2021

Tree Planting Prioritization Report

City of Eugene
Public Works
Engineering Division
June 2021

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Introduction

The City of Eugene Public Works Department strives to be a leader in sustainability, focusing on climate change goals (outlined in the Climate Recovery Ordinance, CRO) and greenhouse gas (GHG) emission tracking. Engineering and Urban Forestry have collaborated toward this effort by developing a tree planting program to implement for 2021 capital improvement projects and beyond. The intent is to plant street trees within the City's right-of-way and City owned properties as part of capital improvement projects. The number of public street trees Urban Forestry manages is documented to be 76,000 and real time data is uploaded directly to our GIS database. Trees provide a valuable economic gain to our community through carbon sequestration and storage. A way to illustrate this is by converting carbon to carbon dioxide equivalents, (CO_2 eq) which is a major pollutant and then translating this to a dollar value of ecosystem services. These externality values can be considered the estimated cost of pollution to society that is not accounted for in the market price of the goods or services that produced the pollution[1].

Urban Forestry recently analyzed our ROW tree canopy using iTree Vue, a software developed by the USDA Forest Service that provides urban and community forestry analysis and benefits assessment tools[1]. Table 1 illustrates the City's current tree canopy benefit, see Appendix A for full document. F

Table 1. Eugene ROW iTree Canopy Tree Benefits

Tree Benefit Estimates: Carbon (English units)

Description	Carbon (kT)	±SE	CO_2 Equiv. (kT)	±SE	Value (USD)	±SE
Sequestered annually in trees	2.20	±0.14	8.08	±0.53	$187,820	±12,255
Stored in trees (Note: this benefit is not an annual rate)	55.31	±3.61	202.82	±13.23	$4,716,858	±307,766

Currency is in USD. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Carbon sequestered is based on 0.874 kT/mi²/yr. Carbon stored is based on 21.940 kT/mi². Carbon is valued at $23,256.92/kT. (English units: kT = kilotons (1,000 tons), mi² = square miles)

The City of Eugene ROW has 25% (as of April 2020) canopy coverage, with a vision to reach 30%. This value is a national suggestion that was set by American Forests[2] based on 20 years of data. Since this is an average, places like the Pacific Northwest can support up to 60% of canopy cover while cities in the southwest strive for 15%. The City of Atlanta has nearly 50% canopy coverage. While this is an attainable goal, Eugene has set its goal of 30% in the ROW, to demonstrate the possibilities with hopes to incorporate a higher City-wide goal, for both public and private sectors in the future.

Aside from economic prosperity, trees also provide societal and environmental value. Expanded canopy shade make bike and pedestrian travel more appealing thus reducing GHG's and transportation emissions. We want to use an equitable lens to ensure everyone of all ages, abilities, and income has access to these resources.

Executive Summary

Data was collected for various scenarios including low canopy, high minority, high poverty, and high populated areas across 126 census blocks within the City of Eugene using iTree Landscape, see Appendix B. Additional data was collected using iTree Canopy and the agency GIS. Figure 1 represents canopy cover by neighborhoods.

