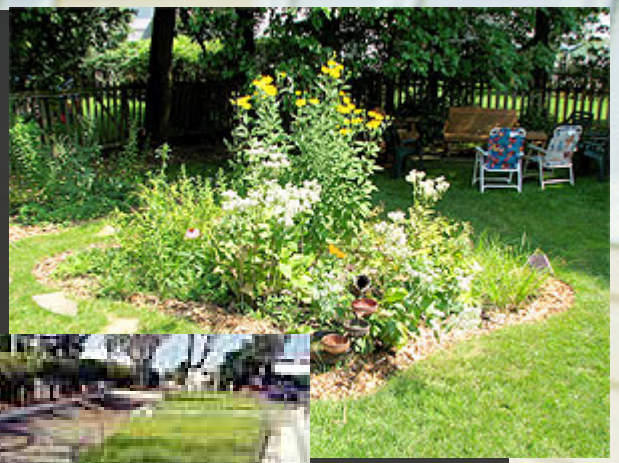
Green Improvements

- Green Roof
- Disconnect Downspout
  - Planter Boxes
  - Rain Garden
  - Cisterns/Rain barrels

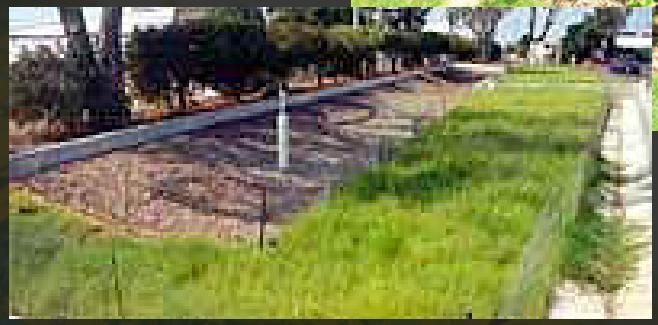




Green Improvements



- Native Vegetation
- Vegetated Filter Strips



- Amended Soil
- Roadside Swales (elimination of curb and gutter)
- Trees/Tree Box Filters

Green Improvements

- Swales in Parking Lot
- Reduced Street Width
- Permeable Pavement on:
  - Parking,
  - Driveways, and
  - Sidewalks

CALCULATOR

DISPLAY PRINTABLE FORMAT | CREATE A PERMANENT LINK | RESET VALUES

Getting Started | **Lot Information** | Predevelopment | Runoff Reduction Goal | Conventional Development | Green Improvements | Advanced Options

Lot Information

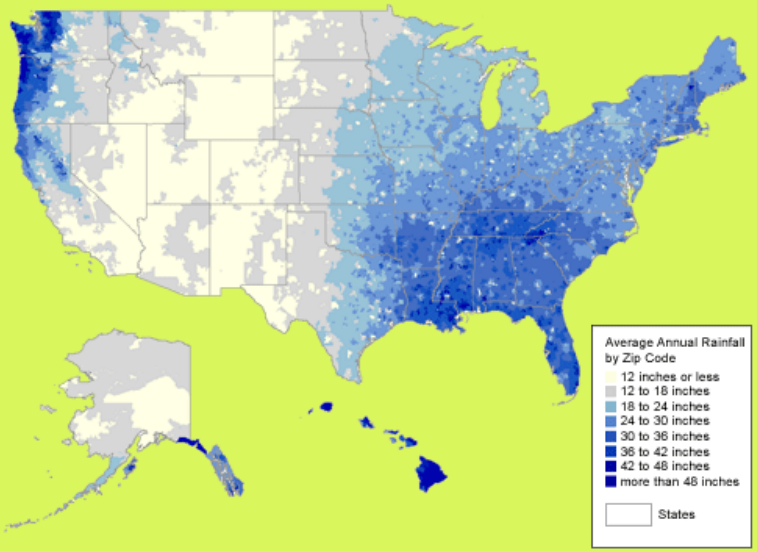
Zip Code:	95814
Annual Rainfall* (in) :	16.44
Storm Type (in) :	99%
Storm Rainfall* (in) :	2.1
Size of Lot+ (acres):	0.603
Or give dimensions+.	
Length of Lot (ft):	150
Width of Lot (ft):	175
Soil Type:	C

* Required fields.
\+ Must have at least one of these fields filled in.

