Afforestation/Reforestation Templates - Table of Contents

City Forest Credits
Afforestation and Reforestation Project Application

INSTRUCTIONS: Provide information about how the project meets the eligibility criteria as outlined in the City Forest Credits (CFC) Afforestation and Reforestation Protocol Version 12. Submit a draft application in word format to CFC before signing the final version. Include a map of the project area with the application. All project information will be shared on the public-facing project webpage on the Carbon Project Registry.

1. Project Name
For example: Ballinger Open Space Planting Project

[Enter text here]

2. Project Operator
Provide the name of organization/entity and contact information for the Project Lead

Organization/Entity: [Enter text here]
Address: [Enter text here]
City: [Enter text here]
State: [Enter text here]
Zip: [Enter text here]
Contact(s): [Enter text here]
Phone: [Enter text here]
Email: [Enter text here]

3. Project Location
Project must be in or adjacent to one of the following. Describe which one of the criteria the project meets and provide name of city, town, or jurisdiction where project is located.

- *Urban Area or Urban Cluster boundary per U.S. Census Bureau*
- *Boundary of any incorporated or unincorporated city or town*
- *Boundary of any planning area for a regional metropolitan planning agency or entity*
- *Within the boundary of land owned, designated, and used by a municipal or quasi-municipal entity for source water or watershed protection*
- *Within a transportation or utility right of way through one of above*

[Enter text here]

4. Project Description
Provide short narrative of the overall project goals, location where trees will be planted, land ownership or eligibility to receive credits, approximate number of trees or acres, main tree species, and project timeframe.

[Enter text here]

5. Project Impacts
Provide short narrative of the environmental, social, and health impacts this project will achieve. Examples include how the project addresses increased access to green spaces for under-resourced communities, flood control or watershed protection, benefits for human health and wellbeing, improved recreation opportunities, or protection of bird and wildlife habitat.

[Enter text here]

6. Planting Design and Quantification Method
Provide short narrative about the planting design and quantification method you will use for the project. Refer to Protocol Appendix A for more detail.

- *Single Tree Quantification Method: trees planted in a dispersed or scattered design that are planted at least 16.5 feet apart (i.e. street trees). This method requires tracking of individual trees and tree survival for sampling and quantification.*

- *Clustered Quantification Method: trees planted at least 16.5 feet apart but are relatively contiguous and designed to create canopy over an area (i.e park-like settings). This method requires tracking change in canopy, not individual tree survival.*

- *Area Reforestation Quantification Method: tree planting areas greater than 5 acres and where many trees are planted closer than 16.5 feet. Higher tree mortality is expected and the goals are to create canopy and a forest ecosystem. Project Operators have several quantification models to choose from, all of which produce a carbon index on a per-acre basis.*

[Enter text here]

7. Additional Information
Provide additional information about your project. If the Project is part of a larger program or planting effort, include one sentence with more information. Examples include collaboration with other partners or how this project fits into a regional initiative.

[Enter text here]

8. Map
Provide a map of the Project Area.

Signed on [insert month and date] in 2024, by [insert name and title of person authorized to sign], for [insert Project Operator name].

_____
Signature

_____
Printed Name

_____
Phone

_____
Email

[Insert Project Name]
Initial Project Design Document

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PROTOCOL REQUIREMENTS

Project Operator (Section 1.1)
Identify a Project Operator for the project. A Project requires one Project Operator, which can be an entity organized and licensed under the laws of its jurisdiction or a governmental body. This is the entity who takes legal responsibility for the project and its reporting.

Commit to 26-year Project Duration in the Project Implementation Agreement (Section 1.3, 2.2)
Sign the Project Implementation Agreement. This is the 26-year agreement between the Project Operator and City Forest Credits (the "Registry") for an urban forest carbon project.

Project Location (Section 1.4)
Project must be located in or along the boundary of one of the following:

A. "Urban Area" per Census Bureau maps;
B. The boundary of any incorporated city or town created under the law of its state;
C. The boundary of any unincorporated city, town, or unincorporated urban area created or designated under the law of its state;
D. The boundary of any regional metropolitan planning agency or council established by legislative action or public charter;
E. Within the boundary of land owned, designated, and used by a municipal or quasi-municipal entity for source water or watershed protection;
F. Within a transportation, power transmission, or utility right of way, provided the right of way begins, ends, or passes through some portion of above criteria.

Ownership or Eligibility to Receive Potential Credits (Section 1.7)
The Project Operator must demonstrate ownership of property and eligibility to receive potential credits by meeting at least one of the following:

A. Own the land, the trees, and potential credits upon which the Project trees are located; or
B. Own an easement or equivalent property interest for a public right of way within which Project trees are located, own the Project trees and credits within that easement, and accept ownership of those Project trees by assuming responsibility for maintenance and liability for them; or
C. Have a written and signed agreement from the landowner granting ownership to the Project Operator of any credits for carbon storage or other benefits delivered by Project trees on that landowner's land. If Project trees are on private property, this agreement, or notice thereof, must be recorded in the property records of the county in which the land containing Project trees is located.

Defining the Project Area (Section 1.5)
Project Operators may include more than one planting site in a project. The initial planting of trees for all properties in a project must occur within a 36-month period or less. Project Operators may include multiple properties under one project.

Additionality (Section 4)
Project Operators must demonstrate compliance with the following additionality requirements:

- A Legal Requirements Test that declares city trees planted due to an enacted law or ordinance not eligible, except for replacement trees planted in place of removed trees for specific reasons (Section 1.8);

- Either 1) a project-specific baseline or 2) the current version of the Registry's performance standard baseline developed in adherence with the WRI GHG Protocol (CFC Standard), supplemented by local canopy change data;
- Sign and comply with a Project Implementation Agreement with the Registry that requires a 26-year Project Duration.

Project Operators must also sign an Attestation of Additionality stating that its 26-year Project Duration commitment is additional to and longer than any commitment it makes to non-carbon project tree plantings, as well as provide information on financial additionality and prior consideration.

Planting Designs and Quantification for Credits (Section 1.2, 10, Appendix A)
All Projects must use one of three different methods for quantifying CO_2. The quantification method used depends on the planting design. The Registry has developed spreadsheets and methods for Project Operators. The quantification methods include:

- Single Tree Quantification Method: trees planted in a dispersed or scattered design that are planted at least 16.5 feet apart (i.e. street trees). This method requires tracking of individual trees and tree survival for sampling and quantification.
- Clustered Quantification Method: trees planted at least 16.5 feet apart but are relatively contiguous and designed to create canopy over an area (i.e. park-like settings). This method requires tracking change in canopy, not individual tree survival.
- Area Reforestation Quantification Method: tree planting areas greater than 5 acres and where many trees are planted closer than 16.5 feet. Higher tree mortality is expected and the goals are to create canopy and a forest ecosystem. Project Operators have several quantification models to choose from, all of which produce a carbon index on a per-acre basis.

Attestation of No Net Harm and No Double Counting (Section 5)
Project Operators must sign an attestation that no project shall cause net harm and no project shall seek credits on trees, properties, or projects that have already received credits. The Project Operator must submit documentation showing no overlap of Project Trees or Project Area with any other registered urban forest carbon project.

Social Impacts (Section 11)
Project Operators will describe how the Project impacts contribute towards achievement of the global UN Sustainable Development Goals (SDGs). The Registry will supply a template to evaluate how the Project aligns with the SDGs.

Validation and Verification by Third-Party Verifiers (Sections 12 & Appendix B)
Project compliance and quantification must be verified by a third-party verifier known as a Validation and Verification Body approved by the Registry.

Issuance of Ex Ante City Forest Carbon Forward Removal Credits to Project Operator (Section 6)
The forecasted amount of CO_2 stored during the project duration is the value from which the Registry issues ex ante City Forest Carbon Forward Removal Credits™. To ensure performance of the credits, the Registry issues credits at five times during the 26-year Project Duration:

- 10% of projected credits after planting

- 30% of projected credits at Year 4
- 30% of projected credits at Year 6
- 10% of projected credits at Year 14
- Remaining credits issued based on quantification of CO_2e at Year 26

Credits for Reversal Pool Account (Section 6.2)
The Registry will issue 95% of Project credits earned and requested and will hold 5% in the Registry's Reversal Pool Account.

Understand Reversals (Section 8)
If the Project Area loses credited carbon stock, the Project Operator must return or compensate for those credits if the tree loss is due to intentional acts or gross negligence of Project Operator. If tree loss is due to fire, pests, or other acts of god (i.e., not due to the Project Operator's intentional acts or gross negligence), the Registry covers the reversed credits from its Reversal Pool Account of credits held back from all projects.

Commit to Monitoring and Reporting (Section 7)
Project Operators must submit an annual monitoring report to the Registry every year for the Project Duration. The reports must be in writing, and the Project Operator must attest to the accuracy of the reports.

Tree Sampling, Measurement, and Imaging Requirements (Appendix A)
To ensure performance of the credits, Project Operators must commit to the following at Years 4, 6, 14, and 26 based on the appropriate quantification method.

Single Tree

1) Initial Credit: Use the carbon quantification tool which contains a worksheet called "Data Collection" for use in tracking each tree. In that file or another tree inventory system, document the GPS coordinates for each tree planted.
2) Years 4 and 6: 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. 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.
    a. Based on this data, the number and species of project trees is adjusted and a new CO2 projected amount by Year 26 is generated.
3) Year 14: Project Operators must follow the same process as stated above for Years 4 and 6, except they must also measure DBH on the sample of trees. The DBH will be used to ensure growth curve consistent with the projected CO2 storage at Year 26.
    a. If the actual growth curves of project trees are less than was projected, the number of credits issued at Year 14 will be adjusted downward.
4) Year 26: Project Operators must generate a random sample of project trees and measure DBH on the sample of trees. The DBH will be used to calculate CO2 storage at that time. Project Operators must also submit geocoded photos of the sampled trees.
    a. Credits may be issued based on the actual CO2 storage at Year 26, minus credits already issued.

INSTRUCTIONS

Project Operators must complete and submit this Initial Credit Project Design Document (PDD) to request credits after the last tree in a project has been planted. 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 amendment to the Project Design Document will need to be submitted for future verification at years 4, 6, 14, and 26.

The Protocol Requirements below are a list of eligibility requirements for informational purposes which are also found in more detail in the CFC Afforestation/Reforestation Protocol Version 12, dated February 29, 2024.

Project Operators should enter data and supporting attachments starting on page 9 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 project:

1. Regional Map
2. Project Area Map
3. Project Area Geospatial Data (shapefile or KML file)
4. Attestation of Land Ownership or Agreement to Transfer Credits
5. Attestation of Planting
6. Attestation of Planting Affirmation
7. Attestation of Additionality
8. Local Canopy Change Data
9. If applicable: Notice of Intent
10. Attestation of No Net Harm and Attestation of No Double Counting of Credits
11. No Double Counting Evidence
12. Carbon Quantification Initial Credits Tool
13. Tree Data (list of trees planted with species, date of planting, GPS coordinates, tree ID and site ID)
14. Social Impact Report
15. Project or Performance Standard Baseline (Appendix A)
16. Quantifying Carbon Dioxide Storage and Co-Benefits (Appendix A)

PROJECT OVERVIEW

Project Name: [Enter text here]
Project Number: [Enter number here from Project Implementation Agreement]
Project Type: Planting Project (under the Afforestation and Reforestation Protocol – version 12, dated February 29, 2024)
Project Start Date: [Enter date last tree was planted]
Project Location: [Enter name of city, town, or jurisdiction, and state]

Project Operator Name: [Enter text here]
Project Operator Contact Information: [Enter name, title, phone number and email address for Project Operator contact person]

Project Description
Describe overall project goals as summarized in the Project Application (2 paragraphs max). Include how many trees were planted, where trees were planted, and the date range for when trees were planted.

[Enter text here]

LOCATION (Section 1.4)

Project Location
Describe the city, town, or jurisdiction where the Project is located. State which urban location criteria is met from Protocol Section 1.4.

[Enter text here]

Project Area Maps
Provide three maps of the Project Area that illustrate the location: geospatial location, regional, and detailed. Maps should include project title, relevant urban or town boundaries, and indicate where trees were planted, and a legend. If the number of trees planted is too dense to show as single points, they can be represented as a heat map or graduated colors map. Include numbered filename of attachments (Ex: 1 Regional Map).

- Project Area Map
  Location of planting sites for Single Tree, boundaries of Project Area for Cluster or Area Reforestation, provide as KML, KMZ, or shapefile format
  Attachment: [Enter text here]

- Regional Map
  Attachment: [Enter text here]

OWNERSHIP OR ELIGIBILITY TO RECEIVE POTENTIAL CREDITS (Section 1.7)

Project Operator must demonstrate ownership of potential credits or eligibility to receive potential credits. If the Project Operator is not the same as the landowner of the Project Area, provide agreement(s) between Project Operator and landowner authorizing Project Operator to execute this project. Include relevant documentation including numbered filename as an attachment.

Name of landowner of Project Area and explanation:
[Enter text here]

Attachment: [Enter text here]

PROJECT DURATION (Section 1.3, 2.2)

Project Operator commits to the 26-year project duration requirement through a signed Project Implementation Agreement with City Forest Credits and agrees to the statement below.

Project Operator has committed to the 26-year project duration and signed a Project Implementation Agreement with City Forest Credits on [Enter date].

ATTESTATION OF PLANTING AND PLANTING AFFIRMATION (Section 3)

Complete and attach the following attestations: 1) Attestation of Planting, including supporting documentary evidence of how trees were paid for and who planted them such as invoices and event photos, 2) Attestation of Planting Affirmation, signed by a representative of a participating organization that can attest to the tree planting. Provide any additional notes as relevant.

Project Operator has signed the Attestation of Planting and provided supporting documentary evidence of planting. A participating organization in the tree planting, [insert name of participating organization(s)] has signed the Planting Affirmation.

Attachment: [Enter text here]

ADDITIONALITY (Section 4)

Additionality is demonstrated by the Project in several ways, as described in the City Forest Credits Standard Section 4.9.2 and Afforestation and Reforestation Protocol. Complete and attach 1) Attestation of Additionality and 2) Project-specific baseline or Performance Standard Baseline. If Project Operator elects to use it, the Performance Standard Baseline is provided as an Attachment to this PDD.

Additionality is demonstrated by Project Operators per the Protocol in the following ways and in the Attestation of Additionality.

- Project trees are not required by law or ordinance to be planted, except for replacement trees planted in place of removed trees for specific reasons (Protocol Section 1.8). See Attestation of Planting.

- The Project did not plant trees on sites that were forested and then cleared of trees within the prior ten years (Protocol Section 1.9)
- Project trees are additional based on a project-specific baseline or the Performance Standard Baseline attached to this PDD. If the latter case, Project Operator has provided local canopy change data to support the use of the Performance Standard Baseline.
- Project Operator has signed a Project Implementation Agreement with City Forest Credits for 26 years.
- The 26-year Project Duration commitment is additional to and longer than any commitment our organization makes to non-carbon project tree plantings.
- Project Operator has signed the Attestation of Additionality.
- The revenue from the sale of carbon credits will play a material role in the successful and durable storage of Project Trees' carbon stock by providing funding that will help ensure the establishment and long-term health of Project Trees. [Project Operator to enter additional text describing how the carbon revenues will be used, e.g., to pay to plant trees, to pay for establishment of trees in the first 6 years, to pay for long-term maintenance, or to pay for other activities that will meaningfully improve or ensure planted trees' health and project success].

