Summit County Tree Canopy Assessment

By Riley Pierce

Introduction

Urban forestry deals heavily with the quantification of the resources brought to an area by trees. Urban areas have few trees that must be cared for in smaller plots, along with a few parks. One important subset of urban forestry though, is "suburban" forestry, which deals with much larger spaces than the inner cities of large cities. One area where suburban forestry has flourished is Summit County, Ohio. The county seat is Akron, the rubber city, which used to be a large city and massive industry hub in Northeast Ohio, with a population of 290,000 at the cities peak in the 1960s. In fact, industry was so huge in Akron that the Cuyahoga river was lit on fire multiple times due to the large amount of pollutants present in the water. Now, the population has fallen to an estimated 197,000. While Akron was once the 45th largest city in the U.S. it is now the 125th largest. With the decline of the big city came the flight to the suburbs, with the area between Akron and Cleveland receiving a huge concentration of new citizens. Cities such as Hudson, Twinsburg, Stow, and Macedonia grew massively during this time. Also, in 1974, the National Park Service designated an area in the north of Summit County as a National Recreation Area. As the NPS moved into the area, they retrieved land from the citizens and removed all signs of previous inhabitants, returning the land to nature. In 2000, the NPS redesignated this area as the Cuyahoga Valley National Park. In this way, Summit county has moved from a heavily industrialized region to a place full of sleepy suburban sprawl, intermixed by a large number of parks and natural spaces. In this area, the word "suburban" is a better descriptor of the cities and towns because these places often have more or nearly equal amounts of natural and developed spaces. Here, green lawns mark the terrain more than anything you could describe as a concrete jungle. The suburban forest has different needs than the urban forest. In the urban forest, there is a dearth of spaces to put trees. In the suburban places, there are already a lot of trees, but they are of the wrong type, they are invasive, they intrude on the utility right of way, the local citizens don't like them, or a development is being put in.

With that being said the following questions are what I am trying to answer with this project:

What communities are getting the best ecological benefits from their suburban forests?

What leads the best communities to success?

Luckily, the tools granted to us by i-Tree will help make it easy to find these answers.

Methodology

The major i-Tree tool used to find the data for this report was i-Tree Canopy. There are 13 cities in Summit county, and for each of these a Canopy assessment was completed for between 250 and 350 points, depending on the size of the community. The list of the communities in Summit

County are is Akron, Barberton, Cuyahoga Falls, Fairlawn, Green, Hudson, Macedonia, Munroe Falls, New Franklin, Norton, Stow, Tallmadge, and Twinsburg. All of the shapefiles used were based on the boundaries set within the Canopy program. After the 13 cities were completed, a 500-point assessment was done for the entirety of Summit County to attempt to get an average for the entire county. For every survey, the default land cover categories were used. These categories are H, Grass/Herbaceous; IB, Impervious Buildings; IR, Impervious Roads; S, Soil/Bare Ground; T, Tree/Shrub; and W, Water. The determination between each category was made based on the experimenter's own discretion. For the assessment of tree benefits the values from the U.S. > Ohio > Summit > Urban options were used across all surveys to provide standard results. After all the surveys were completed, reports were generated from each survey. Then, the relevant data from these reports were placed into an Excel sheet for analysis. Lastly, graphs were made for the land cover types in each city, and then this report was created.