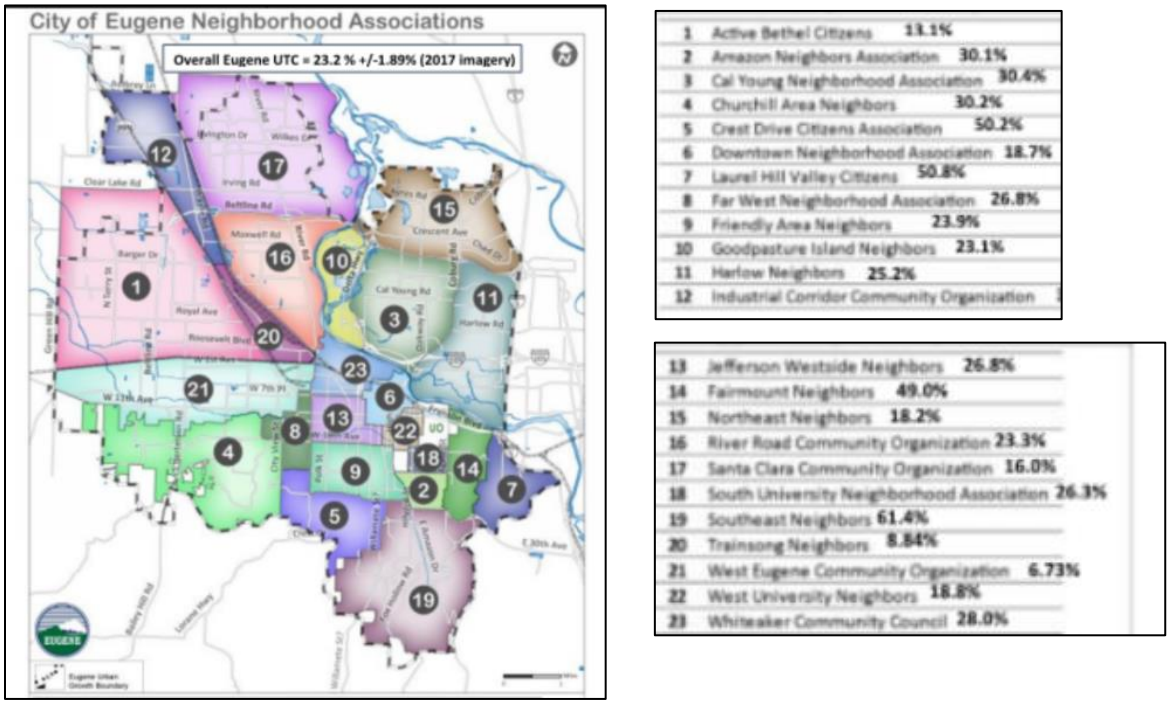


Figure 1. GIS City Tree Cover by Neighborhoods

Due to the nature of the project and budgetary restrictions a total of 14 CIP's have been prioritized to plant more trees within the City's ROW. Table 2 represents a summary of the CIP's that were analyzed. There are over 700 available planting areas and so far 1/3 are planned for trees towards climate recovery for our community.

Table 2. 2021 CIP Priority Index Data Summary

Project #	Name/Location	Neighboorhood	% Canopy (2017)	Priority
900242	Jessen/Laurelhurst...PPP	*Active Bethel*	13.1	HIGH
975774	River Road Improvements (Irvi	*Santa Clara Community Organization*	16	HIGH
900070	8th Ave	*Downtown*	18.7	HIGH
955774	MPG Parking Lot (adj. to Riverf	*Downtown*	18.7	HIGH
90043	Mill & 4th Ave PPP	*Downtown*	18.7	HIGH
900253	Willamette two-way conversio	*West University & Friendly Area*	18.8	HIGH
900244	Arrowsmith...& Terry PPP	*Active Bethel & West Eugene*	13.1 & 6.73	HIGH
900267	13th & Dani	*West Eugene (mostly) & Churchill*	6.73 & 30.2	HIGH
900221	Drywell Elimination (Corliss &	*River Road Community Org*	23.3	MEDIUM
5073	South Willamette Enhancemer	*Friendly Area*	23.9	MEDIUM
900257	Lincoln St PPP (13th to 22nd)	*Friendly Area*	23.9	MEDIUM
900151	17th/19th/Mill PPP	*West University & Friendly Area*	18.8 & 23.9	MEDIUM
900104	Fairmount & 19th PPP	*Fairmount*	49	LOW
900223, 900271-3	WW rehab Harlow	*Cal Young & Harlow (mostly)*	30.4 & 25.2	LOW

Priority Scenarios

Population

This index is weighted towards areas of relatively high population density, low tree cover per capita, and high available planting space. Figure 2 illustrates the geographical prioritization scale, low (green) to high (red), based on the census blocks chosen to analyze.