[Enter text providing information about when the Project Operator became aware of carbon crediting as a potential source of revenue for projects, and/or when it became aware of the work of City Forest Credits' program for smaller projects, and when carbon crediting was first introduced into the overall project scope. State also whether a Notice of Intent was signed]

[Enter text describing the findings from the analysis of the local canopy change data used to support the Performance Standard Baseline]

Attachment: [Enter Attestation Attachment text here]

Attachment: [Enter Project-specific or Performance Standard Baseline text here]

Attachment: [Enter Local Canopy Change Data Attachment text here]

If applicable: Attachment: [Enter Notice of Intent Attachment here]

PLANTING DESIGN AND CARBON QUANTIFICATION DOCUMENTATION (1.2, 10, Appendix A)

Describe the planting design and appropriate quantification method for the project – Single Tree, Clustered, or Area Reforestation. Include the project's climate zone and data collection. Outline the estimated total number of credits to be issued to the project over 26 years as well as the amount to be issued upon successful validation and verification in Year 1. Attach the quantification tool and provide the data you have collected for Project Trees.

Total number of trees planted	
Project area (acres), if applicable	N/A
Total number of trees per acre, if applicable	N/A
Credits attributed to the project (tCO2e)	
Credits after mortality deduction (20%)	

Contribution to Registry Reversal Pool Account (5%) (tCO2e)	
Total credits to be issued to the Project Operator (tCO2e)	
Total credits requested to be issued in Year 1 (10% of above)	

GHG Assertion:
Project Operator asserts that the Project results in GHG emissions mitigation of [Enter number] tons CO_2e over the 26-year Project Duration. Project Operator will provide tree survival and growth data, quantify tons CO_2e, and submit documentation for validation, verification, and credit issuance at Years 4, 6, 14, and 26, per the Afforestation and Reforestation Planting Protocol and Single Tree Planting Design and Quantification Method.

Project Operator asserts that, per Protocol guidelines, 10% of the Project GHG emissions mitigation is issued after initial tree planting, or [Enter number] tons CO_2e.

Explanation of Planting Design:
[Enter text here. State which planting design was used, how many trees were planted, the spacing between trees, the climate zone, and other relevant details about the planting design. Also include an explanation of data collected about the trees during initial planting.]

[If credit issuance was adjusted based on local canopy change data, add explanation here].

Attachment: [Enter text here]

CO-BENEFITS QUANTIFICATION DOCUMENTATION (Section 10 and Appendix A)

Summarize co-benefit quantification per year and provide supporting documentation. The Single Tree Initial Credit tool includes a Co-Benefits Quantification calculator for quantifying rainfall interception, reduction of certain air compounds, and energy savings.

Ecosystem Services	***Resource Units***	***Value***
Rainfall Interception (m3/yr)		
Air Quality (t/yr)		
Cooling – Electricity (kWh/yr)		
Heating – Natural Gas (kBtu/yr)		
Grand Total ($/yr)		

Co-benefits were quantified using CFC's Co-Benefits Quantification Calculator. These ecosystem services represent values in avoided costs of [$ Enter text here] annually when the trees reach 25 years of age.

Attachment: [Enter text here]

ATTESTATION OF NO DOUBLE COUNTING OF CREDITS AND NO NET HARM (Section 5)

Complete and attach the following attestation: 1) Attestation of No Double Counting of Credits and Attestation of No Net Harm. Provide a map that includes both the Project Area and the closest registered

urban forest afforestation or reforestation project based on the registered urban forest planting project database KML/Shapefile provided by CFC to demonstrate that the Project does not overlap with any existing urban forest carbon projects.

Project Operator has mapped the Project Trees against the registered urban forest planting project database and determined that there is no overlap of Project Trees with any registered urban forest afforestation or reforestation carbon project. [Optional: enter text here with any additional details].

Project Operator has signed the Attestation of No Double Counting of Credits and No Net Harm on [enter date].

Attachment: [Enter text here]

SOCIAL IMPACTS (Section 11)

Project Operators shall use the Carbon Project Social Impacts template to evaluate how their Project aligns with the UN Sustainable Development Goals (SDGs). CFC will provide the template. Summarize the three to five main SDGs attributed to this Project.

[Enter text here]

Attachment: [Enter text here]

MONITORING AND REPORTING (Section 7)

Throughout the Project Duration, the Project Operator must report on tree conditions across the Project Area through annual reports and with more detailed data at Years 4, 6, 14, and 26.

Monitoring Reports

Project Operator is required to submit an annual monitoring report on the anniversary of the date of the first Verification Report. For example, if the verification report is dated January 31, 2024, the first monitoring report will be due by January 31, 2025 and each January 31st thereafter for the duration of the project. CFC will provide the due dates for future monitoring reports to Project Operators after the first verification report is approved. Project Operators must submit reports in writing and must attest to the accuracy of the reports. The reports must contain any changes in eligibility status of the Project Operator and any significant tree loss. The information includes updates to land ownership, changes to project design, changes in implementation or management and changes in tree or canopy loss.

Future Project Design Documents and Reporting

Project Operator is required to submit an updated Project Design Document at Years 4, 6, 14, and 26, as well as sampling, measurement of trees or canopy coverage, and/or quantification of CO_2e. Project Operators will submit the updated documentation for request of credit issuance in lieu of a monitoring report that year.

Monitoring Plans

Confirm and describe your plans for annual monitoring of this project and specifics on how sampling, measurement, and imaging (see Protocol Requirements and Appendix A) will be conducted based on your project's quantification method.

[Enter text here]

PROJECT OPERATOR SIGNATURE

Signed on [insert month and date] in 2024, by [insert name and title of person authorized to sign], for [insert Project Operator name].

_____
Signature

_____
Printed Name

_____
Phone

_____
Email

ATTACHMENTS

Update the attachments list as appropriate for your project.

1. Regional Map
2. Project Area Map
3. Project Area Geospatial Data (shapefile or KML file)
4. Attestation of Land Ownership or Agreement to Transfer Credits
5. Attestation of Planting
6. Attestation of Planting Affirmation
7. Attestation of Additionality
8. Local canopy change data
9. If applicable: Notice of Intent
10. Attestation of No Net Harm and Attestation of No Double Counting of Credits
11. No Double Counting Evidence
12. Carbon Quantification Initial Credits Tool
13. Tree Data
14. Social Impact Report
15. Project or Performance Standard Baseline
16. Quantifying Carbon Dioxide Storage and Co-Benefits for Urban Tree Planting Projects (Appendix A)

Attachment

PERFORMANCE STANDARD BASELINE METHODOLOGY (Section 4)

There is a second additionality methodology set out in the WRI GHG Protocol guidelines – the Performance Standard methodology. This Performance Standard essentially allows the project developer, or in our case, the developers of the protocol, to create a performance standard baseline using the data from similar activities over geographic and temporal ranges.

The common perception, particularly in the United States, is that projects must meet a project specific test. Project-specific additionality is easy to grasp conceptually. The 2014 Climate Action Reserve urban forest protocol essentially uses project-specific requirements and methods.

However, the WRI GHG Protocol clearly states that either a project-specific test or a performance standard baseline is acceptable.[1] One key reason for this is that regional or national data can give a more accurate picture of existing activity than a narrow focus on one project or organization.

Narrowing the lens of additionality to one project or one tree-planting entity can give excellent data on that project or entity, which data can also be compared to other projects or entities (common practice). But plucking one project or entity out of its regional or national context ignores all comparable regional or national data. And that regional or national data may give a more accurate standard than data from one project or entity.

By analogy: one pixel on a screen may be dark. If all you look at is the dark pixel, you see darkness. But the rest of screen may consist of white pixels and be white. Similarly, one active tree-planting organization does not mean its trees are additional on a regional basis. If the region is losing trees, the baseline of activity may be negative regardless of what one active project or entity is doing. Here is the methodology described in the WRI GHG Protocol to determine a Performance Standard baseline, together with the application of each factor to urban forestry:

Table 2.1 Performance Standard Factors

WRI Performance Standard Factor	As Applied to Urban Forestry
Describe the project activity	Increase in urban trees
Identify the types of candidates	Cities and towns, quasi-governmental entities like utilities, watersheds, and educational institutions, and private property owners
Set the geographic scope (a national scope is explicitly approved as the starting point)	Could use national data for urban forestry, or regional data
Set the temporal scope (start with 5-7 years and justify longer or shorter)	Use 4-7 years for urban forestry
Identify a list of multiple baseline candidates	Many urban areas, which could be blended mathematically to produce a performance standard baseline

[1] WRI GHG Protocol, Chapter 2.14 at 16 and Chapter 3.2 at 19.

The Performance Standard methodology approves of the use of data from many different baseline candidates. In the case of urban forestry, those baseline candidates are other urban areas.[2]

As stated above, the project activity defined is obtaining an increase in urban trees. The best data to show the increase in urban trees via urban forest project activities is national or regional data on tree canopy in urban areas. National or regional data will give a more comprehensive picture of the relevant activity (increase in urban trees) than data from one city, in the same way that a satellite photo of a city shows a more accurate picture of tree canopy in a city than an aerial photo of one neighborhood. Tree canopy data measures the tree cover in urban areas, so it includes multiple baseline candidates such as city governments and private property owners. Tree canopy data, over time, would show the increase or decrease in tree cover.

Data on Tree Canopy Change over Time in Urban Areas

The CFC quantitative team determined that there were data on urban tree canopy cover with a temporal range of four to six years available from four geographic regions. The data are set forth below:

Table 2.2 Changes in Urban Tree Canopy (UTC) by Region (from Nowak and Greenfield, 2012, see footnote 7)

City	Abs Change UTC (%)	Relative Change UTC (%)	Ann. Rate (ha UTC/yr)	Ann. Rate (m2 UTC/cap/yr)	Data Years
EAST					
Baltimore, MD	-1.9	-6.3	-100	-1.5	(2001–2005)
Boston, MA	-0.9	-3.2	-20	-0.3	(2003–2008)
New York, NY	-1.2	-5.5	-180	-0.2	(2004–2009)
Pittsburgh, PA	-0.3	-0.8	-10	-0.3	(2004–2008)
Syracuse, NY	1.0	4.0	10	0.7	(2003–2009)
Mean changes	-0.7	-2.4	-60.0	-0.3	
Std Error	0.5	1.9	35.4	0.3	
SOUTH					
Atlanta, GA	-1.8	-3.4	-150	-3.1	(2005–2009)
Houston, TX	-3.0	-9.8	−890	-4.3	(2004–2009)
Miami, FL	-1.7	-7.1	-30	-0.8	(2003–2009)
Nashville, TN	-1.2	-2.4	-300	-5.3	(2003–2008)
New Orleans, LA	-9.6	-29.2	−1120	-24.6	(2005-2009)
Mean changes	-3.5	-10.4	-160.0	-7.6	
Std Error	1.6	4.9	60.5	4.3	
MIDWEST					
Chicago, IL	-0.5	-2.7	-70	-0.2	(2005–2009)
Detroit, MI	-0.7	-3.0	-60	-0.7	(2005–2009)

[2] See Nowak, et al. *"Tree and Impervious Cover Change in U.S. Cities,"* Urban Forestry and Urban Greening, 11 (2012), 21-30

City	Abs Change UTC (%)	Relative Change UTC (%)	Ann. Rate (ha UTC/yr)	Ann. Rate (m2 UTC/cap/yr)	Data Years
Kansas City, MO	-1.2	-4.2	-160	-3.5	(2003–2009)
Minneapolis, MN	-1.1	-3.1	-30	-0.8	(2003–2008)
Mean changes	-0.9	-3.3	-80.0	-1.3	
Std Error	0.2	0.3	28.0	0.7	
WEST					
Albuquerque, NM	-2.7	-6.6	-420	-8.3	(2006–2009)
Denver, CO	-0.3	-3.1	-30	-0.5	(2005–2009)
Los Angeles, CA	-0.9	-4.2	-270	-0.7	(2005–2009)
Portland, OR	-0.6	-1.9	-50	-0.9	(2005–2009)
Spokane, WA	-0.6	-2.5	-20	-1.0	(2002–2007)
Tacoma, WA	-1.4	-5.8	-50	-2.6	(2001–2005)
Mean changes	-1.1	-4.0	-140.0	-2.3	
Std Error	0.4	0.8	67.8	1.2	

These data have been updated by Nowak and Greenfield.[3] The 2012 data show that urban tree canopy is experiencing negative growth in all four regions. The 2018 data document continued loss of urban tree cover.

Table 3 of the 2018 article shows data for all states, with a national loss of urban and community tree cover of 175,000 acres per year during the study years of 2009-2014.

To put this loss in perspective, the total land area of urban and community tree cover loss during the study years totals 1,367 square miles – equal to the combined land area of New York City, Atlanta, Philadelphia, Miami, Boston, Cleveland, Pittsburgh, St. Louis, Portland, OR, San Francisco, Seattle, and Boise.

Even though there may be individual tree planting activities that increase the number of urban trees within small geographic locations, the performance of activities to increase tree cover shows a negative baseline. The Drafting Group did not use negative baselines for the Tree Planting Protocol, but determined to use baselines of zero.

Deployment of the Performance Standard baseline methodology for a City Forest Planting Protocol is supported by conclusions that make sense and are anchored in the real world:

- With the data showing that tree loss exceeds gains from planting, new plantings are justified as additional to that decreasing canopy baseline. In fact, the negative baseline would justify as additional any trees that are protected from removal.
- Because almost no urban trees are planted now with carbon as a decisive factor, urban tree planting done to sequester carbon is additional;
- Almost no urban trees are currently planted with a contractual commitment for monitoring. Maintenance of trees is universally an intention, one that is frequently reached when budgets are cut, as in the Covid-19 era. The 25-year commitment required by this Protocol is entirely

[3] Nowak et al. 2018. "Declining Urban and Community Tree Cover in the United States," *Urban Forestry and Urban Greening,* 32, 32-55

additional to any practice in place in the U.S. and will result in substantial additional trees surviving to maturity;

- Because the urban forest is a public resource, and because public funding falls far short of maintaining tree cover and stocking, carbon revenues will result in additional trees planted or in maintenance that will result in additional trees surviving to maturity;
- Because virtually all new large-scale urban tree planting is conducted by governmental entities or non-profits, or by private property developers complying with governmental regulations (which would not be eligible for carbon credits under our protocol), and because any carbon revenues will defray only a portion of the costs of tree planting, there is little danger of unjust enrichment to developers of city forest carbon projects.

Last, The WRI GHG Protocol recognizes explicitly that the principles underlying carbon protocols need to be adapted to different types of projects. The WRI Protocol further approves of balancing the stringency of requirements with the need to encourage participation in desirable carbon projects:

Setting the stringency of additionality rules involves a balancing act. Additionality criteria that are too lenient and grant recognition for "non-additional" GHG reductions will undermine the GHG program's effectiveness. On the other hand, making the criteria for additionality too stringent could unnecessarily limit the number of recognized GHG reductions, in some cases excluding project activities that are truly additional and highly desirable. In practice, no approach to additionality can completely avoid these kinds of errors. Generally, reducing one type of error will result in an increase of the other. Ultimately, there is no technically correct level of stringency for additionality rules. GHG programs may decide based on their policy objectives that it is better to avoid one type of error than the other.[4]

The policy considerations weigh heavily in favor of "highly desirable" planting projects to reverse tree loss for the public resource of city forests.

[4] WRI GHG Protocol, Chapter 3.1 at 19.

