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ACTION
RESERVE

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Abbreviations and Acronyms

ANATI	National Land Administration Authority
CH ₄	Methane
CMW	Carbon Monitoring Worksheet
CO ₂	Carbon dioxide
CRT	Climate Reserve Tonne
EMA	Mexican Accreditation Entity
ES	Environmental Safeguard
FPIC	Free, Prior, and Informed Consent
FMP	Forest Management Plan
GHG	Greenhouse gas
IFM	Improved Forest Management
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
MIAMBIENTE	Ministry of Environment of the Republic of Panama
MRV	Monitoring, Reporting, and Verification
N ₂ O	Nitrous oxide
PAC	Annual Harvest Permit
PFP	Panama Forest Protocol
PIA	Project Implementation Agreement
REDD+	Reducing emissions from deforestation and forest degradation
Reserve	Climate Action Reserve
SSR	Source, sink, and reservoir
SS	Social Safeguards
UNFCCC	United Nations Framework Convention on Climate Change

VR Verified removal

1 Introduction

This protocol is focused on the crediting of activities that sequester CO₂e from the atmosphere through increasing carbon stocks in trees over time. The protocol provides project-level eligibility rules, methods to calculate net removals of CO₂ from the atmosphere due to sequestration activities, procedures to address and compensate for the release of CO₂ back to the atmosphere (i.e., “reversals”), and approaches for long-term project monitoring and reporting. The goal of this protocol is to ensure that the net greenhouse gas (GHG) removals caused by a project are accounted for in a complete, consistent, transparent, accurate, and conservative manner and may therefore be reported to the Reserve as the basis for issuing carbon offset credits (called Climate Reserve Tonnes or CRTs).

The Climate Action Reserve is the most trusted, efficient, and experienced offset registry for global carbon markets. A pioneer in carbon accounting, the Reserve promotes and fosters the reduction of greenhouse gas (GHG) emissions through credible market-based policies and solutions. As a high-quality offset registry for voluntary carbon markets, it establishes rigorous standards involving multi-sector stakeholder workgroup development and local engagement and issues carbon credits in a transparent and publicly available system. The organization also supports compliance carbon markets in California, Washington and internationally. The Reserve is an environmental nonprofit organization headquartered in Los Angeles, California with staff members located around the world. For more information, please visit www.climateactionreserve.org.

The Reserve develops protocols aligned with the laws, decrees, resolutions, and on-the-ground context of a specific jurisdiction or jurisdictions to establish standardized eligibility and additionally criteria and baseline scenarios. This protocol is thus aligned with the laws, norms, and context of the Republic of Panama, including the National Constitution of the Republic of Panama, Law 1 of February 3, 1994 “By which Forest Legislation is Established in the Republic of Panama”, and Law 41 of July 1, 1998 “General Environment of the Republic of Panama”. See Section(s) 3.2 for further information on how these laws were incorporated in the eligibility criteria.

This protocol is designed to ensure the complete, consistent, transparent, accurate, and conservative quantification and verification of GHG emission reductions associated with a forest project.¹

A glossary of terms related to Forest Projects is provided in Section 9 of this protocol. Throughout the protocol, important defined terms are capitalized (e.g., “Forest Owner”).

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

1.1 About Forests, Carbon Dioxide, and Climate Change

Forests² have the capacity to both emit and sequester carbon dioxide (CO₂), a leading GHG 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 particular 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 of carbon in the reservoir, or a net sink, resulting in an increase of carbon to the reservoir. In other words, forests may have a net negative or net positive impact on the climate.

Through sustainable management and protection, forests can play a positive and significant role to help address global climate change. The Reserve's Panama Forest Protocol (PFP) is designed to address the forest sector's unique capacity to sequester, store, and emit CO₂ and to facilitate the positive role that forests can play to address climate change.

² The Forest Legislation of the Republic of Panama of 1994 establishes the definitions for natural forest, artificial forest, plantation forests, lands of aptitude mainly forestry, production forests, protection forests, special forests. The concepts can be included in the definition of "forest" under this Protocol. The Protocol uses the term forests for all forest ecosystems, including forests, jungles, mangroves, and arid zone vegetation that meet the definition of forest under this protocol (see Section 9 Glossary of Terms).

2 Stages of Project Development and Maintenance

The many key steps involved in developing a project credit are shown in Figure 2.1.

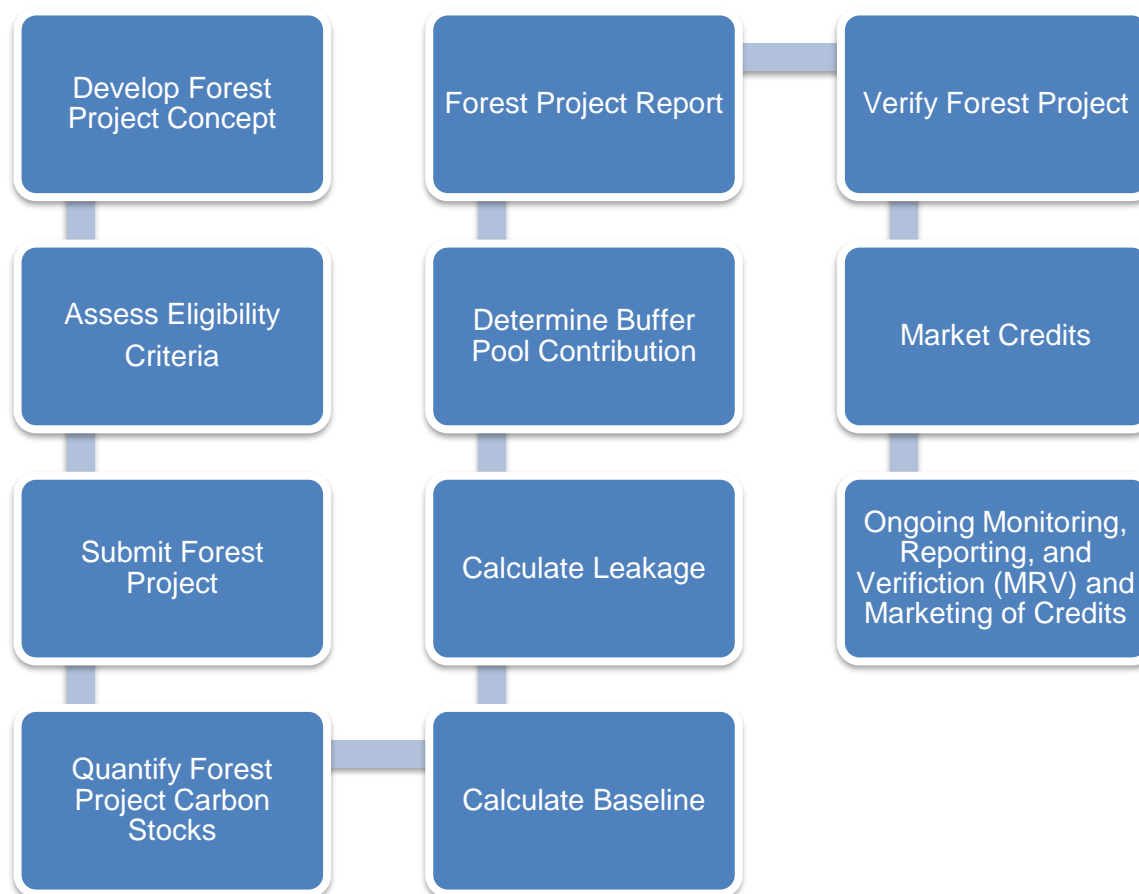


Figure 2.1. Key Steps Involved in Developing and Maintaining a Forest Carbon Project

2.1 Forest Projects

For the purposes of the PFP, a Forest Project is a planned set of defined activities designed to increase removals of carbon through increasing forest carbon stocks.

2.2 Project Area and Activity Areas

Forest Projects have two distinct levels of monitoring: a Project Area and Activity Areas.

2.2.1 Project Area

The Project Area includes all areas within an ownership, held either collectively, privately, or publicly, in which project activities within Activity Areas (defined below) may occur as part of the project, currently or in the future.

For privately owned lands, the Project Area must consist of the entire area included under all land title(s) that encompass planned Activity Areas. Private landowners that have multiple land

titles with Forest Management Plans must include all land titles with Forest Management Plans in their Project Area. All included land titles must share a common ownership³

For public lands, the Project Area is considered to be the entire area included under all land title(s) that encompass planned Activity Areas. All included land titles must be under jurisdiction of the same government agency.

For all ownership types, multiple properties, contiguous or disparate, may be included in a common Project Area if the land titles demonstrate ownership by the same Forest Owner.

Project Areas cannot be redefined without approval by the Reserve following the initial verification. The geographic boundaries defining the Project Area must be described in detail at the time a Forest Project is listed on the Reserve.

The Project Area boundaries must be defined using a map, including the following elements:

- Major settlements (towns), roads and watercourses.
- A legend and a scale.
- A shapefile and KML that includes the project boundary is required to be included with the project submission that matches project boundaries in the project document.
- The maps should be of adequate resolution to clearly identify the requested features.

2.2.2 Activity Areas

Activity Areas are explicit areas within the Project Area where defined activities (Restoration, Reforestation, Agroforestry, Improved Forest Management, etc.) occur that lead to quantified increased sequestration compared to baseline levels. Activity Areas need not be contiguous and new Activity Areas can be added throughout the life of a project. In order to comply with project monitoring and documentation requirements, a shapefile and KML file and map of Activity Area boundaries is required (see Section 7).

2.2.3 Monitoring Requirements for Project and Activity Areas

Distinct monitoring guidance is provided for Project Areas and Activity Areas. The purpose of developing a two-tiered approach to monitoring is to ensure efficiency in addressing project safeguards and leakage at the larger, Project Area level, while allowing for adequate rigor in quantifying carbon stocks at the smaller, Activity Area level. In addition, by allowing for multiple Activity Areas within one Project Area, the protocol provides flexibility for adding new project activities without the need to create a new project.

Figure 2.2 displays the relationship between Activity Areas and the Project Area and outlines some of the general monitoring and reporting requirements associated with each area.

³ Common ownership is defined by having the same landowner or landowners listed on the property title.

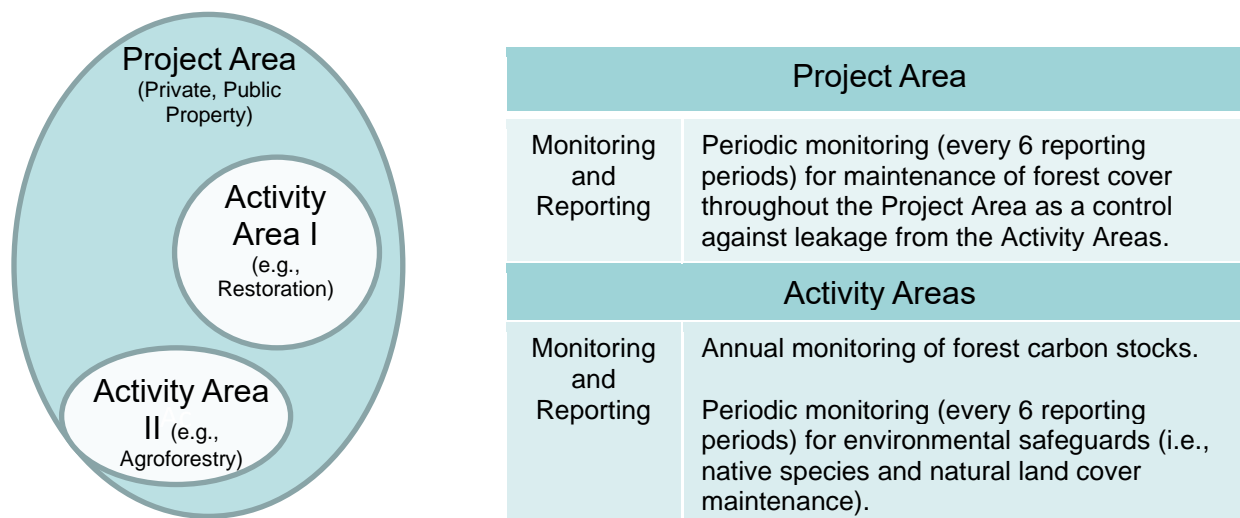


Figure 2.2. Relationship between the Project Area and Activity Areas (within a Project Area) and the General Monitoring Requirements Associated with Each Level

2.3 Project Activities

Under the PFP, the Reserve will register Forest Project activities for enhancement of forest carbon stocks; accordingly, this version of the PFP does not include avoided emissions as eligible activities for the generation of CRTs.

Within the Project Area boundaries, Activity Areas are identified as explicit areas where Forest Owners implement management actions. Each Activity Area must be identified as one of the activities defined by the Reserve in Table 2.1 and meet the associated definition at the Activity Area's initiation. While management actions may change over the course of the Activity Area's life, the activity designation is based on the activity definition that is met at the Activity Area's initiation. For example, a Restoration Activity Area may later obtain an authorized forest management plan, however, the activity designation would remain Restoration since that was the activity established at the Activity Area's initiation. Specific management actions under each activity may be diverse. Some examples are shown in Table 2.1.

In addition to the activity definitions in Table 2.1, Activity Areas must further meet eligibility and additionality criteria in Section 3.

Table 2.1. Activity Area Designation

Activities	Definition	Activity Area Criteria
Agroforestry and Silvopastoral	<p>Agroforestry is the intentional integration of trees into non-tree crop and animal farming systems.</p> <p>Silvopastoral systems is a subset of agroforestry wherein trees are interplanted within landscapes used primarily for livestock grazing. Trees are either planted or otherwise encouraged by natural regeneration. Trees may exist amongst, or adjacent to the cultivated crops and grazing areas, and may be harvested as allowed by law.</p>	<p>Agroforestry and Silvopastoral Activity Areas may be developed within protected areas if the activities are not explicitly prohibited by regulations or terms within the protected area's management plan.</p> <p>Trees that produce an agricultural product may be included; see Section 3.10 for applicable Environmental Safeguards (ES).</p>
Improved Forest Management (IFM)	<p>Improved Forest Management is a set of management actions that enhance sequestration and resiliency of sequestered carbon in forest landscapes under harvest management plans.</p> <p>Activities that lead to carbon enhancements in managed forests, may include, but are not limited to, the following actions:</p> <ul style="list-style-type: none"> ▪ Increase the harvest rotation age towards optimum rotation age. ▪ Harvest selection while thinning to retain the best genotypes and phenotypes to improve the rate of sequestration. ▪ Control stocking to manage competition, and the related effects on forest growth and resiliency. ▪ Increase stocking in understocked areas within the managed forest. ▪ Reduction of litter and surface fuels in fire-prone ecosystems to enhance resiliency. 	<p>The primary land cover is planted forests, forest plantations⁴, or artificial forest⁵, which may be present in varying densities and sizes, and the forest has a forest management plan authorized by MIAMBIENTE for the purposes of commercial timber harvest allowing harvest of all planted trees.</p> <p>The Activity Area is limited to the area with a MIAMBIENTE approved Forest Management Plan for commercial timber harvest and must include the entire area under the Forest Management Plan, or a subset with an equivalent age distribution as the entire area under the Forest Management Plan. The Activity Area cannot include areas that prohibit or limit commercial harvest.</p> <p>For Activity Areas that include a subset of the entire area under the Forest Management Plan, project developers must submit the age class distribution for the entire area and for the subset and demonstrate that each age class is within 5% of the distribution for the entire area under the Forest Management Plan.</p> <p>IFM Activity Areas must comply with required Environmental Safeguards, see Section 3.10.</p>
Reforestation	<p>Reforestation under the PFP includes the direct planting of native tree seedlings or site preparation activities that result in forest regeneration, resulting in enhanced carbon sequestration.</p>	<p>Reforestation can occur on landscapes that have been out of forest cover for the past 10 years or have recently been impacted by a natural disturbance that has reduced the canopy cover to less than 50%. Reforestation Activity Areas must have a reforestation permit approved by MIAMBIENTE. For</p>

⁴ Per Law 1 of 1994, Forest Legislation of the Republic of Panama, a "forest plantation" is forest mass that is product of reforestation.

⁵ Per Law 1 of 1994, Forest Legislation of the Republic of Panama, "artificial forests" are any plant, woody, tree formation, established or created by man; see Section 3.2 Forest Owner.

Activities	Definition	Activity Area Criteria
	Exotic species that have been approved for ecological or climate adaptation purposes approved by MiAMBIENTE may also be allowed. See Section 3.10 for further information.	Reforestation Activity Areas, pre-existing trees or natural regeneration must be excluded from the forest carbon project inventory. Reforestation can occur within protected areas.
Restoration	Restoration is a set of actions applied to increase carbon stocks and canopy cover on degraded natural forests ⁶ . Actions may be direct and include tree planting, authorized thinning for disease and infestation, or other silviculture action to increase forest cover. Actions may also be indirect and focused on reducing ongoing actions that led to degraded forest conditions, thereby enabling natural forest succession to enhance carbon stocks. See Section 3.13.2.3 for further information on the Performance Standard Test for Restoration activities and requirements for demonstrating degradation.	Restoration is an eligible activity in any natural forest, including protected areas, that do not have an authorized Forest Management Plan for commercial timber harvest and/or where commercial harvesting is prohibited due to a law, regulation, or norm. Restoration Activity Areas must have a restoration plan approved by MiAMBIENTE. Actions implemented may not contradict any regulation or management plan governing the Activity Area.
Large Urban Forestry ⁷	Urban Forestry is the direct planting and management for increased forest cover within urban areas.	Large Urban Forest Activity Areas can only occur on lands zoned as a developed or urbanized area or suburban zone by the Ministry of Housing and Territorial Planning, or under urban forest zoning by the municipality. Large Urban Forest Activity Areas can occur on urban landscapes that are at least 10 contiguous hectares with a minimum of 10% canopy cover.
Small Urban Forestry		Small Urban Forest Activity Areas can only occur on lands zoned as a developed or urbanized area or suburban zone ⁸ by the Ministry of Housing and Territorial Planning, or under urban forest zoning by the municipality. Small Urban Forest Activity Areas can include urban areas less than 10 contiguous hectares with a minimum 10% canopy cover and can include the planting of street trees.

Avoided emissions from deforestation and degradation (i.e., avoided emissions) are not eligible as project activities.

⁶ Must meet the forestlands definition in the glossary and have at minimum 10% canopy cover; otherwise, should refer to Reforestation definition and eligibility criteria.

⁷ Also known in the Republic of Panama as "Arborization".

⁸ Executive Decree No. 36, Art.13 (August 31, 1998).

3 Eligibility Criteria and Participation Requirements

Forest Projects must meet several criteria and conditions described below, to be eligible for registration with the Reserve, and must adhere to certain requirements related to their duration and crediting periods.

3.1 Project Location

This protocol is applicable to Forest Projects located anywhere in Panama, provided they meet all other eligibility requirements described in this protocol.

3.2 Forest Owner

A Forest Owner can be any natural or juridical person that has undisputed legal ownership of or jurisdiction over the land through land title or rights granted to them from a governmental agency. Eligible landownership categories under this Protocol include private and public lands. The Climate Action Reserve maintains the authority to determine which public agencies may be eligible to be Forest Owners per the definition of this Protocol.

Comarcas⁹, collective lands¹⁰, possessory rights, and rural settlements may be considered eligible in a future version of the Protocol upon approval from MiAMBIENTE and the presentation of a registered land title and property delineation with the National Authority of Land Administration (ANATI) or Public Registry of Panama.

Per Law 1 of February 3, 1994, Forest Legislation of the Republic of Panama, Article 10¹¹, the State is owner of all Natural Forests and the lands on which these forests exist. Reforested lands or forests planted by the State on State-owned lands are also property of the State. Law 1 of 1994, Forest Legislation of the Republic of Panama, defines Natural Forests as any woody, native plant formation, with a predominance of tree species, which due to their function and composition, should be considered as such. In comparison, Artificial Forests are defined as any plant, woody, tree formation, established or created by man and Forest Plantations are defined as forest mass that is product of reforestation. This Protocol accordingly considers all Natural Forests to be property of the State and to require specific approval from MiAMBIENTE as the governing body to clarify the forest carbon rights on these lands and for the Forest Owners with land titles including Natural Forests to participate in forest carbon projects. Artificial Forests, or planted forests, may be eligible under the allowed landownership categories.

The Forest Owner is responsible for undertaking a Forest Project and registering the Forest Project with the Reserve and is ultimately responsible for all Forest Project reporting. The Forest Owner may, however, engage a project developer to assist or consult with the Forest Owner and to implement the Forest Project. All information submitted to the Reserve on behalf of the Forest Owner shall reference the Forest Owner, who is ultimately responsible for the accuracy and completeness of the information submitted.

⁹ Comarca property includes those properties recognized by the National Constitution, Article 127, including the seven indigenous communities (*pueblos indígenas*).

¹⁰ Collective lands include indigenous communities recognized by Law 411 (2008) that do not belong to the Comarcas.

¹¹ Article 10: The State Forest Heritage is made up of all the natural forests, the lands on which these forests are located and by which state lands preferably suitable for forestry. Forest plantations established by the State on lands owned by the State will also be part of this heritage.

The following types of ownership are eligible for participation.

3.2.1 Private Property

Private property includes those properties inscribed on the Public Registry of Property. Where multiple individuals or entities are listed on a property title, all individuals or entities listed must agree to participate in the Forest Project.

3.2.2 Public Land

Government agencies that voluntarily implement the defined activities in Table 2.1 to increase carbon stocks on public lands, such as municipal or district lands, may be a Forest Owner.

For state owned land, government agencies must submit the legal document inscribed in the Public Registry of Property and/or the Decree or Ordinance that states that the land is destined for a specific use and/or management by a municipality or state.

3.3 Project Coordinator

The Forest Owner must designate a Project Coordinator or serve as project coordinator themselves. The Project Coordinator must be identified through a process established in the social safeguard section on governance for Forest Owners. The role of the Project Coordinator is to be the main communication link between the Reserve and the Forest Owner and to ensure proper implementation of the protocol requirements. The Project Coordinator¹² should serve as the Account Manager for the Project Owner (i.e., Forest Owner) account¹³ with the Reserve.

3.4 Project Developer

A project developer may be the Forest Owner or an independent third-party contracted by the Forest Owner to assist the Forest Owner and implement the Forest Project. The Forest Owner and project developer may decide the terms of the contract and division of work. However, the Forest Owner must give the project developer the authorization to administer the project on the Reserve website and submit all documentation for the project on behalf of the Forest Owner, by means of a Designation of Authority form (found on the Reserve website)¹⁴. The project developer must have an account on the Reserve in order to submit the documentation but is not the immediate owner or recipient of CRTs issued to the project by the Reserve (unless the Forest Owner acts as its own project developer, in which case the project developer account would be issued CRTs directly). In cases in which the Forest Owner contracts a third-party project developer, the Forest Owner would still be required to open a "Project Owner (Limited)" account on the Reserve software in order to receive any CRTs issued to the project.

All information submitted to the Reserve on behalf of the Forest Owner shall reference the Forest Owner, who is responsible for the accuracy and completeness of the information submitted, and for ensuring compliance with this protocol.

¹² The legal representative of the project owner may alternatively serve as the Account Manager for the Forest Owner account on the Reserve registry.

¹³ In the Reserve software, Forest Owners must open a "Project Owner (Limited)" account type. See the Reserve Offset Program Manual for further information regarding account types.

¹⁴ The Project Implementation Agreement, however, must be signed directly by the Forest Owner.

3.5 Aggregation

The goal of aggregation is to alleviate transaction costs for individual landowners while upholding the Reserve's standards for quantification certainty and integrity. Participation in an Aggregate enables individual project activities to be combined with others to reduce costs associated with project administration and improve marketing opportunities by developing economies of scale. See Appendix E for further information on modified quantification and verification requirements for Forest Projects enrolled in an Aggregate as well as guidelines for entering and exiting an Aggregate.

An Aggregate is two or more individual Forest Projects and may be composed of any combination of eligible Forest Owners from any geographic location within Panama.

The eligibility requirements for Forest Projects participating in an Aggregate are as follows:

- Only Forest Projects with less than 10,000 hectares included in Activity Areas may enroll in an Aggregate. No Forest Owner may enroll more than 10,000 hectares in Aggregates (single or multiple), based on the number of hectares included in the Forest Project's Activity Areas¹⁵.
- Each Forest Project must register with the Reserve individually.
- Project Implementation Agreements (see Section 6.1) must be signed by each individual Forest Owner with the Reserve; Buffer Pool contributions are determined and required for each Forest Project. Liability for reversals lies with each individual Forest Owner.

The aggregator may be a corporation or other legally constituted entity, city, county, state agency, individual or a combination thereof, which may then submit documentation on behalf of Aggregate participants (two or more Forest Owners). An aggregator must have a project developer account on the Reserve and may also be a project developer for one or more of the Aggregate participants, and/or Forest Owner of one or more of the Forest Projects.

Forest Owners are ultimately responsible for submitting all required forms and complying with the terms of the PFP, even while participating in an Aggregate. Aggregators must, however, manage the flow of ongoing monitoring and verification reports to the Reserve as a service to Forest Owners. Aggregators may also engage in project development, provide inventory services, and provide other services for the Forest Owner. The scope of aggregator services may be negotiated between Forest Owners and the aggregator and reflected in contracts between the Forest Owners and the aggregator and approved by Forest Owners following the social safeguards.

3.6 Required Documentation for Land Tenure Status

All Forest Owners must demonstrate proof of ownership of the Project Area. The official identifications of individuals are to be kept as private documents and not made public on the registry; in addition, if provided as part of the Project Owner account opening process, the official identifications do not need to be provided as part of the project documentation separately.

¹⁵ A Forest Project with more than 10,000 hectares included in Activity Areas would be required to submit as a standalone project.

Small Private Property

1. Official identification of the owner, which could include an official identification card, passport, or certificate of naturalization.
2. Property or parcel titles inscribed under the Public Registry.

Public Lands

1. Legal document inscribed in the Public Registry of Property (*Registro Público de la Propiedad*) and/or the Decree or Ordinance that states that the land is destined for a specific use and/or management by the provincial, district, or municipal government.
2. For public lands managed by a third-party that will serve as the Forest Owner, a legal concession granting the carbon credit rights to the third-party from the appropriate governing public agency must be provided, aligned with permanence requirements.
3. Official identification of the individual authorized to represent the public agency.

3.6.1 Attestation of Title

Each time a Forest Project is verified, the Forest Owner must sign the Reserve's standard Attestation of Title form indicating that the Forest Owner has an exclusive ownership claim to the GHG removals achieved by their Forest Project over the verification period. Copies of the Attestation of Title form are available on the Reserve's website. Please note that in requesting this form, the Reserve is not providing financial services or acting as a broker to trade any Forest Project CRTs.

3.7 Conflicts

Boundary disagreements may exist for Project Areas. The Reserve cannot issue credits for any lands where substantial disputes exist regarding property ownership. Therefore, all Activity Areas must be free of substantial conflict or dispute (at the Reserve's discretion) with regards to ownership. Forest Owners must attest that there are no boundary conflicts within the Activity Areas by submitting the signed Reserve Attestation of No Conflicts declaring that there are no lawsuits or claims on the property. Documentation must be signed by the Forest Owner or project developer¹⁶ and submitted prior to each verification.

3.8 Regulatory Compliance

Each time the Forest Project is verified, the Forest Owner or project developer¹⁷ must sign the Reserve's Attestation of Regulatory Compliance form indicating that the project is in material compliance with all applicable laws, decrees, or resolutions¹⁸ relevant to the project activity. Materiality is further discussed in the Reserve Offset Program Manual¹⁹ Forest Owners are required to disclose in writing to the verifier any and all instances of material non-compliance²⁰ of the project with any law. CRTs will not be issued for GHG removals that occurred for the monitoring period in which the material non-compliance occurred.

¹⁶ The project developer may sign the Attestation of No Conflicts on behalf of the Forest Owner, only if the Forest Owner has signed a Designation of Authority granting the project developer such rights.

¹⁷ The project developer may sign the Attestation of Regulatory Compliance on behalf of the Forest Owner, only if the Forest Owner has signed a Designation of Authority granting the project developer such rights.

¹⁸ Including the Law 1 of 1994 Forest Legislation, Law 942 Climate Change Framework, and Law 37 Agrarian Code of the Republic.

¹⁹ <http://www.climateactionreserve.org/how/program/program-manual/>

²⁰ Material non-compliance with the law, for purposes of this protocol, is any illegal act, for which the Forest Owner has been prosecuted, that impacts forest stocking, and/or conservation values.

3.9 Social Safeguards

Forest Projects can create long-term climate benefits as well as other social and environmental benefits. Investment into forest carbon projects has the potential to improve quality of life for rural communities, both in terms of increased revenues and in terms of sustaining and improving forest ecosystems.

This protocol includes certain general social and environmental safeguards that must be considered in the project design and implemented throughout the project life to help guarantee that the project will have positive environmental and social outcomes. Moreover, the social safeguards seek to ensure that Forest Owners are centered in the design and implementation of the Forest Projects and, as the owner of the forest carbon, are the primary beneficiaries of the Forest Project.

All projects must comply with the Reserve's Offset Program Manual, including the section on regulatory compliance and programmatic environmental and social safeguards. The safeguards in the protocol are intended to respect internal governmental processes, customs, and rights of Forest Owners while ensuring projects are beneficial, both socially and environmentally. The sections on monitoring, reporting, and verification (Sections 7 and 8) specify the criteria for verification of each of these safeguards and consequences for failure to achieve the minimum thresholds.

The social safeguard requirements include:

1. Free, Prior, and Informed Consent (FPIC)
2. Meeting Notification, Participation, and Documentation
3. Project Governance

The requirements for each of the social safeguard categories are identified below.

Table 3.1. Social Safeguards

Free, Prior, and Informed Consent
<p>Prior to project registration²¹, Forest Owner(s) and Project Developer must hold a meeting or series of meetings to discuss the themes addressed in this section. The meeting minutes and proof of the meeting (through photographs or signatures) must be included in the Project Report.</p> <p>These meetings must adhere to proper notification, participation, and documentation requirements in the section on notification, participation, and documentation below.</p>

²¹ Project registration occurs upon completing the initial verification and issuance of credits.

Free, Prior, and Informed Consent	
Social Safeguard (SS)	Description
SS1 Forest Carbon Project Concepts	<p>The rationale behind the participation in a forest carbon project must be discussed prior to the initial approval of the Forest Project or approval to begin trainings and analysis for the Forest Project (see Section 3.11, Project start date). Presentations must address the following topics in order to understand the basics behind climate change and actions to mitigate it:</p> <ul style="list-style-type: none"> ▪ Concept of climate change associated with GHGs. ▪ Role of forests in mitigating climate change ▪ Opportunities (economic and environmental) for participation in forest carbon project ▪ Methods to enhance forest carbon stocks. ▪ Requirements associated with forest carbon projects, including additionality and permanence. ▪ Importance of maintenance of native biodiversity ▪ General costs associated with Forest Projects and how project design may affect project profitability
SS2 Anticipated Costs ²²	<p>Anticipated costs of the forest carbon project must be discussed and documented in the meeting minutes prior to project registration. The Reserve has developed a Cost Benefit Analysis tool, which Forest Owners may use to estimate project profitability based on project characteristics. The analysis of costs must address the following:</p> <ul style="list-style-type: none"> ▪ Site preparation ▪ Provision of and planting of forest seedlings ▪ Inventory and monitoring ▪ Project governance ▪ Project verification ▪ Changes in land use and access to resources ▪ Administrative costs for the Forest Project ▪ Division of costs between the project developer, Forest Owner, and other parties involved ▪ Division of labor required by parties involved
SS3 Anticipated Benefits	<p>Presentations must be provided that define economic benefits to Forest Owners due to involvement in a forest carbon project during a meeting prior to project registration. The Reserve has developed a Cost Benefit Analysis tool, which Forest Owners may use to estimate project profitability based on project characteristics. The analysis of anticipated benefits must address:</p> <ul style="list-style-type: none"> ▪ Local environmental benefits that are usually associated with biodiversity, water quality, soil conservation, and recreation ▪ Economic benefits associated with carbon and other forest resources (through market mechanisms), along with sources or references for carbon prices ▪ Distribution of benefits, including anticipated timing of distributions, and division of benefit payments to other actors, including project developers, aggregators, and other parties involved ▪ Credit pricing information and where it was sourced
SS4 Credit Sales, Use of Funds, and Benefit Sharing	<p>All credit sales, use of funds generated by the forest carbon project, and distribution of benefits must be discussed and documented in the meeting notes prior to each reporting period; the following must be discussed:</p> <ul style="list-style-type: none"> ▪ Distribution of benefits between all actors involved in the Forest Project, including the Forest Owner, project developer, aggregator, and any other partners that provided

²² An Excel-based tool is available on the Reserve website to facilitate the assessment of anticipated costs and benefits.

Free, Prior, and Informed Consent	
	<p>financial or technical support (see SS7 and SS8 for further requirements regarding the contract terms between the Forest Owner and project developer and/or aggregator).</p> <ul style="list-style-type: none"> ▪ If there are multiple landowners involved in the same Forest Project (i.e. included on the same land title) and/or aggregate, how decisions will be made regarding the use of funds generated by the project. ▪ The dynamics that determine market prices of voluntary carbon credits and sources used. ▪ Credit pricing information and where it was sourced. ▪ If the project has previously sold credits, the extent of any negotiations and all considered offers and credit pricing. ▪ If the project has previously sold credits, purchase agreements and related contracts must be presented on and made available to the landowner. ▪ If there are multiple landowners involved in the same Forest Project (i.e., included on the same land title) and/or aggregate and the project has previously sold credits, how the funds from those credits were used.
SS5 Project Safety	<p>Field safety must be discussed in a meeting to ensure that safety considerations are considered for the project. The following must be included:</p> <ul style="list-style-type: none"> ▪ A presentation regarding health and safety in regard to appropriate gear, climate considerations, proper alimentation, protective equipment, or any site-specific considerations and hazards. ▪ All participants in the project inventory or field activities must attend periodic training, at least one per year, and sign an agreement confirming that they understand the safety considerations. ▪ The agreement with project participants should be presented with project documentation. <p>Projects that are Forest Stewardship Council (FSC)²³ certified automatically comply with this safeguard</p>
SS6 Project Approval	<p>After the topics to comply with SS1-SS5 have been presented in an initial meeting, the project must be approved prior to project registration through:</p> <ul style="list-style-type: none"> ▪ A signed letter of approval from the Forest Owner; if there are multiple landowners involved in the Forest Project (i.e., included on the same land title), a majority (>50%) of landowners approve the project and sign the letter of approval. ▪ The letter of approval must be notarized.
SS7 Project Developer Approval	<p>When working with a separate project developer, the decision must be approved after the topics to comply with SS1-SS5 have been presented in a meeting and through:</p> <ul style="list-style-type: none"> ▪ A contract²⁴ that determines the scope of project developer services, the terms of payments, and the division of costs and benefits must be made available to all participating landowners. Contracts must clearly establish the rights to CRTs and future credit payments, as well as terms for contract renewal, renegotiation, or termination, including measures to reassess the terms of contract on an ongoing basis or in the event of noncompliance with the terms of the contract. The contract must be notarized and will be maintained as a confidential document on the Reserve registry. ▪ To allow Forest Owners flexibility and autonomy in project design and financing, this Protocol does not set a limit on the benefit sharing percentages. However, the Reserve maintains the right to reject any Forest Project that does not comply with the requirements of FPIC per SS1-SS8 and/or the intent of the social safeguards to ensure Forest Projects provide positive social outcomes and that the Forest Owners are the primary beneficiaries of Forest Projects.

²³ <https://latinoamerica.fsc.org/es-ni/presencia-en-la-region/>

²⁴ The contract should be negotiated between the Forest Owner and the project developer and/or aggregator.

Free, Prior, and Informed Consent	
SS8 Aggregate Approval	<p>When joining an Aggregate, the decision and aggregator must be approved by the Forest Owner after the topics to comply with SS1-SS4 have been presented in a meeting through:</p> <ul style="list-style-type: none"> ▪ A contract²⁵ that determines the scope of aggregator services, the terms of payments, and the division of costs and benefits must be made available to all participating landowners. Contracts must be notarized and clearly establish the rights to CRTs and future credit payments, as well as terms for contract renewal, renegotiation, or termination, including measures to reassess the terms of contract on an ongoing basis or in the event of noncompliance with the terms of the contract

Notification, Participation, and Documentation	
<p>A public meeting prior to project registration and prior to each complete verification is held to discuss critical elements associated with project activities that may affect neighboring communities and landowners. Provisions must be made to ensure non-Spanish speaking participants can understand the material and communicate during public meetings. Each meeting must include the following items on the agenda:</p> <ul style="list-style-type: none"> ▪ Forestry activities (management actions, environmental issues, grievances, other concerns and opportunities) ▪ Programmatic events (monitoring, reporting, and verification activities) <p>A meeting (at least once a year) is held between the Forest Owner and Project Developer to discuss critical elements associated with project activities. Each meeting must include the following items on the agenda:</p> <ul style="list-style-type: none"> ▪ Credits issued ▪ Benefit sharing arrangements ▪ Finances 	
Social Safeguard (SS)	Description
SS9 Meeting Notification	<ul style="list-style-type: none"> ▪ Each Forest Owner should describe how notices of the public meeting(s) take place in order to include as many people as possible, including neighboring communities and landowners
SS10 Participation	<ul style="list-style-type: none"> ▪ Public meetings must provide a sign-in sheet so that attendance can be monitored. ▪ Opportunities for all attendees to share opinions, both in writing and orally.
SS11 Meeting Documentation	<ul style="list-style-type: none"> ▪ Meeting notes for all meetings must document the discussions associated with each required item on the agenda and be signed by all attendees. ▪ For public meetings, Forest Owners should describe how the meeting notes will be publicly available²⁶ as part of the project record.

²⁵ The contract should be negotiated between the Forest Owner and the project developer and/or aggregator.

²⁶ Confidential information may be redacted; for further considerations or guidance, consult with the Reserve.

Project Governance	
<p>Forest carbon projects require an organizational structure that will endure for long periods of time. A Project Coordinator must be selected to represent the Forest Owner (if not the Forest Owner) with the project developer, verifiers, and Reserve staff²⁷. The Project Coordinator is responsible for:</p> <ul style="list-style-type: none"> ▪ Ensuring all project-related documentation is in order and up to date ▪ Ensuring meetings include the required elements above and providing the corresponding meeting minutes ▪ Organizing logistics with verifiers and Reserve staff <p>For projects with multiple Forest Owners, they must choose a Project Coordinator and comply with the following:</p>	
Social Safeguard (SS)	Description
SS12 Identification of a Project Coordinator	<ul style="list-style-type: none"> ▪ A description of the selection process must be documented in the Project Report
SS13 Role and Participation of the Project Coordinator	<ul style="list-style-type: none"> ▪ The Project Coordinator should be included as the Account Manager for the Forest Owner account on the Reserve registry ▪ The Project Coordinator should be included in all communications between the project developer and the Reserve and/or verification body as well as communications regarding the sale of credits issued ▪ The Project Coordinator should be included in all Forest Project monitoring, reporting, and verification processes
SS14 Term of the Project Coordinator	<ul style="list-style-type: none"> ▪ The length of the term of Project Coordinator must be defined in the Project Report ▪ The Project Report must identify whether the position of Project Coordinator can be renewed and, if so, for how many terms
SS15 Replacing the Project Coordinator	<ul style="list-style-type: none"> ▪ To address potential disputes associated with the Project Coordinator and/or Forest Project, a dispute resolution process and process to replace the Project Coordinator from the position must be documented in the Project Report

3.10 Environmental Safeguards

Environmental safeguards ensure that Forest Projects sustain and/or enhance forest ecosystem functions. The environmental safeguards are established by activity to take into consideration the different forest ecosystems and land cover types present within different Activity Areas.

Table 3.2 provides a summary of the environmental safeguards and their applicability to each activity type.

Table 3.2. Environmental Safeguards

Environmental Safeguard (ES)	Applicable Activities	Activity Area Guidance
ES1 Maintenance of forest carbon stocks	All	Activity Areas must maintain or increase standing live and dead carbon stocks over the project life, as determined by a running 10-year average of carbon stocks within the Activity Areas. Exceptions may be granted by the Reserve for cases of natural disturbances or silviculture activities aimed at reducing an imminent risk of disease or pest infestation.
ES2 Native Species	IFM, Restoration, Reforestation	IFM, Restoration, and Reforestation Activity Areas must demonstrate verified continuous progress towards achieving a goal of 95% native species within the Activity Areas, as measured by average trees per hectare. For the purposes of this protocol, native species are those

²⁷ The Forest Owner may select themselves to be the Project Coordinator.

Environmental Safeguard (ES)	Applicable Activities	Activity Area Guidance
		<p>found naturally in and around the Project Area. The use of native species outside of their historic range is permitted if the use is intended as an adaptation strategy against climate change. In such cases, a letter stating the use of the particular species is required from the appropriate regional MiAMBIENTE office.</p> <ul style="list-style-type: none"> ▪ For IFM and Restoration: must be met within 50 years. ▪ For Reforestation: must be met immediately following the establishment of a new forest stand.
	Large Urban Forestry	<p>Large Urban Forestry Activity Areas may not reduce the percent of native species throughout the project life. Large Urban Forestry Activity Areas are encouraged to use native species where possible; however, the Reserve acknowledges that the choice of species used in urban areas depends on various factors unrelated to the Forest Project.</p>
	Agroforestry and Silvopastoral	<p>For Agroforestry and Silvopastoral Activity Areas in excess of 30% tree canopy cover, the tree composition must comply with 80% native species as measured by trees per hectare and determined on any 5 hectares within the Activity Area. Agroforestry Activity Areas must meet this requirement at the Activity Area's start date.</p>
ES3 Composition of Native Species	IFM, Restoration, Reforestation	<p>IFM, Restoration, and Reforestation Activity Areas must demonstrate verified continuous progress towards meeting the composition of native species according to the Table 3.3. The native species composition requirements must be met by each Activity Area independently. Exceptions to the composition of native species are accepted through a letter signed by the appropriate regional MiAMBIENTE office that ecological rationale justifies an alternative composition of native species.</p> <ul style="list-style-type: none"> ▪ For IFM and Restoration: must be met within 50 years. ▪ For Reforestation: must be met immediately following the establishment of a new forest stand.
	Large Urban Forest	<p>For Large Urban Forestry Activity Areas, if a single species comprises more than the proportion indicated under Table 3.3, the proportion of the dominant species may not be intentionally increased throughout the project life.</p>
	Agroforestry and Silvopastoral	<p>For Agroforestry and Silvopastoral Activity Areas in excess of 30% tree canopy cover, as determined on any 5 hectares within the Activity Area, the composition of native species shall meet the requirements of Table 3.2 within 25 years of the start date.</p>
ES4 Maintenance or increase of tree canopy cover throughout the Project Area	IFM, Restoration, Reforestation, Agroforestry, Silvopastoral	<p>Tree canopy cover throughout the Project Area must not decrease as a result of human activities over the project life in relative proportion to the area in tree canopy cover at the start date. Monitoring tree canopy cover is a means of assessing the shifting of forest disturbance activities from the Activity Areas to the Project Area as a result of project activities. If a decline in tree canopy cover in excess of 5% is detected during a full verification, the project must rectify the tree canopy cover loss through reforestation in the subsequent 6 reporting periods and commit to a full verification at the end of the 6th reporting period following the detection, regardless of whether the project is in an Aggregate or not. Declines in tree canopy cover resulting from wildfire or other natural disturbances that are not the result of gross negligence are exempt. An efficient method for estimating tree canopy cover is described in Appendix A. Forest Owners that are able to provide evidence that tree canopy cover declines in excess of 5% (by area) are planned and approved activities sanctioned by the provincial, district or municipal government agencies are also exempt from this requirement.</p>
ES5 Sustainable harvesting practices	IFM	<p>Where harvest occurs within the Activity Areas in a contiguous area larger than 5 hectares, a tree, or group of trees, representative of the age cohort that was harvested, can be no further than 100 meters from other trees, either within the harvest area or outside of the harvest area in order to provide refugia for plants and animals.</p>

Environmental Safeguard (ES)	Applicable Activities	Activity Area Guidance
		Should these retained trees fall due to wind events, the fallen trees may be harvested. Retained trees may not be felled intentionally until the regenerated stand reaches 10-years of age. Exceptions, related to safety, ecological, or other rationale, to this requirement may be granted if the request is made to the Reserve in writing prior to the exception occurring.
ES6 Maintenance of natural land cover	Reforestation	Forest Projects should take into consideration the effects of project activities on ecological processes; where project activities result in the conversion of natural land cover, the Forest Owner must provide justification to be approved by the Reserve. See below for further information on determining natural land cover.
ES7 Soil disturbance during site preparation for tree planting	All	Site preparation using deep ripping ²⁸ is prohibited from affecting more than 1% of an Activity Area in any year as determined by the area encompassed by the channels produced by a single ripper, unless the Forest Project has submitted a quantification methodology approved by the Reserve to account for soil carbon loss.