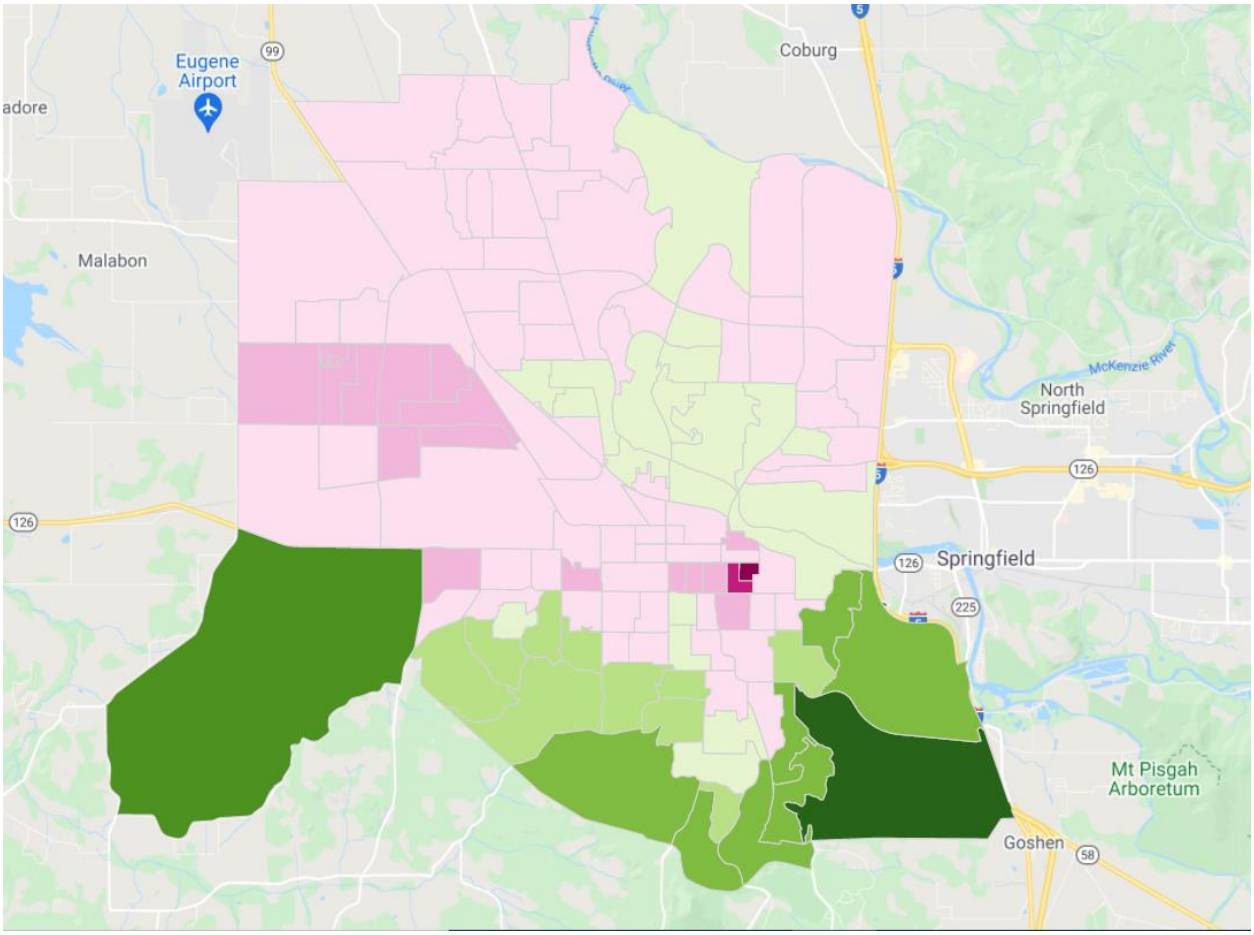


Figure 2. Population Priority Planting Index

Minorities

This index is weighted towards areas of relatively high minority population density, low tree cover per capita, and high available planting space. Figure 3 illustrates the geographical prioritization scale, low (green) to high (red), based on the census blocks chosen to analyze.

