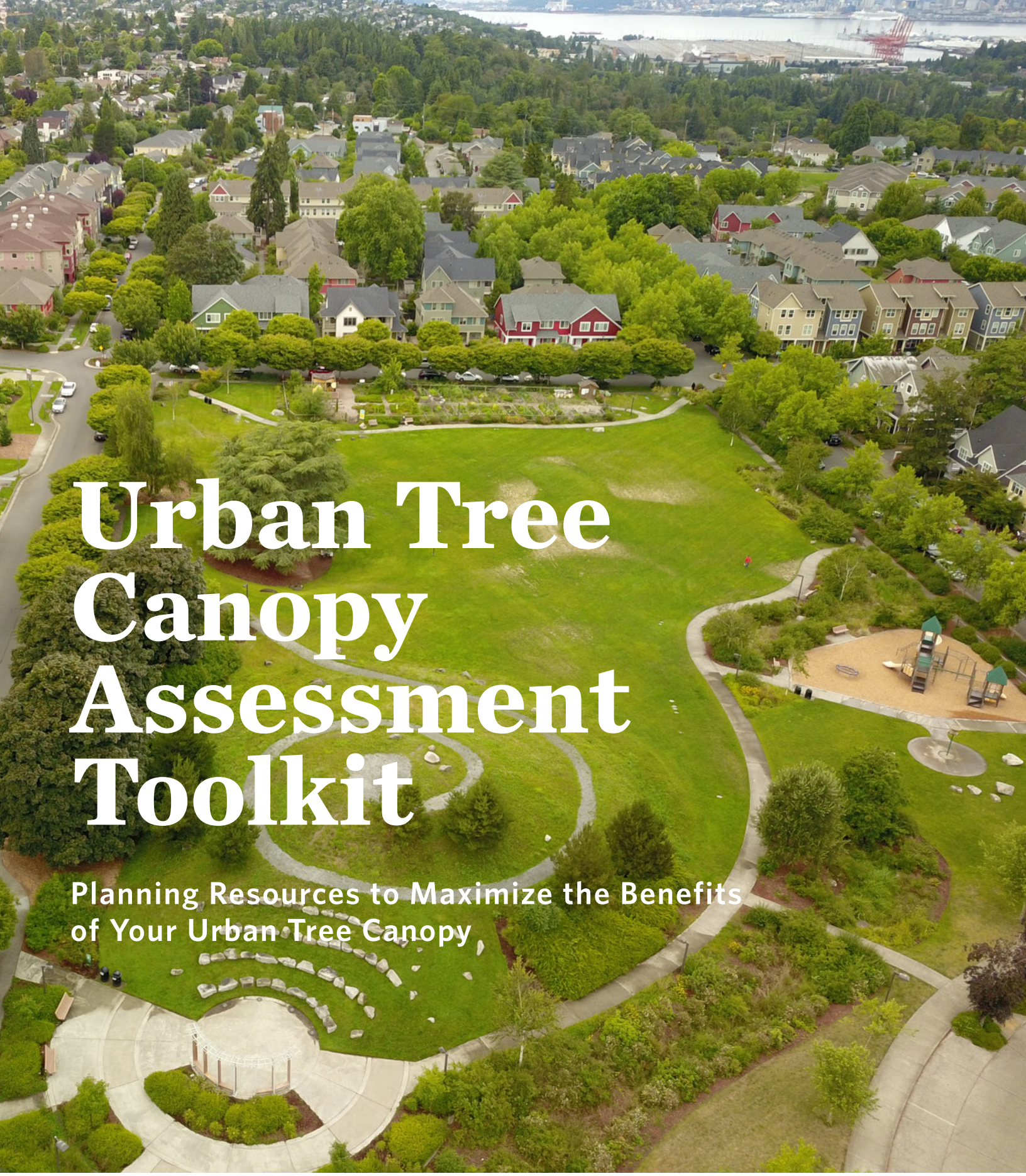


Urban Tree Canopy Assessment Toolkit

Planning Resources to Maximize the Benefits of Your Urban Tree Canopy

The Nature Conservancy
Washington

TABLE OF CONTENTS

Acknowledgements

Funds for this project were provided by the USDA Forest Service Urban and Community Forestry Program, administered through the State of Washington Department of Natural Resources Urban and Community Forestry Program.

