COOPERATIVE AGREEMENT
BETWEEN
THE MISSOURI DEPARTMENT OF CONSERVATION
(Hereinafter referred to as Department)
AND
City of Columbia ~~Street Department~~
(Hereinafter referred to as Cooperator)

NAME OF PROJECT: Tree Resource Improvement and Maintenance (*TRIM*) Grant

Project Number: 18.026
Project Description: Education, Inventory, Other

PARTIES AND CONTACTS:

Chad Herwald
City of Columbia Street Department
701 E. Broadway
Columbia MO 65205-6015

Ann Koenig, Community Forester
Missouri Department of Conservation
3500 E Gans Rd
Columbia MO 65201-8992
(573) 815-7900

AGREEMENT DURATION

The period of this agreement is September 1, 2017 through June 30, 2018.

MEASURABLE OUTCOMES:

1. Complete the approved *TRIM* project anytime between signature of this Agreement and May 4, 2018. Said project shall be completed as described and specified in the application submitted for consideration of cost-share funding. The application is attached and incorporated herein.

2. Any removals of trees over 9" DBH associated with the TRIM Grant can only take place from November 1, 2017 to March 31, 2018. Failure to do so may result in payment being withheld.

3. Costs incurred before this agreement are ineligible for reimbursement.

4. All tree work must conform to the most current version of the American National Standards Institute *A300 Standards for Tree Care Operations.*

5. The Department shall be given appropriate credit in all publications, educational materials and in all media contacts related to this project. The statement "A portion of the funding for this project was made available through the Missouri Department of Conservation's Tree Resource Improvement and Maintenance (TRIM) program" is suggested.

REPORTING REQUIREMENTS:

1. The Cooperator shall contact the local forester noted above under **PARTIES AND CONTACTS** if any changes in the project arise. The local forester or their representative must approve all changes prior to implementation. Failure to do so may result in denial of payment of your *TRIM* project.

2. The Cooperator shall notify in writing the local forester by May 4, 2018 that all work has been completed and request an inspection of the project.

3. Should an extension beyond the May 4, 2018 deadline be desired to complete the project, the Cooperator shall submit a request in writing outlining the extenuating circumstances necessitating such a variance. This written request must be received a minimum of two weeks prior to the May 4, 2018 deadline. Such requests must be sent to the Department of Conservation, Community Forestry Coordinator, P.O. Box 180 Jefferson City, Missouri 65102. Extensions can only be granted by the Community Forestry Coordinator.

4. The Cooperator shall provide documentation of all costs associated with the approved project before payment will be made. This includes copies of all dated invoices for project costs, paid receipts, and a description with documentation of all donations, volunteer assistance, and in-kind costs.

5. The Cooperator shall provide documentation that all activities identified in the application's Publicity Plan are completed.

6. If for any reason, the Cooperator cannot complete the *TRIM* project during the time specified herein, immediate written notification to the Department is required. Providing timely notification will also ensure that no penalties will result for future project applications.

MONITORING REQUIREMENTS:

1. The Department's local forester or their representative shall monitor each project. Such monitoring shall include but not be limited to on-site visits, ongoing informal monitoring through phone calls, email, and desk review of financial information, progress, and performance reports. The Department shall conduct an onsite inspection of each project upon completion to assure compliance with program guidelines.

2. After project inspection and certification that the work fully meets the project specifications, the Department shall process payment. If the inspecting local forester finds the project does not meet specifications, payment will not be issued until specifications are met.

3. The Cooperator shall allow the Department access to all financial records and/or audited financial statements related to this agreement.

REQUIRED PROVISIONS

The Cooperator, City of Columbia Street Department, agrees to defend, indemnify and hold harmless from claim or suit the Department, the Conservation Commission and their employees and agents from any claim or suit brought by any third party in connection with the activities to be performed or improvements to be installed under this agreement.

PAYMENT PROCESS:

Payment to the Cooperator will be the applicable percentage as noted on the *TRIM Cost Share Request Form* of the actual costs required to complete the *TRIM* project, but will not exceed the lesser of **$25,000** or the total of the reimbursable costs required to complete the project. The remainder of cost is the responsibility of the Cooperator. All funds from the Department must be deposited in a timely manner.