Enter the site zip code to view the annual average precipitation and the **90% storm for your site**. You can input any precipitation quantity into these values if you are interested in looking at the total runoff volume produced by each scenario under different precipitation conditions then those determined here. For example if you know and the amount of precipitation for a particular design storm and are interested in seeing total runoff volume changes under those conditions, enter that value here as either the annual or 90% storm and see the results for that same category.

Rainfall estimates may not match other reported standard values. Please consult local regulatory authorities when designing or implementing projects. Please see the Green Values methodology for details on rainfall calculation.

Average Annual Rainfall by Zip Code



RESULTS

The Green Stormwater BMP(s) applied in this scenario change the site impermeable area by **0%** and capture **0%** of the runoff volume required. Compared to conventional approaches, the green practices in this scenario will change the total life-cycle construction and maintenance costs by **0%** (in net present value).

CALCULATOR

Predevelopment

Land Cover+

Your land coverage totals **100%**.

Impervious Area (%):	
Lawn in good condition (%):	
Lawn in fair condition (%):	
Urban Fill (%):	100
Natural Desert Landscaping (%):	
Newly Graded Areas, no vegetation (%):	
Straight Row Crops in good condition (%):	
Pasture in fair condition (%):	
Meadow (%):	
Woods in good condition (%):	
Desert Shrub in fair condition (%):	
Wetlands (%):	
Water (%):	

Local stormwater regulations may define the "predevelopment" condition as the existing condition of the site prior to the development project in question, OR as the original condition of the site prior to any human development (e.g. forest or meadow). Either definition can be satisfied here by defining the different land cover types represented on your site for either predevelopment condition. Check with local authorities to determine which definition you should use to define the predevelopment scenario in this calculator.

Most of the land cover categories below are chosen from the USDA Soil Conservation Service Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds Table 2.2a-d. We tried to provide a short list of land cover categories that can be used in combination to describe a variety of sites around the country, and fit both interpretations of predevelopment. The land cover category is associated with a curve number (either a default value or user-specified) and the area assigned to each land cover type creates a composite curve number for the site under predevelopment conditions.

* Required fields.
\+ Must have at least one of these fields filled in.

RESULTS

The Green Stormwater BMP(s) applied in this scenario change the site impermeable area by **0%** and capture **0%** of the runoff volume required. Compared to conventional approaches, the green practices in this scenario will change the total life-cycle construction and maintenance costs by **0%** (in net present value).

CALCULATOR

DISPLAY PRINTABLE FORMAT | CREATE A PERMANENT LINK | RESET VALUES

Getting Started | Lot Information | Predevelopment | Runoff Reduction Goal | Conventional Development | Green Improvements | Advanced Options

Runoff Volume Reduction Goal

Select a Goal:

Custom

Precipitation Depth Capture (in): 0.5

Volume Captured Over: Whole Site

Required Volume to Capture On Site: **1,094 ft³**

* Required fields.
\+ Must have at least one of these fields filled in.

Select a runoff reduction goal from the following drop-down list. The selected value defines the amount of precipitation (0.5 – 1.5 inches) over the impervious area of the site that must be infiltrated, evapotranspirated, and reused on site with Green Infrastructure BMPs.

The example list on the right demonstrates how these goals are included in stormwater ordinances across the country. Click on any of the examples to open a brief summary of their language and a source where they can be found.

National Standards

The Energy Independence Security Act (ESIA). Section 438. Stormwater Runoff Requirements for Federal Development Projects. Option 1

LEED ND Green Technology and Construction Credit 9: Stormwater Management

1 - 5 certification credits available depending on how much precipitation from the impervious area is infiltrated, evapotranspired, or reused in arid, semi-arid, and humid watersheds. For semi arid (between 20"-40" rain/year) the minimum amount is 0.225 inch and the max is 1.125 inches. The maximum of all categories is 1.5 inches

Pilot Version: LEED for Neighborhood Development Rating System Updated June 2007, pg 115

State and Local Standards

California: LA County Public Works

California: Los Angeles Regional Water Quality Control Board for Ventura County

Connecticut: Town of Tolland

Connecticut: Town of Deep River

Illinois: City of Chicago

Massachusetts Department of Environmental Protection

Minnesota: Ramsey-Washington Metro Watershed District

New Hampshire: Town of Thornton

New Jersey Department of Environmental Protection

North Carolina Department of Environment and Natural Resources

Ohio Environmental Protection Agency: Big Darby Creek Watershed

RESULTS

The Green Stormwater BMP(s) applied in this scenario change the site impermeable area by **0%** and capture **0%** of the runoff volume required. Compared to conventional approaches, the green practices in this scenario will change the total life-cycle construction and maintenance costs by **0%** (in net present value).

