

CLIMATE FORWARD ►



Reforestation Forecast Methodology

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A program of the



CLIMATE
ACTION
RESERVE

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Abbreviations and Acronyms

CalFire	California Department of Forestry and Fire Protection
C	Carbon
CO ₂	Carbon dioxide
CMAI	Culmination of mean annual increment
CRT	Climate Reserve Tonne
FIA	USFS Forest Inventory and Analysis
FMU	Forecasted Mitigation Unit
GHG	Greenhouse gas
t	Metric ton (or tonne)
Reserve	Climate Action Reserve
RM	Reforestation Methodology
SSR	Source, sink, and reservoir
USFS	United States Forest Service

1 Introduction

The Climate Action Reserve (Reserve) is an environmental nonprofit organization that promotes and fosters the reduction and removal of greenhouse gas (GHG) emissions through credible market-based policies and solutions. Based in Los Angeles, the Reserve is the foremost carbon offset registry in North America with internationally recognized expertise in project-level GHG accounting. The Reserve establishes regulatory-quality standards for the development and quantification of GHG emission reduction and removal projects; issues GHG emission reduction and removal credits for use in compliance and voluntary carbon programs; and tracks the transaction of credits over time in transparent, publicly accessible systems. Adherence to the Reserve's standards ensures that emission reductions and removals associated with projects are real, permanent, and additional, thereby instilling confidence in the environmental benefit, credibility, and efficiency of carbon markets.

Climate Forward, a greenhouse gas mitigation program of the Climate Action Reserve, provides a practical solution to companies and organizations seeking cost-effective mitigation of anticipated (i.e., future) operational and/or project related GHG emissions. Climate Forward facilitates investments in GHG reduction and removal activities that are practical, scientifically-sound, transparent, and aligned with forward-looking mitigation needs such as the California Environmental Quality Act (CEQA). Climate Forward will drive forward-looking investment into actions expected to result in GHG reductions, with a goal of expanding the scope and scale of feasible emission reduction and removal project types.

Climate Forward is designed to provide companies, organizations, developers, and other entities with a conservative, robust, and methodologically rigorous option to mitigate an estimate of expected GHG emissions, on a voluntary or compliance basis, using FMUs generated from mitigation projects under this program. Climate Forward fundamentally differs from existing carbon credit programs through its focus on projecting and crediting estimated emission reductions and removals on an *ex ante* basis.

Under Climate Forward, estimated GHG reductions and removals from the mitigation project are recognized as Forecasted Mitigation Units (FMUs), which are each equal to one metric ton of carbon dioxide equivalent (CO₂e) expected to be reduced or sequestered. FMUs can be retired for multiple purposes, including for CEQA mitigation or for other voluntary mitigation purposes.

The Reforestation Forecast Methodology (Reforestation Methodology, RM) provides guidance to account for, report, and confirm forecasted (i.e., *ex ante*) GHG emission removals associated with reforestation activities, or site preparation activities that encourage site occupancy by forest species. Project proponents that initiate RM projects use this document to quantify and register forecasted GHG emission reductions and removals with Climate Forward on an *ex ante* basis. The methodology provides eligibility rules and methods to calculate expected reductions and removals, performance-monitoring instructions, and procedures for reporting project information to Climate Forward. Additionally, a Project Implementation Report (PIR) will receive independent confirmation by a Reserve-approved confirmation body selected by the project proponent. Guidance for confirmation bodies to confirm reductions and removals is provided in the Climate Forward Confirmation Manual and Section 8 of this methodology.

This methodology is designed to ensure the complete, consistent, transparent, accurate, and conservative *ex ante* quantification and confirmation of GHG emission reductions and removals associated with RM projects.¹

1.1 About Forests, Carbon Dioxide, and Climate Change

Forests have the capacity to both emit and sequester carbon dioxide (CO₂), a leading greenhouse gas that contributes to climate change. Trees, through the process of photosynthesis, naturally absorb CO₂ from the atmosphere and store the gas as carbon in their biomass, i.e., trunk (bole), leaves, branches, and roots. Carbon is also stored in the soils that support the forest, as well as the understory plants and litter on the forest floor. Wood products that are harvested from forests can also provide long-term storage of carbon.

When trees are disturbed, through events like fire, disease, pests or harvest, some of their stored carbon may oxidize or decay over time releasing CO₂ into the atmosphere. The quantity and rate of CO₂ that is emitted may vary, depending on the circumstances of the disturbance. Forests function as reservoirs in storing CO₂. Depending on how forests are managed or impacted by natural events, they can be a net source of emissions, resulting in a decrease to the reservoir, or a net sink, resulting in an increase of CO₂ to the reservoir. In other words, forests may have a net negative or net positive impact on the climate.

Through the protection of forests against conversion, sustainable management, and reforestation, forests can play a positive and significant role to help address global climate change. The Climate Forward Reforestation Forecast Methodology is designed to address the forest sector's unique capacity to sequester and store and to facilitate the positive role that reforestation activities can play to combat climate change and do so in an efficient manner to avoid the costs associated with previous approaches to reforestation activities within carbon markets.

1.2 Conceptual Approach to Quantifying GHG Removals from Reforestation Projects with *Ex Ante* and *Ex Post* Crediting Options

The conceptual approach to developing this methodology is based on the biological increase of carbon in trees that have been planted or become established naturally as part of a restoration activity on forestlands. Trees planted following a rotational harvest are not eligible for this methodology. *Ex ante* credits (credits issued prior to the carbon having been sequestered) are issued based on default growth projections to a future point prior to the trees being considered for regeneration harvest. The credit issuance for the *ex ante* approach is based on the value the sequestered carbon has provided in terms of mitigating climate warming effects according to the time-value of maintaining CO₂ out of the atmosphere (tonne-year accounting).

This accounting approach maintains assurances that the GHG benefits are real while providing an incentive to reforest trees by aligning some of the costs of reforestation with conservative crediting. Project proponents can opt to transition the project into the Climate Action Reserve's offset program under the Reforestation Protocol anytime and commit to ongoing monitoring, reporting, and verification for *ex post* crediting. Those choosing to transition to the Reserve's offset program may benefit financially by doing so. The timing of the transition will be determined by the landowner and will likely be when the estimated quantity of *ex post* credits is

¹ See the WRI/WBCSD GHG Protocol for Project Accounting (Part I, Chapter 4) for a description of GHG reduction project accounting principles.

adequate to justify the costs associated with monitoring and verification requirements in the offset protocol. *Ex post* credit issuances are based on accounting for the entire amount of carbon that has been sequestered for each monitoring period, which must be secured for the permanence period of 100 years (tonne-tonne accounting). Figure 1.1 displays the relationship between *ex ante* crediting in Climate Forward and *ex post* crediting in the Climate Action Reserve's offset program. Regardless a landowner's intent or actual decisions made for the future of the project, the RM is a Climate Forward methodology and limited to *ex ante* crediting.

The Revised reforestation approach provides for both ex ante and ex post crediting

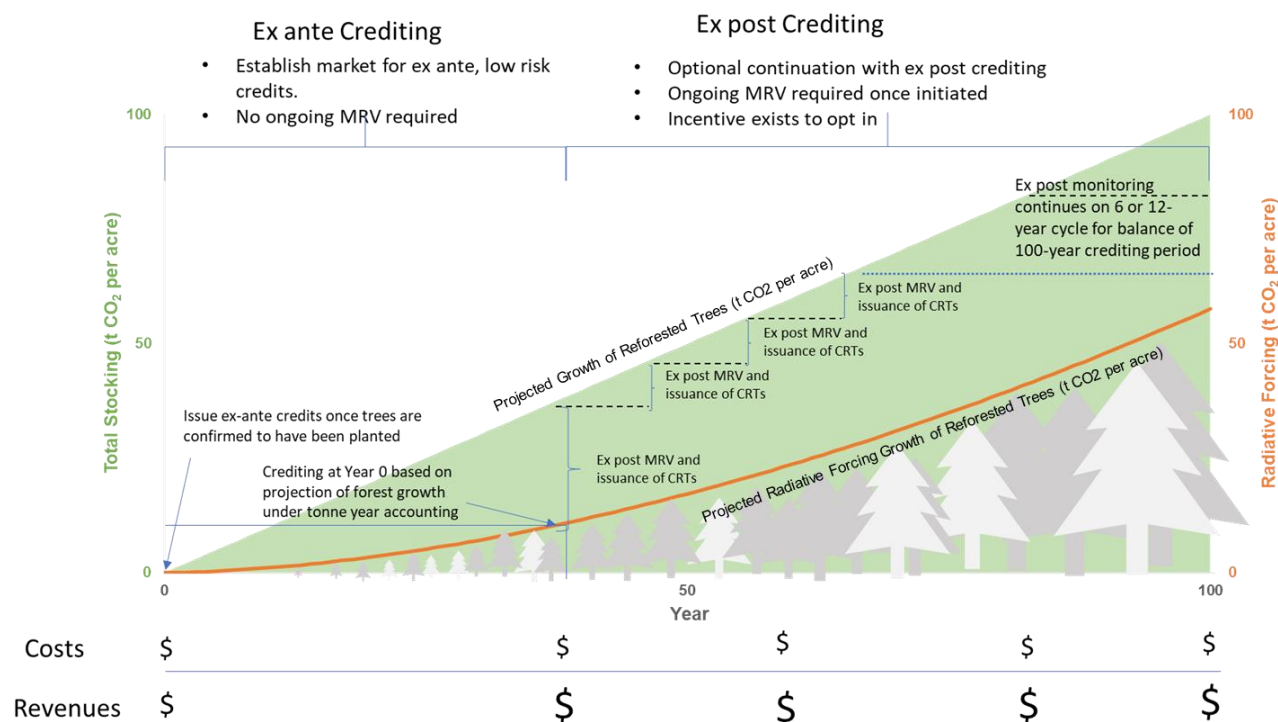


Figure 1.1. Relationship between Crediting in Climate Forward and the Reserve's Offset Program
The radiative forcing curve displays the time-value of CO₂ out of the atmosphere.

2 The GHG Enhancement Project

2.1 Project Definition

For the purposes of the RM, a reforestation project is a planned set of activities designed to increase removals of CO₂ from the atmosphere by the direct planting of trees, or site preparation activities that promote the natural regeneration of tree seedlings, resulting in forest growth that occurs above “business as usual” conditions. Implementation of reforestation activities are deemed successful under the RM if the project area is stocked with seedlings at a rate of 70 percent or greater at the time of confirmation, as described in Appendix A.

A glossary of terms related to reforestation projects is provided in Section 9 of this methodology (e.g., “site preparation”).

In developing a reforestation project, the project proponent must prepare a Reforestation Project Goals Form² that addresses the site’s need and suitability for reforestation and how the project will meet certain requirements described in this document. The Reforestation Project Goals Form must be included with a signature by a Professional Forester or Professional Ecologist with project submission documents. The elements required to be addressed in the Reforestation Project Goals Form are explicitly called out in this methodology.

All other reporting requirements must be submitted with the Reforestation Project Implementation Report (PIR) prior to confirmation. A template of the PIR is also available on the Climate Forward website. The Reforestation Project Implementation Report template provides a clear outline to the reporting requirements.

2.2 The Project Proponent

The “project proponent” is an entity that has an active account on the Climate Forward registry, submits a project for listing and registration with Climate Forward, and is ultimately responsible for all project reporting and confirmation. In all cases, the project proponent must attest to the Reserve that they have exclusive claim to the GHG removals resulting from the project. The assumption under this methodology is that the landowner owns the trees on the project area and therefore owns the GHG removals attributed to the project. At the time a project is confirmed, the project proponent must attest that no other entities are reporting or claiming (e.g., for voluntary reporting or regulatory compliance purposes) the GHG reductions or removals claimed by the project.³ The Reserve will not issue FMUs for GHG reductions or removals that are reported or claimed by entities other than the project proponent.

The owner of the trees is usually the fee owner of the property, unless an easement or lease has been recorded that cedes timber ownership, or any part thereof, to a third party, in which case the specific legal agreement must be reviewed to determine ownership. If the project proponent is an entity that does not have any claim of ownership to the trees, an agreement transferring the claim to GHG removals resulting from the project must exist and be referenced in the Project Implementation Report, as well as be reviewed by the confirmation body. See Section 3.6 for additional information about FMU ownership and Section 8.4.1 for guidance around confirmation of this requirement.

² Available on the Reforestation Forecast Methodology webpage at <https://climateforward.org/program/methodologies/reforestation/>.

³ A standard form for this attestation will be posted on the Climate Forward website at <https://climateforward.org/program/program-and-project-forms/>.

3 Eligibility Rules

Projects must fully satisfy the following eligibility rules in order to be registered with Climate Forward. The criteria only apply to projects that meet the definition of a GHG enhancement project (Section 2.1).

Eligibility Rule I:	Location	→	Geographic area for which eligible tree growth projections exist
		→	Project area requires intervention to re-establish tree cover, with low risk of conversion to non-forest uses
		→	Not on land previously registered as a project, unless the project was closed in good standing
Eligibility Rule II:	Start Date and Crediting Period	→	Submitted within one year of completion of planting or site preparation activities
		→	Crediting period varies by forest community, landowner class, and optional measures that provide long-term security to carbon stocks
Eligibility Rule III:	Additionality	→	Meet performance standard
		→	Exceed regulatory requirements
Eligibility Rule IV:	Environmental and Social Safeguards	→	Appropriate native tree species planted or regenerated
		→	No negative environmental and social impacts
Eligibility Rule V:	Regulatory Compliance	→	Compliance with all applicable laws
Eligibility Rule VI:	Ownership and Double Counting	→	Must not receive credits from more than one program, where GHG boundaries overlap
		→	Demonstrate ownership of rights to GHG emission reductions/removals from the project
Eligibility Rule VII:	Project Resilience Measures	→	Demonstrate by meeting project definition and location requirements
Eligibility Rule VIII:	Permanence	→	Determined by forest community, landowner class, and optional measures that provide long-term security to carbon stocks
Eligibility Rule IX:	Market Expansion Objective	→	Expand opportunities for GHG mitigation
Eligibility Rule X:	Demonstration of <i>Ex Ante</i> Suitability	→	Project activity must be suitable for <i>ex ante</i> crediting

3.1 Location

Projects can be initiated in any geographic area for which tree seedling growth projections have been developed in a scientifically rigorous manner and are published in the Reforestation Communities Data File (a separate document available on the Climate Forward website that displays eligible forest communities). Projects cannot take place on any part of an area where an existing or previously existing project was located that received any amount of financial recognition for climate benefits, unless the previous project has been closed in good-standing and with the written consent of the Reserve.

The project proponent must identify a project area as the geographic area where activities take place as defined in Section 2.1 and ensure that the entire area is eligible as described above. Projects may be composed of separate tracts or distinct polygons. Project acreage shall be based on area calculations derived from GIS analysis using software such as ArcGIS or Google Earth to delineate areas where reforestation activities have been implemented. Contiguous areas within the project area that are not conducive to seedling establishment (watercourses, roads, landings, bogs, rocky areas, etc.) and are larger than 1000 square feet or 1 percent of the project area, whichever is greater, must not be included within the project area.

