



BEREA, KENTUCKY COMMUNITY TREE REPORT



Berea College ariel view. Source: Berea College

PREPARED BY THE URBAN FOREST INITIATIVE
AT THE UNIVERSITY OF KENTUCKY

OVERVIEW

Trees offer numerous invaluable benefits for our health and the environment. They enhance human well-being by reducing stress, improving happiness, and providing green spaces for relaxation and recreation. Beyond their natural beauty, trees play a crucial role in mitigating climate change.

Trees intercept run-off and absorb stormwater; they absorb carbon dioxide and filter particulates from the air. They provide shade and lower temperatures through evapotranspiration. Trees enhance biodiversity, providing habitat for various wildlife and enhancing overall ecosystem benefits. Trees have also been shown to enhance property values and improve human happiness.

The Urban Forest Initiative (UFI) at the University of Kentucky strives to improve tree canopy and community engagement with trees in Kentucky. This report provides a snapshot of our work in Berea's community tree canopy and can be used in education, outreach, and as a valuable planning tool.



Tulip poplar flower. Source: UFI

CONTENTS

PAGE 3
PROJECT INFORMATION

PAGE 5
BACKGROUND

PAGE 9
TREE INVENTORY REPORTS

+ BERE A COLLEGE 9

+ BERE A COMMUNITY SCHOOL 11

+ MEMORIAL PARK 13

+ WALNUT MEADOWS PATH 15

PAGE 17
PROJECT OUTCOMES

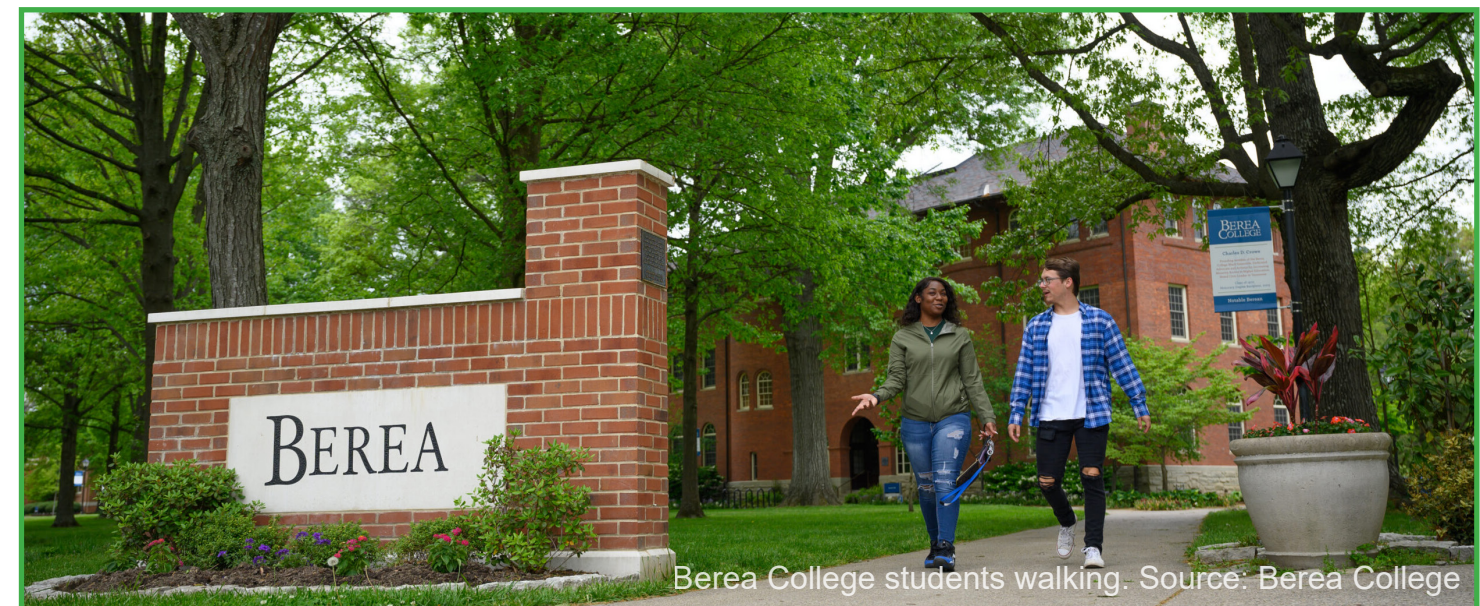
PAGE 20
SUGGESTIONS

PAGE 23
APPENDIX

PAGE 26
SITE REPORTS

PAGE 30
RESOURCES + CITATIONS

PAGE 31
PROJECT TEAM + ABOUT UFI



Berea College students walking. Source: Berea College

PROJECT INFORMATION

PROJECT PURPOSE AND FUNDING

The University of Kentucky Urban Forest Initiative (UFI) received grant funding through the U.S. Department of Agriculture Landscape Scale Restoration (LSR) Program to evaluate the tree canopy in four Kentucky communities with populations of less than 50,000: Berea, Georgetown, Hazard, and Paducah. The overall project goal is to enhance the community tree canopy, specifically through community forestry education, engagement and outreach, and skills training, with the longer-term goal of enhancing tree stewardship to build community resiliency to climate change.

Berea is an appropriate community for inclusion in the project based on its size and its status as a home to a small college. Additionally, Berea has a strong legacy of tree stewardship. Berea College is among 13 Tree Campus Higher Education institutions in Kentucky recognized by the Arbor Day Foundation. This recognition requires that the College have a tree care plan, an annual budget assigned to tree planting and tree care, hosts an Arbor Day observation and a service-learning project that engages the student body.

This report summarizes the work conducted in Berea by UFI between 2020 and 2023 in support of the LSR project. It details the planning process, collaboration with key stakeholders, project highlights, and outcomes.

TREE INVENTORY VS. TREE CANOPY ASSESSMENT

A tree inventory and a tree canopy assessment serve distinct but complementary purposes in understanding and managing community forests. A tree inventory is site-specific; it involves systematically cataloging individual trees within a targeted area, capturing relevant data such as species, size, condition, and location. A tree inventory helps identify the number, distribution, and diversity of

