Pierce Conservation District Reforestation Program – 2022 Project
South Prairie Creek Preserve – North Floodplain Planting Project
Initial Credit Project Design Document

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INSTRUCTIONS

Project Operators complete and submit this Initial Credit Project Design Document (PDD) after planting has been completed. City Forest Credits then reviews this PDD for validation with all other required project documents. An approved third-party verifier then conducts verification. A separate amendment to the Project Design Document will need to be submitted for future verification at years 4, 6, and after year 25.

Please complete sections starting on page 5 where you find "[Enter text here]" as thoroughly as possible.

PROTOCOL REQUIREMENTS

Below are a list of the eligibility requirements in the City Forest Credits (CFC) Tree Planting Protocol Version 9, dated February 7, 2021. Begin your responses on page 4 under PROJECT OVERVIEW.

Project Operator (Section 1.1)
Identify a Project Operator for the project. This is the person or entity who takes responsibility for the project for the 25-year duration.

Commit to 25-year Project Duration in the Project Implementation Agreement (Section 1.2 and Section 5)
Sign the Project Implementation Agreement – this is the 25-year agreement between the Project Operator and CFC for an urban forest carbon project.

Location Eligibility (Section 1.3)
Project Areas must be located in parcels within or along the boundary of at least one of the following criteria.

A. The Urban Area boundary ("Urban Area"), defined by the most recent publication of the United States Census Bureau
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. Examples include the Metropolitan Area Planning Council in Boston and the Chicago Metropolitan Planning Agency;
E. The boundary of land owned, designated, and used by a municipal or quasi-municipal entity such as a utility for source water or watershed protection;
F. A transportation, power transmission, or utility right of way, provided the right of way begins, ends, or passes through some portion of A through E above.

Ownership Eligibility (Section 2)
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 must be recorded in the property records of the county in which the land containing Project trees is located.

Additionality (Section 4 and Appendix D)
Legally Required Trees NOT Eligible - project trees cannot be required by law or ordinance to be planted.

Performance Standard Baseline - Project trees must be additional based on the performance standard baseline attached.

Multiple planting sites may be aggregated into one project (Section 8)
Planting sites can be on public and private land, in different cities, and aggregated into one project, provided that planting on all properties occurs within a 36-month period and that all properties comply with protocol requirements.

Carbon Quantification (Section 12 and Appendix B)
CFC has developed spreadsheets and methods for quantifying carbon stored and credited. The project design including tree spacing and goals will determine the quantification and monitoring requirements. Project Operators will quantify CO_2 using the method appropriate for the project type. CFC supplies all quantification tools. The three main project designs are:

- Single Tree - trees are scattered and spaced apart more than 10 feet, as in streets, yards, some parks, and schools, individual trees are tracked and randomly sampled
- Clustered Parks - trees are relatively contiguous in park-like settings and change in canopy is tracked
- Canopy – trees are planted very close together, often but not required to be in riparian areas, significant mortality is expected, and change in canopy is tracked. The two main goals are to create a forest ecosystem and generate canopy

Verification by third-party verifiers (Section 13)
All projects must be verified before receiving credits.

Imaging Requirements (based on planting method)
In order to receive credits, additional information is required at Years 4, 6, and 26. Below are the imaging requirements by planting method:

1) Single Tree (spaced 10' or more apart, i.e. street trees or linear plantings)
    a. Initial Credit: The carbon quantification tool for your project contains a worksheet called "Data Collection" for use in tracking each tree. In that file, document the GPS coordinates for each tree planted.
    b. Years 4, 6, and 26: Geocoded photos or imaging of a minimum sample of 20% of the trees is required at Years 4, 6, and 26. 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.
2) Clustered Parks (spaced 10' apart but continuously so to generate canopy over time, i.e. natural areas)

a. Initial Credit: Projects 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. At Years 4, 6, and 26: Project provides 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.

3) Canopy (closely planted with spacing less than 10’ apart so to generate canopy and forest ecosystem, high tree mortality expected, i.e. riparian areas)
   a. Initial Credit: Projects 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. At Years 4, 6, and 26: Project provides 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.

PROJECT OVERVIEW

Project Name: Pierce Conservation District Reforestation Program - 2022 Project: South Prairie Creek Preserve - North Floodplain Planting Project
Project Number: 017
Project Type: Planting Project (under the Planting Protocol – version 9, dated February 7, 2021)
Project Start Date: March 31, 2022
Project Location: South Prairie, WA
Project Operator Name: Pierce Conservation District
Project Operator Contact Information: Ryan Bird, ryanb@piercecd.org, (253) 845-9770 ext. 133

Project Description
Describe overall project goals, where the project will take place, what method of planting (per Protocol), partners, time period of when the trees have been or will be planted, and any other relevant information. (minimum of 2 paragraphs)

Pierce Conservation District (the District) planted 12.16 acres in South Prairie, WA between October 1, 2021 and March 31, 2022. 5,842 trees were planted using the cluster planting design and quantification method. This project restored native vegetation to riparian and floodplain habitat along South Prairie Creek, a tributary to the Carbon River in the Puyallup-White River watershed. Planting was completed in areas between a newly constructed half-mile side channel and Silver Springs Creek, a tributary to South Prairie Creek.

This planting is part of a larger effort to improve salmon habitat and restore floodplain processes. The majority of the project's construction occurred in 2020, including creation of the side channel, instream structures in the mainstem of South Prairie Creek, and installation of engineered wood structures in the floodplain. Approximately 22.1 acres have been planted since the beginning of this restoration effort.

Native vegetation in the project area is believed to have been removed by 19th and 20th century settlers in the area. Much of the project site had been used as pasture by a family-owned dairy for many decades, until the property was sold to the Pierce Conservation District ca. 2005. Prior to the start of this project, much of the riparian and floodplain plant community was characterized by a mix of non-native grasses and invasive weeds.

LOCATION AND OWNERSHIP OF PROJECT AREA (Section 1.3 and Section 2)

Project Area Location
Describe where the Project Area is located and how it meets the location criteria.

The Project Area is in unincorporated Pierce County, approximately one mile west of the town of South Prairie, WA. The Project meets the urban location criteria because it is within an "Urban Area" per the U.S. Census Bureau (2010).

The reference address for the Project is 13518 Pioneer Way East, Orting WA 98360.

Project Area Ownership and Right to Receive Credits
Describe the property ownership and include relevant documentation including numbered title/filename as an attachment (Ex: 1 - Attestation of Land Ownership, or 1 - Agreement from Owner to Transfer Credits).

The Project Area lies within six contiguous parcels, with three parcels owned by Pierce Conservation District and three parcels owned by Pierce County Surface Water Management.

Landowner Name	Parcel Numbers	Project Area Size
Pierce Conservation District	0519132700 0519132017 0519131030	10.08 acres
Pierce County Surface Water Management	0519132027 0519132028 0519132029	2.08 acres

Pierce County and the Project Operator signed a Use of Real Property and Carbon Credit Agreement on October 4, 2022. Under this Agreement, the County grants the District ownership of any credits for carbon storage from Project trees planted on County-owned parcels, as well as a right to enter County property to plant, monitor and maintain the trees the District plants.

The Project Operator signed an Attestation of Land Ownership on May 25, 2022 stating ownership in fee simple of the three PCD-owned parcels.

1 – PCD 2022 Use of Real Property and Carbon Credit Agreement Between PC and the PCD
2 – PCD 2022 Attestation of Land Ownership

Maps
Provide a detailed map of the Project Area. Also provide a regional-scale map that shows the Project Area within the context of relevant urban/town boundaries. Include numbered title/filename of attachments (Ex: 2 - Regional Scale Map)

3 – PCD 2022 Planting Location Shapefiles
4 – PCD 2022 Regional Area Map
5 - PCD 2022 Project Area Map

PROJECT DURATION (Section 1.2 and 5)

Project Operator commits to the 25-year project duration requirement through a signed Project Implementation Agreement with City Forest Credits.

Project Operator has committed to the 25-year project duration and signed a Project Implementation Agreement with City Forest Credits.

ATTESTATIONS

Complete and attach the following attestations: Attestation of No Double Counting of Credits, Attestation of No Net Harm, Attestation of Planting, and Attestation of Planting Affirmation. Provide any additional notes as relevant.

Project Operator has signed the Attestation of No Double Counting of Credits and the Attestation of No Net Harm. Project Operator has signed the Attestation of Planting and provided supporting documentary evidence of planting. A participating organization in the tree planting, Washington Conservation Corps, has signed the Planting Affirmation.

6 – PCD 2022 Attestation of No Double Counting
7 – PCD 2022 Attestation of No Net Harm
8 – PCD 2022 Attestation of Planting
9 – PCD 2022 Attestation of Planting Affirmation

ADDITIONALITY (Section 4 and Appendix D)

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 (Protocol Section 4.1). 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 4.2)
- Project trees are additional based on a project specific baseline or the Performance Standard Baseline attached to this PDD.
- Project Operator has signed a Project Implementation Agreement with City Forest Credits for 25 years.
- The 25-year Project Duration commitment is additional to and longer than any commitment our organization makes to non-carbon project tree plantings.

While not required under CFC Tree Planting Protocol Version 9, CFC recommended that the Project Operator sign an Attestation of Additionality in compliance with the most recent version (Version 10) of the Tree Planting Protocol. The Project Operator has signed the Attestation of Additionality.

Filename:
10 – PCD 2022 Attestation of Additionality

PLANTING DESIGN

Describe detailed planting design, including spacing between trees. Will the trees be planted as scattered individual trees, clustered in groups like in natural areas, or tightly clustered to restore a forest ecosystem?

- *Single Tree - trees are scattered and spaced apart more than 10 feet, as in streets, yards, some parks, and schools, individual trees are tracked and randomly sampled*
- *Clustered Parks - trees are relatively contiguous in park-like settings and change in canopy is tracked*
- *Canopy - trees are planted very close together, often but not required to be in riparian areas, significant mortality is expected, and change in canopy is tracked. The two main goals are to create a forest ecosystem and generate canopy*

Describe your data collection on Project Trees and show it in the quantification section below. For example, Project Operator can use the data collection sheet contained in the CFC quantification tool or your own approved method.

The District used the clustered planting design and quantification method to plant 12.16-acre area of former pasture fields.

South Prairie Creek Preserve is comprised of 129 acres owned by both the District and Pierce County Surface Water Management. For this application, 2.08 acres are within parcels owned by Pierce County Surface Water Management, and 10.08 acres are within a parcel owned by the Pierce Conservation District. The project area for this application consists of polygons spread throughout the north floodplain, filling in the remainder of areas that have not been planted. The planting areas are in the western, central, and eastern areas of the north floodplain, and most areas are between the newly constructed side channel and planting areas from previous years. There are also two small polygons that border South Prairie Creek, and one small polygon that borders Silver Springs Creek.

A conifer/deciduous tree-shrub mix of 5,842 trees were planted with a spacing of 10’ on center. Bare root plants were the primary plant stock, while 1-gallon potted plants and live stakes represented a smaller portion of the plant stock. Trees were planted between October 1, 2021 and March 31, 2022. The District will monitor and report on tree canopy growth over the project area for 25 years.

CARBON QUANTIFICATION DOCUMENTATION (Section 12 and Appendix B)

Describe which quantification approach you anticipate using, list the project’s climate zone, and outline the estimated total number of credits to be issued to the project as well as the amount to be issued upon successful verification. When requesting credits after planting, attach one of the three quantification tool documents below and provide the data you have collected for Project Trees.

- *Single Tree - trees are scattered and spaced apart more than 10 feet, as in streets, yards, some parks, and schools, individual trees are tracked and randomly sampled*
- *Clustered Parks - trees are relatively contiguous in park-like settings and change in canopy is tracked*
- *Canopy - trees are planted very close together, often but not required to be in riparian areas, significant mortality is expected, and change in canopy is tracked. The two main goals are to create a forest ecosystem and generate canopy*

The cluster quantification method was used to calculate the estimated carbon credits to be issued and co-benefit information. Pierce Conservation District used the CFC Pacific Northwest Initial Credit Cluster Quantification Tool. Below is a summary of the number of trees, acreage, total credits, and co-benefits.

Total number of trees planted	5,842
Project area (acres), if applicable	12.16
Total number of trees per acre, if applicable	478
Credits attributed to the project (tCO2e)	7,833
Credits after mortality deduction (20%)	6,266
Contribution to Registry Reversal Pool (5%) (tCO2e)	313
Total credits to be issued to the Project Operator (tCO2e)	5,953
Total credits requested to be issued After Planting (10% of above)	595

GHG Assertion:
Project Operator asserts that the Project results in the GHG emissions mitigation of 5,953 tons CO2e. Project Operator will provide imaging of canopy growth over the Project Area, quantify tons CO2e, and submit documentation for verification and credit issuance at Year 4, 6, and after Year 25 per the Tree Protocol and Cluster Quantification Methodology.

Project Operator asserts that the Project results in the GHG emissions mitigation of 595 tons CO2e after initial tree planting.

Filename:
11 – PCD 2022 Initial Credit Cluster Quantification Tool

Tree Species	Sum of No. Trees Planted
Beaked hazelnut	302
bigleaf maple	715
black cottonwood	595
black hawthorn	260
Cascara	100
Douglas fir	510
grand fir	220
Oregon ash	170
Pacific crabapple	80
Pacific willow	150
red alder	240
Red elderberry	720
Sitka spruce	135
Sitka willow	100
vine maple	415
western hemlock	10
western red cedar	1120
Grand Total	**5842**

CARBON CO-BENEFITS QUANTIFICATION DOCUMENTATION (Section 12 and Appendix B)

Summarize co-benefit results based on the project's planting method and provide supporting documentation. CFC can provide co-benefits quantification for Project Operator for rainfall interception, air quality improvements, and energy savings.

Ecosystem Services	***Resource Units***	***Value***
Rainfall Interception (m3/yr)	24,376.06	$178,953.04
Air Quality (t/yr)	-0.9294	$1,810.74
Cooling – Electricity (kWh/yr)	51,069.28	$2,614.75
Heating – Natural Gas (kBtu/yr)	156,015.66	$1,776.03
Grand Total ($/yr)		**$185,154.56**

The co-benefits quantification was calculated using the Pacific Northwest Initial Credit Cluster Quantification Tool supplied by City Forest Credits. The project will provide $185,154.56 in ecosystem services every year once the trees reach age 25.

Attachment 11 – PCD 2022 Initial Credit Cluster Quantification Tool, tab "Co-Benefits"

SOCIAL IMPACTS (Section 11)

Project Operators shall use the Carbon Project Social Impact template to evaluate the UN Sustainable Development Goals (SDGs) to determine how a Project provides social impacts that contribute towards achievement of the global goals. CFC will provide the template. Summarize the three to five main SDGs from this Project.

N/A

MONITORING AND REPORTING PLANS (Appendix A)

Throughout the Project Duration, the Project Operator must report on tree conditions across the Project Area. 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, 2022, the first monitoring report will be due by January 31, 2023 and each January 31st thereafter for the duration of the project.

At Years 4, 6, and 26, sampling, measurement of trees or canopy coverage, and/or quantification of CO_2e will be submitted for request of credit issuance in lieu of a monitoring report that year.

Monitoring Reports

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 following questions are contained in CFC's annual monitoring report template:

1. *Has the contact information for the Project Operator changed? If so, provide new information.*
2. *Have there been changes in land ownership of the Project Area?*
3. *Have there been any changes in the Project Design?*
4. *Have there been any changes in the implementation or management of the Project?*

5. Have there been any significant changes to the site (such as flooding or human changes)?
6. Have there been any significant tree or canopy losses estimated to be greater than 8% of Project Trees or 8% of canopy?
7. Any other significant elements to report?

Confirm and describe your plans for annual monitoring of this project and specifics on how imaging (see Imaging Requirements in the Protocol Requirements section above) will be conducted based on your project's planting method.

Pierce Conservation District staff will submit an annual monitoring report by the anniversary of the first approved verification report and every year thereafter for the 25-year duration of the project. Data collection on project trees will follow the vegetation monitoring manual developed by Pierce Conservation District habitat improvement staff. The monitoring manual is a protocol used to establish monitoring plots and transects within the planting area. Plant health data, line point intercept data, qualitative observations about plant conditions, photo monitoring data, and species richness data are collected. Tree canopy monitoring, as described in the "City Forest Credits Planting Protocol – Cluster Planting Quantification and Monitoring, Standards and Requirements in the Pacific Northwest" document, will be added to our monitoring protocol for Years 4, 6, and after Year 25. Aerial imagery obtained via drone or publicly available GIS imaging will be used to assess tree canopy coverage.

