A COLLABORATION BETWEEN THE CITY OF SPOKANE, THE SPOKANE LANDS COUNCIL, AND GONZAGA UNIVERSITY

URBAN TREE ANALYSIS REPORT 2020

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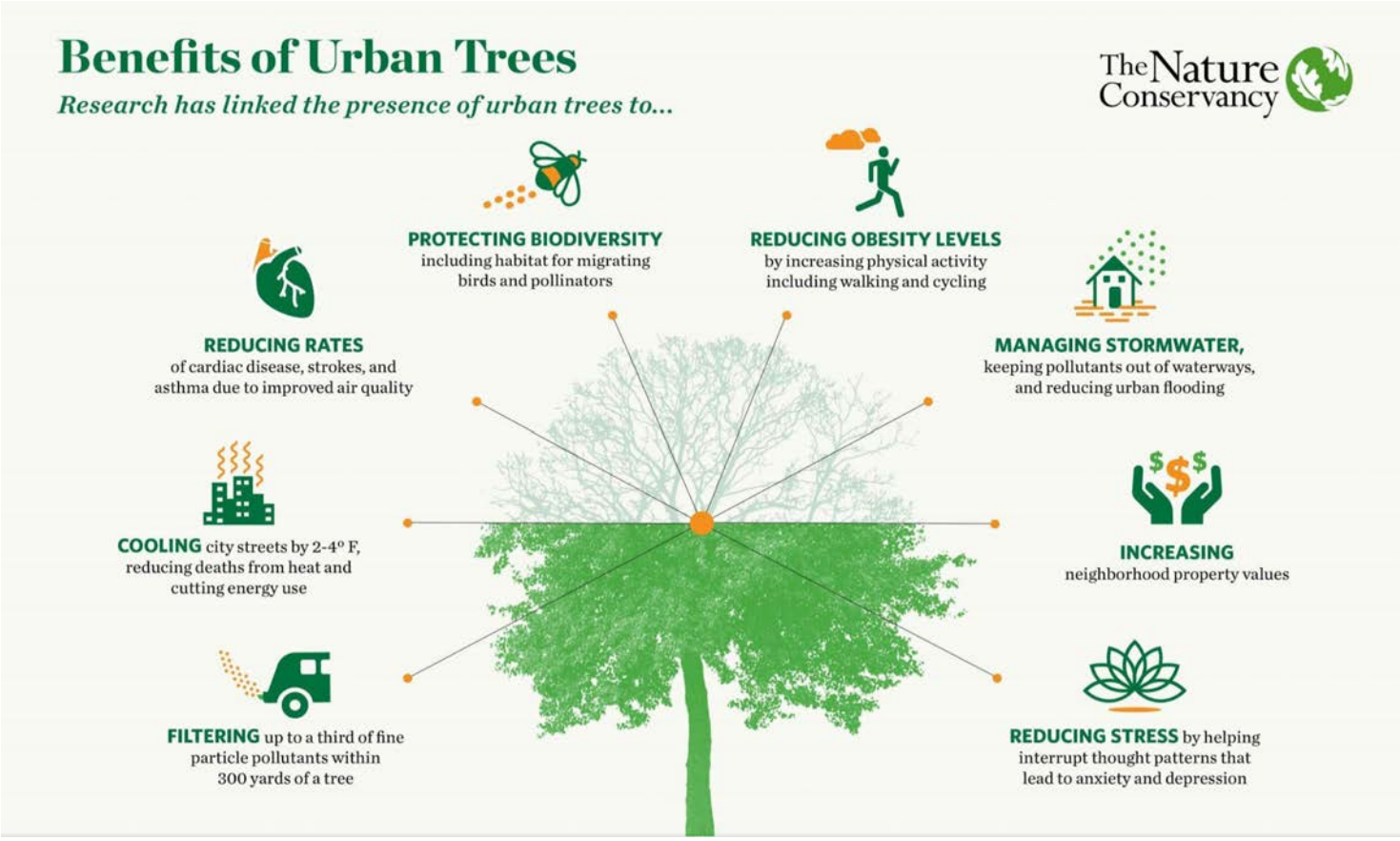
URBAN TREE CANOPY

Benefits of Urban Tree Canopy



LAND COVER

INTRODUCTION

The different categories of land cover, tree canopy, non-canopy vegetation, impervious surfaces, bare soil or water, and their percentages throughout the different urban neighborhoods allows us to visualize the disparities as well as the disproportionate distribution of tree canopy especially. By determining which neighborhoods fall below the desired 30% canopy coverage we can then go on to determine if there is a trend among the socioeconomic status of those neighborhoods.

IMPLICATIONS FOR THE SPOKANE COMMUNITY

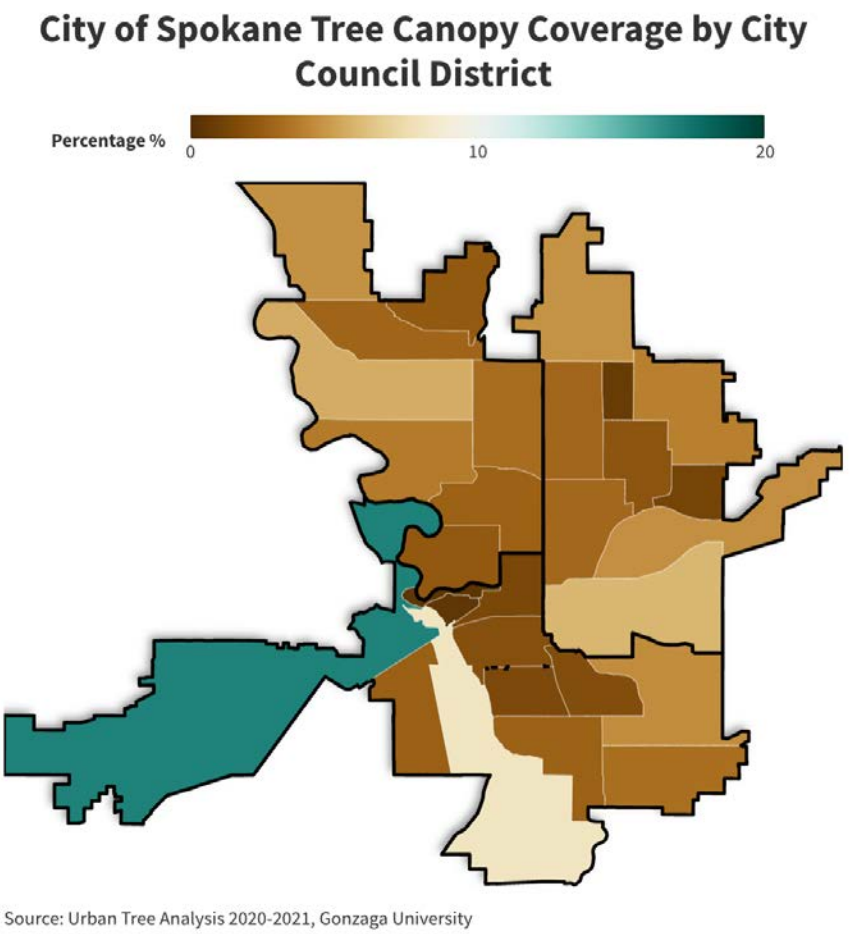
This data collection allows us to correlate land cover with neighborhood demographics, leading us to prioritize areas in the Spokane community that are most in need of an increase in tree canopy in order to allow for other economical benefits.

LAND COVER STATISTICS

Percentages of land cover by neighborhood and district

20%

TREE CANOPY COVERAGE



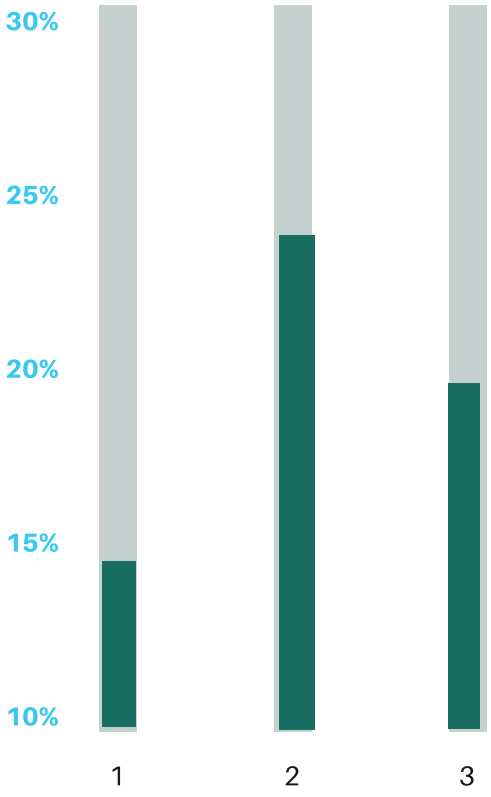
Highest: Manito- 38.5%

Lowest: Riveside-7.8%

District 1: 13.9%

District 2: 24.9%

District 3: 20.8%



CARBON BENEFITS

INTRODUCTION

Tree canopy present in urban areas contributes to overall environmental benefits in many ways, two of which are through carbon sequestration and storage. These two measures can provide a holistic impression of how well tree canopy is contributing to atmospheric carbon reduction in the Spokane area. These two measures should be evaluated by comparing neighborhoods of similar sizes, as larger neighborhoods have the opportunity for more vegetation which leads to much higher levels of carbon storage and sequestration.