CALCULATOR

DISPLAY PRINTABLE FORMAT | CREATE A PERMANENT LINK | RESET VALUES

Getting Started | Lot Information | Predevelopment | Runoff Reduction Goal | **Conventional Development** | Green Improvements | Advanced Options

Conventional Development

Impervious Area

Roof size+ (ft²): Or give dimensions+.	20000
Roof Length (ft):	
Roof Width (ft):	
Number of Parking Spots+:	10
Parking Lot Size+ (ft²):	700
Sidewalk:	
Length (ft):	175
Width (ft):	4
Streets:	
Length (ft):	
Width (ft):	
Driveways and Alleys:	
Length (ft):	
Width (ft):	

Other Land Cover+

Your land coverage totals **100%**.

Total Impervious Area (%):	60.1
Lawn in good condition (%):	39.9
Lawn in fair condition (%):	
Natural Desert Landscaping (%):	
Newly Graded Areas, no vegetation (%):	
Woods in good condition (%):	

RESULTS

The Green Stormwater BMP(s) applied in this scenario change the site impermeable area by **0%** and capture **0%** of the runoff volume required. Compared to conventional approaches, the green practices in this scenario will change the total life-cycle construction and maintenance costs by **0%** (in net present value).

CALCULATOR

DISPLAY PRINTABLE FORMAT | CREATE A PERMANENT LINK | RESET VALUES

Getting Started | Lot Information | Predevelopment | Runoff Reduction Goal | Conventional Development | **Green Improvements** | Advanced Options

Green Improvements

- [x] **Green Roof**
  - Amount (%): 100
  - Depth (in): 6
  - Porosity (Void Ratio): 0.35
- [ ] **Planter Boxes** (disconnect downspout)
- [ ] **Rain Garden** (disconnect downspout)
- [ ] **Cisterns / Rain Barrels** (disconnect downspout)

- [ ] **Native Vegetation**
- [ ] **Vegetation Filter Strips**
- [ ] **Amended Soil**
- [ ] **Roadside Swales** (elimination of curb and gutter)
- [ ] **Trees**

- [ ] **Swales in Parking Lot**
- [ ] **Reduced Street Width**
- [ ] **Permeable Pavement on Parking**
- [ ] **Permeable Pavement on Driveways and Alleys**
- [ ] **Permeable Pavement on Sidewalks**

* Required fields.
\+ Must have at least one of these fields filled in.

Green Roof


Green Roof, Peggy Notebaert Nature Center

Green roofs are vegetated roof covers, with growing media and plants taking the place of bare membrane, gravel ballast, shingles or tiles. Green roofs help to both absorb and evapo-transpirate stormwater runoff, as well as delay and filter runoff flows that exceed the roofs runoff storage capacity. Green roofs have a variety of design options, including extensive and intensive and modular or non-modular.

Green roofs also reduce building energy use and provide the resulting reduction in carbon emissions. This reduction is due to the green roofs' natural thermal insulation properties— structures are cooler in summer and warmer in winter.

The National GVC uses a default depth of 6 inches of growing media.[1] The user can specify any depth of subsurface storage but will incur additional cost if the soil media and/or aggregate exceed the default values.

1. "Design Guidelines for Green Roofs" Canada Mortgage and Housing Corporation. http://egov.cityofchicago.org/webportal/COCWebPortal/COC_ATTACH/design_guidelines_for_green_roofs.pdf

RESULTS

The Green Stormwater BMP(s) applied in this scenario **decrease** the site impermeable area by **93.5%** and capture **76.2%** of the runoff volume required. Compared to conventional approaches, the green practices in this scenario will **increase** the total life-cycle construction and maintenance costs by **111%** (in net present value).

CALCULATOR

DISPLAY PRINTABLE FORMAT | CREATE A PERMANENT LINK | RESET VALUES

Getting Started | Lot Information | Predevelopment | Runoff Reduction Goal | Conventional Development | Green Improvements | Advanced Options

