18 Reserves Forest Carbon Project

ACR 586

January 15, 2020

Cleveland Metroparks

Cleveland, OH

THE CLIMATE TRUST

Table of Contents

*Note: Where file names are mentioned in this document a * at the end of the file name represents the most recent version of the document.*

A.
PROJECT OVERVIEW

A1. PROJECT TITLE

18 Reserves Forest Carbon Project

A2. PROJECT TYPE

ACR Improved Forest Management

A3. PROOF OF PROJECT ELIGIBILITY

ACR Eligibility Requirement	Demonstration of Compliance
Start Date	The project is being validated within three years of the January 15, 2020 start date. The methodology specifies that "The Start Date is when the Project Proponent began to apply the land management regime to increase carbon stocks and/or reduce emissions.", which is marked by the date that Cleveland Metroparks commenced land management enhancement practices to increase and maintain carbon stocks with the purpose of generating and maintaining carbon offsets in compliance with the terms outlined by the American Carbon Registry for offsets issued. The start date is indicated in the Carbon Development Agreement signed January 15, 2020 between The Oregon Climate Trust and The Board of Park Commissioners of the Cleveland Metropolitan Parks (see "Declaration of Restrictions" for Cuyahoga, Lake, Lorain, Medina, and Summit counties).
Minimum Project Term	The project employs the ACR Standard v6.0 with requisite 40-year minimum project term (commitment to project continuance, monitoring and verification). The minimum project term begins on the project start date of January 15, 2020.
Crediting Period	The project employs the ACR Standard v6.0 with requisite 20-year initial crediting period for IFM projects.
Real	The project will seek issuance of ex post credits, and not issuance of ex ante credits.
Emission or Removal Origin/Offset Title	GHG emission reductions generated by the project activity are generated from forest carbon sources and sinks over which Cleveland Metroparks has all management and ownership rights. Cleveland Metroparks holds title to the project area (see Section G)

Additional	Additionality is demonstrated using the ACR Standard Three-Prong Additionality Test, demonstrating that the project activity is regulatory surplus, exceeds common practice, and faces either financial, technological or institutional barriers to implementation. See Section C.
Regulatory Compliance	A regulatory compliance attestation will be signed and submitted to a verification body at each verification event.
Permanent	Permanence is addressed by the project through ongoing assessment of risk using the ACR Tool for Risk Analysis and Buffer Determination making contributions to the risk buffer pool at each verification event.
Net of Leakage	Leakage is accounted for applying the methodology. See Section E3.
Independently Validated	The project will be submitted for independent validation and verification.
Independently Verified	The project will be submitted for independent validation and verification.
Environmental and Community Safeguards	Net positive community and environmental impacts are demonstrated. See Section F.
Forest definition	All areas qualify as "forestland" per the methodology (Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal U.S. Forestlands v1.3) definition of >10% stocking, or roughly >11 ft^2/acre basal area in trees >5" dbh where 100% is 110 ft^2/ac[1]. The area-weighted mean basal area of the Cleveland Metroparks is 131 ft^2/acre, well above 10% stocking.
Eligible landownership type	All landownership types, including non-federal public lands as in the case of this project, are eligible per the ACR Standard v6.0

A4. LOCATION

The project is located in parcels within Cuyahoga, Lake, Lorain, Medina, and Summit counties in Ohio, adjacent to the city of Cleveland. The project area is composed of 8,961 acres archived in the project database ("CMP_ProjectBoundary_*.shp") and illustrated in Figure A1. The project consists of five of the 18 reserves in the Cleveland Metroparks forest system. These parcels include Bradley Woods, Hinckley, North Chagrin, Mill Stream Run, and Brecksville. North Chagrin and Brecksville are located on the east

[1] Leak, William B. 2014. General Technical Report NRS-132. Silvicultural Guide for Northern Hardwoods in the Northeast. USFS Northern Research Station. https://www.fs.fed.us/nrs/pubs/gtr/gtr_nrs132.pdf

side of Cleveland, while the other three are located on Cleveland's west side. The reservations are each located several miles away from the city. Some parcel boundaries are located within densely settled suburban and peri-urban neighborhoods, while other parcels adjoin rural forest land, or in the case of the Brecksville Reservation, the Cuyahoga National Park. The forest holdings of Cleveland Metroparks follow rivers and streams and form an "Emerald Necklace" around the city of Cleveland. Each of the five reserves in the project are non-contiguous except for Mill Stream Run and Brecksville that connect by a narrow corridor. The reserves are composed of mature 80 to 120 year-old mixed hardwood forest with stands of hemlock on steep ravines. The Cuyahoga River runs through sections of the east side of the reserves.

The project area is located on the Glaciated Allegheny Plateau. Repeated glaciations provide an array of soils, topography, and drainages which are now home to a diversity of flora and fauna. The reserves create a connected system of large forestlands around the urban area. The forest connects undeveloped land that promotes habitat for native plants and wildlife. Additionally, the forested land is enjoyed by community members creating access to a wealth of recreational opportunities that include walking, hiking, running, biking, camping, outdoor education, fishing, among many others.

Latitude/Longitude: 41.3039944°N / 81.5999209°W

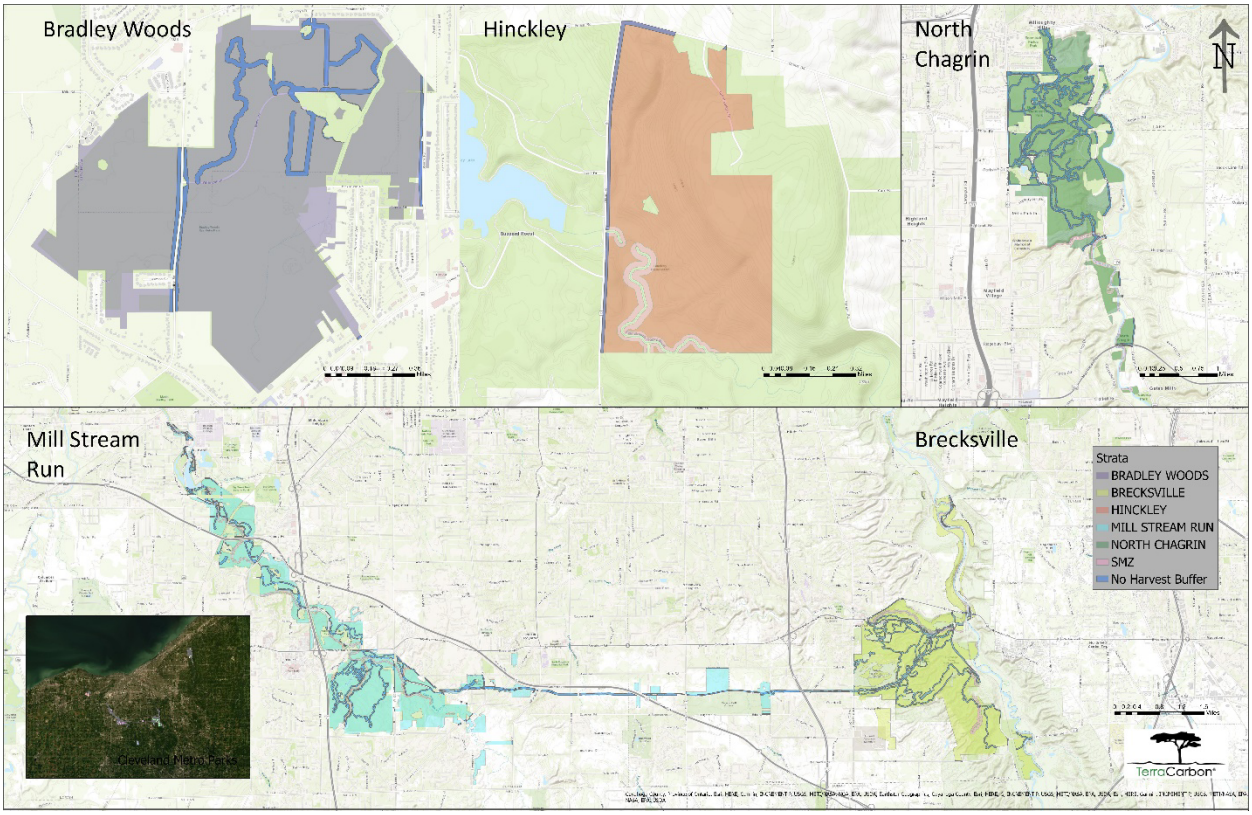

Figure A1. Map of the Cleveland Metroparks project area with USGS topography basemap.

A5. BRIEF SUMMARY OF PROJECT

The project is composed of 8,961 acres of mixed hardwood forest that will be managed for the purpose of increased carbon sequestration by foregoing significant timber harvesting and maintaining mature forest cover, among other objectives, such as improving ecosystem resilience, increasing wildlife habitat, reducing invasive species presence, and growing research and monitoring of natural systems. Cleveland Metroparks' ("CMP") forest holdings contain many valuable ecological, educational, open space, and scenic resource conservation values.

The Cleveland Metroparks' forest will be managed to store carbon, conserve and enhance forest health and ecosystem resilience, and provide compatible public outdoor recreation.

A6. PROJECT ACTION

The carbon project activity is improved forest management. Cleveland Metroparks' forests are being managed to maintain high carbon levels by foregoing harvests and improving forest health and resiliency.

Cleveland Metroparks' landholding acquisition began in the early 1900's when the state's forest cover was approximately 10%, its lowest point since European settlement. After decades of growth, Cleveland Metroparks' once young forest is now mature and primarily consists of fully or overstocked merchantable stands of large diameter and high-quality hardwood sawtimber. The forest faces several threats commonly associated with maturity including tree senescence, susceptibility to pests and pathogens, and lack of seedling regeneration due to low understory light levels and elevated herbivory. Traditional, timber-focused silvicultural practice would suggest the implementation of significant regeneration harvests to both capture the financial value of the timber before it declines and to easily establish a healthy and resilient young forest, while also generating revenue. However, to maintain carbon storage, Cleveland Metroparks has opted for a more nuanced approach to address its forest health concerns, which comes at significant expense (i.e. Centennial Forest Fund restoration donations, Beech Leaf Disease study, Acacia riparian habitat restoration, Abode tree planting, emerald ash borer mitigation etc.; See Cleveland Metroparks 2019 Budget), especially in the absence of timber revenues.

