

HOLYOKE

URBAN FOREST EQUITY PLAN EXECUTIVE SUMMARY

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Executive Summary

EXECUTIVE SUMMARY

Holyoke, founded in 1850, is considered one of the first planned industrial cities in the United States. Its growth and development were fueled by the construction of the South Hadley Falls Dam and the city's canal system which used the power of the Connecticut River to produce abundant and inexpensive energy for paper and textile mills. At its peak in the late 1800s, Holyoke had over 25 paper mills, earning it the title of “Paper City” in 1870.^A



Image A. Historical Holyoke during its industrial era.

The legacy of Holyoke’s industrial past can still be seen today in the city’s densely developed and populated downtown City Center neighborhoods of Churchill, Downtown, South Holyoke, and The Flats (Map A). The majority of land in these neighborhoods is covered by roads, sidewalks, and buildings (known as impervious surfaces) and have few trees, canopy cover, and greenspace (Map B). These conditions along with a variety of social and economic factors make the residents of these neighborhoods more vulnerable to community challenges including flooding, air pollution, high summer temperatures, and other climate change impacts.



Image B. Historical Picture of Holyoke's Canal System.

A. Wistariahurst Museum. (2020). The Magoon Collection: History of Paper Making in Holyoke, MA 1870–2008. Retrieved from: <https://wistariahurst.org/wp-content/uploads/2020/05/Magoon-Finding-Aid-FINAL-05-20-2020.pdf>.

**THE FOUR
FOCUS NEIGHBORHOODS**



CHURCHILL



DOWNTOWN



SOUTH HOLYOKE



THE FLATS

Map A. Map of Holyoke Featuring the Four Focus Neighborhoods



Map B. Holyoke Land Cover



LEGEND

Tree Canopy: The area of land that is covered above by a tree's leaf-covered branches.

Pervious: Land that allows rainfall to infiltrate the soil (grassy areas or low-lying vegetation such as parks, golf courses, and residential lawns).

Bare Soil: Previous surface area with no vegetation (areas such as vacant lots, construction areas, and baseball fields).

Impervious: An area that does not allow rainfall to infiltrate (buildings, roads, and parking lot).

Open Water: All lakes, ponds, streams, wetlands, and other mappable water features.

A SOLUTION FOR HOLYOKE'S CHALLENGES

One of the most effective tools to reduce the impacts of climate change and help address the challenges facing Holyoke's residents are trees.

Trees Make Cities More Livable

Large, healthy trees are key to making cities more livable and improving the quality of life for its residents. Trees add beauty and privacy, create a sense of place, and strengthen relationships among neighbors and communities.^B

Trees Reduce Temperatures

Shade from large, healthy mature trees reduce the amount of sunlight that is absorbed by roads, buildings and sidewalks, while their leaves release water vapor and cool the surrounding area.

Trees Improve Human Health

Research has shown that people who live in neighborhoods with more tree canopy cover have better overall health, including lower rates of obesity, more social connections, less stress, and lower blood pressure.^{C, D} With the negative impacts that chronic stress has on human health—from anxiety and depression to weight gain and heart disease—trees are proving to be a low-cost solution in helping to reduce these health problems.

Trees Reduce Stormwater Runoff and Improve Water Quality

During storms, trees intercept rainfall in their canopies. This intercepted rainfall evaporates from leaves or slowly soaks into the ground, reducing and slowing stormwater runoff and flooding and lessening erosion.^E

Trees Help Reduce the Effects of Climate Change

Trees reduce greenhouse gases that can trap heat in the atmosphere, causing a city to get warmer. For example, carbon dioxide, a major greenhouse gas, is absorbed in tree trunks, branches, leaves, and roots during photosynthesis which keeps it out of the atmosphere helping to lower temperatures.



Image C. Pulaski Park, Holyoke, MA

AN URBAN FOREST EQUITY PLAN

Equal access to a healthy and abundant urban forest, **for all Holyoke's neighborhoods and residents**, is essential in helping to address climate change and related health impacts, reduce inequities, and build community capacity and resilience. **To achieve this vision the City of Holyoke has developed its first Urban Forest Equity Plan (UFEP/Plan) with funding from the Massachusetts Municipal Vulnerability Preparedness (MVP).** The Plan focuses on the four City Center downtown neighborhoods—Churchill, Downtown, South Holyoke, and The Flats—that were part of the originally planned city and now are disproportionately impacted by community challenges. The Plan uses an equity lens to preserve, grow, and care for Holyoke's trees through meaningful community engagement and proactive management. It serves as a guide to move Holyoke along the road towards a more equitable, sustainable, and resilient urban forest.

D. Roe, J.J.; Thompson, C.W.; Aspinall, P.A.; Brewer, M.J.; Duff, E.I.; Miller, D.; Mitchell, R.; Clow, A. (2013) Green Space and Stress: Evidence from Cortisol Measures in Deprived Urban Communities. *Int. J. Environ. Res. Public Health*, 10, 4086–4103.

E. McPherson, E.G., Xiao, X., Maco, S.E., VanDerZanden, A., Simpson, J.R., Bell, N., & Peper, P.J. (2002). *Western Washington and Oregon Community Tree Guide: Benefits, Costs and Strategic Planting*. Center for Urban Forest Research Pacific Southwest Research Station. Retrieved from Fs.fed.us/psw.