Green Improvements

- [ ] Green Roof
- [ ] Planter Boxes (disconnect downspout)
- [x] Rain Garden (disconnect downspout)
  - Amount (ft^2): 200
  - Prepared Soil:
    - Depth (in): 12
    - Porosity (Void Ratio): 0.35
  - Underlying Aggregate:
    - Depth (in): 12
    - Porosity (Void Ratio): 0.25
- [x] Cisterns / Rain Barrels (disconnect downspout)
  - Cistern Capacity (gal): 1000
  - Rain Barrel Capacity (gal):
- [ ] Native Vegetation
- [ ] Vegetation Filter Strips
- [ ] Amended Soil
- [ ] Roadside Swales (elimination of curb and gutter)
- [ ] Trees
- [ ] Swales in Parking Lot
- [ ] Reduced Street Width
- [x] Permeable Pavement on Parking
  - Amount (%): 100
  - Material: Pavers
  - Underlying Aggregate:
    - Depth (in): 10

Rain Gardens (disconnect downspout)

Rain Garden in Chicago, CNT

Rain gardens are bowl-shaped gardens filled with native plants. Runoff from a disconnected roof downspout collects in the bowl and infiltrates into the soil with the help of the long-rooted native plants. Rain gardens are a simple and affordable technique that communities can use to reduce damage from flooding and drainage overflow. The native plants in rain gardens provide valuable wildlife habitat and reduce irrigation needs and maintenance costs in comparison to traditional forms of landscaping. The National GVC uses a default depth of 18 inches of amended soil substrate and 12 inches of gravel aggregate.[1] The user can specify any depth of subsurface storage but will incur additional cost if the soil media and/or aggregate exceed the default values.

1. "Green Development Practices for Stormwater Management", City of Gresham, Oregon http://www.greshamoregon.gov/city/city-departments/environmental-services/watershed-management/template.aspx?id=3288

RESULTS

The Green Stormwater BMP(s) applied in this scenario **decrease** the site impermeable area by **3.3%** and capture **127.3%** of the runoff volume required. Compared to conventional approaches, the green practices in this scenario will **increase** the total life-cycle construction and maintenance costs by **1%** (in net present value).

Green Improvements

- [ ] Green Roof
- [ ] Planter Boxes (disconnect downspout)
- [x] Rain Garden (disconnect downspout)
  - Amount (ft^2): 200
  - Prepared Soil:
    - Depth (in): 12
    - Porosity (Void Ratio): 0.35
  - Underlying Aggregate:
    - Depth (in): 12
    - Porosity (Void Ratio): 0.25
- [x] Cisterns / Rain Barrels (disconnect downspout)
  - Cistern Capacity (gal): 1000
  - Rain Barrel Capacity (gal):

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Rain Garden in Chicago, CNT

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Volume Control | Coefficients and Runoff | Land Use | Costs | Benefits

Volume Control

Required Volume Capture from 0.25" over Whole Site (ft^3)	547
Volume Captured by current BMPs (ft^3)	696
Rain Garden (ft^3)	417
Cisterns / Rain Barrels (ft^3)	134
Permeable Pavement on Parking (ft^3)	146
Percentage of Required Volume Captured by current BMPs (%)	127
Decrease in Impervious Area (%)	3

Prepared Soil:
- Depth (in): 12
- Porosity (Void Ratio): 0.35

Underlying Aggregate:
- Depth (in): 12
- Porosity (Void Ratio): 0.25

☑ **Cisterns / Rain Barrels** (disconnect downspout)
- Cistern Capacity (gal): 1000
- Rain Barrel Capacity (gal):

the help of the long-rooted native plants. Rain gardens are a simple and affordable technique that communities can use to reduce damage from flooding and drainage overflow. The native plants in rain gardens provide valuable wildlife habitat and reduce irrigation needs and maintenance costs in comparison to traditional forms of landscaping. The National GVC uses a default depth of 18 inches of amended soil substrate and 12 inches of gravel aggregate.[1] The user can

Rain Garden in Chicago, CNT

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Volume Control | Coefficients and Runoff | Land Use | **Costs** | Benefits