Attachment 14

QUANTIFYING CARBON DIOXIDE STORAGE AND CO-BENEFITS FOR URBAN TREE PLANTING PROJECTS (Appendix A)

Introduction

Ecoservices provided by trees to human beneficiaries are classified according to their spatial scale as global and local (Costanza 2008) (citations for Part Two are listed in References). Removal of carbon dioxide (CO_2) from the atmosphere by urban forests is global because the atmosphere is so well-mixed it does not matter where the trees are located. The effects of urban forests on building energy use is a local-scale service because it depends on the proximity of trees to buildings.

To quantify these and other ecoservices City Forest Credits (CFC) has relied on peer-reviewed research that has combined measurements and modeling of urban tree biomass, and effects of trees on building energy use, rainfall interception, and air quality. CFC has used the most current science available on urban tree growth in its estimates of CO_2 storage (McPherson et al., 2016a). CFC's quantification tools provide estimates of co-benefits after 25 years in Resource Units (i.e., kWh of electricity saved) and dollars per year. Values for co-benefits are first-order approximations extracted from the i-Tree Streets (i-Tree Eco) datasets for each of the 16 U.S. reference cities/climate zones (https://www.itreetools.org/tools/i-tree-eco) (Maco and McPherson, 2003). Modeling approaches and error estimates associated with quantification of CO_2 storage and co-benefits have been documented in numerous publications (see References below) and are summarized here.

Carbon Dioxide Storage

Project Operators must use one of three different methods for quantifying carbon dioxide (CO2) storage in urban forest carbon projects. Selection of the quantification method depends on the planting project design:

- Single Tree Method - trees planted in a dispersed or scattered design and that are planted at least 10 feet apart (i.e. street trees). This method requires tracking of individual trees and tree survival for sampling and quantification.
- Clustered Method - to trees planted at least 10 feet apart but are relatively contiguous and designed to create canopy over an area (i.e park-like settings). This method requires tracking change in canopy, not individual tree survival
- Area Reforestation Method – tree planting areas greater than 5 acres and where many trees are planted closer than 10 feet. Higher tree mortality is expected and the goals are to create canopy and a forest ecosystem. Project Operators have several quantification models to choose from, all of which produce a carbon index on a per-acre basis.

In all cases, the estimated amount of CO2 stored 26-years after planting is calculated. The forecasted amount of CO2 stored during this time is the value from which the Registry issues ex ante Carbon Forward Removal Credits.TM

To ensure performance of the credits, the Registry issues Carbon Forward Removal Credits at five times during the 26-year Project Duration:

- 10% after planting

- 30% in Year 4, after sampling and mortality check or imaging and calculating canopy
- 30% in Year 6, after sampling and mortality check or imaging and calculating canopy
- 10% in Year 14, after measuring sampled trees or imaging and calculating canopy and
- "True-up" credits at the end of the initial Project Duration in Year 26, when CO2e is quantified from tree measurement and final credits are issued for CO2e stored minus credits already issued.

The mortality checks at Years 4 and 6 correspond to nationality mortality data that shows increased survival rates after three years and six years.

The Registry will issue 95% of Project Credits earned and will hold 5% of total credits in the Registry's Reversal Pool Account. This 5% Reversal Pool Account deduction is applied in all three quantification methods before calculation of any crediting, with these funds going into a program-wide pool to insure against unavoidable reversals due to catastrophic loss of trees.

All ex-ante Carbon Forward Removal Credits convert to ex post City Forest Carbon+ Credits at Year 26 and are marked in the registry of credits.

Scientific Basis for Carbon Dioxide Quantification

Estimates of stored (amount accumulated over many years) and sequestered CO_2 (i.e., net amount stored by tree growth over one year) are based on the U.S. Forest Service's recently published technical manual and the extensive Urban Tree Database (UTD), which catalogs urban trees with their projected growth tailored to specific geographic regions (McPherson et al. 2016a, b). The products are a culmination of 14 years of work, analyzing more than 14,000 trees across the United States. Whereas prior growth models typically featured only a few species specific to a given city or region, the newly released database features 171 distinct species across 16 U.S. climate zones. The trees studied also spanned a range of ages with data collected from a consistent set of measurements. Advances in statistical modeling have given the projected growth dimensions a level of accuracy never before seen. Moving beyond just calculating a tree's diameter or age to determine expected growth, the research incorporates 365 sets of tree growth equations to project growth.

Users select their climate zone from the 16 U.S. climate zones (Fig. 1). Calculations of CO_2 stored are for a representative species for each tree-type that was one of the predominant street tree species per reference city (Peper et al., 2001). The "Reference city" refers to the city selected for intensive study within each climate zone (McPherson, 2010). About 20 of the most abundant species were selected for sampling in each reference city. The sample was stratified into nine diameter at breast height (DBH) classes (0 to 7.6, 7.6 to 15.2, 15.2 to 30.5, 30.5 to 45.7, 45.7 to 61.0, 61.0 to 76.2, 76.2 to 91.4, 91.4 to 106.7, and >106.7 cm). Typically 10 to 15 trees per DBH class were randomly chosen. Data were collected for 16 to 74 trees in total from each species. Measurements included: species name, age, DBH [to the nearest 0.1 cm (0.39 in)], tree height [to the nearest 0.5 m (1.64 ft.)], crown height [to the nearest 0.5 m (1.64 ft.)], and crown diameter in two directions [parallel and perpendicular to nearest street to the nearest 0.5 m (1.64 ft.)]. Tree age was determined from local residents, the city's urban forester, street and home construction dates, historical planting records, and aerial and historical photos.

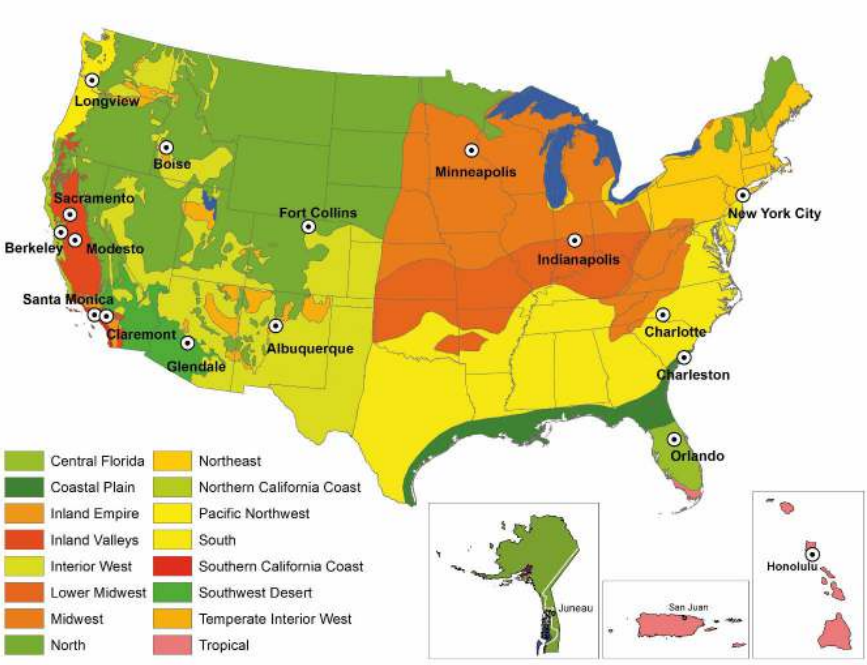

Figure 1. Climate zones of the United States and Puerto Rico were aggregated from 45 Sunset climate zones into 16 zones. Each zone has a reference city where tree data were collected. Sacramento, California was added as a second reference city (with Modesto) to the Inland Valleys zone. Zones for Alaska, Puerto Rico and Hawaii are shown in the insets (map courtesy of Pacific Southwest Research Station).

Species Assignment by Tree-Type

Representative species for each tree-type in the South climate zone (reference city is Charlotte, NC) are shown in Table 1. They were chosen because extensive measurements were taken on them to generate growth equations, and their mature size and form was deemed typical of other trees in that tree-type. Representative species were not available for some tree-types because none were measured. In that case, a species of similar mature size and form from the same climate zone was selected, or one from another climate zone was selected. For example, no Broadleaf Evergreen Large (BEL) species was measured in the South reference city. Because of its large mature size, *Quercus nigra* was selected to represent the BEL tree-type, although it is deciduous for a short time. *Pinus contorta*, which was measured in the PNW climate zone, was selected for the CES tree-type, because no CES species was measured in the South.

Table 1. Nine tree-types and abbreviations. Representative species assigned to each tree-type in the South climate zone are listed. The biomass equations (species, urban general broadleaf [UGB], urban general conifer [UGC]) and dry weight density (kg/m^3) used to calculate biomass are listed for each tree-type.

Tree-Type	Tree-Type Abbreviation	Species Assigned	DW Density	Biomass Equations
Brdlf Decid Large (>50 ft)	BDL	*Quercus phellos*	600	*Quercus macrocarpa* [1.]
Brdlf Decid Med (30-50 ft)	BDM	*Pyrus calleryana*	600	UGB [2.]
Brdlf Decid Small (<30 ft)	BDS	*Cornus florida*	545	UGB [2.]
Brdlf Evgrn Large (>50 ft)	BEL	*Quercus nigra*	797	UGB [2.]

Brdlf Evgrn Med (30-50 ft)	BEM	*Magnolia grandiflora*	523	UGB [2]
Brdlf Evgrn Small (<30 ft)	BES	*Ilex opaca*	580	UGB [2]
Conif Evgrn Large (>50 ft)	CEL	*Pinus taeda*	389	UGC [2]
Conif Evgrn Med (30-50 ft)	CEM	*Juniperus virginiana*	393	UGC [2]
Conif Evgrn Small (<30 ft)	CES	*Pinus contorta*	397	UGC [2]
[1] from Lefsky, M., & McHale, M.,2008. [2] from Aguaron, E., & McPherson, E. G., 2012				

Calculating Biomass and Carbon Dioxide Stored

To estimate CO_2 stored, the biomass for each tree-type was calculated using urban-based allometric equations because open-growing city trees partition carbon differently than forest trees (McPherson et al., 2017a). Input variables included climate zone, species, and DBH. To project tree size at 25-years after planting, we used DBH obtained from UTD growth curves for each representative species.

Biomass equations were compiled for 26 open-grown urban trees species from literature sources (Aguaron and McPherson, 2012). General equations (Urban Gen Broadleaf and Urban Gen Conifer) were developed from the 26 urban-based equations that were species specific (McPherson et al., 2016a). These equations were used if the species of interest could not be matched taxonomically or through wood form to one of the urban species with a biomass equation. Hence, urban general equations were an alternative to applying species-specific equations because many species did not have an equation.

These allometric equations yielded aboveground wood volume. Species-specific dry weight (DW) density factors (Table 1) were used to convert green volume into dry weight (7a). The urban general equations required looking up a dry weight density factor (in Jenkins et al. 2004 first, but if not available then the Global Wood Density Database). The amount of belowground biomass in roots of urban trees is not well researched. This work assumed that root biomass was 28% of total tree biomass (Cairns et al., 1997; Husch et al., 2003; Wenger, 1984). Wood volume (dry weight) was converted to C by multiplying by the constant 0.50 (Leith, 1975), and C was converted to CO_2 by multiplying by 3.667.

Error Estimates and Limitations

The lack of biometric data from the field remains a serious limitation to our ability to calibrate biomass equations and assign error estimates for urban trees. Differences between modeled and actual tree growth adds uncertainty to CO_2 sequestration estimates. Species assignment errors result from matching species planted with the tree-type used for biomass and growth calculations. The magnitude of this error depends on the goodness of fit in terms of matching size and growth rate. In previous urban studies the prediction bias for estimates of CO_2 storage ranged from -9% to +15%, with inaccuracies as much as 51% RMSE (Timilsina et al., 2014). Hence, a conservative estimate of error of ± 20% can be applied to estimates of total CO_2 stored as an indicator of precision.

Co-Benefit: Energy Savings

Trees and forests can offer energy savings in two important ways. In warmer climates or hotter months, trees can reduce air conditioning bills by keeping buildings cooler through reducing regional air temperatures and offering shade. In colder climates or cooler months, trees can confer savings on the fuel needed to heat buildings by reducing the amount of cold winds that can strip away heat.

Energy conservation by trees is important because building energy use is a major contributor to greenhouse gas emissions. Oil or gas furnaces and most forms of electricity generation produce CO_2 and other pollutants as by-products. Reducing the amount of energy consumed by buildings in urban areas is one of the most effective methods of combatting climate change. Energy consumption is also a costly burden on many low-income families, especially during mid-summer or mid-winter. Furthermore, electricity consumption during mid-summer can sometimes over-extend local power grids leading to rolling brownouts and other problems.

Energy savings are calculated through numerical models and simulations built from observational data on proximity of trees to buildings, tree shapes, tree sizes, building age classes, and meteorological data from McPherson et al. (2017) and McPherson and Simpson (2003). The main parameters affecting the overall amount of energy savings are crown shape, building proximity, azimuth, local climate, and season. Shading effects are based on the distribution of street trees with respect to buildings recorded from aerial photographs for each reference city (McPherson and Simpson, 2003). If a sampled tree was located within 18 m of a conditioned building, information on its distance and compass bearing relative to a building, building age class (which influences energy use) and types of heating and cooling equipment were collected and used as inputs to calculate effects of shade on annual heating and cooling energy effects. Because these distributions were unique to each city, energy values are considered first-order approximations.

In addition to localized shade effects, which were assumed to accrue only to trees within 18 m of a building, lowered air temperatures and windspeeds from increased neighborhood tree cover (referred to as climate effects) can produce a net decrease in demand for winter heating and summer cooling (reduced wind speeds by themselves may increase or decrease cooling demand, depending on the circumstances). Climate effects on energy use, air temperature, and wind speed, as a function of neighborhood canopy cover, were estimated from published values for each reference city. The percentages of canopy cover increase were calculated for 20-year-old large, medium, and small trees, based on their crown projection areas and effective lot size (actual lot size plus a portion of adjacent street and other rights-of-way) of 10,000 ft^2 (929 m^2), and one tree on average was assumed per lot. Climate effects were estimated by simulating effects of wind and air-temperature reductions on building energy use.

In the case of urban Tree Preservation Projects, trees may not be close enough to buildings to provide shading effects, but they may influence neighborhood climate. Because these effects are highly site-specific, we conservatively apply an 80% reduction to the energy effects of trees for Preservation Projects.

Energy savings are calculated as a real-dollar amount. This is calculated by applying overall reductions in oil and gas usage or electricity usage to the regional cost of oil and gas or electricity for residential customers. Colder regions tend to see larger savings in heating and warmer regions tend to see larger savings in cooling.

Error Estimates and Limitations

Formulaic errors occur in modeling of energy effects. For example, relations between different levels of tree canopy cover and summertime air temperatures are not well-researched. Another source of error stems from differences between the airport climate data (i.e., Los Angeles International Airport) used to model energy effects and the actual climate of the study area (i.e., Los Angeles urban area). Because of

the uncertainty associated with modeling effects of trees on building energy use, energy estimates may be accurate within ± 25 percent (Hildebrandt & Sarkovich, 1998).

Co-Benefit: Rainfall Interception

Forest canopies normally intercept 10-40% of rainfall before it hits the ground, thereby reducing stormwater runoff. The large amount of water that a tree crown can capture during a rainfall event makes tree planting a best management practice for urban stormwater control.

City Forest Credits uses a numerical interception model to calculate the amount of annual rainfall intercepted by trees, as well as throughfall and stem flow (Xiao et al., 2000). This model uses species-specific leaf surface areas and other parameters from the Urban Tree Database. For example, deciduous trees in climate zones with longer "in-leaf" seasons will tend to intercept more rainfall than similar species in colder areas shorter foliation periods. Model results were compared to observed patterns of rainfall interception and found to be accurate. This method quantifies only the amount of rainfall intercepted by the tree crown, and does not incorporate surface and subsurface effects on overland flow.