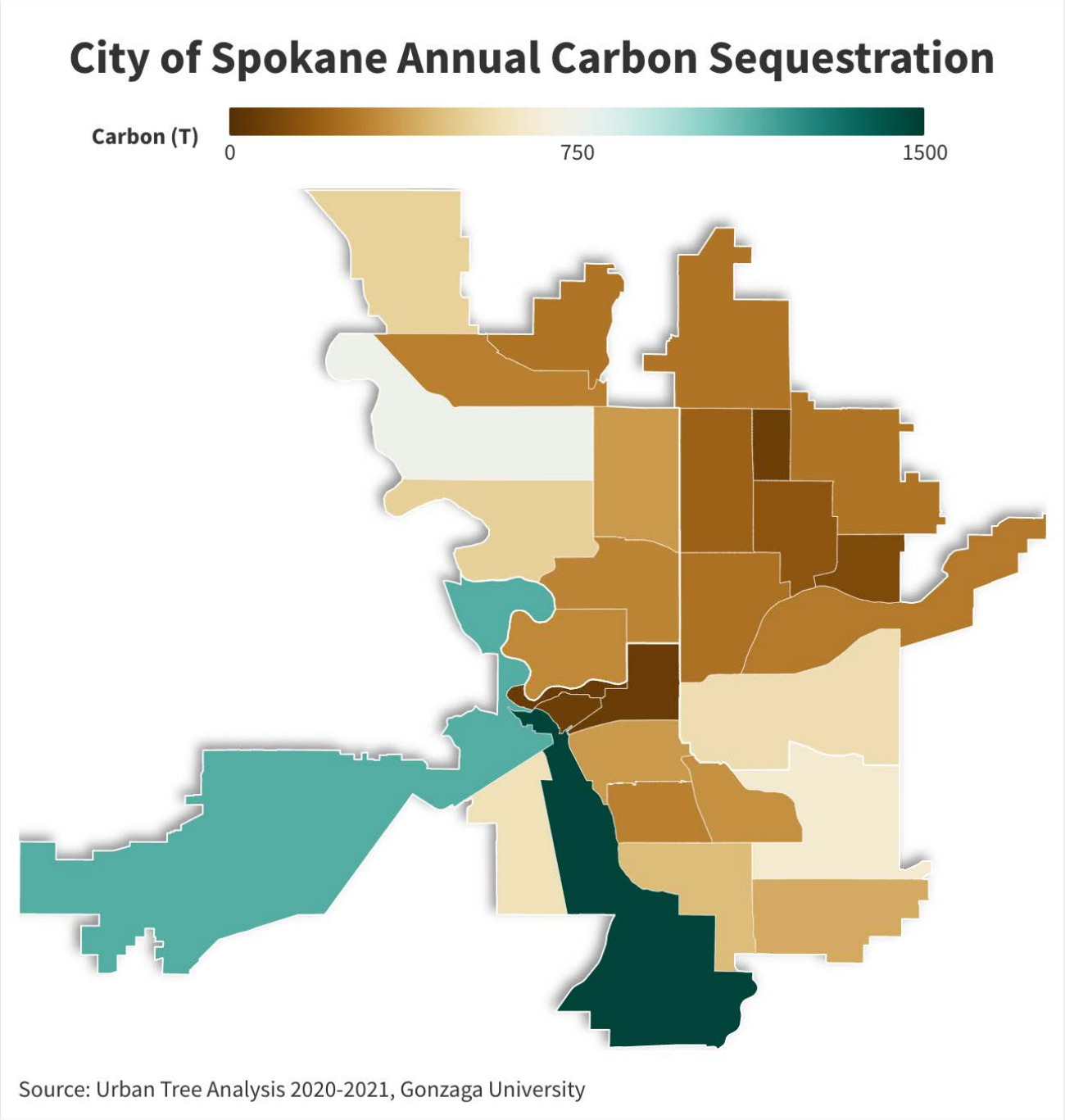
IMPLICATIONS FOR THE SPOKANE COMMUNITY

This particular data was collected by neighborhood, allowing us to understand which areas have proportionally less carbon sequestration and storage than the rest of the city. Areas with less overall tree canopy can then be targeted for tree planting to increase carbon sequestration and storage equitably across the city of Spokane.

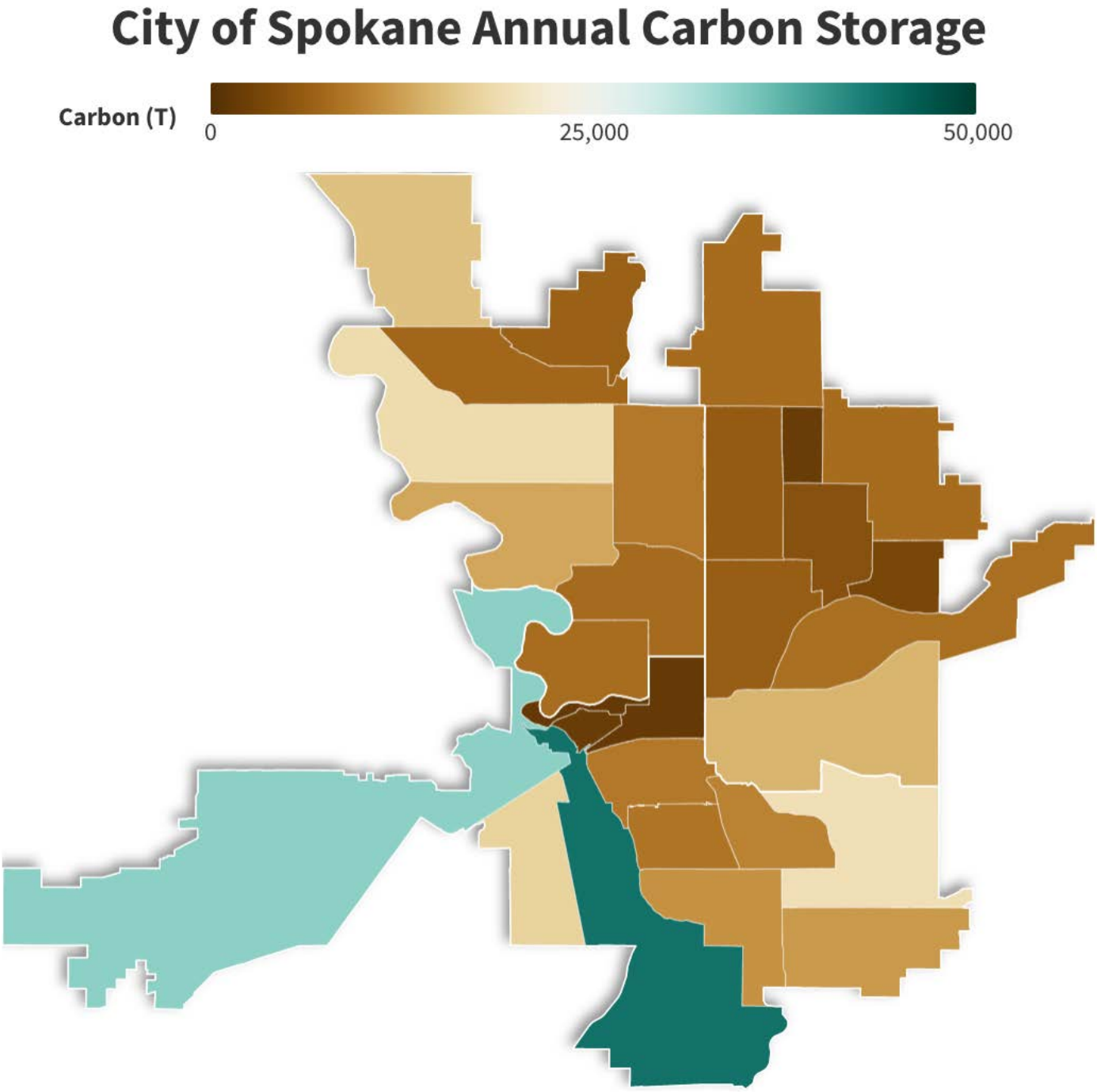
Carbon sequestration through tree canopy and other vegetation refers to the carbon that is removed from the atmosphere around Spokane through an uptake process. Carbon storage refers to the amount of carbon that is stored in the vegetation itself. This includes not only the visible body of trees and plants but also all of the root systems throughout the city.

