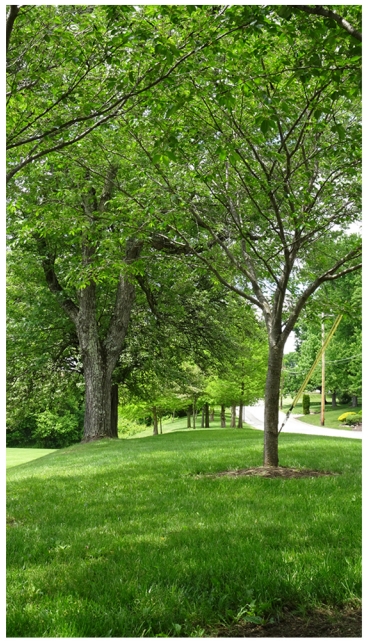


Urban Canopy Master Plan for Publicly-Managed Trees (2020-2030)

Acknowledgements

BRENTWOOD-BALDWIN-WHITEHALL SHADE TREE COMMISSION

Brentwood Members:
Joe Arnstein
Elizabeth Fager
Jamie Kephart

Baldwin Members:
Tiffany Thomas
Candace Seymour
Christopher Seymour

Whitehall Members:
Donna McCrea
Pete Swauger
Kate Zakowski

At-Large Members:
Alyssa Cleve
Taylor Lee
Sam Petrovich

URBAN CANOPY MASTER PLAN (2020-2030)

Committee:
Joe Arnstein
Alyssa Cleve
Donna McCrea
Candace Seymour
Kate Zakowski

Contributors:
Elizabeth Fager
Taylor Lee
Jack McCrea
Inga Pearson
Christopher Seymour
Susan Simmers
Pete Swauger

Graphic Design:
Alyssa Cleve
Donna McCrea
Kate Zakowski

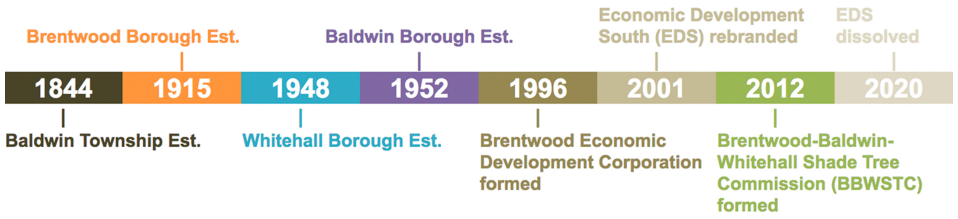
Photography:
Jack McCrea
Pete Swauger

Table of Contents

I. Introduction

HISTORY

Formed in 2012, the Brentwood-Baldwin-Whitehall Shade Tree Commission (BBWSTC) is a multi-municipal shade tree commission, believed to be the first of its kind in the Commonwealth of Pennsylvania. Our collective mission is to "protect, preserve, and enhance the natural assets" of these three municipalities. Economic Development South (EDS), a non-profit community and economic development corporation, was the original champion for the creation of BBWSTC, providing professional planning, support, and resources to help BBWSTC achieve its goals.



Since the dissolution of EDS in 2020, BBWSTC has become largely an independent entity, relying on its parent municipalities for its non-profit 501(c)(3) status and insurance coverage during volunteer events. Consisting of nine voting members appointed by the representative municipalities and three at-large members, BBWSTC has advisory capacity over all the trees on public property or in the public right of way of the member municipalities.

Through the support and assistance of local partners, BBWSTC has been able to plant 464 trees in the tri-borough area in its first eight years of existence. By adding these trees to public lands, BBWSTC has given our municipalities yet another way to join together to create healthy, vibrant, and people-friendly communities.

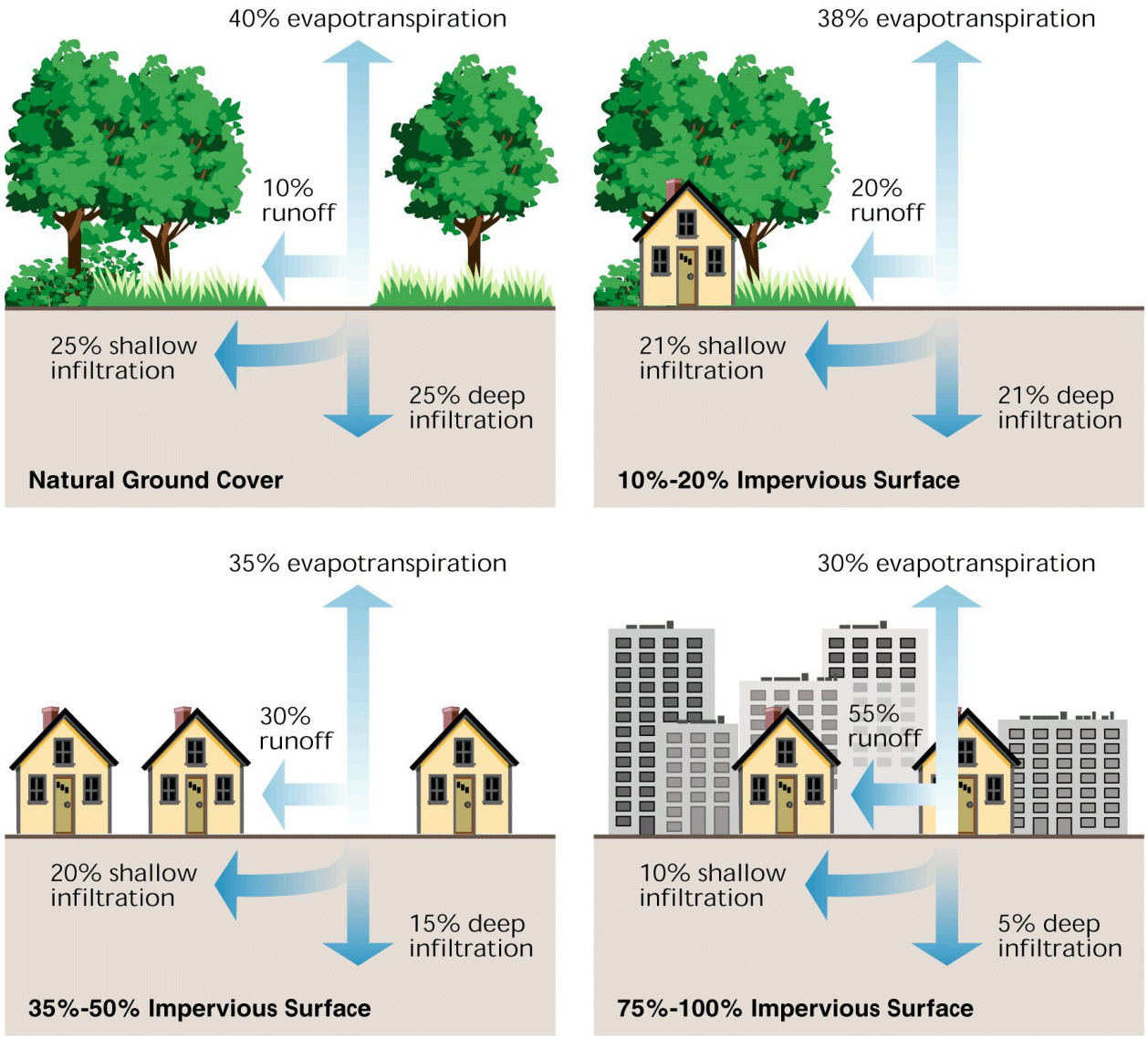
MISSION

It is the mission of the Brentwood-Baldwin-Whitehall Shade Tree Commission **(**BBWSTC) to promote, educate and develop awareness of and participation in environmental projects and initiatives that benefit our shared community.

VISION

The vision of the Brentwood-Baldwin-Whitehall Shade Tree Commission is to have each borough recognize trees as public assets the same way they would other essential public infrastructures. BBWSTC believes that, in our advisory role to each Borough Council, a guided tree canopy development plan is vital to the wellness of our communities. To that end, BBWSTC intends to bring awareness about the benefits of the urban forest to our fellow citizens so that elected officials, community volunteers, business owners and developers not only value public trees as important public assets, but also incorporate this knowledge into their ongoing planning.

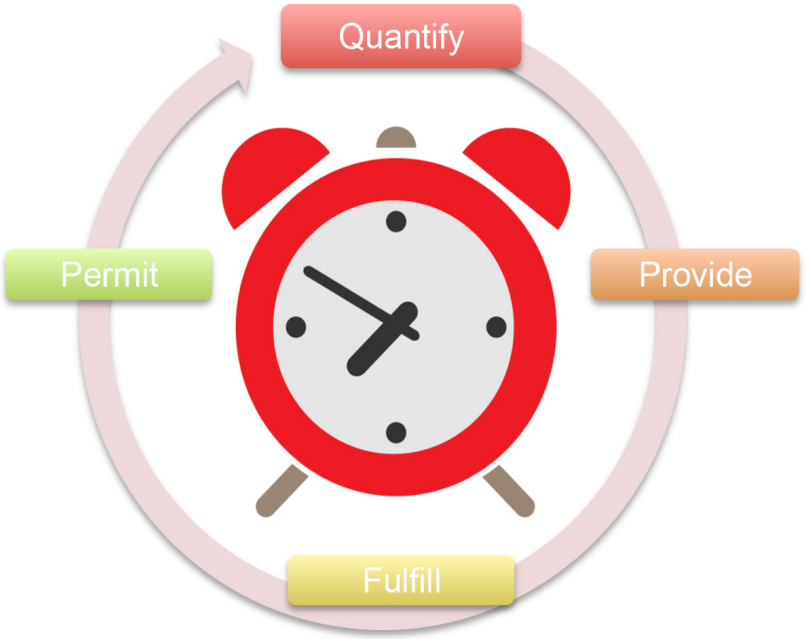
By guiding the planting and management of trees in Brentwood's, Baldwin's, and Whitehall's public spaces, BBWSTC intends to develop a diverse inventory of trees that can:



- provide residents, businesses, and visitors with shade during the summer heat, natural beautification throughout the year, and essential stormwater runoff mitigation to our watersheds
- diminish tree mortality due to species-specific disease and simultaneously reduce the spread of invasive and nuisance trees throughout our public spaces
- identify to the Boroughs' Public Works Departments the dead or diseased trees which need to be removed and the high-risk trees in need of pruning
- encourage the replacement of trees removed by development of natural areas or redevelopment of public spaces as needed

BBWSTC is committed to developing and implementing a sustainable multi-municipal shade tree program by 2030 that contributes to the social, environmental and economic well-being of our combined communities, ensuring residents will continue to value and cherish trees as some of our greatest natural assets for years to come.

Figure 1: Development increases stormwater runoff and heat island formation. Receding tree canopy reduces the natural cooling effect from shade and evapotranspiration. (Source- "Stream Corridor Restoration: Principles, Processes, and Practices, 10/98, by the Federal Interagency Stream Restoration Working Group (FISRWG)." https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/manage/restoration/?cid=nrcs143_026903



Every 10 years, this Master Plan will:

Quantify our current status, provide a road map for how we intend to achieve our mission, and monitor our success

Provide clear and consistent guidelines for assistance the BBWSTC may require from the Boroughs' Public Works Departments to care for public trees (including preservation, planting, pruning, and removal)

Fulfill our role of assisting local residents with tree-related concerns by providing suggestions and reference material

Permit the Commission to make sound budgetary requests for future tree plantings and maintenance when grant funding is unavailable or inadequate

NEED FOR A MASTER PLAN

It is imperative that BBWSTC develop a strategic plan that can help guide the relevant policies of each member Borough as we work towards achieving our unified goals. Though independent, the communities of Brentwood, Baldwin, and Whitehall have identified the value of working in partnership, and as such, BBWSTC must provide a plan that works for all municipalities in order to ensure cohesive and well-informed policies for future development of public spaces and the redevelopment of properties in the community.

SCOPE

Time Period:
Each year over the next 10 years we will reference the long-term goals outlined in this Master Plan to develop annual short-term work plans. The time period and benchmarks to evaluate those short-term plans are included in the scope of the Master Plan. We expect those annual evaluations to demonstrate the effectiveness of the Master Plan in achieving our urban canopy goals. However, the scope of the plan also allows for revisions of long-term goals within the plan's time frame as deemed necessary.

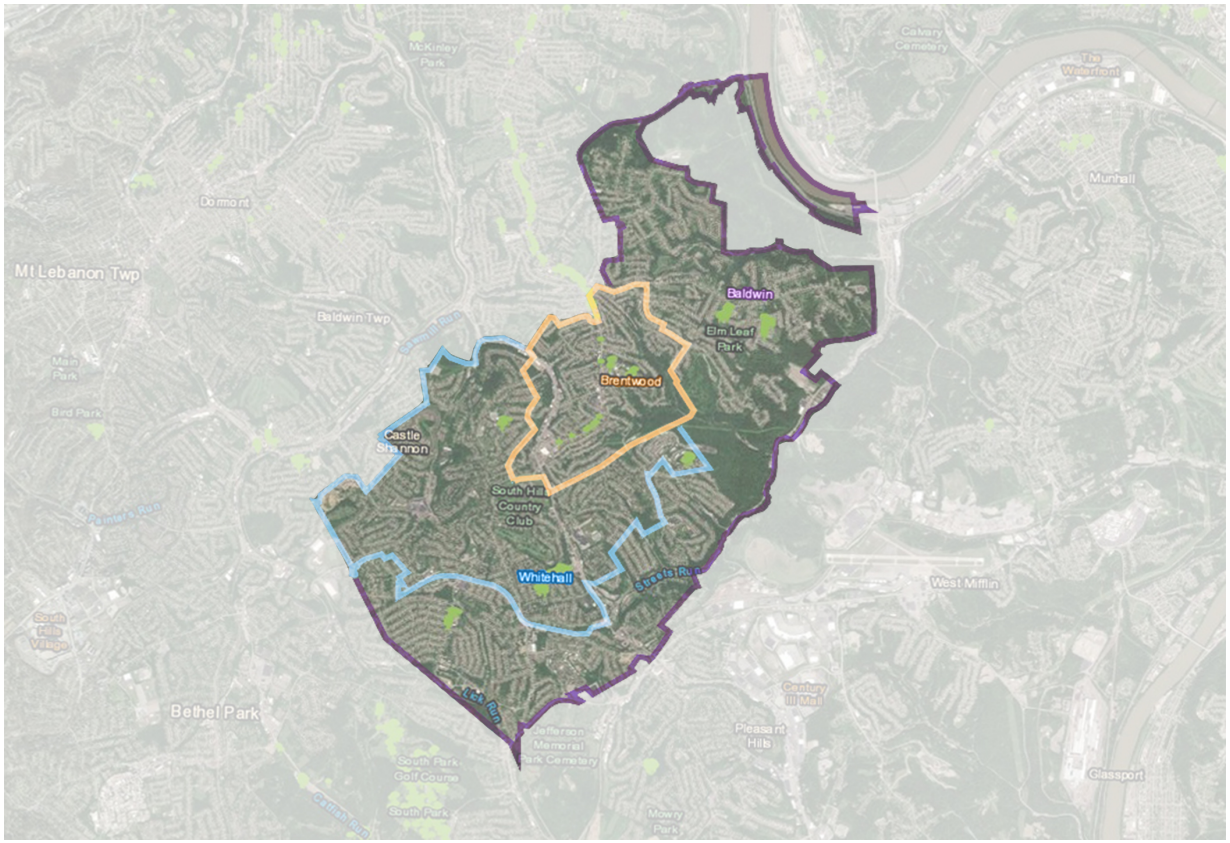
Physical Area:
Together, the municipal boundaries of Brentwood, Baldwin, and Whitehall define the area within the scope of this plan.

The urban forest within these boundaries includes:

- trees on public land in wild, undeveloped areas
- trees on public land in developed areas such as parks and around municipal facilities
- trees on private land

Figure 2: Map below details the physical boundaries of Brentwood (in orange), Baldwin (in purple), and Whitehall (in blue).

Targeted Locations:
While it is important to consider the entire forest when calculating overall tree benefits, our 10-year Master Plan focuses mainly on goals for achieving a healthy urban canopy on public land, and primarily in the developed areas of that public land, such as parks and streets. Our success in achieving the goals of this 10-year strategic plan will allow us to enlarge our scope to include private and wild areas in future decades.



MASTER PLAN FRAMEWORK

This plan is structured to clearly define short, medium, and long-term steps to achieving our urban canopy vision. For each major goal this road map describes the starting point of our journey in its "Where We Are Now" section – the base against which future progress will be measured. The "Where We Are Going" section describes the long-term outcomes expected for each major goal. The "How We Will Get There" section outlines specific medium-range steps to be completed on the road to our destination. This section also identifies some challenges – conditions out of our immediate control – which may slow progress towards our end goals.

Using this framework, our progress can benefit from a circular evaluation process of continuous improvement, in which the long-term goals become the new baseline of our improved status and new long-term goals are set.

II. Goals

ADVISORY ROLE TO BOROUGH COUNCIL

Where We Are Now

Presence at Borough Council Meetings
BBWSTC currently has one Baldwin member who also sits on their Borough's Planning Commission and one Whitehall member who regularly attends Council meetings. All members frequently interact with Borough Council members and personnel to stay informed of upcoming projects.

Communication with Borough Councils
The Shade Tree Commission gives an annual oral report to each borough regarding tree-related activities and provides updates throughout the year of on-going activities.

BBWSTC Relationship with Boroughs' Public Works Departments

- Each Public Works Department partners and co-operates whole-heartedly with the Shade Tree Commission when tree plantings, tree prunings, mulching, and/or weeding are scheduled or recommended.

- Additionally, each Public Works Department has expressed the desire to participate in developing more proactive tree maintenance programs that match their budget and workforce.