Table 3.3 provides further guidance for the environmental safeguard related to the composition of native species for IFM, Reforestation, Restoration, and Agroforestry activities.

Table 3.3. Requirements for the Proportion of Native Species within the Activity Areas (IFM, Reforestation, and Restoration, and Agroforestry).

Project Activity Areas ¹	Native Species Composition Requirements (Trees per Hectare)
Up to 10 hectares	Up to 100% can be in one species.
>10 to ≤50 hectares	Up to 90% can be in one species.
>50 to ≤100 hectares	No more than 80% can be in one species. The balance must be made up of at least two other species.
>100 to ≤1,000 hectares	No more than 70% can be in one species. The balance must be made up of at least two other species.
Greater than 1,000 hectares	No more than 60% can be in one species. The balance must be made up of at least three other species.

¹ The area is determined by the sum of hectares in each Activity Area.

Conceptually, natural land cover includes areas dominated by native species that may exhibit complex age and structural variation and contain critical habitat niches to fully support natural ecosystem functions.

²⁸ Deep ripping mechanically breaks up compacted soil layers by using ripper tines reaching a minimum depth of 30 cm. Tillage that does not reach the minimum 30 cm depth is not considered deep ripping and is not prohibited under this environmental safeguard.

For the purposes of the protocol:

- Natural forest and shrub land cover (*bosque, selva, zonas áridas*) areas are identified where the dominant overstory vegetation is comprised of an overwhelming majority of native species, i.e., greater than 70% by CO₂e stocking.
- Natural grassland areas are identified where grassland plant communities (native or non-native species) exist due to natural environmental features (soil conditions, precipitation, etc.) and/or natural frequency of disturbance events. If the grasslands must be constantly grazed or burned more frequently than would be the case in a natural ecosystem, the grasslands would not meet the definition of natural.
- Wetlands are considered natural wherever they are found not being used for agriculture or intensive aquaculture and not part of a non-natural waterbody.

Crediting will be discontinued in the event a project fails to meet these requirements until the project develops a plan acceptable by the Reserve to return to compliance.

3.11 Project Start Date

The start date of a Forest Project is a date in which project activities commenced (see Section 2.3). The project start date can be no more than twelve months prior to the submittal date²⁹. The Forest Owner must be able to demonstrate project activities initiated on this date through a verifiable action or event. One of the following actions must be used to demonstrate the project start date:

1. A meeting in which the Forest Project, or the commencement of initial trainings or analysis for the Forest Project, was approved. Proof must be provided to the verifier in the form of documentation signed by the Forest Owner, including the meeting notes and agenda detailing project approval and complying with the social safeguards.
2. Submitting the project to the Reserve.

The start date of subsequent Activity Areas is based on the official approval of the added Activity Area and inclusion of that Activity Area in the annual monitoring, reporting and verification. Proof of official approval must be provided to the verifier in the form of meeting notes and agenda.

3.12 Project Crediting Period

The baseline for any Forest Project registered with the Reserve under this version of the PFP is valid for a crediting period of 30 years based on the Forest Project's permanence commitment. This means that a registered Forest Project will be eligible to receive CRTs for GHG removals quantified using this protocol, and verified by Reserve-approved verification bodies, for a period of 30 years following the project's start date. Credits that were generated during the crediting period must continue to be monitored to meet contractual obligations or permanence commitments potentially beyond the crediting period. Projects that have met all Monitoring, Reporting and Verification (MRV) requirements and maintained legal compliance throughout their first crediting period, can extend the crediting period for another 30-year period using the baseline developed for the initial crediting period. A project must demonstrate compliance with

²⁹ The submittal date is the date in which the Forest Owner officially submits the Submittal Form to the Reserve. The Forest Owner will need to state the project start date on the Submittal Form.

the requirements of this protocol through annual MRV to renew the crediting period. The Reserve has final approval of renewing the crediting period.

3.13 Additionality

The Reserve only registers projects that yield GHG removals that are determined to be additional to what would have occurred in the absence of a carbon offset market (i.e., under “business as usual”). For a general discussion of the Reserve’s approach to determining additionality see the Reserve Offset Program Manual.³⁰

To be considered additional, enhancement activities must be the result of defined investment rather than the result of natural activities. Projects that implement the defined activities in Table 2.1 meet this criterion. Defined investment for Reforestation or Agroforestry activities means an investment of labor or capital to establish tree seedlings, either directly (tree planting, site preparation, etc.) or indirectly (protecting regenerated stands against herbivory, conversion to agriculture or grazing, or other abrasive environmental elements). Direct investment for other enhancement activities includes investments in stocking improvements and opportunity costs associated with extended rotations. Indirect investment activities include investments into the protection of forested stands against environmental threats or manmade elements, including illegal harvesting.

Forest Projects must satisfy the following tests to be considered additional:

1. **Legal requirement test.** Forest Projects must achieve GHG removals above any GHG removals that would result from compliance with any law, statute, rule, regulation or ordinance. Legally binding mandates entered into as part of the project and in support of project activities are not considered for the purpose of determining additionality under the legal requirement test (see section 3.13.1).
2. **Performance standard test.** Forest Projects must achieve GHG removals above and beyond any GHG removals that would result from engaging in “business as usual” activities, as defined by the requirements described below (see Section 3.13.2).

3.13.1 Legal Requirement Test

Project activities must not be required by law. Each time a Forest Project undergoes verification, including the initial verification, the Forest Owner or project developer³¹ must sign the Reserve’s Attestation of Voluntary Implementation form indicating that project activities are not legally required at the time of the start date or during the reporting period(s) being verified.

Documented stewardship activities within municipal development plans (if existing) are not considered legally binding for purposes of additionality determination. Instead, they are viewed as desired objectives which would have a better probability of implementation with funding that might occur with carbon sales.

3.13.2 Performance Standard Test

The performance standard test consists of standardized analyses based on activity type to determine whether a risk of forest cover loss to a specific Activity Area is sufficient to warrant

³⁰ <http://www.climateactionreserve.org/how/program/program-manual/>.

³¹ The project developer may sign the Attestation of Voluntary Implementation on behalf of the Forest Owner, only if the Forest Owner has signed a Designation of Authority granting the project developer such rights.

recognition that forest carbon enhancements, protected over a long time (100-year permanence), are considered additional. Forest conversions to other uses, such as agriculture, grazing and urban use, are key drivers of forest carbon loss. Forest carbon loss due to natural disturbance is excluded from this analysis. The different approaches are detailed below for each activity type.

3.13.2.1 Improved Forest Management Activity Areas

Forest Management Plans (FMP) are legal forest management documents authorized by MiAMBIENTE that permit harvesting for commercial purposes; on forest plantations³², Artificial Forests³³, or planted forests FMPs may permit harvesting of all planted trees. Therefore, this protocol considers that all planted trees and periodic growth on Artificial Forests under an FMP is at risk and any non-harvested periodic growth is additional. The Activity Area must include the entire area under the FMP or a subset with an equivalent age distribution (see Section 2.3). Since this protocol only credits for growth above the Activity Area baseline, or its initial carbon stocks (see Section 5.2), and all growth on Artificial Forests is considered at risk under FMPs, Activity Areas under FMPs automatically pass the performance standard test.

Improved Forest Management activities automatically satisfy the performance standard test. Activities are considered additional to the extent they produce GHG removals in excess of those that would have under a “business as usual” scenario, as defined by the baseline (see Section 5.2).

3.13.2.2 Reforestation Activity Areas

Reforestation activities by definition (see Section 2.3) must occur on lands that are not in forest cover on the Activity Area start date and have not been in forest cover within the past 10-years or have recently experienced a natural disturbance that reduced live tree stocking below 50% live canopy cover. Activities that comply with this definition of Reforestation automatically satisfy the performance standard test. Activities are considered additional to the extent they produce GHG removals in excess of those that would have occurred under a “business as usual” scenario, as defined by the baseline (see Section 5.2).

3.13.2.3 Restoration Activity Areas

The performance standard test for Restoration activities is based on evidence that risks to forest inventories are present at considerable levels within the Activity Area. The assessment of risk to carbon stocks across the Activity Area is based on an analysis of drivers of deforestation and degradation that may impact the land use within the Activity Area, including considering surrounding conditions and presence of risk factors.

The Reserve has developed an analytical tool that provides a standardized assessment of risk to Activity Areas. The tool, referred to as the Restoration PST Tool (or *Herramienta del PED de la Restauración* in Spanish), is available on the PFP webpage. The tool evaluates a variety of drivers that impact forest land cover and provides a score for a given Activity Area. Activity Areas with scores that exceed the risk threshold pass the performance standard test.

³² Per Law 1 of 1994, Forest Legislation of the Republic of Panama, a “forest plantation” is forest mass that is product of reforestation.

³³ “Artificial Forests” per Law 1 of 1994, Forest Legislation of the Republic of Panama, are any plant, woody, tree formation, established or created by man; see Section 3.2 Forest Owner.

3.13.2.3.1 Restoration Activity Areas

The first sub-section examines legal restrictions that may reduce the risk of deforestation. Projects must identify legal restrictions that would affect forest cover or canopy area within the Activity Area, particularly inclusion in a Natural Protected Area or other classification that restricts forest harvesting or land use conversion. Activity Areas that are included in such categories have an inherent lower risk of deforestation, however, under certain circumstances may experience persistent risks of degradation and deforestation. Projects may use the Reserve's Restoration PST Tool to determine whether Activity Areas with legal restrictions may be considered additional.

The second sub-section for all forests establishes the risk of deforestation, due to the presence of agricultural activities, biophysical characteristics of the Activity Area, urban development, and economic pressures affecting land management decisions. If an Activity Area demonstrates sufficient risk of deforestation, the Activity Area may pass the performance standard test.

If a Restoration Activity Area does not pass the performance standard test after completing the second sub-section, the Activity Area would need to complete the third sub-section, which assesses the presence of degradation through an analysis of historical canopy cover throughout the Project Area. A forest canopy cover trend for the Project Area is developed by calculating a historical estimate of canopy cover and a recent estimate of canopy cover. The historical trend analysis must compare the percent change normalized to 10 years between two historical estimates that are at least 10 years apart, with the recent estimate within five years of the start date, and with the earliest point no earlier than 1990. For instance, if an Activity Area commences in 2019, the historical estimates may be determined using aerial imagery from 2005 and 2018, since the recent estimate is within five years of the start date, and the two points pre-date the start date, are at least 10 years apart from one another, and do not pre-date 1990. Contact Reserve staff if no images fitting these requirements are available. Both estimates are developed by estimating canopy cover for each date from remotely sensed data. Section C.1.3 includes a standardized methodology for estimating canopy cover from remotely sensed data. If historical imagery is not available, more recent images may be used, subject to Reserve approval.

Activity Areas that have a decreasing trend of historical canopy cover of at least 10% throughout the Project Area demonstrate sufficient degradation to be eligible to pass the performance standard test. Activity Areas that do not have a decreasing trend of historical canopy cover of at least 10% throughout the Project Area do not demonstrate sufficient degradation to pass the performance standard test.

In addition to demonstrating sufficient degradation in section three of the Restoration PST Tool, the Forest Owner must state in the Project Report (see Section 7.1.2) the cause of degradation or risks of deforestation to the Activity Area and the project activities that will be implemented to increase forest carbon stocks within the Activity Area (i.e., tree planting or the removal of the drivers of degradation/deforestation). Activity Areas that cannot increase carbon stocks are not considered eligible. This will be verified and reviewed by the Reserve and, if accurate and satisfactory, the Activity Area will pass the performance standard test.

For Activity Areas that comply with the performance standard, activities are considered additional to the extent they produce GHG removals above the baseline.

3.13.2.4 Small Urban Forestry, Agroforestry, and Silvopastoral

Small Urban Forestry, Agroforestry, and Silvopastoral activities automatically satisfy the performance standard test. Activities are considered additional to the extent they produce GHG removals in excess of the Activity Area baseline (see Section 5.2).

3.13.2.5 Large Urban Forestry

The performance standard test for Large Urban Forestry activities is based on analysis of historical canopy cover throughout the Activity Area. A trend for the Activity Area is developed by calculating a historical estimate of canopy cover and a recent estimate of canopy cover. The trend analysis must compare the percent change normalized to 10 years between two historical estimates that are at least 10 years apart, with the recent estimate within five years of the start date, and with the earliest point no earlier than 1990. For instance, if an Activity Area commences in 2019, the historical estimates may be done using aerial imagery from 2005 and 2018, since the recent estimate is within five years of the start date, and the two points pre-date the start date, are at least 10 years apart from one another, and do not pre-date 1990. Contact Reserve staff if no images fitting these requirements are available. Both estimates are developed by estimating canopy cover for each date from remotely sensed data. Section C.1.3 includes a standardized methodology for estimating canopy cover from remotely sensed data. If historical imagery is not available, more recent images may be used, subject to Reserve approval. If the historical canopy cover trend is decreasing, the Large Urban Forestry Activity Area passes the performance standard test. Activities are considered additional to the extent they produce GHG removals in excess of the Activity Area baseline (see Section 5.2).

3.14 Minimum Time Commitment

Projects must commit to maintaining carbon sequestered due to project activities for a minimum period of 30 years up to the Reserve's 100-year permanence requirement. However, for projects that commit to a period less than 100 years, credits will be issued in an amount proportionate to the length of the commitment relative to 100 years. Permanence commitments must be secured through a contractual agreement referred to as a Project Implementation Agreement. Projects that establish a permanence commitment of less than 100 years will be issued credits (CRTs) proportionate to the atmospheric impact of maintaining the carbon out of the atmosphere for the period of time the CO₂ is secured, commensurate with the length of the commitment relative to 100 years. This is discussed further in Appendix F. Carbon must be monitored and verified for the duration of the permanence commitment.

Forest Projects must submit annual monitoring reports and undergo periodic full verifications, at least every six reporting periods, for the duration of their permanence commitment.

There are three possible exceptions to this minimum time commitment:

1. A Forest Project automatically terminates if a significant natural disturbance occurs,³⁴ leading to an Unavoidable Reversal (see Section 6.2) that reduces the project's standing live or dead carbon stocks below the project's baseline standing live or dead carbon stocks. Once a Forest Project terminates in this manner, the Forest Owner has no further obligations to the Reserve. The project's credits are made whole through the Reserve's Buffer Pool (see Section 6.3.5).

³⁴ The natural disturbance shall not be the result of avoidable or grossly negligent acts of the Forest Owner.

2. A Forest Project may be voluntarily terminated prior to the end of its minimum time commitment if the Forest Owner retires³⁵ a quantity of CRTs as determined by Equation 6.1 (see Section 6.3).
3. A Forest Project may be automatically terminated if there is a breach of certain terms described within the Project Implementation Agreement. Such a termination will require the Forest Owner to retire³⁵ a quantity of CRTs, equal to the total number of CRTs issued.

3.15 Other Eligibility Criteria

An affidavit³⁶ stating that there are no ongoing encumbrances or expectations for specific forest management activities is required in cases where a Reserve project is to be initiated in an area where a previous forest carbon project existed. Forest Projects may not be located on any part of a forest carbon project that was terminated as the result of an avoidable reversal.

³⁵ To retire a CRT means to transfer it to a retirement account in the Reserve's software system. Retirement accounts are permanent and locked, so that a retired CRT cannot be transferred or retired again. See the Reserve Offset Program Manual for further information.

³⁶ Affidavit refers to a declaration under penalty of perjury.

4 GHG Assessment Boundary

The GHG Assessment Boundary encompasses all the GHG sources, sinks, and reservoirs that may be significantly affected by Forest Project activities, including forest carbon stocks, sources of biological CO₂ emissions, and GHG emissions from mobile combustion. For accounting purposes, the sources, sinks, and reservoirs included in the GHG Assessment Boundary are organized according to whether they are predominantly associated with a Forest Project's "primary effect" (i.e., the Forest Project's intended changes in carbon stocks, GHG emissions or removals) or its "secondary effects" (i.e., unintended changes in carbon stocks, GHG emissions or removals caused by the Forest Project).³⁷ Secondary effects may include increases in mobile combustion CO₂ emissions associated with site preparation, as well as increased CO₂ emissions caused by the shifting of harvesting activities from the Project Area to other forestlands (often referred to as "leakage"). Projects are required to account for secondary effects from leakage following the methods described in Section 5.4.

The following table provides a comprehensive list of the GHG sources, sinks, and reservoirs (SSRs) that may be affected by a Forest Project and indicates which SSRs must be included in the GHG Assessment Boundary depending on the project specifics. If an SSR is designated as a reservoir/pool, this means that GHG removals are accounted for by quantifying changes in carbon stock levels. For SSRs designated as sources or sinks, GHG removals are accounted for by quantifying changes in GHG emission or removal rates, as described in the tables.

³⁷ The terms "primary effect" and "secondary effect" come from WRI/WBCSD, 2005. *The Greenhouse Gas Protocol for Project Accounting*, World Resources Institute, Washington, DC. Available at <http://www.ghgprotocol.org>.

Table 4.1. GHG Assessment Boundary

SSR	Description	Type	Gas	Included or Excluded?	Quantification Method	Justification/Explanation
Primary Effect Sources, Sinks, and Reservoirs						
1	Standing live carbon (carbon in all portions of living trees)	Reservoir/ Sink	CO ₂	Included	<p>Baseline: Based on initial field inventory measurements; methodology outlined in Section 5.2</p> <p>Project: Measured by field measurements and updating forest carbon inventory through remeasurement and growth projections</p>	Increases in standing live carbon stocks are the primary effect of carbon enhancement projects.
2	Shrubs and herbaceous understory carbon	Reservoir/ Sink	CO ₂	Excluded	<p>Baseline: N/A</p> <p>Project: N/A</p>	For crediting purposes, shrubs and herbaceous understory carbon is excluded since changes in this reservoir are unlikely to have a significant effect on total quantified GHG removals. Furthermore, it is generally not practical to undertake measurements of shrubs and herbaceous understory that are accurate enough for crediting purposes.
3	Standing dead carbon (carbon in all portions of dead, standing trees)	Reservoir/ Sink	CO ₂	Included	<p>Baseline: Measured based on initial field inventory measurements</p> <p>Project: Measured by updating forest carbon inventory</p>	Carbon enhancement projects may significantly increase standing dead carbon stocks over time.
4	Lying dead wood carbon	Reservoir/ Sink	CO ₂	Excluded	<p>Baseline: N/A</p> <p>Project: N/A</p>	Lying dead wood is difficult to obtain accurate measurements and it is most often conservative to not include them.

SSR	Description	Type	Gas	Included or Excluded?	Quantification Method	Justification/Explanation
5	Litter and duff carbon (carbon in dead plant material)	Reservoir/ Sink	CO ₂	Excluded	Baseline: N/A	Litter and duff carbon is excluded since changes in this reservoir are unlikely to have a significant effect on total quantified GHG removals. Furthermore, it is generally not practical to undertake measurements of litter and duff that are accurate enough for crediting purposes.
					Project: N/A	
6	Soil carbon	Reservoir/ Sink/ Source	CO ₂	Excluded	Baseline: N/A	Soil carbon is anticipated to increase as a result of most carbon enhancement project activities that do not include intensive site preparation. Due to challenges in measurement of soil carbon and associated soil emissions, soil carbon cannot be included as a credited reservoir/pool at this time. Site preparation using deep ripping ³⁸ is prohibited from affecting more than 1% of an Activity Area in any year as determined by the area encompassed by the channels produced by a single ripper, unless the Forest Project has submitted a quantification methodology approved by the Reserve to account for soil carbon loss. See Section 3.10 for further details.
					Project: N/A	
7	Carbon in in-use forest products	Reservoir/ Sink	CO ₂	Excluded	Baseline: N/A	While long-term harvested wood products may increase, along with onsite forest carbon, due to improved management, long-term wood products are not included as creditable data supporting long-term sequestration of harvested wood products is lacking. This may be modified in the future as data related to the fate of harvested wood products is developed. Additionally, Improved Forest Management activities will lead to increased production over medium to long-term.
					Project: N/A	

³⁸ Deep ripping mechanically breaks up compacted soil layers by using ripper tines reaching a minimum depth of 30 cm. Tillage that does not reach the minimum 30 cm depth is not considered deep ripping and is not prohibited under this environmental safeguard.

SSR	Description	Type	Gas	Included or Excluded?	Quantification Method	Justification/Explanation
8	Forest product carbon in landfills	Reservoir/ Sink	CO ₂	Excluded	Baseline: N/A	No data has been obtained to suggest wood products remain in long-term storage in landfills in Panama. This may be modified in the future as data related to the fate of harvested wood products is developed.
					Project: N/A	
Secondary Effects Sources, Sinks, and Reservoirs						
9	Nutrient application	Source	N ₂ O	Excluded	Baseline: N/A	The use of broadcast fertilization is not an eligible activity.
					Project: N/A	
10	Mobile combustion emissions from site preparation activities	Source	CO ₂	Included	Baseline: Assumed to be zero	Mobile combustion CO ₂ emissions from site preparation may be important when machinery is used to prepare areas for planting (see Section 5.4.1).
					Project: Accounted for by intensity of site preparation activities	
			CH ₄	Excluded	Baseline: N/A	Changes in CH ₄ emissions from mobile combustion associated with site preparation activities are not considered significant.
			N ₂ O	Excluded	Baseline: N/A	Changes in N ₂ O emissions from mobile combustion associated with site preparation activities are not considered significant.
					Project: N/A	
11	Mobile combustion emissions from ongoing project operation and maintenance	Source	CO ₂	Excluded	Baseline: N/A	Mobile combustion CO ₂ 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.
					Project: N/A	
			CH ₄	Excluded	Baseline: N/A	CH ₄ emissions from mobile combustion associated with ongoing project operation and maintenance activities are not considered significant.
			N ₂ O	Excluded	Baseline: N/A	N ₂ O emissions from mobile combustion associated with ongoing project operation and maintenance activities are not considered significant.
					Project: N/A	

SSR	Description	Type	Gas	Included or Excluded?	Quantification Method	Justification/Explanation	
12	Stationary combustion emissions from ongoing project operation and maintenance	Source	CO ₂	Excluded	Baseline: 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 Forest Owner 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.	
					Project: N/A		
			CH ₄	Excluded	Baseline: N/A		CH ₄ emissions from stationary combustion associated with ongoing project operation and maintenance activities are not considered significant.
					Project: N/A		
			N ₂ O	Excluded	Baseline: N/A		N ₂ O emissions from stationary combustion associated with ongoing project operation and maintenance activities are not considered significant.
					Project: N/A		
13	Emissions from clearing of shrubs and herbaceous understory carbon	Source	CO ₂	Included	Baseline: N/A	Clearing of shrubs and herbaceous understory for purposes of Reforestation activities may have significant emissions (see Section 5.4.1).	
					Project: Estimated using a default ratio estimator for shrub cover pre and post site preparation activities		
14	Biological emissions from clearing of forestland outside the Activity Area for agriculture and/or grazing	Source	CO ₂	Included	Baseline: N/A	Projects on land currently, or projected to be used for, grazing or growing crops may cause displacement of these activities to other lands, leading to a reduction in carbon stocks on those lands (e.g., due to clearing of trees and shrubs). The shift may be either a market response or physical response to the project activity. Emissions associated with shifting land uses are estimated using default "leakage" factors outlined in Section 5.4.2.	
					Project: Estimated using default land use conversion factors for non-project land		

SSR	Description	Type	Gas	Included or Excluded?	Quantification Method	Justification/Explanation
15	Biological GHG emissions or removals from changes in timber harvesting on forestland outside the Activity Area	Source/Sink	CO ₂	Included/Excluded	Baseline: N/A	If harvesting is reduced in the Activity Area, harvesting on other lands may increase to compensate for the lost production. This “leakage” effect is outlined in Section 5.4.3. Projects may also increase harvesting levels relative to the baseline, potentially causing other landowners to reduce harvesting in response to increased wood product supply. The reduction in harvesting may lead to increased carbon stocks on their lands.
					Project: Estimated based on change in harvested wood volume and default secondary effects value (Section 5.4.3)	
16	Combustion emissions from production, transportation, and disposal of forest products	Source	CO ₂	Excluded	Baseline: N/A	The primary effect of Forest Projects in Panama is to conserve and increase onsite forest carbon stocks, without substantially affecting the production, transportation, and disposal of wood products with regards to baseline levels. Therefore, these emissions are not included in the GHG Assessment Boundary of this protocol.
					Project: N/A	
			CH ₄	Excluded	Baseline: N/A	Combustion-related CH ₄ emissions from changes in the production, transportation, and disposal of forest products are not considered significant.
					Project: N/A	
			N ₂ O	Excluded	Baseline: N/A	Combustion-related N ₂ O emissions from changes in the production, transportation, and disposal of forest products are not considered significant.
					Project: N/A	

SSR	Description	Type	Gas	Included or Excluded?	Quantification Method	Justification/Explanation		
17	Combustion emissions from production, transportation, and disposal of alternative materials to forest products	Source	CO ₂	Excluded	Baseline: N/A	The primary effect of Forest Projects in Panama is to conserve and increase onsite forest carbon stocks, without substantially affecting the production, transportation, and disposal of wood products with regards to baseline levels. Therefore, these emissions are not quantified in the assessment boundary of this protocol.		
					Project: N/A			
			CH ₄	Excluded	Baseline: N/A		Combustion-related CH ₄ emissions from changes in the production, transportation, and disposal of alternative materials are not considered significant.	
					Project: N/A			
			N ₂ O	Excluded	Baseline: N/A			Combustion-related N ₂ O emissions from changes in the production, transportation, and disposal of alternative materials are not considered significant.
					Project: N/A			
18	Biological emissions from decomposition of forest products	Source	CO ₂	Excluded	Baseline: N/A	While long-term harvested wood products may increase, along with onsite forest carbon, due to improved management, long-term wood products are not included as creditable data supporting long-term sequestration of harvested wood products is lacking.		
					Project: N/A			
			CH ₄	Excluded	Baseline: N/A		In-use wood products will produce little to no CH ₄ emissions. CH ₄ emissions can result from anaerobic decomposition of forest products in landfills. Additionally, dimensional wood products are assumed to be in landfills in minimal quantities. Thus, changes in forest-product production are assumed to have no significant effect on future CH ₄ emissions from anaerobic decomposition of forest products in landfills. These emissions are therefore excluded from the GHG Assessment Boundary.	
					Project: N/A			
			N ₂ O	Excluded	Baseline: N/A			Decomposition of forest products is not expected to be a significant source of N ₂ O emissions.
					Project: N/A			

5 Quantifying Net GHG Removals and CRTs

This section provides requirements and guidance for quantifying a Forest Project's net GHG removals from within the Activity Areas. For Forest Projects with multiple Activity Areas, the quantification of net GHG removals is conducted separately for each Activity Area. The Reserve will issue CRTs to a Forest Project upon confirmation by an ISO-accredited and Reserve-approved verification body that the Forest Project GHG removals have been quantified and secured following the applicable requirements of this section (see Section 8 for verification requirements).

The quantification method proceeds in five steps:

1. **Quantifying the Activity Area live and dead standing carbon.** Each reporting period, the Forest Owner must determine the Activity Area carbon stocks in live and dead standing trees. There are two approaches to quantifying the Activity Area live and dead standing carbon discussed in Section 5.1, Appendix B, and Appendix C.
2. **Determining the Activity Area baseline onsite carbon stocks.** The baseline is determined for each Activity Area as the initial forest carbon stocks. Projects are eligible to receive credits to the extent they increase forest carbon inventories above baseline levels within the Activity Areas. The guidance for determining an Activity Area baseline is discussed in Section 5.2. and Appendices B and C. The baseline is established for renewable 30-year crediting periods (see Section 3.12).
3. **Calculating the Activity Area Primary Effect.** Each reporting period, the Forest Owner must quantify the actual change in GHG removals associated with the Activity Area's intended ("primary") effect. For any given reporting period, the primary effect is calculated by:
 - a. Taking the difference between actual onsite carbon stocks for the current reporting period and actual onsite carbon stocks for the prior reporting period.³⁹
 - b. Subtracting from (a) the difference between baseline onsite carbon stocks for the current reporting period and baseline onsite carbon stocks for the prior reporting period.
4. **Quantifying the Activity Area Secondary Effects.** Each reporting period, the Forest Owner must quantify the actual change in GHG emissions or removals associated with the Activity Area's unintended ("secondary") effects, as defined in Section 5.4.5.3 Requirements and guidance for quantifying secondary effects are provided below for each type of activity. Should the project activity result in secondary effects, only increased emissions as the result of the project activity will be included to ensure conservative accounting.

³⁹ For the purposes of calculating the project's primary effect, actual and baseline carbon stocks prior to the start date of the project are assumed to be zero.

- 5. Calculating total net GHG removals.** For each reporting period, total net GHG removals are calculated by summing an Activity Area's Primary and secondary effects. If the result is positive, then the Activity Area has generated GHG removals in the current year. If the result is negative, this may indicate that a reversal has occurred (see Section 6.2).

The required formula for quantifying annual net GHG removals is presented in Equation 5.1. Net GHG removals must be quantified and reported in units of carbon dioxide-equivalent (CO₂e) metric tonnes.

Equation 5.1. Annual Net GHG Removals

$QR_y = [(\Delta AC_{tree} - \Delta BC_{tree}) + SE_y] + N_{y-1}$		
Where,		<u>Units</u>
QR_y	= Quantified GHG removals for reporting period y	tCO ₂ e
SE_y	= Secondary effect GHG emissions caused by the Activity Area activity in reporting period y	tCO ₂ e
N_{y-1}	= Any negative carryover from the prior reporting period (occurs when total quantified GHG removals are negative prior to the issuance of any CRTs for the Activity Area)	
And,		
$\Delta AC_{tree} = (AC_{tree,y})(1 - CD_y) - (AC_{tree,y-1})(1 - CD_{y-1})$		
Where,		
$AC_{tree,y}$	= Actual onsite carbon in standing live and dead trees in Activity Areas as inventoried for reporting period y	tCO ₂ e
$AC_{tree,y-1}$	= Actual onsite carbon in standing live and dead trees in Activity Areas as inventoried for reporting period $y-1$ (if y is the first reporting period of the Activity Area, then the value for $AC_{tree,y-1}$ will be zero)	tCO ₂ e
CD_y	= Appropriate confidence deduction for reporting period y , as determined in Appendix B	
CD_{y-1}	= Appropriate confidence deduction for reporting period $y-1$, as determined in Appendix B	
And,		
Where,		
$BC_{tree,y}$	= Baseline onsite carbon in standing live and dead trees in Activity Areas as estimated for reporting period y	tCO ₂ e
$BC_{tree,y-1}$	= Baseline onsite carbon in standing live and dead trees in Activity Areas as estimated for reporting period $y-1$ (if y is the first reporting period of the Activity Area, then the value for $BC_{tree,y-1}$ will be zero)	tCO ₂ e

5.1 Quantifying the Activity Area Onsite Live and Dead Standing Carbon Stocks

There are two different approaches to quantifying the Activity Area live and dead standing carbon based on activity. For projects with multiple Activity Areas, the quantification of live and dead standing carbon is conducted separately for each Activity Area.

5.1.1 Improved Forest Management, Restoration, Large Urban Forestry

For IFM, Restoration, and Large Urban Forestry Activity Areas (see definitions in Section 2.3) a field sampling inventory is required. A field sampling inventory requires that field sample plots be installed, measurements acquired, and data input into the Reserve's Microsoft (MS) Access database, CALCBOSK, for analytical purposes. This does not require a re-measurement of the inventory each year but does require that inventory estimates be updated using the guidance in Appendix B. The estimate of actual carbon stocks in live and dead standing trees must be adjusted by an appropriate confidence deduction, as described in Appendix B.

5.1.2 Reforestation

Reforestation Activity Areas (see definitions in Section 2.3) must likewise use the field sampling inventory methodology described in Appendix B. However, Reforestation Activity Areas may defer the inventory of carbon stocks that are not affected by site preparation until the second full verification, the scheduling of which is at the discretion of the Forest Owner⁴⁰. By the second full verification, the Forest Owner must provide an estimated inventory of all required carbon stocks by using the field sampling inventory methodology. Activity Areas for which an initial inventory is deferred are not eligible to receive CRTs until after the second full verification where the inventory is verified.

5.1.3 Small Urban Forestry, Agroforestry, and Silvopastoral

Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas (see definitions in Section 2.3) may use the canopy cover inventory methodology described in Appendix C. Nevertheless, Forest Owners also maintain the option to use the field sampling inventory methodology for all Activity Areas as described in Section 5.1 and Appendix B.

The canopy cover inventory methodology includes deriving a measurement of the canopy area within the Activity Area, which are applied to ratio estimators to produce an estimate of CO₂e for the Activity Area. Ratio estimators represent a relationship between CO₂e in standing trees and canopy cover, providing the ability to estimate the CO₂e in standing trees across the Activity Area as a function of the Activity Area's overall canopy cover. For Activity Areas using the canopy cover inventory methodology, there is no confidence deduction. Appendix C provides further guidance for using the canopy cover inventory methodology.

5.2 Determining the Activity Area Baseline

A Forest Project can be issued credits to the extent forest carbon stocks within the Activity Area(s) have increased above and beyond baseline forest carbon stocks. A baseline for purposes of crediting is established separately for each Activity Area.

For all Activity Areas that comply with the additionality criteria, the initial baseline for the Activity Area is defined as the sum of carbon (CO₂e) in the required carbon pools at the start date. Reforestation Activity Areas must exclude previously existing trees in their carbon inventory. Reforested trees within a Reforestation Activity Area would not be included in the baseline quantification. The Reserve tool, CALCBOSK, facilitates the baseline calculation. Once an Activity Area's baseline has been determined, the baseline is held steady throughout the Activity Area's crediting period.

⁴⁰ The intent of allowing the Forest Owner to postpone the full forest carbon inventory and second verification for Reforestation Activity Areas is to allow the planted trees sufficient time to grow prior to investing in the full forest carbon inventory and a site visit verification.

The protocol allows for new Activity Areas to be added to the Project Area following the project start date. For additional Activity Areas added at a later time, the Forest Owner must calculate the baseline for the new Activity Area. Appendices B and C provide further instructions on how to calculate the baseline for each Activity Area depending on the activity and quantification approach used.

5.2.1 Consideration of Legal Constraints

Legal constraints include all laws, regulations, and legally binding commitments applicable to the Project Area at the project initiation that could affect standing live or dead carbon stocks. Legal constraints are considered for determining eligibility and additionality rather than baseline quantification. Projects that comply with additionality criteria, including those related to legal requirements, may thus receive credits for carbon enhancements above the Activity Area baseline (i.e., initial carbon stocks).

5.2.2 Consideration of Financial Constraints

Financial constraints are considered for determining eligibility and additionality rather than baseline quantification. Projects that comply with additionality criteria may thus receive credits for carbon enhancements above the Activity Area baseline (i.e., initial carbon stocks).

5.3 Calculating the Activity Area Primary Effect

For all Activity Areas, each reporting period, the Forest Owner must quantify the actual change in GHG removals associated with the Activity Area's intended ("Primary") effect. The Carbon Monitoring Worksheet facilitates the calculation of the Activity Area's primary effect each reporting period.

5.4 Quantifying the Activity Area Secondary Effects

The approach to Project Area monitoring, established by the fourth environmental safeguard (see Section 3.10), provides assurances that forest enhancement activities do not result in increased forest carbon emissions throughout the Project Area. Nevertheless, significant secondary effects can arise from mobile combustion emissions associated with machinery used in site preparation for Reforestation activities. It is also possible that forest enhancement activities result in emissions on external sites. The approach to the calculation of secondary effects on external sites is split into an analysis conducted for Reforestation, Restoration, Agroforestry, and Silvopastoral activities and an analysis for Improved Forest Management activities. Large and Small Urban Forestry activities have an inherent low risk of secondary effects and thus are exempt from the secondary effects analysis.

5.4.1 Secondary Effects from Site Preparation Activities

Reforestation Activities that involve site preparation activities to make conditions in an Activity Area more conducive to tree establishment will have secondary effect emissions associated with them as a result of the mobile combustion of fossil fuels for heavy equipment operation and the removal of shrub biomass. For such Activity Areas, Equation 5.2 is used to calculate the value of SE_y applied in Equation 5.1. This calculation is only performed for the first reporting period for a Reforestation Activity Area.

Equation 5.2. Secondary Effects Emissions Associated with Site Preparation

$SE_y = SE_{mobile,init} + SE_{shrub,init}$		
Where,		<u>Units</u>
SE_y	= Secondary effect emissions due to site preparation at the start of Reforestation activities	tCO ₂ e
$SE_{mobile,init}$	= Secondary effect emissions due to mobile combustion emissions from site preparation at the start of Reforestation activities	tCO ₂ e
$SE_{shrub,init}$	= Secondary effect emissions due to removal of biomass during site preparation at the start of Reforestation activities	tCO ₂ e

5.4.1.1 Secondary Effects from Mobile Combustion

To quantify combustion emissions associated with site preparation, Forest Owners must use the standard emission factor from Equation 5.3, as well as the level of shrub cover associated with the Activity Area where site preparation activities occur. An estimate of percent shrub cover can be determined through remote sensing. The Reserve has provided a methodology for this approach in Appendix C. As a default or if imagery indicating the ‘after’ conditions is not available in a timeframe necessary to fulfill reporting and verification requirements under the protocol, the shrub canopy cover after site preparation can simply be assumed to be 0%.

Forest Owners must only quantify these emissions for Activity Areas where mechanical equipment, i.e., brush raking or mastication, is used for the removal of competing vegetation site preparation. The results from the calculation of $SE_{mobile,init}$ are used in Equation 5.2. Mobile combustion emissions must be added to any secondary effect emissions from external sites (SE_y in Equation 5.5) in the first reporting period for a Reforestation Activity Area.

Equation 5.3. Mobile Combustion Emissions Associated with Site Preparation

$$SE_{mobile,init} = \sum_{AA} (-1) \times (1.61 \times (CC_{shrub,pre,AA} - CC_{shrub,post,AA}) \times A_{AA})$$

Where,		Units
$SE_{mobile,init}$	= Secondary effect emissions due to mobile combustion from site preparation	tCO ₂ e
1.61	= Mobile combustion emission factor ⁴¹ assuming diesel fuel use, 30.3 liters of fuel consumed per hour of equipment use, ⁴² and 19.7 hours of equipment use to clear a hectare with 100% brush cover	tCO ₂ e/hectare
$CC_{shrub,pre,AA}$	= Shrub cover as a percentage of Activity Area AA prior to site preparation activities	%
$CC_{shrub,post,AA}$	= Shrub cover as a percentage of Activity Area AA after site preparation activities are completed	%
A_{AA}	= Size of the Activity Area AA	hectares

5.4.1.2 Calculating Secondary Effects from Biomass Removal

For Reforestation Activity Areas, emissions must be estimated for the release of biomass-based carbon resulting from site preparation involving the removal of shrub cover. Estimates of the loss of shrub carbon stocks resulting from the removal of shrub cover during site preparation activities in Reforestation Activity Areas must be calculated using the same quantification approach as is described for estimating mobile combustion emissions in Section 5.4.1.1, but using Equation 5.4. The same 'before' and 'after' shrub canopy estimates must be used to calculate both mobile combustion emissions and shrub carbon stock removals, including the optional use of an assumption of 0% shrub canopy cover after site preparation is completed.

Equation 5.4. Shrub Biomass Removal Emissions Associated with Site Preparation

$$SE_{shrub,init} = \sum_{AA} [(-1) \times (A_{AA} \times (CC_{shrub,pre,AA} - CC_{shrub,post,AA}) \times RE_{AA})]$$

Where,		Units
$SE_{shrub,init}$	= Secondary effect emissions due to mobile combustion from site preparation	tCO ₂ e
A_{AA}	= Size of the Activity Area AA	hectares
$CC_{shrub,pre,AA}$	= Shrub cover as a percentage of Activity Area AA prior to site preparation activities	%
$CC_{shrub,post,AA}$	= Shrub cover as a percentage of Activity Area AA after site preparation activities are completed	%
$RE_{shrub,AA}$	= Default ratio estimator for shrubs for Activity Area AA	tCO ₂ e/hectare

⁴¹ 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.

⁴² 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.

Ratio estimators are maintained in the Assessment Area Data File⁴³ found on the Reserve's website and are subject to change. Refer to Assessment Area Data File for current ratio estimator(s). See Section C.1.5 for further guidance.

The difference is the value used for the variable $SE_{shrub,init}$ in Equation 5.2. Contact Reserve staff if no image is available to represent the conditions before site preparation was initiated.

5.4.2 Secondary Effects from External Sites for Reforestation, Restoration, Agroforestry, and Silvopastoral Activities

Reforestation, Restoration, Agroforestry, and Silvopastoral activities may result in a shift of grazing or agricultural activities outside the Project Area. Forest Owners must analyze the effect of Reforestation, Agroforestry, and Silvopastoral activities for each Activity Area at the activity inception. This is a one-time assessment for this activity and the results are used throughout the project life. Using the decision matrix in Figure 5.1, the Forest Owner must determine the percentage associated with the risk of secondary effects. The percent identified is incorporated into Equation 5.5 below as the Leakage Risk Percentage (LR) to calculate the secondary effects value (SE_y) used in Equation 5.1 and the Reserve's Carbon Monitoring Worksheet (CMW). The percentage value is applied as a constant to each reporting period to adjust calculated GHG removals in the reporting period.

In the first reporting period for Reforestation Activity Areas, secondary effect emissions from external sites must be added to any mobile combustion emissions and shrub biomass removal emissions, as calculated in Equation 5.3 and Equation 5.4, respectively.

