



Growing Futures. Growing Trees – Des Moines, IA
Project Design Document – Year 6

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INSTRUCTIONS

Project Operators must complete and submit this Project Design Document (PDD) to request credits after the third anniversary of the Credit Commencement Date. City Forest Credits then reviews this PDD as part of the validation process along with all other required project documents. An approved third-party verifier then does an independent check of all documents and compliance with the Protocol, known as verification. An updated PDD will need to be submitted for future verification at Year 6 and After Year 25.

Project Operators should enter data and supporting attachments starting on page 3 under Project Overview where you find “[Enter text here]” as thoroughly as possible and provide numbered attachments for maps and other documentation (ex: 1 – Regional Map). Keep all instructions in the document.

Below is a list of documents that are needed to complete a successful Year 4 Project Design Document:

For the Single Tree Planting Design:

- Carbon Quantification Year 4 Credit tool
- Tree Sampling Data
- Geocoded photos
- Project geospatial data, if there have been changes (KML file or shapefile)

For the Cluster Planting Design

- Project Area imaging from any telemetry, imaging, or remote sensing service
- i-Tree Canopy report
- i-Tree Canopy source data
- Project geospatial data, if there have been changes (KML file or shapefile)
- Carbon Quantification Year 4 Credit tool

For the Area Reforestation Planting Design (previously Canopy Design):

- Either:
 - Project Area imaging from any telemetry, imaging, or remote sensing service
 - i-Tree Canopy report
 - i-Tree Canopy source data
- Or:
 - Tree plot sampling data
- Project geospatial data, if there have been changes (KML file or shapefile)
- Carbon Quantification Year 4 Credit tool
- Summary of approach to quantifying the local CO₂ index

PROJECT OVERVIEW

Project Name: Growing Futures. Growing Trees – Des Moines, IA

Project Number: 5

Project Type: Planting Project (under the Planting Protocol – Version 6, August 11, 2018)

Project Start Date: December 4, 2019

Project Location: Des Moines, IA

Project Operator Name: Trees Forever

Project Operator Contact Information:

Megan Schneider

Director of Programs Des Moines Metro

515-776-0335

Mschneider@treesforever.org

PROJECT AND PLANTING DESIGN UPDATES

Include information on changes to the project including tree survival, ownership, or other relevant updates.

Tree planting projects for the Growing Futures project occurred throughout the City of Des Moines from April – December of 2019. Tree planting locations were a mix of street tree (right of way) and park plantings, with a major focus on street tree plantings. Tree planting totals for the 2019 season were: 731 trees, combination of overstory and understory. The Project Operator used the single tree planting design method.

Trees Forever is under contract with the City of Des Moines to plant the city's trees and works with the forestry department to target tree plantings. The main project goals were to increase tree equity across the city by targeting trees to under-resourced neighborhoods, working with volunteers to plant trees, and to complete major street corridor plantings. All trees planted are watered, pruned, and maintained by Trees Forever for two years following planting. Upon completion of the two year maintenance period, the City of Des Moines assumes tree maintenance responsibilities.

A total of 9 trees from the sample have been replaced over the six year period. Replacement trees were largely of the same size class as originally planted and did not require changes to the initial quantification tool and planting list. Trees Forever staff collected data on the 142 tree random sample and reported 27 vacant trees and 2 standing dead trees. The project has a current mortality status of 20%.

The initial total number of trees planted was decreased by 3 to correct double counting issues between various projects.

CARBON QUANTIFICATION DOCUMENTATION (Section 12 and Appendix B)

Describe and summarize the planting design, sampling, and appropriate quantification/measurement method for the project – Single Tree, Clustered, or Area Reforestation. Include the project's climate zone and method of data collection. Outline the estimated total number of credits to be issued to the project

over 25 years as well as the amount to be issued upon successful validation and verification in Year 4. Attach the quantification tool and appropriate sampling tool.

List of quantification Tools by planting method (CFC to provide guidance and resources):

- 1) Single Tree - single tree quantification tool
- 2) Clustered - cluster quantification tool
- 3) Area Reforestation - quantification with CO₂ calculated per acre

To ensure performance of the credits, Project Operators must commit to the following at Year 4, with additional requirements at Year 6 and after Year 25 based on the appropriate quantification method.

1) Single Tree

- a. Year 4: Project Operators must generate a random sample of project tree sites using the Single Tree Quantification Tool. Project Operators must visit those sampled tree sites and collect data on whether the sample contains a live tree, standing dead tree, or no tree. Provide geocoded photos or imaging of a minimum sample of 20% of the trees. The tracking file includes a column where each tree is assigned a unique serial number to help with tracking each coordinate and tree picture or image.
 - i. Based on this data, the number and species of project trees is adjusted and a new CO₂ projected amount by after Year 25 is generated.

2) Clustered

- a. Year 4: Project Operators provide images of the Project Area from any telemetry, imaging, remote sensing, i-Tree Canopy, or UAV service, such as Google Earth and estimate the area in tree canopy cover (acres). Imaging from Google Earth with leaf-on may be used. Project Operators will calculate the percent of canopy cover from the Google Earth imaging. Projects can use i-Tree Canopy and point sampling to calculate canopy cover. Using i-Tree Canopy, continue adding points until the standard error of the estimate for both the tree and non-tree cover is less than 5%. i-Tree Canopy will supply you with the standard errors. If tree canopy cover is determined using another approach, such as image classification, a short description of the approach should be provided, as well as the QA/QC measures that were used. A tree cover classification accuracy assessment should be conducted, as with randomly placed points, and the percentage tree cover classification accuracy reported.
 - i. If the canopy coverage equals or exceeds 2.8% (400 trees per acre with an average canopy area of 3.14 square feet per tree (2-foot diameter of canopy) is 2.8% of an acre), then the credits projected in the Clustered Quantification Tool may be issued. If canopy coverage is below 2.8%, then the number of credits issued is reduced by the same percentage as the canopy coverage falls below 2.8%.