OWNERSHIP

Any equipment purchased with funds under this agreement with a value greater than $100.00 remains the property of the Department. The Department will make determination as to disposition of any property, equipment and unused supplies. The Cooperator shall provide to the Department a periodic inventory of all equipment with a value greater than $100.00 purchased with funds from this contract.

APPROVED AND ACCEPTED

MISSOURI DEPARTMENT OF CONSERVATION

BY: Lisa D. Allen

DATE: 9-7-17

TITLE: STATE FORESTER

CITY OF COLUMBIA ~~STREET DEPARTMENT~~

BY: Mike Matthes

DATE: _____

TITLE: City Manager

FEDERAL IDENTIFICATION NUMBER _____

Attest:

By _____
Sheela Amin
Title City Clerk

APPROVED AS TO FORM:

By _____
Nancy Thompson
Title City Counselor

T.R.I.M. Estimated Project Cost Worksheet

Applicant City of Columbia St. Dept. Contact person Chad Herwald

Address 701 E. Broadway

Email Chad.Herwald@como.gov

Phone 573-874-6357 County Boone

City/State Columbia, MO ZIP (9-digit ZIP required) 65205-6015

Project location Columbia

Project Type *(check all that apply)*:

☑ Inventory ☐ Removal ☐ Pruning ☑ Education ☐ Planting ☑ Other

Provide costs only for items associated with your project.

A. Reimbursable Costs	Amount
1. Contract fee *(tree management plan, material development, inventory)*	$ 32,500
2. Contracted labor *(tree removals, pruning, planting, inventory)*	
3. Purchased materials for inventory or tree work	
4. Equipment rental *(inventory, planting, or other tree work)*	
5. Education *(training course fees, program materials)*	
6. Tree planting plan preparation fee	
7. Trees for planting and delivery, less any discount	
8. Purchased materials for planting *(stakes, mulch)*	
SUBTOTAL	$

B. Non-reimbursable Costs	
1. Administrative costs *(tree care, education, inventory)*	$ 1000
2. Paid employee labor *(tree care, education, inventory)*	
3. Donated labor *(tree work, planting, or inventory (at $15/hr))*	
4. Donated equipment costs	
5. In-kind equipment	
6. Donated materials *(stakes, mulch, etc.)*	
7. Discount or credit for trees or tree planting	
8. Other	
SUBTOTAL	$

C. Total Estimated Project Costs

(Add above and round to nearest dollar.) $ 33,500

Transfer total to back side of form

Please complete Cost-Share Request Form on reverse side.

T.R.I.M. Cost-Share Request Form

Applicant City of Columbia St. Dept Contact person Chad Herwald

Project location City of Columbia

C. Total Estimated Project Costs

$ 33,500
Amount from front side of form

D. MDC Cost-Share Computation

Missouri Department of Conservation's Cost Share $ 20,100
(60% X Total estimated project cost)

Tree City USA Bonus $ 5025
(15% X Total estimated project cost)
NOTE: *To qualify for bonus, project must be located in a community that is currently certified as Tree City USA.*

Missouri Arbor Award of Excellence Bonus $ _____
(5% X Total estimated project cost)
NOTE: *To qualify for bonus, applicant must be the winner of an MAAE award within the last 12 months.*

SUBTOTAL
Add all amounts in D (above): $ 25,125

SUBTOTAL REIMBURSABLE COSTS
Enter the SUBTOTAL from A on front side: $ 32,500

TOTAL MDC COST SHARE $25,000
Enter the smaller of the above two lines. Total MDC Cost Share cannot exceed Reimbursable Costs. Maximum available is $10,000 unless specifically authorized.