The rainfall interception benefit was priced by estimating costs of controlling stormwater runoff. Water quality and/or flood control costs were calculated per unit volume of runoff controlled and this price was multiplied by the amount of rainfall intercepted annually.

Error Estimates and Limitations

Estimates of rainfall interception are sensitive to uncertainties regarding rainfall patterns, tree leaf area and surface storage capacities. Rainfall amount, intensity and duration can vary considerably within a climate zone, a factor not considered by the model. Although tree leaf area estimates were derived from extensive measurements on over 14,000 street trees across the U.S. (McPherson et al., 2016a), actual leaf area may differ because of differences in tree health and management. Leaf surface storage capacity, the depth of water that foliage can capture, was recently found to vary threefold among 20 tree species (Xiao & McPherson, 2016). A shortcoming is that this model used the same value (1 mm) for all species. Given these limitations, interception estimates may have uncertainty as great as ± 20 percent.

Co-Benefit: Air Quality

The uptake of air pollutants by urban forests can lower concentrations and affect human health (Derkzen et al., 2015; Nowak et al., 2014). However, pollutant concentrations can be increased if the tree canopy restricts polluted air from mixing with the surrounding atmosphere (Vos et al., 2013). Urban forests are capable of improving air quality by lowering pollutant concentrations enough to significantly affect human health. Generally, trees are able to reduce ozone, nitric oxides, and particulate matter. Some trees can reduce net volatile organic compounds (VOCs), but others can increase them through natural processes. Regardless of the net VOC production, urban forests usually confer a net positive benefit to air quality. Urban forests reduce pollutants through dry deposition on surfaces and uptake of pollutants into leaf stomata.

A numerical model calculated hourly pollutant dry deposition per tree at the regional scale using deposition velocities, hourly meteorological data and pollutant concentrations from local monitoring stations (Scott et al., 1998). The monetary value of tree effects on air quality reflects the value that society places on clean air, as indicated by willingness to pay for pollutant reductions. The monetary value of air quality effects were derived from models that calculated the marginal damage control costs

of different pollutants to meet air quality standards (Wang and Santini 1995). Higher costs were associated with higher pollutant concentrations and larger populations exposed to these contaminants.

Error Estimates and Limitations

Pollutant deposition estimates are sensitive to uncertainties associated with canopy resistance, resuspension rates and the spatial distribution of air pollutants and trees. For example, deposition to urban forests during warm periods may be underestimated if the stomata of well-watered trees remain open. In the model, hourly meteorological data from a single station for each climate zone may not be spatially representative of conditions in local atmospheric surface layers. Estimates of air pollutant uptake may be accurate within ± 25 percent.

Conclusions

Our estimates of carbon dioxide storage and co-benefits reflect an incomplete understanding of the processes by which ecoservices are generated and valued (Schulp et al., 2014). Our choice of co-benefits to quantify was limited to those for which numerical models were available. There are many important benefits produced by trees that are not quantified and monetized. These include effects of urban forests on local economies, wildlife, biodiversity and human health and well-being. For instance, effects of urban trees on increased property values have proven to be substantial (Anderson & Cordell, 1988). Previous analyses modeled these "other" benefits of trees by applying the contribution to residential sales prices of a large front yard tree (0.88%) (McPherson et al., 2005). We have not incorporated this benefit because property values are highly variable. It is likely that co-benefits reported here are conservative estimates of the actual ecoservices resulting from local tree planting projects.

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[Insert Project Name]
Initial Project Design Document

Table of Contents

PROTOCOL REQUIREMENTS

Project Operator (Section 1.1)
Identify a Project Operator for the project. A Project requires one Project Operator, which can be an entity organized and licensed under the laws of its jurisdiction or a governmental body. This is the entity who takes legal responsibility for the project and its reporting.

Commit to 26-year Project Duration in the Project Implementation Agreement (Section 1.3, 2.2)
Sign the Project Implementation Agreement. This is the 26-year agreement between the Project Operator and City Forest Credits (the "Registry") for an urban forest carbon project.

Project Location (Section 1.4)
Project must be located in or along the boundary of one of the following:

A. "Urban Area" per Census Bureau maps;
B. The boundary of any incorporated city or town created under the law of its state;
C. The boundary of any unincorporated city, town, or unincorporated urban area created or designated under the law of its state;
D. The boundary of any regional metropolitan planning agency or council established by legislative action or public charter;
E. Within the boundary of land owned, designated, and used by a municipal or quasi-municipal entity for source water or watershed protection;
F. Within a transportation, power transmission, or utility right of way, provided the right of way begins, ends, or passes through some portion of above criteria.

Ownership or Eligibility to Receive Potential Credits (Section 1.7)
The Project Operator must demonstrate ownership of property and eligibility to receive potential credits by meeting at least one of the following:

A. Own the land, the trees, and potential credits upon which the Project trees are located; or
B. Own an easement or equivalent property interest for a public right of way within which Project trees are located, own the Project trees and credits within that easement, and accept ownership of those Project trees by assuming responsibility for maintenance and liability for them; or
C. Have a written and signed agreement from the landowner granting ownership to the Project Operator of any credits for carbon storage or other benefits delivered by Project trees on that landowner's land. If Project trees are on private property, this agreement, or notice thereof, must be recorded in the property records of the county in which the land containing Project trees is located.

Defining the Project Area (Section 1.5)
Project Operators may include more than one planting site in a project. The initial planting of trees for all properties in a project must occur within a 36-month period or less. Project Operators may include multiple properties under one project.

Additionality (Section 4)
Project Operators must demonstrate compliance with the following additionality requirements:

- A Legal Requirements Test that declares city trees planted due to an enacted law or ordinance not eligible, except for replacement trees planted in place of removed trees for specific reasons (Section 1.8);

- Either 1) a project-specific baseline or 2) the current version of the Registry's performance standard baseline developed in adherence with the WRI GHG Protocol (CFC Standard), supplemented by local canopy change data;
- Sign and comply with a Project Implementation Agreement with the Registry that requires a 26-year Project Duration.

Project Operators must also sign an Attestation of Additionality stating that its 26-year Project Duration commitment is additional to and longer than any commitment it makes to non-carbon project tree plantings, as well as provide information on financial additionality and prior consideration.

Planting Designs and Quantification for Credits (Section 1.2, 10, Appendix A)
All Projects must use one of three different methods for quantifying CO_2. The quantification method used depends on the planting design. The Registry has developed spreadsheets and methods for Project Operators. The quantification methods include:

- Single Tree Quantification Method: trees planted in a dispersed or scattered design that are planted at least 16.5 feet apart (i.e. street trees). This method requires tracking of individual trees and tree survival for sampling and quantification.

- Clustered Quantification Method: trees planted at least 16.5 feet apart but are relatively contiguous and designed to create canopy over an area (i.e. park-like settings). This method requires tracking change in canopy, not individual tree survival.

- Area Reforestation Quantification Method: tree planting areas greater than 5 acres and where many trees are planted closer than 16.5 feet. Higher tree mortality is expected and the goals are to create canopy and a forest ecosystem. Project Operators have several quantification models to choose from, all of which produce a carbon index on a per-acre basis.

Attestation of No Net Harm and No Double Counting (Section 5)
Project Operators must sign an attestation that no project shall cause net harm and no project shall seek credits on trees, properties, or projects that have already received credits. The Project Operator must submit documentation showing no overlap of Project Trees or Project Area with any other registered urban forest carbon project.

Social Impacts (Section 11)
Project Operators will describe how the Project impacts contribute towards achievement of the global UN Sustainable Development Goals (SDGs). The Registry will supply a template to evaluate how the Project aligns with the SDGs.

Validation and Verification by Third-Party Verifiers (Sections 12 & Appendix B)
Project compliance and quantification must be verified by a third-party verifier known as a Validation and Verification Body approved by the Registry.

Issuance of Ex Ante Carbon Forward Removal Credits to Project Operator (Section 6)
The forecasted amount of CO_2 stored during the project duration is the value from which the Registry issues ex ante Carbon Forward Removal Credits™. To ensure performance of the credits, the Registry issues credits at five times during the 26-year Project Duration:

- 10% of projected credits after planting
- 30% of projected credits at Year 4
- 30% of projected credits at Year 6
- 10% of projected credits at Year 14
- Remaining credits issued based on quantification of CO_2e at Year 26

Credits for Reversal Pool Account (Section 6.2)
The Registry will issue 95% of Project credits earned and requested and will hold 5% in the Registry's Reversal Pool Account.

Understand Reversals (Section 8)
If the Project Area loses credited carbon stock, the Project Operator must return or compensate for those credits if the tree loss is due to intentional acts or gross negligence of Project Operator. If tree loss is due to fire, pests, or other acts of god (i.e., not due to the Project Operator's intentional acts or gross negligence), the Registry covers the reversed credits from its Reversal Pool Account of credits held back from all projects.

Commit to Monitoring and Reporting (Section 7)
Project Operators must submit an annual monitoring report to the Registry every year for the Project Duration. The reports must be in writing, and the Project Operator must attest to the accuracy of the reports.

Tree Sampling, Measurement, and Imaging Requirements (Appendix A)
To ensure performance of the credits, Project Operators must commit to the following at Years 4, 6, 14, and 26 based on the appropriate quantification method.

1) Clustered
    a. Initial Credit: Use the carbon quantification tool and input data. In addition, Project Operators must provide maps of the site, with boundaries, as well as a map showing the site within a larger context of land area, such as within a neighborhood, city, or region. Project Operators must document the planting through photos or imaging. Select points and take geo-coded photos that when taken together capture the newly planted trees in the Project Area. If site is rectilinear, take a photo at each of the corners. If the site is large, take photos at points along the perimeter looking into the Project Area. If necessary to capture the trees, take photos facing each of the cardinal directions while standing in the middle of the Project Area. If site is nonrectilinear, identify critical points along property boundaries and take photographs at each point facing in towards the middle of the site. Next, take photographs from the middle of the Project Area facing out at each cardinal direction.
    b. 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%.

c. Year 6: Project Operators must follow the same process as stated above for Year 4.
   i. If the canopy coverage equals or exceeds 11.5% (400 trees per acre with an average canopy area of 12.56 square feet per tree (4-foot diameter of canopy) is 11.5% of an acre), then the credits projected in the Clustered Parks Quantification Tool may be issued. If canopy coverage is below 11.5%, then the number of credits issued is reduced by the same percentage as the canopy coverage falls below 11.5%.
d. Year 14: Project Operators must follow the same process as stated above for Years 4 and 6.
   i. If the canopy coverage equals or exceeds 46% (400 trees per acre with an average canopy area of 50 square feet per tree (8-foot diameter of canopy) is 46% of an acre), then the credits projected in the Clustered Quantification Tool may be issued. If canopy coverage is below 46%, then the number of credits issued is reduced by the same percentage as the canopy coverage falls below 46%.
e. Year 26: Project Operators must follow the same process as stated above for Years 4, 6, and 14.
   i. If the canopy coverage equals 100% of the Project Area at project outset, the credits projected in the Clustered Quantification Tool may be issued. If canopy coverage is below 100% of the Project Area, then the number of credits issued is reduced by the same percentage as the canopy coverage falls below 100%.

2) Area Reforestation
   a. Initial Credit: Project Operators must use local data or the GTR tables to demonstrate projected carbon storage by Year 26. In addition, Project Operators must provide maps of the site, with boundaries, as well as a map showing the site within a larger context of land area, such as within a neighborhood, city, or region. Project Operators must document the planting through photos or imaging. Select points and take geo-coded photos that when taken together capture the newly planted trees in the Project Area. If site is rectilinear, take a photo at each of the corners. If the site is large, take photos at points along the perimeter looking into the Project Area. If necessary to capture the trees, take photos facing each of the cardinal directions while standing in the middle of

the Project Area. If site is nonrectilinear, identify critical points along property boundaries and take photographs at each point facing in towards the middle of the site. Next, take photographs from the middle of the Project Area facing out at each cardinal direction.

b. 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%.
c. Year 6: Project Operators must either conduct a physical tree count using plots or use imaging to determine canopy coverage at Year 6.
    i. If the canopy coverage equals or exceeds 11.5% (400 trees per acre with an average canopy area of 12.56 square feet per tree (4-foot diameter of canopy) is 11.5% of an acre), then the credits projected in the Quantification Tool may be issued. If canopy coverage is below 11.5%, then the number of credits issued is reduced by the same percentage as the canopy coverage falls below 11.5%.
d. Year 14: Project Operators must either conduct a physical tree count using plots or use imaging to determine canopy coverage at Year 6.
    i. If the canopy coverage equals or exceeds 46% (400 trees per acre with an average canopy area of 50 square feet per tree (8-foot diameter of canopy) is 46% of an acre), then the credits projected in the Quantification Tool may be issued. If canopy coverage is below 46%, then the number of credits issued is reduced by the same percentage as the canopy coverage falls below 46%.
e. Year 26: Project Operators must either conduct a physical tree count using plots or use imaging to determine canopy coverage at Year 26.
    i. If the canopy coverage equals 100% of the Project Area at project outset, the credits projected in the Clustered Parks Quantification Tool may be issued. If canopy coverage is below 100% of the Project Area, then the number of credits issued is reduced by the same percentage as the canopy coverage falls below 100%.

INSTRUCTIONS

Project Operators must complete and submit this Initial Credit Project Design Document (PDD) to request credits after the last tree in a project has been planted. 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 amendment to the Project Design Document will need to be submitted for future verification at years 4, 6, 14, and 26.

The Protocol Requirements below are a list of eligibility requirements for informational purposes which are also found in more detail in the CFC Afforestation/Reforestation Protocol Version 12, dated February 29, 2024.

Project Operators should enter data and supporting attachments starting on page 9 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 project:

1. Regional Map
2. Project Area Map
3. Project Area Geospatial Data (shapefile or KML file)
4. Geocoded Photos – after planting
5. Attestation of Land Ownership or Agreement to Transfer Credits
6. Attestation of Planting
7. Attestation of Planting Affirmation
8. Attestation of Additionality
9. Local Canopy Change Data
10. If applicable: Notice of Intent
11. Attestation of No Net Harm and Attestation of No Double Counting of Credits
12. No Double Counting Evidence
13. Carbon Quantification Initial Credits Tool
14. Tree Data (as appropriate per quantification method. For Cluster, list of species planted, and quantity. For Area Reforestation, list of species planted, quantity, and documentation supporting projected carbon storage)
15. Planting Design Map (for cluster ONLY – general depiction of which species were planted where)
16. I-Tree Canopy Baseline report
17. I-Tree Canopy baseline data points
18. Co-Benefit Quantification Initial Credits Tool
19. Social Impact Report
20. Project or Performance Standard Baseline
21. Quantifying Carbon Dioxide Storage and Co-Benefits for Urban Tree Planting Projects (Appendix A)

PROJECT OVERVIEW

Project Name: [Enter text here]
Project Number: [Enter number here from Project Implementation Agreement]
Project Type: Planting Project (under the Afforestation and Reforestation Protocol – version 12, dated February 29, 2024)
Project Start Date: [Enter date last tree was planted]
Project Location: [Enter name of city, town, or jurisdiction, and state]

Project Operator Name: [Enter text here]
Project Operator Contact Information: [Enter name, title, phone number and email address for Project Operator contact person]

Project Description
Describe overall project goals as summarized in the Project Application (2 paragraphs max). Include how many trees were planted and number of acres planted, where trees were planted, and the date range for when trees were planted.