3) Area Reforestation (formerly Canopy planting design)

- a. Year 4: Project Operators must either conduct a physical tree count using plots or use imaging to determine canopy coverage at Year 4.

- i. *If the canopy coverage equals or exceeds 2.8% (400 trees per acre with an average canopy area of 3.14 square feet per tree (2-foot diameter of canopy) is 2.8% of an acre), then the credits projected in the Quantification Tool may be issued. If canopy coverage is below 2.8%, then the number of credits issued is reduced by the same percentage as the canopy coverage falls below 2.8%.*

Overview

Tree planting projects for the Growing Futures project occurred throughout the City of Des Moines from April – December of 2019. Tree planting locations were a mix of street tree (right of way) and park plantings, with a major focus on street tree plantings. Tree planting totals for the 2019 season were: 731 trees, combination of overstory and understory. The Project Operator used the single tree quantification method.

Data Collection

Trees Forever staff collected data on the 142 tree random sample spanning the City of Des Moines provided by City Forest Credits. The status of each tree was documented, along with a geotagged photo. After sampling was completed, the project has a current mortality status of 20%.

Attachments: Des Moines 2019 Midwest Credit Tool - Year 6

Carbon Quantification

Total number of trees planted	731
Project area (acres), if applicable	N/A
Total number of trees per acre, if applicable	N/A
Credits attributed to the project (tCO ₂ e)	1,829
Credits after mortality deduction (20% or insert observed mortality, if greater)	1,463
Contribution to Registry Reversal Pool Account (5%) (tCO ₂ e)	73
Total credits to be issued to the Project Operator (tCO₂e)	1391
Total credits requested to be issued at Year 6 (30%)	413

GHG Assertion:

Project Operator asserts that the Project results in GHG emissions mitigation of 1,391 tons CO₂e over the 25-year Project Duration. Project Operator asserts that, per Protocol guidelines, 30% of the Project GHG emissions mitigation is issued at Year 6, or 413 tons CO₂e.

The initial total number of trees planted was decreased by 3 to correct double counting issues between various projects.

The updated Projected CO₂ stored and credit issuance over 26 years is outlined below:

Single Tree Plantings	Projection at Initial Crediting	Updated Projection at Year 4
Total credits issued at Initial Crediting (10% CO ₂ (t))	157	157

Total credits to be issued at Year 4 (40% CO2 (t))	560	560
Total credits to be issued at Year 6 (30% CO2 (t))	420	413
Total credits to be issued at Year 26 (20% CO2 (t))	263	261
Total credits to be issued (tCO2e)	1400	1391

Attachment: Des Moines 2019 Midwest Credit Tool - Year 6

CO-BENEFITS QUANTIFICATION DOCUMENTATION (Section 12 and Appendix A)

Summarize co-benefit quantification and provide supporting documentation. If necessary, update the CFC-provided Co-Benefits Quantification spreadsheet to calculate updated rainfall interception, reduction of certain air compounds, and energy savings.

Ecosystem Services	Resource Units	Value
Rainfall Interception (m3/yr)	3,373.52	\$24,151.25
Air Quality (t/yr)	0.1079	\$500.07
Cooling – Electricity (kWh/yr)	107,658.08	\$8,173.30
Heating – Natural Gas (kBtu/yr)	1,576,606.29	\$15,347.84
Grand Total (\$/yr)		\$48,172.46

The initial co-benefits decreased slightly to correct double counting issues between various projects.

Attachment: Des Moines 2019 Midwest Credit Tool - Year 6

ADDITIONAL INFORMATION

Include additional information on changes to monitoring and reporting plans since the Initial Credit Planting Design Document was submitted.

There have been no changes to monitoring or reporting plans since the Initial Credit Phase.

SIGNATURE

Signed on September 25th in 2025, by Megan Schneider, Director of Programs, for Trees Forever.


Signature

Megan Schneider

Printed Name

515-776-0335

Phone

mschneider@treesforever.org

Email

ATTACHMENTS

For the Single Tree Planting Design:

- 1 - Carbon Quantification Year 4 Credit tool
- 2 - Tree Sampling Data
- 3 - Geocoded photos
- 4 - Project geospatial data (KML file or shapefile)

For the Cluster Planting Design

- 1 - Project Area imaging from any telemetry, imaging, or remote sensing service
- 2 - i-Tree Canopy report
- 3 - i-Tree Canopy source data
- 4 - Project geospatial data (KML file or shapefile)
- 5 - Carbon Quantification Year 4 Credit tool

For the Area Reforestation Planting Design (previously Canopy Design):

- Either:
 - 1 - Project Area imaging from any telemetry, imaging, or remote sensing service
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- Or:
 - 1 - Tree plot sampling data
 - 2 - Project geospatial data (KML file or shapefile)
 - 3 - Carbon Quantification Year 4 Credit tool
 - 4 - Summary of approach to quantifying the local CO₂ index

