

CLIMATE FORWARD ►



Reforestation Forecast Methodology

Version 2.0 | April 29, 2022

A program of the



CLIMATE
ACTION
RESERVE

Climate Forward, a program of the Climate Action Reserve
www.climateforward.org

Released April 29, 2022

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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 Contributions to a permanence risk pool by individual projects and programmatic monitoring of project sites over time by the Reserve help to secure the permanence of the carbon serving as the basis for FMUs issued to projects registered under this methodology.

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 a corresponding protocol for reforestation activities anytime and commit to ongoing monitoring, reporting, and verification for *ex post* crediting, as further described in Section 6.4 and in the Climate Forward Program Manual.

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

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 adequate to justify the costs associated with monitoring and verification requirements in the corresponding 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 of 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

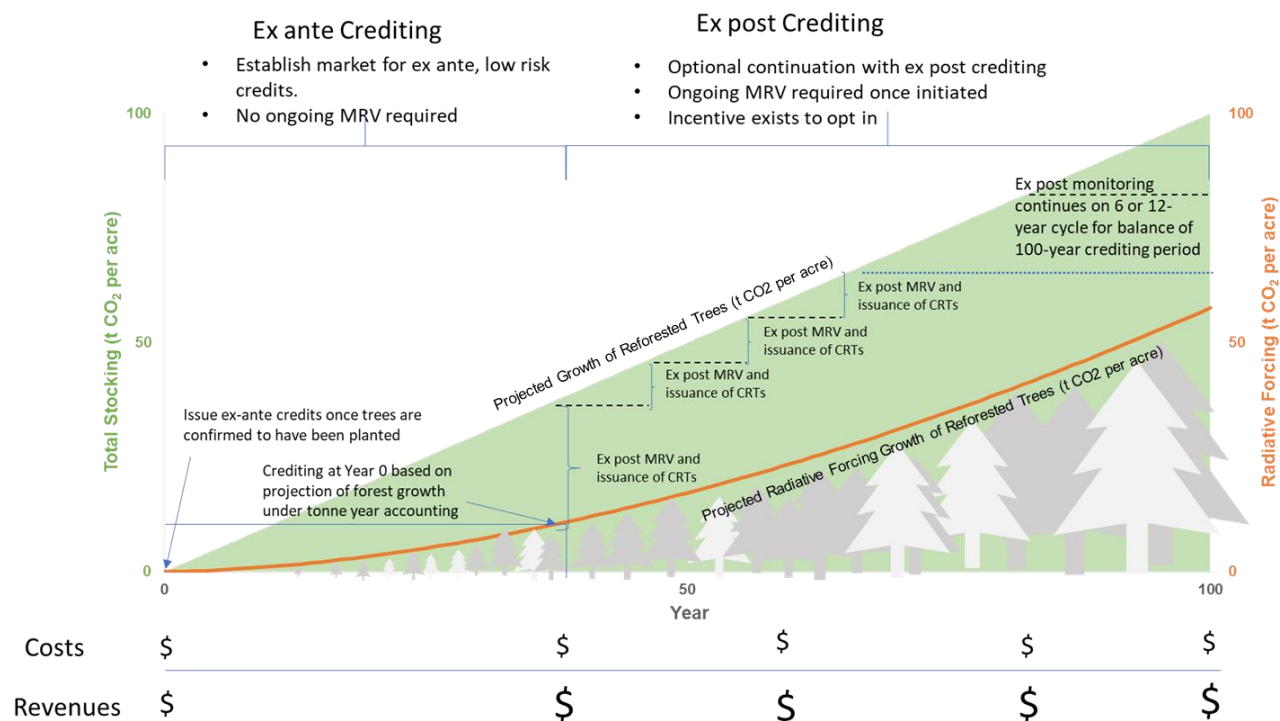


Figure 1.1. Relationship between Crediting in Climate Forward and the Reserve's Offset Program
The radiative forcing curve displays the time-value of CO₂ out of the atmosphere.

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 newly established trees 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 ecologist³ 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.⁴ 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

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

³ Or person with relevant educational and professional experience similar to those required for professional foresters and ecologists as described in the glossary.

⁴ A standard form for this attestation will be posted on the Climate Forward website at <https://climateforward.org/program/program-and-project-forms/>.

transferring the claim to GHG removals resulting from the project must exist, along with documentation demonstrating ownership by the transferring party, and be referenced in the Project Implementation Report, with all such documentation reviewed by the confirmation body. Project proponents may have agreements transferring the claim to GHG removals from multiple properties and the owners of the trees on such properties (along with evidence of ownership by the transferring parties), thereby allowing them to aggregate reforestation activities across multiple properties into a single project to be submitted under this methodology. See Section 3.6 for additional information about FMU ownership and Section 8.4.1 for guidance around confirmation of this requirement.

3 Eligibility Rules

Projects must fully satisfy the following eligibility rules to be registered with Climate Forward. The criteria only apply to projects that meet the definition of a GHG enhancement project (Section 2.1). See subsection text below for full details pertaining to each rule.

Eligibility Rule I:	Location (Section 3.1)	→	Eligible growth projections exist for trees at project location
		→	Project area requires intervention to re-establish tree cover
		→	Site is ecologically favorable and appropriate for establishment of trees
		→	Not on land previously registered as a project, unless the project was closed in good standing
Eligibility Rule II:	Start Date and Crediting Period (Section 3.2)	→	Start date based on the date that planting or site preparation activities are initiated
		→	Submitted within one year of start date
		→	Crediting period varies by forest community, landowner class, and optional measures that provide long-term security to carbon stocks
Eligibility Rule III:	Additionality (Section 3.3)	→	Meet performance standard, that addresses the low likelihood of forest landcover being restored in the near term without intervention and the rationale for the current low levels of forest cover not being related to rotational timber harvest
		→	Exceed regulatory requirements
Eligibility Rule IV:	Environmental and Social Safeguards (Section 3.4)	→	Appropriate native tree species planted or regenerated
		→	No negative environmental and social impacts
Eligibility Rule V:	Regulatory Compliance (Section 3.5)	→	Compliance with all applicable laws
Eligibility Rule VI:	Ownership and Double Counting (Section 3.6)	→	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 (Section 3.7)	→	Demonstrate by meeting project definition and location requirements
Eligibility Rule VIII:	Permanence (Section 3.8)	→	Determined by forest community, landowner class, assumed likelihood of future harvest, and optional measures that provide long-term security to carbon stocks

3.1 Location

Providing all eligibility criteria are met, projects can be initiated in any geographic area for which relevant tree 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).⁵ See Section 5.2.1 for further details about growth projections available for use under this methodology. Projects cannot take place on any part of an area where an existing or previously existing project was located that received carbon credits or financial payments on a tonnes of CO₂e basis, as further described in Sections 3.3.3 and 3.6, unless the previous project has been closed in good-standing and with the written consent of the Reserve.

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 (large roads,⁶ landings, bogs, rocky areas, etc.) and are larger than one quarter acre must not be included within the project area. Additionally, areas where site preparation is used to promote natural regeneration (as the sole means of regeneration or in combination with planting) must be spatially delineated for baseline quantification purposes, as further described in Section 5.1, if such areas comprise only a portion of the entire project area.

The Reforestation Project Goals Form 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 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 the project area is not at a heightened risk of conversion to non-forest uses.⁷ 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.

⁵ Available on the Reforestation Forecast Methodology webpage at <https://climateforward.org/program/methodologies/reforestation/>.

⁶ Roads that are expected to exceed the width of the forest canopy of both sides of the road when the forest has reached a mature stage.

⁷ Guidance for these descriptions is provided in the Reforestation Project Goals Form.

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 must be submitted for listing within one year of the project start date. However, project activities (planting or site preparation for natural regeneration) may still be ongoing at the time 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 as being secure. This period varies by forest community, by 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. To ensure quantification of additionally sequestered stocks is conservative, the project's projected increases in carbon stocking are adjusted to account for stock changes associated with trees on the project area at the time of confirmation that would have grown on the site (e.g., pre-existing trees) regardless of whether the project had been initiated, as further described for estimating baseline carbon stocks in Section 5.1.

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 easements⁸ 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 force yet, e.g., legislation that has been signed into law but does not take effect until after a later, specified date. However, a conservation easement requiring reforestation does not affect project eligibility if the project start date, as described in Section 3.2, is within a year of the date the easement is recorded. Similarly, easement terms prohibiting activities that would otherwise be considered restrictions on baseline activities (e.g., prohibition of livestock grazing or crop cultivation) would not have bearing on a project's additionality if project activities are initiated within a year of easement recordation.

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.

3.3.3 Enhancement Payments

Enhancement payments and payments for ecosystem services provide financial assistance to landowners to implement discrete practices that address natural resource concerns and deliver environmental benefits. Examples of relevant enhancement payments in the United States include:

- California Climate Investments (CCI), formerly called Greenhouse Gas Reduction Funds (GGRF)
- California Forest Improvement Program (CFIP)
- USFS grants and agreements
- NRCS Environmental Quality Incentives Program (EQIP)

⁸ 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, including in jurisdictions where a conservation easement is not a legally available option. The term "conservation easement" will be used throughout this methodology to represent any such legally binding restrictions on land use activities.

