i-Tree For Funding Opportunities

The Landscape of Canopy:

Benchmark, Prioritize, and Assess Impact

May 3, 2023

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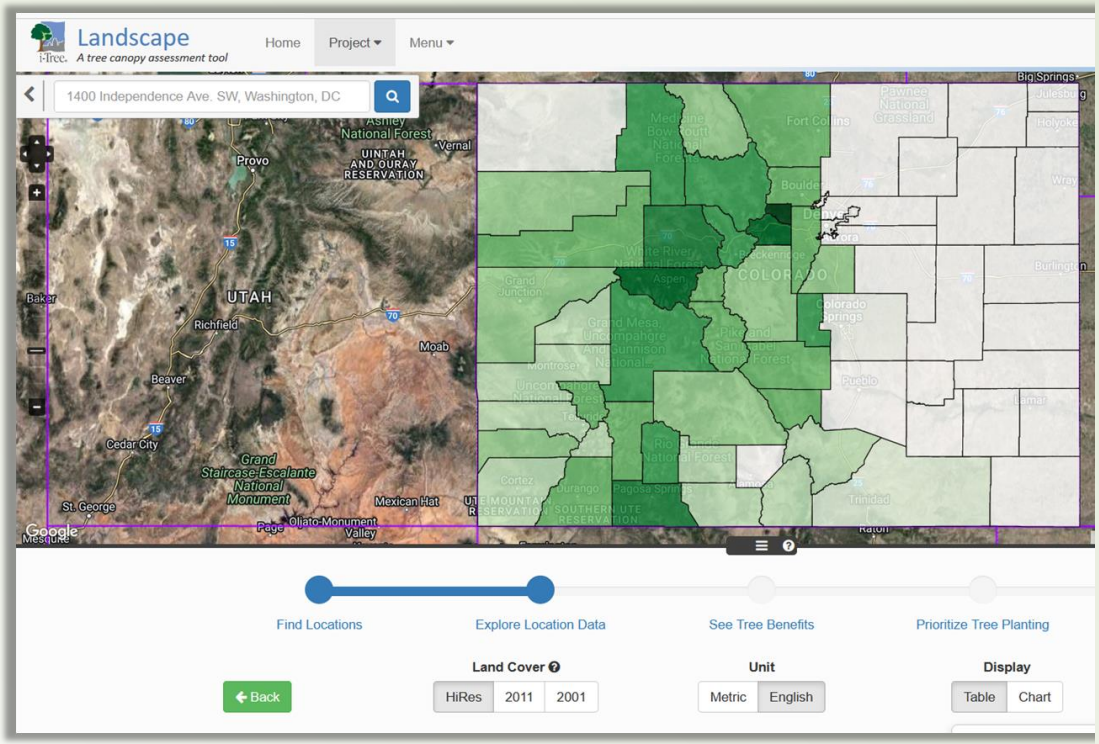
Looking Through Landscape to See Canopy in Action

- **Visualizing the environment** helps us see it in context
  - Trees + people +habitats + infrastructure: *connections*
- Landscape brings **USFS tree benefits science** to a nationwide map tool and offers a rich set of complimentary data
- Spatial distribution of resources and risks: visualizing **canopy impacts at neighborhood scale**
- Includes census demographic data and levels of environmental risk that can be used to **prioritize equity** across project locations



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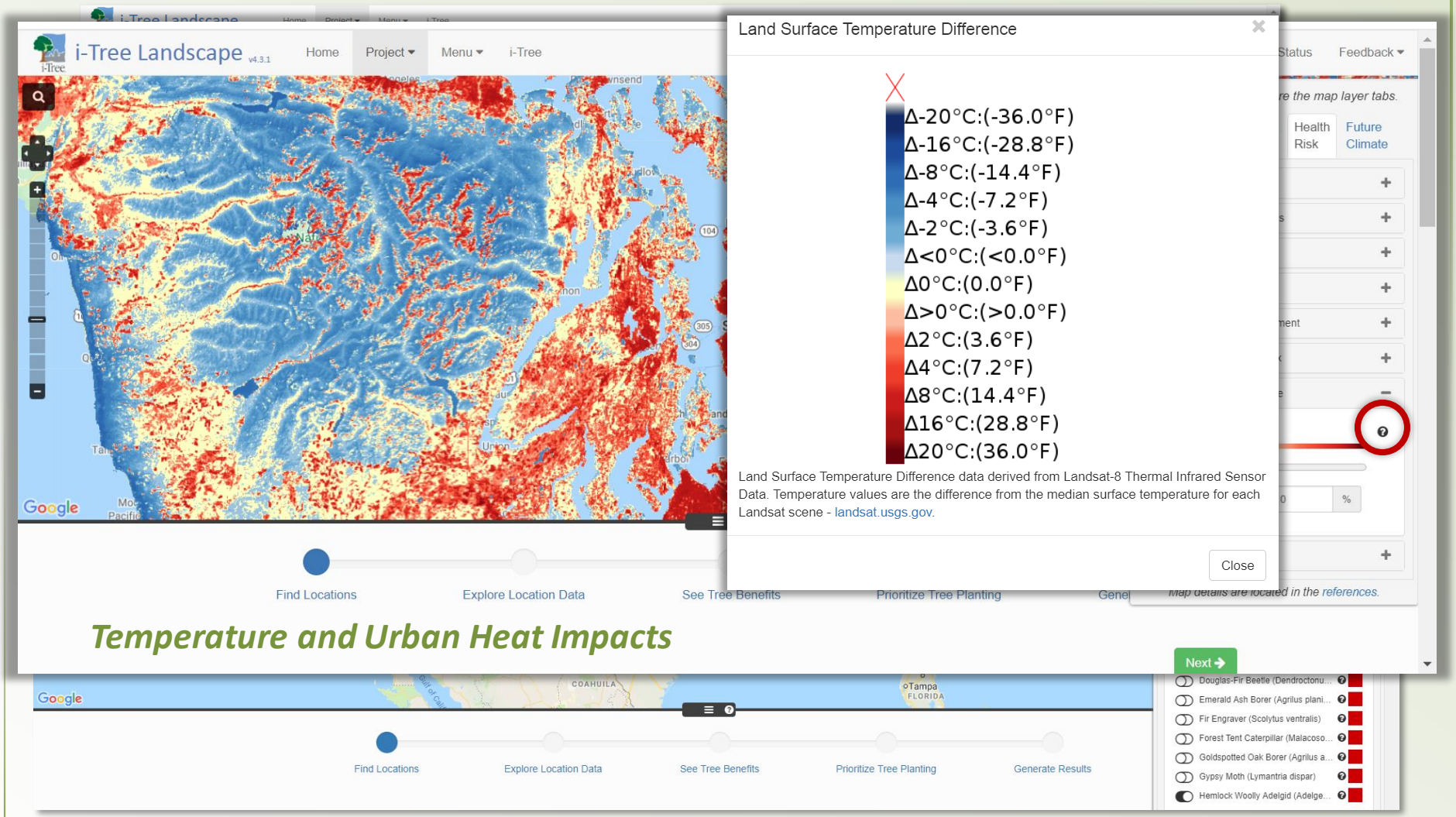
Canopy, Climate, and Census Data on a National Scale