ADDITIONAL INFORMATION

Include additional noteworthy aspects of the project. Examples include collaborative partnerships, community engagement, or project funders. **Collaborative Partnerships and Community Engagement:**

In addition to PCD staff, this planting project was made possible by the help of many partners, including South Puget Sound Salmon Enhancement Group, The Puyallup Tribe of Indians, Pierce County Surface Water Management, and many others. On the ground efforts were augmented by multiple volunteer events, where community members helped with plant installations and other project work. Additionally, the hard work of the Washington Conservation Corps crews and EarthCorps crews were instrumental in completing the plant installation.

Project Impacts:

This planting is part of a larger effort to improve salmon habitat and restore floodplain processes in a high priority stretch of South Prairie Creek. Construction of a half-mile side channel and instream improvements to a half-mile of South Prairie Creek are intended to support adult to juvenile out-migrant survival and productivity for spawning, rearing, foraging, migrating, and overwintering life history stages for fall Chinook, Steelhead, Coho, Chum, Pink, and Cutthroat and Bull Trout.

However, the long-term success of this project – and the long-term achievement of self-sustaining ecosystem processes – depends on establishment of riparian and floodplain plant communities throughout the project site. This carbon planting project is the final piece of the restoration effort. Over time the established vegetation will provide erosion control, provide water and sediment filtration, provide shade to lower water temperatures, contribute to instream habitat diversity, sequester carbon, and improve floodplain and riparian habitat ecosystem processes.

This planting occurs on property owned by the Pierce Conservation District and Pierce County Surface Water Management. The larger scope of the salmon and floodplain restoration effort occurs on contiguous properties totaling 129 acres owned by both Pierce County and the Pierce Conservation District. The salmon and floodplain restoration project as a whole are done in partnership with Pierce County, the Puyallup Tribe of Indians, and the South Puget Sound Salmon Enhancement Group. This project is the culmination of a multi-year effort by these partners and others to identify high-priority opportunities to improve endemic salmonid populations, many of which are threatened and endangered. Revenue generated from the sale of carbon credits will provide much needed maintenance funding for Pierce Conservation District to steward this site for 25 years.

PROJECT OPERATOR SIGNATURE

Signed on October 5, 2022 by Ryan Bird, Habitat Restoration Manager, for Pierce Conservation District.

Ryan Bird
_____
Signature

Ryan Bird
(253) 845-9770 ext. 133
RyanB@piercecd.org

ATTACHMENTS

1 – PCD 2022 Use of Real Property and Carbon Credit Agreement Between PC and the PCD
2 – PCD 2022 Attestation of Land Ownership
3 – PCD 2022 Planting Location Shapefiles
4 – PCD 2022 Regional Area Map
5 – PCD 2022 Project Area Map
6 – PCD 2022 Attestation of No Double Counting
7 – PCD 2022 Attestation of No Net Harm
8 – PCD 2022 Attestation of Planting
9 – PCD 2022 Attestation of Planting Affirmation
10 – PCD 2022 Attestation of Additionality
11 – PCD 2022 Initial Credit Cluster Quantification Tool
12 – PCD 2022 Geotagged Photos
13 – Performance Standard Baseline Methodology
14 - Quantifying Carbon Dioxide Storage and Co-Benefits for Urban Tree Planting Projects

Attachment 13

PERFORMANCE STANDARD BASELINE METHODOLOGY (Section 4 and Appendix D)

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

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

Identify a list of multiple baseline candidates	Many urban areas, which could be blended mathematically to produce a performance standard baseline

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:

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

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)
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 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

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

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 B)

Introduction

Ecoservices provided by trees to human beneficiaries are classified according to their spatial scale as global and local (Costanza 2008) (citations in Part 1 are listed in References at page 16). 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

There are three different methods for quantifying carbon dioxide (CO_2) storage in urban forest carbon projects:

- Single Tree Method - planted trees are scattered among many existing trees, as in street, yard, some parks, and school plantings, individual trees are tracked and randomly sampled
- Clustered Parks Planting Method - planted trees are relatively contiguous in park-like settings and change in canopy is tracked
- Canopy Method – trees are planted very close together, often but not required to be in riparian areas, significant mortality is expected, and change in canopy is tracked. The two main goals are to create a forest ecosystem and generate canopy
- Area Reforestation Method – large areas are planted to generate a forest ecosystem, for example converting from agriculture and in upland areas. This quantification method is under development

In all cases, the estimated amount of CO_2 stored 25-years after planting is calculated. The forecasted amount of CO_2 stored during this time is the value from which the Registry issues credits in the amounts of 10%, 40% and 30% at Years 1, 4, and 6 after planting, respectively. A 20% mortality deduction is applied before calculation of Year 1 Credits in the Single Tree and Clustered Parks Planting Methods. A 5% buffer pool deduction is applied in all three methods before calculation of any crediting, with these funds going into a program-wide pool to insure against catastrophic loss of trees. At the end of the project, in year 25, Operators will receive credits for all CO_2 stored, minus credits already issued.

In the Single Tree Method, the amount of CO_2 stored in project trees 25-years after planting is calculated as the product of tree numbers and the 25-year CO_2 index (kg/tree) for each tree-type (e.g., Broadleaf

Deciduous Large = BDL). The Registry requires the user to apply a 20% tree mortality deduction before calculation of Year 1 Credits. Year 4 and Year 6 Credits depend on sampling and mortality data. A 5% buffer pool deduction is applied as well before calculation at any stage.

In the Clustered Parks Planting Method, the amount of CO_2 stored after 25-years by planted project trees is based on the anticipated amount of tree canopy area (TC). Because different tree-types store different amounts of CO_2 based on their size and wood density, TC is weighted based on species mix. The estimated amount of TC area occupied by each tree-type is the product of the total TC and each tree-type's percentage TC. This calculation distributes the TC area among tree-types based on the percentage of trees planted and each tree-type's crown projection area. Subsequent calculations reduce the amount of CO_2 estimated to be stored after 25 years based on the 20% anticipated mortality rate and the 5% buffer pool deduction.

In the Canopy Method, the forecasted amount of CO_2 stored at 25-years is the product of the amount of TC and the CO_2 Index (CI, t CO_2 per acre). This approach recognizes that forest dynamics for riparian projects are different than for park projects. In many cases, native species are planted close together and early competition results in high mortality and rapid canopy closure. Unlike urban park plantings, substantial amounts of carbon can be stored in the riparian understory vegetation and forest floor. To provide an accurate and complete accounting, we use the USDA Forest Service General Technical Report NE-343, with biometric data for 51 forest ecosystems derived from U.S. Forest Inventory and Assessment plots (Smith et al., 2006). The tables provide carbon stored per hectare for each of six carbon pools as a function of stand age. We use values for 25-year old stands that account for carbon in down dead wood and forest floor material, as well as the understory vegetation and soil. If local plot data are provided, values for live wood, dead standing and dead down wood are adjusted following guidance in GTR NE-343. More information on methods used to prepare the tables and make adjustments can be found in Smith et al., 2006. See Attachment A at the end of this Appendix for more information on the Canopy Method.

Source Materials for Single Tree Method and Clustered Parks Planting Methods

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.

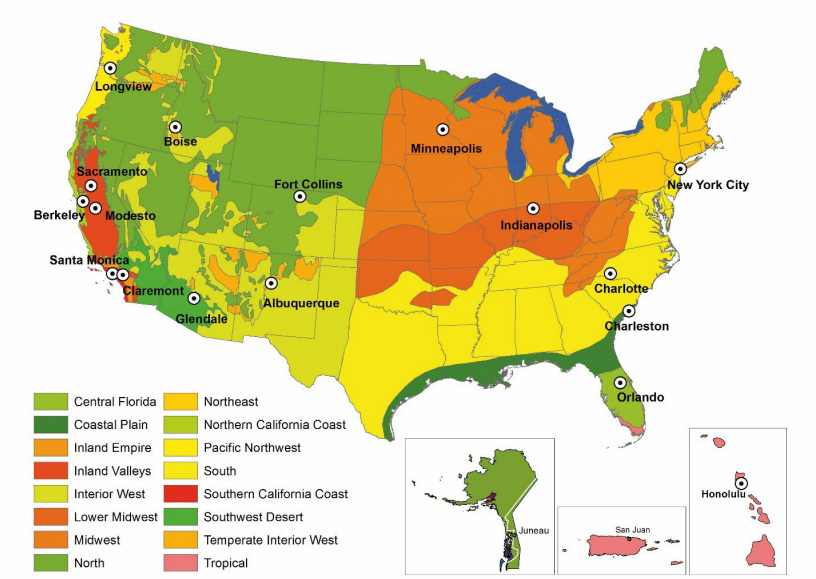


Fig. 1. Climate zones of the United States and Puerto Rico were aggregated from 45 Sunset climate zones into 16 zones. Each zone has a reference city where tree data were collected. Sacramento, California was added as a second reference city (with Modesto) to the Inland Valleys zone. Zones for Alaska, 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.

It should be noted that estimates of CO_2 stored using the Tree Canopy Approach have several limitations that may reduce their accuracy. They rely on allometric relationships for open-growing trees, so storage estimates may not be as accurate when trees are closely spaced. Also, they assume that the distribution of tree canopy cover among tree-types remains constant, when in fact mortality may afflict certain species more than others. For these reasons, periodic "truing-up" of estimates by field sampling is suggested.

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: CO_2 Avoided

Energy savings result in reduced emissions of CO_2 and criteria air pollutants (volatile organic hydrocarbons [VOCs], NO_2, SO_2, PM_{10}) from power plants and space-heating equipment. Cooling savings reduce emissions from power plants that produce electricity, the amount depending on the fuel mix. Electricity emissions reductions were based on the fuel mixes and emission factors for each utility in the 16 reference cities/climate zones across the U.S. The dollar values of electrical energy and natural gas were based on retail residential electricity and natural gas prices obtained from each utility. Utility-specific emission factors, fuel prices and other data are available in the Community Tree Guides for each region (https://www.fs.fed.us/psw/topics/urban_forestry/products/tree_guides.shtml). To convert the amount of CO_2 avoided to a dollar amount in the spreadsheet tools, City Forest Credits uses the price of $20 per metric ton of CO_2.

Error Estimates and Limitations

Estimates of avoided CO_2 emissions have the same uncertainties that are associated with modeling effects of trees on building energy use. Also, utility-specific emission factors are changing as many utilities incorporate renewable fuels sources into their portfolios. Values reported in CFC tools may overestimate actual benefits in areas where emission factors have become lower.

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.

References

Aguaron, E., & McPherson, E. G. (2012). Comparison of methods for estimating carbon dioxide storage by Sacramento's urban forest. In R. Lal & B. Augustin (Eds.), *Carbon sequestration in urban ecosystems* (pp. 43-71). Dordrecht, Netherlands: Springer.

Anderson, L. M., & Cordell, H. K. (1988). Influence of trees on residential property values in Athens, Georgia: A survey based on actual sales prices. Landscape and Urban Planning, 15, 153-164.

Cairns, M. A., Brown, S., Helmer, E. H., & Baumgardner, G. A. (1997). Root biomass allocation in the world's upland forests. Oecologia 111, 1-11.

Costanza, R. (2008). Ecosystem services: Multiple classification systems are needed. Biological Conservation, 141(2), 350-352. doi: http://dx.doi.org/10.1016/j.biocon.2007.12.020

Derkzen, M. L., van Teeffelen, A. J. A., & Verburg, P. H. (2015). Quantifying urban ecosystem services based on high-resolution data of urban green space: an assessment for Rotterdam, the Netherlands. Journal of Applied Ecology, 52(4), 1020-1032. doi: 10.1111/1365-2664.12469

Hildebrandt, E. W., & Sarkovich, M. (1998). Assessing the cost-effectiveness of SMUD's shade tree program. Atmospheric Environment, 32, 85-94.

Husch, B., Beers, T. W., & Kershaw, J. A. (2003). *Forest Mensuration* (4th ed.). New York, NY: John Wiley and Sons.

Jenkins, J.C.; Chojnacky, D.C.; Heath, L.S.; Birdsey, R.A. (2004). Comprehensive database of diameter-based biomass regressions for North American tree species. Gen. Tech. Rep. NE-319. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 45 p.

Lefsky, M., & McHale, M. (2008). Volume estimates of trees with complex architecture from terrestrial laser scanning. Journal of Applied Remote Sensing, *2*, 1-19. doi: 02352110.1117/1.2939008

Leith, H. (1975). Modeling the primary productivity of the world. Ecological Studies*, 14*, 237-263.

Maco, S.E., & McPherson, E.G. (2003). A practical approach to assessing structure, function, and value of street tree populations in small communities. Journal of Arboriculture. 29(2): 84-97.

McPherson, E. G. (2010). Selecting reference cities for i-Tree Streets. Arboriculture and Urban Forestry, *36*(5), 230-240.

McPherson, E. Gregory; van Doorn, Natalie S.; Peper, Paula J. (2016a). Urban tree database and allometric equations. General Technical Report PSW-253. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, CA. 86 p. TreeSearch #52933

McPherson, E. Gregory; van Doorn, Natalie S.; Peper, Paula J. (2016b). Urban tree database. Fort Collins, CO: Forest Service Research Data Archive. http://dx.doi.org/10.2737/RDS-2016-0005

McPherson, G., Q. Xiao, N. S. van Doorn, J. de Goede, J. Bjorkman, A. Hollander, R. M. Boynton, J.F. Quinn and J. H. Thorne. (2017). The structure, function and value of urban forests in California communities. Urban Forestry & Urban Greening. 28 (2017): 43-53.

McPherson, E. G., & Simpson, J. R. (2003). Potential energy saving in buildings by an urban tree planting programme in California. Urban Forestry & Urban Greening, 3, 73-86.

McPherson, E. G., Simpson, J. R., Peper, P. J., Maco, S. E., & Xiao, Q. (2005). Municipal forest benefits and costs in five U.S. cities. Journal of Forestry, 103, 411-416.

Nowak, D. J., Hirabayashi, S., Bodine, A., & Greenfield, E. (2014). Tree and forest effects on air quality and human health in the United States. Environmental Pollution, 193, 119-129.

Peper, P. J., McPherson, E. G., & Mori, S. M. (2001). Equations for predicting diameter, height, crown width and leaf area of San Joaquin Valley street trees. Journal of Arboriculture, 27(6), 306-317.

Schulp, C. J. E., Burkhard, B., Maes, J., Van Vliet, J., & Verburg, P. H. (2014). Uncertainties in ecosystem service maps: A comparison on the European scale. PLoS ONE 9(10), e109643.

Scott, K. I., McPherson, E. G., & Simpson, J. R. (1998). Air pollutant uptake by Sacramento's urban forest. Journal of Arboriculture, 24(4), 224-234.

Smith, James E.; Heath, Linda S.; Skog, Kenneth E.; Birdsey, Richard A. 2006. Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States. Gen. Tech. Rep. NE-343. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 216 p.

Timilsina, N., Staudhammer, C.L., Escobedo, F.J., Lawrence, A. (2014). Tree biomass, wood waste yield and carbon storage changes in an urban forest. Landscape and Urban Planning. 127: 18-27.

Vos, P. E. J., Maiheu, B., Vankerkom, J., & Janssen, S. (2013). Improving local air quality in cities: To tree or not to tree? Environmental Pollution, 183, 113-122. doi: http://dx.doi.org/10.1016/j.envpol.2012.10.021

Wang, M.Q.; Santini, D.J. (1995). Monetary values of air pollutant emissions in various U.S. regions. Transportation Research Record 1475. Washington DC: Transportation Research Board.

Wenger, K. F. (1984). Forestry Handbook. New York, NY: John Wiley and Sons.

Xiao, Q., E. G. McPherson, S. L. Ustin, and M. E. Grismer. A new approach to modeling tree rainfall interception. Journal of Geophysical Research. 105 (2000): 29,173-29,188.

Xiao, Q., & McPherson, E. G. (2016). Surface water storage capacity of twenty tree species in Davis, California. Journal of Environmental Quality, 45, 188-198.

Attachments

Agreement to Collaborate

Attestation of Land Ownership

Project Area Map

Regional Area Map

Attestation of Planting

Attestation of Planting Affirmation

Attestation of No Double Counting and No Net Harm

Attestation of Additionality

Carbon Quantification Initial Credit Tool

Tree Planting Data

Agreement to Collaborate

USE OF REAL PROPERTY AND CARBON CREDIT AGREEMENT BETWEEN PIERCE COUNTY AND THE PIERCE CONSERVATION DISTRICT

Pierce County, a legal subdivision of the State of Washington and a municipal corporation, acting through the Surface Water Management Division of its Planning and Public Works Department ("Pierce County" or "County"), and the Pierce Conservation District, a limited purpose municipal corporation ("District"), as of the date of the chronologically last signature below, enter into this Agreement regarding certain Carbon Credits which could be developed by planting and maintaining trees on County-held real property.