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	This copy assigned to INSERT ORGANIZATION NAME. Proprietary and confidential CFC information. Do not forward to third parties without CFC permission.																
2																	
3		The Single Tree Initial Credit Tool for the Midwest Climate Zone															
4		This document and all sheets ©City Forest Credits 2017-2023. All rights reserved															
5		The analyst can use this method to forecast the amount of CO2 (in metric tonnes, t) estimated to be stored by live project trees after 25 years for crediting. Project Operators will follow the Steps listed below to obtain an updated forecast at Year 4. Users will submit this spreadsheet to the Registry with other documentation to obtain Credits at Year 4.															
6																	
7																	
8																	
9		Steps															
10		1) Confirm that data on the numbers of trees planted by species in the Planting List (Table 1) is accurate. Update planting list if there are replacement trees. During Initial Crediting, the following data should have been collected on each planted tree: species, site id#, tree id# and location (latitude and longitude). We use the term “site” instead of “tree” because some planted trees may no longer be present in the sites where they were planted.															
11																	
12		2) The number of trees to sample will automatically be calculated on the Sample Size Calculator (Table 3, cell D10)															
13		3) Sample the specified number of trees (from Table 3, cell D10). Complete the Data Collection tab with data on sampled trees, including date of data collection, site status (Alive/Dead Standing/Vacant), and whether trees were replaced. Also indicate which trees photographed.															
14		4) The Credits tab will calculate the observed mortality rate (% of planted sites without trees in 25 years). If this exceeds the anticipated mortality rate used during initial crediting, the observed mortality rate will be used. Otherwise, the anticipated mortality rate will be used.															
15		5) Credits will be automatically calculated in Table 5, incorporating tree mortality and the 5% Reversal Pool Account deduction.															
16		6) Table 6 automatically infers the amount of CO ₂ stored after 25 years from the sample to the population of live trees.															
17		7) Table 7 automatically provides estimates of co-benefits for live trees after 25 years.															

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Directions
1) In Table 1 record the number of sites planted for each tree species.
2) If species are not listed, add them to the bottom of Table 1.

Table 1. Planting List

Scientific Name	Common Name	Tree-Type Abbreviation	No. Sites Planted
<i>Malus species</i>	apple	BDS	150
<i>Platanus occidentalis</i>	American sycamore	BDL	84
<i>Cercis canadensis</i>	eastern redbud	BDS	60
<i>Ulmus species</i>	elm	BDL	46
<i>Broadleaf Deciduous Small</i>	broadleaf deciduous small	BDS	45
<i>Gleditsia triacanthos inermis</i>	honeylocust, thornless	BDL	44
<i>Broadleaf Deciduous Large</i>	broadleaf deciduous large	BDL	31
<i>Tilia cordata</i>	littleleaf linden	BDM	31
<i>Quercus rubra</i>	northern red oak	BDL	29
<i>Liriodendron tulipifera</i>	tulip tree	BDL	26
<i>Quercus bicolor</i>	swamp white oak	BDL	27
<i>Gleditsia triacanthos</i>	honeylocust	BDM	24
<i>Quercus macrocarpa</i>	bur oak	BDL	22
<i>Syringa species</i>	lilac	BDS	22
<i>Quercus alba</i>	white oak	BDL	21
<i>Ostrya virginiana</i>	eastern hophornbeam	BDM	18
<i>Celtis occidentalis</i>	northern hackberry	BDL	15
<i>Syringa reticulata</i>	Japanese tree lilac	BDS	12
<i>Betula nigra</i>	river birch	BDM	9
<i>Acer saccharum</i>	sugar maple	BDL	6
<i>Ginkgo biloba</i>	ginkgo	BDM	4
<i>Quercus palustris</i>	pin oak	BDL	3
<i>Populus tremuloides</i>	quaking aspen	BDL	2
<i>Acer ginnala</i>	Amur maple	BDS	
<i>Acer negundo</i>	boxelder	BDM	
<i>Acer nigrum</i>	black maple	BDL	
<i>Acer palmatum</i>	Japanese maple	BDS	
<i>Acer platanoides</i>	Norway maple	BDL	
<i>Acer rubrum</i>	red maple	BDL	
<i>Acer saccharinum</i>	silver maple	BDL	
<i>Acer species</i>	maple	BDL	
<i>Aesculus glabra</i>	Ohio buckeye	BDL	
<i>Albizia julibrissin</i>	mimosa	BDS	
<i>Alnus species</i>	alder	BDM	
<i>Amelanchier canadensis</i>	serviceberry, shadblow	BDS	
<i>Amelanchier laevis</i>	serviceberry, Allegheny	BDM	
<i>Amelanchier spp.</i>	serviceberry, spp.	BDS	
<i>Betula papyrifera</i>	paper birch	BDL	
<i>Betula species</i>	birch	BDM	
<i>Broadleaf Deciduous Medium</i>	broadleaf deciduous medium	BDM	
<i>Broadleaf Evergreen Large</i>	broadleaf evergreen large	BEL	
<i>Broadleaf Evergreen Medium</i>	broadleaf evergreen medium	BEM	
<i>Broadleaf Evergreen Small</i>	broadleaf evergreen small	BES	
<i>Carya species</i>	hickory	BDL	
<i>Castanea dentata</i>	American chestnut	BDL	
<i>Catalpa species</i>	catalpa	BDL	
<i>Catalpa speciosa</i>	northern catalpa	BDL	
<i>Cercidiphyllum japonicum</i>	katsuratree	BDM	
<i>Cladrastis kentukea</i>	yellowwood	BDM	
<i>Conifer Evergreen Large</i>	conifer evergreen large	CEL	
<i>Conifer Evergreen Medium</i>	conifer evergreen medium	CEM	
<i>Conifer Evergreen Small</i>	conifer evergreen small	CES	
<i>Cornus florida</i>	flowering dogwood	BDS	
<i>Cornus species</i>	dogwood	BDS	
<i>Crataegus crusgalli</i>	hawthorn, cockspur	BDS	
<i>Crataegus spp.</i>	hawthorn, spp.	BDS	
<i>Crataegus viridis</i>	hawthorn, green	BDM	
<i>Fraxinus americana</i>	white ash	BDL	
<i>Fraxinus nigra</i>	black ash	BDM	
<i>Fraxinus pennsylvanica</i>	green ash	BDL	
<i>Fraxinus species</i>	ash	BDM	
<i>Gymnocladus dioicus</i>	Kentucky coffeetree	BDL	
<i>Hibiscus syriacus</i>	rose-of-sharon	BDS	
<i>Ilex opaca</i>	American holly	BES	
<i>Ilex species</i>	holly	BES	
<i>Juglans nigra</i>	black walnut	BDL	
<i>Juniperus species</i>	juniper	CEM	
<i>Juniperus virginiana</i>	eastern red cedar	CEM	
<i>Liquidambar styraciflua</i>	sweetgum	BDL	
<i>Magnolia grandiflora</i>	southern magnolia	BEM	
<i>Magnolia virginiana</i>	sweetbay	BEM	
<i>Malus spp.</i>	crabapple, flowering	BDS	
<i>Morus alba</i>	white mulberry	BDM	
<i>Morus species</i>	mulberry	BDM	
<i>Nyssa sylvatica</i>	blackgum	BDM	
<i>Parrotia persica</i>	persian ironwood	BDS	
<i>Phellodendron amurense</i>	Amur corktree	BDM	
<i>Picea abies</i>	Norway spruce	CEL	
<i>Picea mariana</i>	black spruce	CEM	
<i>Picea pungens</i>	blue spruce	CEM	
<i>Picea species</i>	spruce	CEL	
<i>Pinus contorta</i>	Bolander beach pine	CES	
<i>Pinus nigra</i>	Austrian pine	CEM	