CARBON BENEFITS

Carbon data taken by neighborhood

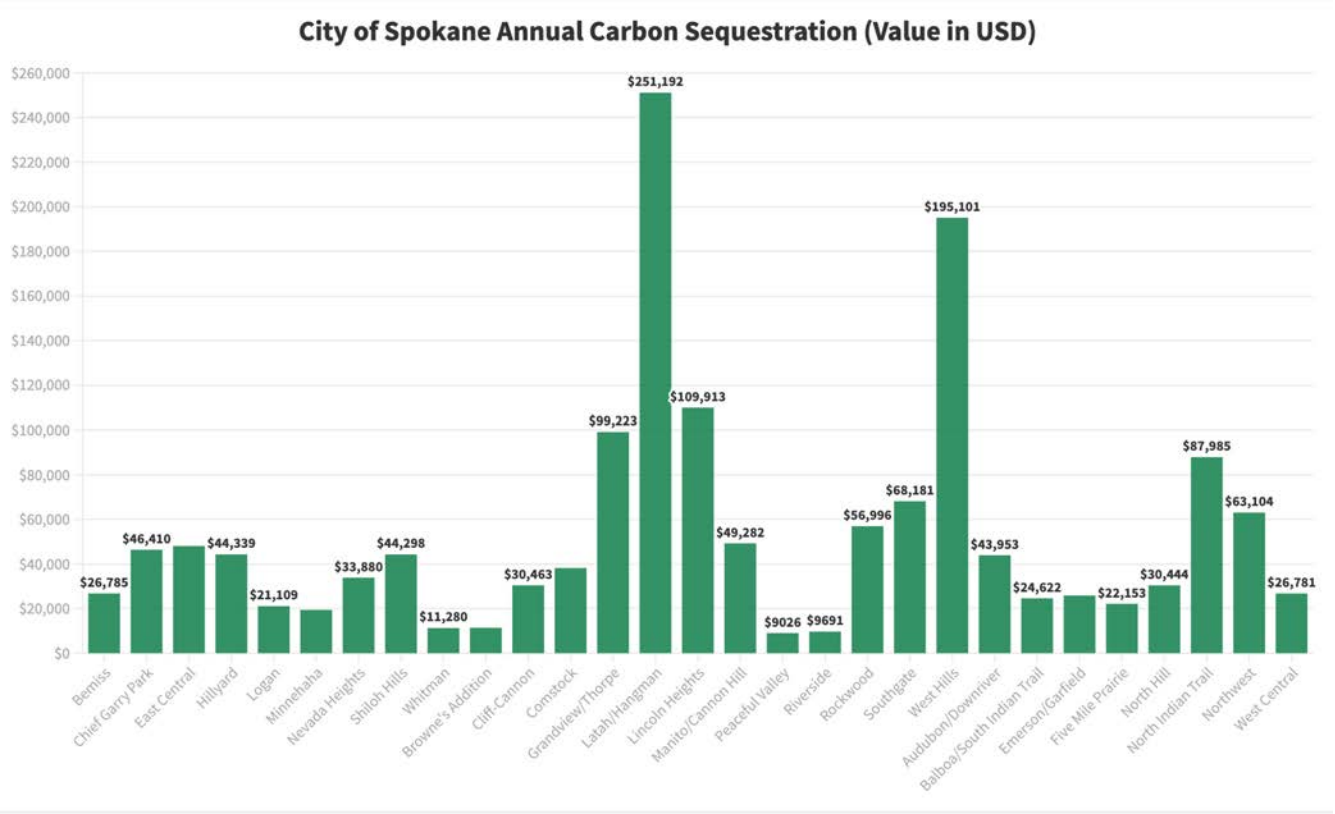


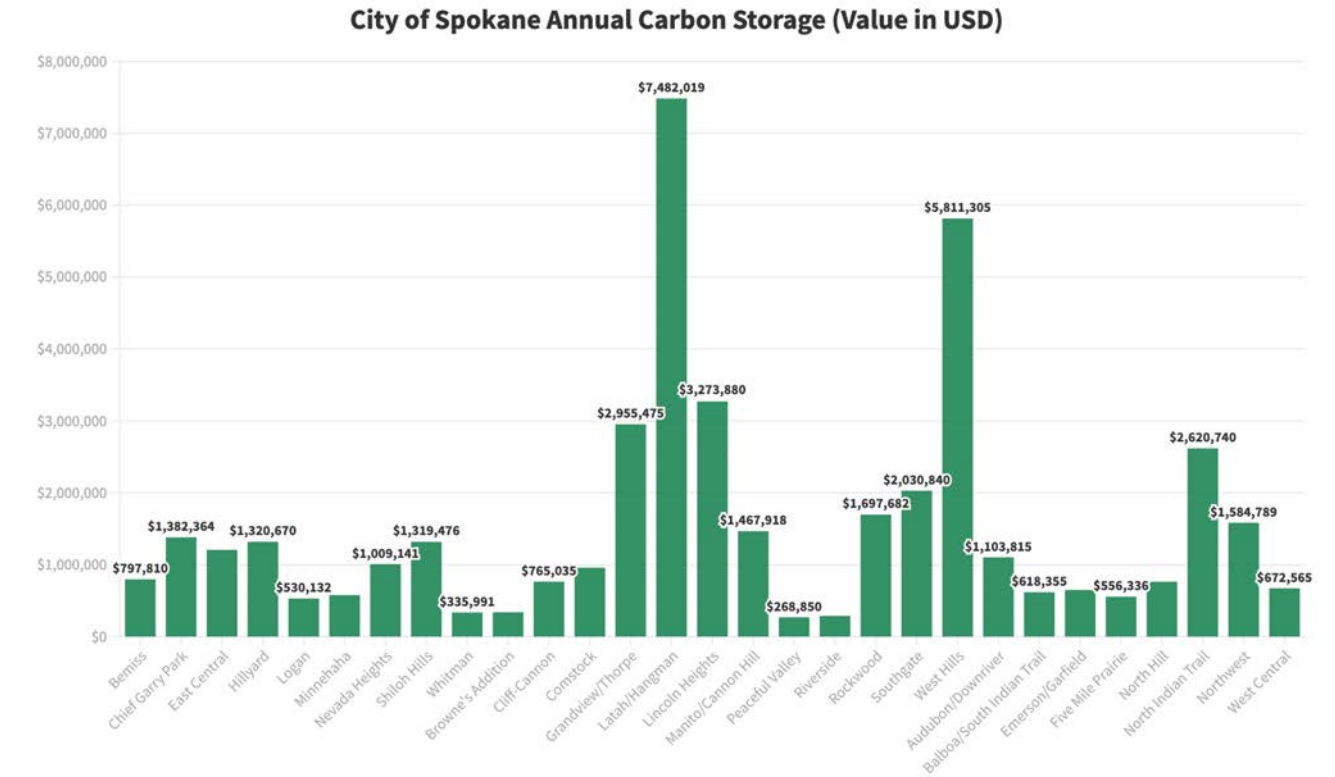
This figure illustrates the disparity of carbon sequestration across the city of Spokane by neighborhood. The neighborhood with the highest amount of carbon sequestered is the Latah/Hangman neighborhood with 1,470 tons of carbon sequester annually. The neighborhood with the lowest carbon storage is the Peacefully Valley neighborhood with 52 tons of carbon sequestered annually. While size of neighborhood does play a role (larger neighborhoods have the opportunity for more trees and therefore more carbon storage) this relationship is not uniform. Some of the larger neighborhoods geographically such as Northwest and East Central still have significantly lower annual carbon sequestration than Latah/Hangman and West Hills. West Hills, being the largest neighborhood, does not have the largest annual carbon sequestration.



Source: Urban Tree Analysis 2020-2021, Gonzaga University

This figure illustrates the disparity of carbon storage across the city of Spokane by neighborhood. The neighborhood with the highest amount of carbon storage is the Latah/Hangman neighborhood with 43,870 tons of carbon stored annually. The neighborhood with the lowest carbon storage is the Peacefully Valley neighborhood with 1,576 tons of carbon stored annually. While size of neighborhood does play a role (larger neighborhoods have the opportunity for more trees and therefore more carbon storage) this relationship is not uniform. Some of the larger neighborhoods geographically such as Northwest and East Central still have significantly lower annual carbon storage than Latah/Hangman and West Hills. West Hills, being the largest neighborhood, does not have the largest annual carbon storage.