⁴³ The Assessment Area Data File may be found on the Reserve's website: <https://www.climateactionreserve.org/how/protocols/panama-forest/>

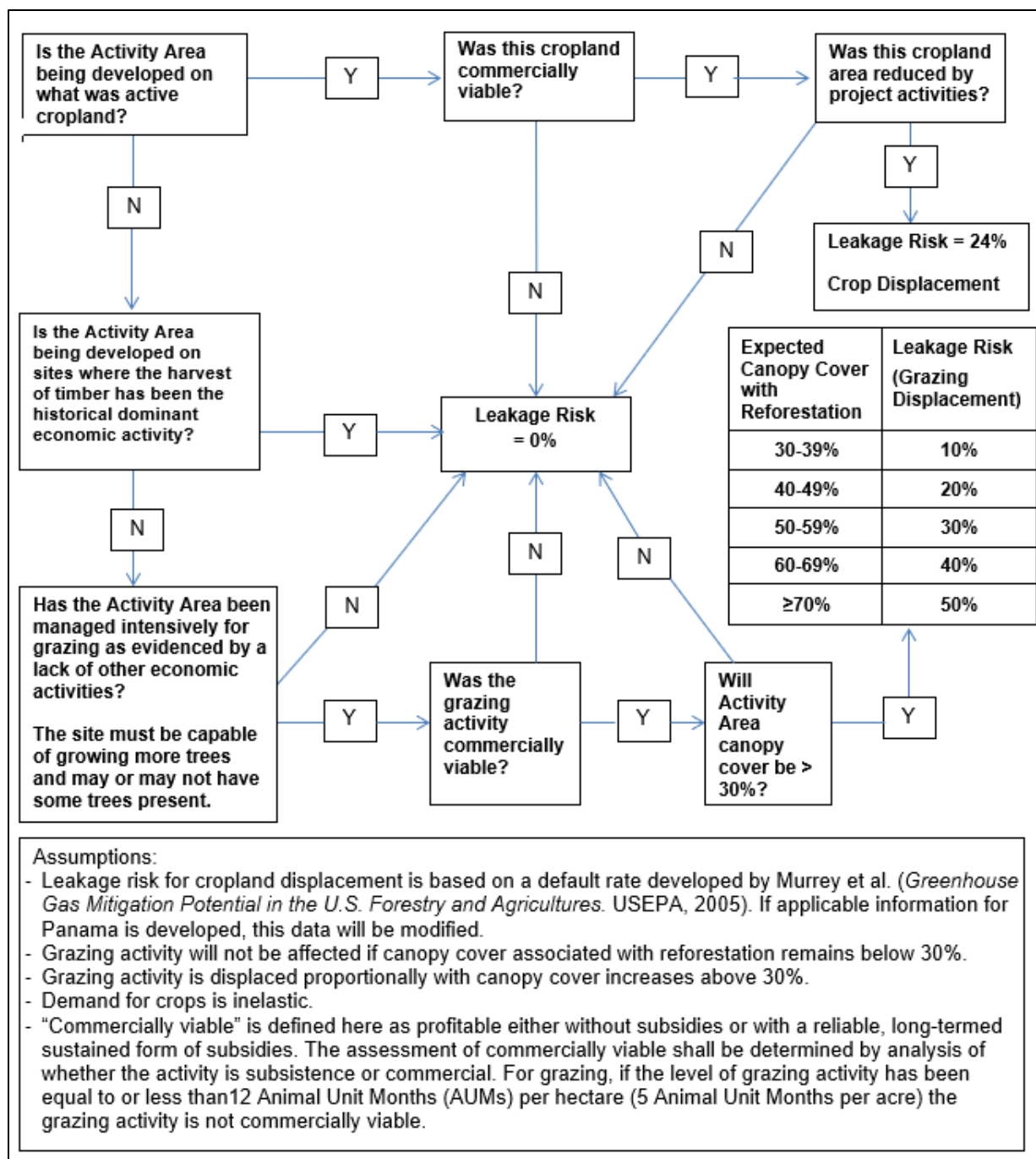


Figure 5.1. Risk Assessment for Reforestation, Restoration, Agroforestry and Silvopastoral Activity Areas

Equation 5.5. Secondary Effect Emissions for Reforestation, Restoration, Agroforestry and Silvopastoral Activities

$SE_y = (\Delta AC_{onsite,y} - \Delta BC_{onsite,y}) \times LR \text{ or } 0, \text{ whichever is lower}$		
Where,		<u>Units</u>
SE_y	= Secondary effects due to shifting of cropland or grazing activities	tCO ₂ e
$AC_{onsite,y}$	= Actual onsite carbon in standing live and dead trees in Activity Areas as inventoried for reporting period y	tCO ₂ e
$BC_{onsite,y}$	= Baseline onsite carbon in standing live and dead trees in Activity Areas as estimated for reporting period y	tCO ₂ e
LR	= Leakage Risk Percentage (Figure 5.1)	%

5.4.3 Secondary Effects for Improved Forest Management Activities

For Improved Forest Management activities, secondary effects can occur if a project reduces harvesting in the Activity Area(s), resulting in an increase in harvesting (along with associated emissions) outside the Activity Area(s).

The assumption under this protocol is that secondary effects may occur because of project activities. However, the amount of secondary effects is dependent on how much harvesting occurs on the Activity Area relative to the baseline scenario. This protocol considers the impacts of shifting harvest activities over the project life. Improved Forest Management activities, where harvesting is anticipated to be an ongoing activity over the project life, are anticipated to increase harvest levels over time compared to baseline management due to improved stocking and growth levels and harvesting closer to an optimal age to enhance forest productivity. However, secondary effects must be reported annually due to the risk that secondary effects may occur in any given year.

Equation 5.6 must be used to estimate the secondary effects risk for Improved Forest Management activities. Recognizing that secondary effects from projects may be influenced by long term harvesting trends, the evaluation in Equation 5.6 considers how actual cumulative harvest amounts vary from baseline cumulative harvest amounts since activity inception.

When baseline cumulative harvested carbon exceeds actual cumulative harvested carbon – *but actual onsite harvested carbon exceeds the baseline amount in a given reporting period* – net GHG reductions are increased (Equation 5.6.B). This allows for prior deductions for secondary effects to be recouped, because the risk has been lowered. However, once actual cumulative harvest amounts exceed baseline cumulative harvest amounts, secondary effects risk is zero, and will remain zero for as long as actual cumulative harvest amounts exceed baseline cumulative harvest amounts (Equation 5.6.A). Under no circumstance shall the net balance of secondary effects CRTs over the course of an Activity Area life be positive. However, maintaining actual cumulative harvest above baseline cumulative harvest will allow an Activity Area to accrue any uncredited positive carryover that can counteract the amount of future secondary effects deductions that would be applied if baseline cumulative harvested carbon were to exceed actual harvested carbon again (Equation 5.6.C). The Reserve provides a calculation workbook for quantifying secondary effects risk (in addition to the other calculations required by the protocol).

Values used for onsite carbon harvested in the Activity Area actual and baseline scenarios ($AC_{hv,n}$ and $BC_{hv,n}$) shall represent all harvested trees, not just merchantable species.

Equation 5.6. Secondary Effects Emissions for Improved Forest Management Activity Areas**Equation 5.6.A:**

$$\text{If } \sum_{n=1}^y (AC_{hv,n} - BC_{hv,n}) \geq 0, \text{ and } \sum_{n=1}^{y-1} SE_n \geq 0,$$

$$\text{then } SE_y = 0^\dagger$$

Equation 5.6.B:

$$\text{If } \left(\sum_{n=1}^y (AC_{hv,n} - BC_{hv,n}) < 0 \text{ and } \sum_{n=1}^{y-1} SE_n < 0 \right) \text{ or } \left(\sum_{n=1}^y (AC_{hv,n} - BC_{hv,n}) \geq 0 \text{ and } \sum_{n=1}^{y-1} SE_n < 0 \right),$$

$$\text{then } SE_y = \text{MIN} \left((AC_{hv,y} - BC_{hv,y}) \times 20\%, \left| \sum_{n=1}^{y-1} SE_n \right| \right)$$

Equation 5.6.C:

$$\text{If } \sum_{n=1}^y (AC_{hv,n} - BC_{hv,n}) < 0 \text{ and } \sum_{n=1}^{y-1} SE_n \geq 0,$$

$$\text{then } SE_y = \text{MIN} \left(\sum_{n=1}^{y-1} SE_n + ((AC_{hv,y} - BC_{hv,y}) \times 20\%), 0 \right)^\dagger$$

Where,

		<u>Units</u>
SE_y	= Estimated annual secondary effects in the current reporting period y	tCO ₂ e
SE_n	= Estimated annual secondary effects in reporting period n	tCO ₂ e
$AC_{hv,n}$	= Actual amount of onsite carbon harvested in reporting period n (prior to delivery to a mill)	tCO ₂ e
$BC_{hv,n}$	= Estimated average baseline amount of onsite carbon harvested in reporting period n (prior to delivery to a mill), as determined above	tCO ₂ e
$AC_{hv,y}$	= Actual amount of onsite carbon harvested in current reporting period y (prior to delivery to a mill)	tCO ₂ e
$BC_{hv,y}$	= Estimated average baseline amount of onsite carbon harvested in current reporting period y (prior to delivery to a mill), as determined in Section 5.4.3.1	tCO ₂ e

[†] Secondary effects are not awarded CRTs but may accrue as positive carryover. Annual accruals are calculated in the same way that secondary effects are calculated when baseline cumulative harvested carbon exceeds actual harvested carbon. Cumulative secondary effects as of the current reporting period are calculated by the following: $\sum_{n=1}^y SE_{as,n} = \sum_{n=1}^{y-1} SE_{as,n} + ((AC_{hv,y} - BC_{hv,y}) \times 20\%)$. Positive carryover reduces or negates future secondary effects deductions.

5.4.3.1 Developing the Baseline of Harvested Wood Products

A baseline of harvested wood products is developed based on the six years' worth of harvest data approved by MiAMBIENTE under an Annual Harvest Permit (PAC for its acronym in Spanish) prior to the Activity Area start date, or the longest set of harvest data available if records going back six years do not exist. Since harvest volume usually originates as volumetric

reports, there are several steps to complete the conversion, using default conversion estimators. The process steps are provided below, followed by an example in Figure 5.2.

Step 1. Develop historical annual values of harvested wood products and develop an average.

The Forest Owner must be careful to align any harvested wood products reports or estimates with the boundaries of the Activity Area. Harvest that occurred outside of the Activity Area shall not be included in the dataset. Historical data shall be based on the Annual Harvest Permit reports using the volume of harvested wood that went to the market submitted to MiAMBIENTE. The dataset shall be presented by conifers and hardwoods in the Project Report on an annual basis for the past six full calendar years prior to the Activity Area start date, or the longest time in which data were collected if records going back six full years are not available. An average must be developed for both species groups.

Step 2. If applicable, convert the log volume to whole tree volume.

Since a shift in GHG emissions would affect whole tree volume, not just the portion associated with wood products, the value used to calculate secondary effects must include the whole tree volume associated with the reported log volume. Forest Owners that already report whole tree volume in annual reports to MiAMBIENTE must use the reported whole tree volume values and skip this step.

Forest Owners that do not report whole tree volume annually to MiAMBIENTE, must convert the log volume to whole tree volume by dividing the log volume by 0.6. This default value is assumed to be the same for hardwoods and softwoods.

Step 3. Convert the whole tree volume to biomass.

Multiply the conifers by 0.53 and hardwood by 0.725 to develop a value for conifers and hardwoods of tonnes per cubic meter and sum the conifer and hardwood values.

Step 4. Convert the biomass values to CO₂e.

Multiply the summed biomass values by 0.5 to convert the biomass values to tonnes of carbon and multiply by 3.67 to calculate tonnes of CO₂e.

Step 5. Enter the tonnes CO₂e associated with baseline harvested wood products into the secondary effects worksheet provided by the Reserve.

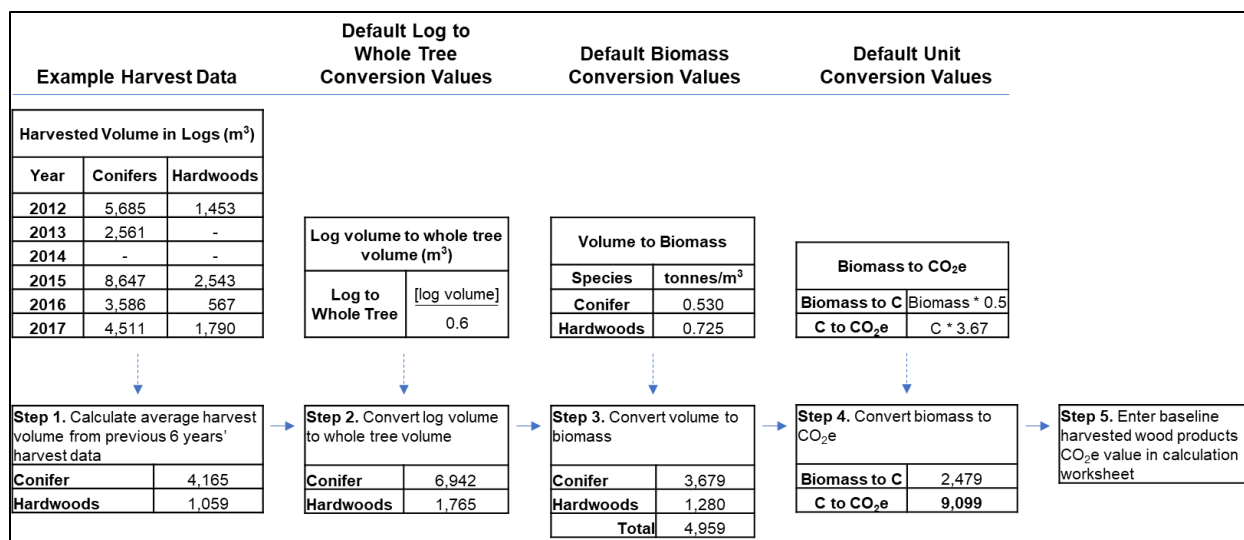


Figure 5.2. Example of the Computational Steps to Develop an Activity Area Baseline of Harvested Wood Products

5.4.3.2 Developing the Annual Report of Harvested Wood Products

An annual report of harvested wood products must be calculated to compare to the baseline harvested wood products estimate developed using the guidance in Section 5.4.3.1. The inclusion of a harvested wood products value in the Reserve's secondary effects calculation tool only occurs when there is at least 365 days' (one year's) worth of harvest data to compare to the baseline estimate. Therefore, the project may be exempt from calculating secondary effects for the first reporting period of the Activity Area, unless the first reporting period happens to be one full year. Reported wood products are included from the last full calendar year's data for the Activity Area and based on the same annual reports submitted to MiAMBIENTE. As an example, a monitoring period that begins on 1-April-2017 and concludes on 31-March-2018 will use the harvest report from 2017 as the basis of the annual report of harvested wood products for the secondary effects calculations. In this example, the 2017 harvest data would only be included in the annual report of harvested wood products and would not be included in the historical average for the baseline harvested wood products. Do not prorate the harvested wood products values from two different calendar year reports.

If the first reporting period is less than one full year, the baseline average must be used for the first reporting period annual report of harvested wood products. For all subsequent reporting periods, data based on the previous full calendar year (1-January to 31-December) must be used, unless the reporting periods going forward are aligned with the calendar year (1-January to 31-December), in which case the harvested wood products report from each calendar year must be used for the reporting period covering the same calendar year.

For example, a first reporting period that begins on 1-February-2020 and concludes on 31-October-2020 will use the baseline average for the first reporting period annual report and then use the 2020 harvested wood products volume for the second reporting period (1-November-2020 to 31-October-2021) annual report (Figure 5.3).

	Baseline Value 6	Baseline Value 5	Baseline Value 4	Baseline Value 3	Baseline Value 2	Baseline Value 1	RP1 Value	RP2 Value
Reporting Period (RP)							2/1/2020-10/31/2020	11/1/2020-10/31/2021
Harvest Cycle	2014	2015	2016	2017	2018	2019	Baseline Average	2020

Figure 5.3 Example 1 of Harvest Wood Products Annual Reports with Initial reporting period Less than a Full Calendar Year

A first reporting period that begins on 1-February-2020 and concludes on 31-December-2020 will also use the baseline average for the first reporting period annual report; however, the project will then use the 2021 harvested wood products volume for the second reporting period (1-January-2021 to 31-December-2021) annual report (Figure 5.4).

	Baseline Value 6	Baseline Value 5	Baseline Value 4	Baseline Value 3	Baseline Value 2	Baseline Value 1	RP1 Value	RP2 Value
Reporting Period (RP)							2/1/2020-12/31/2020	1/1/2021-12/31/2021
Harvest Cycle	2014	2015	2016	2017	2018	2019	Baseline Average	2021

Figure 5.4 Example 2 of Harvest Wood Products Annual Reports with Initial reporting period Less than a Full Calendar Year

If the harvest cycle does not align with the reporting period or calendar year, then the last full harvest cycle should be applied for each baseline and project reporting period value. For example, if the harvest cycle is from October to September, and the project's first reporting period is February 1, 2020, to January 31, 2021, then the project would use the harvest data from the October to September harvest cycle for the years 2013 – 2019 as the six values averaged to determine the baseline harvest value. The Forest Owner would then apply the October 2019-September 2020 cycle as the actual harvest volume for the initial reporting period (February 1, 2020 – January 31, 2021), against which the average baseline harvest value is compared in Equation 5.6.

	Baseline Year -6	Baseline Year -5	Baseline Year -4	Baseline Year -3	Baseline Year -2	Baseline Year -1	RP1 Value	RP2 Value
Reporting Period (RP)							2/1/2020-1/31/2021	2/1/2021-1/31/2022
Baseline Harvest Cycle Value	Oct 2013-Sep 2014	Oct 2014-Sep 2015	Oct 2015-Sep 2016	Oct 2016-Sep 2017	Oct 2017-Sep 2018	Oct 2018-Sep 2019		
Harvest Cycle	Oct 2013-Sep 2014	Oct 2014-Sep 2015	Oct 2015-Sep 2016	Oct 2016-Sep 2017	Oct 2017-Sep 2018	Oct 2018-Sep 2019	Oct 2019-Sep 2020	Oct 2020-Sep 2021

Figure 5.5 Example of Baseline Harvest Value with Harvest Cycle not Aligned with Reporting Period

	Baseline Year -6	Baseline Year -5	Baseline Year -4	Baseline Year -3	Baseline Year -2	Baseline Year -1	RP1 Value	RP2 Value
Reporting Period (RP)							2/1/2020-1/31/2021	2/1/2021-1/31/2022
Harvest Cycle	Oct 2013-Sep 2014	Oct 2014-Sep 2015	Oct 2015-Sep 2016	Oct 2016-Sep 2017	Oct 2017-Sep 2018	Oct 2018-Sep 2019	Oct 2019-Sep 2020	Oct 2020-Sep 2021

Figure 5.6 Example of Actual Harvest Volumes used for Project Reporting Periods when RP1 is a full year (and Harvest Cycle not Aligned with Reporting Period)

If the initial reporting period is less than a full calendar year, then the baseline value should be used for the initial reporting period value, followed by the last full harvest cycle value for the second reporting period, as previously described. For example, if the harvest cycle is from October to September, and the initial reporting period is February 1, 2020, to December 31, 2020, then the project would use the harvest data from the October-September harvest cycles for the years 2013-2019 as the six baseline values averaged to determine the baseline harvest value. That baseline average would then be applied as the actual harvest volume for the initial reporting period value (2/1/2020-12/31/2020), and the October 2020-September 2021 harvest cycle data would be applied as the actual harvest volume for the second reporting period (1/1/2021-12/31/2021).

	Baseline Value 1	Baseline Value 2	Baseline Value 3	Baseline Value 4	Baseline Value 5	Baseline Value 6	RP1 Value	RP2 Value
Reporting Period (RP)							2/1/2020-12/31/2020	1/1/2021-12/31/2021
Harvest Cycle	Oct 2013-Sep 2014	Oct 2014-Sep 2015	Oct 2015-Sep 2016	Oct 2016-Sep 2017	Oct 2017-Sep 2018	Oct 2018-Sep 2019	Baseline Average	Oct 2020-Sep 2021

Figure 5.7 Example of Actual Harvest Volumes used for project Reporting Periods when RP1 is not a full year (and Harvest Cycle not Aligned with Reporting Period)

The annual calculation is conducted using the same approach to conversions that was used for the baseline calculation, excepting that the annual reporting is based on an actual single year's value rather than an averaged set of data.

5.4.3.3 Calculating Secondary Effects from Improved Forest Management Activities

Annual secondary effects (SE_y) are calculated as described in Equation 5.6, using baseline and actual annual harvest amounts as determined above. The results of this calculation are then applied to Equation 5.1.

Table 5.1. Examples: How secondary effects Can Be Recouped and Positive Carryover Can Be Applied Over Time

a. Qualitative Example					
Reporting Period	Greater of Actual or Baseline		Protocol Equation Reference	Secondary Effect	
	Annual	Cumulative			
1	Baseline	Baseline	Equation 5.6.B	Negative secondary effect resulting in deduction applied to GHG reductions	
2	Actual	Baseline	Equation 5.6.B	Positive secondary effect resulting in recouping of previously deducted GHG reductions up until the cumulative secondary effect is zero	
3	Actual	Actual	Equation 5.6.A	No secondary effect, excepting any previous negative secondary effect deductions that have not been recouped and including any positive secondary effects that are carried over to the following year	
4	Baseline	Actual	Equation 5.6.C	No secondary effect, though adjusting any positive secondary effect carryover and carrying forward any remaining balance to the following year	
5	Baseline	Baseline	Equation 5.6.B	Negative secondary effect resulting in deduction applied to GHG reductions, with deduction lowered by any positive secondary effects carryover from when actual cumulative harvest carbon exceeded baseline cumulative harvested carbon	
b. Quantitative example					
Reporting period	1	2	3	4	5
Annual actual carbon in harvested trees	500	1,400	1,400	800	800
Annual baseline carbon in harvested trees	1,000	1,000	1,000	1,000	1,000
Cumulative actual carbon in harvested trees	500	1,900	3,300	4,100	4,900
Cumulative baseline carbon in harvested trees	1,000	2,000	3,000	4,000	5,000
Cumulative difference between actual and baseline CO ₂ in harvested trees	(500)	(100)	300	100	(100)
Annual difference between actual and baseline CO ₂ in harvested trees	(500)	400	400	(200)	(200)
Gross annual secondary effects	(100)	80	80	(40)	(40)
Adjusted gross annual secondary effects, not allowing positive cumulative secondary effects but not including positive secondary effects carryover	(100)	80	20	0	(40)
Carryover of positive secondary effects from prior year	NA	0	0	60	20
Net annual secondary effects	(100)	80	20	-	(20)

6 Ensuring the Permanence of Credited GHG Removals

The Reserve requires that all credited GHG removals be effectively “permanent.” For Forest Projects, this requirement is met by ensuring that the carbon associated with credited GHG removals remains stored for at least 100 years. However, as discussed in Section 3.14, under the PFP, projects may commit to maintaining carbon sequestered due to project activities for a period of time less than 100 years with a minimum time commitment of 30 years. Under the PFP, for projects that commit to maintaining carbon sequestered for a period of time less than 100 years, credits are issued based on the proportion of carbon that is stored or secured for the period of time the carbon is committed relative to the 100-year permanence period. Tonne-year accounting principles, as described in Appendix F are used to quantify the time-value of storing carbon as a relative proportion of the 100-year permanence requirement.

The PFP employs multiple mechanisms designed to address different considerations and potential scenarios to ensure that credited GHG removals meet permanence obligations. The permanence mechanisms include:

1. **A legal contract**, known as the Project Implementation Agreement, notarized and signed by the Forest Owner and Climate Action Reserve stating the obligations of each party in the instance of a reversal (Section 6.1)⁴⁴.
2. An **insurance mechanism**, referred to as a Buffer Pool, based on a project’s risk profile (Appendix G).
3. And, a **long-term economic incentive** approach that redistributes Buffer Pool dividends to projects that demonstrate ongoing compliance and maintenance of sequestered carbon stocks overtime (Appendix H).

6.1 Project Implementation Agreement and Communal Permanence Commitment

A Project Implementation Agreement (PIA) is a contract between the Reserve and the Forest Owner that ensures that the net quantity of carbon sequestered by a project will continue to be monitored and verified throughout the life of the project and specifies remedies in the event of a reversal (Section 6.2).

The PIA sets forth the Forest Owner’s obligation (and the obligation of its successors and assignees) to comply with the monitoring and verification requirements of the Panama Forest Protocol. The Forest Owner’s responsibilities in the event of a reversal are also addressed in the PIA. The PIA must be signed by the landowner(s) of private properties or the appropriate authority for government agencies, and notarized. The contract does not need to be recorded on the deed to the Forest Owner’s property. The PIA defines the period of time in which the Forest Owners commit to maintain the carbon sequestered due to project activities up to 100 years with a minimum of 30 years.

⁴⁴ As per Section 3.8 Regulatory Compliance, the Forest Project must be in material compliance with all laws, decrees, and resolutions of the Republic of Panama. The PIA further establishes that any dispute regarding any aspect of the PIA or the Forest Project, or any material breach of any law related to the Forest Project activity shall be submitted to arbitration in Panama.

As discussed in Appendix F, Forest Projects with a permanence commitment of less than 100 years are issued credits based on the proportion of carbon that is stored or secured for the period of time the carbon is committed relative to the 100-year permanence period.

6.2 Definition of a Reversal

A GHG removal can be “reversed” if the carbon stored because of the removal is subsequently released to the atmosphere prior to fulfilling its permanence commitment. A reversal occurs if the quantified GHG removals for a given reporting period (QR_y in Equation 5.1) are negative, and the established permanence commitment has not yet expired.

Under this protocol, credits are considered reversed in the opposite order to which the credit was quantified and verified. For example, suppose a project was credited 100 tonnes of carbon in year 1 and another 50 tonnes in year 2. In year 3, a reversal occurs that releases 75 credits to the atmosphere. In this situation, the 50 credits issued in year 2 are considered reversed, along with 25 of the credits issued in year 1.

Reversals are considered avoidable if they are the direct result of human activities through acts of gross negligence. Reversals are considered unavoidable if they are the result of natural events, such as wildfire, insect-related mortality or wind.

6.3 Compensation Formula for Reversals

If a reversal occurs, credits must be retired to ensure permanence of the CRTs already issued. Equation 6.1 shows the formula to determine how many CRTs to retire to compensate for a reversal affecting a specific vintage of sequestered carbon.

Equation 6.1. Formula to Determine the Number of CRTs to Retire to Compensate for a Reversal from a Specific Vintage

<i>Where,</i>		<u>Units</u>
CRT_{ret}	= Number of credits to be retired	
RT_y	= Quantity tonnes in reporting period y that has been reversed	tCO ₂ e
s	= Number of years remaining in the permanence commitment period for the CRTs in reporting period $y-1$, including reporting period y	

The quantity CRT_{ret} must be determined for each vintage of carbon affected by a reversal. As indicated above, carbon is considered reversed in the opposite order to which its sequestration was quantified and verified. Furthermore, for quantification purposes, a reversal is assumed to have occurred at the start of the reporting period during which it occurred, regardless of when during the reporting period it actually occurred.

6.3.1 Compensation of Unavoidable Reversals

An Unavoidable Reversal is any reversal that is not due to the Forest Owner’s negligence, gross negligence or willful intent, including natural events like wildfires or disease. Requirements following an Unavoidable Reversal are as follows:

1. A written description and explanation of the Unavoidable Reversal must accompany the Annual Monitoring Report.

2. Within one year of the Reversal notice, the Forest Owner must provide the Reserve with an estimate of current onsite carbon stocks. The Forest Owner will then need to complete verification of those onsite carbon stocks within the following year. A site visit verification may be required based on the scale and nature of the reversal. Exceptions to this timing may be made if the Reserve agrees that an extension is warranted.
3. No transactions will be allowed until the reversal is verified.

If the Reserve agrees that the reversal is unavoidable in origin, the Reserve will retire a quantity of CRTs from its Buffer Pool (see below) for each vintage affected by the reversal, according to Equation 6.1. The tracking of carbon stocks and any reversals will be transparent within the Registry and clearly indicate that the compensation has occurred.

Moreover, the Forest Project will not receive further Buffer Pool dividends distributions (as described in Section 6.3.5) until the Forest Project has replenished the Buffer Pool for those that were retired due to the reversal.

In addition, through the Reserve's adaptive management of the Buffer Pool, the occurrence of a reversal may result in further adjustments to Buffer Pool contributions and dividends distributions programmatically.

6.3.2 Compensation of Avoidable Reversals

An Avoidable Reversal is any reversal that is due to the Forest Owner's negligence, gross negligence or willful intent, including harvesting, development, or harm to the Activity Area. Reversals are detected during annual monitoring and verification events. Subsequent to the identification of a reversal, the following requirements apply:

1. A written description and explanation of the reversal must accompany the Annual Monitoring Report.
2. Within one year of receiving an Avoidable Reversal notice, the Forest Owner must provide the Reserve with an estimate of current onsite carbon stocks. The Forest Owner will then need to complete verification of those onsite carbon stocks within the following year. No transactions will be allowed until the reversal is verified.
3. Within two years of receiving the Avoidable Reversal notice, the Forest Owner must retire a quantity of CRTs determined according to the formula in Equation 6.1 for each vintage affected by the reversal. Project registration and transaction activities will be suspended until the required amount of CRTs is retired.
4. Failure to compensate within the stated time will result in restitution as defined within the contract securing the carbon.

Through the Reserve's adaptive management of the Buffer Pool, the occurrence of a reversal may result in further adjustments to Buffer Pool contributions and dividends distributions programmatically.

6.3.3 Computational Reversals

Computational Reversals include reversals that occur as a result of required protocol calculations. Confidence deductions and accounting for secondary effects may cause a computational reversal under certain circumstances. These types of reversals – which are not directly related to on-the-ground activities, but which nonetheless result in a situation in which the project has been over-credited – must be compensated for as described below.

Requirements for Computational Reversals are as follows:

1. If a Computational Reversal has been identified during annual monitoring, the Forest Owner must give written notice to the Reserve within thirty days of identifying the reversal.
2. Alternatively, if the Reserve determines that a Computational Reversal has occurred, it shall deliver written notice to the Forest Owner.
3. No additional verification requirements will be imposed for a Computational Reversal – the Forest Owner may conduct verification at the next regularly scheduled verification period.
4. The Forest Owner may true up the Computational Reversal during the next regularly scheduled verification period by deducting the reversed quantity from the to-be-issued CRTs. If growth has not compensated for the amount of the Computational Reversal, then existing CRTs will be cancelled as follows:
 - a. The Reserve will cancel CRTs that were issued to the Forest Project, preferably from the relevant vintage, unless those CRTs were previously retired for other purposes or are no longer held by the Forest Owner. Otherwise, CRTs must be purchased from other Forest Projects registered with the Reserve and provided for cancellation.
 - b. The cancelled CRTs must be designated in the Reserve’s software system as compensating for the Computational Reversal.

6.3.4 Role of Monitoring, Reporting, and Verification in the Finding of a Reversal

A reversal can be identified through monitoring by Forest Owners and/or during full verifications by third-party verifiers. Since Forest Owners are responsible to maintain current inventories of onsite carbon stocks and submitting Annual Monitoring Reports, a reversal can be identified by a Forest Owner as part of updating their inventory estimates for growth, harvest, and any other disturbances. Third-party verifiers can identify a reversal by a finding that the inventory is incorrectly characterized in the monitoring report; verifiers should be observant to disturbances while in the process of verifying inventory onsite and confirm that any noted disturbances have been properly reported.

6.3.5 The Reserve Buffer Pool

The Buffer Pool is a holding account for CRTs that is administered by the Reserve. All Forest Projects must contribute a percentage of CRTs to the Buffer Pool any time they are issued CRTs. Each Forest Project contribution is determined by Equation 6.2, as described in the following section. If a Forest Project experiences an Unavoidable Reversal of GHG removals, the Reserve will retire a number of CRTs as indicated in Section 6.3. Contributions are also required from each project for Avoidable Reversal risks to ensure the program remains whole in the event Avoidable Reversals are not compensated by a Forest Owner. The Buffer Pool acts as a general insurance mechanism against reversals for all Forest Projects registered with the Reserve.

The Buffer Pool contributions are determined through a project-specific risk assessment. Forest Projects also receive an economic incentive to ensure against reversals, based on an expected stream of future credits. As projects demonstrate ongoing compliance, a percentage of their Buffer Pool contribution may be redistributed back to the Forest Owner over time based on the tonne-year value of the project specific credits in the Buffer Pool (see Annex H). The Reserve will adaptively manage the Buffer Pool and Buffer Pool dividends, based on an ongoing assessment of programmatic risk and the health of the Buffer Pool.

6.3.5.1 Determination of Buffer Pool Contribution

Forest Owners must apply a risk reduction to their Forest Project to account for project risks associated with wildfire, disease or insects, and hurricanes or other natural disturbances. The credits associated with the Buffer Pool are used primarily for reversals associated with natural disturbances, but the Reserve may use the pool at its discretion for any reversal that may occur. The project's contribution to the Buffer Pool is a default deduction and is calculated as shown in Equation 6.2.

Equation 6.2. Contribution of Project Credits to Buffer Pool

Contribution to Buffer Pool $_{RP\ Y}$	=	$RR \times CRTs_{Reversible,y}$
<i>Where,</i>		
RR	=	Reversal Risk as determined by the guidance in Appendix G.
$CRTs_{Reversible,y}$	=	CRTs secured through contractual agreement or communal/ <i>ejidal</i> commitment, net of confidence deductions and leakage adjustments and verified in reporting period y

6.4 Disposition of Forest Projects after a Reversal

If a reversal lowers the Forest Project's actual standing live or dead carbon stocks below its approved baseline standing live or dead carbon stocks, the Forest Project will automatically be terminated. In this circumstance, the original approved baseline for the project would no longer be valid. The Reserve may consider exemptions to this rule for specific cases and conditions. Depending on the nature of the reversal, a Forest Project may be initiated and submitted to the Reserve for registration on the same Project Area. If the Forest Project is terminated due to an Unavoidable Reversal, another project may be initiated and submitted to the Reserve for registration on the same Project Area. New projects may not be initiated on the same Project Area if the Forest Project is terminated due to an Avoidable Reversal.

If the Forest Project has experienced a reversal and its actual standing live or dead carbon stocks are still above the approved baseline levels, it may continue without termination as long as any reversal of secured CRTs has been compensated by the Buffer Pool; in addition, the Forest Project would not be eligible to receive further redistributions of Buffer Pool contributions until the Forest Project has replenished the Buffer Pool for those that were retired due to the reversal (Appendix G). The project must continue contributing to the Buffer Pool in future years based on Equation 6.2.

7 Project Documentation, Monitoring, and Verification

This section provides requirements and guidance on project monitoring, reporting rules and procedures. Table 7.1 provides a summary of many of the documentation and monitoring reports and forms required by the protocol. The table displays the schedule associated with the reporting and submission requirements. Details related to project documentation, monitoring, and verification are described below.

Forest Projects participating in an Aggregate (see Section 3.5) have a less frequent verification schedule. For guidance on monitoring and verification of projects in an Aggregate, see Appendix E. Forest Projects participating in an Aggregate are still required to follow the annual reporting requirements outlined below.

Table 7.1. List of Important Documents and Activities by Timing of Requirement for Forest Carbon Projects

	Project Submittal		Full Verification	Annual Reporting between Full Verifications	
	Prior to verification	Project Initiation	Generally, Every 6 Reporting Periods ⁴⁵	With Desk Verification	Without Desk Verification
Project Submittal Form	X				
Land Tenure Documents	X				
Project Report		X			
Attestation of Title		X	X	X	
Attestation of Regulatory Compliance		X	X	X	
Attestation of Voluntary Implementation		X	X	X	
Attestation of No Conflicts/Government issued document attesting no conflicts		X	X	X	
Annual Monitoring Report		X	X	X	X
Carbon Monitoring Worksheet		X	X	X	X
Native Species Report from CALC BOSK (if applicable)		X	X		
Monitoring Report for Maintenance of Forest Carbon Stocks in the Project Area (if applicable)		X	X		

⁴⁵ Full visit verifications are generally required at least every 6 reporting periods; however, there are some exceptions. Please see Section 8.2 for all site visit verification scheduling requirements and exceptions for standalone Forest Projects. For Forest Projects in an aggregate, full verifications may also be less frequent than every 6 reporting periods. The schedule for full verifications for Forest Projects in an aggregate depends on the number of Activity Areas in the aggregate. Please see Appendix E for further information on the verification schedule of aggregates.

	Project Submittal		Full Verification	Annual Reporting between Full Verifications	
	Prior to verification	Project Initiation	Generally, Every 6 Reporting Periods ⁴⁵	With Desk Verification	Without Desk Verification
Forest Carbon Project Concepts, Anticipated Benefits, and Project Approval (SS1-SS7)		X			
Meeting Notification, Participation, and Documentation (SS8-SS10)		X	X	X	X
Project Governance (SS11-SS14)		X	X	X	X
Verification Report		X	X	X	
Verification Statement		X	X	X	
Project Implementation Agreement		X	X	X	

* Projects participating in an Aggregate have a less frequent verification schedule.

7.1 Project Documentation

Each of the following documents is discussed in this section in greater detail, unless addressed in a different section as explained below. All documents are provided for the Forest Project unless stated to be required per Activity Area.

Forest Owners or project developers must provide the following documentation to the Reserve in order to list⁴⁶ a Forest Project:

- Project Submittal Form
- KML and shape file displaying the general Project Area and anticipated Activity Area(s) (does not need to be finalized)
- For IFM projects, the authorized Forest Management Plan by MiAMBIENTE
- Restoration PST Tool (if applicable)

Along with the documents required for all reporting periods and all verifications (see below), Forest Owners or project developers must provide the following documentation to the Reserve in order to register⁴⁷ a Forest Project (undergo initial verification and receive CRTs).

- Project Report
- Final KML and shape file of Project Area and Activity Area(s)
- Land Tenure Status (see Section 3.6)
- Native Species Report per Activity Area (if applicable; environmental safeguards 2 and 3; see Section 3.10)

⁴⁶ The project is considered “listed” and made publicly available on the Reserve once a Project Submittal Form is accepted for filing.

⁴⁷ The project is considered “registered” the first time it is verified and accepted by the Reserve.

The Forest Owner must provide the following monitoring reports to the Reserve for each reporting period, regardless of undergoing a verification. There are two exceptions to this requirement. First, the Annual Monitoring Report is not required during the project's initial verification, when a Project Report is submitted. The second exception is for projects that wait to submit their Project Report until the end of the second reporting period. Such projects do not need to separately submit the following documents for the first reporting period.

- Annual Monitoring Report (form provided on the Reserve website⁴⁸)
- Carbon Monitoring Worksheet (CMW)
- Social safeguard documentation (if applicable; see Section 7.1.2)

The Forest Owner must provide the following documentation each time a Forest Project is verified, including initial verification, all full verifications, and desk verifications, in order for the Reserve to issue CRTs for quantified GHG removals.

- Signed Attestation of Title form (see Section 3.6.1)
- Signed Attestation of Regulatory Compliance form (see Section 3.8)
- Signed Attestation of Voluntary Implementation form (see Section 3.13.1)
- Project Implementation Agreement (see Section 6)
- Updated map of Activity Areas, which must delineate all areas affected by a natural disturbance in excess of 5 hectares or harvest during the reporting period being reported
- Verification Report (provided by verifier; see Section 8)
- Verification Statement (provided by verifier; see Section 8)

Along with the above documents, the Forest Owner must provide the following monitoring reports each time a Forest Project undergoes a full verification in order for the Reserve to issue CRTs for quantified GHG removals.

- Native Species Report per Activity Area (if applicable; environmental safeguards 2 and 3; see Section 3.10)
- Monitoring Report for Maintenance of Forest Carbon Stocks in the Project Area (if applicable; see Section 3.10)

7.1.1 Project Submittal Form

The Project Submittal Form is required to determine if the project meets general eligibility requirements of the protocol and to establish a relationship between the Forest Owner and the Reserve. The project is considered "listed" and made publicly available on the Reserve once a Project Submittal Form is accepted for filing.⁴⁹ The form is a template that provides a general description of the project's environmental, social, and land tenure conditions to be outlined. It is intended to enable the Reserve staff to become familiar with the project's environmental and social aspects, project concepts for increasing carbon stores, and information related to eligibility requirements. It is also designed to highlight any potential challenging areas of the

⁴⁸ <http://www.climateactionreserve.org/how/program/documents/>

⁴⁹ In order to submit a project, an account must first be set up with the Reserve. Account registration only needs to occur once; any number of projects can be registered under the same account. See the Reserve Offset Program Manual for further information.

project that might require additional consideration prior to fully developing the project. A copy of the form is available at: <http://www.climateactionreserve.org/how/program/documents/>.

A KML and shape file displaying the general Project Area and anticipated Activity Area(s) is required along with the Project Submittal Form. The KML and shape file are not considered final at project submittal. Revisions to the Project Area may occur up until the project is initially verified.

7.1.2 Project and Monitoring Reports

The Project Report is a required document for reporting project information. Project Reports are intended to serve as the main project document that thoroughly describes how the project meets eligibility requirements, the project's vegetative and social framework, and the current forest conditions, threats, and activities associated with the Project Area. The final KML and shape file displaying the Project Area must be submitted with the Project Report along with a map of the Activity Area boundaries at the time of the initial verification (see Section 2.2). The map of Activity Area boundaries must be updated anytime the Forest Project adds additional Activity Areas. The Project Report also outlines how the project complies with terms for additionality.

Project Reports are intended to communicate project information in a transparent manner and be available to the public. Project Reports must be of professional quality and free of incorrect citations, missing pages, incorrect project references, etc. The Project Report establishes much of the project's base information.

The Project Report can be submitted any time after the project is listed but must be submitted within 12 months of the end of the second reporting period. The project can undergo initial verification as soon as the Project Report is submitted. Alternatively, Projects can postpone their initial verification until the end of the second reporting period but must complete verification within 12 months of the second reporting period. A Project Report template has been prepared by the Reserve and is available on the Reserve's website. The template is arranged to help ensure that all requirements of the protocol are addressed.

Monitoring is the process of regularly collecting and reporting data related to a project's performance. Annual monitoring of Forest Projects is required to ensure up-to-date estimates of project carbon stocks and provide assurance that GHG removals achieved by a project have not been reversed. An updated map of Activity Areas demarcating all areas affected by a natural disturbance in excess of 5 hectares or harvest must also be included in the Annual Monitoring Report for any reporting period undergoing a verification. Additionally, monitoring ensures the project remains in compliance with environmental and social safeguards. Monitoring is required for a period of 100 years following the final issuance of CRTs to a project or for the length of time remaining in the Forest Project's permanence commitment or for the length of time the project remains active. Excepting the flexibility allowed in the submission of the monitoring report for the initial verification (as described below), Annual Monitoring Reports are required to be submitted within 12 months of each reporting period. Monitoring reports are subject to verification per the verification schedule in Section 8.

Figure 7.1 illustrates the optional and final deadline for monitoring reports. Each report must be submitted within 12 months of the given event. For example, project submittal must occur within 12 months of the project start date.