In 2015, Cleveland Metroparks began developing a natural resource management plan. Rather than harvest and merchandize its now mature forest, Cleveland Metroparks chose to pursue and continue strategies that would enable it to keep the majority of its forest carbon from being emitted while also addressing forest health and resiliency challenges that mature forests face. To implement these goals, Cleveland Metroparks began to explore the development of a pilot carbon offset project on part of its forestland and also identified forest health and resiliency actions compatible with maintaining high carbon storage including: deer herbivory management to increase tree seedling regeneration, tree pest management (i.e. hemlock woody adelgid treatments), potentially harvesting 2-5 acre blocks of forest to diversify forest structure and create wildlife habitat, reforesting meadows, restoring wetlands and streams, controlling invasive species, and conducting prescribed burns. These activities may take place both within and beyond the boundaries of the carbon project and represent a holistic forest management approach that aims to increase forest health and resiliency while simultaneously

maintaining high carbon storage levels. All of these activities are conducted and monitored using relevant technology by a professional team of natural resource specialists who routinely publish studies on their innovative restoration and ecological monitoring techniques.

The state of Ohio, through the Division of Forestry, requires that a Timber Harvest Plan be filed with the county's Soil and Water Conservation District to ensure proper BMPs are planned and installed during the harvest to reduce soil erosion and maintain state standards found in the Forestry Pollution Abatement Rules and Standards (Ohio Administrative Code 1501:3-12-01 to 1501:3-12-06). Any pesticides used shall be EPA-approved and applied, stored and disposed of in accordance with EPA-approved labels and by persons appropriately trained, licensed and supervised. All Cleveland Metroparks staff and/or contractors must comply with Ohio Administrative Code regulations and be licensed through the state to apply pesticides. Specifically ORC Chapter 921 Pesticides and OAC Chapter 901:5-11 Pesticides.

The appropriate start date for this project is the signing of the carbon development agreement, when Cleveland Metroparks contractually committed to specifically manage for increased carbon stocks on January 15, 2020. As part of this project, Cleveland Metroparks also signed a declaration of perpetual restriction on its project area land holdings to ensure it is never converted to a residential, commercial, or industrial land use (see Declaration of Restrictions").

Attestation of Regulatory Compliance: This project is not a required project by any law, regulation, or legally binding mandate. The project is in compliance with all local, state, and federal timber laws.

A7. *EX ANTE* OFFSET PROJECTION

Estimates of GHG emission reductions and removal enhancements (before buffer contribution) for the first 20-year crediting period are provided in Table A1 below (derived in Section E). This project does not seek to register any non-carbon environmental benefits.

Project Year	Annual net GHG emission reductions (t CO2)	Cumulative emission reductions earned (t CO2)
2020	160,994	160,994
2021	141,414	302,408
2022	137,185	439,593
2023	110,776	550,369
2024	35,558	585,927
2025	15,427	601,354
2026	15,427	616,781

2027	15,427	632,208
2028	15,427	647,635
2029	15,427	663,062
2030	17,989	681,051
2031	17,989	699,040
2032	17,989	717,029
2033	17,989	735,018
2034	17,989	753,007
2035	17,989	770,996
2036	17,989	788,985
2037	17,989	806,974
2038	17,989	824,963
2039	17,989	842,952
First Crediting Period Total		842,952

A8. PARTIES/RESPONSIBILITIES

Project Landowner / Project Proponent
Cleveland Metroparks
Rosalina Fini
Chief Legal and Ethics Officer
rmf1@clevelandmetroparks.com
216-635-3216
Responsibilities: Managing and overseeing implementation of project activities.

Offset Project Consultant or Project Developer Contact Information:
The Climate Trust
Julius Pasay
Director of Project Development
80 SE Madison St., Ste. 420

Portland, OR 97214
Jpasay@climatetrust.org
503-238-1915 x 214
Responsibilities: Coordinating and managing all aspects of carbon project development and registration.

TerraCarbon LLC
Ben Rifkin
Senior Associate, Forestry & Technical Services
707 E Jefferson St
Charlottesville, VA 22902
Ben.rifkin@terracarbon.com
434-566-0794
Responsibilities: Providing technical advisory services on an as-needed basis.

B.
METHODOLOGY

B1. APPROVED METHODOLOGY

Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal U.S. Forestlands version 1.3 (April 2018).

Hereafter referred to as the "methodology".

B2. METHODOLOGY JUSTIFICATION

Methodology applicability conditions, referencing modifications currently in process, and likely to be accepted by ACR.	**Demonstration of compliance**
Applicable only on non-federally owned forestland within the United States	The project area is publicly-owned and is a political subdivision of the state of Ohio, and located in the United States.
The methodology applies to lands that can be legally harvested by entities owning or controlling timber rights on forestland	The state of Ohio owns and controls timber rights to the property.
Private or non-governmental organization ownerships subject to timber harvesting in the with-project scenario must be certified by FSC, SFI, or ATFS or become certified within one year of the project Start Date	Not applicable
All Tribal lands in the United States, except those lands that are managed or administered by the Bureau of Indian Affairs, are eligible under this methodology	Not applicable
If harvesting occurs in the with-project scenario on public non-federal ownerships, the property must: • be certified by FSC, SFI, or ATFS or become certified within one year of the project Start Date; or • Adherence to an ACR approved long-term forest management plan or program as specified in section A.2 of the methodology; • have its forest management plan sanctioned by a unit of elected government officials within a state, or a state agency, or a federal agency; • and have its forest management plan updated at minimum every 10 years.	Harvesting will take place only to remove hazard trees or to address damage from pests and disease or for other forest health purposes. A longterm management plan was approved by the Board of Commissioners in 2019 (see "NR_Plan_Final.pdf"). ACR approved the use of the forest management plan for this property to meet the eligibility requirement.
Use of non-native species is prohibited where adequately stocked native stands were converted for forestry or other land uses after 1997	The project area is composed entirely of native forest types and no non-native species will be planted.

Methodology applicability conditions, referencing modifications currently in process, and likely to be accepted by ACR.	**Demonstration of compliance**
Draining or flooding of wetlands is prohibited	The project activity does not involve any hydrological manipulation of wetlands.
Project proponent must demonstrate its ownership or control of timber rights at the project start date	The project area has been under Cleveland Metroparks ownership since 1930 and continues under this ownership.
The project must demonstrate an increase in on-site stocking levels above the baseline condition by the end of the Crediting Period	The project is expected to increase on-site stocking levels above the baseline condition by the end of the Crediting Period (consistent with 2020 Carbon Development Agreement and FVS-NE projections produced in this report)

B3. PROJECT BOUNDARIES

The project area boundary is delineated in a shape file archived in the project database and illustrated above in Figure A1. All areas qualify as "forestland" per the methodology definition of >10% stocking (i.e. roughly around >11ft^2/acre basal area in trees >5" dbh), >1 contiguous acre, and not currently developed for non-forest uses. The property boundary shapefile originated from the CMP Real Estate Department shapefile (originally county public parcel data). We delineated the strata based on distinct management areas in the forest, where each reserve is a stratum. Non-forest area was delineated using national hydrography data and CMP developed areas data and verified with recent aerial imagery. A streamside management zone (SMZ) was delineated using the National Hydrography Dataset from USGS to determine streamside buffers following the Ohio best management practices (Figure A2)[2]. The SMZ requirements are based on streamside slope. We used the Ohio Digital Elevation Model (DEM) to determine slope along perennial streams and created a variable buffer distance based on % slope. The following process was used to delineate the SMZ buffer in ArcGIS Pro:

1. Downloaded a digital elevation model (DEM) for Cuyahoga County from the OGRIP website[3].
2. Downloaded the National Hydrography Dataset for Ohio from the USGS website[4].
3. Selected perennial streams/rivers from the polyline dataset.
4. Buffered the streams to 25' on either side of the stream/river to exclude the 'no cut' zone.
5. Buffered the perennial streams to the maximum buffer distance required by the Ohio BMPs, or 450' on either side of the stream.
6. Used 'Slope' tool to calculate slope across the landscape using the DEM.
7. Used 'Zonal Statistics' to calculate mean slope along discrete segments of streams and rivers within the 450' buffer.

[2] Smith, Keith L. 2004. BMPs for Erosion Control for Logging Practices in Ohio. Bulletin 916. Ohio State University Extension.

[3] Ohio Geographically Referenced Information Program. State of Ohio Administrative Services Information Technology. https://ogrip.oit.ohio.gov/ServicesData/GEOhioSpatialInformationPortal/USGSGeodataDistribution(Historical)/DEM.aspx

[4] https://www.usgs.gov/core-science-systems/ngp/national-hydrography

8. Applied a new buffer along streams/rivers with a variable distance based on the mean slope calculated in step 6 following the parameters in Table B1.
9. The buffered region became the SMZ stratum.

Note: the NHD layer appears to be out of date in some locations where the river flow is variable from year to year. To apply a standard approach across the landscape, the location of the flowline from the NHD was considered the location of the river even if the river had shifted.

Slope of Land Between Road and Stream (percent)	Width of Filter Strip for Common LoggingAreas (feet)	Width of Filter Strip in Municipal Watersheds and Critical Areas (feet)
0	25	50
10	45	90
20	65	130
30	85	170
40	105	210
50	125	250
60	145	290
70	165	330
80	185	370
90	205	410
100	225	450

Figure B1. The BMP requirements for perennial streams.

The first project crediting period is from January 15, 2020 to January 14, 2040. The project term extends through January 14, 2040.

B4. IDENTIFICATION OF GHG SOURCES AND SINKS

Carbon pools	**Included / Excluded**	**Justification / Explanation of Choice**
Above-ground biomass carbon	Included	Major carbon pool subjected to the project activity. The project employs a minimum dbh of 1”.
Below-ground biomass carbon	Included	Major carbon pool subjected to the project activity. The project employs a minimum dbh of 1”.

Standing Dead Wood	Included	Major carbon pool subjected to the project activity. The project employs a minimum dbh of 5".
Lying Dead Wood	Excluded	This pool is conservatively excluded. Lying dead wood is optional to include.
Harvested Wood Products	Included	Major carbon pool subjected to the project activity.
Litter/Forest Floor	Excluded	Changes in the litter pool are considered *de minimis* as a result of project implementation
Soil Organic Carbon	Excluded	Changes in the soil organic carbon pool are considered *de minimis* as a result of project implementation
Emissions from Biomass Burning (CO_2 and N_20)	Excluded	This pool is excluded. It is conservatively assumed to be zero in the baseline. No logging slash is burnt in either the baseline or with-project cases as part of management practices.
Market Leakage	Included	As more wood is harvested in the baseline than in the project scenario, market leakage is accounted for to reflect that wood supply elsewhere increases in response to project activity-attributable reductions, assuming demand is constant.

