Securing Arlington's Forest Assets: Arlington's Tree Canopy Benefits

A Presentation to Arlington's Communities

Presented by Karen Firehock, Executive Director and Christian Schluter, GIS Analyst

Green Infrastructure Center

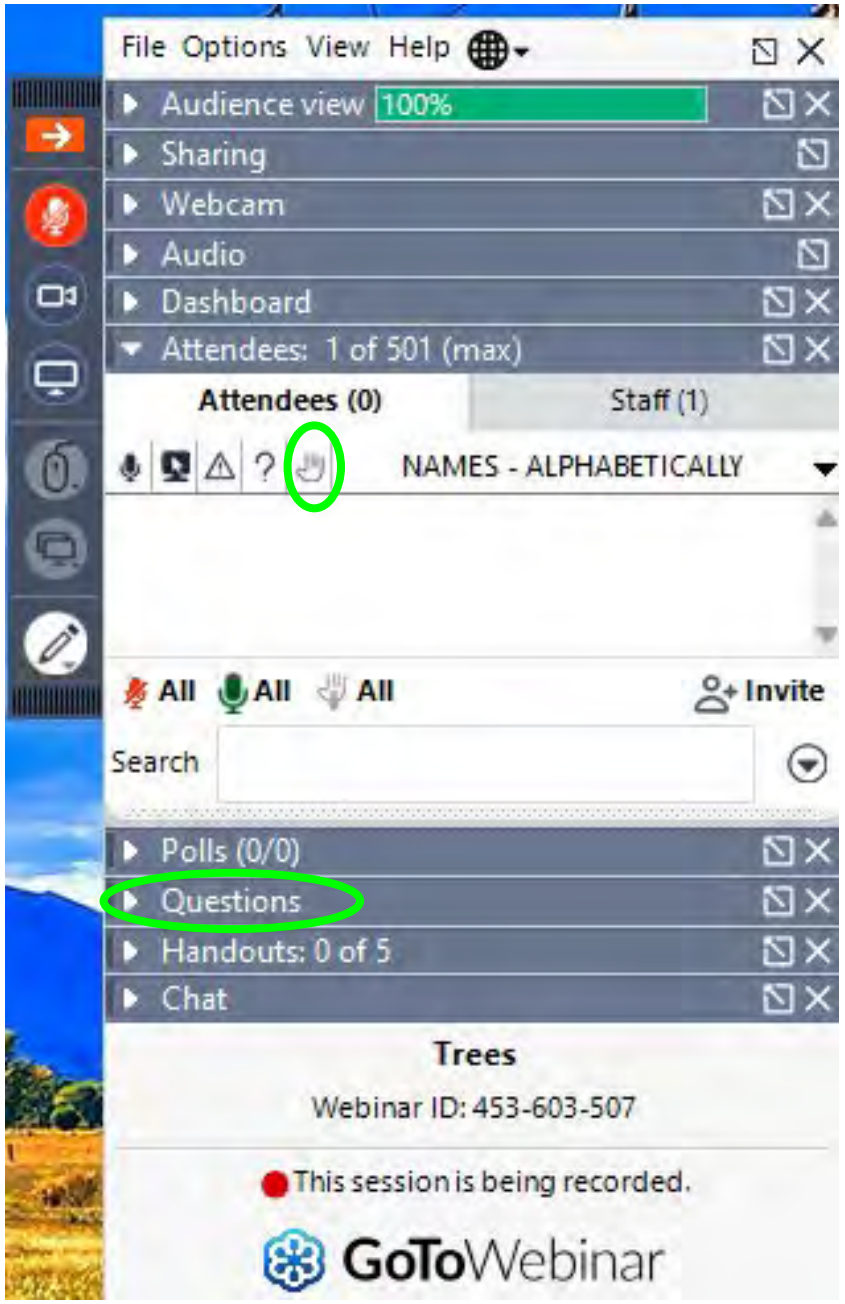
Participating in the webinar

During the presentation portion of the webinar, all attendees will be muted.

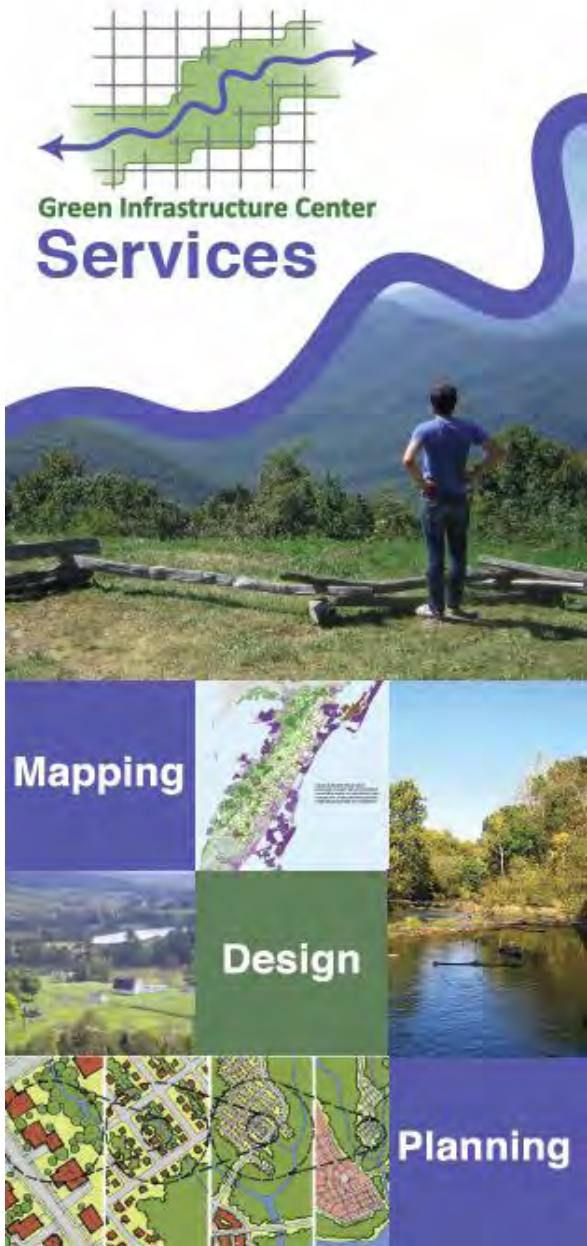
If you have a question, please type your question into the question panel and we will respond at the end.

You also can click on and raise your digital hand and ask your question aloud. You will be called on by the moderator and then you will also need to unmute yourself.

You will receive a link to relisten to this webinar as well as the slides so you can click the slide show links provided.



Webinar provided by the nonprofit Green Infrastructure Center (GIC). We help communities evaluate green assets and manage them to maximize ecological, economic and cultural values.



We do this by:

Building landscape models and landcover maps

Teaching courses and workshops

Researching new green infrastructure methods

Helping communities create strategies

GIC staff specialize and are certified in GIS, Planning, Urban Forestry, Tree Risk Assessment and Landscape Architecture

www.gicinc.org

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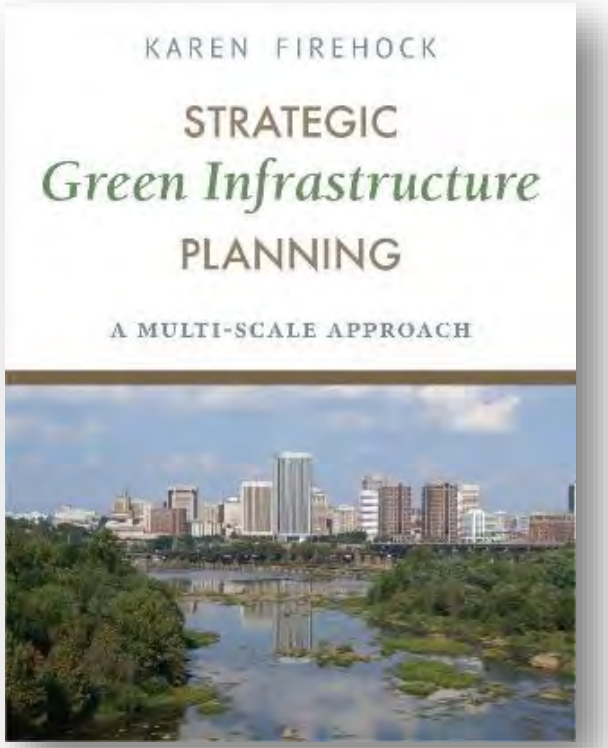
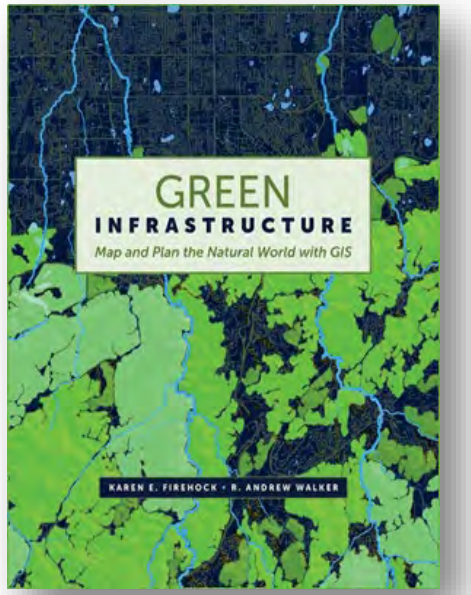
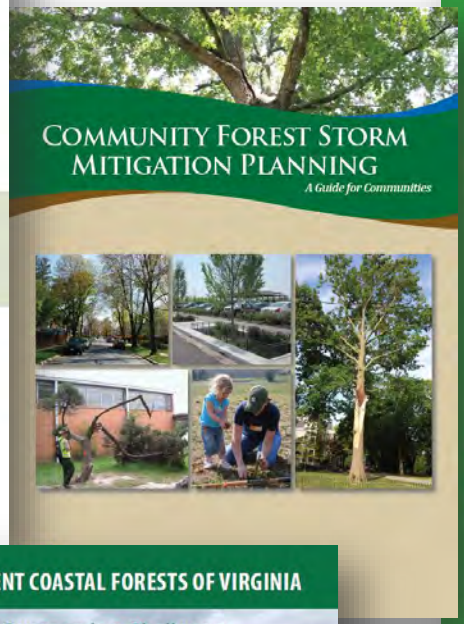
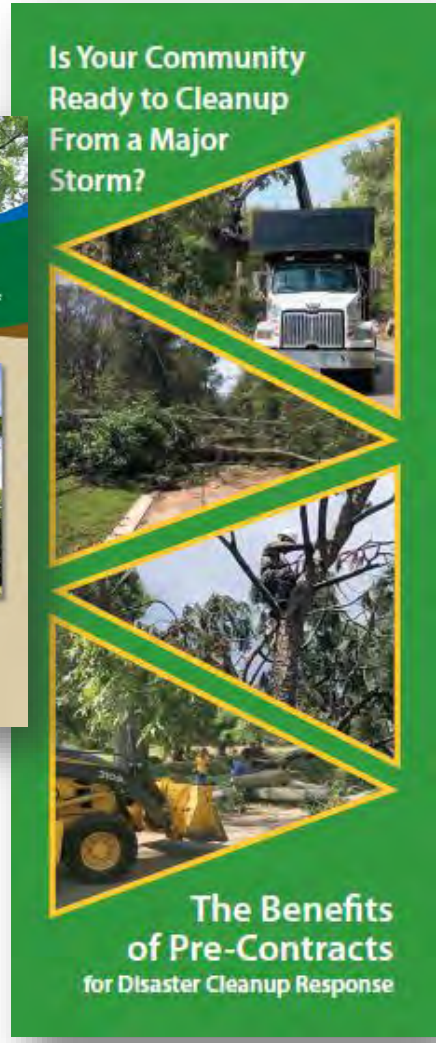
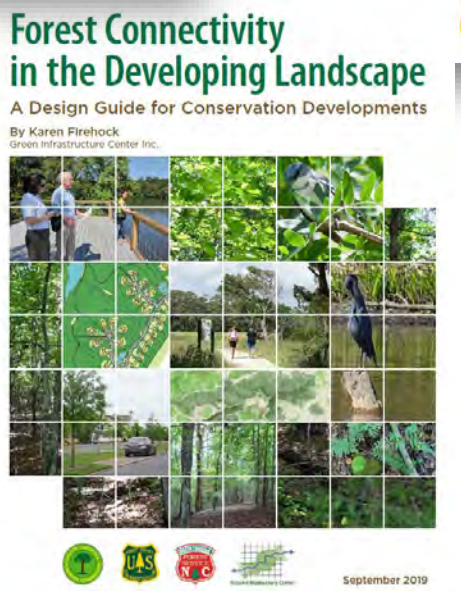


