# TREES, STORMWATER, AND YOU

# OUTLINE

- Trees and the Pittsburgh landscape
- Assessing our trees
- What are the benefits of trees, really?
- Trees and stormwater
- How you can use trees to manage stormwater

# TREES AND THE PITTSBURGH LANDSCAPE

GATEWAY ENGINEERS

# TREES: THE ORIGINAL GREEN INFRASTRUCTURE

- Trees were the original stormwater controls

- Before human intervention, trees, other foliage, and uncompressed topsoil created a natural "sponge" which absorbed much more stormwater than today's urban environment



https://www.pittsburghbeautiful.com/2018/03/07/history-pittsburgh-part-1-beginning/

# TREES: THE ORIGINAL GREEN INFRASTRUCTURE

- Throughout the 20th century mass quantities of the tree canopy was removed to make way for human habitation

- As the land was cleared and replaced with impervious asphalt and concrete, runoff increased drastically



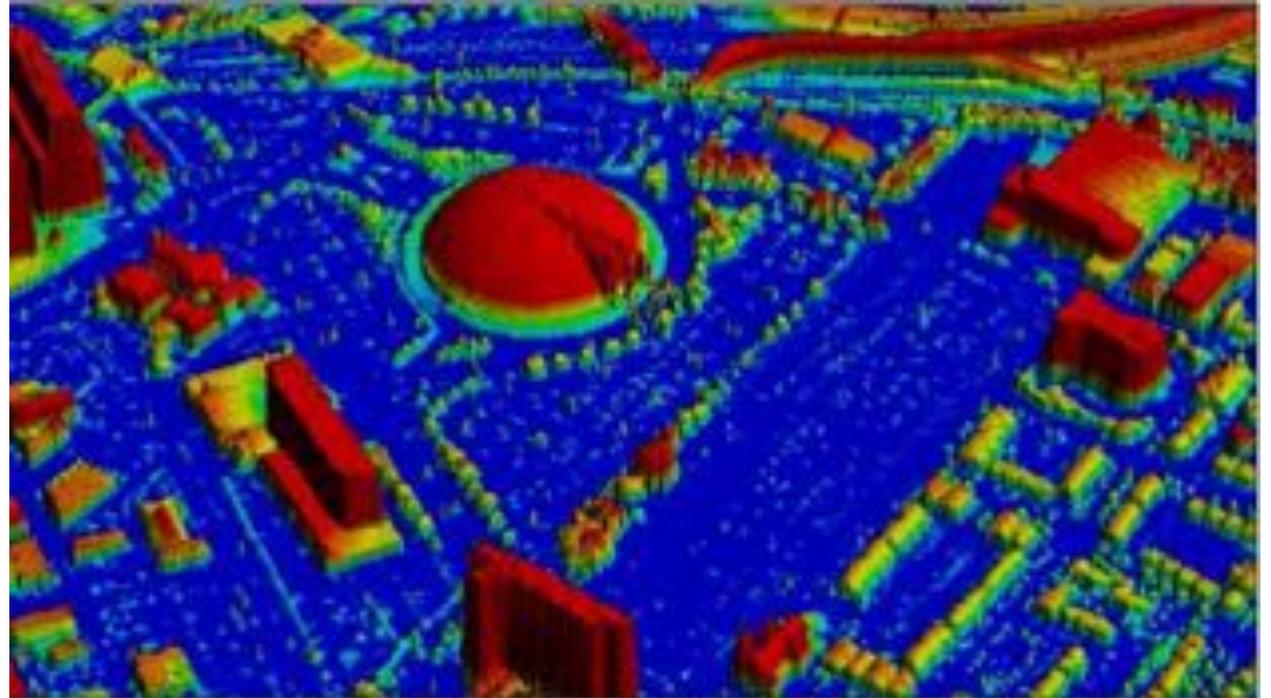https://www.bloomberg.com/opinion/articles/2018-02-13/pittsburgh-shows-the-way-to-a-rust-belt-rebound