City of Spokane Annual Carbon Sequestration (Value in USD)
$260,000
$240,000
$220,000
$200,000
$180,000
$160,000
$140,000
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$0
$26,785
$46,410
$44,339
$21,109
$33,880
$44,298
$11,280
$30,463
$99,223
$251,192
$109,913
$49,282
$9026
$9691
$56,996
$68,181
$195,101
$43,953
$24,622
$22,153
$30,444
$87,985
$63,104
$26,781
Bemiss
Chief Garry Park
East Central
Hillyard
Logan
Minnehaha
Nevada Heights
Shiloh Hills
Whitman
Browne's Addition
Cliff-Cannon
Comstock
Grandview/Thorpe
Latah/Hangman
Lincoln Heights
Manito/Cannon Hill
Peaceful Valley
Riverside
Rockwood
Southgate
West Hills
Audubon/Downriver
Balboa/South Indian Trail
Emerson/Garfield
Five Mile Prairie
North Hill
North Indian Trail
Northwest
West Central


City of Spokane Annual Carbon Storage (Value in USD)
$8,000,000
$7,000,000
$6,000,000
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$0
$797,810
$1,382,364
$1,320,670
$530,132
$1,009,141
$1,319,476
$335,991
$765,035
$2,955,475
$7,482,019
$3,273,880
$1,467,918
$268,850
$1,697,682
$2,030,840
$5,811,305
$1,103,815
$618,355
$556,336
$2,620,740
$1,584,789
$672,565
Bemiss
Chief Garry Park
East Central
Hillyard
Logan
Minnehaha
Nevada Heights
Shiloh Hills
Whitman
Browne's Addition
Cliff-Cannon
Comstock
Grandview/Thorpe
Latah/Hangman
Lincoln Heights
Manito/Cannon Hill
Peaceful Valley
Riverside
Rockwood
Southgate
West Hills
Audubon/Downriver
Balboa/South Indian Trail
Emerson/Garfield
Five Mile Prairie
North Hill
North Indian Trail
Northwest
West Central

AIR QUALITY BENEFITS

INTRODUCTION

The benefits of tree canopy can be seen in the sequestration of compounds such as CO (carbon monoxide), N02(nitrogen dioxide), O3(ozone), SO2(sulfur dioxide) PM10 and PM2.5, therefore improving the air quality of the neighborhood.The more trees there are in the area, the less prevalent these gases are in the air because of the absorbtion by the trees.

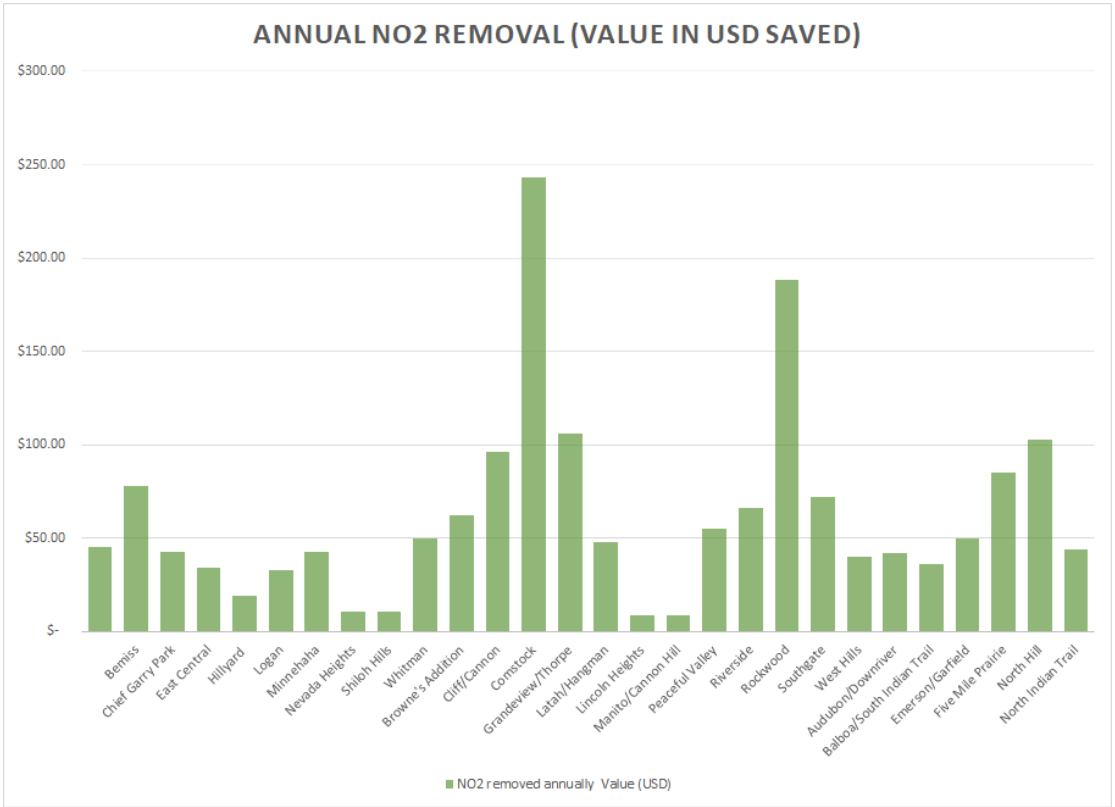
IMPLICATIONS FOR THE SPOKANE COMMUNITY

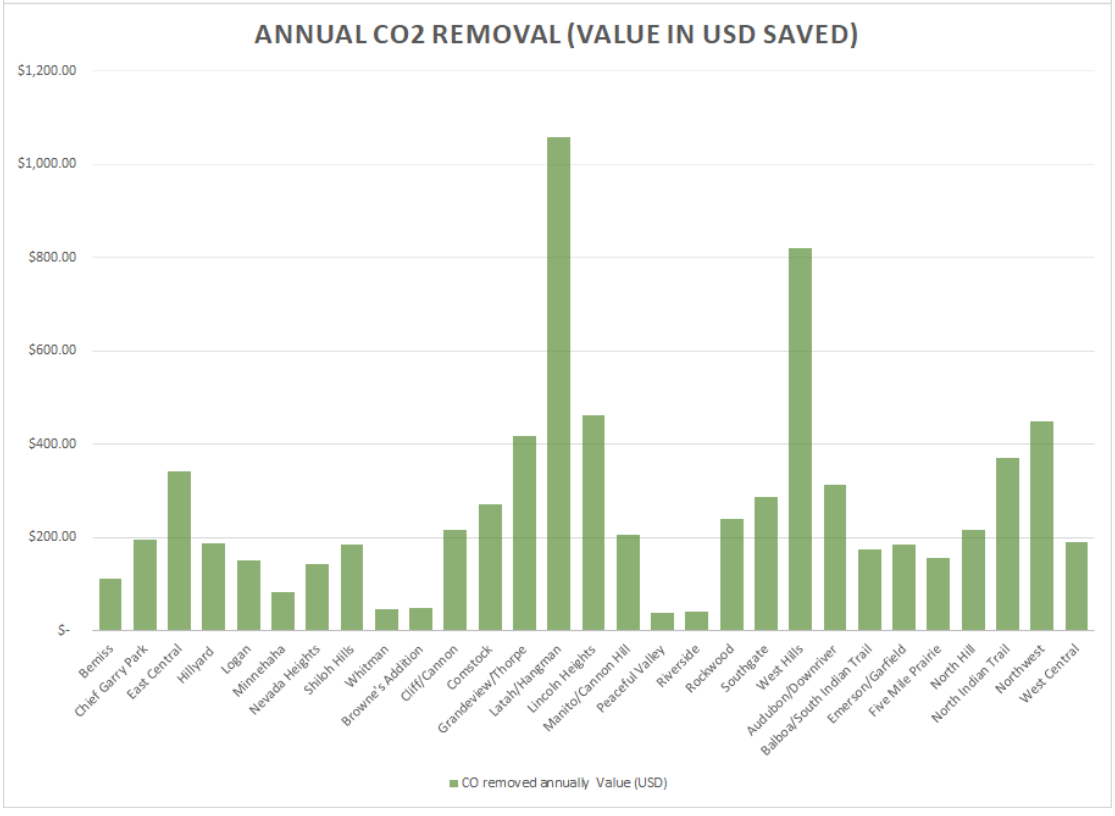
This portion of the data allows us to draw preliminary conclusions about the air quality of each neighborhood in Spokane. Tree canopy is not the only factor of air quality, but is an element of the whole equation. Better air quality in a neighborhood leads to multiple health and environmental benefits. With this data we can begin to see which Spokane neighborhoods should be prioritized to improve air quality in the area.

Health benefits such as reduced rates of cardiac disease, strokes, and asthma have been linked to improved air quality. Since an increase in tree canopy improves air quality, it can also be said that more tree canopy reduces rates of these health issues. Tree canopy becomes a preventative measure against these health problems, therefore improving overall community health as well as decreasing costs related to these issues.