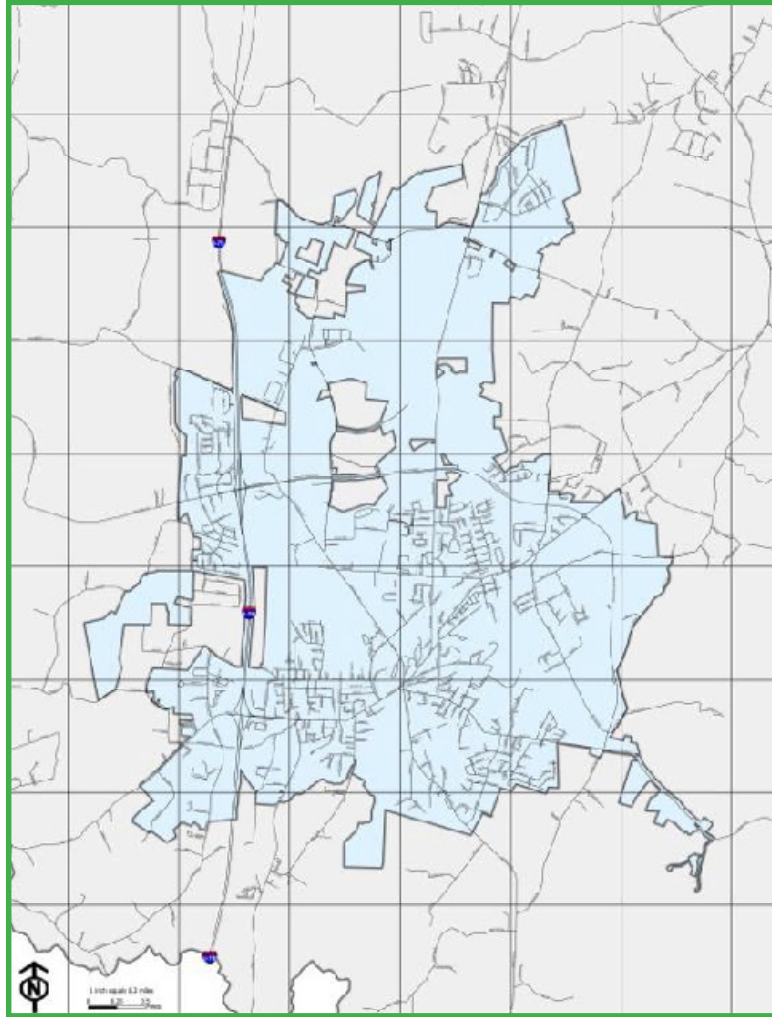
trees, providing a detailed snapshot of a local tree population; it is an outstanding management tool.

In contrast, a tree canopy assessment provides general information about the extent of tree cover within a given area. It involves analyzing spatial coverage of tree canopies, measuring factors such as the percentage of ground shaded by tree canopies, tree density, and vertical stratification. A tree canopy assessment offers insights into the overall benefits provided by a community forest such as stormwater mitigation, shade provision, temperature regulation, and carbon sequestration. By assessing the canopy it is possible to quantify the ecosystem services it provides and understand its contribution to the environment.

For this project UFI staff utilized tree inventory, canopy assessment and calculation of ecosystem services. Tree inventories were completed by the UFI team and volunteers at specific sites; canopy assessments and calculation of ecosystem services (benefits) were completed using the i-Tree tools¹. i-Tree Landscape was used to calculate existing tree canopy coverage and draw comparisons at different scales to assess patterns within the community. Ecosystem services were calculated using i-Tree Eco. This approach lends important insights to the overall composition, value, and potential of Berea's community forest, and provide guidance for management decisions.

¹<https://www.itreetools.org>

BACKGROUND



Map of Berea. Source: City of Berea Government

HISTORY OF BEREA

The City of Berea's history is linked to the story of Berea College, a private, tuition-free institution founded as a co-educational and interracial college. It was the first of its kind in the South, led by the dreams of the Reverend John G. Fee after he was sold land by Cassius Clay, an abolitionist. Berea College operated for 40 years until 1904 when the State of Kentucky forced the college to segregate. Berea College is situated in the center of the city and is today known as a progressive enclave with a strong tradition of Appalachian arts, including music and

crafts. Berea's 2023 population was 16,769 and its median income in 2020 was \$43,618. Berea College boasts a motto of breaking the cycle of poverty and charges no tuition for its students. Berea has been designated by the State of Kentucky as one of twenty Trail Towns, and is the host of over 9,000 acres of forest used for classes and outreach programs. Berea also is the site of the state-renowned hiking Pinnacles.

Based on the 2021 city limits, the city of Berea has approximately 22.5% tree canopy* but there are pockets of the city that have higher canopy coverage. It is essential to grow the urban tree canopy to create a more resilient Berea as extreme weather disasters become more common in the future.

Berea's 2023 population was 16,769. Nearly 91% of Berea's residents are white and Hispanic/Latin residents represent 4.4% of the ethnic mix.



Mountain Day Celebration. Source: Berea College

OVERVIEW OF STUDY AREAS

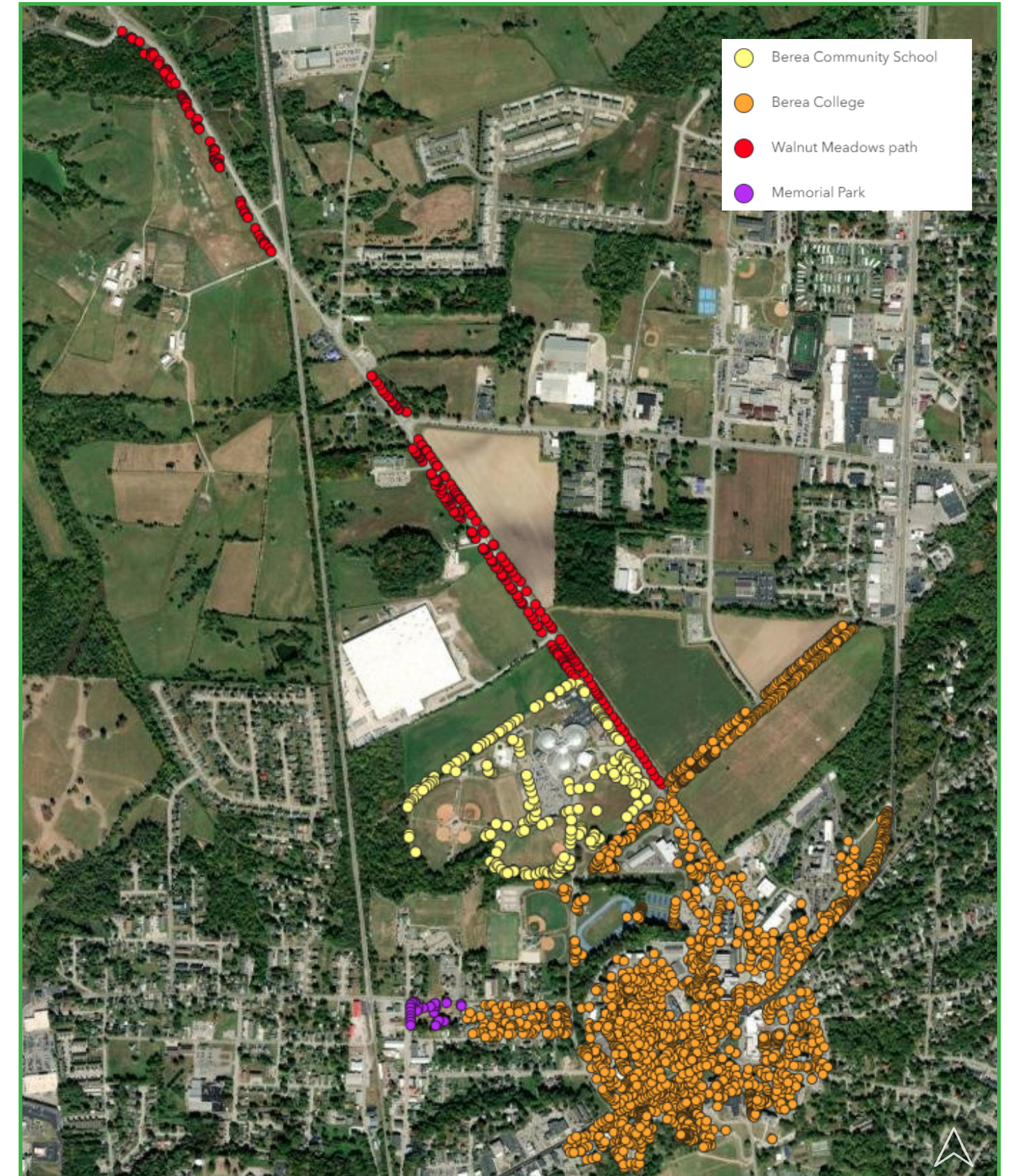
For tree mapping and identification, UFI selected sites in key spaces with the aim of gathering information about Berea’s tree canopy, forming the basis for a better understanding of tree distribution, species diversity, tree health, and the attendant challenges associated with management of the community tree canopy. Throughout summer 2021 and with assistance from staff and volunteers at Berea College, UFI mapped trees across four public sites. Site selection was based on stakeholder interests and involvement and their high public visibility. Sites included:

- + **Berea College** (153 acres)
- + **Berea Community School** (55 acres)
- + **Memorial Park** (3 acres)
- + **Walnut Meadows Shared Trail** (48 acres)

Table 1. Summary of tree mapping sites in Berea and an estimate of the ecosystem services those trees provide.

SUMMARY OF ECOSYSTEM BENEFITS ACROSS ALL SITES						
Site	Site Area (acres)	No. trees mapped	Stormwater captured (gal.)	Pollution removed (oz.)	Carbon sequestered (lbs.)	Monetary Benefit (\$)
Berea College	153	1973	1,730,843	16,274	45,135	\$4,207
Berea Community School	55	190	215,078	2,404	10,270	\$928
Memorial Park	3	23	38,773	458	2,054	\$185
Multi-use trail	48	249	588,044	1,471	7,832	\$682
Total	259	2,435	2,572,738	20,607	65,291	\$6,002

Figure 1. Berea trees identified and mapped in 2021



TREE INVENTORY REPORT

BEREA COLLEGE

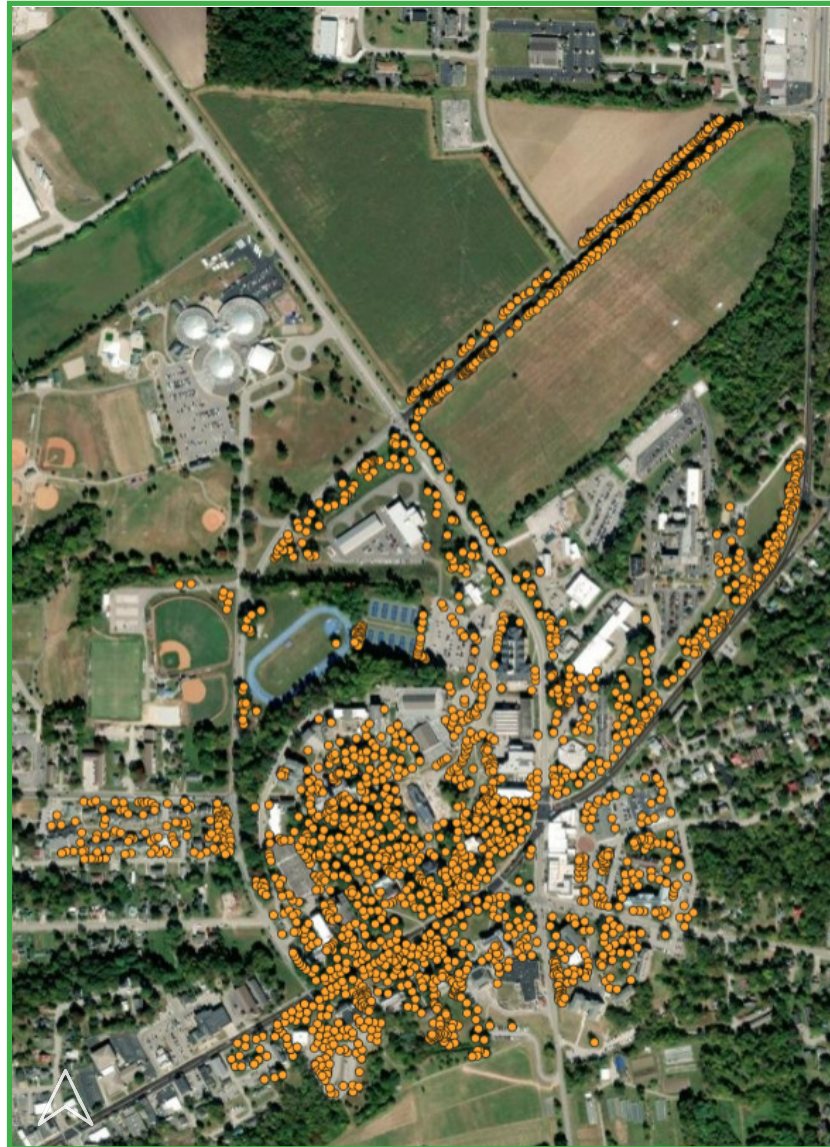


Figure 2. Trees inventoried and mapped at Berea College in 2021

Berea College was awarded Tree Campus USA status in 2015 after meeting the standards of the Arbor Day Foundation of having a 1) tree care plan, 2) an Arbor Day observation, 3) a service-learning project that engages the student body, and 4) annual expenditures dedicated to tree planting and care. Berea College sits on 140 acres and in the 2022-2023 school year had an enrollment of approximately 1,500 students. In addition to the inventorying reported here, there are also 7,700 acres of forest and 1,200 acres devoted to agriculture and natural resources that are controlled by the college: the oldest managed forest in Kentucky, and one of the oldest in the nation. It was established in 1897 by Berea College to fill the gap between the nation’s conservation goals and scientific knowledge needed to achieve them.