Project proponents (or the underlying landowner in cases where the project proponent is not the owner of the trees, as described in Section 2.2) may pursue enhancement payments that support carbon project activities. In general, the Reserve does not categorically prohibit such payment stacking under this methodology unless such payments are specifically quantified on a per tCO_{2e} basis. However, project proponents are strongly encouraged to reach out to the Reserve as early as possible when considering stacking such payments with a project since additional sources of financing could call into question the additionality of the project. Furthermore, they must disclose any such payments to the Reserve at the time of listing and to the confirmation body and the Reserve at the time of confirmation. The Reserve maintains the right to determine if payment stacking has occurred, or is occurring, and whether it would impact project eligibility.

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.

The project's environmental, economic, and social effects (positive and negative) must be described in the PIR, which shall address:

- Air and water quality
- Water supply
- Habitat
- Flora and fauna
- Recreation and scenic views
- Employment
- Environmental justice
- Other relevant social development issues

This may include a discussion of how the project aligns with the United Nations' Sustainable Development Goals,⁹ 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.

⁹ Additional information regarding the Sustainable Development Goals may be found online at: <https://sustainabledevelopment.un.org/>.

For projects on communal lands,¹⁰ the project proponent must adhere to the following free, prior and informed consent requirements:¹¹

1. Prior to project registration, project proponents must hold a communal meeting or assembly, aligned with their communal norms and customs, that is:
 - a. Conducted in a language appropriate to potential community participants
 - b. Announced in a manner that ensures the information reaches all community members, including commonly vulnerable groups such as women, young people, and non-voting community members
 - c. Held in a manner that ensures all community members are able to participate and have an opportunity to share opinions and ask questions
 - d. Documented in a way to ensure the information is made publicly available and to satisfy project reporting purposes under this methodology
2. The meeting should address the following:
 - a. Principles of climate change, carbon markets, forest carbon project concepts, and the rationale for participating in a project
 - b. Requirements associated with the Climate Forward project under this methodology as well as considerations for transitioning the project to the Climate Action Reserve's voluntary offset program, if applicable
 - c. Anticipated costs and benefits of the project, including anticipated use of funds from credit sales and planned oversight mechanisms to ensure funds are used in accordance with the community's decisions
 - d. Approval by the community, following communal norms and customs, of the project and the involvement of the project proponent

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.

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

¹⁰ Including all forms of communal governance structures.

¹¹ Project proponents considering the eventual transition of the project to an existing corresponding offset protocol under the Climate Action Reserve should consult the relevant offset protocol to ensure the specific requirements associated with social safeguards, and other relevant eligibility requirements that may be applicable, are met when submitting a project under this methodology.

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 carbon removals and emissions reductions serving as the basis for the project's 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 subject to nominal risk of 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. Project proponents must also describe in the Reforestation Project Goals Form how reforestation activities under the project are designed to mitigate future risks to and promote the long-term survival of newly established trees.

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) that includes requisite terms, as outlined in Section 3.8.1, or public ownership where management objectives can be demonstrated as being consistent with the long-term maintenance of projected increases in carbon stocks
- Use of a Permanence Risk Pool
- 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 that include certain requisite terms specified here meet the permanence requirement using tonne-tonne accounting. For such projects, the timeframe for assessing the *tonne-tonne* values (i.e., crediting period) is

the projected growth of the forest stand to year 100, with the assumption that such stocks will be maintained for 100 years after they have been sequestered (i.e., additional stocks sequestered in year 100 will achieve their full climate benefit when maintained for 100 years after the date of sequestration). Projects with non-perpetual easements may also use tonne-tonne accounting if the length of the easement term is at least 200 years.

The terms identified in Table 3.1 must be included in an easement covering the project area for the project to be eligible to use tonne-tonne accounting based on the default projections provided in the Reforestation Communities Data File.

Table 3.1. Conservation Easement Terms

Required for a project to use tonne-tonne accounting (TTA) or for a project using tonne-year accounting (TYA) to extend its crediting period (see Section 3.8.2).

Easement Terms	Duration of Applicability		
	TTA (Default)	TTA (Project-Specific Modeling)	TYA Crediting Period Extension
1. The entity granted the easement must be a qualified easement holder according to the conservation easement enabling statute of the state in which the project is located. If the easement is granted to a non-governmental agency, the easement holder must be accredited by the Land Trust Alliance (or be accredited by a similar entity if in a jurisdiction where the Land Trust Alliance does not operate).	At the time of easement recordation	At the time of easement recordation	At the time of easement recordation
2. The project area must be dedicated to forest landcover upon establishment of trees on the site.	At least 200 years	At least 200 years	At least until the end of the crediting period
3. Reforestation of the site is required in the event of a loss of >50% live and dead tree canopy on >10% of the total project area as a result of natural disturbance, whether through active planting, site preparation to promote natural regeneration, or passive management that otherwise allows the site to return to forest cover over time, provided passive management includes monitoring to ensure the disturbed site is recovering, with active management (planting and/or site preparation) undertaken if monitoring over a period no longer than 20 years indicates natural recovery is not occurring. At a minimum, reforestation would be required after each of two such natural disturbances occurring on the project area.	At least 200 years	At least 200 years	At least until the end of the crediting period

Easement Terms	Duration of Applicability		
	TTA (Default)	TTA (Project-Specific Modeling)	TYA Crediting Period Extension
4. Terms used to encumber timber harvest during the crediting period must limit harvest activities within reforested areas to management for forest resiliency (thinnings), human safety, or salvage (in the event of an ecological perturbation, such as wildfire, insect infestation, or disease, or in the event of tree senescence, with the intent of capturing mortality while the tree(s) still have commercial value). Other than salvage harvesting, harvest activities conducted on reforested areas 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%. For projects applying TTA, harvesting occurring after the crediting period but prior to when at least 200 years have passed since the establishment of trees on the site shall be limited so that harvest volumes do not exceed growth.	At least 200 years	N/A (see text below this table)	At least until the end of the crediting period

Recognizing that landowners may want greater flexibility with respect to timber harvesting, a conservation easement may also be placed on the project area that includes only terms 1, 2, and 3 in Table 3.1 to secure the permanence of the carbon sequestered under the project and be eligible for the use of tonne-tonne accounting. Such projects are not eligible to use the default projections provided in the Reforestation Communities Data File, but rather must conduct project-specific modeling to forecast the increase in carbon stocking on the site under management as restricted by the conservation easement, as described in Section 5.1. Forecasted onsite carbon stocks must be estimated through a modeling exercise.

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 more likely to undergo a 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 requisite terms described above 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 programmatic *ex ante* and permanence risk discounts (see Sections 5.3 and 5.6). As an example, if a project with a perpetual conservation easement that includes the requisite terms in Table 3.1 is predicted to sequester 225 tonnes of CO₂e per acre, net of any risk discounts, 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.

Absent a conservation easement with the terms specified in Table 3.1 that provides security to mature forest stands through ongoing monitoring and enforcement by qualified easement holders, the temporal portion of the reforested stand’s growth projection that is deemed secure (i.e., the sequestered carbon is likely to remain sequestered) is linked to the merchantability of the trees present, typically based on a combination of tree size and growth rates over time. For example, as a stand’s growth rate changes over time and the trees achieve commercial dimensions, the stand faces an increased likelihood of undergoing a regeneration harvest. The likelihood of such harvest varies by species involved and landowner class.

The Reserve has developed a companion document called the Reforestation Communities Data File in which the point in time when harvest is assumed to occur for a given project area or forest community type within a project area is identified. Such points in time are based on the forest community type, growth rates, tree dimensions, and/or landowner class. The data file thus defines the applicable temporal length of growth projections for each forest community prior to the point at which there is a heightened likelihood that the forest stands will undergo a regeneration harvest. This span of time is referred to as the crediting period.

The landowner classes recognized under this methodology are defined in the Reforestation Communities Data File based on the jurisdiction where eligible projects are located. For projects in the United States, the 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 in the U.S. 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 in the U.S. 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 in the U.S., 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 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.

For projects outside of the U.S., the specific thresholds that define the crediting period(s) applicable to a project are based on the jurisdiction in which the project is located and are indicated in the Reforestation Communities Data File.¹² For projects located in the U.S., Table 3.2 displays the threshold growth rates or percent of CMAI (in years) used to determine the crediting period and ensure conservative crediting. The threshold growth rates for the U.S. are applied to each forest community, as growth characteristics of forest communities vary widely.