The Reforestation Project Goals Form⁴ provides a template for the Professional Forester or Professional Ecologist to address site aspects related to the area being reforested. The form must provide a description of why the project area is a site that requires intervention to achieve stocking levels that will allow it to trend toward forest cover, how the environmental characteristics are favorable for the establishment and growth of tree seedlings, and why it does not appear to be at a heightened risk of conversion to non-forest uses.⁵ For project areas that are being reforested following a natural disturbance, the form must include a description of how the management action will enable the project area to trend toward previous forest conditions due to the intervention. The site selection section of the Reforestation Project Goals Form must be completed and submitted with the signature of a Professional Forester or Professional Ecologist at the time of project submission to provide assurance that these characteristics are met by the Project Site.

3.2 Project Start Date and Crediting Period

The project start date is the first date that trees have been planted or site preparation activities have been initiated for the natural regeneration of trees. The project start date can be no earlier than January 1, 2018.

The project submission must occur within one year of the project start date, with the exception of projects with a start date prior to the original release of this methodology (March 2, 2020), which must submit the project no later than March 1, 2021. However, project activities (planting or site preparation for natural regeneration) need not be completed before the project is submitted.

All projects that pass the eligibility requirements set forth in this methodology as of the project start date are eligible to register FMUs with Climate Forward for the duration of the project's crediting period. The crediting period is the period in which future projections of sequestered carbon are recognized for crediting purposes. This period varies by forest community, by

⁴ Available on the Reforestation Forecast Methodology webpage at <https://climateforward.org/program/methodologies/reforestation/>.

⁵ Guidance for these descriptions is provided in the Reforestation Project Goals Form.

landowner class, and by any additional protective measures that may secure future carbon tonnes, such as conservation easements, that contain explicit language related to the maintenance and enforcement of prescribed levels of sequestered carbon. The crediting periods are provided as reference values in the Reforestation Communities Data File, which is an annex to this methodology.

3.3 Additionality

Climate Forward registers only projects that yield surplus GHG reductions and/or removals that are additional to what would have occurred in the absence of the project.

Projects must satisfy the following tests to be considered additional:

1. The performance standard test
2. The legal requirement test

3.3.1 The Performance Standard Test

Projects pass the performance standard test by meeting a methodology-wide performance threshold – i.e., a standard of performance applicable to all prospective projects, established on an *ex ante* basis. The performance standard threshold represents “better than business as usual”. If the project meets the threshold, then it exceeds what would happen under the “business as usual” scenario and generates additional GHG reductions.

The performance standard test is applied at the time of the project’s start date. All projects that pass this test at the project’s start date are eligible to register FMUs with Climate Forward for the duration of the project’s crediting period, even if the performance standard changes after the project’s start date.

Under this RM, the project area must not have been in a forest landcover for a period of at least ten years prior to the start date or must have been affected by a natural disturbance within the past 10 years that resulted in the forest canopy cover levels of live trees within the project area being less than 25 percent, as assessed on the project start date. It is understood that recently disturbed areas may have canopy cover levels greater than 25 percent in need of reforestation. Regardless of whether these areas are reforested or not during the planting effort, areas of contiguous forest canopy cover in excess of 4,356 square feet (1/10th acre) must be excluded from the project area.

3.3.2 The Legal Requirement Test

All project crediting must be based on GHG enhancements that are not legally required through regulation, conservation easement, contract, or any other legally binding requirement, excepting management obligations within conservation easements⁶ with Required RM Terms used to secure long-term carbon specifically for this RM, which can defer legally binding requirements associated with the conservation easement with Required RM Terms until confirmation activities have been completed. Conservation easements that existed on the project area prior to the project being initiated and that neither prohibit nor require reforestation do not affect project eligibility. A legal obligation to reforest the project area site at any level renders the project ineligible. Such legal obligations include those that have been adopted but have not entered into

⁶ Other deed restrictions or legally binding agreements that are maintained with the land in cases of ownership transfers are applicable in lieu of a conservation easement. The term “conservation easement” will be used throughout this methodology to represent any such legally binding restrictions on land use activities.

force yet, e.g., legislation that has been signed into law but does not take effect until after a later, specified date.

The legal requirement test is applied at the time of a project's start date. To satisfy the legal requirement test, project proponents must submit a signed Attestation of Legal Additionality form prior to the commencement of confirmation activities. In addition to the attestation, the Project Implementation Report must include a description of any laws that reference requirements to reforest the project area. Portions of the project area with requirements to reforest are not eligible. The confirmation body must confirm the Attestation of Legal Additionality by reviewing evidence provided by the project proponent, and any other evidence they feel is necessary such as literature reviews, independent expert testimony, or letters from relevant government agency representatives, or other means. All projects that pass this test at the project start date are eligible to register reductions or removals with Climate Forward for the duration of the crediting period, even if legal requirements change or new legal requirements are enacted during that period.

3.4 Environmental and Social Safeguards

Projects must support and/or enhance native ecosystems. Only projects that adhere to the objective of initiating a forest of diverse native tree species are eligible. The strategy to achieve this objective must be explained and justified in the Reforestation Project Goals Form and submitted, with Professional Forester or Professional Ecologist approval, at the time of project submission. Considerations for achieving the objective may include site conditions, landowner economic objectives, seedling availability, successional events that occur following initial plantings, etc.

Project proponents must describe in the PIR the project's effects (positive and negative) on air and water quality, water supply, habitat, flora and fauna, jobs, recreation, scenic views, employment, and environmental justice. This may include a discussion of how the project aligns with the United Nations' Sustainable Development Goals,⁷ as well as additional quantification of any non-GHG benefits (such quantification is not specified by this methodology).

The project proponent must attest that the project will not materially undermine progress on environmental and social issues such as air and water quality, endangered species and natural resource protection, and environmental justice. The project proponent must provide applicable authorizations, permits, and certifications from the appropriate authorities required for project operations to the confirmation body at the commencement of confirmation activities.

3.5 Regulatory Compliance

The project proponent must sign an Attestation of Regulatory Compliance prior to the commencement of project confirmation activities, attesting that no laws have been broken in the implementation of the project, and provide an assessment of any aspects of the project which may present a risk of future regulatory violations. Where such risks are identified, the project proponent shall describe measures undertaken to reduce and/or mitigate these risks. The confirmation body shall endeavor to confirm that the project implementation did not result in any regulatory noncompliance, and also that appropriate measures have been implemented to avoid potential future noncompliance during the project crediting period.

⁷ Additional information regarding the Sustainable Development Goals may be found online at: <https://sustainabledevelopment.un.org/>.

3.6 Ownership and Double Counting

The ownership of the FMUs is assumed to be the entity that has legal ownership of the trees, unless an agreement transferring FMU ownership to another entity is in place, as described in Section 2.2. The project proponent must submit an affidavit within the PIR outlining the names and contact information of the legal owner(s) of timber rights within the project area.

The project proponent must submit a signed Attestation of Title form indicating that the project proponent has exclusive ownership rights to the emission reductions and removals resulting from the mitigation project and that the project is not being submitted for emission reduction credits under any other carbon crediting program, world-wide. As indicated in Section 2.2, any agreements transferring FMU ownership must be referenced in the PIR and reviewed by the confirmation body. By signing the Attestation of Title, the project proponent attests that the FMUs have not and will not be registered with, reported in, held, transferred or retired via any emissions registry or inventory other than the Climate Forward registry, or registered with Climate Forward under a different project title or location. Evidence of transfer of rights of all GHG emission reductions to the project proponent is required and must be confirmed by the confirmation body. The project proponent must provide a signed Attestation of Title document for each project, attesting to their ownership of all GHG emission reductions generated by the project. This signed attestation, and any necessary supporting evidence, must be provided to the confirmation body. In addition to the Attestation of Title, confirmation bodies may wish to review relevant contracts, agreements, and/or supporting documentation between project proponents, end users, and other parties that may have a claim to the FMUs generated by the project.

A map must be provided prior to confirmation as a KML file that identifies the area in which the reforestation project has been undertaken. The map may be used to display the project site as part of public sharing and ensuring that project boundaries do not overlap.

3.7 Project Resilience Measures

Project proponents must only include areas that are conducive to growing trees and not subject to conversion to non-forest uses, as explained and addressed in Sections 2.1 and 3.1. Additionally, tree planting is limited to a diversity of native species, as described and addressed in Section 3.4.

3.8 Ensuring Permanence

The mechanisms to ensure permanence of the *ex ante* FMUs resulting from sequestered CO₂ from reforestation activities include:

- Tonne-year accounting
- An optional conservation easement (perpetual or term) with Required RM Terms or public ownership where management objectives can be demonstrated as being consistent with the long-term maintenance of projected increases in carbon stocks
- Conservative estimates of carbon projections

3.8.1 Tonne-Tonne Accounting

Additional removals of atmospheric CO₂ begin immediately when CO₂ is sequestered in biomass at levels beyond “business as usual”. The additional sequestered CO₂ completely mitigates an equal GHG emission elsewhere when the additional sequestered CO₂ has been maintained out of the atmosphere for at least 100 years.

Tonne-tonne accounting recognizes the entire CO₂e value that has been sequestered in cases where the sequestered value can be reasonably assured to be sustained for a 100-year period following the sequestration. Projects with perpetual conservation easements with the Required RM Terms meet the permanence requirement using tonne-tonne accounting. For reforestation projects with perpetual conservation easements with Required RM Terms, the timeframe for assessing the *tonne-tonne* values (i.e., crediting period) is the projected growth of the forest stand to year 100. Projects on government-owned lands also meet the permanence requirement using tonne-tonne accounting under certain conditions. To be eligible to use tonne-tonne accounting, projects on public lands must be able to demonstrate that management is expected to lead to increases in carbon stocks that: 1) meet or exceed those stocks projected for the project area for the lesser of either 100 years or the year at which the Culmination of Mean Annual Increment (CMAI) occurs, and 2) are maintained at or above such projected stocking levels. CMAI is a benchmark for measuring forest maturity which can be determined from the growth projections. Forest stands at CMAI are at a high risk of regeneration harvest. Although forests on public lands may very well grow beyond CMAI, considering the accumulation of carbon only to the point of CMAI is a conservative approach to quantification. To demonstrate consistency of management with the 100-year permanency of projected stock increases on a project area on public lands, the project proponent must provide a description of the following:

- Management history
- Management objectives
- Likelihood of management plan changing in the future in a way that will prevent projected increases in carbon stocks from being achieved

In the case of a project either with a perpetual conservation easement including the Required RM Terms or on public lands capable of demonstrating management consistency with the long-term maintenance of projected carbon stock increases (hereafter referred to under the landowner class “government (secured)”), FMU issuance would be based on the tonne-tonne value projected for the crediting period, net of the resiliency discount (see Section 5.3). As an example, if a project with a perpetual conservation easement with Required RM Terms were predicted to have sequestered 225 tonnes per acre, after the resiliency discount has been applied, the project would be credited 225 tonnes per acre.

3.8.2 Tonne-Year Accounting

Tonne-year accounting recognizes the time value of CO₂ held out of the atmosphere for time periods less than the full permanence period of 100 years. Where the ability to secure the additional sequestered CO₂ is less than 100 years, the amount of credits issued is proportional to the 100-year permanence timeframe, at a rate of 1 percent per year. As an example, if the methodological approach to crediting provides reasonable assurance that the CO₂ in reforested trees will be secured for the next 30 years, 100 tonnes sequestered today would be credited at a value of 30 tonnes.

Tonne-year accounting is applied to reforestation projects with non-perpetual conservation easements that include the Required RM Terms. The timeframe for assessing the tonne-year values in such cases, and the resulting amount of FMUs to be issued, is the term length of the easement, up to a maximum of 100 years from the project start date. Absent a conservation easement with Required RM Terms that provides security to mature forest stands through ongoing monitoring and enforcement by qualified land trusts, the temporal portion of the reforested stand’s growth projection that is deemed secure (i.e., the sequestered carbon is

extremely likely to remain sequestered) is linked to the stand's growth rate and the proximity of the trees on the projection curve to achieving commercial dimensions and being at risk for regeneration harvest.

Growth rates in reforested stands start high and gradually slow as the forest stand trends toward a mature condition. The forest growth rates represent a return on investment to the forest landowner. Forest investments remain attractive during the period of rapid growth and become less attractive as growth rates slow, at which point landowners may choose to capture the value in standing timber (i.e., through harvest activities) and seek an alternative investment vehicle. This methodology operates with an assumption that expectations of financial returns vary based on defined landowner classes.

The Reserve has developed a companion document called the Reforestation Communities Data File in which threshold growth rates are provided by landowner class for the eligible forest communities. The data file defines the temporal length of growth projections for each forest community prior to the point at which the forest stands are at heightened risk of regeneration harvest (i.e., the length of time until the projected growth rate becomes lower than the assumed threshold rate of return) for each landowner class. This period is referred to as the crediting period.

Landowner classes recognized under this methodology are government, non-profit, tribal, and private. The private landowner class is further divided into two sub-classes in recognition that expectations of financial returns can vary considerably among private landowners. Under this methodology, private landowners with forestland holdings of 45,000 acres or more are assumed to manage their forests for timber production and the revenue derived from timber harvests. Such large private landowners are therefore more likely to harvest earlier in growth cycles to achieve financially-driven management objectives and are therefore assumed to harvest when growth rates are relatively high. All other private landowners are assumed to be less financially driven when making management decisions, with the risk of harvest heightened after growth rates have decreased further.

Projects taking place on large private forestlands may be eligible to use the growth rate threshold for other private landowners if they can demonstrate that the large private landowner has: 1) a history of managing its forests in a way that is consistent with the harvest rotation length suggested by the stand age at which harvest risk increases for other private landowners, as indicated by the Reforestation Communities Data File for the relevant forest type, and 2) a management plan in place that is similarly consistent.

Although growth rate thresholds will define the crediting period for most forest type and landowner class combinations, some forest types achieve maturity (based on CMAI) at nearly the same time as the growth rate thresholds are achieved. In such cases, crediting periods are defined by the proximity of forested stands to CMAI rather than by threshold growth rates. Therefore, a secondary threshold condition is established based on years as a percent of the year in which CMAI occurs. This condition only applies to forest types for which growth is expected to culminate quickly. This ensures that the risk of a regeneration harvest remains extremely low during the period credited by this methodology. Thus, this methodology considers both growth rates and proximity to CMAI to define the length of time during which CO₂e will be quantified on a tonne-year basis and issued as FMUs in the absence of a conservation easement as described above. The FMUs issued to reforestation projects using tonne-year accounting are the tonne-year values associated with the CO₂e projected at the defined crediting period.

Table 3.1 displays the threshold growth rates or percent of CMAI (in years) used to determine the crediting period and ensure conservative crediting. These values are applied to each forest community, as growth characteristics of forest communities vary widely. Table 3.1 also displays the basis for crediting period length for projects with conservation easements with Required RM Terms and for public lands where management is demonstrated to be consistent with project carbon stock increases.

Table 3.1. Basis for Determining Length of a Project's Crediting Period

Landowner Class	Basis for Length of Crediting Period		Tonne-Tonne (TT) or Tonne-Year (TY)
	No Conservation Easement with Required RM Terms		
	Threshold value identified as the lesser of column A or column B for a given forest community		
	A	B	
	Growth rate	Percent of the year (in terms of years) at which CMAI occurs	
Large Private	4%	80%	TY
Other Private or Tribal	3%		TY
Non-Profit or Government (Non-Secured) ⁸	2%		TY
	Management Demonstrated to be Consistent with Maintenance of Projected Carbon Stock Increases		
Government (Secured)	The lesser of the year at which CMAI occurs or 100 years.		TT
	Conservation Easement with Required RM Terms		
Any Ownership Class	Length of term in conservation easement (with Required RM Terms) up to 100 years, assessed at the tonne-year value for projects with term conservation easements and the tonne-tonne value for projects with perpetual conservation easements.		TY or TT

A project may record a conservation easement with the Required RM Terms at any time during the crediting period and transition to landowner class with a conservation easement and be awarded the balance of FMUs associated with the landowner class. At such a time, the conservation easement baseline documentation must provide evidence that the reforested trees are generally shifting the land cover within the project area back to forest cover. The Forest Owner must submit a request to the Reserve for the additional FMUs and include as part of the request evidence for tree survival, a copy of the conservation easement (that complies with the Required RM Terms), and quantification documents, including both original and updated accounting.