Contributors to the toolkit: Eric Candela (American Forests), Krista Heinlein (Davey Tree), Liz Johnston (City Forest Credits), Scott Maco (Davey Tree)

Authors: Hannah Kett (The Nature Conservancy), Lorraine Nay (Independent Contractor)

BACKGROUND

Within our cities and towns, the trees that line our streets, fill our parks and shade our streams provide people and nature with a multitude of benefits—seen and unseen. These trees help clean the water flowing into streams, rivers and Puget Sound, help purify the air we breathe, cool our neighborhoods—and so much more.

AS THE PUGET SOUND REGION'S cities and towns experience increasing growth, identifying opportunities to invest in high-impact tree planting and preservation based on local priorities is a fundamental step to ensuring people will continue to receive the myriad benefits trees provide.

Urban tree canopy assessments are foundational to understand the amount and distribution of tree canopy cover in a community to set goals and targets to strategically increase canopy cover and prioritize protection of existing tree canopy. However, our cities often lack the resources to support urban tree canopy assessments as well as efforts to expand, manage and protect urban tree canopy based on the priorities of their individual communities.

With these challenges in mind, a coalition was formed with the following goals:

1. Create a regional high-resolution urban tree canopy assessment based on best available science to prioritize urban tree canopy projects that achieve the highest return on investment.

2. Pilot urban forest carbon credit projects to tap new sources of funding.

Funding from the USDA Forest Service Urban and Community Forestry Program, administered through the State of Washington Department of Natural Resources supported collaboration across The Nature Conservancy, Davey Tree Expert Company, American Forests, and City Forest Credits in developing a suite of resources to deliver on these goals.

The outcome is the **Urban Tree Canopy Model**. The model provides Central Puget Sound municipalities, organizations and tree advocates with the data and tools to prioritize tree planting and preservation that supports multiple benefits: reduced stormwater pollution, improved air quality, captured carbon, expanded habitat, health and well-being, and social equity. Carbon financing resources supplement the model as a new form of funding to support implementation.

Now, practitioners in the region and beyond can access these resources and engage with the partners behind the effort. The Urban Tree Canopy Assessment Toolkit provides guidance and resources to get started.

The Urban Tree Canopy Assessment Toolkit is based on 3 years of collaboration across local, regional and national partners to conduct a coordinated urban tree canopy assessment and consistent priority ranking for tree planting opportunities across the region based on stormwater mitigation, reducing urban heat island and promoting social equity.

THE PROJECT FOCUSED ON THE densely populated area of the region – which includes 77 cities in the Puget Sound Urban Growth Area and seven other unincorporated areas across three counties: King, Pierce and Snohomish, and demonstrates a regional approach for urban tree canopy assessment and prioritization.

The process was designed to be adapted and applied by other regions in Washington State and across the United States. The toolkit supports practitioners in learning from this process and helps them develop a high-resolution assessment and prioritization of the tree canopy in their region.

HOW CAN THIS TOOLKIT BE USED?

Here are some examples of how the resources in this toolkit might be used in guiding your urban forestry management decisions, in Puget Sound and beyond:

- Communicate to decision-makers the ecosystem service value of existing trees in your neighborhood, city or region
- Prioritize future planting opportunities through an equity lens at the census block or neighborhood scale through an easy-to-use tool
- Use the high-resolution tree canopy assessment to identify specific blocks to target for tree planting or preservation
- Reduce vulnerability of your urban tree canopy to impacts of climate change with a climate species guide
- Plan tree planting projects with a specific understanding of the benefits that could be achieved, the number of trees required, and the potential revenue they can generate for maintenance through carbon credits

PARTNERS INVOLVED IN THE CENTRAL PUGET SOUND PROJECT

Davey Tree – Davey's environmental consulting team collected the tree canopy data and synthesized the data with locally-informed criteria for environmental, human health, and socio-economic equity priorities to develop the assessment and priority rankings for tree planting opportunities in the region.

American Forests – American Forests incorporated the tree canopy data into the national Tree Equity Score tool and collaborated with the Northern Institute of Applied Climate Sciences to produce the Climate Adaptive Species Guide.

City Forest Credits – Worked with local jurisdictions to educate them about carbon credits opportunities, identified eligible publicly-owned sites for tree planting or preservation, and provided guidance on registering projects and completing the crediting process.