B5. BASELINE

The baseline scenario represents an aggressive harvest regime, targeted to maximize net present value at a 4% discount rate, typical of practices in the project region while minimizing social and political impact of the harvest[5]. It is common for other state and local entities in Ohio to harvest timber at or below the current age (80-120 years old) of the forest both as a source of revenue and to regenerate high-conservation and high-financial value species such as oak, maple, and beech. The baseline practice involves even-age regeneration harvest such as patch cuts and group selection cuts staged over 5 years and left to naturally regenerate from advanced regeneration, stump sprouts, and seed source. The baseline scenario incorporates highly conservative assumptions with consideration for potential risk of lost revenue and typical practices in the region, including the following:

- 40% of total forest canopy cover, totaling 3,808 acres, will be retained as reserves within each reservation in the project area. These reserves will include:
    - A matrix of mature forest surrounding the patch cuts and group selection cuts, including a buffer along the boundary of Cuyahoga NP in the Brecksville Reserve.

[5] Heiligmann, Randall et al. Harvesting and reproduction methods for Ohio forests. Extension Fact Sheet F-47-01. The Ohio State University Extension. School of Natural Resources.

  - A variable width buffer, 50’ to 450’, depending on slope, as a no-harvest zone to protect streamside managements zones (SMZs) in accordance with the state of Ohio Silviculture Best Management Practices (BMPs).
  - Aesthetic buffers to be maintained on either side of all trails (50’) and roads (100’) within the project area.
- A 25’ streamside buffer on both sides of all perennial streams was removed entirely from project area and is additional to the aforementioned 40% retention.
  The NPV analysis includes a 25% loss in non-timber revenue due to harvesting activities during each of the 10 years in the baseline, while less than 5% of total revenue is actually tied directly to the maintenance of forest cover within the Cleveland Metropark system based on the 2019 and 2020 budget reports. The NPV analysis, including this assumption, demonstrates that timber harvesting is still more profitable than carbon removal activities.
- Harvest of the remaining 60% of the project area is staged over 5 years and will not exceed production of more than 21 million bdft/yr, which is easily accommodated by local mill capacity.

Derivation and justification for the baseline is detailed in Section E.

B6. PROJECT SCENARIO

The project activity is improved forest management, via the forest management plan and the development agreement.

B7. REDUCTIONS AND ENHANCED REMOVALS

The project activity produces net emission reductions by increasing stocking relative to the baseline, via improved forest management practices previously described in Section A6.

B8. PERMANENCE

Risks that may substantially affect the project’s GHG emission reductions or removal enhancements include fire, forest pests, climate change, and failure of project activity to avoid unsustainable forest resource extraction and land use change.

The project addresses permanence by application of the ACR Tool for Risk Analysis and Buffer Determination v1.0, to assess risk of reversal and withhold from issuance a commensurate percentage of ERTs, to be held in reserve in the ACR buffer pool. The initial risk analysis is detailed below and will be updated at each verification.

The project has an initial risk rating of 20% based on application of the ACR Risk Tool, detailed in Table B1 below.

Table B1. Calculation of project risk score.

Risk Category	Value Applied	Project Justification
Management and Governance Risks		

Financial	3%	The project site is located on US Public Lands.
Project Management	3%	The project site is located on US Public Lands.
Social Policy	2%	Default value – the project site is located in the US.
Conservation Easement Deduction	0%	The project site has no conservation easement.
Natural Disaster Risks		
Fire	2%	The risk of wildfire in the project site counties (Cuyahoga, Lorain, Medina, Summit, and Lake) is low, according to Section 2.7 of the 2019 State of Ohio Enhanced Hazard Mitigation Plan[6] and the USFS Wildfire Risk to Communities tool[7].
Diseases and Pests	8%	Emerald ash borer and gypsy moth infestation is present within a 30-mile radius of the project area[8]. Beech leaf disease is also present within the project area.
Other Natural Disaster Events	2%	Default value for all projects that claim ERTs associated with sequestration.
Total Risk Score	20%	

Based on the Minimum Buffer Percentage in Table B1, the projected Buffer Contribution amount for the initial 20-year baseline period is 168,598 t CO2e.

[6] https://www.ema.ohio.gov/mip/planning_sohmp.aspx
[7] https://wildfirerisk.org/explore/0/39/
[8] https://www.srs.fs.usda.gov/pubs/gtr/gtr_srs250/gtr_srs250.pdf;
https://www.fs.fed.us/foresthealth/technology/pdfs/IDSurvey_2018_highlights.pdf

C.
ADDITIONALITY

C1. REGULTORY SURPLUS TEST

The project activity is not required by law[9]. There are no mandatory harvest restrictions in the state of Ohio. The Ohio Forestry Best Management Practices (BMPs) are highly recommended and generally followed but are voluntary[10]. The Ohio BMPs have been conservatively incorporated into the baseline scenario by establishing SMZs along all perennial streams and rivers that will not be harvested in the baseline or with-project scenarios.

C2. COMMON PRACTICE TEST

Methodology section B4 requires that "proposed project activity exceeds the common practice of similar landowners managing similar forests in the region." To demonstrate this requirement, we define:

- "similar landowners" as non-federal, public ownership (consistent with the ownership classes specified for the NPV analysis in methodology Table 1).
- "similar forests" as predominately hardwood timberlands (per FIA definition) not withdrawn from timber utilization and capable of producing more than 20 cubic feet per acre of industrial wood per year[11]. Unlike state/municipal parks, nature preserves, or wildlife refuge lands, the CMP project area is not under statute to restrict commercial timber harvest and practices on these lands are not comparable.
- "region" as Ohio.
- "common practice" on the basis of average biomass stocking reported by FIA.

Cleveland Metroparks implements forest management practices that exceed common and predominant forestry practices on other comparable forestland ownerships in Ohio and NW Pennsylvania.

CMP implements ecological practices that improve forest health and lead to increased carbon sequestration while choosing not to implement large commercial harvests. FIA data for Ohio's forestland, which like the project area is predominantly hardwood (96% of state forestland is hardwood forest composed of oak/hickory and maple/beech/birch), reveal that state, county, municipal, and local government unreserved timberland had lower average biomass stocking by ~26% less than that currently in the Cleveland Metroparks project area (see Table C.1)[12],[13]. By implementing the project

[9] http://codes.ohio.gov/orc/1503
[10] https://www.safohio.org/bmps/
[11] Based on the USFS Forest Inventory & Analysis (FIA) program definition, *"Timberland is forest land that is producing or is capable of producing crops of industrial wood and is not withdrawn from timber utilization by statute or administrative regulation. These areas are capable of producing at least 20 cubic feet per acre of industrial wood (equivalent to the solid wood content of about ¼ cord) per year. Inaccessible and inoperable areas can be included."*

[12] Albright, Thomas, et al. 2018. Ohio Forests 2016. Resour. Bull. NRS-118. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 114 p.
[13] USDA Forest Service. 2020. Forests of Ohio, 2019. Resource Update FS–247. Madison, WI: U.S. Department of Agriculture Forest Service, Northern Research Station. 2 p. https://doi.org/10.2737/FS-RU-247

activities, CMP will not only maintain current stocks, but increase them over the next 40 years, thereby expected to continue to exceed common practice.

Using FIA above-ground live biomass stocking data for the state of Ohio, we calculated tCO2e/ac for each publicly-owned class of forestland that is categorized as 'timberland' by FIA (see Table C.1). To compare FIA biomass data to CMP inventory measurements, we converted dry short tons of biomass to tCO2e. We multiplied first by 0.907185 to convert short tons to metric tons, then by 0.5 to convert from biomass to C, and finally by 3.664 to convert to CO2-equivalent. The carbon value was then divided by the total acreage as measured by FIA for each ownership class and forest type. The CMP live, above-ground value is calculated in the PIVOT LIVE AGB table in "CMP_Inventory_Degrown_*.xls"

Table C.1. Average live, above-ground carbon stocks by ownership class on publicly owned timberland derived from 2019 FIA database for the state of Ohio compared to carbon stocks on the Cleveland Metroparks project area.

Owner group	Owner class	Timberland tCO2e/ac
State and local government	State	112.8
State and local government	County and municipal	121.3
State and local government	Other local government	122.0
Cleveland Metroparks		165.8

C3. IMPLEMENTATION BARRIERS TEST

The project activity faces a financial barrier. Net present values were calculated referencing the baseline and project scenarios outlined in Sections E1 and E6 below, using a 4% discount rate. Property taxes are not calculated because state property is tax-exempt.

The project activity, without carbon revenue, is not expected to directly generate any additional revenue for Cleveland Metroparks. CMP provides many recreational services to nearby residents in addition to allowing trail access to its vast forestlands. CMP receives revenue through property taxes, grants, donations, and use fees at the Zoo and park-managed golf courses. These recreational resources and related revenue are realized in both the baseline and project scenarios and are not included in the NPV analysis. Funding is not tied explicitly to the project activities. For example, CMP receives grant funding for protection and management of hemlocks almost all of which live in steep ravines protected by SMZs in the baseline scenario. The tax levy that also finances Cleveland Metroparks activities is dependent on a variety of complex factors. Therefore, revenue would be unaffected by baseline activities[14]. However, a loss of revenue is conservatively included in the baseline analysis as a potential cost of implementing the baseline activity, taking into account restricted grants listed in the 2021 budget

[14] Pers. Comm. Rose Fini, Cleveland Metroparks.

summary for the last 3 years[15]. Recreational resources are safeguarded in the baseline scenario by maintaining forest buffers around public roads, public trails, parking lots, and SMZs around waterways as described in Section E1, to maintain aesthetic, recreational, and ecological values. CMP actively discourages off-trail forest use so any perceived aesthetic impacts will be limited with the implementation of buffers, and will also be temporary given the rapidity with which temperate deciduous forests green up. SMZs, delineated based on state BMPs, around waterways, which are designed around steep slopes, also protect against soil erosion and sedimentation of waterways. The baseline NPV maximization scenario is expected to yield NPV (in 2020) of $35,048,039 (documented in "CMP_NPVanalysis_*.xlsx") after the area undergoes an even-aged regeneration harvest. Thus, the project activity, which generates no timber-related revenue, is clearly not the most profitable forest management use.

C4. PERFORMANCE STANDARD TEST

Not applicable.

[15] 2021 Cleveland Metroparks Budget. https://www.clevelandmetroparks.com/about/cleveland-metroparks-organization/finance-reports/budget

D.
MONITORING PLAN

D1. MONITORED DATA AND PARAMETERS

Live tree stocks will be monitored via forest inventory conducted every 5 years or less, with field measurement and estimation procedures consistent with those outlined in Section E1 below.

The following parameters, specified in the Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal U.S. Forestlands v1.3, will be monitored.