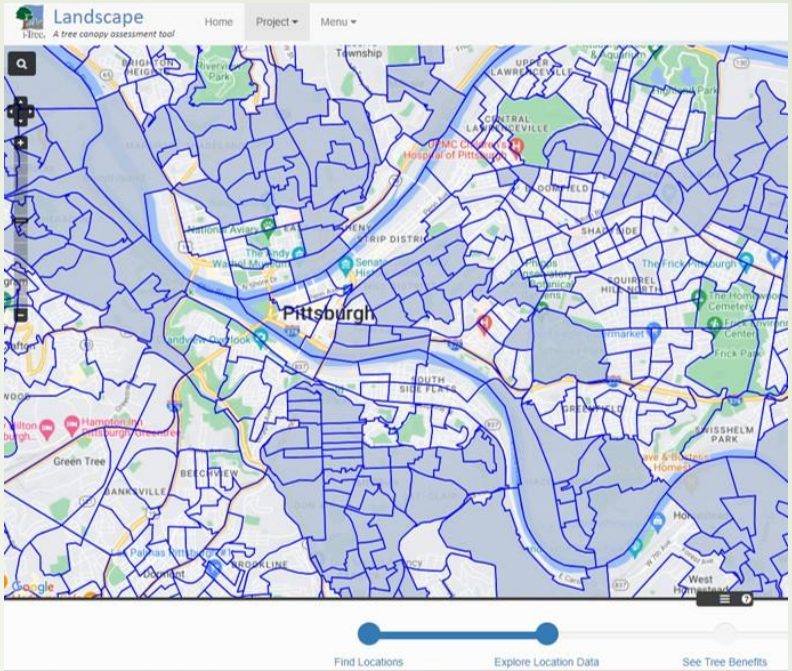
i-Tree Landscape

Benefits of Urban and Community Forests

- Mitigate flooding and stormwater runoff concerns
- Reduce urban heat island effects and energy costs
- Improve air quality and public health
- Mitigate greenhouse gas emissions

Delivering Benefits Where They Are Needed Most

- Landscape can help you build a custom prioritization analysis
- **Climate and Economic Justice Screening Tool Layers**
- Visuals and data to support funding requests



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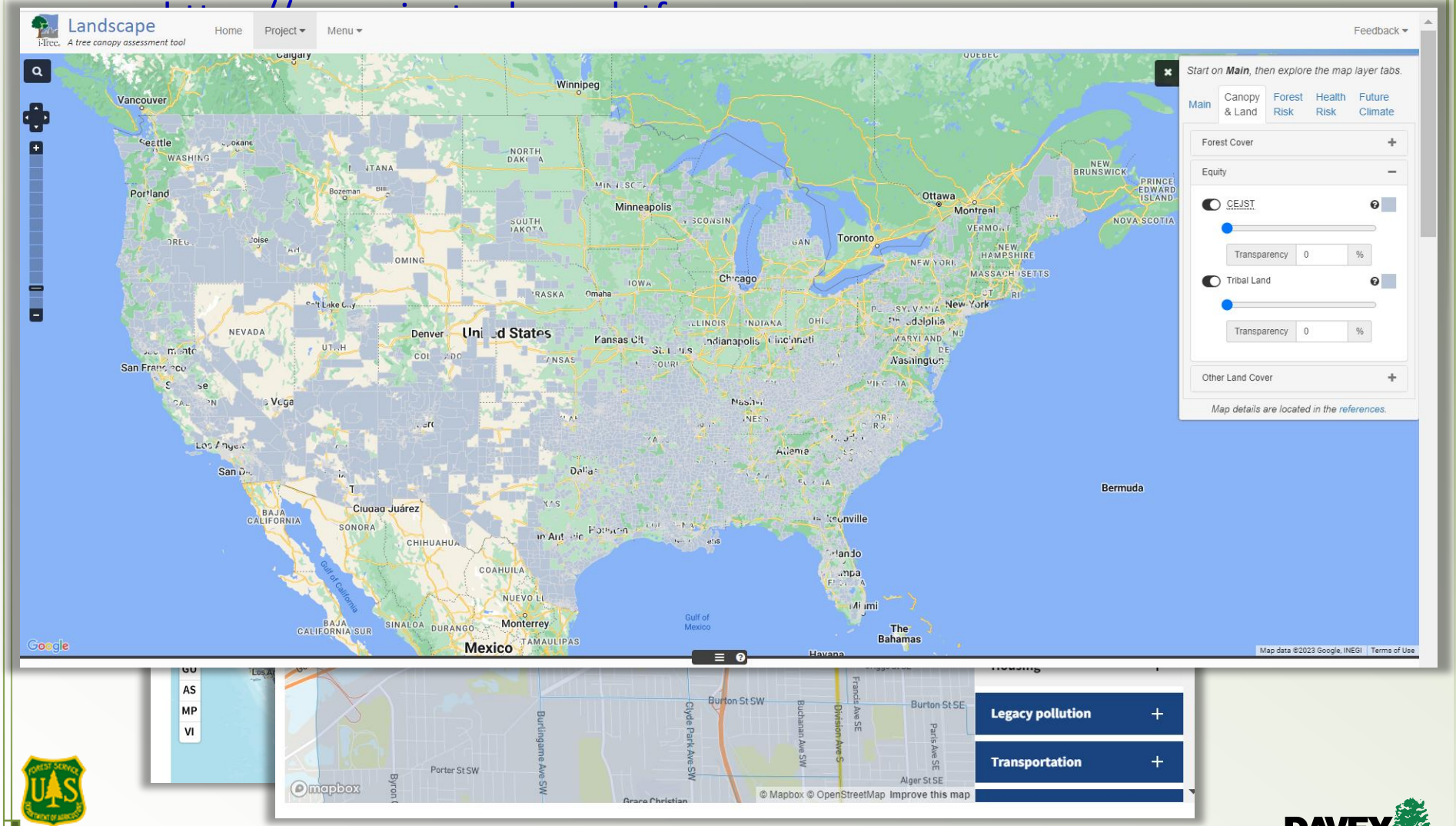
i-Tree Landscape