I. RECITALS.

A. Whereas, County holds certain real property located within Pierce County and adjacent to South Prairie Creek, parcel numbers 0519132027, 0519132028 and 0519132029, legally described in Exhibit A (Subject Property), and that Subject Property is managed by the Surface Water Management Division of County's Planning and Public Works Department; and

B. Whereas, consistent with and in order to achieve the governmental purposes set forth in Pierce County ordinances (e.g., Chapters 11.02 and 11.05 PCC) authorizing and empowering the Surface Water Management Division, County intends to manage Subject Property, among other things, to restore South Prairie Creek for the purpose of improving flood control, flood capacity, and fish habitat; and

C. Whereas, County's management plan for portions of the Subject Property includes the planting and maintenance of trees, because doing so would help accomplish the above governmental functions, and that the County would incur significant expense to do so; and

D. Whereas, certain non-governmental organizations grant Carbon Credits for tree-planting and maintenance projects that meet specific requirements, and which are documented to the extent required by the granting organization, and that said Carbon Credits have a monetary value; and

E. Whereas, District plans a tree-planting project that would include portions of the Subject Property and other real property, and District would then develop, document, and apply for a potential carbon credit from City Forest Credits, one such non-governmental organization; and

F. Whereas, the portions of the Subject Property where the District wishes to locate the tree-planting project are depicted on Exhibit B, incorporated herein by reference (Tree Project Area), and Tree Project Area is also a location where the County intended to plant trees; and

G. Whereas, the District and County estimate that the potential Carbon Credit that could be derived from trees planted within the Tree Project Area would be $40,000 to $60,000, if the

Credit is ultimately approved and realized at the end of the anticipated 25-year stewardship or maintenance period; and

H. Whereas, County estimates that its cost to acquire, plant, and maintain trees within the Tree Project Area would be similar to or might exceed the potential future value of the Carbon Credit that District may eventually obtain; and

I. Whereas, when a Carbon Credit applicant does not own the real property where the trees will be planted, City Forest Credits requires the real property owner and the Carbon Credit applicant to sign an Agreement to Transfer Potential Credits, a copy of which agreement is attached to this Agreement as Exhibit C and incorporated herein by reference; and

J. Whereas, in order to further its governmental purposes (creek restoration) and in exchange for the value of acquiring, planting, and maintaining the trees the District plants on the Subject Property, County wishes to convey to District all rights to seek the Carbon Credit derived from the portion of the District's tree-planting project located within the Tree Project Area;

NOW THEREFORE, in consideration of the mutual benefits and covenants described herein (including all exhibits and attachments), County and District agree as follows:

1. As set forth in the Agreement to Transfer Potential Credits, a copy of which is attached hereto as in Exhibit C, the County will convey to District the right to seek the Carbon Credit for all trees planted and maintained by District as part of the "Tree Project" described in the Agreement to Transfer Potential Credits. County agrees to sign that Agreement in the form attached as Exhibit C. County gives up any right it might have to itself claim the potential Carbon Credit for the Tree Project described in Exhibit C.

2. During the term of this Agreement, County grants to District a limited, temporary, and revocable right to enter and use the land depicted in Exhibit B as the Tree Project Area. This right is limited in scope, authorizing District and its agents to enter and use the depicted property solely to plant, monitor, and maintain the trees District plants to obtain the Tree Project Carbon Credit described in Exhibits C and D.

3. District shall not use or permit the Tree Project Area to be used for any purpose other than as expressly set forth in Section 2 above without the prior written consent of County, which consent may be granted, withheld, conditioned or delayed by County in its sole and absolute judgment and discretion. Further, District shall not use the Subject Property in violation of any statute, rule, ordinance, permit, order, regulation or code in effect and applicable to any part of thereof. Nor shall District do or permit to be done in, on, under or about the Tree Project Area, or any part thereof, or bring into, keep, or permit to be brought into or kept in or about the Tree Project Area anything that may constitute a waste, nuisance or unreasonable annoyance or that may injure of damage the Tree Project Area. In addition to the foregoing, District shall not transport, generate, handle, store, or dispose of any Hazardous Substance in, on, under or about the Tree Project Area other

than as expressly authorized by this Agreement. As used herein, the term "Hazardous Substance" means any hazardous, toxic, or dangerous, waste, or material, which is or becomes regulated under any federal, state or local statute, ordinance, rule, regulation, or other law now or hereafter in effect pertaining to environmental protection, contamination, or cleanup. District shall hold harmless, protect, indemnify and defend County from and against any damage, loss, claim, or liability of any kind, type or nature whatsoever arising out of or relating in any way to any breach of this Section 3, including any attorneys' fees and costs incurred. The indemnity and hold harmless provisions of this Section 3 shall survive expiration or earlier termination of the Term.

4. County reserves and shall at all times during the Term of this Agreement have the right to enter upon the Tree Project Area for any and all purposes not inconsistent with District's right to enter and use and also to observe District's activities thereupon.

5. District agrees that it will plant approximately 11,800 trees in total as part of its Tree Project (on a combination of County and non-County Real Property) of which approximately 5,842 trees are expected to qualify for Carbon Credit, all as specified in the City Forest Credits Planting Project Application, attached hereto as Exhibit D and incorporated by reference. District agrees that it is solely responsible for acquiring said trees, including the cost of acquisition.

6. District agrees that it is solely responsible for the care, monitoring, maintenance, and replanting of trees necessary to achieve both the Carbon Credit requirements and County's creek restoration goals, and will bear all labor and expense required to do so, including when necessary the control of invasive or other unwanted competing plants. District agrees to maintain the trees for both Carbon Credit and County purposes for 25 years.

7. District is solely responsible for all documentation and work necessary to certify or otherwise obtain the Carbon Credits from City Forest Credits. District is solely entitled to the value of the Credit or Credits obtained from the trees District plants and maintains on the Subject Property.

8. District and County anticipate that the monetary value of the Carbon Credit District obtains from the trees planted on County's property will be roughly equivalent to the cost of planting and maintaining those trees. To the extent that the monetary value instead significantly exceeds that cost, then District and County agree that District will strive to use the "excess" funds to further enhance County-held real property in ways that serve the shared purposes of District and County. On County request, District agrees to provide an accounting of its costs and the proceeds derived from sale of the Carbon Credits.

9. County will remain responsible for reasonable ordinary maintenance of the Tree Project Area not related to maintenance of the Tree Project described in Exhibits C and D.

10. County agrees, as required by Exhibit C, that County will not cut, damage, or harvest the

trees planted by District on the Tree Project Area except as allowed by Exhibit C. County agrees that it will coordinate with District the County's own activities on the Tree Project Area to ensure protection of the Tree Project.

11. As related to this Agreement, including District's use of the Tree Project Area, District agrees to defend, indemnify and save harmless the County, its appointed and elected officers and employees, from and against all loss or expense, including but not limited to judgments, settlements, attorney's fees and costs by reason of any and all claims and demands upon the County, its elected or appointed officials or employees for damages because of personal or bodily injury, including death at any time resulting therefrom, sustained by any person or persons, and for damages to property including loss of use thereof, whether such injury to persons or damage to property is due to the negligence of the District, its Subcontractors, its successor or assigns, or its or their agent, servants, or employees, the County, its appointed or elected officers, employees or their agents, except only such injury or damage as shall have been occasioned by the sole negligence of the County, its appointed or elected officials or employees.

    The preceding paragraph is valid and enforceable only to the extent of District's negligence where the damages arise out of services or work in connection with or collateral to, a contract or agreement relative to construction, alteration, repair, addition to, subtraction from, improvement to, or maintenance of, any building, highway, road, railroad, excavation, or other structure, project, development, or improvement attached to real estate, including moving and demolition in connection therewith, a contract or agreement for architectural, landscape architectural, engineering, or land surveying services, or a motor carrier transportation contract and where the damages are caused by or result from the concurrent negligence of (i) the County or its agents or employees, and (ii) the District or the District's agents or employees.

    With respect to the performance of this Agreement and as to claims against the County, its officers, agents and employees, District expressly waives its immunity under Title 51 of the Revised Code of Washington, the Industrial Insurance Act, for injuries to its employees and agrees that the obligations to indemnify, defend and hold harmless provided in this Agreement extend to any claim brought by or on behalf of any employee of District. This waiver is mutually negotiated by the parties to this Agreement.

12. Insurance – For the duration of the contract and until all work specified in the contract is completed, the contractor shall maintain in effect all insurance as required herein and comply with all limits, terms and conditions stipulated therein. Work under this contract shall not commence until evidence of all required insurance and bonding is provided to the Pierce County. The contractor's insurer shall have a minimum A.M. Best's rating of A- VII. Evidence of such insurance shall consist of a completed copy of the certificate of insurance, signed by the insurance agent for the contractor and returned to Pierce County Risk Management. If for any reason, any material change occurs in the coverage during the course of the contract, such changes shall not become effective until 45 days after Pierce County has received written notice of such changes. The policy shall be endorsed and shall provide that the insurance afforded applies separately to each insured against

which a claim is made or a suit is brought except with respect to the limits of the company's liability.

The policy shall be endorsed and shall reflect that the insurance afforded shall be primary insurance and any insurance or self-insurance carried by the County shall be excess and not contributory insurance to that provided by the contractor.

TYPE		**LIMITS** (Not less than)
	Per Occurrence	Aggregate
Commercial General Liability (CG 00 01) Premises/operations Products/completed operations Personal injury Explosion, collapse & underground Contractual liability	**$1,000,000**	**$2,000,000**
Auto Policy (CA 00 01) or Equivalent (non-owned, hired, and owned)	**$1,00,000 CSL**	**$2,000,000**
Workers' Compensation	**Statutory**	
Professional Liability*	**$1,000,000**	

*Professional Liability is only required for Professional Services Contracts such as services provided by engineers, architects, attorneys, medical providers, and computer programmers.

13. The term of this Agreement begins upon its execution and expires 25 years thereafter. To the extent authorized by law, the parties may extend this Agreement by mutual agreement when such further term is necessary to obtain the anticipated Carbon Credits.

14. County shares the District's commitment to planting trees in the Tree Project Area and does not anticipate a need to terminate the rights granted herein. But County reserves the right to terminate District's right to enter and use the Tree Project Area at County's convenience upon 30 days written notice to District. Provided, however, that should County so terminate District's rights prior to the end of the term established in Section 13, County agrees to reimburse District only for its reasonable documented costs expended prior to termination for the acquisition, planting, and maintaining of the trees District planted in the Tree Project Area. County shall not be responsible to pay District the potential or actual value of the credit or credits. County and District agree to negotiate in good faith should any dispute arise regarding the costs expended to acquire, plant, and maintain the trees.

15. In the event that any litigation should arise concerning the construction or interpretation of any of the terms of this Agreement, the venue of such action of litigation shall be in the courts of the State of Washington in and for the County of Pierce. This Agreement shall be governed by the law of the State of Washington. Except as provided in Sections 3 and 11, in any dispute, whether in a court or an alternative dispute forum, each party shall be responsible for its own attorney fees and actual costs, including expert witness costs, regardless of who prevails.

16. District may not assign its rights under this Agreement to any other entity or person without the prior written consent of County, which consent may be granted, withheld, conditioned or delayed by County in its sole and absolute judgment and discretion.

See Signatures on Next Page

Pierce County Signatures:

Approved as to Legal Form Only:

DocuSigned by:
899CE74C5CDC4C6...
10/4/2022
Deputy Prosecuting Attorney Date

Recommended:

DocuSigned by:
Bruce Wagner
3B4BB94F113E49D...
10/4/2022
Deputy Director Date

DocuSigned by:
Gary Robinson
88F99CA97BBD418...
10/4/2022
Finance Director Date

Final Action:

10/3/22
Pierce County Executive Date

STATE OF WASHINGTON)
) ss.
COUNTY OF PIERCE)

On this 3rd day of OCTOBER, 2022, before me, the undersigned, a notary public in and for the state of Washington, duly commissioned and sworn, personally appeared BRUCE F. DAMMEIER, known to me to be the Executive of Pierce County, Washington, a municipal corporation and political subdivision of the state of Washington, who executed the within and foregoing instrument and acknowledged the said instrument to be the free and voluntary act of said municipal corporation for the uses and purposes therein mentioned, and on oath stated that he is authorized to execute the said instrument.

In witness whereof, I have hereunto set my hand and affixed my official seal the day and year first above written.

NOTARY SIGNATURE
PRINTED NAME LILLIAN ALLRED
NOTARY PUBLIC IN AND FOR THE STATE OF WASHINGTON,
RESIDING AT TACOMA, WA
MY COMMISSION EXPIRES 7-7-26

LILLIAN ALLRED 14034 NOTARY PUBLIC COMMISSION EXPIRES 07-07-25 STATE OF WASHINGTON

Pierce Conservation District Signature:

Oct 4 2022
Executive Director, Date
Pierce Conservation District

DANA COGGON
Printed Name

STATE OF WASHINGTON)
) ss.
COUNTY OF PIERCE)

On this 4th day of October, 2022, before me, the undersigned, a notary public in and for the state of Washington, duly commissioned and sworn, personally appeared Dana COGGON, known to me to be the Executive Director of Pierce Conservation District., a limited purpose municipal corporation, who executed the within and foregoing instrument and acknowledged the said instrument to be the free and voluntary act of said corporation for the uses and purposes therein mentioned, and on oath stated that he/she is authorized to execute the said instrument.

In witness whereof, I have hereunto set my hand and affixed my official seal the day and year first above written.

Cynthia Ross
NOTARY SIGNATURE
PRINTED NAME Cynthia Ross
NOTARY PUBLIC IN AND FOR THE STATE OF WASHINGTON,
RESIDING AT Puyallup, WA
MY COMMISSION EXPIRES 11/26/2025

CYNTHIA M ROSS
Notary Public
State of Washington
Commission # 21034606
My Comm. Expires Nov 26, 2025

Exhibit A
(Legal Descriptions)

Pierce County Tax Parcel 0519132027
The West 300 feet of the following described property lying North of South Prairie Creek:

Beginning on the North line of Paul Emery Donation Land Claim at a point 43.75 chains West of the Northeast corner of Section 13, Township 19 North, Range 5 East, W.M., in Pierce County, Washington; Thence West along the North line of said donation land claim and the North line of said Section 13, a distance of 1,376.15 feet, more or less, to appoint 1,019 feet East of the Northwest corner of said Section 13; Thence South 00°29' West 2,515 feet, more or less, to the North line of the former Northern Pacific Railway Company's right of way; thence Northeasterly along said right of way to a point South of the Point of Beginning; thence North to the Point of Beginning.

Situate in Pierce County, Washington.

Pierce County Tax Parcel 0519132028
The East 300 feet of the West 600 feet of the following described property lying North of South Prairie Creek:

Beginning on the North line of Paul Emery Donation Land Claim at a point 43.75 chains West of the Northeast corner of Section 13, Township 19 North, Range 5 East, W.M., in Pierce County, Washington; Thence West along the North line of said donation land claim and the North line of said Section 13, a distance of 1,376.15 feet, more or less, to appoint 1,019 feet East of the Northwest corner of said Section 13; Thence South 00°29' West 2,515 feet, more or less, to the North line of the former Northern Pacific Railway Company's right of way; thence Northeasterly along said right of way to a point South of the Point of Beginning; thence North to the Point of Beginning.

Situate in Pierce County, Washington.

Pierce County Tax Parcel 0519132029
That portion of the following described property lying North of South Prairie Creek:

Beginning on the North line of Paul Emery Donation Land Claim at a point 43.75 chains West of the Northeast corner of Section 13, Township 19 North, Range 5 East, W.M., in Pierce County, Washington; Thence West along the North line of said donation land claim and the North line of said Section 13, a distance of 1,376.15 feet, more or less, to appoint 1,019 feet East of the Northwest corner of said Section 13; Thence South 00°29' West 2,515 feet, more or less, to the North line of the former Northern Pacific Railway Company's right of way; thence Northeasterly along said right of way to a point South of the Point of Beginning; thence North to the Point of Beginning. Except the West 600 feet.

Situate in Pierce County, Washington.