Where We Are Going

Act as a resource to the Borough Councils to advise on matters having an environmental impact on the Borough, including, but not limited to land development, park development or improvements, and revitalization projects

Review the plans upon request of Borough for residential, commercial, and industrial developments in order to ascertain the impact of tree canopy removal and to make recommendations concerning the retention of existing trees on said sites and/or the planting of new trees in areas where trees have been removed

Advise the Borough Councils on periodic updates to their respective Borough Codes as they pertain to shade trees

Inform each Borough Council of tree-related work completed in a timely manner for the current year and work planned/needed for the upcoming year

Establish and maintain relationships with Public Works Representatives by partnering with the Borough Manager or designated Public Works representative to make recommendations on the type and kind of trees to be planted within the Boroughs

How We Will Get There

-Objective- Establish regular and on-going communication with Borough Councils

Action:
Request a representative from each Borough's Council to:

- Review and share the minutes from the monthly BBWSTC meetings
- Investigate and communicate opportunities to work together on initiatives
- Stay apprised of bids for borough capital improvement projects and ask to be included as a stakeholder on those projects

Challenge: *To be recognized as a stakeholder by Borough Councils*

-Objective- Establish a semi-annual presence at Borough Council meetings

Action:
Prepare, submit, and present to each Borough Council a semi-annual report of its activities and upcoming projects

Action:
Prepare, submit, and present to each Borough Council any requests for financial support for upcoming projects as needed by August 31st of each year

Action:
Create a replicable reporting template to be easily updated for and understood by Borough Council members

Challenge: *Soliciting BBWSTC members to prepare and present at Borough Council Meetings*

-Objective- Establish and maintain relationships with Public Works Representatives

Action:
Provide maps to the Borough Manager and Public Works teams to identify dead or diseased trees targeted for removal

Action:
Consult with the Borough Manager before taking action on any tree-related activity

Action:
Inform Borough Manager and Public Works teams of available tree maintenance and tree care trainings

Action:
Invite Public Works employees to participate in tree planting and tending projects. This will, in turn, ensure that the same tree care standards are utilized across all three boroughs, including acceptable tree planting and pruning techniques. These steps will subsequently reduce the amount of time BBWSTC members and volunteers will have to spend to correct improper tree pruning and mulching, among other things.

Challenge: *The limited availability of Public Works to address tree-related concerns and trainings*

-Objective- Advise Borough Council on Tree Ordinances

Action:
Propose that each Borough's Council adopts Tree Canopy Coverage policies for future development

Action:
Submit examples of ordinances to Borough Council

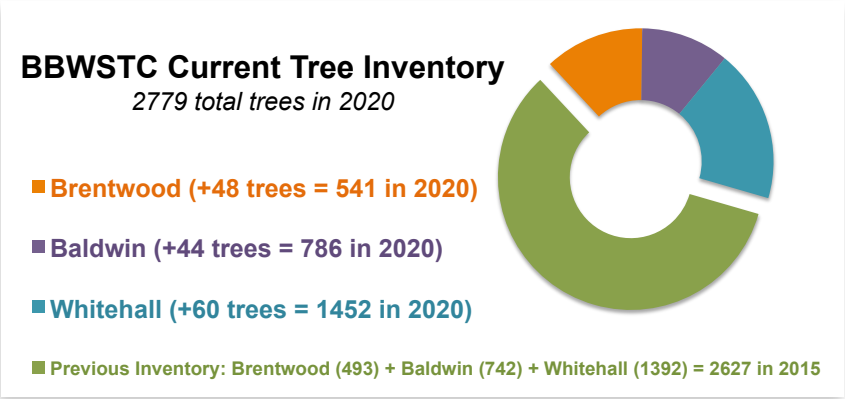
Challenge: *Time and political constraints to create unique ordinances for each Borough*

TREE INVENTORY

One of the reasons for the formation of the tri-borough Shade Tree Commission was to give community leaders measurement tools for tracking canopy increase/decrease and setting future canopy goals. A tree inventory is one such tool. *>>> See Appendix C, Tree Inventory and Data Reporting Tools <<<*

Where We Are Now

This tree inventory includes the species names and trunk diameter for 2779 trees. It shows immediate and real-time data regarding carbon sequestration, rainwater retention, and air quality improvement on a per-tree or per-area basis.



Where We Are Going

- **Generate more accurate tree inventory reports** at more consistent intervals
- **Establish standards** for replicable report generation methodology using the tree inventory database tools

How We Will Get There

-Objective- Enhance tree inventory data by adding relevant information, allowing reporting tools to generate more accurate results

Action:
Update every entry in BBWSTC tree inventory with tree species, trunk diameter at breast height (DBH), height, crown health, utility conflict, site type, condition, and planting date

Action:
- Add newly-planted trees to the inventory database with complete data
- Delete trees from the database if they have fallen or been removed, and leave empty planting site info after deleting the tree
- Establish a regular schedule for updating size and condition of trees
- Export inventory data from opentreemap annually to an offline location

* To compare improvements in tree canopy over a set period of time, exports from opentreemap need to be saved annually to discrete offline spreadsheets, since the online inventory does not save old versions of data.

Action:
Determine which tools and reporting methods to use for tracking tree inventory changes

Challenge: *Time constraints for BBWSTC volunteer members*

Challenge: *Database/reporting tools aren't under the control of BBWSTC*

-Objective- Maximize detailed report generation by using i-Tree Eco

Action:
Learn to use i-Tree Eco

Action:
Agree which i-Tree Eco reports contribute best to our goals

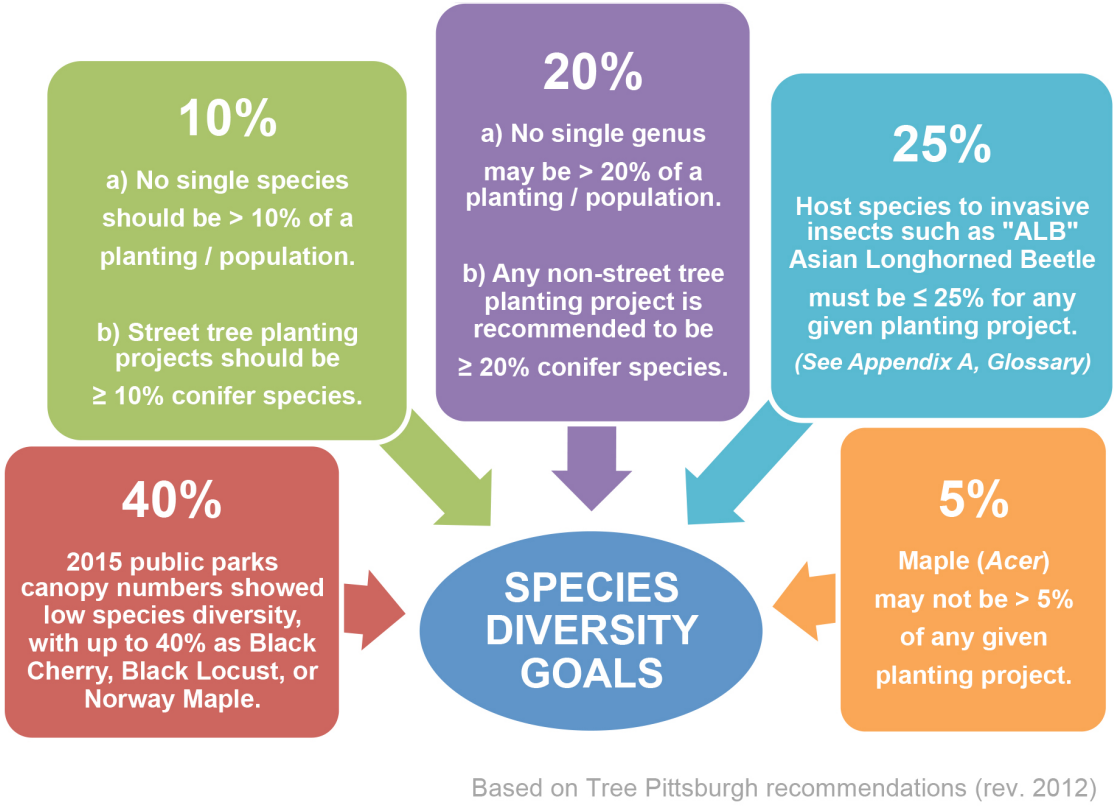
CANOPY COVER

Where We Are Now

Currently, the boroughs have no target goals for the quantity of tree canopy and the level of diversity ideal for each municipality.

To date BBWSTC has hosted 16 planting events in order to increase canopy cover in our communities. We relied almost exclusively on grants provided by TreeVitalize, DCNR, and Tree Pittsburgh to fund these plantings.
>>> See Appendix G, List of BBWSTC Tree Plantings 2012-2020 <<<

Canopy maps generated for us by Tree Pittsburgh serve as a baseline when measuring and evaluating the on-going progress of our municipalities towards their Tree Canopy goals. Generally, LiDAR (Light Detection and Ranging) reports indicate that the three Boroughs lost 15% of their overall Urban Tree Canopy between 2010 and 2015, with the top reasons for the decline being disease/age, storm damage, and new development. The 2016 reports, based on the 2015 inventory, show that in our public parks the existing tree canopy has low diversity, with up to 40% consisting of three species – Black Locust, Norway Maple, and Black Cherry. Each species in the remaining 60% makes up 5% or less of the total canopy.



Based on Tree Pittsburgh recommendations (rev. 2012)

Where We Are Going

- **Restore canopy cover** in each Borough to their 2010 levels
- **Increase species diversity** per Tree Pittsburgh recommendations so that no single species makes up more than 10% of the canopy

How We Will Get There

-Objective- Restore Borough canopy cover and species diversity to 2010 levels

Action:
Generate annual tree count and diversity reports to track canopy loss/gains

Action:
Use diversity reports to determine species for upcoming plantings *>>> See Appendix H, Tree Species Planted by BBWSTC 2012-2020 <<<*

Action: Identify for removal Black Walnut and Norway Maple trees at the end of their productive lives

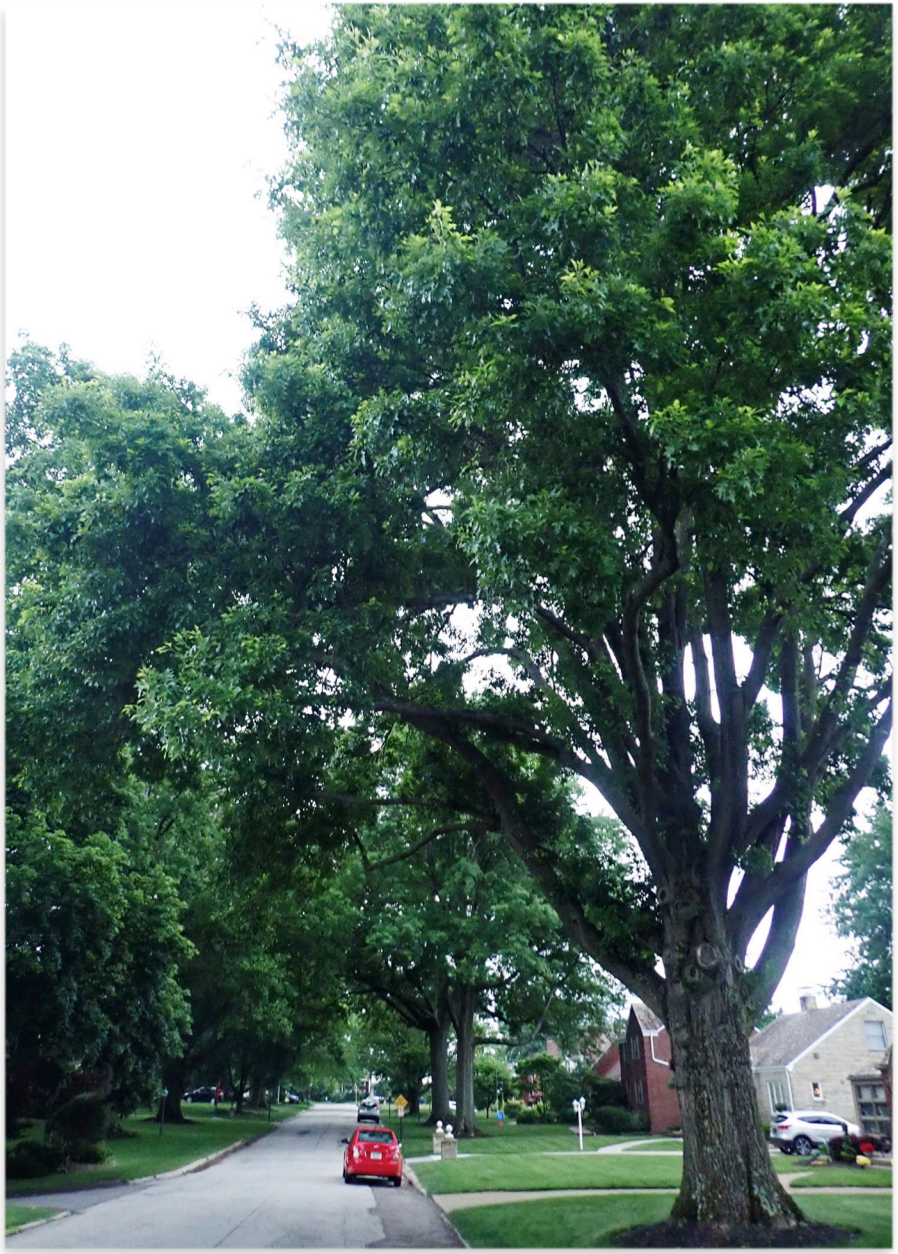
Action:
Plan and implement diverse replacement plantings for all trees removed due to disease, development, or maintenance work

Action:
Propose that each Borough's Council adopts a Tree Canopy Coverage Ordinance for future development

Challenge: *Tree removal on private property and for commercial development is outpacing BBWSTC's tree planting efforts*

Challenge: *Diminishing availability of public property viable for tree plantings*

Challenge: *Opposition from private property owners to tree plantings*



TREE PRESERVATION, PROTECTION, MAINTENANCE, AND REMOVAL

Where We Are Now

Borough Efforts:
The municipalities took the first step towards creating a comprehensive tree program by forming a Shade Tree Commission, whose responsibility it is to develop and recommend municipal programs for tree protection and preservation. Additionally, the boroughs have the following tree-related programs:

- Baldwin currently has a strategic plan that specifically states the need for preservation of its natural resources.
- Brentwood has a strategic plan stating a need for more and better recreational spaces, including enhancing public spaces with trees.
- Whitehall has a Parks Master Plan.

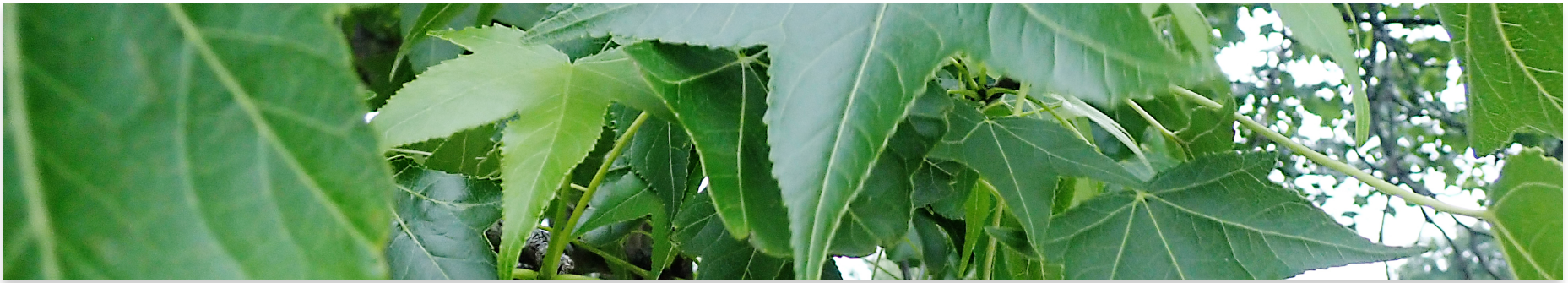
Protection and Preservation:
In southwestern Pennsylvania, and our boroughs specifically, tree stressors include animals, insects, pollution, invasive species, and weather. To combat these stressors, BBWSTC employs the following best practices:

- Trunk guards and/or wire cages are deployed at each planting to protect young trees from deer browsing and rubbing.
- Disease-resistant species are selected for new plantings.
- Pollution and salt tolerant species are selected for high-stress sites.
- STC members stay current on information about local insect threats.

Tree Removal and Maintenance:
Currently the tree removal and maintenance policy employed by the Public Works Department of each municipality is to respond on a case-by-case basis to resident requests as they are received. A maintenance employee reviews the request and takes action based on the location and disposition of the tree in question.

