The Findings – continued

The projection about the long-term value of maples is concerning, but there is some silver lining in the research. While the maples are modeled to lose significant importance, other species are projected to gain value, and in fact help to make up consequential ground. Some species which the research points toward as gaining value over time include bur oak, sycamore, swamp white oak, shingle oak, shagbark hickory, sassafras, hackberry, red bud, black locust, American beech, and American hornbeam.

A second portion of research focused on a very preliminary comparison of tree species between Goshen (hardiness zone 5B) and Bloomington, In. (hardiness zone 6A). Using the same methodology as projections for Goshen's urban forest as a way to compare economic value across hardiness zones, honey locust, sweetgum, hackberry and swamp white oak were determined to be species which have thrived in a warmer hardiness zone and whose value will rise during the next 80 years of climate change. The results point toward the need for more research into hardiness zone approaches to planting for the future.

Conclusion

A diverse pallet of tree species will be critical to maintaining – and even increasing – the economic value of urban forests in the 21st Century. In northern Indiana, including Goshen, where maple species have historically been over-planted, the value and function of our urban forests may be especially jeopardized by climate change due to over-representation by a limited number of tree species.

Planning – and planting – with thought and research will allow our urban forests to play the critical cooling role which we will need. Diversifying, with an eye on climate-resilient tree species, is essential. For more information on Goshen's climate-resilient urban forest research, please visit: https://goshenindiana.org/forestry

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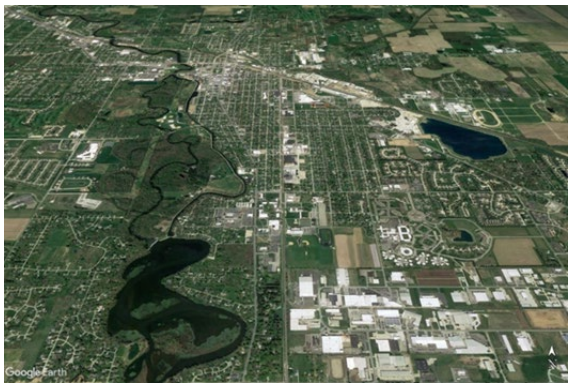

Climate Resilient Urban Forests

For Michiana

In 2020, the City of Goshen commissioned research into the impacts of climate change on its urban forest. In particular, the City wanted to know whether projected climate change impacts will affect our urban forest over the 21st Century, and what the City should be doing to prepare the urban forest for these impacts.

The City of Goshen is interested in this research for two clear reasons. One, it recognizes that the benefits which the urban forest provides to residents are significantly valuable now, and may become more valuable as temperatures rise during the 21st Century. Two, adoption of an aggressive canopy goal in 2019 requires ongoing attention to the forest species mix which the City curates, especially in light of projected climate change impacts.

A recent Goshen College graduate, Aidan Friesen, was contracted to expand on research which he designed for a smaller neighborhood in Goshen. Using the City of Goshen's Public Tree Inventory and the analysis of eco-benefits embedded within (Davey Resource Group TreeKeeper 8 software), and data from the US Forest Service *Climate Atlas* (https://www.fs.fed.us/nrs/atlas/tree/373) the research built mathematical ratios to estimate the projected economic value of different tree species at the end of the century, factoring in different climate impact scenarios.

> "Trees and other plants help cool the environment."
>
> – US EPA
>
> *Heat Island Compendium*
>
> https://www.epa.gov/heatislands/using-trees-and-vegetation-reduce-heat-islands

The research also made a limited attempt to compare urban forest data from the City of Bloomington, Indiana (USDA hardiness zone 6A) with Goshen's data (USDA hardiness zone 5B). This research focused on looking for tree species from a warmer hardiness zone which may project higher economic benefits than projections for species in Goshen, indicating species which might become favorable for planting in Goshen.

In order to model projections for future urban forest economic benefits, the research had to limit its sample size to the tree species present in the US Forest Service *Climate Atlas*. At the time of the research only 36 species out of the 85 recorded in Goshen's Public Tree Inventory were present in the *Climate Atlas*. The sample size therefore dropped from 13,499 trees to 8,650.

The Findings

Within a range of climate scenarios from low to harsh, the value of Goshen's *current* urban forest eco-benefits are projected to decrease from **25**% (low scenario) to **55**% (harsh scenario) by the end of the century. These numbers reveal details which tell an important story about diversity in the urban forest.

Goshen, nicknamed "The Maple City", is dominated by maple trees. Overall tree inventory data shows that maples make up 44% of our public trees; the research sample (64% of the total inventory) included 53% maple – silver maple (27%), sugar maple (18%), and red maple (8%). (Norway maple was not included since it is not listed in the *Climate Atlas*.) The largest projected decrease in Goshen's urban forest value due to climate change lays with the maples.

Under a low climate change scenario (projected to year 2100) Goshen's maples lose 81% of their current value. Under a harsh scenario, they lose 90% of their current value.