Exhibit B
(Illustration depicting portion of Pierce County Parcels that will be part of Tree Project Area)

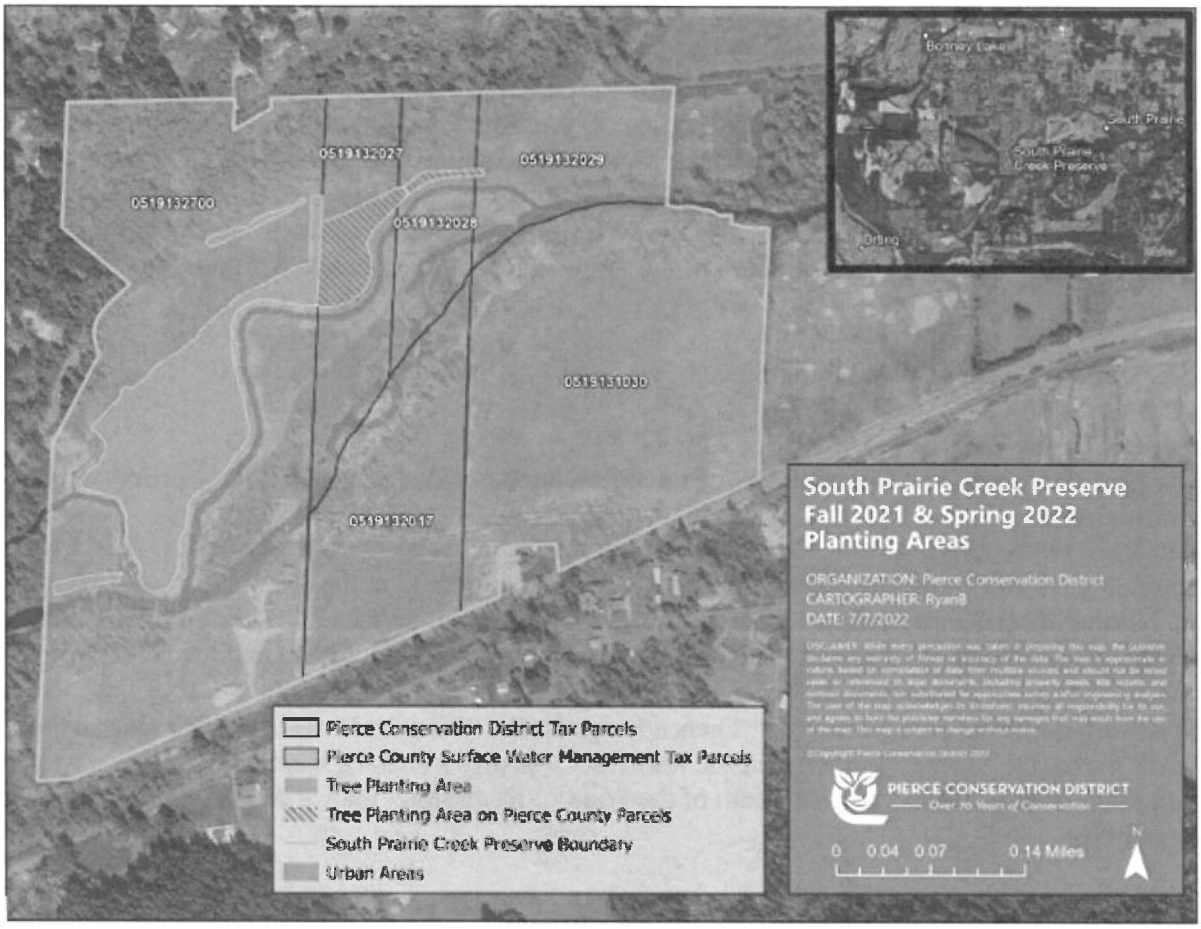


Exhibit C
(City Forest Credits Agreement to Transfer Potential Credits)

Pierce Conservation District Reforestation Program – 2022
South Prairie Creek Preserve – North Floodplain Planting Project
Agreement to Transfer Potential Credits

This Agreement to Transfer Potential Credits ("Agreement") is entered into this 4th day of October, 2022,(the "Effective Date") by Pierce County, a municipal corporation and legal subdivision of the State of Washington, acting through the Surface Water Management Division of its Planning and Public Works Department (the "Landowner") and Pierce Conservation District, a limited purpose municipal corporation and legal subdivision of the State of Washington (the "Project Operator"). As part of its mission, the Project Operator works to improve water quality, promote sustainable agriculture, create thriving habitat, and build a just and healthy food system for all, through education, community engagement, and financial and technical assistance, and Project Operator thus has undertaken a tree-planting 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 run-off reductions, energy savings, fish habitat, and air quality benefits arising from the planting and growth of trees in the Tree Project ("Carbon+ Credits"). The Carbon+ 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 Carbon+ Credits developed from the Tree Project during the term of this agreement, including rights to register with CFC, and develop and sell the Carbon+ Credits. The Carbon+ Credit rights transferred by this Agreement are for the Tree Project described in Project Operator's application and as described and depicted on Exhibit's A and B attached to this agreement

3. 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.

4. Obligations of Project Operator

Project Operator will pay all costs and assume all responsibilities for development and sale of Carbon+ Credits from the Tree Project, including without limitation the responsibility to obtain, plant, maintain, and monitor the trees planted in the Tree Project.

5. Project Operator Representations

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

agreement.

6. 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.

7. Term of Agreement and Option to Renew

This Agreement shall remain in force for 25 years after the Effective Date of the Agreement.

8. Governing Law

This agreement shall be construed and enforced in accordance with the laws of the State of Washington.

9. Parties

Project Operator	
Name:	Dana Coggon
Title:	Executive Director, Pierce Conservation District
Address:	P.O. Box 1057 Puyallup, WA 98371
Phone:	
Email:	Dana@piercecd.org
Signature:	Dana Coggon 3B59E8595C6C414...
Date:	10/4/2022

Exhibit C
(City Forest Credits Credit Transfer Agreement)

Pierce County Signatures:

Approved as to Legal Form Only:

DocuSigned by:
899CE74C5CDC4C6...
10/4/2022
Deputy Prosecuting Attorney Date

Recommended:

DocuSigned by:
Bruce Wagner
3B4BB94F113E49D...
10/4/2022
Deputy Director Date

DocuSigned by:
Gary Robinson
88F99CA97BBD418...
10/4/2022
Finance Director Date

Final Action:

DocuSigned by:
Bruce Dammeier
1BD2210628D6495...
10/4/2022
Pierce County Executive Date

Exhibit D
(PCD South Prairie Creek Preserve Project Application)

City Forest Credits
Carbon Planting Project Application

1. Project Name
Pierce Conservation District Reforestation Program
2022 Projects
South Prairie Creek Preserve – North Floodplain Planting Project

2. Project Type
Planting

3. Project Location
The site is in unincorporated Pierce County, approximately one mile west of the town of South Prairie, WA. Reference address for project: 13518 Pioneer Way East, Orting WA 98360.

4. Project Operator
Organization/Entity: Pierce Conservation District
Address: PO Box 1057
City: Puyallup
State: WA
Zip: 98371
Contact(s): Ryan Bird, Habitat Restoration Manager
Phone: 253-845-9770 ext. 133
Email: ryanb@piercecd.org

5. Project Description
This project will restore native vegetation to an estimated 12.16 acres of riparian and floodplain habitat along South Prairie Creek, a tributary to the Carbon River in the Puyallup-White River watershed. Planting will take place in floodplain and riparian areas between a newly constructed half-mile side channel and Silver Springs Creek, a tributary to South Prairie Creek.

This planting is part of a larger effort to improve salmon habitat and restore floodplain processes. The majority of the project's construction occurred in 2020, including creation of the side channel, instream structures in the mainstem of South Prairie Creek, and installation of engineered wood structures in the floodplain. Approximately 22.1 acres have been planted since the beginning of this restoration effort. This application represents the remaining 12.16 acres which will be planted during the Fall/Winter 2021-2022 season.

Native vegetation in the project area is believed to have been removed by 19th and 20th century settlers in the area. Much of the project site had been used as pasture by a family-owned dairy for many decades, until the property was sold to the Pierce Conservation District

ca. 2005. Prior to the start of this project, much of the riparian and floodplain plant community was characterized by a mix of non-native grasses and invasive weeds.

6. Project Impacts

This planting is part of a larger effort to improve salmon habitat and restore floodplain processes in a high priority stretch of South Prairie Creek. Construction of a half-mile side channel and instream improvements to a half-mile of South Prairie Creek are intended to support adult to juvenile out-migrant survival and productivity for spawning, rearing, foraging, migrating, and overwintering life history stages for fall Chinook, Steelhead, Coho, Chum, Pink, and Cutthroat and Bull Trout.

However, the long-term success of this project – and the long-term achievement of self-sustaining ecosystem processes – depends on establishment of riparian and floodplain plant communities throughout the project site. This carbon planting project is the final piece of the restoration effort. Over time the established vegetation will provide erosion control, improve floodplain and riparian habitat ecosystem processes, provide shade to lower water temperatures, contribute to instream habitat diversity, and sequester carbon.

7. Number of trees to be planted and general planting-design

The planting plan submitted in this application is for a 12.16-acre area of former pasture fields. The project area for this application consists of polygons spread throughout the north floodplain, filling in the remainder of areas that have not been planted. The planting areas are primarily located in the western and central portions of the north floodplain, and are mostly between the newly constructed side channel and planting areas from previous years. There is also one small polygon that borders South Prairie Creek in the southwestern area of the preserve, and one small polygon that borders Silver Springs Creek in the northwestern area of the preserve.

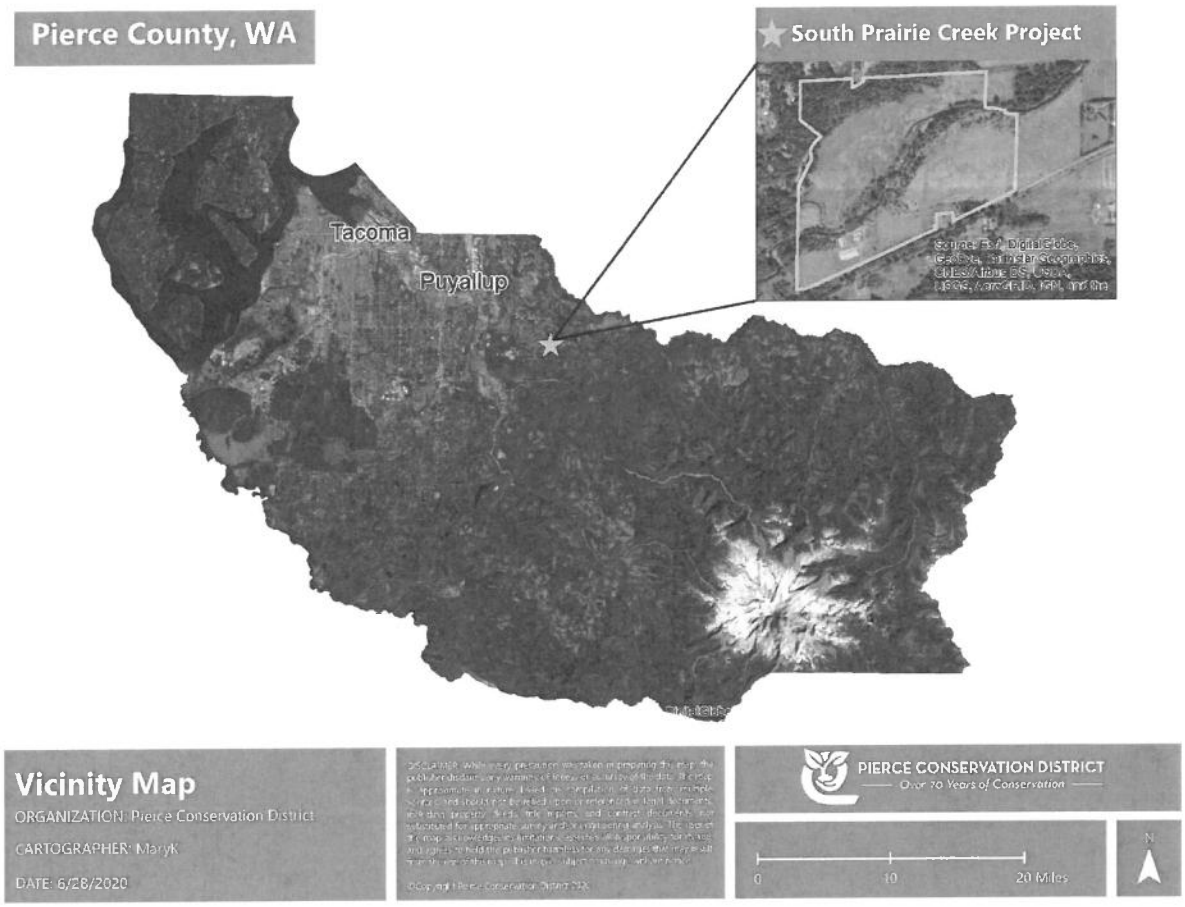
South Prairie Creek Preserve is comprised of 129 acres owned by both the District and Pierce County Surface Water Management. For this application, 2.08 acres are within parcels owned by Pierce County Surface Water Management, and 10.08 acres are within a parcel owned by the Pierce Conservation District.

We will use the single-tree canopy planting approach. The project area will be planted with a conifer/deciduous tree-shrub mix of 5,842 plants with a spacing of 10' on center. Bare root plants will be the primary plant stock, 1-gallon potted plants will represent a smaller portion of the plant stock, and live stakes may also be used.

Common Name	Scientific Name	# of Plants
Abies grandis	Grand fir	220
Picea sitchensis	Sitka spruce	135
Pseudotsuga menziesii	Douglas fir	510
Thuja plicata	Western red cedar	1,120
Tsuga heterophylla	Western hemlock	10
Alnus rubra	Red alder	240
Fraxinus latifolia	Oregon ash	170
Populus balsamifera	Black cottonwood	595
Salix sitchensis	Sitka willow	100
Malus fusca	Pacific crabapple	80
Corylus cornuta	Beaked hazelnut	302
Crataegus douglasii	Black hawthorn	260
Rhamnus purshiana	Cascara	100
Acer circinatum	Vine maple	415
Sambucus racemosa	Red elderberry	720
Acer macrophyllum	Big leaf maple	715
Salix lucida	Pacific willow	150
	Total	**5,842**

8. Additional Information

This planting occurs on property owned by the Pierce Conservation District and Pierce County Surface Water Management. The larger scope of the salmon and floodplain restoration effort occurs on contiguous properties totaling 129 acres owned by both Pierce County and the Pierce Conservation District. The salmon and floodplain restoration project as a whole are done in partnership with Pierce County, the Puyallup Tribe of Indians, and the South Puget Sound Salmon Enhancement Group. This project is the culmination of a multi-year effort by these partners and others to identify high-priority opportunities to improve endemic salmonid populations, many of which are threatened and endangered. Revenue generated from the sale of carbon credits will provide much needed maintenance funding for Pierce Conservation District to steward this site for 25 years.