The Nature Conservancy – Managed the funding, facilitated the process and assisted the team in developing a science-based approach. The Nature Conservancy also served as the place-based partner to engage local jurisdictions and practitioners in the project.

These tools and resources developed for the Central Puget Sound urban growth area are available to help practitioners in the region prioritize tree planting for urban forest management efforts.

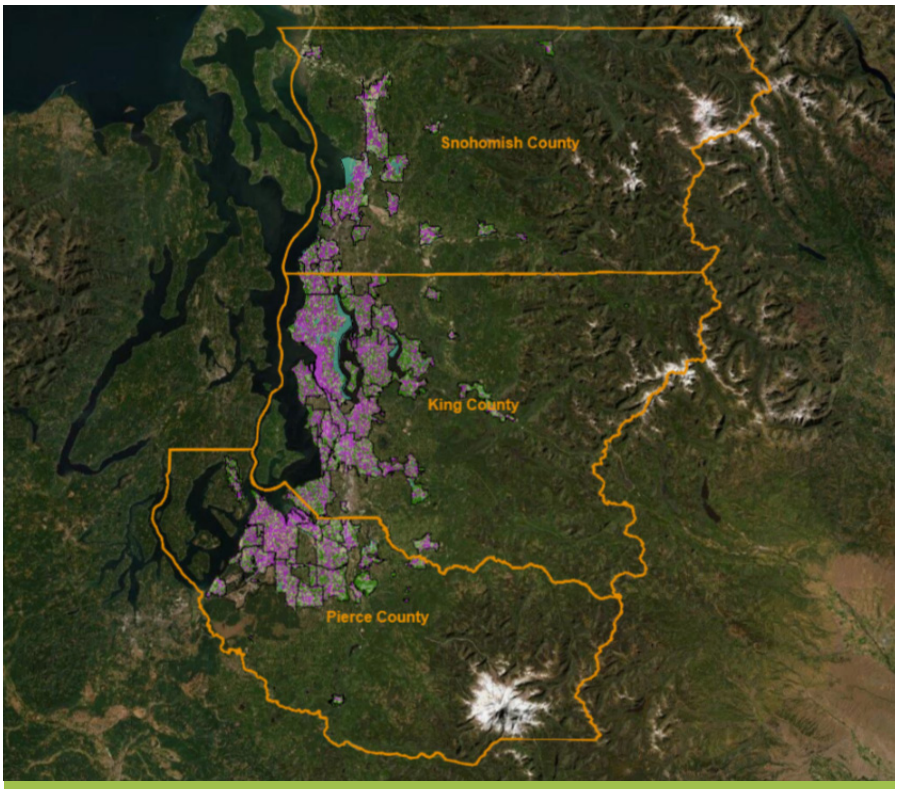
HIGH-RESOLUTION URBAN TREE CANOPY ASSESSMENT

To help the communities in the Puget Sound area mitigate against the threats to its ecosystems by rapid urbanization, an urban tree canopy assessment was conducted by the Davey Resource Group. The study was completed in 2020 using NAIP aerial imagery and existing land cover dataset from 18 cities to create a high-resolution view of the urban tree canopy.

The canopy data layers can be downloaded from the Washington State Department of Natural Resources GIS Open Data site.

The datasets were used to find suitable planting locations within public and private properties. High priority planting locations were identified by analyzing each site to assign a priority ranking for stormwater, urban heat island, social equity, and a composite overall ranking. Visit the assessment report website to learn more. The data was also incorporated into the I-Tree Landscape and Tree Equity Score tools.

i-Tree Landscape ® is host to the high-resolution urban tree canopy data within the urban growth areas of Pierce, King and Snohomish counties. Use this tool to explore tree canopy, land cover, possible planting areas and information about the ecosystem benefits provided by the tree canopy. The tool helps you compare different geographic areas and highlights specific ecosystem values for prioritizing urban tree canopy efforts. For more information, view the Davey Resource Group led webinar that provides a primer for utilizing this data rich tool.



A zoomed out look at the Urban Canopy Priority Planting Assessment

Tree Equity Score, developed by American Forests, explores the alignment between population density, tree canopy, surface temperature, income, employment, race, age and health. The tool has incorporated the high-resolution tree canopy data produced by Davey Resource Group for the Central Puget Sound urban areas. For more information, view the American Forests webinar on how the Tree Equity Score supports prioritization, planning and decision making.