# LONG TERM EFFECTS

# ASSESSING OUR TREES

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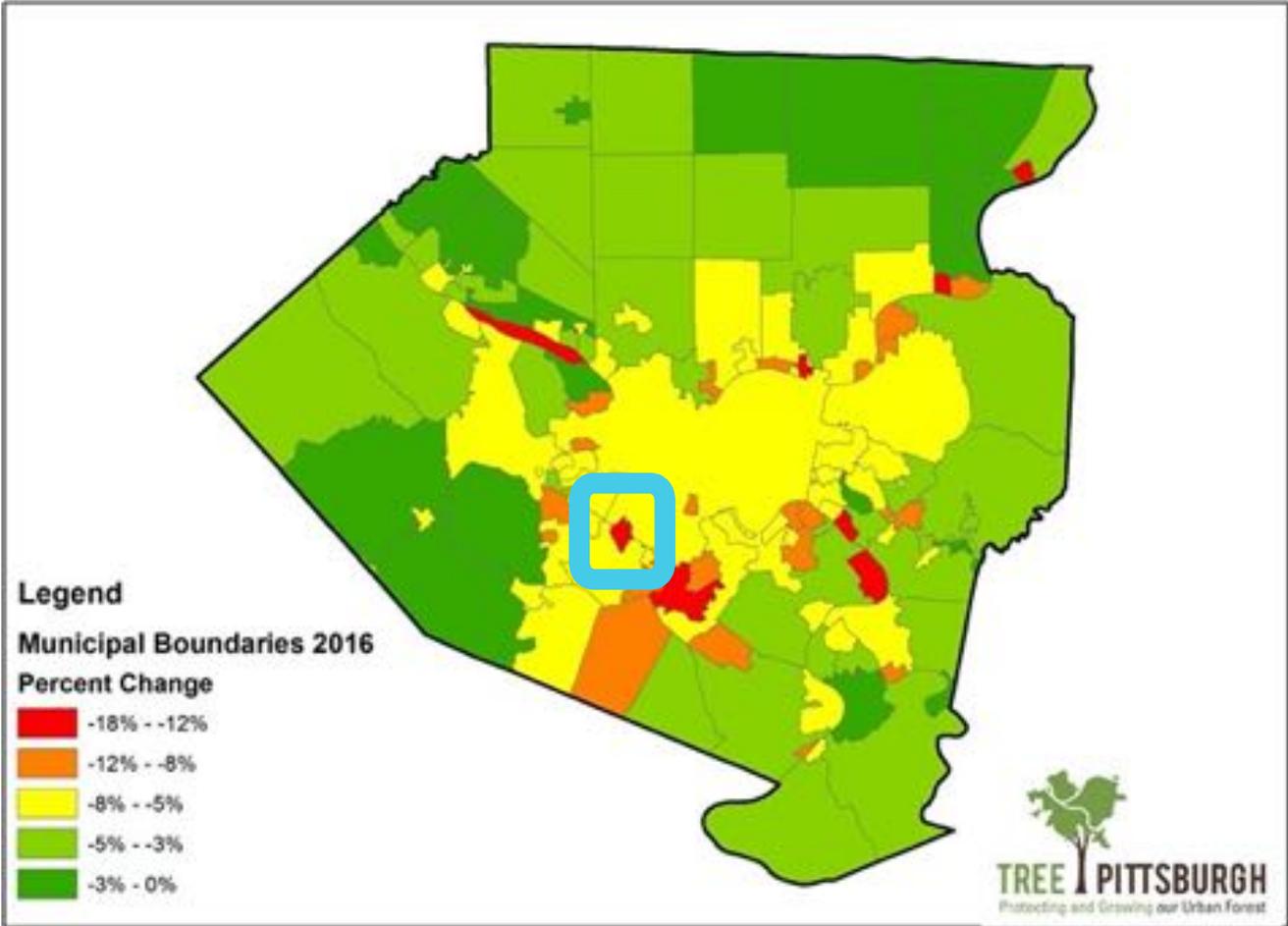
# TREE CANOPY ASSESSMENT