[Enter text here]

LOCATION (Section 1.4)

Project Location
Describe the city, town, or jurisdiction where the Project is located. State which urban location criteria is met from Protocol Section 1.4.

[Enter text here]

The reference address for this project is [enter text here; or if there are many properties, state how many parcels are included and provide all parcel numbers and/or addresses as a bulleted list].

Project Area Maps
Provide three maps of the Project Area that illustrate the location: geospatial location, regional, and detailed. Maps should include project title, relevant urban or town boundaries, and indicate where trees were planted as a defined Project Area, and a legend. Include numbered filename of attachments (Ex: 1 Regional Map).

- Project Area Map
  Location of planting sites for Single Tree, boundaries of Project Area for Cluster or Area Reforestation, provide as KML, KMZ, or shapefile format
  Attachment: [Enter text here]

- Regional Map
  Attachment: [Enter text here]

- [For Cluster ONLY] Planting Design Map
  Attachment: [Enter text here]

- Geo-coded Photos of Project Site, before and after planting

  Select points and take geo-coded photos that when taken together capture the newly planted trees in the Project Area. If site is rectilinear, take a photo at each of the corners. If the site is large, take photos at points along the perimeter looking into the Project Area. If necessary to capture the trees, take photos facing each of the cardinal directions while standing in the middle of the Project Area. If site is nonrectilinear, identify critical points along property boundaries and take photographs at each point facing in towards the middle of the site. Next, take photographs from the middle of the Project Area facing out at each cardinal direction. Provide photos as individual JPG files and/or embedded in a KML file.

  Attachment: [Enter text here]

OWNERSHIP OR ELIGIBILITY TO RECEIVE POTENTIAL CREDITS (Section 1.7)

Project Operator must demonstrate ownership of potential credits or eligibility to receive potential credits. If the Project Operator is not the same as the landowner of the Project Area, provide agreement(s) between Project Operator and landowner authorizing Project Operator to execute this project. Include relevant documentation including numbered filename as an attachment.

Name of landowner of Project Area and explanation:
[Enter text here]

If there are multiple landowners, complete the following table. If not, delete the table:

Landowner	Parcel Number	Description/Notes *Include Project Area acres for each parcel*
	Total Project Area	[*Enter Sum of Project Area acres*]

Attachment: [Enter text here]

PROJECT DURATION (Section 1.3, 2.2)

Project Operator commits to the 26-year project duration requirement through a signed Project Implementation Agreement with City Forest Credits and agrees to the statement below.

Project Operator has committed to the 26-year project duration and signed a Project Implementation Agreement with City Forest Credits on [Enter date].

ATTESTATION OF PLANTING AND PLANTING AFFIRMATION (Section 3)

Complete and attach the following attestations: 1) Attestation of Planting, including supporting documentary evidence of how trees were paid for and who planted them such as invoices and event photos, 2) Attestation of Planting Affirmation, signed by a representative of a participating organization that can attest to the tree planting. Provide any additional notes as relevant.

Project Operator has signed the Attestation of Planting and provided supporting documentary evidence of planting. A participating organization in the tree planting, [insert name of participating organization(s)] has signed the Planting Affirmation.

Attachment: [Enter text here]

ADDITIONALITY (Section 4)

Additionality is demonstrated by the Project in several ways, as described in the City Forest Credits Standard Section 4.9.2 and Afforestation and Reforestation Protocol. Complete and attach 1) Attestation of Additionality and 2) Project-specific baseline or Performance Standard Baseline. If Project Operator elects to use it, the Performance Standard Baseline is provided as an Attachment to this PDD.

Additionality is demonstrated by Project Operators per the Protocol in the following ways and in the Attestation of Additionality.

- Project trees are not required by law or ordinance to be planted, except for replacement trees planted in place of removed trees for specific reasons (Protocol Section 1.8). See Attestation of Planting.
- The Project did not plant trees on sites that were forested and then cleared of trees within the prior ten years (Protocol Section 1.9)
- Project trees are additional based on a project-specific baseline or the Performance Standard Baseline attached to this PDD. If the latter case, Project Operator has provided local canopy change data to support the use of the Performance Standard Baseline.
- Project Operator has signed a Project Implementation Agreement with City Forest Credits for 26 years.
- The 26-year Project Duration commitment is additional to and longer than any commitment our organization makes to non-carbon project tree plantings.
- Project Operator has signed the Attestation of Additionality.
- The revenue from the sale of carbon credits will play a material role in the successful and durable storage of Project Trees' carbon stock by providing funding that will help ensure the establishment and long-term health of Project Trees. [Project Operator to enter additional text describing how the carbon revenues will be used, e.g., to pay to plant trees, to pay for establishment of trees in the first 6 years, to pay for long-term maintenance, or to pay for other activities that will meaningfully improve or ensure planted trees' health and project success].

[Enter text providing information about when the Project Operator became aware of carbon crediting as a potential source of revenue for projects, and/or when it became aware of the work of City Forest Credits' program for smaller projects, and when carbon crediting was first introduced into the overall project scope. State also whether a Notice of Intent was signed]

[Enter text describing the findings from the analysis of the local canopy change data used to support the Performance Standard Baseline]

Attachment: [Enter Attestation Attachment text here]

Attachment: [Enter Project-specific or Performance Standard Baseline text here]

Attachment: [Enter Local Canopy Change Data Attachment text here]

If applicable: Attachment: [Enter Notice of Intent Attachment here]

PLANTING DESIGN AND CARBON QUANTIFICATION DOCUMENTATION (1.2, 10, Appendix A)

Describe the planting design and appropriate quantification method for the project – Single Tree, Clustered, or Area Reforestation. Include the project's climate zone and data collection. Outline the estimated total number of credits to be issued to the project over 26 years as well as the amount to be issued upon successful validation and verification in Year 1. Attach the quantification tool and provide the data you have collected for Project Trees.

Total number of trees planted	
Project area (acres)	
Total number of trees per acre	
Credits attributed to the project (tCO2e)	
Credits after mortality deduction (30% [N/A if Area Reforestation])	
Contribution to Registry Reversal Pool Account (5%) (tCO2e)	
Total credits to be issued to the Project Operator (tCO2e)	
Total credits requested to be issued in Year 1 (10% of above)	

GHG Assertion:
Project Operator asserts that the Project results in GHG emissions mitigation of [Enter number] tons CO_2e over the 26-year Project Duration. Project Operator will provide imaging of canopy growth over the Project Area, quantify tons CO_2e, and submit documentation for validation, verification, and credit issuance at Years 4, 6, 14, and 26, per the Tree Planting Protocol and [Select appropriate: Cluster/Area Reforestation] Planting Design and Quantification Method.

Project Operator asserts that, per Protocol guidelines, 10% of the Project GHG emissions mitigation is issued after initial tree planting, or [Enter number] tons CO_2e.

Explanation of Planting Design:
[Enter text here. State which planting design was used, how many trees and acres were planted, the spacing between trees, the climate zone, and other relevant details about the planting design. Also include an explanation of data collected about the trees during initial planting.

For area reforestation, include a description of how the tCO2/acre was determined.]

[If credit issuance was adjusted based on local canopy change data, add explanation here].

Attachment: [Enter text here]

CO-BENEFITS QUANTIFICATION DOCUMENTATION (Section 10 and Appendix A)

Summarize co-benefit quantification per year and provide supporting documentation. The Cluster Initial Credit tool includes a Co-Benefits Quantification calculator for quantifying rainfall interception, reduction of certain air compounds, and energy savings. For Area Reforestation, the Co-benefits Quantification calculator will be provided as a separate document.

Ecosystem Services	***Resource Units***	***Value***
Rainfall Interception (m3/yr)		
Air Quality (t/yr)		
Cooling – Electricity (kWh/yr)		
Heating – Natural Gas (kBtu/yr)		
Grand Total ($/yr)		

Co-benefits were quantified using CFC's Co-Benefits Quantification Calculator. These ecosystem services represent values in avoided costs of [$ Enter text here] annually when the trees reach 25 years of age.

Attachment: [Enter text here]

ATTESTATION OF NO DOUBLE COUNTING OF CREDITS AND NO NET HARM (Section 5)

Complete and attach the following attestation: 1) Attestation of No Double Counting of Credits and Attestation of No Net Harm. Provide a map that includes both the Project Area and the closest registered urban forest afforestation or reforestation project based on the registered urban forest planting project database KML/Shapefile provided by CFC to demonstrate that the Project does not overlap with any existing urban forest carbon projects.

Project Operator has mapped the Project Trees against the registered urban forest planting project database and determined that there is no overlap of Project Area or Project Trees with any registered urban forest afforestation or reforestation carbon project. [Optional: enter text here with any additional details].

Project Operator has signed the Attestation of No Double Counting of Credits and No Net Harm on [enter date].

Attachment: [Enter text here]

SOCIAL IMPACTS (Section 11)

Project Operators shall use the Carbon Project Social Impacts template to evaluate how their Project aligns with the UN Sustainable Development Goals (SDGs). CFC will provide the template. Summarize the three to five main SDGs attributed to this Project.

[Enter text here]

Attachment: [Enter text here]

MONITORING AND REPORTING (Section 7)

Throughout the Project Duration, the Project Operator must report on tree conditions across the Project Area through annual reports and with more detailed data at Years 4, 6, 14, and 26.

Monitoring Reports

Project Operator is required to submit an annual monitoring report on the anniversary of the date of the first Verification Report. For example, if the verification report is dated January 31, 2024, the first monitoring report will be due by January 31, 2025 and each January 31st thereafter for the duration of the project. CFC will provide the due dates for future monitoring reports to Project Operators after the first verification report is approved. Project Operators must submit reports in writing and must attest to the accuracy of the reports. The reports must contain any changes in eligibility status of the Project Operator and any significant tree loss. The information includes updates to land ownership, changes to project design, changes in implementation or management and changes in tree or canopy loss.

Future Project Design Documents and Reporting

Project Operator is required to submit an updated Project Design Document at Years 4, 6, 14, and 26, as well as sampling, measurement of trees or canopy coverage, and/or quantification of CO_2e. Project Operators will submit the updated documentation for request of credit issuance in lieu of a monitoring report that year.

Monitoring Plans

Confirm and describe your plans for annual monitoring of this project and specifics on how sampling, measurement, and imaging (see Protocol Requirements and Appendix A) will be conducted based on your project's quantification method.

[Enter text here]

PROJECT OPERATOR SIGNATURE

Signed on [insert month and date] in 2024, by [insert name and title of person authorized to sign], for [insert Project Operator name].

_____
Signature

_____
Printed Name

_____
Phone

_____
Email

ATTACHMENTS

Update the attachments list as appropriate for your project.

1. Regional Map
2. Project Area Map
3. Project Area Geospatial Data (shapefile or KML file)
4. Geocoded Photos – before planting
5. Geocoded Photos – after planting
6. Attestation of Land Ownership or Agreement to Transfer Credits
7. Attestation of Planting
8. Attestation of Planting Affirmation
9. Attestation of Additionality
10. Local canopy change data
11. If applicable: Notice of Intent
12. Attestation of No Net Harm and Attestation of No Double Counting of Credits
13. No Double Counting Evidence
14. Carbon Quantification Initial Credits Tool
15. Tree Data (as appropriate per quantification method. For Cluster, list of species planted, and quantity. For Area Reforestation, documentation supporting projected carbon storage)
16. Planting Design Map (for cluster ONLY – general depiction of which species were planted where)
17. I-Tree Canopy Baseline report
18. I-Tree Canopy baseline data points
19. Co-Benefit Quantification Initial Credits Tool
20. Social Impact Report
21. Project or Performance Standard Baseline
22. Quantifying Carbon Dioxide Storage and Co-Benefits for Urban Tree Planting Projects (Appendix A)

Attachment

PERFORMANCE STANDARD BASELINE METHODOLOGY (Standard, Section 4)

There is a second additionality methodology set out in the WRI GHG Protocol guidelines – the Performance Standard methodology. This Performance Standard essentially allows the project developer, or in our case, the developers of the protocol, to create a performance standard baseline using the data from similar activities over geographic and temporal ranges.

The common perception, particularly in the United States, is that projects must meet a project specific test. Project-specific additionality is easy to grasp conceptually. The 2014 Climate Action Reserve urban forest protocol essentially uses project-specific requirements and methods.

However, the WRI GHG Protocol clearly states that either a project-specific test or a performance standard baseline is acceptable.[1] One key reason for this is that regional or national data can give a more accurate picture of existing activity than a narrow focus on one project or organization.

Narrowing the lens of additionality to one project or one tree-planting entity can give excellent data on that project or entity, which data can also be compared to other projects or entities (common practice). But plucking one project or entity out of its regional or national context ignores all comparable regional or national data. And that regional or national data may give a more accurate standard than data from one project or entity.

By analogy: one pixel on a screen may be dark. If all you look at is the dark pixel, you see darkness. But the rest of screen may consist of white pixels and be white. Similarly, one active tree-planting organization does not mean its trees are additional on a regional basis. If the region is losing trees, the baseline of activity may be negative regardless of what one active project or entity is doing. Here is the methodology described in the WRI GHG Protocol to determine a Performance Standard baseline, together with the application of each factor to urban forestry:

Table 2.1 Performance Standard Factors

WRI Performance Standard Factor	As Applied to Urban Forestry
Describe the project activity	Increase in urban trees
Identify the types of candidates	Cities and towns, quasi-governmental entities like utilities, watersheds, and educational institutions, and private property owners
Set the geographic scope (a national scope is explicitly approved as the starting point)	Could use national data for urban forestry, or regional data
Set the temporal scope (start with 5-7 years and justify longer or shorter)	Use 4-7 years for urban forestry
Identify a list of multiple baseline candidates	Many urban areas, which could be blended mathematically to produce a performance standard baseline

[1] WRI GHG Protocol, Chapter 2.14 at 16 and Chapter 3.2 at 19.

The Performance Standard methodology approves of the use of data from many different baseline candidates. In the case of urban forestry, those baseline candidates are other urban areas.[2]

As stated above, the project activity defined is obtaining an increase in urban trees. The best data to show the increase in urban trees via urban forest project activities is national or regional data on tree canopy in urban areas. National or regional data will give a more comprehensive picture of the relevant activity (increase in urban trees) than data from one city, in the same way that a satellite photo of a city shows a more accurate picture of tree canopy in a city than an aerial photo of one neighborhood. Tree canopy data measures the tree cover in urban areas, so it includes multiple baseline candidates such as city governments and private property owners. Tree canopy data, over time, would show the increase or decrease in tree cover.