Costs

	Construction Cost ($)				Annual Maintenance Cost ($)				Life Cycle Cost ($, NPV)			
	Conventional	Green	Difference	%	Conventional	Green	Difference	%	Conventional	Green	Difference	%
Concrete Sidewalk	$3,633	$3,633	$0	0%	$20	$20	$0	0%	$5,066	$5,066	$0	0%
Parking Lot	$3,857	$0	$-3,857	-100%	$105	$0	$-105	-100%	$8,022	$0	$-8,022	-100%
Conventional Stormwater Storage	$6,316	$0	$-6,316	-100%	$16	$0	$-16	-100%	$8,209	$0	$-8,209	-100%
Standard Roof	$150,000	$150,000	$0	0%	$1,000	$1,000	$0	0%	$214,283	$214,283	$0	0%
Permeable Pavement- Pavers	$0	$4,970	$4,970	0%	$0	$25	$25	0%	$0	$6,849	$6,849	0%
Turf	$1,019	$977	$-42	-4%	$437	$419	$-18	-4%	$15,071	$14,450	$-622	-4%
Rain Garden	$0	$1,400	$1,400	0%	$0	$68	$68	0%	$0	$3,859	$3,859	0%
Downspout Disconnection	$0	$70	$70	0%	$0	$1	$1	0%	$0	$101	$101	0%
Cisterns	$0	$1,450	$1,450	0%	$0	$70	$70	0%	$0	$3,983	$3,983	0%
Additional Aggregate	$0	$3,500	$3,500	0%	$0	$3	$3	0%	$0	$4,346	$4,346	0%
Total	**$164,825**	**$166,000**	**$1,175**	**1%**	**$1,578**	**$1,605**	**$27**	**2%**	**$250,651**	**$252,936**	**$2,285**	**1%**

Detailed cost sheet.

Benefits Sheet

Reduced Air Pollutants

Value ($): 0.181 per tree (Source: http://cufr.ucdavis.edu/products/cufr_188_gtr186a.pdf)

Carbon Dioxide Sequestration

Value ($): 0.12 per tree per year (Source: http://www.fs.fed.us/ne/syracuse/Data/State/data_IL.htm#statesum)

Tree Value

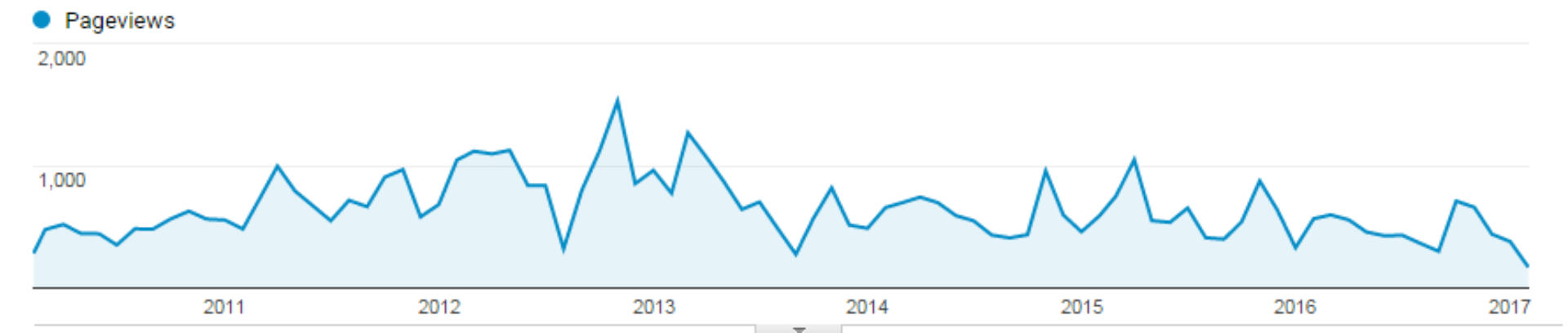
Value ($): 275 per tree (Source: http://www.fs.fed.us/ne/syracuse/Data/State/data_IL.htm#statesum)
Value High Range ($): 632 per tree (Source: Total value for trees in Chicago Region - we use $275 for initail value and add $9.65 per year for 37 years)

While we were able to estimate the total value of trees in the Chicago region, we were not able to value the hydrologic benefits of trees. It is commonly acknowledged that planting trees with a significant canopy on a site will reduce the amount of stormwater falling under the tree, at least initially, and reduce the runoff from the site. While there is little published data on the amount of the hydrologic benefits in the scientific literature, we did find one reference to such data in Stormwater Magazine.[1]

The article discusses a study done for Garland, Texas. The study "determined that increased tree cover could save even more. For example, a medium-size, 3.86-ac. residential site, with its 8 percent canopy cover, provided a 3 percent runoff reduction. If the site's tree canopy were increased to 35 percent, runoff reduction would quadruple, to 12.8 percent; a canopy cover of 45 percent would bring that number to 16.1 percent. (American Forests, a national nonprofit organization, recommends that cities maintain a 40 percent tree cover.) The study, however, did not recommend how a site with such home density would accommodate the resultant roots that would accompany the increased tree canopy

Current Use

- We get inquiries from:
  - Academics
  - Advocates
  - Interested individuals
- Track usage with Google Analytics



RainReady Resilience Planning Tool

- Use LIDAR data to find catchments
- Use local knowledge and surveys to find problem areas
- Set stormwater capture goals
- Using local land cover, land use and flow paths design green improvements on an area basis to help develop a plan of action.