F. The George Washington University. (November 5, 2020). *Equity vs. Equality: What's the Difference?* Retrieved from: <https://onlinepublichealth.gwu.edu/resources/equity-vs-equality/>

G. Houston GPS—<https://houstongps.org/equity/>

Equity in Urban Forestry

What is Equity? Equity is allocating resources and opportunities based on each person's individual needs and circumstances, to achieve equal outcomes.^F These outcomes include equal access to "environmental benefits," like a healthy urban forest.

In urban forestry, equity means allocating the resources and opportunities needed to improve the size, quality, number, and maintenance of trees and greenspaces in neighborhoods that may be lacking tree canopy and greenspace.

The goal of equity-focused efforts in urban and community forestry is to achieve equal environmental, economic, social, and cultural urban forest benefits across ALL neighborhoods, regardless of race, income, or other characteristics.

Figure A. Illustration of Equity^G

Providing the tools and resources based on each person's circumstances to provide equal access to the apples.



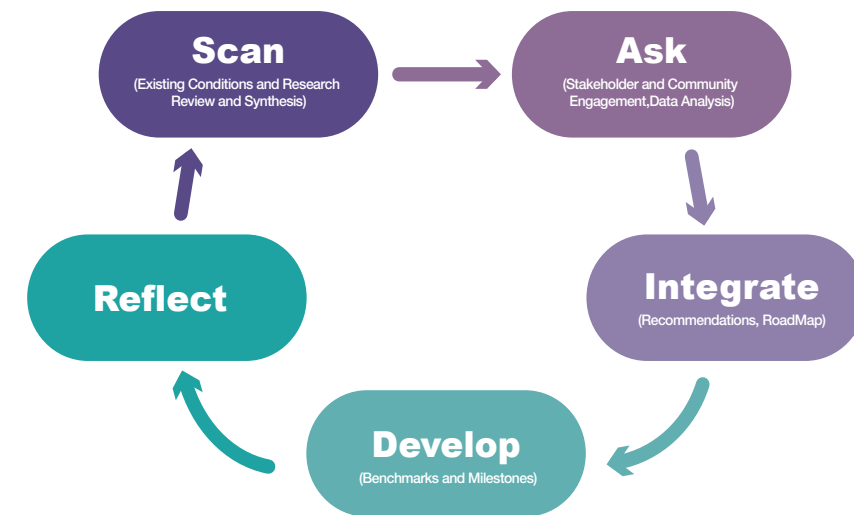
B. Kuo, F. E. (2003). The role of arboriculture in a healthy social ecology. *Journal of Arboriculture*, 29(3), 148–155

C. Ulmer, J.A., Wolf, K.L., Backman, D.R., Tretheway, R.L., Blain, C.J., O'Neil-Dunne, J.P.M., and Frank, L.D. (2016) Multiple health benefits of urban tree canopy: The mounting evidence for green prescription. *Health and Place*, 42, 54–62.

The Planning Process

A project team of City of Holyoke staff from the Office of Conservation and Sustainability, Department of Public Works, and the Office of Planning and Economic Development along with the planning consultants led by Davey Resource Group, Inc. (DRG) and supported by Community Circle and Fair Forests Consulting guided the development of Holyoke's Urban Forest Equity Plan. The team used an adaptive management approach of Scan, Ask, Integrate, Develop, and Reflect to develop the plan.

Figure B. Adaptive Management Plan Cycle



Community Engagement

Community engagement was an important part in developing the UFEP and will be equally important in its implementation. The focus of the community engagement activities were to reach and involve Holyoke residents most impacted by the city's challenges and inequities, and provide them an opportunity to help shape the Plan's recommendations. To provide meaningful and equitable access to participate in the planning process, the project team used a variety of strategies to gather input and feedback from Holyoke residents.

These strategies were developed and implemented based on COVID-19 restrictions that limited indoor gatherings, and included:

- » Bi-lingual (English/Spanish) UFEP Engagement Activities Flyer
- » Dedicated UFEP Webpage on City of Holyoke's Website
- » Media Outreach
- » Postcards
- » Call for Selfies (Included throughout the Executive Summary)
- » Virtual Community Forums on Zoom and Facebook Live
- » Online Surveys in English and Spanish
- » Printed Copies of the Online Surveys in English and Spanish



“This tree is my favorite because this was the first place that I visited in Holyoke after Hurricane Maria 2017. This is the first tree that I saw with this beautiful color, the first time that I saw it in real life!”

“Este árbol es mi favorito porque este fue el primer lugar que visité en Holyoke después del huracán Maria. ¡Este es el primer árbol que vi con este color hermoso, la primavera vez que lo vi en la vida real!”

Community Themes and Priorities

The input and feedback received during the Community and Stakeholder Engagement activities identified a set of community themes and priorities.

Equity. Residents do not have equal access to the environmental, social, and economic benefits Holyoke’s urban forest provides.

Tree Canopy. The four neighborhoods of Churchill, Downtown, South Holyoke and the Flats have low tree canopy cover, ranging from 10–16%.

Impervious Surfaces (Buildings, Road, Sidewalks, etc.). The landscape of the four focus neighborhoods is dominated by impervious surfaces, which cover, on average, 70% of the land in the neighborhoods. For comparison, citywide impervious surfaces cover 30% of the land.

Resources (Budget & Staff). The City does not have sufficient funding or staff to address all of Holyoke’s public tree care needs and ensure that high risk trees are removed in a timely manner.

Tree Maintenance. The City’s current public tree maintenance program is *reactive*. A reactive program impacts the community’s perception of the city’s responsiveness to tree care needs and puts the public trees at risk, impacting their health and storm-readiness.

Climate Change. The effects of climate change are already being felt in Holyoke, including extreme storm events, flooding, and increasing temperatures, which can have a disproportionate impact on the city’s most vulnerable residents.