CLIMATE SPECIES GUIDE

The Puget Sound region will continue to experience increased impacts from climate change, and it's important that we are planting with these impacts in mind. The Northern Institute of Applied Climate Science (NIACS) conducted a tree species vulnerability analysis and developed a tree species selection guide based on anticipated climate change impacts in the region. The full report, Puget Sound Regional Climate Projects and Tree Species Vulnerability Assessment, digs into the data while a shorter 3-page document provides a high-level view of the assessment and adaptability of different tree species. This webinar led by the NIACS team explains how they developed the guide.

URBAN ADAPTABILITY:

- \+ ***High:*** *Species may perform better than modeled*
- • ***Medium***
- – ***Low:*** *Species may perform worse than modeled*

ZONE SUITABILITY:

- ✓ ***Suitable***
- ✕ ***Not Suitable***

VULNERABILITY:

- ▼ ***Low:*** *Suitable zone, high adaptability*
- ● ***Low-moderate:*** *Suitable zone, medium adaptability*
- ⊖ ***Moderate:*** *Suitable zone, low adaptability or zone not suitable, high adaptability*
- ○ ***Moderate- high:*** *Zone not suitable, medium adaptability*
- △ ***High:*** *Zone not suitable, low adaptability*

**Invasive species*

© Hannah Letinich

7-STEPS TO BUILDING AN URBAN TREE CANOPY MODEL

This guidance was developed using the framework and lessons learned from the Central Puget Sound project. While the approach your region may take will be shaped by local circumstances, here are basic steps to consider for your project based on lessons from Central Puget Sound:

1. Get organized

Build partnerships and secure funding. Partners include local and regional municipal stakeholders and expert resources. By bringing together a diverse set of partners, you can best leverage expertise and ensure the quality of the final product.

2. Identify local priorities

To ensure you are collecting and organizing the data that is most relevant, engage local municipalities, program partners and others to identify environmental, human health, and equity priorities. As part of this process, identify what prioritization tools already exist in your region that can be used to inform your project.

3. Capture tree canopy data

Collect and assemble existing urban forestry canopy cover datasets. In areas where current data does not exist, consider producing high-resolution GIS-based land cover layers at a regional scale using 1m color infrared aerial imagery and remotely-sensed data.

4. Identify high impact planting opportunities

Use the regional priorities and the available data layers to identify suitable planting locations across public and private property. Composite overall rankings focused on desired benefits or priorities (such as social equity, stormwater, urban heat island, etc.) assist decision makers in identifying high value planting projects.

5. Support place-based prioritization

To ensure place-based prioritization, consider incorporating the data into tools that allow practitioners in your region to explore different prioritization scenarios. Use Tree Equity Score to compare different census blocks based on equity considerations. With I-Tree Landscape you can create tree planting maps based on specific parameters for ecosystem services.

6. Prepare for the impacts of climate change

Develop a climate species guide to evaluate your existing trees and support species selection for future projects. The guide should include an analysis of anticipated climate trends and identify suitable climate-ready trees that are well-adapted to face present and future climatic challenges.

7. Consider carbon financing

Explore carbon credits as a funding source for planting or preservation with City Forest Credits.

These are some of the essential tools that can inform urban tree canopy management. By working with these tools in tandem, you can build an urban canopy management plan that best supports the priorities of your community.

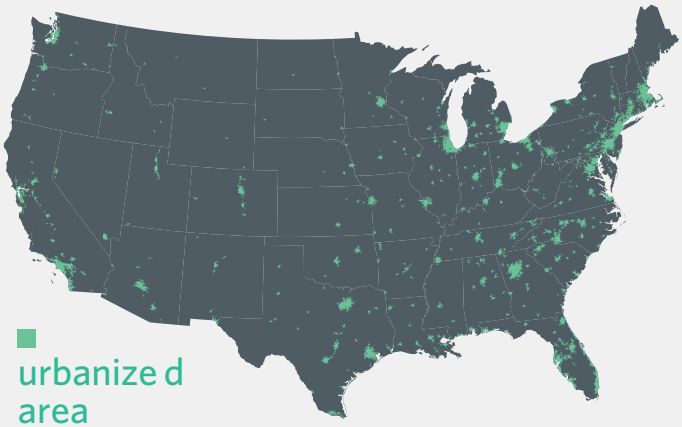
Tree Equity Score – Get started by learning how tree distribution relates to your region's equity priorities. Use the Tree Equity Score to examine how different census blocks compare when it comes to canopy coverage and other equity indicators.

i-Tree Landscape – Take a deeper look at the ecosystem services provided by trees in your landscape. This interactive tool enables you to explore and prioritize specific census blocks based your ecosystem service priorities.