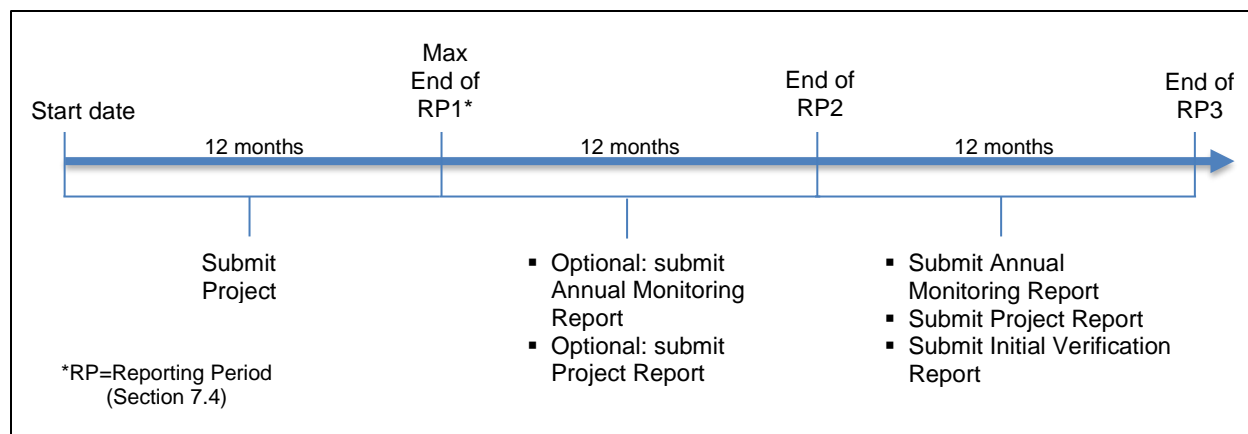


Figure 7.1. Schedule of Monitoring Report Requirements

The following documents related to forest carbon and environmental safeguards must be submitted prior to initial verification and subsequently on an annual basis:

- Annual Monitoring Report
- Carbon Monitoring Worksheet (CMW)

The following documents related to forest carbon and environmental safeguards must be submitted prior to initial verification and subsequently before each full verification for each applicable activity (see Section 3.10).

- Monitoring Report for Native Species (Presence and Composition) per Activity Area
- Monitoring Report for Maintenance of Forest Carbon Stocks in the Project Area

Many of the reports are automated from the Reserve's Microsoft (MS) Access database (CALCBOSK).

7.1.2.1 Annual Monitoring Report

The Annual Monitoring Report is a form that can be downloaded from the Reserve's website⁵⁰ and must be submitted to the Reserve on an annual basis. The form is the basis for annual monitoring and requires the submittal of the CMW to be submitted as an attachment. The Annual Monitoring Report must be submitted within 12 months of each reporting period, with the exception of the first reporting period as discussed in Section 7.

7.1.2.2 Carbon Monitoring Worksheet

The Reserve will provide an example of the CMW used for tracking forest carbon within the Activity Areas. The CMW can be downloaded from the Reserve's website along with the Quantification Tools User Manual, which provides detailed instructions. For Forest Projects with multiple Activity Areas, Forest Owners should contact the Reserve for the appropriate CMW. The CMW must be used by Forest Owners and submitted to the Reserve on an annual basis. Data entered into the CMW must be to two significant digits. The CMW is the basis for data reporting of:

⁵⁰ <http://www.climateactionreserve.org/how/program/documents/>

- Live and dead carbon in standing trees associated with baseline and project activity per Activity Area
- Inventory sampling confidence and adjustments for uncertainty for Activity Area stocks (not applicable for Activity Areas that use the canopy cover inventory methodology)
- Totaled Verified Removals per Forest Project
- Contribution to reversal Buffer Pool per Forest Project

The CMW automates the calculation, or provides evidence of:

- Carbon credits generated by vintage
- Estimates of secondary effects
- Reversals (if any)
- Maintenance or increase of standing live and dead carbon stocks over the project life, as determined by a running 10-year average (environmental safeguard 1)

The CMW must be updated and submitted along with the Annual Monitoring Report on an annual basis to reflect changes in forest carbon stocks according to the protocol.

7.1.2.3 Monitoring Report for Native Species (Presence and Composition)

Monitoring is required within the IFM, Restoration, Reforestation, Large Urban Forestry, and Agroforestry Activity Areas to ensure compliance with native species requirements (see Section 3.10). The non-carbon requirements within Activity Areas include:

1. Demonstration of compliance with the percent of total native species (environmental safeguard 2)
2. Demonstration of compliance with the composition of native species (environmental safeguard 3)

Inventory data from sampling activities provides the basis for monitoring compliance with the native species requirements (environmental safeguard 2 and 3). Inventory data must be updated annually according to guidance in Section 5 and Appendix B to reflect current conditions. For Agroforestry Activity Areas employing the canopy cover methodology, the Forest Owner may provide photo imagery or other documentation to demonstrate compliance with native species requirements (see Section 7.3).

A report must be generated to display the distribution of native species based on percentage representation of trees per hectare within each Activity Area. Continuous progress means that the percentage of native species positively trends toward the targets on a running 10-year basis⁵¹ Annual declines are allowed from year to year to address issues of uncertainty associated with inventory estimates. The Activity Area is out of compliance if the Activity Area exceeds a relapse of 3% in any year or if the 10-year rolling average does not show positive improvement of 5% or greater toward the target. CALCBOISK automates the required reports for each Activity Area. Submission of the report is required prior to all full verifications to facilitate verification of environmental safeguards 2 and 3.

⁵¹ The trend must be positive using a running 10-year average, which means annual fluctuations are allowed and that the metric cannot be calculated until the project has been engaged for 10 years.

7.1.2.4 Monitoring Report for Maintenance or Increase of Tree Canopy Cover in the Project Area

Monitoring is required to ensure IFM, Restoration, Reforestation, Agroforestry, and Silvopastoral activities do not lead to increased harvest or conversion of forests throughout the entire Project Area. The monitoring strategy is based on the repeated estimates of tree canopy cover using the methodology described in Appendix A prior to each full verification. The Monitoring Report that must be provided prior to each full verification is generated through CALCBOISK. A carbon inventory of areas outside of Activity Areas is not required.

7.2 Monitoring Guidance for Social Safeguards

The monitoring requirements associated with social safeguards are designed to ensure the requirements specified in Section 3 are being followed. In the instance of a Forest Project being in non-compliance with the social safeguards, project activity will be suspended until the project is brought into compliance and reports used for determination are verified. The schedule of monitoring varies depending on the monitoring theme. Table 7.2 displays the monitoring requirements and schedule for each monitoring theme.

Table 7.2. Monitoring Requirements and Schedule

Free, Prior, and Informed Consent			
Prior to project registration ⁵² , Forest Owner(s) and Project Developer must hold a meeting or series of meetings to discuss the themes addressed in this section. The meeting minutes and proof of the meeting (through photographs or signatures) must be included in the Project Report.			
These meetings must adhere to proper notification, participation, and documentation requirements in the section 3.9			
Monitoring Theme	Monitoring Requirement	Required Documentation	Schedule of Requirement
SS1 Forest Carbon Project Concepts	A presentation covering the required themes must be presented to the forest Owner prior to the initial approval of the Forest Project or approval to begin training and analysis for the Forest Project (see Section 3.11). The required elements from Section 3, SS9, apply to the meeting.	<ol style="list-style-type: none"> 1.Meeting notes, for the meeting where the presentation was made, including the agenda and any questions or comments. 2. A list of the names of all attendees, along with contact information if available. 3. PowerPoint that presented concepts, if available, or summary of points reviewed. 	<p>The meeting must be held prior to initial approval of the Forest Project or approval to begin training and analysis for the Forest Project.</p> <p>Documentation must be included in the Project Report prior to initial verification.</p>
SS2 Anticipated Costs	In a meeting a report that outlines the anticipated project costs is presented. The report and presentation must, at a minimum, include the themes specified in Section 3 (SS2). The required elements from Section 3, SS9 apply to the meeting.	<ol style="list-style-type: none"> 1. Meeting notes that indicate costs were discussed during the meeting, including an agenda and any follow-up questions and comments. 2. A list of the names of all attendees, along with contact information, if available. 3. PowerPoint that presented concepts, if available, or summary of points reviewed. 	<p>The meeting must be held prior to project registration.</p> <p>Documentation must be included in the Project Report prior to initial verification.</p>

⁵² Project registration occurs upon completing the initial verification and issuance of credits.

<p>SS3 Anticipated Benefits</p>	<p>In a meeting, a report that outlines the anticipated project benefits is presented. The report and presentation must, at a minimum, include the themes specified in Section 3 (SS3). The required elements from Section 3, SS9 to SS11 apply to the meeting.</p>	<ol style="list-style-type: none"> 1. Meeting minutes that indicate benefits were discussed during the meeting(s), including an agenda and any follow-up questions and comments. 2. A list of the names of all attendees, along with contact information if available. 3. PowerPoint that presented concepts, if available, or summary of points reviewed. 	<p>The Meeting must be held prior to project registration.</p> <p>Documentation must be included in the Project Report prior to initial verification.</p>
<p>SS4 Credit Sales, Use of Funds, and Benefit Sharing</p>	<p>In a meeting, report all credit sales or use of funds, including the themes specified in Section 3 (SS4). The required elements from Section 3, SS9 apply to the meeting.</p>	<ol style="list-style-type: none"> 1. Meeting minutes that indicates the themes specified in Section 3 (SS4) were discussed during the meeting(s), including an agenda and any follow up questions and comments. 2. A list of the names of all attendees, along with contact information if available. 3. PowerPoint that presented concepts, if available, or summary of points reviewed. 	<p>Documentation of the presentation of all themes specified in Section 3 (SS4) must be included in the Project Report prior to initial verification and as part of annual reporting.</p>
<p>SS5 Project Safety</p>	<p>In a meeting, a report that outlines the safety measures considered for the project. The report and presentation must, at a minimum, include the themes specified in Section 3 (SS5). The required elements from Section 3, SS9 applies to the meeting.</p>	<ol style="list-style-type: none"> 1. Meeting notes that indicates the themes specified in Section 3 (SS5) were discussed during the meeting(s), including an agenda and any follow up questions and comments. 2. A list of the names of all attendees, along with contact information if available. 3. PowerPoint that presented concepts, if available, or summary of points reviewed. 4. An agreement of understanding signed by all project participants. 	<p>Documentation of the presentation of all themes specified in Section 3 (SS5) must be included in the Project Report prior to initial verification and as part of annual reporting.</p>
<p>SS6 Project Approval</p>	<p>In a meeting the forest owner approves the project.</p> <p>The meeting must result in an officially documented vote and/or meeting notes and meet the voting requirements specified in Section 3 (SS6). The required elements from Section 3, SS9 apply to the Meeting.</p>	<ol style="list-style-type: none"> 1. A copy of the results of the vote specifically addressing project approval by the members (if applicable) 2. Meeting minutes for the meeting where the presentation was made, including any follow up questions and comments. 3. A list of the names of all attendees, along with contact information if available. 	<p>Meeting must be held prior to project registration. Documentation must be included in the Project Report prior to initial verification.</p>
<p>SS7 Project Developer</p>	<p>In a meeting the Forest Owner approves the project developer.</p> <p>The meeting must result in an officially documented vote and/or meeting notes and meet the requirements specified in Section 3 (SS7). The required elements from Section 3, SS9 apply to the Meeting.</p>	<ol style="list-style-type: none"> 1. Meeting notes for the meeting where the presentation was made, including any follow up questions and comments. 2. A list of the names of all attendees, along with contact information if available (if applicable). 3. If approved, the signed notarized contract with the project developer in 	<p>The meeting must be held prior to project registration. Documentation must be included in the Project Report prior to initial verification and/or included in the Annual Monitoring Report in the instance of renewing or</p>

		compliance with the requirements in SS7.	changing the project developer.
SS8 Aggregate Approval	In the meeting the Forest Owner approves joining an Aggregate. The meeting must result in a meeting minute and meet the voting requirements specified in Section 3 (SS8). The required elements from Section 3, SS9 apply to a meeting.	<ol style="list-style-type: none"> 1. Meeting minutes for the meeting where the presentation was made, including any follow up questions and comments. 2. A list of the names of all attendees, along with contact information if available. 3. If approved, the signed and notarized contract with the aggregator in compliance with the requirements in SS8. 	Meeting must be held prior to project registration. Documentation must be included in the Project Report prior to initial verification and/or included in the Annual Monitoring Report in the instance of entering/leaving an aggregate.

Notification, Participation, and Documentation			
<p>A public meeting prior to project registration and prior to each complete verification is held to discuss critical elements associated with project activities that may affect neighboring communities and landowners. Provisions must be made to ensure non-Spanish speaking participants can understand the material and communicate during public meetings. Each meeting must include the following items on the agenda:</p> <ul style="list-style-type: none"> ▪ Forestry activities (management actions, environmental issues, grievances, other concerns and opportunities) ▪ Programmatic events (monitoring, reporting, and verification activities) <p>A meeting (at least once a year) is held between the Forest Owner and Project Developer to discuss critical elements associated with project activities. Each meeting must include the following items on the agenda:</p> <ul style="list-style-type: none"> ▪ Credits issued ▪ Benefit sharing arrangements ▪ Finances 			
Monitoring Theme	Monitoring Requirement	Required Documentation	Schedule of Requirement
SS9 Proper Notification	Forest Projects must hold at least one public meeting annually. Posting requirements are specified in Section 3, SS9.	<ol style="list-style-type: none"> 1. A description of how notices of the public meeting(s) took place in order to include as many people as possible. 2. Project Report or Annual Monitoring Report 	Must be provided as part of the Project Report prior to initial verification and a part of annual monitoring.
SS10 Participation	At least one annual meeting must be open to the public for participation. The Forest Owner must provide a space for participation from neighboring communities and/or landowners.	<ol style="list-style-type: none"> 1. Copies of sign-in sheets. 2. Meeting notes that summarize public comments. 3. Project Report or Annual Monitoring Report 	Must be provided as part of the Project Report prior to initial verification and a part of annual monitoring.
SS11 Meeting Documentation	Documentation of all meetings must occur as per Section 3, SS11 Meeting notes must address each item on the agenda and not on the agenda that were discussed. Meeting notes from the public meeting must be available to the public.	<ol style="list-style-type: none"> 1. Meeting notes, accompanied with a description of how and when the meeting notes were made available to Forest Owner(s). 2. For the public meeting, a description of how and when the meeting notes were made available to the public. 	Must be provided as part of the Project Report prior to initial verification and a part of annual monitoring.

Project Governance

The forest owner may select a project coordinator or serve as project coordinator himself/herself. A project coordinator must be selected to represent the Forest Owner (if not him/herself) with the project developer, verifiers, and Reserve staff. The Project Coordinator is responsible for:

- Ensuring all project-related documentation is in order and up to date
- Ensuring meetings include the required elements above and providing the corresponding meeting notes
- Organizing logistics with verifiers and Reserve staff

For projects with multiple Forest Owners, they must choose a Project Coordinator and comply with the following

Monitoring Theme	Monitoring Requirement	Required Documentation	Schedule of Requirement
SS12 Identification of a Project Coordinator	If the coordinator is different than the forest owner, Section 3, SS12 requires that a description of the selection/election process for a Project Coordinator be included in the Project Report.	<ol style="list-style-type: none"> 1. The description of the nomination and election/selection process must be included in the Project Report. 2. Meeting Notes that describe how the processes was reviewed approve the Project Coordinator. 	Must be provided with the Project Report prior to initial verification and in the event of a change in Project Coordinator.
SS13 Role and Participation of the Project Coordinator	Section 3, SS13 requires that a description of the role and participation of the Project Coordinator be included in the Project Report.	<ol style="list-style-type: none"> 1. A description of the role and participation of the Project Coordinator must be included in the Project Report. The Project Report and Annual Monitoring Report must further include the signature of the Project Coordinator attesting to their inclusion in the Forest Project MRV processes and ongoing compliance of the social safeguards. 	Must be provided in the Project Report prior to initial verification and Annual Monitoring Report.
SS14 Term of the Project Coordinator	If the coordinator is different than the forest owner Section 3, SS14 requires that the length of the term of the Project Coordinator be included in the project report	<ol style="list-style-type: none"> 1. A description of the term of Project Coordinator must be included in the Project Report. 2. The process for renewing the term of Project Coordinator must be addressed in the Project Report. 3. Meeting notes that describe how the terms were discussed and approved by the Forest Owner. 	Must be provided with the Project Report prior to initial verification and in the event of a change in Project Coordinator.
SS15 Replacing the Project Coordinator	Section 3, SS15 requires that a provision be included in the Project Report describing the process for replacing a Project Coordinator, even prior to completion of a term.	<ol style="list-style-type: none"> 1. A description of the process for replacing the Project Coordinator must be included in the Project Report. 2. A dispute resolution process must be documented in the Project Report. 3. Meeting notes that describe how the terms were discussed and approved by the Forest Owner. 	Must be provided with the Project Report prior to initial verification and in the event of a change in Project Coordinator.

7.3 Monitoring Objectives and Results for Non-Compliance

Forest Projects must monitor forest carbon stocks and compliance with environmental safeguards. The schedule of monitoring varies depending on the monitoring theme. Table 7.3 displays the monitoring requirements and schedule for each monitoring theme.

Table 7.3. Monitoring Objectives and Results for Non-Compliance

Activity	Monitoring Objective	Monitoring Tool	Programmatic Concerns and Rationale for Monitoring	Result of being Out of Compliance
All	Maintenance or increase of forest carbon stocks in Activity Areas	Carbon Monitoring Worksheet	Reversal of credited carbon stocks and environmental safeguard 1	Forest Owner must compensate for reversal. Project activity is suspended until reversal fully compensated.
All	Credit Issuance by Vintage as determined by carbon stock estimates	Carbon Monitoring Worksheet	Over-/Under-issuance of forest carbon credits. Data are periodically verified for quality of input	Measurements, calculations and data input may need to be improved or enhanced.
All	Social safeguards (SS1-SS14)	Annual Monitoring Report, Project Report Meeting minutes	Ongoing compliance with the social safeguards	Project activity suspended until project is brought into compliance and documentation used for determination are verified.
IFM, Restoration, Reforestation	Continuous progress toward a goal of 95% native species in Activity Areas	Native Species (Presence) Report from CALCBOSK	Environmental safeguard 2	Project activity suspended until project is brought into compliance and data used for determination are verified.
Large Urban Forestry	Maintain or increase the percent native species in Activity Areas	Native Species (Presence) Report from CALCBOSK	Environmental safeguard 2	Project activity suspended until project is brought into compliance and data used for determination are verified.
Agroforestry	Percent native species in Activity Areas	If the Activity Area used the field sampling inventory methodology: Species (Composition) Report from CALCBOSK	Environmental safeguard 2	Project activity suspended until project is brought into compliance and data used for determination are verified.
		If employing the canopy cover methodology, the Forest Owner may provide photo imagery or other documentation to demonstrate compliance with native species diversity requirements.		

Activity	Monitoring Objective	Monitoring Tool	Programmatic Concerns and Rationale for Monitoring	Result of being Out of Compliance
IFM, Restoration, Reforestation,	Continuous progress toward compositional diversity of native species in Activity Areas	Native Species (Composition) Report from CALCBOSK	Environmental safeguard 3	Project activity suspended until project is brought into compliance and data used for determination are verified.
Agroforestry	Continuous progress toward compositional diversity of native species in Activity Areas	If the Activity Area used the field sampling inventory methodology: Species (Composition) Report from CALCBOSK	Environmental safeguard 3	Project activity suspended until project is brought into compliance and data used for determination are verified.
		If employing the canopy cover methodology, the Forest Owner may provide photo imagery or other documentation to demonstrate compliance with native species diversity requirements.		
Large Urban Forestry	Maintain or increase species diversity in Activity Areas	Native Species (Composition) Report from CALCBOSK	Environmental safeguard 3	Project activity suspended until project is brought into compliance and data used for determination are verified.
IFM, Restoration, Reforestation, Agroforestry, Silvopastoral	Maintenance of tree canopy cover throughout the Project Area	Monitoring Report prior to full verification	Environmental safeguard 4	If a decline in tree canopy cover since the previous full verification is detected during a full verification in excess of 5% and due to human activities, the project must rectify the forest cover loss through reforestation in the subsequent 6 reporting periods. If unable to rectify the tree canopy cover loss in the following 6 reporting periods, project activity will be suspended until brought into compliance and data used for determination are verified.

Activity	Monitoring Objective	Monitoring Tool	Programmatic Concerns and Rationale for Monitoring	Result of being Out of Compliance
IFM	Retention trees for harvested areas exceeding 5 hectares	Monitoring Report prior to full verification	Environmental safeguard 5	If no trees of the harvested age cohort are found within 100 meters from the area harvested, project activity will be suspended until project is brought into compliance and data used for determination are verified.
Reforestation	Maintenance of natural land cover	Project Report prior to initial verification	Environmental safeguard 6	Project activity suspended until project is brought into compliance and data used for determination are verified.
All	Monitor soil disturbance from site preparation for tree planting	Project Report prior to initial verification and all Monitoring Reports	Environmental safeguard 7	If deep ripping exceeds 1% of an Activity Area in a given year, crediting for any increases in forest carbon stocks will be suspended for the number of reporting periods equivalent to the proportion of the Activity Area affected, rounded up to the nearest percentage point.

7.4 Reporting Periods

A “reporting period” is a period of time for which a Forest Owner quantifies and reports GHG removals (i.e., the length of time covered by the annual CMW) and submits monitoring reports for all required annual monitoring elements listed above. Reporting periods for Forest Projects have a required duration of 12 months, with the exception of the first reporting period, which can be any length of time up to 12 months from the project’s start date.

All reporting periods after the first reporting period must be 12 months in duration and cover the same calendar period each year. Reporting periods must be contiguous, i.e., there must be no gaps in reporting during the crediting period of a Forest Project once the first reporting period has commenced.

A Forest Project is considered automatically terminated if the Forest Owner chooses not to report data and undergo verification at required intervals.

7.4.1 Issuance and Vintage of CRTs

Vintages are assigned to CRTs based on the proportional quantity of CRTs in each calendar year within a reporting period.

Table 7.4. Issuance and Vintage of CRTs

Project start date	First Reporting Period End Date		Second Reporting Period End Date	
August 15, 2012	February 15, 2013		February 15, 2014	
	137 days in 2012 / 185 total days = 74%	46 days in 2013 / 185 total days = 26%	319 days in 2013 / 365 days = 92%	46 days in 2014 / 365 days = 8%
Vintage	2012	2013		2014
CRTs	740	260	1,840	160
Note	First reporting period is 185 days and terminates on February 15. First reporting period can be less than 365 days to establish a desired reporting cycle.		Second reporting period (and all subsequent reporting periods) must be one year in duration.	

7.5 Transparency and Record Keeping

The Reserve requires data transparency for all Forest Projects, including data that displays current carbon stocks, reversals, and verified GHG removals, as well as verification reports. For this reason, all non-confidential project data reported to the Reserve will be publicly available on the Reserve's registry.

All documents and forms related to the project must be retained by the Forest Owner for the duration of the project. This information may be requested by the verification body or the Reserve at any time.

8 Project Verification

This section provides guidance to Reserve-approved verification bodies for verifying GHG removals associated with a planned set of activities to increase forest carbon stocks.

This section supplements the Reserve's Verification Program Manual, which provides verification bodies with the general requirements for a standardized approach for independent and rigorous verification of GHG removals. The Verification Program Manual outlines the verification process, requirements for conducting verification, conflict of interest and confidentiality provisions, core verification activities, content of the verification report, and dispute resolution processes. In addition, the Verification Program Manual explains the basic verification principles of ISO 14064-3:2006 which must be adhered to by the verification body.

Panama Forest Project verification bodies must read and be familiar with the following International Organization for Standardization (ISO) and Reserve documents and reporting tools:

1. Panama Forest Protocol (this document)
2. Reserve Offset Program Manual
3. Reserve Verification Program Manual
4. Reserve software
5. ISO 14064-3:2006 Principles and Requirements for Verifying GHG Inventories and Projects

Only Reserve-approved Panama Forest Project verification bodies are eligible to verify Panama Forest Project reports. To become a recognized Panama Forest Project verifier, verification bodies must become accredited under ISO 14065 and be accredited under the Mexican Accreditation Body (EMA – Entidad Mexicana de Acreditación) and/or American National Standards Institute (ANSI). Information on the accreditation process can be found on the Reserve website at <http://www.climateactionreserve.org/how/verification/how-to-become-a-verifier/>.

8.1 Standard of Verification

The Reserve's standard of verification for Forest Projects is the Panama Forest Protocol (this document), the Reserve Offset Program Manual, and the Reserve Verification Program Manual. To verify a Forest Owner's initial Project Report and annual monitoring reports, verification bodies apply the verification guidance in the Reserve's Verification Program Manual and this section of the PFP to the requirements and guidance described in Sections 2 through 7 of the PFP.

This section of the protocol provides requirements and guidance for the verification of Forest Projects under the PFP and describes the core verification activities and criteria that are necessary for a verification body to provide a reasonable level of assurance that the GHG removals quantified and reported by Forest Owners are materially correct.

Verification bodies will use the criteria in this section to determine if there exists reasonable assurance that the data submitted on behalf of the Forest Owner to the Reserve addresses each requirement in the PFP. Project reporting is deemed accurate and correct if the Forest Project is in compliance with the protocol.

Further information about the Reserve's principles of verification, levels of assurance, and materiality thresholds can be found in the Reserve's Verification Program Manual on the Reserve's website.⁵³

If material issues arise during verification of a participating project, the Forest Owner will need to independently address the issues and required corrective actions. These are described in this section of the protocol and the Reserve Verification Program Manual.⁵⁴

8.2 Verification Cycle

All Forest Projects must complete the initial verification and all subsequent verifications within 12 months of the end of the reporting period(s) being verified. For required verifications, failure to complete verification within the 12-month time period will result in account activities being suspended until the verification is complete. The project will terminate if the required verification is not completed within 36 months of the end of the reporting period(s) being verified. There is no consequence for failure to complete verification activities within 12 months for optional verifications.

Following the initial verification, subsequent verifications may include multiple reporting periods, referred to as the "verification period." The end date of any verification period must correspond to the end date of a reporting period.

While Forest Owners may depend on consultants or project developers to complete project requirements, responsibility for monitoring reports and verification compliance is assigned to the Forest Owner. It is the Forest Owner's responsibility to ensure that verifications are conducted according to the minimum required schedule specified in Table 8.1. A Verification Report, List of Findings, and Verification Statement must be submitted within 12 months of the end of any reporting period(s) being verified.

The Forest Owner is responsible for selecting a single verification body for any given year or set of years. The same verification body may be used up to six consecutive years (one regularly scheduled full verification). Other verification guidance is provided in the Verification Program Manual.

Verification is required at specific intervals to ensure ongoing monitoring of forest carbon stocks, inventory confidence, and compliance with social and environmental safeguards. Optional verifications, known as desk verifications, are at the Forest Owner's discretion and may be conducted between required verifications for crediting and/or to adjust the project's confidence estimate, among other rationale, based on changed management circumstances. Submission of Annual Monitoring Reports to the Reserve is required even if the Forest Owner chooses to forego an optional verification, with the exception of the submittal of the Project Report during the initial verification. Verification of the Annual Monitoring Report is not required with the submittal of the Project Report.

Refer to the table below for minimum required full verifications, optional desk verifications, and any exceptions to the minimum requirements.

⁵³ <http://www.climateactionreserve.org/how/program/program-manual/>

⁵⁴ <http://www.climateactionreserve.org/how/program/program-manual/>

Projects participating in an Aggregate have a less frequent verification schedule. For guidance on verification of projects in an Aggregate, see Aggregation E.

Table 8.1. Forest Project Verification Schedule

Project Type	Verification Type	Required Timing
All Forest Projects	Initial verification of the first, or first and second reporting period(s)	Must be completed within 36 months of the project start date.
All Forest Projects	All verifications (full verifications, and desk verifications)	Must be completed within 12 months of the end of the reporting period(s) being verified.
All Forest Projects	Full Verifications	Required to be completed within one year of notifying the Reserve of an avoidable reversal.
		Required to be completed within 2 years of notifying the Reserve of an unavoidable reversal.
		Required upon adding a new Activity Area.
		Required for the verification following the end of every 6 th reporting period.
	Desk Verification	Optional, between required full verification years.
All Forest Projects receiving under 4,000 CRTs/year	Full Verifications	Required for the verification following the end of every 12 th reporting period after a full verification has taken place, or once 48,000 CRTs have been accumulated across the unverified reporting periods.
	Desk Verification	Optional, between required full verification years.
Any Forest Project not seeking CRTs by the time a full verification is required	Desk Verification	If a Forest Project opts not to receive additional CRTs during a normal full verification year and has not experienced a reversal, they may undergo a desk verification of the monitoring reports submitted since the last verification in lieu of a full verification. If canopy cover has declined on the Activity Area by more than 5%, then a full verification must be conducted.

8.2.1 Initial Verification

All Forest Projects must be initially verified within 36 months of their start date. The initial verification must cover the initial reporting period and may also include the second reporting period. The initial verification must confirm the project's eligibility, compliance with applicable social and environmental safeguards, and that the included Activity Areas' initial inventory and baseline have been established in conformance with the PFP. The verification body must assess and ensure the completeness and accuracy of all required reporting elements for the Project Report (see Section 7.1.2), presented in Table 7.1.

While the initial verification must be conducted for the entire Forest Project, Forest Projects with multiple Activity Areas of different activities may have different requirements for the distinct activities.

8.2.1.1 Improved Forest Management, Restoration, and Large Urban Forestry Activity Areas

For IFM, Restoration, and Large Urban Forestry Activity Areas, the initial verification must include a site visit (see Section 8.4). Verifiers must confirm that the methodology for quantifying Activity Area baseline and current carbon stocks was implemented correctly following the

guidance in Appendix B and complete sequential sampling (see Section 8.4).

8.2.1.2 Reforestation Activity Areas

For Reforestation Activity Areas, the initial verification must confirm the implementation of the Reforestation activity and that the activity commenced after the Activity Area start date. Verification of the activity may be conducted through the use of geotagged photos, documented evidence of the purchase or receipt of trees, or through an onsite confirmation by the verification body. If an onsite confirmation is required, the verification body does not need to complete the site visit requirements of Section 8.4, rather the verification body need only confirm the planting of the trees and the estimated date of activity commencement. In addition to confirming the implementation of the activities, the initial verification should confirm eligibility and compliance with the applicable social and environmental safeguards.

8.2.1.3 Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas

For Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas that use the canopy cover inventory methodology, the initial verification does not require a site visit. Verifiers must confirm that the methodology for quantifying Activity Area baseline and current carbon stocks was implemented correctly following the guidance in Appendix C. For Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas that use the field sampling inventory methodology, a site visit is required following the guidance in Section 8.2.1.3.

8.2.2 Full Verification

A full verification involves review of the Forest Project's eligibility, quantification, and adherence to environmental and social safeguards. After a Forest Project's initial verification, subsequent full verifications must assess and ensure accuracy in measurement and monitoring techniques and record keeping practices.

Requirements for the full verifications vary by activity (i.e., IFM, Reforestation, Small and Large Urban Forestry, etc.). While full verifications must be conducted for the entire Forest Project, Forest Projects with multiple Activity Areas of different activities may have different requirements for the distinct activities.

Forest Projects not in an Aggregate must undergo a full verification every six reporting periods or in the event of adding a new Activity Area. See Table 8.1 for other exceptions. For example, if a Forest Project undergoes a full verification within the 12 months after the first Reporting Period, the Forest Project must undergo the next full verification within the 12 months after the seventh Reporting Period or sooner, such that a full verification must always occur within a period of six Reporting Periods. Forest Projects participating in an Aggregate have a different verification schedule (see Appendix E).

8.2.2.1 Improved Forest Management, Restoration, and Large Urban Forestry Activity Areas

For IFM, Restoration, and Large Urban Forestry Activity Areas, a site visit is required as part of all full verifications (see Section 8.4).

During verifications with site visits the Forest Owner may support the verification process by assisting in the monitoring activities to the extent that the verifier feels confident in the results of the verification process. However, the verification body should independently take all required measurements (see Section 8.4).

8.2.2.2 Reforestation Activity Areas

For Reforestation Activity Areas, a site visit is required as part of all full verifications. Reforestation activities may defer the second full verification indefinitely beyond the end of the sixth reporting period at the discretion of the Forest Owner. If deferred, the second verification must include a site visit and the verification body must confirm the Activity Area boundaries.

8.2.2.3 Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas

For Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas that use the canopy cover inventory methodology, site visits are not a required component of full verifications. Full verifications involve review of the Activity Area's eligibility, quantification, and adherence to environmental and social safeguards (if applicable). For Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas that use the field sampling inventory methodology, a site visit is required following the guidance in Section 8.2.2.3.

8.2.3 Desk Verifications

For all Activity Areas, for reporting periods in between required full verifications, project verification activities may consist of a desk verification. Desk verifications are considered complete verifications, in that the verification body must review the data in the annual monitoring reports to check calculations and information for reasonability, accuracy, and completeness. Desk verifications do not include a field inspection of reported data unless the verifier determines a field visit is required to resolve a specific conflict.

The desk verification of reported data is a reasonableness inspection. Verifiers must compare changes in reported carbon stocks and carbon stock increment to previously reported carbon stocks and increment to assess whether reported changes are justified, taking into consideration harvest fluctuations, forest conditions, updates to plot inventories and growth as projected through CALCBOSK from one reporting period to the next. Verifiers must repeat calculations of reporting period carbon stocks using the Activity Area data in an independent version of CALCBOSK. Any major fluctuations compared to the previous reporting period's reporting must be fully justified as part of the reporting period documentation. The verifier, with the Reserve's counsel, may make a determination that the reported data necessitates further review, including a site visit of updated inventory plots.

8.3 Project Verification Activities

Required verification activities for Forest Projects will depend on whether the verification body is conducting an initial verification for registration on the Reserve, a minimum required full verification, or an optional annual verification involving a desk verification. The following sections contain guidance for all of these verification activities.

8.3.1 Emission Sources, Sinks, and Reservoirs

For all verification activities, verification bodies review a project's reported sources, sinks, and reservoirs to ensure that all are identified properly and to confirm their completeness. Table 4.1 in Section 4 provides comprehensive lists of all GHG sources, sinks, and reservoirs that must be included in the quantification and reporting of GHG removals.

8.3.2 Project Area Definition

Verification bodies are required to review the geographic boundaries defining the Project Area and Activity Areas and their compliance with the requirements outlined in Sections 2.2 and 2.3.

Table 8.2. Verification Requirements for Project Area Definition

Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines	
2.2	1. Project Area and Activity Area	The Project Area has been presented according to requirements in Section 2.2.1.	Initial Verification	Maps, displaying Project Area that includes towns, roads, and major watercourses, and tenure documents demonstrating total hectares.	Low Verification is complete if maps, displaying towns, roads, and major watercourses, have been prepared, are legible, and appear to be an accurate depiction of the Project Area and the Project Area hectares correspond with land tenure documents.
		Activity Areas are clearly defined.	Initial Verification Full verification when new Activity Areas are added	Maps display Activity Areas. Inventory sample points should be distributed within Activity Areas.	Low Verification is complete if the Activity Areas within the Project Area have been completed and appear to accurately depict the Activity Areas in the Project Area.
		Proof that a description, shapefile, and maps of the geographic boundaries defining the Project Area and Activity Areas are on file at the Reserve.	Initial Verification Full verification when new Activity Areas are added	KML and shape files have been uploaded to the project files and are publicly available.	None Verification is complete if legible maps of the Project Area and Activity Areas have been uploaded to the Reserve's site and are publicly available.
2.3	2. Project Activities	Initial Verification	The Project Report confirms how each Activity Area meets the defined activity definition and states the defined activities that will lead to increased carbon stocks over time and not avoided emissions.	Very Low Verification is complete if the Project Report correctly confirms how each Activity Area meets the defined activity definition and states the defined activities that the project will implement that will increase carbon stocks over time.	

8.3.3 Eligibility Criteria and Participation Requirements

Verification bodies are required to affirm the project's eligibility according to the rules in Section 3.

Table 8.3. Verification Requirements for Eligibility Criteria

Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
3.1	Project Location	Initial Verification	1. Map that shows that the project is located in Panama	None Verification is complete if legible maps of the Project Area and Activity Areas have been uploaded to the Reserve's site and are publicly available.
3.2	Forest Owner Type	Initial Verification	1. Land tenure documentation as defined in Section 3.6	None Verification is complete if the verifiers review the land tenure status per requirements in Section 3.6 and confirms the Forest Owner is a natural or juridical legal person.
3.5	Aggregation	All Verifications	1. Aggregate documentation (if any)	None Verifiers must identify if a project is part of an Aggregate and if so refer to Appendix E for the verification schedule requirements.
3.6	Land Tenure Documentation	1. Initial Verification 2. Full Verification	1. The verification body must conduct a review to confirm ownership and claims to GHG removals that have occurred over the verification period.	None Verification is complete if: <ul style="list-style-type: none"> ▪ verifier receives proof of ownership per requirements in Section 3.6. ▪ verifier confirms there have been no changes to land ownership.
3.6.1	Attestation of Title	All Verifications	1. Proof that a signed Attestation of Title is on file at the Reserve for the dates of the verification period.	None Verification is complete if a current Attestation of Title is filed with the Reserve. Reserve personnel will provide confirmation.

Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
3.7	Conflicts	1. Initial Verification 2. Full Verifications	1. Proof that a signed Attestation of No Conflicts is on file at the Reserve. Review of ANATI and/or the Public Registry for any documented land tenure conflicts.	None Verification is complete if verifier confirms that the Attestation of No Conflicts has been uploaded to the Reserve site and that Activity Areas are free of substantial conflicts or disputes with regards to ownership per review of ANATI and/or the Public Registry.
		Desk Verifications	1. Proof that a signed Attestation of No Conflicts is on file at the Reserve.	None Verification is complete if verifier confirms that the Attestation of No Conflicts has been uploaded to the Reserve site and that Activity Areas are free of substantial conflicts or disputes with regards to ownership.
3.8	Regulatory Compliance	All Verifications	1. Proof that a signed Attestation of Regulatory Compliance form is on file with the Reserve for the reporting period. 2. Confirmation by the Forest Direction of MiAMBIENTE	Very Low Verification is complete if: <ul style="list-style-type: none"> ▪ a current Attestation of Regulatory Compliance form is on file with the Reserve. ▪ verifier has confirmed through communications with MiAMBIENTE personnel that the claim on the attestation is correct and/or through independent review of compliance with applicable laws, decrees, and resolutions. Verifier shall consult with Reserve personnel to determine the period of time the project was not in regulatory compliance and the effect the violation will have on project crediting.
3.11	Project start date	Initial Verification	1. Official approval of the project by the Forest Owner or project submittal to the Reserve.	Low to Moderate Verification is complete when verifier is able to confirm the start date as defined in Section 3.11.

Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
3.12	Project Crediting Period	Initial Verification	1. Project Report	Low to Moderate Verification is complete when verifier is able to confirm the Project Crediting Period as defined in Section 3.12.
3.13.1	Legal Requirement Test	All Verifications	1. Any laws, statutes, rules, regulations, or ordinances from the federal, provincial, or municipal level that may indicate whether project activities, including carbon stocking, are legally required at the time of the project start date. 2. Any other binding requirements that may affect carbon stocks, e.g., trusts. 3. Signed Attestation of Voluntary Implementation.	Very Low Verification is complete if: <ul style="list-style-type: none"> ▪ all laws, decrees, and resolutions affecting carbon stocking within the Activity Areas are documented and justification is provided indicating the impact of the legal requirements on carbon sequestration. ▪ a current Attestation of Voluntary Implementation form is on file with the Reserve. Credits cannot be issued for sequestration that is required by law.
3.13.2	Performance Standard Test	1. Initial Verification 2. Full verification when new Activity Areas are added	1. Project Report 2. Forest Management Plan	Very Low Verification is complete if: <ul style="list-style-type: none"> ▪ Review demonstrates that the Activity Area is under a Forest Management Plan that allows for commercial harvesting of all planted trees, and the Forest Project and all included Activity Areas meet requirements defined in the protocol. Where uncertainty persists, the Reserve shall be consulted for a final decision.
			1. Project Report	Very Low <ul style="list-style-type: none"> ▪ Verification is complete if Activity Areas meet activity definitions and all requirements defined in the protocol. Where uncertainty persists, the Reserve shall be consulted for a final decision.
			1. Project Report 2. Restoration PST Tool	Very Low Verification is complete if: <ul style="list-style-type: none"> ▪ review and investigation of the analysis demonstrates that the analysis was conducted correctly, and the

Section of PFP	Verification Items		Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
					<p>Forest Project and all included Activity Areas meet requirements defined in the protocol. Where uncertainty persists, the Reserve shall be consulted for a final decision.</p> <p>For Activity Areas that required an assessment of degradation, verification is complete if:</p> <ul style="list-style-type: none"> ▪ a review of the calculation confirms that the methodology for quantifying tree canopy area specified in Section C.1.3 was implemented correctly. ▪ Confirmation that the historical trend was developed by at least two historical images that are at least 10 years apart, and with the recent estimate within five years of the start date and the earliest point no earlier than 1990. ▪ The verifier must independently calculate the canopy area for the Project Area using a randomized or systematic application of points used by the Forest Owner. The points must be overlaid on the remote sensing image the Forest Owner used to generate their estimate/measurement of canopy area. The verifier shall determine if each point 'hits' or 'misses' a tree crown. The verifier shall sample enough plots to arrive at a determination of canopy area with +/- 10% at 90% confidence interval. The percentage canopy area determined by the verifier must be within 10% of the estimate provided by the Forest Owner. The verifier may repeat their effort if the Forest Owner is not in conformance with the verifier. Failure to find conformance after three efforts results in failure of the ability to verify the reported canopy area. The Forest Owner must resample/re-measure the canopy area prior to renewing verification activities. ▪ The i-Tree Canopy tool may be used to perform the analysis. ▪ Verifier confirmed the Project Report includes a description of the cause of degradation or risks of deforestation to the Activity Area and the project activities that will be implemented to increase forest carbon stocks within the Activity Area.

Section of PFP	Verification Items		Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
		Large Urban Forestry		<ol style="list-style-type: none"> 1. Project Report 2. Canopy Cover Trend Analysis 	<p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ a review of the calculation confirms that the methodology for quantifying tree canopy area specified in Section C.1.3 was implemented correctly. ▪ Confirmation that the historical trend was developed by at least two historical images that are at least 10 years apart, and with the recent estimate within five years of the start date and the earliest point no earlier than 1990. ▪ The verifier must independently calculate the canopy area for each Activity Area using a randomized or systematic application of points used by the Forest Owner. The points must be overlaid on the remote sensing image the Forest Owner used to generate their estimate/measurement of canopy area. The verifier shall determine if each point 'hits' or 'misses' a tree crown. The verifier shall sample enough plots to arrive at a determination of canopy area with +/- 10% at 90% confidence interval. The percentage canopy area determined by the verifier must be within 10% of the estimate provided by the Forest Owner. ▪ The verifier may repeat their effort if the Forest Owner is not in conformance with the verifier. Failure to find conformance after three efforts results in failure of the ability to verify the reported canopy area. The Forest Owner must resample/re-measure the canopy area prior to renewing verification activities. ▪ The i-Tree Canopy tool may be used to perform the analysis. ▪ The verifier confirms calculation of the historical trend is accurate.