Results and Discussion

After the canopy surveys and reports were completed, the following results were obtained about the land coverage statistics.
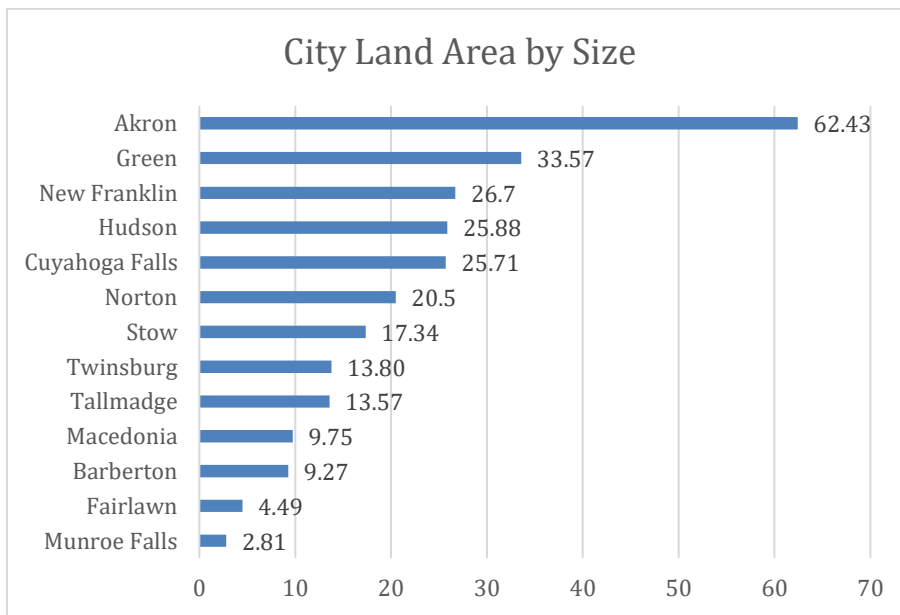

Fig. 1

The above graph simply displays the area in square miles of each city in Summit county. Interestingly, there are many cities that fall into class sizes. These classes or strata seem to be the "25 square mile" of New Franklin, Hudson, and Cuyahoga Falls, the "13 square mile" cities of Twinsburg and Tallmadge, and finally the "9 square mile" cities of Macedonia and Barberton. Akron obviously dominates in size in Summit County, as it is more than 20x the size of the smallest city, Munroe Falls. The average size of a city in Summit county is 20.45 square miles, which is about the size of Norton.

H Percent by City

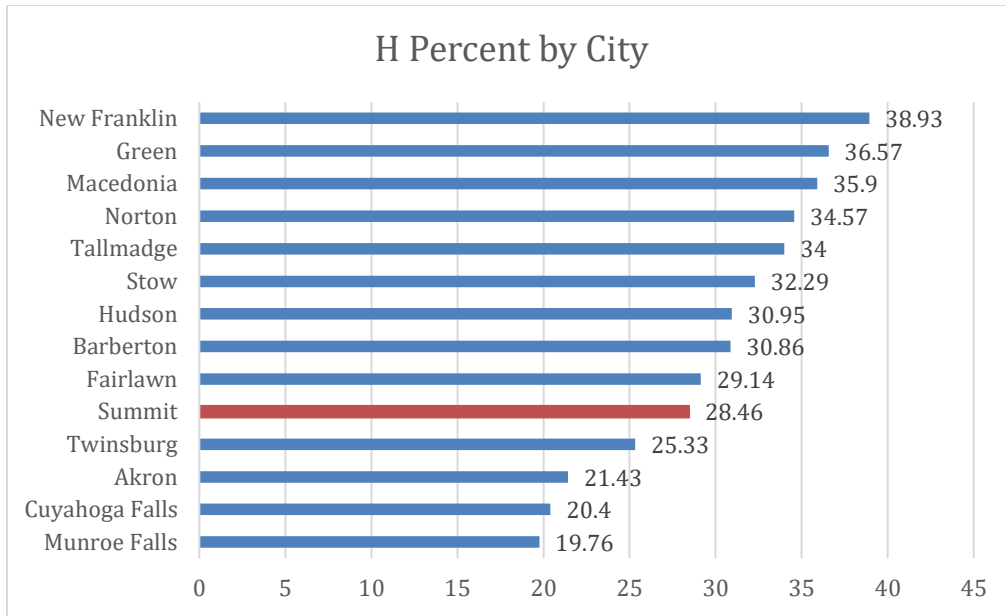| City	Percent
New Franklin	38.93
Green	36.57
Macedonia	35.9
Norton	34.57
Tallmadge	34
Stow	32.29
Hudson	30.95
Barberton	30.86
Fairlawn	29.14
Summit	28.46
Twinsburg	25.33
Akron	21.43
Cuyahoga Falls	20.4
Munroe Falls	19.76