CNT

CNT/RainReady Resilience Planning Tool

Catchment: 420

Priority Score 7

Area: 962,156 sqft view data

Print Snapshot
Generate Permalink

FLOOD RISK SCORE: 5 expand

OPPORTUNITY SCORE: 2 expand

AVERAGE ANNUAL RAINFALL

Annual Rainfall (in): 35.8 edit

Design Storm Rainfall (in): 5.5 edit

Design Storm Time (hrs): 24 edit

REDUCTION GOAL

Precipitation Depth Capture (in): 1.0

Volume Needed to Capture:
80,180cuft (599,788 gallons)

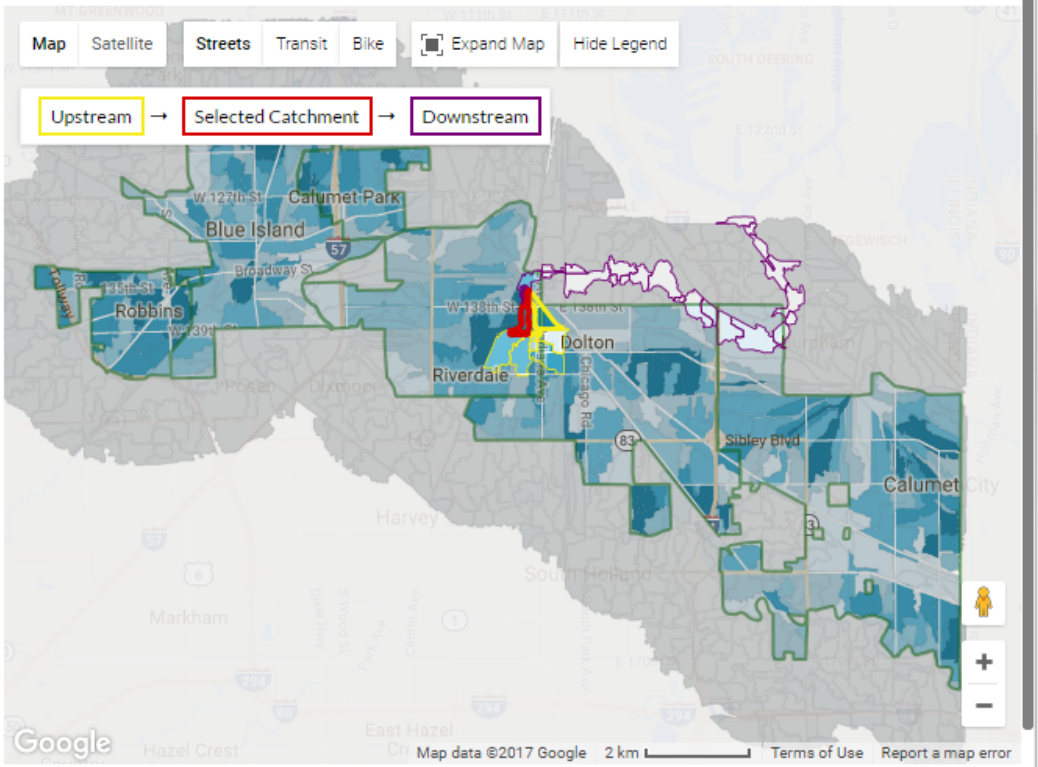
0.0%
0 Goal Reached 100

Total Cost: $0
show detail

GREEN IMPROVEMENTS

	Lifecycle Cost	% Towards Goal
Roof Water Capture:		
☐ Green Roof	$0	0%
Roof Water Redirection:		
☐ Planter Boxes	$0	0%
☐ Rain Garden	$0	0%
☐ Rain Barrel	$0	0%
☐ Cistern	$0	0%

Map Layers | Community Areas | Enter an Address or Catchment ID



FLOOD RISK

low 0 1 2 3 4 5 high

GREEN IMPROVEMENT CO-BENEFITS

0%	$0	0%
Runoff Reduction	Water Treatment Cost Reduction	Volume Capture Increase

Show Details

AVERAGE ANNUAL RAINFALL

Annual Rainfall (in): 35.8 edit
Design Storm Rainfall (in): 5.5 edit
Design Storm Time (hrs): 24 edit

