ITree Academy 2021 Capstone Project
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For my capstone project for the iTree academy I choose to conduct a thousand-point canopy study of the Downtown area of Morgantown West Virginia. Morgantown's downtown is comprised of many old and new buildings that are mixed use of primarily commercial and residential building. I choose the downtown area because we lose trees downtown due to the harsh nature of the urban environment. Historically we lose several street trees a year to vandalism, car accident, and street tree age with limited growing space. It is often hard to get buy in from upper management of the city for the planting of new street trees in downtown due to the cost and shorter than average life span of urban street tree. I felt the canopy tool would highlight the need for more green infostructure in Downtown Morgantown. Here are the findings of my Canopy survey.
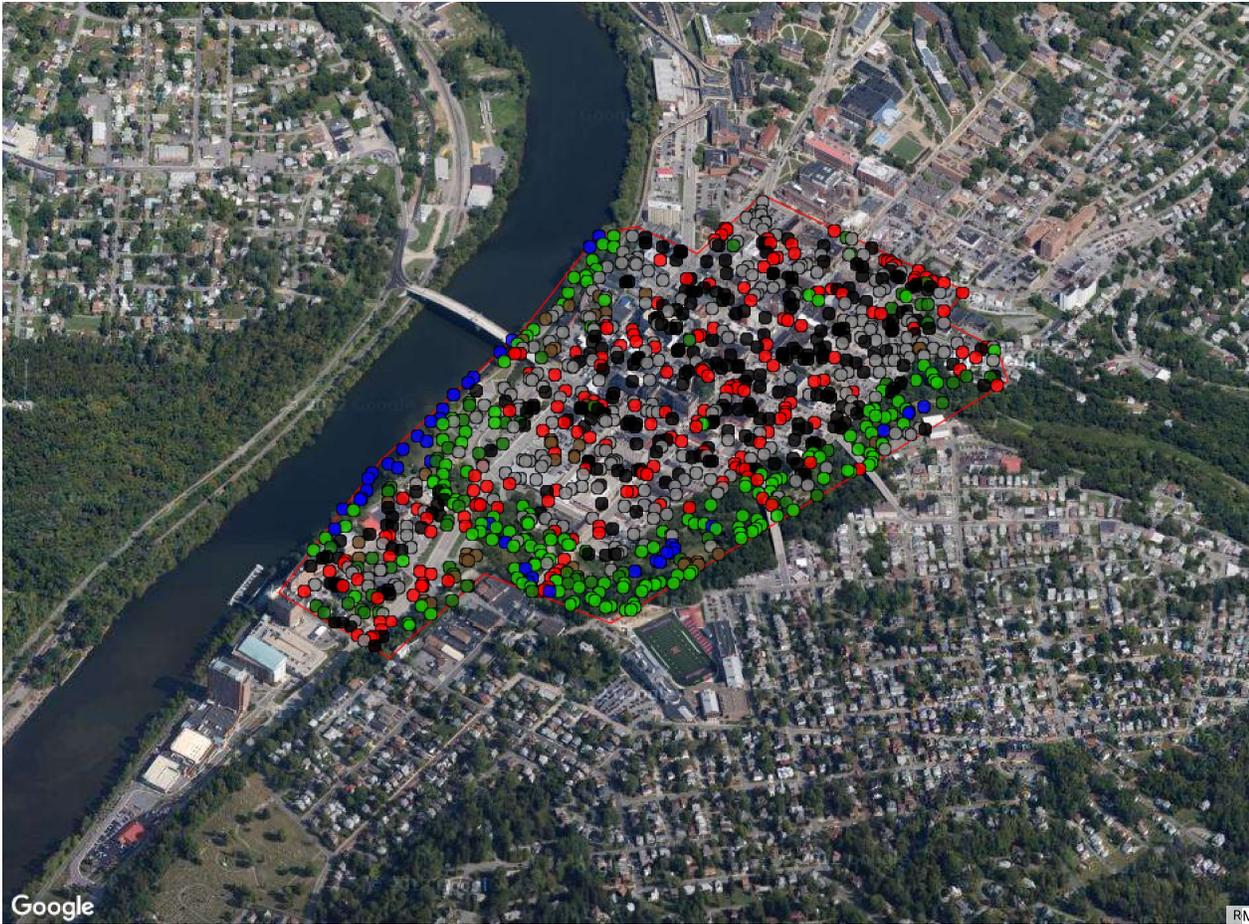
Grass Herbaceous 6.6%
Impervious Buildings 26.2%
Impervious Other 24.8%
Impervious Roads 18%
Soil/Bare Ground 3.9%
Water 4.2%
Trees/Shrub 16.3%