Fig. 2

Figure 2 displays the percent of land cover that was grassy or herbaceous ground cover. Most of this terrain is homeowner lawns, but it also includes wild fields, fallow farm fields, baseball fields, cemeteries, and other spaces. The orange bar denotes what the overall Summit County survey found. Most cities had more grassy areas than the average city. It seems that the most urban spaces, which lack large green lawns had the lowest grassy cover areas. This includes the cities of Twinsburg, Akron, and Cuyahoga Falls. Munroe Falls is not an urban space, but is instead very small and very heavily forested, which places it at the bottom. The top cities with the most grassy cover are in more rural areas, with many more large lawns and big farm fields. These more heavily rural cities in the south of Summit County are New Franklin, Green, and Norton.
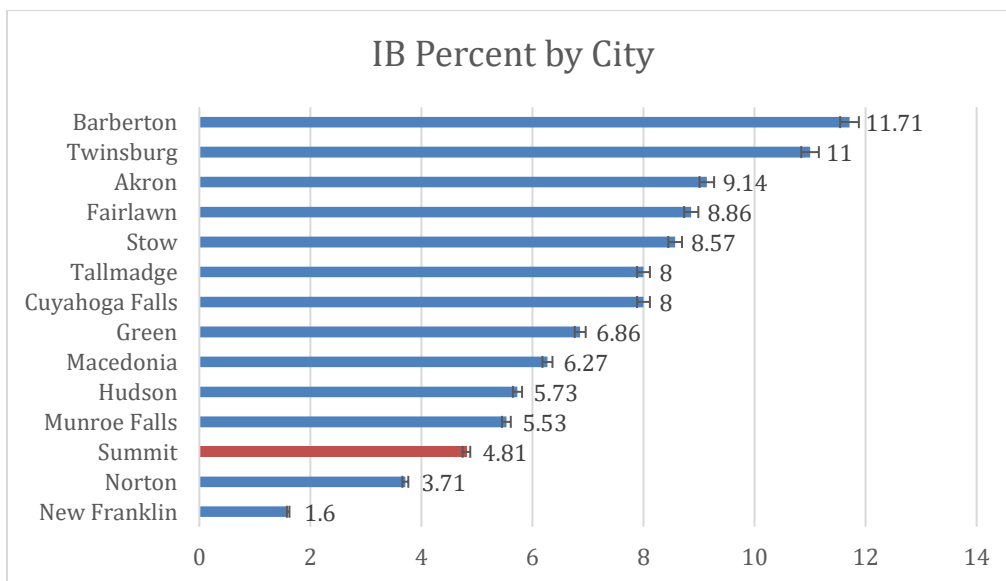
IB Percent by City

City	Percent
Barberton	11.71
Twinsburg	11
Akron	9.14
Fairlawn	8.86
Stow	8.57
Tallmadge	8
Cuyahoga Falls	8
Green	6.86
Macedonia	6.27
Hudson	5.73
Munroe Falls	5.53
Summit	4.81
Norton	3.71
New Franklin	1.6

Fig. 3

Figure 3 depicts the percent of land cover that is covered by impervious buildings, these include any structure with a hard rood such as industrial buildings, houses, community buildings, or sheds. Overall, there is a very low amount of coverage for this category. The highest coverage is found in the more urban areas where the houses are packed tight, leading to a lot more roof coverage. These tightly packed areas are Barberton, Twinsburg, Akron, Fairlawn, Stow, Tallmadge, and Cuyahoga Falls. These cities will have a hard time finding new areas to place trees because so much space is already taken up by housing. The least covered areas are the rural cities, like Norton and New Franklin. These cities have very big lots and small downtown areas, which allows each individual landowner a lot of space to plant trees.