- Measures the area covered by tree canopy as seen from above
- Can help decision makers plan and manage urban forestry goals
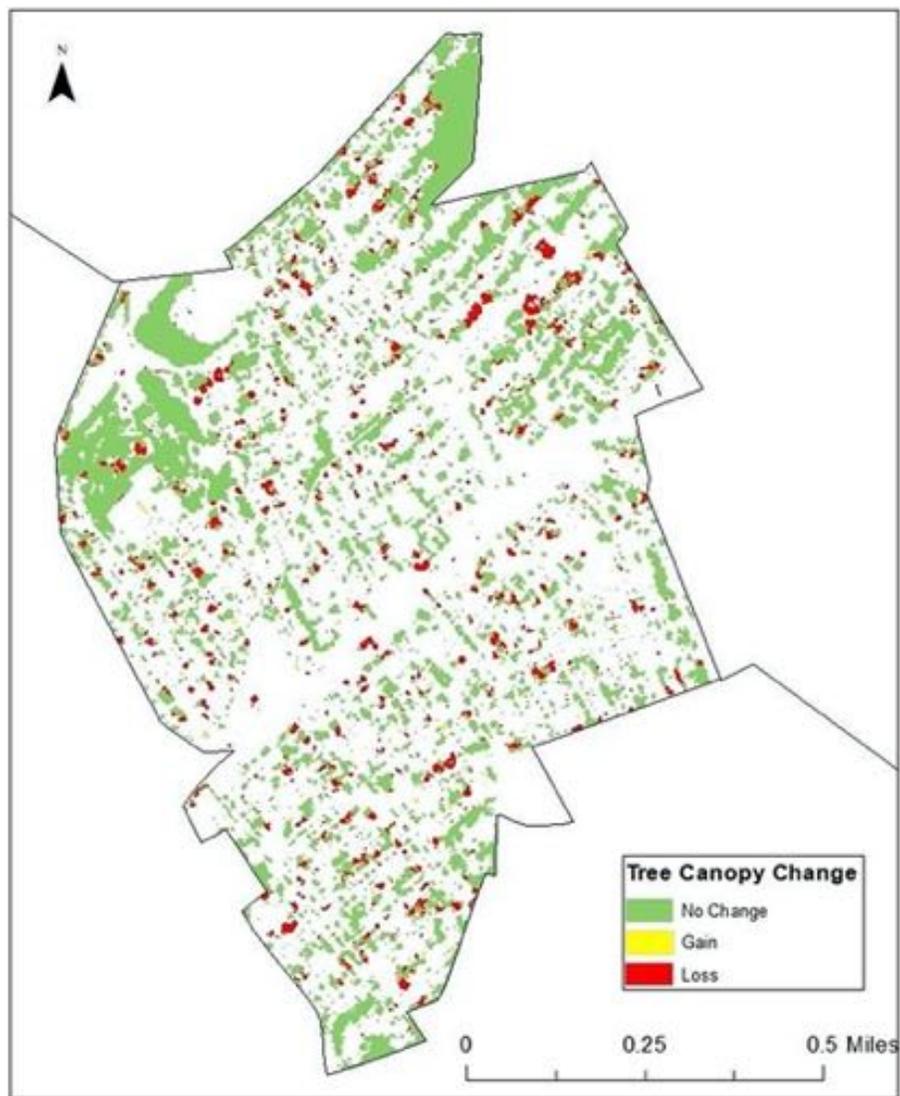  - See what kinds of changes, if any, have occurred among urban trees

# CANOPY CHANGE 2010-2015



Source: Tree Pittsburgh

Allegheny County Tree Canopy Percent Change

Legend
Municipal Boundaries 2016
Percent Change
-18% - -12%
-12% - -8%
-8% - -5%
-5% - -3%
-3% - 0%

Source: Tree Pittsburgh

Tree Canopy Change
- No Change
- Gain
- Loss

- **18 acres** lost between 2010 and 2015 (almost **14 football fields**)
- Loss from natural causes
  - Pests and disease
  - Storms
- Loss caused by humans
  - Development
  - Infrastructure
  - Residential