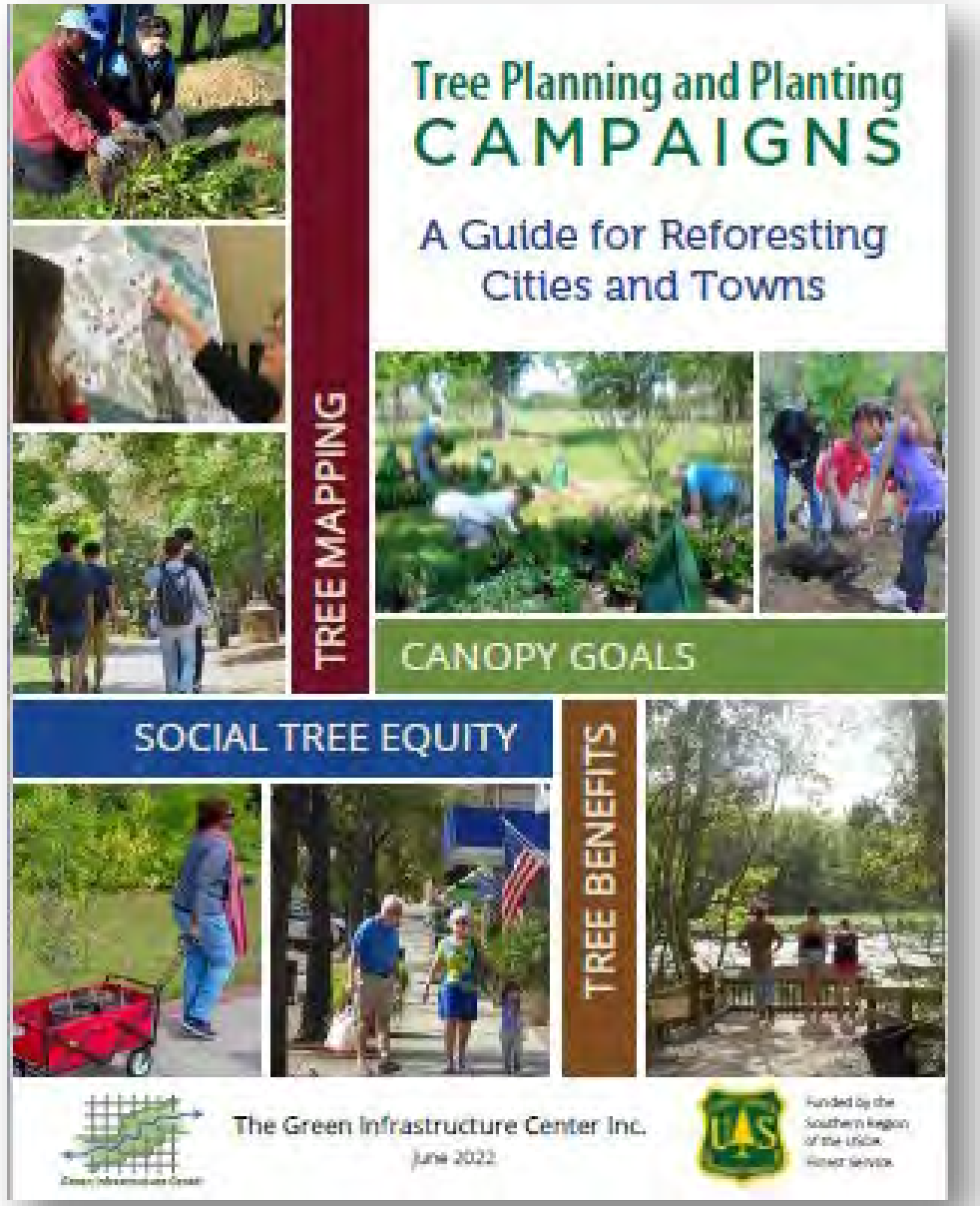








We have books, guides and tools for green infrastructure planning at the national, state and city scale. More publications at http://www.gicinc.org/resources.htm



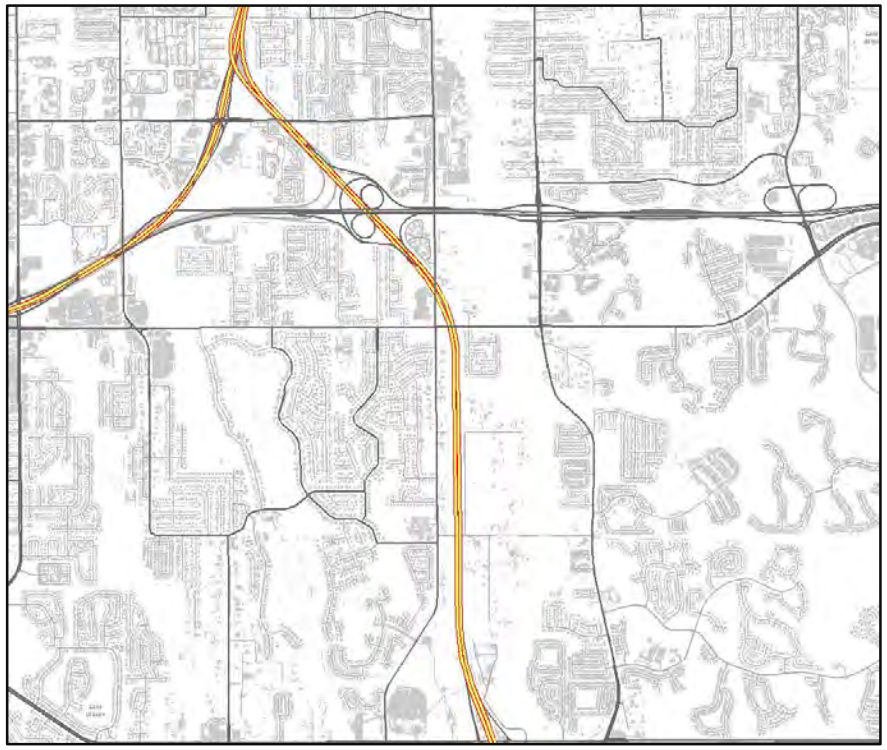
Our tree campaign guide is based on 15 years of testing and has all the arguments and methods for citizens and policy makers to break through; ***moving from wishes to direct action***.

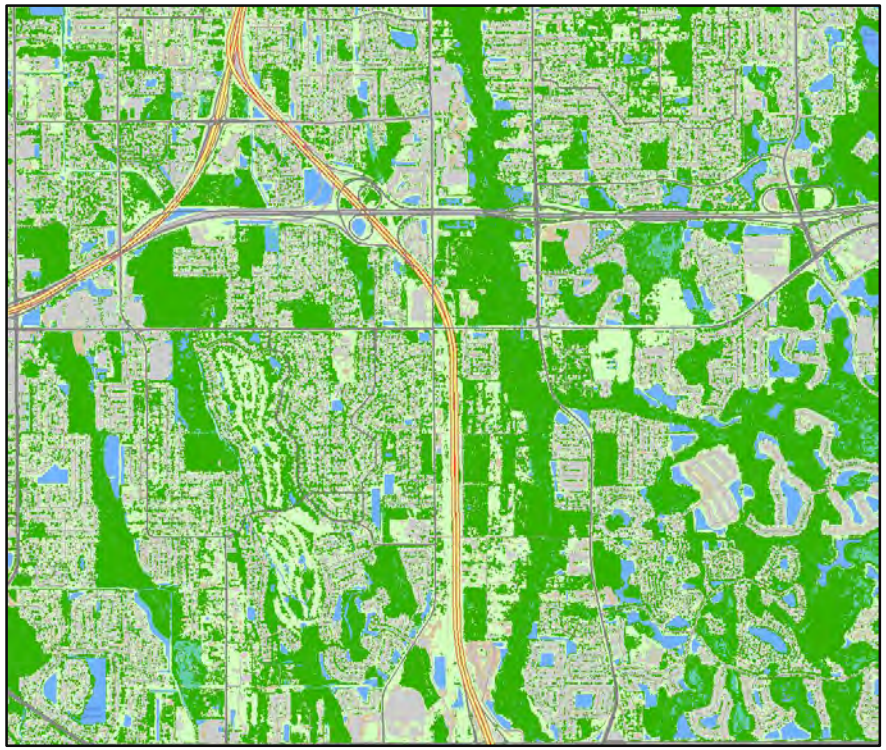
This guide features our work throughout the southern United States and other tree advocacy groups too --- highlighting the best methods, tools and tips from community-based urban forestry groups.

It also tackles pressing issues such as mapping urban heat islands, working in diverse communities and using the right data to make the case for urban forests. And it's free to download!

http://www.gicinc.org/PDFs/TreePlantingCampaignGuide_GIC_June2022.pdf

Urban Forests are Green Infrastructure!





Left shows the gray infrastructure including buildings and roads (left). Classified high-resolution satellite imagery (right) adds a green infrastructure data layer (trees and other vegetation).

Benefits of Trees and Forests

- Preserving biodiversity and wildlife habitat.
- Conserving working lands such as farms and forests, that contribute to the economy.
- Protecting and preserving water quality and supply.
- Providing cost-effective stormwater management and hazard mitigation.
- Improving public health, quality of life and recreation networks.

Trees: the original green infrastructure!

Trees give us cleaner air, shade, beauty and stormwater benefits at a cost that is far cheaper than engineered systems!

Estimates for the amount of water a typical street tree can intercept in its crown, range from 760 gallons to 4000 gallons per tree per year, depending on species.

Estimate the value of a tree in your yard with itreemytree
https://mytree.itreetools.org/#/

We need to be concerned – America's trees are in trouble!

Recent national data show urban and suburban tree canopy cover is trending downwards at a rate of about **175,000 acres lost per year** – approximately 36 million trees annually. As these trees are lost, so are the benefits they provide – **an economic loss of $96 million** per year (Nowak and Greenfield 2018).

