Scope of Work
McKinney, Texas Urban Ecosystem Analysis and Canopy Study
December 2010

The Texas Trees Foundation (TTF) will provide the City of McKinney with geospatial services and ecosystem benefits modeling to advance the understanding of the function, structure and value of their urban forest resource and make recommendations on how to enhance the City's tree canopy. This Scope of Work (SoW) details the meetings, tasks, sub-tasks, timelines, review and acceptance process, deliverables and cost (including project management) needed to complete the project. It is written in a way that provides creativity and flexibility while also describing deliverables that will ensure the City's expectations are met. Task 1 will begin after a contract is signed by both parties, which is expected by early
February 2011 . This SoW will be included within our Project Execution Plan (PEP) which will be a living/evolving internal document used to improve communication and manage risk throughout the project.

Task 1 – Project Initiation and Data Collection: In this task, TTF will obtain a greater understanding of the technical and planning aspects of the project through data gathering, meeting with City staff, review of existing plans/ordinances, and a project kickoff meeting and charrette.

Steps:

- Complete McKinney's GIS data request form and identify other data needed
    - Review data, organize in geodatabase, confirm with memo
    - Obtain 2010 NAIP imagery and McKinney's most recent leaf-off aerials
- Meet with City staff, identified by the City, to better understand city initiatives and project goals.
- Obtain and review copies of relevant existing ordinances, comprehensive plans, master plans, and other documents related to the protection of trees.

Deliverables: (by end of February 2011)

- List of data needs and questions to further develop project understanding.
- Kickoff meeting attended by Matt in person and Ian by phone, prior to charrette.
- Memo providing a recap of decisions and action items.
- Attend and participate in the charrette (Matt) in February 2010 with other ARRA projects and green team.

Acceptance Criteria: receipt of deliverables and meeting attendance

Task 1 Cost: $3,000

Task 2 – Land Cover Mapping and GIS Tree Canopy Assessment: TTF will use the imagery and GIS data obtained in Task 1 to perform GIS services and a remote sensing classification in McKinney and assess the distribution of tree canopy (TC) by land use

categories and other geographic boundaries that will aid in the ecosystem services analysis, TC goal setting, and planning/reporting tasks of this project.

Steps:

- Classify the following five land cover types over an area of approximately 68 square miles: tree/forest canopy, impervious surfaces, bare soil, grass/shrub/open space, and water.
    - Perform a manual QA/QC step to improve automated classification errors for an overall accuracy of 90% (95% for tree canopy)
    - Deliver the 5-class land cover in vector and raster format with a separate GIS layer for impervious surfaces so that impervious areas overlapping tree canopy are not excluded (not underestimated as in the 5-class file)
- Calculate the area and percent of tree canopy citywide and for various land use categories provided to TTF by McKinney
    - Determine two other geographic boundaries to compute tree canopy metrics that will be meaningful for planning and policy purposes
    - Develop, test and deliver a "TC Calculator" spreadsheet tool
        - Include in training to City and for tree canopy goal setting
    - Develop maps, tables and charts of TC results for different audiences
- Use i-Tree Vue and freely available 30-meter National Land Cover Data (NLCD) from 1992 to 2001 and high-resolution 2010 tree canopy to assess overall change.

Deliverables: (by end of April 2011)

- ESRI-compatible GIS files in vector geodatabase and rater format: 5-class land cover and separate layers for tree canopy cover and impervious surfaces
- A comparison of how the canopy cover has changed over time (note that the effect on the environment that has occurred will be addressed in Task 3).
    - Geospatial layers and maps
- Urban Tree Canopy (UTC) Assessment: maps, tables, and charts of tree canopy area and percent by land use categories (including the public right-of-way) and other boundaries
- Excel-based "TC Calculator" tool and a GeoPDF map of TC results for non-technical (non-GIS) users

Acceptance Criteria. The City will perform an accuracy assessment of the land cover data and TTF can provide methods for doing so. Alternatively, the City may simply perform a visual review of the data and then comments or approval. Maps will be shared with the City to allow for one round of review and input before approval.