Data or Parameter Monitored	$C_{P,TREE,t}$
Unit of Measurement	metric tons CO_2
Description	Carbon stored in above and below ground live trees at the beginning of the year *t*
Data Source	Forest inventory.
Measurement Methodology	To be consistent with field measurement protocols specified in "CM Carbon Inventory SOPs 6-22-20.docx".
Data Uncertainty	To be calculated as the mean +/- 90% confidence interval
Monitoring Frequency	Every 5 years or less, or at request for ERT issuance
Reporting Procedure	
QA/QC Procedure	To be consistent with field measurement protocols specified in "CM Carbon Inventory SOPs 6-22-20.docx". The inventory will use a stratified random sample design and re-measure the same permanent plots established in 2020, which targeted a precision level of +/- 10% of the mean live tree biomass with 90% confidence.
Notes	

Data or Parameter Monitored	$C_{P,DEAD,t}$
Unit of Measurement	metric tons CO_2
Description	Carbon stock stored in dead wood at the beginning of the year *t* Standing dead wood only (lying dead wood excluded from project accounting boundary).
Data Source	Forest inventory.
Measurement Methodology	To be consistent with field measurement protocols specified in "CM Carbon Inventory SOPs 6-22-20.docx".
Data Uncertainty	To be calculated as the mean +/- 90% confidence interval

Monitoring Frequency	Every 5 years or less, or at request for ERT issuance
Reporting Procedure	
QA/QC Procedure	To be consistent with field measurement protocols specified in "CM Carbon Inventory SOPs 6-22-20.docx". The inventory will use a stratified random sample design and re-measure the same permanent plots established in 2020, which targeted a precision level of +/- 10% of the mean live tree biomass with 90% confidence.
Notes	

Data or Parameter Monitored	Project area
Unit of Measurement	Acres
Description	Area of IFM project
Data Source	Validated project GHG Plan
Measurement Methodology	Not re-measured – area remains fixed through crediting period. Determination of project area documented in Section B3 of the project GHG Plan.
Data Uncertainty	None
Monitoring Frequency	Not monitored.
Reporting Procedure	Reported in GHG Plan and all monitoring reports.
QA/QC Procedure	Project area boundary verified with aerial imagery.
Notes	

Data or Parameter Monitored	Sample plot area
Unit of Measurement	Acres (variable)
Description	Area (variable) of forest inventory sample unit
Data Source	Standard Operating Procedures document "CM Carbon Inventory SOPs 6-22-20.docx".
Measurement Methodology	As per standard operating procedures detailed in "CM Carbon Inventory SOPs 6-22-20.docx",

	employing fixed radius plots. Plot centers are permanently marked in the field.
Data Uncertainty	None
Monitoring Frequency	Sample plot area is not monitored. Sample plots are to be re-measured every 5 years or less.
Reporting Procedure	Reported in project monitoring reports.
QA/QC Procedure	As per detailed quality control procedures outlined in "CM Carbon Inventory SOPs 6-22-20.docx".
Notes	

Data or Parameter Monitored	Tree species
Unit of Measurement	Taxon (to species level)
Description	Species of tree measured in forest inventory sample unit
Data Source	Forest inventory
Measurement Methodology	As per standard operating procedures detailed in "CM Carbon Inventory SOPs 6-22-20.docx".
Data Uncertainty	None
Monitoring Frequency	Sample plots are to be re-measured every 5 years or less.
Reporting Procedure	Reported in project monitoring reports.
QA/QC Procedure	As per detailed quality control procedures outlined in "CM Carbon Inventory SOPs 6-22-20.docx". Inventory field crew members will be trained in or have familiarity with regional dendrology.
Notes	

Data or Parameter Monitored	$C_{P,HWP,t}$
Unit of Measurement	metric tons CO_2
Description	Carbon remaining stored in wood products 100 years after harvest for the project in year t.

Data Source	Monitored from recorded harvest volumes.
Measurement Methodology	Harvests are not planned for the project area. However, in the event of a harvest, Cleveland Metroparks will receive scaled receipts for confirmation.
Data Uncertainty	None
Monitoring Frequency	Annual data summed for the monitoring period, applied as average annual for the monitoring period
Reporting Procedure	
QA/QC Procedure	Harvest volumes will be scaled by a professional wood scaler and/or using calibrated scales.
Notes	

Data or Parameter Monitored	$BS_{P,t}$
Unit of Measurement	in metric tons CO_2
Description	Carbon stock in logging slash burned in the project in year *t*
Data Source	
Measurement Methodology	Burning of logging slash is not performed as part of management practices.
Data Uncertainty	None
Monitoring Frequency	Annual
Reporting Procedure	
QA/QC Procedure	If necessary, monitoring and measurement of logging slash will be conducted by a professional forester.
Notes	

E.
QUANTIFICATION

E1. BASELINE

Baseline analysis began with a forest carbon inventory of the project area, conducted during July 2020. The inventory employed a stratified random sample design with fixed radius plots. Field measurement protocols are documented in "CM Carbon Inventory SOPs 6-22-20.docx". Minimum diameter at breast height (dbh) for live trees was 1" and standing dead wood was set at 5". TerraCarbon selected the randomized plot locations using ArcGIS Pro v2.5.

Strata were delineated to represent the different management units within the Cleveland Metroparks forest. The project area is separated into six strata, five (Hinckley, Brecksville, North Chagrin, Bradley Woods, and Mill Stream Run) of which are based on the CMP reservation boundaries, and one (SMZ) that was delineated separately based on hydrological features using the USGS National Hydrography Dataset, described in Section B.

The final stratification is illustrated in Figure A1 and detailed in Table E1.

Table E1. 18 Reserves Forest Carbon Project inventory design.

Stratum	Code	Acres	n	Plot size	Plot Radius (ft)	Nested Subplot	Subplot Radius (ft)
Hinckley	HY	321.0	7	1/10th acre	37.2	1/1000th acre	3.7
Bradley Woods	BW	789.4	21	1/10th acre	37.2	1/1000th acre	3.7
North Chagrin	NC	1,691.7	26	1/10th acre	37.2	1/1000th acre	3.7
Brecksville	BV	2,763.3	46	1/10th acre	37.2	1/1000th acre	3.7
Mill Stream Run	MSR	3,023.3	59	1/10th acre	37.2	1/1000th acre	3.7
SMZ	SMZ	372.7	10	1/30th acre	21.5	1/1000th acre	3.7
TOTAL		8,961.4	169				

Inventory Analysis and Results

Total aboveground biomass carbon was estimated from the inventory data applying species group-specific allometric equations sourced from Jenkins et al 2003[16]. For all trees, total aboveground biomass was adjusted to deduct any portion observed missing (referencing defect assessments for the top, middle and bottom thirds of the total aboveground biomass of inventory trees). Deductions for defect were incorporated by multiplying total aboveground biomass by weighted average overall percent sound (1 minus recorded percent defect) referencing the proportions of aboveground tree biomass represented in each of three assessed thirds (table below referenced from Climate Action Reserve 2012).

Table E2. Allocation of total aboveground biomass in top, bottom, and middle thirds:

Tree Portion	Percent of Tree Biomass
Top 1/3	10%
Middle 1/3	25%
Bottom 1/3	65%

Root biomass was estimated from total aboveground biomass using component ratios from Jenkins et al 2003, to produce total live tree biomass. Total live tree biomass was multiplied by 0.5 to estimate carbon fraction, then multiplied by 3.664 to calculate CO_2 equivalent.

Carbon in standing dead wood was estimated in the same way as for live trees, with deductions for decay class recorded in the field. For all standing dead wood with methodology decay class 4, only stem wood (and defect recorded in bottom and middle portions) was included in carbon calculations. Conservatively, only aboveground biomass for dead trees are included in stock estimates.

Table E3. Decay class descriptions and deductions for standing dead wood, found in the ACR IFM methodology.

ACR IFM methodology decay class	Deduction	ACR IFM meth decay class description
1	0.97	Tree with branches and twigs that resembles a live tree (except for leaves)
2	0.95	Tree with no twigs but with persistent small and large branches
3	0.9	Tree with large branches only
4	0.8	Bole only, no branches

[16] Jenkins, J.C., Chojnacky, D.C., Heath, L.S. and R.A. Birdsey. 2003. National-scale biomass estimators for United States tree species. Forest Science 49:12-35

Baseline and ex-ante carbon stock estimates were modeled from the July 2020 inventory data using the US Forest Service Vegetation Simulator (FVS) Northeastern (NE) variant.

The FVS-NE model was calibrated to the project area entering the FVS location code 919 (Allegheny NF), Ecoregion Code 221Fa (Allegheny Plateau) and 222Ia (Lake Erie Plain) and site index derived from the USGS SSURGO Web Soil Survey database. Because the forest inventory took place in July, and the bulk of forest growth occurs in spring to early summer, the inventory was de-grown one year, or one growing season, using FVS to represent stocks at the beginning of the 2020 growing season which aligns with the project start date, January 15, 2020. Growing the inventory back one year was accomplished by growing forward the 2020 inventory by 1 year with no management, then subtracting the difference in diameter growth from the 2020 inventory.

Above- (live and dead) and belowground (live) tree biomass carbon stocks at the January 15, 2020 project start date are detailed in Table E4, documented in "CMP_InventoryCalcsDEGROWN_*.xlsx".

Table E4. Live tree and standing dead wood stocks at project start date.

	BV	BW	HY	MSR	NC	SMZ
mean *live tree* tCO2/ac	225.0	261.0	351.4	150.3	207.2	119.6
mean *standing dead* tCO2/ac	9.3	4.4	24.2	8.6	1.0	1.3

Total live and standing dead forest carbon stocks at the project start date is estimated to be 1,855,325.6 t CO2e.

NPV ANALYSIS

Discount rate assumption

We analyzed the Net Present Value (NPV) of projected cash flows for each baseline stratum for each year over a 100-year period to determine the baseline management scenario (that maximizes NPV). For purposes of our NPV analysis, we used a real discount rate of 4%, the rate for non-federal public land, stated in the methodology.

Timber and revenue assumptions

Model projections were made for the following management scenarios.

Stratum	**Harvest/management scenario**	**To determine:**
Brecksville, Bradley Woods, Hinckley, North Chagrin, and Mill Stream Run, SMZ	"Grow100Yrs" Allow existing stocks to grow 100 years	Year in which existing commercial stocks are harvested. A 100' no-harvest buffer is maintained around

		all public roads and parking lots, while a 50' no-harvest buffer is maintained around public trails.
Brecksville, Bradley Woods, Hinckley, North Chagrin, and Mill Stream Run	"Even-age harvest 1" Even-age harvest down to 1" dbh on all reservations and allow resprout and natural regeneration to grow for 100 years.	Optimal stand re-entry timetable. Stand re-entry does not occur until after the end of the first crediting period.