Land Ownership. Over 90% of the residents in the four focus neighborhoods rent their homes and do not have control over whether they can plant trees on their property.

Community Engagement, Outreach and Education. Tree planting and care information that is culturally, linguistically, and age appropriate was identified as a need within the community.

Tree Protection/Preservation/Planting Standards. The City of Holyoke does not have tree protection, preservation, or planting standards or ordinances for use by city staff or external stakeholders (e.g., developers).

Infrastructure Conflicts. Residents were concerned about tree roots raising sidewalks and creating tripping hazards, while other stakeholders raised concerns that the needs of infrastructure (e.g., roads and utilities) and development are sometimes prioritized over trees.

Interdepartmental Collaboration/Communication. Interdepartmental collaboration and communication needs to be improved to ensure that tree protection, preservation, and planting are considered in all construction and development projects.

Tree Planting & Post-Planting Care. The City does not have best management practices, standards, or specifications in place to ensure proper species selection, planting, and post-planting care of newly planted trees.



“I took a selfie in front of my favorite tree, a deciduous redwood that was planted at our residence on Pine as part of my City’s tree program a few years ago. It’s doing well.”

“Me tomé una selfie al frente de mi árbol favorito, un secuoya de que se fue sembrado en nuestra residencia en Pine como parte del programa de los árboles de la Ciudad hace unos años. Hasta haciendo bien.”

State of Holyoke's Urban Forest

TREE CANOPY COVER

The amount, location, and distribution of tree canopy is the driving force behind the benefits an urban forest provides to the community. **As tree canopy increases, so do the tree benefits.** In 2014, an urban tree canopy assessment studied Holyoke's Environmental Justice areas, which includes the four urban core neighborhoods (Churchill, Downtown, South Holyoke, and The Flats).^H The assessment used aerial imagery from 2012 to measure the amount of tree canopy (leaves, branches, stems of trees and other woody plants) and other land cover in the study area.

The amount of tree canopy cover in the four target neighborhoods is low (average 12%), while the amount of impervious surfaces, like roads, buildings, and sidewalks is high (70% average) (Table A). The large amount of impervious surfaces in the four target neighborhoods are of particular concern because research has found that urban heat island effects (warmer temperatures in cities) are greatest in areas where impervious surfaces cover more than 35% of the land^I (Figure C).

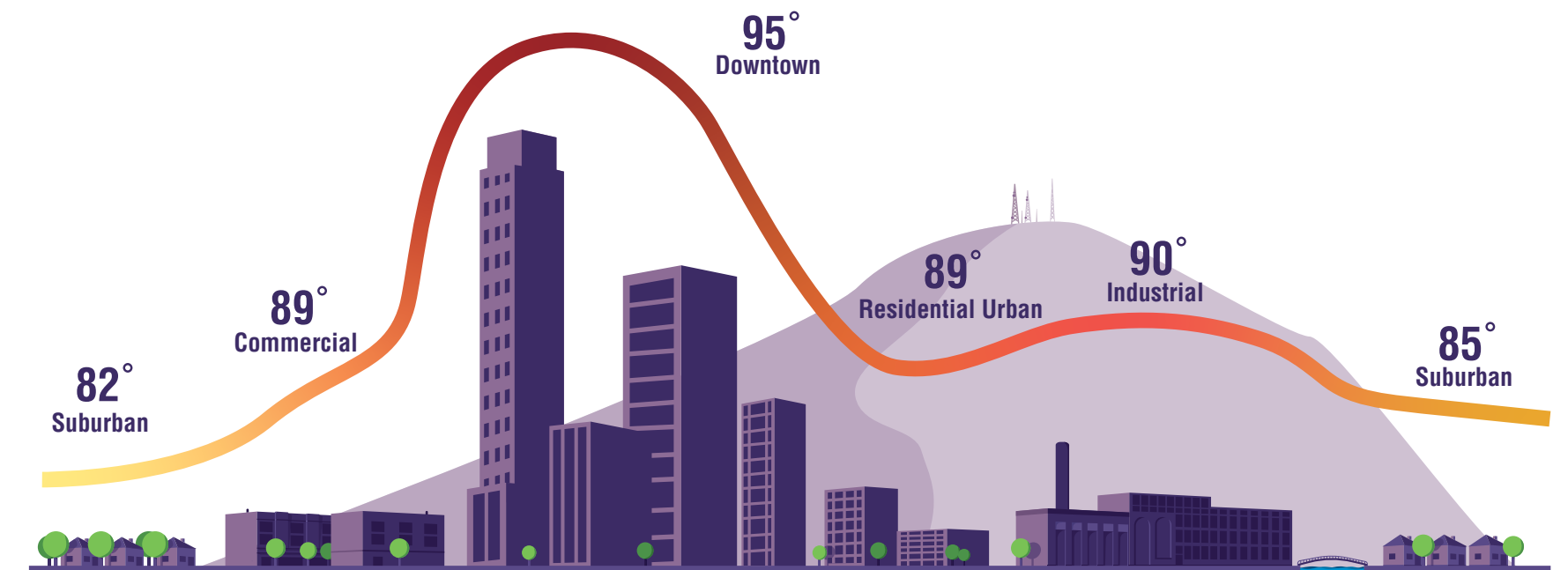
Table A. Percent of Impervious Surfaces v. Tree Canopy by Neighborhood

| Neighborhood | Percent of Land Covered by Impervious Surfaces* | Percent of Land Covered by Tree Canopy** |
|---------------|---|--|
| Churchill | 69% | 10% |
| Downtown | 72% | 16% |
| South Holyoke | 73% | 12% |
| The Flats | 66% | 11% |
| City Average | 30% | Data not available |

*Holyoke Impervious Surfaces Mitigation Plan (2020)
 **Community Based Assessment of Urban Forestry Conditions, Holyoke (2014)

Figure C. Urban Heat Island Effect in Urban Areas.