1973 trees measured

89 species identified

Table 2. All tree species measured at Berea College with importance values >3% (n=1973)*

BEREA COLLEGE TREES					
Species (Common name)	Species (Scientific name)	Number of trees	Species relative abundance (%)	Relative basal area (% of site total)	Relative importance value (%)
Eastern redbud	<i>Cercis canadensis</i>	185	9.4	3.9	6.6
Pin oak	<i>Quercus palustris</i>	108	5.5	13.2	9.3
Bald cypress	<i>Taxodium distichum</i>	84	4.3	5.4	4.8
Red maple	<i>Acer rubrum</i>	75	3.8	3.3	3.6
White oak	<i>Quercus alba</i>	56	2.8	8.3	5.5
American sweetgum	<i>Liquidambar styraciflua</i>	55	2.8	3.9	3.3
Northern red oak	<i>Quercus rubra</i>	52	2.6	8.7	5.7
Willow oak	<i>Quercus phellos</i>	38	1.9	4.4	3.2
American sycamore	<i>Platanus occidentalis</i>	37	1.9	4.1	3.0
Southern red oak	<i>Quercus falcata</i>	32	1.6	6.7	4.2
Other		1,251	63.4	38.2	N/A
Total		1,973	100	100	N/A

*See appendix for definitions of relative abundance, basal area, and importance value.

Eastern redbud is the most abundant species (185 individuals) and represents >9% of the trees mapped (Table 2), followed by pin oak, at 108 individuals representing 5.5% of the total.

Table 3. Summary of tree size classes (inches) on Berea College campus

BEREA COLLEGE TREE SIZE CLASSES						
Common name	Scientific name	< 8	8 - 16	16 - 24	24 +	Grand Total
Eastern redbud	<i>Cercis canadensis</i>	8.1%	1.0%	0.1%	0.1%	9.4%
Pin oak	<i>Quercus palustris</i>	1.9%	2.2%	0.9%	0.6%	5.5%
Flowering dogwood	<i>Cornus florida</i>	4.2%	0.1%	0.0%	0.0%	4.3%
Red maple	<i>Acer rubrum</i>	2.2%	1.3%	0.3%	0.1%	3.8%
Other		53.8%	15.5%	4.6%	3.0%	77.0%
Total		70.2%	20.1%	5.9%	3.8%	100%

TREE INVENTORY REPORT

BEREA COMMUNITY SCHOOL

Berea Community School is the collocated campus of the Berea Independent School District elementary, middle, and high schools. Enrollment for the 2019 school year across all grades was 1,087 students.



Figure 3. Trees inventoried and mapped at Berea Community School in 2021

Red maple is the most abundant species (34 individuals) and represents >9% of the trees mapped (Table 4), followed by pin oak, at 108 individuals representing 5.5% of the total.

190 trees measured 32 species identified

Table 4. All tree species measured at Berea Community School with an importance value >3% (n=190)*

BEREA COMMUNITY SCHOOL TREES					
Species (Common name)	Species (Scientific name)	Number of trees	Species relative abundance (%)	Relative basal area (% of site total)	Relative importance value (%)
Red maple	<i>Acer rubrum</i>	34	17.9	15.8	16.8
Pin oak	<i>Quercus palustris</i>	18	9.5	25.8	17.6
Sugar maple	<i>Acer saccharum</i>	13	6.8	5.5	6.2
Flowering crab apple	<i>Malus spp.</i>	13	6.8	3.0	4.9
Eatsern redbud	<i>Cercis canadensis</i>	10	5.3	2.4	3.8
American sweetgum	<i>Liquidambar styraciflua</i>	10	5.3	2.3	3.8
Shumard oak	<i>Quercus shumardii</i>	6	3.2	6.6	4.9
Post oak	<i>Quercus stellata</i>	3	1.6	9.7	5.6
Other	Other	83	43.7	28.8	N/A
Total		190	100	100	N/A

*See appendix for definitions of relative abundance, basal area, and importance value.

Table 5. Summary of tree size classes (inches) on Berea Community School campus

BEREA COMMUNITY SCHOOL TREE SIZE CLASSES						
Common name	Scientific name	< 8	8 - 16	16 - 24	24 +	Grand Total
Red maple	<i>Acer rubrum</i>	3.6%	9.9%	1.0%	3.1%	17.7%
Pin oak	<i>Quercus palustris</i>	0.0%	1.6%	3.6%	4.2%	9.4%
Sugar maple	<i>Acer saccharum</i>	2.6%	2.1%	1.0%	1.0%	6.8%
Crabapple	<i>Malus spp</i>	2.6%	3.1%	1.0%	0.0%	6.8%
Sweetgum	<i>Liquidambar styraciflua</i>	1.0%	4.2%	0.0%	0.0%	5.2%
Eastern redbud	<i>Cercis canadensis</i>	3.6%	0.5%	0.5%	0.5%	5.2%
Tulip poplar	<i>Liriodendron tulipifera</i>	3.1%	1.6%	0.0%	0.0%	4.7%
Other		22%	9.3%	5.9%	7.3%	44.2%
Total		38.5%	32.3%	13.0%	16.1%	100.0%

TREE INVENTORY REPORT

MEMORIAL PARK

Memorial Park is located on W. Jefferson St, 0.4 miles west of Berea College. This 2-acre city park is dedicated to those who have lost their lives serving in the U.S. military and is Berea's oldest park.

