USING NATURE TO REDUCE FLOOD IMPACTS IN CHESTER CREEK

#ChesterCreek

The study you will learn about today assessed the economic benefits of green infrastructure in Duluth, Minnesota, as a method for reducing flood impacts in the Chester Creek Watershed. Visit the different stations to learn about current and past flooding events that have impacted Duluth, how current precipitation and land use can create runoff during flood events and cause damages, how flooding and associated damages might increase in the future due to climate change, and how green infrastructure can be used to lessen those impacts. We also want to hear about the types of green infrastructure you would like to see in the Chester Creek Watershed to reduce flooding impacts as well as what you can do on your own property.

Stations:

Station 1 **Flood Impacts**	**What are the current and past flooding events that have impacted Duluth?**
Station 2 **Current Precipitation and Land Use**	**What causes flooding in the Chester Creek Watershed and results in damages?**
Station 3 **Future Precipitation and Land Use**	**How will climate change and development affect flooding in the future?**
Station 4 **Green Infrastructure Options**	**How can we lessen flooding impacts using nature?**
Station 5 **Opportunities in Chester Creek**	**What green infrastructure opportunities should be implemented in the Chester Creek Watershed to lessen flooding?**

Project Sponsors

THE CITY OF DULUTH MINNESOTA

Sea Grant Minnesota

MSFCD

ERG

U.S. Army Corps of Engineers®

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

Great Lakes RESTORATION

Station 1

HEAVY RAINS = FLOODING

DULUTH'S FLOOD HISTORY

1876

7.83 inches

1909

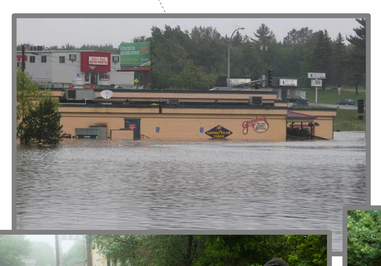
6.48 inches (July)

1972

3 - 6 inches (August)
4 - 5.5 inches (September)

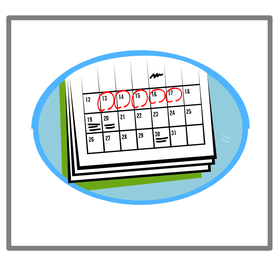
2012

6 - 10 inches (June)

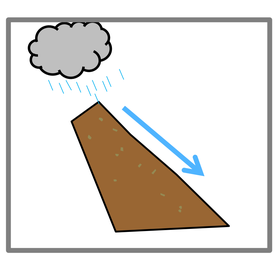


When's the next one?

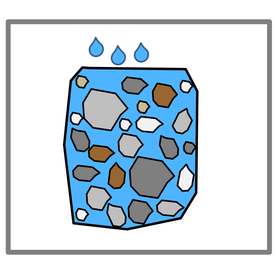
WHY IT FLOODS



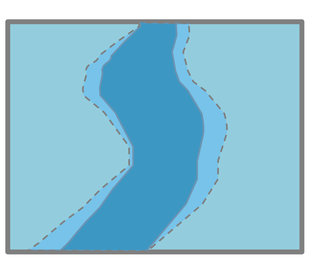
Rain weeks before



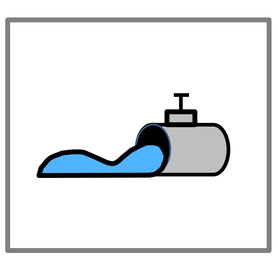
Steep landscape, water moves fast



Soil saturated, couldn't absorb more water



Creeks approaching peak fullness



Too much water, too fast for storm water pipes

BIG STORMS: WHAT ARE THE CHANCES?

Our project is identifying the impacts from a big storm known as a "100-year" storm. This type of storm has a 1% chance of occurring every year. Extreme events such as the June 2012 100-year storm and flood do not happen very often, but when they do, they cause major damages.

Station 2

HEAVY RAIN + PAVED AREAS = DAMAGES

HEAVY RAIN

5 or more inches in 24 hours. Duluth usually experiences big storms in the summer and fall.