Where We Are Going

Develop comprehensive, proactive protocols to protect trees from damage, preserve threatened and endangered trees, remove invasive or dangerous trees, and nurture the health of tree assets through their most productive years



How We Will Get There

-Objective- Protect and preserve new and existing tree assets

Action:
Research and recommend Borough ordinances that enforce tree protection standards during street and park construction projects

Challenge: *Adoption of ordinances is at the discretion of Borough Council*

Action:
Continue protecting young trees using best planting practices
>>> See Appendix I, Organizing a Tree Planting Event <<<

Action:
Place informational markers at the sites of especially old, endangered or valuable trees

Action:
Invite residents to nominate trees with unique characteristics for informational marking

Challenge*: Tagging trees requires a suitable, cost-effective method*

-Objective- Reduce the number of invasive or dangerous trees in each Borough

Action: Perform annual assessments to recommend candidate trees for removal

Challenge: *Removal depends on evaluation by an arborist and is at the discretion of the Boroughs*
>>> See Appendix E, Tree Removal and Preservation <<<

-Objective- Establish, in conjunction with the Boroughs' Departments of Public Works, a 5-year cyclical plan to monitor park and street trees for maintenance actions, risks, and pests based on the guidelines set forth in the Tree Maintenance Plan

Action:
At the beginning of each year, align BBWSTC maintenance calendar with the Tree Maintenance Plan
>>> See Appendix D, BBWSTC Tree Maintenance Plan <<<

Action:
Meet annually with the DPW of each Borough to agree on responsibilities for scheduled tree maintenance tasks

Challenge: *The capacity (and resources) of BBWSTC to manage the required tasks will depend on each DPW accepting some responsibilities*

FUNDRAISING AND GRANTS

Where We Are Now

Since inception, BBWSTC has not been allocated an annual budget by any of the three Boroughs it represents. Occasionally, BBWSTC has requested Borough Public Works and Baldwin-Whitehall School District (BWSD) resources for tree plantings or tree maintenance. Tree planting and tree maintenance events are mainly organized by BBWSTC. However, we do and will continue to partner with other community organizations and local non-profit organizations. In-kind donations are solicited by BBWSTC and have come from a variety of supportive local businesses.

BBWSTC does not hire any third-party consultants or advisors to conduct its business. Any expenditures BBWSTC incurs are (and will continue to be) funded from grants using the Boroughs as their representative non-profit organization in the application process. Successful grant awards have come from Pennsylvania Department of Conservation and Natural Resources (DCNR) and TreeVitalize, and we will continue to seek these grants as well as new grant opportunities. Despite our success in procuring grants, state budget cuts have significantly reduced these opportunities for BBWSTC to obtain resources to carry out our mission. BBWSTC will seek to leverage each Borough's funding by obtaining both public and private grants that invest in our communities and positively impact our residents and businesses.

Where We Are Going

Work actively with the Borough Council and designated Borough Officials to secure grants and contributions for fulfilling the objectives defined in this Master Plan

How We Will Get There

-Objective- Establish a repeatable process to request a Shade Tree Budget Line Item for tree plantings and maintenance from each member Borough

Action:
Demonstrate the economic value of the tree canopy to each member Borough using tree inventory reports during annual presentations to each Borough Council

Action:
Request tree project line item funding from Borough Councils based on BBWSTC's annual work plan

Action:
Actively work with the Borough Council and designated Borough Representative to secure grants and contributions for fulfilling the objectives defined in this Master Plan

Action:
Engage each Borough council two months before the next year's budget is set, to request the allocation of funds for use by the Commission. The funds allocated by a Borough will be used exclusively within that Borough

Action:
Utilize grassroots fundraisers at community events (e.g. Whitehall Community Day) to raise funds to support BBWSTC initiatives

-Objective- Apply for all grant opportunities

Action:
Seek out and research diverse grant opportunities

-Objective- Deepen our relationships with PA DCNR, TreeVitalize, Western Pennsylvania Conservancy (WPC), Tree Pittsburgh, and other organizations in order to broaden our potential opportunities for grant funding, tree care education and awareness, and other initiatives

Action:
Assign Commission members to be contacts with PA DCNR, TreeVitalize, WPC, Tree Pittsburgh, and other organizations

PUBLIC OUTREACH

Where We Are Now

In its first seven years, BBWSTC primarily engaged the three communities in tree planting events, organizing more than one tree planting each year for four years. We partner with the Borough Council members and the Public Works employees on mutually-beneficial tree projects. Examples of such projects are Brentwood's and Whitehall's park improvements through DCNR grants.

The Shade Tree Commission:

- participates in a number of community events in each municipality
- employs social media linked to the website of each municipality
- submits a one-page tree care message to the Whitehall bi-annual newsletter

Where We Are Going

Outreach is an important tool that allows us to inform, engage, and excite the public about the actions BBWSTC is taking to create a healthy urban canopy and why we need to enhance our canopy. Our goal is to encourage community members, employees, municipal members, community groups, and businesses to interact with trees and with us in ways that will help BBWSTC reach our overall goal of a healthy urban forest.

We need to partner with outside groups like Tree Pittsburgh, PA DCNR, and WPC for community education and resources. Additionally, to build upon our past efforts, we ask the respective municipalities to take an active interest and role in assisting and promoting our commission as well as our various outreach events.

We will assist the Borough Managers as well as the Councils in disseminating news and information regarding proper selection, planting, and maintenance of trees. Such information will be made available digitally and in print where applicable and will be distributed to the community.

We will make every effort to explore additional methods of communication to the community.

How We Will Get There

-Objective- Demonstrate the benefits of BBWSTC's mission to the Borough residents we serve

Action:
Publish a photo list of recommended trees for various types of private spaces, along with a guide for how to decide on the right tree for the right place

Action:
Regularly submit articles, guides, and recommendations to community news outlets, websites, and social media

Action:
Present formal tree talks and tree-related films to local groups, libraries, schools, etc.

Action:
Participate in community events, host summer program activities, etc.

Action:
Raise awareness of tree species, agree on and procure suitable tree markers for public reference in parks and developed municipal areas

Action:
Partner with Boroughs to engage volunteers for planting and tree tending events

Action:
Partner with Tree Pittsburgh to host Tree Giveaway Days

Action:
Organize Arbor Day and Earth Day events and activities such as Tree ID Walks and tree-related games

Action:
Share tree-related scheduled events and educational opportunities open to the public

Action:
Invite volunteers to participate in ongoing monitoring and reporting of neighborhood trees

Challenge: *Time constraints for planning public events*

Challenge: *Insurance coverage must be procured and general safety must be ensured*

Challenge: *Restrictions and public safety concerns pertaining to COVID-19 impact public interactions*

III. Metrics of Success

Knowing if we are making progress towards our goals requires evaluation of everything we do and strive to do. Such evaluation requires ongoing monitoring of each goal, and analysis of the results to determine how and when this Master Plan needs to be revised. Using this continual evaluation process, the Master Plan has the ability to respond and adapt to changes as needed.

MONITOR

Progress of the actions in this plan will be measured in at least 1 of 3 ways:

- Actions without specific metrics will be given an annual status of 'completed,' 'on-going,' 'approaching,' or 'tabled.'
- On-going actions will require acknowledgement of the completion of specific milestones. Milestones can range in degree, but shall be outlined in advance.
- Actions with specific metrics will involve generating a standard set of reports based on our tree inventory.

ANALYZE

By analyzing the output from monitoring activities, an annual status report should be produced to show:

- the status of the actions in the annual work plan
- summaries of tree planting and maintenance events
- a list of current disease and pest threats in each Borough
- a comparison of progress to benchmark values set out in this plan
- recommendations, if needed, for changes to the Master Plan

>>> See Appendix J, Status Reports for a status report template <<<

IV. Summary

The Brentwood–Baldwin–Whitehall Shade Tree Commission strives to educate for and promote participation in environmental projects and initiatives that benefit our shared community. In order to accomplish this mission, we must partner with our neighbors, municipal leaders, businesses, and allies. **Despite 8 years of dedicated effort by BBWSTC to plant and preserve the tree canopy, our 3 communities have lost 15% of canopy cover.** Thus, it is imperative to follow this Master Plan and its outlined goals to guide the planting and management of public trees in our Boroughs, stem the loss, and rebuild canopy cover. With combined effort, we can positively contribute to the social, environmental, and economic well-being of our combined communities, ensuring residents will continue to value and cherish trees as some of our greatest natural assets for generations to come.

V. Appendices

APPENDIX A: GLOSSARY

501(c)(3) organization – a non-profit organization, as defined by Section 201(c)(3) of the United States Internal Revenue Code, that allows for federal tax exemption; examples include public charities, private foundations, and non-profit corporations

adaptive species – a species that originates from a foreign ecosystem, but may become acclimated to a new area without harming existing native species

ALB – Asian Longhorned Beetle, an invasive insect that feeds on a wide variety of trees including Ash, Birch, Elm, Golden Raintree, Horse Chestnut/Buckeye, Katsura, London Plane Tree/Sycamore, Maple, Mimosa, Poplar, and Willow

anaerobic ("sour") mulch – mulch that contains a build-up of acidic organic matter (low pH value) due to a lack of oxygen within the bark chips

Arbor Day – a special day dedicated to tree activities, usually held on the last Friday in April throughout the USA, but celebrated on different days in other countries to coincide with Spring planting

arbor tie – flexible web strapping used to anchor young trees and prevent wind from uprooting them

arborist – a person who specializes in tree care and maintenance; a certified arborist is a professional who has passed a certificate examination

BBWSTC – Brentwood Baldwin Whitehall Shade Tree Commission; established in 2012 through the collaboration of EDS and these three municipalities in the South Hills of Pittsburgh, BBWSTC was first multi-municipal shade tree commission in Pennsylvania

balled and burlapped ("B & B") – a method of preparing a tree for transplanting where the tree is dug with soil left around its roots, then wrapped in burlap until planting

bare-root – a method of transplanting trees where dormant trees are dug, their roots washed, trimmed, and kept moist until replanting

budget line item – a portion of a budget set aside for a particular item or category

caliper – the measurement of a tree's diameter in inches

canopy – the branches and foliage that compose a tree's crown

canopy cover – as seen from above, the area of land surface covered by tree canopy

carbon sequestration – the process of filtering carbon dioxide gas out of the air and storing it, either biologically or geologically

community/urban forestry – the planning, design, planting, and management of vegetation on public lands in and around a community; these forests provide visual, social, economic, and environmental benefits to the community

critical root one (CRZ) – also known as the root protection zone (RPZ), a circle on the ground corresponding to the drip line of the tree; since the drip line can be irregular and hard to define, an alternative method of determining this dimension is to multiply the tree's DBH by 12 (essentially, 1' of CRZ for 1" of DBH)

crown drip line – an imaginary circle on the ground around the perimeter of a tree's canopy, used for the purpose of determining where the majority of the tree's roots are located for watering or avoidance while digging

DBH – Diameter at Breast Height, a standard form of measuring the size of a tree's trunk in inches

DCNR – Pennsylvania Department of Conservation and Natural Resources, a state agency tasked with conserving and sustaining Pennsylvania's natural resources for our present and future generation's use and enjoyment

deer antler rubbing – bucks, or male deer, "rub" their antlers on the trunks of trees to mark their territory, show dominance, and intimidate other bucks; this rubbing action scrapes the surface of the xylem and removes the cambium at the base of the tree trunk, which can greatly damage the tree and even kill it

diameter tape – a special tape measure with markings reduced by the value of Pi (π), used for determining the diameter of a tree's trunk

DPW – Department of Public Works, a branch of municipal government that maintains borough properties, such as parks, public grounds, and ball fields

Earth Day – an annual event held internationally on April 22nd to support and promote environmental protection

eco-benefits – items or actions which help to improve the environment

EDS – Economic Development South was an organization created to develop economic opportunities for municipalities along the Route 51 corridor in Allegheny County, Pennsylvania; it was an integral part of the creation of BBWSTC, and it ceased operations in 2020

geo-referenced database – a collection of data that relates ground-based geographic coordinates with the coordinate system of a digital map or aerial photo

GIS – Geographic Information Systems are computer-based tools used to store, visualize, analyze, and interpret geographic data

GPS – Global Positioning System is a satellite-based navigation system made up of at least 24 satellites

invasive species – The National Park Service defines invasive species as non-native species that cause harm to the environment, economy, or human, animal, or plant health (Executive Order 13751). It is often thought that the terms 'invasive' and 'non-native' can be used interchangeably, but this is not always true. For a plant or animal to be invasive, it must do harm. Simply being non-native is not cause for concern. The National Park Service actively manages those non-native species that do harm. Understanding the difference between invasive and non-native species and when a species is managed is crucial.

ISA – International Society of Arboriculture, an organization that promotes the professional practice of arboriculture to foster a greater awareness of the benefits of trees; ISA offers a credentials program for arborists who want to expand their tree care knowledge

LiDAR – Light Detection And Ranging is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth

MS-Excel – a Microsoft spreadsheet application used to organize and manipulate data

mulch – a protective covering of various substances, usually organic, placed on top of the soil around plants to retard weed growth, prevent moisture loss, moderate temperatures, and release nutrients into the soil; popular mulches include wood chips, bark chips, compost, and leaf mold

native species – a naturally-occurring species that is specifically adapted to its ecosystem; may be indigenous (occurring in several areas) or endemic (occurring in only one area)

One-Call System (Dial 811) – the phone number to call before you dig; representatives will locate all underground utilities and flag or spray paint them so a tree may be safely planted without hitting them

Opentreemap – an online tree inventory database found at opentreemap.org

pH – a scale of acidity measured from 0 to 14; acidic soils are a low pH value (less than 7) and alkaline soils are a high pH value (greater than 7)

PA MS4 – Pennsylvania Municipal Separate Storm Sewer System Program administered by the PA Department of Environmental Protection to meet stormwater requirements set forth by the federal Clean Water Act

rainwater retention – slowing or interrupting the flow of rainwater to prevent it from rushing into waterways or stormwater systems

riparian zone – the land area adjacent to a waterway

root ball – the clump of soil and tree roots dug with the tree and covered with burlap and twine or a wire basket, awaiting planting

sapling – a young tree that measures no more than four inches in diameter (DBH)

species diversity – the number of species and abundance of each species living in a particular area

street tree – a tree growing within a street's right of way

tree crown – the mass of branches and foliage growing outward from a tree's trunk

tree inventory – a listing, location, and description, either on paper or in a digital format, of existing trees and potential future planting sites; an inventory may also include such data about each tree as its species, condition, height, DBH, etc.

tree tender – an individual who has basic knowledge of tree care following the completion of a course developed by the Pennsylvania Horticultural Society

topping – an ill-advised practice of reducing tree height by chopping branches off in the middle, leaving large branch stubs; this weakens the tree and makes it susceptible to insects and decay

tree pit – the site where a tree can be planted, such as a sidewalk with a planting strip cut into it for a street tree, or the area surrounding the trunk for a park, yard, or restoration tree

urban forest – a collection of all the trees growing on private and public lands within a municipality or borough, which provide ecological benefits to the city, town, or suburb in which they grow

walking inventory – a count and recording of trees made by individuals walking around a designated area

water sprout – also known as a "sucker," an upright shoot that originates from the trunk, a sign of tree stress

WPC – Western Pennsylvania Conservancy protects and restores exceptional places to provide the region with clean waters and healthy forests, wildlife, and natural areas for the benefit of present and future generations; WPC also promotes the local planting of trees through its TreeVitalize grant program

APPENDIX B: BOROUGH ORDINANCES

Brentwood Borough

This is a summary of Brentwood code **Chapter 197**, which defines the responsibilities of tree ownership.

§ 197-2. Certain trees prohibited.
Do not plant water-seeking trees such as Willow or Locust near streets, alleys or sidewalks.

§ 197-3. Clearance above street and sidewalk.
Property owners must maintain all trees on their property such that there is a clearance of at least 8 feet above borough sidewalks and 14 feet above borough roadways. Dead limbs above borough property must be removed.

§ 197-4. Traffic hazards.
Trees may not block the view of vehicle drivers.

§ 197-5. Removal and trimming of trees. [Amended 9-28-2015 by Ord. No. 1242]
Property owners failing to comply with tree regulations may be required to pay the borough for the cost of the necessary work, as well as for legal fees.

§ 197-6. Selective trimming and removal by borough.
The borough has the right to trim any trees or other vegetation encroaching onto or in the airspace above the legal right-of-way from an adjacent property.

§ 197-7. Adjoining property. [Amended 9-28-2015 by Ord. No. 1242]

A. All debris resulting from compliance with tree maintenance must be removed by the end of the day on which the work was done.
B. Property owners must take timely action to eradicate pests or diseases which pose a threat to public trees.
C. Plants declared to be a public nuisance must be controlled or removed at the property owner's expense.
D. Property owners must pay the costs of any damage to adjoining property caused by trees growing on their property. Adjoining property owners have the right to prune or remove any portion of a plant encroaching from another property.
E. In the case of an emergency, the borough's Department of Public Works may removed any portion of a tree falling on the public right-of-way without permission from the property owner, and will not charge the owner for the cost of removing the hazard.

§ 197-8. Roots endangering public sewer.
A property owner has 30 days to remove any plant whose roots are damaging the public sewer system. After 30 days the borough has the right to remove the offending plant and charge the property owner for that work, plus a 10% surcharge and legal fees.

§ 197-9. Violations and penalties.
Violations of the provisions of Chapter 197 can result in fines, fees and possible imprisonment.

The full text of **Chapter 197** of the Brentwood code can be found at:
https://ecode360.com/6199511

Ordinance 1024. Multi-municipal Shade Tree Agreement
An ordinance allowing Brentwood Borough to enter into an Intergovernmental Cooperation Agreement (IGCA) with the boroughs of Whitehall and Baldwin for the purpose of establishing a multi-municipal shade tree commission (STC).

Per this ordinance, the STC was established as an advisory-only entity funded initially through grants, but with the ability to obtain on-going funding through grants, donations, and voluntary appropriations from the participating boroughs.

Ordinance 1024 defines the same general objectives and structure as those set forth in Baldwin's Ordinance 845 and Whitehall's Ordinance 1043. Detailed descriptions of the structure, responsibilities and jurisdiction of the Shade Tree Commission are set forth in Exhibit A, the Intergovernmental Cooperation Agreement (IGCA)

The full text of Brentwood's **Ordinance 1024 and Exhibit A (the IGCA)** can be found at:
https://brentwoodboro.com/boroughgovernment/ordinances-and-resolutions-2/send/86-2012-ordinances/14278-ordinance-2012-1204-multi-municipal-shade-tree-commission.html

Baldwin Borough

This is a summary of Baldwin code **Chapter 148**, which describes when and how TIMBERING AND LOGGING can be done.