Data on Tree Canopy Change over Time in Urban Areas

The CFC quantitative team determined that there were data on urban tree canopy cover with a temporal range of four to six years available from four geographic regions. The data are set forth below:

Table 2.2 Changes in Urban Tree Canopy (UTC) by Region (from Nowak and Greenfield, 2012, see footnote 7)

City	Abs Change UTC (%)	Relative Change UTC (%)	Ann. Rate (ha UTC/yr)	Ann. Rate (m2 UTC/cap/yr)	Data Years
EAST					
Baltimore, MD	-1.9	-6.3	-100	-1.5	(2001–2005)
Boston, MA	-0.9	-3.2	-20	-0.3	(2003–2008)
New York, NY	-1.2	-5.5	-180	-0.2	(2004–2009)
Pittsburgh, PA	-0.3	-0.8	-10	-0.3	(2004–2008)
Syracuse, NY	1.0	4.0	10	0.7	(2003–2009)
Mean changes	-0.7	-2.4	-60.0	-0.3	
Std Error	0.5	1.9	35.4	0.3	
SOUTH					
Atlanta, GA	-1.8	-3.4	-150	-3.1	(2005–2009)
Houston, TX	-3.0	-9.8	−890	-4.3	(2004–2009)
Miami, FL	-1.7	-7.1	-30	-0.8	(2003–2009)
Nashville, TN	-1.2	-2.4	-300	-5.3	(2003–2008)
New Orleans, LA	-9.6	-29.2	−1120	-24.6	(2005-2009)
Mean changes	-3.5	-10.4	-160.0	-7.6	
Std Error	1.6	4.9	60.5	4.3	
MIDWEST					
Chicago, IL	-0.5	-2.7	-70	-0.2	(2005–2009)
Detroit, MI	-0.7	-3.0	-60	-0.7	(2005–2009)

[2] See Nowak, et al. *"Tree and Impervious Cover Change in U.S. Cities,"* Urban Forestry and Urban Greening, 11 (2012), 21-30

City	Abs Change UTC (%)	Relative Change UTC (%)	Ann. Rate (ha UTC/yr)	Ann. Rate (m2 UTC/cap/yr)	Data Years
Kansas City, MO	-1.2	-4.2	-160	-3.5	(2003–2009)
Minneapolis, MN	-1.1	-3.1	-30	-0.8	(2003–2008)
Mean changes	-0.9	-3.3	-80.0	-1.3	
Std Error	0.2	0.3	28.0	0.7	
WEST					
Albuquerque, NM	-2.7	-6.6	-420	-8.3	(2006–2009)
Denver, CO	-0.3	-3.1	-30	-0.5	(2005–2009)
Los Angeles, CA	-0.9	-4.2	-270	-0.7	(2005–2009)
Portland, OR	-0.6	-1.9	-50	-0.9	(2005–2009)
Spokane, WA	-0.6	-2.5	-20	-1.0	(2002–2007)
Tacoma, WA	-1.4	-5.8	-50	-2.6	(2001–2005)
Mean changes	-1.1	-4.0	-140.0	-2.3	
Std Error	0.4	0.8	67.8	1.2	

These data have been updated by Nowak and Greenfield.[3] The 2012 data show that urban tree canopy is experiencing negative growth in all four regions. The 2018 data document continued loss of urban tree cover.

Table 3 of the 2018 article shows data for all states, with a national loss of urban and community tree cover of 175,000 acres per year during the study years of 2009-2014.

To put this loss in perspective, the total land area of urban and community tree cover loss during the study years totals 1,367 square miles – equal to the combined land area of New York City, Atlanta, Philadelphia, Miami, Boston, Cleveland, Pittsburgh, St. Louis, Portland, OR, San Francisco, Seattle, and Boise.

Even though there may be individual tree planting activities that increase the number of urban trees within small geographic locations, the performance of activities to increase tree cover shows a negative baseline. The Drafting Group did not use negative baselines for the Tree Planting Protocol, but determined to use baselines of zero.

Deployment of the Performance Standard baseline methodology for a City Forest Planting Protocol is supported by conclusions that make sense and are anchored in the real world:

- With the data showing that tree loss exceeds gains from planting, new plantings are justified as additional to that decreasing canopy baseline. In fact, the negative baseline would justify as additional any trees that are protected from removal.
- Because almost no urban trees are planted now with carbon as a decisive factor, urban tree planting done to sequester carbon is additional;
- Almost no urban trees are currently planted with a contractual commitment for monitoring. Maintenance of trees is universally an intention, one that is frequently reached when budgets are cut, as in the Covid-19 era. The 25-year commitment required by this Protocol is entirely

[3] Nowak et al. 2018. "Declining Urban and Community Tree Cover in the United States," *Urban Forestry and Urban Greening,* 32, 32-55

additional to any practice in place in the U.S. and will result in substantial additional trees surviving to maturity;

- Because the urban forest is a public resource, and because public funding falls far short of maintaining tree cover and stocking, carbon revenues will result in additional trees planted or in maintenance that will result in additional trees surviving to maturity;
- Because virtually all new large-scale urban tree planting is conducted by governmental entities or non-profits, or by private property developers complying with governmental regulations (which would not be eligible for carbon credits under our protocol), and because any carbon revenues will defray only a portion of the costs of tree planting, there is little danger of unjust enrichment to developers of city forest carbon projects.

Last, The WRI GHG Protocol recognizes explicitly that the principles underlying carbon protocols need to be adapted to different types of projects. The WRI Protocol further approves of balancing the stringency of requirements with the need to encourage participation in desirable carbon projects:

Setting the stringency of additionality rules involves a balancing act. Additionality criteria that are too lenient and grant recognition for "non-additional" GHG reductions will undermine the GHG program's effectiveness. On the other hand, making the criteria for additionality too stringent could unnecessarily limit the number of recognized GHG reductions, in some cases excluding project activities that are truly additional and highly desirable. In practice, no approach to additionality can completely avoid these kinds of errors. Generally, reducing one type of error will result in an increase of the other. Ultimately, there is no technically correct level of stringency for additionality rules. GHG programs may decide based on their policy objectives that it is better to avoid one type of error than the other.[4]

The policy considerations weigh heavily in favor of "highly desirable" planting projects to reverse tree loss for the public resource of city forests.

[4] WRI GHG Protocol, Chapter 3.1 at 19.

Attachment 12

QUANTIFYING CARBON DIOXIDE STORAGE AND CO-BENEFITS FOR URBAN TREE PLANTING PROJECTS (Appendix A)

Introduction

Ecoservices provided by trees to human beneficiaries are classified according to their spatial scale as global and local (Costanza 2008) (citations for Part Two are listed in References). Removal of carbon dioxide (CO_2) from the atmosphere by urban forests is global because the atmosphere is so well-mixed it does not matter where the trees are located. The effects of urban forests on building energy use is a local-scale service because it depends on the proximity of trees to buildings.

To quantify these and other ecoservices City Forest Credits (CFC) has relied on peer-reviewed research that has combined measurements and modeling of urban tree biomass, and effects of trees on building energy use, rainfall interception, and air quality. CFC has used the most current science available on urban tree growth in its estimates of CO_2 storage (McPherson et al., 2016a). CFC's quantification tools provide estimates of co-benefits after 25 years in Resource Units (i.e., kWh of electricity saved) and dollars per year. Values for co-benefits are first-order approximations extracted from the i-Tree Streets (i-Tree Eco) datasets for each of the 16 U.S. reference cities/climate zones (https://www.itreetools.org/tools/i-tree-eco) (Maco and McPherson, 2003). Modeling approaches and error estimates associated with quantification of CO_2 storage and co-benefits have been documented in numerous publications (see References below) and are summarized here.

Carbon Dioxide Storage

Project Operators must use one of three different methods for quantifying carbon dioxide (CO2) storage in urban forest carbon projects. Selection of the quantification method depends on the planting project design:

- Single Tree Method - trees planted in a dispersed or scattered design and that are planted at least 10 feet apart (i.e. street trees). This method requires tracking of individual trees and tree survival for sampling and quantification.
- Clustered Method - to trees planted at least 10 feet apart but are relatively contiguous and designed to create canopy over an area (i.e park-like settings). This method requires tracking change in canopy, not individual tree survival
- Area Reforestation Method – tree planting areas greater than 5 acres and where many trees are planted closer than 10 feet. Higher tree mortality is expected and the goals are to create canopy and a forest ecosystem. Project Operators have several quantification models to choose from, all of which produce a carbon index on a per-acre basis.

In all cases, the estimated amount of CO2 stored 26-years after planting is calculated. The forecasted amount of CO2 stored during this time is the value from which the Registry issues ex ante Carbon Forward Removal Credits.TM

To ensure performance of the credits, the Registry issues Carbon Forward Removal Credits at five times during the 26-year Project Duration:

- 10% after planting

- 30% in Year 4, after sampling and mortality check or imaging and calculating canopy
- 30% in Year 6, after sampling and mortality check or imaging and calculating canopy
- 10% in Year 14, after measuring sampled trees or imaging and calculating canopy and
- "True-up" credits at the end of the initial Project Duration in Year 26, when CO2e is quantified from tree measurement and final credits are issued for CO2e stored minus credits already issued.

The mortality checks at Years 4 and 6 correspond to nationality mortality data that shows increased survival rates after three years and six years.

The Registry will issue 95% of Project Credits earned and will hold 5% of total credits in the Registry's Reversal Pool Account. This 5% Reversal Pool Account deduction is applied in all three quantification methods before calculation of any crediting, with these funds going into a program-wide pool to insure against unavoidable reversals due to catastrophic loss of trees.

All ex-ante Carbon Forward Removal Credits convert to ex post City Forest Carbon+ Credits at Year 26 and are marked in the registry of credits.

Scientific Basis for Carbon Dioxide Quantification

Estimates of stored (amount accumulated over many years) and sequestered CO_2 (i.e., net amount stored by tree growth over one year) are based on the U.S. Forest Service's recently published technical manual and the extensive Urban Tree Database (UTD), which catalogs urban trees with their projected growth tailored to specific geographic regions (McPherson et al. 2016a, b). The products are a culmination of 14 years of work, analyzing more than 14,000 trees across the United States. Whereas prior growth models typically featured only a few species specific to a given city or region, the newly released database features 171 distinct species across 16 U.S. climate zones. The trees studied also spanned a range of ages with data collected from a consistent set of measurements. Advances in statistical modeling have given the projected growth dimensions a level of accuracy never before seen. Moving beyond just calculating a tree's diameter or age to determine expected growth, the research incorporates 365 sets of tree growth equations to project growth.

Users select their climate zone from the 16 U.S. climate zones (Fig. 1). Calculations of CO_2 stored are for a representative species for each tree-type that was one of the predominant street tree species per reference city (Peper et al., 2001). The "Reference city" refers to the city selected for intensive study within each climate zone (McPherson, 2010). About 20 of the most abundant species were selected for sampling in each reference city. The sample was stratified into nine diameter at breast height (DBH) classes (0 to 7.6, 7.6 to 15.2, 15.2 to 30.5, 30.5 to 45.7, 45.7 to 61.0, 61.0 to 76.2, 76.2 to 91.4, 91.4 to 106.7, and >106.7 cm). Typically 10 to 15 trees per DBH class were randomly chosen. Data were collected for 16 to 74 trees in total from each species. Measurements included: species name, age, DBH [to the nearest 0.1 cm (0.39 in)], tree height [to the nearest 0.5 m (1.64 ft.)], crown height [to the nearest 0.5 m (1.64 ft.)], and crown diameter in two directions [parallel and perpendicular to nearest street to the nearest 0.5 m (1.64 ft.)]. Tree age was determined from local residents, the city's urban forester, street and home construction dates, historical planting records, and aerial and historical photos.

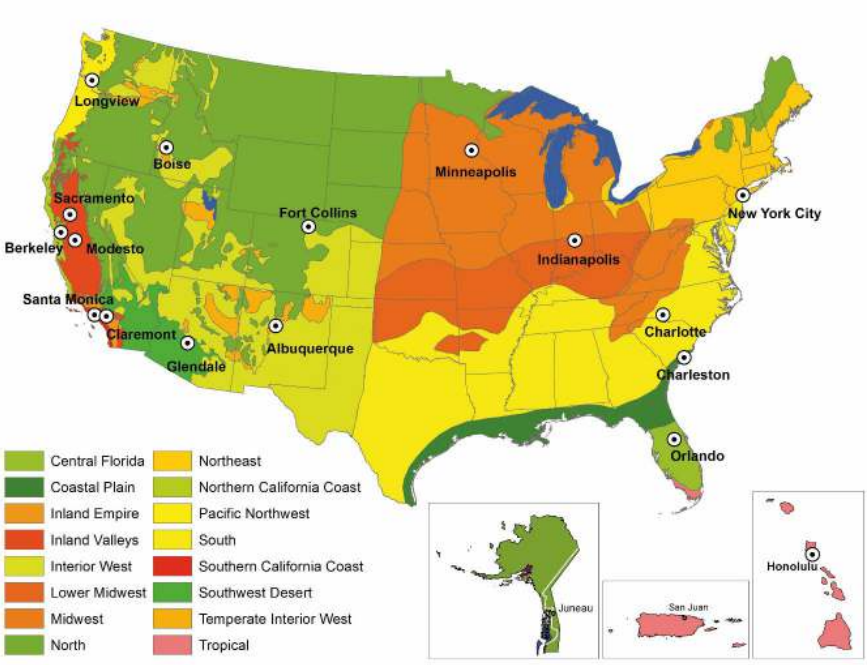

Figure 1. Climate zones of the United States and Puerto Rico were aggregated from 45 Sunset climate zones into 16 zones. Each zone has a reference city where tree data were collected. Sacramento, California was added as a second reference city (with Modesto) to the Inland Valleys zone. Zones for Alaska, Puerto Rico and Hawaii are shown in the insets (map courtesy of Pacific Southwest Research Station).

Species Assignment by Tree-Type

Representative species for each tree-type in the South climate zone (reference city is Charlotte, NC) are shown in Table 1. They were chosen because extensive measurements were taken on them to generate growth equations, and their mature size and form was deemed typical of other trees in that tree-type. Representative species were not available for some tree-types because none were measured. In that case, a species of similar mature size and form from the same climate zone was selected, or one from another climate zone was selected. For example, no Broadleaf Evergreen Large (BEL) species was measured in the South reference city. Because of its large mature size, *Quercus nigra* was selected to represent the BEL tree-type, although it is deciduous for a short time. *Pinus contorta*, which was measured in the PNW climate zone, was selected for the CES tree-type, because no CES species was measured in the South.

Table 1. Nine tree-types and abbreviations. Representative species assigned to each tree-type in the South climate zone are listed. The biomass equations (species, urban general broadleaf [UGB], urban general conifer [UGC]) and dry weight density (kg/m^3) used to calculate biomass are listed for each tree-type.

Tree-Type	Tree-Type Abbreviation	Species Assigned	DW Density	Biomass Equations
Brdlf Decid Large (>50 ft)	BDL	*Quercus phellos*	600	*Quercus macrocarpa* [1.]
Brdlf Decid Med (30-50 ft)	BDM	*Pyrus calleryana*	600	UGB [2.]
Brdlf Decid Small (<30 ft)	BDS	*Cornus florida*	545	UGB [2.]
Brdlf Evgrn Large (>50 ft)	BEL	*Quercus nigra*	797	UGB [2.]

Brdlf Evgrn Med (30-50 ft)	BEM	*Magnolia grandiflora*	523	UGB [2.]
Brdlf Evgrn Small (<30 ft)	BES	*Ilex opaca*	580	UGB [2.]
Conif Evgrn Large (>50 ft)	CEL	*Pinus taeda*	389	UGC [2.]
Conif Evgrn Med (30-50 ft)	CEM	*Juniperus virginiana*	393	UGC [2.]
Conif Evgrn Small (<30 ft)	CES	*Pinus contorta*	397	UGC [2.]
[1.] from Lefsky, M., & McHale, M.,2008. [2] from Aguaron, E., & McPherson, E. G., 2012				

Calculating Biomass and Carbon Dioxide Stored

To estimate CO_2 stored, the biomass for each tree-type was calculated using urban-based allometric equations because open-growing city trees partition carbon differently than forest trees (McPherson et al., 2017a). Input variables included climate zone, species, and DBH. To project tree size at 25-years after planting, we used DBH obtained from UTD growth curves for each representative species.