Table 3.2 also displays the basis for crediting period length for projects in the U.S. with conservation easements with the terms in Table 3.1 and for public lands where management is demonstrated to be consistent with project carbon stock increases. As indicated in the table below, tonne-year accounting is also applied to reforestation projects with non-perpetual conservation easements that include the requisite terms described in Table 3.1. 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. Although tonne-tonne accounting is not used for such projects, project proponents nevertheless benefit by extending the length of the crediting period applicable to their project.

¹² Not all potential project locations are currently defined in the Reforestation Communities Data File. New locations will be added as needed.

Table 3.2. Example of the Basis for Determining Length of a Project's Crediting Period

Landowner Class	Basis for Length of Crediting Period in the United States		Tonne-Tonne (TT) or Tonne-Year (TY)
	No Conservation Easement with Requisite 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) ¹³	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 Terms in Table 3.1		
Any Ownership Class	Length of term in conservation easement (with requisite terms, as specified in Section 3.8.1) 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 terms in Table 3.1 at any time during the crediting period and be awarded the balance of FMUs associated with the project based on the appropriate conservation easement landowner class within the Reforestation Communities Data File, net of any previously issued FMUs. At such a time, the conservation easement baseline documentation (i.e., documents describing the conditions of the subject property at the time the easement is recorded) must provide evidence that the reforested trees are generally shifting the land cover within the project area back to forest cover.

Following the recordation of the easement, 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 terms in Table 3.1), and quantification documents, including both original and updated accounting. Similarly, a project originally registering as being on privately held land may transfer ownership of the project area to a government agency and be issued credits based on the ownership change, including changing quantification of FMUs to being based on tonne-tonne accounting if documentation is provided demonstrating management consistency with the long-term maintenance of projected carbon stock increases, as described for the “government (secured)” landowner class in Section 3.8.1.

¹³ 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 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 the terms in Table 3.1 or with government (secured) lands.

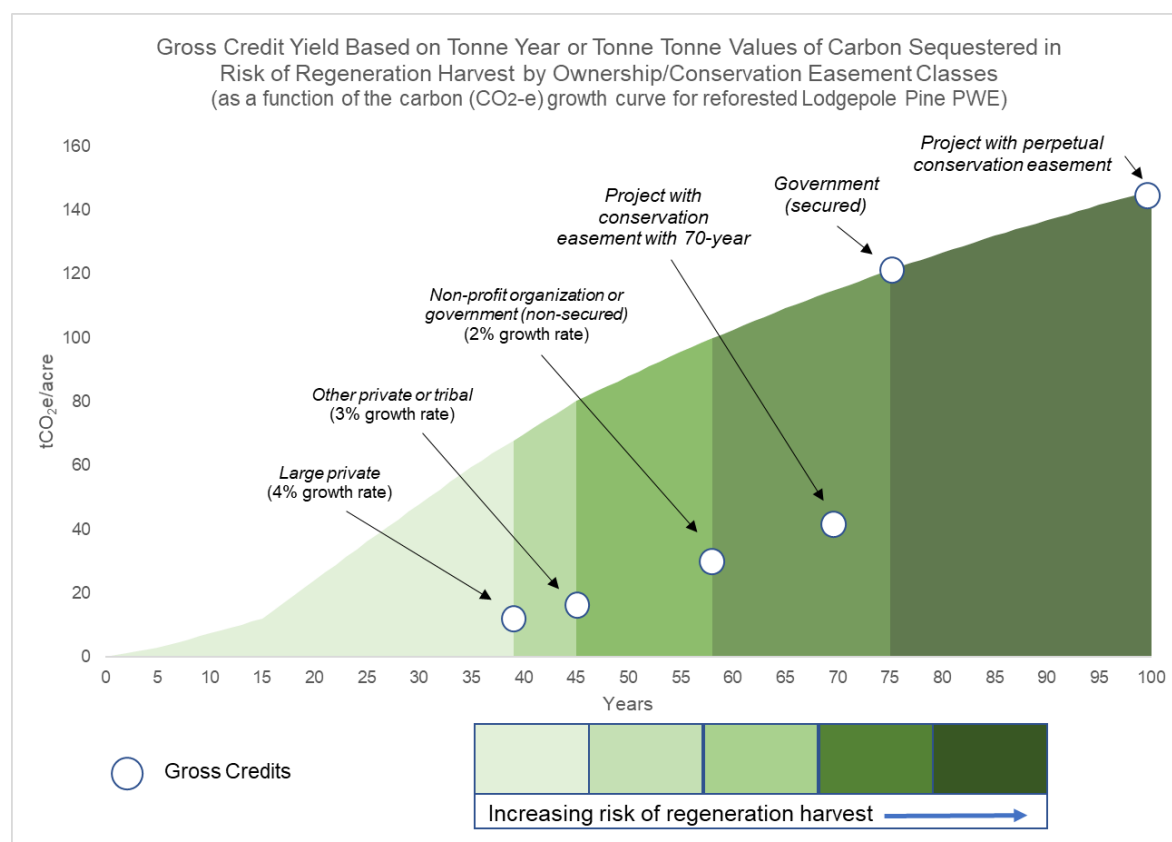


Figure 3.1. Example of Gross FMUs that are Issued Based on Landowner Class or Conservation Easement Term Length for the Lodgepole Pine PWE Forest Community in the U.S.

3.8.3 Conservative Crediting and Permanence Risk Pool

There are several elements of conservatism included in the methodology designed to account for potential risks to the integrity of the quantified climate benefits, including the following:

1. Confirmation activities are initiated only after the trees in the reforested project area have been in the ground for a minimum of one year from planting or from seedlings established from natural regeneration. As such, the trees will have passed a highly vulnerable period and have a high probability of aligning with the projected growth.
2. A deduction is applied to all projects to address the risk that any individual reforestation project will fail to realize fully the climate benefits for which it is being credited, whether as a result of forests unexpectedly underperforming relative to the projections that serve as the basis for credit issuance or as a result of a project being abandoned before the end of its crediting period. This programmatic *ex ante* risk discount helps to ensure that

the population of all projects in the system will achieve greater emissions removals than the sum of credits issued.

As outlined in Section 5.3, a maximum discount of 10 percent is applied for projects with crediting periods of 100 years, with the discount(s) for any shorter crediting period(s) adjusted proportionally based on the length of the crediting period(s) relative to 100 years. Projects employing a conservation easement including the first three terms identified in Table 3.1 have a maximum discount of 5 percent applied, scaled proportionally to the length of the crediting period(s) relative to 100 years.

It is anticipated that thinning operations may occur in 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. As crediting period length increases toward 100 years, the likelihood increases for further emissions associated with biomass removals to ensure the forest is healthy and resilient to natural disturbances. Furthermore, the uncertainty of growth projections increases as the crediting period length increases.

3. In the absence of a conservation easement with the terms identified in Table 3.1 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 harvesting that would substantially impact the growth trajectory of the forest.
4. All reforestation projects submitted under this methodology will contribute a certain percentage of FMUs into a “permanence risk pool.” GHG reductions and removals can be “reversed” if the stored carbon associated with them is released back to the atmosphere. Many biological and non-biological agents, both natural and human-induced, can cause reversals. Some of these agents cannot completely be controlled (and are therefore “unavoidable”), such as natural agents like fire, insects, and wind. This pool provides insurance against reversals of GHG reductions and removals due to unavoidable causes. Refer to Section 5.6 for more information on the permanence risk pool.

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 achieve appreciable levels of carbon. The *ex ante* approach under this methodology 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 tree 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

trees that are reasonably established in the ground and only for a time frame when commercial opportunities for the harvest of the newly established trees are highly limited.

The first year following tree establishment is a period of high vulnerability for newly established trees. It is a time in which such trees 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 trees 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.¹⁴ 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	<p>Baseline: Estimated based on presence of pre-existing trees and seedlings generating naturally beyond the scope of the project activity as described in Section 5</p> <p>Project: Estimated from predetermined forecasted values as described in Section 5.2</p>	<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 are accounted for by estimating the canopy cover of such trees at the start of the project and applying a proportional adjustment to projected stock increases on the project area, as outlined in Section 5.</p>
2	Shrubs and herbaceous understory carbon	CO ₂	Yes	<p>Baseline: Estimated based on shrub biomass estimates derived from photo plots prior to project start date</p> <p>Project: Estimated from predetermined forecasted values as described in Section 5.2. No positive crediting applied, but a deduction is applied if shrub cover is expected to decrease after project area is reforested.</p>	<p>Shrubs and herbaceous understory may constitute a significant portion of carbon affected by reforestation projects as part of site preparation. Although such stocks are assumed to recover over the course of the crediting period, an estimate of changes in shrub stocks is made for instances where net decreases are likely relative to stocking levels just prior to the start of the project.</p>

¹⁴ 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>

SSR	Source Description	GHG	Included?	Baseline/Project	Justification/Explanation
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>
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	Yes/No	Baseline: Under eligible project conditions, estimated from standardized factors Project: Under eligible project conditions, estimated from standardized factors	In cases where reforestation activities follow disturbance events, soil carbon is expected to at least remain the same and may increase and it is conservative not to include it. However, certain conditions may exist where there is high certainty for soil carbon increases as a result of reforestation activities, as further described in Sections 5.1.4 and 5.2.3.
7	Carbon in in-use forest products	CO ₂	No	Baseline: N/A Project: N/A	Not included because minimal 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
8	Forest product carbon in landfills	CO ₂	No	Baseline: N/A Project: N/A	Not included because minimal 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 shrub 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.
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.

