Sustainable Solutions of Central Texas

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# Urban Tree Shade Analysis: Progress Report

## Prepared By:

**INTRODUCTION**

This document is an update on the work and overall progress of the "Urban Tree Shade Analysis" project for the City of Austin Parks and Recreation Department-Urban Forestry Program. For your convenience, we have provided the summary, purpose, and scope of our project from our original proposal. These sections of the document are not necessary for those individuals familiar with the project, but they provide clarity and direction for individuals who are new to it or need a brief reminder of the project goals.

**Summary**

The use of tree shade for sun protection can affect many aspects of life, especially within an urban environment such as Austin. By recognizing tree shade patterns and developing a tree shade index, our team will be able to determine the location of areas that need future tree implementation based on their lack of canopy coverage. This information may also allow us to illustrate the relationship between current urban shading and the frequency of road maintenance intervals, crime rates, air quality, home sale prices, and available moisture levels in soil, all in addition to other possible implications. The City of Austin Parks & Recreation department, which oversees the Urban Forestry Program (UFP) and Urban Forestry Board (UFB), is interested in the tree shade distribution and its related impacts in the City of Austin. Sustainable Solutions of Central Texas (SSOCT) is ideally suited to help the UFP and the City of Austin reach this goal through our team of geographic experts skilled in the use of Geographic Information Systems (GIS). We will use GIS to help the UFP identify areas of tree shade distribution as it relates to the streets and sidewalks for future planning based on demand and need within the city.

**Purpose**

The objective of this project is to create a block-by-block tree shade index for the streets and sidewalks of the City of Austin. SSOCT will do this by examining and analyzing the existing tree canopy within the city limits, and restricting the canopy to just the streets and sidewalks that it overlays. The tree canopy is very important to the urban environment of the city. It provides cleaner air, improves esthetic qualities, and it keeps us shaded from the sun. Once the shade index has been established, we can use it to determine which streets and sidewalks of the city are lacking tree cover, therefore identifying areas where trees should be implemented in the future. SSOCT may also use the shade index to examine the less shaded streets and sidewalks to establish a relationship between them and the street pavement conditions of those same streets and sidewalks. The results of this study will provide the UFP with a tree shade index of the streets and sidewalks that can be used for further evaluation and analysis.

**Scope**

The study region for this project includes all land within the city limits of Austin, Texas. The completion of this project will take approximately 3 months (September 8, 2011 to December 13, 2011).

**DATA**

Table 1-Data Layers and their sources.

| Layer | Source |
|---|---|
| Streets | CAPCOG* |
| Sidewalks | COA* |

| Tree Canopy (Lidar) | COA* |
|---|---|
| Watersheds | COA* |
| Planning Neighborhoods | COA* |

*Abbreviations: Capitol Area Council of Governments (CAPCOG), City of Austin (COA)

## COMPLETED TASKS AND METHODS

We started our project using six distinct data layers to complete our tree shades indices. Those layers included: city streets, city sidewalks, watersheds, tree canopy layer, city neighborhoods, and Austin Police Department districts. Our plan was to create the shade indices based on a series of clips, buffers and joins. Also, we originally planned on including the extra territorial jurisdiction (ETJ) in our project scope. We have since changed all the above aspects of our project. After talks with the UFP, we decided to change our methodology and the layers used. Despite the reorganization of methods, we will still be producing tree shade indices for both streets and sidewalks. However, we did decide to decrease the scope of the project to the city limits rather than the ETJ mainly due to the fact that our primary layers didn't extend out to the ETJ. While developing our tree shade indices, we have completed a large portion of the necessary tasks. We have completed buffering both the streets and the sidewalks by 20 ft. Instead of using round buffers that we originally planned on using, we used flat buffers as displayed in
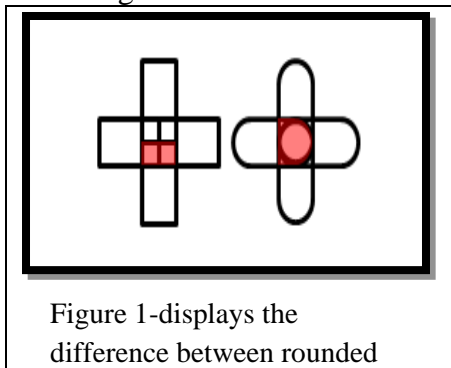


Figure 1-displays the difference between rounded

Figure 1. This was done to decrease the overlap at intersecting street and sidewalk segments. We have also completed clipping the canopy layer to the streets and sidewalks layers with flat buffers. This gave us two layers with the canopy coverage inside the street and sidewalk segments, which was described in the original methodology in our proposal document and can be seen in Figures 2 and