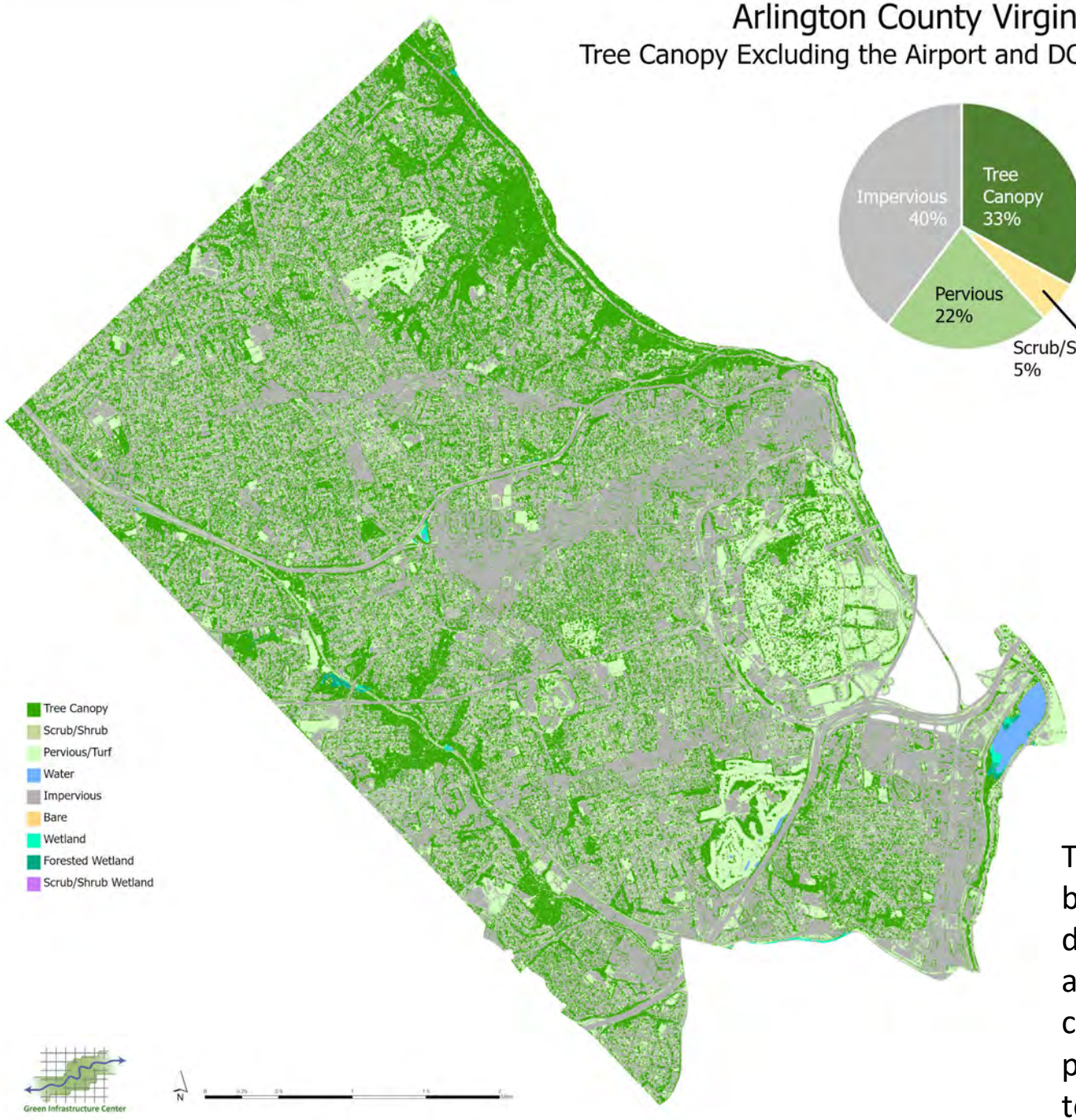
Mapping canopy cover

We use National Agricultural Imagery Program (NAIP) infrared bands that we classify to turn images into data = land cover map. The program collects new data every two years. The latest imagery was flown in 2021. Each image is a little different by year depending on the angle and time of day the flight took place. We also use LiDAR to determine the heights of vegetation.

New! Arlington's Tree Canopy is 31% based on imagery that was flown in 2021 and processed by GIC in fall 2022.

The prior 2017 study showed 38% canopy coverage, about 7% more than we found. Why might this be the case?

GIC made sure to use 2018 **LiDAR data** to differentiate trees from shrubs. LiDAR stands for Light Detection and Ranging. It bounces a beam from a source above the land and measures the return interval back to the source. If the beam takes longer to return, then the item is shorter. Previous studies did not employ LiDAR. They may have overestimated tree cover. And trees have likely been lost.



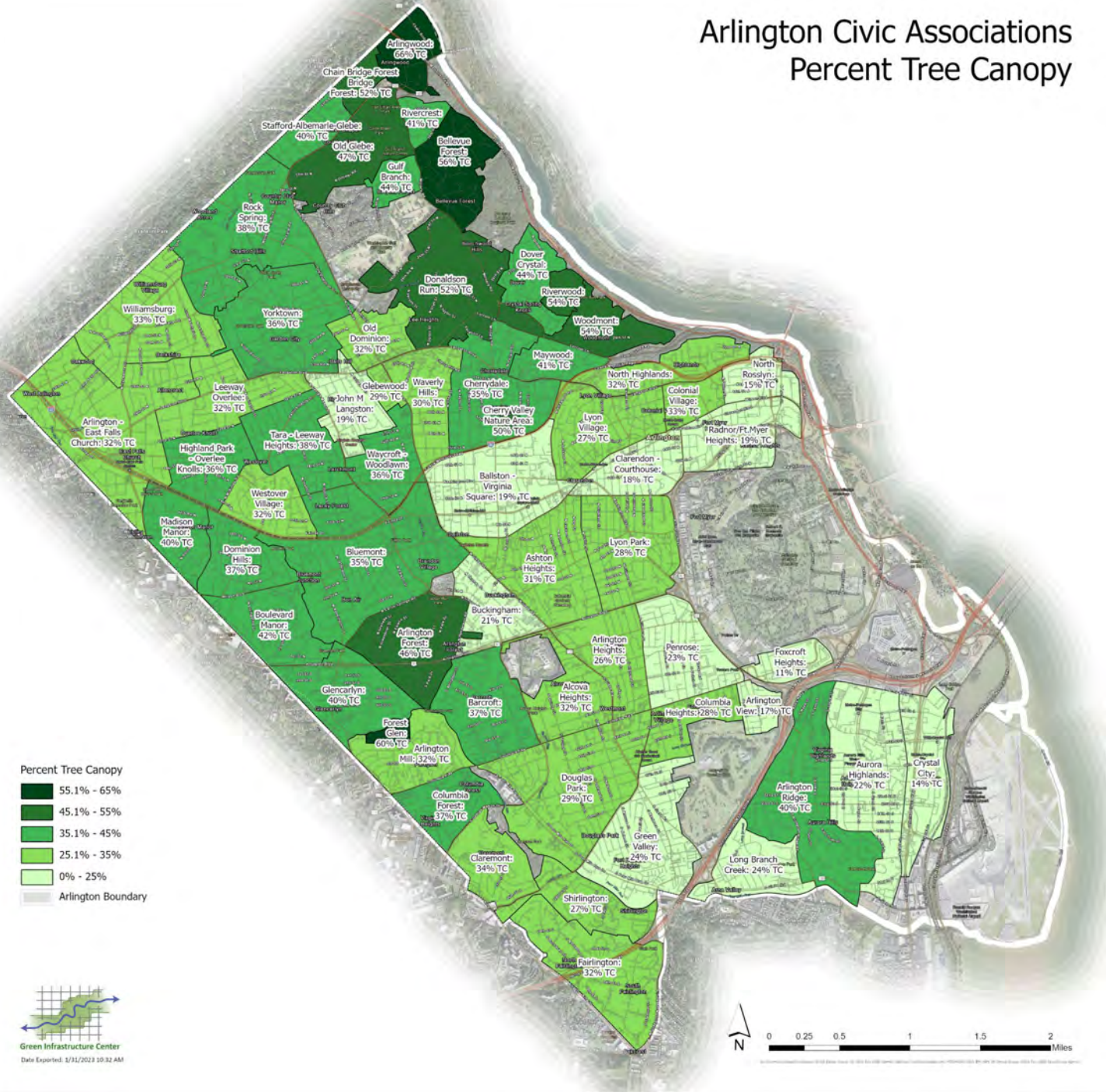
This tree in Fairlington was beheaded from storm damage. Many older trees are suffering and need care. We also need to plant new young trees today for the future.

Excluding land in the airport and land on Dept of Defense properties**, Arlington's Tree Canopy is 33%** based on imagery that was flown in 2021 and processed fall 2022.

The prior 2017 study showed 41% canopy (this is more than we found.) Same reasons as already stated.

All studies have a margin of error of several percentage points. But this **difference of 8%** is greater than a such a margin.

Arlington Civic Associations
Percent Tree Canopy



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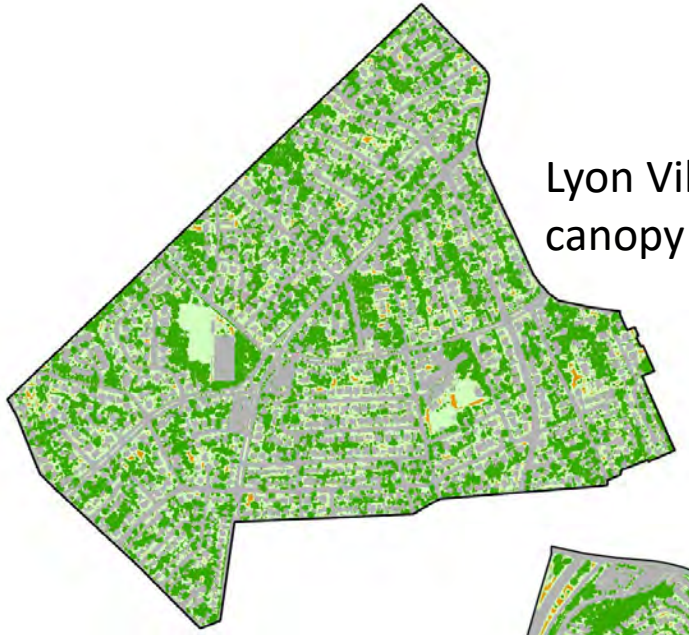
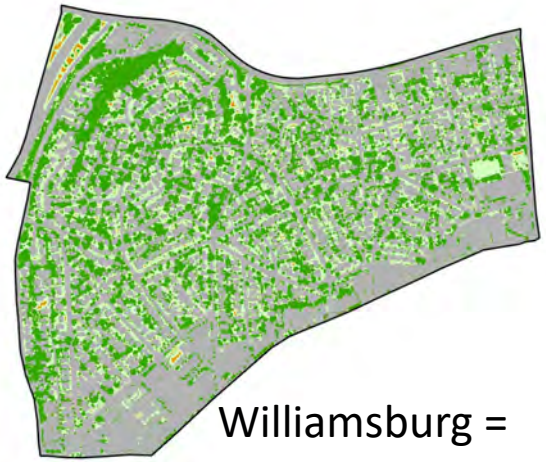
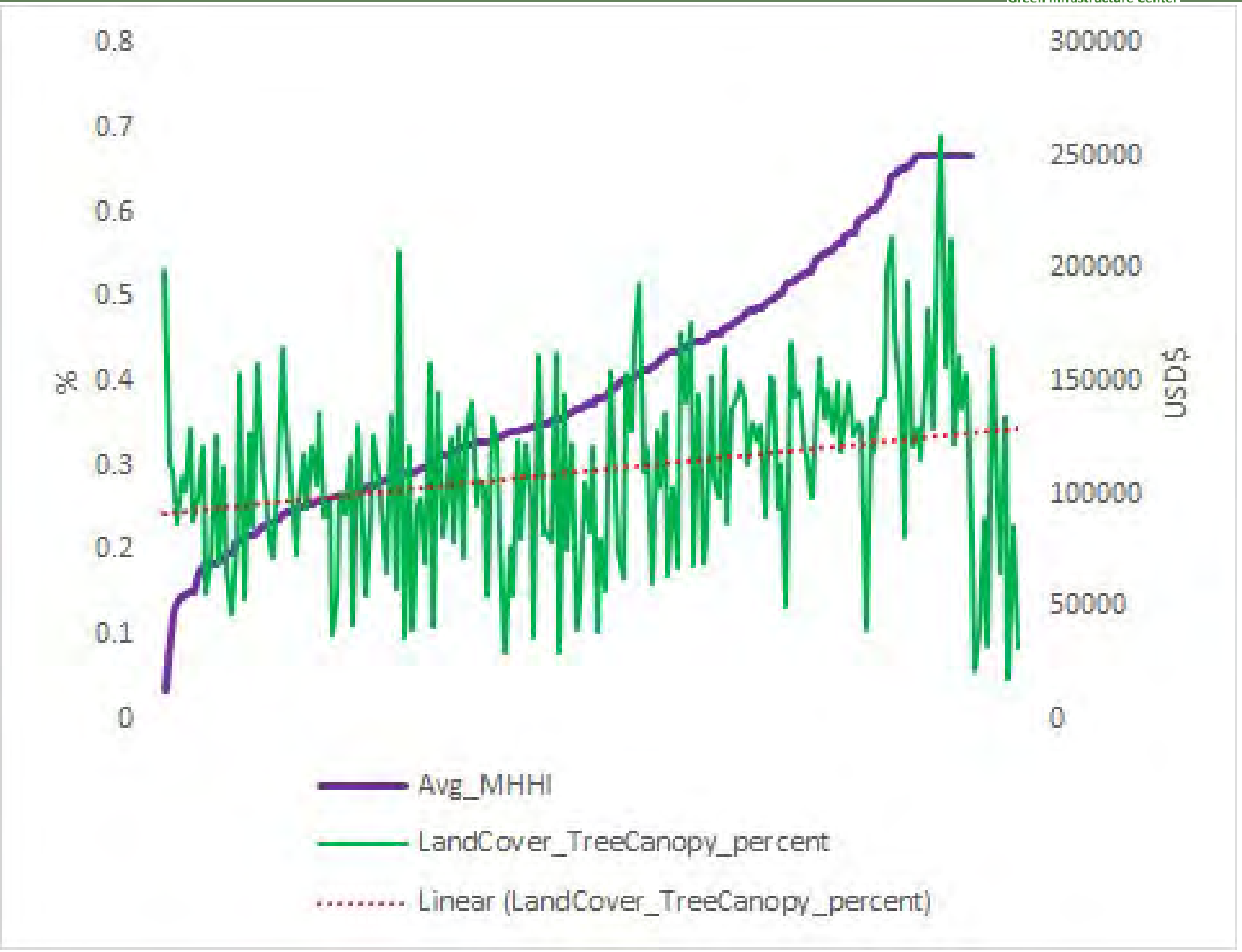