PARKING LOTS, ROOFS, STREETS

528 acres, or 12% of the watershed, is covered in paved materials.

Paved areas such as parking lots and rooftops do not absorb water. Instead, they create the potential for flooding, because water runs off into either Chester Creek or the storm drains. Storm drains sometimes cannot keep up with the amount of water that runs off paved areas.

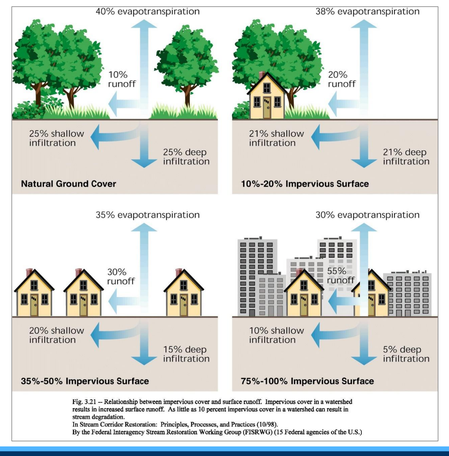


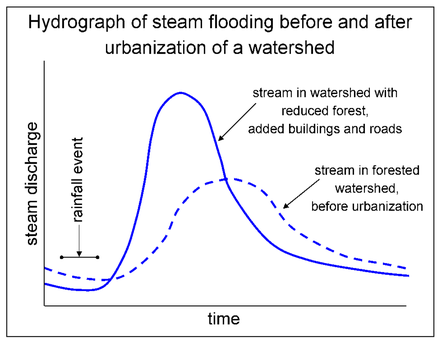
Fig. 3.21 – Relationship between impervious cover and surface runoff. Impervious cover in a watershed results in increased surface runoff. As little as 10 percent impervious cover in a watershed can result in stream degradation.
In Stream Corridor Restoration: Principles, Processes, and Practices (10/98).
By the Federal Interagency Stream Restoration Working Group (FISRWG) (15 Federal agencies of the U.S.)

FLOODING HAPPENS

This information will help us identify when flooding could occur:

- Amount of rain from the 100-year storm
- Information about what is on the land

These two pieces of information give us the peak discharge estimate, which is the amount of water moving through Chester Creek at a certain location and time.



IMPACTS

$

It all adds up and impacts your wallet and your quality of life!

Station 3

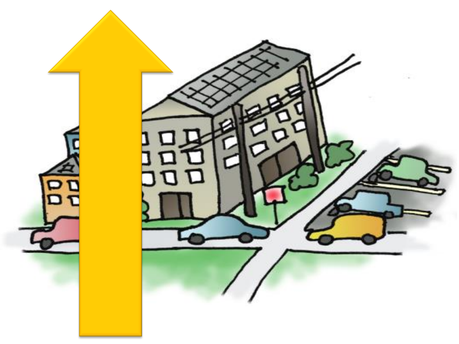
FUTURE CLIMATE CHANGE

↑ HEAVY RAIN + ↑ PAVED AREAS = ↑ DAMAGES

MORE HEAVY RAIN

Big storms and flooding have increased over the last century and are expected to increase still further. Climate models are projecting an 8 to 10% increase in big storm events because of climate change. Our project looked at heavy rain projections for the year 2035.