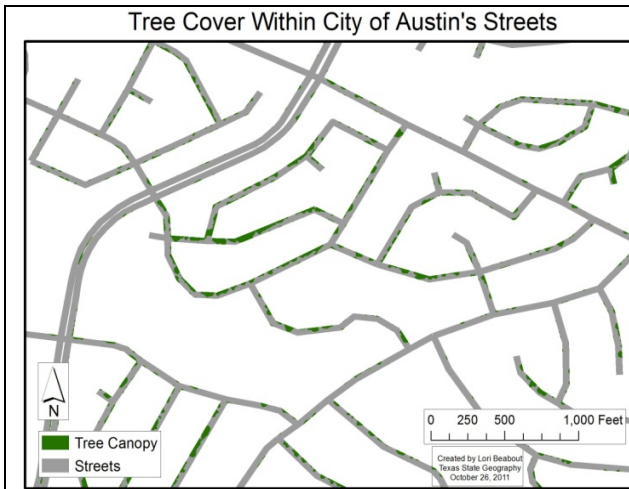| Tree Cover Within City of Austin's Streets | Tree Cover Within City of Austin's Sidewalks |

Figure 2-The layer of canopy coverage restricted to the segmented streets layer.
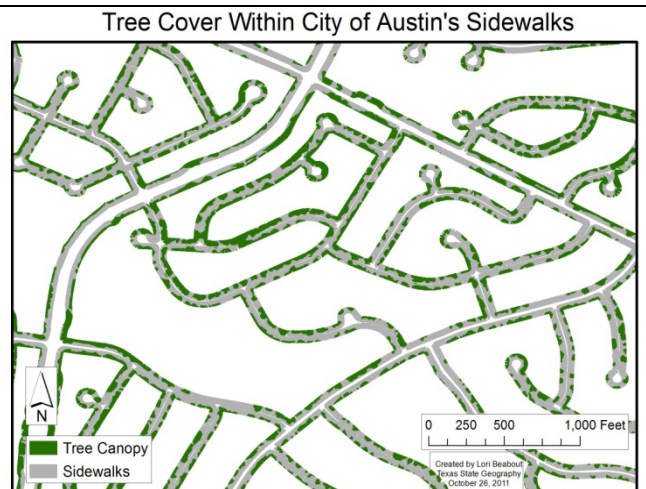
Figure 3-The layer of canopy coverage restricted to the segmented sidewalks layer.

3. We have also dissolved those canopy layers within the streets and sidewalks, allowing for an intersection step with the street and sidewalk segments. This step was added to our original methodology. The intersection of layers has been completed as well, which allows for us to produce the primary calculations necessary for the final shade indices which we will describe later on in this document as we are currently working on them. As far as data analysis goes, we have completed over three quarters of the required work to produce our final shade indices for the city streets and sidewalks. The project is on task and is still set to reach final completion on or before December 12, 2011.

**CURRENT TASKS**

Currently, we are dividing the area of the clipped canopy within the street segments by the overall area of the street segments, which will give us a percentage of the canopy that falls within a segment of our overall street network. We are also performing the same calculation on the sidewalk segments and their corresponding canopy coverage within those segments. Once these calculations are complete we will have our shade percentages within all segments of the streets and sidewalks of the City of Austin.

**FUTURE TASKS**

SSOCT will establish our final shade indices as soon as the shade percentages of the individual street and sidewalk segments have been calculated. We will then use a spatial join, to allow calculation of the average street shade and average sidewalk shade for all neighborhoods and watersheds. After calculation is complete, we will be creating our map documents. We will have two maps of the watersheds within the city of Austin each displaying their average percent of sidewalk tree shade and their average percent of street tree shade. We will do the same for neighborhoods, creating two maps with the same display. To provide more detailed views, we will create four more maps as examples of what the data can be used to display. One map will display a single neighborhood and the tree shade indices by street segment that are within it. The same will be done for that neighborhood but will be displaying sidewalk tree shade indices at the resolution provided instead. The second two maps will be the exact same as these mentioned last two but will be displaying the data within a watershed rather than within a neighborhood. In general, a bit more calculation, creation of our map documents, our website, and final report, are the remaining tasks necessary to complete our project.

**TIMETABLE**

Table 2-Proposed Timetable

| Activity | Initiation Date | Completion Date |
|---|---|---|
| Form teams | August 29 | August 29 |
| Data collection | August 31 | September 21 |
| Data pre-processing | September 12 | October 5 |
| Clipping layers into manageable forms | September 28 | October 12 |

| Data interpretation | October 12 | October 17 |
| --- | --- | --- |
| Analysis of tree shade indices | October 17 | November 14 |
| Create website | November 14 | December 5 |
| Prepare final deliverables | December 5 | December 12 |

**CONCLUSION**

This progress report has described the different phases, methods, and analysis techniques used by our team so far. There have been several "speed bumps" along the way, but in hindsight we see them as trial and error phases that have strengthened our overall work output and progress. We look forward to the final completion of this project and have enjoyed working with the Urban Forestry Program. We hope our final results are able to provide solutions between economic and environmental relationships to help preserve the future of urban trees in the Austin area.