§ 148-2. Minimum standards.
These are the minimum requirements for major and minor timbering and logging permits.

§ 148-3. Permit required for minor logging operation; exceptions.
This section lists are the three instances where a minor logging permit is not required.

§ 148-4. Application for minor timbering and logging permit; special conditions.
This describes the detailed information which must be submitted to obtain and execute a minor logging permit.

§ 148-5. Issuance of minor timbering and logging permit; expiration; appeal.
This describes the conditions under which a logging permit can be issued, when the permit expires, and when it can be revoked.

§ 148-6. Permit required for major logging operation.
This states that major logging can not begin without a permit.

§ 148-7. Application for major timbering and logging permit; special conditions.
This describes the detailed information which must be submitted to obtain and execute a major logging permit.

§ 148-8. Notification of neighboring property owners.
The permit applicant must provide the Building Inspector with a list of property owners within 1000 feet of the timbering area to be permitted. The Building Inspector must notify affected property owners in writing and must schedule a public hearing.

§ 148-9. Public hearing.

§ 148-10. Council action.
Council must approve or deny the permit within 90 days of the applicant meeting all permit requirements.

§ 148-11. Violations and penalties.
Fines, fees and possible imprisonment may be imposed for failing to follow proper permitting requirements.

§ 148-12. Other remedies.
The borough may take whatever action deemed necessary to curtail unlawful logging.

The full text of **Chapter 148** of the Baldwin code can be found at: *https://ecode360.com/7027378*

This is a summary of Baldwin code **Chapter 150** which defines a property owner's responsibilities regarding TREES, SHRUBS AND BUSHES

§ 150-1. Interference with public sewer prohibited.
Do not plant vegetation near a sewer system if the roots could damage or clog the sewer system.

§ 150-2. Notice to remove; failure to comply.
A landowner will have 30 days following written notification to remove any plants damaging or clogging the sewer system and, if non-compliant, will be liable for borough costs to carry out that removal.

§ 150-3. Violations and penalties. [Amended 12-19-1985 by Ord. No. 566]
Not adhering to these regulations may result in fines and possible imprisonment.

The full text of **Chapter 150** of the Baldwin code can be found at: *https://ecode360.com/7027586?highlight=trees#7027586*

This is a summary of the tree-related sections of Baldwin's **Article IV Chapter 168-420 Supplemental Regulations**

R. Non-residential design standards.

(2) Screening
This describes when commercial property screening is required and the acceptable types and dimensions of visual barriers.

(4) Landscaping
This describes acceptable landscaping methods for any commercial property not covered by buildings or parking areas.

The full text of Baldwin's **Article IV Chapters 168-420** can be found at: *https://ecode360.com/7028601?highlight=trees#7028601*

Ordinance 845 - Multi-municipal Shade Tree Agreement
An ordinance to allow Baldwin Borough to enter into an Intergovernmental Cooperation Agreement (IGCA) with the boroughs of Whitehall and Brentwood for the purpose of establishing a multi-municipal shade tree commission (STC).

Per this ordinance, the STC was established as an advisory-only entity funded initially through grants, but with the ability to obtain on-going funding through grants and other sources of funding.

Ordinance 845 defines the same general objectives and structure as those set forth in Brentwood's Ordinance 1204 and Whitehall's Ordinance 1043. Detailed descriptions of the structure, responsibilities and jurisdiction of the Shade Tree Commission are set forth in Exhibit A, the Intergovernmental Cooperation Agreement (IGCA)

The full text of Baldwin's **Ordinance 845 and Exhibit A (the IGCA)** is available *from the borough upon request.*

Whitehall Borough

This is a summary of Whitehall code **§153.18**, which seeks to protect Riparian Buffers.
§153.18.1.
Describes how riparian buffers must be protected during land development.
§153.18.2.
Defines when and where a riparian buffer must be created.
§153.18.3.
Minimum Management Requirements for RIPARIAN BUFFERS.
§153.18.4
Describes how riparian buffer protection shall be enforced.
§153.18.5
Protects the 100-year floodplain in a riparian buffer.
§153.18.6.
Describes limitations of stormwater management systems in riparian buffers.
§153.18.7
Describes conditions for allowing recreational trails in riparian buffers.
§153.18.8
Describes limitations of sanitary sewer and septic systems in riparian buffers.
§153.18.9
Describes when underground and overhead utilities are permitted in the riparian buffer and the steps required to restore the area after utility work disturbance.

The full text of **Chapter 153.18** of the Whitehall code can be found at:
https://whitehallboro.org/wp-content/uploads/2020/05/20181205Chapter-153-Stormwater-Management.pdf

This is a summary of Whitehall code **Chapter 166** regarding protection of trees.
§ 166.1. Permit required to trim or remove trees.
Do not cut, prune or harm trees on public land without borough approval.
§ 166.2. Interference with or injury to sewer lines.
Do not plant any tree where it could damage or clog sewer pipes.
§ 166.3. Maintenance of dead or untrimmed trees.
Trees must be pruned and maintained such that no branches, dead or alive, interfere with public traffic.
§ 166.4. Compliance with other regulations.
Do not violate any future tree-related regulations enacted by the borough.
§ 166.5. Orders to remove trees; work performed by BOROUGH.
The Building Inspector has the authority to enforce the regulations in this chapter of the code, notify property owners of infractions and initiate abatement actions 5 days after notification.
§ 166.6. Violations and penalties.
Chapter 166 applies to any residential or commercial property owner.

The full text of **Chapter 166** of the Whitehall code can be found at:
https://whitehallboro.org/wp-content/uploads/2020/05/520303v2-Whitehall-Chapter-166-Trees-3-28-12.pdf

This is a summary of the tree-related sections of Whitehall's **ARTICLE XLII STREETSCAPE ENHANCEMENT OVERLAY ("SEO") DISTRICT**
180.145.7.15. Street Trees.
This describes what types of trees are acceptable along streets and where those trees can be situated.
*NOTE: *S denotes a shrub, not a tree*
Article XLII Appendix A sets out the following tree guidelines:
Trees (for use where there are no power lines)
- Bald Cypress *(Taxodium distichum)*
- Honeylocust *(Gleditsia triacanthos var. inermis)*
- Swamp White Oak *(Quercus albla)*
- Black Gum *(Nyssa sylvatica)*
- Greenspire Linden *(Tilia cordata 'Greenspire')*

Trees (for use where power lines are > 20' high)
- Hawthorn, Winter King *(Cralaegus viridis 'Winter King')*
- Japanese Tree Lilac *(Syringa reticulata)*
- Magnolia, some varieties such as *'Galaxy', x loebneri, x sou langiana and virginia*

Trees (for use where power lines are 15·20' high)
- Amur Maple *(Acer ginnala)*
- Hawthorn, Crusader *(Crataegus crus-galli f: inermis 'Crusader')*
- Magnolia, some varieties such as ' Royal Star', 'Betty' and 'Ann'

Shrubs
- Bayberry *(Myrica pensylvanica)*
- Butterfly Bush *(Buddleia davidii)*
  —BBWSTC note—currently on PA DCNR Invasive Species List and is not recommended for planting *https://www.dcnr.pa.gov/Conservation/WildPlants/InvasivePlants/Pages/default.aspx*
- Cotoneacaster, most; *S
- Gro-Low Sumac *(Rhus aromatica 'Gro-Low')*; *S
- Forsythia; There are some varieties which would satisfy condition *S

- Junipers, most
- Mugho Pine *(Pinus Mugo)*
- Potentilla *(Potenlilla fruiticosa)*; *S
- Knock Out Rose *(Rosa 'Knock Out')*
- Summersweet *(Clethra alnifolia)*; There are some varieties which would satisfy condition *S

The full text of **Chapter 180.145** of the Whitehall code can be found at: *https://whitehallboro.org/wp-content/uploads/2020/05/20180207Chapter180Article42-1.pdf*

Ordinance 1043 - Multi-municipal Shade Tree Agreement
An ordinance to allow Whitehall Borough to enter into an Intergovernmental Cooperation Agreement (IGCA) with the boroughs of Brentwood and Baldwin for the purpose of establishing a multi-municipal shade tree commission (STC). Per this ordinance, the STC was established as an advisory-only entity funded initially through grants, but with the ability to obtain on-going funding through grants, donations, and voluntary appropriations from the participating boroughs.

Ordinance 1043 defines the same general objectives and structure as those set forth in Brentwood's Ordinance 1204 and Baldwin's Ordinance 845. Detailed descriptions of the structure, responsibilities and jurisdiction of the Shade Tree Commission are set forth in Exhibit A, the Intergovernmental Cooperation Agreement (IGCA)

Ordinance 1045 – Amendments to Ordinance 1043
This ordinance modified some of the wording of Exhibit A (the IGCA) to be the same as that of Baldwin's and Brentwood's IGCA Exhibits.

The full text of Whitehall's **Ordinances 1043, 1045 and Exhibit A (the IGCA)** is available *from the borough upon request.*

Intergovernmental Cooperation Agreement (IGCA)

The Boroughs of Brentwood, Baldwin and Whitehall, recognizing the economic, health, environmental and aesthetic benefits of appropriately sited trees, established a multi-municipal shade tree commission whose purpose is to protect, preserve, maintain, and plant municipal trees. The STC consists of 9 voting members (3 from each borough) and 3 non-voting at-large members, all of whom serve without compensation or term limits. Responsibilities of the STC include:

- advising member boroughs on tree-related problems and concerns
- consulting on tree welfare when public land is being repaired, renovated or developed
- maintaining an inventory of trees on public land
- soliciting grants and other forms of tree funding
- developing community volunteer networks
- recommending actions or legislations to borough citizens and councils
- reporting annually on STC activities.

The full text of the IGCA can be found on Brentwood's website: *https://brentwoodboro.com/boroughgovernment/ordinances-and-resolutions-2/send/86-2012-ordinances/14278-ordinance-2012-1204-multi-municipal-shade-tree-commission.html*

APPENDIX C: TREE INVENTORY AND DATA REPORTING TOOLS

Public Tree Inventory – Initial Data Collection and Database Tool

Three years after the formation of the Brentwood-Baldwin-Whitehall Shade Tree Commission, in the summer of 2015, data for each borough's initial, public, tree inventory was collected in the field by three students from the Pennsylvania State University Department of Ecosystem Science and Management. The inventory crew was under the guidance of Urban Forester, Brian Wolyniak (Penn State Extension at Penn State Center Pittsburgh), and Associate Professor and Extension Specialist in Community and Urban Forestry, William Elmendorf (Penn State Department of Ecosystem Science and Management). The walking inventory of trees and site characteristics was accomplished using diameter tapes and portable field computers with GPS receivers. The field assistants measured and evaluated each tree or planting site and entered its species, diameter, and location into a geo-referenced database using customized, data-entry forms within GIS Cloud software. Tree and planting site locations were positioned on borough maps using GPS in conjunction with aerial imagery of the Borough.

By the following year, under the guidance and training of Penn State Extension, the BBWSTC's inventory data (approximately 2,627 trees) was created using *opentreemap.org*, an online tool managed by the Pennsylvania Department of Conservation and Natural Resources (PA DCNR).

Several, different online tools are available to collect a tree inventory. However, opentreemap was chosen over the many others because:

- it is free and simple to learn.
- it allows trees in Brentwood, Baldwin, and Whitehall to be included and tracked in larger PA DCNR studies.

Each borough's public tree inventory database is a subset of the PA Tree Map profile in opentreemap and can be identified by its project name – Brentwood, Baldwin, or Whitehall. STC members were trained in the use of the tree inventory database tool and one login account with editing capabilities was created for each of the project names. One login may be simultaneously used by multiple people to input and update data.

Both the opentreemap desktop application (for office use) and mobile app (for field use) have the following online capabilities:

- addition or removal of individual trees
- search by tree species, location, size, age, and project name
- real-time calculation of the eco-benefits of selected trees

>>> See Figure 3 in the following pages <<<

Additionally, the opentree desktop application allows:

- batch addition or removal of a group of trees using a bulk import template
- export of raw data in .csv format to an external tool, such as MS-Excel, for further manipulation

Because opentreemap saves inventory data immediately, there is no "undo" or previous version available.
Any backup management is the responsibility of the users.

Public Tree Inventory – Maintenance

The 2015 tree inventory, while essential for locating and identifying our public trees initially, did not include crucial details such as tree height, approximate age, or crown condition – data used to more accurately calculate the environmental benefits of our trees. To improve data accuracy in the future, BBWSTC will use the opentreemap mobile app (in the field) and desktop application (in the office) to maintain and update its tree inventory by meeting the objectives detailed in the Tree Inventory section of this plan's goals.

>>> See Section II. Goals, Tree Inventory, How We Will Get There <<<

To compare improvements in tree canopy over a set period of time, exports of the opentreemap inventory data need to be saved annually to discrete offline spreadsheets. These exports will be integral for reference and archiving. The online inventory does not save old versions of data.

Public Tree Inventory – Data Reporting Tools

In 2016 each borough received their first Tree Inventory Summary Report, based on the initial tree inventory data collected in 2015 and a LiDAR aerial map comparing the tree canopy gains/losses from 2010-2015.

Our ability to generate useful reports from these tools depends on:

- the accuracy and completeness of tree inventory data
- the skill set of our members in the use of the data reporting tools available to them

BBWSTC currently has four tools available to us for producing tree inventory reports.

1. Online opentreemap Application

Using tree inventory entries, the online opentreemap application can produce simple online reports indicating:

- the number of trees in an area
- the tree benefits, in relevant units/year, and in dollar terms for a selected area when measuring:
    - stormwater filtering
    - energy conserved
    - air quality improvement and CO2 removed and stored

A simple, instant Eco Benefits report can be generated by anyone with a basic knowledge of the search capabilities of the opentreemap application.

>>> See Figure 4 in the following pages <<<

2. LiDAR

Various Pennsylvania organizations, including Tree Pittsburgh, are able to supply the BBWSTC with LiDAR maps showing overall canopy loss/gain in our boroughs. New maps are produced every 5 years.

3. MS-Excel (or similar) Software

Raw data can be exported from the opentreemap tree inventory database as a .csv file and imported into a spreadsheet like MS-Excel. The pivot table and graphing features of Excel are able to produce easy-to-read, graphical reports on species diversity, tree gain/loss and other aspects of the urban canopy. These snapshots serve as a baseline when measuring and evaluating the on-going progress of our municipalities towards their tree canopy goals.

A few caveats, however, to this approach: first, the step to import the .csv file to a spreadsheet might require the input of missing fields or the correction of inaccurate data. Also, some familiarity with the tree inventory data fields is necessary to ready the spreadsheet for further report generation. Finally, in order to display the imported and corrected data in graphical formats, the user will require fluency in the use of the spreadsheet functions.

>>> See Figures 5 & 6 in the following pages <<<

4. The i-Tree Software Suite

Raw data can be exported from the opentreemap database and imported into i-Tree software and into municipal GIS systems. The free i-Tree software from USDA Forest Service has the ability to calculate ecosystem service costs and benefits from selected data. The use of i-Tree tools requires specific training. Information about i-Tree can be found online at: *www.itreetools.org*.

From the array of tools in the i-Tree Software Suite, i-Tree Streets was chosen to create graphs for the initial 2016 Tree Inventory Summary Reports. Since then, i-Tree Streets became a legacy tool, which is no longer supported. The i-Tree tool that currently serves our reporting purposes best is the i-Tree Eco application.

i-Tree Eco

This tool must have more complete information for each tree added to the opentreemap tree inventory. Additional inventory fields, such as crown condition and tree height, are needed in order for i-Tree Eco to calculate its more detailed tabular reports, which may be useful for Boroughs requiring compliance with the PA MS4 Stormwater Program. Such tabular reports show a summary of the tree benefits for all inventoried trees in a hypothetical region.

>>> See Figure 7 in the following pages <<<

i-Tree Eco can also provide various estimate reports using sampling input from aerial canopy views. This method can be used to generate reports for an entire area that includes trees on private, public developed and undeveloped land when individual inventory entries are not available.

Figure 3: opentreemap has the capability to search by various parameters.