Source: Tree Pittsburgh

# WHY DOES IT MATTER?

- In 2014, Western Pennsylvania Conservancy and Pittsburgh Shade Tree Commission funded an inventory of the city's street trees

- There are **33,498** street trees within the City of Pittsburgh, an <u>increase</u> of almost **4,000** since 2005

- Appraised value of more than **$51,000,000**

- **15,000,000** gallons of stormwater absorbed by street trees
  - (That's approximately **10 Dormont Swimming Pools**\*)

- Approximately **4,400,000 pounds of carbon** stored in street trees
  - (CO2 equivalent to **823,455 gallons** of gasoline consumed\*)

Source: Western Pennsylvania Conservancy, \*comparisons mine

# WHAT ARE THE BENEFITS OF TREES, REALLY?

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# TREES DO THAT?



- Help clean our air
- Contribute to our health
- Provide us with oxygen
- Provide much-needed cooling
- Increase property values
- Help save energy
- Help control stormwater

# HELP CLEAN OUR AIR

- Global forests removed about one-third of fossil fuel emissions annually from 1990 to 2007 (US Forest Service, 2011)

- Roadside trees reduce nearby indoor air pollution by more than 50% (Lancaster University, United Kingdom, 2013)



Wikipedia

# CONTRIBUTE TO OUR HEALTH



https://www.treepittsburgh.org/programs/tree-careplanting/

- A study of 10 cities found community forests save an average of one life each year. In NYC, trees save an average of **eight lives** every year. (US Forest Service, 2013)
- Office workers with a view of trees report significantly less stress and more satisfaction. (Chungbuk National University, South Korea, 2007)

# PROVIDE US WITH OXYGEN

- One large tree can provide a day's supply of oxygen for up to four people. (North Carolina State University)

- More than 20% of the world's oxygen is produced in the Amazon Rainforest. (Rain Forest Alliance)

# PROVIDE COOLING



https://www.visitpittsburgh.com/blog/top-green-spaces-and-public-parks-in-pittsburgh/

- Trees lower surface and air temps by providing shade. Shaded surfaces may be 20-45˚F cooler than peak temp of unshaded areas. (US EPA)

- Trees cool the city by up to 10˚F by shading our homes and streets and releasing water vapor through their leaves. (Arborday.org)

# INCREASE PROPERTY VALUES

- The sale premium of having street trees was the same as adding 129 square feet of finished space. (US Forest Service)

- In Fulton County (Atlanta), Georgia, mature trees positively influenced home sale prices. Homes sold for nearly $105,000 more in neighborhoods with mature trees. (University of Georgia, 2002)



Wikimedia Commons

# HELP SAVE ENERGY



https://energyinfo.oregon.gov/blog/2016/09/07/landscaping-energy-savings

- Just three trees, properly placed around a house (south and west sides), can save up to 30% of energy use. (US Forest Service)
- Trees or shrubs planted to shade air conditioners help cool a building more efficiently, using less electricity. A unit operating in the shade uses as much as 10% less electricity than the same one operating in the sun. (US Dept. of Energy)

# HELP CONTROL STORMWATER

# TREES AND STORMWATER

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# REDUCE PEAK FLOW AND RUNOFF VOLUMES

- Leaves and branches intercept and store rainfall (Tree Pittsburgh)

- A deciduous tree retains approximately 20% of the rain that falls on its canopy (Tree Pittsburgh)