SSR	Source Description	GHG	Included?	Baseline/Project	Justification/Explanation
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.
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.

SSR	Source Description	GHG	Included?	Baseline/Project	Justification/Explanation
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.
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.

SSR	Source Description	GHG	Included?	Baseline/Project	Justification/Explanation
		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 under this methodology is shown in Equation 5.1.

Equation 5.1. Calculating GHG Removals

$ER_{total} = \sum [(ER_f + SE_f) \times (1 - R_{ExA,f} - R_{Rev,f})]$		
Where,		<u>Units</u>
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
$R_{ExA,f}$	= Programmatic <i>ex ante</i> risk discount applied for forest type f (see Section 5.3)	%
$R_{Rev,f}$	= Permanence risk contribution applied for forest type f (see Section 5.3)	%
And		
$ER_f = \left[\sum_{y=1}^{CP_f} \left((\Delta AC_{tree,f,y} + (AC_{soil,f,y} - BC_{soil,f})) \times 1\% \times (CP_f - y + 1) \right) \right] \times (1 - (CC_{tree,f} + S_f)) + MIN(0, (AC_{shrub,f,CP} - BC_{shrub,f,0}))$		
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
$\Delta AC_{tree,f,y}$	= Increase in actual live tree carbon as forecasted for year y from prior year $y-1$ for forest type f	tCO ₂ e
$AC_{soil,f,y}$	= Actual soil carbon as forecasted for the end of the crediting period CP for forest type f (only applicable under certain conditions, as described in Section 5.2.3)	tCO ₂ e
$BC_{soil,f}$	= Baseline soil carbon for forest type f (only applicable under certain conditions, as described in Section 5.1.4)	tCO ₂ e
$CC_{tree,f}$	= Canopy cover of pre-existing trees as a percentage of total area represented by forest type f	%
S_f	= Adjustment factor applied to account for pre-existing seedlings regenerating within the area represented by forest type f (see Section 5.1.2)	%
$AC_{shrub,f,CP}$	= Actual shrub carbon as forecasted for the end of the crediting period CP for forest type f	tCO ₂ e
And		
$BC_{shrub,f,0} = (CC_{shrub,pre,f} - CC_{shrub,post,f}) \times A_f \times RE_f$		
$BC_{shrub,f,0}$	= Baseline shrub carbon at the initiation of project activities for forest type f	tCO ₂ e
$CC_{shrub,pre,f}$	= Shrub cover as a percentage of the area A comprising forest type f prior to site preparation activities	%
$CC_{shrub,post,f}$	= Shrub cover as a percentage of the area A comprising forest type f after site preparation activities have occurred	%
A_f	= Total area represented by forest type f	Acres
RE_f	= Ratio estimator, by height class, for shrub carbon stocking for location of forest type f	tCO ₂ e/acre

5.1 Estimating Baseline Carbon Stocks

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), as described in Section 2.1. Nevertheless, pre-existing trees may be present when the project is undertaken, including naturally regenerating seedlings that may be expected to continue growing in the future irrespective of any project activities performed to re-establish tree cover. For quantification purposes under this methodology, projects must account for changes to carbon stocking that would have occurred to such baseline trees and seedlings in the absence of the project according to the requirements specified in this section.

5.1.1 Pre-Existing Trees

For projects with pre-existing live trees in the project area at the time the project is initiated, project proponents must estimate (via sampling) the percent canopy cover within the project area (or within each forest type comprising the project area for projects involving multiple forest types) using remotely sensed data from the sampling methodology indicated in Appendix B. Locations of sample points produced during the analysis must be retained by the project proponent for review by the confirmation body. The remote sensing data used for the analysis must have a minimum resolution of 1 meter, be dated within 12 months of the start date and should be from a month where foliage is present and visible (spring or summer).¹⁵ If the images used pre-date the project start date, pre-existing trees must be discernable from other vegetative cover. The percent canopy cover determined from the analysis for each forest type within the project area is entered for the variable $CC_{tree,f}$ in Equation 5.1 as a deduction to the forecasted emissions removals for the project. Canopy cover values are entered into the Reforestation Communities Data File, a companion document to the RM, available on the Climate Forward website, that performs FMU quantification for projects. Projects with no pre-existing trees within the project area are not required to perform the canopy cover analysis, though the project proponent must demonstrate the lack of pre-existing trees by providing remote sensing imagery of the project area from prior to the project start date demonstrating the lack of tree cover in such cases.

5.1.2 Naturally Regenerating Seedlings

For projects (or forest types comprising a portion of a project) involving site preparation that results in promoting natural regeneration, seedlings that emerge following the site preparation activities are considered additional to baseline activities. However, in project areas or in forest types comprising a project area where site preparation was not used, seedlings (including sprouts) that exist prior to planting activities must be accounted for as baseline seedlings in the quantification of FMUs.

For project areas or forest types where no relevant site preparation activities occurred, the professional forester or ecologist associated with the project must ocularly estimate the likely contribution of pre-existing seedlings to future forest cover on the site for each forest type and assign a natural regeneration class, as described in Table 5.1. This assessment is to be performed prior to planting based on a set of random sample points. The regeneration class of a forest type determines the adjustment factor S_r applied in Equation 5.1.

¹⁵ Contact Reserve staff if an appropriate image is not available.

Table 5.1. Classes Used to Determine Adjustment to Actual Live Tree Carbon Stocks to Account for Pre-Existing Seedlings

Natural Regeneration Class	Current Level of Natural Forest Regeneration is Not Likely to Contribute to Forest Cover in Excess of the Percentage Specified Below Over the Next 30 – 50 Years, Absent Management Intervention	Variable S_f
Very Low	10%	0%
Low	25%	20%
Medium	50%	50%
High	>50%	100%

Plot results are to be entered into the Reforestation Communities Data File, which automatically determines the Natural Regeneration Class for the project or for the forest type based on the mode of the sample results. The number of points to be sampled is calculated as the square root of the total acres represented by the forest type or a minimum of 10 points. The locations of the random points are determined as part of the remote sensing analysis conducted for pre-existing trees per Section 5.1.1, starting from the first point and continuing until the required number of points is met. A photo must be taken at each point, with the associated plot number recorded. The photo must be facing north and must provide a clear view of the site conditions. If a clear view cannot be obtained at the original plot location, the plot location may be offset by up to 10 meters, with the direction and distance of offsetting recorded.

5.1.3 Shrub Carbon

Carbon in shrubs is assumed to be affected by reforestation activities under this methodology, whether directly as part of initial actions to reestablish trees on the project area or indirectly as trees become established and shrub stocks are reduced as the ongoing growth of trees results in increased competition for resources. Although shrub carbon is taken into consideration, it is only included in quantification when baseline shrub stocks are greater than projected shrub stocks. In other words, projects are not awarded credits if shrub stocks are expected to increase relative to baseline stocking levels.

Projects are required to assess baseline shrub carbon stocks for each forest type within the project area using remotely sensed imagery based on the sampling methodology indicated in Appendix B. The remote sensing data used for the analysis should be from a month where foliage is present and visible (spring or summer) and must be dated within the 12 months prior to the start date for variable $CC_{shrub,pre,f}$ in Equation 5.1. If the project involves site preparation activities, analysis must also be performed using imagery from within the 12 months following completion of such activities to determine the value for variable $CC_{shrub,post,f}$. Contact Reserve staff if no images fitting these requirements are available.

If all shrub cover is removed during site preparation activities, analysis of post-treatment shrub cover is not required. Furthermore, project proponents may optionally assume for quantification purposes that all shrub cover has been removed rather than conducting the post-treatment shrub cover analysis, which will result in a conservative estimate of shrub stocks that have been removed. Projects with no shrub cover within the project area immediately preceding the project start date are not required to perform the shrub canopy cover analysis, though the project proponent must provide remote sensing imagery of the project area from prior to the project start date demonstrating the lack of shrub cover in such cases.

To complete the baseline shrub calculation, the project proponent must also determine the default ratio estimator (RE_f) applicable to each forest type comprising the project area. Values for RE_f to be applied in Equation 5.1, are provided in the Reforestation Communities Data File by height class. The professional forester or ecologist associated with the project must choose the appropriate height class based on average shrub composition within each forest type area and indicate the rationale for their selection.

5.1.4 Soil Carbon

Organic carbon in soils is assumed to be affected by reforestation activities under this methodology under certain conditions. For instances where there is a high degree of certainty that soil organic carbon stocks have been depleted as a result of the management history of the project area and soil carbon stocking would subsequently be restored through reforestation of the site, projects are eligible to quantify estimated increases in soil organic carbon relative to baseline stocking levels. Conditions for eligibility to quantify such increases are identified in the Reforestation Communities Data File. Estimated baseline soil organic carbon stocking is entered as the variable $BC_{soil,f}$ in Equation 5.1.