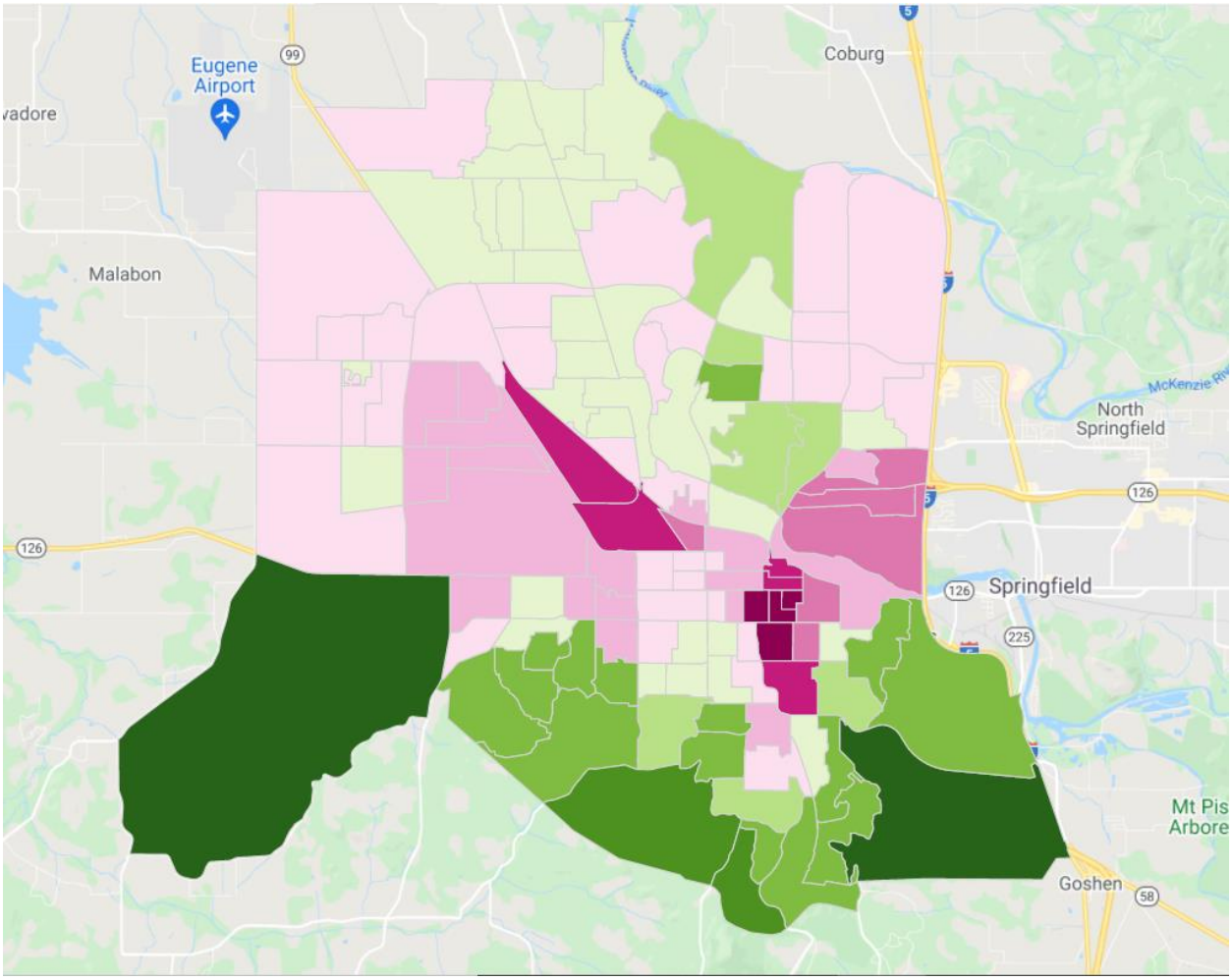


Figure 3. Minority Priority Planting Index

Poverty

This index is weighted towards areas of relatively high proportion of population below the poverty line, low tree cover per capita, and high available planting space. Figure 4 illustrates the geographical prioritization scale, low (green) to high (red), based on the census blocks chosen to analyze.