CEJST Community Designations



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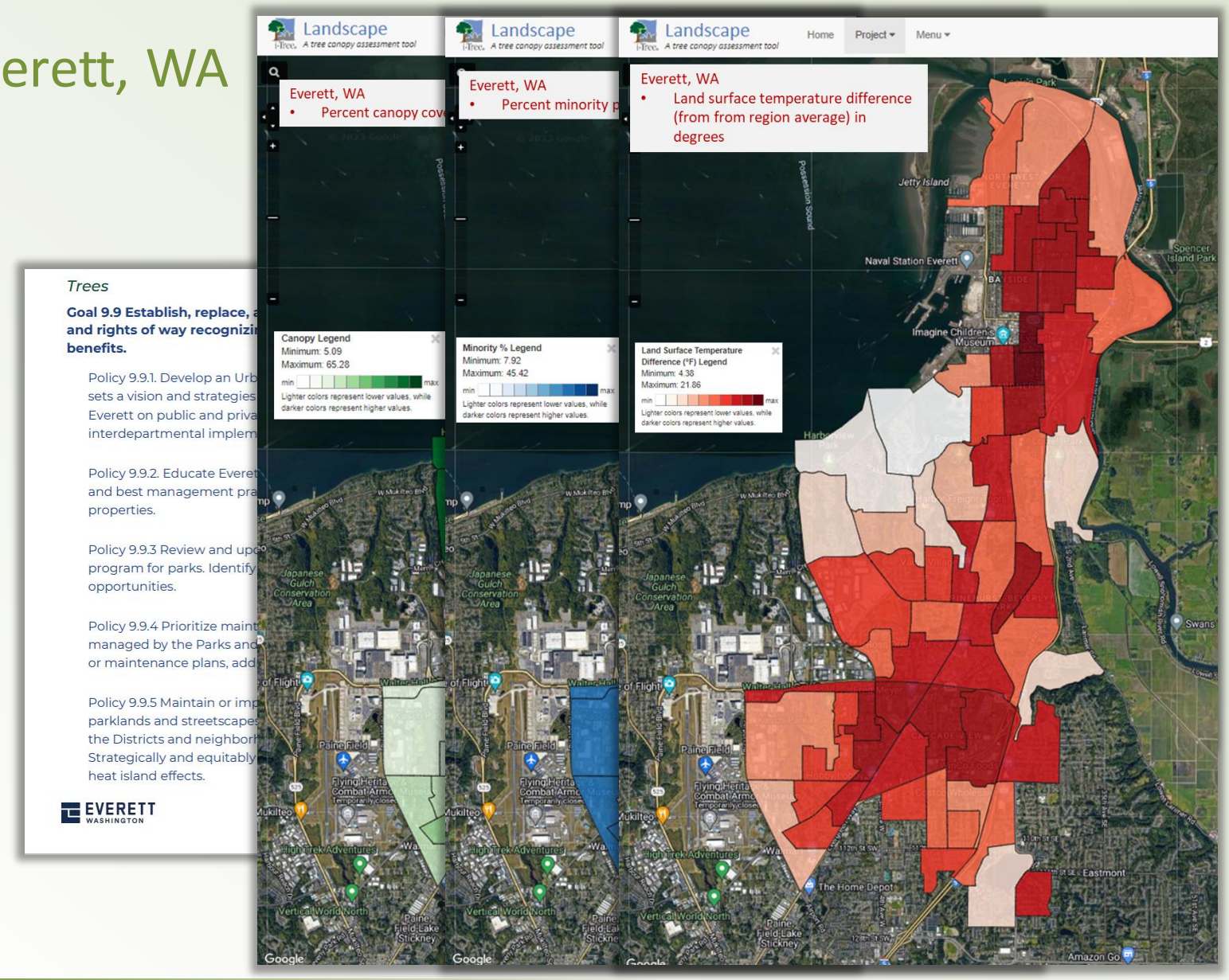
Benefits on a Community Scale