IR Percent by City

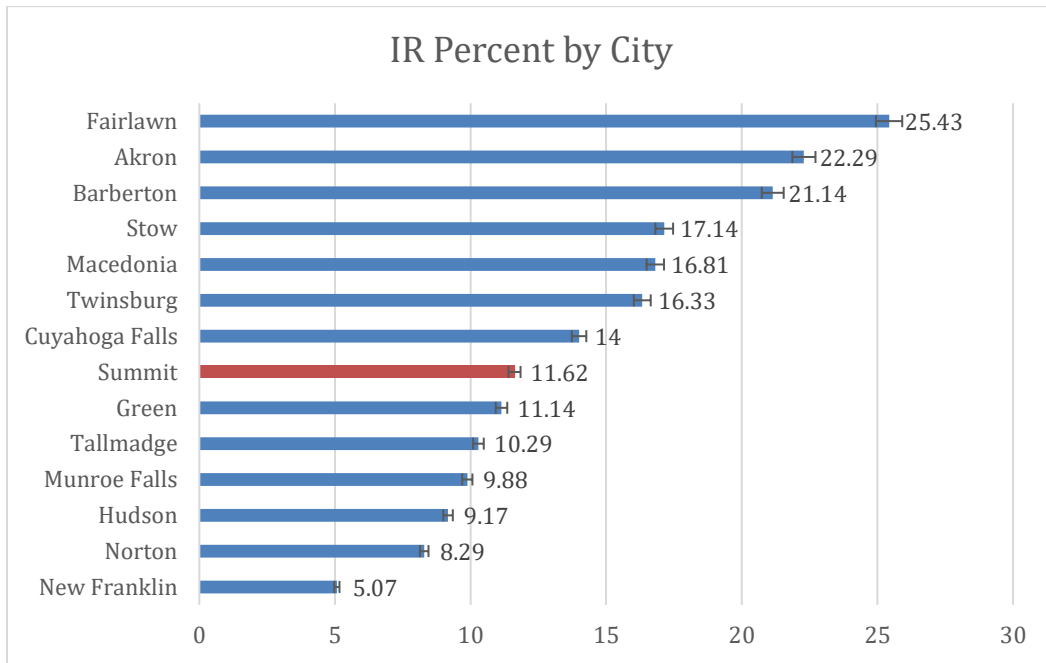| City	Value
Fairlawn	25.43
Akron	22.29
Barberton	21.14
Stow	17.14
Macedonia	16.81
Twinsburg	16.33
Cuyahoga Falls	14
Summit	11.62
Green	11.14
Tallmadge	10.29
Munroe Falls	9.88
Hudson	9.17
Norton	8.29
New Franklin	5.07

Fig. 4

Figure 4 shows the percent coverage by impervious roads, which includes all car roadways, rail roads, driveways, and sidewalks, since those are roads for people. Figure 3 can help us understand the road data as well, more urban areas have a higher percentage of road coverage due to an abundance of housing, which leads to more sidewalks, more driveways, and tighter roadways. This figure shows a hard split between more urban and more rural cities, with all the cities above the Summit County survey being generally more urban, and all cities below being more rural.

S Percent by City

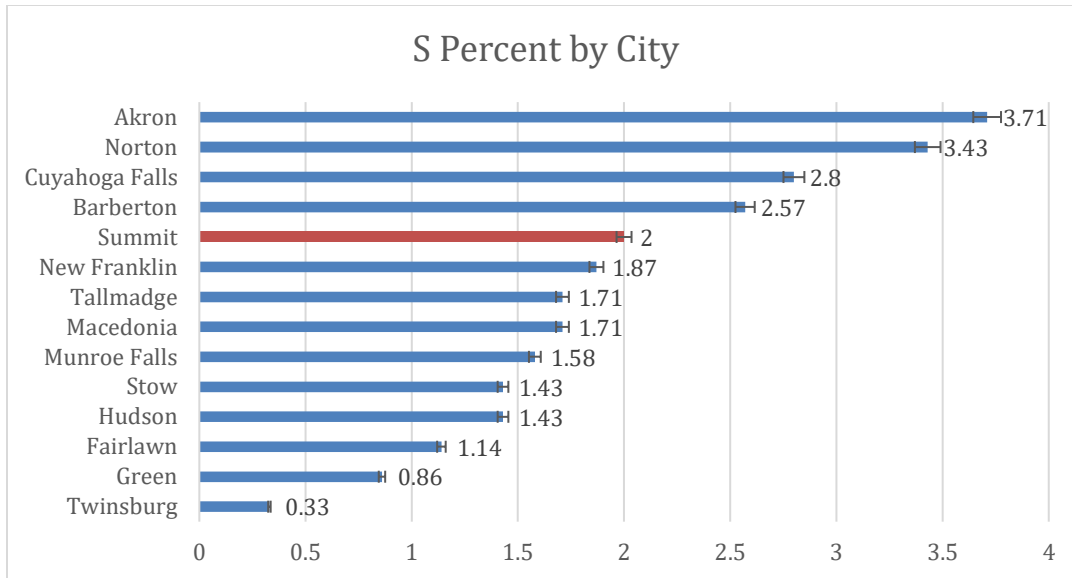| City	Value
Akron	3.71
Norton	3.43
Cuyahoga Falls	2.8
Barberton	2.57
Summit	2
New Franklin	1.87
Tallmadge	1.71
Macedonia	1.71
Munroe Falls	1.58
Stow	1.43
Hudson	1.43
Fairlawn	1.14
Green	0.86
Twinsburg	0.33