Table 2. Summary of Planting Sites

Tree-Type	Tree-Type Abbreviation	No. Sites Planted
Brdlf Decid Large (>50 ft)	BDL	356
Brdlf Decid Med (30-50 ft)	BDM	86
Brdlf Decid Small (<30 ft)	BDS	289
Brdlf Evgrn Large (>50 ft)	BEL	0
Brdlf Evgrn Med (30-50 ft)	BEM	0
Brdlf Evgrn Small (<30 ft)	BES	0
Conif Evgrn Large (>50 ft)	CEL	0
Conif Evgrn Med (30-50 ft)	CEM	0
Conif Evgrn Small (<30 ft)	CES	0
Total Sites Planted		731

redbud, eastern (<i>Cercis canadensis</i>)	59
planetree, London (<i>Platanus x acerif</i>	74
crabapple, flowering (<i>Malus</i> spp.)	149

Table 3. Sample Size Calculator

Description	Value
1) Margin of Error (15% required)	15%
2) Confidence level (95% required)	95%
3) Total number of project sites	731
4) Mean stored CO ₂ per tree (kg)	1003
5) Standard deviation of stored CO ₂ (kg)	729
6) Expected proportion of tree survival (75% required)	75%
Calculated sample size	142

Use the Sample Size Calculator that we provide to determine the number of sites to sample. We use the term “site” instead of “tree” because some planted trees may no longer be present in the sites where they were planted.

Directions

- 1) Margin of error, the default value of 15% is used.
- 2) Confidence level, the default value of 95% is used.
- 3) The total number of original sites is automatically filled in from the Planting List tab.
- 4) Mean stored CO₂ for all tree types 25 years after planting is automatically filled in from Table 4 below.
- 5) Standard deviation of the average CO₂ stored for all tree types 25 years after planting is automatically filled in from the Table 4.
- 6) Expected proportion of tree survival – for sampling purposes we conservatively estimate that 75% of the planted trees are expected to survive. This value is used as the default in the Sample Size Calculator.

Table 4. Stored CO₂ (kg) by tree type for years after planting in the Midwest climate zone.

Age	BDL	BDM	BDS	BEL	BEM	BES	CEL	CEM	CES	Avg.	Std. Dev.
5	91	53	65	104	44	13	13	25	47		
10	536	423	150	355	149	60	78	105	166		
15	1,357	1,015	248	843	348	149	299	249	313		
20	2,520	1,704	398	1,641	673	286	876	458	470		
25	3,979	2,451	700	2,800	1,159	475	2,145	724	632	1,003	729
30	5,678	3,307	1,376	4,341	1,847	720	2,145	1,039	795		
35	7,562	4,397	2,916	6,249	2,779	1,025	2,145	1,390	958		
40	9,573	5,938	6,338	8,468	4,006	1,392	2,145	1,765	1,119		

