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Austin Tree Planting Prioritization 2016

Prepared by Green Leaf Consulting

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**1.1 Introduction**

*1.2 Summary*

The City of Austin Public Works Department has a goal of planting 1,000 trees each year within the full purpose Austin City Limits. While the city has been successfully planting trees, there is no system in place to determine these planting locations and this effort has been driven by public request. The application of a GIS would provide the City of Austin a scoring system for priority areas that are in need of trees being planted. These areas will fit the criteria established to ensure that the locations with the highest need of trees get the most attention.

*1.3 Purpose*

To design a scoring system that will determine ideal locations that the Public Works Department can plant trees. This study will examine planting factors determined by Alan Halter in his Tree Planting Prioritization Report. These categories included public health and safety, air quality, environmental justice, water quality, critical places, forest replenishment needs, tree preservation and development impacts, and urban heat islands. Each of these have multiple factors within them to determine their overall priority score. Other factors that will be determining these locations will be utility interference as well as locations with enough area to plant fifty or more trees, as this is more cost efficient for the city. The areas of focus will be divided among the ten political districts within Austin. This study will identify the areas within Austin City Limits that will be the most beneficial as well as the most cost effective to plant trees.

*1.4 Scope*

This study will be based within the full purpose Austin City Limits in locations with high priority for tree planting. These areas will be divided between the ten political districts.

**2.1 Literature Review**

The focus for this paper is to show how other large cities used tree planting prioritizations to more efficiently address specific environmental issues. The tree canopy of any urban area helps mitigate the effects of heat islands and air pollution commonly found in cities.

In a study conducted on the existing and possible tree canopy coverage of New York city, it was shown that New York City was below their optimal (30%) tree canopy coverage for the entire city (Grove et al., 2006). The city, at the time this study was conducted, was only at 24% tree canopy coverage for the entire city. This emphasized the city’s need to plant more trees along Right-of-Ways and to focus on areas that were lacking sufficient tree canopy coverage. Right-of-Ways were an ideal location to begin looking for areas to plant trees because they can help reduce the heat held by the street and help mitigate pollution from cars. Since trees have a much broader surface area they are more effective at capturing pollutants and cooling down impervious surfaces than short vegetation (Freer-Smith, 2011). This finding reinforces the importance of planting trees along streets and trails in order to lower temperatures and reduce pollutants in these areas.

Another interesting approach to prioritizing tree planting was implemented by the City of Baltimore with the help of many different community and private organizations (Grove et al., 2013). In this program the City of Baltimore asked the community where trees should be planted and for what specific benefits or reasons. This data was collected and then the City of Baltimore brought several departments together in a collaborative effort to produce maps for the organizations to plant trees. Some organizations wanted to focus on specific areas that they were interested in planting trees. Others focused on the environmental/economic benefits such as capturing CO2 from the atmosphere or cooling down hotspots created by exposed impervious surfaces (Bettinger et al., 2013). The city of Austin could look to Baltimore’s approach as an example of how to include different organizations who will focus on specific areas that are most important to them while helping achieve a larger city-wide goal.

Maco and McPherson brought up an important point about the correlation between the amount of tree canopy to the amount of benefits provided by the trees. In their case study they looked at San Francisco’s 14% city wide coverage more carefully, similar to the City of Austin Tree Planting Prioritization project. They found that the percentage of canopy coverage from one city zone to the next could range anywhere from 4% to 46 %. This is important to keep in mind moving forward and deciding on location to plant trees for the City of Austin. Even though the city average was 14% the tree canopy coverage wasn’t evenly distributed and therefore the benefits associated with urban tree canopy weren’t evenly distributed. These studies illustrate the importance of the tree planting project in Austin and could be used as a reference for creating the criteria specific to Austin.

**3.1 Proposal**

*3.2 Data*

For the purposes of this project we will employ multiple different spatial datasets to create a workable map that will show tree planting prioritization and potential planting sites. Most of these datasets are readily available through the GIS open data portal on the City of Austin website. The datasets acquired from the City of Austin that will be used in this project will be as follows:

* City of Austin Jurisdictional Boundaries – our study area will only include sites within the full purpose jurisdictional boundaries
* Single Member Council Districts – we will find potential planting sites in each district with input from each respective council members
* Urban Roadways – to establish a reference for planting locations
* Urban Trails – trails are ideal locations for tree planting
* Tree Planting Prioritization 2014 – this dataset uses a 2014 study to show levels of tree planting prioritization by census tract by taking into account many different factors (air quality, water quality, ect). This dataset is a good guide to finding high priority areas.
* Tree Canopy 2010 – this dataset will show which areas in Austin lack tree cover
* 2015 Aerial Imagery – georeferenced true-color imagery will help us determine the conditions and locations of potential planting sites

Other data:

* Critical places – schools, hospitals, libraries, rec centers, health centers, population density
* Water quality – Impervious cover, water quality score, creek buffers, floodplains
* Urban heat island – average surface temperature from Landsat 7 satellite imagery

*3.3 Methodology*

Our primary goal is to find sites along urban streets and trails that are 1) conducive to efficient tree-planting projects and 2) in need of more trees. To find these sites we will analyze aerial imagery of high-priority census tracts in ArcMap and ERDAS that has been overlayed with urban roadway and trail data. This will be helpful in identifying roads that have medians or right-of-ways that can facilitate multiple new tree plantings.