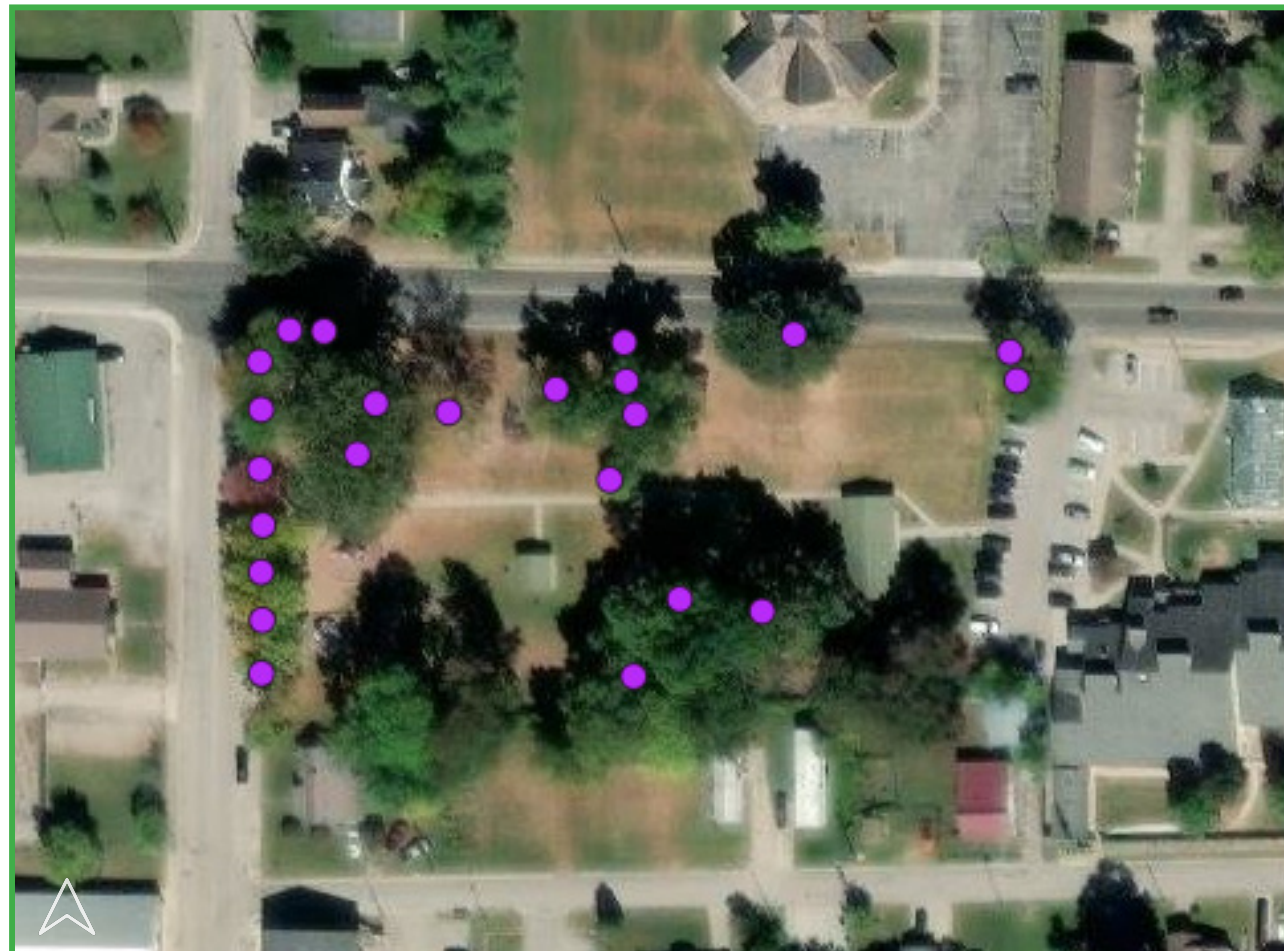


Figure 4. Trees inventoried and mapped at Memorial Park in 2021

Red maple is the most abundant species (7 individuals), followed by Southern red oak (4 individuals), representing 30% and 17% of the totals, respectively (Table 6).

23 trees measured **5** species identified

Table 6. All tree species measured at Memorial Park with importance values >3% (n=23)*

MEMORIAL PARK TREES					
Species (Common name)	Species (Scientific name)	Number of trees	Species relative abundance (%)	Relative basal area (% of site total)	Relative importance value (%)
Red maple	<i>Acer rubrum</i>	7	30.4	12.8	21.6
Southern red oak	<i>Quercus falcata</i>	4	17.4	42.6	30.0
Post oak	<i>Quercus stellata</i>	3	13.0	25.6	19.3
Sugar maple	<i>Acer saccharum</i>	3	13.0	8.0	10.5
Flowering crab apple	<i>Malus spp.</i>	3	13.0	1.2	7.1
Black cherry	<i>Prunus serotina</i>	2	8.7	7.5	8.1
Other	Other	1	4.3	2.3	3.3
Total		23	100	100	N/A

*See appendix for definitions of relative abundance, basal area, and importance value.

Table 7. Summary of tree size classes (inches) at Memorial Park

MEMORIAL PARK TREE SIZE CLASSES						
Common name	Scientific name	< 8	8 - 16	16 - 24	24 +	Grand Total
Red maple	<i>Acer rubrum</i>	0.0%	0.0%	21.7%	8.7%	30.4%
Southern red oak	<i>Quercus falcata</i>	0.0%	0.0%	0.0%	17.4%	17.4%
Sugar maple	<i>Acer saccharum</i>	0.0%	0.0%	8.7%	4.3%	13.0%
Crabapple	<i>Malus spp</i>	4.3%	8.7%	0.0%	0.0%	13.0%
Post oak	<i>Quercus stellata</i>	0.0%	0.0%	0.0%	13.0%	13.0%
Black cherry	<i>Prunus serotina</i>	0.0%	0.0%	4.3%	4.3%	8.7%
	Other	0.0%	0.0%	4.4%	0.0%	4.3%
Total		4.3%	8.7%	39.1%	47.8%	100.0%

TREE INVENTORY REPORT

WALNUT MEADOWS MIXED-USE PATH



This 0.5-mile-long public path serves an inter-urban connector, spanning Walnut Meadows Road from Berea College to Interstate 75. It is a mixed-use path frequented by walkers, joggers, cyclists and other non-motorized vehicles. UFI identified and mapped trees along the Walnut Meadows trail from Berea College to the trail's intersection with Artisan Way, immediately before it reaches State Highway 956.

Figure 5. Trees inventoried and mapped on Walnut Meadows path in 2021

249 trees measured **26** species identified

Table 8. All tree species measured on Walnut Meadows path with importance values >3% (n=249)*

WALNUT MEADOWS TRAIL TREES					
Species (Common name)	Species (Scientific name)	Number of trees	Species relative abundance (%)	Relative basal area (% of site total)	Relative importance value (%)
American sweetgum	<i>Liquidambar styraciflua</i>	63	25.3	22.6	24.0
Red maple	<i>Acer rubrum</i>	50	20.1	16.3	18.2
Eastern redbud	<i>Cercis canadensis</i>	34	13.7	32.7	23.2
Silver maple	<i>Acer saccharinum</i>	15	6.0	7.4	6.7
Shingle oak	<i>Quercus imbricaria</i>	13	5.2	1.8	3.5
Bald cypress	<i>Taxodium distichum</i>	7	2.8	3.9	3.4
Other	Other	67	26.9	15.3	N/A
Total		249	100	100	N/A

*See appendix for definitions of relative abundance, basal area, and importance value.

Table 9. Summary of tree size classes (inches) on Walnut Meadows path

WALNUT MEADOWS TRAIL TREE SIZE CLASSES						
Common name	Scientific name	< 8	8 - 16	16 - 24	24 +	Grand Total
Sweetgum	<i>Liquidambar styraciflua</i>	13.0%	11.9%	0.0%	0.0%	24.9%
Red maple	<i>Acer rubrum</i>	13.4%	6.3%	0.0%	0.0%	19.8%
Eastern redbud	<i>Cercis canadensis</i>	5.9%	4.3%	2.4%	0.8%	13.4%
Silver maple	<i>Acer saccharinum</i>	2.8%	3.2%	0.0%	0.0%	5.9%
Shingle oak	<i>Quercus imbricaria</i>	4.7%	0.4%	0.0%	0.0%	5.1%
Pin oak	<i>Quercus palustris</i>	3.6%	0.4%	0.0%	0.0%	4.0%
Sugar maple	<i>Acer saccharum</i>	4.0%	0.0%	0.0%	0.0%	4.0%
Other		19.4%	2.4%	0.8%	0.4%	22.9%
Total		66.8%	28.9%	3.2%	1.2%	100.0%

PROJECT OUTCOMES

+ **Tree inventory:** A total of 2,435 community trees were mapped, identified, and georeferenced across the community; 1,973 trees on Berea College campus and 462 in surrounding areas of the city. Site reports and ecosystem services were generated. The Berea tree inventory created the momentum for convening leaders of Campus Sustainability and Tree Canopy management from both Berea College and University of Kentucky in August 2023.