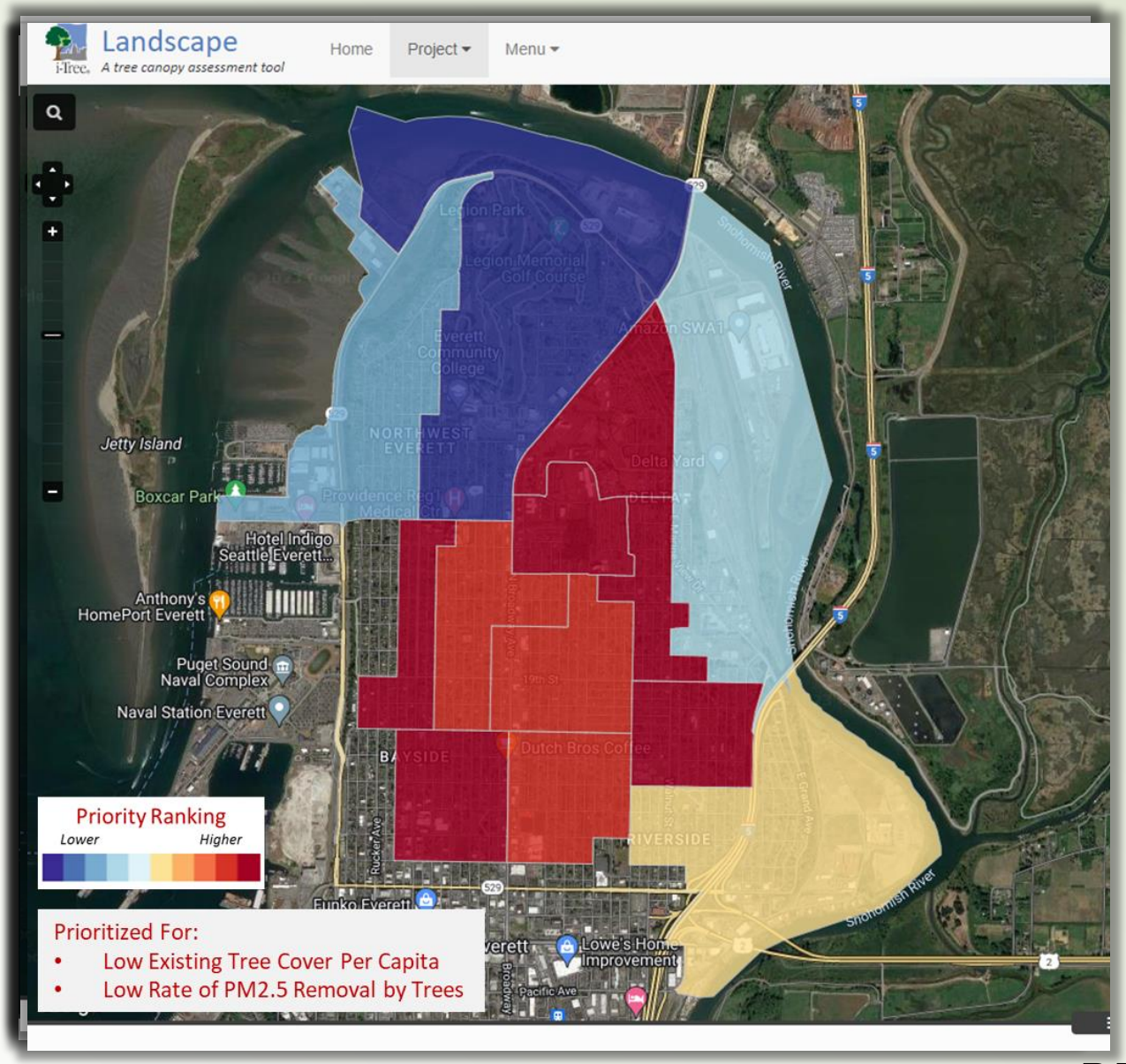
Everett, WA



Benefits on a Community Scale

Everett, WA

Delta Neighborhood



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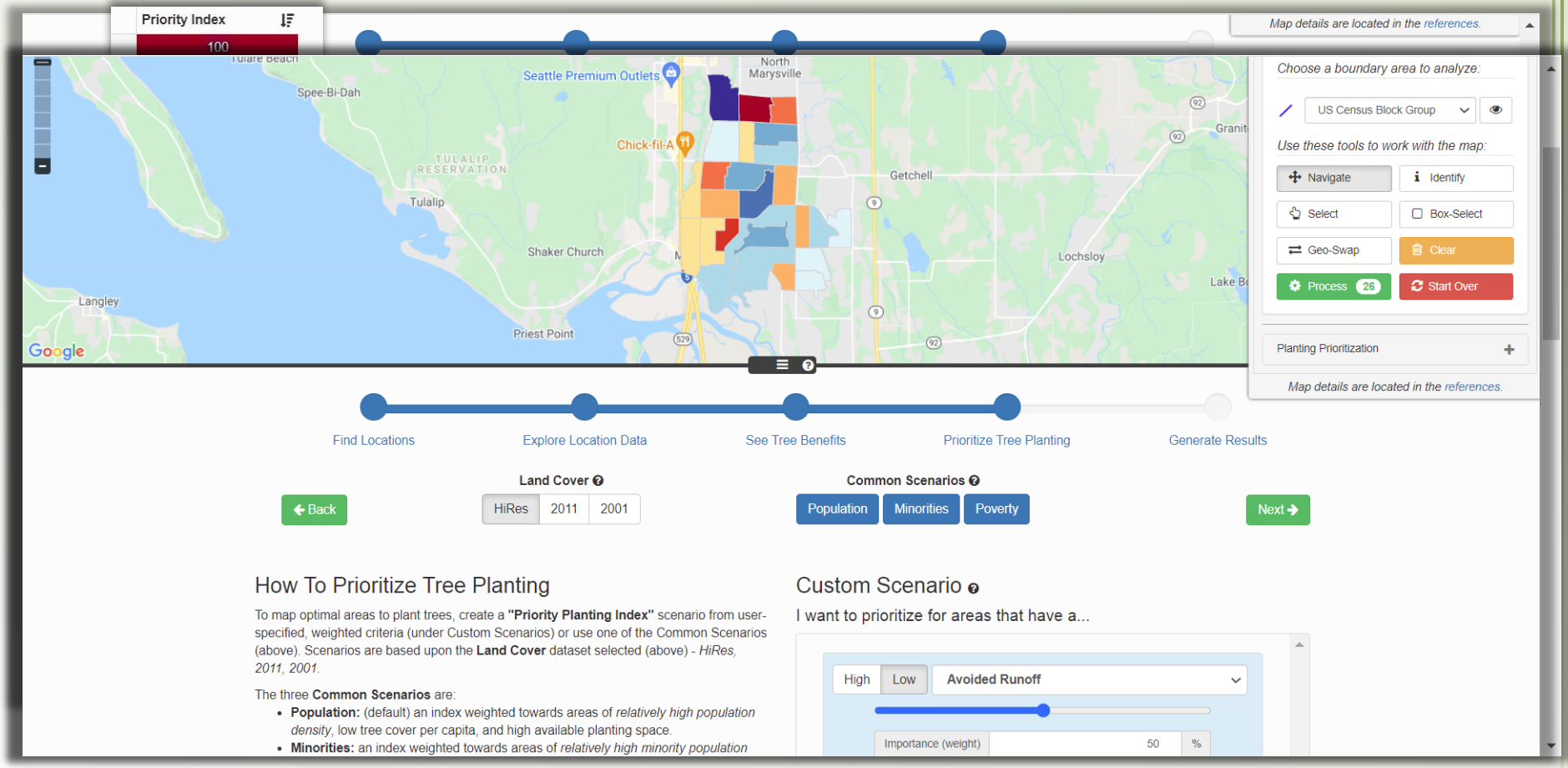
View Strengths and Priorities Across Geographies