- Large trees intercept upwards of 2,000 gallons of rainfall annually (Midwest Community Tree Guide)



https://cwp.org/making-urban-trees-count/#
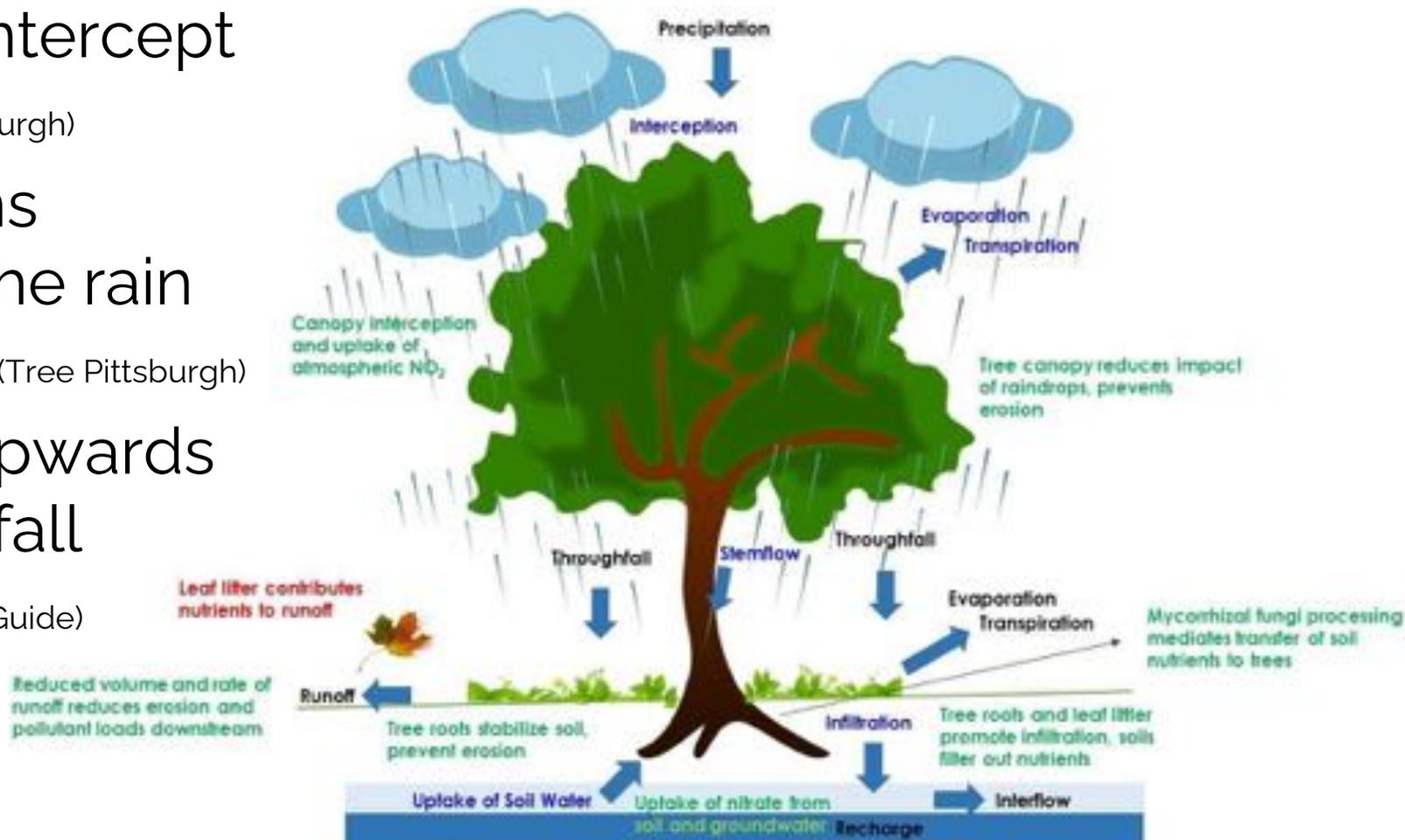
# INCREASED PERVIOUS SURFACES



https://upstreampgh.org/projects/stormwater-tree-pits/

- More trees, lawns, and street tree pits in sidewalks means less concrete and cement, and more soil for water to infiltrate