E. Local Cost-Share Computation

Total MDC Cost Share subtracted from Total Estimated Project Costs $ 8,500

I certify that funds received through the Tree Resource Improvement and Maintenance program will be used only for the care of trees or planting of trees on public property, as noted in this application. I certify that all trees subject to this contract will be pruned in accordance with American National Standard Institute *A300 Standard Practices for Wood Plant Maintenance* specifications and that trees will be planted in accordance with the enclosed *How to Plant a Tree* brochure.

Chad Herwald City Arborist
Name and Title of Representative

Chad Herwald 6/1/2017
Signature of Representative Date

C Koen 5/1/17
Signature of Missouri Department of Conservation Forester Date

Revised March 2016

Supporting Documentation

Columbia, MO Urban Tree Canopy Analysis and Outreach Education Campaign

Section 2: Narrative

Final Product: The City of Columbia plans to use the Davey Resource Group to update and expand our current Urban Tree Canopy Analysis and create an outreach education tool in the form of an online web-based Story Map. In the Spring of 2017, the City started the process of creating an Urban Forest Master Plan which will be completed in the winter of 2017. While the city is extremely excited about having an Urban Forest Master Plan unfortunately there wasn't enough budgeted to complete a 100% urban tree canopy (UTC) analysis for the entire city or to create a mechanism to educate the public as to the results of the Urban Forest Master Plan.

This grant will enable the City and residents the ability to understand the benefits of the entire urban tree canopy as it relates to:

- Priority Planting Analysis
- Socio-Economic & Demographic Analysis
- i-Tree Hydro Stormwater Pollution Assessment
- Critical Forest Identification
- Tree Canopy Health Assessment
- Forest Fragmentation

Upon completion of the UTC, Davey Resource Group will incorporate the results of the UTC as well as the findings and recommendations from the Urban Forest Master Plan (UFMO) into a Web-Based Story Map. This Story Map will facilitate communication and education of the City's residents as to the benefits of trees and the City's proactive approach to resource management.

Benefit to Current Program: The City of Columbia takes great pride in its urban forest, open spaces, and other natural resources. Columbia has been a long time Tree City USA and leads central Missouri with innovative and creative solutions. The city has taken on the challenge of creating the first UFMP in the state and is excited to expand the UTC and educational components of this plan.

The scope of the current UFMP is to:

- Create a basic UTC for % canopy understanding
- Detailed analysis of 3 priority neighborhoods
- Update street tree inventory
- Create management zones & proactive mainenance schedule
- Leaf debris analysis
- Case study reasearch with comparable communities
- Future recommendations

This project will allow the City to expand the analysis of the current UTC to the entire city and create a state-of-the-art educational tool.

Participants: The City Arborist, Chad Herwald, will perform the project oversight on behalf of the city. Mr. Herwald is overseeing Columbia's current Urban Forest Master Plan efforts as well as previous street tree inventories in the past and is excited to take the City's street department forward. For the data collection and educational portions of the project, the City's intent is to hire a highly-qualified arboricultural contractor to perform the inventory. The contractor will have *Certified Arborists* as site managers and field staff, and the contractor's project manager will have the additional accreditation of *Municipal Specialist.*

Facilities and Equipment: For the expanded UTC, Davey will utilize an automated feature extraction methodology protocol established by the USDA Forest Service. This methodology and approach ensures a greater than 95% accurate inventory of the complete urban tree canopy. For the outreach education tool, Davey will utilize ESRI Story Map tools to create an easy to view and use web-based portal for information exchange with the public. An example of this can be found at https://gis.davey.com/CommunityReleaf/Cleveland.

Administration Contact:

Chad Herwald
City of Columbia
701 E. Broadway, 5th Floor
Columbia, MO 65205
573-874-6357

Timetable: Upon award of the grant, the city will meet with the consultant to finalize data deliverables and what should be built into the Story Map. Approximately three months will be required for data collection, data analysis, and creation of the Story Map. A detailed timeframe is described below:

Week 1	After grant awarded the city will meet with the consultant to sign the official contract.
Week 2	Initial press release to local newspapers, television stations, and city's web site as to purpose and scope of the project.
Week 2-3	Load existing UTC data and begin data extraction and analysis.
Weeks 3-8	Data extration and analysis.
Week 9	Establish information from completed Urban Forest Master Plan and Urban Tree Canopy analysis that will be incorporated into the web-based Story Map.