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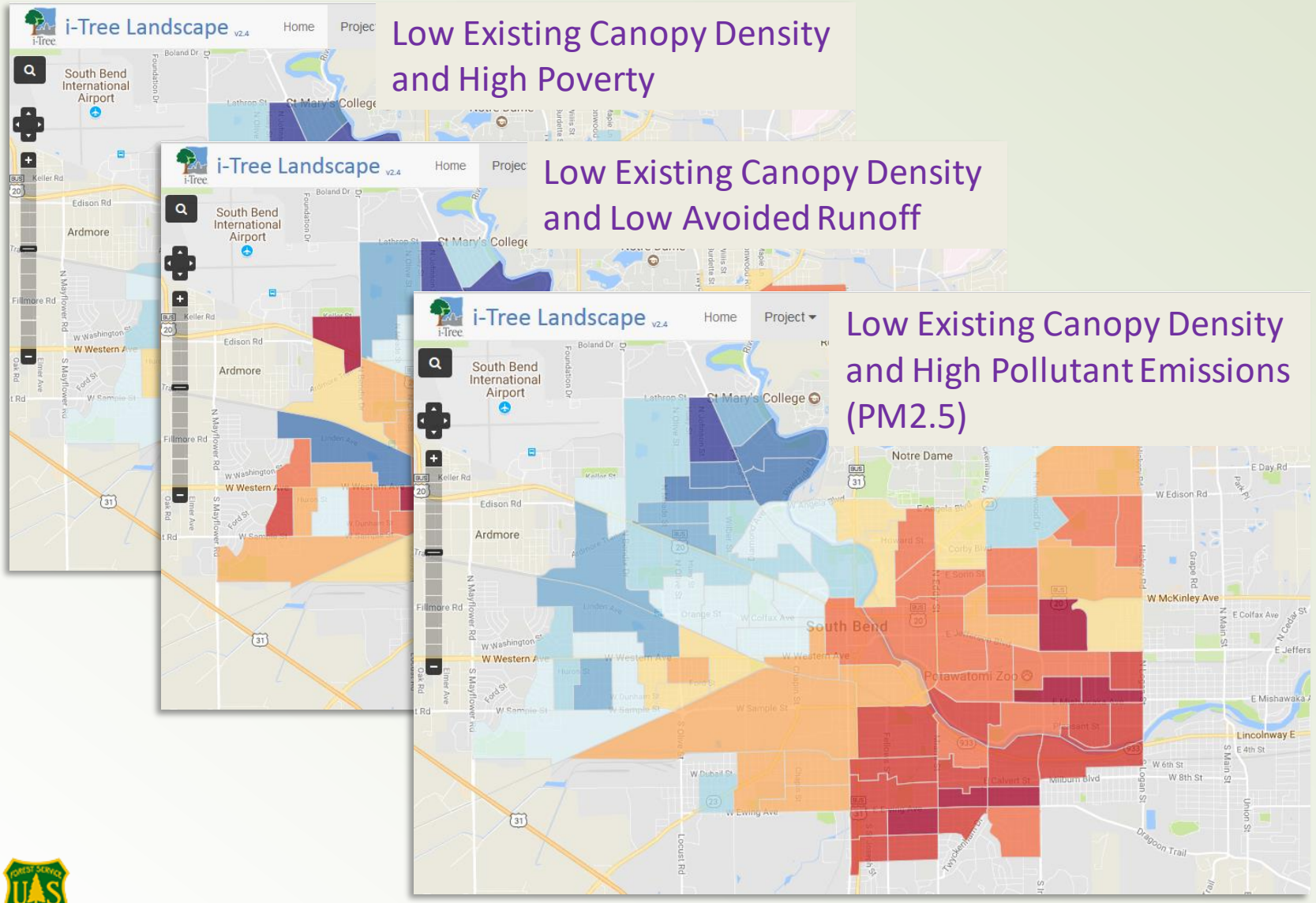
Inform Community Decisions and Prioritize Strategies



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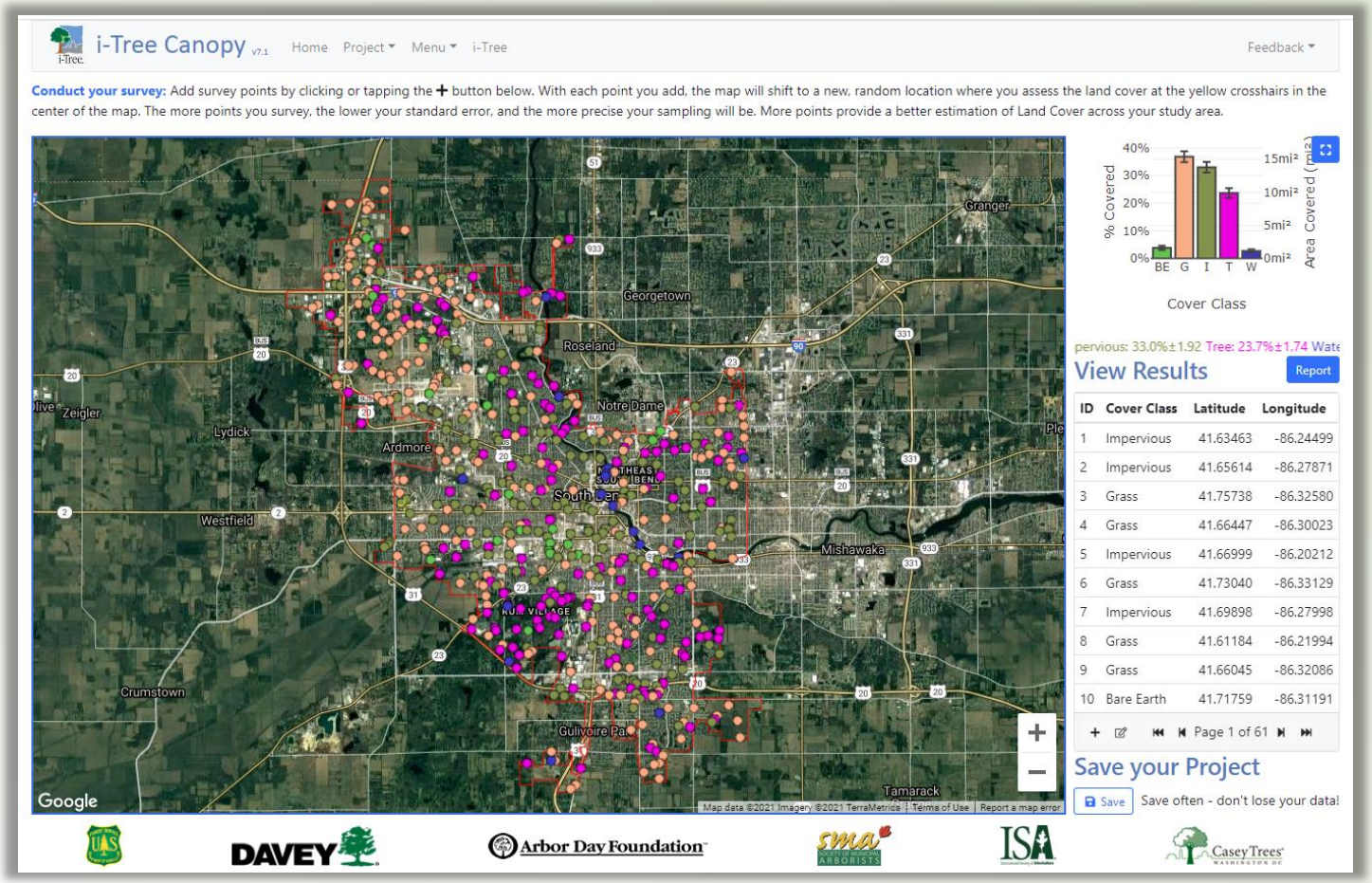
Benchmark Canopy Assets