Lyon Village = 27% canopy cover



Williamsburg = 33% canopy cover

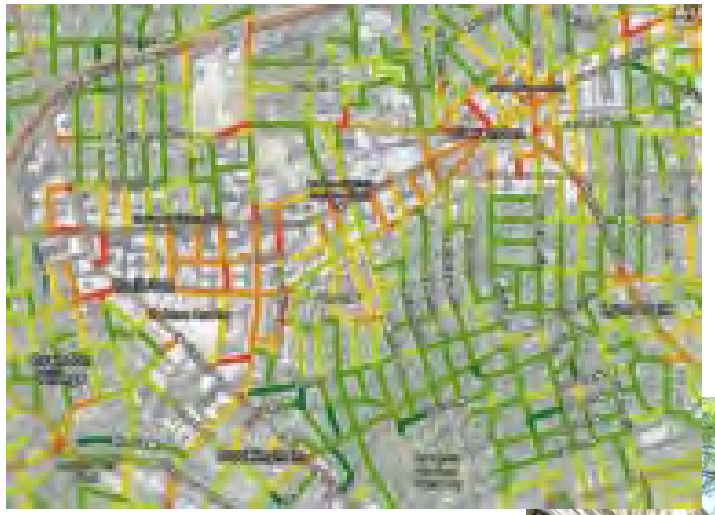
Green Valley = 25% canopy



Tree Canopy trends slightly higher in higher income neighborhoods

Trees shading streets

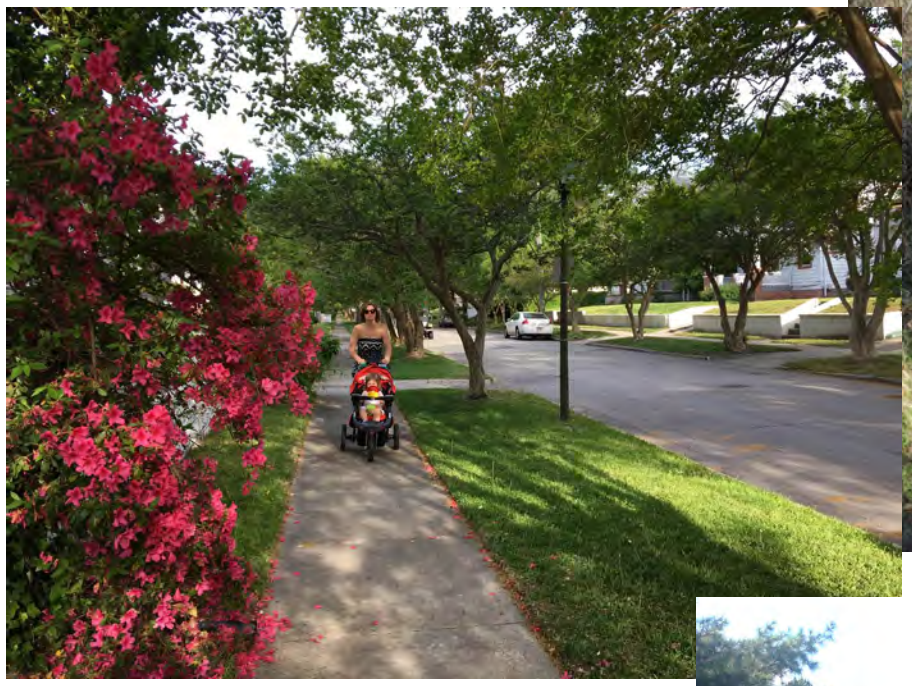
Red and orange streets have less than 5% shade.

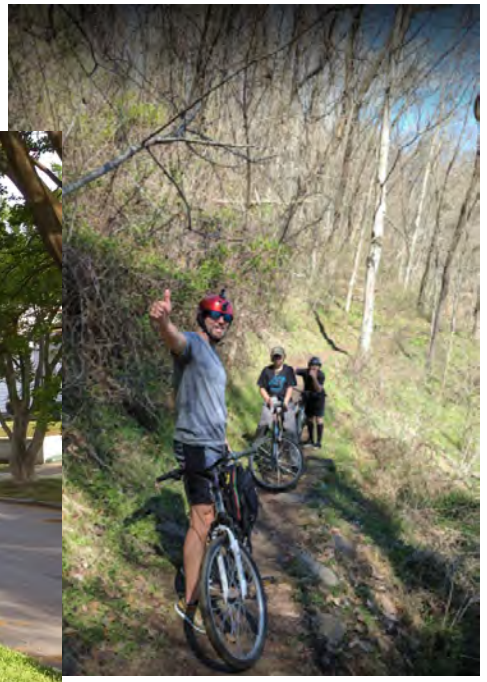


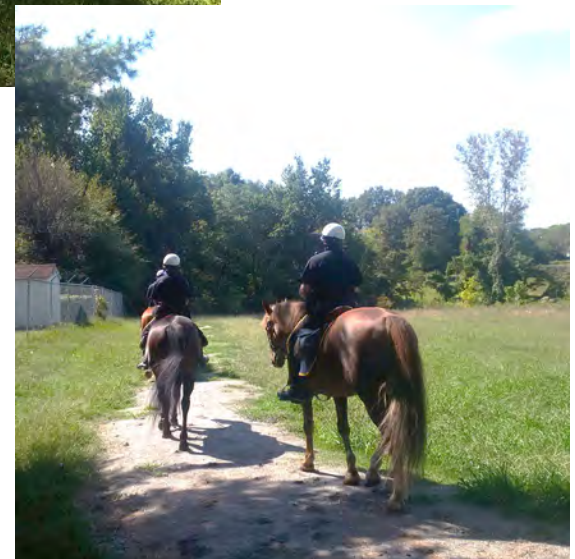
Example from Ballston. Shade is important for commercial areas too (people shop longer and pay more in shaded commercial areas).

Trees: Create Healthy Communities

- Access to fitness opportunities. (addresses obesity, nature deficit disorders)
- Clean air – trees absorb pollutants, VOCs, filter runoff, cool the city. (combat asthma)
- Well-being and mental health - -people heal faster when they can see or access green. (hospitals need this for patients, reduces absenteeism of workers)
- Less crime occurs near trees. (issue especially for downtowns and public housing areas)
- Employees will exercise if they can access green where they work and on the way to work. (addresses employee health)







Urban Tree Canopy Values

Trees provide more attractive areas for development, historic districts, commercial areas opportunities for people to interact with nature.

A study by the University of Washington found that people shopped longer and more often in tree-lined retail areas and spent about 12 percent more money.

Trees = more tax revenue even in developed commercial districts!

Job Development

Small companies, especially those that are have well paid and skilled workforce place a strong importance on the “green” of the local environment.
Crompton Love and Moore, 1997

The creative class: artists, media, lawyers, analysts, make up 30 percent of the U.S. workforce and they place a premium on outdoor recreation and access to nature.
Florida, 2002

Trees and parks attract better paid jobs and thus a better tax base = $

What is an urban heat island?

Urban heat islands occur when a metro area is significantly warmer than its surrounding rural areas due to human activities. Temperature differences are usually larger at night than during the day, and is most apparent when winds are weak.

Paved areas in cities absorb and re-radiate tremendous heat!

Greenhouse gases trap that heat and re-radiate it back to Earth.

Cost of Urban Heating...

"Heat island" effect can contribute significantly to energy consumption during hot summer days—about $100 million dollars annually just in Los Angeles.

Electricity demand for air conditioning increases approximately 1–9% for each 2°F increase in temperature. (U.S. EPA).

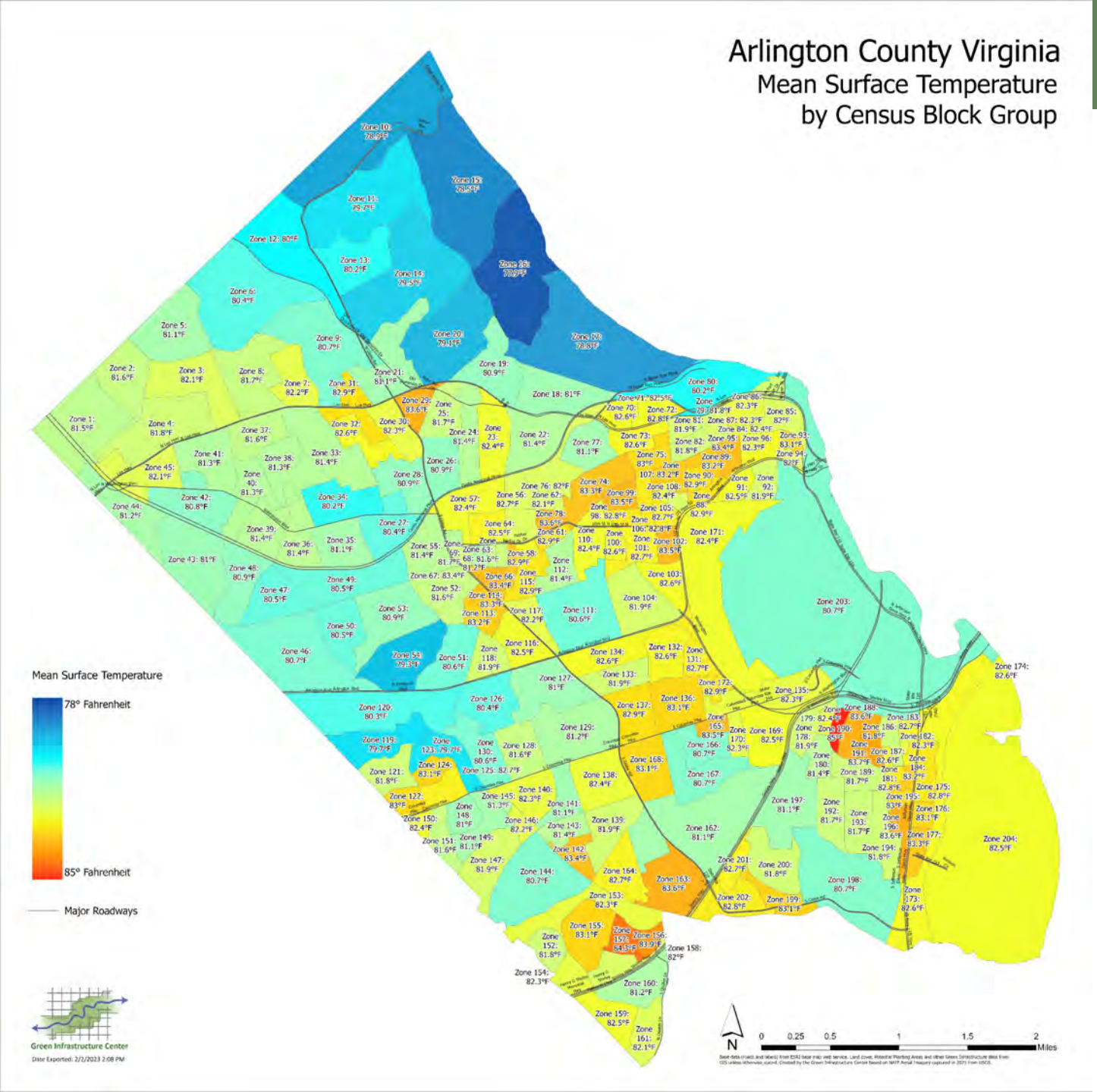
Power generated from oil fuel/coal then generates more greenhouse gases = more climate change impacts!