Weeks 10-11	Create web-based Story Map
Week 12	Another press release will be prepared by streets Department staff and sent to local media acknowledging the MDC, discussing the findings, and the scope of the inventory project.

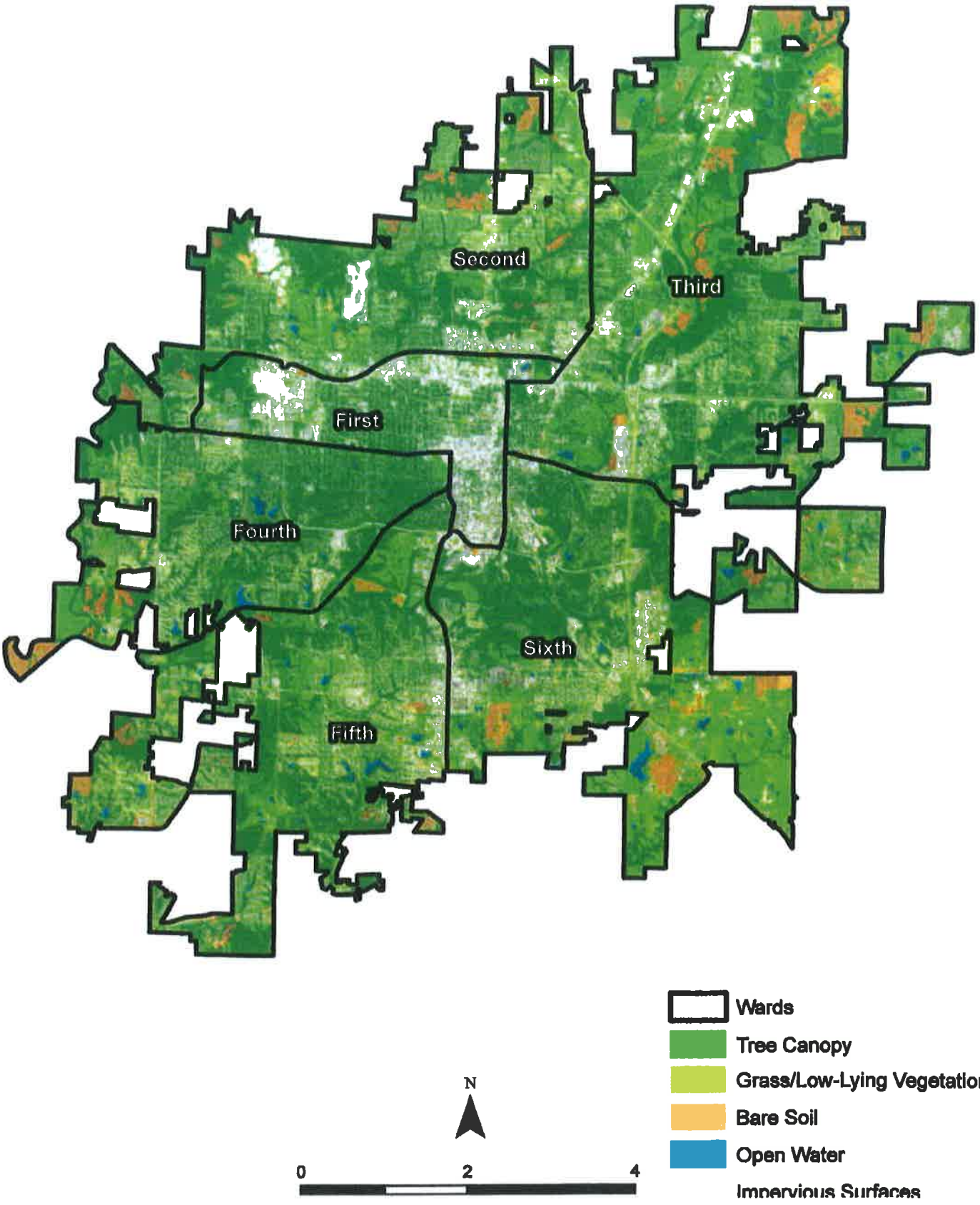
Steps to Complete:

- Determine need and scope of expanded UTC and creation of an educational tool **(completed)**
- Meet with possible consultants to complete the project **(completed)**
- Apply for grant assistance with funding **(pending)**
- After award of grant, meet with selected consultant to finalize contract and schedule project.
- Consultant to complete expanded Urban Tree Canopy analysis.
- Consultant to create the web-based educational Story Map tool.
- Presentation of project results to city.