Berea College utilized the tree canopy data generated from the project to create an interactive tree plotter web tool (Campus Trees (Public) (arcgis.com)) which is aiding in effective canopy management. The mapping endeavor was a collaborative effort involving volunteers, a student intern who developed valuable skills in urban and community forestry, and UFI personnel, with most of the tree inventory effort shouldered by Christina Hoddinott, the GIS Manager at Berea College, and Michael Barnes, Berea College arborist, who played pivotal roles in the development and completion.

UFI calculated benefits of mapped trees, including stormwater runoff (118,000 feet³/yr), CO₂ sequestered (27 tons/yr), and pollution removal (1,834 pounds/yr), which was useful information for campus sustainability managers.

The Berea Campus tree map created a ripple effect of productive discussion highlighting the economic and ecological benefits provided by trees. These discussions led to more informed decisions on tree canopy enhancements, including tree planting, removal, and maintenance, and re-establishment of the Berea College Tree Committee. That led to a shift in tree care on Berea College campus to use wood chip mulching, plant more trees, and introduce penalties to contractors who do not comply with the appropriate tree protection guidelines.

+ **Training:** TreeCATs workshops have graduated 129 students to date. Offered by UFI annually, TreeCATs is a 20-hour virtual urban and community forestry workshop that introduces participants to concepts addressing urban and

community forestry infrastructure, tree identification and stewardship, tree pests and diseases, planning and design, trees and wellness, greenspace equity, and career paths.

+ **Engagement:** Tree Week is an annual series of events celebrating trees and green spaces initiated by UFI in 2018. Berea held its first Tree Week in 2020. It was enthusiastically embraced by participants of the UFI-LSR Berea project as an avenue for engaging residents in tree- and forest-related activities. Berea's Tree Week has grown significantly each year, with over 21 in-person and asynchronous events annually, coupled with increased student and citizen engagement. Tree Week creates opportunities for elevating the visibility of trees in the town of Berea and on the Berea College campus. It also created the stimulus for creation of an Earth Week event on Berea's campus, during which Sustainability, the EcoVillage, and the Forestry Outreach Center hosted anchor events on different days.



Tree Week mulching in Berea. Source: Berea Forestry Outreach Center



Large tree on the Berea College campus. Source: UFI

SUGGESTIONS

- + **Maintain the Tree Management Plan.** A comprehensive tree management plan outlines goals, strategies, and guidelines for tree planting, maintenance, and removal. Updating it periodically is important, especially in light of construction activities and growth. The plan should address tree species selection, keeping in mind the “10-20-30 rule of thumb,” which suggests that a community tree canopy should comprise no more than 10% of any particular species, 20% of any particular tree genus, and 30% of any particular plant family. The comprehensive plan should also consider planting locations, making the most optimal species selection for any particular location, and considering the final size of the mature tree, its tolerance to environmental stresses, and any additional characteristics (pollen production, fruit production, tree shape, maintenance needs) that may make one specific species a better choice than another. Tree maintenance practices and long-term care should be kept up to date in the management plan.
- + **Protect mature trees.** Berea and Berea College have many large trees, and large trees provide the greatest benefits. Develop and enforce a clearly defined plan for tree protection during construction and development efforts. The Urban Tree Foundation (UTF) provides many useful resources for tree protection, planting, and care standards, all found online at urbantree.org.
- + **Consider replacing non-native trees.** A long-term tree canopy plan should include plans to replace non-native tree species.
- + **Plant properly.** Properly plant young trees in appropriate locations (account for maximum height and ensure adequate rooting space) to avoid conflicts with wires, buildings, and pavement. Provide plenty of water for the first three years while new roots become established.



Tree canopy from underneath. Source: UFI

BEYOND THE BASICS: WHAT CAN BEREA DO?

Berea and Berea College have a legacy of strong tree stewardship; continuing that legacy is to your benefit. There are numerous ongoing efforts beyond this Landscape Scale Restoration project that promote community forestry in Berea.

+ **Promote Tree Planting and Green Spaces:** Encourage community members to plant and care for trees on their properties. Organize tree planting initiatives in public spaces, parks, and along streets. Promote the benefits of green spaces and educate residents about the positive impacts of trees on the environment, health, and quality of life.

+ **Engage and Educate the Community:** Continue Tree Week celebrations! Conduct workshops, seminars, and educational campaigns to raise awareness about urban and community forestry. Teach community members about proper

tree care, the importance of biodiversity, and the role trees play in mitigating climate change and improving air quality.

+ **Establish Partnerships:** Collaborate with local government agencies, nonprofit organizations, and businesses to support urban forestry initiatives. Seek partnerships to secure funding, expertise, and resources for tree planting, maintenance, and education programs.

+ **Implement Tree Inventories and Monitoring:** Expand tree inventory to further assess the existing tree population in the community. Use the data to identify areas where tree planting is needed and to monitor the health and growth of existing trees. Regular monitoring helps identify issues such as insect pests, diseases, or hazardous trees that require attention.

+ **Implement Tree Protection Policies:** Advocate for tree protection ordinances and policies that regulate tree removal and encourage tree preservation during development projects. Encourage the enforcement of existing tree protection regulations and work towards strengthening them if needed.

+ **Foster Community Engagement:** Continue to participate in Tree Week! Organize volunteer events, tree care workshops, and community tree planting days to engage residents actively. Encourage community ownership and involvement in urban forestry projects by establishing neighborhood tree stewardship programs or tree adoption programs.

+ **Support Professional Training and Certification:** Provide opportunities for individuals to receive training and certification in urban forestry and arboriculture. This helps ensure that there are skilled professionals available to guide and assist with tree planting, maintenance, and tree care practices within the community. Apply to TreeCATs when the opportunity arises.

+ **Monitor and Evaluate Progress:** Regularly assess the effectiveness of urban and community forestry initiatives. Monitor the growth and health of trees planted, track community engagement, and evaluate the impact of urban forestry efforts on the environment and community well-being.

APPENDIX

The following terms are commonly used to describe trees.