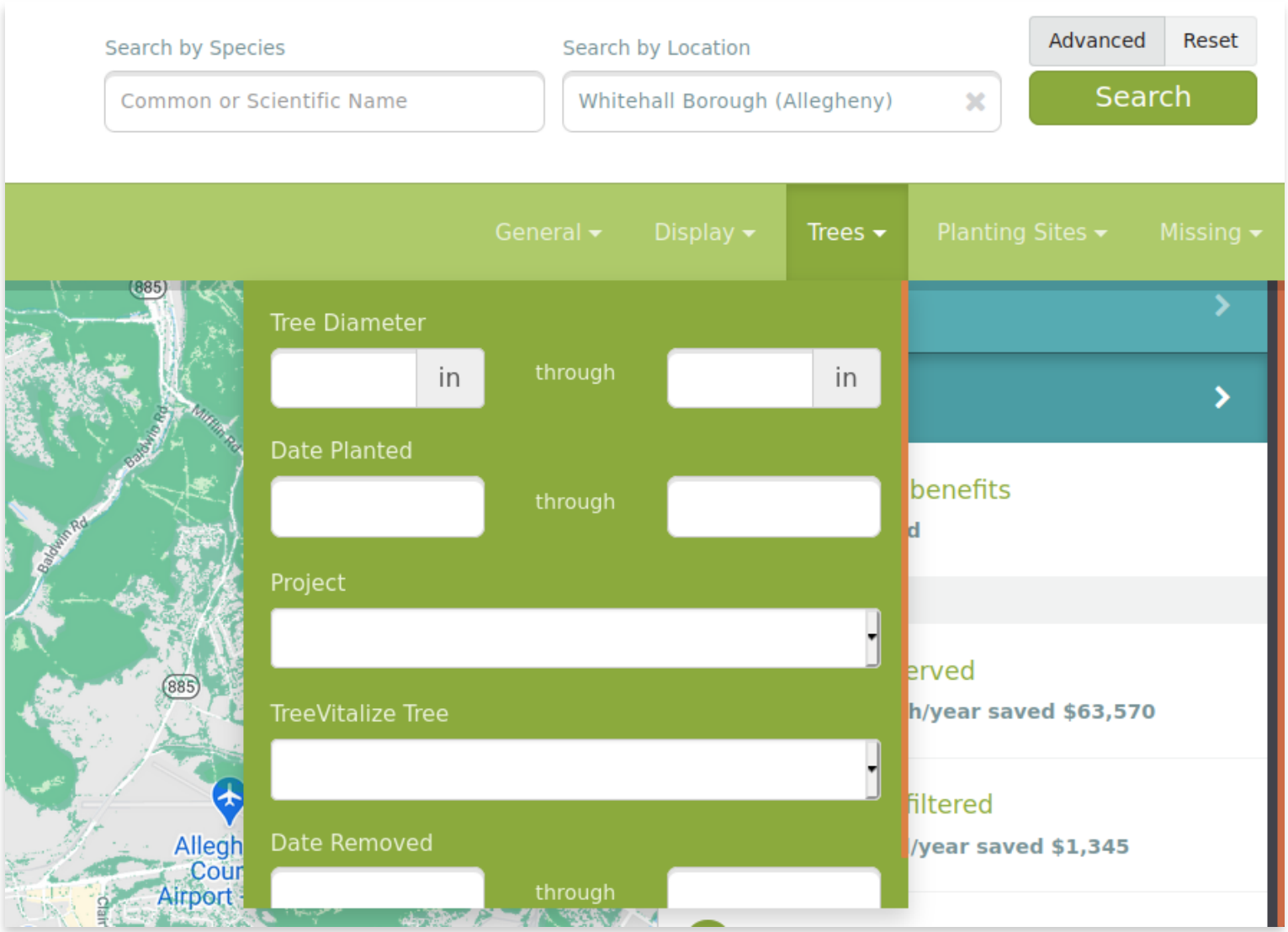
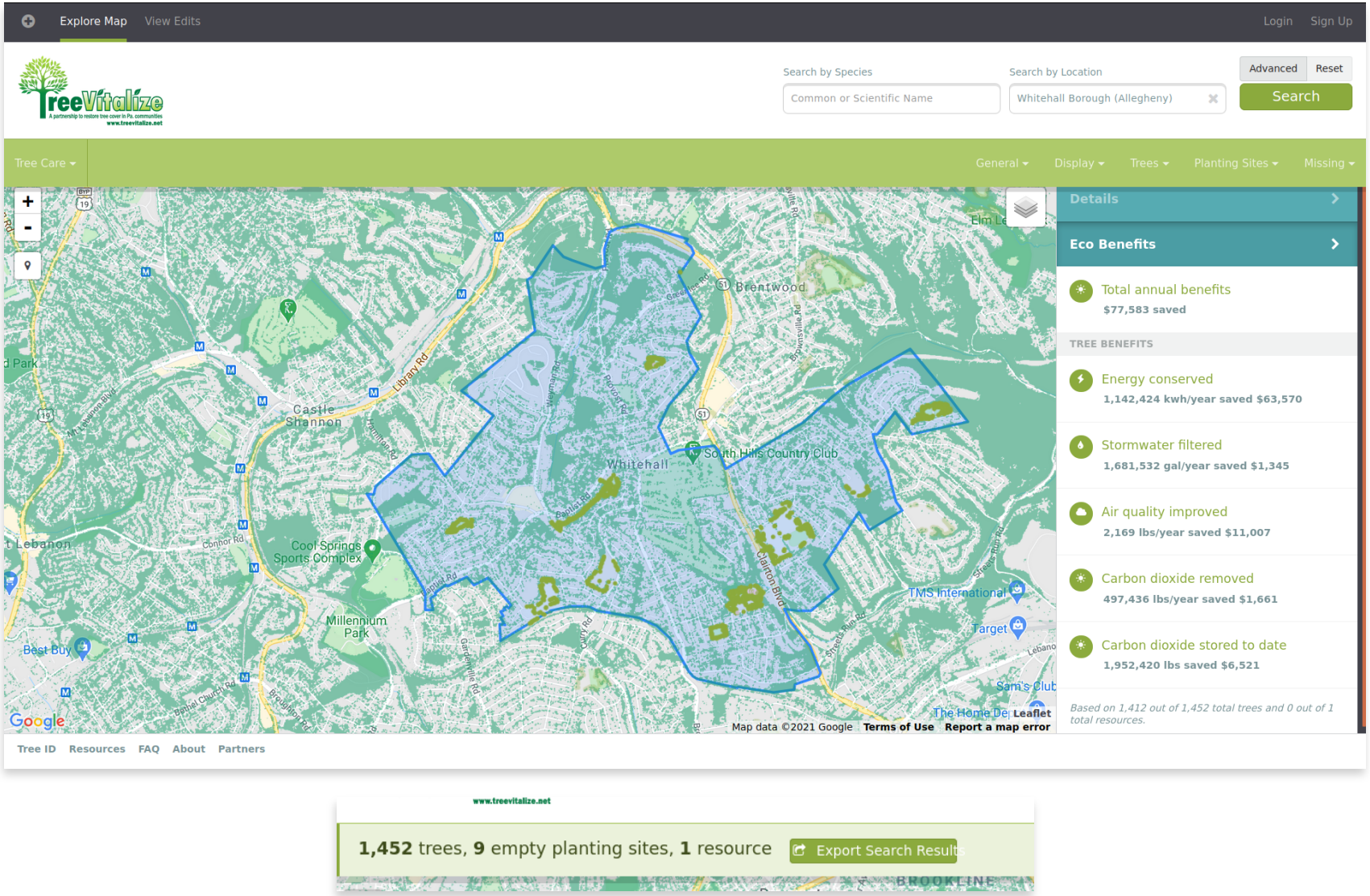
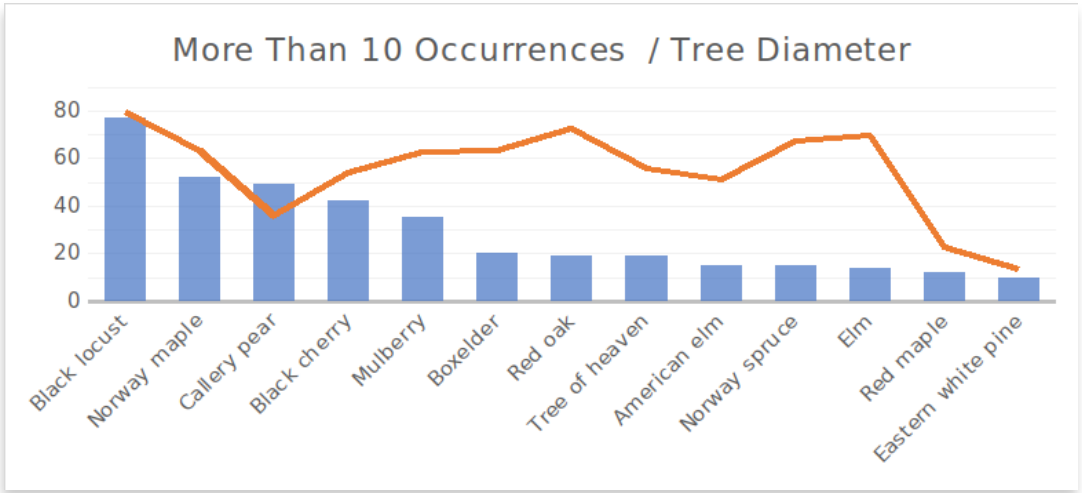


Figure 4: Example report generated by opentreemap.



Figures 5 & 6: Example reports generated by MS-Excel based on hypothetical data.



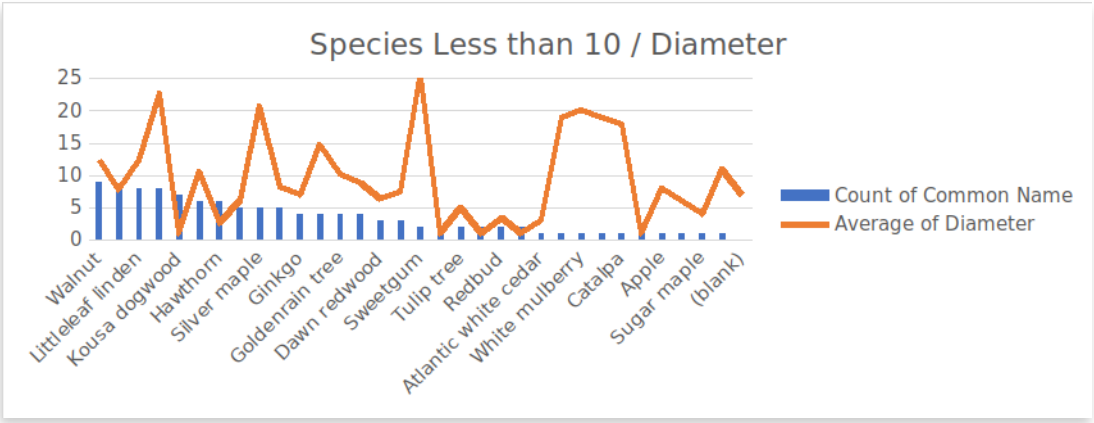


Figure 7: Example report generated by i-Tree Eco.

Benefits Summary by Species

Generated: 4/25/2019

Species	Trees	Carbon Storage		Gross Carbon Sequestration		Avoided Runoff		Pollution Removal		Structural Value
	Number	(ton)	($)	(ton/yr)	($/yr)	(ft^3/yr)	($/yr)	(ton/yr)	($/yr)	($)
Western redcedar	20	0.05	6.31	0.00	0.61	44.13	2.95	0.00	1.04	1,406.55
Littleleaf linden	3	0.57	76.32	0.03	3.53	143.38	9.58	0.00	3.39	4,565.73
Eastern hemlock	9	1.42	188.96	0.07	8.99	311.97	20.85	0.00	7.37	11,843.34
Winged elm	20	11.86	1,577.36	0.33	44.05	778.30	52.03	0.01	18.40	36,357.83
American elm	29	18.00	2,394.47	0.57	75.84	1,601.35	107.04	0.02	37.85	40,882.37
Chinese elm	101	47.38	6,303.75	1.66	220.24	4,324.13	289.05	0.06	102.22	163,281.57
Siberian elm	6	6.20	824.85	0.19	25.16	322.85	21.58	0.00	7.63	9,583.13
Slippery elm	3	2.31	307.49	0.09	11.66	194.50	13.00	0.00	4.60	6,897.20
Chaste tree	61	4.13	549.18	0.38	50.16	505.29	33.78	0.01	11.94	30,364.44
Japanese zelkova	59	23.83	3,170.62	0.97	128.69	1,136.24	75.95	0.02	26.86	106,191.75
Total	**8,056**	**2,996.45**	**398,671.19**	**99.64**	**13,257.27**	**161,524.67**	**10,797.25**	**2.40**	**3,818.22**	**10,634,176.63**

Carbon storage and gross carbon sequestration value is calculated based on the price of $133.05 per ton.
Avoided runoff value is calculated by the price $0.067/$ft^3$. The user-designated weather station reported 39.8 inches of total annual precipitation.
Pollution removal value is calculated based on the prices of $1,459.85 per ton (CO), $846.24 per ton (O3), $157.34 per ton (NO2), $60.75 per ton (SO2), $31,396.19 per ton (PM2.5).

APPENDIX D: BBWSTC TREE MAINTENANCE PLAN

BBWSTC has created a *Tree Maintenance Plan* (the Plan) to carry out our mission. BBWSTC should refer to the Plan on a monthly basis to schedule, organize and perform necessary tree care responsibilities. It may be modified and amended by BBWSTC as needed.

1 Pruning

Young trees (up to 5 years old) can be pruned up to once per year or not at all. Pruning should be completed before the spring bloom. Newly planted trees should not be pruned *except for* branches that are dead, damaged, diseased, or deranged until they recover from the stress of transplanting (1-2 years).

Proper pruning is essential in developing a tree with a strong structure and desirable form. Trees that receive the appropriate pruning measures while they are young will require less corrective pruning as they mature.
Keep these few simple principles in mind before pruning a tree:

- Always have a purpose in mind before making a cut. Each cut has the potential to change the growth of the tree.
- Poor pruning can cause damage that lasts for the life of the tree. Learn where and how to make the cuts before picking up the pruning tools.
- Trees do not heal the way people do. When a tree is wounded, it must grow over the damage, and the wound is contained within the tree forever.
- Small cuts do less damage to the tree than large cuts. Correcting issues when a tree is young will reduce the need for more drastic pruning later.

1.1 Making the Cut with Pruning Tools

Pruning cut location is critical to a tree's growth and wound closure response. Make pruning cuts just outside the branch collar to avoid damaging the trunk and compromising wound responses. Improper pruning cuts may lead to permanent internal decay. If a large branch must be shortened, prune it back to a secondary branch or a bud. Cuts made between buds or branches may lead to stem decay, sprout production, and misdirected growth.

Figure 8: Anvil pruners are not recommended.

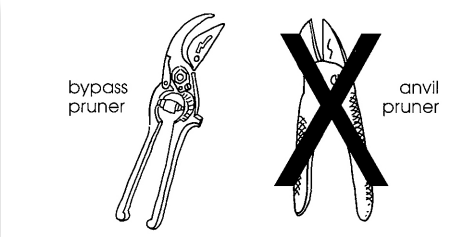
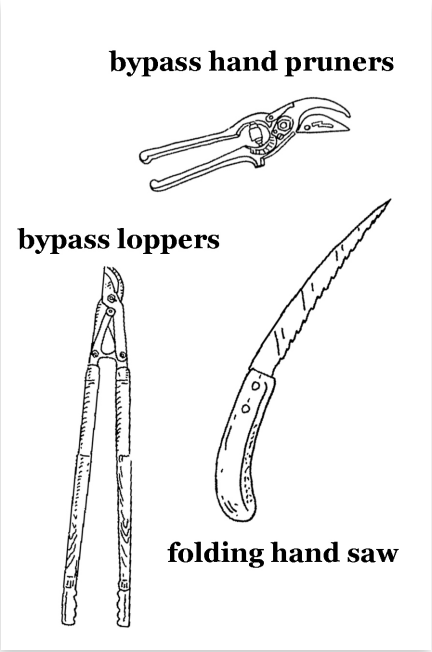


Figure 9: Proper pruning tools.



Small branches can be cut easily with hand pruners. Scissor-type or bypass-blade hand pruners preferred over the anvil type as they make cleaner, more accurate cuts.
>>> See Figure 8 shown left <<<
Cuts larger than one-half inch (1.27 cm) in diameter should be made with lopping shears or a pruning saw.
>>> See Figure 9 shown left <<<
Hedge shears should be used for shaping hedges only. Do not use shears to prune a tree. Whichever tool you use, make sure it is kept clean and sharp.

1.2 Establish a Strong Scaffold Structure

A good structure of primary branches should be established while the tree is young. These limbs, called scaffold branches, are a mature tree's framework. Properly trained young trees will develop a strong structure that requires less corrective pruning as they mature. The goal in training young trees is to establish a strong, central trunk with sturdy,

well-spaced branches. This form mimics tree growth in forest settings where outward branching is limited by neighboring trees. Some tree species develop some or all of these characteristics naturally, even when grown openly in an urban or park setting. Others may require more frequent attention.

1.3 Trunk Development

For most young trees, a single, dominant, upward-growing leader is the goal. Do not prune back the tip of this leader or allow secondary branches to outgrow the main leader. Sometimes, a tree will develop double leaders known as codominant stems. Codominant stems can lead to structural weaknesses, so it is best to remove or shorten one of the stems while the tree is young. A tree's secondary branches contribute to the development of a sturdy, well-tapered trunk. When numerous branches are being removed, it is preferable to retain some, at least temporarily, to promote trunk diameter growth.

1.4 Permanent Branch Selection

Most of the branches present on a young tree at planting will be pruned away at maturity to provide clearance for mowing, pedestrians, and/or vehicle traffic. The height of the lowest permanent branch is determined by the tree's intended function and location in the landscape. The road side of a street tree may be raised to 16 feet (5 m) to accommodate traffic. In most other situations, 8 feet (2.4 m) of clearance is sufficient. Trees used as screens or wind breaks, however, usually branch low to the ground. Sufficient branch spacing and balance, both vertically and radially, is important. The space between permanent branches should be approximately 3 percent of the tree's eventual height (for example, 1.5 feet [0.5 m] for a tree that can grow to be 50 feet [15 m] tall). Beyond spacing, the strength of branch structure depends on the relative size of the branches and branch angles. Branches similar in diameter to the trunk or limb from which they arise are more prone to failure than those smaller in diameter. Narrow angles of attachment can enclose bark within a branch union. Such growth is called included bark, a condition that weakens the branch attachment and may lead to failure when the tree matures. Branches with weak attachments should be pruned while still small. Balance should be considered by retaining some branches in each direction radially, spreading from the center outward. Make sure one scaffold branch is not allowed to grow directly above another. When pruning, be sure not to remove too many branches. Leaves and their supporting branches are major sites of food production and storage. Eliminating too much of the canopy can "starve" the tree, reduce growth, and increase stress. No more than 25% of the crown should be removed in one pruning.

2 Wound Dressings

Despite any claims otherwise, research has shown that wound dressings do not reduce decay or speed wound closure and rarely prevent insect or disease infestations. Most experts recommend that wound dressing not be used.