Micro-climates

Urban areas change weather patterns .. By increasing heat = more evaporation and more rain = more flooding

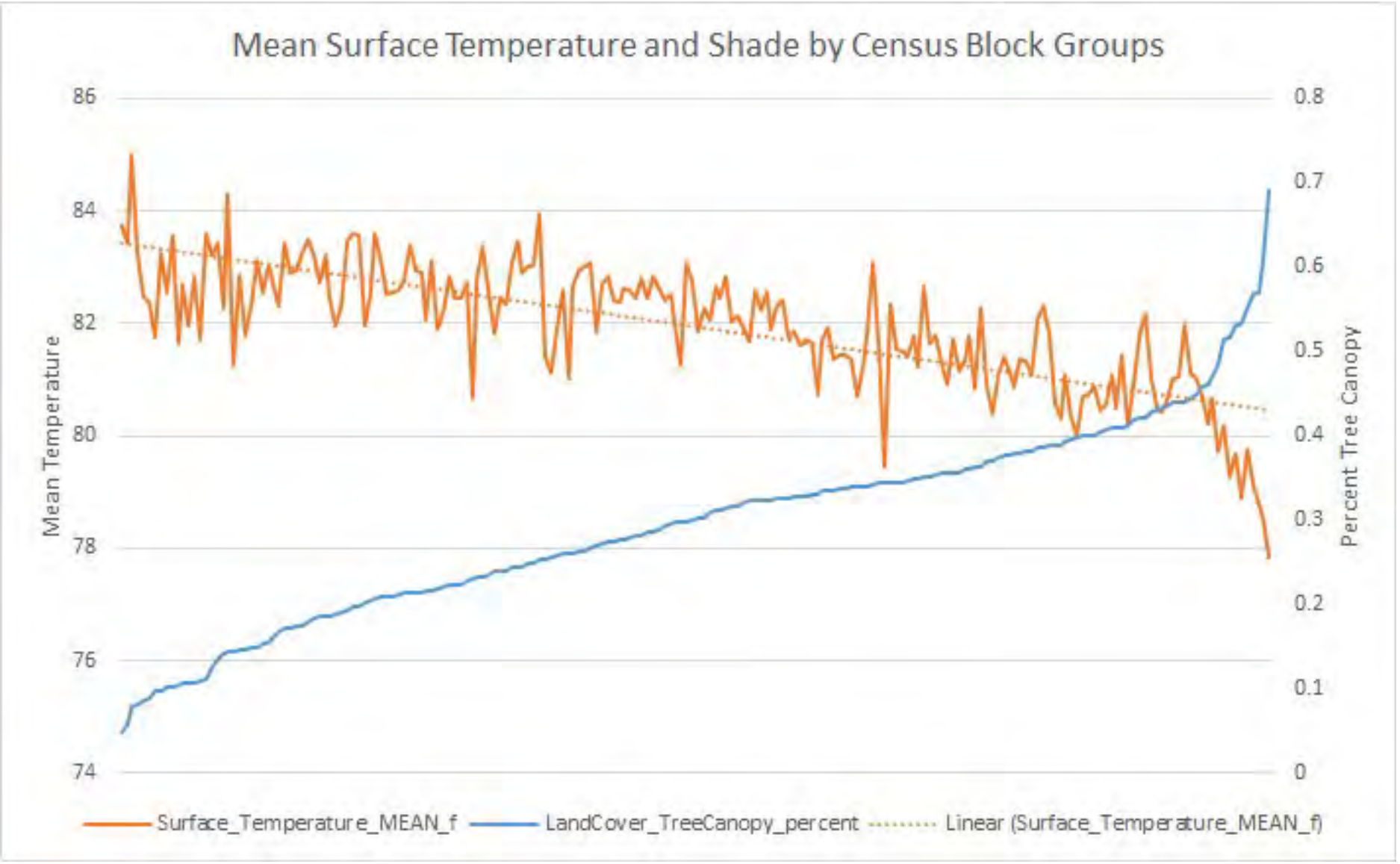
Stream in Arlington overtops its banks

https://www.arlingtonmagazine.com/is-arlington-ready-for-the-next-flood/



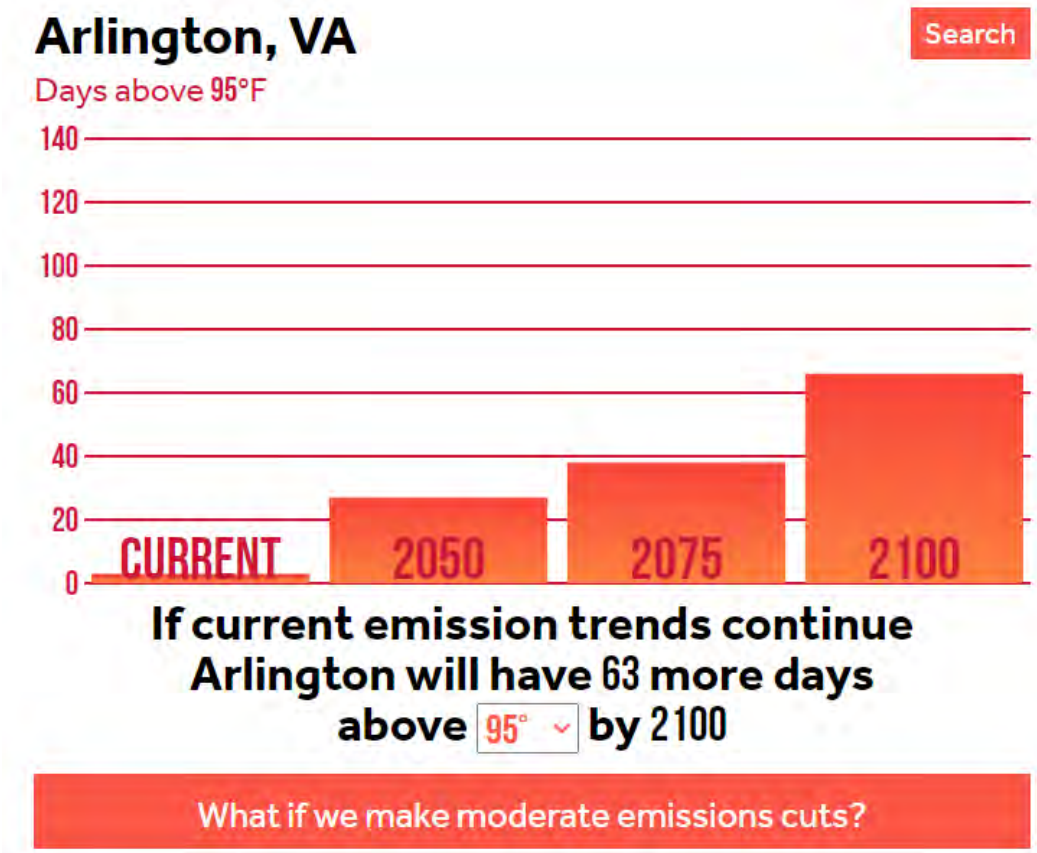
Census Blocks & Tree Cover

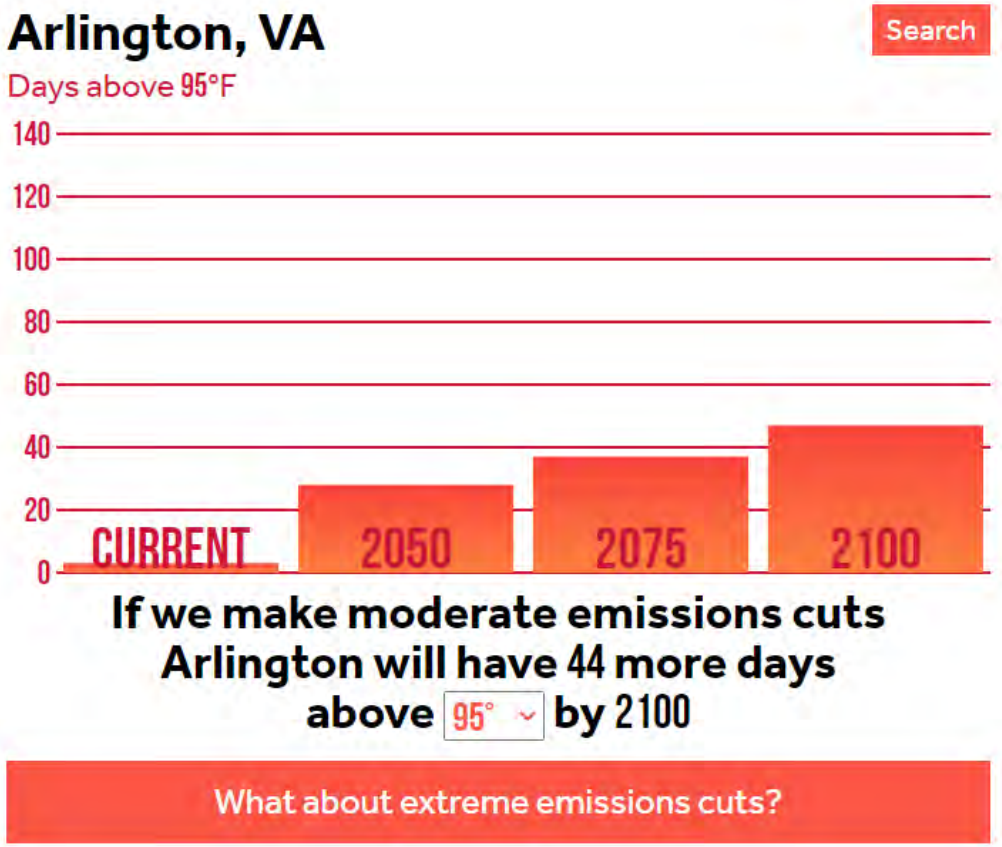
Areas with little or no trees are significantly hotter. Blues are cooler areas while oranges and reds are hotter.



Areas in Arlington lacking good tree cover are significantly hotter.