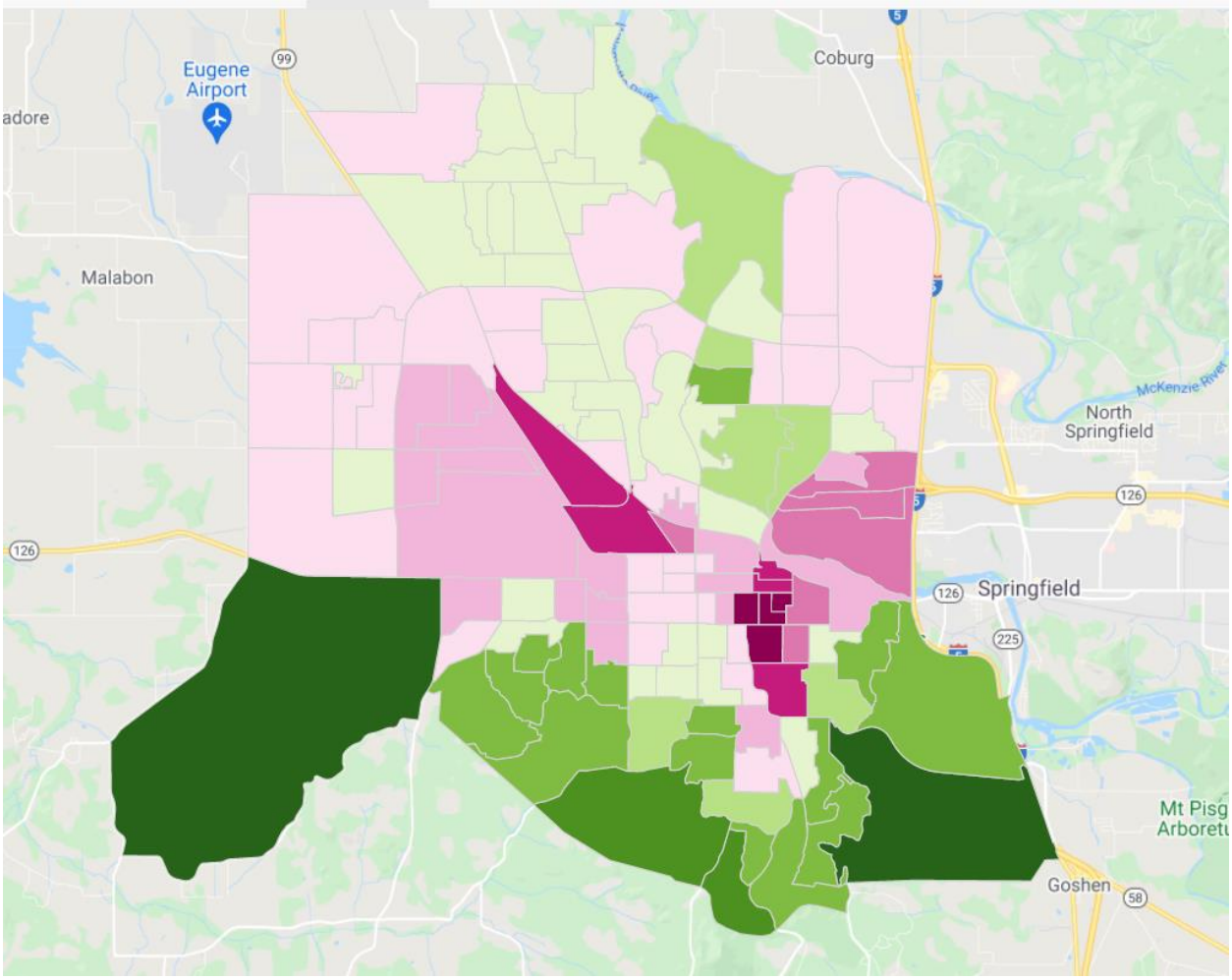


Figure 4. Poverty Priority Planting Index

Custom Scenario

After analyzing the 3 common scenarios, a custom one was developed to narrow down underserved communities. This scenario analyzes a combination of the high minority, high poverty, and low canopy coverage areas. Figure 5 illustrates the geographical prioritization scale, low (green) to high (red), based on the census blocks chosen to analyze.