Pierce County, WA
South Prairie Creek Project
Tacoma
Puyallup
Vicinity Map
ORGANIZATION: Pierce Conservation District
CARTOGRAPHER: MaryK
DATE: 6/28/2020
PIERCE CONSERVATION DISTRICT
Over 70 Years of Conservation
0
10
20 Miles
N

DocuSign

Certificate Of Completion

Envelope Id: DAD9FC9AA9234CCFA2B2E6EDC2224B47
Status: Completed
Subject: SC-109576: Use of Real Property and Carbon Credit Agreement Between PC and the PCD
Source Envelope:
Document Pages: 17
Signatures: 8
Certificate Pages: 5
Initials: 0
AutoNav: Enabled
EnvelopeId Stamping: Disabled
Time Zone: (UTC-08:00) Pacific Time (US & Canada)

Envelope Originator:
Kimberly Smith
1102 Broadway
Ste 101
Tacoma, WA 98402
kimberly.smith@piercecountywa.gov
IP Address: 24.17.172.242

Record Tracking

Status: Original
9/30/2022 8:36:00 AM
Holder: Kimberly Smith
kimberly.smith@piercecountywa.gov
Location: DocuSign

Signer Events	Signature	Timestamp
Dana Coggon DanaC@piercecd.org Executive Director Piece Conservation District Security Level: Email, Account Authentication (None)	DocuSigned by: Dana Coggon 3B59E8595C6C414... Signature Adoption: Pre-selected Style Using IP Address: 50.232.229.18	Sent: 10/4/2022 12:32:44 PM Viewed: 10/4/2022 12:34:32 PM Signed: 10/4/2022 12:35:08 PM
Electronic Record and Signature Disclosure: Accepted: 10/4/2022 12:34:32 PM ID: 26aa51ee-63d4-4382-8db6-80ec2f3397ee		
Bruce Wagner bruce.wagner@piercecountywa.gov M&O Division Manager PPW Maintenance & Operations Security Level: Email, Account Authentication (None)	DocuSigned by: Bruce Wagner 3B4BB94F113E49D... Signature Adoption: Pre-selected Style Using IP Address: 162.5.17.30	Sent: 10/4/2022 12:35:10 PM Viewed: 10/4/2022 12:49:01 PM Signed: 10/4/2022 1:01:43 PM
Electronic Record and Signature Disclosure: Accepted: 10/4/2022 12:49:01 PM ID: 190da1cc-2580-4db8-8fef-3185b44960a1		
Gary Robinson Gary.Robinson@piercecountywa.gov Finance Director Security Level: Email, Account Authentication (None)	DocuSigned by: Gary Robinson 88F99CA97BBD418... Signature Adoption: Pre-selected Style Using IP Address: 162.5.8.134	Sent: 10/4/2022 12:35:10 PM Viewed: 10/4/2022 1:10:15 PM Signed: 10/4/2022 1:10:27 PM
Electronic Record and Signature Disclosure: Accepted: 10/4/2022 1:10:15 PM ID: 9c2e6a3f-2b51-4fde-8243-50323a427d0d		
Ian Northrip ian.northrip@piercecountywa.gov Deputy PA Security Level: Email, Account Authentication (None)	DocuSigned by: 899CE74C5CDC4C6... Signature Adoption: Uploaded Signature Image Using IP Address: 162.5.36.148	Sent: 10/4/2022 12:35:10 PM Viewed: 10/4/2022 1:57:01 PM Signed: 10/4/2022 1:57:57 PM
Electronic Record and Signature Disclosure: Accepted: 10/4/2022 1:57:01 PM ID: 3917c9eb-61e2-4241-a179-1e25e4119807		

Signer Events	Signature	Timestamp
Bruce Dammeier pcexecutive@piercecountywa.gov Pierce County Executive Security Level: Email, Account Authentication (None)	DocuSigned by: Bruce Dammeier 1BD2210628D6495... Signature Adoption: Pre-selected Style Using IP Address: 162.5.54.49	Sent: 10/4/2022 1:57:59 PM Viewed: 10/4/2022 1:59:52 PM Signed: 10/4/2022 2:00:01 PM
Electronic Record and Signature Disclosure: Accepted: 10/4/2022 1:59:52 PM ID: 4d939b33-5e9b-4382-91c1-a0fd9b3e8c6a		
Kimberly Smith kimberly.smith@piercecountywa.gov Procurement and Contracts Specialist 1 Security Level: Email, Account Authentication (None)	**Completed** Using IP Address: 24.17.172.242	Sent: 10/4/2022 2:00:04 PM Viewed: 10/4/2022 2:10:27 PM Signed: 10/4/2022 2:12:24 PM
Electronic Record and Signature Disclosure: Not Offered via DocuSign		

In Person Signer Events	Signature	Timestamp

Editor Delivery Events	Status	Timestamp

Agent Delivery Events	Status	Timestamp

Intermediary Delivery Events	Status	Timestamp

Certified Delivery Events	Status	Timestamp

Carbon Copy Events	Status	Timestamp
Tammy Maines tammy.maines@piercecountywa.gov Security Level: Email, Account Authentication (None)	COPIED	Sent: 10/3/2022 4:08:54 PM Viewed: 10/3/2022 4:09:20 PM
Electronic Record and Signature Disclosure: Accepted: 8/22/2022 5:41:21 AM ID: 6c40de9b-9f00-4613-a918-39e90e376bba		
Kerri Schaefer kerri.schaefer@piercecountywa.gov PPW-CONTRACTS Security Level: Email, Account Authentication (None)	COPIED	Sent: 10/3/2022 4:08:00 PM Viewed: 10/4/2022 7:33:56 AM
Electronic Record and Signature Disclosure: Not Offered via DocuSign		

Witness Events	Signature	Timestamp

Notary Events	Signature	Timestamp

Envelope Summary Events	Status	Timestamps
Envelope Sent	Hashed/Encrypted	10/3/2022 4:08:00 PM
Certified Delivered	Security Checked	10/4/2022 2:10:27 PM
Signing Complete	Security Checked	10/4/2022 2:12:24 PM
Completed	Security Checked	10/4/2022 2:12:24 PM

Payment Events	Status	Timestamps

Electronic Record and Signature Disclosure

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To request delivery from us of paper copies of the notices and disclosures previously provided by us to you electronically, you must send us an email to curtis.hanson@piercecountywa.gov and in the body of such request you must state your email address, full name, mailing address, and telephone number. We will bill you for any fees at that time, if any.

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To inform us that you no longer wish to receive future notices and disclosures in electronic format you may:

i. decline to sign a document from within your signing session, and on the subsequent page, select the check-box indicating you wish to withdraw your consent, or you may;

ii. send us an email to curtis.hanson@piercecountywa.gov and in the body of such request you must state your email, full name, mailing address, and telephone number. We do not need any other information from you to withdraw consent.. The consequences of your withdrawing consent for online documents will be that transactions may take a longer time to process..

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The minimum system requirements for using the DocuSign system may change over time. The current system requirements are found here: https://support.docusign.com/guides/signer-guide-signing-system-requirements.

Acknowledging your access and consent to receive and sign documents electronically

To confirm to us that you can access this information electronically, which will be similar to other electronic notices and disclosures that we will provide to you, please confirm that you have read this ERSD, and (i) that you are able to print on paper or electronically save this ERSD for your future reference and access; or (ii) that you are able to email this ERSD to an email address where you will be able to print on paper or save it for your future reference and access. Further, if you consent to receiving notices and disclosures exclusively in electronic format as described herein, then select the check-box next to 'I agree to use electronic records and signatures' before clicking 'CONTINUE' within the DocuSign system.

By selecting the check-box next to 'I agree to use electronic records and signatures', you confirm that:

- You can access and read this Electronic Record and Signature Disclosure; and
- You can print on paper this Electronic Record and Signature Disclosure, or save or send this Electronic Record and Disclosure to a location where you can print it, for future reference and access; and
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Attestation of Land Ownership

Pierce Conservation District Reforestation Program – 2022 Projects
South Prairie Creek Preserve – North Floodplain Planting Project
Attestation of Land Ownership

I am the Executive Director of the Pierce Conservation District and make this attestation regarding the ownership of land upon which the Pierce Conservation District is the Project Operator of a tree planting project Pierce Conservation District Reforestation Program – 2022 Projects (South Prairie Creek Preserve – North Floodplain Planting Project).

1. Land Ownership

The Pierce Conservation District 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 Pierce Conservation District Reforestation Program – 2022 (South Prairie Creek Preserve – North Floodplain Planting Project) Project is planting trees and which is the subject of this Declaration is specified in Exhibit A.

Signed by Dana Coggon, Executive Director, for Pierce Conservation District.

Dana Coggon May 25 2022

Signature

253-845-9770

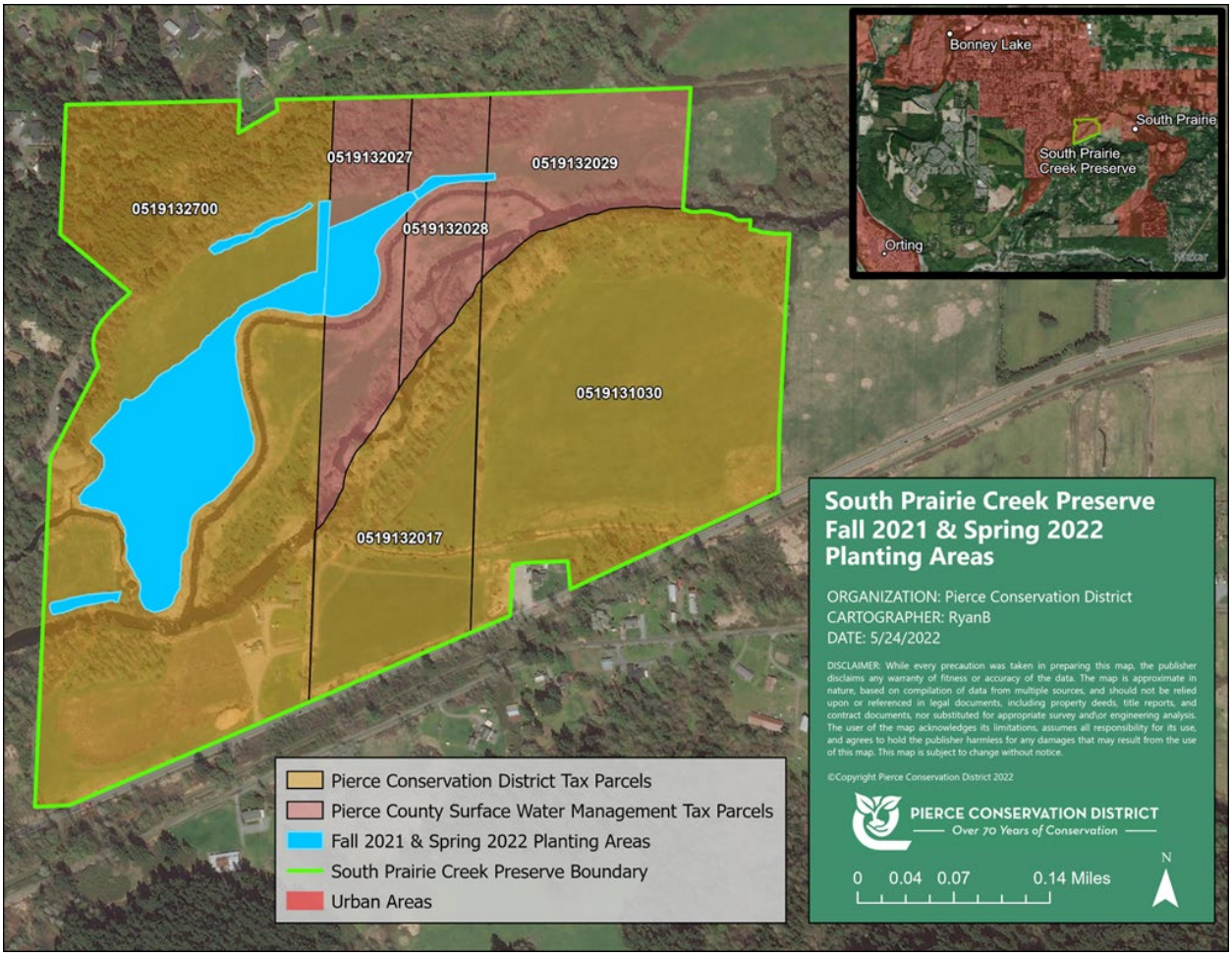
Phone

dcoggon@piercecd.org

Email

Exhibit A

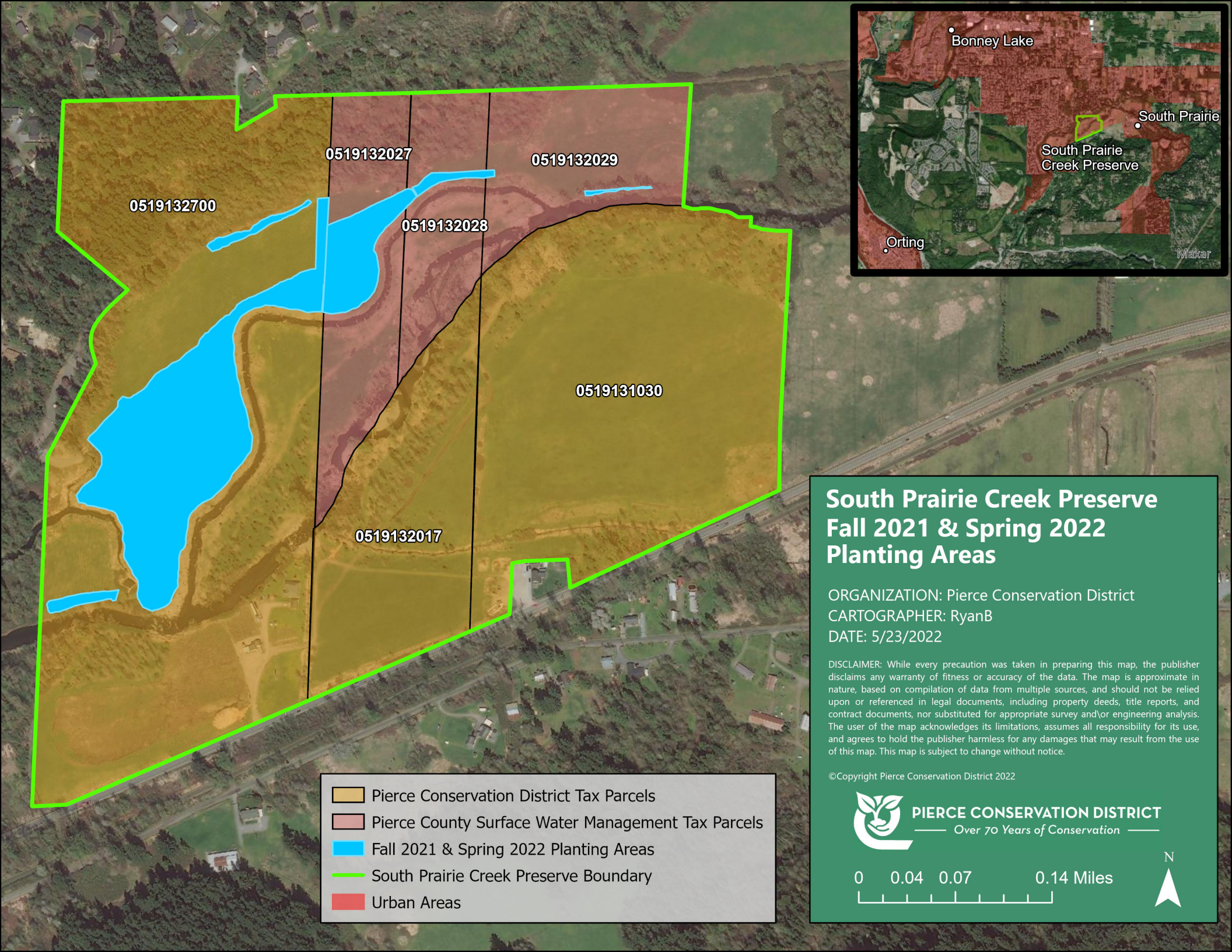
Specification of Property (can be maps, legal description, and/or other reasonably specific delineations of the property upon which the project is taking place)



Description: The South Prairie Creek Preserve is comprised of six Pierce County tax parcels, three of which are owned by the Pierce Conservation District: 0519132700, 0519132017, and 0519131030. Of the three parcels owned by Pierce Conservation District, the Interior Floodplain lies within parcel 0519132700 only.

Address: A reference address for the project site is 13518 Pioneer Way E., Orting, WA 98360.