Revenue

We projected the revenue from saw timber using the average stumpage prices based on the Ohio Timber Price Report from July 31, 2020[17] (Table E5) represented by the dominant species by volume in each stratum.

Table E5. Stumpage prices for timber in West and Northeast Ohio in 2020.

Strata	dominant timber	$/MBF	Region
BV	northern red oak	$ 366.00	Northeast
BW	red maple	$ 372.00	West
HY	northern red oak	$ 548.50	West
MSR	northern red oak	$ 364.00	Northeast
NC	yellow-poplar	$ 224.50	Northeast
SMZ	American sycamore	$ 318.00	Northeast

Cost assumptions

The Cleveland Metroparks is a political subdivision of the State and, as public land, is tax exempt. We did not separately project the costs related to cutting, hauling and delivery because they are implicitly accounted for in the stumpage prices. Under the even-age regeneration harvest and natural regeneration scenario there are no additional costs to be accounted for. Existing road infrastructure is sufficient to facilitate harvests.

Legal and market constraints

[17] Ohio Timber Price Report. July 2020. Ohio Woodland Stewards Program. Ohio State University Extension. https://woodlandstewards.osu.edu/ohio-timber-price-report

Scenarios modeled in the NPV analysis (and subsequent baseline scenarios) follows typical harvesting practices around the northeastern Ohio area[18]. A full range of silvicultural treatments are implemented across state, county, and municipal land in the region, including even-aged harvests such as clear cuts, patch cuts, and shelterwood harvests. In Ohio, there are 21 state forests that are actively managed for timber products. In 2018, there were 108 clear cuts larger than 10 acres and 297 shelterwood harvests implemented on state forest land. On the ~193,000 forested acres of state land, the average annual harvest was 10.7 million board feet[19]. Forests owned and managed by counties and municipalities that are not restricted from harvesting also implement the full range of silvicultural practices that include even-age management such as Muskingum Watershed Conservancy District, Allegheny County in Pennsylvania, and a number of other public ownerships as described in communication provided by a private forester. The Pittsburgh Airport, owned and managed by Alleghany County, implemented a shelterwood harvest and patch clear cuts a few years ago[20].

The Muskingum Watershed Conservation District (MWCD), which is also a political subdivision of Ohio, 2014 annual report states on page 33: "MWCD forestry operations completed three major harvesting projects in 2014 which consisted of selective harvesting at Atwood, Leesville and Tappan. The District also completed multiple clear cuts, mainly converting mature pine stands to native hardwood through natural regeneration. These major project locations resulted in 950,000 board feet of lumber harvested and 15,500 tons of pulpwood."[21]

There are no state or federal regulations that apply to silviculture practices in Ohio. The Ohio Forestry Best Management Practices (BMP) prescribe a *shade strip* and a *filter strip* along perennial streams in Ohio. The shade strip is a no-cut zone 25 feet from either side of the stream. This 25-foot buffer was removed from the project area. The streamside management zone (SMZ) is a variable width buffer based on the slope of land between harvest area and the stream. A variable buffer distance was established around perennial streams and rivers on the CMP property.

Additionally, 40% of the land area in each reservation will be retained as no-harvest reserves through the 20-year baseline period. These reserves will exist in the form of a matrix of stands surrounding patch cuts and group selection cuts in addition to aesthetic buffers around roads, trails, streams, and adjacent park boundaries like the shared boundary with the Cuyahoga National Park in the Brecksville reservation. The remaining 60% of harvestable area will be harvested in 10 to 20 acres patch cuts and group selection cuts.

NPV calculation and optimal harvest scheduling

For each stratum and harvest scenario, we calculated NPV of cash flows at each year during the 100-year period using the 4% real discount rate and then selected the year that maximized the NPV of

[18] Pers. Comm. Tom Anundson, Forester.
[19] Boyles, Robert. Five Year Forest Management Plan for State Forests 2015-2020. Ohio Department of Natural Resources. Division of Forestry. https://ohiodnr.gov/static/documents/forestry/plans/5YearPlan15-20.pdf
[20] Pers. Comm. Tom Anundson. Forester.
[21] https://www.mwcd.org/upload/documents/annual_reports/mwcd_annual_report_of_operations_2014.pdf

timber revenue as the optimal harvest year. The optimal harvest year for all strata is 2020 (see Table E6). Harvests in the baseline are staggered over 5 years, harvesting 22.1 million bdft/yr (see "CMP_bsl_harvestsched_*.xlsx"). Harvests will be conducted within each reservation in order by highest stocking value (bdft/ac). Up to 1,030.6 acres will be harvested per year over 5 years until all eligible acres in the project area are harvested. The following harvest schedule lays out acres harvested in each year by reservation:

Table E6. The baseline harvest schedule in acres harvested per year by reservation. Each reservation is harvested in order by the highest stocked forest (bdft/ac) per reservation. Each reservation has acres reserved for aesthetic buffers around roads, trails, and streams. Additional reserve acres in each reservation will be retained to maintain a total of 40% of each reservation in unharvested woodland. The remaining 60% of forested acres are harvested with variable sized patch cuts and group selection cuts.

Harvest area by year							Ann harvest limit (acres)
Harvest Order (by highest stocking/ac)	1	2	3	4	5	6	1,030.6
Year	**HY**	**BW**	**BV**	**NC**	**MSR**	**SMZ**	**Annual harvest (acres)**
2020	192.6	473.6	364.4	-	-	-	1,030.6
2021	-	-	1,030.6	-	-	-	1,030.6
2022	-	-	262.9	767.7	-	-	1,030.6
2023	-	-	-	247.3	783.4	-	1,030.6
2024	-	-	-	-	1,030.6	-	1,030.6
Aesthetic Buffer Acres	8.8	50.6	383.9	335.6	446.0	372.7	1,597.7
Additional Reserve Acres	119.5	265.2	721.4	341.1	763.3	-	2,210.5
Harvested Acres	192.6	473.6	1,658.0	1,015.0	1,814.0	-	5,153.2
Total Acres	321.0	789.4	2,763.3	1,691.7	3,023.3	372.7	8,961.4
% Harvested	60%	60%	60%	60%	60%	0%	
% Reserve	40%	40%	40%	40%	40%	100%	

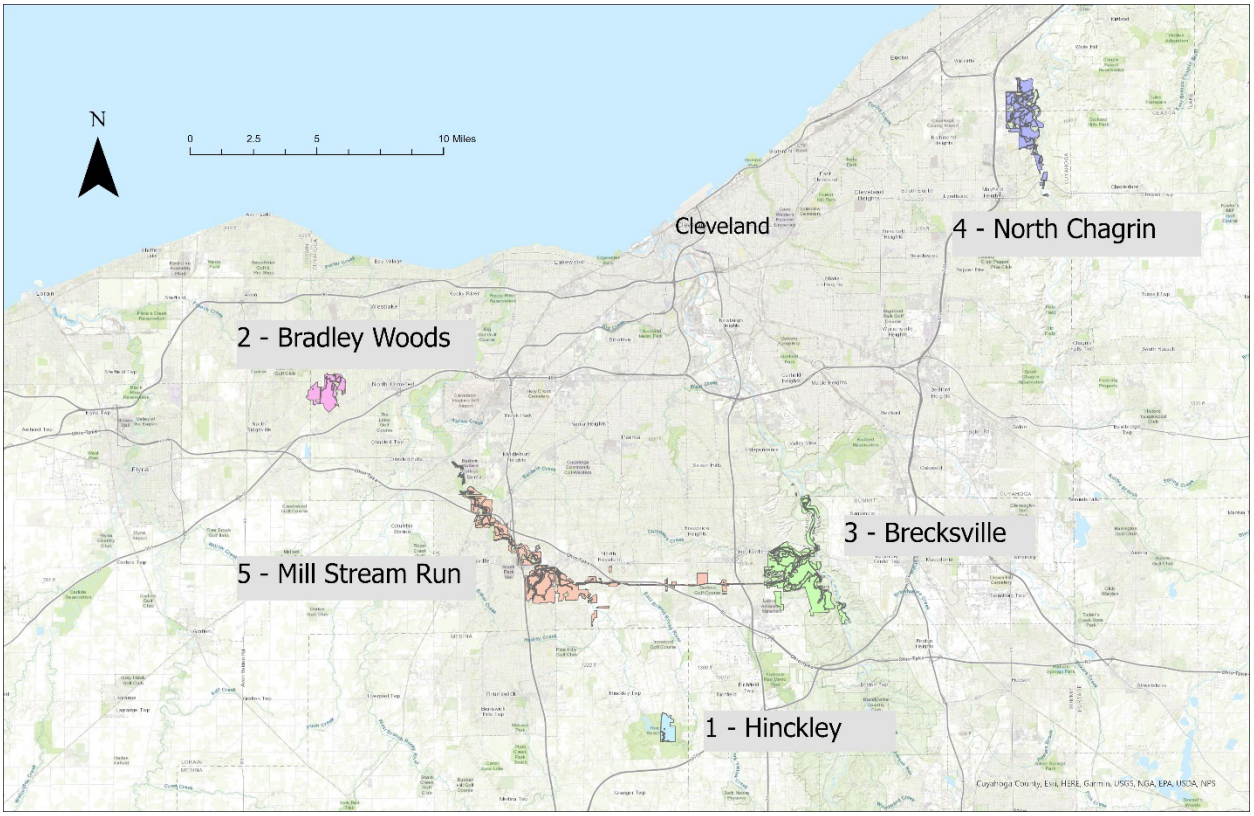

Figure E1. Layout of the reservations in the Cleveland Metroparks project area, numbered in order of highest board foot per acre stocking value for timber harvest. Road access is excellent at all reservations.

An incomplete survey of mills within 90 miles of the project area showed that mill capacity can handle at least 43 million board feet per year of timber and these mills are not currently operating near maximum capacity. Management will include even-age regeneration harvest down to 1" dbh of all species in all strata except the SMZ and forest buffers around trails, roads, and parking lots, allowing natural regeneration and stump sprouting to take place following the harvest[22]. The majority of Cleveland Metroparks forest is 80 to 120 years old. As evidenced by the NPV analysis, many of the trees are mature and have a high timber value. Moderate to heavy deer browse throughout the CMP reservations is suppressing natural regeneration.

Table E7. An incomplete list of mills with capacity to handle a large influx of timber within 90 miles of the project area.

Mill	Contact	Capacity
Doll Sawmill	Eric Doll	2-5 MMbdft/yr depending on demand

[22] Heiligmann et al. Harvesting and Reproduction Methods for Ohio Forests: Extension Fact Sheet F-47-01. The Ohio State University Extension. Columbus, OH.