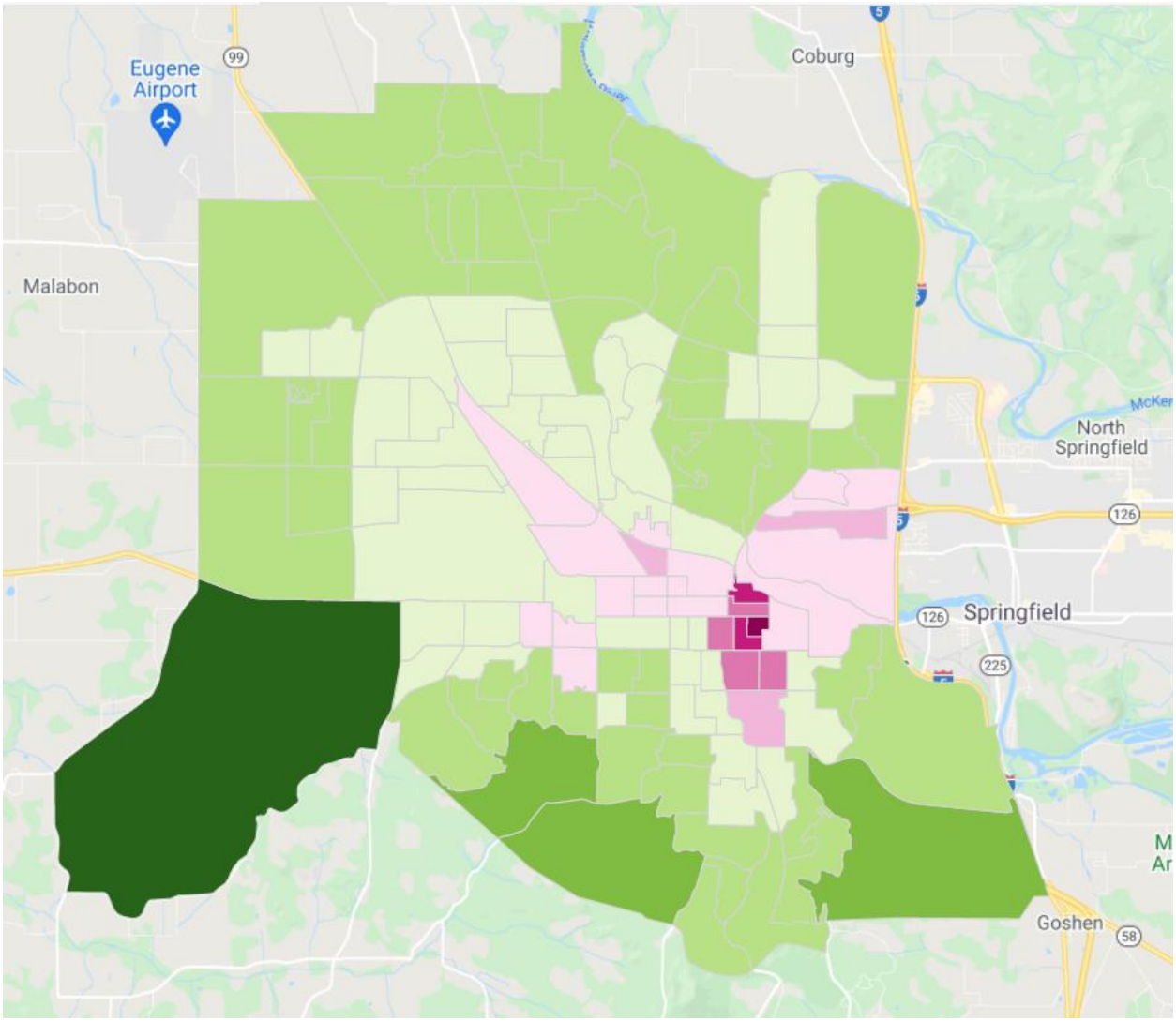


Figure 5. Custom Priority Planting Index

Conclusions

Urban trees play a major role for triple bottom line analysis by providing many social, economic, and environmental benefits such as:

- Air pollution removal of ozone, carbon monoxide, nitrogen dioxide, particulate matter, and sulfur dioxide
- Carbon sequestration and storage
- Oxygen Production
- Avoided Runoff, enhanced stormwater management
- Cooling impervious surfaces helps mitigate the “heat island effect” thus reducing energy demands
- Providing more livable space promotes aesthetic and psychological benefits

Recommended Actions

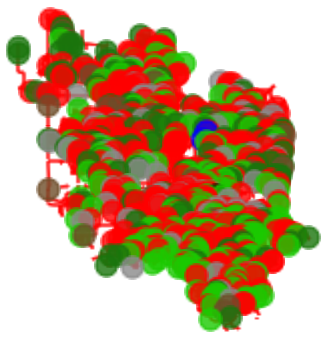
Using the 2021 CIP Priority Index Data Summary, table 2, to plant street trees in potential sites would be highly encouraged to work towards climate recovery and help reach 30% ROW coverage.

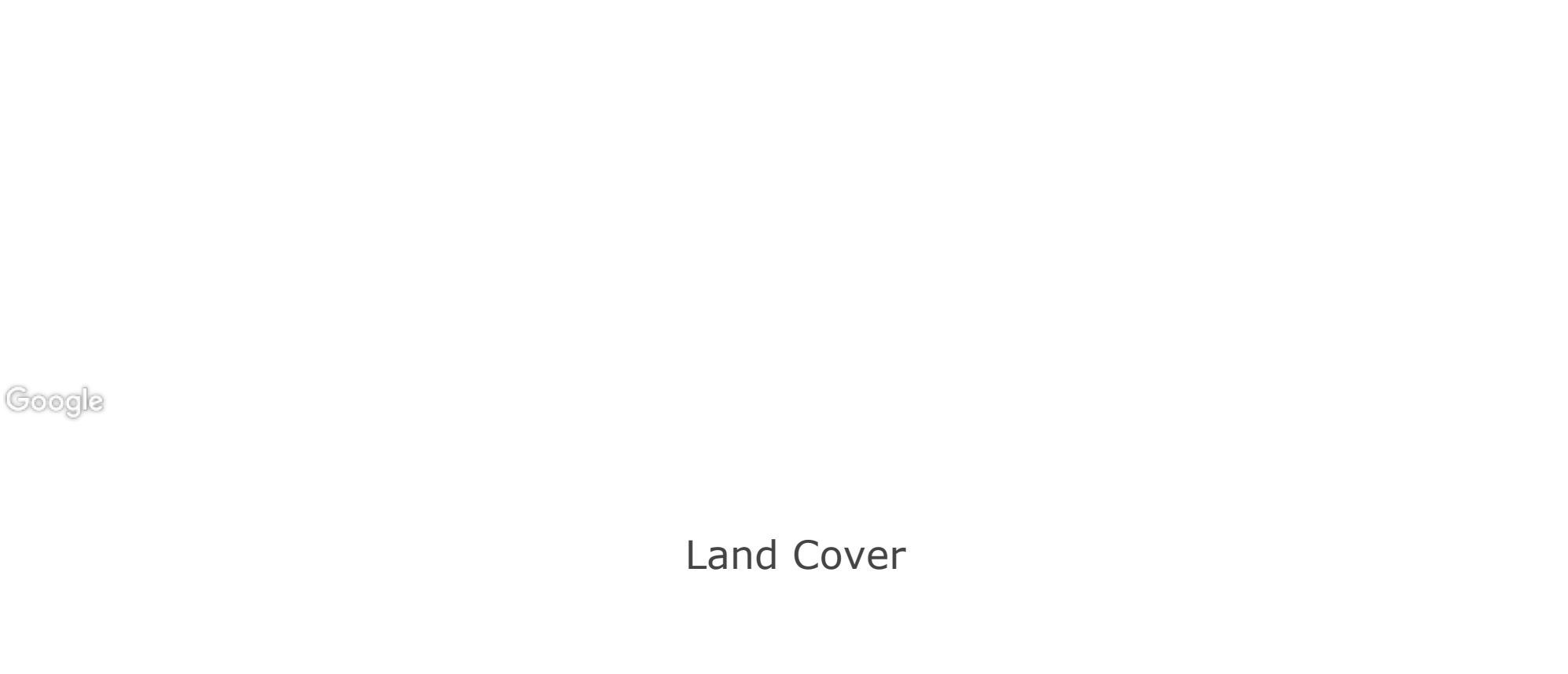
APPENDIX A – iTree Canopy for City of Eugene Right-of-Way