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Example Data Collection Table											
Data Collection Dates:			Crew: Megan Schneider								
Date Planted	Tree ID #	Species	Site ID #	Lat	Long	Address	Status	Replacement Tracker	Date Removed	Date Replaced	Notes
10/20/2019	1	<i>birch, river (Betula nigra)</i>	142361	41.56971532	-93.66474747	3660 Water Works Pkwy	Vacant				
9/11/2019	9	<i>tuliptree (Liriodendron tulipifera)</i>	142146	41.59004388	-93.6228473	600 4th St	Alive				
9/11/2019	10	<i>birch, river (Betula nigra)</i>	142147	41.58988038	-93.6228473	600 4th St	Alive	Replaced #1		9/11/2020	London Plane
5/15/2019	12	<i>crabapple, flowering (Malus spp.)</i>	141745	41.60774147	-93.6274936	713 College Ave	Alive				
5/15/2019	14	<i>crabapple, flowering (Malus spp.)</i>	141747	41.60774047	-93.62731389	1602 7th St	Alive				
5/15/2019	23	<i>crabapple, flowering (Malus spp.)</i>	141754	41.606847	-93.62825669	1530 8th St	Alive				
5/15/2019	25	<i>crabapple, flowering (Malus spp.)</i>	141751	41.60716388	-93.62825535	1540 8th St	Alive				
5/15/2019	27	<i>birch, river (Betula nigra)</i>	141761	41.60600568	-93.62705104	1501 7th St	Vacant				
4/20/2019	43	<i>oak, northern red (Quercus rubra)</i>	141728	41.5826296	-93.63633148	210 15th St	Alive				
6/1/2019	53	<i>honeylocust (Gleditsia triacanthos)</i>	38129	41.60475981	-93.64521378	1417 21st St	Alive				
6/1/2019	57	<i>oak, bur (Quercus macrocarpa)</i>	141742	41.60535788	-93.6453665	1432 21st St	Alive				
6/1/2019	61	<i>honeylocust (Gleditsia triacanthos)</i>	141738	41.60578406	-93.6453665	2028 Clark St	Alive				
7/24/2018	64	<i>oak, white (Quercus alba)</i>	37690	41.605684	-93.65710411	1445 29th St	Alive				
9/24/2019	72	<i>crabapple, flowering (Malus spp.)</i>	142157	41.61292288	-93.67186132	2016 40th Pl	Alive				
1/10/2019	73	<i>planetree, London (Platanus x acerifolia)</i>	16149	41.64034402	-93.67277237	4700 40th St	Alive				
6/23/2017	77	<i>Kentucky coffeetree (Gymnocladus dioicus)</i>	141132	41.58461117	-93.67390641	4142 Grand Ave	Alive				
7/11/2019	84	<i>honeylocust, thornless (Gleditsia triacanthos inermis)</i>	142343	41.59295566	-93.67366045	836 41st St	Alive				
11/9/2015	92	<i>crabapple, flowering (Malus spp.)</i>	142337	41.59429663	-93.67475345	918 42nd St	Alive				
11/9/2015	93	<i>crabapple, flowering (Malus spp.)</i>	142338	41.59429061	-93.67486342	918 42nd St	Alive				
11/9/2015	107	<i>oak, swamp white (Quercus bicolor)</i>	142477	41.59420124	-93.67552191	4215 Crocker St	Alive	Replaced #1		11/9/2016	Hackberry
6/5/2019	124	<i>redbud, eastern (Cercis canadensis)</i>	140915	41.62205241	-93.69469112	2930 56th St	Vacant				
1/17/2018	129	<i>crabapple, flowering (Malus spp.)</i>	140828	41.5188692	-93.62573798	900 Amos Ave	Alive				
11/11/2015	134	<i>planetree, London (Platanus x acerifolia)</i>	44282	41.59461274	-93.56790492	2600 Capitol Ave	Vacant				
6/1/2019	138	<i>linden, littleleaf (Tilia cordata)</i>	38136	41.60571592	-93.6452201	2028 Clark St	Alive				
11/23/2015	145	<i>planetree, London (Platanus x acerifolia)</i>	142395	41.60438707	-93.70159202	1408 Cummins Pkwy	Alive				
6/20/2018	146	<i>planetree, London (Platanus x acerifolia)</i>	15172	41.60509868	-93.70117582	1449 Cummins Pkwy	Alive				
6/27/2019	150	<i>planetree, London (Platanus x acerifolia)</i>	50667	41.58959808	-93.6095892	321 E 6th St	Vacant				Replaced, but not by Trees Forever
12/4/2015	157	<i>planetree, London (Platanus x acerifolia)</i>	142419	41.62011879	-93.57345044	2807 E 24th St	Vacant				
12/4/2015	159	<i>planetree, London (Platanus x acerifolia)</i>	142417	41.62055591	-93.57346385	2813 E 24th St	Vacant				
12/4/2015	165	<i>serviceberry, spp. (Amelanchier spp.)</i>	142427	41.62028321	-93.57357785	2809 E 24th St	Vacant				Replaced, but not by Trees Forever
12/4/2015	169	<i>viburnum, spp. (Viburnum spp.)</i>	142431	41.62015789	-93.57357651	2809 E 24th St	Alive				