Biomass equations were compiled for 26 open-grown urban trees species from literature sources (Aguaron and McPherson, 2012). General equations (Urban Gen Broadleaf and Urban Gen Conifer) were developed from the 26 urban-based equations that were species specific (McPherson et al., 2016a). These equations were used if the species of interest could not be matched taxonomically or through wood form to one of the urban species with a biomass equation. Hence, urban general equations were an alternative to applying species-specific equations because many species did not have an equation.

These allometric equations yielded aboveground wood volume. Species-specific dry weight (DW) density factors (Table 1) were used to convert green volume into dry weight (7a). The urban general equations required looking up a dry weight density factor (in Jenkins et al. 2004 first, but if not available then the Global Wood Density Database). The amount of belowground biomass in roots of urban trees is not well researched. This work assumed that root biomass was 28% of total tree biomass (Cairns et al., 1997; Husch et al., 2003; Wenger, 1984). Wood volume (dry weight) was converted to C by multiplying by the constant 0.50 (Leith, 1975), and C was converted to CO_2 by multiplying by 3.667.

Error Estimates and Limitations

The lack of biometric data from the field remains a serious limitation to our ability to calibrate biomass equations and assign error estimates for urban trees. Differences between modeled and actual tree growth adds uncertainty to CO_2 sequestration estimates. Species assignment errors result from matching species planted with the tree-type used for biomass and growth calculations. The magnitude of this error depends on the goodness of fit in terms of matching size and growth rate. In previous urban studies the prediction bias for estimates of CO_2 storage ranged from -9% to +15%, with inaccuracies as much as 51% RMSE (Timilsina et al., 2014). Hence, a conservative estimate of error of ± 20% can be applied to estimates of total CO_2 stored as an indicator of precision.

Co-Benefit: Energy Savings

Trees and forests can offer energy savings in two important ways. In warmer climates or hotter months, trees can reduce air conditioning bills by keeping buildings cooler through reducing regional air temperatures and offering shade. In colder climates or cooler months, trees can confer savings on the fuel needed to heat buildings by reducing the amount of cold winds that can strip away heat.

Energy conservation by trees is important because building energy use is a major contributor to greenhouse gas emissions. Oil or gas furnaces and most forms of electricity generation produce CO_2 and other pollutants as by-products. Reducing the amount of energy consumed by buildings in urban areas is one of the most effective methods of combatting climate change. Energy consumption is also a costly burden on many low-income families, especially during mid-summer or mid-winter. Furthermore, electricity consumption during mid-summer can sometimes over-extend local power grids leading to rolling brownouts and other problems.

Energy savings are calculated through numerical models and simulations built from observational data on proximity of trees to buildings, tree shapes, tree sizes, building age classes, and meteorological data from McPherson et al. (2017) and McPherson and Simpson (2003). The main parameters affecting the overall amount of energy savings are crown shape, building proximity, azimuth, local climate, and season. Shading effects are based on the distribution of street trees with respect to buildings recorded from aerial photographs for each reference city (McPherson and Simpson, 2003). If a sampled tree was located within 18 m of a conditioned building, information on its distance and compass bearing relative to a building, building age class (which influences energy use) and types of heating and cooling equipment were collected and used as inputs to calculate effects of shade on annual heating and cooling energy effects. Because these distributions were unique to each city, energy values are considered first-order approximations.

In addition to localized shade effects, which were assumed to accrue only to trees within 18 m of a building, lowered air temperatures and windspeeds from increased neighborhood tree cover (referred to as climate effects) can produce a net decrease in demand for winter heating and summer cooling (reduced wind speeds by themselves may increase or decrease cooling demand, depending on the circumstances). Climate effects on energy use, air temperature, and wind speed, as a function of neighborhood canopy cover, were estimated from published values for each reference city. The percentages of canopy cover increase were calculated for 20-year-old large, medium, and small trees, based on their crown projection areas and effective lot size (actual lot size plus a portion of adjacent street and other rights-of-way) of 10,000 ft^2 (929 m^2), and one tree on average was assumed per lot. Climate effects were estimated by simulating effects of wind and air-temperature reductions on building energy use.

In the case of urban Tree Preservation Projects, trees may not be close enough to buildings to provide shading effects, but they may influence neighborhood climate. Because these effects are highly site-specific, we conservatively apply an 80% reduction to the energy effects of trees for Preservation Projects.

Energy savings are calculated as a real-dollar amount. This is calculated by applying overall reductions in oil and gas usage or electricity usage to the regional cost of oil and gas or electricity for residential customers. Colder regions tend to see larger savings in heating and warmer regions tend to see larger savings in cooling.

Error Estimates and Limitations

Formulaic errors occur in modeling of energy effects. For example, relations between different levels of tree canopy cover and summertime air temperatures are not well-researched. Another source of error stems from differences between the airport climate data (i.e., Los Angeles International Airport) used to model energy effects and the actual climate of the study area (i.e., Los Angeles urban area). Because of

the uncertainty associated with modeling effects of trees on building energy use, energy estimates may be accurate within ± 25 percent (Hildebrandt & Sarkovich, 1998).

Co-Benefit: Rainfall Interception

Forest canopies normally intercept 10-40% of rainfall before it hits the ground, thereby reducing stormwater runoff. The large amount of water that a tree crown can capture during a rainfall event makes tree planting a best management practice for urban stormwater control.

City Forest Credits uses a numerical interception model to calculate the amount of annual rainfall intercepted by trees, as well as throughfall and stem flow (Xiao et al., 2000). This model uses species-specific leaf surface areas and other parameters from the Urban Tree Database. For example, deciduous trees in climate zones with longer "in-leaf" seasons will tend to intercept more rainfall than similar species in colder areas shorter foliation periods. Model results were compared to observed patterns of rainfall interception and found to be accurate. This method quantifies only the amount of rainfall intercepted by the tree crown, and does not incorporate surface and subsurface effects on overland flow.

The rainfall interception benefit was priced by estimating costs of controlling stormwater runoff. Water quality and/or flood control costs were calculated per unit volume of runoff controlled and this price was multiplied by the amount of rainfall intercepted annually.

Error Estimates and Limitations

Estimates of rainfall interception are sensitive to uncertainties regarding rainfall patterns, tree leaf area and surface storage capacities. Rainfall amount, intensity and duration can vary considerably within a climate zone, a factor not considered by the model. Although tree leaf area estimates were derived from extensive measurements on over 14,000 street trees across the U.S. (McPherson et al., 2016a), actual leaf area may differ because of differences in tree health and management. Leaf surface storage capacity, the depth of water that foliage can capture, was recently found to vary threefold among 20 tree species (Xiao & McPherson, 2016). A shortcoming is that this model used the same value (1 mm) for all species. Given these limitations, interception estimates may have uncertainty as great as ± 20 percent.

Co-Benefit: Air Quality

The uptake of air pollutants by urban forests can lower concentrations and affect human health (Derkzen et al., 2015; Nowak et al., 2014). However, pollutant concentrations can be increased if the tree canopy restricts polluted air from mixing with the surrounding atmosphere (Vos et al., 2013). Urban forests are capable of improving air quality by lowering pollutant concentrations enough to significantly affect human health. Generally, trees are able to reduce ozone, nitric oxides, and particulate matter. Some trees can reduce net volatile organic compounds (VOCs), but others can increase them through natural processes. Regardless of the net VOC production, urban forests usually confer a net positive benefit to air quality. Urban forests reduce pollutants through dry deposition on surfaces and uptake of pollutants into leaf stomata.

A numerical model calculated hourly pollutant dry deposition per tree at the regional scale using deposition velocities, hourly meteorological data and pollutant concentrations from local monitoring stations (Scott et al., 1998). The monetary value of tree effects on air quality reflects the value that society places on clean air, as indicated by willingness to pay for pollutant reductions. The monetary value of air quality effects were derived from models that calculated the marginal damage control costs

of different pollutants to meet air quality standards (Wang and Santini 1995). Higher costs were associated with higher pollutant concentrations and larger populations exposed to these contaminants.

Error Estimates and Limitations

Pollutant deposition estimates are sensitive to uncertainties associated with canopy resistance, resuspension rates and the spatial distribution of air pollutants and trees. For example, deposition to urban forests during warm periods may be underestimated if the stomata of well-watered trees remain open. In the model, hourly meteorological data from a single station for each climate zone may not be spatially representative of conditions in local atmospheric surface layers. Estimates of air pollutant uptake may be accurate within ± 25 percent.

Conclusions

Our estimates of carbon dioxide storage and co-benefits reflect an incomplete understanding of the processes by which ecoservices are generated and valued (Schulp et al., 2014). Our choice of co-benefits to quantify was limited to those for which numerical models were available. There are many important benefits produced by trees that are not quantified and monetized. These include effects of urban forests on local economies, wildlife, biodiversity and human health and well-being. For instance, effects of urban trees on increased property values have proven to be substantial (Anderson & Cordell, 1988). Previous analyses modeled these "other" benefits of trees by applying the contribution to residential sales prices of a large front yard tree (0.88%) (McPherson et al., 2005). We have not incorporated this benefit because property values are highly variable. It is likely that co-benefits reported here are conservative estimates of the actual ecoservices resulting from local tree planting projects.

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[Include Project Name]
Agreement to Transfer Potential Credits

This Agreement to Transfer Potential Credits ("Agreement") is entered into this [insert day] day of [insert month], 2024 (the "Effective Date") by [insert landowner name] (the "Landowner") and [insert Project Operator name], a [insert entity incorporation type] (the "Project Operator") whose mission is [insert mission] and who has undertaken an afforestation or reforestation project ("Tree Project") on the Property of Landowner (the "Property").

1. Purpose and Intent

Project Operator and Landowner desire to help Project Operator fund this Tree Project by allowing Project Operator to develop potential carbon and environmental credits that it can attempt to sell to defray project costs or to plant additional trees. The Landowner will receive the benefits of the trees planted in this project at little to no cost to the Landowner.

These potential carbon or environmental credits or offsets include amounts of carbon dioxide stored, stormwater runoff reductions, energy savings, and air quality benefits arising from the planting and growth of trees in the Tree Project ("City Forest Carbon Forward Removal Credits" or "Credits"). The Credits will be developed using the protocols and registry of City Forest Credits, a non-profit organization ("CFC").

2. Rights Granted

Landowner grants Project Operator the title and rights to any and all Credits developed from the Tree Project during the term of this agreement, including rights to register with CFC, and develop and sell the Credits.

3. Subject Lands

The Property specified in Exhibit A.

4. Obligations of Landowner

Landowner shall not cut, harvest, or damage trees in the Tree Project except in cases of emergency involving fire or flooding or to mitigate hazard if trees are identified as a hazard by a certified arborist.

5. Obligations of Project Operator

Project Operator will pay all costs and assume all responsibilities for development and sale of Credits from the Tree Project.

6. Landowner Representations

Landowner represents that it has authority to enter this agreement, and that the Property is free from any liens, claims, encumbrances, tenancies, restrictions, or easements that would prevent or interfere with the rights to Credits granted under this Agreement.

7. Project Operator Representations

Project Operator represents that it has the capacities necessary to execute its obligations under this agreement.

8. Default

If either party is in default of this agreement, the other party may notify the defaulting party of the specific nature of the default. The defaulting Party has 30 days from the date of notice to correct the default. If the default is not corrected in 30 days, the non-defaulting party may cancel this agreement. Notice of cancellation shall be delivered in writing to the current contact address of the defaulting party.

9. Term of Agreement and Option to Renew

This Agreement shall remain in force for 26 years after the Effective Date of the Agreement. Project Operator may renew this Agreement for a second 26 years if it delivers written notice of renewal to Landowner at least 90 days prior to expiration of this Agreement.

10. Governing Law

This agreement shall be construed and enforced in accordance with the laws of the State of [insert state name].

11. Parties

Project Operator			Landowner	
Name:			Name:	
Title:			Title:	
Address:			Address:	
Phone:			Phone:	
Email:			Email:	
Signature:			Signature:	
Date:			Date:	

Exhibit A

Legal Description of Property

[Insert Project Name]
Attestation of Land Ownership

I am the [insert title] of the [insert name of landowner] and make this Attestation regarding the ownership of land upon which the [insert Project Operator] is the Project Operator of an afforestation or reforestation project [insert name of planting project].

1. Land Ownership

The [insert name of landowner] is the owner in fee simple of the land identified in Section 2 and in Exhibit A.

2. Subject Lands

The Property upon which the [insert name of project] Project is planting trees and which is the subject of this Attestation is specified in Exhibit A.

Signed on [insert month and date] in 2024, by [insert name and title of person authorized to sign], for [insert Project Operator name].

_____
Signature

_____
Printed Name

_____
Phone

_____
Email

Exhibit A

[Insert specification of property, including maps, legal description, and/or other reasonably specific delineations of the property upon which the project is taking place]

[Insert Project Name]
Attestation of Additionality

I am the [insert title] of the [insert name of Project Operator] and make this attestation regarding additionality from this tree planting project, [insert name of project].

- Project Description
    - The Project that is the subject of this attestation is described more fully in both our Application and our Project Design Document (PDD), both of which are incorporated into this attestation.
- Legal Requirements Test (Protocol Section 1.8)
    - Project trees are not required by law or ordinance to be planted (except for replacement trees planted in place of removed trees for specific reasons).
- The Project did not plant trees on sites that were converted out of a forest use or that were cleared of healthy, non-invasive trees and then planted with project trees (Protocol Section 1.9)
- Project-Specific Baseline or Performance Standard Baseline
    - Project trees are additional based on a project specific baseline. See PDD; or
    - Project trees are additional based on the Performance Standard baseline; see attached baseline to the PDD. Project Operator has provided local canopy change data to support the use of the Performance Standard Baseline.
- Project Implementation Agreement for Project Duration
    - [insert name of Project Operator] has signed a Project Implementation Agreement with City Forest Credits for 26 years.
- The 26-year Project Duration commitment is additional to and longer than any commitment [insert Project Operator name] makes to non-carbon project tree plantings.
- Financial Additionality
    - A successful afforestation carbon project goes beyond tree planting to ensure survival of the trees to a healthy maturity at 26 years after the Project start date. These Project Trees are at risk during all stages of this project. The Project Operator has no guaranteed source of long-term maintenance funding outside of the carbon revenues. [Project Operator to provide additional details, e.g., city budgets wax and wane based on the economic cycle; the Project Operator's existing funding sources for tree planting do not cover maintenance at all, or maintenance past [x] years, etc.].
    - The revenue from the sale of carbon credits will play a material role in the successful and durable storage of Project Trees' carbon stock by providing funding that will help ensure the establishment and long-term health of Project Trees. [Project Operator to enter additional text describing how the carbon revenues will be used, e.g., to pay to plant trees, to pay for establishment of trees in the first 6 years, to pay for long-term maintenance, or to pay for other activities that will meaningfully improve or ensure planted trees' health and project success].

- Prior Consideration: [Enter text providing information about when the Project Operator became aware of carbon crediting as a potential source of revenue for projects, and/or when it became aware of the work of City Forest Credits' program for smaller projects, and when carbon crediting was first introduced into the overall project scope. State also whether a Notice of Intent was signed.]
- In addition, many of the activities undertaken as part of the carbon project are beyond the Project Operator's common practice, including: [Project Operator to select from the list below]
    - Project design (species and planting selection) to maximize carbon storage
    - Care through establishment phase (up to/through Year 3)
    - Long-term maintenance
    - Long-term monitoring and growth assessment
    - Acceptance of reversal obligations
    - Long-term legal commitment to the project

Signed on [insert month and date] in 2024, by [insert name and title of person authorized to sign], for [insert Project Operator name].