- **i-Tree Canopy**
  - Combining the magic of Google with US Forest Service science

There's a map for that…



canopy.itreetools.org

Benchmark Canopy Assets – i-Tree Canopy

- The view from the top
  - Baseline assessment of your canopy cover: *what do I have?*
  - Estimate air pollution and carbon benefits of tree canopy, with associated dollar values
  - Ability to measure change over time

Land Use	Description	% Cover
Tree	Tree/Large Shrub	23.7 ±1.74
Impervious	Road/Building/Other Impervious	33.0 ±1.92
Grass	Grass/Herbaceous/Crop	36.8 ±1.97
Bare Earth	Bare ground/Soil	3.83 ±0.78
Water	Water	2.67 ±0.66

Benchmark Canopy Assets – i-Tree Canopy

- User-driven configuration
  - Random point sample survey of land use
  - Analysis considers your location factors

- *Complete a survey in an afternoon*
- CJEST tracts available for boundary selections

Tree Benefit Estimates: Carbon (English units)

Description	Carbon (kT)	±SE	CO_2 Equiv. (kT)	±SE	Value (USD)	±SE
Sequestered annually in trees	7.06	±0.52	25.87	±1.90	$915,276	±67,107
Stored in trees (Note: this benefit is not an annual rate)	217.02	±15.91	795.75	±58.34	$28,153,880	±2,064,197

Currency is in USD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Amount sequestered is based on 0.713 kT of Carbon, or 2.615 kT of CO_2, per mi²/yr and rounded. Amount stored is based on 21.940 kT of Carbon, or 80.446 kT of CO_2, per mi² and rounded. Value (USD) is based on $129,727.42/kT of Carbon, or $35,380.20/kT of CO_2 and rounded. (English units: kT = kilotons (1,000 tons), mi² = square miles)

Tree Benefit Estimates: Air Pollution (English units)

Abbr.	Description	Amount (T)	±SE	Value (USD)	±SE
CO	Carbon Monoxide removed annually	5.26	±0.39	$7,015	±514
NO2	Nitrogen Dioxide removed annually	19.83	±1.45	$8,586	±630
O3	Ozone removed annually	124.98	±9.16	$299,050	±21,926
SO2	Sulfur Dioxide removed annually	12.36	±0.91	$1,793	±131
PM2.5	Particulate Matter less than 2.5 microns removed annually	8.52	±0.62	$817,867	±59,965
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	34.86	±2.56	$218,527	±16,022
Total		**205.81**	**±15.09**	**$1,352,839**	**±99,188**

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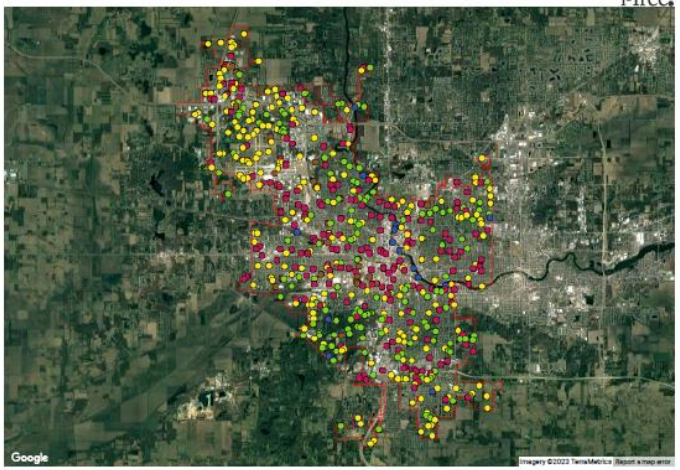
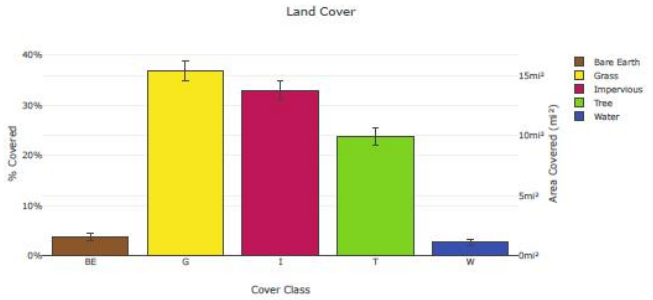
Benchmark Canopy Assets and Impacts

i-Tree Canopy

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 6/3/2023





Abbr.	Cover Class	Description	Points	% Cover ± SE	Area (mi²) ± SE
BE	Bare Earth	Bare ground/Soil	23	3.83 ± 0.78	1.60 ± 0.33
G	Grass	Grass/Herbaceous/Crop	221	36.83 ± 1.97	15.39 ± 0.82
I	Impervious	Road/Building/Other Impervious	198	33.00 ± 1.92	13.79 ± 0.80
T	Tree	Tree/Large Shrub	142	23.67 ± 1.74	9.89 ± 0.73
W	Water	Water	16	2.67 ± 0.66	1.11 ± 0.27
Total			600	100.00	41.80

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Currency is in USD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Air Pollution Estimates are based on these values in T/mi²/yr @ $/T/yr and rounded:
CO 0.532 @ $1,333.50 | NO2 2.005 @ $432.97 | O3 12.634 @ $2,392.86 | SO2 1.250 @ $145.05 | PM2.5 0.861 @ $95,979.82 | PM10* 3.524 @ $6,268.44 (English units: T = tons (2,000 pounds), mi² = square miles)

Tree Benefit Estimates: Hydrological (English units)

Abbr.	Benefit	Amount (Kgal)	±SE	Value (USD)	±SE
AVRO	Avoided Runoff	998.69	±73.22	$8,924	±654
E	Evaporation	5,014.88	±367.68	N/A	N/A
I	Interception	5,015.94	±367.76	N/A	N/A
T	Transpiration	12,269.59	±899.59	N/A	N/A
PE	Potential Evaporation	46,900.01	±3,438.63	N/A	N/A
PET	Potential Evapotranspiration	33,172.17	±2,432.13	N/A	N/A