5.2 Estimating Project Carbon Stocks

5.2.1 Live Trees

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 site 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.

The selection of data projection(s) within the Reforestation Communities Data File to quantify estimated removals for a project is based on the following:

1. Species composition, as described within the Reforestation Communities Data File for forest types for which projections are available.
 - a. Identify the region in which the project is located and determine the applicable forest type(s) based on the region boundaries and associated forest types indicated in the Reforestation Communities Data File.
 - b. If the forest type(s) associated with the region in which the project is located is not appropriate for the project (in part or in total), then look to neighboring regions for an appropriate forest type. Whether a projection is appropriate for the project is determined by species composition.
2. Tree establishment conditions
 - a. Determine if the project's tree establishment conditions (planting or site preparation results) are similar to those that serve as the basis for the projections. An example of planting conditions not consistent with projections in the Reforestation Communities Data File are the planting of trees larger than seedlings and/or the use of planting densities that are not likely to satisfy the 70

percent stocking requirement, as described in Section 2.1 and confirmed based on the procedure outlined in Appendix A Confirmation of Site Stocking.

If no projections contained in the Reforestation Communities Data File are appropriate for the forest community (including as related to the location of the project) or the planting conditions of a project or a portion of the project area, the project proponent may propose the use of a new projection (i.e., quantification parameter) to the Reserve for inclusion in the Data File or for project-specific use, subject to review and approval by the Reserve. Project Proponents must demonstrate how the projection is appropriate for the project conditions and is conservative. To help ensure carbon stocks projections represent conservative estimates, modeling parameters appropriate for the project area must be applied. Modeling must be performed using the Forest Vegetation Simulator (FVS) from the U.S. Forest Service,¹⁶ reporting carbon values based on the default live tree carbon (above- and belowground) outputs from FVS. The modeling exercise must use bare ground as the initial conditions, with final live tree carbon stocking results adjusted for baseline tree and/or seedling carbon stocks, as described in Section 5.1. Modeling must also be performed under the oversight of a professional forester, with a description of how modeling parameters are reasonable and conservative. Parameters described should include but not be limited to:

- Site indexes, with consideration given to relevant sources of information such as inventory measurements, soil maps that indicate site productivity, and/or past harvest plans on the project area.
- Mortality, with the mortality function of the growth and yield model used for modeling enabled and default rates applied so that increases in live tree stocks are moderated commensurate with expected rates of natural mortality.

Projects based on the reforestation of sites that are eligible for the inclusion of increases in soil carbon, as described in Section 5.1.4, based on restoration of highly disturbed soils may be required to conduct project-specific modeling. Such projects must contact Reserve staff for guidance. Any resulting projections proposed for use must include appropriate and conservative adjustments to growth, which are to be described in the Project Implementation Report and are subject to review and approval by the Reserve.

Projections proposed for use by a project located in a jurisdiction other than those already included in the Reforestation Communities Data File at the time of project submission must be based on appropriate and conservative parameters to identify the length of the crediting period consistent with the principles outlined in Section 3.8.2. Such parameters are subject to review and approval by the Reserve. Projects eligible to apply tonne-tonne accounting are not required to propose parameters to identify the crediting period length.

However, as indicated in Section 3.8.1, project proponents who wish to apply tonne-tonne accounting for FMU quantification for a project with a conservation easement including terms 1 and 2 (and optionally term 3) indicated in Table 3.1 but not term 4 must conduct a modeling exercise to estimate the increase in live tree carbon stocks on the project area.

To determine forecasted project carbon stocks under the conservation easement, project proponents must model the changes to standing live tree carbon stocks similar to modeling performed by projects proposing a new projection as described above (including the use of conservative parameters), but through a series of growth and harvesting scenarios over a 100-

¹⁶ For projects in areas where FVS is not applicable, contact the Reserve to determine an alternative model to use.

year timeframe using FVS. Modeling of the growth and harvesting scenarios must reflect not only all legal requirements that constrain the ability to harvest carbon stocks, but also the terms of the conservation easement covering the project area. Furthermore, modeling must be performed in a way that reflects a scenario in which harvesting occurs to the full and maximum extent allowed under the conservation easement. Project proponents must develop a modeling plan that documents how the forecasted carbon stock values were derived and describes the means by which the projections of forest carbon values adhere to the harvest constraints contained in the conservation easement.

Use of any projection, including those contained in the Reforestation Communities Data File, must be approved and justified by a Professional Forester or Professional Ecologist in the Project Goals Form. Nevertheless, the Reserve may require at its sole discretion the use of another projection if the proposed projection is deemed inappropriate. In cases where the appropriateness of the proposed use of a projection is unclear, the default approach taken by the Reserve will be to require the use of a conservative projection.

Since a reforested stand results in additional carbon being sequestered over time, for projects without permanent conservation easements with the terms indicated in Table 3.1 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 5.2 for an example of how tonne-year values are attributed to a project.

Table 5.2. Example of Tonne-Year Values and Cumulative Crediting

This example uses a project that is sequestering 100 additional tonnes of CO ₂ e per year across an entire project area owned by a large private landowner with a forest type 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 the terms indicated in Table 3.1, the threshold growth rate of return for the applicable landowner type (see Table 3.2) 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 5.2 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 containing the terms indicated in Table 3.1 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 5.3.

Table 5.3. Example of Tonne-Year Values and Cumulative Crediting with Conservation Easement with Requisite Terms

This example uses the same project conditions as shown in Table 5.1, except the project area has a conservation easement with the terms indicated in Table 3.1, 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 the terms indicated in Table 3.1, 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 Shrub Carbon

To ensure conservative accounting with respect to changes to carbon stocks in shrubs as a result of the project activity (as described in Table 4.1), shrub carbon is only included in quantification when baseline shrub stocks are greater than projected shrub stocks. In other words, projects are not awarded credits for expected increases in shrub stocks relative to baseline stocking levels. Projections of shrub stocking by forest type at the end of a project's crediting period, as indicated in the Reforestation Communities Data File, are entered into Equation 5.1 as the variable $AC_{shrub,f,CP}$.

5.2.3 Soil Carbon

Quantifying future increases in soil stocks resulting from reforestation activities is only applicable under certain conditions, as described in Section 5.1.4. For eligible conditions indicated in the Reforestation Communities Data File, projected soil organic carbon stocks at the end of the crediting period(s) for the project are entered into Equation 5.1 as the variable $AC_{soil,f,CP}$.

5.2.4 Determining Gross Forecasted GHG Removals

The following steps are used to determine the gross forecasted 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 the terms indicated in Table 3.1 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, as described in Section 5.2.1. If the geography, species composition, planting conditions and/or land ownership varies in such a way that the project area can be stratified into different forest types, determine the applicable forest projections and corresponding acreage for each stratum and include a map (and GIS layer in KML file format) of the strata with the project reporting documentation. 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. For projects eligible to account for increases in soil organic carbon stocks, as described in Sections 5.1.4 and 5.2.3, determine baseline and actual forecasted soil carbon stocking at the end of the crediting period, by forest type, according to the data provided in the Reforestation Communities Data File.
4. Based on steps 1 through 3, determine the tonne-year carbon stocking value (t CO₂e/acre) for live trees and soil carbon for the forest type(s) on the project area. If the project includes a perpetual conservation easement with the terms indicated in Table 3.1 or is on public lands capable of demonstrating management consistency with the long-term maintenance of projected carbon stock increases, the tonne-tonne value must be used. This data is provided in the Reforestation Communities Data File.
5. Calculate baseline tree adjustment factors for each forest type, as described in Sections 5.1.1 and 5.1.2, and apply to live tree stocks calculated in step 3.
6. Determine baseline shrub carbon stocking by forest type according to Section 5.1.3 and actual forecasted shrub carbon stocking at the end of the crediting period, by forest type, using the projections provided in the Reforestation Communities Data File. If forecasted shrub stocks are lower than baseline shrub stocks for a given forest type, subtract the amount shrub stocking decreases from the live tree stocks determined in step 4. If shrub stocking is expected to show a net increase under the project activity for a given forest type by the end of the crediting period relative to baseline stocking, no further

adjustment is made to the live tree stocks determined in step 4.

7. Calculate the total FMUs associated with the entire project area by multiplying total carbon stocking for each forest type on the project area, as determined in step 5, 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. The data file performs the calculations specified in Equation 5.1 – 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 performance decline and/or site conversion (see Section 5.4), a programmatic *ex ante* discount is applied to account for the potential under- or non-performance of projects over the course of their crediting period. The discount rate applied increases as the crediting period length increases. The underlying assumption is that the risk of non- or under-performance (relative to the projections serving as the basis for crediting) and abandonment (see Section 5.4) increases over time as forests mature and landowners face various management pressures. Furthermore, as forests age, landowners are more likely to engage in management for forest health and resilience to mitigate ongoing risk from natural disturbances, which may result in deviations below the projections used for quantification under this methodology.