AIR QUALITY BENEFITS

Amount of gases sequestered through tree coverage by neighborhood





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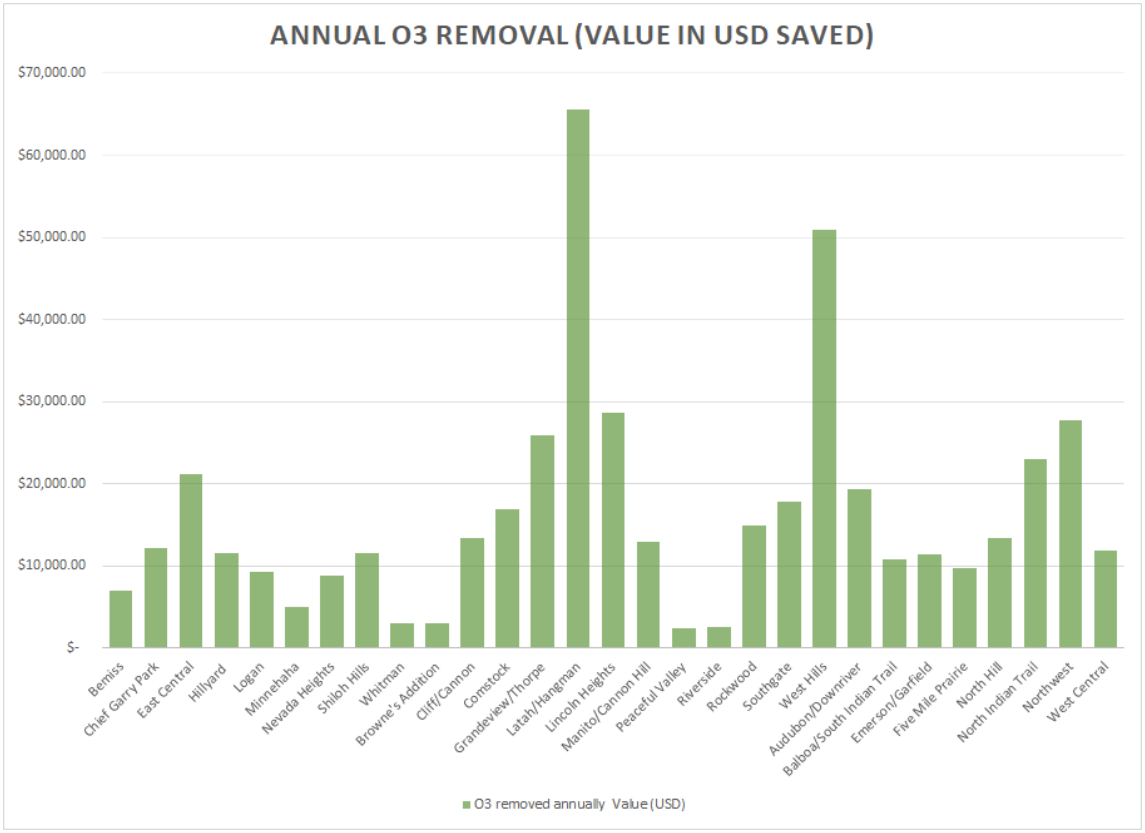
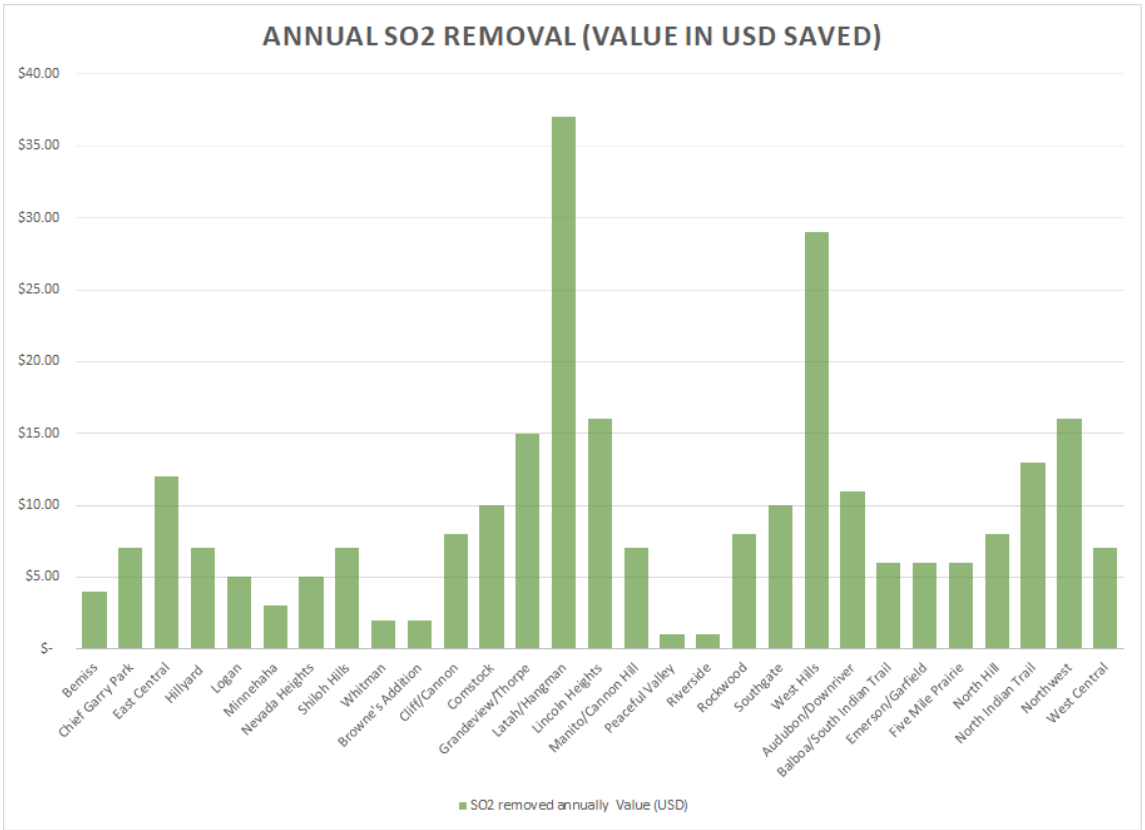
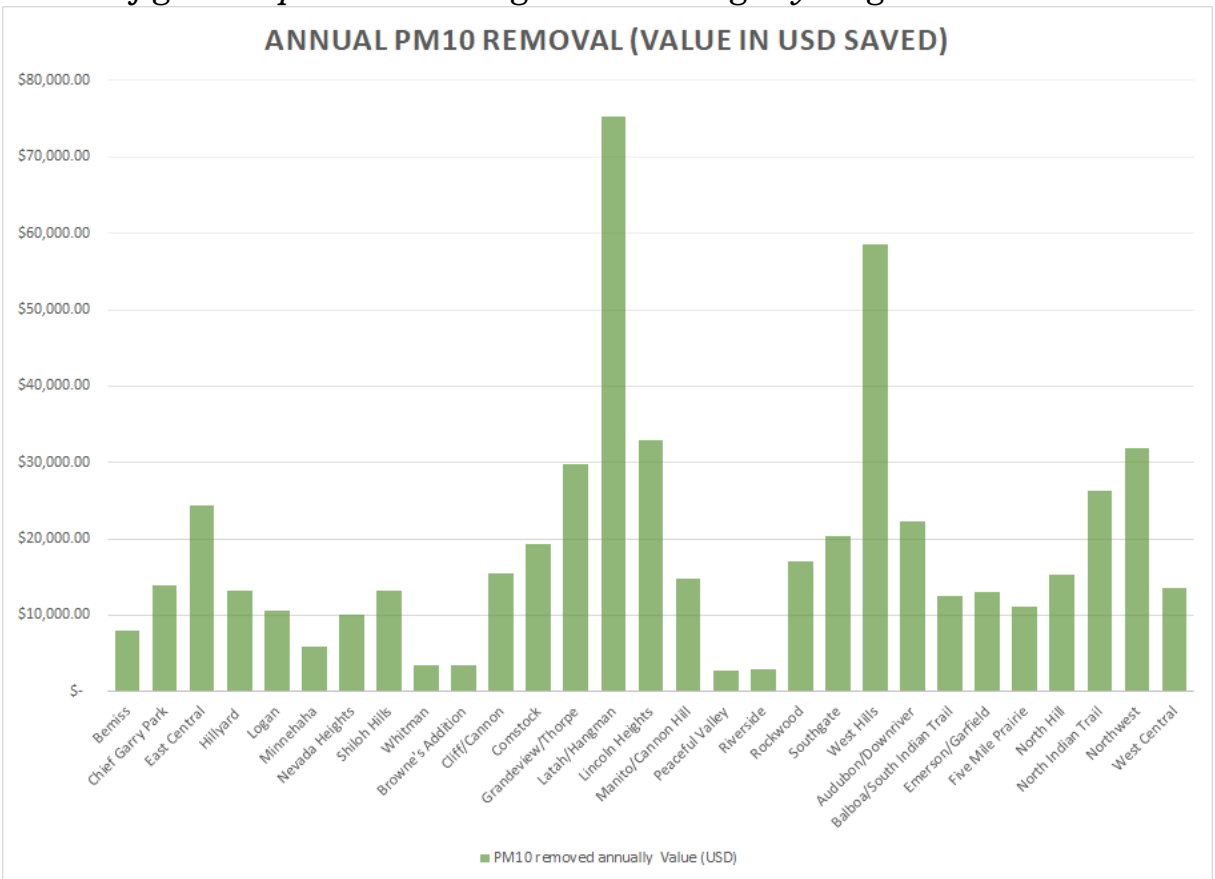
Amount of gases sequestered through tree coverage by neighborhood