Section 3: Maps

City of Columbia, MO

Columbia, MO
UTC by Ward



Example of Web-Based Story Map

See last 5 pages

Section 4: Itemized Budget Information

A: Reimbursable Costs

Item	Description	Cost
Contract Fee	Expanded Urban Tree Canopy analysis and creation of web-based Story Map	$24,900
Contract Fee	Urban Forest Master Plan Components	$7,600
	SubTotal	$32,500

B: Non-reimbursable Costs

Item	Description	Cost
Administrative Costs	Project update meetings, attending training, project oversight, city Arborist $23/hr.x43hr.	$1,000
Paid Employee Labor	Inventory implementation of removals and pruning	
Donated Labor	Tree work, planting, or inventory	
Donated Equipment	Inventory, planting, tree work	
In-kind Equipment	Community owned & used equipment for tree work, inventory, planting	
Donated Materials		
Other		
	SubTotal	$1,000

C: Total Estimated Project Costs

Amount from SubTotal A & B combined	$33,500

D. MDC Cost-share Computation

MDC Cost-share	60% x Total estimated project costs	$20,100
Tree City USA Bonus	15% x total estimated project costs	$5,025
Arbor Award	5% x total estimated project costs	
	Subtotal D	$25,125
	Subtotal Reimbursable Costs	$24,900
	Total MDC Cost Share	$24,900

Section 7: Publicity/Education

At least two press releases will be made via local media and the city's web site. A significant portion of this project is the creation of a web-based educational Story Map tool that will enable the residents of Columbia, as well as neighboring communities, to become aware of the results of the UTC and the city's Urban Forest Master Plan.

Conclusion:

With the support of the State of Missouri, Department of Conservation's T.R.I.M. Grant, the City of Columbia, its businesses, residents, and community support groups, will have:

- A comprehensive Urban Tree Canopy analysis of the entire city based on professional and scientific processes.
- An understanding of priority planting locations throughout the City
- Analyis of the impacts of the urban forest as it relates to Socio-Economic and Demographics
- an i-Tree Hydro Stormwater Pollution Assessment
- Identification of Critical Forests
- a Tree Canopy Health Assessment
- Analysis of Forest Fragmentation
- and, a public relations strategy in the form of an online web-based custom Story Map

DAVEY
RESOURCE GROUP
A Division of The Davey Tree Expert Company

Corporate Headquarters
1500 North Mantua Street
P.O. Box 5193
Kent, Ohio 44240-5193
330.673.5685
Toll Free 1 800 828 8312
Fax 330.673 0860

1101 Larall Drive
Columbia, Missouri 65203
573.673.7530
Fax 330 673.0860

Project Pricing - Columbia, MO

Urban Forest Master Plan Components

Master Plan C

Davey Resource Group will develop a Maintenance Schedule, Budget Table, Standard Operating Procedures for pruning & safety, conduct Case Study Reference City data, and a recommended species list as part of the Urban Forest Master Plan

$7,600

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Project Pricing - Columbia, MO

Extended Citywide Urban Tree Canopy Analysis

Priority Planting Analysis	**$4,200**
Socio-Economic & Demographic Analysis	**$4,000**
i-Tree Hydro Stormwater Pollution Assessment	**$2,000**
Critical Forest Identification	**$3,250**
Tree Canopy Health Assessment **$2,000** ⟶	
Forest Fragmentation	**$950**

Custom Story Map

Outreach Educational Campaign

Davey Resource Group will utilize online capabilities combined with data to produce an amazing visual display for the project. Story maps are put together through a fusion of text, data, and images to detail project findings. Using this technology, our clients will have the means to showcase projects to the public in a simplified manner that allows for understanding and learning.