i-Tree Canopy v7.0

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/19/2020





Abbr.	Cover Class	Description	Points	% Cover ± SE	Area (mi²) ± SE
H	Grass/Herbaceous		109	15.53 ± 1.37	1.56 ± 0.14
IB	Impervious Buildings		1	0.14 ± 0.14	0.01 ± 0.01
IO	Impervious Other		67	9.54 ± 1.11	0.96 ± 0.11
IR	Impervious Road		314	44.73 ± 1.88	4.50 ± 0.19
S	Soil/Bare Ground		33	4.70 ± 0.80	0.47 ± 0.08
T	Tree/Shrub		176	25.07 ± 1.64	2.52 ± 0.16
W	Water		2	0.28 ± 0.20	0.03 ± 0.02
Total			**702**	**100.00 ± 0.00**	**10.06 ± 0.00**

Tree Benefit Estimates: Carbon (English units)

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Tree Benefit Estimates: Air Pollution (English units)

Abbr.	Description	Amount (lb)	±SE	Value (USD)	±SE
CO	Carbon Monoxide removed annually	1,968.13	±128.42	$1,312	±86
NO2	Nitrogen Dioxide removed annually	12,989.91	±847.57	$2,498	±163
O3	Ozone removed annually	83,289.46	±5,434.48	$192,190	±12,540
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	16,147.13	±1,053.57	$50,609	±3,302
PM2.5	Particulate Matter less than 2.5 microns removed annually	6,896.35	±449.97	$711,868	±46,448
SO2	Sulfur Dioxide removed annually	4,390.77	±286.49	$249	±16
Total		**125,681.73**	**±8,200.50**	**$958,726**	**±62,555**

Currency is in USD. 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/mi²/yr @ $/lb/yr:
CO 780.654 @ $0.67 | NO2 5,152.427 @ $0.19 | O3 33,036.643 @ $2.31 | PM10* 6,404.734 @ $3.13 | PM2.5 2,735.427 @ $103.22 | SO2 1,741.592 @ $0.06 (English units: lb = pounds, mi² = square miles)

Tree Benefit Estimates: Hydrological (English units)

Abbr.	Benefit	Amount (Mgal)	±SE	Value (USD)	±SE
AVRO	Avoided Runoff	66.87	±4.36	$597,548	±38,989
E	Evaporation	203.11	±13.25	N/A	N/A
I	Interception	204.88	±13.37	N/A	N/A
T	Transpiration	141.35	±9.22	N/A	N/A
PE	Potential Evaporation	783.54	±51.12	N/A	N/A
PET	Potential Evapotranspiration	680.93	±44.43	N/A	N/A

Currency is in USD. 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 Mgal/mi²/yr @ $/Mgal/yr:
AVRO 26.524 @ $8,936.00 | E 80.561 @ N/A | I 81.265 @ N/A | T 56.067 @ N/A | PE 310.791 @ N/A | PET 270.090 @ N/A (English units: Mgal = millions of gallons, mi² = square miles)