This image illustrates the impact that impervious surfaces and tree canopy/greenspace have on afternoon temperatures. Downtown areas that have more buildings, roads, and sidewalks (impervious surfaces) and less tree canopy and greenspace are warmer than surrounding suburban and rural areas that have more tree canopy, greenspace and less impervious surfaces.



H. City of Holyoke. (2014). Community Based Assessment of Urban Forestry Conditions, Holyoke, Massachusetts. Prepared by Davey Resource Group.

I. Bounoua, L., Zhang, P., Mostovoy, G., Thome, K., Masek, J., Imhoff, M., Shepherd, M., Quattrochi, D., Santanello, J., Silva, J., Wolfe, R., Mounirou Toure A., 2015. Impact of Urbanization on US Surface Climate. Environmental Research Letters, Volume 10 (8).

TREE CANOPY CHANGE OVER TIME

The amount of tree canopy varies across Holyoke changing over decades sometimes gradually and other times abruptly due to factors, including weather, climate, disease, disinvestment, economics, and development. This variability leads to an inequitable distribution of tree canopy cover and areas with lower tree canopy cover receiving fewer of the tree benefits.

Marc Healy, a Ph.D. candidate in the Graduate School of Geography at Clark University in Worcester, Massachusetts, conducted a study to measure the changes in Holyoke's tree canopy from 1952–2017. In the four focus neighborhoods, the study found that the greatest gains in tree canopy cover were in areas with the most impervious surfaces and that during poor economic periods tree canopy increased, while during economically strong periods tree canopy decreased.

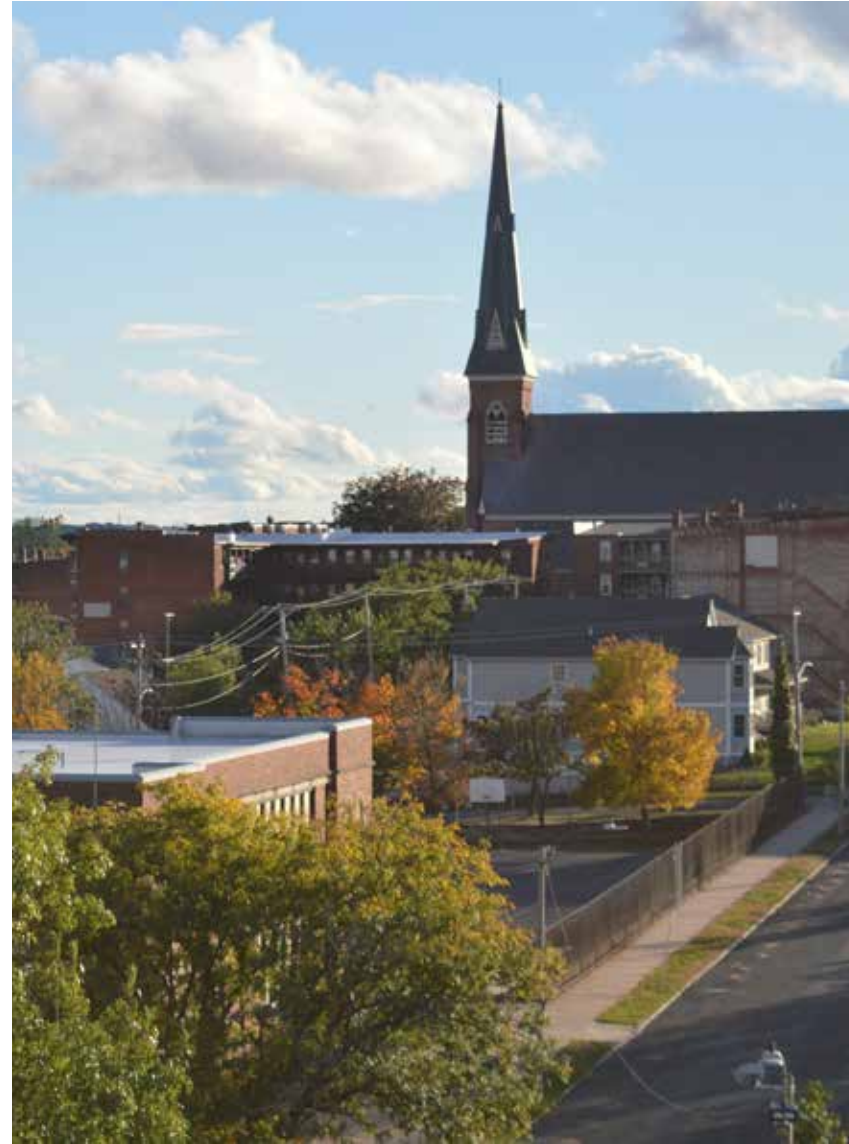


Table B. Holyoke Tree Canopy Analysis

| Neighborhood | 1952 Tree Canopy Cover | 1971 Tree Canopy Cover | 2003 Tree Canopy Cover | 2014 Tree Canopy Cover |
|---------------|------------------------|------------------------|------------------------|------------------------|
| The Flats | 2.9% | 6.0% ↑ | 13.2% ↑ | 12.3% ↓ |
| South Holyoke | 2.9% | 4.4% ↑ | 9.4% ↑ | 11.5% ↑ |
| Downtown | 8.7% | 8.2% ↓ | 14.7% ↑ | 13.6% ↓ |
| Churchill | 7.1% | 5.2% ↓ | 7.6% ↑ | 9.6% ↑ |