We will use Alan Halter’s 2014 report, “Tree Planting Prioritization” as a guide to developing a more simplified, fine-grained analysis of prioritizing tree planting locations. In this report, Halter analyzes the data of multiple factors that are deemed important in deciding the prioritization of tree planting locations in order to identify high priority census tracts. These factors include public health & safety, air quality, environmental justice, water quality, critical places, forest replenishment, forest preservation & development impacts, and urban heat islands. We will take into account these factors to prioritize the streets and trails that we have found to be cost-effective and logistically efficient for tree planting.

We will use ArcMap to create a workable geodatabase to create a series of maps that will help identify ideal planting locations. All relevant data will be brought into ArcMap to identify the locations of high-priority census tracts within the full purpose jurisdiction. Tree canopy data will be added in order to analyze existing tree canopy. We will then go into each of the high-priority zones and join the data for the priority-determining factors listed above to the streets and trails that we have deemed fit for tree planting. Prioritization of the locations that we have identified will be based on the amount of criteria present that determines whether or not that location is high-priority. Once locations are chosen, we will be digitizing the area and perform spatial analysis to generate locations of best fit.

*3.4 Budget*



No table name

*3.5 Timeline*

 Data Collection & Client Discussion

Data Analysis & Geodatabase Creation

Map Design & Create Final Product

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*3.6 Final Deliverables*

Our expected result for this project is to create a working and easy to update database for the City of Austin to utilize in an effort to plant 1000 trees a year. Ultimately our database will utilize the tree planting priority map created by Alan Halter, but with added functionality and finer grained analysis. By including data that will allow the city of Austin to identify locations that will best suit their needs, planting 1000 trees a year should become a much easier endeavor in terms of logistics and planning.

Our end goal is to create a database that our client can access and identify areas that are available, and large enough to plant a cost efficient amount of trees (roughly 50 at a time), and over time, edit to reflect current changes and trends. As well this database can help track environmental implications, and anticipate cultural trends, such as water and air quality, or traffic and residential trends due to added greenery.

**4.1 Conclusion**

To conclude, this project will produce a functional geodatabase that identifies high priority locations for tree planting, areas that are cost effective for planting, and able to updated to track environmental and social changes and trends. It will also produce a mapbook that is divided by district and shows areas within the high priority zones where trees can be planted without utility interference as well as areas where fifty or more trees can be planted. This project will be used to determine planting locations and continue to be used in the future for the same purpose.

**5.1 Participation**

* Maxwell Piotrzkowski – Project Manager
	+ - Methodology, Data, Presentation
* Dustin Posey – GIS Analyst
	+ - Group logo creation, Budget, Expected Results, Putting paper together
* Benjamin Griffith – GIS Analyst
	+ - Literature Review, References
* Alyssa Carvajal – GIS Analyst and Project Design
	+ - Introduction, Timeline, Conclusion, Participation, Presentation, Putting paper together

**6.1 References**

Grove, J.M.; Nowak, D.; O'Neil-Dunne, J.; Pelletier, K; Walton, J. 2006. A report on New York City's present and possible urban tree canopy: Prepared for Fiona Watt, Chief of the Division of Forestry and Horticulture. New York Department of Parks and Recreation, USDA Forest Service, Northern Research Station. 28 pp

Maco, S. E., and E. G. McPherson. 2002. Assessing Canopy Cover over Streets and Sidewalks in Street Tree Populations. *Journal of Arboriculture 28*, No. 6 (November): 270-276.

Grove, J. Morgan; Galvin, Michael; Locke, Dexter H.; Murphy, Charles; and O'Neil-Dunne, Jarlath, P.M. 2013. Applications of Urban Tree Canopy Assessment and Prioritization Tools: Supporting Collaborative Decision Making to Achieve Urban Sustainability Goals. *Cities and the Environment (CATE)*: Vol. 6: Iss. 1, Article 7.

Freer-Smith, Peter; Sinnett, Danielle; Tallis, Matthew; Taylor, Gail. 2011. Estimating the removal of atmospheric particulate pollution by the urban tree canopy of London, under current and future environments. *Landscape and Urban Planning*, v 103, n 2, p 129-138.

Bettinger, Pete; Bowker, J.M.; Siry, Jacek; Merry, Krista. 2013. Efficient assessments of urban tree planting potential within or near the southern Piedmont region of the United States. *Computers, Environment and Urban Systems*, v 39, 39-47.

City of Austin. Average Bid Price 2014, Web. 28 Sep 2016. <http://www.austintexas.gov/page/average-bid-prices>