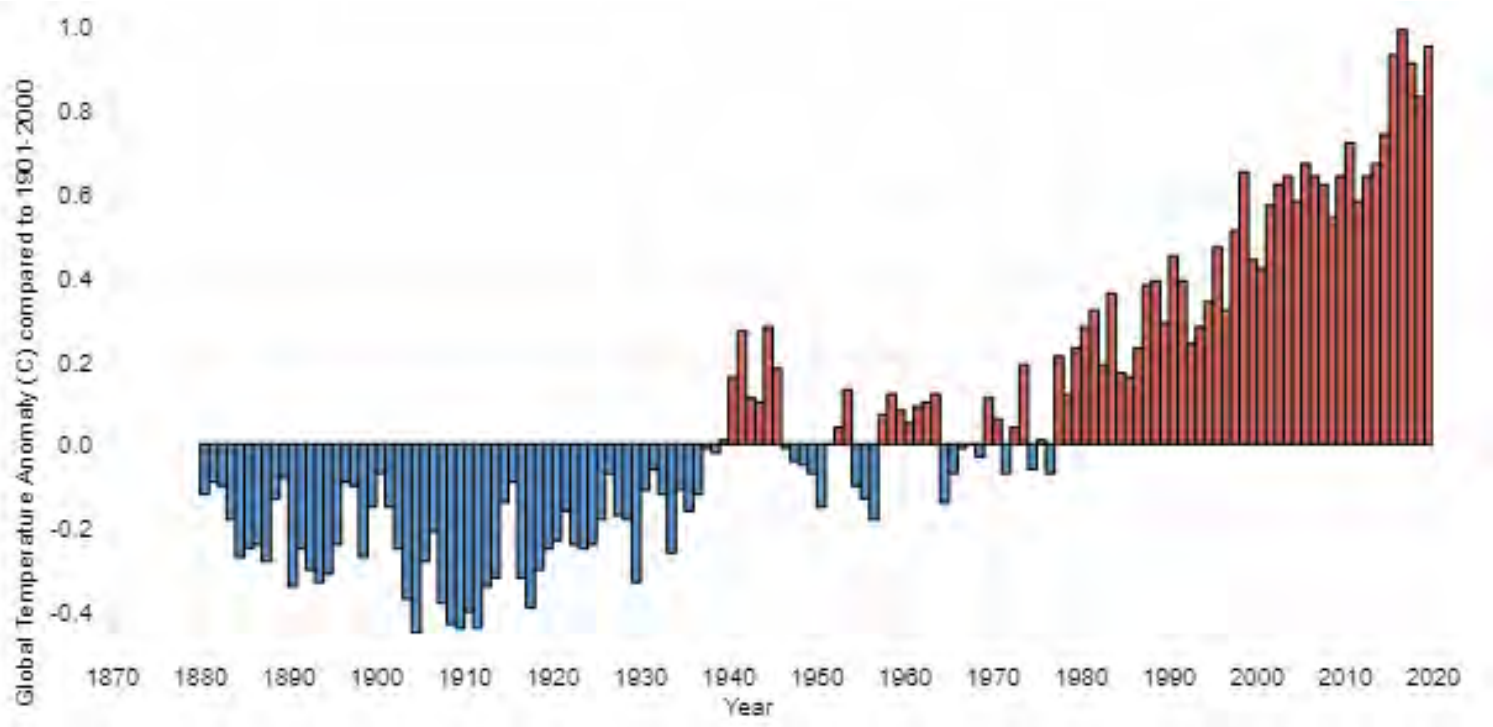
Consequences of Emissions on Hot Days...





https://www.climatecentral.org/news/hot-summers-cities-climate-change-21676

But we can combat this problem with new trees!

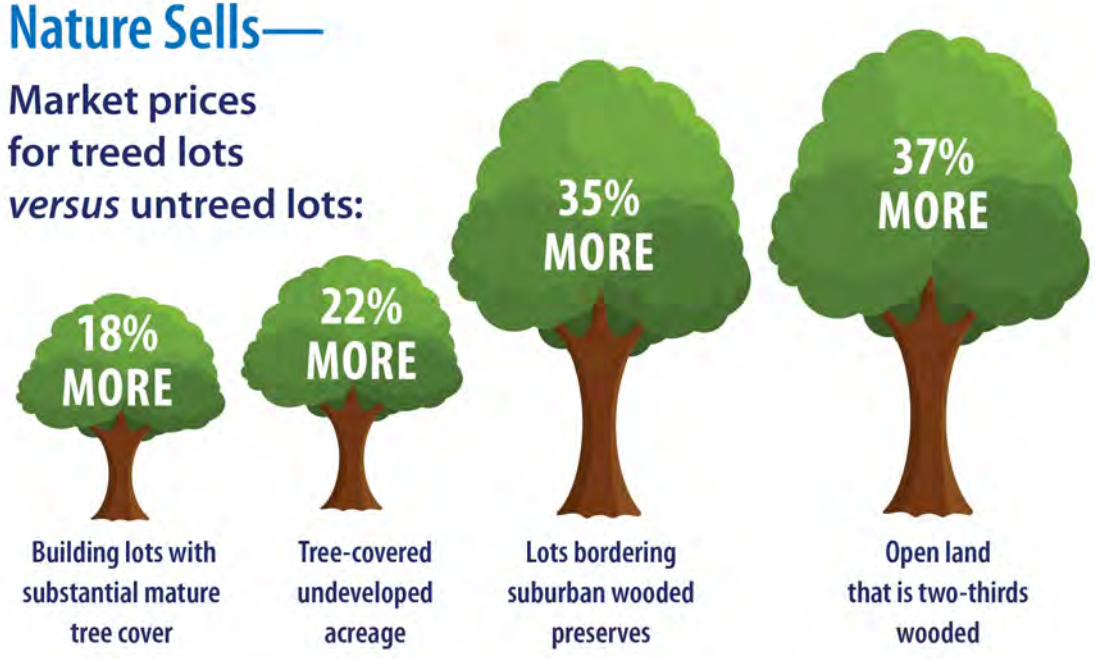


Global Temperatures

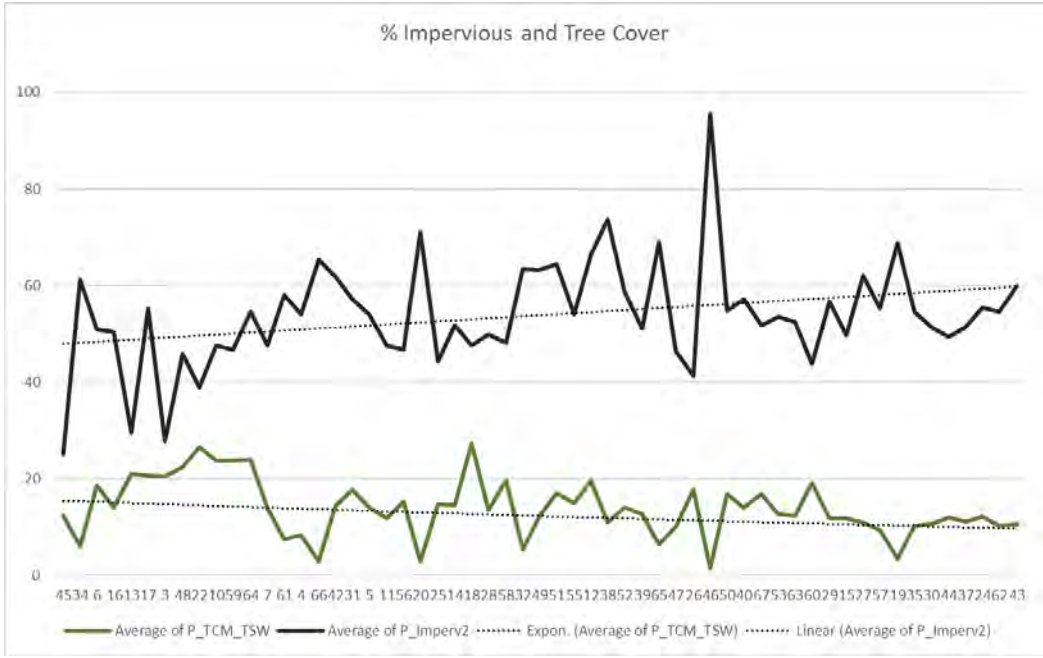
“Restoring forests is the only thing on Earth that can reverse the emissions that drive global warming,” Conservation International CEO M. Sanjayan

Trees combat heat & add value to neighborhoods

Trees add value to properties, in improved real estate values, savings on air conditioning costs, lower heat island and even sequestering carbon!



Source: Kathleen Wolf, 2007, *City Trees and Property Values.*



Decreases in tree canopy correlate to increased urban heating. Areas under trees are often 12 degrees cooler and neighborhoods are cooler too!

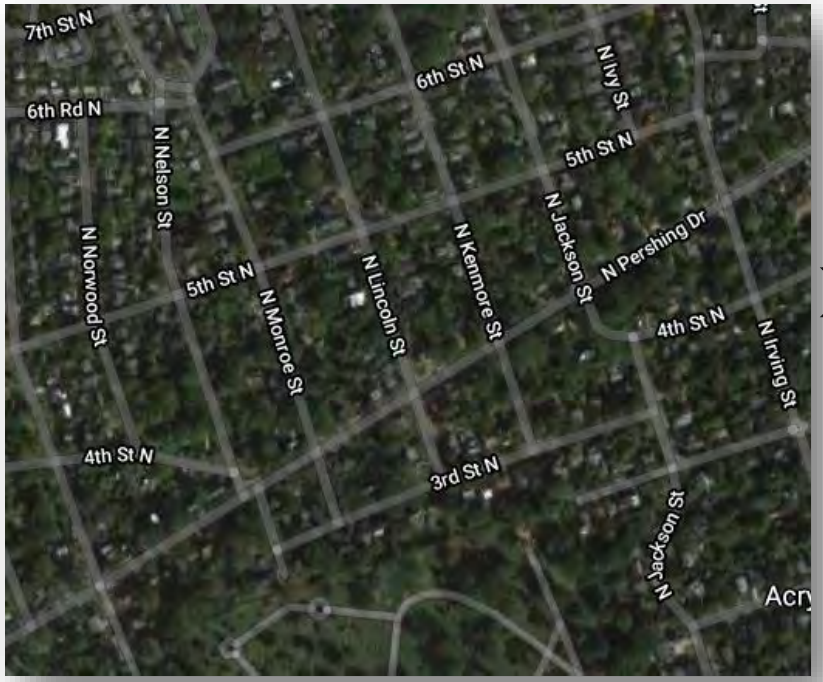
Air Quality Benefits

Pollutant (Abbrev.)	Benefit Description	Removal rate (lbs/acres/year)	lbs/year
CO	Carbon monoxide removed annually	**1.13**	**336**
NO2	Nitrogen dioxide removed annually	**6.241**	**6,24**
O3	Ozone removed annually	**48.212**	**36,210**
PM10	Particulate matter greater than 2.5 microns and less than 10 microns removed annually	**13.683**	**9,631**
PM2.5	Particulate matter less than 2.5 microns removed annually	**2.463**	**1,157**
SO2	Sulfur dioxide removed annually	**3.068**	**2,229**

Trees clean the air and reduce greenhouse gas causing chemicals. Even at the neighborhood scale, trees significantly reduce particulate pollutants resulting in less respiratory illnesses, such as asthma.