Figure 3.1 displays an example of the gross FMUs that are issued (without consideration of discounts discussed in Section 5.3) based on the tonne-year values associated with each landowner class (or conservation easement with a term less than 100 years) and how such issuances relate to the increasing risk of rotational harvest. It also shows the FMUs issued based on the tonne-tonne values associated with a perpetual conservation easement with Required RM Terms or with government (secured) lands.

⁸ Government-owned lands for which management is not demonstrated to be consistent with the long-term maintenance of projected carbon stock increases.

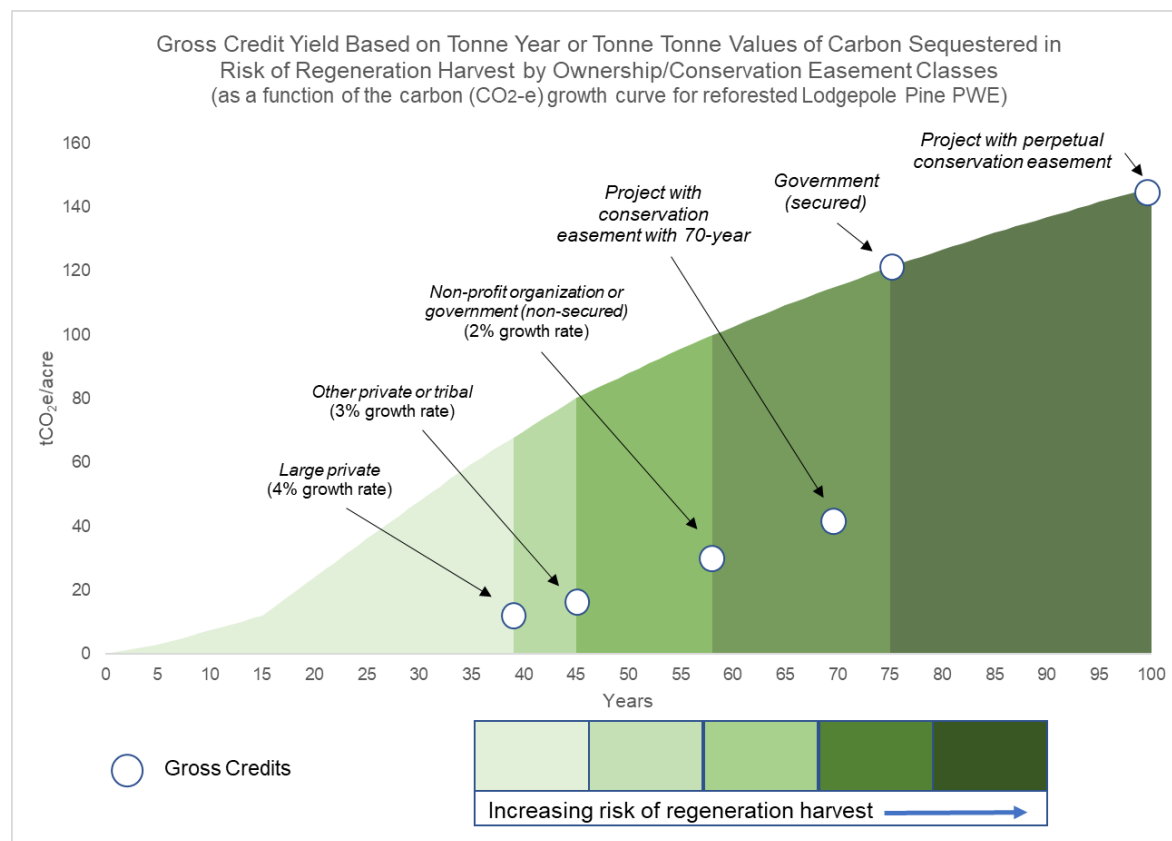


Figure 3.1. Example of Gross FMUs that are Issued Based on Landowner Class or Conservation Easement Term Length for the Lodgepole Pine PWE Forest Community

3.8.3 Conservative Crediting

There are several elements of conservatism as part of the methodology design, including the following:

1. Confirmation activities are initiated only after the trees in the reforested project area have been in the ground for a year from planted seedlings or seedlings established from natural regeneration. As such, the seedlings will have passed a highly vulnerable period and have a high probability of aligning with the projected growth.
2. Projects without conservation easements or on public lands which are crediting only during the early phase of forest growth are credited based on 98 percent of the mean growth projection. This establishes a virtual buffer pool that will ensure that the population of all projects in the system will achieve greater emissions removals than the sum of credits issued. It is anticipated that thinning operations may occur in the young forest stands, which will promote resilient stand conditions and encourage growth among retained trees, but these operations will not significantly alter growth projections and will serve, when they occur, to reduce the incidence of high-severity wildfire and pest infestations.
3. Projects with conservation easements including the Required RM Terms and projects on government (secured) lands are credited at 90 percent of the mean growth projection. These projects are credited for growth projections more distant in the future. The discount addresses both the emissions associated with biomass removals to ensure the

forest is resilient to natural disturbances, but also addresses the potential for natural disturbances to occur.

4. In the absence of a conservation easement with Required RM Terms to provide ongoing reporting and monitoring activities, project crediting is based on forward projections of carbon accrual that extend only to a conservative point in time prior to a heightened risk of project failure due to regeneration harvest.
5. For projects that use conservation easement with Required RM Terms, the terms must include a provision for reforestation activities in the event that a natural disturbance modifies the landcover such that it is no longer in forest cover. In such cases, the reforestation activity ensures the credited emissions removals will be achieved with time. This methodology does not require that the emissions removals are absolutely met at the projected times.

3.9 Market Expansion Objective

Crediting of reforestation projects does not provide the financial resources needed to address the high upfront costs associated with site preparation and tree planting. Financial incentives to perform reforestation activities are not well-served by *ex post* methodologies, since high project initiation costs are not balanced with payments from carbon markets, due to the length of time following the establishment of trees before projects contain appreciable levels of carbon. This *ex ante* approach recognizes the future value of carbon in reforested sites to finance a substantial portion, if not all, of site preparation and planting costs.

3.10 Demonstration of *Ex Ante* Suitability

The focus of this methodology is to provide FMUs to landowners/project proponents at a time that aligns with the demand for financial resources to cover the costs of seedling establishment. The *ex ante* crediting within the RM addresses this need by providing credits based on future projections of forest growth. Furthermore, the RM only recognizes future projections based on tree seedlings that are reasonably established in the ground and only for a time frame when commercial opportunities for the harvest of the planted trees are highly limited.

The first year following tree establishment is a period of high vulnerability for tree seedlings. It is a time in which the seedlings have a heightened risk of mortality due particularly to drought. Also, poor planting practices are often revealed within the first year with heightened mortality. The predictability that tree seedlings will survive is greatly improved if they remain alive a year after the reforestation effort. The next substantial risk to carbon sequestration in the life of the reforested stand is the commercial exploitation that might occur in the future at a point in time depending on the rate of commercial maturation of the tree species planted and laws that regulate the timing of stand rotation. This methodology quantifies the projection of future carbon values based on a determination of adequate stocking of live trees a year after the reforestation effort is completed. At this point, early mortality risks have been avoided and credits will only be provided to a predetermined point in time when harvesting risk is heightened, based on forest community and landowner class, which establishes the crediting period for FMUs.

4 The GHG Assessment Boundary

The GHG Assessment Boundary delineates the GHG sources, sinks, and reservoirs (SSRs) that must be assessed by project proponents in order to determine the net change in emissions caused by a project.⁹ Table 4.1 outlines SSRs that may be related to reforestation activities and explains and justifies the accounting approach to the specific SSR.

Table 4.1. Description of all Sources, Sinks, and Reservoirs

SSR	Source Description	GHG	Included?	Baseline/ Project	Justification/Explanation
Primary Effect Sources, Sinks, and Reservoirs					
1	Standing live carbon (carbon in all portions of living trees)	CO ₂	Yes	Baseline: Assumed to be 0 Project: Estimated from predetermined forecasted values as described in Section 5.2	<p>Increases in standing live carbon stocks are likely to be the largest primary effect of reforestation projects.</p> <p>Any pre-existing trees on the project area do not need to be considered in accounting of the live tree pool, since the site must be approved by a Professional Forester or Professional Biologist as a site that would trend toward forest cover as the result of active efforts to reforest the site.</p>
2	Shrubs and herbaceous understory carbon	CO ₂	No	Baseline: N/A Project: N/A	<p>Shrubs and herbaceous understory may constitute a significant portion of carbon affected by reforestation projects as part of site preparation. However, such stocks are assumed to recover fully over the course of the crediting period.</p>

⁹ The definition and assessment of SSRs is consistent with ISO 14064-2 guidance.

SSR	Source Description	GHG	Included?	Baseline/ Project	Justification/Explanation
3	Standing dead carbon (carbon in all portions of dead, standing trees)	CO ₂	No/Yes	Baseline: N/A Project: N/A	<p>No crediting is provided for standing dead wood. The primary effect of reforestation projects is the carbon sequestration associated with growing trees that originated through project activities.</p> <p>The projections used for crediting the reforested trees are net of mortality, which would be very low considering the young trees included in the timeframe for crediting.</p> <p>Projects that move standing dead wood out of the forest must demonstrate that the use of the material offsite (biomass energy, heat, wood products, etc.) results in an improved GHG permanence than would have occurred if the standing dead trees would have been left on site.</p> <p>If burned on site, projects must use conservation burning techniques to enhance biochar production that will persist longer than the decay of the dead trees absent controlled pyrolysis.</p>
4	Lying dead wood carbon	CO ₂	No/Yes	Baseline: N/A Project: N/A	<p>Lying dead wood cannot be used for crediting as it has no relevance to the primary effect.</p> <p>Projects that move lying dead wood out of the forest must demonstrate that the use of the material offsite (biomass energy, heat, wood products, etc.) results in an improved GHG permanence than would have occurred if the lying dead trees would have been left on site.</p> <p>If burned on site, projects must use conservation burning techniques to enhance biochar production that will persist longer than the decay of the dead trees absent controlled pyrolysis.</p>

SSR	Source Description	GHG	Included?	Baseline/ Project	Justification/Explanation
5	Litter and duff carbon (carbon in dead plant material)	CO ₂	No	Baseline: N/A Project: N/A	Carbon from litter and duff may be affected by reforestation projects as part of site preparation, but the emission source is assumed to be <i>de minimis</i> .
6	Soil carbon	CO ₂	No	Baseline: N/A Project: N/A	In cases where reforestation activities follow disturbance events, soil carbon is expected to at least remain the same and may increase. Since baseline and project soil carbon quantification is difficult and expensive, soil carbon is not included in quantification at this time. It is conservative not to include it.
7	Carbon in in-use forest products	CO ₂	No	Baseline: N/A Project: N/A	Not included because no harvesting is expected to occur during the crediting period under the baseline or under the project activity, as further described in Section 5.2.1.
8	Forest product carbon in landfills	CO ₂	No	Baseline: N/A Project: N/A	Not included because no harvesting is expected to occur during the crediting period under the baseline or under the project activity, as further described in Section 5.2.1.
Secondary Effect Sources, Sinks, and Reservoirs					
9	Biological emissions from site preparation activities	CO ₂	No	Baseline: N/A Project: N/A	Biological emissions from site preparation addressed in SSR 2 – 8.
10	Mobile combustion emissions from site preparation activities	CO ₂	Yes	Baseline: N/A Project: Yes	Mobile combustion emissions from site preparation are included when tractors are used for brush clearing.
		CH ₄	No	Baseline: N/A Project: N/A	Changes in CH ₄ emissions from mobile combustion associated with site preparation activities are not considered significant.
		N ₂ O	No	Baseline: N/A Project: N/A	Changes in N ₂ O emissions from mobile combustion associated with site preparation activities are not considered significant.

SSR	Source Description	GHG	Included?	Baseline/ Project	Justification/Explanation
11	Mobile combustion emissions from ongoing project operation and maintenance	CO ₂	No	Baseline: N/A Project: N/A	Mobile combustion emissions from ongoing project operation and maintenance are unlikely to be significantly different from baseline levels and are therefore not included in the GHG Assessment Boundary.
		CH ₄	No	Baseline: N/A Project: N/A	Changes in CH ₄ emissions from mobile combustion associated with ongoing project operation and maintenance activities are not considered significant.
		N ₂ O	No	Baseline: N/A Project: N/A	Changes in N ₂ O emissions from mobile combustion associated with ongoing project operation and maintenance activities are not considered significant.
12	Stationary combustion emissions from ongoing project operation and maintenance	CO ₂	No	Baseline: N/A Project: N/A	Stationary combustion CO ₂ emissions from ongoing project operation and maintenance could include GHG emissions associated with electricity consumption or heating/cooling at project proponent facilities, or at facilities owned or controlled by contractors. These emissions are unlikely to be significantly different from baseline levels and are therefore not included in the GHG Assessment Boundary.
		CH ₄	No	Baseline: N/A Project: N/A	Changes in CH ₄ emissions from stationary combustion associated with ongoing project operation and maintenance activities are not considered significant.
		N ₂ O	No	Baseline: N/A Project: N/A	Changes in N ₂ O emissions from stationary combustion associated with ongoing project operation and maintenance activities are not considered significant.

SSR	Source Description	GHG	Included?	Baseline/ Project	Justification/Explanation
13	Biological emissions from clearing of forestland outside the project area	CO ₂	No/Yes	Baseline: N/A Project: Estimated using default land-use conversion factors for non-project land	Reforestation projects on land currently used for grazing or growing crops may cause displacement of these activities to other lands, leading to a decline in carbon stocks on those lands (e.g., due to clearing of trees and shrubs). The shift may be either a market or physical response to the project activity. Emission associated with shifting land uses are estimated using default “leakage” factors, as detailed in Figure 5.1.
14	Biological emissions/removals from changes in harvesting on forestland outside the project area	CO ₂	No	Baseline: N/A Project: N/A	Not included because no harvesting is expected to occur during the crediting period under the baseline or under the project activity, as further described in Section 5.2.1.
15	Combustion emissions from production, transportation, and disposal of forest products	CO ₂	No	Baseline: N/A Project: N/A	Not included because no harvesting is expected to occur during the crediting period under the baseline or under the project activity, as further described in Section 5.2.1.
		CH ₄	No	Baseline: N/A Project: N/A	Not included because no harvesting is expected to occur during the crediting period under the baseline or under the project activity, as further described in Section 5.2.1.
		N ₂ O	No	Baseline: N/A Project: N/A	Not included because no harvesting is expected to occur during the crediting period under the baseline or under the project activity, as further described in Section 5.2.1.