8.3.4 Project Social Safeguards

Verification bodies are required to review the Forest Owner's compliance with the social safeguards (SS) described in Section 3.9 and 7.1.2. The social safeguards must be checked for all projects.

Table 8.4. Verification Requirements for Social Safeguards

Free, Prior, and Informed Consent				
Prior to project registration ⁵⁵ , the Forest Owner(s) and Project Developer must hold a meeting to discuss the themes addressed in this section. The meeting minutes and proof of the meeting (through photographs or signatures) must be included in the Project Report.				
These meetings must adhere to proper notification, participation, and documentation requirements in the section 3.9.				
Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
3.9, 7.1.2	SS1 Forest Carbon Project Concepts	Initial Verification	<ol style="list-style-type: none"> 1. Meeting notes where presentation was made, including an agenda and any follow-up questions and comments. 2. A list of the names of all attendees, and, if available, their contact information. 3. Presentation or PowerPoint, if available, or summary of points reviewed 	Low Verification is complete if: <ul style="list-style-type: none"> ▪ The Meeting Notes have been archived following a meeting and included in the Project Report. ▪ The Meeting Notes and PowerPoint (or summary of points reviewed) indicate costs and benefits were discussed at the meeting. ▪ An agenda for the meeting has been included in the Project Report. ▪ A list of names of attendees and, if available, their contact information (verifier may interview attendees) has been included in the Project Report. ▪ The verification team has interviewed the Project Coordinator independent of the project developer and confirms all themes detailed in SS1-SS3 were discussed in a meeting.
3.9, 7.1.2	SS2 Anticipated Costs	Initial Verification	<ol style="list-style-type: none"> 1. Meeting Notes that indicate that costs and division of costs and labor were discussed during the meeting, including an agenda and any follow up questions and comments. 2. A list of the names of all attendees, and, if available, their contact information. 3. Presentation or PowerPoint, if available, or summary of points reviewed 	
3.9, 7.2	SS3 Anticipated Benefits	Initial Verification	<ol style="list-style-type: none"> 1. Meeting Notes that indicate that benefits and distribution of benefits were discussed during the meeting, including an agenda and any follow up questions and comments 2. A list of the names of all attendees, and, if available, their contact information. 	

⁵⁵ Project registration occurs upon completing the initial verification and issuance of credits.

Free, Prior, and Informed Consent				
Prior to project registration ⁵⁵ , the Forest Owner(s) and Project Developer must hold a meeting to discuss the themes addressed in this section. The meeting minutes and proof of the meeting (through photographs or signatures) must be included in the Project Report.				
These meetings must adhere to proper notification, participation, and documentation requirements in the section 3.9.				
Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
			3. Presentation or PowerPoint, if available, or summary of points reviewed	
3.9, 7.1.2	SS4 Credit Sales, Use of Funds and Benefit Sharing	All Verifications	<ol style="list-style-type: none"> 1. Meeting Notes that indicate all themes detailed in SS4 were discussed during the meeting, including an agenda and any follow up questions and comments. 2. A list of the names of all attendees, and, if available, their contact information. 	<p>Low</p> <p>verification is complete if:</p> <ul style="list-style-type: none"> ▪ The Meeting Notes have been archived included in the Project Report or Annual Monitoring Report. ▪ The Project Report or Annual Monitoring Report includes a description of all themes detailed in SS4. ▪ The verification team has interviewed the Project Coordinator independent of the project developer and confirms all themes detailed in SS4 were discussed in a meeting and any purchase agreements have been presented on and shared with the project members; the verification team may interview other project members if needed.
3.9, 7.1.2	SS5 Project Safety	All Verifications	<ol style="list-style-type: none"> 1. Meeting notes that indicate all themes detailed in SS5 were discussed during the meetings, including an agenda and any follow up questions. 2. A of the names of all attendees, and, if available, their contact information. 3. Presentation or PowerPoint, if available, or summary of points reviewed 4. An agreement signed by all project participants. 5. FSC certificate, if applicable 	<p>Low</p> <p>Verification is complete if :</p> <ul style="list-style-type: none"> ▪ The Meeting has been archived following a community Assembly and included in the Project Report or Annual Monitoring Report. ▪ The Project Report or Annual Monitoring Report includes a description of all themes detailed in SS5. ▪ Copy of the signed agreement is on file with the Reserve. ▪ The verification team has interviewed the Project Coordinator independent of the project developer and confirms all themes

Free, Prior, and Informed Consent				
Prior to project registration ⁵⁵ , the Forest Owner(s) and Project Developer must hold a meeting to discuss the themes addressed in this section. The meeting minutes and proof of the meeting (through photographs or signatures) must be included in the Project Report.				
These meetings must adhere to proper notification, participation, and documentation requirements in the section 3.9.				
Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
				detailed in SS5 were discussed in a General Congress and project safety has been adequately addressed.
3.9, 7.1.2	SS6 Project Approval	Initial Verification	<ol style="list-style-type: none"> 1. Meeting Notes that include an agenda, and any follow up questions and comments. 2. List of the names of all attendees, and, if available, their contact information. 	<p>Low</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ a copy of the meeting notes is included in the Project Report. ▪ an agenda for the meeting is archived and available for review. ▪ a list of attendees is included in the Project Report (verifier may interview attendees as part of the verification). ▪ Meeting Notes are archived and available for review. ▪ the verification team has interviewed the Project Coordinator independent of the project developer and confirms the Forest Project was approved in a meeting; the verification team may interview other community members if needed.
3.9, 7.1.2	SS7 Project Developer Approval	<ol style="list-style-type: none"> 1. Initial Verification 2. Full verification after changing project developers 	<ol style="list-style-type: none"> 1. Meeting Notes that include an agenda, and any follow up questions and comments. 2. A list of the names of all attendees, and, if available, their contact information. (Optional) 3. Notarized contract between Forest Owner and project developer. 	<p>Low</p> <p>Verification is complete if :</p> <ul style="list-style-type: none"> ▪ Copy of contract between Forest Owner and project developer is on file with the Reserve.
3.9, 7.1.2	SS8 Aggregate Approval	<ol style="list-style-type: none"> 1. Initial Verification 2. Full verification after entering or 	<ol style="list-style-type: none"> 1. Meeting minute that includes an agenda, where the forest approves the aggregate. 2. List of the names of all attendees, and, if available, their contact information. 	<p>Low</p> <p>Verification is complete if :</p> <ul style="list-style-type: none"> ▪ A copy of the aggregate approval is archived

Free, Prior, and Informed Consent				
<p>Prior to project registration⁵⁵, the Forest Owner(s) and Project Developer must hold a meeting to discuss the themes addressed in this section. The meeting minutes and proof of the meeting (through photographs or signatures) must be included in the Project Report.</p> <p>These meetings must adhere to proper notification, participation, and documentation requirements in the section 3.9.</p>				
Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
		exiting an Aggregate	3. Notarized Contract between Forest Owner and Aggregate. 4. Aggregate Submittal Form (if applicable).	and available for review. <ul style="list-style-type: none"> ▪ An agenda for the Meeting is archived and available for review. ▪ A list of attendees is archived and available for review (verifier may interview attendees as part of the verification). ▪ Meeting Notes are archived and available for review. ▪ Copy of the contract between Forest Owner and Aggregate is on file with the Reserve. ▪ the verification team has interviewed the Project Coordinator/Forest Owner independent of the project developer and confirms the Aggregate was approved in a meeting and the terms of the contract with the aggregator have been presented on and shared with the Forest Owner Aggregate Submittal Form is properly filled out and on file with the Reserve (if applicable).

Notification, Participation, and Documentation
<p>A public meeting prior to project registration and prior to each full verification is held to discuss critical elements associated with project activities that may affect neighboring communities and landowners. Provisions must be made to ensure non-Spanish speaking participants can understand the material and communicate during public meetings. Each meeting must include the following items on the agenda:</p> <ul style="list-style-type: none"> ▪ Forestry activities (management actions, environmental issues, grievances, other concerns and opportunities) ▪ Programmatic events (monitoring, reporting, and verification activities) <p>A meeting (at least once a year) is held between the Forest Owner and Project Developer to discuss critical elements associated with project activities. Each meeting must include the following items on the agenda:</p> <ul style="list-style-type: none"> ▪ Credits issued ▪ Benefit sharing arrangements ▪ Finances

Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
3.9, 7.1.2	SS09 Meeting Notification	<ol style="list-style-type: none"> 1. Initial Verification 2. Full Verifications 	<ol style="list-style-type: none"> 3. A description of how notices of the public meeting(s) took place in order to include as many people as possible. 	<p>Very low</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ the Project Report or Annual Monitoring Report includes a description of the public meeting(s) notices indicating a high level of effort to communicate with the neighboring communities and landowners. ▪ verifier has interviewed the Project Coordinator independent of the project developer and may interview additional neighboring landowners to determine if notes are consistent with public testimonies.
	SS10 Participation	<ol style="list-style-type: none"> 1. Initial Verification 2. Full Verifications 	<ol style="list-style-type: none"> 1. Copies of sign-in sheets. 2. Meeting notes that summarize public comments. 3. Project Report or Annual Monitoring Report. 	<p>Very low</p> <p>Verification is complete if :</p> <ul style="list-style-type: none"> ▪ copies of the sign-in sheets are included in the Project Report or Annual Monitoring Report. ▪ summary notes of any comments raised during the public meeting(s) in which the project was discussed are included in the Project Report or Annual Monitoring Report. ▪ verifier has interviewed the Project Coordinator independent of the project developer and may interview additional neighboring landowners to determine if notes are consistent with public testimonies.
	SS11 Meeting Documentation	All Verifications	<ol style="list-style-type: none"> 1. Meeting notes, accompanied with a description of how and when the meeting notes were made available to Forest Owner(s). 2. For the public meeting, a description of how and when the meeting notes were made available to the public. 	<p>Very low</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ A description of how and when the meeting notes were made available to the Forest Owner and/or public is included in the Project Report or Annual Monitoring Report. ▪ verifier has interviewed the Project Coordinator independent of the project developer and may interview additional neighboring landowners to determine if notes are consistent with public testimonies.

Project Governance				
<p>The selection of a Project Coordinator is optional for private properties, the same project owner can be the project coordinator. A project coordinator must be selected to represent the Forest Owner (if not him/herself) with the project developer, verifiers, and Reserve staff. The Project Coordinator is responsible for:</p> <ul style="list-style-type: none"> ▪ Ensuring all project-related documentation is in order and up to date ▪ Ensuring meetings include the required elements above and providing the corresponding meeting notes. ▪ Organizing logistics with verifiers and Reserve staff ▪ <p>For projects with multiple Forest Owners, they must choose a Project Coordinator and comply with the elements described in Sections 3.9</p>				
Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines

3.9, 7.1.2	SS12 Identification of a Project Coordinator	<ol style="list-style-type: none"> 1. Initial Verification 2. In the event of a change in Project Coordinator 	<ol style="list-style-type: none"> 1. The description of the selection process included in the Project Report or Annual Monitoring Report. 2. Meeting notes that describe how the Project Coordinator was selected 	<p>Low</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ a description of the nomination and election/selection process is included in the Project Report or Annual Monitoring Report.
	SS13 Role and Participation of the Project Coordinator	All Verifications	<ol style="list-style-type: none"> 1. Description of the role and participation of the Project Coordinator included in the Project Report or Annual Monitoring Report. 2. Communications between project coordinator, verification team and project developer. 	<p>Medium</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ A description of the role and participation of the Project Coordinator is included in the Project Report or Annual Monitoring Report. ▪ The Project Coordinator has been included in all appropriate communications between the project developer and the verification body. ▪ The Project Coordinator was included in the Forest Project MRV processes. ▪ The Project Coordinator has signed the Project Report and Annual Monitoring Report attesting to their inclusion in the Forest Project MRV processes and ongoing compliance of the social safeguards.
	SS14 Term of a Project Coordinator	<ol style="list-style-type: none"> 1. Initial Verification 2. In the event of a change in Project Coordinator 	<ol style="list-style-type: none"> 1. A description of the term of Project Coordinator included in the Project Report or Annual Monitoring Report. 2. The process for renewing the term of Project Coordinator is addressed in the Project Report or Annual Monitoring Report. 	<p>Low</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ A description of the term of the Project Coordinator is included in the Project Report or Annual Monitoring Report. ▪ the process of renewing the term of the Project Coordinator is addressed in the Project Report or Annual Monitoring Report.

	SS15 Replacing the Project Coordinator	<ol style="list-style-type: none"> 1. Initial Verification 2. In the event of a change in Project Coordinator 	<ol style="list-style-type: none"> 1. A description of the process for replacing the Project Coordinator must be included in the Project Report. 2. A dispute resolution process must be documented in the Project Report. 3. Meeting notes that describe how the terms were discussed and approved by the Forest Owner. 	<p>Low</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ A description of the process for replacing the Project Coordinator is addressed in the Project Report or Annual Monitoring Report. ▪ A dispute resolution process is addressed in the Project Report or Annual Monitoring Report ▪ Meeting notes that describe how the terms were discussed and approved by the Forest Owner are included in the Project Report or Annual Monitoring Report.
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8.3.5 Project Environmental Safeguards

The verification body must evaluate the project against the environmental safeguards presented in Section 3.10. The environmental safeguards are established by activity (i.e., IFM, Restoration, Reforestation, etc.). Forest Projects that do not initially meet these criteria but can demonstrate progress towards meeting these criteria within the required timelines are eligible to register and maintain that registration with the Reserve.

Table 8.5. Verification Requirements for Environmental Safeguards

Section of PFP	Verification Items	Applicable Activities	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
3.10, 7.3	ES1 Maintenance or increase of forest carbon stocks	All	All Verifications	<ol style="list-style-type: none"> 1. Carbon Monitoring Worksheet (CMW) must show maintenance or increase of Standing Live and Dead carbon stocks in Activity Areas as determined by a running 10-year average of carbon stocks within the Activity Areas. 	<p>None</p> <p>Verification is complete when verifier makes observation with CMW that annual monitoring is consistent with requirement. Verification cannot be completed if the project does not meet this requirement prior to consultation from the Reserve. This condition is not evoked until the project has 10-years' worth of monitoring data.</p>
3.10, 7.3	ES2 Native species	IFM, Restoration, Reforestation	<ol style="list-style-type: none"> 1. Initial Verification 2. Full Verifications 	<ol style="list-style-type: none"> 1. Project carbon stock inventories and site visit observation must demonstrate progress toward a goal of 95% native species from CALC BOSK. 	<p>None</p> <p>Verification is complete when data is queried within CALC BOSK and the project indicates that it is in compliance with the native species requirement. Verifiers must confirm</p>

Section of PFP	Verification Items	Applicable Activities	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
		Large Urban Forest	<ol style="list-style-type: none"> 1. Initial Verification 2. Full Verifications 	<ol style="list-style-type: none"> 1. Project carbon stock inventories must demonstrate that the percent of native species does not decrease throughout the project life. 	<p>that the correct species are identified as native.</p> <p>If the application indicates that the project is not in compliance with this requirement, verifier shall notify the Reserve.</p>
		Agroforestry	<ol style="list-style-type: none"> 1. Initial Verification 2. Full Verifications 	<ol style="list-style-type: none"> 1. Project carbon stock inventories and verifier observations must demonstrate compliance with the percent of native species requirement: <ol style="list-style-type: none"> a. CALCBOSK if using the field sampling inventory methodology or, b. Photo imagery or other documentation if using the canopy cover inventory methodology. 	<p>None</p> <p>For Activity Areas that employed the field sampling inventory methodology, verification is complete when data is queried within CALCBOSK and the project indicates that it is in compliance with the percent native species requirement.</p> <p>If the application indicates that the project is not in compliance with this requirement, verifier shall notify the Reserve.</p> <p>For Activity Areas that employed the canopy cover inventory methodology, verification is complete when photo imagery or other documentation demonstrates compliance with species diversity requirements. If the project developer is unable to provide such documentation, the verification team may review the species diversity of the Activity Area during a site visit to determine, based on verifier judgement, whether the species diversity requirement has been met.</p> <p>If the verifier is unable to make a determination based on simple ocular observation, they may install sample plots based on the locations of the plots used for the canopy cover analysis, as described in Appendix C. The minimum number of plots sampled is the greater of either 5 plots or the square root of the total area of the Activity Area in hectares. Plots are selected in the same order in which they were selected in the canopy cover analysis. At each plot location, the verifier shall tally the number of</p>

Section of PFP	Verification Items	Applicable Activities	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
					trees present, by species, within a 20 meter radius of the plot center. If, after sampling the minimum number of plots, the results do not indicate that the Activity Area meets the native species requirement, the verifier may, at the request of the project developer, sample additional plots (selected based on the same order in which they were selected in the canopy cover analysis).
3.10, 7.3	ES3 Compositional diversity of species	IFM, Restoration, Reforestation	1. Initial Verification 2. Full Verifications	1. Project carbon stock inventories and site visit observations must demonstrate continuous progress toward a compositional diversity of species from CALCBOSK.	None Verification is complete when data is queried within CALCBOSK and the project indicates that it is in compliance with the compositional diversity requirement.
		Large Urban Forest	1. Initial Verification 2. Full Verifications	1. Project carbon stock inventories must demonstrate that if a single species comprises more than the proportion indicated in Table 3.3, the proportion of the dominant species does not increase throughout the project life.	If the application indicates that the project is not in compliance with this requirement, verifier shall notify the Reserve.
		Agroforestry	1. Initial Verification 2. Full Verifications	1. Project carbon stock inventories and verifier observations must demonstrate continuous progress toward a compositional diversity of species from: a. CALCBOSK if using the field sampling inventory methodology or, b. Photo imagery or other documentation if using the canopy cover inventory methodology.	None For Activity Areas that employed the field sampling inventory methodology, verification is complete when data is queried within CALCBOSK and the project indicates that it is in compliance with the compositional diversity requirement. If the application indicates that the project is not in compliance with this requirement, verifier shall notify the Reserve. For Activity Areas that employed the canopy cover inventory methodology, verification is complete when photo imagery or other documentation demonstrates compliance

Section of PFP	Verification Items	Applicable Activities	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
					<p>with species diversity requirements. If the project developer is unable to provide such documentation, the verification team may review the species diversity of the Activity Area during a site visit to determine, based on verifier judgement, whether the species diversity requirement has been met.</p> <p>If the verifier is unable to make a determination based on simple ocular observation, they may install sample plots based on the locations of the plots used for the canopy cover analysis, as described in Appendix C. The minimum number of plots sampled is the greater of either 5 plots or the square root of the total area of the Activity Area in hectares. Plots are selected in the same order in which they were selected in the canopy cover analysis. At each plot location, the verifier shall tally the number of trees present, by species, within a 20 meter radius of the plot center. If, after sampling the minimum number of plots, the results do not indicate that the Activity Area meets the species diversity requirement, the verifier may, at the request of the project developer, sample additional plots (selected based on the same order in which they were selected in the canopy cover analysis).</p>
3.10, 7.3	ES4 Maintenance of tree canopy cover throughout the Project Area	IFM, Restoration, Reforestation	<ol style="list-style-type: none"> 1. Initial Verification 2. Full Verifications 	<ol style="list-style-type: none"> 1. Monitoring Report for Maintenance of Tree Canopy Cover in the Project Area 	<p>None</p> <p>Verification is complete when:</p> <ul style="list-style-type: none"> ▪ verifier conducts an analysis of i-Tree points and confirms data attributes are appropriate. Verification proceeds on a 10%/1% basis (random selection of 10% of the points and must be within 99% agreement). If verification is not satisfied with initial selection of 10%, an additional new group of 10% points is selected and the cumulative values are assessed. This is repeated until the analysis is satisfied.

Section of PFP	Verification Items	Applicable Activities	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
					<p>The benefit of the doubt should go to the Forest Owner on point attribution</p> <ul style="list-style-type: none"> ▪ verifier confirms that the Monitoring Report for Maintenance of Tree Canopy Cover in the Project Area was submitted and conducted accurately
3.10, 7.3	ES5 Sustainable harvesting practices	IFM	<ol style="list-style-type: none"> 1. Initial Verification 2. Full Verifications 	<ol style="list-style-type: none"> 1. Site visit observations must demonstrate that the project complies with the requirements of the environmental safeguard. 	<p>None</p> <p>Verification is complete when:</p> <ul style="list-style-type: none"> ▪ the verifier confirms that where harvest occurs within the Activity Areas in a contiguous area larger than 5 hectares, a tree, or group of trees, representative of the age cohort that was harvested, is no further than 100 meters from other trees, either within the harvest area or outside of the harvested area ▪ The verifier confirms that the project meets one of the exceptions to this requirement, related to salvaged trees, safety, ecological, or other rationale

Section of PFP	Verification Items	Applicable Activities	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
3.10, 7.3	ES6 Maintenance of natural land cover	Reforestation	Initial Verification	1. Project Report and site visit observations must demonstrate that the project complies with the requirements of the environmental safeguard.	<p>None</p> <p>Verification is complete when the Project Report and site visit observations indicate that the project is in compliance with the environmental safeguard.</p> <p>If the Project Report or site visit observations indicate that the project is not in compliance with this requirement, verifier shall notify the Reserve.</p>
3.10, 7.3	ES7 Soil disturbance from site preparation for tree planting	All	All Verifications	1. Monitoring Reports and site visit observations must demonstrate that the project complies with the requirements of the environmental safeguard.	<p>None</p> <p>Verification is complete when the verifier confirms that no deep ripping occurred or that the area affected by deep ripping, as reported in the Monitoring Report and observed during a site visit, was less than 1% of the Activity Area where deep ripping was performed. If record of ripper tine width is not available, verifier is to assume a tine width of 0.2 meter. For the purposes of this protocol, "deep ripping" pertains to tines extending more than 30cm into the soil during ripping.</p> <p>If the Monitoring Report or site visit observations indicate that the project is not in compliance with this requirement, verifier shall notify the Reserve.</p>

8.3.6 Quantifying Net GHG Removals and CRTs

Verification bodies are required to confirm that the Forest Owner has quantified the net GHG removals and CRTs for each Activity Area according to the requirements in the PFP. The guidance provided below is separated by quantification step.

8.3.6.1 Calculating the Activity Area Baseline

Verification bodies are required to confirm that the Forest Owner has developed a baseline for each Activity Area according to the requirements in Section 5.2. The guidance is separated by activity.

8.3.6.1.1 Improved Forest Management, Restoration, Reforestation, and Large Urban Forestry Activity Areas

Table 8.6. Verification Requirements for Calculating the Activity Area Baseline: Improved Forest Management, Restoration, Reforestation, and Large Urban Forestry Activity Areas

Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
5.2, Appendix B	1. Baseline Carbon Stocks	<ol style="list-style-type: none"> 1. Initial Verification 2. Full verification when new Activity Areas are added 	<ol style="list-style-type: none"> 1. CALCBOSK 	<p>Moderate</p> <p>Verification is complete if: a review of the analysis shows they properly employed calculations from CALCBOSK and the inventory estimate calculated on the verifier's CALCBOSK is equal to the inventory estimate provided by the Forest Owner.</p>

8.3.6.1.2 Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas

For Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas that use the canopy cover inventory methodology, follow the below guidance; for Activity Areas that use the field sampling inventory methodology, follow the guidance in Section 8.3.6.1.1.

Table 8.7. Verification Requirements for Calculating the Activity Area Baseline: Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas

Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
5.2, Appendix C	1. Baseline Carbon Stocks	1. Initial Verification 2. Full verification when new Activity Areas are added	1. Determination of the activity and Assessment Area 2. Selection of default ratio estimator 3. Estimate of canopy cover 4. Calculation of CO ₂ e	<p>Moderate</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ a review of the calculation confirms that the methodology for quantifying tree canopy area specified in Appendix C was implemented correctly ▪ Confirmation that the remote sensing image the Forest Owner used to generate their estimate is dated within 12 months of the Activity Area start date ▪ The verifier must independently calculate the canopy area for each Activity Area using a randomized or systematic application of points used by the Forest Owner. The points must be overlaid on the remote sensing image the Forest Owner used to generate their estimate/measurement of canopy area. The verifier shall determine if each point 'hits' or 'misses' a tree crown. The verifier shall sample enough plots to arrive at a determination of canopy area at +/-10% at 1 standard error. The percentage canopy area determined by the verifier must be within 10% of the estimate provided by the Forest Owner. <p>The verifier may repeat their effort if the Forest Owner is not in conformance with the verifier. Failure to find conformance after three efforts results in failure of the ability to verify the reported canopy area. The Forest Owner must resample/re-measure the canopy area prior to renewing verification activities.</p> <p>The i-Tree Canopy tool may be used to perform the analysis.</p>

8.3.6.2 Quantifying the Activity Area Actual Onsite Carbon Stocks

Verification bodies are required to review the Forest Project's carbon stock estimates as described in Section 4. The guidance is separated by activity.

8.3.6.2.1 Improved Forest Management, Restoration, Reforestation, and Large Urban Forestry Activity Areas

Table 8.8. Verification Requirements for Quantifying the Activity Area Actual Onsite Carbon Stocks: Improved Forest Management, Restoration, Reforestation, and Large Urban Forestry Activity Areas

Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
5.1.1, Appendix B	1. Estimates of Actual Onsite Tree Carbon Stocks	1. Initial Verification 2. Full Verifications	<ol style="list-style-type: none"> 1. The inventory of the Activity Area's carbon stocks in required and optional pools 2. CALCBOSK 3. Updated map of Activity Areas delineating all areas affected by a natural disturbance in excess of 5 hectares or harvest event 4. For Activity Areas where stratification is employed, stratification rules documented by the Forest Owner 	<p>Low</p> <p>The verifier must copy the inventory data into a verification database (CALCBOSK; provided by the Reserve) prior to the tests described in this section.</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ the review of the plot layout and plot selection (for sampling) was conducted per Appendix B ▪ plot protocols (stated in Appendix B) were adhered to in field. Verifiers should confirm that plot dates were accurately entered. ▪ verifier is satisfied with evidence that the reported harvested volume is accurate and that all plots affected by a natural disturbance or harvest event have been updated in the reported inventory⁵⁶ ▪ verifier confirms no plots have been excluded beyond 5% threshold and no plot has been excluded beyond 1 reporting period ▪ verifier is satisfied with evidence that any excluded plots up to the 5% threshold were excluded due to a recent harvest or disturbance ▪ the error checks on the CALCBOSK application reveal no unexplained issues ▪ the inventory estimate calculated on CALCBOSK is equal to the inventory estimate provided by the Forest Owner

⁵⁶ Up to 5% of the total inventory plots can be excluded for a given reporting period. Excluded plots are not used to calculate the reported inventory of CO₂e nor are they used to calculate the sampling error. Additionally, an excluded plot must be included in the next year's inventory, meaning the plot must be remeasured within the year prior to the next reporting period (see Section B.3.3).

Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
				<ul style="list-style-type: none"> ▪ sequential sampling is conducted with satisfactory findings as described in Section 8.4 ▪ for Activity Areas with stratified inventories, a review of the stratification rules and inventory are consistent with requirements and guidance in Appendix B (see Section 8.4.1 for further verification guidance) ▪ basis for stratification is clearly described ▪ stratification boundaries map is reviewed and does not have obvious improper assignments (e.g., medium carbon stratum includes areas >3 hectares with no trees) ▪ plot locations and stratum assignments are compared with stratification boundaries map to ensure consistency between the stratum assignment of each plot and the stratum in which it is located <p>If a natural disturbance or harvest has occurred during the reporting period:</p> <ul style="list-style-type: none"> ▪ plots located where the disturbance occurred have been resampled or excluded (up to 5% threshold) ▪ stratum assignments of plots located where the disturbance occurred have been updated, as needed to maintain consistency with stratification rules ▪ stratum boundaries have been updated, as needed, to reflect areas where disturbance occurred
		Desk Verification	<ol style="list-style-type: none"> 1. Evidence that reported onsite carbon stocks are reasonable given reported harvest, growth, and disturbance effects since the prior reporting period. 2. Updated map of Activity Areas delineating all areas affected by a natural disturbance in excess of 5 hectares or harvest event. 	<p>Moderate</p> <p>Verification is complete when:</p> <ul style="list-style-type: none"> ▪ the estimates of forest carbon change, or the actual onsite carbon stocks relative to the previous year's onsite carbon stocks, are within a reasonable fluctuation that reflects growth, harvest and natural disturbances from the previous year. ▪ verifier is satisfied with evidence that the reported harvested volume is accurate and that all plots affected by a natural disturbance or harvest event have been updated in the reported inventory⁵⁷ ▪ The error checks on the CALCBOSK application reveal no unexplained issues

⁵⁷ Up to 5% of the total inventory plots can be excluded for a given reporting period. Excluded plots are not used to calculate the reported inventory of CO₂e nor are they used to calculate the sampling error. Additionally, an excluded plot must be included in the next year's inventory, meaning the plot must be remeasured within the year prior to the next reporting period (see Section B.3.3).

Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
				<ul style="list-style-type: none"> ▪ The inventory estimate calculated on CALCBOSK is equal to the inventory estimate provided by the Forest Owner ▪ Verifier confirms no plots have been excluded beyond 5% threshold and no plot has been excluded beyond 1 reporting period ▪ Verifier is satisfied with evidence that any excluded plots up to the 5% threshold were excluded due to a recent harvest or disturbance ▪ Verifier is satisfied with evidence that the volume of carbon stocks lost through natural disturbance, if any, is reasonably accurate ▪ A high level of proof exists if the plots existing in the disturbed area have been completely re-measured prior to the end of the reporting period ▪ A low level of proof exists if other approaches are used that may estimate the area affected multiplied by the average carbon stocks within the Activity Area. Such approaches would require more verification scrutiny <p>For Activity Areas employing stratified inventories:</p> <ul style="list-style-type: none"> ▪ Stratum assignments of plots located where a natural disturbance or harvest occurred have been updated, as needed to maintain consistency with stratification rules ▪ Stratum boundaries have been updated, as needed, to reflect areas where a natural disturbance or harvest occurred

8.3.6.2.2 Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas

For Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas that use the canopy cover inventory methodology, follow the below guidance; for Activity Areas that use the field sampling inventory methodology, follow the guidance in Section 8.3.6.2.1.

Table 8.9. Verification Requirements for Quantifying the Activity Area Actual Onsite Carbon Stocks: Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas

Section of PFP	Verification Items	Required at	Material to Review	Level of Professional Judgment and Verification Review Guidelines
5.1, Appendix C	1. Estimates of Actual Onsite Carbon Stocks	All Verifications	1. Estimate of canopy cover 2. Calculation of CO _{2e}	<p>Moderate</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ a review of the calculation confirms that the methodology for quantifying tree canopy area specified in Appendix C was implemented correctly ▪ Confirmation that the remote sensing image the Forest Owner used to generate their estimate is dated within 12 months of the end of the reporting period ▪ The verifier must independently calculate the canopy area for each Activity Area using a randomized or systematic application of points used by the Forest Owner. The points must be overlaid on the remote sensing image the Forest Owner used to generate their estimate of canopy area. The verifier shall determine if each point 'hits' or 'misses' a tree crown. The verifier shall sample enough plots to arrive at a determination of canopy area at +/- 10% at 1 standard error. The percentage canopy area determined by the verifier must be within 10% of the estimate provided by the Forest Owner. <p>The verifier may repeat their effort if the Forest Owner is not in conformance with the verifier. Failure to find conformance after three efforts results in failure of the ability to verify the reported canopy area. The Forest Owner must resample/re-measure the canopy area prior to renewing verification activities.</p> <p>The i-Tree Canopy tool may be used to perform the analysis.</p>

8.3.6.3 Quantifying the Activity Area Primary Effect

For all Activity Areas, verification bodies are required to review the Forest Project's primary effect as described in Section 5.3.

Table 8.10. Verification Requirements for Quantifying the Activity Area Primary Effect

Section of PFP	Verification Items	Required at	Materials to Review	Level of Professional Judgment and Verification Review Guidelines
5.3	1. Quantification of Primary Effect	All Verifications	1. CMW	<p>Very Low</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ verifier confirms Forest Owner used the Reserve's Carbon Monitoring Worksheet (CMW) with the appropriate Target Sampling Error applied ▪ inputted data are current and consistent with the inventory data calculated in CALCBOSK or following the canopy cover inventory methodology ▪ verifier is satisfied with the mathematical calculations <p>This may require the verifier to download or request a blank copy of the calculation worksheet from the Reserve with the appropriate Target Sampling Error and input project data to ensure the calculation worksheet has not been tampered with.</p>

8.3.6.4 Quantifying the Activity Area Secondary Effect

Verification bodies are required to review the Forest Project's secondary effect as described in Section 5.4. The secondary effects guidance is divided by activity.

8.3.6.4.1 Improved Forest Management Activity Areas

Table 8.11. Verification Requirements for Quantifying the Activity Area Secondary Effect: Improved Forest Management Activity Areas

Section of PFP	Verification Items	Required at	Materials to Review	Level of Professional Judgment and Verification Review Guidelines
5.4.3	1. Quantification of Secondary Effects	All Verifications	<ol style="list-style-type: none"> 1. The project's secondary effects calculations must be checked for completeness and accuracy 2. Record of average volume of timber (historic and 	<p>Very Low</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ verifier confirms Forest Owner used the Reserve's CMW and the Reserve's secondary effects calculation tool. ▪ the input data are current and consistent with the leakage risk factor calculated using the methodology from Section 5.4.3. ▪ verifier confirms values match those presented to MiAMBIENTE and are aligned with the volume of timber for the Activity Area.

			current) provided to MiAMBIENTE	<ul style="list-style-type: none"> ▪ verifier confirms the use of whole tree volumes for the calculation of harvested wood products, either through annual reports to MiAMBIENTE or the methodology presented in Section 5.4.3.1. ▪ verifier is satisfied with the mathematical calculations.
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8.3.6.4.2 Reforestation Activity Areas

Table 8.12. Verification Requirements for Quantifying the Activity Area Secondary Effect: Reforestation Activity Areas

Section of PFP	Verification Items	Required at	Materials to Review	Level of Professional Judgment and Verification Review Guidelines
5.4.1	1. Quantification of Secondary Effects	Initial Verification	1. CMW: the project's secondary effects calculations must be checked for completeness and accuracy	<p>Very Low</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ verifier confirms site preparation intensity indicated by Forest Owner is accurate ▪ verifier confirms Forest Owner used the Reserve's CMW ▪ the input data is accurate ▪ verifier is satisfied with the mathematical calculations

8.3.6.4.3 Reforestation, Restoration, Agroforestry, and Silvopastoral Activity Areas

Table 8.13. Verification Requirements for Quantifying the Activity Area Secondary Effect: Reforestation, Restoration, Agroforestry, and Silvopastoral Activity Areas

Section of PFP	Verification Items	Required at	Materials to Review	Level of Professional Judgment and Verification Review Guidelines
5.4.2	1. Quantification of Secondary Effects	All Verifications	1. CMW: The project's secondary effects calculations must be checked for completeness and accuracy	<p>Very Low</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> ▪ verifier confirms Forest Owner used the Reserve's CMW ▪ the input data are current and consistent with the leakage risk factor calculated using Figure 5.1 from Section 5.4.2 ▪ verifier is satisfied with the mathematical calculations

8.3.7 Permanence

Verification bodies are required to review the Forest Project's compliance with the permanence requirements described in Section 6.

Table 8.14. Verification Requirements for Ensuring Permanence

Section of PFP	Verification Items	Required at	Materials to Review	Level of Professional Judgment and Verification Review Guidelines
6.1	Project Implementation Agreement and Communal Permanence Commitment	All Verifications	<ol style="list-style-type: none"> PIA Project Report or Annual Monitoring Report 	<p>Low</p> <p>Verification is complete if:</p> <ul style="list-style-type: none"> verifier affirms that an executed PIA is on file with the Reserve. verifier affirms that calculations in the CMW of credits issued by reporting period are correct. Verifier should ensure each vintage (year in which removal enhancements occurred) is correctly calculated
Appendix F	For projects that have a commitment period of less than 100 years: Tonne-Year Accounting	All Verifications	<ol style="list-style-type: none"> PIA (if applicable) CMW Project Report or Annual Monitoring Report 	<p>Low</p> <p>For projects that have a commitment period of less than 100 years, verification is complete if:</p> <ul style="list-style-type: none"> verifier affirms status (including length) of the permanence commitment as established by the PIA coincides with the reported contract length in the Project Report or Annual Monitoring Report and used in the calculation of credits using Equation F.1 and in the CMW verifier affirms that an executed PIA is on file with the Reserve. verifier affirms that calculations in the CMW of credits issued by reporting period are correct. Verifier should ensure each vintage (year in which removal enhancements occurred) is correctly calculated
6.2	Reversal determination	All Verifications	<ol style="list-style-type: none"> If a reversal has occurred, the verification body must check the type of reversal (avoidable or unavoidable), the extent of the reversal, and the compensation calculations 	<p>Low to Moderate</p> <p>Verification is complete when:</p> <ul style="list-style-type: none"> verifier confirms the source of the reversal is avoidable or unavoidable. If the reversal is avoidable the verifier must contact the Reserve for further action

Section of PFP	Verification Items	Required at	Materials to Review	Level of Professional Judgment and Verification Review Guidelines
6.2; Appendix G	Reversal Risk Rating	All Verifications	1. The calculation of the project's contribution to the Buffer Pool and any Buffer Pool dividends distributions in the CMW	None Verification is complete if the calculation for the Buffer Pool contribution and any Buffer Pool dividends distributions has been correctly calculated and included in the CMW.

8.4 Site Visit Activities: Verifying Carbon Inventories

For IFM, Restoration, Reforestation, and Large Urban Forestry Activity Areas, Verification bodies are required to verify carbon stock inventory estimates of all sampled carbon pools within the Activity Areas. Inventories of carbon stocks are used to determine the Activity Area baseline and to quantify GHG removals against the baseline over time. Verification of carbon inventories consists of ensuring the Forest Owner's sampling methodology conforms to requirements listed in the protocol and that the Activity Area's inventory sample plots are within specified tolerances when compared to the verifier's sample plots. Verification is effectively an audit to confirm that the inventory estimate is sound.

For IFM, Restoration, Reforestation, and Large Urban Forestry Activity Areas, a site visit is required to verify the project's onsite stocks at each full verification and focus on ensuring that the project's inventory methodology is technically sound and correctly implemented.

Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas that use the field sampling inventory methodology must also follow the guidance in this section.

For Forest Projects that add new Activity Areas, the site visit, and sequential sampling (see Section 8.4.1), is only required for the newly added Activity Area; however, if only the newly added Activity Area undergoes sequential sampling, the site visit would not be considered a full verification of the Forest Project that could count towards meeting the full verification schedule requirements either for a single Forest Project or as part of an aggregate.

See Appendix D for specific requirements for verification bodies conducting full verifications with site visits.

8.4.1 Sequential Sampling for Verification

The Panama Forest Protocol utilizes a sequential sampling method for verification of Activity Area inventory estimates that require a site visit as part of the full verifications. Sequential sampling is intended to provide an efficient sampling method for verifiers to determine if randomly selected Activity Area measurements are within specified tolerance bounds established by the protocol. The Reserve provides an online worksheet for verifiers to download to facilitate the sequential sampling analysis. Sequential sampling is conducted based on the number and types of Activity Areas included in a Forest Project and whether the project employs stratified field-based inventories. Sequential sampling is required for each Activity Area for projects with multiple Activity Areas, as further described below in Section 8.4.1.

Verification using the sequential sampling methodology requires the verification body to sequentially sample successive plots. Sequential approaches have stopping rules rather than fixed sample sizes. Verification is successful after a minimum number of successive plots in a sequence indicate agreement. Where the stopping rules indicate the potential presence of a bias, additional verification plots may be collected after that time if it is felt that random chance may have caused the test to fail and a convergence towards agreement is expected with additional verification samples.

The results of any additional verification plot may also be inconclusive and require additional verification plots for a determination to be made. For effective application of the sequential statistics in the field, the determination of when the stopping rule is met is conducted after a group of the randomly selected plots have been measured in the field. This can be conducted

after the minimum number of plots has been measured by the verifier, or as frequently as needed. The data can also be entered in the field, if portable computers are available, where the most rapid conclusion to verification might be determined.

To increase efficiency in the verification process, three different levels of sequential sampling are performed by the verifier. All tests are performed with the same randomly selected plots and can only be completed by analysis of the plots in the sequential order they were selected. The data identified below used for each test are input into the appropriate sequential sampling tool. In the case of the test of CO₂e/hectare, the field data are input into a verifier's version of CALCBOSK to provide a CO₂e/hectare value. The testing of inventory data can only be satisfied when the CO₂e/hectare comparison between the verifier and Forest Owner is completed. This test is conducted on a plot-by-plot basis using only estimates of CO₂e/hectare. The verifier's estimates of CO₂e/hectare are derived by measurements of diameter and height (measured by verifier), species determination, defect and decay determination, and a determination of the appropriate trees to be included in the sample ('in' or 'out' trees).

1. **Diameter Test (optional):** A comparison of diameter data between the verifier and the Forest Owner is conducted on a tree-by-tree basis until sequential sampling rules have been achieved, indicating that the verifier and Forest Owner measurements of diameter are aligned within acceptable tolerance levels. If and when the stopping rules are met, verifiers will use the diameter data provided for each tree from the Forest Owner's database for any additional data inputs needed for the CO₂e/hectare comparison.
2. **Height Test (optional):** Like the diameter test, a comparison of height data is performed between the verifier and the Forest Owner until sequential sampling rules have been achieved, indicating that the verifier and Forest Owner measurements of height are aligned within acceptable tolerance levels. Trees that do not have height measurements sampled by the Forest Owner must be excluded from the sequential sampling height test. If and when the stopping rules are met, verifiers will use the height data provided for each tree from the Forest Owner's database for any additional data inputs needed for the CO₂e/hectare comparison.
3. **CO₂e/hectare (required):** The testing of inventory data can only be satisfied when the CO₂e/hectare comparison between the verifier and Forest Owner is completed. This test is conducted on a plot-by-plot basis using estimates of CO₂e/hectare. The verifier's estimates of CO₂e/hectare are derived by measurements of diameter and height (measured by verifier or using Forest Owner's data, as described above), species determination, defect and decay determination, and a determination of the appropriate trees to be included in the sample ('in' or 'out' trees).

8.4.1.1 Inventory Estimates

The inventory estimate developed by the Forest Owner must meet the minimum precision threshold stated in Appendix B of +/- 20% at the 90% confidence interval. CALCBOSK provides for a quick check of the Activity Area's inventory confidence. The inventory confidence output from CALCBOSK should be input into the Reserve's calculation worksheet (CMW). Forest Owners can improve the precision of their estimates through additional inventory effort.