12/4/2015	178	<i>planetree, London (Platanus x acerifolia)</i>	142412	41.62233141	-93.57059657	3001 E 25th St	Alive				
6/3/2019	181	<i>linden, littleleaf (Tilia cordata)</i>	141902	41.61811404	-93.51862439	2526 E 48th St	Alive				Replaced, but not by Trees Forever
7/24/2019	183	<i>crabapple, flowering (Malus spp.)</i>	142376	41.51555611	-93.62554833	903 Southdale Dr	Vacant				
7/24/2019	186	<i>crabapple, flowering (Malus spp.)</i>	142379	41.51631929	-93.62556442	7500 SW 9th St	Alive				
7/24/2019	187	<i>crabapple, flowering (Malus spp.)</i>	142380	41.51645385	-93.62556442	7500 SW 9th St	Alive				
12/14/2017	202	<i>planetree, London (Platanus x acerifolia)</i>	134361	41.58995222	-93.61434682	219 E Grand Ave	Vacant				
12/14/2017	205	<i>planetree, London (Platanus x acerifolia)</i>	134388	41.59002559	-93.61405433	219 E Grand Ave	Vacant				
6/26/2019	214	<i>hophornbeam, American (Ostrya virginiana)</i>	43428	41.61211657	-93.56273924	2754 E Jefferson Ave	Alive				
12/14/2017	220	<i>birch, river (Betula nigra)</i>	134447	41.58874475	-93.61363783	307 E 3rd St	Alive				
10/29/2019	224	<i>zz Vacant (zz Vacant)</i>	142294	41.61582436	-93.56804842	2336 Farwell Rd	Alive	Replaced #1		10/29/2020	Tuliptree
10/20/2019	225	<i>oak, swamp white (Quercus bicolor)</i>	142527	41.57264583	-93.63146185	4 Grays Lake Trl	Alive				
4/20/2019	229	<i>hawthorn, green (Crataegus viridis)</i>	34131	41.60400186	-93.63849779	1523 Forest Ave	Alive				
4/20/2019	242	<i>hophornbeam, American (Ostrya virginiana)</i>	34121	41.60263433	-93.63897235	1308 16th St	Alive				
4/20/2019	245	<i>hawthorn, green (Crataegus viridis)</i>	141588	41.6029757	-93.63895803	1600 Gillette St	Alive				
4/20/2019	248	<i>hophornbeam, American (Ostrya virginiana)</i>	34123	41.6032419	-93.63897481	1320 16th St	Alive				
12/11/2017	261	<i>Kentucky coffeetree (Gymnocladus dioicus)</i>	132374	41.58778841	-93.62389061	413 5th Ave	Alive				
5/4/2019	264	<i>elm, hybrid (Ulmus x)</i>	52121	41.5843721	-93.65985207	3101 Grand Ave	Alive				
5/4/2019	277	<i>Kentucky coffeetree (Gymnocladus dioicus)</i>	141154	41.58439014	-93.66333512	3407 Grand Ave	Alive				
5/4/2019	286	<i>hawthorn, green (Crataegus viridis)</i>	141115	41.58439801	-93.66504294	3524 Grand Ave	Alive				
5/4/2019	289	<i>hawthorn, spp. (Crataegus spp.)</i>	141121	41.58439799	-93.66487124	3511 Grand Ave	Alive				
5/4/2019	291	<i>hawthorn, spp. (Crataegus spp.)</i>	141501	41.58440507	-93.66468912	3448 Grand Ave	Alive				
5/1/2019	293	<i>redbud, eastern (Cercis canadensis)</i>	52112	41.58439216	-93.66439573	3448 Grand Ave	Dead Standing				
5/4/2019	296	<i>hawthorn, green (Crataegus viridis)</i>	52114	41.58439717	-93.66494425	3511 Grand Ave	Alive				
5/4/2019	304	<i>Kentucky coffeetree (Gymnocladus dioicus)</i>	10817	41.58456552	-93.66602491	3663 Grand Ave	Alive				
5/4/2019	318	<i>planetree, London (Platanus x acerifolia)</i>	52093	41.58456832	-93.66820984	3721 Grand Ave	Alive				
5/4/2019	324	<i>linden, littleleaf (Tilia cordata)</i>	141161	41.58442432	-93.66791449	3707 Grand Ave	Alive				
5/4/2019	326	<i>planetree, London (Platanus x acerifolia)</i>	142136	41.58458077	-93.66883943	3820 Grand Ave	Alive				
5/4/2019	327	<i>planetree, London (Platanus x acerifolia)</i>	142137	41.58458479	-93.66875092	3721 Grand Ave	Alive				
5/4/2019	328	<i>planetree, London (Platanus x acerifolia)</i>	142138	41.58458278	-93.66863022	3721 Grand Ave	Alive				
6/23/2017	340	<i>hawthorn, cockspur (Crataegus crusgalli)</i>	52104	41.58443467	-93.67111492	3930 Grand Ave	Alive				
11/20/2015	347	<i>redbud, eastern (Cercis canadensis)</i>	141170	41.58444705	-93.67134518	4004 Grand Ave	Alive				
6/23/2017	356	<i>sycamore, American (Platanus occidentalis)</i>	52103	41.58444971	-93.67199603	4006 Grand Ave	Alive	Replaced #1		6/23/2018	Elm
11/20/2015	363	<i>linden, littleleaf (Tilia cordata)</i>	141178	41.5844521	-93.67260525	4021 Grand Ave	Alive	Replaced #1		11/20/2016	Sycamore