_____
Signature

_____
Printed Name

_____
Phone

_____
Email

[Insert Project Name]
Attestation of No Double Counting of Credits and No Net Harm

I am the [insert title] of the [insert name of Project Operator] and make this attestation regarding no double counting of credits and no net harm from this tree planting project, [insert name of project].

1. Project Description

The Project that is the subject of this Attestation is described more fully in both our Application and our Project Design Document (PDD), both of which are incorporated into this Attestation.

2. No Double Counting by Applying for Credits from another Registry

[Insert name of Project Operator] has not and will not seek credits for CO_2 for the project trees or for this project from any other organization or registry issuing credits for CO_2 storage.

3. No Double Counting by Seeking Credits for the Same Trees or Same CO_2 Storage

[Insert name of Project Operator] has not and will not apply for a project including the same trees as this project nor will it seek credits for CO_2 storage for the project trees or for this project in any other project or more than once. [Insert name of Project Operator] has checked the location of the Project Area against registered urban forest carbon afforestation and reforestation projects. Project Operator has determined that there is no overlap of Project Area or Project Trees with any registered urban forest carbon afforestation and reforestation project.

4. No Net Harm

The trees planted in this project will produce many benefits, as described in our Application and PDD. Like almost all urban trees, the project trees are planted not for harvest but for the benefits they deliver to people, communities, and the environment as living trees in a metropolitan area.

The project trees will produce many benefits and will not cause net harm. Specifically, they will not:

- Displace native or indigenous populations
- Deprive any communities of food sources
- Degrade a landscape or cause environmental damage

Signed on [insert month and date] in 2024, by [insert name and title of person authorized to sign], for [insert Project Operator name].

_____
Signature

_____
Phone

_____
Email

[Insert Project Name]
Project Operator Attestation of Planting

I, the undersigned Project Operator for the Planting Project named [insert project name], located at [insert project location(s)], and submitted to City Forest Credits by application dated [insert date], attest to the following in order to confirm the planting of trees under this Project:

- Trees planted were not required by any law or ordinance to be planted;
- Trees were planted under this project on the following date (s): [insert month and year of first tree planted and last tree planted];
- The organizations or groups that participated in the planting event(s) are listed in the attached documents;
- Planting events are shown in photos attached, which can include photos of tree stock and planting activities;
- The number of trees planted by species are, to a reasonable certainty, [insert number of trees or acres planted].

These planting numbers are confirmed by one or more of the following supporting and attached documents:

1. Invoices for trees planted, or
2. Invoices or a statement from the party who funded the tree purchase or supplied the trees attesting to the number of trees purchased, or
3. Any reporting to the owner or public body regarding the planting, invoices, costs, or other data regarding the planting, or
4. Any other reliable estimate of trees planted that is approved by the Registry

Signed on [insert month and date] in 2024, by [insert name and title of person authorized to sign], for [insert Project Operator name].

_____
Signature

_____
Printed Name

_____
Phone

_____
Email

Exhibit A

[Add invoices, event photos, and names of participating organizations]

[Insert Project Name]
Notice of Intent for Carbon Project

I am the [insert title] of the [insert name of Project Operator]. This Notice of Intent documents [insert name of Project Operator]'s intention to register an urban forest carbon project for the following tree plantings, described in greater detail below.

Location of Tree Plantings	Approximate number of trees or acres planted to be enrolled in a carbon project

Due to capacity constraints, planting timelines, obtaining grant or other funding to complete planting and/or establishment of trees, the need to aggregate small numbers of annual plantings into a three-year project, or other confounding factors, such as [Project Operator to insert examples or details if possible], [insert name of Project Operator] may need a full three years and six months from planting the first Project Tree in the list described above to submit a formal application and all project documentation to City Forest Credits for a carbon project.

This document serves as a record of [insert Project Operator]'s awareness of the material importance of carbon crediting to the long-term success of this afforestation/reforestation project and of the Project Operator's intent to register the properties and trees listed above within 42 months (3 years and 6 months) after planting the first of the Project Trees. The number of trees or acreage to be enrolled in the Project Area is an estimate and could change by the time the Project Application is submitted.

Signed on [insert month and date] in 2024, by [insert name and title of person authorized to sign], for [insert Project Operator name].

_____
Signature

_____
Printed Name

_____
Phone

_____
Email

City Forest Carbon Project
Social Impacts

UN Sustainable Development Goals

The 17 United Nations Sustainable Development Goals (SDGs) are an urgent call for action and global partnership among all countries, representing key benchmarks for creating a better world and environment for everyone. Well-designed and managed urban forests make significant contributions to the environmental sustainability, economic viability and livability of cities. They help mitigate climate change and natural disasters, reduce energy costs, poverty and malnutrition, and provide ecosystem services and public benefits. See more details in the CFC Carbon Project Social Impact Reference Guide.

Instructions

This template sets out all relevant SDGs and lists various urban forest project activities that fall within each SDG. Evaluate the SDGs to determine how your carbon project provides social impacts that may contribute towards achievement of the global goals. Check the box(es) that contain one of your project activities and describe in no fewer than two sentences how your project activities align with the corresponding SDG. On page 12, select the icon for three to five of the most relevant SDGs to your project and provide any additional information.

SDG 3 - Good Health and Well Being

Goal: Ensure healthy lives and promote well-being for all at all ages.

Examples of project activities include, but are not limited to:

- ☐ Plant or protect trees to reduce or remove air pollutants
- ☐ If planting trees, select trees for reduced pollen counts and irritant production
- ☐ Plant or protect trees to create shade, provide UV exposure protection, reduce extreme heat negative effects, and/or reduce temperatures to relieve urban heat effects
- ☐ Design project to buffer sounds, optimize biodiversity, or create nature experiences
- ☐ Locate project near vulnerable populations, such as children or elderly
- ☐ Locate project near high volume roads to screen pollutants
- ☐ Locate project near people to encourage recreation, provide new parks or green space, or otherwise promote an active lifestyle
- ☐ Locate project near schools, elderly facilities, or mental health services to promote nature-based wellness, attention restoration, or other mental well-being
- ☐ Locate project in area with conditions of project-defined high inequity to trees, such as at schools, affordable or subsidized housing, formerly redlined neighborhoods, areas with high property vacancy rates, or area with high proportion of renters
- ☐ Reduce stormwater runoff or improve infiltration rates
- ☐ Design project to reduce human exposure to specific pollutants or toxins
- ☐ Other

[Enter text describing activities you checked above]

SDG 6 - Clean Water and Sanitation

Goal: Ensure availability and sustainable management of water and sanitation for all

Examples of project activities include, but are not limited to:

- ☐ Research and assess environmental injustices related to water in project area
- ☐ Locate project near high-traffic roads or to otherwise improve, mitigate, or remediate toxic landscapes near water
- ☐ Protect or plant trees to improve historically or culturally important sites related to water that have been degraded and/or neglected
- ☐ Reduce stormwater by planting or protecting trees
- ☐ Plant forested buffers adjacent to streams, rivers, wetlands, or floodplains
- ☐ Prevent soil erosion by protect steep slopes
- ☐ Improve infiltration rates
- ☐ Improve, mitigate, or remediate toxic landscapes and human exposure to risk
- ☐ Drought resistance, such as selecting appropriate water-efficient trees for project climate zone
- ☐ Other

[Enter text describing activities you checked above]

SDG 8 - Decent Work and Economic Growth

Goal: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Examples of project activities include, but are not limited to:

- ☐ Community participation in project implementation, including such things as providing access to financial resources for ongoing community-based care
- ☐ Emphasize local hiring and support small businesses
- ☐ Promote local economic opportunities through workforce training, career pathway development, or other employment
- ☐ Other

[Enter text describing activities you checked above]

SDG 10 - Reduced Inequalities

Goal: Reduce inequalities within and among countries

Examples of project activities include, but are not limited to:

- ☐ Provide connections and cohesion for social health, such as create or reinforce places that promote informal interactions, engage local residents and users in tree management, include symbolic or cultural elements, or other events
- ☐ Research, understand, and design to address understand historic and current sociocultural inequities, community health conditions, environmental injustices, or prior local greening efforts in community
- ☐ Locate project near vulnerable populations, such as children or elderly, to provide air quality improvements or buffer against extreme heat effects
- ☐ Locate project in high-density residential areas or where there is a lack of trees to improve access and promote an active lifestyle
- ☐ Locate project near schools, elderly facilities, or mental health services to promote nature-based wellness, attention restoration, or other mental well-being
- ☐ Locate project in area with conditions of project-defined high inequity to trees, such as at schools, affordable or subsidized housing, formerly redlined neighborhoods, areas with high property vacancy rates, or area with high proportion of renters
- ☐ Locate project near high-traffic roads or to otherwise improve, mitigate, or remediate toxic landscapes
- ☐ Protect or plant trees to improve historically or culturally important sites that have been degraded and/or neglected
- ☐ Community engagement in project design, including such things as engaging and respecting existing relationships and social networks, community cultural traditions, and public participation methods that are empowering and inclusive
- ☐ Community participation in project implementation, including such things as addressing and removing barriers to participation, promote ongoing community-based care and access to financial resources
- ☐ Emphasize local hiring and support small businesses
- ☐ Research and consider potential for gentrification and displacements
- ☐ Promote local economic opportunities through workforce training, career pathway development, or other employment
- ☐ Other

[Enter text describing activities you checked above]

SDG 11 - Sustainable Cities and Communities

Overall: Make cities inclusive, safe, resilient, and sustainable.

Examples of project activities include, but are not limited to:

- ☐ Plant or protect trees to reduce or remove air pollutants
- ☐ If planting trees, select trees for reduced pollen counts and irritant production
- ☐ Locate project near high volume roads to screen pollutants
- ☐ Locate project near vulnerable populations, such as children or elderly
- ☐ Plant or protect trees to create shade, provide UV exposure protection, reduce extreme heat negative effects, and/or reduce temperatures to relieve urban heat effects
- ☐ Locate project near people to encourage recreation, provide new parks or green space, or otherwise promote an active lifestyle
- ☐ Design project to improve wellness and mental health, such as planting trees to buffer sounds, optimize biodiversity, optimize views from buildings, or create nature experiences
- ☐ Locate project near schools, elderly facilities, or mental health services to promote nature-based wellness, attention restoration, or other mental well-being
- ☐ Provide connections and cohesion for social health, such as create or reinforce places that promote informal interactions, engage local residents and users in tree management, include symbolic or cultural elements, or other events
- ☐ Research, understand, and design to address understand historic and current sociocultural inequities, community health conditions, environmental injustices, or prior local greening efforts in community
- ☐ Locate project in area with conditions of project-defined high inequity to trees, such as at schools, affordable or subsidized housing, formerly redlined neighborhoods, areas with high property vacancy rates, or area with high proportion of renters
- ☐ Community engagement in project design, including such things as engaging and respecting existing relationships and social networks, community cultural traditions, and public participation methods that are empowering and inclusive
- ☐ Community participation in project implementation, including such things as addressing and removing barriers to participation, promote ongoing community-based care and access to financial resources
- ☐ Other

[Enter text describing activities you checked above]

SDG 12 - Responsible Production and Consumption

Goal: Ensure sustainable consumption and production patterns

Examples of project activities include, but are not limited to:

- ☐ Plant or protect trees to create shade or reduce temperatures to relieve urban heat effects
- ☐ Provide cooling benefits and energy savings by shading impervious surfaces such as streets or parking lots, or planting trees on south and west sides of buildings
- ☐ Other

[Enter text describing activities you checked above]

SDG 13 - Climate Action

Goal: Take urgent action to combat climate change and its impacts.

Examples of project activities include, but are not limited to:

- ☐ Plant or protect trees to reduce or remove air pollutants
- ☐ Plant or protect trees to create shade or reduce temperatures to relieve urban heat effects
- ☐ Promote community capacity for social and climate resilience by engaging local residents or users in tree management, or other events to connect people to the project
- ☐ Reflect cultural traditions and inclusive engagement for climate resilience
- ☐ Design project to improve soil health
- ☐ Provide cooling benefits and energy savings by shading impervious surfaces such as streets or parking lots, or planting trees on south and west sides of buildings
- ☐ Plant or protect trees to reduce stormwater runoff
- ☐ Select water-efficient trees for climate zone and drought resistance
- ☐ Create and/or enhance wildlife habitat
- ☐ Other

[Enter text describing activities you checked above]

SDG 14 - Life Below Water

Goal: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Examples of project activities located in areas with marine ecosystems include, but are not limited to:

- ☐ Locate project near high-traffic roads or to otherwise improve, mitigate, or remediate toxic landscapes near water
- ☐ Plant or protect trees in project areas to reduce stormwater runoff
- ☐ Plant forested buffers adjacent to streams, rivers, wetlands, or floodplains
- ☐ Prevent soil erosion into by protecting steep slopes
- ☐ Improve infiltration rates
- ☐ Improve, mitigate, or remediate toxic landscapes and human exposure to risk
- ☐ Drought resistance, such as selecting appropriate water-efficient trees for project climate zone
- ☐ Enhance wildlife habitat, such as riparian habitat for fish, birds, and other animals
- ☐ Other

[Enter text describing activities you checked above]

SDG 15 - Life on Land

Goal: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Examples of project activities include, but are not limited to the following with increased functionality of green infrastructure:

- ☐ Plant or protect trees to reduce stormwater runoff
- ☐ Select water-efficient trees for climate zone and drought resistance
- ☐ Create and/or enhance wildlife habitat to improve local biodiversity
- ☐ Plant forested buffers adjacent to streams, rivers, wetlands, or floodplains
- ☐ Prevent soil erosion by protect steep slopes
- ☐ Improve infiltration rates
- ☐ Other

[Enter text describing activities you checked above]

SDG 17 - Partnerships for the Goals

Overall: Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Examples of project activities include, but are not limited to:

- ☐ Promote community connections and capacity for social resilience by engaging local residents or users in tree management, or other events to connect people to the project
- ☐ Community engagement in project design, including such things as engaging and respecting existing relationships and social networks, community cultural traditions, and public participation methods that are empowering and inclusive
- ☐ Community participation in project implementation, including such things as addressing and removing barriers to participation, promote ongoing community-based care and access to financial resources
- ☐ Other

[Enter text describing activities you checked above]

Summary of Project Social Impacts

[Select or delete SDG icon from options below, and enter text describing activities]

[Select SDG icon and enter text describing activities]

[Select SDG icon and enter text describing activities]

[Insert Project Name]
Monitoring Report

Project Operator Name: [insert text here]
Project Name: [insert text here]
Project Location: [insert text here]
Deadline to Submit to CFC *(annually from the date of the first Verification Report):* [insert text here]

1. **Has the contact information for the Project Operator changed? If so, provide new contact information.**

   [insert text here]

2. **Have there been changes in land ownership of the Project Area?**

   [insert text here]

3. **Have there been any changes in the Project Design?**

   [insert text here]

4. **Have there been any changes in the implementation or management of the Project?**

   [insert text here]

5. **Have there been any significant changes to the site (such as flooding or human changes)?**

   [insert text here]

6. **Have there been any significant tree or canopy losses estimated to be greater than 10% of Project Trees or 10% of canopy?**

   [insert text here]

7. **Do you anticipate future canopy loss (such as a new pest or disease issue found)?**

   [insert text here]

8. **Any other significant elements to report?**
   [insert text here]

Signed on [insert month and date] in 2024, by [insert name and title of person authorized to sign], for [insert Project Operator name].

_____
Signature

_____
Printed Name

_____
Phone

_____
Email