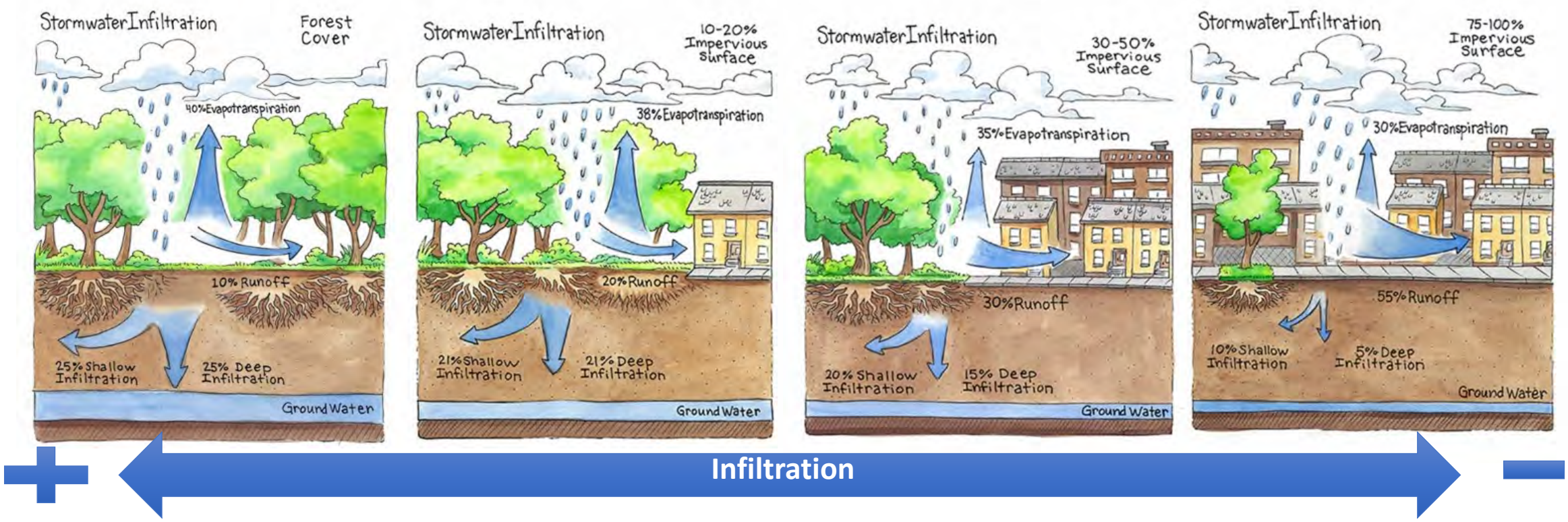
Water flow strategies

How do we make this…



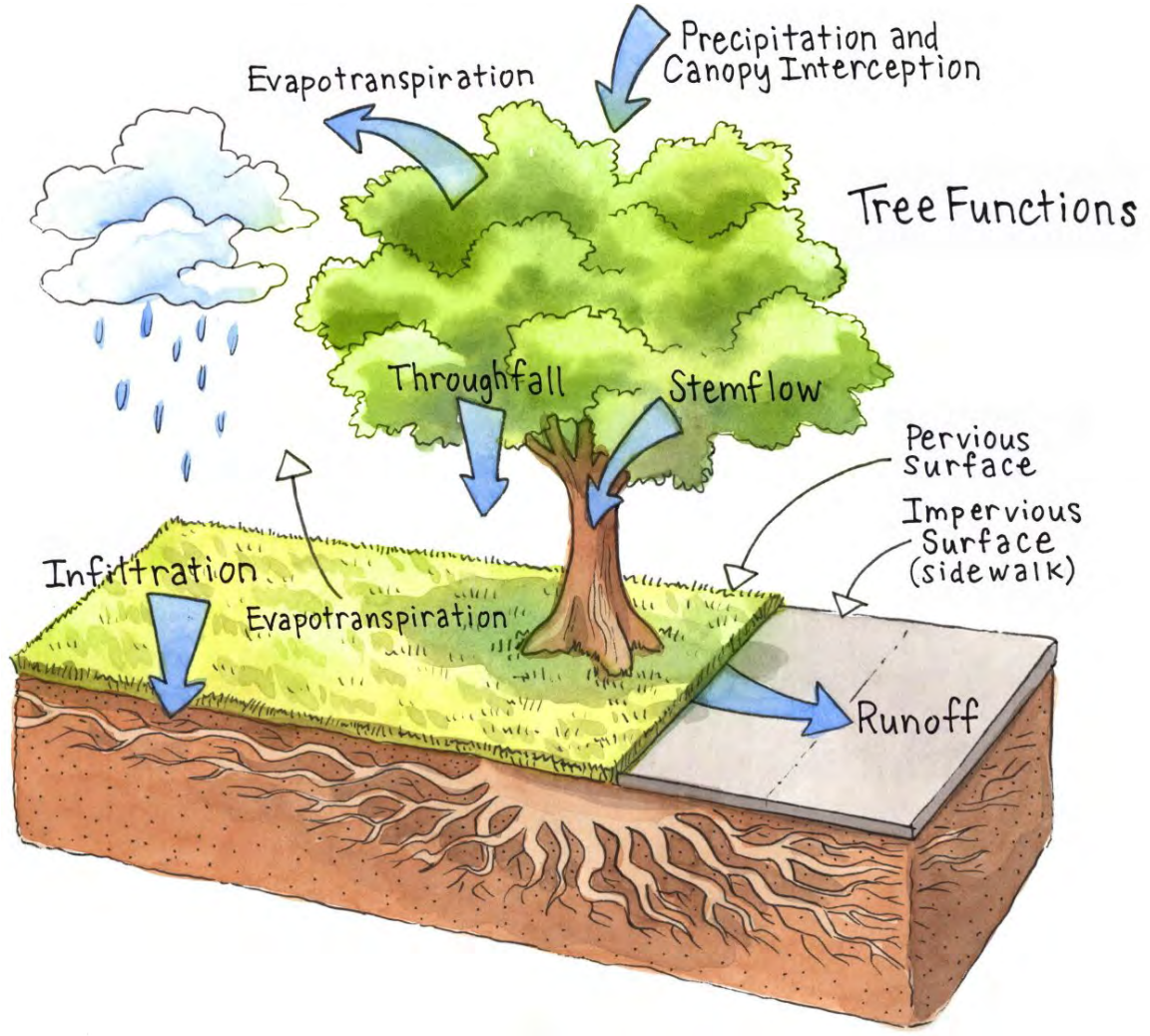
function like this?

As land cover changes, so does stormwater runoff and infiltration ...



Urban Tree Canopy and Water

- 20%+ of annual rainfall retained in crown (Xiao et al., 2000)
- Delays runoff up to 3.7 hours
- ↑ infiltration capacity of soils
- One tree can soak up 700 to 4000 gallons water annually depending on the age and species!



This parking lot could be retrofitted so we get less of this …

One acre of pavement releases 36 times more runoff than a forest.

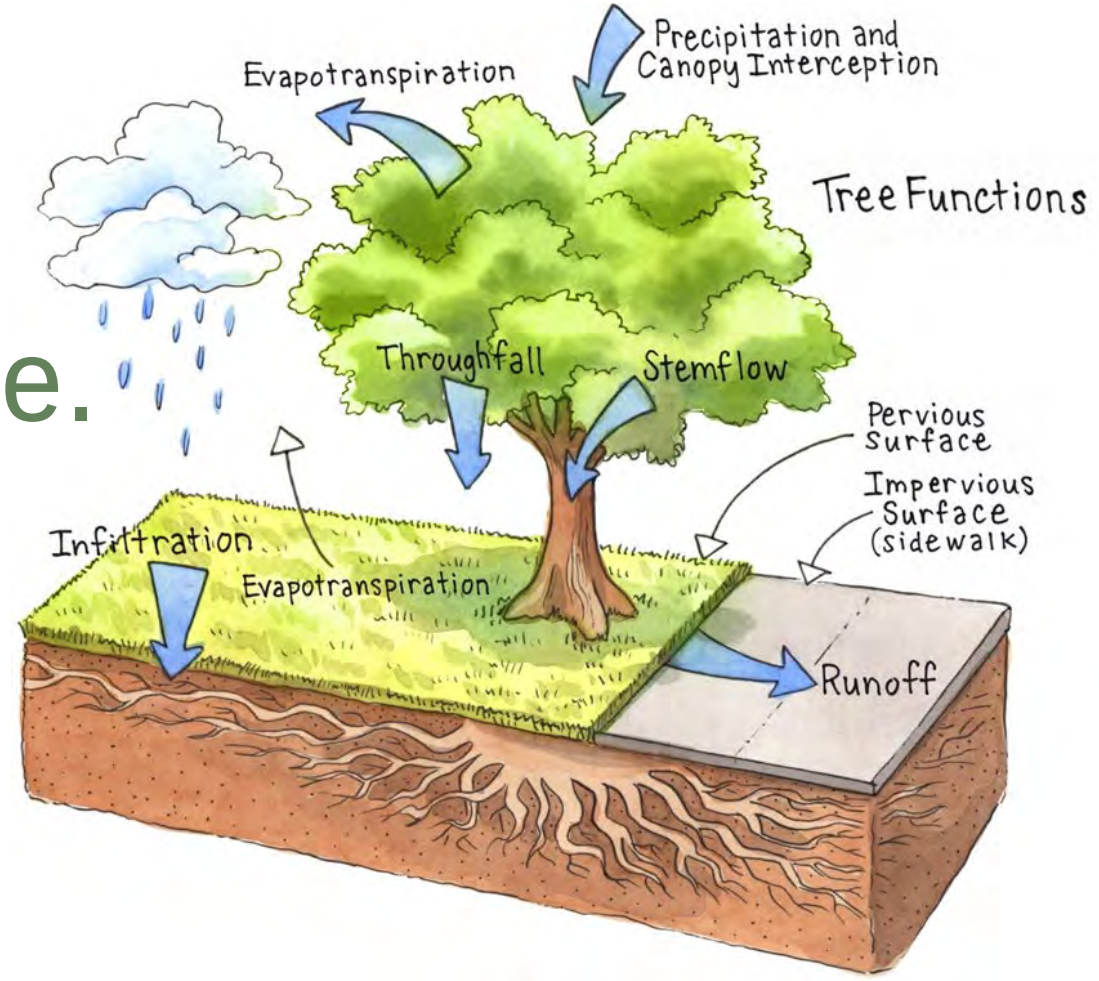
During a rainfall event of one inch, one acre of forest will release 750 gallons of runoff, while a parking lot will release 27,000 gallons.

(PennState Extension).

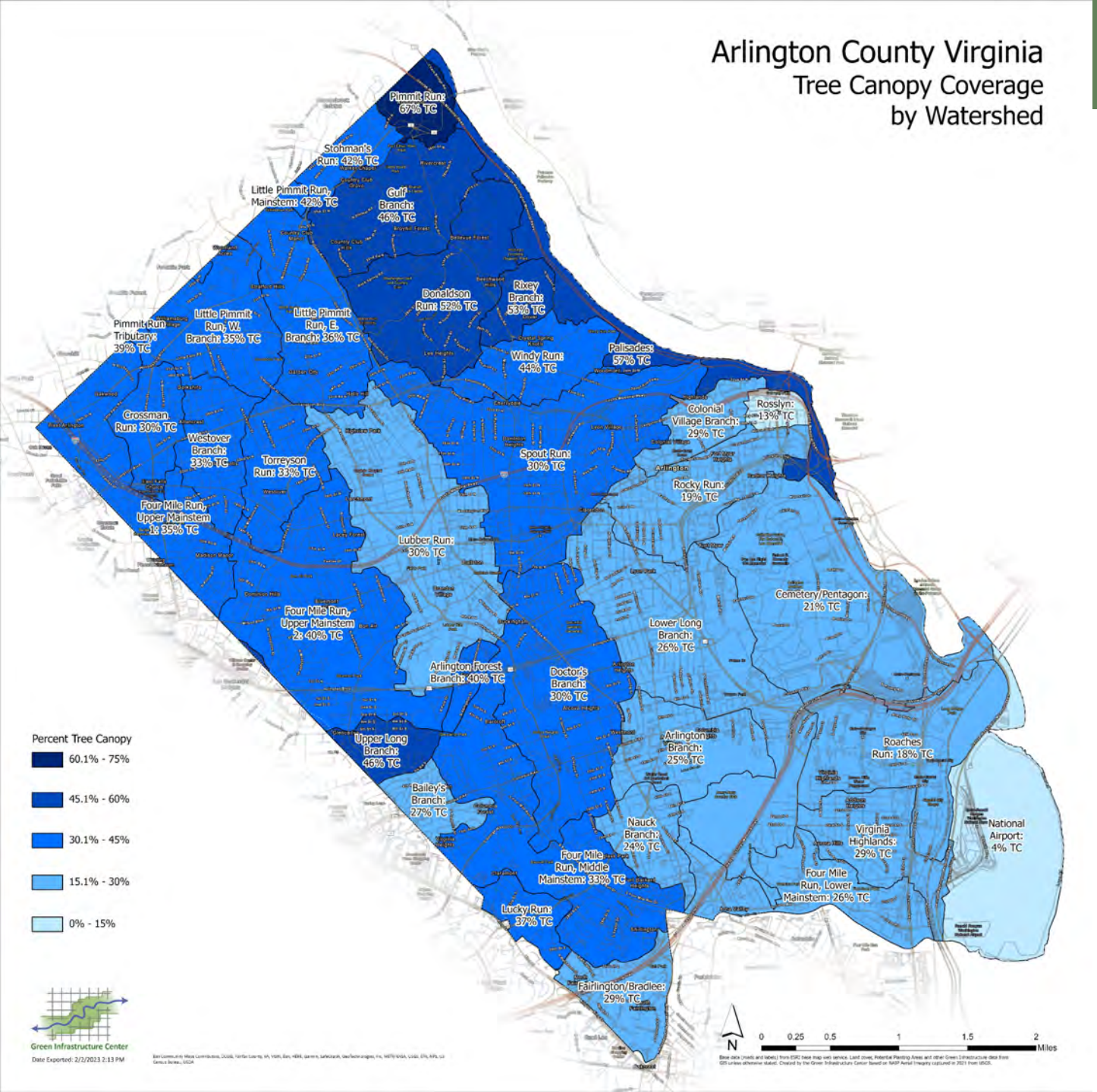
Arlington Flooding

Link and use trees as stormwater infrastructure.