3 Weeding

Weeds and grass should be removed within 3 feet from the base of the trunk. Mulch should be applied to this area to suppress weed and grass growth.

4 Mulching

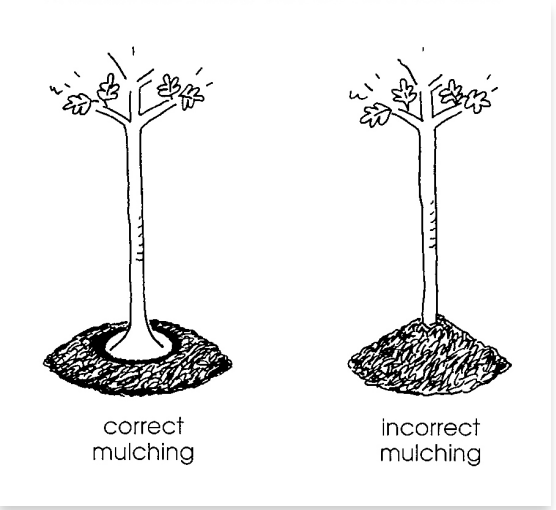
Mulch around the base of the trunk should be replenished once per year, preferably in the spring to minimize water loss during the summer months.

Mulch should not be piled against the trunk. Do not make a mulch volcano. Make a donut.
>>> See Figure 10 shown below <<<

Remember Three 3s:

- 3-inch-deep layer of mulch
- 3 inches away from the trunk's base
- 3 feet out from trunk (6-7 feet diameter)

Figure 10: Tree Tenders donut mulch.



4.1 Benefits of Proper Mulching

- Helps reduce soil moisture loss through evaporation
- Helps control weed germination and growth

- Insulates soil, protecting roots from extreme summer and winter temperatures
- Can improve soil biology, aeration, structure (aggregation of soil particles), and drainage over time
- Can improve soil fertility as certain mulch types decompose
- Inhibits certain plant diseases
- Reduces the likelihood of tree damage from "weed whackers" or the dreaded "lawn mower blight"
- Gives planting beds a uniform, well-cared-for look

Trees growing in a natural, forest environment have roots anchored in rich, well-aerated soil full of essential nutrients and microbes. Blanketed by leaves, organic materials, and living organisms, the soil is replenished with recycled nutrients. This environment is optimal for root growth and mineral uptake. Urban landscapes and new developments, however, are typically harsher environments with poor-quality soils, reduced organic matter, and large fluctuations in soil temperature and moisture. Applying a layer of organic mulch can mimic a more natural environment and improve plant health.

4.2 Types of Mulch

Mulches are available in many forms. The two major types of mulch are inorganic and organic. Inorganic mulches include various types of stone, lava rock, pulverized rubber, geotextile fabrics, and other materials. Inorganic mulches do not decompose and do not need to be replenished often. On the other hand, they do not improve soil structure, add organic materials, or provide nutrients. For these reasons, most horticulturists and arborists prefer organic mulch.

Organic mulches include wood chips, pine needles, hardwood and softwood bark, cocoa hulls, leaves, compost mixes, and a variety of other products usually derived from plants. They decompose in the landscape at different rates depending on the material, climate, and soil microorganisms present. Those that decompose faster must be replenished more often. Because the decomposition process improves soil quality and fertility, many arborists and other landscape professionals consider that characteristic a positive one, despite the added maintenance.

4.3 Not Too Much Mulch!

As beneficial as mulch is, too much can be harmful. Unfortunately, many landscapes are falling victim to a plague of over mulching. "Mulch volcanoes" are excessive piles applied around the base of trees. While organic mulches must be replenished over time, buildup can occur if reapplication outpaces decomposition or if new material is added simply to refresh color. Deep mulch can be effective in suppressing weeds and reducing maintenance, but it often causes additional problems.

4.4 Improper Mulching Causes Problems

- On wet soils, deep mulch can lead to excess moisture in the root zone, which can stress the plant and cause root rot.
- Piling mulch against the trunk or stems suffocates the tree; creates dark, moist conditions preferred by mold and fungus; and allows insects to invade the soft bark.
- Some mulch, like fresh, grass clippings, can affect soil pH and may eventually lead to nutrient deficiencies or toxic buildups.
- Mulch piled high against the trunks of young trees may create habitats for rodents that chew the bark and can girdle the trees.
- Thick blankets of fine mulch can become matted and may reduce the penetration of water and air.
- Anaerobic "sour" mulch may give off pungent odors, and the alcohols and organic acids that build up may be toxic to young plants.

4.5 Proper Mulching

The choice of mulch and the method of application can be important to the health of landscape plants.

The following are some guidelines to use when applying mulch:

- Determine whether soil drainage is adequate and if there are plants that may be affected by the choice of mulch. Most commonly available mulches work well in most landscapes. Some plants benefit from slightly acidic mulch, like pine bark.
- For well-drained sites, apply a 2- to 4-inch (5- to 10-cm) layer of mulch (less if poorly drained). Coarse mulches can be slightly deeper. Apply mulch out to the edge of a tree's crown or beyond. If trees had a say, the entire root system (extending beyond the drip line) would be mulched.
- If mulch is already present, check the depth. If sufficient, break up any matted layers to refresh the appearance with a rake. Some landscape maintenance companies spray mulch with a water-soluble, vegetable-based dye to add color to faded material.
- If mulch is piled against the stems or tree trunks, pull it back several inches/centimeters so that the base of the trunk is exposed. Composted wood chips can make good mulch, especially when

they include some bark and leaves. Fresh wood chips also may be used around established trees and shrubs.

5 Tree Support (Stakes & Ties)

Stakes and ties installed at a young tree's planting should be removed as soon as the tree can support itself, in 6 to 12 months. It is recommended they not be removed in winter for ease of removal.

6 Watering

Improper watering is the main reason young trees fail in an urban environment. Young and newly planted trees require a periodic deep watering unless there is sufficient rainfall. Trees need more water in hot summer months, and may need a watering schedule during these months. Mature trees, 5 years and older, do not need watering.

Recommended watering schedule if rainfall is less than one inch per week:

- **Year 1:** 1x / wk.
- **Year 2:** 2x / mo.
- **Year 3:** every 1-2 mo.
- **Year 4:** every other mo.
- **Year 5:** every 3-4 mo.

7 Tree Maintenance Calendar

This yearly calendar serves as a guide for scheduling maintenance events. After each maintenance event, the tree inventory should be updated with the current size and status of each tree.

>>> See Figure 11 shown right <<<

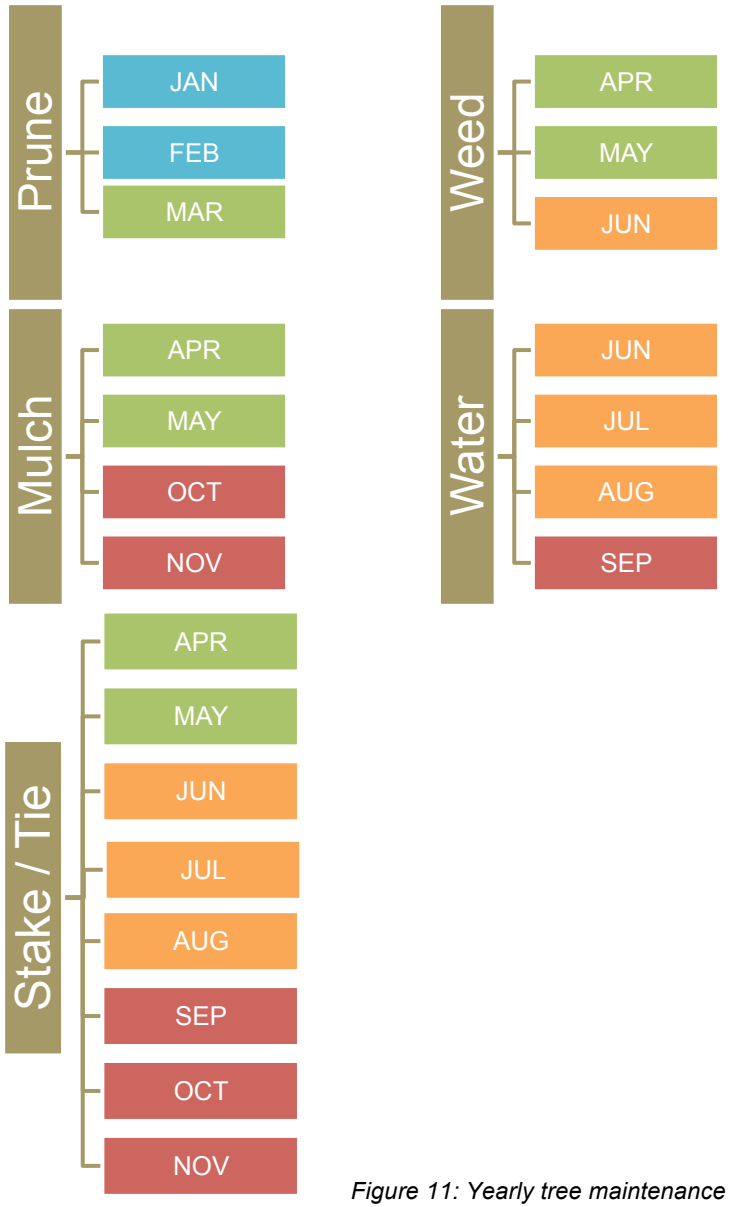


Figure 11: Yearly tree maintenance calendar.

APPENDIX E: TREE REMOVAL AND PRESERVATION

Tree Removal

The decision about which trees to preserve and which trees to remove should be based on individual tree evaluation.

Additional steps include:

- positively identifying and confirming ownership before authorizing tree removal
- having an ISA Certified Arborist evaluate tree health and risk for failure before removal
- using only experienced, certified professionals to remove trees

Tree condition is also a good assessment for whether a tree would be a candidate for removal. Young, vigorous, healthy trees are the best candidates for protection, because they grow new tissue quickly and adapt readily to new environments. However, it is large, old trees that are most often the focus of preservation. Of course, it is possible to preserve old trees as long as they are healthy, but younger ones may give the best return on investment. Vigorous trees usually have full canopies and healthy leaves. Trees with large cavities or other structural weaknesses are not good candidates for preservation, unless the problems can be alleviated by pruning, cabling or bracing.

Three conditions indicate poor tree health.

1. The leaves are small and pale for the species.
2. Some of the branches are dead.
3. Most of the foliage arises from short twigs along the major limbs, known as epicormic growth.

Evaluation guidelines for possible removal:

- tree is dead or dying
- tree is deemed hazardous, where the hazardous condition cannot be corrected through pruning or other reasonable arboricultural practices

When trees are not deemed dead, dying or hazardous, the following factors will be considered:

- life expectancy of the tree
- desirability of the tree species
- amount of space available for tree growth
- overall quality and structural integrity of the tree
- persistent and uncontrollable insect, disease, or fruiting problems
- frequency and extensiveness of the tree's maintenance requirements
- feasibility and timeliness of planting a replacement tree
- proximity and quality of trees near to the one considered for removal
- wishes and desires of the property owner/resident
- quality and extent of past pruning and other tree maintenance practices the tree has undergone
- extent and frequency of damage the tree is causing to surrounding infrastructure such as sidewalks, streets, sewers, etc.
- location of the tree with regard to streetlights, traffic control devices, intersection sight lines and the requirements of the tree related to available growing space

Unless the tree is deemed a hazard, there must be a minimum of two weeks between the time it is marked for removal and the actual removal date. Shortly after the tree is removed the stump must be ground out.

Tree Protection and Preservation

Trees improve a community's quality of life by providing environmental and aesthetic benefits such as shade, cooling, and wildlife habitat. Our urban trees are part of our infrastructure and are a valuable asset. Unlike other assets, however, trees are living entities and have basic biological requirements for survival and growth. As such, this unique asset must be actively managed and protected to maintain its health, function, safety, and aesthetic value. Tree preservation is preferred to replacement, as a new tree requires 20 to 30 years to provide significant aesthetic, infrastructural, and environmental benefits.

Protecting young trees and preserving mature ones benefits the community by:

- Reducing stormwater runoff – Trees absorb the first 30% of precipitation through their leaf systems. A typical medium-sized tree can intercept as much as 2,380 gallons of rainfall per year from reaching the ground.

- Reducing street maintenance costs – Streets with little or no shade need repaving twice as often as those with 30% tree cover.
- Reducing energy expenses – Cities can lower the costs of heating, cooling, and meeting air quality standards required by local, state and federal regulations.
- Large trees return five times the average annual net benefit of small trees.*

**https://www.fs.fed.us/psw/publications/documents/psw_gtr199/psw_gtr199guide.pdf*

https://www.fs.fed.us/psw/topics/urban_forestry/products/CUFR_182_UFfactsheet4.pdf

https://www.walkable.org/download/22_benefits.pdf

The average cost of planting a 2" caliper tree, even with volunteer help, is $300, but for every dollar invested, a 40-year old, mature tree returns about $3.17 dollars of benefits. To realize the initial tree investment, it is imperative that newly-planted trees be protected and older trees be kept healthy throughout their natural life.

How to protect newly-planted trees:
- Use properly-fitting tree guards around the trunks until the trunk caliper is at least 5" in size. Tree guards discourage rodent gnawing, deer rubbing, and minimize damage from lawn maintenance.
- Use stakes and arbor ties to keep the tree from tipping in high winds or when pushed by animals.
- Use a 6' wire cage around any small tree which is susceptible to deer browsing. Leave the cage in place at least until the deer can no longer reach and browse the main leader.
- Water, weed, and mulch regularly.
  >>> See Appendix D, BBWSTC Tree Maintenance Plan <<<

How to preserve established trees to maturity:
- Schedule regular arborist assessments and, if necessary, schedule treatments for insect and disease infestation.
  Prune trees to maintain a strong and open scaffolding structure.
  >>> See Appendix D, BBWSTC Tree Maintenance Plan <<<
- Discourage the use of trees for hanging posters, locking up bikes, permanently wrapping its trunk with light strings, or any other tree-damaging activities.
- Prevent pollutants from being dumped onto their critical root zones, especially when the tree is growing in a sidewalk tree pit or median.
- Prevent soil compaction, mounding, and direct damage during construction.

How Trees are Damaged During Construction

Surface and root zone impacts in construction sites can disrupt a tree's interaction with its environment, leading to tree damage or death. Understanding these impacts and their severity is critical to successful preservation.

Surface impacts:
- Wind damage – Trees develop strong anchorage only where it is needed, so trees in groups may have less secure anchorage. Removing some trees from a group will expose the remaining trees to excessive wind velocities and lead to wind-thrown trees.
- Excessive pruning – Trees are pruned to prevent damage to utility wires and buildings, but careless pruning can cause tree death. When too many branches are removed or the branches have been pruned improperly, the tree may not be able to sustain itself or may experience decay.
- Physical injury to trunk and crown – Construction equipment can injure the above-ground portion of a tree by breaking branches, tearing the bark, and wounding the trunk. These injuries are permanent and, if extensive, can be fatal.

Root zone impacts:
- Raising the grade can interfere with gas exchange and suffocate roots, and can also raise the water table and drown the roots.
- Lowering the grade removes topsoil and feeder roots, exposing the other roots to drying and freezing. Lowering the grade can also lower the water table and cause drought.
- Compacting the soil within the drip line blocks air and water from the roots.
- Chemicals dumped in the soil can change soil chemistry and can be toxic to trees.
- Cutting of roots – The roots of the tree are found mostly in the upper 6 to 12 inches of the soil. In a mature tree, the roots extend far from the trunk – typically growing a distance of one to three times the height of the tree. The amount of damage a tree can suffer from root loss depends, in part, on how close to the tree the cut is made.

- Severing one major root can cause the loss of 5 to 20 percent of the root system. Trenching and excavating in the root zone can damage as much as 40 percent of the root system, causing tree death within a few years.

>>> See Figure 12 shown below <<<

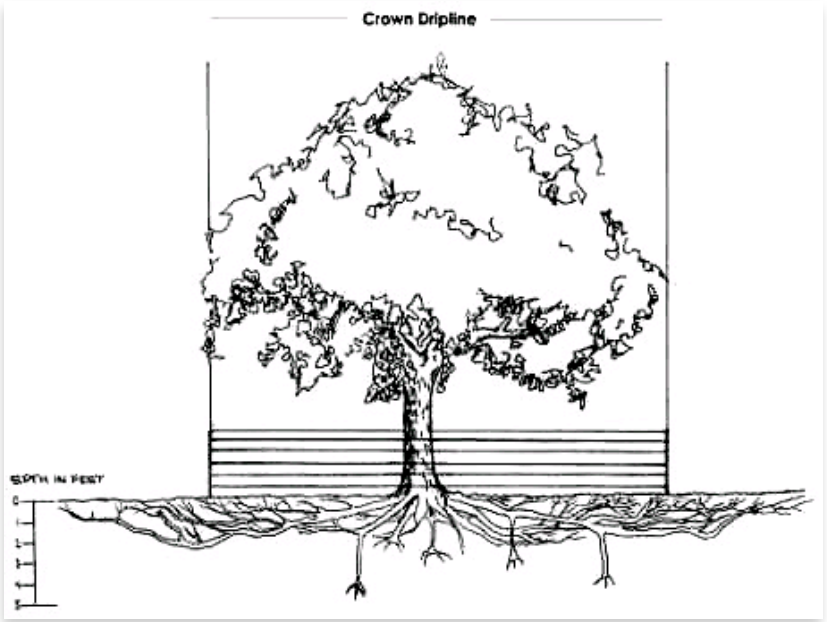


Figure12: Extent of root system.