SSR	Source Description	GHG	Included?	Baseline/ Project	Justification/Explanation
16	Combustion emissions from production, transportation, and disposal of alternative materials to forest products	CO ₂	No	Baseline: N/A Project: N/A	Not included because no harvesting is expected to occur during the crediting period under the baseline or under the project activity, as further described in Section 5.2.1.
		CH ₄	No	Baseline: N/A Project: N/A	Not included because no harvesting is expected to occur during the crediting period under the baseline or under the project activity, as further described in Section 5.2.1.
		N ₂ O	No	Baseline: N/A Project: N/A	Not included because no harvesting is expected to occur during the crediting period under the baseline or under the project activity, as further described in Section 5.2.1.
17	Biological emissions from decomposition of forest products	CO ₂	No	Baseline: N/A Project: N/A	Not included because no harvesting is expected to occur during the crediting period under the baseline or under the project activity, as further described in Section 5.2.1.
		CH ₄	No	Baseline: N/A Project: N/A	Not included because no harvesting is expected to occur during the crediting period under the baseline or under the project activity, as further described in Section 5.2.1.
		N ₂ O	No	Baseline: N/A Project: N/A	Not included because no harvesting is expected to occur during the crediting period under the baseline or under the project activity, as further described in Section 5.2.1.

5 Quantifying GHG Emission Removals

GHG removals are calculated by comparing the baseline to the forecasted mitigation project performance over a certain time period. GHG removals are achieved when the mitigation project results in higher CO₂ sequestration over a certain time period compared to what would have happened absent the mitigation project. The general formula for calculating GHG removals is:

GHG Removals = [(Incremental Forecasted Mitigation Project Sequestration – Incremental Forecasted Baseline Sequestration) + (Forecasted Baseline Emissions – Forecasted Mitigation Project Emissions)] + Secondary Effects, as shown in equation form in Equation 5.1.

Equation 5.1. Calculating GHG Removals

$ER_{total} = \sum (ER_f + SE_f)$		
Where,		
ER_{total}	= Total project emissions removals	tCO ₂ e
SE_f	= Secondary effect GHG emissions caused by the project activity for forest type f (see Section 5.5)	tCO ₂ e
And,		
$ER_f = \sum_{y=1}^{CP_f} (\Delta AC_{f,y} \times 1\% \times (CP_f - y + 1))$		
Where,		
ER_f	= Total emissions removals for forest type f	tCO ₂ e
Y	= Years since project initiation	Years
CP_f	= Duration of crediting period for forest type f	Years
$\Delta AC_{f,y}$	= Increase in actual live tree carbon as forecasted for year y from prior year $y-1$ for forest type f [†]	tCO ₂ e

[†]Baseline live tree carbon stocks are assumed to remain at 0 tCO₂e during the crediting period.

5.1 Estimating Baseline Carbon Stocks

For quantification purposes under this methodology, baseline live tree carbon stocks are assumed to be zero, in accordance with project eligibility requirements related to additionality specified in Section 3.3, the GHG assessment boundary specified in Section 4, and the intended primary effect of the project activity – the increase in live tree carbon stocks that results from reforestation. Any pre-existing seedlings that may be present prior to the reforestation activities are assumed to be *de minimis* since a determination is required at project submission that the project area is understocked and in need of management activities to achieve stocking levels that would convert the project area to forest cover or restore an area to full forest cover (in the event of reforestation following natural disturbance).

5.2 Estimating Project Carbon Stocks

5.2.1 Basis for Estimates of Forecasted GHG Removals

Per the GHG assessment boundaries detailed in Section 4, estimates of future GHG removals are based on increases in carbon stocking in the live tree pool. This methodology relies on the results of projected regenerated forest stands from credible sources, with the assumption that a seedling stocking rate of 70 percent or greater at the time of confirmation, as determined by

confirmation body sampling as outlined in Appendix A, is sufficient to achieve the increases in carbon stocks forecasted for the project area. The Reserve shall be the arbiter in determining which studies are adequately rigorous for inclusion in this methodology. The data projections for included forest communities are presented in the Reforestation Communities Data File, which is an associated document to the RM available on the Climate Forward website.

Since a reforested stand results in additional carbon being sequestered over time, for projects without a permanent conservation easements with Required RM Terms or on public lands for which management of the site cannot be demonstrated to be consistent with the long-term maintenance of expected increases in carbon stocks, the amount recognized for crediting under this methodology is based on the tonne-year value of the carbon sequestered during each year of the project, up to the point where the thresholds discussed in Section 3.8 (Ensuring Permanence) are surpassed. In other words, a given tonne of carbon sequestered during the first year of the project will have a different tonne-year value than another tonne sequestered in any subsequent year of the project. See Table 5.1 for an example of how tonne-year values are attributed to a project.

Table 5.1. Example of Tonne-Year Values and Cumulative Crediting

This example uses a project that is sequestering 100 additional tonnes of CO₂e per year across the entire project area, with a forest type and discount rate of 4 percent for a large private landowner, for which the risk of regeneration harvest is assumed to take place 36 years after project initiation.

Years since project inception	Tonnes sequestered (tCO ₂ e)		Years since project initiation						Cumulative tonne-year value (tCO ₂ e)
			1	2	3	...	35	36	
1	100	Annual achieved tonne-year value (tCO ₂ e)	1	1	1	...	1	0	35
2	100			1	1	...	1	0	34
3	100				1	...	1	0	33
...
35	100						1	0	1
36	Risk threshold achieved							0	0
Total	0		Total						630

If the entire project area has a conservation easement with Required RM Terms, the rate of return for the applicable landowner type will be disregarded and the project will be issued FMUs on a tonne-year basis as if the project area were not eligible for harvest until the term of the easement is completed, up to a maximum of 100 years. In other words, if the landowner of the project in the example displayed in Table 5.1 is a large private landowner, the project would be awarded 630 FMUs based on a threshold rate of return of 4 percent, which results in a high risk of regeneration harvest 36 years after the project was initiated. However, if the same landowner placed a conservation easement with Required RM Terms on their land before the project was initiated that prevented regeneration harvest throughout the term of the easement, which for the example is set to 55 years, the applicable threshold rate of return would be disregarded and the project would be awarded 1,540 FMUs, based on the assumption that all additional tonnes of CO₂e are maintained through 55 years after project initiation, as shown in Table 5.2.

Table 5.2. Example of Tonne-Year Values and Cumulative Crediting when Conservation Easement with Required RM Terms

This example uses the same project conditions as shown in Table 5.1, except the project area has a conservation easement with Required RM Terms, resulting in a high risk of rotational harvest assumed to take place 55 years after project initiation.

Years since project inception	Tonnes sequestered (tCO ₂ e)		Annual Years since project initiation						Cumulative tonne-year value (tCO ₂ e)
			1	2	3	...	55	56	
1	100	Annual achieved tonne-year value (tCO ₂ e)	1	1	1	...	1	0	55
2	100			1	1	...	1	0	54
3	100				1	...	1	0	53
...
55	100						1	0	1
56	Risk of -5,500							0	0
Total	0		Total						1,540

For projects with perpetual conservation easements with Required RM Terms, the project is issued FMUs on a tonne-tonne basis, as opposed to a tonne-year basis. The basis for gross crediting, prior to the application of any discounts and deductions for secondary effects and management for resilience, is the full amount of CO₂e projected to be sequestered at 100 years. These projects will continue to undergo project monitoring by the conservation easement holder as part of the conservation easement terms. Projects on public lands where ongoing management of the site is shown to be consistent with the long-term maintenance of expected increases in carbon stocks are also issued FMUs on a tonne-tonne basis. Gross crediting for such projects is the full amount of CO₂e projected to be sequestered at the lesser of the point in time when CMAI is achieved or 100 years.

5.2.2 Determining Gross Forecasted GHG Removals

The following steps are used to determine the gross forecasted live tree carbon stocks and associated FMUs for a project:

1. Identify the landowner class, which is the ownership class of the Forest Owner where the project area exists, or whether a conservation easement (perpetual or term) with Required RM Terms as identified above encumbers the entire project area.
2. Using the Reforestation Communities Data File, determine the forest type that corresponds to the project's geography and species composition of the trees planted or regenerating on the project area. If the geography and/or species composition varies in such a way that the project area can be stratified into different forest types, determine the forest type and corresponding acreage for each stratum. Forest types in the Reforestation Communities Data File may have limited areas of applicability. See the Forest Type Applicability Map (available in both PDF and GIS file formats on the Climate Forward website) to determine the forest types applicable to the project site.
3. Based on steps 1 and 2, determine the tonne-year carbon stocking value (t CO₂e/acre) for the forest type(s) on the project area. If the project includes a perpetual conservation easement with the Required RM Terms, the tonne-tonne value must be used. This data is provided in the Reforestation Communities Data File.

4. Calculate the total FMUs associated with the entire project area by multiplying the tonne-year or tonne-tonne value for each forest type on the project area by the corresponding acreage represented by that forest type.

The Reforestation Communities Data File facilitates the calculation of the FMUs a project proponent may claim for a project according to these steps and is provided on the Climate Forward website.¹⁰ The data file performs the calculations specified in Equation 5.1 and Equation 5.4.

5.3 Estimating Performance Decline

The carbon projections used in this Reforestation Methodology are expected to perform as predicted without decline. Climate change may be a factor in the future carbon sequestration, but whether the effect will be negative, as in prolonged droughts, or positive, as with CO₂ fertilization, lacks certainty and does not, therefore, merit any modifications to the published growth projections. Nevertheless, to ensure a conservative accounting (across the suite of projects) against the unlikely event of project site conversion and/or performance decline, a discount of 2 percent is applied to account for the potential abandonment of projects that do not have a conservation easement or are on government (non-secured) lands. This discount is applied automatically by the Reforestation Methodology Calculation Tool.

Where conservation easements are used to secure further credits associated with the growth curves or on government (secured) lands, a 10 percent resiliency discount is applied to crediting. The discount is intended to address the potential need in maturing forests for active management for forest resilience that may involve thinning forested stands so that the stands can resist catastrophic losses associated with ecological perturbations, such as wildfire, insects, or disease. The Required RM Terms for conservation easements include provisions for forest thinning to address resilience.

5.4 Estimating Abandonment Rates

The likelihood of projects being abandoned is expected to be very low given the lack of economic incentive for landowners to harvest their trees prior to the point when the risk of regeneration harvest is high. That point in time is identified as described in Section 5.2.1. Additionally, the project area must be validated by a Professional Forester or Professional Ecologist as being favorable for the establishment and growth of tree seedlings and not at an elevated risk of conversion to non-forest uses, as described in Section 3.1. As described in Section 5.3, a discount of 2 percent is applied to account for the potential abandonment of projects, which serves as a virtual buffer pool against the unlikely event of project area conversion and/or performance decline. As indicated above, this discount is applied automatically by the Reforestation Communities Data File.

5.5 Accounting for Secondary Effects

For reforestation projects, significant secondary effects can arise from two sources, detailed in the sections below.

5.5.1 Combustion Emissions Associated with Machinery Use in Site Preparation

To quantify combustion emissions associated with site preparation, project proponents must use the standard emission factor provided in Equation 5.2, as well as the level of brush cover

¹⁰ <https://climateforward.org/program/methodologies/reforestation/>

associated with the site preparation area and the number of acres treated for each forest type where site preparation activities occur. An estimate of percent brush cover can be determined through remote sensing. The Reserve has provided a methodology for this approach in Appendix B. Alternative approaches to quantifying site preparation emissions must be submitted to and approved by the Reserve prior to confirmation activities.

Project proponents must only quantify these emissions for the areas where mechanical equipment, i.e., brush raking or mastication, is used for the removal of competing vegetation site preparation. Mobile combustion emissions must be added to secondary effect emissions (SE in Equation 5.4) for the project.

Equation 5.2. Combustion Emissions Associated with Site Preparation for Each Forest Type

$MC_f = (-1) \times (0.65 \times BC_{PA,f} \times PA_f)$		
Where,		<u>Units</u>
MC_f	= Secondary effect emissions due to mobile combustion from site preparation for forest type f	tCO ₂ e
0.65	= Mobile combustion emission factor, ¹¹ assuming diesel fuel use, 8 gallons of fuel consumed per hour of equipment use, ¹² and 8 hours of equipment use to clear an acre with 100 percent brush cover	tCO ₂ e/acre
$BC_{PA,f}$	= Brush cover as a percentage of the site preparation area PA for forest type f	
PA_f	= Size of the site preparation area for forest type f	acres

5.5.2 Activity-Shifting Leakage

The shifting of cropland or grazing activities to forestland outside the project area (which may be both a market and/or physical response to the project activity) is accounted for over the life of the project. To quantify emissions from the shifting of cropland and grazing activities each year, project proponents must determine the appropriate “leakage” risk percentage for the project following the decision tree in Figure 5.1. This percentage must be applied to the projected tonne-year value for the project to determine the secondary effects due to shifting of cropland or grazing activities (Equation 5.3).

Equation 5.3. Emissions from Shifting Cropland and Grazing Activities

$AS_f = (-1) \times L_f \times ER_f$		
Where,		<u>Units</u>
AS_f	= Secondary effect emissions due to shifting of cropland or grazing activities for forest type f	tCO ₂ e
L_f	= Leakage risk percentage, as determined from Figure 5.1	%
ER_f	= Total emissions removals for forest type f	tCO ₂ e

¹¹ From U.S. EPA Greenhouse Gas Inventory Guidance, Direct Emissions from Mobile Combustion Sources, https://www.epa.gov/sites/production/files/2016-03/documents/mobileemissions_3_2016.pdf

¹² Based on upper end of fuel consumption range for 'high' load factor application for D6 (175 HP) track-type tractor, from Caterpillar Performance Handbook #48, Caterpillar, Peoria, IL, https://wheelercat.com/wp-content/uploads/2018/07/SEBD0351_ED48.pdf.