About i-Tree Canopy

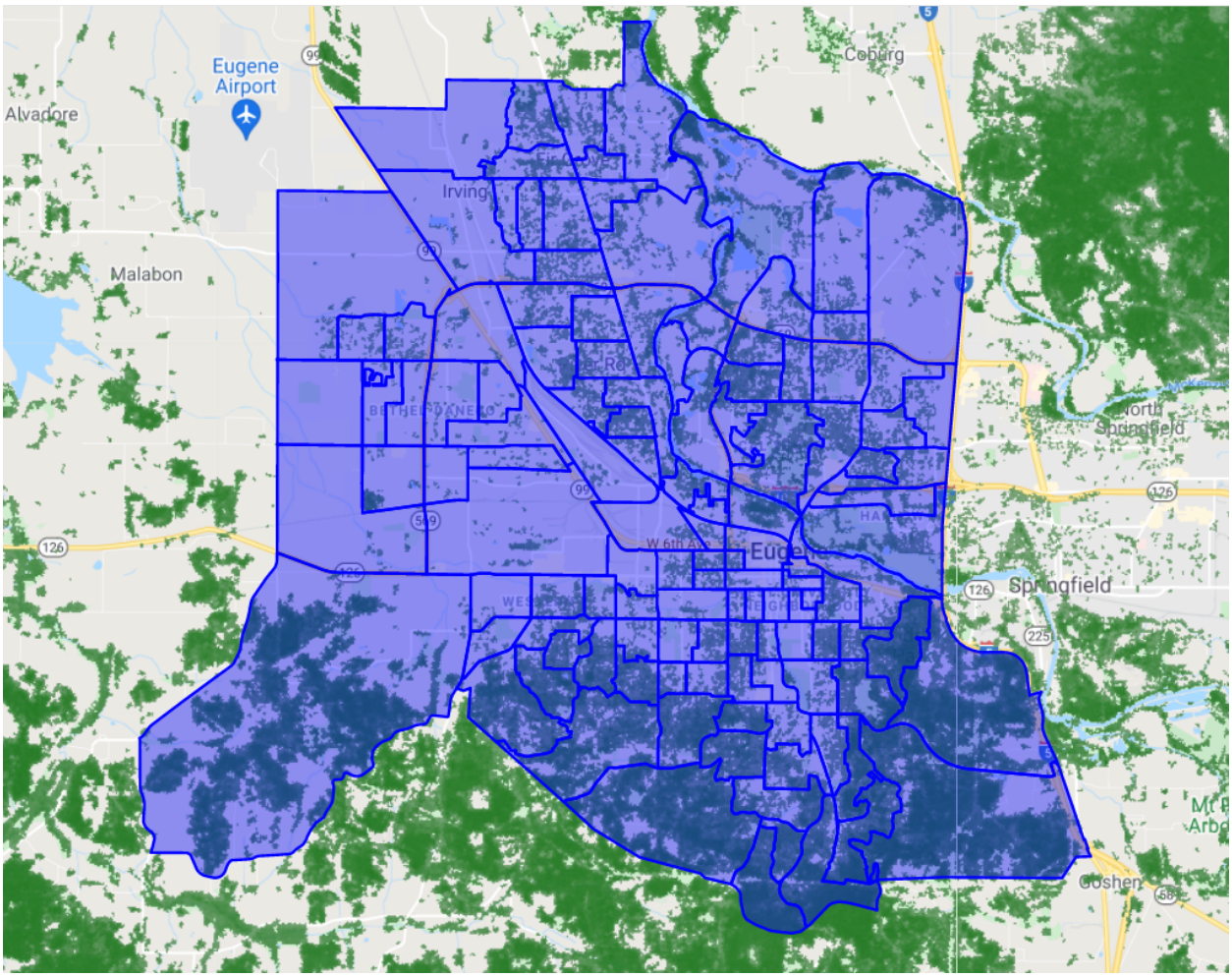
The concept and prototype of this program were developed by David J. Nowak, Jeffery T. Walton, and Eric J. Greenfield (USDA Forest Service). The current version of this program was developed and adapted to i-Tree by David Ellingsworth, Mike Binkley, and Scott Maco (The Davey Tree Expert Company)

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.

Use of this tool indicates acceptance of the EULA.

APPENDIX B – 126 Census Blocks Within The City of Eugene Using iTree Landscape



iTree Landscape_tree canopy coverage_126 census blocks

References

1. https://www.itreetools.org/documents/255/i-Tree%20Vue%20Users%20Manual.pdf

2. https://www.americanforests.org/blog/no-longer-recommend-40-percent-urban-tree-canopy-goal/