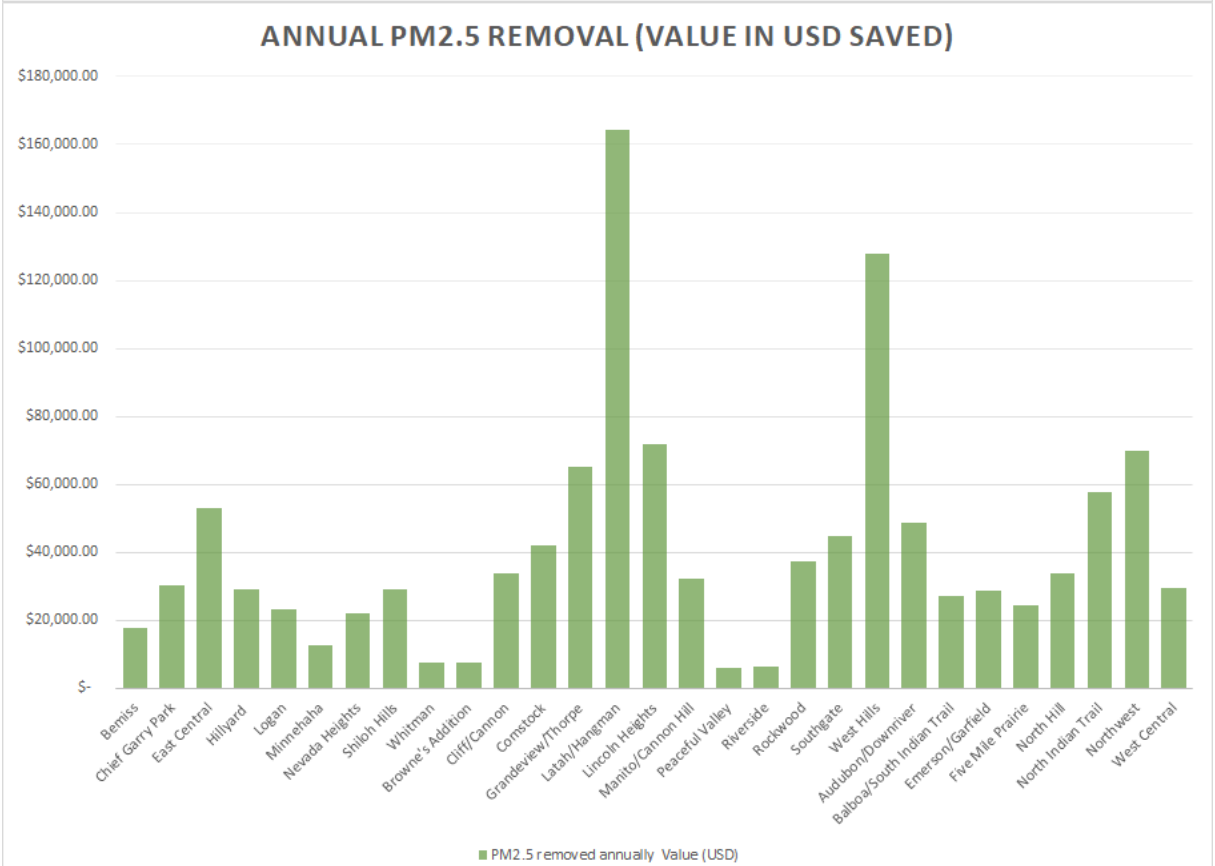




AIR QUALITY BENEFITS

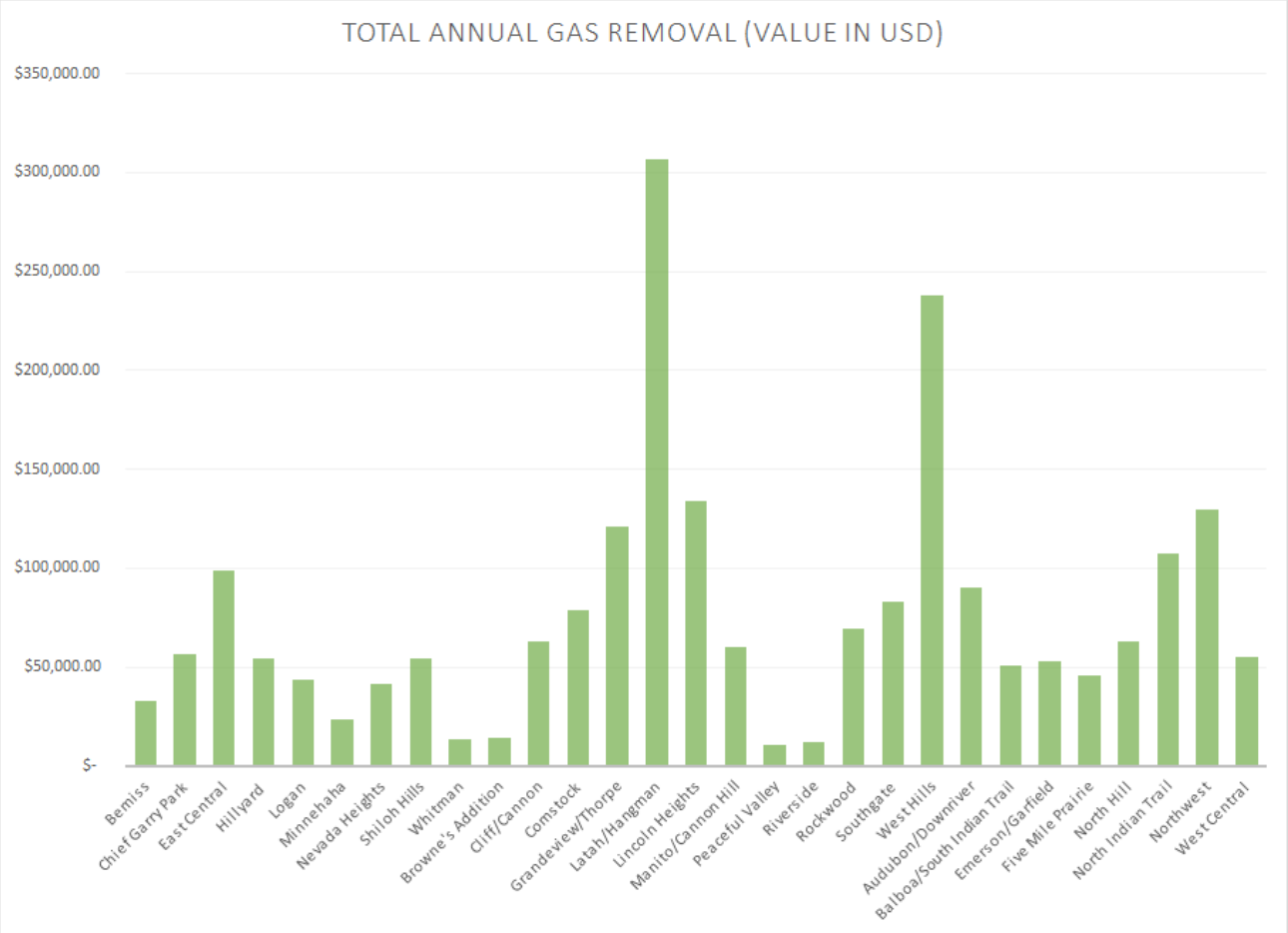
Amount of gases sequestered through tree coverage by neighborhood





AIR QUALITY BENEFITS

Amount of gases sequestered through tree coverage by neighborhood



These graphs show the estimated money saved through the removal of harmful gases by trees. The more tree coverage there is in a neighborhood, the more gases are able to be removed. It should be considered that larger neighborhoods have a higher amount of land and therefore will likely remove a larger amount of gases because there is more space for trees. Although size of neighborhood is a large factor, it is not the only one, as some larger neighborhoods such as East Central and Northwest still have low levels of gas removal from tree coverage.

HYDROLOGICAL BENEFITS

INTRODUCTION

Urban development and growth create unprecedented challenges especially when it comes to water provision and sanitation. The two main water-based challenges faced by cities are the lack of access to safe water and sanitation and the increasing risk of water-related disasters such as floods and droughts. Those who suffer the most from these water-related challenges are the urban poor who live in low socio-economic areas.