1953–1971



1971–2003



2003–2014



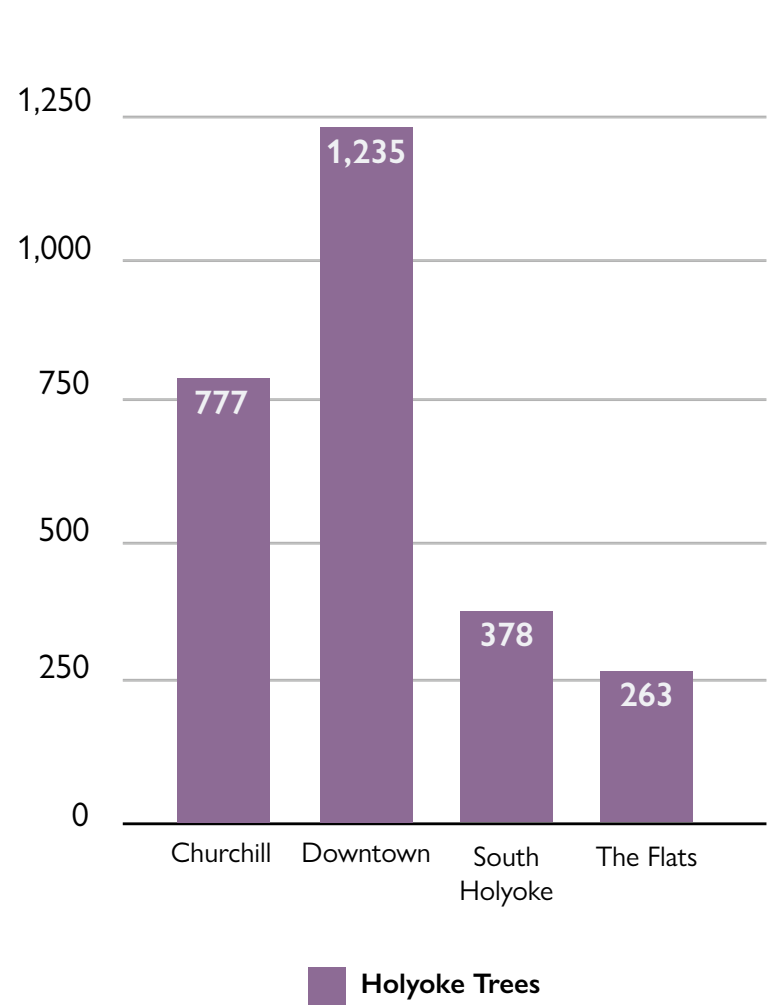
Street and Park Trees in the Focus Neighborhoods

As part of the development of the UFEP, **Holyoke's first inventory of public street and park trees** was conducted in the four target neighborhoods. Arborists from Davey Resource Group visited each street and park tree in the Churchill, Downtown, South Holyoke, and The Flats neighborhoods and gathered information on their species, size, location, condition, and maintenance needs.