The discount applied is scaled relative to the 100-year maximum crediting period allowed under this methodology, based on a maximum discount of 10 percent, and is determined separately for each forest type comprising a project. Thus, a project consisting of one forest type with a crediting period of 35 years and a second forest type with a crediting period of 50 years would have a discount of 3.5 percent applied to the former and a discount of 5 percent applied to the latter. Projects with a conservation easement containing the first three requisite terms indicated in Table 3.1 have significantly lowered risk of non-performance and, as such, have a maximum discount of 5 percent applied, with the applicable discount similarly scaled relative to the 100-year maximum crediting period. Discounts are determined and applied automatically by the Reforestation Communities Data File.

5.4 Estimating Abandonment Rates

The likelihood of projects being abandoned is expected to be 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 and described in Section 3.8.2. 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 variable discount is applied that accounts for the potential abandonment of projects, which contributes to a programmatic *ex ante* risk discount to maintain the integrity of issued credits in the unlikely event of project area conversion and/or performance decline. As indicated above,

this discount is determined by forest type and 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 change in the level of shrub cover associated with the forest types where site preparation activities occur. An estimate of percent shrub cover for the entire area represented by a given forest type is determined through remote sensing using the methodology provided in Appendix B. The remote sensing data used for the analysis should be from a month where foliage is present and visible (spring or summer) and must be dated within the 12 months prior to the start date for imagery used to analyze shrub cover prior to site preparation (variable $CC_{shrub,pre,f}$) and within the 12 months following completion of site preparation for imagery used to analyze shrub cover post-treatment (variable $CC_{shrub,post,f}$). Contact Reserve staff if no images fitting these requirements are available. If all shrub cover is removed during site preparation activities, analysis of post-treatment shrub cover is not required. Furthermore, project proponents may optionally assume for quantification purposes that all shrub cover has been removed rather than conducting the post-treatment canopy cover analysis, which will result in a conservative estimate of mobile combustion emissions.

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

$MC_f = (-1) \times (0.65 \times (CC_{shrub,pre,f} - CC_{shrub,post,f}) \times A_f)$		
Where,		Units
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, ¹⁷ assuming diesel fuel use, 8 gallons of fuel consumed per hour of equipment use, ¹⁸ and 8 hours of equipment use to clear an acre with 100% shrub cover	tCO ₂ e/acre
$CC_{shrub,pre,f}$	= Shrubs cover as a percentage of area A comprising forest type f prior to site preparation activities	%
$CC_{shrub,post,f}$	= Shrubs cover as a percentage of area A comprising forest type f after site preparation activities have occurred	%
A_f	= Size of the area for forest type f	acres

¹⁷ 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

¹⁸ 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.

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

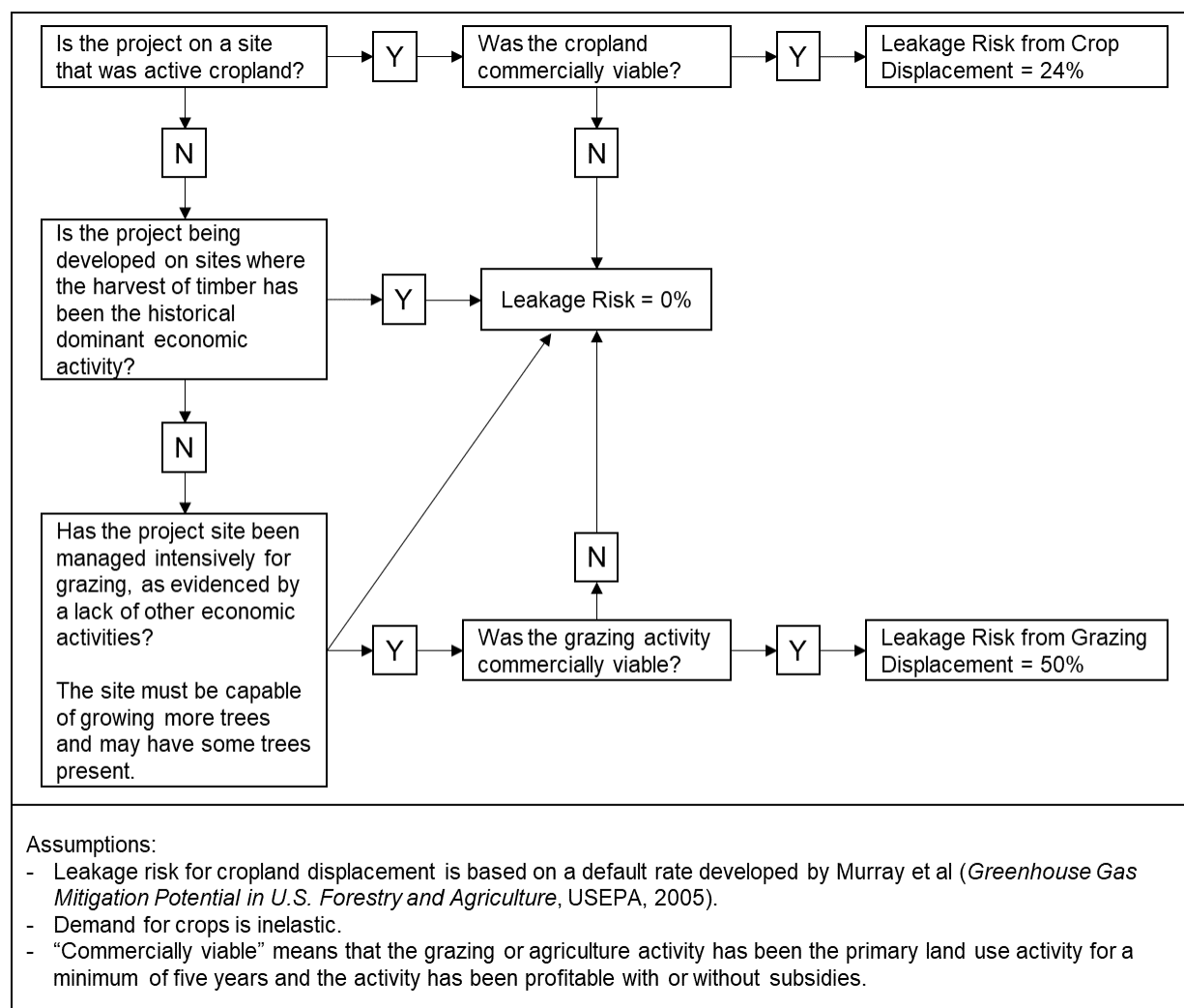


Figure 5.1. Activity Shifting ("Leakage") Risk Assessment for Reforestation Projects

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

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

5.6 Permanence Risk Pool

As described in Section 3.8.3, the permanence risk pool is designed to act as a programmatic insurance mechanism to protect against unavoidable reversals (reversals caused by natural agents like fire, disease, or insects; the risk of avoidable reversals are addressed by the programmatic *ex ante* risk discount). To align with the design of the Climate Forward program, no ongoing monitoring and reporting is required to be undertaken by project proponents after a project is registered and FMUs are issued. Projects may always opt into voluntary monitoring

and reporting, as described in Section 6.2, and project proponents are encouraged to inform the Reserve of any suspected reversals.

Projects may also opt to transfer into the Climate Action Reserve's offset program under a corresponding protocol, as described in Section 6.4, where ongoing ex post monitoring, reporting, verification guidance is provided. The Reserve aims to ensure that all FMUs meet permanence standards at the program level. Regardless of whether any voluntary monitoring and reporting occurs by a project proponent, the Reserve will maintain an estimate of the overall tonne-year value of carbon stocks participating in the program through programmatic monitoring. If the Reserve determines a reversal has occurred, whether intentional or unintentional, within the crediting period of a project, FMUs will be retired from the permanence risk pool. Reversals will be quantified based on the FMUs issued to the project net of the tonne-year value achieved prior to the reversal.

Similar to programmatic *ex ante* risk discounts, all projects are required to contribute to the permanence risk pool, based on a maximum discount of 10 percent¹⁹ and scaled according to the crediting period length(s) of the project, by forest type, relative to the 100-year maximum crediting period allowed under this methodology. However, projects employing a conservation easement with at least terms 1 through 3 indicated in Table 3.1 are eligible to reduce their maximum discount to 5 percent.

The Reforestation Communities Datafile will calculate the project's required contribution based on the presence of an easement containing the necessary terms.

¹⁹ Percentages are based on the default reversal risk percentages in the Reserve's Forest Protocol V5.0 related to unavoidable reversals.