8/2/2019	373	<i>oak, northern red (Quercus rubra)</i>	141306	41.56981766	-93.59436497	1507 Hartford Ave	Alive				
8/2/2019	375	<i>planetree, London (Platanus x acerifolia)</i>	141301	41.56986568	-93.59551921	1929 SE 14th St	Alive				
8/2/2019	380	<i>lilac, common (Syringa vulgaris)</i>	141523	41.57004643	-93.59332427	1540 Hartford Ave	Alive				
8/2/2019	382	<i>lilac, common (Syringa vulgaris)</i>	141525	41.57004241	-93.59342888	1540 Hartford Ave	Alive				
8/2/2019	384	<i>redbud, eastern (Cercis canadensis)</i>	141527	41.57006047	-93.59525278	1929 SE 14th St	Alive				
8/2/2019	391	<i>crabapple, flowering (Malus spp.)</i>	141518	41.57006047	-93.59292462	1540 Hartford Ave	Alive				
8/2/2019	392	<i>crabapple, flowering (Malus spp.)</i>	141519	41.57006047	-93.59299168	1540 Hartford Ave	Alive				
8/2/2019	394	<i>crabapple, flowering (Malus spp.)</i>	141521	41.57005044	-93.59306946	1540 Hartford Ave	Alive				
8/2/2019	397	<i>redbud, eastern (Cercis canadensis)</i>	141511	41.57004041	-93.59237745	1541 Hartford Ave	Alive	Replaced #1		8/2/2020	Honeylocust
8/2/2019	400	<i>crabapple, flowering (Malus spp.)</i>	141514	41.5700384	-93.59256252	1541 Hartford Ave	Dead Standing				
8/2/2019	401	<i>crabapple, flowering (Malus spp.)</i>	141458	41.57052	-93.588043	1601 Hartford Ave	Vacant				
8/2/2019	403	<i>crabapple, flowering (Malus spp.)</i>	141460	41.57045579	-93.58821466	1601 Hartford Ave	Vacant				
8/2/2019	411	<i>crabapple, flowering (Malus spp.)</i>	141470	41.57024385	-93.58903286	1601 Hartford Ave	Vacant				
8/2/2019	416	<i>crabapple, flowering (Malus spp.)</i>	141475	41.57016559	-93.58948883	1601 Hartford Ave	Vacant				
8/2/2019	418	<i>crabapple, flowering (Malus spp.)</i>	141477	41.57014151	-93.58968732	1601 Hartford Ave	Vacant				
8/2/2019	424	<i>lilac, common (Syringa vulgaris)</i>	141483	41.57007428	-93.59006685	1601 Hartford Ave	Alive				
8/2/2019	426	<i>lilac, common (Syringa vulgaris)</i>	141485	41.57007027	-93.59020096	1601 Hartford Ave	Vacant				
8/2/2019	427	<i>redbud, eastern (Cercis canadensis)</i>	141486	41.57005622	-93.59029752	1601 Hartford Ave	Alive				
8/2/2019	429	<i>redbud, eastern (Cercis canadensis)</i>	141488	41.57006425	-93.59044772	1601 Hartford Ave	Alive				
8/2/2019	430	<i>redbud, eastern (Cercis canadensis)</i>	141489	41.5700482	-93.5905121	1601 Hartford Ave	Alive				
8/2/2019	442	<i>lilac, common (Syringa vulgaris)</i>	141504	41.57003639	-93.59190002	1541 Hartford Ave	Vacant				
6/8/2019	447	<i>crabapple, flowering (Malus spp.)</i>	141633	41.61644652	-93.61591601	206 E Holcomb Ave	Alive	Replaced #1		6/8/2020	Honeylocust
6/8/2019	450	<i>crabapple, flowering (Malus spp.)</i>	141626	41.61629011	-93.61633175	203 E Holcomb Ave	Alive				
6/8/2019	472	<i>honeylocust, thornless (Gleditsia triacanthos inermis)</i>	141607	41.61640842	-93.61465269	312 E Holcomb Ave	Alive				
6/8/2019	473	<i>oak, northern red (Quercus rubra)</i>	141605	41.61639638	-93.61452931	312 E Holcomb Ave	Vacant				
6/8/2019	475	<i>oak, bur (Quercus macrocarpa)</i>	141603	41.61639638	-93.61434155	314 E Holcomb Ave	Alive				
6/8/2019	477	<i>serviceberry, spp. (Amelanchier spp.)</i>	22412	41.61628356	-93.61444446	317 E Holcomb Ave	Alive				
6/8/2019	478	<i>crabapple, flowering (Malus spp.)</i>	141612	41.61629	-93.61450873	317 E Holcomb Ave	Alive				
6/8/2019	480	<i>crabapple, flowering (Malus spp.)</i>	22413	41.61627628	-93.61430099	317 E Holcomb Ave	Alive				
6/8/2019	481	<i>crabapple, flowering (Malus spp.)</i>	141606	41.61629838	-93.61373986	409 E Holcomb Ave	Alive				
11/19/2015	485	<i>honeylocust, thornless (Gleditsia triacanthos inermis)</i>	142438	41.62234645	-93.57730478	2225 Hull Ave	Alive				
11/19/2015	486	<i>honeylocust, thornless (Gleditsia triacanthos inermis)</i>	142439	41.62234845	-93.57767358	2225 Hull Ave	Alive				
11/19/2015	492	<i>honeylocust, thornless (Gleditsia triacanthos inermis)</i>	30003	41.62234818	-93.57757876</						