Trumbull County Hardwood Ltd	John Detweiler	10-12 MMbdft/yr at 80% capacity
Denoon Lumber	Billy Denoon	20-24 MMbdft/yr
Total		32-43 MMbdft/yr

No harvest will take place in the SMZ.

The results of our analysis are presented below (and in "CMP_NPVanalysis*.xlsx") and support the basis for the management scenarios incorporated in the project baseline.

Table E8. NPV analysis outcomes for the CMP strata.

Stratum	harvest	abbreviation	max NPV revenues ($/acre)	year
BV	Regeneration cut	NPV_Grow	$9,155	2020
BW	Regeneration cut	NPV_Grow	$10,414	2020
HY	Regeneration cut	NPV_Grow	$22,234	2020
MSR	Regeneration cut	NPV_Grow	$4,915	2020
NC	Regeneration cut	NPV_Grow	$4,676	2020
SMZ	Thin throughout diameter	NPV_Grow	$448	2029

None of the management scenarios justifies a repeat cut within the first 20-year crediting period aside from the SMZ, as evidenced in the "NPV_Clearcut" tab. All scenarios from the above analysis were applied in the 20-year baseline scenario. The baseline harvest schedule is staggered out over 5 years (2020 to 2024) for added conservatism.

Baseline management scenarios

Stratum	Management regime
Brecksville, Bradley Woods, Hinckley, North Chagrin, and Mill Stream Run	Case Reservations 2020: On 1,030.6 acres, even-age regeneration harvest in year 2020, natural regeneration and stump sprouting. Case Reservations 2021: On 1,030.6 acres, even-age regeneration harvest in year 2021, natural regeneration and stump sprouting.

Stratum	Management regime
5,153.2 acres	Case Reservations 2022: On 1,030.6 acres, even-age regeneration harvest in year 2022, natural regeneration and stump sprouting. Case Reservations 2023: On 1,030.6 acres, even-age regeneration harvest in year 2023, natural regeneration and stump sprouting. Case Reservations 2024: On 1,030.6 acres, even-age regeneration harvest in year 2024, natural regeneration and stump sprouting.
SMZ 372.7 ac	No harvest will occur in the SMZ.

Baseline projections

The scenarios above were projected in FVS-NE for the period 2020 to 2040. Projections were annualized using annual outputs for harvest years and linear interpolation for the remaining growing years (FVS-NE produces projections in 10 year cycles); "CMP_bsl_livetreeproj*.xlsx". Biomass carbon estimates for live trees were produced using Jenkins et al 2003 equations, matching the calculations applied to the forest inventory measurements.

Standing dead wood was modeled using the Fire and Fuels Extension of FVS (FVS FFE) to produce detailed snag lists for each model cycle. Biomass carbon of each snag was estimated using model output cubic foot volumes of hard and soft components of dead wood, multiplied by dead wood density. As described in the table below, dead wood with decay class 4 is categorized as soft wood while hard wood corresponds to decay classes 1-3. Dead wood densities were sourced from California Air Resources Board database "REF_SPECIES.xlsx", predominantly sourced from the USFS Wood Handbook 2010, and incorporated deductions for decay classes corresponding to the hard and soft dead wood components output from the FVS FFE model, and wood applying component ratios from Jenkins et al 2003. Standing dead biomass was converted to carbon applying a carbon fraction of 0.5, and carbon converted to carbon dioxide equivalent (CO2e) applying a conversion factor of 3.664. Detailed standing dead wood calculations are provided in "CMP_bsl_snagproj_*.xlsx".

FVS FFE snag class	Deduction	Description/justification
soft	0.8	Per FVS FFE no branches remain, corresponds with methodology decay class 4

hard	0.97	Corresponds to methodology decay class 1; per FVS FFE: "Soft snags are more decayed and are assumed to have 80% of the wood density of hard snags"

FVS FFE = Rebain et al., 2012

Harvested wood products

Step 1:
Long-term storage in wood products was calculated from FVS projections of removals. Projected harvested volumes were broken out into the following categories: softwood sawlog, softwood pulp, hardwood pulp and hardwood sawlog. Pulp/saw breakdowns referenced merchantability standards in the FVS-LS variant (Dixon & Keyser 2008[23]).

Volumes were converted to biomass by applying species-specific specific gravities referenced from the California Air Resources Board database "REF_SPECIES.xls". Biomass was converted to carbon applying a carbon fraction of 0.5, and then converting to CO2 equivalent by multiplying by 3.664. Harvest t CO_2/acre (before delivery to mill) for each modeled group (i.e. baseline stratum) were summed for four categories: hardwood saw, hardwood pulp, softwood saw and softwood pulp.

Step 2:

Carbon transformed to wood products was estimated applying mill efficiency values referenced from the ARB 2015 forest protocol "Regional Mill Efficiency Data.xls" database[24], for the Northeast region (which includes Ohio), specified below:

Species group	**sawtimber**	**pulp**
softwood	0.569	0.513
hardwood	0.614	0.650

Steps 3 and 4:

[23] Dixon, Gary E.; Keyser, Chad E., comps. 2008 (revised September 25, 2018). Northeast (NE) Variant Overview – Forest Vegetation Simulator. Internal Rep. Fort Collins, CO: U. S. Department of Agriculture, Forest Service, Forest Management Service Center. 55p.
[24] Sourced at: https://www.arb.ca.gov/cc/capandtrade/protocols/usforest/usforestprojects_2015.htm

Transformed carbon was summed across the hardwood/softwood/pulp/sawtimber categories and then distributed among a range of end wood product classes. Distributions of end wood product classes referenced ARB 2015 forest protocol values for the Western Allegheny Plateau supersection:

Supersection	Softwood Lumber	Hardwood Lumber	Plywood	Oriented Strand Board	Non-structural Panels	Miscellan-eous	Paper
Western Allegheny Plateau	3.8758%	88.4420%	0.0000%	0.0000%	0.2509%	0.3020%	7.1293%

Wood product amounts retained in storage for 100 years in in-use wood products and landfills were then calculated referencing end wood product class-specific 100-year average storage factors provided in the methodology[25].

Step 5:

Carbon in long-term storage was then summed across in-use wood products and landfills and across modeled groups/baseline strata to produce annual total t CO_2 stored in in-use wood products and landfills over 100 years from wood harvested in a given year.

Detailed harvested wood product calculations are provided in "CMP_bsl_hwpproj_*.xlsx".

Emissions due to burning logging slash are conservatively assumed in the baseline to be zero. Thus, parameter BS_{BSL} equals zero and the outcome of equation 4 of the methodology, parameter GHG_{BSL}, equals zero.

Table E9. Projections of live tree, standing dead wood and harvested wood products carbon stocks in the project area in the baseline scenario for the first crediting period from 2020 to 2040. For the live tree and standing dead pools, stocks represent stocks at January 15 of the corresponding year. For harvested wood products (HWP), stocks represent stocks harvested in the annual interval beginning January 15 of the corresponding project year.

Year	Live t CO2/acre	Standing dead t CO2/acre	total HWP t CO2
2020	199.7	7.3	48,043.3

[25] Sourced from Smith JE, Heath LS, Skog KE, Birdsey RA (2006) Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States. In: General Technical Report NE-343 (eds Usdafs), PP. 218. USDA Forest Service, Washington, DC, USA.

2021	172.3	7.3	42,930.6
2022	148.1	7.0	39,070.4
2023	124.7	6.7	30,489.1
2024	106.3	6.3	28,695.6
2025	88.8	6.1	
2026	89.9	5.9	
2027	91.0	5.6	
2028	92.1	5.4	
2029	93.2	5.3	
2030	94.3	5.1	
2031	96.0	4.9	
2032	97.6	4.8	
2033	99.2	4.6	
2034	100.9	4.4	
2035	102.5	4.3	
2036	104.4	4.1	
2037	106.3	4.0	
2038	108.2	3.8	
2039	110.1	3.7	
2040	112.0	3.5	

From the modeled stocks, we first calculated long-term average baseline stocking level for the first 20-year crediting period, 1,013,457.4t CO2, and the change in baseline carbon stocks for each year.

Year T, project year 5 (January 15 to December 31 2024), is the year that projected stocking levels in the baseline reach the long-term average, after which $\Delta CBSL,t$ becomes 0; i.e. the crediting baseline is equal

to the modeled baseline until the modeled baseline reaches the long-term average, at which point baseline stocks are assumed to be constant (and subsequent change in stocks is equal to zero).

The figure below depicts the projected baseline stocks, average baseline stock for the first crediting period, and projected with-project stocks (see below for derivation of with-project stock projections).

Figure E1. The baseline and with-project scenarios modeled over the 20-year old crediting period.

E2. PROJECT SCENARIO

Ex-ante projection of the project scenario is derived and documented in Section E6 below.

E3. LEAKAGE

Quantification of leakage is limited to market leakage, as no activity-shifting leakage is allowed by the methodology beyond *de minimis* levels. A management plan, approved for use by ACR, was written prior to the project start and details harvest plans across all properties owned and managed by Cleveland Metroparks during the project lifetime, demonstrating that no activity-shifting leakage will occur.

Market leakage was determined by quantifying the merchantable carbon removed in both the baseline and with-project cases. Carbon in long-term storage in in-use wood products and landfills, calculated above, was used to assess relative amounts of "total wood products produced" in the two scenarios. No significant harvest is currently envisioned in the project scenario and is modeled to produce no commercial wood volumes. The decrease in wood production relative to the baseline was then calculated and the applicable market leakage discount factor was determined.

Calculation of leakage factor:

Period	Total HWP stored for 100 yrs in the Baseline (tCO2e)	Total HWP stored for 100 yrs in the Project Scenario (tCO2e)	Decrease in Wood Products as Percentage of Baseline Stocks	Applicable Leakage Factor
2020-2040	189,229	0	100%	40%

E4. UNCERTAINTY

Per the methodology, "The 90% statistical confidence interval (CI) of sampling can be no more than ±10% of the mean estimated amount of the combined carbon stock across all strata. If the Project Proponent cannot meet the targeted ±10% of the mean at 90% confidence, then the reportable amount shall be the lower bound of the 90% confidence interval."

Parameter $e_{BSL,TREE}$ (8.2%) is derived below from the original (July 2020) inventory data.