8.4.1.2 Measurement Specifics for Verifiers for Sequential Sampling

The following standards shall guide verifier measurements:

- Verifiers shall measure all diameters (DBH) to the nearest 1/10th of a cm of 'in' trees on plots until sequential sampling requirements for diameters are met. If and when met, verifiers can accept the diameter measurement data of the Forest Owner.
- Verifiers shall measure the heights to the nearest meter of all trees for which a height measurement is required to calculate biomass until sequential sampling requirements for heights are met. If and when met, verifiers can accept the height data of the Forest Owner. The use of regressions to estimate heights is allowable for Forest Owners; verifiers must measure each height for comparison with Forest Owners' estimates (until sequential sampling requirements are met). In cases where distance measurements are used to determine height, it is recommended that the tools used to determine distance measurements be able to obtain an accuracy of +/- 10 cm for each 10 m of height.
- Verifiers shall measure plot boundaries where trees are not obviously 'in' or 'out' of the fixed area plots. Tools and methods used for distance measurements for plot boundaries should be able to obtain an accuracy of 1cm for each 10 m of distance.
- Special Rules for 'in'/'out' trees: Verifiers may encounter trees that are 'in', either in the large tree plot or the small tree plot, which were not measured by the Forest Owner. The cause of the omission(s) may be that the trees were determined to be too small to be included, per sampling methodology criteria, at the time of the Forest Owner measurement. Similarly, trees that were determined to be too small in the large plot by the Forest Owner, i.e., less than 30 cm, may have grown and now exceed the 30 cm threshold for inclusion.
- The verifier shall not include trees in the verifier measurements (for sequential sampling purposes) if the tree was omitted by the Forest Owner and the tree diameters, at time of verification audit, are less than 33 cm for the large plot and less than 8 cm for the small plot. Similarly, trees that were included by the Forest Owner in the small plot and, at the time of verifier audit, are less than 33 cm shall continue to be entered in the small tree plot, such that the expansion values are consistent with those of the Forest Owner. This applies a reasonable cushion to Forest Owners who apply the sampling methodology correctly, but through no fault of their own are penalized due to forest growth changing measurement parameters. It should be noted that the cushion is minimal and will not relieve Forest Owners from growth over long periods of time that would exceed the cushion allowances. Hence, Forest Owners need to base the re-measurement of the plots on an adequate timeframe to avoid verification problems with their inventory data. Any trees that do not meet the criteria of the standards listed above shall be included as part of the verifier's plot estimate for purposes of sequential sampling.
- Verifiers shall insert their own determination of species for each tree included in the verifier's inventory.
- For defect and decay (vigor classification), verifiers may first consider the inputs of the Forest Owner and determine whether or not they are reasonable. If considered reasonable, the verifier may insert the same classification as the Forest Owner for each tree included in the verifier's inventory. If, however, considered unreasonable, or not recorded by the Forest Owner, the verifier shall insert their own determination.
- Verifier judgement should be applied to situations in which a tree was included in the project inventory, but upon verification, the tree is no longer standing. In these instances,

if the tree appears to have fallen due to natural causes and does not appear to be part of a larger natural disturbance or harvest (i.e., an event detectable by the Forest Owner prior to arrival at the plot), the verifier may include the tree in the verifier's inventory. Verifiers may use the following guidance to determine if it is reasonable to include a recently fallen tree:

- Does the tree appear to have fallen prior to the project developer plot measurement date? If yes, the tree should not be included in the verifier's sample measurements.
- Does the tree appear to have been part of a harvest event? If yes, the tree should not be included in the verifier's sample measurements.
- Does the tree appear to have fallen as part of a larger natural disturbance? If yes, the tree should not be included in the verifier's sample measurements.
- Does the tree appear to have fallen naturally since the plot measurement date and does not appear to be part of a larger natural disturbance or harvest? If yes, verifier to take measurements on fallen tree.

8.4.1.3 Selection of Inventory Plots

The distribution of inventory plots available for selection for sequential sampling depends on the number of Activity Areas using field sampling inventories comprising the project and/or whether the inventory is stratified. Projects composed of a single Activity Area with a non-stratified inventory is considered to have a single stratum for sequential sampling purposes.

Verifiers shall use CALC BOSK to produce a list of randomly output plots for sequential sampling. For projects not employing a stratified inventory, plots will be selected for sequential sampling randomly from within each Activity Area. For projects with a stratified inventory, plots shall be randomly selected for sequential sampling from within each stratum. Additionally, the verifier shall perform independent assessments on a minimum of three strata, unless the stratification design has less than three strata, in which case the assessment is conducted on two strata. Verifiers shall select the strata used to perform the assessment based on their own professional judgement of where the risks of measurement error are likely to have the biggest effect on the overall inventory estimate. This may be based on criteria related to:

- Carbon stocking levels;
- Area of a particular stratum relative to other strata;
- Strata that may be found in difficult to access areas due to remoteness or terrain which could lead to a reduced effort by forest inventory personnel.

The verifier shall upload a copy of the randomly selected plots (including the identification of stratum, where relevant), in the order selected by CALC BOSK, on their Reserve account prior to implementing field verification activities. It is required that the verifier apply the random order selection in the sequential sampling worksheets. The verifier is free to measure the set of plots that were randomly selected in any order that provides the greatest efficiency while sampling in the field, but when the verifier inputs data into the sequential sampling spreadsheets, the verifier must follow the random selection order to properly conduct the analysis and maintain the integrity of sequential analysis. This may provide significant efficiencies when selected stands and/or plots are in close geographic proximity and it is hypothesized that the stopping rules will require the additional plots that are in close proximity.

The main statistical test used to evaluate the Forest Owner's inventory is based on a comparison of the verifier's measurements of plots, calculated as CO₂e per hectare compared to the Forest Owner's measurements of plots, which may include adjustments from originally

field-sampled data to account for growth. The Activity Area or stratum passes sequential sampling when the minimum number of passing plots in sequence is achieved (as identified in Table 8.15) or the first passing plot after a minimum of 12 plots have been measured – whichever is achieved first.

Table 8.15. Number of Passing Plots in Sequence, as a Function of Activity Area Size

Number of Strata Verified	Activity Area Hectares				
		<200	201 - 2,000	2,001 – 4,000	>4,000
≥3	Passing Plots in Sequence	3	4	5	6
2		4	6	7	8
1		6	8	10	12

There are many factors that influence the quality of plot data developed by the Forest Owner and may lead to inconsistencies between data reported by the Forest Owner and data collected by the verifier, including but not limited to:

1. Diameter measurements
2. Height measurements
3. Species Identification
4. Trees attributed to the wrong subplot, i.e., small trees included in the large plot or large trees entered in the small tree portion of the data entry form in CALC BOSK, leading to gross over-estimations of plot value
5. Trees that are measured as inside the fixed area plot and the converse, trees included in the plot that shouldn't be
6. Trees completely missed during the plot measurements
7. Trees that are measured on the plot that have fallen

Additionally, plot data are 'grown' in CALC BOSK to adjust measurements for tree growth, which may introduce further variation between verified measurements and project data.

8.4.1.4 Height and Diameter Sequential Sampling

The Reserve has developed tools that increase verification efficiencies where it can be justified to do so. Specifically, where verification findings are closely aligning with project data for diameters and heights for successive plots, according to quality control thresholds developed by the Reserve, verification of plot measurements may continue without further measurement of the Forest Owner's diameter and/or height measurements and proceed to evaluating other aspects of plot measurements. Passing of the diameter and height sequential sampling is not required.

A tool has been developed for verifiers to perform the comparison of diameter and height measurements and is available on the Reserve's website. The tool identifies at which point the verifier may discontinue measuring diameter and/or height measurements with stopping rules. The stopping rules require a minimum of 40 trees be measured which must come from plots that are in the sequential order produced from CALC BOSK. Additionally, the trees on the plots must be entered in the tool in the order the trees exist on the plot, beginning with the small trees (A-n) and proceeding to the larger trees (1-n). If, after 40 trees (or more) have been measured and the comparison of verifier and Forest Owner data are within the thresholds shown in Table 8.16, further measurements are discontinued, the verifier will accept the Forest Owner's measurements for the variable they have demonstrated adequacy, and the verifier will focus on

other plot variables, as mentioned above.

Table 8.16. Threshold Variables that Define the Stopping Rules for Verification of Diameters and Heights

Variables		Threshold
Minimum number of trees sampled		40 trees
Diameter		
Mean average difference of measurements	High threshold	0.635 cm
	Low threshold	-0.635 cm
Standard deviation of the difference of measurements		2.54 cm
Height		
Mean average difference of measurements	High threshold	0.32 m
	Low threshold	-0.32 m
Standard deviation of the difference of measurements		1.80 m

The stopping rules are based on a comparison of diameters and heights that are measured by the Forest Owner. Missed trees are not included in the stopping rules used to assert adequacy of diameter and height measurements but must be included in the overall plot comparison of CO₂e in the main sequential sampling test. Trees that have been measured by the Forest Owner erroneously, that is they're not actually in the plot, will not be used as part of the stopping rules for diameters and heights. Verifiers may use professional judgement for trees that have fallen based on the ability to obtain accurate measurements.

8.5 Completing the Verification Process

After completing the core project verification activities for a Forest Project, the verification body must take the following steps. Each document listed is discussed in greater detail below.

1. Complete a Verification Report to be delivered to the Forest Owner (public document).
2. Complete a detailed List of Findings containing both immaterial and material findings (if any) and deliver it to the Forest Owner (private document).
3. Prepare a concise Verification Statement detailing the vintage and the number of GHG removals verified and deliver it to the Forest Owner (public document).
4. Verify that the number of GHG removals, as well as the reversal risk rating, specified in the Verification Report and Statement match the number entered into the Reserve system.
5. Conduct an exit meeting with the Forest Owner to discuss the Verification Report, List of Findings, and Verification Statement and determine if material misstatements (if any) can be corrected. If so, the verification body and Forest Owner should schedule a second set of verification activities after the Forest Owner has revised the project submission.
6. If a reasonable level of assurance is successfully obtained, upload electronic copies of the Verification Report, List of Findings, Verification Statement, and optional Verification Activity Log into the Reserve system.
7. Return important records and documents to the Forest Owner for retention.

Verification bodies must produce a transparent Verification Report documenting the overarching verification activities for the Forest Project. The Verification Report must be provided to the Forest Owner and project developer as well as made available to the Reserve and public. This document is a detailed summary and scope of verification activities undertaken and serves as the basis for the public and the Reserve to evaluate GHG projects registered on the Reserve.

A positive Verification Report must provide positive assertion that the Forest Project meets all eligibility requirements, followed all monitoring requirements, appropriately applied the calculation methodologies provided, and is free of material errors. In addition, the Verification Report must include a discussion of how the perceived areas of risk in the project were incorporated into verification activities and data review.

The Verification Statement is the official confirmation and final statement of findings during the verification process, detailing the number of CRTs issued, the vintages (if more than one) and the standard used to verify those CRTs for a Forest Project. The Verification Statement confirms the verification activities and outcomes for all stakeholders (Forest Owners, project developers, verifiers, the Reserve, and the public).

The Reserve relies on a Verification Statement provided by the verification body as the basis for issuing CRTs. A positive Verification Statement indicates that the Forest Project and reported GHG removals meet the Reserve standards and that the project successfully meets the verification standards contained in this protocol.

The Verification Statement must be signed by the designated Lead Verifier and Senior Internal Reviewer (also part of the verification team) on file with the Reserve. No deviations are allowed. An electronic version of the Verification Statement template is available on the Reserve website⁵⁸. Further guidance is provided in the Reserve's Verification Program Manual⁵⁹

Verifiers may also complete an optional Project Verification Activity Log, which is designed to help verifiers understand the minimum requirements for verification activities specific to a project type. This document is private and only available for the Reserve, the Forest Owner and project developer to view. The logs may be uploaded to the Reserve when verification activities have been completed.

Finally, the List of Findings identifies and details all material and immaterial findings identified by the verifier throughout the verification. The List of Findings should be delivered first to the Forest Owner and project developer to allow them the opportunity to correct any issues found during the course of verification that might impact CRT registration. The List of Findings submitted to the Reserve should represent a summary of all findings and resolutions throughout the verification process. The document will remain private.

The Verification Report and Verification Statement shall be submitted at the conclusion of verification. If a project is deemed ineligible or noncompliant with a protocol to the extent that it can no longer move forward, verification bodies shall submit only their Verification Statement and List of Findings in the same manner noted above.

Further guidance for the Verification Report, Verification Statement, Verification Activity Log, and List of Findings can be found in the Reserve's Verification Program Manual. The Verification Program Manual also provides further guidance on quality assurance, negative verification statements, goals for exit meetings, dispute resolution, and record keeping.

⁵⁸ <http://www.climateactionreserve.org/how/verification/verification-documents>

⁵⁹ <http://www.climateactionreserve.org/how/program/program-manual/>

9 Glossary of Terms

The following includes a list of defined terms applied in the context of the PFP:

Above-Ground Live Biomass	Live trees including the stem, branches, and leaves or needles, brush and other woody live plants above ground.
Activity Area	An Activity Area is a spatially discrete area within the Project Area where management activities are undertaken for the purpose of increasing forest carbon inventories for which the Forest Owner intends to generate offsets. Inventories within Activity Areas are held to a higher standard than inventories outside of Activity Areas.
Additionality	A criterion for Forest Project eligibility. A Forest Project is “additional” if it would not have been implemented without incentives provided by the carbon offset market, including the incentives created through the Reserve program. Under this protocol, Forest Projects meet the additionality criterion by demonstrating that they pass a legal requirement test and a performance test, as described in Section 3.12, and by achieving GHG reductions and removals quantified against an approved baseline, determined according to the requirements in Section 5.2.
Aggregate	An Aggregate must consist of two or more individual Forest Projects and may be comprised of any combination of the eligible project activities and Forest Owners from any geographic location within Panama.
Aggregator	A corporation or other legally constituted entity, city, county, state agency, individual or a combination thereof, which may then submit documentation on behalf of Aggregate participants (two or more Forest Owners).
Allometric Equation	An equation that utilizes the genotypical relationship among tree components to estimate characteristics of one tree component from another. Allometric equations allow the below-ground root volume to be estimated using the above-ground bole volume.
Annual Monitoring Report	Form that serves as the basis for annual monitoring and requires the submittal of the CMW and Monitoring Report for Native Species to be submitted as attachments. The form can be downloaded from the Reserve’s website and must be submitted to the Reserve on an annual basis.
Avoidable Reversal	An avoidable reversal is any reversal that is due to the Forest Owner’s negligence, gross negligence or willful intent, including harvesting, development, and harm to the Project Area.

Attestation of Regulatory Compliance	Each time the Forest Project is verified, the Forest Owner must sign the Reserve's Attestation of Regulatory Compliance form indicating that the project is in material compliance with all applicable laws relevant to the project activity. Copies of the Attestation of Regulatory Compliance form are available on the Reserve's website ⁶⁰ .
Attestation of Title	Each time a Forest Project is verified, the Forest Owner or project developer must sign the Attestation of Title form indicating that the Forest Owner has an exclusive ownership claim to the GHG removals achieved by their Forest Project over the verification period. Copies of the Attestation of Title form are available on the Reserve's website ⁷¹ .
Attestation of Voluntary Implementation	Each time a Forest Project undergoes verification, including the initial verification, the Forest Owner or project developer must sign the Reserve's Attestation of Voluntary Implementation form indicating that project activities are not legally required at the time of the start date nor during the reporting period(s) being verified. Copies of the Attestation of Voluntary Implementation form are available on the Reserve's website ⁷¹ .
Baseline	The level of GHG emissions, removals, and/or carbon stocks at sources, sinks, and reservoirs affected by a Forest Project that would have occurred under a "business as usual" scenario. For the purposes of this protocol, a project baseline must be estimated following standard procedures in Section 5.2.
Biological Emissions	For the purposes of this protocol, biological emissions are GHG emissions that are released directly from forest biomass, both live and dead, including forest soils. For Forest Projects, biological emissions are deemed to occur when the reported tonnage of onsite carbon stocks, relative to baseline levels, declines from one year to the next.
Biomass	The total mass of living organisms in a given area or volume; recently dead plant material is often included as dead biomass ⁶¹
Bole	A trunk or main stem of a tree.
Buffer Pool	The Buffer Pool is a holding account for Forest Project CRTs administered by the Reserve. It is used as a general insurance mechanism against unavoidable reversals for all Forest Projects registered with the Reserve. If a Forest Project experiences an unavoidable reversal of GHG reductions and removals (see Section 6.2), the Reserve will retire a number of CRTs from the Buffer Pool equal to the total amount of carbon that was reversed (measured in metric tons of CO ₂ -equivalent).

⁶⁰ <https://www.climateactionreserve.org/how/program/documents/>

⁶¹ Metz, Davidson, Swart, & Pan, 2001.

Business as Usual	The activities, and associated GHG reductions and removals that would have occurred in the Project Area in the absence of incentives provided by a carbon offset market.
CALCBOSK	CALCBOSK is a data management tool for users of the Reserve's Mexican Forest Protocol. The tool is built to complement the quantification methodology requirements for the protocol and its use is required. Project inventory data are entered in forms within CALCBOSK and automated reports can be generated.
Carbon Pool	A reservoir that has the ability to accumulate and store carbon or release carbon. In the case of forests, a carbon pool is the forest biomass, which can be subdivided into smaller pools. These pools may include above-ground or below-ground biomass or harvested wood products, among others.
Climate Reserve Tonne (CRT)	The unit of offset credits used by the Climate Action Reserve. Each Climate Reserve Tonne represents one metric ton of CO ₂ reduced or removed from the atmosphere, completing the Reserve requirements for permanence through a secured contract or time.
Computational Reversal	A computational reversal is any reversal that is due to required protocol calculations (including the confidence deduction and secondary effects).
Confidence Interval	A range of values so defined that there is a specified probability that a population parameter lies within it.
Deep Ripping	Deep ripping mechanically breaks up compacted soil layers by using ripper tines reaching a minimum depth of 30 cm.
Deforestation	The conversion from forestland use to another land use.
Degradation	From the point of view of climate change policy and the IPCC, it refers to loss of carbon stock within forests that remain forests. ⁶²
Forest Management	The planning and implementation of actions on forestlands to meet specific environmental, economic, social and cultural objectives.
Forest Management Plan	Legal documents authorized by MiAMBIENTE that enable Forest Management and ensure sustainable management by ensuring forest harvest does not exceed forest growth.
Forest Owner	A Forest Owner can be any entity that has undisputed legal ownership of the forest carbon through outright ownership or through rights granted to them from a government agency. See Section 3.3 for further information.
Forest Project	A planned set of defined activities designed to increase removals of CO ₂ from the atmosphere through forest management that increases forest carbon stocks.

⁶² UNFCCC, 2008.

Forest/Forestland	Land spanning more than 0.5 hectares with trees that have the potential to grow higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ and that allows for management of one or more forest resources, including timber, fish and wildlife, biodiversity, water quality, recreation, aesthetics, and other public benefits. Please note this definition does not exclude trees that are less than 5 meters from being included in the forest carbon inventory.
General Congress	General Congress is the highest comarca authority where decisions are made.
General Congress Resolution	A General Congress Resolution is a document that describes all the resolutions that took place during a General Congress.
Lead Verifier	Must be designated as an active Lead Verifier on the COI Form and must have successfully completed sector-specific project verifier training.
Listed	A Forest Project is considered “listed” when the Forest Owner has created an account with the Reserve, submitted the required Project Submittal Form and other required documents, paid the project submission fee, and the Reserve has approved and accepted the project for listing.
Litter	Any piece(s) of dead woody material from a tree, e.g., dead boles, limbs, and large root masses, on the ground in forest stands that is smaller than material identified as lying dead wood.
Lying Dead Wood	Any piece(s) of dead woody material from a tree, e.g., dead boles, limbs, and large root masses, on the ground in forest stands. Lying dead wood is all dead tree material with a minimum average diameter of 13 cm and a minimum length of 2.5 m. Anything not meeting the measurement criteria for lying dead wood will be considered litter. Stumps are not considered lying dead wood.
Metric Ton or “Tonne” (t)	A common international measurement for the quantity of GHG emissions, equivalent to about 2,204.6 pounds or 1.1 short tons.
Natural Forest	Natural forests are identified where the dominant overstory vegetation is comprised of an overwhelming majority of native tree species, i.e., greater than 70% by CO ₂ e stocking.
Non-Forest Cover	Land with a tree canopy cover of less than 10 percent.
Non-Forest Land Use	An area managed for residential, commercial or agricultural uses other than for the production of timber and other forest products, or for the maintenance of woody vegetation for such indirect benefits as protection of catchment areas, wildlife habitat, or recreation.
Onsite Carbon Stocks	Carbon stocks in living biomass, dead biomass, and soils within the Project Area.
Permanence	The requirement that GHGs must be permanently reduced or removed from the atmosphere to be credited as carbon offsets. For Forest Projects, this requirement is met by ensuring that the carbon

	associated with credited GHG reductions and removals remains stored for at least 100 years.
Primary effects	The Forest Project's intended changes in carbon stocks, GHG emissions or removals.
Project Coordinator	Serves as the main communication link between the Reserve and the Forest Owner to ensure proper implementation of the protocol requirements.
Project Implementation Agreement	A contract between the Reserve and the Forest Owner that effectively secures Verified Removals for periods of time (up to 100 years).
Project Life	The project life is time period that the Forest Project is obligated to monitoring and verification activities which is defined in the Project Implementation Agreement.
Project Report	Required document for reporting project information. Project Reports are intended to serve as the main project document that thoroughly describes how the project meets eligibility requirements, the project's vegetative and social framework, and the current forest conditions, threats, and activities associated with the Project Area.
Project Submittal Form	Required form to submit a Forest Project; located on the Reserve's website . See Section 7.1.1 for further information.
REDD+	In policy texts currently in discussion under the UNFCCC, REDD+ is understood to include reduced deforestation and degradation, forest enhancement, sustainable management of forest, and forest conservation.
Reduction	The avoidance or prevention of an emission of CO ₂ (or other GHG). GHG reductions are calculated as gains in carbon stocks over time relative to a Forest Project's baseline (also see Removal).
Registered	A Forest Project becomes registered with the Reserve when it has been verified by a Reserve-approved and ISO-accredited verification body, all required documentation has been submitted by the Forest Owner to the Reserve for final approval, and the Reserve approves the project.
Removal	Sequestration ("removal") of CO ₂ from the atmosphere caused by a Forest Project. GHG removals are calculated as gains in carbon stocks over time relative to a Forest Project's baseline (also see Reduction).
Reporting Period	A discrete period of time over which a Forest Owner quantifies and reports GHG removals to the Reserve. The length of the reporting period can be any amount of time up to 12 months for the first reporting period. Subsequent reporting periods must be exactly 12 months.
Reservoir	Physical unit or component of the biosphere, geosphere or hydrosphere with the capacity to store or accumulate carbon removed from the atmosphere by a sink or captured from a source.

Retire	To retire a CRT means to transfer it to a retirement account in the Reserve's software system. Retirement accounts are permanent and locked, so that a retired CRT cannot be transferred or retired again.
Reversal	A reversal is a decrease in the stored carbon stocks associated with quantified GHG reductions and removals that occurs before the end of the project life. Under this protocol, a reversal is deemed to have occurred if there is a decrease in the difference between project and baseline onsite carbon stocks from one year to the next, regardless of the cause of this decrease (i.e., if the result of $(\Delta AC_{\text{onsite}} - \Delta BC_{\text{onsite}})$ in Equation 5.1 is negative).
Safeguard	Policy or procedure that identifies, evaluates, minimizes, and mitigates direct and indirect impacts to communities and ecosystems.
Secondary Effects	Unintended changes in carbon stocks, GHG emissions, or GHG removals caused by the Forest Project.
Senior Internal Reviewer	The Senior Internal Reviewer must be an active Lead Verifier as designated on the COI Form, the form and has successfully completed sector-specific project verifier training. The Senior Internal Reviewer must remain independent of all verification activities and must perform a final quality assurance review on the data, the Verification Report, the List of Findings and must sign the Verification Statement attesting to the accuracy of reported data. The Senior Internal Reviewer must not participate in site visits as this would compromise their objectivity and independence in the final review.
Sequestration	The process of increasing the carbon (or other GHGs) stored in a reservoir. Biological approaches to sequestration include direct removal of CO ₂ from the atmosphere through land-use changes ⁶³ and changes in forest management.
Significant Disturbance	Any natural impact that results in a loss of at least 20 percent of the above-ground live biomass that is not the result of avoidable or grossly negligent acts of the Forest Owner.
Sink	Physical unit or process that removes a GHG from the atmosphere.
Source	Physical unit or process that releases a GHG into the atmosphere.
Standing Dead Carbon Stocks	The carbon in standing dead trees. Standing dead trees include the stem, branches, roots, or section thereof, regardless of species, with minimum diameter (breast height) of 13 cm and a minimum height of 15 m. Stumps are not considered standing dead stocks.
Standing Live Carbon Stocks	The carbon in the live tree pool. Live trees include the stem, branches, roots, and leaves or needles of all above-ground live biomass, regardless of species, with a minimum diameter (breast height) of 13 cm and a minimum height of 5 m (inventory methodology must include all trees 13 cm and greater).

⁶³ Metz, Davidson, Swart, & Pan, 2001.

Start date	The start date of a Forest Project is a date in which project activities commenced. See Section 3.11.
Stocks (or Carbon Stocks)	The quantity of carbon contained in identified carbon pools.
Submitted	The Reserve considers a Forest Project to be “submitted” when all of the appropriate forms have been submitted and uploaded to the Reserve software system, and the Forest Owner has paid a project submission fee.
Tree	A woody perennial plant, typically large and with a well-defined stem or stems carrying a more or less definite crown with the capacity to attain a minimum diameter at breast height of 13 cm and a minimum height of 5 m. ⁶⁴ <i>Rhizophora mangle</i> (red mangrove) and <i>Avicennia germinans</i> (black mangrove) are included in the tree definition for the purposes of this protocol.
Unavoidable Reversal	An unavoidable reversal is any reversal not due to the Forest Owner’s negligence, gross negligence or willful intent, including wildfires or disease that are not the result of the Forest Owner’s negligence, gross negligence or willful intent.
Verification	The process of reviewing and assessing all of a Forest Project’s reported data and information by an ISO-accredited and Reserve-approved verification body, to confirm that the Forest Owner has adhered to the requirements of this protocol.
Verified Removals	Quantified GHG removals that have been verified through either full or desk verifications. See Section 5 for further information.
Verification Report	This document is a detailed summary and scope of verification activities undertaken and serves as the basis for the public and the Reserve to evaluate GHG projects registered on the Reserve. The Verification report must be provided to the Forest Owner as well as made available to the Reserve and public.
Verification Statement	The official confirmation and final statement of findings during the verification process, detailing the number of CRTs issued, the vintages (if more than one) and the standard used to verify those CRTs. The Verification Statement confirms the verification activities and outcomes for all stakeholders (Forest Owners, verifiers, the Reserve, and the public).

⁶⁴ Helms 1998.

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Appendix A. Fourth Environmental Safeguard: Project Area Forest Canopy Cover Monitoring

To meet the requirements of the fourth environmental safeguard, Forest Projects with Improved Forest Management, Restoration, Agroforestry, Silvopastoral, and Reforestation activities must monitor forest canopy cover throughout the Project Area. Forest canopy cover throughout the Project Area must not decrease as a result of human activities over the project life. If a decline in forest canopy cover greater than 5% is detected relative to the project start date during a full verification, the project must rectify the forest canopy cover loss in the subsequent 6 reporting periods.

The fourth environmental safeguard analysis is used to evaluate leakage within the Project Area, whereas the secondary effects analysis (see Section 5.4) is used to evaluate leakage outside of the Project Area.

Conducting ongoing Project Area monitoring is based on the development of estimates of forest canopy cover using remotely sensed imagery. The methodology to assess compliance with the fourth environmental safeguard involves the following steps, further detailed in the sections below:

1. Select randomized points throughout the Project Area using the i-Tree Canopy Tool
2. Determine if each point is forest canopy cover using photo images (Google Earth)
3. Import the data into CALCBOSK and generate the Forest Canopy Cover Report

To comply with the fourth environmental safeguard, a review of the forest canopy cover within the Project Area must be conducted and the corresponding monitoring report must be prepared and submitted for every full verification.

A.1. Establishing Randomized Points

Randomized points are placed throughout the Project Area using the United States Forest Service's i-Tree Canopy Tool.⁶⁵ The Reserve will accept, and may approve, proposals of alternative methods of installing random points and/or measuring forest canopy cover.

The Project Area is input as the area of interest in the i-Tree Canopy Tool. The Project Area must be imported as a GIS shapefile into the i-Tree Canopy Tool. The i-Tree Canopy Tool will create random points on an aerial photo of the Project Area. The i-Tree Canopy tool automatically calculates the confidence of the estimate of canopy cover. The effort of sampling with random points must continue until the mean error estimate is within 10% of the calculated mean at one standard error (68% confidence interval). The points must be archived for the project life and made available to verifiers during verification.

For further guidance, see the PFP Quantification Tools User Manual.

A.2. Determine Tree Canopy Cover

To determine the current tree canopy cover, the most recent photo image from publicly available sources (Google Earth, etc.) must be used; however, publicly available images from current and

⁶⁵ <http://www.itreetools.org/canopy/>

past years and other verifiable sources, such as local knowledge of management history, may be used to further inform the decision of land cover type. The analysis of current tree canopy cover is conducted using the random points established in the previous step. For further information on how to export the random points selected by i-Tree Canopy and import the points into Google Earth, see the PFP Quantification Tools User Manual.

For each point, determine the presence of tree canopy cover. A reference area surrounding the point may be used to provide context to the point; however, the determination of tree canopy cover should be made for the selected point. The reference area for determining tree canopy cover of a random point is an approximate 1/10th of a hectare surrounding the point. It is advisable to use the Google Earth tool to draw a polygon around the point to determine the reference area. As the determination of tree canopy cover may require a level of subjectivity, the determination will need to be verified; however, the Reserve's default will be to assume that the Forest Owner properly determined tree canopy cover and the verifier should only flag cases in which there are clear and certain errors by the Forest Owner.

Each point must be classified as tree canopy cover or other by the Forest Owner using the standardized land cover keys provided in Table A.1. The criteria listed in Table A.1 must be used when making land cover key assignments. The Forest Owner should enter the land cover classification into an excel spreadsheet. The PFP Quantification Tools User Manual provides further guidance on how to structure the spreadsheet to import the forest land cover classifications into CALCBOSK. The land cover key is used by CALCBOSK to calculate the distribution of forest land cover.

Table A.1. Criteria for Assignment of Tree Canopy Cover Keys

Tree Canopy Cover		Key
Tree Canopy Cover	Presence of Tree Canopy Cover.	FO
Other	Absence of Tree Canopy Cover.	OT

A.3. Generate Tree Canopy Cover Report

The Forest Owner must import the data into CALCBOSK. The PFP Quantification Tools User Manual provides guidance on how to import the table into CALCBOSK. Once imported into CALCBOSK, the Forest Owner can produce the Tree Canopy Cover Report, which will state the percent forest land cover.

Appendix B. Field Sampling Tree Inventory Quantification Methodology

Quantification of Activity Areas requires a forest inventory that produces accurate estimates of the included carbon pools,⁶⁶ monitors permanence, and evaluates compliance with environmental safeguards.

All activities that use the field sampling inventory methodology must use a database and application that facilitates inventory calculations and monitoring. The database and application is called 'CALCBOSK' and is accessible by contacting the Reserve. In addition, the PFP Quantification Tools User Manual includes further instructions on using CALCBOSK and the other quantification tools referred to throughout this section. It is strongly encouraged that project developers conduct thorough Quality Assurance/Quality Control (QA/QC) measures upon entering inventory data into CALCBOSK. CALCBOSK has several error-check buttons that facilitate the QA/QC review; however, a complete review of all data entered is recommended to avoid problems with verification.

Large Urban Forestry, Reforestation, Restoration and Improved Forest Management Activity Areas must use the field sampling inventory methodology. A field sampling inventory requires that field sample plots be installed, measurements acquired, and data input into CALCBOSK for analytical purposes. Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas may alternatively use the inventory methodology in Appendix C.

B.1. Developing Initial Activity Area Inventories

Forest Projects must develop an initial inventory for each Activity Area. The initial inventory is then used to calculate the baseline by back-casting to the Activity Area start date (see Section B.2), and to calculate the actual carbon stocks for the end of each reporting period by growing the inventory forward and/or updating the inventory data through remeasurements (see Section B.3). CALCBOSK will automatically grow or degrow the inventory to a selected date (see Section B.3). The following steps are required to develop the initial inventory:

1. Determine if inventory should be stratified and, if so, stratify the Activity Area (See Section B.1.1)
2. Develop inventory sample plots (see Section B.1.2)
3. Calculate the standing live and dead carbon in the sample plots and expand the carbon per plot to a per hectare basis (see Section B.1.3)
4. Calculate the confidence statistics (see Section B.1.4)

B.1.1. Forest Vegetation Stratification

Stratification of an Activity Area for inventory purposes is not required, but it may help Forest Owners more easily achieve the Target Sampling Error, especially if carbon stocking varies considerably within an Activity Area. Stratification may also simplify verification and possibly lower the costs of verification. The Reserve recommends stratification based on relative carbon stocking (tCO₂e/ha) divided into three strata, e.g., low, medium, and high carbon stocking. Forest Owners must describe the basis for determining stratification assignments, such as carbon stocking levels applicable to each stratum, with the 'low' stratum reserved for sites that

⁶⁶ See Table 4.1 (GHG Assessment Boundary).

have been recently harvested or reforested and/or with small trees (within a Forest Management Plan). Furthermore, the basis for stratification should be the *potential* distribution of conditions expected to be present on the project over the course of the project lifetime. Thus, for stratification based on carbon stocking levels, stratification classes should represent the potential carbon stocking in the standing live and dead tree pools throughout the duration of the project. The use of potential conditions as the basis for determining stratification classes is meant to indicate that the current forest vegetation conditions may not represent the range of variation that may arise from management activities, natural disturbances, or forest growth during the project lifetime.

A map of the current forest strata, based on a minimum polygon size of 3 hectares (i.e., minimum mapping unit), must be included in the stratification rules provided in the Project Report. The Project Report must also include the guidelines for updating forest strata for disturbance and growth events. A minimum of 10 plots must be established for each stratum. However, when determining the number of plots for each stratum, Forest Owners should consider the requirements concerning the confidence statistics in Section B.1.4 and the number of plots required to pass sequential sampling, as outlined in Section 8.4.1.3.

B.1.2. Sampling Methodology for Activity Areas (Standing Live and Dead Trees)

Inventory sample plots for developing a carbon inventory are only required in Activity Areas using the field sampling inventory methodology. Inventory sample plots are not required to be measured for those areas within the Project Area but otherwise outside of any Activity Areas.

Where sampling is required, the sampling methodology must be designed to achieve an unbiased inventory estimate with a sample error that does not exceed +/- 20% of the mean at the 90% confidence level for standing live and dead trees based on CO₂e estimates at the Activity Area level. For Forest Projects with multiple Activity Areas, this targeted standard error is achieved across the entire Forest Project by “aggregating” the Activity Areas. Further guidance for projects with multiple Activity Areas is provided below in Section B.1.4.

As part of QA/QC measures, it is recommended that project developers conduct check-plots by selecting a percentage of all plots to be re-measured by different field cruisers to ensure quality of the inventory across all field cruisers and reduce the risk of problems with verification.

B.1.2.1. Inventory Sampling Plots

A 25-by-25 meter grid of plot locations must be randomly placed on the Activity Area. This must be conducted separately for each Activity Area that uses the field sampling inventory methodology.

Plots are randomly selected from the pool of plots available in the Activity Area for sampling using the randomization utility within CALCBOSK (see the Quantification Tools User Manual for further information). Once the plots have been selected, the Forest Owner should inform the Reserve and send a copy of the plot selection to the Reserve. Achieving the overall sampling standard of the mean estimate being within +/- 20% of the calculated mean at the 90% confidence level will require a different number of plots based on the variability of stocking within the Activity Area as well as the number of Activity Areas included in the Forest Project.⁶⁷ Forest Owners are responsible for estimating the number of plots needed to achieve the confidence

⁶⁷ No projects are accepted if the standard error is greater than +/- 20% at the 90% confidence level.

statistic minimum standard. Alternatively, plots can be sampled in the order of their random selection until the desired confidence statistic is achieved. CALCBOSK can help estimate the number of plots required to meet target sampling errors based on a sub-sample of plots (see the Quantification Tools User Manual for further information).

Once the plots have been selected, the inventory plots will be monumented for future re-measurement as part of ongoing monitoring. A map of the sampled plots should be submitted with the Project Report. Additional plots may be added in the future in the order of their random selection at the Activity Area initiation in order to improve confidence estimates. A plot cannot be removed once it is part of the basis of the inventory, unless randomly selected by CALCBOSK for removal or replacement (see Section B.3.1). CALCBOSK will calculate the inventory confidence from the Activity Area data. The Quantification Tools User Manual provides further guidance on how to generate the report to check the inventory confidence.

Data from inventory plots are valid for a period of 12 years following field sampling, during which time the plot data can be updated (using CALCBOSK) with estimates of annual growth increment to both diameter and height measurements, or unless randomly selected for removal and replacement. The process for updating plots is described in detail in Section B.3. Since plot data can be no older than 12 years, plots must be periodically re-measured or new plots installed for both annual monitoring and periodic field verification. Any time more plots are desired for improving inventory confidence, new inventory plots must be selected randomly for measurement from the grid of potential plots described above. Plot data (not plot location) must be removed or replaced from the inventory when an event substantially changes the forest cover surrounding the plot, e.g., harvest or forest fire.

Inventory plots are installed as fixed radius plots. The size of the radius varies depending on the attribute that is measured, as shown in Table B.1 below. Only the random plots selected for sampling need to be installed. Plot centers must be monumented so they can be relocated for future measurement or for verification. Monumenting plot locations so that they are available for re-measurement and/or verification can be challenging. GPS coordinates must be recorded for each plot at, or offset from, the plot center. Since GPS coordinates will only partially assist in relocating the plot center, additional navigational devices are necessary. It is recommended that an object be placed at plot center that is highly resistant to environmental features, including weather, animals, and fire. A small piece of metal rebar may be suitable. Relocating the plot center can be enhanced through the identification of bearing trees, or trees with aluminum tags affixed to them with a measured distance and compass bearing to the plot center etched or otherwise written on them. A minimum of two trees will assist in triangulating to the plot center. Marking these trees with highly visible paint will also be useful for plot center relocation.

For plots that fall on the border of the Activity Area or strata, see Section B.1.2.1. Guidance for Border Plots.

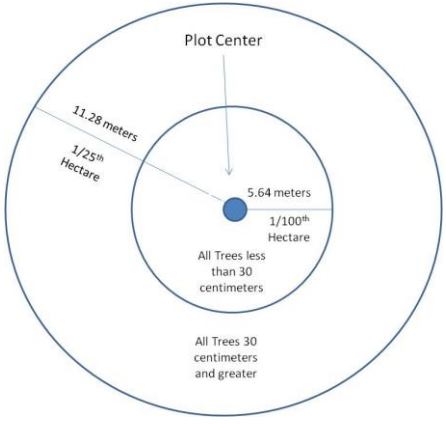
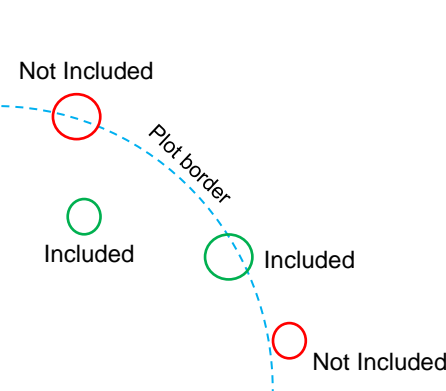
Table B.1 displays the data that are to be collected at each inventory plot. Forest Owners may use varying tools or sampling methods; however, all sampled data must be entered into CALCBOSK to calculate the carbon estimates for the Activity Areas and verifiers must use the sampling methodology as detailed in the protocol.

Special considerations are provided for mangrove forests, such that certain mangrove species do not require height measurements, including *Rhizophora mangle*, *Avicennia germinans*, *Laguncularia racemosa*, *Conocarpus erectus*, or *Avicennia bicolor*. In addition, the DBH for

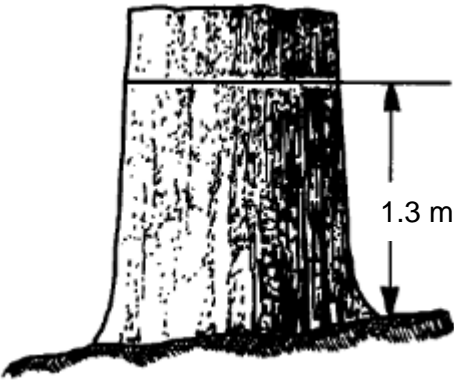
Rhizophora mangle (mangle rojo) should be taken 30 cm above the highest stilt root. Further exemptions or modifications may be made on a case-by-case basis to be approved by the Reserve.

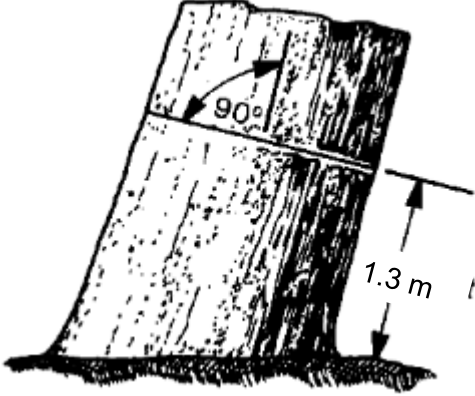
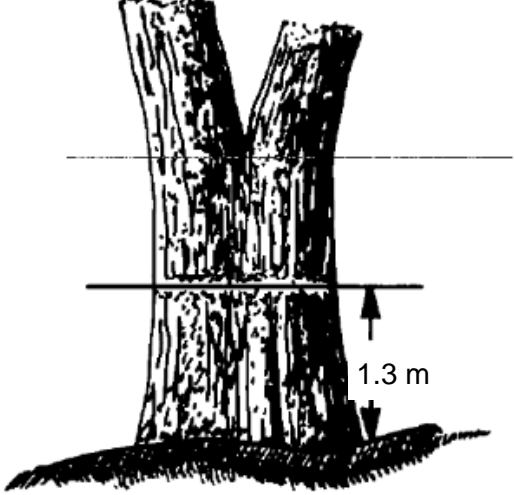
The Quantification Tools User Manual has further guidance on entering the data into CALC BOSK.