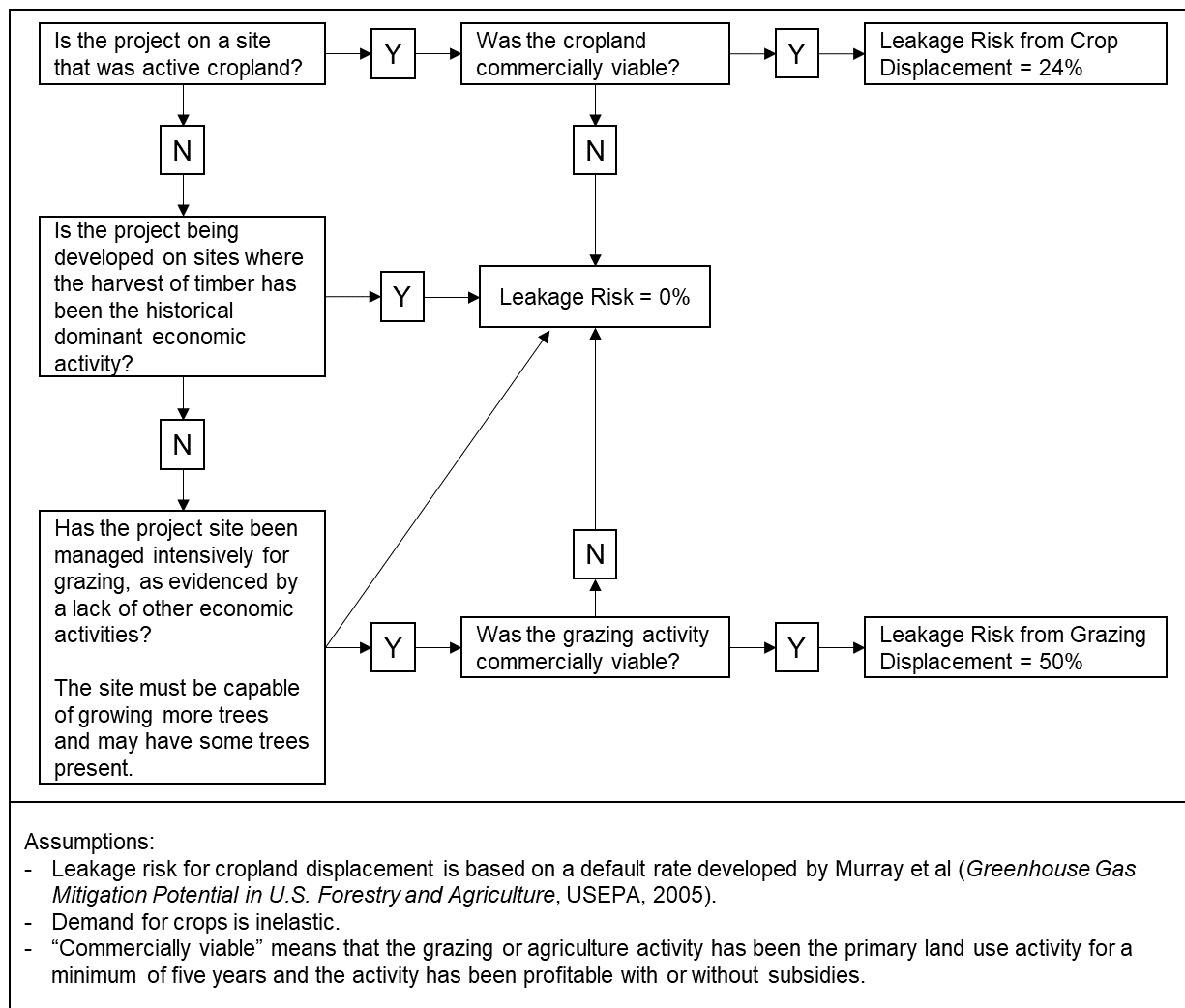


Figure 5.1. Activity Shifting ("Leakage") Risk Assessment for Reforestation Projects

Total secondary effect emissions for reforestation projects are calculated in Equation 5.4. The value for secondary effect emissions will always be negative or zero.

Equation 5.4. Total Secondary Effect Emissions

$$SE_f = (AS_f + MC_f) \text{ or } 0, \text{ whichever is lower}$$

6 Project Implementation and Monitoring

Climate Forward requires that a PIR be established for all implementation and reporting activities associated with the project.¹³ A template PIR form is available from the Reserve to help to ensure all aspects of required reporting are included. The PIR, and its associated companion documents (Reforestation Project Goals Form and Reforestation Communities Data File), will serve as the basis to communicate the project's attributes to the public, including any co-benefits associated with the project, and will serve as the basis for the confirmation body's review of project data to confirm compliance with the methodology.

Other than the initial quantification of carbon projections and secondary effects, there are no requirements nor guidance for ongoing monitoring activities. Projects that choose to optionally transition to the Climate Action Reserve's Reforestation Protocol are subject to monitoring, reporting, and verification requirements found within that protocol.

6.1 Quantification Parameters

Each project must include the prescribed implementation parameters necessary to calculate GHG emission removals. These must be shown in a table, such as below in Table 6.1.

Table 6.1. Project Implementation Parameters

Parameter	Description	Data Unit	Calculated (c) Measured (m) Reference (r) Operating Records (o)
Baseline stocks	Baseline is the "business as usual" case for reforestation projects. As only seedlings are being assessed as the primary effect of a project, older, pre-existing trees are not included. Baseline carbon stocks are assumed to be zero.	CO ₂ equivalent	(r) - The value is referenced as zero.
Project stocks	Project stocks are based on projected values for each forest type and sometimes species within the forest type, as they relate to the seedlings planted by the project, assuming adequate seedling stocking at the time of project confirmation. The project stocks are discounted for conservative accounting as a measure against project failure and, in cases where conservation easements are used, to address management for resiliency.	CO ₂ equivalent	(r) - The values and adjustments are described in the Reforestation Communities Data File.

6.2 Voluntary Ongoing Monitoring Incentive

Projects developed under this methodology can optionally decide to migrate the project to *ex post* monitoring under the Climate Action Reserve's voluntary offset program. Since the integrity of *ex ante* crediting is based on only recognizing the *tonne-year value* of the projected sequestered tonnes (except projects for which the long-term maintenance of sequestered

¹³ A copy of the Project Implementation Report template can be accessed at <https://climateforward.org/program/program-and-project-forms/>.

carbon is assured and *ex ante* credits are issued based on tonne-tonne values), submitting the project to the Climate Action Reserve voluntary offset program can result in the issuance of CRTs commensurate with the *actual* tonnes verified at the submission date, less any tonnes that were issued previously as FMUs. Figure 1.1 in Section 1.2 displays the relationship of crediting under Climate Forward and the Reserve's offset program. The Reserve's offset program recognizes actual sequestered carbon and ensures permanence through a commitment to maintain, monitor and report on the sequestered tonnes as defined by the Reserve's Reforestation Protocol.

7 Reporting and Record Keeping

This section provides requirements and guidance on reporting rules and procedures. A priority of Climate Forward is to facilitate consistent and transparent information disclosure among project proponents. Project proponents must submit an emission removal report as part of the Project Implementation Report to Climate Forward.

7.1 Project Submittal and Confirmation Documentation

Project submission must be within one year of the project start date. The documents below are required for project listing, confirmation, and registration with Climate Forward. Templates for these documents can be accessed on the Climate Forward website.¹⁴

Listing:

- Project Submission form
- Reforestation Project Goals Form (not public)
- Signed Attestation of Title form

Confirmation:

- Signed Attestation of Title form
- Signed Attestation of Legal Additionality form
- Signed Attestation of Regulatory Compliance form
- Project Implementation Report (not public)
- Reforestation Communities Data File (not public)

Registration:

- Confirmation Report
- Confirmation Statement
- Confirmation List of Findings

The above project documentation will be available to the public via the Climate Forward online registry, unless otherwise noted. Further disclosure and other documentation may be made available on a voluntary basis through the Climate Forward registry.

7.2 Record Keeping

For purposes of independent confirmation and historical documentation, project proponents are required to keep all information outlined in this methodology for a period equal to either the project crediting period or seven years after the information is generated (whichever is less). This information will not be publicly available, but may be requested by the confirmation body or the Reserve. Records must be kept in both hard copy and digital format, where possible.

Examples of information the project proponent must retain includes:

- All data inputs for the calculation of the project carbon enhancements, including all required sampled data, which will be included in the PIR
- Copies of all project-related permits, formal notices of regulatory violations, and any relevant administrative or legal consent orders dating back at least 3 years prior to the implementation of the project

¹⁴ Climate Forward documents and forms are available at <https://climateforward.org/program/program-and-project-forms/>.

- Executed Attestation of Title, Attestation of Regulatory Compliance, and Attestation of Legal Additionality forms
- Results of emission removal calculations, which will be included within the PIR
- Confirmation records and results
- All evidence relating to continued implementation

The Reserve also requires that the following project-related records be retained by the confirmation body for a minimum of seven years after completing confirmation activities. It must be noted that some records may be subject to fiscal or other legal requirements that are longer than the Reserve's mandated period.

Confirmation bodies shall retain electronic copies, as applicable, of the:

- Project Implementation Report
- Project proponent's SSR and/or project activity data as well as evidence cited
- Confirmation plan
- Sampling plan
- Confirmation Report
- List of Findings
- Confirmation Statement

Each confirmation body must have an easily accessible record-keeping system, preferably electronic, that provides readily available access to project information. Copies of the original activity and source data records shall be maintained within said record-keeping system. Records must be kept in both hard copy and digital format, where possible. The Reserve may at any time request access to the record-keeping system or any supporting documentation for oversight or auditing purposes.

7.3 Reporting and Confirmation Period

Project proponents must report forecasted GHG removals from the project for the entire crediting period. The project's report will include all forecasted carbon enhancements for the entire crediting period. A confirmation period is the period of time over which forecasted GHG removals are confirmed. A confirmation period begins with the project start date and ends with the submission of the final Confirmation Report to Climate Forward. The end date of any confirmation period may not extend past the project crediting end date. Confirmation activities cannot commence until the project is submitted by the project proponent and approved by the Reserve, and at least one year following the completion of the activity that led to seedling establishment (tree planting or site preparation to enable natural establishment of tree seedlings). For projects employing site preparation to allow for the natural regeneration of trees, the project proponent may wish to delay confirmation more than one year to ensure seedlings have established well enough to be considered healthy and viable during sampling by the confirmation body at the time of the confirmation site visit, as outlined in Appendix A.

Under extenuating circumstances, exceptions to the requirement to wait at least one year following the completion of activities leading to seedling establishment may be made at the sole discretion of the Reserve. In such instances, terms and conditions to be fulfilled by the project proponent are determined by the Reserve to ensure the overall integrity of the FMUs issued are maintained. See the Climate Forward Program Manual for further details.

8 Confirmation Guidance

This section provides confirmation bodies with guidance on confirming GHG emission removals associated with the project activity. This confirmation guidance supplements the Climate Forward Confirmation Manual and describes confirmation activities specifically related to this methodology.

Confirmation bodies trained to confirm a reforestation project must be familiar with the following documents:

- Climate Forward Program Manual
- Climate Forward Confirmation Manual
- Reforestation Forecast Methodology (this document)

The Climate Forward Program Manual, Climate Forward Confirmation Manual, and Climate Forward methodologies are designed to be compatible with each other and are posted on the Climate Forward website at <http://www.climateforward.org/>.

In cases where the Climate Forward Program Manual or Climate Forward Confirmation Manual differs from the guidance in this methodology, this methodology takes precedent.

Only confirmation bodies trained and accredited by the Reserve are eligible to confirm project reports. Information about confirmation body accreditation and Climate Forward project confirmation training can be found on the Climate Forward website at <http://www.climateforward.org/program/confirmation/>.

The confirmation of the project must be conducted with the oversight of a Professional Forester so that professional standards and project quality are maintained, including with respect to sampling procedures to confirm seedling stocking, as outlined in Appendix A Confirmation of Seedling Stocking. Any Professional Forester confirming a project in an unfamiliar jurisdiction must consult with a Professional Forester practicing in that jurisdiction to understand all laws and regulations that govern reforestation activities within the jurisdiction, as well as factors that may influence seedling viability.

8.1 Standard of Confirmation

Confirmation bodies must confirm that all project activities and related documentation are in conformance with this document and with any related documents, such as the Reforestation Communities Data File, and that the estimated emission removals have been calculated accurately. The confirmation process incorporates both a desktop documentation review and a site visit assessment of the mitigation project.

Beyond criteria for the confirmation of mitigation project implementation, the confirmation body also confirms any provisions specified in the forecast methodology that are to be undertaken to ensure the continued implementation of the mitigation project for the duration of its crediting period. The confirmation body assesses whether such measures have been appropriately implemented.

8.2 Confirming the Project Implementation Report

The Project Implementation Report serves as the basis for confirmation bodies to confirm that the monitoring and reporting requirements have been met. Confirmation bodies shall confirm that the PIR covers all aspects of monitoring and reporting contained in this methodology and specifies how data for all relevant parameters were collected and recorded.

When assessing the Project Implementation Report, the confirmation body shall:

- (a) Assess the compliance of the Project Implementation Report with the requirements of the methodology, Climate Forward Program Manual, and Climate Forward Confirmation Manual
- (b) Identify the list of parameters required by the methodology and confirm that the Project Implementation Report accounted for all necessary parameters
- (c) Assess the means of implementation of the project data capture, including data management and quality assurance and quality control procedures, and determine whether these are sufficient to ensure the accuracy of forecasted GHG emission removals to be achieved by the batch/project/program

8.3 Core Confirmation Activities

The Climate Forward Confirmation Manual describes the core confirmation activities that shall be performed by confirmation bodies for all project confirmations. Confirmation is an audit of reported data whereby risks of errors and omissions are assessed. The core confirmation activities are described in the subsections below.

8.3.1 Reviewing GHG Management Systems and Estimation Methodologies

The Reforestation Methodology relies largely on default values in reference tables.

8.3.2 Confirming Emission Enhancement Estimates

The confirmation body further investigates areas that have the greatest potential for material misstatements and then confirms whether material misstatements have occurred.

8.3.3 Undertaking Site Visits

In addition to undertaking a desk review, the Reforestation Methodology requires one site visit at least one year after trees have been planted or otherwise established naturally following a site preparation event. The specific itinerary for a site visit and the scheduling of activities shall be specified in the confirmation plan.

8.4 Confirmation Items

Confirmation bodies are expected to use their professional judgment to confirm that methodology requirements have been met in instances where the methodology does not provide sufficiently prescriptive guidance. For more information on Climate Forward's confirmation process and professional judgment, please see the Climate Forward Confirmation Manual.

Note: The tables below shall not be viewed as a comprehensive list or plan for confirmation activities, but rather guidance on areas specific to mitigation projects that must be addressed during confirmation.

8.4.1 Project Eligibility and Credit Issuance

To determine that a project is eligible under a given forecast methodology, it must meet a set of criteria that a confirmation body shall confirm during the confirmation process. These requirements determine if a project is eligible to register with Climate Forward and/or have credits issued. If any requirement is not met, the project may be determined ineligible.

Use the following table to list the criteria for reasonable assurance with respect to eligibility and credit issuance for a given project.

Table 8.1. Eligibility Confirmation Items

Methodology Section	Eligibility Qualification Item	Apply Professional Judgment?
2.1 Project Definition	Activities implemented on the project area are based on the planting of trees or site preparation to allow for natural regeneration.	No
2.1 Project Definition	Seedling stocking at the time of the confirmation site visit rate of 70 percent or greater at the time of confirmation, as determined by confirmation body sampling per guidance in Appendix A.	Yes, for determination of seedling health and viability
3.1 Location	The project is in a geographic area for which tree seedling growth projections are published in the Reforestation Communities Data File.	No
3.1 Location	No other project exists or previously existed and received financial recognition for climate benefits, unless the previous project was closed in good-standing and the Reserve has provided written consent.	No
3.1 Location	A project area has been identified that meets requirements for the project definition (Section 2.1) and the performance standard test (Section 3.3.1)	Yes, but only for the canopy level estimates in 3.3.1
3.1 Location	The Reforestation Project Goals Form has been completed and signed by a Professional Forester or Professional Ecologist at the time of project submission.	No
3.2 Project Start Date	The project start date is aligned with the initiation of planting of trees or site preparation activities.	Yes, to confirm trees are consistent with project start date
3.2 Project Start Date	The project meets the date restrictions for the submission date relative to the project start date.	No
3.3.1 Performance Standard Test	The project area must not have been in forest land cover for at least the past ten years prior to the start date or was affected by a natural disturbance within the past 10 years that resulted in the forest canopy levels of live trees being less than 25 percent, as assessed on the start date.	Yes
3.3.2 Legal Requirement Test	A signed Attestation of Legal Additionality form has been submitted to the Reserve.	No
3.3.2 Legal Requirement Test	The PIR includes a description of any laws that reference requirements to reforest the project area.	No
3.4 Environmental and Social Safeguards	The Reforestation Project Goals Form is provided with an explanation of the type and quantity of each species used is provided with a signature from a Professional Forester or a Professional Ecologist	No

Methodology Section	Eligibility Qualification Item	Apply Professional Judgment?
3.4 Environmental and Social Safeguards	PIR contains a description of the project's effects on air and water quality, habitat, flora and fauna, jobs, recreation, scenic views, employment, and environmental justice.	No
3.4 Environmental and Social Safeguards	Project proponent has included an attestation within the PIR that the project will not materially undermine progress on environmental and social issues.	No
3.5 Regulatory Compliance	The project proponent has provided an assessment in the PIR of the risks and actions to reduce or mitigate risks of future regulatory violations and an attestation that no laws have been violated in the implementation of the project.	No, the required elements must be present Yes, to the appropriateness of the reduction or mitigation of future risks
3.6 Ownership and Double Counting	The PIR contains an affidavit outlining the names and contact information of the legal entity that controls the trees (timber) and a signature of each owner is provided.	No
3.6 Ownership and Double Counting	If project proponent is not the owner of the trees, the PIR contains a reference to any external agreement transferring the right to claim emissions reductions credits to the project proponent, with such agreements reviewed by the confirmation body to ascertain whether the agreement indicates the following: <ul style="list-style-type: none"> ▪ The date the agreement starts; ▪ The agreement is made between the project proponent and the entity with legal control of the trees identified in the affidavit indicating all entity/entities with any legal claim to the trees (timber); ▪ The project area is being reforested under this methodology and will generate emissions reductions and removals which will be recognized by FMU issuance under the Climate Forward program; ▪ The time frame for the FMUs issued to the project proponent are aligned with the time frame for projected increases in carbon stocks identified for the project area according to the Reforestation Communities Data File (i.e., the crediting period); ▪ The ability to be issued FMUs and transact such FMUs via the Climate Forward registry is transferred to the project proponent. 	No
3.6 Ownership and Double Counting	A KML file has been provided outlining the area where reforestation has been applied.	No

8.4.2 Quantification

Confirmation bodies shall include quantifications within the confirmation process such as recalculations and risk assessment. These quantification items inform any determination as to whether there are material and/or immaterial misstatements in the project's GHG emission

enhancement calculations. If there are material misstatements, the calculations must be revised before FMUs are issued.