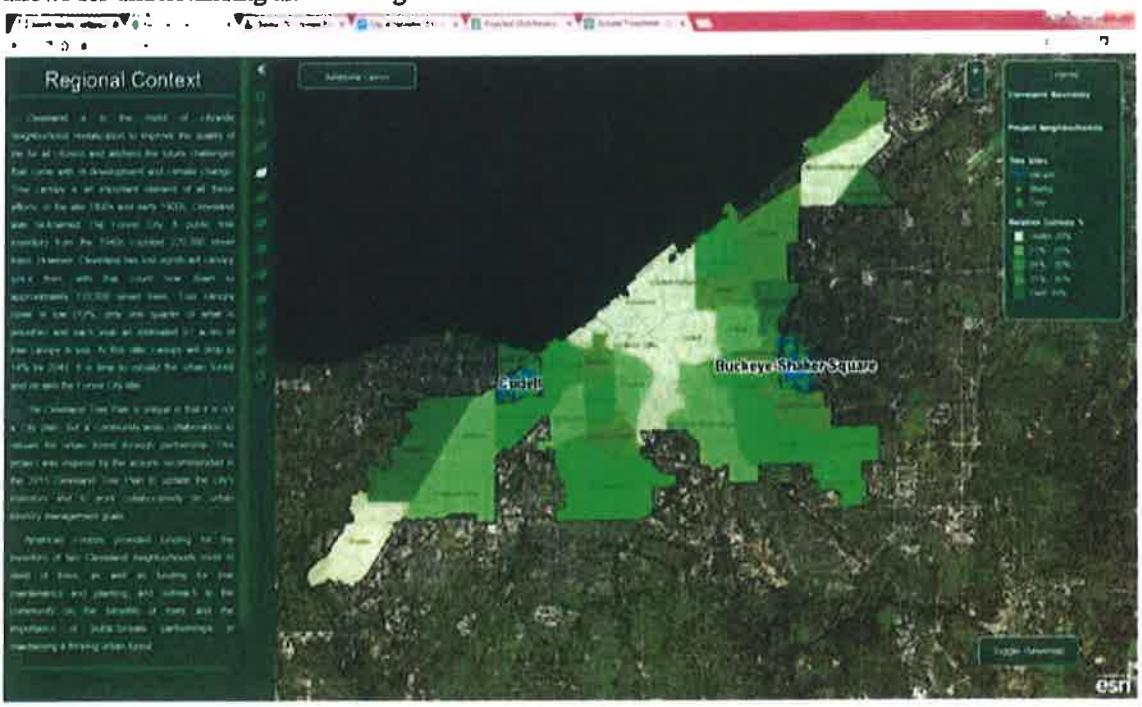
$8,500

Total $24,900

Public Relations Strategies

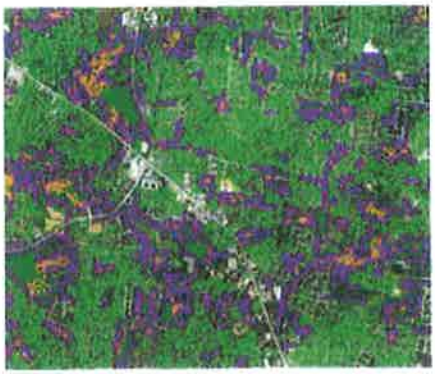
Story Map - $8,500 for custom version

A new service that Davey Resource Group offers that can detail projects using online capabilities combined with data to produce an amazing visual display for the project. Story maps are put together through a fusion of text, data, and images to detail project findings. This deliverable can be very beneficial for Clients not only as web service, but also from a Public Relations standpoint. Using this technology, our clients will have the means to showcase projects to the public in a simplified manner that allows for understanding and learning.