- Establish city trees' role as infrastructure to receive federal aid for post-storm clean up efforts.
- Credit urban trees in a stormwater utility fee to promote more urban tree plantings.
- One large tree can soak up thousands of gallons of stormwater annually!



We will provide an analysis of how much stormwater the trees soak up in Arlington at the community event in March.



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The better treed each watershed is, the more water can be captured. This map shows canopy cover in each watershed

(darkest blue has highest tree cover).

Note that streams in Arlington may still be impaired by stormwater that flows underground from paved areas and enters streams directly. But having more trees can help capture much of that rainwater before it runs off into storm drains.

What are trees worth?

The value of tree benefits varies widely, but can be as much as $80 to $120 per tree per year for a large tree. Small trees that never get very large, like the crape myrtle, provide not much more than $15 in benefits on average. In some cases they are a net loss to communities after the costs are subtracted. The Center for Urban Forest Research has studied large, medium, and small trees in a number of locations throughout the West and found that, on average, mature large trees deliver an annual net benefit two to six times greater than mature small trees:

Mature tree size
The approximate tree size 40 years after planting.

Relative Size at Maturity:

Small-stature
Less than 25 feet tall and wide with trunk diameters less than 20 inches.

Medium-stature
25 - 40 feet tall and wide with trunk diameters 20 - 30 inches.

Large-stature
Greater than 40 feet tall and wide with trunk diameters commonly over 30 inches.

Large Tree
- Total benefits/year = $55
- Total costs/year = $18
- Net benefits/year = $37
- Life expectancy = 120 years
- Lifetime benefits = $6,600
- Lifetime costs = $2,160
- Value to community = $4,440

Medium Tree
- Total benefits/year = $33
- Total costs/year = $17
- Net benefits/year = $16
- Life expectancy = 60 years
- Lifetime benefits = $1,980
- Lifetime costs = $1,020
- Value to community = $960

Small Tree
- Total benefits/year = $23
- Total costs/year = $14
- Net benefits/year = $9
- Life expectancy = 30 years
- Lifetime benefits = $690
- Lifetime costs = $420
- Value to community = $270

—hypothetical case using data for trees at year 30, projected to life expectancy from McPherson, E.G., et. al. 2003. Northern mountain and prairie community tree guide: benefits, costs and strategic planting. Center for Urban Forest Research, Pacific Southwest Research Station, USDA Forest Service. 92p.

https://urbanforestrysouth.org/resources/library/citations/the-large-tree-argument-1-up

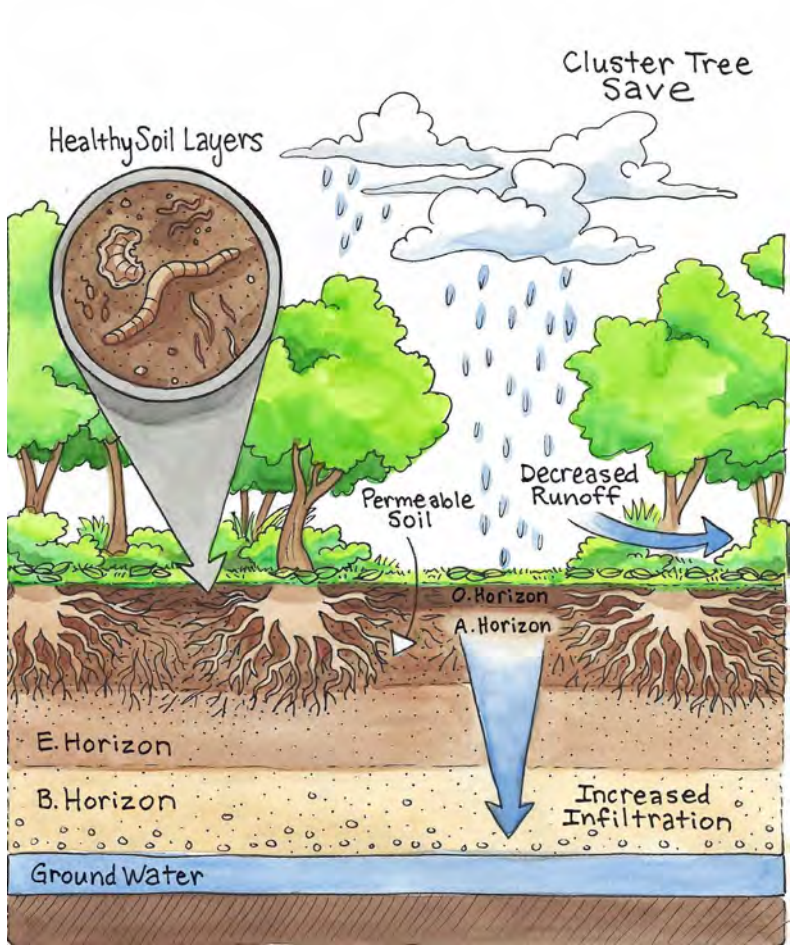
Key Strategy: Save existing trees. Bigger is better!

Larger trees provide more benefits. If you replace a 20-inch diameter tree today with a 1-inch diameter tree, it could take 20 or more years to achieve all the benefits that the large tree provides, so keeping large trees in place is key! Plant the next generation today so your kids can enjoy them later!

Image credit: City of Greenville from GIC's campaign with the city

What does a tree need for health?

- Air (circulation)
- Light (photosynthesis)
- Water (growth)
- Nutrients (from soil and even the air)
- Space (roots and canopy need to spread out)
- Free from pests and diseases (watch out for these and treat as needed)

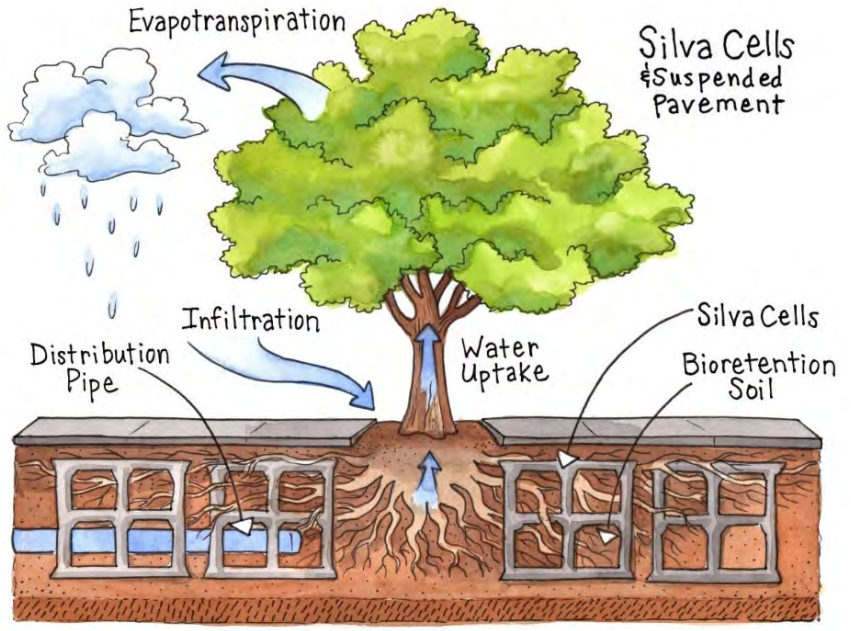


Urban trees also need watering the first few years to help them get established.

They should have some attention to pruning to ensure proper and safe form, to avoid issues like this one below.

Check out Trees VA for more! https://treesvirginia.org/education/tree-planting

Accommodate Large Trees



Larger trees offer greater benefits – so think carefully when setting planting goals for streets! We can also treat the roots and alter existing pavement to help this tree continue to thrive.

Consider using suspended pavement systems, rather than just choosing small trees! Trees will pay back your investment!

Give urban trees room to grow! These trees were planted at the same time!

So what's the difference?

Well...
Trees at left have bigger openings but less underground soil volume and support.

https://greenblue.com/na/ Thanks to GreenBlue Urban for these images of their work.

Underground supports can enable large trees even in tight spaces

The structural supports direct roots to where they are desired. They also can include spaces for utilities and protect them from roots too!

https://greenblue.com/na/ Thanks to GreenBlue Urban for these images of their work.

Key Strategy: Plant trees on private lands (public too!)

GIC found there is room for more trees.

So far, we have not found as much plantable area as prior studies since we excluded areas too close to buildings, narrow roadway strips, or playing fields. We will finalize this analysis before the community meeting.

More can be planted! So, organize plantings in your community and encourage them in HOA lands, yards, streets …everywhere!

Areas in orange are open space potentially available for planting.

Local Resources for Arlington

Arlington County Sustainability and Environment Office Forestry information
https://www.arlingtonva.us/Government/Programs/Sustainability-and-Environment/Trees

Arlington's Ecosystem Services Report for its trees:
https://environment.arlingtonva.us/wp-content/uploads/sites/13/2017/02/iTree-2016-Written-report.pdf

Arlington's Urban Forest Master Plan (update in process):
https://www.arlingtonva.us/Government/Projects/FNRP/FNRP-Overview-and-Timeline

Arlington's Urban Forestry and Natural Resources Commission (FNRC) provides the County Board with advice and recommendations:
https://www.arlingtonva.us/Government/Commissions-and-Advisory-Groups/Forestry-and-Natural-Resources-Commission

Apply to plant trees in your Arlington Community! (due in June)
https://www.ecoactionarlington.org/community-programs/trees/

Arlington County Civic Federation Environmental Affairs Committee: https://www.civfed.org/about-us/committees/environmental-affairs/

USDA Urban Forest Connections Webinar Series -
https://www.fs.usda.gov/research/products/multimedia/webinars/urbanforestconnections

Other Resources for Arlington

Arlington Tree Action Group

The Tree Stewards of Arlington and Alexandria

Audubon Society of Northern Virginia

Northern Virginia Conservation Trust

Preserving Donaldson Run

Virginia Urban Forest Council (Trees Virginia)

Master Gardener Program

Casey Trees (Washington, DC)

American Forests

Arbor Day Foundation

Friends of Upton Hill

Friends of Aurora Highlands Parks

Next Steps*

Send your comments on actions you would like to see taken by your community, by the county, by everyone, or requests for more information to:

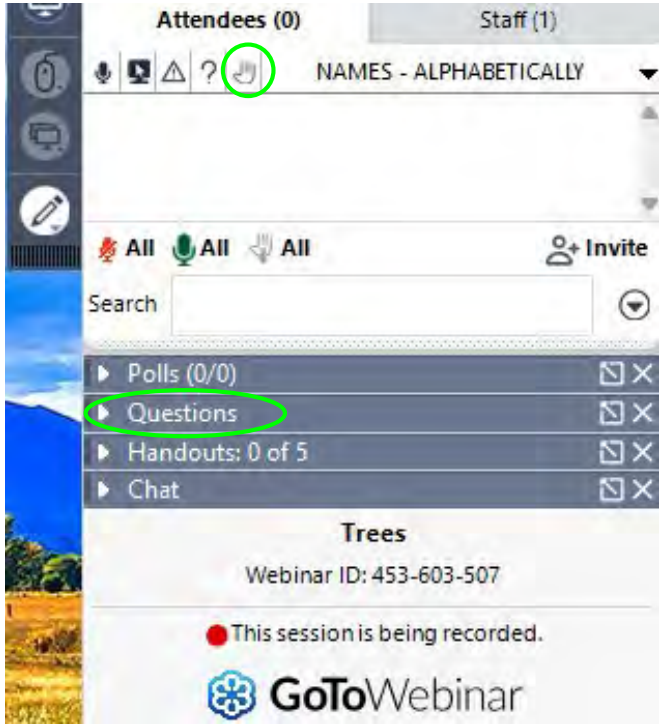
accf213comment@gmail.com

Register to attend March 25 Community Workshop to see maps in person and engage in the discussion:

accf325regis@gmail.com

Webinar now open for live dialogue. Raise your digital hand or type a question in Questions Panel.

**Note that the canopy study was initiated and funded by private citizens, This webinar, and following workshop are sponsored by the Arlington County Civic Federation in its role to inform citizens. The ACCF and Arlington County have not yet endorsed the information provided here.*



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