Currency is in USD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Hydrological Estimates are based on these values in Kgal/mi²/yr @ $/Kgal/yr and rounded:
AVRO 100.962 @ $8.94 | E 506.978 @ N/A | I 507.085 @ N/A | T 1,240.391 @ N/A | PE 4,741.345 @ N/A | PET 3,353.532 @ N/A (English units: Kgal = thousands of gallons, mi² = square miles)

About i-Tree Canopy

The concept and prototype of this program were developed by David J. Nowak, Jeffery T. Walton, and Eric J. Greenfield (USDA Forest Service). The current version of this program was developed and adapted to i-Tree by David Ellingsworth, Mike Binkley, and Scott Maco (The Davey Tree Expert Company)

Limitations of i-Tree Canopy

The accuracy of the analysis depends upon the ability of the user to correctly classify each point into its correct class. As the number of points increase, the precision of the estimate will increase as the standard error of the estimate will decrease. If too few points are classified, the standard error will be too high to have any real certainty of the estimate.

Additional support provided by:

canopy.itreetools.org

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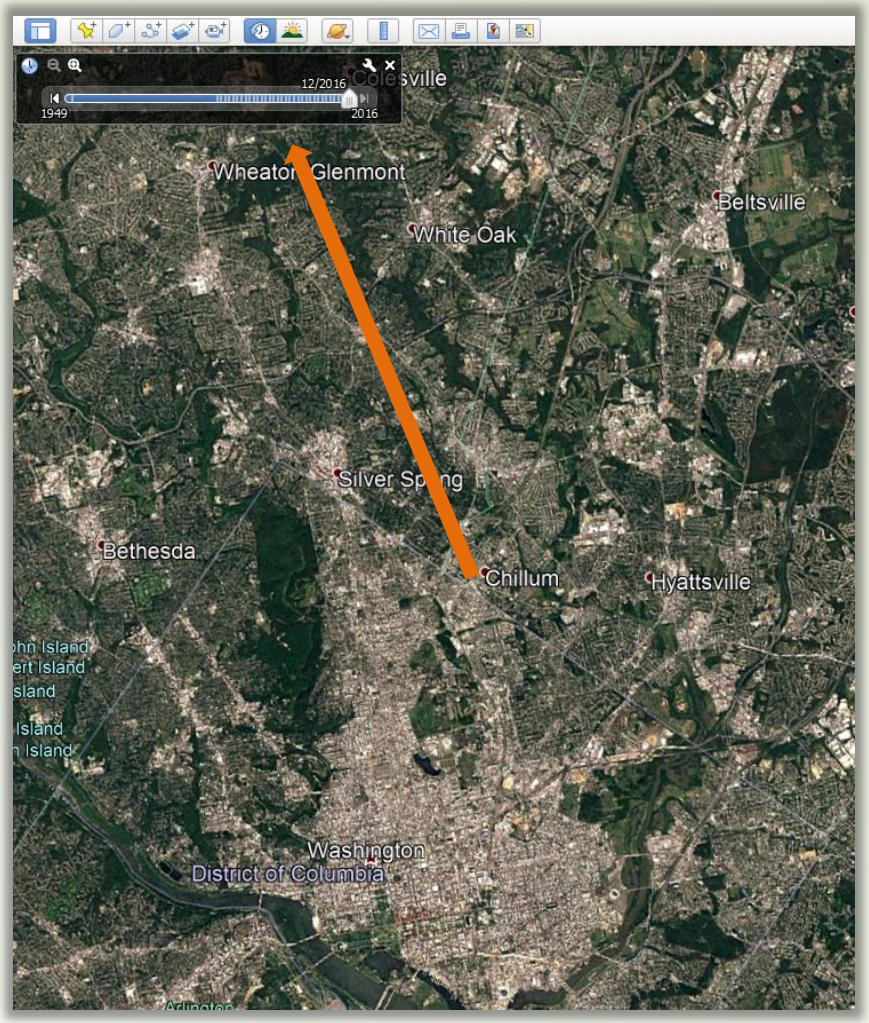
Canopy Change Survey

- Utilizes **Google Earth Pro** to evaluate trends and projects with historic images
  - Free to download
  - Canopy points to KML
  - Capture changes to your sample over time

Land Use	2005	2016
Tree	23.0%	23.7% (+)
Impervious	32.1	33.0 (+)
Grass	38.4	36.8 (-)
Bare Ground	4.33	3.83 (-)
Water	2.16	2.67 (+)



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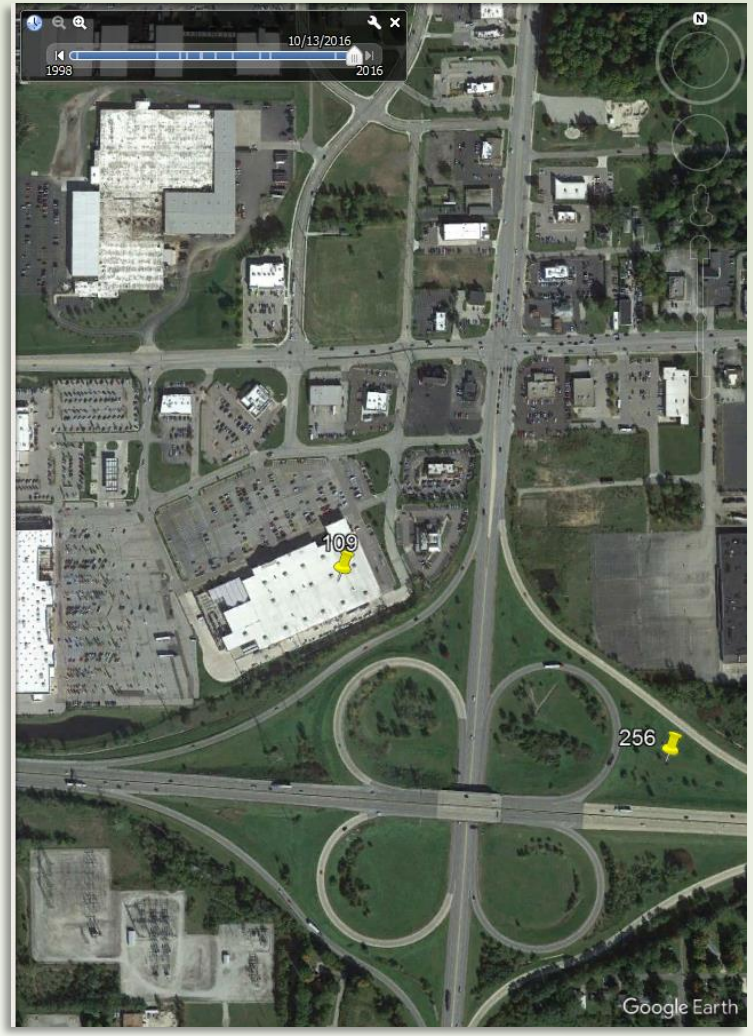
Canopy Change Over Time

2005

2016



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Canopy – Now What?