Forest Fragmentation - $950

The overall health of the urban ecosystem depends highly on the ability of the trees, plants, wildlife, insects, and humans to interact collectively as a whole. However, a key factor in declining urban health is urban build- up and sprawl, which can lead to the removal and decrease of canopy across a community. Often this effect causes canopies to be fragmented and leads to the degradation of ecosystem health, which in turn leads to a decline in habitat quality and canopy connectivity. This decline results in changes and imbalance to microclimates and increases the risk and susceptibility to invasive species.



Year	Rainfall (Inches)	Total Runoff (Gallons)	Avoided Runoff (Gallons)	Avoided Pollutant Load (Mean lbs.)
2005	16.22	712,339,534	72,648,885	72,787
2006	15.94	688,413,212	62,558,307	121,644
2007	13.39	654,839,856	23,960,929	45,843
2008	11.69	482,934,682	28,291,765	44,438
2009	20.16	928,492,461	78,620,757	94,672
2010	13.39	677,777,383	30,811,701	19,731
2011	14.53	711,194,877	39,795,134	58,885
2012	11.50	623,404,973	20,770,524	39,091
Average	14.60	684,924,622	44,682,250	62,136

Critical Forest Identification - $3,250

Preserving forests is a huge driving force behind this study. Identifying the most critical areas of forest could be essential for conservation and preservation activities. This assessment would include land cover data, forest fragmentation metrics, as well as generating localized watersheds. Creating very small watersheds would be crucial in selecting areas that would fall into headwater watersheds. These watersheds are important mainly because what activities occur, such as runoff and pollution, will greatly affect streams and water supplies downstream.

Tree Canopy Health Assessment - $2,000

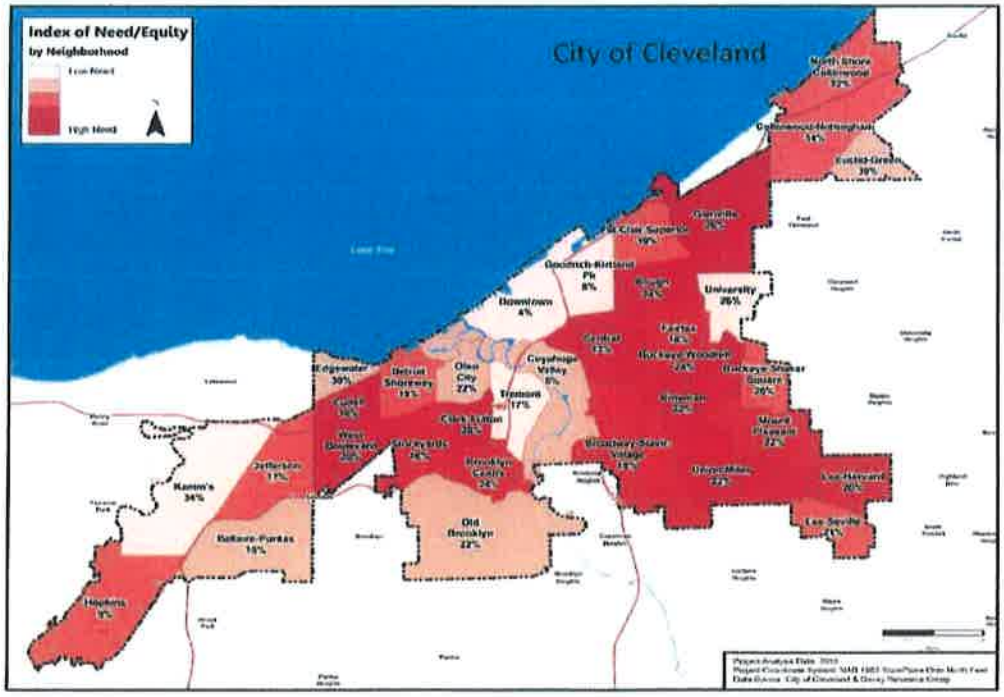
Generally, healthy vegetation will absorb most of the visible light that falls on it, and reflects a large portion of the near-infrared light; thus, healthy vegetation will be more pronounced than dead or dying vegetation because of the amount of chlorophyll within the leaves to absorb visible light. To assess canopy health and to identify areas with dead or dying trees, Davey Resource Group will utilize NDVI to extract ratio values from the most current NAIP imagery using the red and near-infrared bands. The NDVI values will then be normalized on a scale from 0 – 1 to highlight canopy communities and the overall condition of the trees.