-  Stormwater tree pits attempt to maximize the stormwater capture potential of trees by directing water over the pervious surface at their base. Water, solids and pollutants drop out into the soil instead of continuing into the sewer system. (Upstream Pittsburgh)
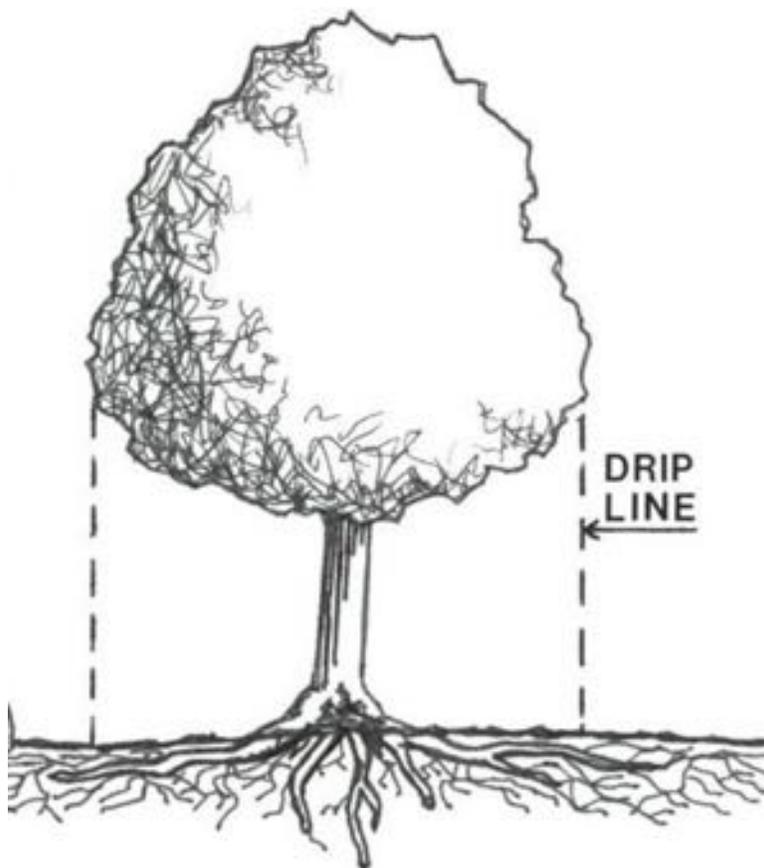
# INCREASE WATER QUALITY

- Trees and nutrients absorb excess nitrogen and phosphorus particles that can decrease water quality and cause damage to aquatic ecosystems (Tree Pittsburgh)

- Root channels and organic matter enhances the infiltration of dissolved pollutants which are then immobilized and transformed into less harmful contaminants by microbes in the soil. (treesforever.org)



https://www.cbf.org/blogs/save-the-bay/2020/08/pennsylvania-streams-how-are-they-doing.html

# INCREASED PERMEABILITY AND STABILITY OF SOIL



Tree Pittsburgh

- Root growth and decomposition loosens soil and allows more water to infiltrate

- Deciduous trees can increase infiltration rates up to 150% when compared to an unplanted space