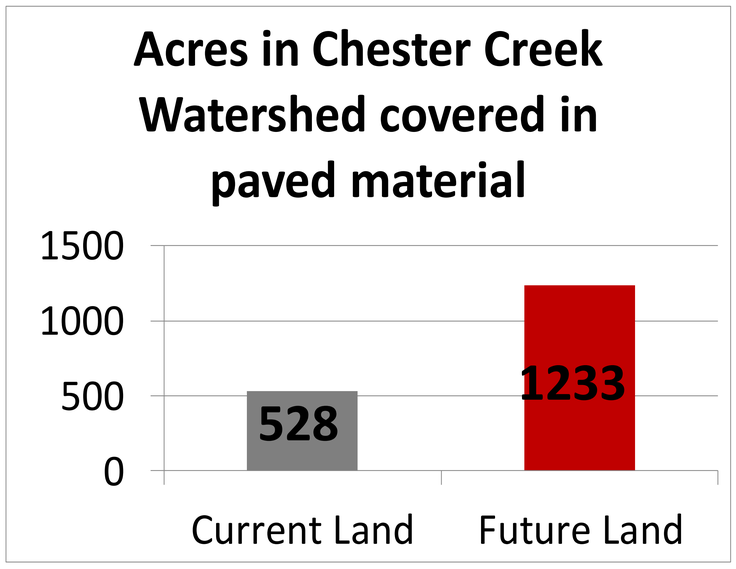
MORE PARKING LOTS, ROOFS, STREETS



Currently 528 acres, or 12% of the watershed, is covered in paved materials. Paved surfaces within the future Chester Creek Watershed could reach up to 1,233* acres or 29%* of, by 2035.

*That's over **700** more acres of paved materials.*

* Based on Duluth's future land use build out scenario from the comprehensive plan.



FLOODING HAPPENS MORE OFTEN

The chances of a damaging peak discharge from the 100-year storm event almost **doubles.**

GREATER IMPACTS

It all adds up and impacts your wallet and your quality of life!

Station 4

INCREASED GREEN INFRASTRUCTURE = DECREASED FLOODING

PROTECT EXISTING FORESTS AND WETLANDS

Wetlands and forests help absorb flood water and reduce erosion along stream banks caused by fast-moving floodwaters. Chester Creek Watershed is **19.2% wetland** and **35.1% forest**!

CREATE NEW NATURAL AREAS TO ABSORB FLOOD WATERS

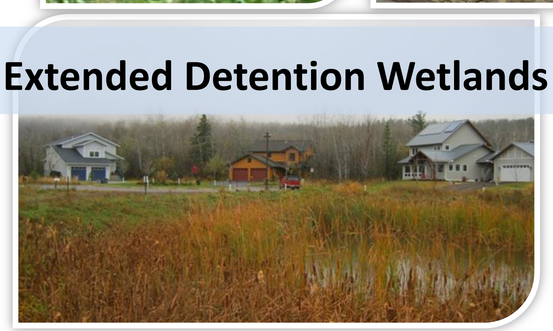
Benefits:

- ❖ Reduces peak discharges
- ❖ Captures and reduces a variety of pollutants like sediment, nutrients, and bacteria
- ❖ Reduces temperatures
- ❖ Reduces runoff quantity during storm events
- ❖ Can be designed for public access