Climate Species Guide - Optimize your planning for anticipated climate trends by developing a Climate Species Guide for your region.

© Hannah Letinich

Tree Equity Score



TES calculates scores based on how much tree canopy and surface temperature align with income, employment, race, age and health factors in the U.S. **Scores are available for 150,000 neighborhoods and 486 urbanized areas (places with at least 50,000 residents).** More than 70% of people in the U.S. live in one of these places. Each score indicates whether there are enough trees in specific neighborhoods or municipalities for everyone to experience the health, economic and climate benefits that trees provide.

TES uses
eight layers of data
to create scores:

- tree canopy
- population density
- income
- employment
- race
- age
- health
- surface temperature

The U.S. Census Bureau, U.S. Department of Agriculture, U.S. Geological Survey and EarthDefine were among the sources for data that contributed to the scores.

What is Tree Equity Score?

How do we know if there are enough trees in a neighborhood for everyone to reap the benefits? Tree Equity Score (TES) answers this question. The TES tool calculates scores based on how much tree canopy and surface temperature align with income, employment, race, age and health factors in the United States. Scores are available for 150,000 neighborhoods and 486 urbanized areas. Each score indicates whether there are enough trees in specific neighborhoods or municipalities for everyone to experience the health, economic and climate benefits that trees provide.

Why use Tree Equity Score?

The tree equity score metric is an essential ingredient for all who want to ensure an equitable urban tree canopy. Urban foresters have long recognized the relationship between tree canopy cover, race and income. The Tree Equity Score builds on that work. It provides a free and interactive platform at a national scale to explore this data and demonstrate the impact of tree planting on other equity outcomes. Local decision makers and advocates can use the scores to plant trees in the communities that need them most and allocate funding to ensure their long-term care.

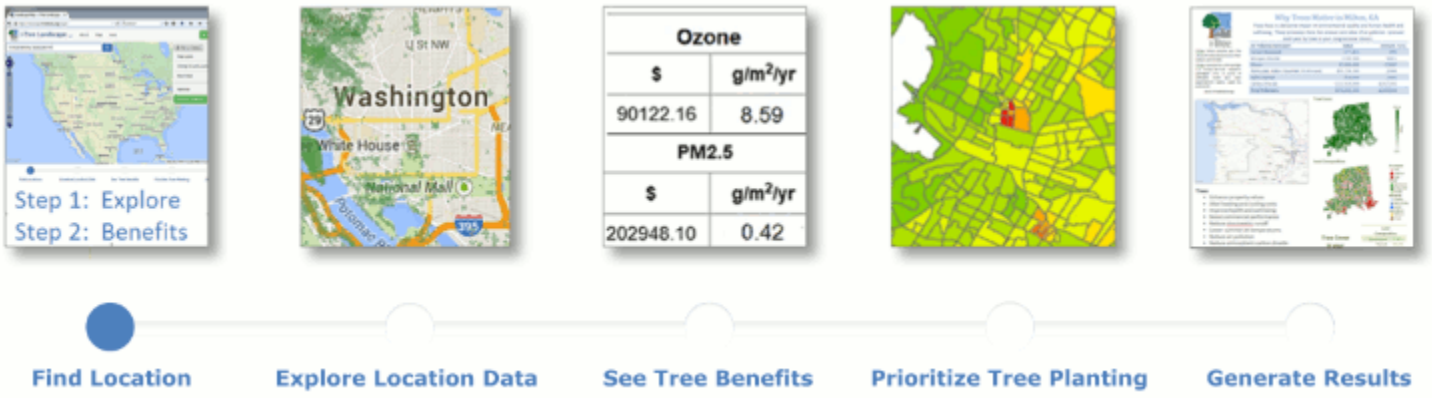
Getting Started

Get started by visiting the Tree Equity Score website and check out the user-friendly Tree Equity Score User Guide.