Table E10. Live tree statistics from July 2020 inventory

Strata	BV	BW	HY	MSR	NC	SMZ
mean tCO2/ac	229.0	264.1	355.1	153.5	210.9	122.8
variance	22030.0	16296.4	20070.2	9989.5	15860.8	23204.5
stan dev	148.4	127.7	141.7	99.9	125.9	152.3
CV(%)	65%	48%	40%	65%	60%	124%
stan error	22.1	27.9	53.5	13.0	24.7	48.2
90% CI	37.2	48.0	104.0	21.8	42.2	88.3
n	45	21	7	59	26	10
ac	2763.3	789.4	321.0	3023.3	1691.7	372.7
variance	3738086388.5	483566571.8	295391471.0	1547622677.5	1745757789.9	322374653.8

stan error	10.1					
mean	203.3					
90% CI	16.6					
90% CI as % of mean	8.2%					

Parameter e_{BSL_DEAD} (20.2%) is derived below from the original (July 2020) inventory data.

Table E11. Standing dead statistics from July 2020 inventory

Strata	BV	BW	HY	MSR	NC	SMZ
mean tCO2/ac	9.3	4.4	24.2	8.6	1.0	1.3
variance	126.0	42.7	985.7	167.7	5.8	7.1
stan dev	11.2	6.5	31.4	13.0	2.4	2.7
CV(%)	120%	150%	130%	150%	233%	201%
stan error	1.7	1.4	11.9	1.7	0.5	0.8
90% CI	2.8	2.5	23.1	2.8	0.8	1.5
n	45	21	7	59	26	10
ac	2763.3	789.4	321.0	3023.3	1691.7	372.7
variance	21373810.8	1268112.9	14507818.9	25985684.0	643255.8	99304.9
stan error	0.9					
mean	7.3					
90% CI	1.5					
90% CI as % of mean	20.2%					

Overall uncertainty in the baseline is calculated using equation 10 of the methodology,

$$UNC_{BSL} = \frac{\sqrt{(C_{BSL,TREE} * e_{BSL\_TREE})^2 + (C_{BSL,DEAD} * e_{BSL\_DEAD})^2 + (C_{BSL,HWP} * e_{BSL\_TREE})^2 + (GHG_{BSL} * e_{BSL\_TREE})^2}}{(C_{BSL,TREE} + C_{BSL,DEAD} + C_{BSL,HWP} + GHG_{BSL})}$$

where $C_{BSL,TREE}$ is the live tree carbon stock at the start date, $C_{BSL,DEAD}$ is the dead wood carbon stock at the start date and $C_{BSL,HWP}$ is the twenty-year average stock of carbon in long term storage in wood products. Emissions due to burning logging slash are conservatively assumed in the baseline to be zero, thus parameter GHG_{BSL} equals zero.

Overall uncertainty in the baseline is 8.02%.

Total project uncertainty, *UNC,t*, is calculated using equation 19 of the methodology, and for future monitoring events, where re-measurement of forest carbon stocks has taken place, will use separate baseline, $UNC_{BSL,t}$ (value 8.02%) and project, $UNC_{P,t}$ (value to be determined), uncertainties.

E5. REDUCTIONS AND REMOVAL ENHANCEMENTS

Methodology calculations and estimates of net reductions and removals enhancements are detailed in Table E12 below and in "CMP_ACRCalcs_*.xslx".

Table E12. Calculations for the first crediting period. All change values apply to the annual interval beginning January 15 of the corresponding year (i.e. project year 2020 accounts the change taking place between January 15 and December 31 2020).

ACR Account Year	0	1	2	3	4	5	6	7	8	9	10
year (stocks at beginning)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
ACR Account Year Date		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Baseline											
Live Tree CO2 Baseline	1,789,979.7	1,543,665.9	1,326,794.3	1,117,440.4	952,344.2	795,796.9	805,699.0	815,601.2	825,503.3	835,405.5	845,307.6
Standing dead CO2 Baseline	65,345.9	65,707.7	63,138.7	60,099.9	56,819.1	54,217.6	52,517.2	50,584.0	48,760.5	47,225.8	45,661.4
HWP Baseline		9,461.4	9,461.4	9,461.4	9,461.4	9,461.4	9,461.4	9,461.4	9,461.4	9,461.4	9,461.4
sum stocks	1,855,325.6	1,618,835.0	1,408,855.8	1,205,924.6	1,047,009.2	897,321.7	914,984.9	932,415.3	949,955.4	967,784.3	985,583.5
20yr Avg Baseline		1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4
Year T	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
deltaC baseline		-236,490.6	-209,979.2	-202,931.2	-158,915.5	-33,551.8	0.0	0.0	0.0	0.0	0.0
Project											
Live Tree CO2 Project	1,789,979.7	1,821,813.6	1,847,525.7	1,873,237.8	1,898,949.8	1,924,661.9	1,950,373.9	1,976,086.0	2,001,798.1	2,027,510.1	2,053,222.2
Standing dead CO2 Project	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9
Greenhouse gas emission from logging slash burning	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HWP Project	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum stocks	1,855,325.6	1,887,159.5	1,912,871.6	1,938,583.7	1,964,295.7	1,990,007.8	2,015,719.9	2,041,431.9	2,067,144.0	2,092,856.1	2,118,568.1
deltaC project		31,833.9	25,712.1	25,712.1	25,712.1	25,712.1	25,712.1	25,712.1	25,712.1	25,712.1	25,712.1
Total uncertainty		0.0713	0.07	0.07	0.07	0.06	0.08	0.08	0.08	0.08	0.08
Emissions reduction at t		160,994.0	141,414.0	137,185.0	110,776.0	35,558.0	15,427.0	15,427.0	15,427.0	15,427.0	15,427.0
Negative C balance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERTs Issued at time t		160,994.0	141,414.0	137,185.0	110,776.0	35,558.0	15,427.0	15,427.0	15,427.0	15,427.0	15,427.0
ERTs Transferred In		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ERTs Transferred Out		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERTs Retired		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tradable Balance at time t		160,994.0	141,414.0	137,185.0	110,776.0	35,558.0	15,427.0	15,427.0	15,427.0	15,427.0	15,427.0
Total Tradable Balance	0.0	160,994.0	302,408.0	439,593.0	550,369.0	585,927.0	601,354.0	616,781.0	632,208.0	647,635.0	663,062.0

ACR Account Year	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
year (stocks at beginning)	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
ACR Account Year Date	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**
Baseline										
Live Tree CO2 Baseline	859,977.1	874,646.6	889,316.1	903,985.6	918,655.1	935,705.0	952,754.9	969,804.8	986,854.7	1,003,904.6
Standing dead CO2 Baseline	44,151.0	42,640.5	41,130.1	39,619.7	38,109.3	36,764.4	35,419.4	34,074.5	32,729.6	31,384.6
HWP Baseline	9,461.4	9,461.4	9,461.4	9,461.4	9,461.4	9,461.4	9,461.4	9,461.4	9,461.4	9,461.4
sum stocks	1,008,204.0	1,030,824.6	1,053,445.1	1,076,065.6	1,098,686.2	1,123,852.6	1,149,019.0	1,174,185.4	1,199,351.8	1,224,518.2
20yr Avg Baseline	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4	1,013,457.4
Year T	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
deltaC baseline	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Project										
Live Tree CO2 Project	2,083,205.4	2,113,188.6	2,143,171.8	2,173,155.0	2,203,138.2	2,233,121.4	2,263,104.6	2,293,087.8	2,323,071.0	2,353,054.2
Standing dead CO2 Project	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9	65,345.9
Greenhouse gas emission from logging slash burning	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HWP Project	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum stocks	2,148,551.3	2,178,534.5	2,208,517.7	2,238,500.9	2,268,484.1	2,298,467.3	2,328,450.5	2,358,433.7	2,388,416.9	2,418,400.1
deltaC project	29,983.2	29,983.2	29,983.2	29,983.2	29,983.2	29,983.2	29,983.2	29,983.2	29,983.2	29,983.2
Total uncertainty	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08

Cleveland Metroparks / 18 Reserves

Emissions reduction at t	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0
Negative C balance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERTs Issued at time t	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0
ERTs Transferred In	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERTs Transferred Out	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERTs Retired	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tradable Balance at time t	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0	17,989.0
Total Tradable Balance	681,051.0	699,040.0	717,029.0	735,018.0	753,007.0	770,996.0	788,985.0	806,974.0	824,963.0	842,952.0

E6. EX-ANTE ESTIMATION METHODS

Live tree carbon stocks in the with-project scenario were projected *ex-ante* in FVS-LS for the period 2020 to 2040. Projections were annualized using linear interpolation; see "CMP_wp_livetreeproj_*.xlsx". Biomass carbon estimates for live trees were produced using Jenkins et al 2003 equations, matching the calculations applied to the forest inventory measurements and baseline scenario.

Management scenarios were developed with input from CMP land managers. No harvest or other timber management activities are planned on any of the reservations.

Stocks of standing dead wood are assumed to be constant through the period.

Projections of the with-project scenario are summarized in Table E13 below.

Table E13. Projections of live tree, standing dead wood and harvested wood products carbon stocks in the project area in the with-project scenario for the first crediting period from 2020 to 2040. For the live tree and standing dead pools, stocks represent stocks at January 15 of the corresponding year.

Year	Live t CO2/acre	Standing dead t CO2/acre	total HWP t CO2
2020	199.7	7.3	0.0
2021	203.3	7.3	0.0
2022	206.2	7.3	0.0
2023	209.0	7.3	0.0
2024	211.9	7.3	0.0
2025	214.8	7.3	0.0
2026	217.6	7.3	0.0
2027	220.5	7.3	0.0
2028	223.4	7.3	0.0
2029	226.2	7.3	0.0
2030	229.1	7.3	0.0
2031	232.5	7.3	0.0

2032	235.8	7.3	0.0
2033	239.2	7.3	0.0
2034	242.5	7.3	0.0
2035	245.8	7.3	0.0
2036	249.2	7.3	0.0
2037	252.5	7.3	0.0
2038	255.9	7.3	0.0
2039	259.2	7.3	0.0
2040	262.6	7.3	0.0

No burning of logging slash is expected to take place in the project area. Thus, parameter BS_P equals zero and the outcome of equation 13 of the methodology, parameter GHG_P, equals zero.

In ex ante calculations of net emission reductions, it is assumed that future inventories achieve overall precision less than +/-10% of the mean with 90% confidence, thus UNC_P is assumed to be equal to $UNC_{BSL.}$

F.
COMMUNITY & ENVIRONMENTAL IMPACTS

F1. NET POSITIVE IMPACTS

The environmental and community impacts of the Project Activity have been assessed in accordance with the requirements specified in the ACR Standard V6.0. The five ACR requirements for environmental and community impact assessments are addressed below. Net positive community and environmental impacts have been identified. No negative community or environmental impacts are foreseen.