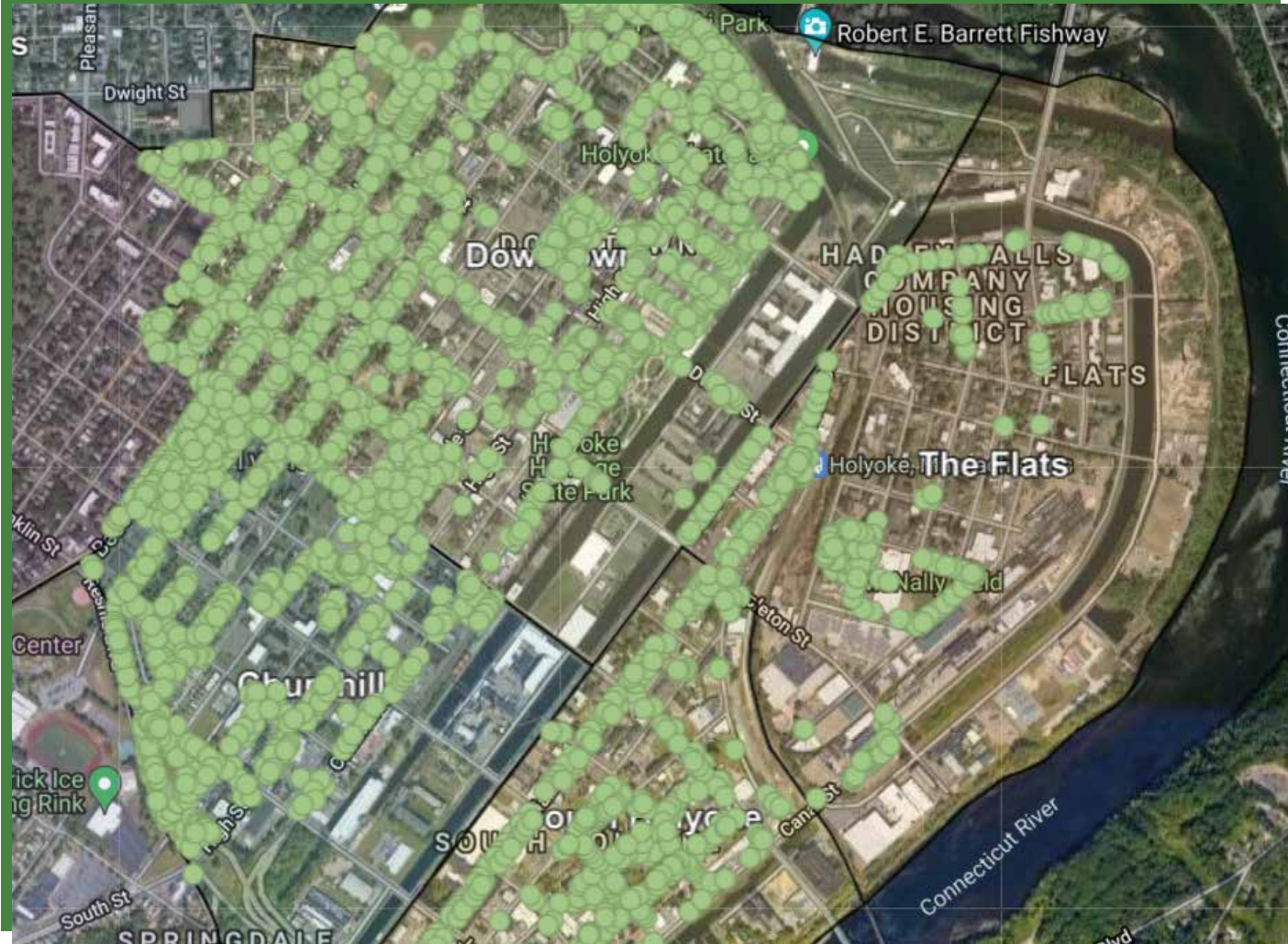
TREES BY NEIGHBORHOOD

A total of 2,653 trees were inventoried in the four neighborhoods (Figure D). The Downtown neighborhood has the most street and park trees while the fewest were found in The Flats.

Figure D. Holyoke Tree Inventory by Neighborhood



Map C. Aerial View of Public Trees Inventoried (TreeKeeper®)



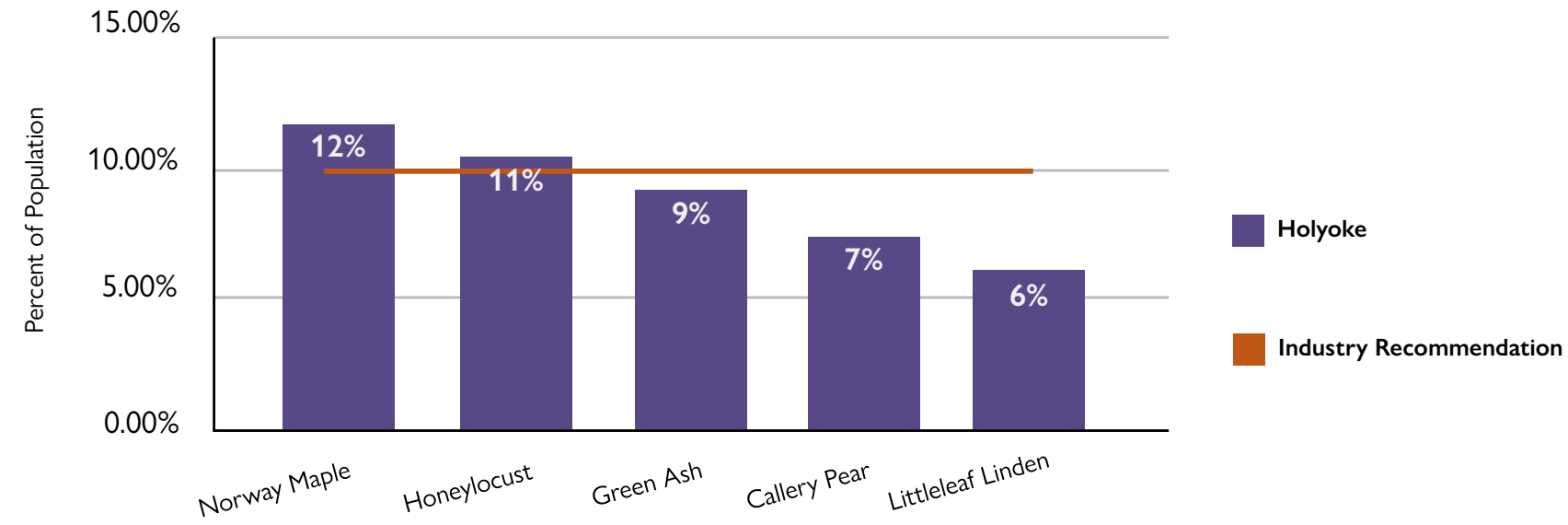
Green dots are the inventoried public street and park trees in the four neighborhoods.

NEIGHBORHOOD SPECIES DIVERSITY

Species diversity is the variety of tree species growing in an urban forest. Having more tree species (greater diversity) maximizes the many benefits that trees provide, and helps protect the urban forest from pests, diseases, and extreme weather events such as storms and drought.

The top five species in the four neighborhoods shown in Figure E are: Norway Maple, Honeylocust, Green Ash, Callery Pear, and Littleleaf Linden. Industry guidelines recommend that a single species should compose no more than 10% of the tree population to reduce species susceptibility to insect pests and diseases.