Fig. 5

Figure 5 displays the percentage of area in each city that is covered by bare soil, or bare ground, this includes soil piles, waterway banks, sand pits, and gravel lots. Many of the spaces in this area are gravel parking lots and driveways, which are not impervious roads because they allow run off to soak into and flow through them. Often when the surveys were being completed, the soil was surrounding newly built houses and buildings that had not been seeded into grassy lawns yet. The experimenter views this as a gauge of the current development happening in the city. Akron has a great deal of roadwork going on, and so it scored high in this category, Cuyahoga Falls is also doing a lot of development currently. Norton has a high percent coverage of soil because there is a large lake that has been drained recently, leading to a great deal of bare soil being present there. Still, the coverage of bare soil is never above 4% across all cities, this is due to Summit County's wet and temperate climate, which allows weedy plants to quickly arise in any newly turned earth wherever it lies. Interestingly, if we look at the two "9 square mile" cities, Tallmadge, and Twinsburg, we see a disparity between the amount of bare soil. Twinsburg, which is already heavily developed, and has a higher IB and IR percentage has a tiny bare soil coverage because there is not much space for new construction. On the other hand, Tallmadge has much lower IB and IR coverage and is currently trying to develop more of its land, leading to more bare soil.
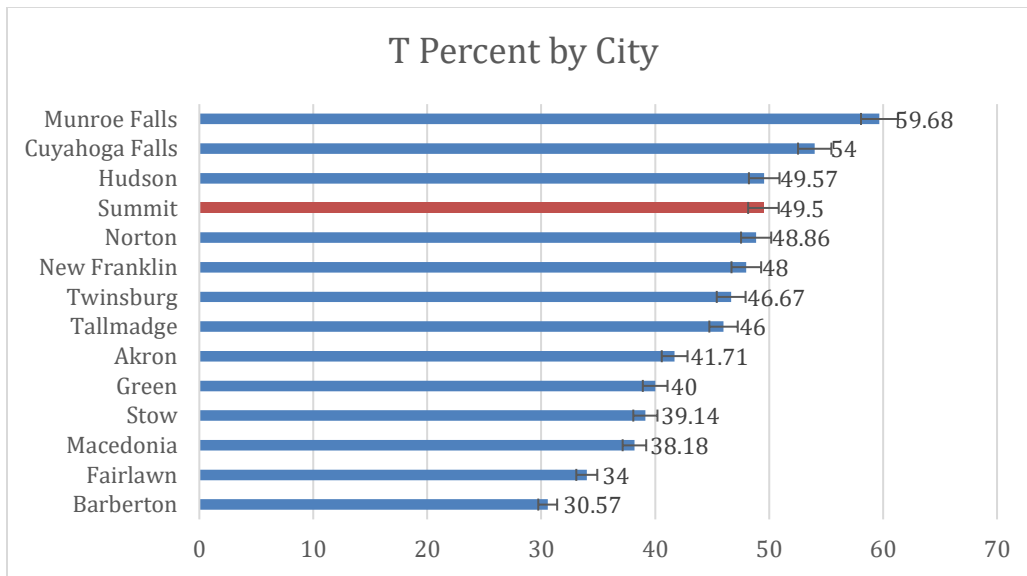
T Percent by City

City	T Percent
Munroe Falls	59.68
Cuyahoga Falls	54
Hudson	49.57
Summit	49.5
Norton	48.86
New Franklin	48
Twinsburg	46.67
Tallmadge	46
Akron	41.71
Green	40
Stow	39.14
Macedonia	38.18
Fairlawn	34
Barberton	30.57