## FEW TREES

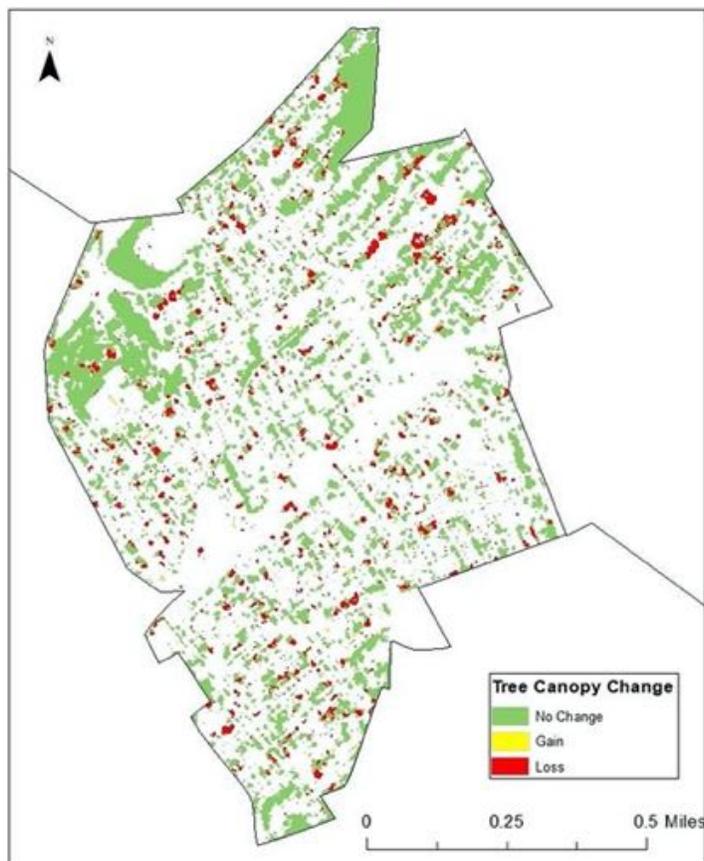## ABUNDANT TREES



Arbor Day Foundation

# STORMWATER VALUE OF TREES

- Pittsburgh's street trees prevent approximately 15 million gallons of stormwater from infiltrating into the wastewater system
  - $134,848 in sewage treatment costs
  - Does not include cost of fixing potholes, landslides, erosion, and other problems caused by stormwater runoff and flooding
  - Does not include trees in parks and on private property
  - Average benefit of a tree is **$5 in sewage costs**

Pittsburgh Tribune-Review





Source: Tree Pittsburgh

## VALUE OF DORMONT'S TREES



**Tree Canopy Change**
- No Change
- Gain
- Loss

0    0.25    0.5 Miles

Dormont 118.53 acres of trees in 2015

Approximately 115 trees/acre → 18,372 trees

18,372 X $5 → $91,860 sewage cost savings

Source: Tree Pittsburgh

# WHAT CAN I DO?

# PROTECT EXISTING TREES!

- Older, larger trees provide greater stormwater benefits, so it is important to protect these trees while also planting new ones.



Source: Tree Pittsburgh

# PROTECT FROM CONSTRUCTION

- Talk to your contractors about tree protection
- Advocate for a municipal tree protection ordinance

Source: Tree Pittsburgh
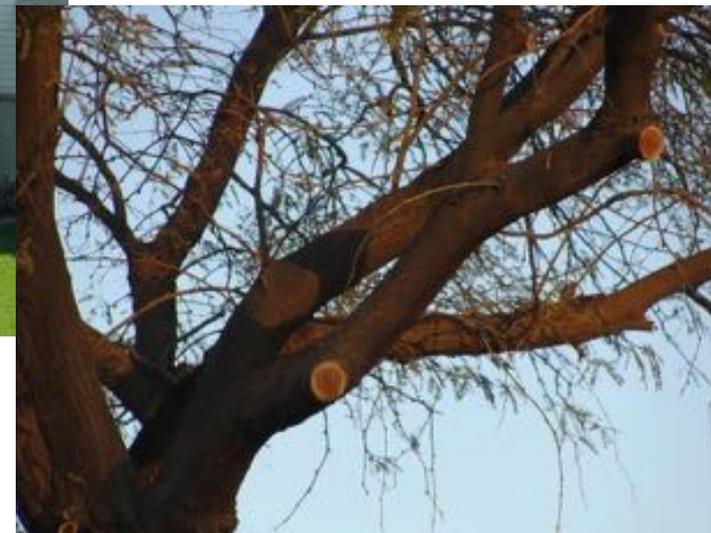
# PROTECT BY MAINTENANCE

- Mulch trees properly

**No!**

- Use proper pruning practices

**No!**

Source: Tree Pittsburgh

# PLANT NEW TREES

- Trees age just like all infrastructure, so it's important to plan for the future of "tree infrastructure" by planting new trees.





Source: Tree Pittsburgh

# PLANT ON PRIVATE PROPERTY

- Plant trees on your private property!
  - Buy trees and install them, or pay a contractor to install them (Be sure to call 811 before you dig)
  - Get trees through Tree Pittsburgh's free tree giveaways



My tree!

# THANK YOU!

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