IMPLICATIONS FOR THE SPOKANE COMMUNITY

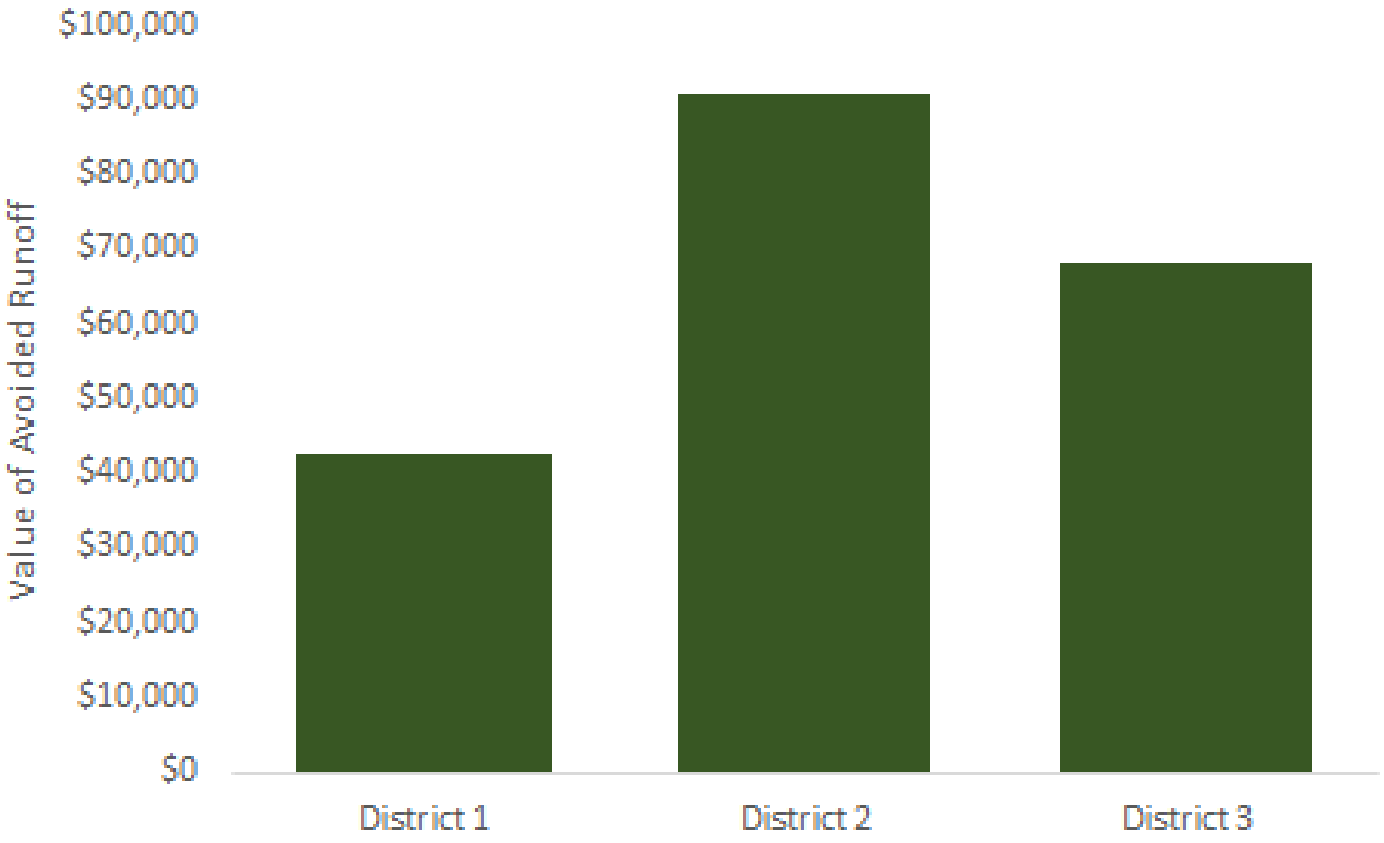
For a city like Spokane, water plays a key role in our society. The Spokane River is not only a prominent recreation site, but it brings vital resources such as fish to tribal populations and energy to Spokane Residents. However, due to flooding and runoff issues, the Spokane River is riddled with pollutants such as heavy metal pollution, trash, and sewage, all which comprise the integrity of the Spokane River and the livelihood of those who live around it.

Urban trees not only bring aesthetic value to our neighborhoods, but they bring important hydrological benefits in managing runoff and the problems associated with runoff. Leaf canopies of trees as rainfall interception from falling droplets that could lead to soil erosion and provides a surface buffer for the rain to evaporate before hitting the ground or pavement. Additionally, tree root systems help absorb water flooding in shallow grasses and help promote infiltration into the Spokane Aquifer, growing our groundwater storage.