Fig. 6

Figure 6 shows the largest category of all the land coverage types, the tree/shrub coverage. Summit County lives in the edge of the mixed mesophytic forest (MMF) type in the eastern temperate forests. Other original forest types are beech forests, mixed oak forests, and oak-sugar maple forest types. MMF is the primary forest type however, and it holds a wide variety of tree species including beech, sugar maple, red maple, tulip polar, magnolia, chestnut, white and red oak, ash, sassafras, redbud, and flowering dogwood. These are also just the native species, as a large number of invasive trees and shrubs have moved into the forests in Summit County. The two important cities with higher than average tree and shrub coverage, Cuyahoga Falls and Hudson are both bordering the Cuyahoga Valley National Park (CVNP). Munroe Falls has a large amount of tree coverage because nearly one third of the city is a heavily forested park, which upsets the average coverage within the city. Predictably, cities that are more urban and further away from the CVNP have less tree coverage. The prime example of this is Barberton, which is just as far away from the CVNP as Norton, but is considerably more urban than Norton, this leads Barberton to have very low tree canopy coverage compared to its more rural neighbor. Also, if we look at the "25 square mile" cities, we can see that Cuyahoga Falls and Hudson have above average tree cover and are close to the CVNP. However, New Franklin, which is of a similar size, falls just under the average, and is very far from the CVNP, but is much more rural than the other two.
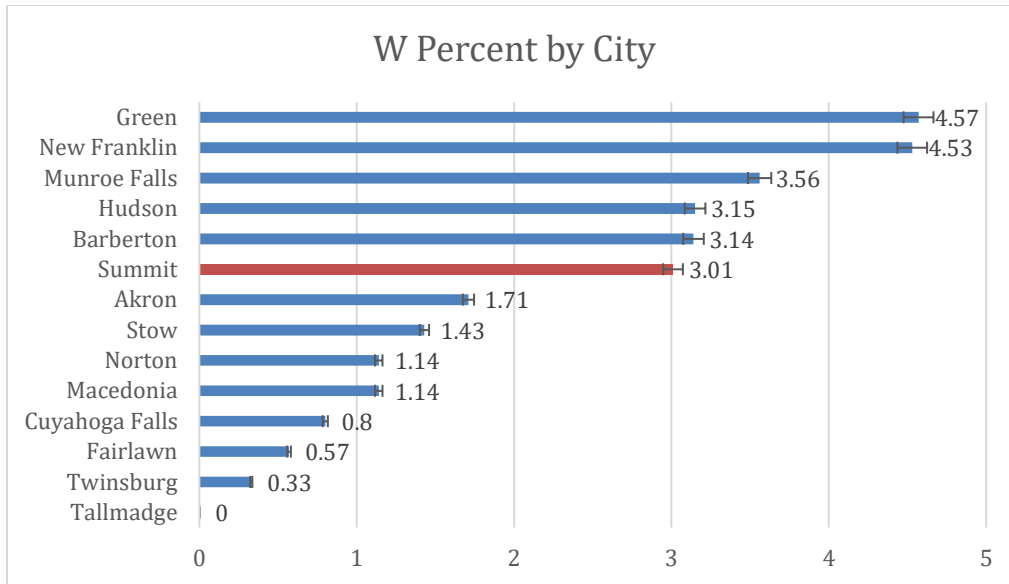
W Percent by City

City	Value
Green	4.57
New Franklin	4.53
Munroe Falls	3.56
Hudson	3.15
Barberton	3.14
Summit	3.01
Akron	1.71
Stow	1.43
Norton	1.14
Macedonia	1.14
Cuyahoga Falls	0.8
Fairlawn	0.57
Twinsburg	0.33
Tallmadge	0

Fig. 7

Figure 7 portrays the amount of each city that is covered by bodies of water, which includes rivers like the Cuyahoga, lakes like Nimisila Reservoir, small, dirty ponds in backyards, and swimming pools. Water coverage does not mean much between cities, as it is a product of the individual geography of each area.