6/8/2019	722	<i>lilac, Japanese tree (Syringa reticulata)</i>	141645	41.61536627	-93.61440643	317 Watson Ave	Alive				
6/8/2019	729	<i>lilac, Japanese tree (Syringa reticulata)</i>	141648	41.61536827	-93.61394643	407 Watson Ave	Alive				
6/8/2019	733	<i>crabapple, flowering (Malus spp.)</i>	141651	41.61537329	-93.61351192	2314 Saylor Rd	Alive				
12/14/2017	734	<i>planetree, London (Platanus x acerifolia)</i>	134922	41.58265318	-93.62199856	512 Market St	Alive				

Alive

Vacant

Dead

113

27

2

	A	B	C	D	E	F	G	H	I	J	K	L
1	This copy assigned to INSERT ORGANIZATION NAME. Proprietary and confidential CFC information. Do not forward to third parties without CFC permission.											
2												
3		Directions										
4		Using the information you provide and background data, the tool calculates the amount of Credits that could be issued after planting (10%), at Year 4 (30%), at Year 6 (30%), at Year 14 (10%), and at Year 26 (20%). A mortality deduction (% loss) is applied to account for anticipated tree losses (Cell D6). A 5% Reversal Pool Account deduction is applied that will go into a program-wide pool to insure against catastrophic loss of trees. This tool is used to determine credits issued after planting (Initial Crediting). A different tool is used for credit issuance in Years 4, 6, 14, and 26. The tool in those years requires calculation of a sample and collection of data on tree status in the sample sites.										
5												
6		Anticipated Mortality Deduction (%) at Initial Crediting		20%								
7		Observed Mortality (%) at Year 4		20.4%								
8		Table 5. Projected CO₂ stored by live trees 25 years after planting, issued at five times over the Project Duration. These values account for anticipated tree losses and the 5% Reversal Pool Account deduction.										
9												
10								10%	40%	30%	20%	
11			No. Sites Planted	No. Live Trees	Mortality Deduction (%)	25-yr CO₂ stored (kg/tree)	Total 25-yr CO₂ stored, includes Mortality and Reversal Pool Account Deduction (t)	Year 1 10% CO₂ (t)	Year 4 40% CO₂ (t)	Year 6 30% CO₂ (t)	Year 26 20% CO₂ (t)	
12		BDL	356	285	0.20	3,978.85	1076.5	107.65	430.61	322.96	215.30	
13		BDM	86	69	0.20	2,451.33	160.2	16.02	64.09	48.07	32.04	
14		BDS	289	231	0.20	700.27	153.8	15.38	61.52	46.14	30.76	
15		BEL	0	0	0.00	0.00	0.0	0.00	0.00	0.00	0.00	
16		BEM	0	0	0.00	0.00	0.0	0.00	0.00	0.00	0.00	
17		BES	0	0	0.00	0.00	0.0	0.00	0.00	0.00	0.00	
18		CEL	0	0	0.00	0.00	0.0	0.00	0.00	0.00	0.00	
19		CEM	0	0	0.00	0.00	0.0	0.00	0.00	0.00	0.00	
20		CES	0	0	0.00	0.00	0.0	0.00	0.00	0.00	0.00	
21			731	585	0.20	7,130.5	1390.5	139.05	556.22	417.16	278.11	
22												sumcheck
23						Credits issued	1391	157	560	413	261	1391

	A	B	C	D	E	F	G	H
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2								
3		In Table 4 the tool infers the amount of CO ₂ stored after 25 years from the sample to the population of live trees. Values in column H account for anticipated tree losses and the 5% Reversal Pool Account deduction.						
4								
5		Table 6. Grand Total CO₂ Stored after 25 years (all live trees, includes anticipated tree loss and Reversal Pool Account deduction)						
6		Tree-Type	No. Sites Planted	Mortality Deduction (%)	Total Live Trees After Mortality	25-yr CO₂ stored (kg/tree)	CO₂ Total - No Deductions (t)	Grand Total CO₂ with Deductions (t)
7		Brdlf Decid Large (>50 ft)	356	0.20	283	3,978.85	1,416.5	1,070.8
8		Brdlf Decid Med (30-50 ft)	86	0.20	68	2,451.33	210.8	159.4
9		Brdlf Decid Small (<30 ft)	289	0.20	230	700.27	202.4	153.0
10		Brdlf Evgrn Large (>50 ft)	0	0.20	0	0.00	0.0	0.0
11		Brdlf Evgrn Med (30-50 ft)	0	0.20	0	0.00	0.0	0.0
12		Brdlf Evgrn Small (<30 ft)	0	0.20	0	0.00	0.0	0.0
13		Conif Evgrn Large (>50 ft)	0	0.20	0	0.00	0.0	0.0
14		Conif Evgrn Med (30-50 ft)	0	0.20	0	0.00	0.0	0.0
15		Conif Evgrn Small (<30 ft)	0	0.20	0	0.00	0.0	0.0
16			731		582	7130	1,829.7	1,383.2

	A	B	C	D	E	F	G	H	I	J
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2										
3		Using the information you provide and background data, the tool provides estimates of co-benefits per year after 25 years.								
4										
5		Table 7. Co-Benefits <u>per year</u> after 25 years (all live trees, includes tree mortality)								
6		Ecosystem Services	Resource Units Totals	Total \$						
7		Rainfall Interception (m3/yr)	3,373.52	\$24,151.25						
8		Air Quality (t/yr)								
9		O3	0.0457	\$152.58						
10		NOx	0.0074	\$24.72						
11		PM10	0.0240	\$68.25						
12		Net VOCs	0.0308	\$254.52						
13		Air Quality Total	0.1079	\$500.07						
14		Energy (kWh/yr & kBtu/yr)								
15		Cooling - Electricity	107,685.08	\$8,173.30						
16		Heating - Natural Gas	1,576,606.29	\$15,347.84						
17		Energy Total (\$/yr)		\$23,521.14						
18		Grand Total (\$/yr)		\$48,172.46						
19										
20				\$1,252,483.88						