1. An overview of the Project Activity and geographic location.

The 18 Reserves Carbon Project is located on Erie and Mississauga native lands in Cuyahoga, Medina, Lorrain, Summit, and Lake counties surrounding the city of Cleveland, Ohio. With a border to Lake Erie, Cleveland Metroparks realized the importance of urban watersheds. Stormwater, pollution, algal blooms, invasive species, and loss of wetlands pose continuing challenges, and Cleveland Metroparks has received national attention for making watershed stewardship a priority through education, scientific monitoring and environmental restoration. Cleveland Metroparks is committed to maintaining the health and diversity of the natural resources within its forest by:

- Appropriately managing native plant and wildlife populations to promote balanced and naturally functioning ecosystems.
- Identifying, protecting, and managing endangered species and habitats within the forest.
- Substantially improving water quality within the forest through monitoring and advocacy of appropriate improvement measures.
- Promoting fisheries in appropriate bodies of water within the forest.

In 2020, Cleveland Metroparks signed a Carbon Development Agreement to manage the reserves for the purposes of increasing carbon stocks. The project area includes 8,961 acres of mixed hardwood forests, which makes up a portion of the 23,700 acres of land currently owned and managed by Cleveland Metroparks. The project activity will implement Improved Forest Management practices within the project area, avoiding the clearing of the mature mixed hardwood forest, thereby mitigating risks to a critical natural and recreational resource and habitat for threatened species in the region.

2. *Applicable laws, regulations, rules, and procedures and the associated oversight institutions.*

There are no state or federal laws that regulate forest management of the property. There are no easements or restrictions within the project area that restricts harvesting. The Ohio Forestry BMPs provide non-legally required recommendation for forest management practices. The reserves are governed by the Board of Park Commissioners of the Cleveland Metropolitan Park District (see “2018-Bylaws.pdf”). CMP is recording a declaration of restriction to forever protect the project area from development to non-forest land use. Any harvests during the project lifetime aside from de minimis removal of hazard trees near trails or roads or to address the impact of pests and disease will conform to the Metroparks Natural Resource Plan (NR_Plan_Final.pdf). Any tree removals that occur on the property will follow all Ohio BMPs.

3. *A description of the process to identify community(ies) and other stakeholders affected by the project and, as applicable, the community consultation and communications plan.*

The reserves exist largely within an urban landscape and are heavily used by public and private interests. The 2018 Bylaws provide mechanisms for notifying the public of Board meetings and decisions through the Board's website, by mail, e-mail, and through news media.

The Board of Park Commissioners of the Cleveland Metroparks District meets regularly to discuss all aspects of forest and park management.

4. *An assessment of the project's environmental risks and impacts, including factors such as climate change mitigation and adaptation, biodiversity, air quality, water quality, soil quality, and ozone quality, as well as the protection, conservation, or restoration of natural habitats such as forests, grasslands, and wetlands. The assessment shall: 1) identify each risk/impact; 2) categorize the risk/impact as positive, negative, or neutral and substantiate the risk category; 3) describe how any negative impacts will be avoided, reduced, mitigated, or compensated; 4) detail how risks and impacts will be monitored, and how often and by whom; and 5) describe how positive impacts contribute to sustainable development goals.*

Risk/Impact Factor	Risk/impact category (positive, negative, neutral)	Measure(s) to avoid, reduce, mitigate, or compensate negative impacts	Monitoring approach	Contribution to sustainable development goals
Climate change mitigation and adaptation	Positive – The stated goal of the project activity is to increase carbon storage in CMP forests	N/A	Following the ACR Standard, the carbon stocks will be monitored at least every 5 years.	**Goal 13 – Climate Action** CMP intends to manage its forests to increase carbon storage by allowing trees to grow and remove carbon from the atmosphere (see "NR_Plan_Final.pdf").
Biodiversity	Positive – The forest will be managed to maintain forest health and a diversity of native species as compared to the baseline.	The Natural Resources team runs an Invasive Plant Management Program to remove and monitor at least 12 invasive	Regular vegetation surveys will track movement and growth of invasive species throughout the forest (see "NR_Plan_Final.pdf").	**Goal 15 – Life on Land** The project activity helps to protect mature forest in CMP while mitigating threats from invasive vegetation, pests, and pathogens that

		plant species that can negatively impact forest and wetland health[26]		threaten the biodiversity in the region.
Air quality	Positive – Maintaining vegetation in the forest helps reduce air pollution which is an issue densely populated urban areas of the metropolitan area around Cleveland, Ohio.	N/A	N/A	**Goal 11 – Sustainable Cities and Communities** Estimated benefit of maintaining forest cover in the CMP reservations in Cuyahoga County and Hinckley Township resulted in 1.3 million lbs of pollutants removed from the atmosphere by vegetation[27].
Water Quality	Neutral – The project activity will maintain or increase vegetation cover around wetlands and waterbodies at higher levels compared to the baseline, however due to intensive land use near the forest, the wetlands are at risk of degradation.	N/A	CMP monitors wetlands regularly (see "NR_Plan_Final.pdf").	**SDG 6 – Clean Water and Sanitation** The forest captures precipitation and slows runoff, reducing the volume of water entering the stormwater system[28].
Natural habitat	Positive – The project activity will prevent the clearing of mature hardwood trees that would lead to	Ongoing monitoring and potential removals or treatments of trees with	CMP is undertaking an Emerald Ash Borer Program to combat the spread of EAB throughout the region. Additionally,	**Goal 15 – Life on Land** The conservation of mature forest in the CMP reserves will maintain critical

[26] https://www.clevelandmetroparks.com/getmedia/b0d6e634-3140-46c2-b415-f9b44263a771/InvasivePlantManagementProgramv1_3.pdf.ashx

[27] The Trust for Public Lands. 2018. The economic benefits of Cleveland Metroparks. www.tpl.org/cleveland-metroparks-2018

[28] The Trust for Public Lands. 2018. The economic benefits of Cleveland Metroparks. www.tpl.org/cleveland-metroparks-2018

	the loss of critical habitat for native species. Neutral – The forest reserves face risks from pests and pathogens that may impact forest health. Maintaining over-stocked mature forest presents potential forest health issues.	harmful pests and pathogens mitigate the risk.	CMP is monitoring for beech leaf disease that is now spreading throughout the region.	habitat for a diversity of native birds, mammals, reptiles, and amphibians, among others.[29]
Community	Positive – The project activity maintains forests and other natural spaces that support an array of educational and recreational opportunities for urban and suburban communities[30].	N/A	CMP will conduct ongoing stakeholder consultations and communication.	**SDG 8 – Decent Work and Economic Growth** Recreational use of the trails and forested reservation areas produces $64.6 million annually in tourism revenue for the residents of Cuyahoga County. The proximity of forest to residential areas increase property values and drives revenue for local businesses[31]. **& SDG 3 – Good Health and Well-being** The accessibility of reservations and trails for local community members increases physical activity and results in

[29] https://www.clevelandmetroparks.com/about/conservation/natural-resources
[30] https://www.clevelandmetroparks.com/about/recreation
[31] The Trust for Public Lands. 2018. The economic benefits of Cleveland Metroparks. www.tpl.org/cleveland-metroparks-2018

				measurable medical cost care savings[32]. **SDG 4 – Quality Education** Staff at five nature centers around the county provide free or low-cost nature programming to all ages from pre-schoolers to seniors[33].

5. *For community-based projects, an assessment of the project's community risks and impacts, including factors such as land and natural resource tenure, land use and access arrangements, natural resource access (e.g., water, fuelwood), food security, land conflicts, economic development and jobs, cultural heritage, and relocation. The assessment shall: 1) briefly describe the process to identify community risks/impacts; 2) identify each risk/impact; 3) categorize the risk/impact as positive, negative, or neutral, and substantiate the risk category; 4) provide detailed information regarding the community stakeholder consultation process (e.g., meeting minutes, attendees), including documentation of stakeholder comments and concerns and how those are addressed; 5) provide evidence of Free, Prior and Informed Consent for the Project Activity, as applicable; 6) provide evidence of no relocation or resettlement (voluntary or involuntary), as applicable; 7) describe how any negative project impacts will be avoided, reduced, mitigated, or compensated; 8) detail how risks/impacts will be monitored, and how often and by whom; 9) describe the mechanism for ongoing communications with the community and grievance mechanisms, as applicable; and 10) describe how positive impacts contribute to sustainable development goals.*

This is not a community-based project.

F2. STAKEHOLDER COMMENTS

Board meetings are open to the public and include a public comment period during each meeting at which time the public can comment on any matter on the agenda or any other issue they would like to discuss. CMP plans to provide periodic updates about the status of 18 Reserves Carbon Project at future Board meetings. A Board meeting was held on January 15, 2020 to deliberate on the development of the carbon project (see "01-15-20-Minutes.pdf" and "01-15-20-AGENDA-REV.pdf"). Board meeting agendas and minutes document public comments during the Board meetings. Additionally, information about the 18 Reserves project will be made available on the CMP website.

[32] The Trust for Public Lands. 2018. The economic benefits of Cleveland Metroparks. www.tpl.org/cleveland-metroparks-2018

[33] https://www.clevelandmetroparks.com/parks/education

G.
OWNERSHIP AND TITLE

G1. PROOF OF TITLE

The state of Ohio owns the Cleveland Metroparks land in title. Titles for all properties included in the project area are documented in “Proof of Ownership Key.xlsx”. The titles are available for each reservation in the shared “Ownership” folder.

G2. CHAIN OF CUSTODY

Not Applicable – no offsets have been bought or sold previously, nor has the project entered into any forward option contracts.

G3. PRIOR APPLICATION

Not Applicable – the project proponent has not applied for GHG emission reduction credits through any other GHG emissions trading system or program. The reductions and removals that the project generates will not be used for the purpose of demonstrating compliance with binding limits that are in place in another program of jurisdiction.

H.
PROJECT TIMELINE

H1. START DATE

The start data is evidenced by the development agreement dated January 15, 2020, which signifies that Cleveland Metroparks commits to maintaining and increasing carbon stocks on the 18 Reserves project area through the use of light management that seeks to improve forest health, vigor, and long-term resiliency.

H2. PROJECT TIMELINE

Project activity	**Date**	**Source/Notes**
Project start date and start of the crediting period	January 15 2020	
Forest inventory	July 2020	
Validation and registration of the project	Anticipated 2021	
First monitoring	January-December 2020	
First verification	Anticipated 2021	
Periodic monitoring and verification	2020-2039	Every 5 years or less, or at request for ERT issuance
End date of first project crediting period	January 14, 2040	
Second crediting period	January 15 2040 – January 14, 2060	Baseline re-evaluated in January 2040
End date of project term	January 14, 2060	