Resources

Tree Equity Score Fact FAQ

i-Tree Landscape



What is i- Tree Landscape?

i-Tree Landscape is a web browser application that uses tree canopy maps, land cover data and other types of data to spatially estimate ecosystem services of trees. It can help map optimal locations to plant or protect trees in order to sustain or enhance the ecosystem benefits based on user-specified parameters including existing land use, Census data, and impacts of climate change. Use i-Tree Landscape to explore tree canopy, land cover, and basic demographic information in a location of your choosing.

i-Tree Landscape also offers the opportunity to compare the ecosystem service value of trees across different census locations helping to emphasize the importance of specific ecosystem benefits, such as air quality, energy conservation and stormwater mitigation.

Why use i-Tree Landscape?

Using i-Tree modeling can provide tools and resources to help local and regional municipalities and other organizations effectively develop urban forestry management plans for multiple benefits including ecosystem, economic, social and human health.

With the information provided by i-Tree Landscape, you will learn about the benefits of trees in your selected location and see how planting trees will increase the benefits provided. Use the tool to map and explore the areas where you decide to prioritize your tree planting efforts and communicate recommendations to stakeholders.

Getting Started

i-Tree Landscape is a data rich tool. Get started by reviewing "How to Use i-Tree Landscape" to get the most out of the tool.

Resources

- i-Tree Landscape Overview Video
- i-Tree Landscape Fact Sheet

Explore High Resolution Tree Cover Data

i-Tree Landscape contains data from the National Land Cover Database of tree canopy and land use cover maps (30-m resolution) for most of the United States. Check out the High Resolution Land Cover Map to view cities and regions where high resolution data is available (10-m resolution or better) in i-Tree Landscape.

Climate Species Guide

What is a Climate Species Guide?

Trees can be vulnerable to a variety of climate-related stressors such as intense heat, drought, flooding, and changing pest and disease patterns. Tree species analysis based on anticipated climate change impacts is essential for assessing and planning a resilient urban tree canopy. Climate-ready tree species are those well-adapted to face both present and future climatic challenges. A climate species guide includes data and analysis of climate trends and related information on tree species resilience and suitability.

Why use a Climate Species Guide?

A climate species guide developed for your geography will help you evaluate the climate vulnerability of your existing trees by using it in conjunction with a tree inventory. In addition, it can help in the development of tools like recommended planting lists, by identifying which tree species are more adaptable and suitable for a location and least vulnerable under a changing climate.

Getting Started

Climate Change Response Framework provides an integrated set of tools, partnerships, and actions to support climate-informed conservation and management. View their Urban Forest content to find the resources and support to prepare a vulnerability assessment and tree selection guide for your region.

Resources

The Northern Institute of Applied Climate Science (NIACS) coordinates all Climate Change Response Framework projects in conjunction with their many partners.

© Hannah Letinich

CARBON FINANCING

What is Carbon Financing?

Carbon financing is an innovative funding tool that places a financial value on carbon emissions. Carbon registries issue verified carbon credits to projects that reduce or remove greenhouse gas emissions from the atmosphere. Credits can be sold on the voluntary carbon market to companies, cities, or organizations that want to offset their emissions.

How does it work?

City Forest Credits (CFC) is a national nonprofit carbon registry that serves one sector of carbon – the carbon stored in forests and trees in metropolitan areas in the United States. CFC establishes standards for quantifying and verifying urban forest projects, and issues and tracks credits in a secure online database. Companies can purchase verified carbon credits from municipalities, nonprofits, land trusts, and others leading carbon projects.

Why use Carbon Financing?

- New source of revenue. Urban forest leaders never have enough money to grow and care for city trees. Carbon credits provide a new source of revenue to fill the gaps.
- Increase community engagement. Carbon credits increase community engagement opportunities for participating businesses. Employees can volunteer, customers can see the benefits, and board members can witness neighborhoods being transformed.
- The carbon credits market is growing. While the global voluntary carbon market was estimated to be worth about $400 million in 2020, forecasts place the value of the sector between $10-25 billion by 2030. Additionally, climate action is increasingly important in the realm of corporate social responsibility and net zero commitments. By contributing to carbon offset projects, companies signal to consumers and investors that they're committed to taking action on climate change.