- + **Relative abundance (%)** is defined as the number of individuals of a species (or genus, or family) out of the total number of trees in a given area.
- + **Basal area** is a measure of the trunk area an individual tree occupies, which is strongly correlated with the canopy size. Basal area is calculated using: Basal area = $\pi \cdot r^2$ where r = radius (1/2 of tree DBH).
- + **Relative basal area** is the sum of the basal area of each tree of a given species divided by the total basal area of all trees in the area.
- + **Importance value** is an average of the relative basal area and relative abundance of each tree species. Here 'importance value' refers to the extent to which a tree species occupies a given land area, calculated from the proportion of individual trees (rel. abundance) and proportion of tree basal area (rel. basal area) of each tree species relative to the total.
- + **Diameter at breast height (DBH)** is a common measure of tree size and is defined as trunk diameter 4.5 feet above the ground. Many factors can affect tree size and growth, including species, age, site, soil, and land use history.



UFI team member measuring tree using DBH. Source: UFI

ECOSYSTEM BENEFITS

- + **Stormwater captured** is an estimate of the ability of trees measured based on their size and leaf canopies. This number is a metric that evaluates the ability of measured trees to provide a surface area where rain can land and evaporate, reduce erosion caused by falling rain, and take up water through root networks and soil infiltration.
- + **Pollution removed** addresses the collective power of trees measured to capture carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter less than 2.5 microns (PM_{2.5}), particulate matter between 2.5 and 10 microns (PM₁₀), and sulfur dioxide (SO₂). These pollutants negatively impact air quality and contribute to public health concerns such as asthma and heart disease.
- + **Carbon sequestered** estimates the amount of atmosphere-warming carbon embedded within the trees measured, including their growth, minus estimated carbon lost through decomposition due to tree mortality. Trees are especially important carbon stores; through photosynthesis, plants convert carbon dioxide and water into oxygen. Trees absorb carbon dioxide and release oxygen.
- + **Annual monetary benefit** quantifies the three metrics described above; that is, it estimates the monetized value of wholesale ecosystem benefits of trees on site. It estimates the compensatory value trees provide to that site, based on 2016 dollars.

METHODOLOGY

Data Collection Tools: Arc Collector, Microsoft Excel, and i-Tree Eco²

Tree inventory data were collected using Arc Collector, a mobile field data collection application developed by Environmental Systems Research Institute (ESRI) using a tree inventory form developed by Nic Williamson (ISA Certified Arborist; former UFI Coordinator). Statistics on tree diversity, size and health were analyzed, and graphs were created using Microsoft Excel. Information on tree ecosystem benefits was calculated using i-Tree Eco².

²i-Tree Eco (version 6.0.32) . <https://www.itreetools.org/i-tree-tools-download>

Data Collection Process & Volunteer Training

UFI tree experts trained staff and volunteers to provide the knowledge and skills needed for accurate data collection, and a quality control process was implemented to ensure reliability and consistency. Trained supervisors and experienced arborists were present during data collection, actively providing real-time guidance and support. By incorporating volunteer training and implementing quality control measures, the tree inventory data collection process benefited from a collaborative and systematic approach. Incorporating volunteer tree mappers fosters community engagement and participation and strengthens one's sense of place. Our quality control checks ensured production of reliable and high-quality data that will serve as a valuable resource for community planning, tree management, and decision-making processes.

SITE REPORTS

Berea, Kentucky Berea College 101 Chesnut Street



Background

Along with its progressive social history, Berea College has a rich natural landscape as well. Because of the work Berea College has done regarding their tree canopy, they were awarded Tree Campus USA in 2015, along with celebrating Tree Week, hosting a Berea College Tree Committee, and apply as a sub-awardee of UK's grant application for an urban and community forestry grant from the USDA.

About the Trees

1973 trees, 89 species

Overall health



Explanation:
The overall tree canopy health is good. Continue to maintain, prune, and mulch trees.

Species Diversity



Explanation:
Tree species diversity is high at Berea College. High diversity is desirable and keeps trees resilient to host-specific pests.

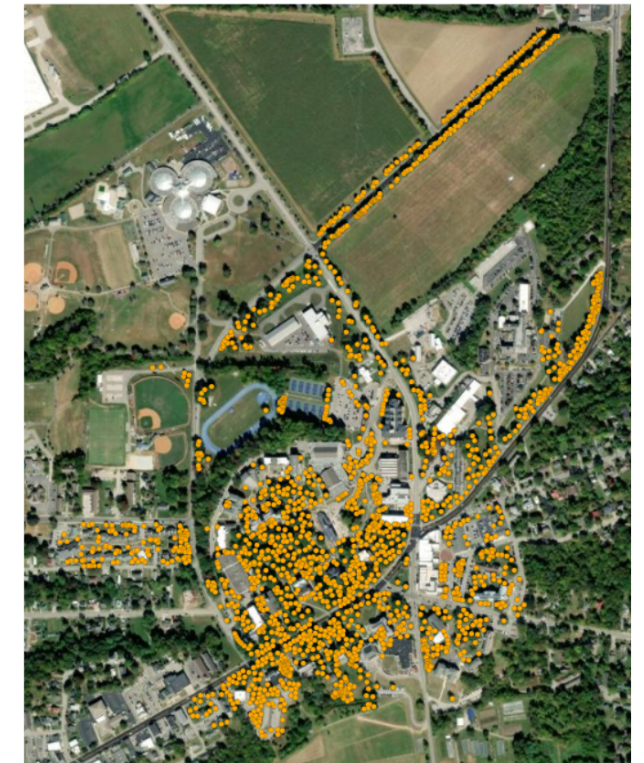
Size Diversity



Explanation:
Tree species diversity is high at Berea College. High diversity is desirable and keeps trees resilient to host-specific pests.

Consideration: continue to maintain a diverse canopy with a variety of ages, sizes, and species.

Trees of Berea College Mapped



Top trees at Berea College

Tree species	# of trees	% total
Eastern redbud	185	9%
Pin oak	108	5%
Flowering dogwood	85	4%
Bald cypress	84	4%
Red maple	75	3%
other	1,465	74%
total	1,973	100%

Berea, Kentucky Berea Community School

116 Jane Street



Background

Berea Community School is a set of three schools (elementary, middle, and high) in southeastern Berea. Total enrollment for the 2019-2020 academic school year in elementary, middle, and high school was 1,087.

About the Trees

190 trees, 32 species

Overall health



Explanation:
The overall tree canopy health is good. Continue to maintain, prune, and mulch trees.

Species Diversity



Explanation:
Maple and oak dominate the tree canopy at BCS. Future plantings should avoid using these species in order to avoid the devastation of the tree canopy by host-specific pests.

Size Diversity



Explanation:
Tree sizes are mixed, representing a healthy distribution.

Consideration: Host-specific pests can devastate a homogenized site.