Socio-Economic and Demographic Analysis - $4,000

Davey Resource Group will relate the current UTC to socio-demographic and economic data for the City. Data from the most current census community survey will be aggregated for census tracts and/or blocks groups to determine trends and correlations. This data can be used by the City to prioritize results of the UTC Analysis even further. Examination of socio-demographic and economic data can chart positive and negative correlations to the percentage of UTC within the given tract or block group.

Typical analysis includes:

- Canopy % vs. median household income
- Canopy % vs. population density
- Canopy % vs. ethnicity
- Canopy % vs. age group
- Canopy % vs. education
- Additional descriptive statistics such as % renter and % homeowner, building value, building age, % single family homes, unemployment, and child poverty can all be explored.



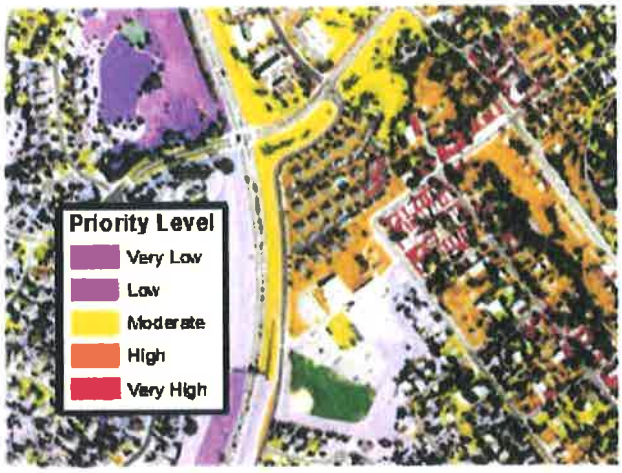
i-Tree Hydro Stormwater Pollution Assessment - $2,000

Using i-Tree software, the amount pollutants in stormwater runoff are generated. Data spanning from 2005-2012 will be analyzed to get the average pollutant runoff within the city limits. This could be essential later on when determining water quality measures and setting goals focused on stream restoration or preservation. Estimated average annual pollutant runoff for total suspended solids, oxygen compounds, phosphorus, nitrogen, and other pollutants will be reported.

Extended UTC Analysis

Priority Planting Analysis (Citywide) - $4,200

Per protocols set by USDA Forest Service, a standard UTC assessment provides mapping and information on "all possible planting areas." This summation of possible planting areas is equal to the total of all areas that are open ground and includes areas such as golf courses, active agricultural fields, and sports fields. While it is theoretically possible that these types of pervious surfaces and land uses could represent future tree planting areas, it is often, and understandably so, not practical for a community to consider them for tree planting initiatives.



Therefore, to determine more likely and reasonable areas to plant trees. Davey Resource Group will locate "preferred planting areas." The identification of preferred planting areas takes into account land use and other factors such as approved community master planning that limit where trees may be planted. The preferred planting area analysis will be completed for the entire project area and these areas prioritized based on maximizing ecological services, providing equal access to trees and natural resources, or protecting public health and safety. While the final planting area parameters will be decided by the City of Columbia, the following information is generally used to identify preferred planting areas.

- Socio-demographics and population density per Census Tract
- Proximity to surface waters and impaired waterways
- Topography, floodplains, and soil types
- Public/private ownership
- Linkages to greenways and other forest resources
- Stormwater problem areas
- Mitigating urban heat island effect

Using city input and a combination of parameters, like those listed above, Davey Resource Group will categorize each suitable planting area into five priority categories ranging from Very Low to Very High based on the Columbia's parameters. This information will provide helpful insight on the best places to plant trees; however, site visits and proper planning will still need to be executed before tree planting can begin.