



White Paper - Activity Penetration Analysis of Urban and Peri-Urban Forest Conservation

Version 2.0

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Purpose

This document outlines the use of an activity penetration analysis to demonstrate that urban and peri-urban forest conservation project activities are not common practice, as required under Section 6 on Additionality of the City Forest Credits (CFC) Preservation Protocol (Version 13). The full list of requirements for project additionality is provided in the CFC Preservation Protocol.

Introduction

The preservation of urban and peri-urban forests provides a host of nature-based benefits to people and wildlife, including improvements to air quality, watershed health, urban heat mitigation, carbon sequestration, habitat connectivity, and human health and well-being (O'Brien et al., 2022; Wolf et al., 2020). But forests in and around metropolitan areas of the US are at risk of conversion to developed uses, with urban growth projected to add close to 100 million acres of urban land to the United States by 2060 (Nowak & Greenfield, 2018). Between 2001 to 2015, more than two thirds of global, urbanization-related forest loss took place in the eastern US alone (Curtis et al., 2018).

This analysis determined that conservation of forestland in urban and metropolitan areas of the US is at 4.3% – a low level of penetration relative to its maximum adoption capacity and below the 5% threshold set in CFC Standard Section 4.9.1 for common practice demonstrations¹.

¹ The Clean Development Mechanism's [Methodological Tool for Common Practice \(TOOL24; Version 03.1\)](#) recommends a 20% threshold to demonstrate that an activity is not common practice. The 5% threshold used here is more conservative and consistent with commonly used additionality thresholds listed in the Clean Development Mechanism Concept Note CDM-MP83-A09 *Consistent use of market penetration metrics for additionality, common practice, and FOIK*, as well as Verra's VMD0052 *Demonstration of Additionality of Tidal Wetland Restoration and Conservation Project Activities*.

Analysis

Activity penetration is determined for a certain time frame (t) by calculating the level of measured project activity as a percentage of its maximum adoption capacity, or:

$$\text{Activity Penetration}(t) = \text{Measured Activity}(t) / \text{Maximum Adoption Capacity}(t) * 100$$

$$= \text{Protected Urban and Peri-urban Forestland}(t) / \text{Total Urban and Peri-urban Forestland}(t) * 100$$

The time frame for this analysis was selected as the period between 2001 to 2021. The bounding date of 2021 was selected based on data availability for forest land cover and protection status. A wide period of analysis spanning two decades was chosen conservatively to reflect the pace of land use change and the length of time required to fund land acquisition and protection.

Maximum Adoption Capacity Calculation

To determine the Maximum Adoption Capacity for urban and peri-urban forest conservation, the total amount of forestland within CFC's service area of urban and peri-urban lands was calculated.

First, CFC's service area was estimated as the non-overlapping union between US Census-designated 2020 Urban Areas (US Census Bureau, 2023) and federal Metropolitan Planning Organization boundaries (USDOT, 2024), with exclusions as described in the CFC Preservation Protocol Section 1.3.

Forest distribution was determined using the US Geological Survey's National Land Cover Database (NLCD). Developed in collaboration with the Multi-Resolution Land Characteristics Consortium, the NLCD has been, per the USGS, "one of the most widely used geospatial datasets in the US, serving as a basis for understanding the Nation's landscapes in thousands of studies and applications, trusted by scientists, land managers, students, city planners, and many more as a definitive source of U.S. land cover" (EROS, 2018). The latest suite of 2021 NLCD products for the conterminous US was used for this analysis; it includes 16 land use classes at 30-m spatial resolution (MRLC, 2023). The amount of land cover classified as forest (Deciduous Forest – 41, Evergreen Forest – 42, Mixed Forest – 43) in 2021 was calculated for areas lying within the CFC service area.

The total national extent of urban and peri-urban forests (as determined by the CFC service area) in 2021 was 273,917 km².

Measured Activity Calculation

To determine the Measured Activity for urban forest conservation, the total amount of protected forestland within CFC's service area of urban and peri-urban lands was calculated.

First, protected areas were determined using the US Geological Survey's Protected Areas Database (PAD-US; USGS GAP, 2022). This dataset is "America's official national inventory of US terrestrial and marine protected areas" (Gap Analysis Project, 2022) and includes lands owned and managed by federal and state agencies, regional, county, and local agencies, nonprofits and land trusts, and private landowners (PAD US, 2016). Conservation easement data included in PAD-US is taken from the National Conservation Easement Database. Although the PAD-US dataset has gaps, given the voluntary nature of reporting and the ongoing development of the database, it has been described as the "most comprehensive" publicly available dataset of US protected areas (Healey et al., 2023) and has been used in multiple peer-reviewed publications for national analyses of vegetation, land use, and land protection trends (for example, see Healey et al., 2023; McKerrow et al., 2021; Jackson et al., 2021; Browning et al., 2022).

This analysis uses the latest version of the dataset, PAD-US 3.0, which was released in 2022 and includes protected lands established in 2021. Only lands classified as GAP Status Code 1 and 2 were considered "fully protected", as these lands are permanently protected from conversion, have a mandated management plan, and are not subject to extractive uses such as mining and logging (USGS GAP, 2022). Lands classified as GAP Status Code 3 and 4 were excluded because they are subject to extractive uses (Status 3) or lack mandated or legally recognized protection (Status 4; USGS GAP, 2022).

The time period was established by excluding fully protected lands whose Date of Establishment was older than 2001. However, about 42% of Status 1 and Status 2 lands do not have a Date of Establishment; to be conservative, these properties were included in the analysis, even if they likely represent lands protected prior to 2001.

To analyze only urban and peri-urban forests, protected lands that fell outside of the CFC service area were excluded. The amount of land cover classified as forest (Deciduous Forest – 41, Evergreen Forest – 42, Mixed Forest – 43) by the 2021 NLCD within urban and peri-urban Protected Areas of Status 1 and 2 was then calculated.

The total national extent of protected urban and peri-urban forests (as determined by the CFC service area) from 2001 to 2021 is 11,808 km².

Activity Penetration Calculation

Activity Penetration(t) = Measured Activity(t) / Maximum Adoption Capacity(t) * 100

= Protected Urban and Peri-urban Forestland(t) / Total Urban and Peri-urban Forestland(t)
* 100

= 11,808 km² / 273,917 km² * 100

= 4.3%

The activity penetration for urban and peri-urban forest conservation between 2001 to 2021 is 4.3%, which is less than the 5% threshold set in the CFC Standard to demonstrate that an activity is not common practice.

Additional Notes

Activity penetration of urban forest conservation across all time periods was also analyzed by repeating the steps above, but including Protected Areas where the Date Established was older than 2001. The activity penetration for all urban and peri-urban forest conservation from 1800 to 2021 was calculated at 5.94%, just above the 5% threshold set in the CFC Standard for common practice analysis.

All analyses were conducted using ArcGIS Pro 3.2.1. This analysis will be updated as new versions of the NLCD and PAD-US datasets become available.

Sources

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