As you can see on my Canopy point report the downtown area has very few green tree dots on the city streets. The report indicates that our downtown area on has 16.3% canopy. It is also evident that the riparian areas alone the Monongahela River and Deckers Creek have the majority our Urban Trees. In conclusion I hope to use this report as a tool to demonstrate the need for additional tree planting in the downtown areas of Morgantown West Virginia.
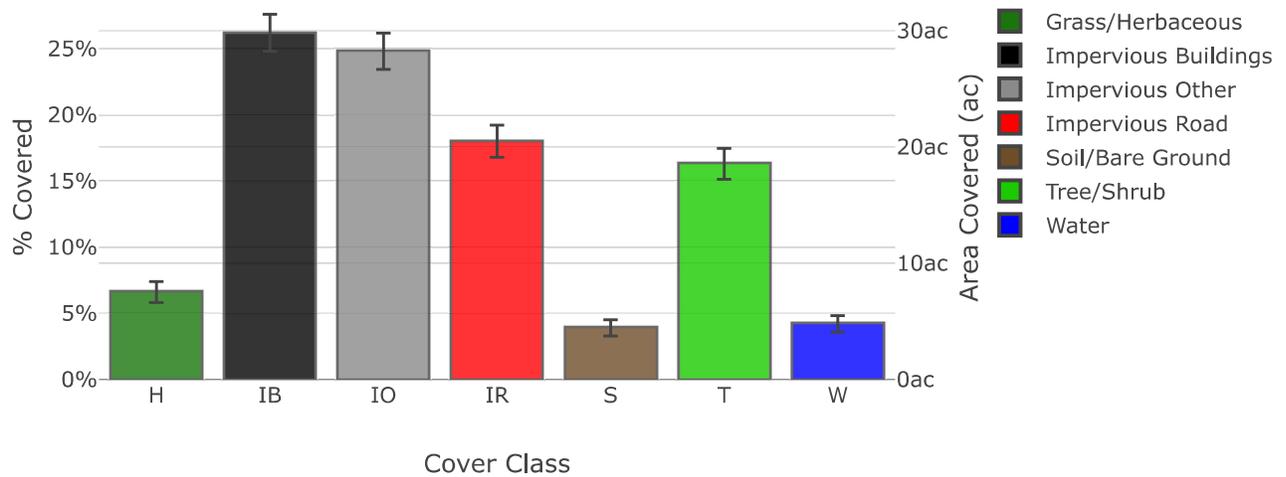
Land Cover

Legend:
- Grass/Herbaceous
- Impervious Buildings
- Impervious Other
- Impervious Road
- Soil/Bare Ground
- Tree/Shrub
- Water

Abbr.	Cover Class	Description	Points	% Cover ± SE	Area (ac) ± SE
H	Grass/Herbaceous		66	6.60 ± 0.79	7.51 ± 0.89
IB	Impervious Buildings		262	26.20 ± 1.39	29.82 ± 1.58
IO	Impervious Other		248	24.80 ± 1.37	28.22 ± 1.55
IR	Impervious Road		180	18.00 ± 1.21	20.49 ± 1.38
S	Soil/Bare Ground		39	3.90 ± 0.61	4.44 ± 0.70
T	Tree/Shrub		163	16.30 ± 1.17	18.55 ± 1.33
W	Water		42	4.20 ± 0.63	4.78 ± 0.72
Total			**1000**	**100.00**	**113.81**

Tree Benefit Estimates: Carbon (English units)

Description	Carbon (T)	±SE	CO$_2$ Equiv. (T)	±SE	Value (USD)	±SE
Sequestered annually in trees	25.32	±1.81	92.85	±6.65	$4,319	±309
Stored in trees (Note: this benefit is not an annual rate)	635.93	±45.57	2,331.76	±167.09	$108,459	±7,772

Currency is in USD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Amount sequestered is based on 1.365 T of Carbon, or 5.005 T of CO$_2$, per ac/yr and rounded. Amount stored is based on 34.281 T of Carbon, or 125.697 T of CO$_2$, per ac and rounded. Value (USD) is based on $170.55/T of Carbon, or $46.51/T of CO$_2$ and rounded. (English units: T = tons (2,000 pounds), ac = acres)

Tree Benefit Estimates: Air Pollution (English units)

Abbr.	Description	Amount (lb)	±SE	Value (USD)	±SE
CO	Carbon Monoxide removed annually	20.96	±1.50	$14	±1
NO2	Nitrogen Dioxide removed annually	115.78	±8.30	$25	±2
O3	Ozone removed annually	894.35	±64.09	$1,162	±83
SO2	Sulfur Dioxide removed annually	56.91	±4.08	$4	±0
PM2.5	Particulate Matter less than 2.5 microns removed annually	45.69	±3.27	$2,432	±174
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	253.83	±18.19	$796	±57
Total		**1,387.52**	**±99.43**	**$4,432**	**±318**

Currency is in USD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Air Pollution Estimates are based on these values in lb/ac/yr @ $/lb/yr and rounded:

CO 1.130 @ $0.67 | NO2 6.241 @ $0.22 | O3 48.211 @ $1.30 | SO2 3.068 @ $0.07 | PM2.5 2.463 @ $53.23 | PM10* 13.683 @ $3.13 (English units: lb = pounds, ac = acres)

Tree Benefit Estimates: Hydrological (English units)

Abbr.	Benefit	Amount (gal)	±SE	Value (USD)	±SE
AVRO	Avoided Runoff	153.66	±11.01	$1	±0
E	Evaporation	3,450.65	±247.27	N/A	N/A
I	Interception	3,473.11	±248.88	N/A	N/A
T	Transpiration	3,267.48	±234.14	N/A	N/A
PE	Potential Evaporation	22,191.79	±1,590.24	N/A	N/A
PET	Potential Evapotranspiration	18,302.48	±1,311.53	N/A	N/A

Currency is in USD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Hydrological Estimates are based on these values in gal/ac/yr @ $/gal/yr and rounded:

AVRO 8.283 @ $0.01 | E 186.013 @ N/A | I 187.224 @ N/A | T 176.139 @ N/A | PE 1,196.288 @ N/A | PET 986.628 @ N/A (English units: gal = gallons, ac = acres)

About i-Tree Canopy

The concept and prototype of this program were developed by David J. Nowak, Jeffery T. Walton, and Eric J. Greenfield (USDA Forest Service). The current version of this program was developed and adapted to i-Tree by David Ellingsworth, Mike Binkley, and Scott Maco (The Davey Tree Expert Company)

Limitations of i-Tree Canopy

The accuracy of the analysis depends upon the ability of the user to correctly classify each point into its correct class. As the number of points increase, the precision of the estimate will increase as the standard error of the estimate will decrease. If too few points are classified, the standard error will be too high to have any real certainty of the estimate.

Additional support provided by:

Use of this tool indicates acceptance of the EULA.