Project Area Map



South Prairie Creek Preserve Fall 2021 & Spring 2022 Planting Areas

ORGANIZATION: Pierce Conservation District
CARTOGRAPHER: RyanB
DATE: 5/23/2022

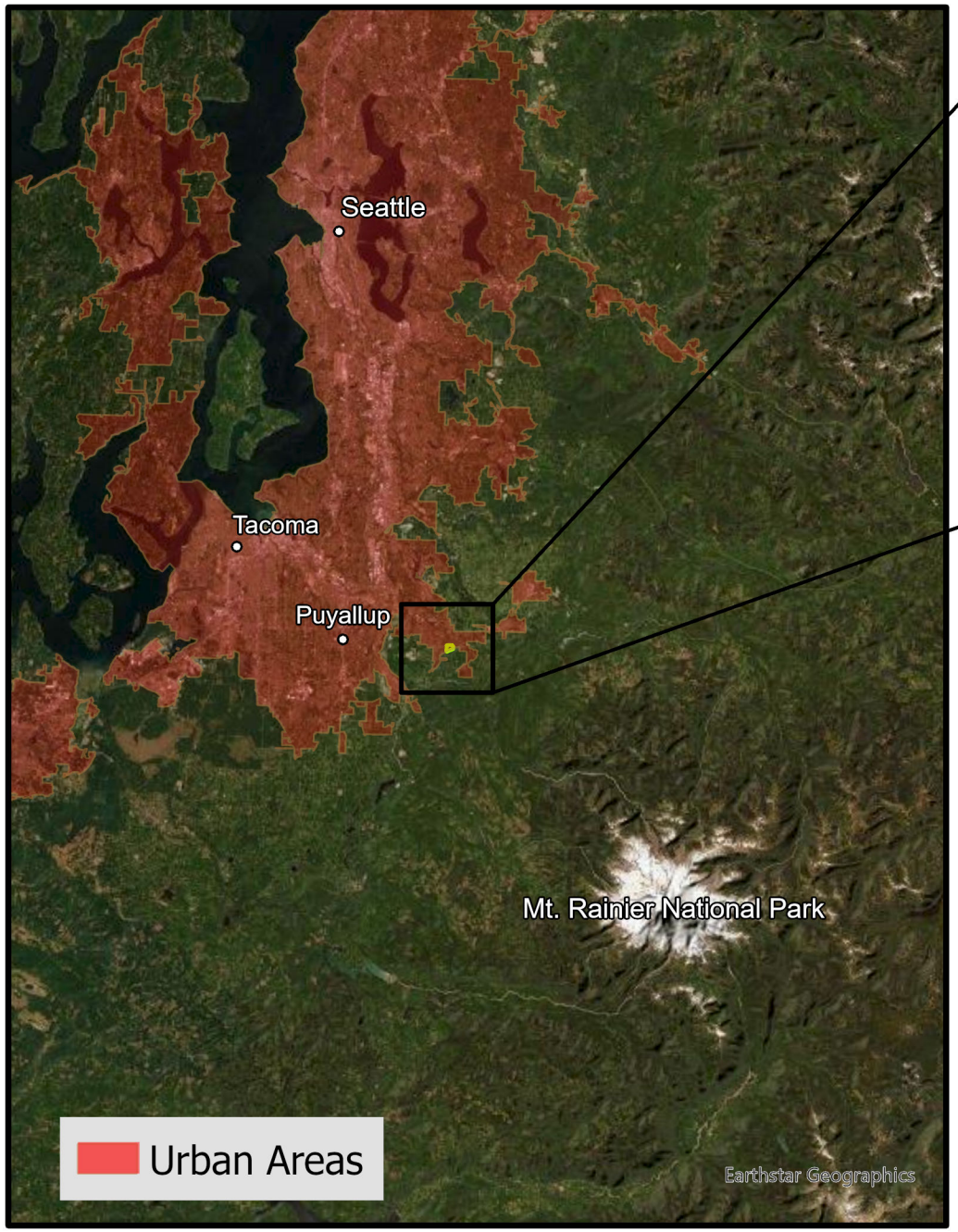
DISCLAIMER: While every precaution was taken in preparing this map, the publisher disclaims any warranty of fitness or accuracy of the data. The map is approximate in nature, based on compilation of data from multiple sources, and should not be relied upon or referenced in legal documents, including property deeds, title reports, and contract documents, nor substituted for appropriate survey and\or engineering analysis. The user of the map acknowledges its limitations, assumes all responsibility for its use, and agrees to hold the publisher harmless for any damages that may result from the use of this map. This map is subject to change without notice.

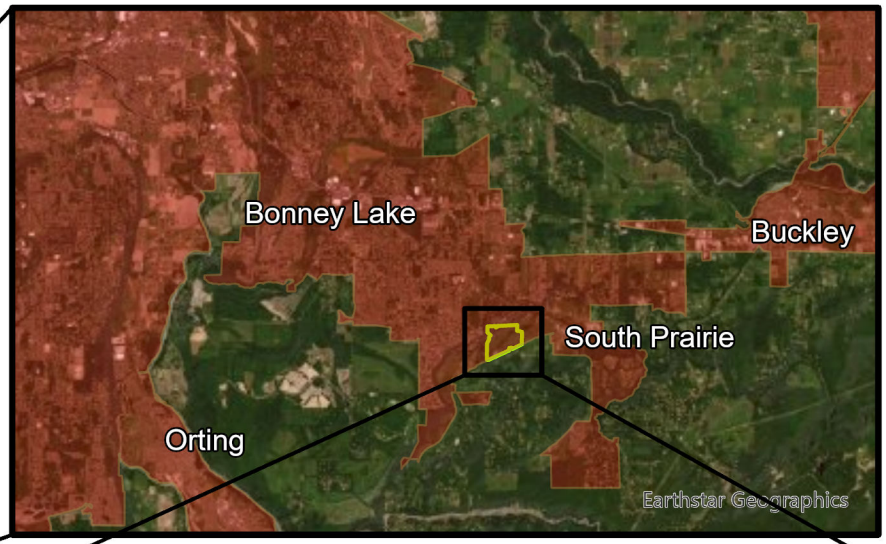
PIERCE CONSERVATION DISTRICT
Over 70 Years of Conservation

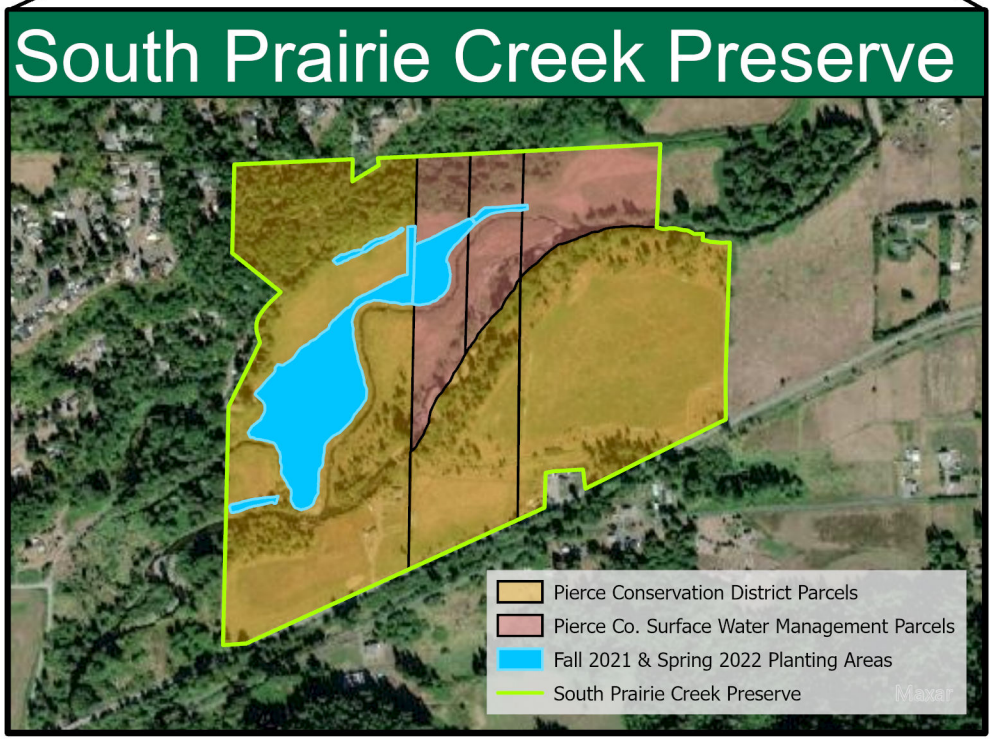
0 0.04 0.07 0.14 Miles

N

Regional Area Map







South Prairie Creek Preserve Vicinity Map

ORGANIZATION: Pierce Conservation District

CARTOGRAPHER: RyanB

DATE: 5/31/2022

PIERCE CONSERVATION DISTRICT

Over 70 Years of Conservation

0 0.13 0.25 0.5 Miles

N

Attestation of Planting

Pierce Conservation District Reforestation Program – 2022 Projects
South Prairie Creek Preserve – North Floodplain Planting Project
Project Operator Attestation of Planting

I, the undersigned Project Operator for the Planting Project named Pierce Conservation District Reforestation Program 2022 Projects - South Prairie Creek Preserve – North Floodplain Planting Project, located at South Prairie, WA, and submitted to City Forest Credits by application dated 5/25/2022, 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): October 1st, 2021 – March 31st, 2022;
- The organizations or groups that participated in the planting event(s) are listed in the attached documents (Exhibit C);
- Planting events are shown in photos attached, which can include photos of tree stock and planting activities (Exhibit A);
- The number of trees planted by species are, to a reasonable certainty, 5,842.

Tree Species	Number of Trees Planted
Beaked hazelnut	302
bigleaf maple	715
black cottonwood	595
black hawthorn	260
Cascara	100
Douglas fir	510
grand fir	220
Oregon ash	170
Pacific crabapple	80
Pacific willow	150
red alder	240
Red elderberry	720
Sitka spruce	135
Sitka willow	100
vine maple	415
western hemlock	10
western red cedar	1,120
Grand Total	**5,842**

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

1. **Invoices for trees planted (Exhibit B)**, 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 re the planting, or
4. Any other reliable estimate of trees planted that is approved by the Registry

Signed by Ryan Bird, Habitat Restoration Manager, for Pierce Conservation District.

Ryan Bird

Ryan Bird (Jun 8, 2022 08:46 PDT)

Signature

Phone: (253) 845-9770 ext. 133
Email: RyanB@piercecd.org

Exhibit A – Tree Planting Photos

Exhibit B – Invoices

Storm Lake Growers, Inc.

18510 SR 203
Monroe, WA 98272

Invoice

Date	Invoice #
1/12/2022	22-8

Bill To	Ship To
Pierce Conservation Dist. PO Box 1057 Puyallup, WA 98371	253 225 0306 Spring Site Rd E Orting, WA 98360

P.O. Number	Terms	Rep	Ship	Via	F.O.B.	Project
	N30		1/12/2022	SL Truck		

Quantity	Item Code	Description	Price Each	Amount
282	CORCO1	Hazelnut 1 gal	4.00	1,128.00T
135	SYMAL1	Snowberry 1 gal	3.75	506.25T
1	DELIV	Delivery Charge	150.00	150.00T
		Sales Tax	9.30%	165.94

Total $1,950.19

Storm Lake Growers, Inc.

18510 SR 203
Monroe, WA 98272

Invoice

Date	Invoice #
10/11/2021	21-831

Bill To	Ship To
Pierce Conservation Dist. PO Box 1057 Puyallup, WA 98371	Spring Site Rd E Orting, WA 98360 253-225-0306

P.O. Number	Terms	Rep	Ship	Via	F.O.B.	Project
	N30		10/11/2021	SL Truck		

Quantity	Item Code	Description	Price Each	Amount
130	PSEME1	Douglas Fir 1 gal	3.75	487.50T
75	ABIGR1	Grand Fir 1 gal	3.75	281.25T
295	THUPL1	Cedar 1 gal	3.75	1,106.25T
20	TSUHE1	Hemlock 1 gal	3.75	75.00T
65	PICSI1	Sitka Spruce 1 gal	3.75	243.75T
185	POPTI1	Cottonwood 1 gal	3.75	693.75T
125	FRALA1	Oregon Ash 1 gal	3.75	468.75T
40	ALNRU1	Alder 1 gal	3.75	150.00T
35	MALFU1	Crabapple 1 gal	3.75	131.25T
60	RHAPU1	Cascara 1 gal	3.75	225.00T
5	SALSI1	Sitka Willow 1 gal	3.75	18.75T
60	CRADO1	Hawthorne 1 gal	3.75	225.00T
1	DELIV	Delivery Charge	150.00	150.00T
		Sales Tax	9.30%	395.84

Total $4,652.09

Storm Lake Growers, Inc.

18510 SR 203
Monroe, WA 98272

Invoice

Date	Invoice #
10/14/2021	21-860

Bill To	Ship To
Pierce Conservation Dist. PO Box 1057 Puyallup, WA 98371	253 225 0306

P.O. Number	Terms	Rep	Ship	Via	F.O.B.	Project
	N30		10/13/2021	SL Truck		

Quantity	Item Code	Description	Price Each	Amount
270	ALNRU1	Alder 1 gal	3.75	1,012.50T
40	CORSE1	Red Twig Dogwood 1 gal	3.75	150.00T
20	LONIN1	Twinberry 1 gal	3.75	75.00T
75	CORCO1	Hazelnut 1 gal	4.00	300.00T
40	AMEAL1	Serviceberry 1 gal	3.75	150.00T
145	ACECI1	Vine Maple 1 gal	3.75	543.75T
235	OMECE1	Indian Plum 1 gal	3.75	881.25T
230	SAMRA1	Red Elderberry 1 gal	3.75	862.50T
115	PHYCA1	Ninebark 1 gal	3.75	431.25T
213	RUBPA1	Thimbleberry 1 gal	3.75	798.75T
39	RUBSP1	Salmonberry 1 gal	3.75	146.25T
80	SYMAL1	Snowberry 1 gal	3.75	300.00T
1	DELIV	Delivery Charge	150.00	150.00T
		Sales Tax	9.30%	539.52

Total $6,340.77

Washington Association of Conservation Districts
Plant Materials Center
16564 Bradley Road
Bow, WA 98232
PHONE: 360-757-1094
EMAIL: wacd@ncia.com

INVOICE

Invoice Number: 22-093-Final
Invoice Date: Jan 20, 2022
Page: 1

Bill To:	Ship to:
Pierce Conservation District (Ryan) PO Box 1057 Puyallup, WA 98371	New Sound Transportation 7495 26th Streett E Fife, WA 98424

Customer ID	Customer PO	Sales Representative	
PI694	Projects	Jacqueline M. Gauthier	
Customer Contact	**Shipping Method**	**Payment Terms**	**Due Date**
Ryan Bird	Oak Harbor	Net 30 Days	2/19/22

Quantity	Description	Unit Price	Amount
175	Red Alder (Alnus rubra) WW, 1-0, 12"+ (25)	0.98	171.50
540	Black Cottonwood (Populus trichocarpa) WW, 1-0, 12"+ (10)	0.76	410.40
100	Cascara (Rhamnus purshiana [Frangula]) WW, 1-0, 12"+ (25)	1.03	103.00
75	Pacific Crabapple (Malus fusca) WW, 1-0, 12"+ (25)	1.40	105.00
100	Pacific Willow (Salix lucida ssp. lasiandra) WW, 36" cutting	0.91	91.00
100	Sitka Willow (Salix sitchensis) WW, 36" cutting	0.91	91.00
125	Red Osier Dogwood (Cornus sericea, C. stolonifera) WW, 1-0, 12"+ (25)	1.03	128.75
675	Red Elderberry (Sambucus racemosa) WW, 1-0, 12"+ (25)	0.81	546.75
200	Grand Fir (Abies grandis) 422-1.5, 2-0, 12"+ (25)	0.62	124.00
250	Black Hawthorn (Crataegus douglasii) WW, 1-0, 12"+ (25)	1.03	257.50
920	Big Leaf Maple (Acer macrophyllum) WW, 1-0, 18"+ (10)	0.87	800.40
375	Vine Maple (Acer circinatum) WW, 1-0, 12"+ (25)	1.03	386.25
400	Pacific Ninebark (Physocarpus capitatus) WW, 1-0, 12"+ (25)	1.03	412.00
150	Oregon Ash (Fraxinus latifolia) WW 1-0, 12"+ (25)	1.03	154.50
725	Osoberry (Oemlaria cerasiformis) WW, 1-0, 12+ (25)	0.81	587.25
25	Nootka Rose (Rosa nutkana) WW, 1-0, 12"+ (25)	1.40	35.00
100	Salmonberry (Rubus spectabilis) WW, 1-0, 12"+ (25)	1.03	103.00
175	Serviceberry (Amelanchier alnifolia) WW, 1-0, 12"+ (25)	1.03	180.25
650	Thimbleberry (Rubus parviflorus) WW, 1-0, 12"+ (25)	0.81	526.50
75	Twinberry (Lonicera involucrata) WW, 1-0, 12"+ (25)	1.40	105.00
1	Customer Deposit - 25%	1,330.00	-1,330.00

Subtotal	Continued
Sales Tax	Continued
TOTAL	**Continued**

We will add finance charges on invoices more than 90 days overdue.

Washington Association of Conservation Districts
Plant Materials Center
16564 Bradley Road
Bow, WA 98232
PHONE: 360-757-1094
EMAIL: wacd@ncia.com

INVOICE

Invoice Number: 22-093-Final
Invoice Date: Jan 20, 2022
Page: 2

Bill To:
Pierce Conservation District (Ryan) PO Box 1057 Puyallup, WA 98371

Ship to:
New Sound Transportation 7495 26th Streett E Fife, WA 98424

Customer ID	Customer PO	Sales Representative	
PI694	Projects	Jacqueline M. Gauthier	
Customer Contact	**Shipping Method**	**Payment Terms**	**Due Date**
Ryan Bird	Oak Harbor	Net 30 Days	2/19/22

Quantity	Description	Unit Price	Amount
1	Shipping Charges	308.88	308.88

Subtotal	4,297.93
Sales Tax	
TOTAL	**4,297.93**

We will add finance charges on invoices more than 90 days overdue.