Ecological Benefits and Conclusions

Across all of Summit County, Canopy estimates that 25 million dollars in carbon is sequestered each year, of that total, $13 million is sequestered by the 13 cities in the county. This load is not shared equally though, Akron is estimated to remove $3.1 million in carbon each year, while the three "25 square mile" cities each sequester about 1.5 million a year. The lowest dollar amount removed by a city is Munroe Falls, which sequesters about $202,000 a year. While this amount is small compared to other cities, it still makes a big difference to such a small community. It is important to protect all trees in this region, as having a beautiful environment is a growing industry in the county. Additionally, it can help to protect the people that live in these cities, $43-$47 million in the big six pollutants is removed by Summit County plants every year, which is a massive benefit, and creates real changes in people's lives. Many more Ohioans would have asthma or suffer from acid rain or become poisoned by ozone if the CVNP had not been established and the Cuyahoga River had not been cleaned by the EPA.

After all of this, what community is doing the best in reducing its IB and IR footprints while increasing its T and H coverage? Let's look at one last graph.
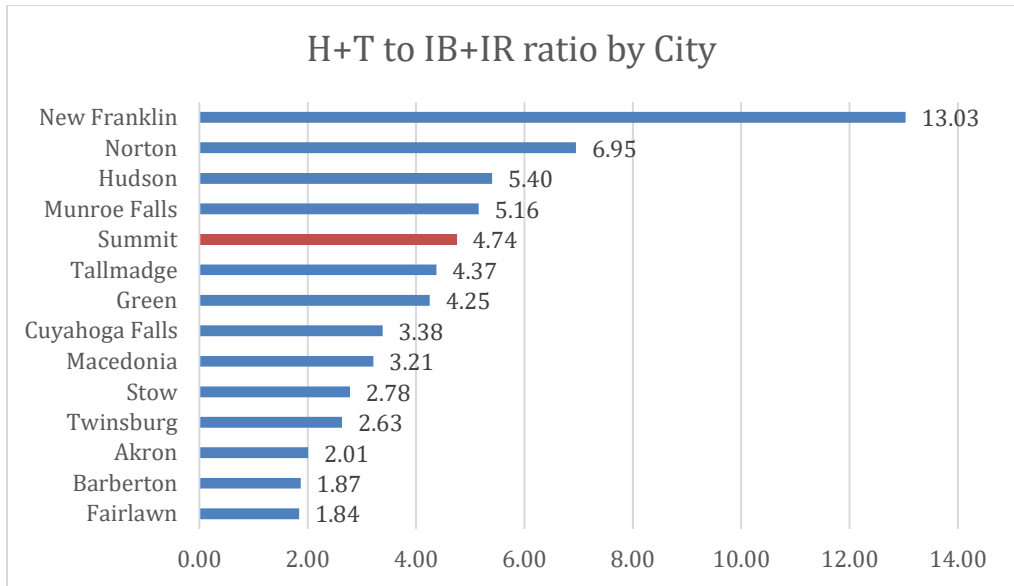
New Franklin has an 87 to 7 plant coverage to building and road coverage ratio. While this looks great for the environment, much of New Franklin is farmland, which is not very ecologically productive, and this model is not applicable to the other cities in this area. Norton, Hudson, and Munroe Falls are doing very well at finding a good balance between urban and rural areas. Each of these cities takes a different approach as well. Norton in the south of Summit County is heavily rural and full of farmland and open grassy pastures that are beginning to be shrubby forests. Hudson in the north is a rich town that spends more than any other city in Ohio on tree maintenance and is a qualified Tree City USA that borders a heavily forested National Park. Hudson is using overwhelming economic force to create a clean and safe environment. Munroe Falls is dealing with the age-old debate in conservation, the single large or several small conservation districts debate. As I stated before, almost a third of Munroe Falls is a big park, which is large relative to the city, but is part of the network of several small parks called the Metroparks. In this way, Munroe Falls has reached a perfect union between the two types of conservation district and exists happily as a small part of a bigger picture, with little industry, and little space for anything other than natural areas. There are no farms, just forest. Munroe Falls has an interesting mix of administrative size and conservation district size that smaller communities can use as an example.

In Summit County there can be found three successes at man's attempt to live in harmony with nature, each is different, and each is viable for a different sort of community. Take these strategies home with you, and soon you may find a National Park in your backyard.