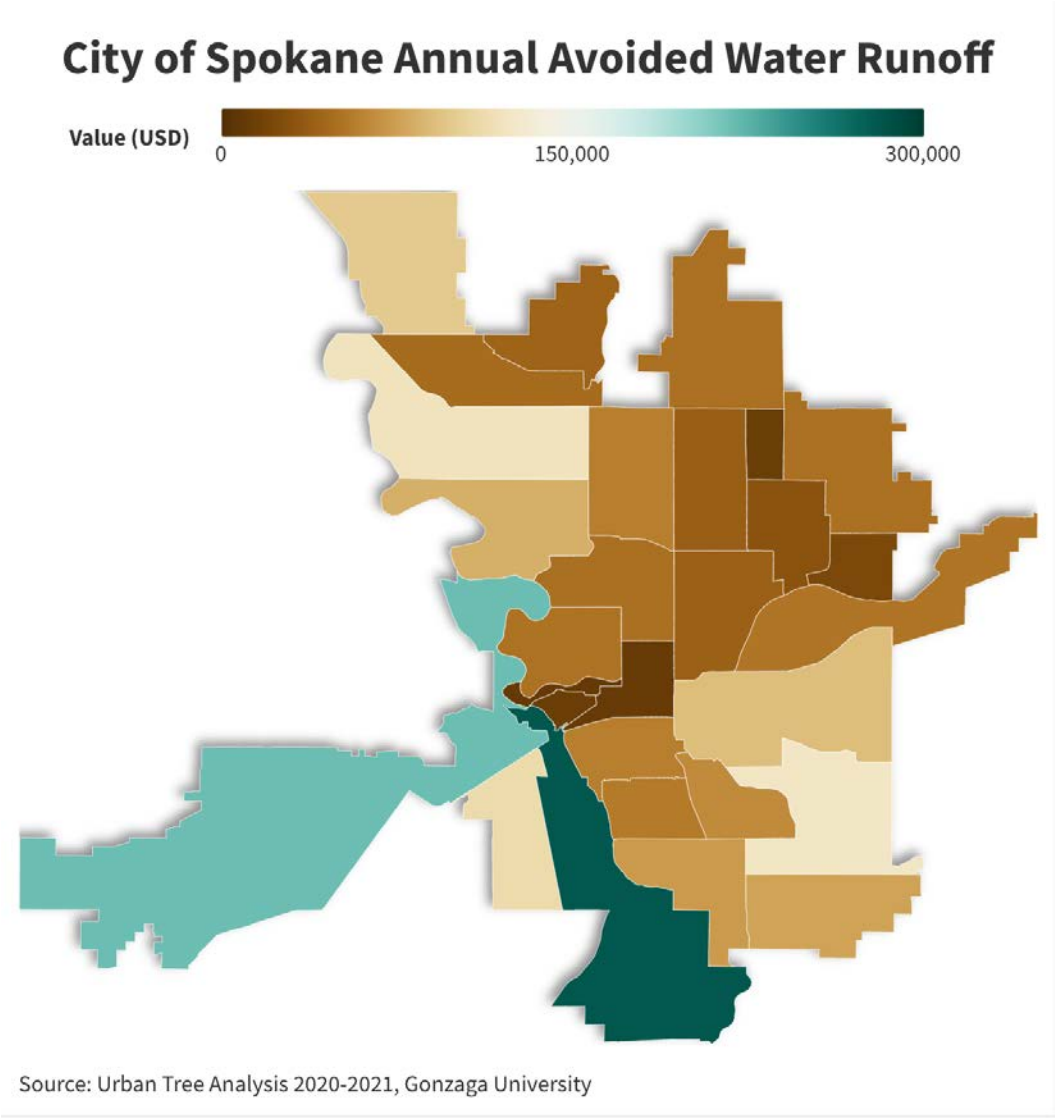
HYDROLOGICAL BENEFITS

2M

TOTAL AMOUNT SAVED BY SPOKANE COUNTY IN AVOIDED RUNOFF FROM EXISTING TREES



HYDROLOGICAL BENEFITS

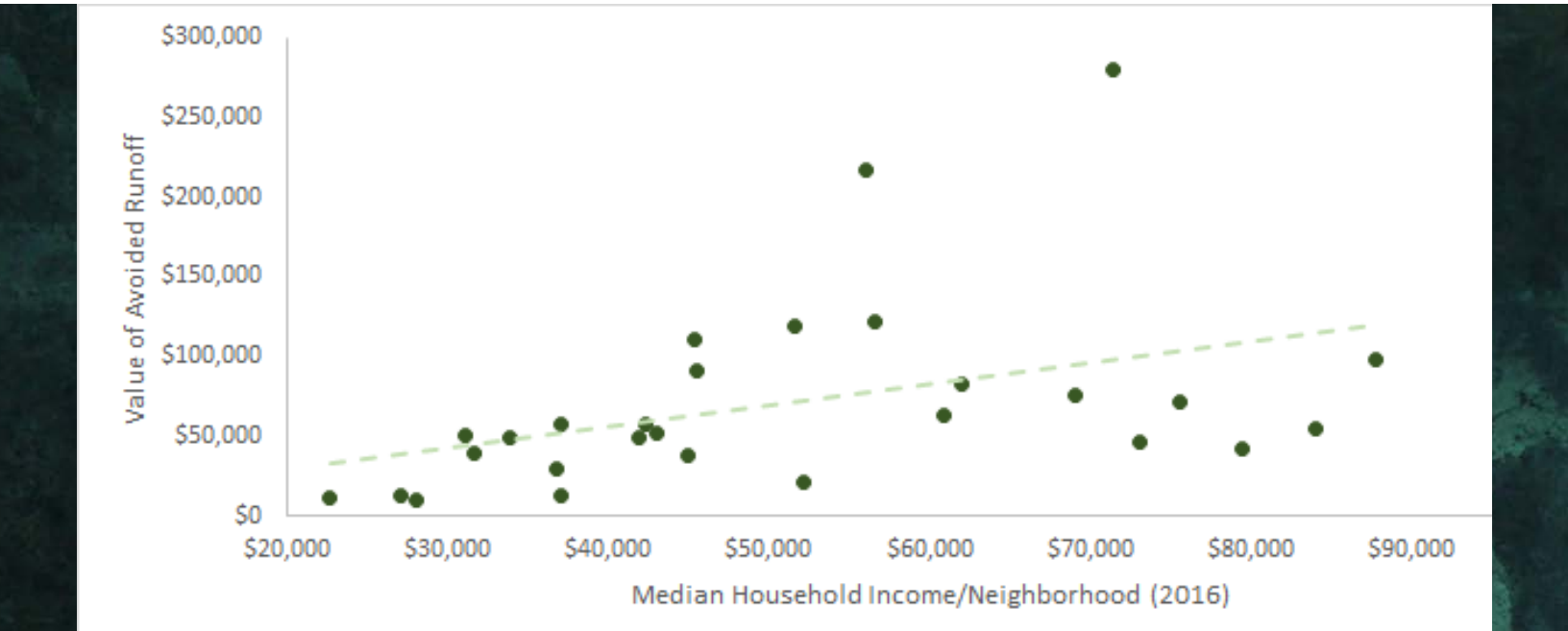


This figure illustrates Avoided water runoff across the city of Spokane By neighborhood. The neighborhood with the highest Avoided Runoff is the Latah/Hangman neighborhood with 13.71 mgal of runoff avoided The neighborhood with the lowestAvoided Runoff is the Peacefully Valley neighborhood with 1.13 Mgal of Runoff Avoided manually.

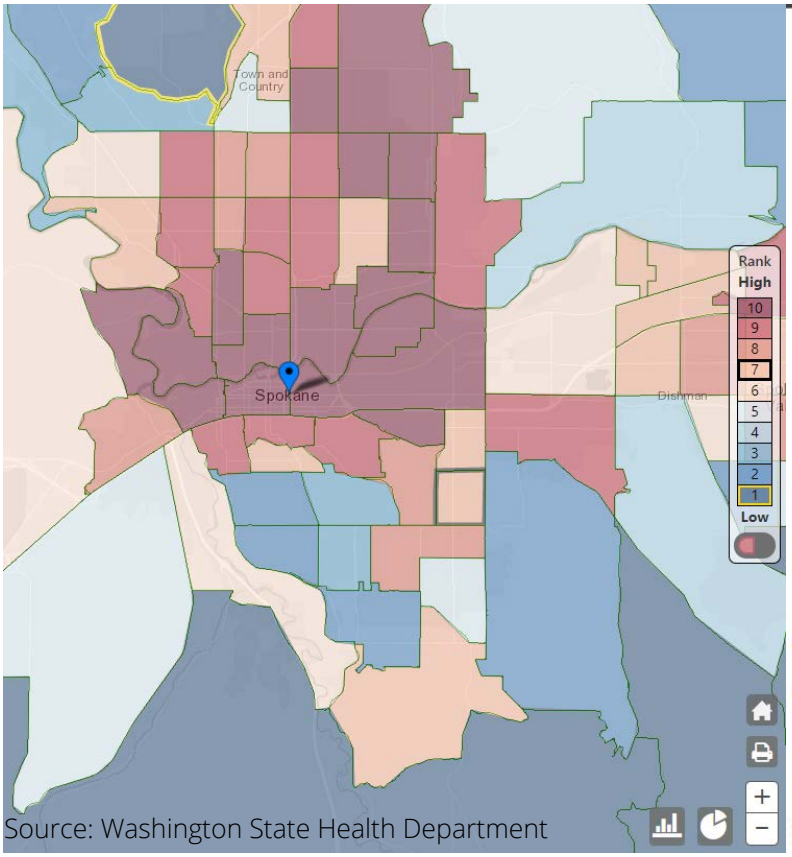
INCOME DISPARITY

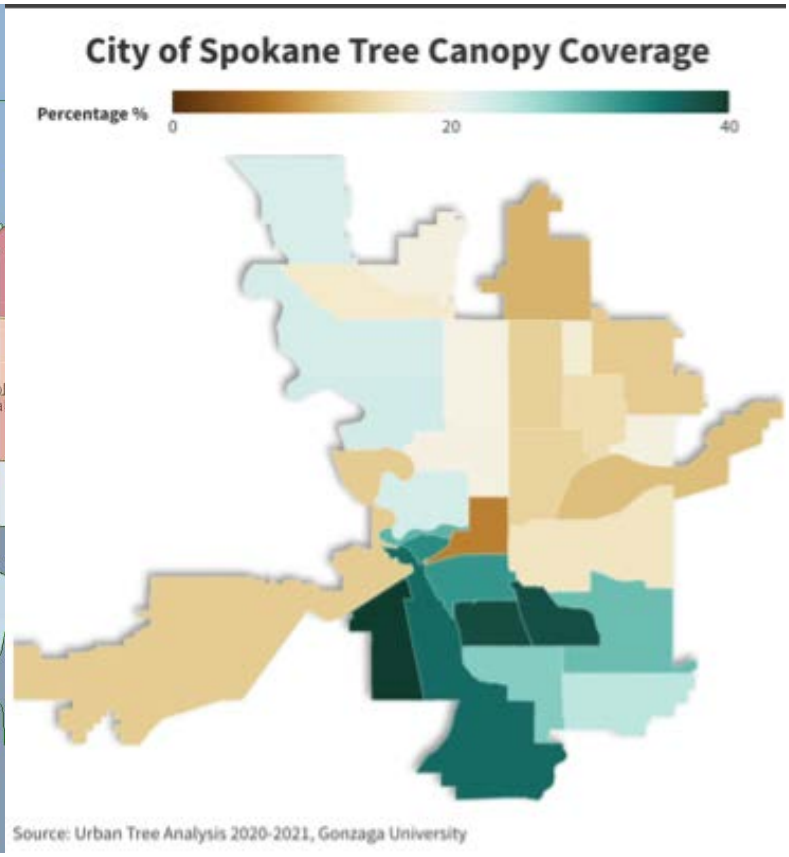
The different categories of land cover and their percentages throughout the different urban neighborhoods allows us to visualize the disparities as well as the disproportionate distribution of tree canopy in Spokane.

While size of neighborhood does contribute to percentage of tree canopy and the benefits brought by trees, it also appears that the distribution of tree canopy is correlated with income level of the neighborhood. With higher percentages of canopy cover in Southhill neighborhoods like Manito, and low percentages in lower income areas like the Logan. Tree canopies have direct implications on the quality of life of people near them, as well as promoting economic benefits by reducing environmental degradation in the forms of water runoff and air pollution. Tree canopy contribution to greenspaces promotes the welfare of all people in the Spokane community, contributing not only to environmental and economic benefits, but also social benefits such as lowering local heat indexes and reducing crime rate. The benefits of tree canopy coverage in an urban area have been identified and are a priority for the city of Spokane to take action on to promote equity and justice across the city.



INCOME DISPARITY





These two maps illustrate the percentage of population living in poverty in each Spokane neighborhood (left) v percentage of tree canopy in each neighborhood (right). As can be seen in the comparison of the two maps, there is some similarity between which neighborhoods have a high poverty rate and which neighborhoods have a low tree canopy. For example, Riverside neighborhood has 7.8% tree canopy and a high ranking poverty rate.

CONCLUSIONS

As can be seen from this report, there are many benefits and advantages to having a high tree coverage percentage. Health, environmental, and monetary benefits can all be traced back to a high percentage of tree coverage.

It is a trend in many cities, including Spokane, for higher income neighborhoods to have a higher percentage of tree canopy. This becomes an environmental justice issue of inequity based on income, socio-economic status as well as race and ethnicity. Therefore, when moving on with this project, factors of income and demographics of the community should be considered when deciding where to plant more trees in Spokane in order to address this disparity.

Another important consideration is how many trees can be planted in a given neighborhood and specifically where there is available space. The next step of this project will be finding specific areas that trees can be planted. Something to consider will be the eco zone of each neighborhood and what percentage of tree canopy is reasonable for that ecosystem. Some areas may be better equipped for a large amount of trees while others are not. This data provides a base level of information that will need to be incorporated with many other factors in order to increase tree canopy in Spokane.