6 Project Implementation and Monitoring

Climate Forward requires that a Project Implementation Report (PIR) be established for all implementation and reporting activities associated with the project.²⁰ 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. However, projects may optionally transition to the Climate Action Reserve's voluntary offset program and a corresponding protocol, subject to monitoring, reporting, and verification requirements found within that protocol. Additionally, the Reserve will conduct programmatic monitoring of reforestation projects as a means to ensure the integrity of FMUs issued overall under this methodology.

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 newly established trees are being assessed as the primary effect of a project, with future sequestration being impacted by the presence of older, pre-existing trees or naturally regenerating trees that would have been present regardless of whether the project activity was undertaken, such trees competing for resources and canopy area with those trees established by the project are included in the baseline. Baseline carbon stocks are evaluated based on an estimate of canopy cover of pre-existing trees and/or an estimate of natural regeneration occurring irrespective of the project activity.	CO ₂ equivalent	(m) - Remote and on-site sampling is performed to estimate pre-existing tree canopy cover and natural regeneration occurring irrespective of the project activity, respectively.

²⁰ A copy of the Project Implementation Report template can be accessed at <https://climateforward.org/program/program-and-project-forms/>.

Parameter	Description	Data Unit	Calculated (c) Measured (m) Reference (r) Operating Records (o)
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 naturally regenerated seedlings encouraged by the project activity or trees planted by the project, assuming adequate tree stocking at the time of project confirmation. The project stocks are discounted for conservative accounting as a measure against potential project performance decline and abandonment. A contribution to a permanence risk pool is also required of each project to address the risk of potential reversals from natural disturbances or other unavoidable causes.	CO ₂ equivalent	(r) - The values and adjustments are described in the Reforestation Communities Data File.

6.2 Voluntary Monitoring and Reporting

Although project proponents have no obligation to monitor and report ongoing project outcomes after it is registered with Climate Forward, some may want to continue monitoring and reporting on the project on a voluntary basis with no bearing on credits issued to the project. Project proponents may conduct such voluntary monitoring and reporting by submitting relevant documentation to be posted on the project's account page on the Climate Forward registry. Such documents will be listed alongside project documents posted for project registration. Submitted documents will be reviewed by Reserve staff to ensure any claims being made are reasonable; however, they will not be subject to confirmation and will be indicated as such in the registry. Although project proponents reporting in this manner are doing so voluntarily and define how and what to report in their Climate Forward account, the following items are recommended for minimal reporting purposes:

- Reporting date
- Changes to project area since most recently submitted report
- Current aerial/satellite imagery of the project area
- Inventory results and/or carbon stock estimates (if such work has been conducted), which will not be reviewed by the Reserve or a confirmation body

6.3 Voluntary Ongoing Monitoring Incentive

Each Climate Forward methodology is designed to ensure the quantification of emission reductions over the crediting period is conservative. It may be possible to have additional FMUs issued following *ex post* verification, using data collected by the project through ongoing monitoring from the project sites. If data collected from within or after the crediting period are submitted in a Project Monitoring Report and successfully verified, the Reserve may approve the issuance of further FMUs. *Ex post* FMUs may only be issued for sites for which ongoing monitoring and data collection has occurred. A site visit is required during *ex post* verification. Nevertheless, the Reserve retains the right to determine at its sole discretion whether a project proponent has successfully demonstrated that it has outperformed the basis for FMUs originally issued to their project.

Project proponents also have the option to conduct *ex post* monitoring and verification to convert FMUs and/or the associated project to the Reserve's voluntary offset program, as described in Section 6.4.

6.4 Conversion of FMUs to Offset Credits

Projects developed under this methodology can also optionally decide to transfer FMUs to offset credits (Climate Reserve Tonnes, or CRTs) and potentially the project to *ex post* monitoring under the Climate Action Reserve's voluntary offset program, which recognizes sequestered carbon that has been measured and ensures permanence through a commitment to maintain, monitor and report on the sequestered tonnes as defined by the Reserve's corresponding *ex post* protocols containing reforestation as an eligible project activity. Since the integrity of *ex ante* crediting under the Climate Forward Reforestation Forecast Methodology is based on only recognizing the *tonne-year value* of the projected sequestered tonnes (except for projects for which the long-term maintenance of sequestered carbon is assured and *ex ante* credits are issued based on tonne-tonne values), submitting the project to the Reserve's voluntary offset program can result in the issuance of CRTs commensurate with the tonnes measured and verified and the permanence commitment made by the project at the time of transfer, less any tonnes that were issued previously as FMUs and were subsequently retired.

If any previously issued FMUs were not retired prior to the transfer of a project, those unretired FMUs may be transitioned to CRTs. Any FMUs that have been retired prior to the transition of the project would need to be deducted from the CRT issuance before the amount of unretired FMUs to be transitioned would be determined. For example, if a transferring project was originally issued 100 FMUs, of which 50 had been retired prior to the transfer of the project, and a total of 100 CRTs were quantified under the Reserve's Forest Project Protocol (prior to reconciliation with the project's FMU issuance), the 50 retired FMUs would be unavailable for transition and their associated climate benefits assumed to have been realized already. As a result, 50 unretired FMUs would be transitioned to CRTs for the project.

Since the quantification for the issuance of CRTs being converted from FMUs is dependent on the permanence commitment associated with the resulting CRTs, project proponents should contact the Reserve prior to initiating the conversion process. Furthermore, if conversion is to occur prior to the end of a project's crediting period, reconciliation of credits between Climate Forward and the Reserve's voluntary offset program will be managed by the Reserve.

Figure 1.1 in Section 1.2 displays the general relationship of crediting under Climate Forward and the Reserve's voluntary offset program. Further information about the process for transferring credits and projects between programs can be found in the Climate Forward Program Manual.²¹

²¹ Available at <https://climateforward.org/program/>.

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.²²

Listing:

- Project Submission form
- Reforestation Project Goals Form
- Reforestation Project Conservation Easement Screening Form (if applicable; not public)
- KML File of Project Area

Confirmation:

- Signed Attestation of Title form
- Signed Attestation of Legal Additionality form
- Signed Attestation of Regulatory Compliance form
- Project Implementation Report (including KML of project strata, if applicable)
- Reforestation Communities Data File

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.

²² Climate Forward documents and forms are available at <https://climateforward.org/program/program-and-project-forms/>.

Examples of information the project proponent must retain include:

- All data inputs for the calculation of the project carbon enhancements, including all required sampled data (including relevant records from sampling performed following the guidance in Appendix B), 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
- 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 tree 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. For

projects based on sowing seeds, confirmation must wait until the project area is stocked with seedlings that are 6 inches in height on average to allow confirmation bodies to evaluate seedling health properly, as indicated 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 Site 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:

1. Assess the compliance of the Project Implementation Report with the requirements of the methodology, Climate Forward Program Manual, and Climate Forward Confirmation Manual
2. Identify the list of parameters required by the methodology and confirm that the Project Implementation Report accounted for all necessary parameters
3. 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. However, data produced documenting estimates of pre-existing trees, naturally regenerating seedlings, and shrub cover will be reviewed by the confirmation body.

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, or, for projects based on sowing seeds, after newly established trees are 6 inches in height on average. 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	Site stocking at the time of the confirmation site visit rate of 70% 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 of newly established trees
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 Section 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%, as assessed on the start date.	Yes

Methodology Section	Eligibility Qualification Item	Apply Professional Judgment?
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 and is signed by a professional forester or a professional ecologist.	No
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	<p>If project proponent is not the owner of the trees, the PIR contains a reference to any external agreement(s) 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:</p> <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); 	No

Methodology Section	Eligibility Qualification Item	Apply Professional Judgment?
	<ul style="list-style-type: none"> The ability to be issued FMUs and transact such FMUs via the Climate Forward registry is transferred to the project proponent. <p>For instances where multiple agreements have been obtained from the owners of the trees when projects comprise multiple properties under multiple ownerships, the confirmation body must confirm that all properties comprising the project area are covered by an agreement containing the above-indicated provisions.</p> <p>For all projects involving the transfer of the right to claim emissions reductions credits to the project proponent, proof of ownership of the trees by the party(ies) transferring their rights must be provided.</p>	
3.6 Ownership and Double Counting	A KML file has been provided outlining the area where reforestation has been applied.	No
3.8 Ensuring Permanence	If a conservation easement is used to extend the project crediting period or apply tonne-tonne accounting, the project proponent has demonstrated that the required easement provisions are consistent with the terms identified in Table 3.1. If the project is on government (secured) lands, the project proponent has demonstrated that management on the project area will be consistent with the permanence requirements of this methodology, as outlined in Section 3.8.1.	Yes

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 related to pre-existing trees or seedlings are estimated following the guidance in Section 5.1. Confirmation body is to replicate the evaluation of pre-existing tree canopy cover and baseline shrub cover, with the confirmation body's canopy cover estimate for each being within +/-5% (with a standard error less than +/-10% of the canopy cover estimate) of the project's reported results. Rationale and any supporting evidence for the selection of height class(es) to determine the ratio estimator applied to estimate baseline shrub carbon stocking is reviewed for reasonableness.	Yes, with respect to shrub height classes and pre-existing seedlings