WASHINGTON STATE DEPARTMENT OF
NATURAL RESOURCES

Webster Forest Nursery
Mail Stop (MS) 47017
Olympia WA 98504-7017
360 902-1234 | 877 890-2626 | FAX 360 664-0963

TREE SEEDLING ORDER CONFIRMATION / INVOICE

Sold To:	Ship To:
Pierce Conservation District **Ryan Bird** **308 W Stewart Ave** **Puyallup, WA 98371** Phone:	**Same as Sold To Address**

Order Number:	Order Date:	To Be Shipped:	Paid:✓
14570	**9/7/2021**	**P/U at Nursery**	

Nursery Code	Species	Stock Type	Cntn Type	Zone	Elev	Quantity	# Bags	Price / Tree	Tax	Total Cost
PU20-003	Douglas Fir	1+1		Kitsap	1000-2000	480	4	0.53		$252.00
PU20-024	Sitka Spruce	P+1	2A	Twin Harbors	0-1000	120	1	1.13		$135.60
PU20-027	W Redcedar	P+1	2A	Twin Harbors	0-2000	1,050	7	0.62		$648.90
					Total Quantity:	1,650	12			$1,036.50

Date	Check #	Payee	Amount
9/20/2021	25516	Pierce Conservation District	1,036.50

Comments:

Seedlings:	$1,036.50
Special Charges:	$0.00
Parcel Post if Applicable:	$0.00
Sales Tax:	$0.00
Order Total:	**$1,036.50**
Payments:	$1,036.50
Current Balance:	$0.00
Amount Due:	**$0.00**

Terms: Payment due 30 days after order or at time of pick up, whichever comes first.

Orders subject to cancellation without notice if not paid in full.

ALL SALES ARE FINAL - NO REFUNDS

Please Remit Payment To: DNR Webster Forest Nursery | Mail Stop (MS) 47017 | Olympia WA 98504-7017

Sound Native Plants
PO Box 7505
Olympia, WA
98507-7505

360-352-4122

Invoice

DATE	INVOICE #
3/25/2022	22-079

BILL TO

Pierce Conservation District
Ryan Bird
Phone (253) 845-9770 ext. 133
RyanB@piercecd.org

P.O. NO.	TERMS	SALESREP	SHIP DATE	ORDERED BY	PROJECT
	Net 30	SE	3/25/2022	Ryan	Live Stakes 2022

QTY	DESCRIPTION	PRICE	TOTAL
70	Sitka willow - Salix sitchensis, live stakes, Diameter: 1" - 1 1/2" x 5'	3.85	269.50
50	Pacific willow - Salix lucida (lasiandra), live stakes, Diameter: 1" - 1 1/2" x 5'	3.85	192.50
30	Black cottonwood - Populus balsamifera (trichocarpa), live stakes, Diameter: 1" - 1 1/2" x 5'	4.25	127.50
50	Red osier dogwood - Cornus sericea (stolonifera), live stakes, Diameter: 1" - 1 1/2" x 5'	3.85	192.50
	SALES TAX (THURSTON PTBA 3434)	9.20%	71.94

Total $853.94

TERMS: Total due in full on pickup/delivery unless prior credit has been arranged. Overdue invoices subject to 1-1/2% per month finance charge. Orders cancelled less than 5 business days in advance subject to 10% restocking fee. Holding fees may be charged on orders delayed more than 3 months. Non-refundable 50% deposit required for orders placed more than 6 months in advance. We reserve the right to cancel or decrease quantities of any order due to crop failures or other circumstances beyond our control. Deposits will be proportionately refunded should this occur.

Exhibit C – Participating Organizations

The following organizations participated in the planting events:

- Washington Conservation Corps (WCC) at the Washington Department of Ecology
- Pierce Conservation District staff

CFC Planting Attestation of Planting Final

Final Audit Report 2022-06-08

Created:	2022-06-08
By:	Mark McPherson (info@cityforestcredits.org)
Status:	Signed
Transaction ID:	CBJCHBCAABAA_tt0jJklazeFRVor2_kYX66bKPtJsIZo

"CFC Planting Attestation of Planting Final" History

Document created by Mark McPherson (info@cityforestcredits.org)
2022-06-08 - 2:06:18 PM GMT

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2022-06-08 - 2:06:32 PM GMT

Email viewed by Ryan Bird (ryanb@piercecd.org)
2022-06-08 - 3:44:48 PM GMT

Document e-signed by Ryan Bird (ryanb@piercecd.org)
Signature Date: 2022-06-08 - 3:46:13 PM GMT - Time Source: server

Agreement completed.
2022-06-08 - 3:46:13 PM GMT

Attestation of Planting Affirmation

Attestation of Planting Affirmation

I, the undersigned working on behalf of Karolina Zakarkaite at Washington Conservation Corps (WCC) at the Washington Department of Ecology, attest and confirm that tree planting(s) occurred on the following dates under the project named in the City Forest Credits registry Pierce Conservation District Reforestation Program 2022 Projects - South Prairie Creek Preserve – North Floodplain Planting Project by the Project Operator, Pierce Conservation District.

Trees were planted under this project on the following date(s): October 1, 2021 – March 31, 2022

The approximate number of trees planted is: 5,842.

Signed by Karolina Zakarkaite, WCC Assistant Supervisor, for Washington Department of Ecology.

Karolina Zakarkaite (Jun 9, 2022 14:46 PDT)

Signature

Email: karolzak1999@gmail.com

CFC Planting Attestation of Planting Affirmation Final

Final Audit Report 2022-06-09

Created:	2022-06-08
By:	Mark McPherson (info@cityforestcredits.org)
Status:	Signed
Transaction ID:	CBJCHBCAABAAxE_VIFfXN5N5gJXySWMk929hldPHV7Il

"CFC Planting Attestation of Planting Affirmation Final" History

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2022-06-09 - 9:43:25 PM GMT

Document e-signed by Karolina Zakarkaite (karolzak1999@gmail.com)
Signature Date: 2022-06-09 - 9:46:19 PM GMT - Time Source: server

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2022-06-09 - 9:46:19 PM GMT

Attestation of No Double Counting and No Net Harm

Pierce Conservation District Reforestation Program – 2022 Projects
South Prairie Creek Preserve – North Floodplain Planting Project
Attestation of No Double Counting of Credits

I am the Habitat Restoration Manager of the Pierce Conservation District and make this attestation regarding the no double counting of credits from tree planting project, Pierce Conservation District Reforestation Program – 2022 Projects (South Prairie Creek Preserve – North Floodplain Planting 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

Pierce Conservation District 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

Pierce Conservation District 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.

Signed by Ryan Bird, Habitat Restoration Manager, for Pierce Conservation District.

Ryan Bird

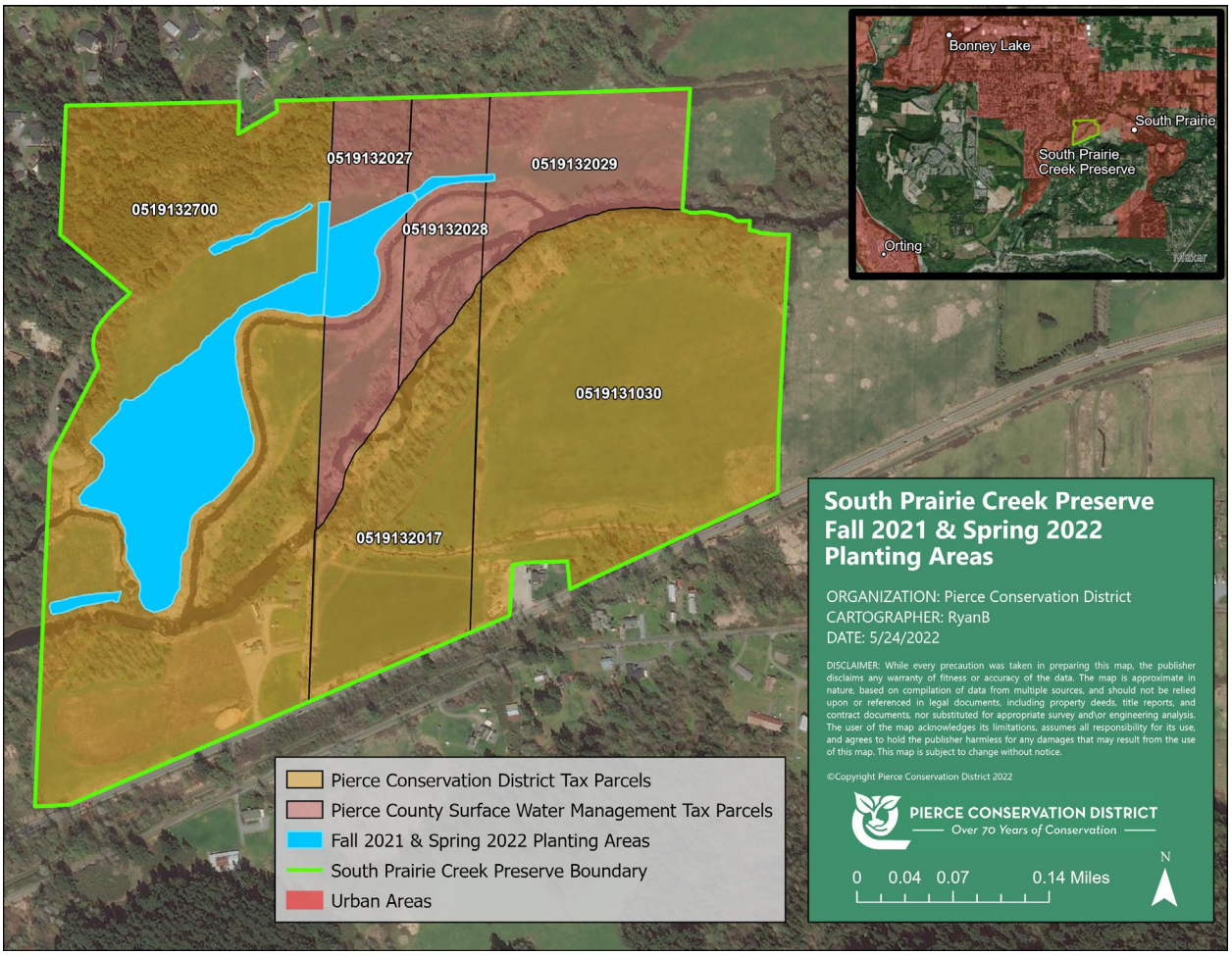
Ryan Bird (Jun 8, 2022 08:49 PDT)

Signature

Phone: 253-845-9770 ext. 133
Email: ryanb@piercecd.org

Exhibit A

Specification of Property (can be maps, legal description, and/or other reasonably specific delineations of the property upon which the project is taking place)



CFC Planting Attestation of No Double Counting of Credits Final

Final Audit Report 2022-06-08

Created:	2022-06-08
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"CFC Planting Attestation of No Double Counting of Credits Fina l" History

Document created by Mark McPherson (info@cityforestcredits.org)
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2022-06-08 - 3:48:59 PM GMT

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Signature Date: 2022-06-08 - 3:49:53 PM GMT - Time Source: server

Agreement completed.
2022-06-08 - 3:49:53 PM GMT

Pierce Conservation District Reforestation Program – 2022 Projects
South Prairie Creek Preserve – North Floodplain Planting Project
Attestation of No Net Harm

I am the Habitat Restoration Manager of the Pierce Conservation District and make this attestation regarding the no net harm from tree planting project, Pierce Conservation District Reforestation Program – 2022 Projects (South Prairie Creek Preserve – North Floodplain Planting 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 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 by Ryan Bird, Habitat Restoration Manager, for Pierce Conservation District.

Ryan Bird

Ryan Bird (Jun 8, 2022 08:47 PDT)

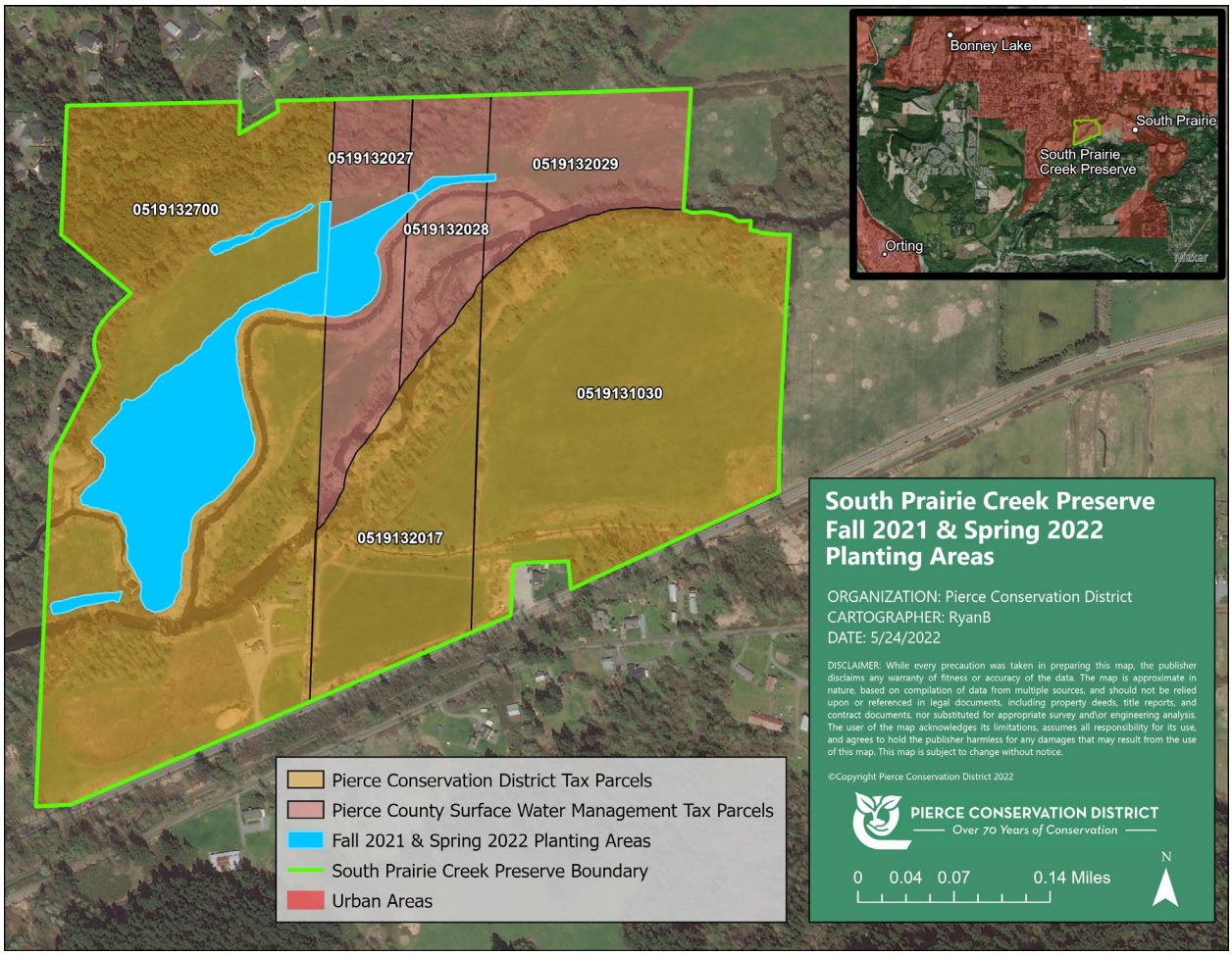
_____

Signature

Phone: 253-845-9770 ext. 133
Email: ryanb@piercecd.org

Exhibit A

Specification of Property (can be maps, legal description, and/or other reasonably specific delineations of the property upon which the project is taking place)



CFC Planting Attestation of No Net Harm Final

Final Audit Report 2022-06-08

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By:	Mark McPherson (info@cityforestcredits.org)
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Transaction ID:	CBJCHBCAABAADJUfBdJ1nynAT7Uv-HGE6Ix_oDVvlZRS

"CFC Planting Attestation of No Net Harm Final" History

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Signature Date: 2022-06-08 - 3:47:19 PM GMT - Time Source: server

Agreement completed.
2022-06-08 - 3:47:19 PM GMT

Attestation of Additionality

Pierce Conservation District Reforestation Program – 2022 Projects
South Prairie Creek Preserve – North Floodplain Planting Project
Attestation of Additionality

I am the Habitat Restoration Manager of the Pierce Conservation District and make this attestation regarding additionality from this tree planting project, Pierce Conservation District Reforestation Program – 2022 Projects (South Prairie Creek Preserve – North Floodplain Planting 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.
- 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-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 Implementation Agreement for Project Duration
  - Pierce Conservation District has signed a Project Implementation Agreement with City Forest Credits for 25-years.
- The 25-year Project Duration commitment is additional to and longer than any commitment Pierce Conservation District makes to non-carbon project tree plantings.

Signed by Ryan Bird, Habitat Restoration Manager, for Pierce Conservation District.