Rain Barrels and Cisterns

Green and Blue Roofs

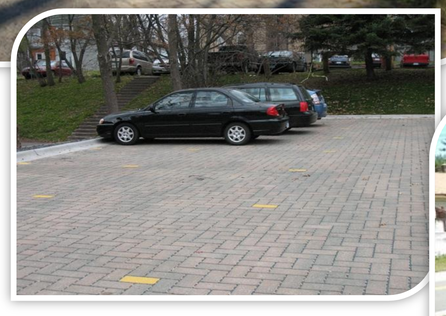
Extended Detention Wetlands



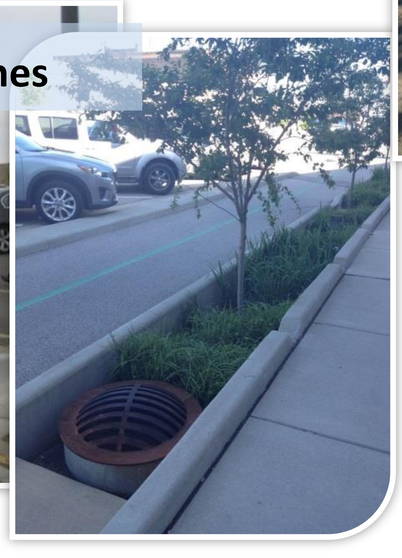
Retention Ponds

Underground Storage

Permeable Pavement



Stormwater Tree Trenches



Bioswales and Rain Gardens

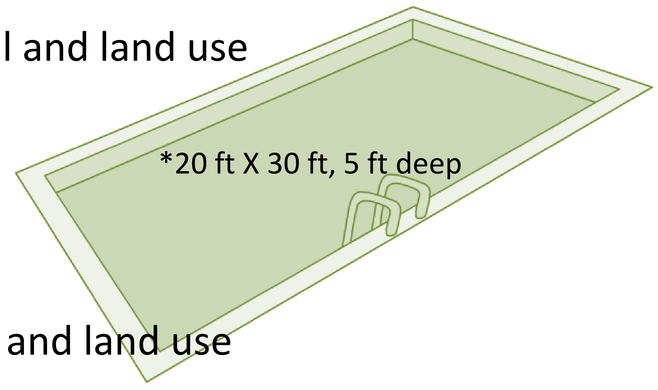
Station 5

YOU CHOOSE! GREEN INFRASTRUCTURE FOR CHESTER CREEK WATERSHED

GOALS

To reduce the damaging 100-year storm peak discharge by **20%**, we need to store this amount of stormwater:

- ❑ **76 acre-feet** needed under current rainfall and land use
  - ❑ That's **1,100 swimming pools***



- ❑ **86 acre-feet** needed under future rainfall and land use
  - ❑ That's **1,245 swimming pools***

What is an acre-foot?

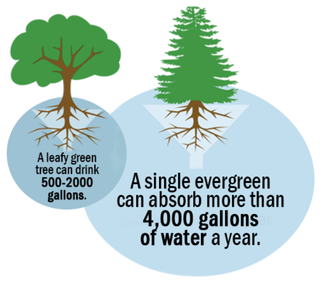
1 acre-foot = 1 acre of water 1 foot deep or 326,000 gallons of water.

Risk Reduction

- With 76 acre-feet of storage, the annual chances of the damaging peak discharge goes down to **0.24%** from 1%.
- With 86 acre-feet of storage, the annual chances of the damaging peak discharge goes down to **0.51%** from 1.84%.

How can we reach this goal?

The City of Duluth as well as its homeowners and businesses can work together to implement different green infrastructure techniques. These techniques will vary in the amount of water storage they provide, but it all contributes to the goal.



Source: Natural Resources Defense Council

HOW MUCH MONEY CAN BE SAVED USING GREEN INFRASTRUCTURE?

$1.63 MILLION or $89,000 per year! This is over a 20-year period. And if you extend that timeline, the City of Duluth and its residents will save even more money.

Reduced Storm Sewer Infrastructure Costs

$158,600

Reduced Building Damages

$1,029,000

Increased Recreational Use

$326,000

Reduced Post Storm Land Restoration Costs

$263,400

Don't forget the other benefits: increased property values, improved water quality, wildlife habitat, and more green space in which to play!

WHAT GREEN INFRASTRUCTURE WOULD YOU BE INTERESTED IN PUTTING ON YOUR PROPERTY?

Put a ✓ next to the green infrastructure practices you could do on your property.

Plant Trees

Divert Downspouts to Permeable Area

Replace Lawn with Native or Perennial Plants

Install Permeable Sidewalk, Patio, or Driveway

Install a Rain Barrel

Install a Green Roof

Install a Rain Garden

CAST YOUR VOTE!

WHAT GREEN INFRASTRUCTURE WOULD YOU LIKE TO SEE IN CHESTER CREEK WATERSHED?

Put a ✓ next to your top 3 green infrastructure choices.

Conservation of Natural Areas

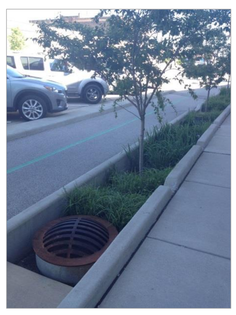
Rainwater Cisterns

Extended Detention Wetlands

Permeable Sidewalks, Pavement

Retention Ponds

Stormwater Tree Trenches



Blue or Green Roofs

Underground Storage

Rain Gardens and Bioswales