Methodology Section	Quantification Item	Apply Professional Judgment?
	Images from the photo plots taken to determine the likely future forest cover produced by pre-existing seedlings are reviewed for each forest type on sites not involving site preparation that results in the promotion of natural regeneration. The review of the photos is to be combined with observations made during the confirmation site visit to evaluate, based on professional judgment, whether the Natural Regeneration Class assignment(s) for future forest cover within each forest type, as asserted by the professional forester or ecologist associated with the project, are reasonable.	
5.2.1 Estimating Project Stocks in Live Trees	If project proponent is conducting modeling for a project employing a conservation easement that includes only terms 1-3 of those indicated in Table 3.1 or for a project for which approval from the Reserve was obtained owing to project species and/or planting conditions being inconsistent with assumptions applicable to default projections, such modeling has been performed in accordance with the modeling guidance provided in this methodology, including the incorporation of appropriate conservativeness factors.	Yes
5.2.4 (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 terms described in Table 3.1 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. For projects composed of multiple strata, based on forest communities and/or planting conditions, a map and KML file have been provided depicting strata boundaries.	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	For projects including soil carbon increases, eligible conditions allowing for quantification of changes in soil carbon stocks, as outlined in the Reforestation Communities Data File, are met and reported.	No
5.2.2 (5) Determining Gross Forecasted GHG Removals	Images from at least 5 photo plots taken to evaluate shrub carbon stocking are reviewed for each forest type. Plots to be reviewed are randomly selected from among the project's sample plots and average results from carbon stocking based on the identification of corresponding fuel models must be within 10% of the average results reported by the project proponent.	Yes
5.2.2 (6) Determining Gross	The expansion of the per acre values reported in the Reforestation Communities Data File to the project area has been correctly reported in the project's Climate Forward Registry account.	No

Methodology Section	Quantification Item	Apply Professional Judgment?
Forecasted GHG Removals		
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 shrub cover analysis, per Appendix B, was conducted correctly, with estimated shrub cover prior to site preparation made by the project proponent within +/- 5% of an estimate produced by the confirmation body.	No
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
5.6 Permanence Risk Pool	The discounts identified in Section 5.6 have been correctly applied.	No
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, de-forestation, 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 methodology, the easements must include the requisite terms, as described in Table 3.1.
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.
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 Site 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.

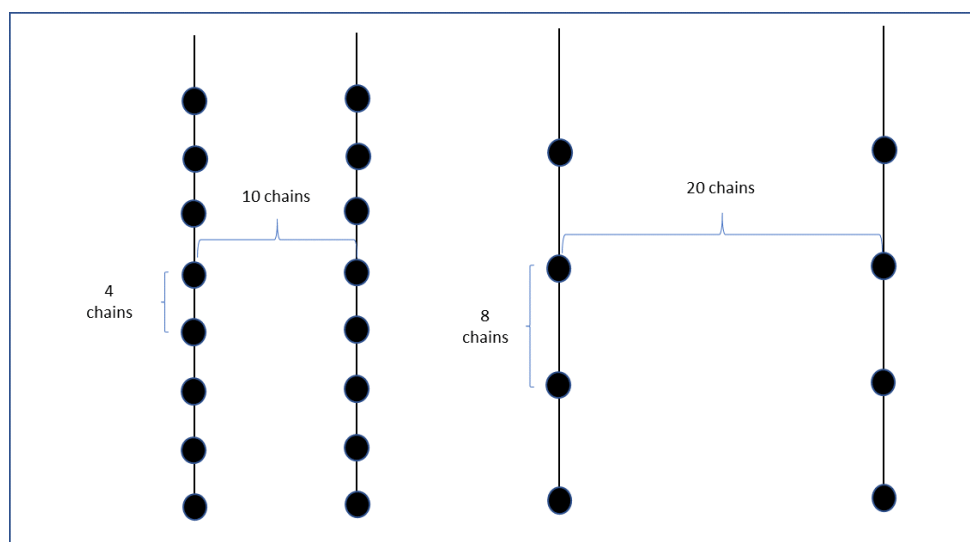


Figure A.1. Examples of the Application of the Uniform Plot Distribution Requirement

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. For projects using the default calculations provided in the Reforestation Communities Data File based on either seed or seedling plantings, a plot radius of 8.3 feet using a measuring tape or other calibrated measuring device must be used. Projects not using the default calculations in the Reforestation Communities Data File based on approval from the Reserve, as described in Section 5.2, are to use an alternate sample plot radius selected by Reserve staff from Table A.1. The plot radius to be used is based on the planting density of the project, rounded up to the nearest density indicated in Table A.1.

Table A.1. Alternate Sample Plot Radius Lookup Table

Trees/Seedlings per Acre	Sample Area (ft ²)	Sample Plot Radius (ft)
190	229	8.5
180	242	8.8
170	256	9.0
160	272	9.3
150	290	9.6
140	311	10.0
130	335	10.3
120	363	10.8
110	396	11.2
100	436	11.8
90	484	12.4
80	545	13.2
70	622	14.1
60	726	15.2
50	871	16.7
40	1,089	18.6

- 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' project tree is found within the plot area. A countable project tree is:
 - i. Sapling or seedling that is at least 6 inches tall
 - ii. Meets the native tree requirements per Section 3.4
 - iii. Is healthy. Healthy means the seedling appears vigorous and likely will continue growing.

- f. If a plot center is located along the edge of a stratum or the project area such that a portion of the plot area will fall outside of the stratum/project area, the confirmation body may displace the plot location up to the length of the plot radius from the originally mapped location so that the full area of the plot falls within the stratum/project area, recording the azimuth and distance of displacement. For example, if a plot with a radius of 8.3 feet falls only 5 feet from the edge of the project area, the confirmation body may displace the plot center as much as 8.3 feet away from the originally mapped plot location.
 - g. 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. In such cases, the confirmation body shall confirm the site is less than one quarter acre in size and consistent with the requirements specified in Section 3.1. Furthermore, when conducting sampling on a project that has pre-existing trees, as reported according to baseline quantification requirements outlined in Section 5.1.1, any plot that lands under a pre-existing tree (based on any part of the sample plot falling directly under the canopy of a pre-existing tree) shall be excluded. If a plot is excluded, the confirmation body shall continue to the next plot. Excluded plots are to be recorded by the confirmation body to indicate they were not sampled and why. However, excluded plots are not included in the calculation of the stocking level percentage, as outlined in Step 4.
- 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 three 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.
 - c. Option 3 – Confirmation activities may be paused to allow the project proponent to attempt to re-establish trees again on the project area to satisfy the minimum stocking requirement. In such instances, the Reserve will determine if the project is able to remain listed under the original version of the methodology under which it was originally listed, as well as when confirmation activities may resume.

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 Canopy Cover

The following is a description of the requisite method for determining the percentage canopy cover on the project area for quantification of baseline pre-existing tree carbon stocks and/or secondary effects related to mobile emissions. The method for each is essentially identical, with the only difference being what type of vegetation is determined to be absent or present at each sample point.

The canopy cover of pre-existing trees must be determined to adjust project credit quantification downward, as indicated in Section 5.1.1. Such trees are assumed to occupy space that otherwise would be occupied by trees that are establishing on the site as part of the project activity and thus would serve as the basis for forecasted live tree stock increases resulting from the project. The percentage pre-existing tree canopy cover must be estimated for each forest type comprising the project area. The results from application of the method described below to evaluate tree canopy cover are entered as $CC_{tree,f}$ in Equation 5.1.

Shrub cover must be quantified for those portions of each forest type comprising the project area where site preparation activities involving mechanical equipment (e.g., brush raking, mastication) occurred as a part of reforestation activities, as indicated in Section 5.5.1, respectively. The quantification of secondary effects emissions related to the combustion emissions associated with site preparation activities under the Reforestation Methodology is based on the change in total shrub canopy area, as derived from analysis conducted using remote sensing imagery from both before and after site preparation activities. If all shrubs are removed on areas where site preparation activities occur, on imagery from before site preparation activities need be analyzed. The percentage of shrub cover must be determined for each site preparation area by forest type. The results from the analysis described below are entered as $CC_{shrub,pre,f}$ or $CC_{shrub,post,f}$ in Equation 5.2.

Sampling, whether for pre-existing tree canopy cover or for shrub cover, must achieve a standard error that is +/- 10 percent or less of the estimate of percent canopy cover (e.g., if percent tree canopy 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 directly allow for the selection of specific imagery dates. As such, the analysis should be performed using i-Tree Canopy's instructions for comparing results to historical imagery, with imagery from other sources and from appropriate dates for the analysis used. To properly use imagery outside of the i-Tree Canopy interface, 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. 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.

Instructions for conducting the i-Tree Canopy analysis are provided in the document "Canopy Cover Analysis Instructions."²³

²³ Available on the Reforestation Forecast Methodology webpage at <https://climateforward.org/program/methodologies/reforestation/>.