Figure E. Top Five Species in the Four Neighborhoods

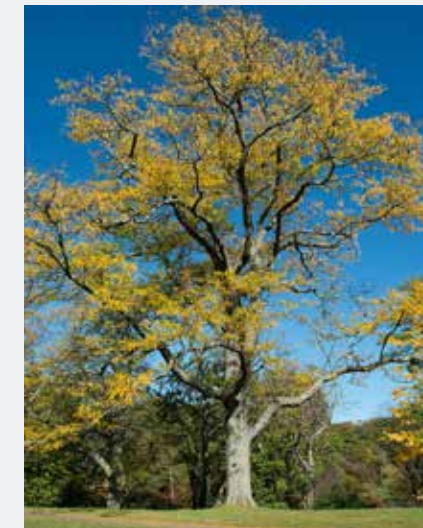


HOLYOKE'S TOP FIVE TREE SPECIES IN THE FOCUS NEIGHBORHOODS

Norway Maple



Honeylocust



Green Ash



Callery Pear



Littleleaf Linden



Neighborhood Benefits of Holyoke's Public Trees¹

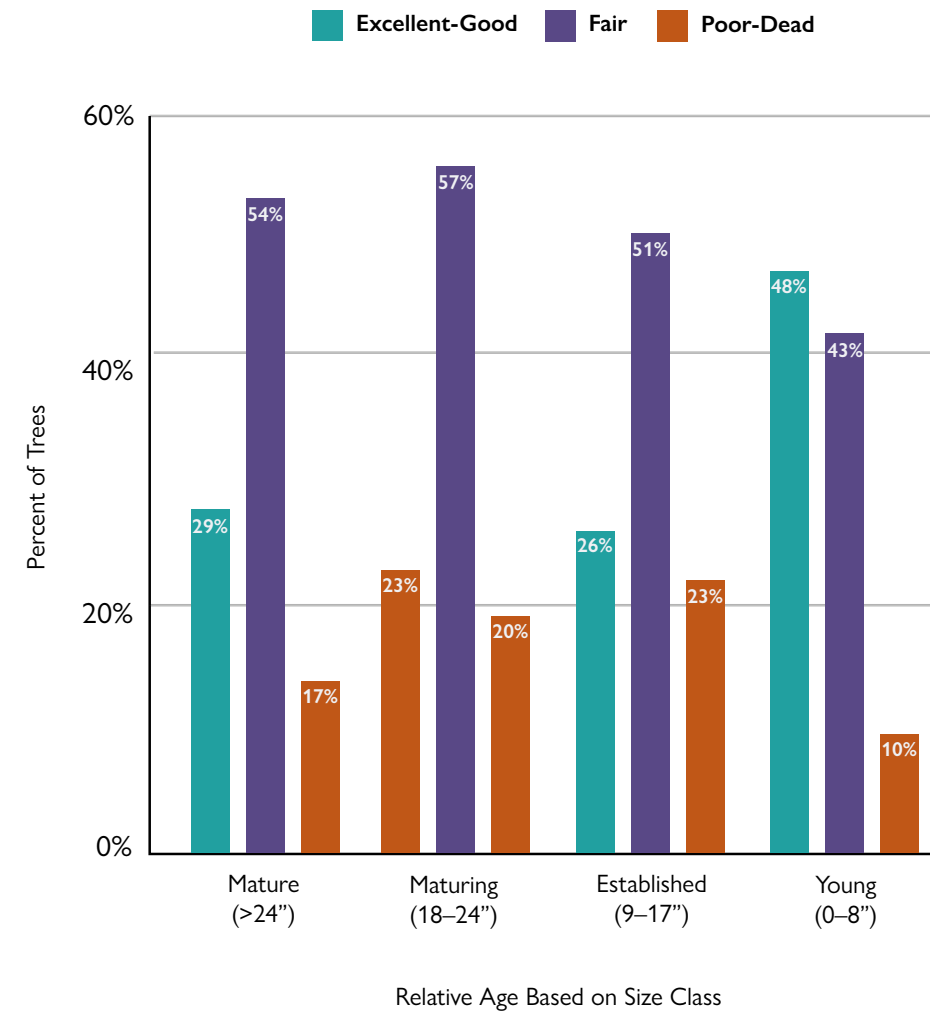
The 2,653 inventoried public street and park trees in the Churchill, Downtown, South Holyoke and the Flats neighborhoods provide \$5,605 (\$2.11 per tree) in **annual** environmental benefits to residents.

J. Source: USDA Forest Service i-Tree Eco itreetools.org.

CONDITION OF NEIGHBORHOOD TREES

Understanding tree condition together with size/age provides insight into the longevity and stability of the City's inventoried street and park trees. While most of the trees were found to be in fair condition or better across size classes, **nearly 20% of the trees in the established, maturing, and mature size class are in poor or dead condition** (Figure F). Proper tree maintenance and care will help reduce the number of mature and maturing trees in "Poor" or worse condition.

Figure F. Condition of Inventoried Trees



MAINTENANCE & FUNDING

Stable and predictable funding is critical to effectively manage and grow Holyoke's public street and park trees. In fiscal year 2021, Holyoke's Forestry budget was \$158,825, of which just over \$60,000 was for tree care contractors to conduct street and park tree removal and pruning activities.

Holyoke's Forestry budget is not sufficient to address all of the City's public tree care needs. For example, based on the Holyoke's current Forestry budget and the recommended maintenance needs of the newly inventoried public trees (Figure G), it will take three to five years to remove all 307 identified trees removals in the four target neighborhoods.

The UFEP provides a five-year proactive tree management program for the street and park trees in the four target neighborhoods. However, **a complete inventory of the remaining street and park trees in Holyoke is crucial in determining the true funding needs of the public tree care program.**

Estimated Cost to Complete Holyoke's Street and Park Tree Inventory

To complete Holyoke's public tree inventory, an estimated 9,000 public street and park trees will need to be inventoried. Based on the cost to inventory the four target neighborhoods, it is estimated to cost \$37,170 to inventory the City's remaining trees.