Trees can require several years to adjust to injury and environmental changes that occur during construction. Stressed trees are more prone to health problems such as disease and insect infestation. Consulting an arborist about continued maintenance of trees is essential, along with continued monitoring and periodic evaluation for declining health and safety hazards.

How to Preserve a Tree During Construction

Fence off the tree's critical root zone from compaction or damage before allowing nearby construction to begin. The critical root zone is marked using the DBH in inches and measuring that many feet from the trunk in all directions, i.e. the radius of a circle with the tree as the center point is equal to the number of feet that matches the DBH in inches.

>>> See Figure 13 shown below <<<

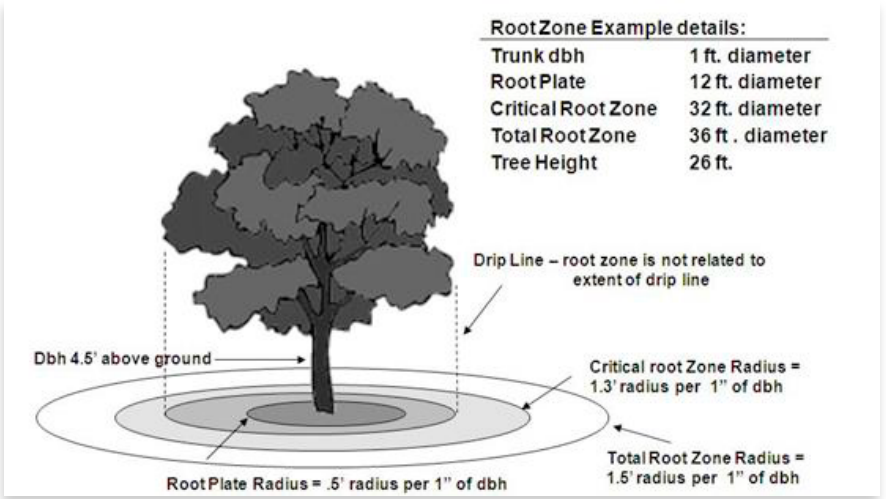


Figure13: Root zone details from: https://gatrees.org/resources/where-are-my-trees-roots/

APPENDIX F: PREFERRED SPECIES LIST

The following pages are tree species recommended / restricted by Tree Pittsburgh in 2020.

Recommended Street Trees – two pages
These (typically smaller) trees do well in harsh, urban environments and fit well under utility lines.

Recommended Trees for Parks and Open Spaces – three pages
These trees can be larger with more spread, providing more shade and environmental benefits.

Restricted Trees – three pages
These tree species are currently experiencing pest/disease pressures or are causing ecological harm, and they should not be considered for planting.

NOTE : Tree species not specifically recommended or restricted should be planted sparingly

TREE SPECIES FOR STREETS IN ALLEGHENY COUNTY

LARGE SHADE TREES - Trees in the Shade Tree category should be planted where no overhead electrical distribution lines exist. Wires on the adjacent side of the street should be checked for conflicts. Shade trees are the most desirable size of tree for planting, and should be used at all times in the absence of overhead electrical distribution utilities.

Common Name	Latin Name	Preferred Cultivars	Growth Habit	Frequency of Use	Stormwater Tolerant	Notes
Hackberry	Celtis occidentalis	Chicagoland' 'Prairie Pride'		Moderately	Yes	
Ginkgo	Ginkgo biloba	'Magyar'		Frequently		Use of 'Magyar' cultivar only, inspect graft union before planting to ensure male var.
Kentucky Coffee	Gymnocladus dioicus	Fruitless cultivars only		Moderately		
Black gum	Nyssa sylvatica	Many cultivars are NOT hardy		Frequently	Yes	Spring plant only
London Plane	Platanus x acerifolia	'Exclamation' 'Columbia' NOT 'Bloodgood'		Frequently		
Oak, Swamp White	Quercus bicolor	Regal Prince		Frequently	Yes	
Oak, Chinkapin	Quercus muehlenbergii	'Green Vase'		Frequently		
Oak, Hybrid	Quercus Hybrids	NOT 'Village Green'		Frequently		
Bald Cypress	Taxodium distichum			Moderately	Yes	Highly susceptible to bagworms
Zelkova	Zelkova serrata			Moderately		Early, heavy and frequent pruning required

MEDIUM TREES - Do NOT plant under electrical distribution lines.						
Common Name	**Latin Name**	**Preferred Cultivars**	**Growth Habit**	**Frequency of Use**	**Stormwater Tolerant**	**Notes**
Maple, Hedge	Acer campestre	Do NOT use cultivars, straight species only		Moderately		Susceptible to verticillium wilt
Hornbeam, European	Carpinus betulus	'Fastigiata' 'Frans Fontaine'		Moderately		
Maackia, Amur	Maackia amurensis			Moderately		
Hophornbeam	Ostrya virginiana			Frequently		

SMALL TREES - Use only under electrical distribution lines. These trees will likely be utility pruned, however it will not be severe.						
Common Name	**Latin Name**	**Preferred Cultivars**	**Growth Habit**	**Frequency of Use**	**Stormwater Tolerant**	**Notes**
Dogwood, Cornelian Cherry	Cornus mas	'Golden Glory'		Frequently		
Silverbell, Carolina	Halesia tetraptera			Moderately		
Crabapple	Malus spp.	'Red Jewel', 'Spring Snow' NOT Red Barron'		Frequently		Rose family, do not plant with cherries, hawthorns, pears, serviceberry or juniper
Cherry, Flowering	Prunus spp.	'Accolade', 'Autumnalis', 'Snow Goose' NOT 'Okame'		Frequently		Rose family, do not plant with crabapples, hawthorns, pears, serviceberry or juniper

NOTE: Tree species not specifically recommended or restricted should be planted sparingly

TREE SPECIES FOR PARKS & OPEN SPACES IN ALLEGHENY COUNTY

CONIFEROUS TREES - 20% of trees in a planting must be conifers. Plant NO MORE than 30% of any plant family, NO MORE than 20% of any plant genus, and NO MORE than 10% of any plant species.

Common Name	Latin Name	Growth Habit	Frequency of Use	Stormwater Tolerant
Cypress, Sawara	Chamaecyparis pisifera		Moderately	Yes
Cedar, Alaskan	Cupressus nootkatensis		Frequently	
Ginkgo	Ginkgo biloba		Frequently	
Larch, European	Larix decidua		Moderately	Yes
Larch, Japanese	Larix kaempferi		Frequently	
Larch, Siberian	Larix sibirica		Moderately	
Redwood, Dawn	Metasequoia gyptostroboides		Frequently	Yes
Baldcypress, Pond	Taxodium ascendens		Moderately	Yes
Baldcypress, Common	Taxodium distichum		Frequently	Yes
Arborvitae, Giant Western	Thuja plicata		Moderately	

DECIDUOUS TREES - **Up to 80% of a park planting can be deciduous. Plant NO MORE than 30% of any plant family, NO MORE than 20% of any plant genus, and NO MORE than 10% of any plant species**

Common Name	Latin Name	Growth Habit	Frequency of Use	Stormwater Tolerant
Buckeye, Yellow	Aesculus flava		Moderately	
Buckeye, Red	Aesculus pavia		Moderately	
Alder, Speckled	Alnus incana ssp. Rugosa		Frequently	Yes
Alder, Hazel	Alnus serrulata		Frequently	Yes
Alder, Mountain	Alnus viridis ssp. Crispa		Frequently	Yes
Serviceberry, Saskatoon	Amelanchier alnifolia		Moderately	
Serviceberry, Downy	Amelanchier arborea		Moderately	
Serviceberry, Shadblow	Amelanchier canadensis		Moderately	
Serviceberry, Allegheny	Amelanchier laevis		Moderately	
Pawpaw	Asimina triloba		Moderately	
Birch, Black	Betula lenta		Frequently	
Hornbeam, European	Carpinus betulus		Moderately	
Hickory, Bitternut	Carya cordiformis		Moderately	
Hickory, Pignut	Carya glabra		Moderately	
Hickory, Shellbark	Carya laciniosa		Moderately	Yes
Hickory, Shagbark	Carya ovata		Moderately	
Hickory, Mockernut	Carya tomentosa		Moderately	
Catalpa, Northern	Catalpa speciosa		Moderately	Yes
Hackberry, Common	Celtis occidentalis		Moderately	Yes
Redbud	Cercis canadensis		Moderately	

NOTE : Tree species not specifically recommended or restricted should be planted sparingly

DECIDUOUS TREES

Common Name	Latin Name	Growth Habit	Frequency of Use	Stormwater Tolerant
Dogwood, Kousa	Cornus kousa		Frequently	
Dogwood, Cornelian Cherry	Cornus mas		Frequently	
Persimmon, American	Diospyros virginiana		Frequently	
Kentucky Coffee	Gymnocladus dioicus		Frequently	
Silverbell, Carolina	Halesia tetraptera		Moderately	
Holly, American	Ilex opaca		Frequently	Yes
Sweetgum	Liquidambar styraciflua		Frequently	Yes
Tulip Poplar (Tuliptree)	Liriodendron tulipifera		Frequently	
Magnolia, Cucumber	Magnolia acuminata		Frequently	
Magnolia, Umbrella	Magnolia tripetala		Moderately	
Magnolia, Sweetbay	Magnolia virginiana		Frequently	Yes
Black Gum	Nyssa sylvatica		Frequently	Yes
Hophornbeam, American	Ostrya virginiana		Moderately	
Parrotia, Persian	Parrotia persica		Frequently	
Sycamore, American	Platanus occidentalis		Frequently	Yes
London Plane	Platanus x acerifolia		Moderately	Yes

RESTRICTED TREE SPECIES FOR ALLEGHENY COUNTY

The tree species below are currently experiencing pest/disease pressures or are causing ecological harm and should not be considered for planting.

Common Name	Latin Name	Notes
Maple, Trident	Acer buergerianum	Hardiness, poor performance
Maple, Amur	Acer ginnala	DCNR Invasive Species List
Maple, Striped	Acer pensylvanicum	Poor performance
Maple, Norway	Acer platanoides	DCNR Invasive Species List
Maple, Sycamore	Acer pseudoplatanus	DCNR Invasive Species List
Maple, Tatarian	Acer tataricum	Relation to A. ginnala, invasive, poor performance
Tree of Heaven	Ailanthus altissima	DCNR Invasive Species List
Mimosa	Albizia julibrissin	DCNR Invasive Species List
Alder, European Black	Alnus glutinosa	DCNR Invasive Species List
Angelica, Japanese	Aralia elata	DCNR Invasive Species List
Mulberry, Paper	Broussonetia papyrifera	DCNR Invasive Species List
Chestnut, American	Castanea dentata	Oak wilt, chestnut blight
Chestnut, Chinese	Castanea mollissima	Oak wilt, chestnut blight
Chinkapin, Allegheny	Castanea pumila	Oak wilt, chestnut blight
Dogwood, Flowering	Cornus florida	Pests and disease, poor performance
Filbert, Turkish	Corylus colurna	Eastern Filbert Blight (EFB)
Cypress, Leyland	Cupressus x leylandii	Hardiness, poor performance
Beech, American	Fagus grandifolia	Beech leaf disease, beech bark disease
Beech, European	Fagus sylvatica	Beech leaf disease, beech bark disease
Ash, White	Fraxinus americana	Emerald Ash Borer (EAB)
Ash, Black	Fraxinus nigra	Emerald Ash Borer (EAB)
Ash, Green	Fraxinus pennsylvanica	Emerald Ash Borer (EAB)
Ash, Pumpkin	Fraxinus profunda	Emerald Ash Borer (EAB)
Butternut	Juglans cinerea	Canker

RESTRICTED TREES

Common Name	Latin Name	Notes
Crabapple, Red Barron	Malus spp. 'Red Barron'	Poor performance
Mulberry, White	Morus alba	DCNR Invasive Species List
Royal Princess Tree	Paulownia tomentosa	DCNR Invasive Species List
Corktree, Amur	Phellodendron amurense	DCNR Invasive Species List
Corktree, Japanese	Phellodendron japonicum	DCNR Invasive Species List
Corktree, Lavalle	Phellodendron lavallei	DCNR Invasive Species List
Spruce, Norway	Picea abies	Spruce decline
Spruce, Engelman	Picea engelmannii	Spruce decline
Spruce, White	Picea glauca	Spruce decline
Spruce, Dwarf Alberta	Picea glauca var. albertiana	Spruce decline
Spruce, Black	Picea mariana	Spruce decline
Spruce, Serbian	Picea omorika	Spruce decline
Spruce, Blue	Picea pungens	Spruce decline
Spruce, Red	Picea rubens	Spruce decline
Pine, Austrian Black	Pinus nigra	Population crash due to disease
Pine, Red	Pinus resinosa	Population crash due to disease
Cherry, Okame	Prunus 'Okame'	Poor performance
Fir, Douglas	Pseudotsuga menziesii	Population crash due to disease
Pear, Callery	Pyrus calleryana	DCNR Invasive Species List
Oak, Willow	Quercus phellos	Poor performance
Mountain Ash, American	Sorbus americana	Population crash due to disease
Mountain Ash, European	Sorbus aucuparia	Population crash due to disease
Mountain Ash, Showy	Sorbus decora	Population crash due to disease
Bee Bee Tree	Tetradium daniellii	DCNR Invasive Species List
Sumac, Poison	Toxicodendron vernix	Poisonous
Hemlock, Eastern	Tsuga canadensis	Hemlock Wooly Adelgid, Hemlock Elongate Scale

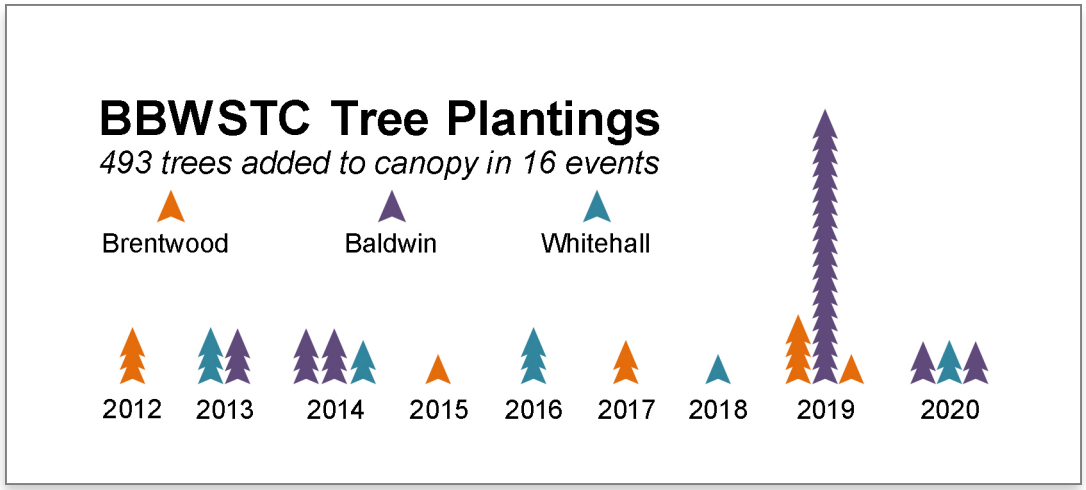
RESTRICTED TREES		
Common Name	**Latin Name**	**Notes**
Hemlock, Carolina	Tsuga caroliniana	Hemlock Wooly Adelgid, Hemlock Elongate Scale
Elm, American	Ulmus americana	Poor performance, Dutch Elm Disease (DED)
Elm, Chinese	Ulmus parvifolia	Poor performance
Elm, Siberian	Ulmus pumila	DCNR Invasive Species List
Elm, Slippery	Ulmus rubra	Dutch Elm Disease (DED)