REDUCTION GOAL

Precipitation Depth Capture (in): 0.5

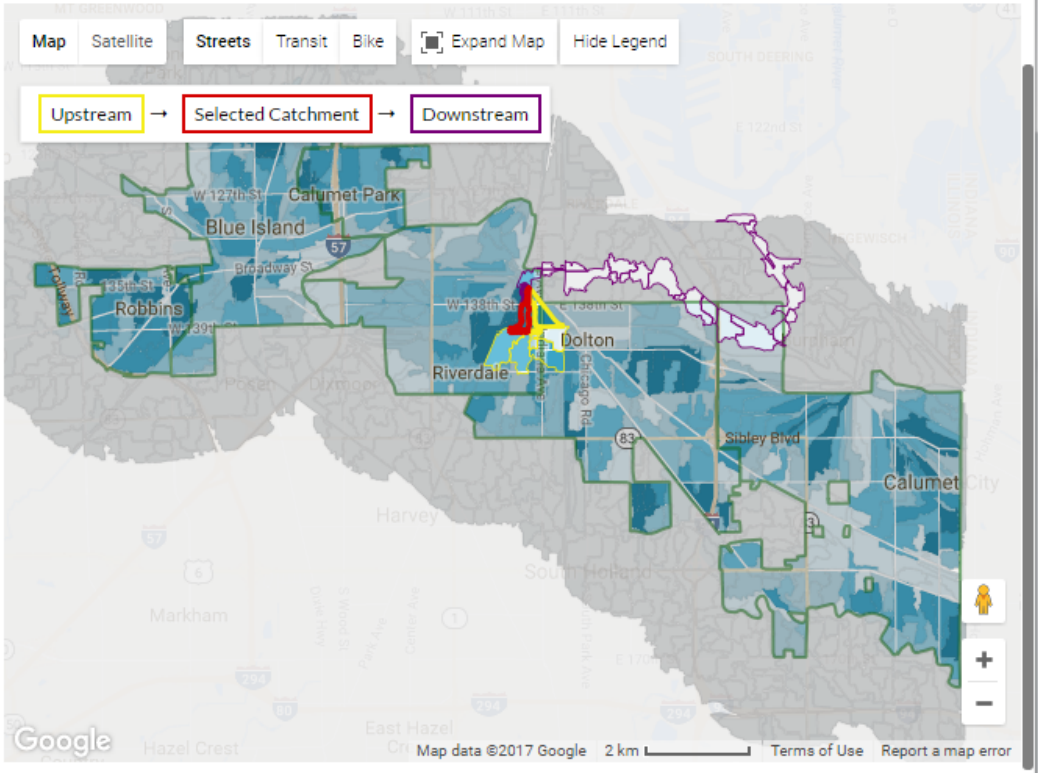
Volume Needed to Capture:
40,090cuft (299,894 gallons)

53.5%
0 Goal Reached 100

Total Cost: $668K
show detail

GREEN IMPROVEMENTS

	Lifecycle Cost	% Towards Goal
Roof Water Capture:		
Green Roof	$0	0%
Roof Water Redirection:		
Planter Boxes	$0	0%
Rain Garden	$535K	43.5%
Coverage: 29074 Sq. Ft. (11%) of 259,342 Sq. Ft.	show details	show details
show advanced options		
Rain Barrel	$0	0%
Cistern	$133K	10%
Coverage: 30 Possible Cisterns (30%) of 101 Possible Cisterns	show details	show details



FLOOD RISK

low 0 1 2 3 4 5 high

GREEN IMPROVEMENT CO-BENEFITS

2.1%	$5	6.9%
Runoff Reduction	Water Treatment Cost Reduction	Volume Capture Increase

Show Details

CNT/RainReady Resilience Planning Tool

Map Layers | Community Areas | Enter an Address or Catchment ID

Catchment: 420

Priority Score 7

Area: 962,156 sqft view data

Print Snapshot
Generate Permalink

FLOOD RISK SCORE: 5 hide

Community Defined Risk Area: 1.7%
Problem Area: 77.5%
Impervious Area: 43.4%
Depression Area: 41.1%
Surveyed for Flooding: 88.2% (15/17)

OPPORTUNITY SCORE: 2 hide

Land Based Assets

Vacant Land: 2.1%	Streets: 10.3%	Parks: 0.0%
Public Land: 0.0%	Alleys: 4.6%	Trees: 27.8%
Schools: 0.0%	Utilities: 0.4%	Large Residential: 2.2%