Task 2 Cost: $18,000

Task 3 – Ecosystem Services Analysis: Based on the information gathered from Task 1 TTF will work with McKinney to determine the environmental and economic benefits provided by trees. Data generated from this will be rolled into products in Task 4, the communications, planning and reporting components of this project include:

- Avoided energy costs in kilowatt hours and dollars:

    - We propose to use U.S. Forest Service Community Tree Guides and local i-Tree Stratum (now referred to as "Streets") values will be adjusted for local conditions and used to estimate benefits of future public and private trees. Energy savings will not be assessed for current tree canopy.
- Stormwater/water quality benefit in units of gallons and dollars:
    - CITYgreen will be used to assess the benefit for current and future development scenarios and by land use categories.
- Carbon storage/sequestration and air pollution removal:
    - CITYgreen will be used to assess the benefits of current and future development scenarios based on various tree canopy grow-out scenarios
    - i-Tree Vue will be used to compare carbon and air pollution removal benefits from 2001 and 1992 NLCD.
        - If i-Tree version 4.0 is able to incorporate high-resolution land cover data then this will be used for current (2010) conditions.
        - We will then compare/contrast results from the three time periods.

Deliverables (by end of May 2011):

- CITYgreen reporting for up to 6 scenarios
- Excel tables developed for tree benefits
- Summary of ecosystem services analysis results

Acceptance Criteria. The City will be involved in the methods and parameters used for assessing ecosystem services, therefore it is assumed that approval will be upon delivery of ecosystem analysis and summary/usage of the results in the subsequent task.

Task 3 Cost: $12,000

Task 4 – Goal Setting, Planning, Outreach, and Final Reporting

At this stage of the project, TTF will attend two community organized events to gather input from the public. This process is aimed at ensuring all voices are heard, that objectives from other initiatives or plans are integrated and effective, and that deliverables in Task 4 make the best use of the project budget for urban forest planning and public communication.

<u>Steps</u>:

- UTC Goal Setting
    - GIS assessment by land use
        - Use TC Calculator
        - By future zoning and densities
        - Forest preservation potential by land use
    - Riparian, open space and park opportunities
    - Conduct a cost/benefit analysis of implementing a UTC goal citywide and by land use types
    - Simulated before and after views showing the effects of tree planting, as needed to support other planning and communication elements

- TTF will develop a plan for tree planting to increase ecosystem services. This will include but is not limited to:
    - Prioritizing areas based on City-provided criteria to maximize tree benefits. Possible examples include:
        - Low tree canopy / high impervious areas
        - Current and future priority zoning / land use designations
        - Proximity to buildings, parking lots, and riparian or specific transportation corridors
        - Trails, bike paths and walkability
    - Review and discuss McKinney's compilation of progressive ordinances nationwide for tree planting on new development by land use categories (residential, commercial, low impact development, etc)
        - Allow McKinney to consider what is reasonable and of interest locally
    - Develop plan and send draft for review
- We have identified several mechanisms for communicating the results to city staff, community leaders and the general public for consideration by McKinney.
    - We will provide training on the use of i-Tree Design and a streaming video recording of how everyday citizens can estimate potential tree benefits on their property based on property placement, selection and care.
    - Videos or animations and 3-D grow-out scenarios of different land use densities and tree planting designs and associated benefits.

Deliverables:

- Through the steps above, an approach to maintaining and increasing the City's tree canopy and green infrastructure by communicating with city staff, community leaders and the general public about the importance of urban forestry as a community asset.
- A detailed report that states the overall project overview and findings including species information and modeling showing the benefits of the current urban tree canopy under existing conditions and various growth scenarios.
- Media ("How-To" videos/animations)
- Visualizations/Grow-Out Scenarios
- High-level training on GIS, i-Tree tools used in the project, and other deliverables
- Presentation for City Council

Acceptance Criteria. Delivery of Products and Presentation.

Task 4 Cost: $17,000

From a project management and budgeting standpoint, TTF will invoice the City monthly and we will provide information on our remaining budget and percent complete at the task-level. This will also provide an opportunity to discuss what has been accomplished within each task at a midway point to refine scope if needed at that time. All dates with in the SoW are subject to change at any time by TTF.