Ryan Bird

Ryan Bird (Jun 8, 2022 08:48 PDT)

Signature

Phone: 253-845-9770 ext. 133
Email: ryanb@piercecd.org

CFC Planting Attestation of Additionality Final

Final Audit Report 2022-06-08

Created:	2022-06-08
By:	Mark McPherson (info@cityforestcredits.org)
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Transaction ID:	CBJCHBCAABAAKNOKIwkJOH-88OgDzlnpml92bD5GzgeD

"CFC Planting Attestation of Additionality Final" History

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2022-06-08 - 3:47:27 PM GMT

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Signature Date: 2022-06-08 - 3:48:50 PM GMT - Time Source: server

Agreement completed.
2022-06-08 - 3:48:50 PM GMT

Carbon Quantification Initial Credit Tool

Directions

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

Table 1. Planting List

Scientific Name	Common Name	Tree-Type Abbreviation	No. Sites Planted
Thuja plicata	western red cedar	CEL	1120
Sambucus racemosa	Red elderberry	BDS	720
Acer macrophyllum	bigleaf maple	BDL	715
Populus balsamifera ssp. trichocarpa	black cottonwood	BDL	595
Pseudotsuga menziesii	Douglas fir	CEL	510
Acer circinatum	vine maple	BDS	415
Corylus cornuta	Beaked hazelnut	BDS	302
Crataegus douglasii	black hawthorn	BDS	260
Alnus rubra	red alder	BDM	240
Abies grandis	grand fir	CEL	220
Fraxinus latifolia	Oregon ash	BDL	170
Salix lucida	Pacific willow	BDM	150
Picea sitchensis	Sitka spruce	CEL	135
Rhamnus purshiana	Cascara	BDS	100
Salix sitchensis	Sitka willow	BDS	100
Malus fusca	Pacific crabapple	BDM	80
Tsuga heterophylla	western hemlock	CEL	10
Abies pinsapo	abeto de Espana	CEL	
Chamaecyparis nootkatensis	Alaska cedar	CEL	
Prunus serrulata 'Amanogawa'	Amanogawa cherry	BDS	
Tilia americana	American basswood	BDM	
Ulmus americana	American elm	BDL	
Ilex opaca	American holly	BEM	
Chamaecyparis thyoides	Atlantic white cedar	CEM	
Cedrus atlantica	Atlas cedar	CEL	
Taxodium distichum	bald cypress	BDL	
Malus ioensis var. plena	Bechtel crabapple	BDS	
Magnolia macrophylla	bigleaf magnolia	BDM	
Prunus emarginata	Bitter cherry	BDM	
Robinia pseudoacacia	black locust	BDL	
Populus nigra	black poplar	BDL	
Prunus blireiana	Blierana plum	BDS	
Cunninghamia lanceolata	blue Chinese fir	CEL	
Picea pungens	blue spruce	CEL	
Acer negundo	boxelder	BDL	
Pinus aristata	bristlecone pine	CES	
Broadleaf Deciduous Large	broadleaf deciduous large	BDL	
Broadleaf Deciduous Medium	broadleaf deciduous medium	BDM	
Broadleaf Deciduous Small	broadleaf deciduous small	BDS	
Broadleaf Evergreen Large	broadleaf evergreen large	BEL	
Broadleaf Evergreen Medium	broadleaf evergreen medium	BEM	
Broadleaf Evergreen Small	broadleaf evergreen small	BES	
Quercus macrocarpa	bur oak	BDL	
Abies magnifica	California red fir	CEL	
Phoenix canariensis	Canary Island date palm	PEL	
Calodendrum capense	Cape chestnut	BDM	
Crataegus x lavallei	Carriere hawthorn	BDS	
Fraxinus oxycarpa	Caucasian ash	BDM	
Prunus cerasifera	cherry plum	BDS	
Celtis sinensis	Chinese hackberry	BDL	
Juniperus chinensis	Chinese juniper	CES	
Magnolia x soulangiana	Chinese magnolia; saucer magnolia	BDS	
Pyrus calleryana 'Cleveland'	Cleveland pear	BDM	
Sequoia sempervirens	coast redwood	CEL	
Quercus agrifolia	coastal live oak; California live oak	BEL	
Prunus laurocerasus	common cherry laurel	BES	
Malus sylvestris	common crabapple	BDS	
Syringa vulgaris	common lilac	BDS	
Pyrus communis	common pear	BDM	
Prunus domestica	common plum	BDS	
Conifer Evergreen Large	conifer evergreen large	CEL	
Conifer Evergreen Medium	conifer evergreen medium	CEM	
Conifer Evergreen Small	conifer evergreen small	CES	
Salix matsudana	corkscrew willow	BDS	
Phoenix dactylifera	date palm	PEM	
Cedrus deodara	deodar cedar	CEL	
Malus x purpurea var eleyi	Eleyi crabapple	BDS	
Ulmus procera	English elm	BDL	
Ilex aquifolium	English holly	BES	
Juglans regia	English walnut	BDL	
Taxus baccata	English yew	CEM	
Fagus sylvatica	European beech	BDL	
Larix decidua	European larch	BDL	
Larix decidua 'Pendula'	European larch 'pendula'	BDS	
Sorbus aucuparia	European mountain ash	BDM	
Betula pendula	European white birch	BDM	
Pyrus kawakamii	evergreen pear	BES	
Cornus florida	flowering dogwood	BDS	
Photinia x fraseri	Fraser photinia	BES	

Table 2. Summary of Planting Sites

Tree-Type	Tree-Type Abbreviation	No. Sites Planted
Brdlf Decid Large (>50 ft)	**BDL**	1480
Brdlf Decid Med (30-50 ft)	**BDM**	470
Brdlf Decid Small (<30 ft)	**BDS**	1897
Brdlf Evgrn Large (>50 ft)	**BEL**	0
Brdlf Evgrn Med (30-50 ft)	**BEM**	0
Brdlf Evgrn Small (<30 ft)	**BES**	0
Conif Evgrn Large (>50 ft)	**CEL**	1995
Conif Evgrn Med (30-50 ft)	**CEM**	0
Conif Evgrn Small (<30 ft)	**CES**	0
	Total Sites Planted	5842

Sequoiadendron giganteum	giant sequoia	CEL	
Ginkgo biloba	ginkgo	BDL	
Laburnum anagyroides	golden chain tree	BDS	
Koelreuteria paniculata	goldenrain tree	BDM	
Fraxinus pennsylvanica ' Sherwood G	green ash 'sherwood glen'	BDL	
Prunus subhirtella	Higan cherry	BDS	
Chamaecyparis obtusa	Hinoki cypress	CEL	
Gleditsia triacanthos	honeylocust	BDL	
Carpinus betulus 'Fastigiata'	hornbeam 'fastigiata'	BDM	
Aesculus hippocastanum	horsechestnut	BDL	
Calocedrus decurrens	incense cedar	CEM	
Pinus pinea	Itailian stone pine	CEM	
Pinus thunbergiana	Japanese black pine	CEL	
Malus floribunda	Japanese flowering crabapple	BDS	
Acer palmatum	Japanese maple	BDS	
Pinus densiflora	Japanese red pine	CEM	
Syringa reticulata	Japanese tree lilac	BDS	
Cercidiphyllum japonicum	katsura tree	BDM	
Prunus serrulata	Kwanzan cherry	BDS	
Acer palmatum 'Dissectum'	lace-leaf maple	BDS	
Ulmus americana 'Liberty'	liberty elm	BDL	
Tilia cordata	littleleaf linden	BDM	
Pinus contorta	lodgepole pine	CES	
Platanus hybrida	London planetree	BDL	
Acer species	maple	BDL	
Fraxinus pennsylvanica 'Marshall'	Marshall green ash	BDM	
Washingtonia robusta	Mexican fan palm	PES	
Albizia julibrissin	mimosa	BDS	
Fraxinus holotricha	Moraine ash	BDM	
Tsuga mertensiana	mountain hemlock	CEM	
Sambucus caerulea var neomexican	neomexican blue elderberry	BDS	
Abies procera	noble fir	CEL	
Catalpa speciosa	northern catalpa	BDL	
Celtis occidentalis	northern hackberry	BDL	
Quercus rubra	northern red oak	BDL	
Thuja occidentalis	northern white cedar	CEL	
Acer platanoides	Norway maple	BDM	
Acer platanoides 'Fairview'	Norway maple 'Fairveiw'	BDM	
Acer platanoides 'Emerald Queen'	Norway maple 'Queen Elizabeth'	BDM	
Acer platanoides 'Schwedleri'	Norway maple 'Schwedler'	BDL	
Picea abies	Norway spruce	CEL	
Liquidambar orientalis	Oriental sweetgum	BDM	
Cornus nuttallii	Pacific dogwood	BDM	
Taxus brevifolia	Pacific yew	CEM	
Palm Evergreen Large	palm evergreen large	PEL	
Palm Evergreen Medium	palm evergreen medium	PEM	
Palm Evergreen Small	palm evergreen small	PES	
Prunus persica	peach	BDS	
Salix amygdaloides	peachleaf willow	BDM	
Carya illinoinensis	pecan	BDL	
Parrotia persica	Persian ironwood	BDM	
Quercus palustris	pin oak	BDL	
Pinus ponderosa	ponderosa pine	CEL	
Chamaecyparis lawsoniana	Port Orford cedar	CEL	
Corylus maxima var. purpurea	purple giant filbert	BDS	
Wisteria sinensis	purple wisteria	BDS	
Fagus sylvatica 'Atropunicea'	purple-leaf beech	BDL	
Populus tremuloides	quaking aspen	BDL	
Acer rubrum	red maple	BDM	
Acer rubrum 'Morgan'	red maple 'Morgan'	BDM	
Betula nigra	river birch	BDM	
Paulownia tomentosa	royal paulownia	BDM	
Chamaecyparis pisifera	Sawara false cypress	CES	
Quercus coccinea	scarlet oak	BDL	
Pinus sylvestris	Scotch pine	CEM	
Salix scouleriana	Scouler willow	BDL	
Prunus serrulata 'Shirofugen'	Shirofugen cherry	BDS	
Prunus serrulata 'Shirotae'	Shirotae cherry	BDS	
Ulmus pumila	Siberian elm	BDL	
Acer saccharinum	silver maple	BDL	
Crataegus laevigata	smooth hawthorn	BDS	
Rhus glabra	smooth sumac	BDS	
Malus angustifolia	southern crabapple	BDS	
Magnolia grandiflora	southern magnolia	BEL	
Rhus hirta	staghorn sumac	BDS	
Abies lasiocarpa	subalpine fir	CEL	
Acer saccharum	sugar maple	BDL	
Prunus avium	sweet cherry	BDM	
Pinus mugo	sweet mountain pine	CES	
Liquidambar styraciflua	sweetgum	BDM	
Acer pseudoplatanus	sycamore maple	BDL	
Pinus contorta var. latifolia	tall lodgepole pine	CEL	
Prunus cerasifera 'Thundercloud'	thundercloud purple plum	BDS	
Ailanthus altissima	tree of heaven	BDM	
Acer buergerianum	trident maple	BDS	
Liriodendron tulipifera	tulip tree	BDL	
Sciadopitys verticillata	umbrella pine	CEM	
Unknown species	unknown	BDM OTHER	
Fraxinus velutina	velvet ash	BDL	
Crataegus phaenopyrum	Washington hawthorn	BDS	

Salix x sepulcralis Simonkai	weeping willow	BDL	
Fraxinus americana	white ash	BDL	
Tilia americana var. heterophylla	white basswood	BDL	
Morus alba	white mulberry	BDM	
Quercus alba	white oak	BDL	
Populus alba	white poplar	BDL	
Populus alba 'Pyramidalis'	white poplar 'pyramidalis'	BDL	
Picea glauca	white spruce	CEL	
Prunus yedoensis	Yoshino flowering cherry	BDM	

Directions

Using the information you provide and background data, the tool calculates the amount of Credits that could be issued at years 1 (10%), 3 (40%), and 5 (30%) after planting. A mortality deductions (% loss) is applied to account for anticipated tree losses (Cell D6). A 5% buffer pool deduction is applied that will go into a program-wide pool to insure against catastrophic loss of trees. This tool is used to determine credits issued after planting (Intial Crediting). A different tool is used for credit issuance in Years 4 and 6. The tool in those years requires calculation of a sample and collection of data on tree status in the sample sites.

Mortality Deduction (%):	20%

Table 3. Credits are based on 10%, 40%, and 30% at Years 1, 3, and 5 after planting, respectively, of the projected CO_2 stored by live trees 25-years after planting. These values account for anticipated tree losses and the 5% buffer pool deduction.

						10%	40%	30%	20%
	No. Sites Planted	**No. Live Trees**	**Mortality Deduction (%)**	**25-yr CO_2 stored (kg/tree)**	**Tot. 25-yr CO_2 stored w/ losses and 5% deduction (t)**	**10% CO_2 (t)**	**40% CO_2 (t)**	**30% CO_2 (t)**	**20% CO_2 (t)**
BDL	1480	1184	0.20	2,062.82	2320.3	232.03	928.10	696.08	464.05
BDM	470	376	0.20	1,277.75	456.4	45.64	182.56	136.92	91.28
BDS	1897	1518	0.20	604.21	871.1	87.11	348.44	261.33	174.22
BEL	0	0	0.20	0.00	0.0	0.00	0.00	0.00	0.00
BEM	0	0	0.20	0.00	0.0	0.00	0.00	0.00	0.00
BES	0	0	0.20	0.00	0.0	0.00	0.00	0.00	0.00
CEL	1995	1596	0.20	1,520.44	2305.3	230.53	922.12	691.59	461.06
CEM	0	0	0.20	0.00	0.0	0.00	0.00	0.00	0.00
CES	0	0	0.20	0.00	0.0	0.00	0.00	0.00	0.00
	5842	4674		5,465.2	5953.1	595.31	2381.23	1785.92	1190.61

In Table 4 the tool infers the amount of CO_2 stored after 25 years from the sample to the population of live trees. Values in column H account for anticipated tree losses and the 5% buffer pool deduction.

Table 4. Grand Total CO_2 Stored after 25 years (all live trees, includes tree losses and buffer pool deduction)

Tree-Type	No. Sites Planted	Mortality Deduction (%)	Total Live Trees After Mortality	25-yr CO_2 stored (kg/tree)	CO_2 Tot. - No Deductions (t)	Grand Total CO_2 w/ Deductions (t)
Brdlf Decid Large (>50 ft)	1480	0.20	1184	2,062.82	3,053.0	2,320.3
Brdlf Decid Med (30-50 ft)	470	0.20	376	1,277.75	600.5	456.4
Brdlf Decid Small (<30 ft)	1897	0.20	1518	604.21	1,146.2	871.1
Brdlf Evgrn Large (>50 ft)	0	0.20	0	0.00	0.0	0.0
Brdlf Evgrn Med (30-50 ft)	0	0.20	0	0.00	0.0	0.0
Brdlf Evgrn Small (<30 ft)	0	0.20	0	0.00	0.0	0.0
Conif Evgrn Large (>50 ft)	1995	0.20	1596	1,520.44	3,033.3	2,305.3
Conif Evgrn Med (30-50 ft)	0	0.20	0	0.00	0.0	0.0
Conif Evgrn Small (<30 ft)	0	0.20	0	0.00	0.0	0.0
	5842		4674	5,465.2	7,833.0	5,953.07

Using the information you provide and background data, the tool provides estimates of co-benefits after 25 years in Resource Units per year and $ per year.

Table 7. Co-Benefits PER YEAR after 25 years (all live trees, includes tree losses)

Ecosystem Services	Resource Units Totals	Total $
Rainfall Interception (m3/yr)	24,376.06	$178,953.04
Air Quality (t/yr)		
O3	0.7521	$1,558.70
NOx	0.2427	$503.05
PM10	0.4240	$1,560.96
Net VOCs	-2.3483	-$1,811.96
Air Quality Total	-0.9294	$1,810.74
Energy (kWh/yr & kBtu/yr)		
Cooling - Electricity	51,069.28	$2,614.75
Heating - Natural Gas	156,015.66	$1,776.03
Energy Total ($/yr)		$4,390.78
Grand Total ($/yr)		$185,154.56
		$4,628,864.00

Tree Planting Data

Tree Species	Sum of No. Trees Planted
Beaked hazelnut	302
bigleaf maple	715
black cottonwood	595
black hawthorn	260
Cascara	100
Douglas fir	510
grand fir	220
Oregon ash	170
Pacific crabapple	80
Pacific willow	150
red alder	240
Red elderberry	720
Sitka spruce	135
Sitka willow	100
vine maple	415
western hemlock	10
western red cedar	1120
Grand Total	**5842**