Use the following table to list the items that confirmation bodies shall include in their risk assessment and recalculation of the project's GHG emission removals.

Table 8.2. Quantification Confirmation Items

Methodology Section	Quantification Item	Apply Professional Judgment?
5.1 Estimating Baseline Carbon Stocks	The baseline carbon stocks are reported as zero.	No
5.2.2 (1) Determining Gross Forecasted GHG Removals	The landowner class has been correctly reported, with supporting descriptions and documentation provided for projects employing a conservation easement with Required RM Terms or projects on public lands where management is consistent with the long-term maintenance of the projected increases in carbon stocks for the project area, as described in Section 3.8.1.	No
5.2.2 (2) Determining Gross Forecasted GHG Removals	The forest communities have been properly identified and reported.	Yes, there may be some subjectivity in defining boundaries between forest communities
5.2.2 (3) Determining Gross Forecasted GHG Removals	The tonne-year or tonne-tonne carbon stocking value has been correctly reported for the forest type and landowner class.	No
5.2.2 (4) Determining Gross Forecasted GHG Removals	The expansion of the per acre values reported in the Reforestation Communities Data File to the project area has been correctly calculated.	No
5.3 Estimating Performance Decline	The discounts identified in Section 5.3 have been correctly applied.	No
5.5.1 Accounting for Secondary Effects	The PIR displays the results of the analysis for combustion emissions associated with site preparation activities and confirms the brush cover analysis, per Appendix B, was conducted correctly, with estimated brush cover prior to site preparation made by the project proponent within +/- 5 percent of an estimate produced by the confirmation body.	No

Methodology Section	Quantification Item	Apply Professional Judgment?
5.5 Accounting for Secondary Effects	The emissions associated with shifting cropland and grazing activities have been correctly calculated based on variables determined by project proponent and the level of crop and grassland displacement appears correct based onsite visit observations.	No, for the calculation Yes, for the stated level of crop and grassland displacement
Equation 5.1 Calculating GHG Enhancements	The final assessment of FMUs is correctly calculated based on adjustments associated with secondary effects and proportional stocking levels and correctly reported in the PIR.	No

8.5 Completing Confirmation

The Climate Forward Confirmation Manual provides detailed information and instructions for confirmation bodies to finalize the confirmation process. It describes completing a Confirmation Report, preparing a Confirmation Statement, submitting the necessary documents to Climate Forward, and notifying the Reserve of the project's confirmed status.

9 Glossary of Terms

Additionality	Project activities that are above and beyond “business as usual” operation, exceed the baseline characterization, and are not mandated by regulation.
Anthropogenic emissions	GHG emissions resultant from human activity that are considered to be an unnatural component of the Carbon Cycle (i.e., fossil fuel destruction, deforestation, etc.).
Batch	The implementation of the reforestation activities at multiple sites over a finite period of time, not to exceed 365 days between the activities.
Biogenic CO ₂ emissions	CO ₂ emissions resulting from the destruction and/or aerobic decomposition of organic matter. Biogenic emissions are considered to be a natural part of the Carbon Cycle, as opposed to anthropogenic emissions.
Carbon dioxide (CO ₂)	The most common of the six primary greenhouse gases, consisting of a single carbon atom and two oxygen atoms.
CO ₂ equivalent (CO ₂ e)	The quantity of a given GHG multiplied by its total global warming potential. This is the standard unit for comparing the degree of warming which can be caused by different GHGs.
Confirmation	The process used to ensure that a given participant’s GHG emissions or emission removals have met the minimum quality standard and complied with the Reserve’s procedures and methodologies for calculating and reporting GHG emissions and emission removals.
Confirmation body	An entity that has been trained and authorized by the Reserve to confirm the proper implementation of mitigation projects.
Conservation easement	A conservation easement is a voluntary, legal agreement that restricts defined uses of the land in order to protect its conservation values. Conservation easements, for this methodology, may have defined temporal terms or be perpetual. In order for projects to recognize the crediting benefits of conservation easements under this protocol, the easements must include the Required RM Terms.
Direct emissions	GHG emissions from sources that are owned or controlled by the reporting entity.
Emission factor (EF)	A unique value for determining an amount of a GHG emitted for a given quantity of activity data (e.g., metric tons of carbon dioxide emitted per barrel of fossil fuel burned).
Forest landcover (cover)	Landscapes with vegetation capable of achieving at least 15 feet in height and with a canopy cover of the same vegetation of at least 10 percent canopy closure.
Forest community	A collection or association of forest tree species within a designated geographical unit, which forms a relatively uniform patch, distinguishable from neighboring patches of different vegetation types.
Fossil fuel	A fuel, such as coal, oil, and natural gas, produced by the decomposition of ancient (fossilized) plants and animals.

Greenhouse gas (GHG)	Carbon dioxide (CO ₂), methane (CH ₄), nitrous oxide (N ₂ O), sulfur hexafluoride (SF ₆), hydrofluorocarbons (HFCs), or perfluorocarbons (PFCs).
GHG reservoir	A physical unit or component of the biosphere, geosphere, or hydrosphere with the capability to store or accumulate a GHG that has been removed from the atmosphere by a GHG sink or a GHG captured from a GHG source.
GHG sink	A physical unit or process that removes GHG from the atmosphere.
GHG source	A physical unit or process that releases GHG into the atmosphere.
Global Warming Potential (GWP)	The ratio of radiative forcing (degree of warming to the atmosphere) that would result from the emission of one unit of a given GHG compared to one unit of CO ₂ .
Indirect emissions	Reductions in GHG emissions that occur at a location other than where the enhancement activity is implemented, and/or at sources not owned or controlled by project participants.
Metric ton (t, tonne)	A common international measurement for the quantity of GHG emissions, equivalent to about 2204.6 pounds or 1.1 short tons.
Professional Ecologist	An ecologist who meets the requirements of professional registrations within jurisdictions where professional or certified ecologists exist. For purposes of this methodology, an affiliation with state or national registries or certification by a professional society (e.g., Ecological Society of America) is adequate for the professional to perform the role of a Professional Ecologist wherever the methodology is used, unless jurisdictional requirements otherwise prohibit this designation, in which case the jurisdiction's laws are assumed. Additionally, ecologists with appropriate educational and professional experience (minimum: BA/BS or higher in forestry/natural resources with at least 2 years professional field experience, including experience with reforestation) may perform the role of Professional Ecologist under the methodology within jurisdictions where no professional or certified ecologist requirements exist.
Professional Forester	A forester who meets the requirements of professional registrations within jurisdictions where professional or certified foresters exist. For purposes of this methodology, an affiliation with state or national registries or certification by a professional society (e.g., Society of American Foresters) is adequate for the professional to perform the role of a Professional Forester wherever the methodology is used, unless jurisdictional requirements otherwise prohibit this designation, in which case the jurisdiction's laws are assumed. Additionally, foresters with appropriate educational and professional experience (minimum: BA/BS or higher in forestry/natural resources with at least 2 years professional field experience, including experience with reforestation) may perform the role of Professional Forester under the methodology within jurisdictions where no professional or certified forester requirements exist.
Project baseline	A "business as usual" GHG emission assessment against which GHG enhancements are measured.
Project proponent	An entity that undertakes a GHG project, as identified in Section 2.1 of this methodology.

Project Resilience Measures	Activities tailored to the specific project that are undertaken to ensure the continuing implementation of the project for the duration of the crediting period.
Reforestation Project Goals Template	A form that outlines required project information and includes a signature line that must be signed by a Professional Forester or Professional Ecologist. The form must be submitted at the time of project submission. The form is available on the Climate Forward website.
Required RM Terms	<p>Terms that must be included within an optional conservation easement (or other deed restrictions or legally binding agreements that are maintained with the land in cases of ownership transfers) for the crediting terms in this Reforestation Methodology to be applied, as described in Section 3.8.</p> <p>Terms used to encumber timber harvest must limit harvest activities to management for forest resiliency (thinnings), human safety, or salvage (in the event of an ecological perturbation, such as wildfire, insect infestation, or disease). Other than salvage harvesting, harvest activities conducted prior to the end of the crediting period for the project, as determined according to this methodology, shall increase Quadratic Mean Diameter (QMD) in all trees greater than 12 inches and shall not reduce canopy cover, on a continuous analysis area of every 10 acres, below 60 percent. Terms shall also include a requirement to reforest any portion of the project area where forest landcover is lost as the result of a natural disturbance. The entity granted the easement must be a qualified holder according to the conservation easement enabling statute of the state in which the project is located.</p>
Site preparation	Activities that improve the success of planted trees and/or enable natural regeneration of trees to occur. These activities include but are not limited to management activities that reduce competing vegetation, soil scarification, and the cessation of other management practices, such as farming or grazing, that inhibit the natural establishment of trees.

10 References

International Organization for Standardization, ISO 14064-2:2006 Greenhouse gases — Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements (2006).

World Resource Institute and World Business Counsel for Sustainable Development, Greenhouse Gas Protocol for Project Accounting (November 2005).

Climate Forward Program Manual. <https://climateforward.org/program/program-and-project-forms/>

Climate Forward Confirmation Manual. <https://climateforward.org/program/program-and-project-forms/>

Appendix A Confirmation of Seedling Stocking

Confirmation bodies must confirm that the reforested project area is stocked at rate of at least 70 percent based on sampling at the time of the confirmation site visit. The sampling approach to confirmation activities is described in the steps below and is to be applied once for every 1,000 acres comprising the project area. For example, the sampling approach would be applied once by a confirmation body reviewing a project composed of 650 acres and three times for a project made up of 2,700 acres. Confirmation bodies must allocate all portions of the project area into “sampling divisions” that represent those portions of the project from which sample areas will be selected, as described below. Sampling divisions may be delineated in consideration of a variety of factors deemed appropriate by the confirmation body, such as logistical practicality and logical geographic features (e.g., watershed boundaries, groupings of non-contiguous parcels in the same vicinity), but should be no larger than 1,000 acres. A map of sampling divisions must be included in the Confirmation Report.

1. Identifying the ‘least stocked area’

Confirmation body shall perform visual reconnaissance throughout each sampling division and determine where the likely least stocked 40 acres is found. This shall be referred to as the sample area. If the sampling division is less than 40 acres, the sample area includes the entire project area.

2. Developing sample plots

Sample plots shall be placed on the sample area in a uniform grid. A minimum of 40 plots must be included in the grid once placed over the sample area. The grid shall be considered uniform if the distance between lines does not exceed by two- and one-half times the distance between plots on the lines. See Figure A.1.

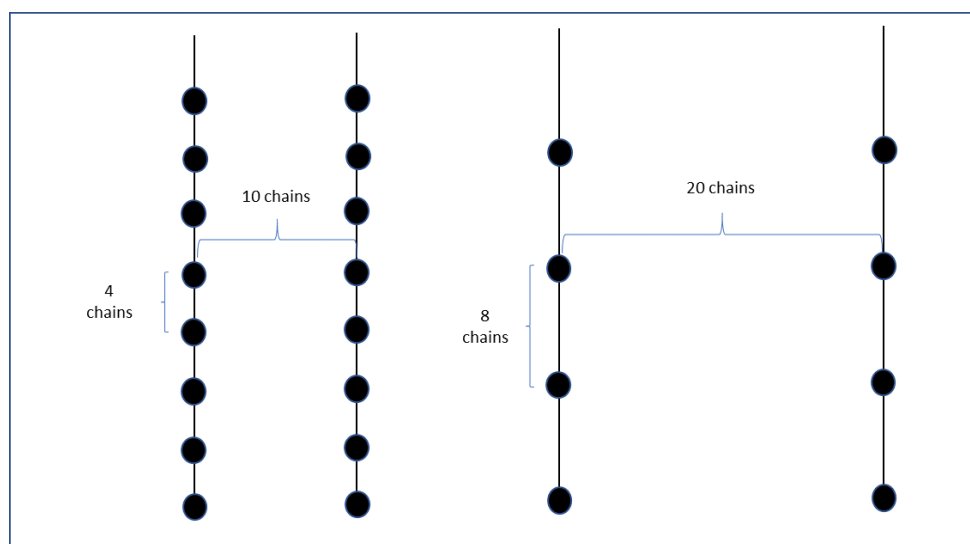


Figure A.1. Examples of the Application of the Uniform Plot Distribution Requirement

The distance between the plot lines cannot exceed 2.5 times the distance between the plots on a line.

3. Field sampling

- a. A starting point must be established in the field that can be relocated within at least a 6-month period. Flagging should generally be acceptable for this, except in cases of extreme weather, animals (curious bears), or other, in which case other approaches to more resilient landmarks should be used.
- b. Hand compasses and pacing may be used to navigate from plot center to plot center, as minimal technological requirements.
- c. All sample plots are fixed plots with a plot radius of 8.3 feet using a measuring tape or other calibrated measuring device.
- d. Plot centers must be flagged with three pieces of flagging at least 16 inches long.
- e. A plot is considered stocked if at least one 'countable' seedling is found within the plot area. A countable seedling is a seedling that meets the native tree requirements per Section 3.4 and is healthy. Healthy means the seedling appears vigorous and likely will continue growing.
- f. A plot location may be excluded by the confirmation body only if the plot center is located on a site not conducive to seedling establishment, such as a road, landing, watercourse, rocky area, bog, wetland, or other such site. Confirmation body shall proceed to the next plot in such a case.