Note: This is an estimate and actual costs to complete the inventory will depend on several factors, including the number of trees and the data/information being collected?

Figure G. Recommended Maintenance Needs

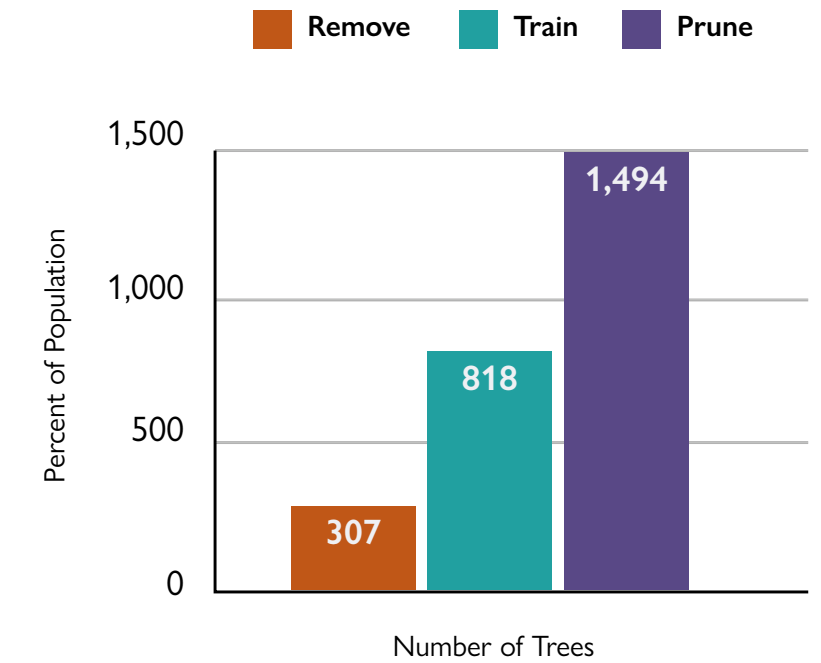


Figure H. Moving Towards a Proactive Maintenance Program

Reactive tree maintenance (top)

Attending to tree hazards and conditions on an as-needed or emergency only basis is costly and yields more long-term damage to roadways and tree health.

Preparing the City (middle)

Before proactive tree maintenance can happen, current conditions need to be tended to. Trees must be removed or replaced, and sidewalks and streets must be repaired.

Proactive tree maintenance (bottom)

A proactive management approach has many benefits for the City and urban canopy, including cost savings, reduced hazards, and creating a resilient and healthy urban forest for Holyoke's residents.



“I took a selfie in front of the Old Pine Oak Tree behind my row house on Suffolk and Pine—It’s a great tree in the summer, as the leaves shade the house, and a great tree in the winter when most of its leaves are gone and so it lets in needed sunlight at the back of the house.”

“Me tomé una selfie frente al un viejo árbol pino y roble detrás de mi casa asosada en Suffolk y Pine—es un gran árbol en el verano, ya que las hojas dan sombra a la casa, y un gran árbol le en el invierno cuando la mayoría de sus hojas se han ido y deja entrar la luz necesaria en la parta trasera de la casa.”

**MEET THE RESIDENTS:
DAPHNE**

Recommendations

The recommendations are listed in implementation order based on community feedback and the consultant team’s professional opinion related to the management needs of Holyoke’s public tree population. The highest priority for implementation is Recommendation #1, while Recommendation #8 is a lower priority. However, no matter where a recommendation is ranked—its implementation is an important piece in ensuring that Holyoke’s urban forest is equitable, sustainable, and resilient.

The UFEP provides a description of each Recommendation along with action steps, implementation ideas, and resources.

Table C. Recommendations

| Category | Recommendation |
|---|---|
|  | Recommendation #1: Engage, encourage, and support active participation by rental property owners, residents, and neighborhood & partner organizations in tree planting & care. |
|  | Recommendation #2: Develop and implement culturally, linguistically, and age-appropriate public engagement, outreach, and education strategies around the importance of trees and their care. |
|  | Recommendation #3: Develop and implement a strategy to maximize investment and resources to meet the desired level of service for the planting, care and management of Holyoke’s public trees. |
|  | Recommendation #4: Improve care and planting of public trees. |
|  | Recommendation #5: Improve communication & collaboration among city departments and between the city and external organizations. |
|  | Recommendation #6: Establish best management practices for tree planting, tree maintenance, and planning with a focus on equity. |
|  | Recommendation #7: Ensure Holyoke’s regulations and guidelines are in place to support tree canopy growth and preservation. |
|  | Recommendation #8: Prioritize and ensure space for trees. |

The Urban Forest Equity Plan recommendations and action steps are based on the priorities, challenges, and opportunities identified during the planning process. They focus on providing **all Holyoke residents and neighborhoods with equal access to a healthy, sustainable, and resilient urban forest and the many benefits it provides.**

The recommendations and action steps will help Holyoke to:



ENGAGE

and connect with residents, property owners, businesses, and community partners about the important role that they play in the growth, preservation, and care of Holyoke’s trees.



PLAN

for an equitable, sustainable, and resilient urban forest by developing strategies to support tree canopy growth and preservation, and to maximize investment.



MANAGE

public tree maintenance and planting more effectively by improving data and ensuring resources are in place to support their long-term growth and care.