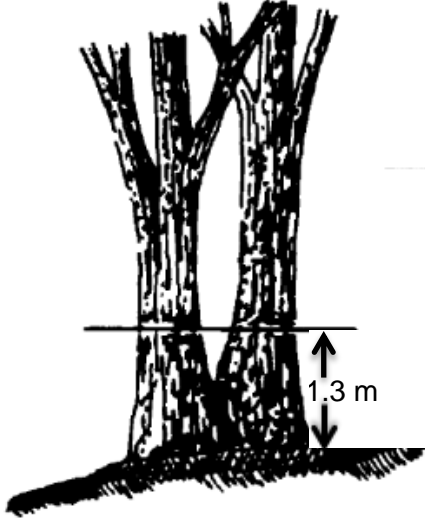
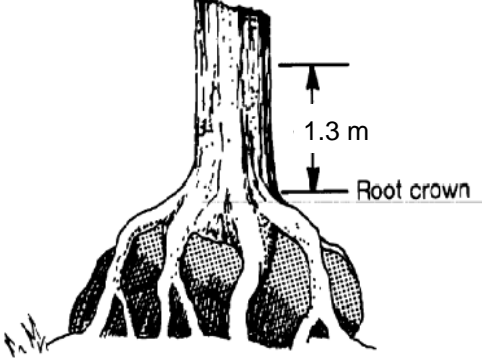
Table B.1 Inventory Plots


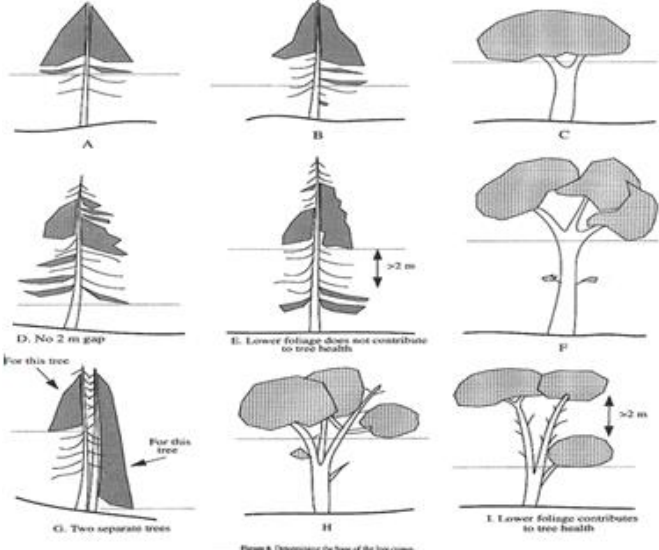
For Each Plot		
Item	Attribute	Description
1	Date of Plot Visit	Day/Month/Year
2	Latitude	From GPS (in degrees)
3	Longitude	From GPS (in degrees)
4	Plot Number	Enter the plot number for the plot, as described in the section above.
5	Inventory Personnel	Enter the initials of the inventory technicians responsible for measuring and recording data on the plot.
6	Slope	Using the clinometer, average the slope measurements looking uphill and downhill to the nearest 5%.
7	Aspect	Enter the degrees (azimuth) looking directly downhill from plot center. If the plot slope is 0, aspect may be recorded as "-1".
<p>On a Fixed 1/25th Hectare Radius (Radius = 11.28 m), all trees \geq 30 cm DBH and \geq 3m height</p> <p>On a Fixed 1/100th Hectare Radius (Radius = 5.64 m), all trees \geq 5 cm⁶⁸ and $<$ 30 cm DBH</p> <p>Note for borderline trees: 50% or more of the estimated base of the tree must be inside the plot in order for the tree to be included.</p> <p>For defining the plot boundaries, radial measurements need to be corrected for horizontal distances based on the slope from plot center to each tree. The radial measurements are based on distances from plot center to the base of the tree.</p>		
		


⁶⁸ A minimum of 5cm DBH is recommended; however, projects may include trees with smaller diameters if the Forest Owner determines that the benefits of including smaller trees will outweigh the added costs. Forest Owners will need to clarify the adjusted minimum DBH in the Project Report, and verifiers will need to include trees of all sampled sizes in the verification.

Item	Attribute	Description
8	Tree Number	<p>Trees are assigned a number 1 to X (for 'large' trees 30cm and greater) and a letter A to Z (for 'small' trees less than 30cm), starting from 0 degrees (North) and generally proceeding clockwise. The numbering convention in CALCBOSK facilitates the relocation and the verification of the trees. Over time, the numbering convention will breakdown as trees grow into plots and small trees with a letter designation grow into large trees with a numeric designation. The following procedures must be adhered to with the numbering convention:</p> <p>Previously measured small trees that are now measured as large trees must be re-numbered during the inventory update with a value 1 to X. Use a numeric value that has not been used for any tree previously. Put a note in the plot notes indicating that the change was made.</p> <p>Small trees that become large trees that were not previously measured (i.e., outside of the 1/25th hectare plot) must be numbered with a value 1 to X. Use a numeric value that has not been used for any tree previously.</p> <p>It is understood and acceptable that the tree identification system will not follow the original clockwise pattern over time. Other than previously measured small trees, never re-attribute a tree's identification.</p>
9	Species	Enter the species code for each species on the plot. The species code can be found for each species in the species list found on CALCBOSK.
10	DBH	<p>Measure and record Diameter at Breast Height (DBH) to the nearest tenth of a centimeter on every tree using a diameter tape and wrapping the tree at a height of 1.3 meters from the base of the tree on the uphill side. The guide here displays how uncommon trees should be measured (use uphill guidance).</p>  <p>The diagram shows a tree trunk with a horizontal line indicating the measurement point at 1.3 meters above the ground. A vertical double-headed arrow on the right side of the trunk is labeled '1.3 m', indicating the height from the base to the measurement point. The measurement is taken on the uphill side of the tree.</p>

Item	Attribute	Description
		 <p data-bbox="630 709 1409 800">For leaning trees, take the DBH on the side of the shortest angle (see image above). If the angle is less than 30%, then take DBH as usual.</p>
		<p data-bbox="630 814 1377 898">Forked trees above DBH are counted as one tree. Forked trees below DBH are counted as two trees (or however many forked stems exist). Add minimum DBH to be included.</p>  <p data-bbox="630 1423 743 1451">One Tree</p>

Item	Attribute	Description
		 <p data-bbox="630 793 755 825">Two Trees</p>
		 <p data-bbox="630 1297 1409 1329">When tree roots are present, measure 1.3m above the root crown.</p> <p data-bbox="630 1360 1307 1413"><i>Images via FSH 2409.12 USDA Forest Service Timber Cruising Handbook</i></p>
11	Total Height	<p data-bbox="630 1423 1421 1633">Measure of total height (height from base of tree to top) of all required trees in the plot to the nearest tenth of a meter. Height measurements are not required for species with allometric equations that do not use height. If the angle from level to the point of measurement exceeds 45 degrees (i.e., 100% or 66 topo), the distance from the measured tree must be increased to reduce the angle.</p>

Item	Attribute	Description						
		 <p data-bbox="630 793 1409 911">For dead trees with broken tops, estimate the total height (as if the tree were whole) to the nearest meter by imaging the tree whole or comparing the tree to other live trees of similar diameters and species.</p>						
12	Height to Crown Base	 <p data-bbox="630 1520 1349 1577">Measure the distance from the base of the tree to the ocularly balanced base of the tree's crown. See examples above.</p>						
13	Vigor	<p data-bbox="630 1612 1409 1793">For each tree, provide a rating of the tree's apparent vigor. Determination of vigor is based on consideration of color of foliage, crown proportion and appearance, retention of leaves/needles, appearance of apical growth, length between growth whorls, and presence of cavities and fungal growth. The code is assigned based on the following classes:</p> <table border="1" data-bbox="618 1799 1421 1885"> <thead> <tr> <th data-bbox="618 1799 727 1885">Code</th> <th data-bbox="727 1799 1256 1885">Description</th> <th data-bbox="1256 1799 1421 1885">Decay Adjustment (adjustment)</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Code	Description	Decay Adjustment (adjustment)			
Code	Description	Decay Adjustment (adjustment)						

Item	Attribute	Description		
				to wood density)
		1	Very Healthy/Dominant: Crown is full on all sides and crown length is at least 30% of the tree's length, or the total height of the tree (measured in step 11) minus the height to crown base (measured in step 12) divided by the total height of the tree is at least 30%. Tree crown is generally above other trees around it and it is experiencing minimum competition.	100%
		2	Healthy/Codominant: Crown may not be full on all sides due to competition with neighboring trees but has some portion of its crown in full sunlight. Crown is at least 20% of the tree's length.	100%
		3	Suppressed: Crown is generally below other trees and has some live foliage but is on decline.	100%
		4	Dead with moderate decay: Tree has no remaining foliage. Branches and top are mostly intact and bark is mostly attached to the tree.	75%
		5	Dead with advanced decay: Tree may exhibit missing top, fungal bodies, missing bark. No remaining foliage exists on the tree's crown.	50%
	Defect Estimate	Section of Tree	Standardized Portion of Biomass in each Section of Whole Trees	Actual portion of defect in each section of tree (Observed as applied to whole tree) Example: 100% if entire portion is missing (i.e., full defect), 0% if no portion is missing (i.e., no defect). 0% defect is the default in CALCBOSK.
14		Top 1/3	10%	0 – 100%
Mid 1/3		30%	0 – 100%	
Bottom 1/3		60%	0 – 100%	
15	Previous 5 years' radial increment	<p>These data are used to estimate growth in the forest. This is required in the absence of repeated plot measurements or a viable growth model for each species.</p> <p>Enter the measurement (millimeters) of the past 5-years' radial growth (from a ring count) on a 'highly or moderately vigorous' tree</p>		

Item	Attribute	Description
		(vigor codes 1 or 2) and a 'low vigor' tree (vigor code 3; if present) in the plot; select the first feasible trees (some species may not be suitable for measurement) facing north and continuing clockwise.

B.1.2.2. Guidance for Border Plots

In cases where plot boundaries extend beyond the border of an Activity Area or a stratum boundary, the “Walkthrough Method” must be used⁸¹. The Walkthrough Method provides an unbiased and simple procedure to adjust plot data to correct for abnormal plot boundaries created by the plot’s position relative to an Activity Area or stratum boundary.

The following steps must be followed for plots whose normal boundaries extend beyond an Activity Area or stratum boundary.

1. Locate the plot center as usual using the plot coordinates.
2. For each tree that is in the direction of the Activity Area or stratum boundary:
 - a. Measure the distance from the plot center to the tree.
 - b. Using the same distance (a), measure from the tree in the same direction.
 - c. If the extended line crosses the Activity Area or stratum boundary, count the tree twice. Otherwise, count the tree once (as usual).

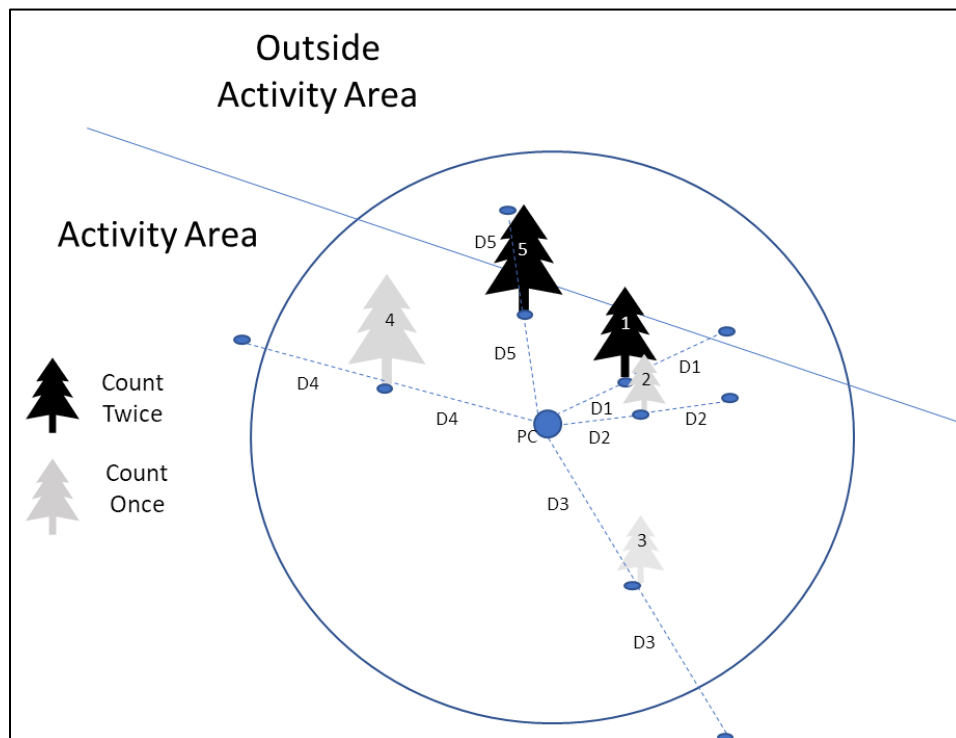


Figure B.1 Example of the Walkthrough Method

Table B.2 Walkthrough Method Tree Count and Rationale (Related to Figure B.1)

Tree	Count	Rationale
1	Twice	Distance (D1) from PC to Tree 1 * 2 crosses Activity Area boundary
2	Once	Distance (D2) from PC to Tree 2 * 2 does not cross Activity Area boundary
3	Once	Distance (D3) from PC to Tree 3 * 2 does not cross Activity Area boundary
4	Once	Distance (D4) from PC to Tree 4 * 2 does not cross Activity Area boundary
5	Twice	Distance (D5) from PC to Tree 5 * 2 crosses Activity Area boundary

B.1.3. Calculating the Carbon in Standing Live and Dead Trees

This section provides a step-by-step approach to calculating the CO₂e inventory in standing live and dead trees. This section applies only to the inventory estimates within the Activity Areas. Developing forest CO₂e estimates from sampling in the Activity Areas must be done according to the following general steps, which are performed automatically in CALCBOSK:

1. Calculate the net CO₂e tonnes for standing live and dead trees on a per hectare basis for each plot.
2. Determine the average net CO₂e tonnes for standing live and dead trees by summing the plots and dividing by the number of plots represented, on a stratum-basis if the Activity Area inventory is stratified.
3. Multiply the plot average(s) by the area (in hectares) of the Activity Area or of each stratum to calculate total CO₂e tonnes and summing across strata (as needed) to determine total CO₂e tonnes for the Activity Area.
4. Calculate the Activity Area sampling error and confidence deduction.

The plot data used to calculate the inventories must represent current conditions at the time the inventory is created. The process for updating forest inventories is discussed in Section B.3. CO₂e is calculated for each tree sampled in the plots using equations provided in the species table found in latest version of CALCBOSK, based on the measured plot data. The CO₂e estimates calculated for each tree are adjusted based on the defect noted for each tree during inventory sampling. The net CO₂e is expanded to a per hectare basis, following the detailed process outlined in Table B.3. These calculations are automated in CALBOSK.

Table B.3 Calculate the CO₂e Tonnes for each Plot on a per Hectare Basis

Steps	Description	Tools/Process Required
1	Calculate the cubic volume and biomass (grams) in aboveground components of each tree.	CALCBOSK calculates volume and/or biomass directly from the input variables, either DBH and total height or just DBH, from the forest inventory. The equations used by CALCBOSK are published on the Reserve's website. ⁶⁹
2	Convert the aboveground biomass to CO ₂ e tonnes	The aboveground biomass estimates from Step 1 are converted to tonnes CO ₂ e by dividing the biomass estimate (in grams) by 1000, multiplying the quotient by 0.5 (to convert the value to carbon) and again by 3.67 (to convert the value to CO ₂ e). The product is tonnes CO ₂ e per tree.

⁶⁹ Biomass equations may have set DBH bands where the equation functions properly; when outside of those bands, the equation may result in unrealistic biomass estimates such as negative values. When equations result in a negative biomass, CALCBOSK applies a minimum biomass of 0.

Steps	Description	Tools/Process Required	
3	Adjust aboveground CO ₂ e estimate for dead and dying trees	The estimate of aboveground tonnes of CO ₂ e per tree are multiplied by 0.5 for dead trees and by 0.75 for dying trees to account for decomposition that impacts wood densities. The CO ₂ e estimates for other trees remain unchanged.	
4	Add belowground CO ₂ e	Multiply aboveground CO ₂ e estimated tonnes for all trees (live, dead, and dying) by 120% to incorporate an estimate of CO ₂ e tonnes in belowground tree components and provide gross total tree CO ₂ e in tonnes.	
5	Adjust the tree's CO ₂ e tonnes based on defect percentages assigned to each tree.	Defect – Bottom 33%	60% x CO ₂ e tonnes in gross tree (Step 4) X Defect% (Bottom 33%)
		Defect – Middle 33%	30% x CO ₂ e tonnes in gross tree (Step 4) X Defect% (Middle 33%)
		Defect – Top 33%	10% x CO ₂ e tonnes in gross tree (Step 4) X Defect% (Top 33%)
		Sum Defect	Sum of CO ₂ e defect from each step above
		Adjusted CO ₂ e	CO ₂ e tonnes (Step 4) – Sum Defect
6	Expand the CO ₂ e tonnes estimate in each tree to a per hectare basis.	Multiply the CO ₂ e tonnes estimate in each tree by the weight required to represent the plot estimate on a per hectare basis. For example: 25 x CO ₂ e Tonnes (Step 5) for trees sampled in 1/25 th hectare radius 100 x CO ₂ e Tonnes (Step 5) for trees sampled in 1/100 th hectare radius.	

The individual tree estimates within each Activity Area are summed within each plot and expanded to a per-hectare value. Subsequently, the plot estimates are averaged to obtain a mean estimate for each Activity Area or, as applicable, each stratum, as shown in Table B.1.

Table B.4 Determine the CO₂e Tonnes for each Activity Area

Steps	Description	Tools/Process Required
7	Calculate the average CO ₂ e tonnes per hectare in the Activity Area or the stratum.	Sum the CO ₂ e estimates from each plot within the Activity Area or within each stratum on a per hectare basis and divide by the number of plots in Activity Area or stratum.
8	Calculate the total CO ₂ e tonnes in the Activity Area, including, as needed, in each stratum	Multiply the average estimate of CO ₂ e tonnes per hectare by the total hectares represented by the Activity Area. For projects using a stratified inventory, average estimates of CO ₂ e tonnes per hectare within each stratum are multiplied by the total hectares represented by their respective strata before summing total CO ₂ e tonnes from all strata to determine the total CO ₂ e tonnes for the Activity Area.
9	Calculate the sampling error for the mean per hectare value of CO ₂ e tonnes for the Activity Area and determine confidence deduction	The sampling error is calculated (across all strata for stratified inventories) at the 90% confidence level automatically in CALC BOSK. Confidence deduction is determined as described in Section B.1.4.

B.1.4. Calculating Confidence Statistics

Although Activity Area tree data will be accepted with sampling errors up to +/- 20% of the mean at the 90% confidence interval, deductions for uncertainty are applied to an Activity Area's inventory if the sampling error exceeds the Target Sampling Error (TSE).

The TSE and confidence deduction depends on whether the Forest Project has multiple Activity Areas or is enrolled in an aggregate. If a project incorporates a single Activity Area and is not enrolled in an aggregate, a TSE of 5% (Table B.5) is applied as the basis for the calculation of a confidence deduction (Table B.6). However, the TSE varies depending on the number of Activity Areas involved, whether within a single Forest Project or as part of a project Aggregate. By recognizing the principle of an improved population-wide sampling error through the combination of multiple sampling sub-populations, projects with multiple Activity Areas are able to reduce the sampling intensity, thereby reducing inventory costs without compromising statistical integrity. Thus, while the TSE is increased for each Activity Area, achieving the adjusted TSE in all Activity Areas would achieve the overall project sampling error target of +/- 5% of the mean at the 90% confidence level. The underlying statistical rationale for this approach, including a description of how the sliding scale was determined, is provided in Appendix E.

The TSE for individual Activity Areas ranges between +/- 5 to 20 % of the mean at the 90% confidence level depending on the total number of Activity Areas using the field sampling inventory methodology in the Forest Project as shown in Table B.5 below. The same TSE applies to all Activity Areas in a Forest Project with multiple Activity Areas or in an aggregate.

Table B.5 Target Sampling Error at the 90 Percent Confidence Level

Number of Participating Activity Areas* in the Forest Project/Aggregate	Target Sampling Error (TSE)
1	5%
2	7%
3	8%
4	9%
5	10%
6	11%
7	12%
8	13%
9	14%
10	15%
11	16%
12	17%
13	18%
14	19%
15+	20%

*Only Activity Areas that use the field sampling inventory methodology are included.

The inventory for each Activity Area is evaluated (independent of the inventories for other Activity Areas) to determine if the sampling error exceeds the TSE. If the sampling error for a given Activity Area exceeds the TSE, a confidence deduction is applied to the inventory for that Activity Area. Confidence deductions are determined according to Table B.6 using the appropriate TSE (from Table B.5). Regardless the TSE, Activity Area inventories with a sampling error greater than +/- 20% of the mean at the 90% confidence level will not be

accepted. Furthermore, the confidence deduction is applied directly to the inventory of live and dead trees reported as the actual project stocks for the Activity Area, but not to the baseline estimate, thus ensuring a conservative quantification of project benefits.

Table B.6 Determining the Confidence Deduction for Activity Areas

Actual Project Sampling Error at 90% Confidence Level	Confidence Deduction
≤ 5%	0%
> 5% - ≤ 20%	Actual sampling error % – TSE% (to the nearest 1 percent)
> 20%	100% (Account is suspended until corrections are made)

Credits that are withheld from transactions due to the confidence deduction can be recouped when increased sampling effort (usually the addition of more plots) improves the confidence estimate of the inventory or when the TSE is adjusted by inclusion of additional Activity Areas. Likewise, inventory estimates that decrease in confidence will result in a reduction of credits available for transaction, which can result in a Computational Reversal (See Section 6.3.3).

B.2. Determining Activity Area Baseline

For Activity Areas that pass the performance standard (see Section 3.13.2), the baseline is calculated as the sum of carbon inventories in the required pools (tCO_{2e}) at the start date.

Forest Owners have the option to postpone their baseline development until their first verification by back casting an inventory developed within 2 years of the Activity Area start date. This gives the Forest Owner the flexibility to complete their initial inventory within the first two reporting periods (i.e., by the end of the second reporting period). The Forest Owner then develops an inventory that is representative of the Activity Area's start date by back casting the later developed inventory.

Plot data recorded for the development of the initial inventory may include radial increment data (in the absence of other growth data), which can be used to estimate DBH and tree height at an earlier time. CALC BOSK, the companion data management tool for the protocol, will back-cast inventory data to the selected start date.

B.3. Updating Activity Area Carbon Inventories and Determining Actual Onsite Carbon Stocks

Since Activity Area forest carbon stock estimates are constantly fluctuating due to additional inventory data, forest growth, harvest, and natural disturbances, estimates of forest carbon stocks must be updated and reported annually. The annual adjustments to inventory data are based on the inclusion of new information, adjusting existing data for forest growth and disturbances, and recalculating the carbon estimates and the confidence deduction.

The annually updated inventory of Activity Areas is based on modeling changes to ('growing') live trees in the inventory data to the end-of-the reporting period date. The length of time in which the inventory plots are modeled is dependent on the most recent date plot measurements were acquired in the field and input into CALC BOSK. All plots are required to be remeasured within a 12-year timeframe. Each step is described in greater detail below.

B.3.1. Updating Forest Inventory Data Based on New Information

For the Activity Areas, any plots sampled or re-sampled in the past year must be incorporated into the project inventory. If a plot is re-measured, the old data must be replaced with the new data in terms of representing the plot's inventory. Plot data is valid for 12 years, at which point the plot must be re-measured, or unless randomly selected for removal or replacement. Prior to each Complete Verification, 5% of plots must be selected randomly to be removed and replaced with a new plot to prevent any bias in the management of inventory plots. The Activity Area inventory therefore must be based on plots sampled within the 12-year period. Forest Owners may decide to perform all of their inventory sampling in a given year or distribute it throughout the 12-year timeframe; Forest Owners may likewise decide to remove and replace 5% of plots in a given year or distribute it throughout the timeframe between Complete Verifications (typically every 6 years). CALCBOSK must be used to select the random plots to be replaced. Forest Owners are advised to inspect the modeled growth estimates with actual field conditions and determine the frequency of updating plots based on how well the modeled data tracks with actual conditions. Poor alignment between actual data and modeled data would indicate the need for more frequent field sampling efforts, as full verifications with site visit activities place a high focus on the comparison of data managed in CALCBOSK and actual data measured in the field.

B.3.2. Updating Forest Inventory Data for Growth

The approach to 'growing' trees in CALCBOSK is through the use of near-term (less than 12 year) projections of inventory data based on recent historical growth of live trees. Historical radial increment samples are acquired initially from each plot, which are used as the basis for forward projections of diameter. Height measurements are projected forward based on conserving the proportion of diameter to height (based on initial and ongoing sampling data) and adjusting the height based on the modified (grown) diameter. The steps involved are displayed in Table B.7. However, CALCBOSK automates these steps. See the Quantification Tools User Manual for further information on using the automated functionality in CALCBOSK to update the inventory data annually.

Where increment data cannot be acquired from the stated procedures in the inventory manual, the Reserve will work with the Forest Owner to develop an alternative solution. This is usually reserved for hardwoods where radial data cannot be acquired.

Where sufficient sample plots have been remeasured, the growth programming in CALCBOSK will switch to calculating diameter and height increment based on the subsample of remeasured inventory plots. This functionality will engage within 6 to 12 years following the first reporting period, depending on how many plots have been remeasured. This method is expected to provide improved growth estimates over the initial approach, since both diameter and height will be projected based on real measurements.

Table B.7. Steps used in CALCBOSK for Updating Tree Records

Steps	Description	Tools/Process Required
1	Querying data for analysis.	Query live tree records that have been measured for growth increment by species class (conifer and hardwood), and vigor class in the Activity Area. (CALCBOSK assigns size classes to inventory data.)
2	Determine annual diameter increment.	The previously collected data for diameter increment (see item 15 in Table B.1) represent the increment over

Steps	Description	Tools/Process Required
		<p>the previous 5 years. This data must be divided by 5 to determine the average annual diameter increment.</p> <p>Note: In many cases, it is impossible to extract good increment samples from hardwoods. In such cases, the conifer increment is applied to the hardwood trees after adjusting the increment based on a comparison of average hardwood diameter to conifer diameter on a plot-by-plot basis, where tree ages are assumed to be equal.</p>
3	Calculate average annual diameter increment.	The average annual diameter increment by species class and vigor class is calculated by summing the results from Step 2 for each species class and vigor class and dividing by the number of records summed.
4	Add diameter increment to tree records.	The average diameter increment for each species class and vigor class is multiplied by the number of days between the desired report date and the date the tree record was measured in the field. This adjusts the tree's diameter either forward or backward to a previous or future estimate.
5	Calculate a diameter-to-height regression estimator.	<p>Height adjustments for each tree are based on the tree's diameter/height relationship from field measurements and applying the same relationship to trees with modified diameters from modeling.</p> <p>When the basis of modeled projections switches to an analysis of re-measured trees, whereby both the change in diameter and height can be determined, growth projections will be made by developing both diameter and height increment estimates for each species and vigor class combination.</p>
6	Calculate the estimated height for each tree based on the increment determined from Step 5.	Apply the estimated height increment developed in Step 5 for each tree record to update the tree's height. Like the diameter 'growth', the height change can occur forward or backward looking to a specific desired reporting date.

B.3.3. Updating Forest Inventory Estimate for Harvests and/or Disturbances

Inventory estimates should be updated annually for any disturbance (including harvest disturbance) that results in an estimated reduction to the reported carbon pools of 0.5 percent or more. However, due to real timing challenges in scheduling the development of monitoring reports and accomplishing the fieldwork associated with inventory management, plots that have been modified by harvest and/or natural disturbances since the previous reporting period must be excluded from the inventory analysis until the plots are updated with re-measured data from field visits. No more than 5% of the total inventory plots used to derive the inventory estimate within an Activity Area can be excluded for a reporting period and only plots in disturbed areas may be excluded. Excluded plots are not used to calculate the reported inventory of CO₂e nor are they used to calculate the sampling error. Forest Owners should submit a list of plots to be excluded for purposes of verification prior to the site visit portion of a full verification. Furthermore, no plot can be excluded for a period of time greater than one reporting period—

excluded plots must be remeasured for inclusion in the inventory for the reporting period immediately following the reporting period during which the disturbance occurred.

Plots that are excluded shall not be used in the calculations for sampling error. Nevertheless, the minimum confidence standard and discounts for uncertainty when the inventory does not achieve the Target Sampling Errors, as described in Section B.1.4, are still applicable when plots are excluded or estimated.

B.3.4. Updating Strata

Forest vegetation is in constant flux because of harvest, natural disturbances, and growth. Updates to stratum assignments and boundaries will be required as changes occur to an Activity Area that make existing strata delineations inaccurate. Since harvest and natural disturbances can produce rapid changes in conditions, updates to the stratification should be made within the same reporting period in which such an event occurred, if feasible, to ensure the inventory is as up to date as possible. The area that has been disturbed can simply be re-stratified with a stratum that reflects the post-disturbance forest condition, according to the stratification classes determined for the project. Any plots that existed in the disturbed area must be removed from the set of plots used to estimate the stratum average, as described above, unless and until the affected plots are re-measured. Plots associated with harvested or disturbed areas should be remeasured as soon as possible, though such plots (up to 5% of the total inventory plots) may be excluded for one reporting period, as described in Section B.3.3.

Updates to strata boundaries and assignments must follow the same stratification rules specified when the Activity Area was established. Verification of stratified inventories must ensure that any areas that are disturbed are accurately characterized in the inventory GIS system and that the assigned stratum reflects the current forest condition. The overall stratification shall be reviewed by the Forest Owner every 12 years at a minimum to ensure stratum labels address any changes in vegetation that may have occurred due to forest growth.

B.3.5. Completing the Annual Update Process

Upon updating the height and diameter increments, the land use and forest cover classes for disturbances, and the Activity Area (hectare) assignments, as well as stratum assignments, when applicable, in CALCBOSK, the forest carbon stocks can be recalculated using the methods identified in Section B.1.3. The Quantification Tools User Manual provides further guidance for updating the data in CALCBOSK. The confidence statistics and the associated confidence deduction for each Activity Area may only be updated in the Carbon Monitoring Worksheet for reporting periods undergoing a full verification during which the inventory updates are to be reviewed and approved by a verifier.

Appendix C. Canopy Cover Quantification Methodology

Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas may use the canopy cover inventory methodology to estimate carbon stocks in live trees. Nevertheless, Forest Owners always maintain the option to use the field sampling inventory methodology to quantify live tree carbon for all Activity Areas.

For Forest Projects with multiple Activity Areas, quantification of carbon stocks should be conducted independently for each Activity Area. The canopy cover quantification methodology will be used to determine the Activity Area baseline as well as to quantify the actual onsite carbon stocks at the end of each reporting period. Section C.3 describes the process for updating the inventory to quantify the actual onsite carbon stocks for each reporting period. The canopy cover inventory methodology includes deriving a measurement of the canopy area within the Activity Area, which are applied to ratio estimators to produce an estimate of CO_{2e} for the Activity Area. Ratio estimators represent a relationship between CO_{2e} in standing trees and canopy cover, providing the ability to estimate the CO_{2e} in standing trees across the Activity Area as a function of the Activity Area's overall canopy cover.

In addition, the canopy cover inventory methodology must be used to estimate the emissions associated with site preparation activities that impact shrubs at the start of project activities on a Reforestation Activity Area. Such estimates are based on a comparison of pre- and post-site preparation shrub cover, as outlined in Section 5.4.1.2.

Large Urban Forest and some Restoration Activity Areas (see Sections 3.13.2.5 and 3.13.2.3) are required to establish a historical trend of the Activity Area's canopy cover to complete the performance standard test and should refer to Section C.1.3 for guidance.

C.1. Developing Initial Activity Area Inventories

Default ratio estimators for live tree stocks for Agroforestry, Silvopastoral, and Small Urban Forestry Activity Areas, and for shrub stocks for Reforestation Activity Areas, are available on the Reserve's Panama Forest Project webpage. Default ratio estimators are based on published values of above- and below-ground live tree or shrub pools from field studies and are organized by Assessment Area, which are defined geographic areas available on the Reserve's Panama Forest Project webpage in the format of a map file and also as reference tables. These tables will be updated as new studies and data become available. Projects determine which Assessment Area(s) their Activity Areas fall in based on activity and a geographic comparison of the Activity Area polygons with the map file. Forest Owners must initiate their project using the most current version of the default values and must maintain these values for the project crediting period.

Default ratio estimators for all the activities included in this section are values representing the amount of CO_{2e} per hectare of canopy cover. Equation C.1 is used to estimate the total tonnes of CO_{2e} in onsite carbon stocks in Small Urban Forestry, Agroforestry, Silvopastoral and Reforestation Activity Areas.

Equation C.1. General Equation Used to Calculate Total CO₂e Stocks in Small Urban Forestry, Agroforestry, Silvopastoral, and Reforestation Activity Areas

$AC_{onsite,y} = \sum A_m \times (CC_m \times RE_m)$		
Where,		
		<u>Units</u>
$AC_{onsite,y}$	= Onsite carbon stocks	tCO ₂ e
A_m	= Total area of Assessment Area m within the Activity Area	hectares
CC_m	= Estimated canopy cover for Assessment Area m within the Activity Area	%
RE_m	= Default ratio estimator for activity and Assessment Area m	tCO ₂ e/hectare

The general approach to developing estimates of CO₂e through default ratio estimators for each Activity Area uses the following steps, all of which are described in more detail in this document:

1. Determine the activity and Assessment Area(s) applicable to the Activity Area – see Section C.1.1
2. Select the default ratio estimator appropriate for the activity and Assessment Area – see Section C.1.2
3. Develop an estimate of the canopy cover within the Activity Area – see Section C.1.3
4. Apply the canopy cover estimate to the default ratio estimator and multiply by the total hectares of the Activity Area to expand the CO₂e estimate to the Activity Area – see Section C.1.4

For Reforestation Activity Areas requiring an estimate of the impact on shrub carbon stocks resulting from site preparation activities that remove shrub cover, Steps 3 and 4 above are conducted twice—once using a satellite image from prior to the start of site preparation activities and a second time using a satellite image from after the completion of site preparation activities, as described in Section 5.4.1.

C.1.1. Determine the Appropriate Assessment Area Applicable to the Activity Area

Map layers of Assessment Areas (in .shp and .kml formats) applicable to Agroforestry and Silvopastoral Activity Areas, Small Urban Forestry Activity Areas, and Reforestation Activity Areas can be found on the Panama Forest Project webpage. Forest Owners can determine the appropriate Assessment Area(s) by uploading the Activity Area shapefile to mapping software and performing an analysis (such as “Intersect” in ArcGIS) with the Assessment Area layer.

Forest Owners shall calculate the number of project hectares for each Assessment Area applicable to the Activity Area. If the Activity Area spans multiple Assessment Areas, identify all applicable Assessment Areas.

C.1.2. Select the Correct Default Ratio Estimator

Use the tables of Assessment Areas and their corresponding default ratio estimators to select the default ratio estimator that corresponds with the Assessment Area(s) applicable to your Activity Area. If the Activity Area spans multiple Assessment Areas, identify all applicable default ratio estimators.

As described in Equation C.1, default ratio estimators are simple coefficients that are multiplied by the area of canopy cover for each Activity Area.

C.1.3. Estimating Current Canopy Cover in Standing Trees within the Activity Area

The total canopy of trees for Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas, or shrubs for Reforestation Activity Areas must be estimated (via sampling) for each of the Assessment Areas using remotely sensed data throughout the Activity Area. A current satellite image or up-to-date remote sensing data must be used for sampling with a recommended resolution of at least 3m. The image should be dated within 12 months of the Activity Area start date and should be from a month where foliage is present and visible (spring or summer). Contact Reserve staff if no image is available.

Large Urban Forestry and some Restoration Activity Areas must use the following methodology to assess the Activity Area's canopy cover in order to pass the performance standard test (see Section 3.13.2.5 and 3.13.2.3). Section C.1.3.1 provides further guidance specific to Large Urban Forestry and Restoration Activity Areas that need to complete the historical canopy cover trend analysis.

For sampling the canopy layer, the sampled portion must be displayed as a layer in a GIS. The following methods are allowed for sampling canopy area:

1. Randomized points developed using the i-Tree Canopy tool derive a 'hit' or 'miss' (of tree canopy, or shrub canopy for Reforestation Activity Areas) and must be determined by the technician. The points superimposed on the Activity Area allow a percentage of canopy cover, total canopy area, and confidence statistics to be calculated. If a project spans multiple Assessment Areas, the i-Tree estimate process should be completed separately for each Assessment Area.

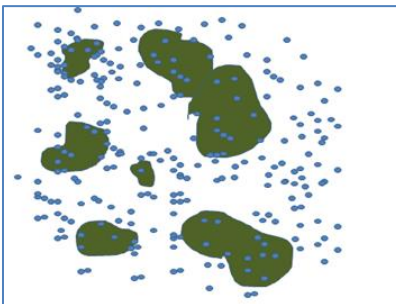


Figure C.1. Example of Overlaying Random Points in the Activity Area to Determine Canopy Percentage

2. A systematic sample can be conducted with a grid of points established in GIS and placed over the Activity Area for the purposes of estimating canopy area. The Forest Owner must determine the 'hit' and 'miss' of each point (in terms of being coincident with a tree/shrub crown or multiple tree/shrub crowns), which will enable a percentage of canopy cover to be determined and total canopy area to be determined (as described above). If an Activity Area spans multiple Assessment Areas, this process should be completed separately for each Assessment Area.

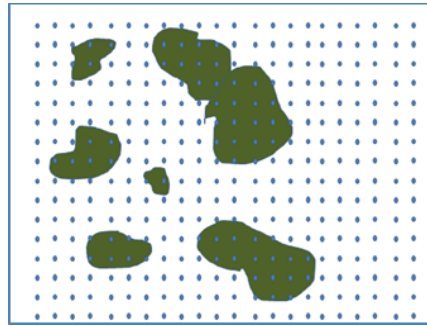


Figure C.2. Example of Overlaying a Systematic Grid in the Activity Area to Determine Canopy Percentage

3. Sampling can be conducted using remotely sensed data as a subset of the Activity Area. Again, the sampling must be designed to develop estimates for each Assessment Area independently. The sampling must incorporate randomized strips (two parallel lines with a known distance between them to calculate area) or randomized or systematic area plots. The Forest Owner must be able to calculate accurately the area within the strip or plot that is tree/shrub canopy and the area that is not tree/shrub canopy.

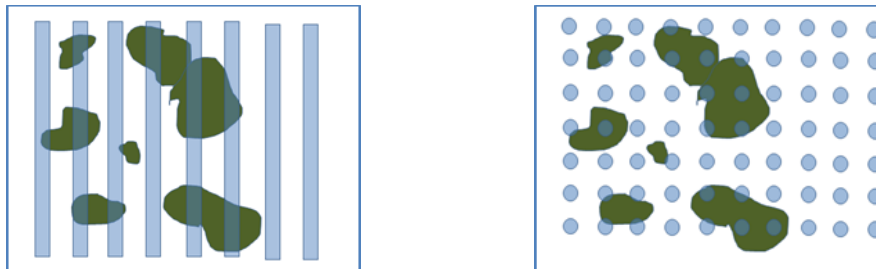


Figure C.3. Example of Overlaying Known Area Sampling Units (Strips and Fixed Radius)

Regardless of the method utilized:

1. The points, strips, or plots must be maintained for the project life and be available for verification.
2. Sampling for canopy cover must continue until the sampling error for the average canopy cover (points labeled as “tree” in i-Tree Canopy) for each Assessment Area is achieved within +/-10% at 1 standard error. Regardless of the sampling method used, a list of point/plots/strips and its corresponding geographic information estimated percentage of canopy cover relative to the Activity Area must be included in the Project Report. For example, for projects utilizing randomized points developed using i-Tree Canopy, a table of cover class, description, latitude and longitude of each point shall be included in the Project Report, as well as a table of estimated percentage of canopy cover by cover class.

The Reserve does not require that a new set of random points be generated each year. The same points may be applied to an updated image. It is acceptable to augment the set of random points to maintain and/or augment the confidence in the canopy cover estimate. However, the confidence level achieved in the first reporting

period must be met or exceeded in future reporting periods.

3. Data shall be carried out to one decimal point, for example, 17.3%. The mean percent canopy estimate from sampling is multiplied by the area within each Activity Area, corresponding to each Assessment Area, to estimate the canopy area.

C.1.3.1. Large Urban Forestry and Non-Mangrove Restoration Activity Areas: Developing a Historical Trend for the Performance Standard Test

Large Urban Forestry and some non-mangrove Restoration Activity Areas must use the methodology detailed in Section C.1.3 to develop the estimates of canopy cover for the Activity Area in order to pass the performance standard test. For these Activity Areas, a historical estimate of canopy cover must be compared to a more recent estimate of canopy cover in order to create a trend of canopy cover for the Activity Area. The trend analysis must compare the percent change normalized to 10 years between two historical estimates that are at least 10 years apart, with the recent estimate within five years of the start date, and the earliest point no earlier than 1990. For instance, if an Activity Area commences in 2019, the historical estimates may be done using aerial imagery from 2005 and 2018, since the recent estimate is within five years of the start date, and the two points pre-date the start date, are at least 10 years apart from one another, and do not pre-date 1990. Contact Reserve staff if no images fitting these requirements are available. Both estimates are developed by estimating canopy cover for each date from remotely sensed data as described in Section C.1.3.

Table C.1 demonstrates an example of how to determine the percent change normalized to 10 years for the historical canopy cover trend analysis. For Large Urban Forestry Activity Areas, if the percent change in canopy cover is decreasing, the Activity Area passes the performance standard test. For Restoration Activity Areas that have to complete the canopy cover trend analysis, if the percent change of historical canopy cover is decreasing by at least 10%, the Activity Area demonstrates sufficient degradation to be eligible to pass the performance standard test. See Section 3.13.2.3 for further guidance on how Restoration Activity Areas may pass the performance standard test.

Table C.1. Example of Canopy Cover Trend Analysis for a Large Urban Forestry or Restoration Activity Areas

(A) Mean Estimate from Historical Image (2005)*	(B) Mean Estimate for More Recent Historical Image (2018)*	(C) Percent Change	(D) Timeframe (years)	(E) Percent Change Normalized to 10 years
65.4%	56.3%	-13.9%	13	-10.7%
*Note that the canopy cover estimates, if sampled, must be derived from a sampling process with a sampling error within +/- 10% @ 1 standard error.				

C.1.4. Determining the Activity Area Estimate of CO_{2e}

With the average canopy cover estimated and ratio estimators selected for each of the applicable Assessment Areas, an estimate of CO_{2e} for the Activity Area can be estimated (see Table C.2 for an example). The ratio estimators are applied to the canopy cover estimates in each Assessment Area and summed to determine the estimated CO_{2e} in the Activity Area, as described in Equation C.1.

Table C.2. Example of Expanding Ratio Estimators Based on Canopy Cover Area to Estimate Total CO₂e within an Activity Area

Assessment Area	Total Area within Activity Area (A_m)	Mean Estimate of Canopy Cover* (CC_m)	Ratio Estimators (RE_m)	Total CO ₂ e
	(hectares)	(percent)	(CO ₂ e tonnes/hectare/%canopy cover)	(tonnes)
Agroforestry Subtropical Dry Forest	35	18.1%	444	2,812.7
Agroforestry Subtropical Mountain Systems	65	35.0%	301	6,847.8

*Note that the canopy cover estimates, if sampled, must be derived from a sampling process with a sampling error within +/- 10% @ 1 standard error.

C.1.5. Determining the Initial Change in Shrub CO₂e on Reforestation Activity Areas

The change in shrub carbon stocks at the start of project activities on a Reforestation Activity Area is estimated by calculating the difference between the amount of shrub carbon stocks before the initiation of shrub removal during site preparation and the amount remaining after the completion of site preparation activities, as outlined in Section 5.4.1.2 and Equation 5.4. Images used to derive canopy cover for such estimates should be as near to the Activity Area start date as possible while still appropriately representing the 'before' and 'after' conditions. If imagery indicating the 'after' conditions is not available in a timeframe necessary to fulfill reporting and verification requirements under the protocol, the shrub canopy cover after site preparation can simply be assumed to be 0%. Table C.3 provides an example of the calculation to be performed. The results from the calculation are entered as the value for the variable $SE_{shrub,init}$ in Equation 5.2 for the first reporting period for the Reforestation Activity Area.