Getting Started

Get started by visiting the City Forest Credits website. Learn about the program, success stories, and standards that set the rules for carbon credits for tree planting or preservation projects.

Resources

City Forest Credits Carbon Protocols

Carbon Credits Defined

A carbon credit is one metric ton of carbon dioxide, however City Forest Credits amplifies the impact with Carbon+ Credits for urban forest projects. Each credit also quantifies rainfall interception, air quality, and energy savings through cooling and heating effects, with metrics expressed in resource units and avoided costs.

Case Story: Pierce Conservation District Pilots Carbon Financing

The Pierce Conservation District (CD) is the first conservation district in the country to launch an urban forest carbon program that will generate a new revenue source for reforesting and maintaining riparian habitat.

With funding support from a Boeing grant, Pierce CD was able to launch its carbon credit program in 2019 with two pilot sites—a 1.5-acre restoration site along Clarks Creek in partnership with the city of Puyallup, and a 7.5-acre restoration site at the South Prairie Creek Preserve property.

Clarks Creek sits in the middle of the city center and is part of a recreational corridor connecting different parks. The pilot project will enhance users' experiences and improve water quality for many different species of salmon. South Prairie Creek, a major tributary of the Carbon River, is some of the most productive spawning grounds for endangered Chinook salmon in the Puyallup watershed and is part of a much larger ongoing restoration project.

The CD planted 3,700 trees following rigorous protocols in order to meet voluntary carbon market standards. City Forest Credits and a third-party verifier completed the validation and verification process regarding the eligibility, planting design and carbon quantification for the planting project.

Adhering to City Forest Credits protocols, trees at these two sites will sequester 4,588 tons of carbon dioxide over a 25-year period that will produce credits that can then be sold to fund both sites' long-term maintenance. Companies can purchase credits directly from the CD, providing an opportunity for local investment in places important to their business and where people live, work, and recreate.

The CD has plans to continue expanding this effort by planting approximately 10 to 15 acres every year; another 5,000 publicly-owned acres have already been identified for more plantings. Pierce CD is leading the way in showing how reforestation projects can be funded through carbon credits, creating more green space in metropolitan areas and enriching the health and well-being of communities.

Sources: City Forest Credits, Pierce Conservation District, Puget Sound Partnership Making Waves.

American Forests

American Forests Website
https://www.americanforests.org/

Central Puget Sound Urban Tree Canopy Assessment

Washington State Department of Natural Resources GIS Open Data
https://data-wadnr.opendata.arcgis.com/

Central Puget Sound Tree Canopy GIS Story Map
https://gis.davey.com/pugetsound/

City Forest Credits

City Forest Credits Protocols
https://www.cityforestcredits.org/carbon-credits/carbon-protocols/

City Forest Credits Website
https://www.cityforestcredits.org/

Climate Species Guide Resources

Northern Institute of Applied Climate Science (NIACS)
https://forestadaptation.org/contact

Puget Sound Region Climate Projections and Tree Species Vulnerability
https://forestadaptation.org/assess/ecosystem-vulnerability/urban/puget-sound-region

Urban Forest Vulnerability Assessment Resources
https://forestadaptation.org/assess/ecosystem-vulnerability/urban

Davey Resource Group

Davey Resource Group Website
https://www.davey.com/davey-resource-group

I-Tree Landscape

How to Use I-Tree Landscape
https://landscape.itreetools.org/help/

I-Tree Landscape Fact Sheet
https://www.itreetools.org/documents/174/Landscape_factsheet.pdf

I-Tree Landscape Overview Video
https://www.youtube.com/watch?v=2xwTeq-QdyI

I-Tree Landscape Website
https://landscape.itreetools.org/

The Nature Conservancy

The Nature Conservancy Website
https://www.nature.org/

The Nature Conservancy in Washington Cities Program
www.washingtonnature.org/cities/trees

Tree Equity Score

Tree Equity Score Fact FAQ
https://www.treeequityscore.org/faq/

Tree Equity Score User Guide
https://www.treeequityscore.org/user-guide/

Tree Equity Score Website
https://www.treeequityscore.org/

Washington State Department of Natural Resources

Urban and Community Forestry in Washington State
https://dnrtreelink.wordpress.com/


The Nature
Conservancy
Washington