4. Quantifying the stocking level percentage and determining if the sampling division is stocked.

Confirmation body shall tally each sampled plot as being 'stocked' or 'unstocked.' A stocked plot percentage shall be calculated once all the plots located within the sample area have been sampled. If the stocked plot percentage represents 70 percent or more of all plots sampled, the sampling division is determined to meet the stocking requirement. If the stocked plot percentage falls below the 70 percent threshold, the sampling division is determined not to meet the stocking requirement and cannot be issued FMUs. The determination of stocking of each sampling division is made independent of other sampling divisions.

5. Next steps for a sampling division that fails to meet the stocking requirements.

For sampling divisions that fail to meet the stocking requirements, project proponents have two options:

- a. Option 1 – the project proponent can request that the confirmation body expand the sampling survey to the next least stocked area within the same sampling division and proceed through an additional round of sampling, in which case the additional sampling results must be added to the original sampling results to calculate the combined stocking percentage, with the sampling division considered stocked if the combined stocking percentage is at least 70 percent.
- b. Option 2 – the original sample area may be removed from the project area, in which case the PIR must be revised. A subsequent confirmation effort to confirm stocking must proceed as before, but without the unstocked sample area that has been removed from the project area.

6. Confirmation body reporting of field sampling activities

The following required documents must be presented in the confirmation report.

- a. The confirmation body must include a map(s) within the confirmation report that identifies the sample area and the plot locations within each sampling division. The map must indicate the compass bearings (Azimuth) of the lines and the distance between plots and lines. Each plot must be identified on the map with a

unique identifier (1 to n). The map must display the starting point in the field that indicates the initiation of sampling activities.

- b. The confirmation body must include a list of all plots sampled and whether they were determined to be stocked or unstocked.

Appendix B Quantification of Brush Cover Removed as Part of Site Preparation Activities

The following is a description of the recommended method for determining the percentage brush cover comprising those portions of a project area where site preparation activities involving mechanical equipment (e.g., brush raking, mastication) occurred as a part of reforestation activities. The quantification of secondary effects emissions related to the combustion emissions associated with site preparation activities under the Reforestation Methodology assumes that all brush is removed on areas where site preparation activities occur. The percentage brush cover must be determined for each site preparation area by forest type. The results from the analysis described below are entered as $BC_{PA,f}$ in Equation 5.2. Sampling must achieve a standard error that is +/- 10 percent or less of the estimate of percent canopy cover for both brush cover and non-brush cover (e.g., if percent brush cover is estimated as 35 percent, a standard error of 3.5 percent would have to be achieved to halt sampling).

The methodology presented below is based on the use of i-Tree Canopy, which does not allow for the selection of specific imagery dates. Since the brush cover analysis must be completed using remote imagery as close to but before the date when site preparation activities were initiated, the analysis should be performed using i-Tree Canopy's instructions for comparing results to historical imagery. As a result, the project proponent should estimate the number of sample points required to achieve the target standard error of +/- 10 percent of the percent cover estimate for both brush and non-brush cover types. Alternatively, sample points may be added in i-Tree Canopy until the target standard error is achieved based on the provided imagery; however, a comparison of the points initially sampled in i-Tree Canopy to the appropriate historical remote imagery may result in the need to add more sample points to properly achieve the target standard error.

The instructions here indicate the general i-Tree Canopy analysis process, with specific guidance for how to conduct the analysis using historical imagery provided at the end.

1. Navigate to the i-tree Canopy website: <https://canopy.itreetools.org/index.php>
2. Upload a Shapefile of the site preparation area by selecting the [Load ESRI Shapefile] button (Figure B.1).

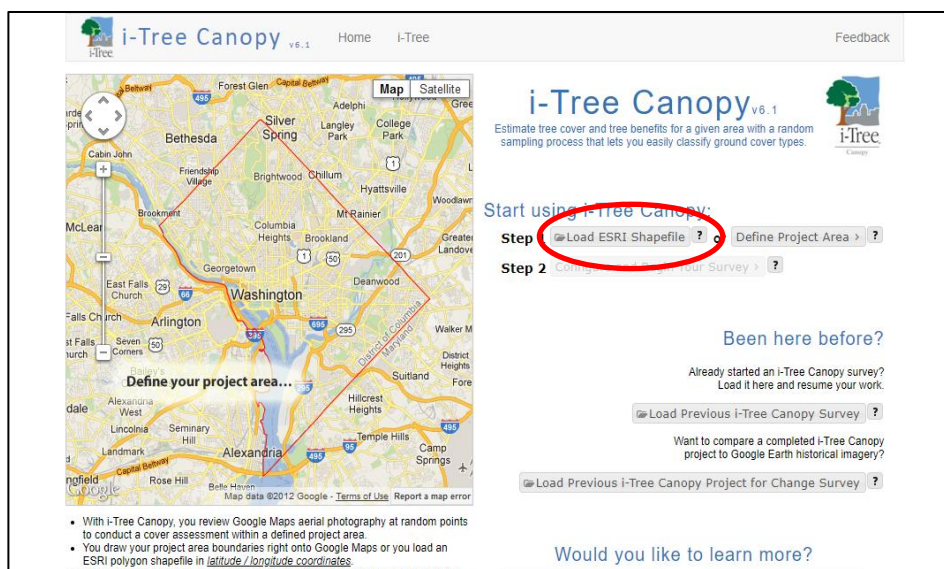


Figure B.1. i-Tree Canopy Startup Screen Step 1

3. Select the [Configure and Begin Your Survey] button (Figure B.2).

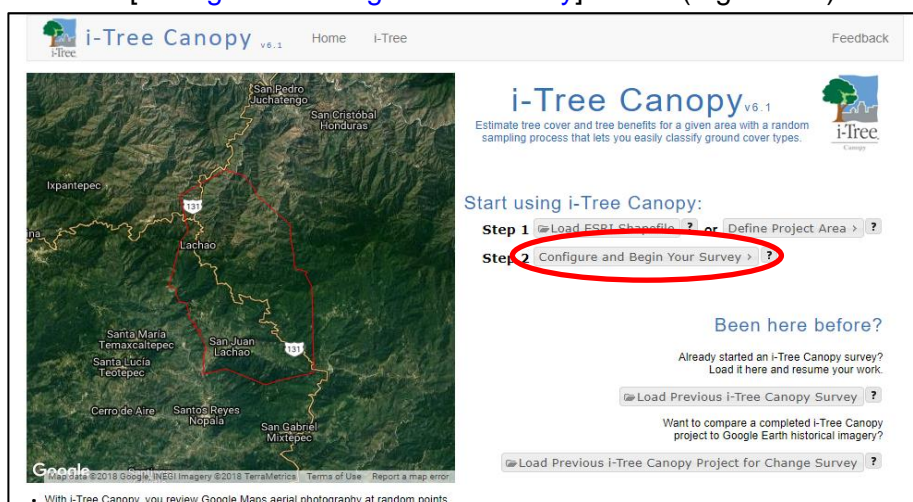
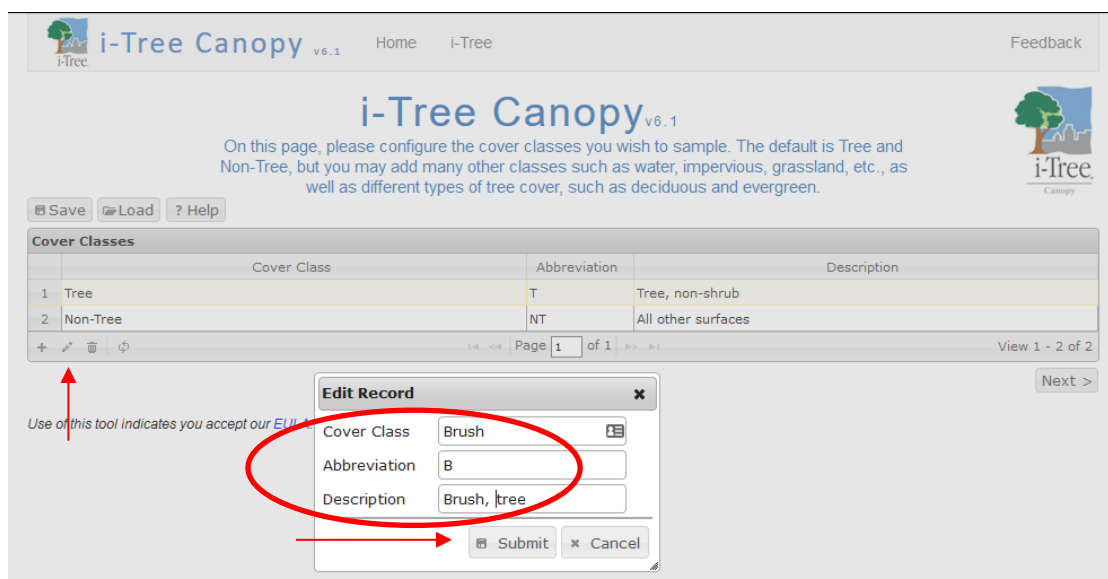


Figure B.2. i-Tree Canopy Startup Screen Step 2

4. On the Cover Class Configuration screen, modify the attributes of each cover class by selecting the cover class to edit, clicking on the pencil icon below the left side of the table, editing the attributes, and submitting the edits for each to save the modifications (Figure B.3). Change the 'Tree' cover class to 'Brush' to represent brush cover (and any residual tree cover also assumed to be removed during site preparation). Change the 'Non-Tree' cover class to 'Non-Brush' to represent all other cover.



i-Tree Canopy v6.1

On this page, please configure the cover classes you wish to sample. The default is Tree and Non-Tree, but you may add many other classes such as water, impervious, grassland, etc., as well as different types of tree cover, such as deciduous and evergreen.

Save Load ? Help

Cover Class	Abbreviation	Description
1 Tree	T	Tree, non-shrub
2 Non-Tree	NT	All other surfaces

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Use of this tool indicates you accept our [EULA](#)

Edit Record

Cover Class:

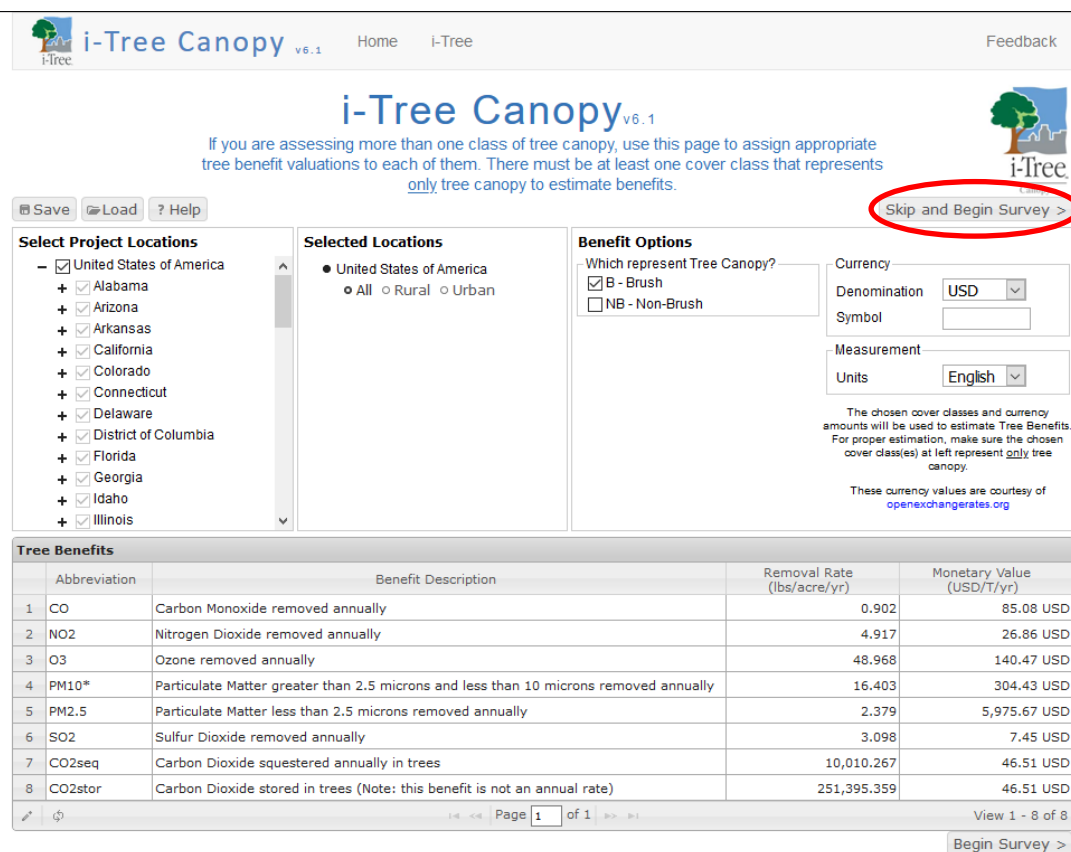
Abbreviation:

Description:

Submit Cancel

Figure B.3. Cover Class Configuration Screen

5. Skip through the Tree Benefit Valuation screen (Figure B.4).



i-Tree Canopy v6.1

If you are assessing more than one class of tree canopy, use this page to assign appropriate tree benefit valuations to each of them. There must be at least one cover class that represents only tree canopy to estimate benefits.

Save Load ? Help

Select Project Locations

- ☒ United States of America
 - ☒ Alabama
 - ☒ Arizona
 - ☒ Arkansas
 - ☒ California
 - ☒ Colorado
 - ☒ Connecticut
 - ☒ Delaware
 - ☒ District of Columbia
 - ☒ Florida
 - ☒ Georgia
 - ☒ Idaho
 - ☒ Illinois

Selected Locations

- ☒ United States of America
 - ☐ All ☐ Rural ☐ Urban

Benefit Options

Which represent Tree Canopy?

☒ B - Brush

☐ NB - Non-Brush

Currency:

Denomination:

Symbol:

Measurement:

Units:

The chosen cover classes and currency amounts will be used to estimate Tree Benefits. For proper estimation, make sure the chosen cover class(es) at left represent only tree canopy.

These currency values are courtesy of openexchangerates.org

Tree Benefits

Abbreviation	Benefit Description	Removal Rate (lbs/acre/yr)	Monetary Value (USD/T/yr)
1 CO	Carbon Monoxide removed annually	0.902	85.08 USD
2 NO2	Nitrogen Dioxide removed annually	4.917	26.86 USD
3 O3	Ozone removed annually	48.968	140.47 USD
4 PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	16.403	304.43 USD
5 PM2.5	Particulate Matter less than 2.5 microns removed annually	2.379	5,975.67 USD
6 SO2	Sulfur Dioxide removed annually	3.098	7.45 USD
7 CO2seq	Carbon Dioxide sequestered annually in trees	10,010.267	46.51 USD
8 CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	251,395.359	46.51 USD

Page 1 of 1 View 1 - 8 of 8

Begin Survey >

Figure B.4. Tree Benefit Valuation Screen

6. Add points and classify the points as [Brush] or [Non-Brush] based on the presence of brush canopy or no brush canopy at each sample point (Figure B.5). Positive identification of brush canopy is based on the presence of brush (or tree) cover at the center of the yellow crosshair on the aerial image. Once the cover class is determined, select the corresponding cover class name from the cover class attribute dropdown menu for the current sample point. Zoom in and out on the aerial image by using the [+] and [-] buttons on the bottom right corner of the image as needed to more easily identify the cover class for each point.