APPENDIX G: LIST OF BBWSTC TREE PLANTINGS 2012-2020

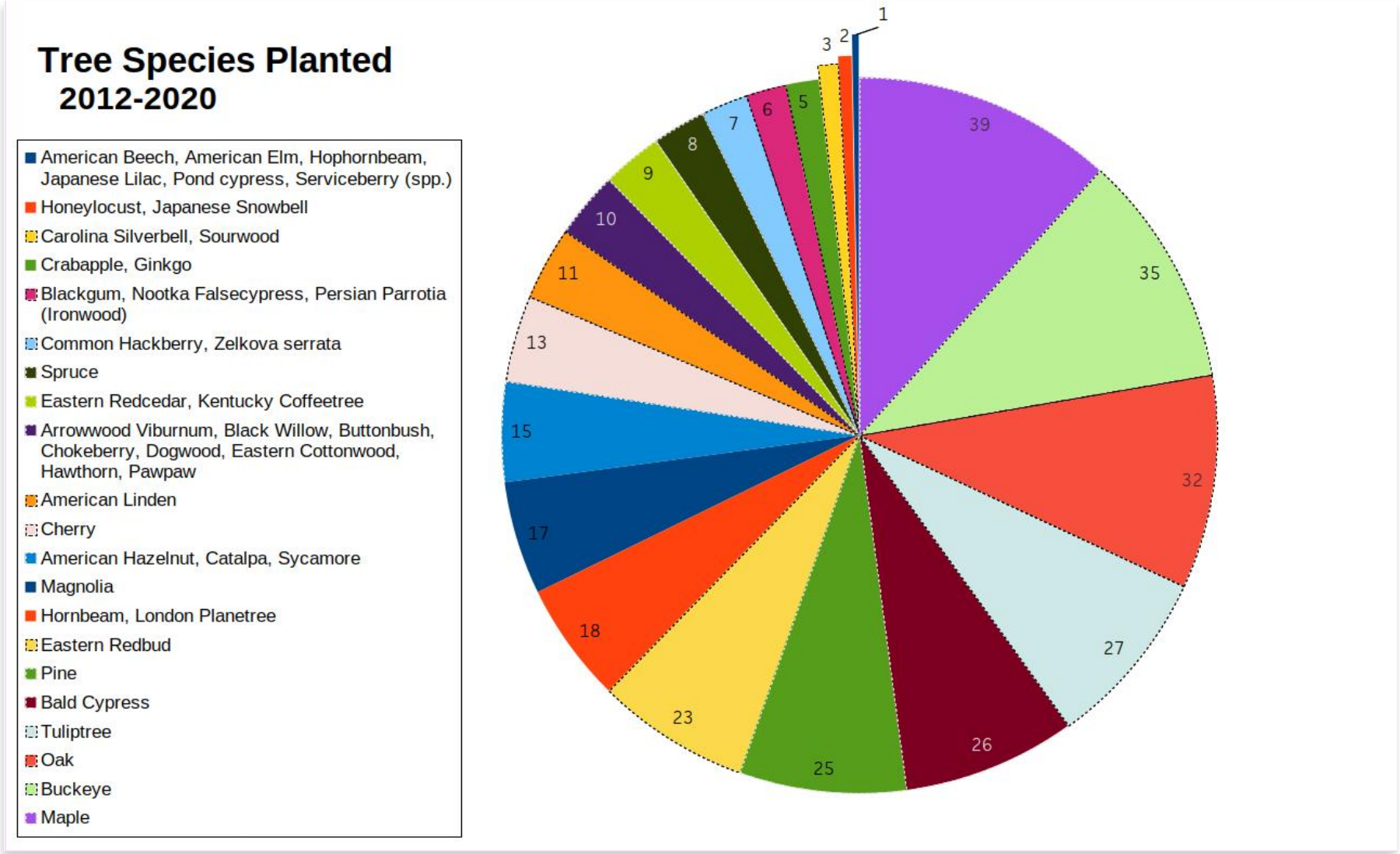
Number of Events = 16

Total Trees Planted = 493

November 2012	Brentwood Park (Brentwood)	25 trees
April 2013	Snyder Park (Whitehall)	25 trees
October 2013	Baldwin Municipal Complex (Baldwin)	25 trees
April 2014	McAnnulty Elementary School (Baldwin)	25 trees
April 2014	Paynter Elementary School (Baldwin)	25 trees
November 2014	Prospect Park (Whitehall)	15 trees
April 2015	Brownsville Road (Brentwood)	9 trees
October 2016	Whitehall Borough Building (Whitehall)	25 trees
April 2017	Brownsville Road Apartments (Brentwood)	15 trees
May 2018	Whitehall Pool (Whitehall)	4 trees
April 2019	Brentwood Park (Brentwood)	40 trees
October 2019	Colewood Park Riparian Planting (Baldwin)	200 trees
November 2019	Brownsville Road (Brentwood)	11 trees
October 2020	Colewood Park (Baldwin)	15 trees
November 2020	Orchard Heights Park (Whitehall)	12 trees
November 2020	Leland Park (Baldwin)	22 trees



APPENDIX H: TREE SPECIES PLANTED BY BBWSTC 2012-2020



APPENDIX I: ORGANIZING A TREE PLANTING EVENT

1
Getting Started

A tree-planting event is initiated when the Commission or Borough identifies a viable location (typically on public land) that could benefit from canopy cover, beautification, and/or stormwater management. BBWSTC learned that Google Maps is a great starting point thanks to its satellite view, which displays an overhead view of structures, roads, and green space. The *opentreemap.org* tool uses Google Maps, which may show empty tree planting sites in the targeted area and may also show helpful information about nearby tree species. Once due diligence is performed to determine the landowner's identity and the location of any easements, rights of way, or utility lines (above and below ground), a site visit is organized. The primary stakeholders, such as the landowner or municipal representative, BBWSTC members, and an urban forester from TreeVitalize or DCNR (if they are supplying the funding) are gathered to tour the potential planting site in order to find the best locations for new trees to be planted. Care is taken to locate sewer grates, property lines, overhead utilities, sight lines, and any other visible site characteristics that should be avoided. The map printed from Google Maps can now be marked with the optimal planting locations.

2
Tree Selection

The next step in planning a planting is to select a tree species and size suitable for each potential planting site. BBWSTC strongly promotes the planting of native tree species according to Tree Pittsburgh's diversity guidelines. *>>> See Appendix F, Preferred Species List <<<*

For park areas, a 1"-2" caliper tree is preferred, while hillside sites are easier to plant when trees are no larger than 1" caliper. The mature height, width, and overall shape of the tree should be considered, especially if the tree is to be planted near utility lines or structures. Other factors to consider include whether the soil is generally dry or wet; whether the tree will drop fruit, seeds, or other debris; whether deciduous leaves or needles will create a maintenance problem (such as near a pool or fountain); environmental tolerances (e.g. salt tolerance, animal browsing, etc.), sun exposure, and root structure.

The end result of the tree selection process is a planting map, showing the planting site location of each tree species in the targeted area. The map should indicate the expected mature size of each tree selected, helpful for the marking process during site preparation.

3
Procurement

Once the proper species of tree is selected for each site, we will either:

- **submit an application form** to a granting agency that describes the project and wait to hear what type of grant will be awarded. Grants from the DCNR's TreeVitalize program include procurement and delivery of the trees, tree stakes, ties, and trunk guards by the funding organization. In contrast, grants of money require us to procure the trees and materials as described below.

- **contact local nurseries** to determine whether they have these trees in stock or if they must be ordered specially. When possible, it is best to consult multiple local nurseries so that we can find the best prices available – a must when dealing with limited funding. Inquire about delivery fees since they can add up quickly when delivering multiple loads of trees. Sometimes it is more cost efficient to have the local municipal Public Works staff use their trucks to transport the trees from the nursery to the planting site. Tree guards, stakes, and ties must also be ordered. *A.M. Leonard* is a reliable source for these items, but Western Pennsylvania Conservancy may also sell these items if they have sufficient surplus in their warehouse.

4
Setting the Planting Date

Plantings are best scheduled for spring (April-May) and autumn (October-November) – times when the trees are dormant.

Factors to consider when determining the planting date are:

- due to seasonal weather, some species of trees are more sensitive to transplanting in spring than fall, or vice versa
- the granting entity may dictate the schedule based on their staff availability
- conflicts with other projects scheduled by the municipality and the availability of their DPW team
- scheduled events, such as ball games, which may conflict with planting activities or parking availability

It is important that all stakeholders are included in the planting date decision and that all are satisfied they can meet their obligations on that date.

5
Logistics

In advance of the planting date, numerous logistical concerns need to be addressed, such as those detailed below.

Liability

Take care of any legal liability issues. Make sure there is some type of insurance coverage in place that will cover any incidents or injuries during the tree planting. On public land, this coverage is normally provided by the municipalities' insurance policy, but this coverage should be confirmed. Plantings on private land require additional research. An approved waiver form may be requested for either type of planting.

Community

Plantings are an easy way to bring community members together. Invite public participation via municipal websites, BBWSTC Facebook and Instagram pages and/or email notifications. Previous volunteers can be contacted using a list maintained by BBWSTC.

Tools

While volunteers are helpful, they also require additional considerations including provision for gloves and tools. Itemize the number of shovels, rakes, wheelbarrows, buckets, heavy-duty wire cutters, scissors, and stake pounders, which can be provided and by whom. Send reminders to those individuals the day before the planting and remind everyone to label their tools for easy identification during event cleanup. For easy movement from site to site, use a bucket to carry small tools and materials.

Refreshments

Of course, any community activity is always more fun when free food and drinks are available for the attendees, being mindful of dietary restrictions. Soliciting food and beverage donations can take several days or weeks in the run up to the planting. Start by presenting potential donors with a one-page description of the event and an explanation of how a donor business will be acknowledged. The names of past donor businesses are maintained by BBWSTC. Alternately, food trucks are a popular option and should be considered for future plantings where donations cannot be secured in time.


Breakfast provided by Brentwood businesses Crazy Mocha and Giant Eagle

Photography

Arrange for at least one BBWSTC member to take "Before" / "After" / "Planting Day" photos of the site, the "Planting Activities," "The Volunteers," and an "Inventory Close-Up" of each tree for the *opentreemap.org* tree inventory.

Tree Tenders

Confirm the number of Tree Tenders in attendance. Tree Tender member minimums are determined by:

- grant requirements for a specific number of Tree Tender attendees
- the planting demonstration on planting day, best performed by at least 3 Tree Tenders

- the expected number of volunteer groups. Tree Tenders oversee the individual plantings to be sure each tree is being handled and planted using best practices. Depending on the distance between planting sites, one Tree Tender can oversee from 2 to 5 planting groups. For many volunteers this is a new experience that can be an opportunity for the Tree Tender to share amazing tree traits, so don't stretch the Tree Tenders too thinly. Tree Tenders should wear BBWSTC shirts or orange vests so they are easily identifiable throughout the planting event

6
Site Preparation

Two weeks prior to the planting date, each planting site should be marked with a 3' diameter white paint circle. It is imperative that a Borough employee calls the PA One Call aka "Call Before You Dig" (811 line). This call will trigger each utility company to check their infrastructure and, if necessary, send out a representative to mark any nearby, underground utilities. If it is determined that underground lines are under or near any of the staked sites, those trees should be relocated.

Digging such large holes is an extremely tedious undertaking, especially in this part of Western Pennsylvania, where clay soil and large rocks can impede this process tremendously. It is suggested that machines such as

augers and backhoes dig these holes to a depth and width that corresponds with the dimensions of the root ball or container, as provided by the nursery. It is preferable that the hole be too shallow – needing a little, extra digging by hand – rather than too deep. The root ball needs to sit on a firm, hard-packed surface, rather than on soil that was added back into a too-deep hole. Any rocks and sods resulting from digging the hole should be removed to a discard area or compost pile.

For safety and a better planting outcome, the soil removed while digging the hole should be replaced in the hole until planting day.

This temporary replacement technique serves 3 purposes:
1. In public areas, the chance of someone falling in the hole is minimized.
2. For plantings early or late in the year, an overnight freeze will not solidify the soil to be replaced on planting day.
3. Rain will not wash away the soil or pool up in the bottom of the hole.

When requesting Borough support for a planting, it is best to list all needed items in one request. Items might include the hole digging, mulch, tree stakes, trunk guards, access to bathroom facilities, or support from Public Works employees. Once the planting sites are marked is a good time to confirm with the DPW team that adequate mulch will be delivered on the day of the event and agree on where it will be dropped. If the targeted area is large, request that a DPW utility truck be available to transport the mulch around the area. Otherwise, participants will need to use buckets or wheelbarrows for that purpose. Typically, one yard of mulch is required for every six trees to be planted.

Finally, the day before the trees are to be delivered, mark each hole with a stake or flag indicating which tree species is to be planted at that location. Flagging or staking any sooner raises the risk the identifying markers will be removed by the public.

7
Delivery Day

The optimal tree delivery time is very early on planting day. Deliveries of 12 or more, large (1”- 2” caliper) trees usually arrive on a flatbed trailer.

The best way to unload these heavy trees is to slide and maneuver them into the bucket of a front end loader and drive them directly to their assigned planting sites. If machinery is not available, be sure to have a wooden ramp and a handcart. Two people should be able to wrestle each tree down the ramp and onto the handcart for delivery to its planting site.

Tree deliveries the day prior to planting day can be treated in much the same way, although the safety of placing the trees at the sites overnight must be considered. For trees being delivered more than one day prior to planting, arrangements should be made for safe storage until the morning of the planting event.

8
Planting Day

7:00 – 8:00 am

BBWSTC members, grant funding staff, and requested Public Works crews arrive at least 1 hour before the volunteers to place the trees at their sites, lay out tools and materials and review the Tree Tender assignments. To warm up, start digging pre-loosened soil out of the holes, especially the demonstration hole.

8:00 – 9:00 am

Volunteers sign-in and enjoy a light breakfast if it is provided. Before starting the planting demo at 9:00 am, capture group photos.

9:00 – 10:00 am
When volunteers are participating it is imperative that BBWSTC (or a TreeVitalize representative) gather everyone around one tree to present a short tree planting demonstration before any other planting begins. This important step ensures that everyone understands how to correctly plant a tree.

The demonstration should include the following steps with explanations for why the step is necessary:

- Remove all tags and other markers (except for the species ID tag) from the tree.

- Show how to check the depth of the hole against the height of the root ball or container. If the hole is too deep, it should be backfilled and stamped down. If it is too shallow (the better of the two conditions) it should be dug to the proper depth.

- Multiple volunteers can now be enlisted to help twist and roll the tree into the hole without destroying its root ball or damaging the thin bark on the trunk. The tree should be observed from various points of view to make sure it is standing vertically and not leaning.

- Cut away the wire cage and the burlap (toss the nails holding the burlap in place into the hole with the root ball). The burlap can be collected for composting, while the wire cages can be collected for metal recycling.

- Backfill the soil around the root ball, with someone occasionally stomping around the perimeter of the hole to eliminate air pockets in the soil. Emphasize that the root flare of the tree should remain exposed and the soil should not be piled up around it.

- Mulch (preferably natural / dye-free) should be applied over the soil, taking care to avoid the dreaded mulch volcano, where mulch is mounded up the sides of the trunk. The opposite should occur – mulch should be pulled away from the tree trunk, creating a donut-shaped mulch bed around the tree.

- Stake the tree against wind using wooden stakes, a stake pounder, and Arbor Tie (a type of strapping that won't cut into the trunk like wire would). Deer guards or fencing can also be applied at this time.

- Water the newly-planted tree – a very important planting step. If dry weather is predicted, make arrangements to manually water these trees over the summer.

10:00 am – 2:00 pm
Volunteers and Tree Tenders can now spread out to their assigned trees and do their own planting. Each group of four volunteers, with the help of a Tree Tender, should be able to plant two large trees by noon. Stronger groups may be able to plant three in the same time period. By inviting

more volunteers, more trees can be in the ground by noon, but the latest an event should end is 2:00 pm.

2:00 – 3:00 pm
Clean up. Bamboo stakes, plastic, and other non-compostable items should be collected and taken to a garbage dumpster. Burlap, paper products, and other compostable items should be collected for delivery to a composting site. Collect wire separately for the metal recycling location. Tools and extra materials should be returned to their owners or BBWSTC members.

9
After Planting

- Collect each tree's species, height, DBH, planting date, health, GPS location, and site type for the tree inventory.
- Take a photo of the whole tree and one of a specific leaf, flower or seed, if present, to include in the tree inventory entry.
- Enter the newly-planted trees into the online tree inventory database (*opentreemap.org*).
- Return to the planting area the following day to check the condition of the trees, staking, and trunk guards.
- Create an event album on Facebook and upload the best photos there and also to Instagram.
- Create a neighborhood article on the SouthHillsRecord.org online site and contact print outlets for possible inclusion in their printed media.
- Thank businesses that donated with a suitable follow-up note.
- Present an event report to the respective Borough's Council.

Tree planting events involve many pre-planning and follow-up steps in order to make sure that the actual event goes smoothly. More importantly, pre-planning ensures that these trees will provide shade for years to come in the locations thoughtfully selected for them.

APPENDIX J: STATUS REPORT TEMPLATE

This status template is the tool by which the Shade Tree Commission will track their progress toward the long term goals and objectives identified in the Brentwood-Baldwin-Whitehall Urban Canopy Master Plan.

GOAL	ADVISORY ROLE TO BOROUGH COUNCIL				
	OBJECTIVES	APPROACHING	ONGOING	COMPLETED	TABLED
	Establish regular communication with Borough Council				
	Establish a semi-annual presence at Borough Council meetings				
	Build Relationships with the Borough Manager and Department of Public Works (DPW)				
	Advise Borough Council on Tree Ordinances				

GOAL	TREE INVENTORY				
	OBJECTIVES	APPROACHING	ONGOING	COMPLETED	TABLED
	Improve the tree inventory with more complete and accurate details				
	Implement i-Tree Eco for accurate tree inventory reports				

GOAL	CANOPY COVER				
	OBJECTIVES	APPROACHING	ONGOING	COMPLETED	TABLED
	Restore the amount and diversity of canopy cover to 2010 levels				

BOROUGH	TREE NUMBERS/% MOST POPULOUS SPECIES IN PUBLIC AREAS										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Brentwood	493/17%										
Baldwin	742/18.7%										
Whitehall	1392/18.5%										

	OBJECTIVES	APPROACHING	ONGOING	COMPLETED	TABLED
	Protect and maintain new tree assets				
	Reduce the number of invasive and dangerous trees				
	Establish a 5-year cyclical plan to monitor trees for maintenance actions, risks, and pests				

GOAL	FUNDRAISING AND GRANTS				
	OBJECTIVES	APPROACHING	ONGOING	COMPLETED	TABLED
	Establish a repeatable process to request a Shade Tree Budget Line Item for tree plantings and maintenance from Borough Council				
	Deepen our relationships with area tree-related and community organizations, libraries, and borough departments to broaden potential opportunities for grant funding, tree care education and awareness, and other initiatives.				
	Actively seek out sources of funding, donations, supplies and sweat equity for tree events				

BOROUGH	GRANTS & DONATIONS AWARDED										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Brentwood	WPC (9)		PHLS (15)		WPC (8+4)*						
Baldwin					Tree Pittsburgh (200)	Tree Pittsburgh (15); GBWAA (22)					
Whitehall		WPC (25)				WPC (12)					

GOAL	PUBLIC OUTREACH				
	OBJECTIVES	APPROACHING	ONGOING	COMPLETED	TABLED
	Demonstrate, through media and in-person events, the benefits of BBWSTC's mission to the residents of the Boroughs we serve.				

MEDIUM	OUTREACH EVENTS										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Brentwood	planting		planting		planting						
Baldwin					planting	planting					
Whitehall		planting									
Facebook											
Instagram						created					
Other											