Trees of Berea Community School Mapped



Top trees at Berea Community School

Tree species	# of trees	% total
Red maple	34	18%
Pin oak	18	9%
Sugar maple	13	7%
Crabapple	13	7%
American sweetgum	10	5%
other	105	54%
total	190	100%

Berea, Kentucky Memorial Park

W Jefferson Street



Background

Memorial Park is Berea's oldest park, dedicated to those who have lost their lives serving in the U.S. military. This 2-acre city park is located on W Jefferson Street, 0.4 miles west of Berea College. It includes two playgrounds, two picnic shelters and restroom facilities, and a lighted sidewalk.

About the Trees

23 trees, 5 species

Overall health



Explanation:
Continue to maintain large trees.

Species Diversity



Explanation:
Maple and oak dominate the tree canopy at Memorial Park. Future plantings should include a more diverse array of tree species.

Size Diversity



Explanation:
There are a nice mix of mid-sized and large trees, but there are not many young trees.

Consideration: Experts recommend that there not be more than 30% of any tree family, 20% of any genus, and 10% of any species in an area.

Trees of Memorial Park Mapped



Top trees at Memorial Park

Tree species	# of trees	% total
Red maple	7	30%
Southern red oak	4	17%
Post oak	3	13%
Sugar maple	3	13%
Flowering crab apple	3	13%
other	3	13%
total	23	100%

Berea, Kentucky Walnut Meadows Mixed-Use Path Wlanut Meadows Road



Background

This 0.5-mile-long path serves a connector path, spanning along Walnut Meadows Road from Berea College to Interstate 75. UFI identified and mapped trees from Berea College along the path from Artison Way to its intersection with Highway 956.

About the Trees

249 trees, 26 species

Overall health



Explanation:

The overall tree canopy health is good. Continue to prune and mulch existing and future trees.

Species Diversity



Explanation:

Sweetgum and maple dominate the tree canopy on this path. Future plantings should avoid using those species and strive for a more varied canopy.

Size Diversity

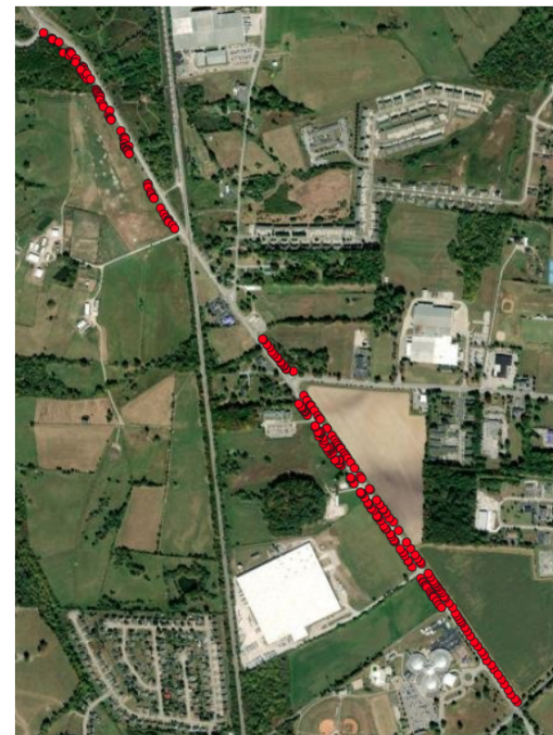


Explanation:

The abundance of young trees will mature into an attractive gateway into Berea.

Consideration: Plantings should focus on increasing diversity with respect to species and size.

Trees of Walnut Meadows Mapped



Top trees on Walnut Meadows path

Tree species	# of trees	% total
American sweetgum	63	25%
Red maple	50	20%
Eastern redbud	34	14%
Silver maple	15	6%
Shingle oak	13	5%
other	74	30%
total	249	100%

RESOURCES + CITATIONS

ADDITIONAL RESOURCES

Ecological regions of Kentucky: <https://www.uky.edu/hort/?q=Ecological-Regions-of-Kentucky>

Tree Identification resources: https://forestry.ca.uky.edu/tree_id/

Urban Tree Foundation: <http://www.urbantree.org/index.shtml>

Trees are good, tree owner information: <https://www.treesaregood.org/treeowner>

Green Cities, Good Health: <http://depts.washington.edu/hhwb/>

Vibrant Cities Lab: <https://www.vibrantcitieslab.com/>

Tree Equity Score: <https://treeequityscore.org/>

CITATIONS

Berea College (n.d.). <https://www.berea.edu/>

City of Berea, (2018). "Early Berea, The Glade." Early Berea, The Glade - City of Berea (bereaky.gov)

City of Berea, (2020). "Comprehensive Plan." Amended-2020-Comp-Plan.pdf (bereaky.gov)

U.S. Census Bureau (2022). American Community Survey 5-year estimates. Retrieved from Census Reporter Profile page for Berea, KY. <http://censusreporter.org/profiles/16000US2105842-berea-ky/>

PROJECT TEAM

The LSR Team includes UFI co-leads Lynn Phillips, Ph.D., A.I.C.P., Associate Professor of Geography, and Lynne Rieske-Kinney, Ph.D., Professor of Forest Entomology; Ignazio Graziosi, Ph.D., UFI Coordinator, and Carly Cecil, UFI Outreach Coordinator. The broader LSR team includes Mary Arthur, Ph.D., emeritus professor of Forestry, Ned Crankshaw, Ph.D., Professor of Landscape Architecture and Dean of the College of Design, Ellen Crocker, Ph.D., Assistant Professor of Forestry Extension, Jonathon Larson, Ph.D., Assistant Professor of Entomology Extension, Mr. Rob Paratley (Adjunct Instructor of Forestry), Chris Sass, Ph.D., Associate Professor of Landscape Architecture, Jeff Stringer, Ph.D., Professor of Forestry Extension, Mr. Shane Tedder (UK Facilities Sustainability Coordinator), Mr. Nic Williamson (Facilities, former UFI Coordinator and Forestry Extension), Ms. Grace Coy, Ms. Shelby Grow, and Ms. Allison Eades. This project could not have been completed without UFI interns Felix Lowery, James Worthington, and Charles Petty, and numerous citizens of the greater Berea area.

ABOUT THE URBAN FOREST INITIATIVE

The Urban Forest Initiative (UFI) at the University of Kentucky works to improve understanding and appreciation of the role of trees in and near human communities. Originating at the University of Kentucky, UFI now works throughout Kentucky, focusing on climate-impacted communities. UFI conducts inventories of community trees, linking those trees to the ecosystem benefits they provide while addressing areas for improvement in the diversity and distribution of trees among species, age, and size. UFI also contributes to the greater collaborative network of community forestry professionals and advocates across the state to promote sharing knowledge and best practices of trees canopy stewardship in and beyond Kentucky.

Email: ufi@uky.edu

Website: ufi.ca.uky.edu

Social media: [@urbanforestlex](https://twitter.com/urbanforestlex)