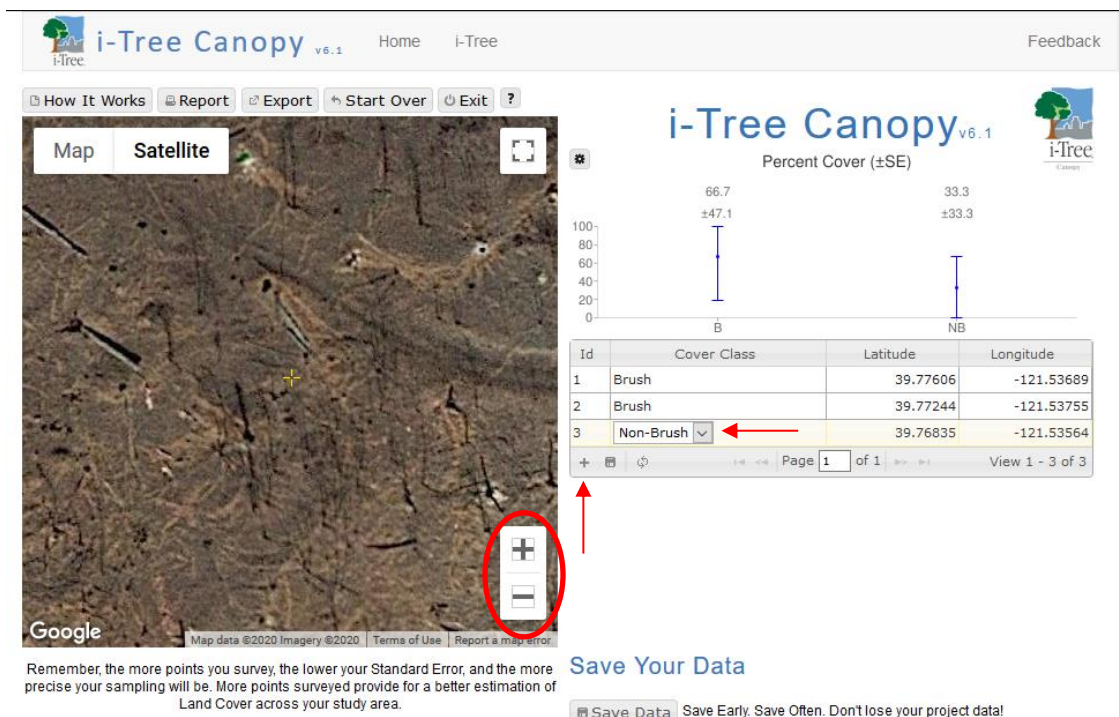


Figure B.5. Adding and Classifying Sample Points

7. Continue adding points until a confidence estimate for average canopy cover meets or exceeds a standard error of ± 10 percent of the percent cover estimate for both brush and non-brush cover classes (Figure B.6). For example, the project proponent would stop adding points for the project in Figure B6 since the standard error (SE) for both the 'Brush' and 'Non-Brush' cover classes are ± 10 percent (or lower) of the percent cover for each cover class—the SE is less than ± 3.45 (10 percent of 34.5) for the 'Brush' cover class and the SE for the 'Non-Brush' cover class is less than to ± 6.55 (10 percent of 65.5).

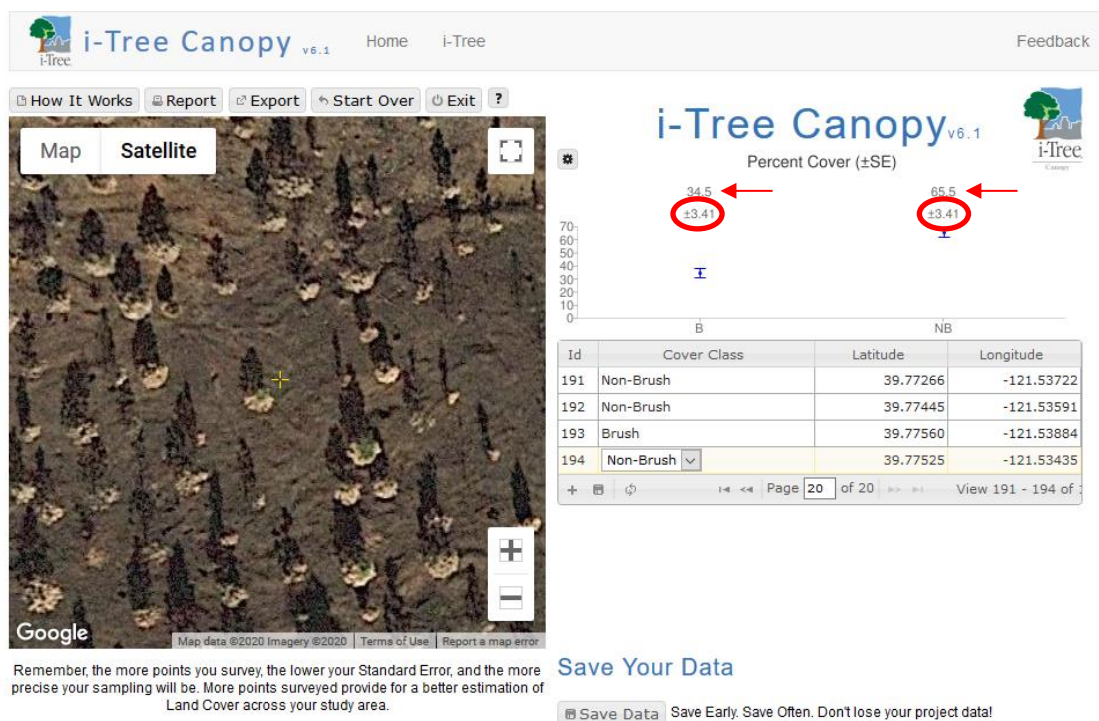


Figure B.6. Adding Sample Points Until Standard Error Less Than +/- 10 Percent Achieved

8. Save analysis data as you go along (Figure B.7). Upon clicking the [Save Data] button for the first time, specify the file name of choice, using the file type extension .dat, and saving to the location of choice.

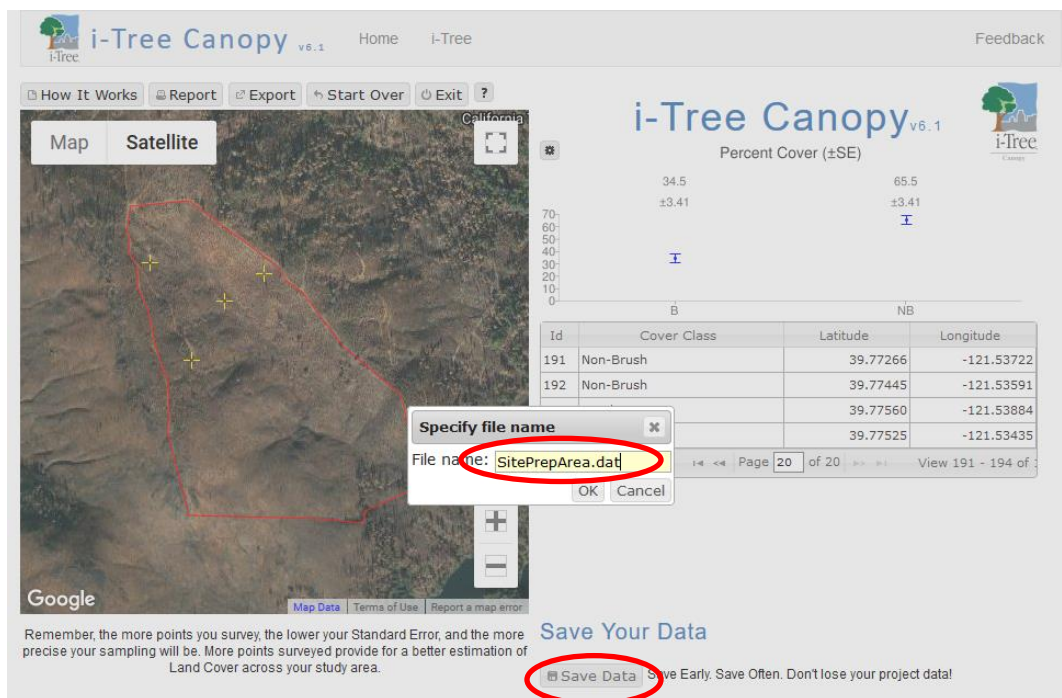


Figure B.7. Saving Data in i-Tree Canopy

9. Once the target standard error is achieved or the target number of sample points have been taken, save the data and click on the [\[Start Over\]](#) button (Figure B.8), confirming in the pop-up window that appears that you want to delete all data and start over.

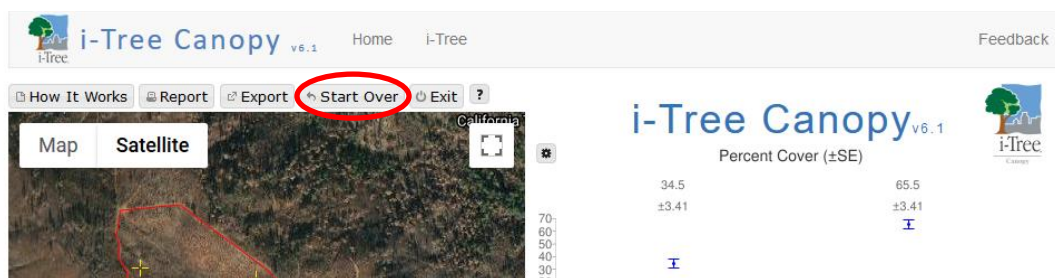


Figure B.8. Starting Over with i-Tree Canopy

10. Click the [\[Load Previous i-Tree Canopy Project for Survey Change\]](#) button (Figure B.9).

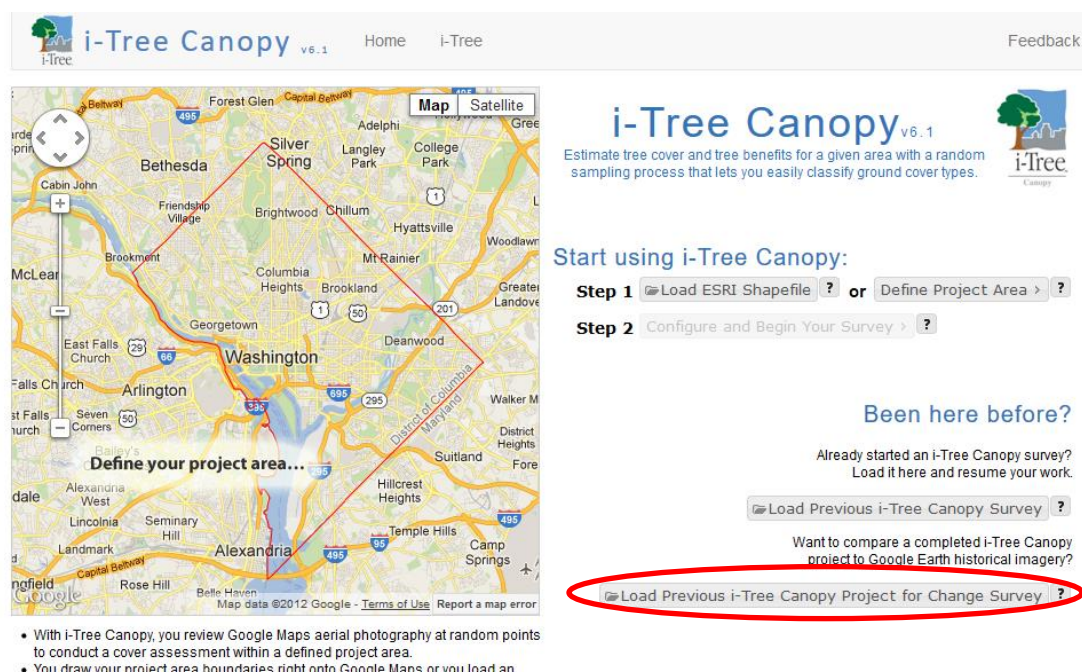


Figure B.9. Loading Analysis Data for Comparison to Historical Imagery

11. Click on the [\[KMZ Out\]](#) button (Figure B.10) to save the file as a KMZ version and open it in Google Earth (requires a separate download).



Figure B.10. Exporting KMZ File

12. Place i-Tree Canopy and Google Earth windows side-by-side.
13. Click the first survey point table record in i-Tree Canopy to zoom to it.
14. Click the first survey point in Google Earth's table of contents to zoom to it.
15. Use the Google Earth historical imagery slider to view imagery corresponding to the date closest to but before the date that site preparation activities were initiated.
16. In i-Tree Canopy, change the point's classification accordingly as needed.
17. Repeat these steps for your remaining i-Tree Canopy points.
18. Periodically save your re-survey project, using the .dat file type extension.
19. If standard error exceeds +/- 10 percent for either cover class after reclassifying using the historical imagery, additional sample points should be added by saving the re-survey project data, exiting the change survey mode in i-Tree Canopy by clicking on the [Start Over] button, and reloading the re-survey project data from the i-Tree Canopy startup screen by clicking on the [Load Previous i-Tree Canopy Survey] button (Figure B.11).

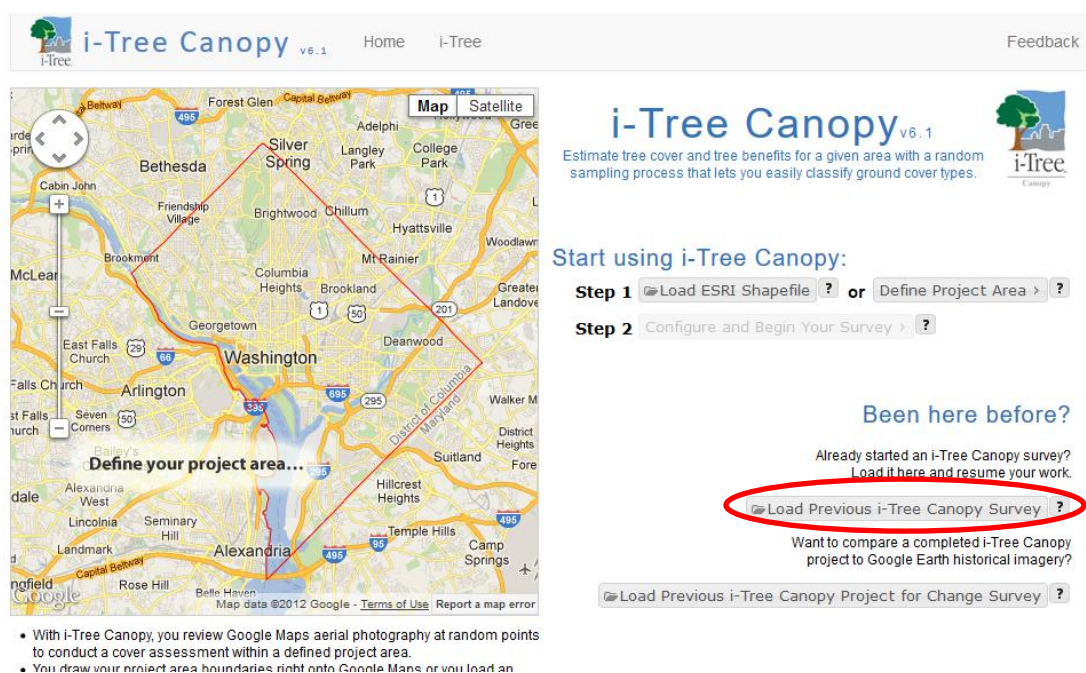


Figure B.11. Loading Re-Survey Project Data to Add More Sample Points

20. Add additional sample points as needed and repeating the comparison using Google Earth with the updated KMZ file until the target standard error is achieved for both cover classes.