Capital Projects
Greenways and Trails Plan

- Cal-Sag Trail (0.0 Miles) | Path | ITEP 2014 Program Includes some on-street segments | Status: Programmed
- Greenway (0.0 Miles) | | | Status: Planned

Planned Priorities
NDRC Project Areas

- NDRC No. 16 (16.4 Acres) intersect this catchment out of the total area of 123.8 acres. | Type: not affected by Phase II project

AVERAGE ANNUAL RAINFALL

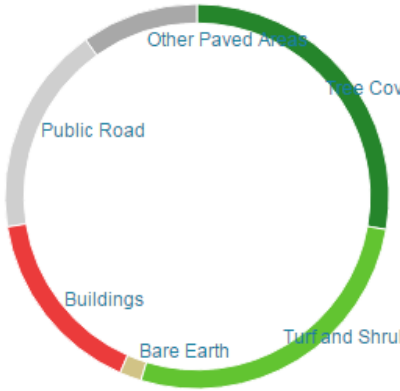
Annual Rainfall (in): 35.8 edit
Design Storm Rainfall (in): 5.5 edit
Design Storm Time (hrs): 24 edit

CATCHMENT DATA

close

Land Cover

- Tree Cover: 267,073 sqft (27.8 %)
- Turf and Shrubs: 259,342 sqft (27 %)
- Bare Earth: 17,739 sqft (1.8 %)
- Water: 0 sqft (0 %)
- Buildings: 153,098 sqft (15.9 %)
- Public Road: 170,169 sqft (17.7 %)
- Other Paved Areas: 94,735 sqft (9.8 %)



Demographics
Median Income:
% Minority

GREEN IMPROVEMENT CO-BENEFITS

2.1%	$5	6.9%
Runoff Reduction	Water Treatment Cost Reduction	Volume Capture Increase

Show Details

Volume Needed to Capture:
40,090cuft (299,894 gallons)

Total Cost: $668K
show detail

Map Layers | Community Areas | Enter an Address or Catchment ID

GREEN IMPROVEMENTS

	Lifecycle Cost	% Towards Goal
Roof Water Capture:		
☐ Green Roof	$0	0%
Roof Water Redirection:		
☐ Planter Boxes	$0	0%
☑ Rain Garden	$535K	43.5%
Coverage: 29074 Sq. Ft. (11%) of 259,342 Sq. Ft.	show details	show details
☐ Rain Barrel	$0	0%

hide advanced options

Land Cover Replaced

Land Cover: Turf and Shrubs

Construction Specs.

Soil Depth: 12 (in)

Soil Porosity: 35 (Void Ratio)

Aggregate Depth: 12 (in)

Aggregate Porosity: 25 (Void Ratio)

Costs

Cost per Sq. Ft.: $ 8

Maintance per Sq. Ft. per Year: ¢ 38

Life Years: Years 30

GREEN IMPROVEMENT CO-BENEFITS

close

Co-Benefits

	Tree Cover	Turf and Shrub	Bare Earth	Building	Public Road	Other Paved Area	Total
Volume Capture (CuFt)							
No BMP	111,073	88,476	1,941	2,728	3,033	1,688	175,425
BMP	111,073	96,001	1,941	6,739	3,033	1,688	187,567
% difference	0%	9%	0%	147%	0%	0%	7%
Runoff (Inches)							
No BMP	2.69	2.99	4.38	5.28	5.28	5.28	3.83
BMP	2.69	2.87	4.38	4.99	5.28	5.28	3.75
% difference	0%	0%	0%	0%	0%	0%	0%
Runoff Volume (CuFt)							
No BMP	59,910	64,543	6,470	67,407	74,924	41,711	307,437
BMP	59,910	61,937	6,470	63,687	74,924	41,711	300,862
% difference	0%	-4%	0%	-6%	0%	0%	-2%
Runoff Treatment Cost ($/Storm)							
No BMP	41	44	4	46	51	29	211

GREEN IMPROVEMENT CO-BENEFITS

2.1% Runoff Reduction

$5 Water Treatment Cost Reduction

6.9% Volume Capture Increase

Show Details

Lessons Learned

- Flooding does NOT only happen in floodplains!
- Good Tools Require Transparency!
  - Good documentation
  - Making complex concepts manageable by people who are not immersed in the subject matter
  - Start with something that works
- Green Infrastructure/Improvements Work and can be Cost Effective
- No One Size Fits All Solutions!

CNT

THANK YOU

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