- Putting canopy in context can be meaningful to community stories
- Results can drive conversations with communities
  - Opportunities for input, engagement, and stewardship

- ***What you have, where you have it, and where you want to go next***

OAKS OF NORTH LAWNDALE

Community Roots That Grow On Trees

Spotlight: North Lawndale, Chicago, IL

The ways that trees benefit a community are as numerous as their branches. Planning for trees, understanding their benefits, planting them and caring for them fosters engagement, stewardship and sustainability.

When you add that to their public health and environmental advantages, trees can have a positive impact on neighborhoods for generations.

Inspired by the 7000 Oaks art installation, the Oaks of North Lawndale project partners neighborhood residents with the city and the School of the Art Institute of Chicago in an effort to nurture a greener, peaceful, and re-forested community.

In September 2017, SAIC set up its mobile foundry at their Homan Square campus, site of the project launch event with artist Pedro Reyes, who joined residents in the melting of weapons to create shovel heads which were used to plant the first trees.

The Oaks of North Lawndale project could raise canopy coverage in the neighborhood to at least 23%, representing an increase of more than 38% over current canopy amounts.

Trees would be planted over a multi-year period, providing opportunities for sustained collaboration among neighbors, artists and educators at SAIC, a local tree nursery and gardeners, the North Lawndale Employment Network and job skills training programs, along with other organizations.

Trees in urban environments are known to...

...improve human health.
- Improve air quality
- Improve respiratory health, overall well-being, and reduce stress
- Protect from harmful UV light

...benefit the community.
- Reduce crime by fostering neighborhood social interactions
- Lower summer air temperatures and reduce energy costs
- Provide aesthetic benefits and promote community equity
- Enhance property values

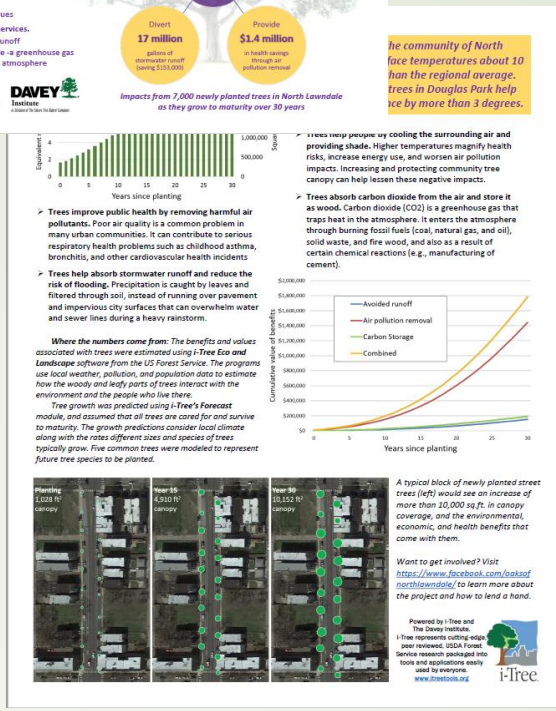
... provide environmental services.
- Reduce stormwater runoff
- Absorb carbon dioxide -a greenhouse gas that traps heat in the atmosphere

Shade: **3.5 million** square feet (about 60 football fields)
Store: **1500 tons** of carbon ($189,000)
7,000 trees can
Add: **$6.8 million** to landscape value based on mature tree worth
Divert: **17 million** gallons of stormwater runoff (saving $153,000)
Provide: **$1.4 million** in health savings through air pollution removal

Impacts from 7,000 newly planted trees in North Lawndale as they grow to maturity over 30 years

SAIC School of the Art Institute of Chicago

DAVEY Institute



he community of North face temperatures about 10 han the regional average. trees in Douglas Park help ce by more than 3 degrees.

Years since planting

- **Trees improve public health by removing harmful air pollutants.** Poor air quality is a common problem in many urban communities. It can contribute to serious respiratory health problems such as childhood asthma, bronchitis, and other cardiovascular health incidents
- **Trees help absorb stormwater runoff and reduce the risk of flooding.** Precipitation is caught by leaves and filtered through soil, instead of running over pavement and impervious city surfaces that can overwhelm water and sewer lines during a heavy rainstorm.

Where the numbers come from: *The benefits and values associated with trees were estimated using* ***i-Tree Eco and Landscape*** *software from the US Forest Service. The programs use local weather, pollution, and population data to estimate how the woody and leafy parts of trees interact with the environment and the people who live there.*

Tree growth was predicted using ***i-Tree's Forecast*** *module, and assumed that all trees are cared for and survive to maturity. The growth predictions consider local climate along with the rates different sizes and species of trees typically grow. Five common trees were modeled to represent future tree species to be planted.*

- **Trees help people by cooling the surrounding air and providing shade.** Higher temperatures magnify health risks, increase energy use, and worsen air pollution impacts. Increasing and protecting community tree canopy can help lessen these negative impacts.
- **Trees absorb carbon dioxide from the air and store it as wood.** Carbon dioxide (CO_2) is a greenhouse gas that traps heat in the atmosphere. It enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, and fire wood, and also as a result of certain chemical reactions (e.g., manufacturing of cement).

Avoided runoff
Air pollution removal
Carbon Storage
Combined

Cumulative value of benefits

Years since planting

Planting 1,028 ft² canopy
Year 15 4,930 ft² canopy
Year 30 10,152 ft² canopy

A typical block of newly planted street trees (left) would see an increase of more than 10,000 sq.ft. in canopy coverage, and the environmental, economic, and health benefits that come with them.

Want to get involved? Visit https://www.facebook.com/oaksofnorthlawndale/ to learn more about the project and how to lend a hand.

Powered by i-Tree and The Davey Institute. i-Tree represents cutting-edge, peer reviewed, USDA Forest Service research packaged into tools and applications easily used by everyone. www.itreetools.org

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