Table C.3. Example of Calculating the Change in Shrub CO_{2e} Resulting from Site Preparation Activities within a Reforestation Activity Area

Assessment Area	Total Area within Activity Area (A_m)	Estimated Canopy Cover Area* (CC_m)	Ratio Estimators ⁷⁰ (RE_m)	Total CO _{2e}
	(hectares)	(percent)	(CO _{2e} tonnes/ hectare of canopy cover)	(tonnes)
Before Shrub Removal				
Shrub Subtropical	15	40.2%	184	1,109.5
Shrub Tropical	85	55.0%	195	9,116.3
Total				10,225.8
After Shrub Removal				
Shrub Subtropical	15	0.0%	184	0
Shrub Tropical	85	5.1%	195	845.3
Total				845.3
Change in Shrub CO_{2e} ('After' – 'Before')				
Total Change ($\Delta SE_{shrub,init}$)				-9,380.5

*Note that the canopy cover estimates, if sampled, must be derived from a sampling process with a sampling error within +/- 10% @ 1 standard error.

C.2. Developing Activity Area Baseline

For Small Urban Forestry, Agroforestry, and Silvopastoral Activity Areas, the baseline is calculated as the sum of carbon inventories in the required pools (tCO_{2e}) at the start date. To calculate the carbon inventory at the start date, the total canopy of trees must be estimated (see Section C.1.3) using a current satellite image dated within 12 months of the Activity Area start date. Contact Reserve staff if no image is available.

For Reforestation Activity Areas, the baseline only includes tree carbon stocks at the start date, as indicated in Section 4, using the field sampling inventory methodology, as indicated in Section 5.1.2 and described in Appendix B. Shrub carbon stocks are not included as a component of the baseline.

C.3. Maintaining and Updating Activity Area Inventories

Activity Area inventories must be reported to the Reserve on an annual basis for each reporting period. Activity Area inventories are in constant flux due to forest growth and mortality or removal and therefore must be updated on an annual basis for reporting. The inventory must be updated annually through a re-calculation of the canopy area and applying the ratio estimator(s) used for the initial inventory.

It is important to note that the basis of a successful verification depends on alignment (see Section 8.2.3) between verifier data and Forest Owner data for each randomly selected plot (selected by verifier), therefore these guidelines do not ensure successful project verification.

⁷⁰ Ratio estimators are maintained in the Assessment Area Data File and are subject to change. Refer to Assessment Area Data File for current ratio estimator(s).

It is acceptable to use the previous points used to develop the canopy area and re-evaluate them with updated imagery. It is also acceptable to use newly generated random point to develop a revised estimate on the updated imagery. The image should be dated within 12 months of the end of the reporting period and should be from a month where foliage is present and visible (spring or summer). The image used for the end of a reporting period must be dated after the image used for the prior reporting period or the start date for the first reporting period. The Forest Owner may provide an attestation asserting that no new image update is available for the current year in which case the Reserve will accept the previous year's reported inventory.

Appendix D. Verification Body Requirements for Site Visit Verifications

The verification team must always include a forester onsite during full verifications with site visits that is either contracted or employed directly by the verification body that meets one of the following qualifications:

Option	Credentials	Experience
1	CONAFOR certification – Forest Technical Advisor in Silviculture (see below)	At least two years of experience sampling, developing, and analyzing forest biomass or carbon inventories.
2	CONAFOR certification – <i>Promotor Forestal</i> /Forest Technician (see below)	
3	Demonstration of university training (12 semester or 18 quarter hours) or its equivalent (at the Reserve's sole discretion) in the following areas: <ul style="list-style-type: none"> ▪ Sampling design ▪ Implementing and analyzing forest biomass or carbon inventories ▪ Forest biometrics 	
4	Registered professional forester in states or provinces (U.S. or Panama) where professional registration exists or Certified Forester under the Society of American Foresters.	

Further detail for the above certification requirements:

CONAFOR Certification- Silviculture	<ul style="list-style-type: none"> ▪ Coursework & evaluation through a CONAFOR approved entity ▪ Must demonstrate competence in the following: <ul style="list-style-type: none"> ▪ Developing & implementing Forest Management Plans ▪ Sampling methods ▪ Technical studies for managing forests & forest resources ▪ GIS ▪ Treatments and techniques for forest management
CONAFOR Certification as a Promotor Forestal/Forest Technician	<ul style="list-style-type: none"> ▪ Coursework & evaluation through a CONAFOR approved entity ▪ Coursework must include: <ul style="list-style-type: none"> ▪ Forest management plans & community-based silviculture ▪ Basics of silviculture treatments ▪ Forest inventories: objectives, characteristics and types of sampling, instruments and tools, establishing plots, measurement criteria, GPS ▪ Process and systematization of data for forest inventories: recording data, processing information, calculating volumes at tree/plot/hectare/stand

Appendix E. Aggregation

As part of its efforts to encourage greater participation by forest landowners in the Climate Action Reserve's carbon offset program, the Reserve has developed rules and procedures under which smaller Forest Projects may be aggregated. The goal of aggregation is to alleviate transaction costs for individual landowners, while upholding the Reserve's standards for quantification certainty and integrity. Allowing smaller projects to register as part of a group, or "Aggregate," can help reduce costs by enabling economies of scale and supporting the marketing of offset credits at volume.

The Reserve's aggregation rules were first developed for the Reserve's Forest Project Protocol for the United States, and were prepared with assistance from a stakeholder workgroup, feedback from a public meeting (18-May-2010), and with a process of public comment and response.

By enrolling in an Aggregate, a Forest Project will:

- Require fewer sample plots for each included Activity Area that uses the field sampling inventory methodology (Appendix B) to generate a forest carbon inventory of sufficient statistical certainty to avoid a confidence deduction. Greater statistical uncertainty associated with individual Activity Areas will be compensated through aggregation with other Activity Areas. Allowable standard errors for individual Activity Areas are established based on the total number of participating Activity Areas using the field sampling inventory methodology in the Aggregate.
- Have a less frequent verification schedule than is required for standalone Forest Projects.

E.1. Aggregation Requirements

This model of aggregation enables small projects to participate in the Reserve by allowing the forest inventory and verification requirements to be applied at an Aggregate level rather than at the level of individual Forest Projects. However, each Forest Owner must retain a Reserve account and a separate Project Implementation Agreement (PIA) with the Reserve. Participation in an Aggregate in no way changes how a project meets environmental or social safeguards or meets requirements for submitting annual monitoring reports.

Detailed requirements for aggregating projects (also referred to as enrolling projects in an "Aggregate") are described below.

E.1.1. Eligible Project Types

Aggregates may be comprised of any combination of the eligible activity types (see Section 2.3) and Forest Owner type (see Section 3.2) from any geographic location within Panama.

E.1.2. Number of Forest Owners

An Aggregate must consist of two or more individual Forest Projects. There is no limit to the number of Forest Projects or Activity Areas in an Aggregate. The inventory sampling for Activity Areas and verification requirements for Forest Projects within an Aggregate vary depending on the total number of Forest Projects and Activity Areas in the Aggregate (see Appendices E.2 and E.3).

E.1.3. Area Limitations

There is no upper or lower limit on the total amount of forest area (i.e., the sum of all participating projects) enrolled in an Aggregate. However, an individual Forest Owner may enroll only up to 10,000 hectares in Aggregates, whether in a single Aggregate or across multiple different Aggregates. Area owned by an individual Forest Owner may be enrolled in Aggregates as either a single Forest Project with one 10,000 hectares Activity Area, a single Forest Project with multiple Activity Areas that sum to no more than 10,000 hectares, or as multiple Forest Projects with their included Activity Areas adding up to 10,000 hectares. Any Activity Areas that would cause the Forest Owner to exceed the 10,000 hectares limit must be submitted as a standalone Forest Project.

In Aggregates formed by three or more Activity Areas, no single Activity Area may comprise more than 50 percent of the total combined area in an Aggregate, based on the hectares included in each Activity Area. This is to prevent any one Activity Area from disproportionately affecting the inventory statistics and having excessive influence on the composite sampling error. In the case of Aggregates formed from two Activity Areas, no single Activity Area may comprise more than 70 percent of the total combined area in the Aggregate, based on the hectares included in each Activity Area.

E.1.4. Qualifications and Role of Aggregators

An aggregator may be a corporation or other legally constituted entity, city, district, municipal, or province agency, individual or a combination thereof. An aggregator must have a project developer account on the Reserve. A Forest Owner may serve as its own aggregator or as an aggregator for a group of Forest Projects when it is the owner of one or more of the Forest Projects.

Once approved for a project developer account on the Reserve, an aggregator must remain in good standing or all of the aggregator's account activities will be suspended until issues are resolved to the satisfaction of the Reserve. In order for an aggregator to remain in good standing, aggregators must:

- Execute contracts with Forest Owners that include the mandatory components as defined Section E.1.6. The contracts will be required at the time of the first verification of each Forest Project.
- Select a single verification body for all enrolled projects in any given year or set of years.
- Ensure the verification schedule for all Forest Projects in the Aggregate meets the verification standards according to the PFP (see Section 8 and Section E.3).
- Maintain a Reserve account to which CRTs may be transferred from the accounts of participating Forest Owners and from which CRTs may be transacted.
- Include Project Coordinators on all correspondence related to their projects during reporting and verification, including seeking advice or guidance from the Reserve.

Forest Owners are ultimately responsible for complying with the terms of the PFP. Aggregators may, however, manage the flow of ongoing monitoring and verification reports to the Reserve as a service to Forest Owners. Aggregators may also engage in project development, provide inventory services, and provide other services for the Forest Owner. The scope of aggregator services may be negotiated between Forest Owners and the aggregator and reflected in contracts between the Forest Owners and the aggregator.

E.1.5. Forming an Aggregate

In order to form an Aggregate, aggregators are required to establish a project developer account on the Reserve. Only a project developer account may submit project documents on behalf of the Forest Owner upon completing a Designation of Authority Form.

Aggregators must also submit an “Aggregate Submittal Form” that includes the following information:

- The name, description, and contact information of the aggregator.
- A list of initial Forest Owner participants (which must be greater than one).
- The initial reporting period is the end date for all participating Forest Projects.

The Aggregate Submittal Form will be available to the public on the Reserve’s website and will require approval by Reserve staff. It must be modified any time a participant joins or leaves an Aggregate. Aggregators should submit the Aggregate Submittal Form prior to forming the Forest Owner accounts so that the Reserve can appropriately assign the Forest Owner accounts to the Aggregate.

In addition to the Aggregate Submittal Form, aggregators must submit:

- Copies of the contract(s) between each Forest Owner and aggregator. Forest Owners may decide whether or not contracts with aggregators are made available to the public. Contracts must establish the rights to CRTs and future credit payments, as well as terms for contract renewal, renegotiation, or termination.

All Forest Projects must likewise submit the Project Submittal Form (see Section 7.1.1). Each Forest Project participating in an Aggregate may have a distinct project start date, however all participating Forest Projects must synch their initial reporting period end-date.

E.1.6. Joining an Aggregate

To add a Forest Project to an Aggregate after the initial Aggregate submittal, aggregators will be required to update the Aggregate Submittal Form. This form must be updated at the time of project submittal.

In addition to the Aggregate Submittal Form, aggregators must submit:

- Copies of contract(s) between each Forest Owner and aggregator. Forest Owners may decide whether or not contracts with aggregators are made available to the public. Contracts must establish the rights to CRTs and future credit payments, as well as terms for contract renewal, renegotiation, or termination.
- All Forest Projects must likewise submit the Project Submittal Form (see Section 7.1.1).

Any projects that join the Aggregate must undergo a full verification before they will be allowed to join the Aggregate and must sync the end of their initial reporting period with the reporting period end-date of all participating Forest Projects.⁷¹

E.1.7. Leaving an Aggregate or Termination of Contract between Forest Owner and Aggregator

To leave an Aggregate, the Forest Owner for a project is required to provide the Reserve with the following:

- A statement that the Forest Owner intends to withdraw a project from a specific Aggregate and aggregator.
- If Forest Owner intends to retain a standalone project, a statement that the Forest Owner understands that they will be required to meet the standalone project inventory standards and that they will not be issued further CRTs until they have met those inventory standards and their new inventory has been verified.

If the Forest Owner intends to enroll the project in a different Aggregate, rather than switching to a standalone Forest Project, it will have 24 months to do so. During such time as the Forest Project is not enrolled in an Aggregate, account activities will be suspended. After 24 months, the Forest Project will be required to meet the requirements of a standalone Forest Project.

In the event that a Forest Project leaving an Aggregate changes the targeted standard error for the Forest Projects remaining in the Aggregate (because there are fewer than 15 Activity Areas remaining – see Section E.2), either (a) the same number of Activity Areas included in the exited Forest Project must be added to the Aggregate by already included Forest Projects or including a new Forest Project within 12 months of the departure date of the exiting Forest Project, or (b) new targeted standard error levels will apply to all of the remaining participants based on the number of remaining Activity Areas.

In addition, the aggregator must update the Aggregate Submittal Form to reflect the Forest Projects remaining in the Aggregate.

E.1.8. Accounts on the Reserve, Transfers of CRTs

Each Forest Owner with Forest Projects in an Aggregate must have a separate account with the Reserve to maintain transparency at the level of the individual Forest Owner. For each participating Forest Project, the Forest Owner must sign a PIA with the Reserve, meet all applicable social and environmental safeguards, and submit annual monitoring reports specific to that Forest Project. Each Forest Project is required to contribute to the Reserve's Buffer Pool and compensate for reversals as described in Section 6. Each Forest Project is independently responsible for meeting all reporting requirements described in Section 7. Many of these tasks, such as the transmission of annual documents, may be managed by the aggregator.

⁷¹ The purpose for each project participant to undergo a third-party full verification (whether initial or subsequent to an initial verification) at the time of entry into an Aggregate is to confirm that the project is in conformance with the PFP and the rules for inventory accuracy in the specific Aggregate are met. This is an important provision for the protection of the other participants in the Aggregate and for the integrity of the Aggregate system as a whole. An example of when this requirement is particularly critical is when a project is moved from one Aggregate to another and the two Aggregates have different sampling error targets.

Aggregators must maintain a Reserve account under which all projects in the aggregate must be submitted and administered. CRTs from Forest Projects participating in an Aggregate may be retired directly from the Forest Owner account, transferred to the account of the aggregator, or transferred to other accounts on the Reserve registry. Transfers from individual Forest Owner accounts to the aggregator's account are not subject to Reserve CRT transfer fees.

E.2. Inventory Standards for Participating Projects

For Activity Areas that use the field sampling inventory methodology (Appendix B), the target sampling error is +/- 5 percent of the mean at the 90 percent confidence level. Activity Areas that cannot meet this target level are still eligible but may have to take a confidence deduction that reduces their reported carbon stocks. To achieve a sampling error of +/- 5 percent of the mean at the 90 percent confidence level can be prohibitive for smaller Activity Areas because it requires a large number of plots relative to the total area of the Activity Area. Under these aggregation rules, Forest Owners enrolled in an Aggregate may submit Activity Area inventories with reduced sampling requirements based on the statistical principle that the targeted sampling error (+/- 5 percent of the mean at the 90 percent confidence level) is achieved across the entire Aggregate.

For Aggregated projects, the sampling error allowed for inventory data associated with individual Activity Areas varies on a sliding scale based on the number of participating Activity Areas using the field sampling inventory methodology. This sliding scale was determined through consultation with statisticians and affirmed by a model exercise as described in Section E.4. The target sampling error for the individual Activity Areas ranges between 7 to 20 percent of the mean at the 90 percent confidence level based on the total number of Activity Areas in the Aggregate using the field sampling inventory methodology as discussed in Section B.1.4 and shown below in Table E.1. The same targeted sampling error applies to all Activity Areas in an Aggregate using the field sampling inventory methodology.

Table E.1 Target Sampling Error at the 90 Percent Confidence Level for Activity Areas in an Aggregate

Number of Activity Areas	Target Sampling Error (TSE)
2	7%
3	8%
4	9%
5	10%
6	11%
7	12%
8	13%
9	14%
10	15%
11	16%
12	17%
13	18%
14	19%
15+	20%

As discussed in Section B.1.4, for Activity Areas included in an Aggregate, confidence deductions are determined according to Table E.2 (using the appropriate TSE from Table E.1).

Table E.2 Inventory Confidence Deductions for Activity Areas in an Aggregate

Actual Sampling Error at 90% Confidence Level	Confidence Deduction
0 - TSE%	0%
TSE to 20%	(Actual sampling error – TSE %) to the nearest 1/10 th per cent
Greater than 20%	100%

Using this approach, the Reserve’s inventory standard remains essentially the same for single large Forest Projects and aggregated groupings of Forest Projects with smaller Activity Areas while allowing the Forest Projects in an Aggregate to benefit from reduced costs associated with the reduced number of plots required per Activity Area. The underlying statistical rationale for this approach is explained in Section E.4.

E.3. Monitoring and Verification

Each Forest Project is required to undergo a full verification at the Forest Project’s initiation to confirm that the Forest Project’s Activity Area(s) baseline(s) and initial inventory(ies) have been established in conformance with the PFP and that the rules for inventory accuracy have been met as outlined in this document. Subsequent verifications may follow a schedule where only a representative sample of Forest Projects in an Aggregate is verified each year, as described below.

The aggregator is responsible for selecting a single verification body for all enrolled Forest Projects in any given year or set of years. The same verification body may be used up to six consecutive years (the number of consecutive years allowed is from the Verification Program Manual). Verification bodies must pass a conflict-of-interest review against all enrolled Forest Owners and the aggregator.

The aggregator must also coordinate a verification schedule that meets the requirements described in this section.

Required Full Verification Schedule for Aggregates

Full verifications must be conducted on a schedule such that at all times a minimum of 50 percent of the Forest Projects in the Aggregate (rounding up in the case of an uneven number of Forest Projects) have successfully completed a full verification within the previous six years, and that all Forest Projects in the Aggregate have successfully completed a full verification within the previous twelve years. These verification requirements are mandatory regardless of the mix of entry dates represented by the group of Forest Projects in the Aggregate. The initial full verification required for entry into the Aggregate may count to meet these full verification obligations.

On six-year intervals, beginning with the first year of the existence of the Aggregate, the verification body must select from the total group of Forest Projects those projects that will have scheduled full verifications in order to meet these obligations. The process must utilize random selection, while still meeting the six- and twelve-year completion requirements. For example, in the case where there is ten Forest Projects that joined the Aggregate in the first year, five of those projects must be chosen randomly to have a full verification sometime before the seventh year. The remaining five projects must then complete a full verification sometime before the thirteenth year. Projects must then be randomly selected again for the next twelve-year full

verification cycle, such that five projects would be randomly selected to complete a full verification before the nineteenth year, and the remaining five would have to complete a full verification prior to the twenty-fifth year, and so on (see Table E.3 and Table E.4). Verification bodies are required to present the random selection of Forest Projects as part of the NOVA/COI review process.

The full verifications may be spread out through each six-year interval or scheduled in a more concentrated manner that economizes on verification expenses. A verifier may submit one Verification Report for all Forest Projects within an Aggregate participating in a verification period. The Verification Report must reference all Forest Projects in the aggregate and demonstrate the random selection of eligible Forest Projects for the full verification in compliance with the aggregation requirements. Forest Owners must be notified of a full verification upon selection by the verification body.

For Forest Projects not selected to undergo a full verification, verification is limited to the confirmation of signed Attestations and that the credits in the Reserve software match the Annual Monitoring Report. Any discrepancies should be resolved prior to issuing a successful verification determination. Verification bodies may not extend their verification scope beyond that stated in the Protocol. Verification Statements are required for each Forest Project seeking credits in a verification period, regardless of the scope of the verification.

Required Desk Verification Schedule for Aggregates

Between full verifications, each Forest Owner must submit annual project monitoring reports. The Aggregate may also opt to undergo a desk verification in order to receive additional credits prior to the next required full verification. If undergoing a desk verification, verification bodies must audit a sample of the annual monitoring reports, equivalent to the square root of the total number of participating Forest Projects in the Aggregate, or the total number of participating Forest Projects divided by 12, whichever is higher (when rounded to the next highest whole number). As an example, an Aggregate with 16 Forest Projects must have four project monitoring reports verified in a given reporting period. Audited Forest Projects must be selected randomly and must not include projects undergoing full verification for the reporting period. Forest Owners will not know when their annual monitoring reports will require verification. Since this is a random process, a Forest Owner may have the annual report verified in consecutive years or not until the Forest Project is verified with a required full verification. Verification bodies are required to present the random selection of Forest Projects as part of the NOVA/COI review process. A verifier may submit one Verification Report for all Forest Projects within an Aggregate that undergoes a desk verification in a given verification period.

For Forest Projects not selected to undergo a desk verification, verification is limited to the confirmation of signed Attestations and that the credits in the Reserve software match the Annual Monitoring Report. Any discrepancies should be resolved prior to issuing a successful verification determination. Verification bodies may not extend their verification scope beyond that stated in the Protocol. Verification Statements are required for each Forest Project seeking credits in a verification period, regardless of the scope of the verification.

If a desk verification for a participating Forest Project is unsuccessful, the verification body must verify additional participating Forest Projects until the total number of successful desk verifications reaches the required number (as described above). If the required number of successful desk verifications has not been achieved within 12 months after the date the

verification body submits a negative Verification Opinion and Report to the Reserve for a Forest Project in the Aggregate, crediting of all the participant Forest Projects in the Aggregate will be suspended until the required number of successful desk verifications has been achieved.

If material issues arise during verification of a participant Forest Project, the Forest Owner will need to independently address the issues and required corrective actions using the same process taken with standalone Forest Projects as described in Section 8 and the Reserve Verification Program Manual⁷².

The Reserve will not issue CRTs for a Forest Project in an Aggregate that has an unsuccessful verification. If a participating Forest Project is not successfully verified within 24 months of a negative Verification Opinion, the Forest Project will be automatically terminated.

If during a given reporting period at least the square root of all participating Forest Projects undergoes a full verification, the remaining Forest Projects are not required to undergo a desk verification in order to receive credits. The initial verifications of Forest Projects that join an Aggregate after the Aggregate's original start date do not count towards the minimum number of projects that must undergo a full verification in order to avoid incurring additional desk verifications (see Table E.3 and Table E.4).

Aggregators may assist the Forest Owner in preparing documents for verification and facilitate the verification process. The scope of these services is determined by the specific contract between the Forest Owner and the aggregator. The ultimate responsibility for monitoring reports and verification compliance is assigned to each participating Forest Owner.

Table E.3 Verification Schedule of an Aggregate

RP*	Projects in Aggregate	IVs*	FVs* (not counting IVs)	Randomly Selected for FVs	Total FVs (including IVs)	% of Projects with FVs in the Past 6 Years	% of Projects with FVs in the Past 12 Years	DVs* Randomly Selected
1	5	5			5	100%	100%	0
2	5				0	100%	100%	3
3	5				0	100%	100%	3
4	5				0	100%	100%	3
5	5				0	100%	100%	3
6	5				0	100%	100%	3
7	5		3	3	3	100%	100%	0
8	5				0	60%	160%	3
9	5				0	60%	160%	3
10	5				0	60%	160%	3
11	5				0	60%	160%	3
12	5				0	60%	160%	3
13	5		3	1	3	60%	160%	0
14	5				0	60%	120%	3
15	5				0	60%	120%	3
16	5				0	60%	120%	3
17	5				0	60%	120%	3
18	5				0	60%	120%	3
19	5		3	3	3	60%	120%	0

⁷² <http://www.climateactionreserve.org/how/verification/verification-documents/>

20	5				0	60%	120%	3
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*RP: reporting period; IV: initial verification; FV: full verification; DV: desk verification

Table E.4 Verification Schedule of an Aggregate with Forest Projects added during different Reporting Periods

RP*	Projects in Aggregate	IVs*	FVs* (not counting IVs)	Randomly Selected for FVs	Total FVs (including IVs)	% of Projects with FVs in the Past 6 Years	% of Projects with FVs in the Past 12 Years	DVs* Randomly Selected
1	5	5			5	100%	100%	0
2	10	5			5	100%	100%	3
3	15	5			5	100%	100%	4
4	20	5			5	100%	100%	4
5	20				0	100%	100%	5
6	20				0	100%	100%	5
7	20				0	100%	100%	5
8	20				0	75%	100%	5
9	20				0	50%	100%	5
10	20		10	10	10	25%	100%	0
11	20				0	50%	150%	5
12	20				0	50%	150%	5
13	20				0	50%	150%	5
14	20				0	50%	125%	5
15	20				0	50%	100%	5
16	20		10	0	10	50%	75%	0
17	20				0	50%	100%	5
18	20				0	50%	100%	5
19	20				0	50%	100%	5
20	20				0	50%	100%	5
21	20				0	50%	100%	5
22	20		10	10	10	50%	100%	0
21	20				0	50%	100%	5

*RP: Reporting Period; IV: Initial Verification; FV: Full Verification; DV: Desk Verification

E.4. Rationale for Reduced Sampling Requirements

The underlying theory supporting the target sampling errors was determined through consultation with statisticians and affirmed with the use of the model described below. The model was originally developed for the Reserve's Forest Project Protocol for the United States, which requires the quantification of carbon stocks at the project level, but has since been applied to the PFP, which requires the quantification of carbon stocks at the Activity Area level. Thus, where the model refers to individual projects, for the PFP, this would relate to individual Activity Areas.

The model assumes that an aggregate would contain from 2 to 25 projects included with each participating project in the aggregate comprised of four inventory strata. Hypothetical inventory data were generated for each stratum using random numbers within a range as shown in Table E.5 below. This was assumed to encompass a significant range of potential variability at the stratum and project level.

Table E.5 Parameters Used to Generate Hypothetical Inventory Data

	Min Value	Max Value
Mean live-tree carbon density (MgC/acre)	20	100
Standard deviation (% of mean)	10%	100%
Inventory stratum size (acres)	50	1,000

Using the hypothetical inventory data generated, the weighted-average mean and standard deviation were calculated for each individual project in the aggregate (where a project is comprised of four strata) and at the total level for the equivalent standalone project (i.e., all inventory strata from all projects were assumed to represent distinct inventory strata in a single large project). These data were then used to calculate the required sample size for each individual project belonging to an aggregate and for an equivalent standalone project of the same total size. The analysis was repeated 1,000 times to get an average result for many different hypothetical inventory samples. The total number of plots required will vary significantly depending on the actual mean and standard deviation of each of the projects in question, but it should be roughly the same number of plots that would be required if all of those projects were registered as a single (equivalent standalone) project.

Table E.6 shows the total sample size requirements for projects in an aggregate that are (a) treated individually, and (b) treated as an equivalent standalone project (i.e., made up of the combined individual projects) assuming +/- 5 percent error at the 90 percent confidence level. Smaller individual projects will in general have a higher sampling requirement compared to larger individual projects. The results show that inventory costs would be 2 to 27 times higher (relative to an equivalent standalone project) if each individual project were required to meet the sampling error of +/- 5 percent at the 90 percent confidence level.

Table E.6 Number of Inventory Plots Required for Aggregate vs. Equivalent Standalone Project for +/- 5 Percent at 90 Percent Confidence

Number of Projects in the Aggregate	Total number of plots required for all projects in the aggregate		Difference in Total Number of Plots (and Cost)
	Treating the entire geographic area as one equivalent standalone project that meets +/- 5% sampling error in aggregate	Requiring each component project to meet +/- 5% sampling error	
2	340	725	213%
3	338	1,080	320%
4	337	1,444	428%
5	337	1,797	533%
6	336	2,158	642%
7	335	2,506	748%
8	334	2,856	855%
9	333	3,223	968%
10	333	3,573	1,073%
11	331	3,935	1,189%
12	331	4,284	1,294%
13	331	4,641	1,402%
14	331	4,995	1,509%
15	330	5,350	1,621%
16	329	5,712	1,736%
17	329	6,068	1,844%
18	329	6,431	1,955%

Number of Projects in the Aggregate	Total number of plots required for all projects in the aggregate		Difference in Total Number of Plots (and Cost)
	Treating the entire geographic area as one equivalent standalone project that meets +/- 5% sampling error in aggregate	Requiring each component project to meet +/- 5% sampling error	
19	330	6,788	2,057%
20	330	7,140	2,164%
21	330	7,506	2,275%
22	330	7,871	2,385%
23	330	8,221	2,491%
24	330	8,576	2,599%
25	330	8,947	2,711%

The model was then used to affirm the target sampling error at 90 percent confidence level to apply at the individual project level for aggregates in Table E.1. Table E.7 shows the results of a Monte Carlo simulation of 1,000 iterations of the analysis using different random numbers to generate the initial inventory figures. It shows that using the target sampling errors suggested in the proposal for determining the required sample size of individual projects, the level of actual accuracy at the aggregate level is likely to be similar or better than the +/- 5 percent currently required in the PFP and the number of total plots is not significantly higher than an equivalent standalone project.

Table E.7 Number of Inventory Plots Required and Equivalent Sampling Error for Aggregate vs. Standalone Project

Number of Projects in the Aggregate	Target Sampling Error (TSE) at 90% Confidence for each Project in an Aggregate (Based on the Number of Projects in the Aggregate)	Sum of Plots Required for all Projects in the Aggregate: (mean of 1,000 Iterations)		Percentage Increase of Plots Required for Aggregated Projects (Compared to Standalone Projects) (D-C) / C	Resulting Sampling Error if Plots from the Aggregate were Applied to a Single Standalone Project at 90% Confidence Interval *
		With the Projects in the Aggregate Treated as One Project (+/-5% at 90%)	With the Projects in the Aggregate Treated as Aggregated Projects (TSE % at 90%)		
A	B	C	D	E	F
2	+/- 7%	351	365	4%	+/- 4.9%
3	+/- 8%	343	416	21%	+/- 4.5%
4	+/- 9%	339	439	29%	+/- 4.3%
5	+/- 10%	338	446	32%	+/- 4.3%
6	+/- 11%	338	440	30%	+/- 4.3%
7	+/- 12%	335	431	29%	+/- 4.4%
8	+/- 13%	335	420	25%	+/- 4.4%
9	+/- 14%	334	407	22%	+/- 4.5%
10	+/- 15%	333	393	18%	+/- 4.6%
11	+/- 16%	332	380	14%	+/- 4.6%
12	+/- 17%	332	368	11%	+/- 4.7%
13	+/- 18%	331	357	8%	+/- 4.8%
14	+/- 19%	331	345	4%	+/- 4.9%
15	+/- 20%	331	333	1%	+/- 5.0%
16	+/- 20%	331	355	7%	+/- 4.8%
17	+/- 20%	331	377	14%	+/- 4.7%
18	+/- 20%	331	399	21%	+/- 4.5%
19	+/- 20%	331	421	27%	+/- 4.4%
20	+/- 20%	332	443	33%	+/- 4.3%
21	+/- 20%	331	465	40%	+/- 4.2%
22	+/- 20%	331	487	47%	+/- 4.1%
23	+/- 20%	331	509	54%	+/- 4.0%
24	+/- 20%	330	532	61%	+/- 3.9%
25	+/- 20%	330	555	68%	+/- 3.8%

* This is the sampling error that would result if the total number of plots used for the equivalent standalone project were equal to the total number of plots listed in column D (i.e., the total number of plots required if each small project were treated individually, using the target sample error identified in column B).

Example

Using the data in Table E.7, an aggregate involving 9 projects in total (column A) requires a sampling error of +/- 14 percent (column B) to be used in inventory design for each individual property. For the example shown below, this translates to just over 45 plots per property, or a total of 407 plots at the aggregate level (column D). Conversely, the number of plots required to achieve +/- 5 percent sampling error on an equivalent standalone project would be 334 for the same example (column C). The number of plots required at the aggregate level is therefore 22 percent greater than the equivalent standalone project (column E).

The simple graphic below illustrates the distribution of plots to the properties within the aggregate group of 9 projects and in the equivalent standalone project.

Aggregate			Standalone
(Total = 407 plots)			(Total = 334 plots)
45	45	45	334
45	45	45	
45	46	46	

The two Project Areas are identical at the aggregate level, but because the aggregated project requires more total plots, it will theoretically achieve a sampling error of +/- 4.5 percent (column F in Table E.7) instead of +/- 5 percent for the equivalent standalone project.

Appendix F. Tonne-Year Accounting

Under this protocol, credits are issued based on a combination of the amount of carbon that is sequestered and the length of time that carbon is stored or secured through a commitment relative to a 100-year permanence timeframe, with the minimum time commitment of 30 years. Permanence commitments are secured through the PIA. Tonne-year accounting principles are used to quantify the time-value of storing carbon as a relative proportion of the 100-year permanence requirement. The longer that sequestered and verified carbon is maintained (or secured through commitment), the more credits are issued, up to a maximum of 1 credit for each tonne of carbon sequestered. Credit amounts will be issued in full relative to the amount carbon sequestered 100 years after the date the carbon was initially sequestered, or to the full temporal extent the sequestered carbon is secured through a commitment. Credits will be issued based on the time-value of storing carbon for the guaranteed period, relative to 100 years (e.g., the time-value for storing carbon for 30 out of 100 years).

Tonne-tonne accounting is applied to projects that make a 100-year permanence commitment through the PIA and thus receive the full value of the additional carbon sequestered each reporting period minus any applicable deductions detailed in this protocol including Buffer Pool contributions (see Appendix G).

F.1. Tonne-Year Accounting and Credit Issuance

In order to meet the permanence requirements of this protocol, one credit (CRT) is issued for each tonne of CO₂e removed from the atmosphere for a period of 100 years. Tonnes of CO₂e sequestered and stored for shorter periods will receive a fractional amount of credits according to the length of time the sequestered CO₂e is stored and/or committed relative to 100 years. Specifically, for each additional tonne of CO₂e that is stored and verified, credits will be issued proportional to the value of the atmospheric impact of sequestering and maintaining each tonne for the amount of time in which it is secured. This is achieved by multiplying the number of tonnes of sequestered CO₂e in a given reporting period by the simplified radiative forcing coefficient of 1% per tonne of CO₂e per year. Credits will be issued proportional to the length of the commitment – e.g., 0.3 credits per tonne that is secured for 30 years.

The commitment to secure CO₂e must be established through the PIA (Section 6.1). Equation F.1, below, shows the formula for determining the number of credits that will be issued for a carbon sequestered in any given year.

Equation F.1 Formula for Credit Issuance under Tonne-Year Accounting

$CRT_y = \sum_{n=1}^y (QR_n \times (YR_n + CL_y) \times 0.01 - PC_n)$		
Where,		<u>Units</u>
CRT_y	= Sum of credits to be issued in reporting period y	CRTs
QR_n	= Quantified GHG removals for reporting period n , for each reporting period in which additional carbon was sequestered	tCO ₂ e
YR_n	= Length of time since the initiation of reporting period n in which the additional carbon was sequestered, for each reporting period in which additional carbon was sequestered	Years
CL_y	= Length of commitment into future from current reporting period y that secures all sequestered carbon	Years

PC_n	=	Previous credits issued for reporting period n , for each reporting period in which credits were issued	CRTs
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For projects with a commitment period less than the 100-year permanence period, the expected stream of future credits can provide an ongoing economic incentive to protect against reversals over time, as long as carbon is maintained. Quantified GHG removals that have been verified through full or desk verifications but are not yet secured are recognized by the Reserve as Verified Removals (VRs) and are not issued as CRTs until they have been secured through a commitment or the passage of time (see Section 6.1).

Forest Projects may extend or renew their permanence commitments (i.e., through the PIA), generating further CRTs based on the length of the extension. The proportion of further CRTs issued is thus based on the length of time the VRs will be secured and the simplified radiative forcing coefficient of 1% per year. For projects that establish a 100-year commitment period initially, additional CRTs for previously sequestered carbon would not be generated by the renewal of the contractual agreement or commitment, only for additional carbon sequestered each reporting period.

For example, if 100 tonnes of CO₂e is sequestered in the first reporting period, (determined by the Forest Owner to be one year from the start date), and the Forest Owner submits the Project Report at the end of the first reporting period and commits to securing the 100 tonnes of CO₂e against reversals for 30 years, then 31 CRTs will be issued upon verification. This is based on using the simplified radiative forcing coefficient of 1% per year multiplied by the combination of the 1 year for which the tonnes have already been maintained and the 30 years for which the tonnes are secured through contract:

$$CRT_p = (100 \times (1 + 30) \times 1\% - 0)$$

Alternatively, if the first reporting period were 12 months, the Project Report was not submitted until 12 months later at the end of the second reporting period, and the project was thus not verified until after the second reporting period, then 32 credits would be issued following verification.

$$CRT_p = (100 \times (2 + 30) \times 1\% - 0)$$

In this second example, after the initial verification, the project would have 68 VRs that have not yet been issued as CRTs out of the initial 100 tonnes of CO₂e that were sequestered and verified. If, in the next year, the permanence commitment is extended by another year (so that the commitment period still has a term of 30 years total), using the simplified 1% radiative forcing coefficient, another 1 VR would be converted into a CRT in addition to the prior credits because the project has demonstrated another year toward the 100-year permanence requirement. Permanence commitments may be extended in this way until the end of the commitment reaches a date that is 100 years after the carbon was first sequestered. At that point, a total of 100 credits will have been issued for the 100 tonnes CO₂e sequestered in the first reporting period. An example is provided in Table F.1 again using the simplified 1% radiative forcing coefficient. In Table F.1, the column “Credits Issued (CRT_x)” is the credit issuance for the amount of tonnes originally sequestered or the “Quantified GHG Removals (QR_x)” in each reporting period based on the commitment length, which shows how additional CRTs are issued for those previously sequestered tonnes in later reporting periods through extending the commitment length. The rows for reporting periods 1, 2, and 3 are the sum of all

credits issued in each reporting period based on the amount credited for the tonnes sequestered and secured in that reporting period and previous years.

Table F.1 Example of CRT Issuance

Assumptions		1. Commitment length = 30 years and is extended annually. 2. Reporting period 1 ends one year from the start date. 3. Three years of reporting are shown below.							
The amount of CRTs issued in any annual reporting period is determined by the amount of additional CO ₂ e sequestered in the reporting year multiplied by the length of the commitment period that secures the CRTs plus 1/100th multiplied times the CRTs issued in the reporting period to account for the project having met 1% of its 100-year permanency requirement.									
Reporting period 1			Reporting period 2			Reporting period 3			Total CRTs Issued Each reporting period
Quantified GHG Removals (QR_1)		100	Quantified GHG Removals (QR_2)		300	Quantified GHG Removals (QR_3)		100	
Reporting period	Previous Credits Issued (PC_n)	Credits Issued (CRT_1)	Reporting period	Previous Credits Issued (PC_n)	Credits Issued (CRT_2)	Reporting period	Previous Credits Issued (PC_n)	Credits Issued (CRT_3)	
1	0	31	1	-	-	1	-	-	31
2	31	1	2	0	93	2	-	-	94
3	32	1	3	93	3	3	0	31	35
Total CRTs issued through reporting period 3									160

Table F.2 Shows the same example, but with the horizontal representing the credits issued in each reporting period based on the originally sequestered tonnes as the commitment is extended each year. The vertical in Table F.2 shows the sum of all credits issued based on the amount credited for the tonnes sequestered and secured in that reporting period and previous years.

Table F.2 Example 2 of CRT Issuance

	1	2	3
Tonne-Year Value of Credits Issued	100	300	100
RP 1	31	1	1
RP 2		93	3
RP 3			31
Total Credits Issued Per RP	31	94	35

Appendix G. Determination of Buffer Pool Contribution

Forest Projects must derive a reversal risk rating using the worksheets in this section. The worksheets are designed to identify and quantify the specific types of risks that may lead to a reversal, based on project-specific factors.

This risk assessment must be updated every time the Forest Project undergoes a full verification. Therefore, a project's risk profile and its assessment are dynamic. Furthermore, the Reserve adaptively manages the Buffer Pool contributions and will update the estimated risk values as needed. Any adjustments to the risk ratings will affect only current and future year contributions to the Buffer Pool. The Reserve will likewise redistribute offset credits from the Buffer Pool to the Forest Owner's account based on the ongoing assessment of project and programmatic risk and the tonne-year value of credits held in the Buffer Pool. The Reserve may waive a Forest Owner's future redistributions from the Buffer Pool based on ongoing assessment of risk and occurrence of reversals. If a Forest Project's risk rating increases, the Forest Owner must contribute additional offset credits to the Buffer Pool to ensure that all offset credits (including those issued in prior years) are properly insured.

Risks that may lead to reversals are classified into the categories identified in Table G.1. However, the Buffer Pool is treated as a combined risk pool and all Buffer Pool credits may be used for a reversal due to any risk category or type of reversal.

Table G.1 Forest Project Risk Types

Risk Category	Risk Type	Description	How Risk is Managed in this Protocol
Financial	Financial Failure Leading to Bankruptcy	Financial failure can lead to bankruptcy and/or alternative management decisions to generate income that result in reversals through over-harvesting or conversion	Project-specific risk value based on project activity and Forest Owner type.
Management	Illegal Harvesting	Loss of project stocks due to timber theft	Project-specific risk value based on project activity and Forest Owner type.
	Conversion to Non-Forest Uses	Alternative land uses are exercised at project carbon expense	
	Over-Harvesting	Exercising timber value at expense of project carbon	
Social and Political	Social Risks	Changes in communal or social governance and project acceptance.	Project-specific risk value based on Forest Owner type and executed activities to reduce risk.
	Political Risks	Changing government policies, regulations, and general economic conditions	Default risk value.

Risk Category	Risk Type	Description	How Risk is Managed in this Protocol
Natural Disturbance	Wildfire	Loss of project carbon through wildfire	Project-specific risk value based on execution of activities to mitigate risk or project activity.
	Disease/Insects	Loss of project carbon through disease and/or insects	Default risk value.
	Other Episodic Catastrophic Events	Loss of project carbon from wind, snow and ice, or flooding events	Default risk value.

G.1. Financial Risk

Financial failure of an organization resulting in bankruptcy can lead to dissolution of agreements and forest management activities to recover losses that result in reversals. Projects that occur on public lands are at a lower risk as well as projects with activity types of higher economic value.

Table G.2 Financial Failure Leading to Bankruptcy

Applies to all projects		
Identification of Risk	Contribution to Reversal Risk Rating	
	Private Lands	Public Lands
Default Financial Risk for Restoration, Reforestation, and Urban Forest Activities	8%	6%
Default Financial Risk for IFM, Agroforestry and Silvopastoral Activities	6%	4%

G.2. Management Risk

Management failure is the risk of management activities that directly or indirectly could lead to a reversal.

G.2.1. Management Risk I – Illegal Removals of Forest Biomass

Illegal logging occurs when biomass is removed either by trespass or outside of a planned set of management activities that are controlled by regulation. Illegal logging is exacerbated by lack of controls and enforcement activities.

Table G.3 Risk of Illegal Removals of Forest Biomass

Applies to all projects	
Identification of Risk	Contribution to Reversal Risk Rating
Default Harvesting Risk with a Forest Management Plan or domestic or international forest certification including Forest Stewardship Council ⁷³	2%
Lands with no Forest Management Plan or international forest certification including the Forest Stewardship Council	4%

G.2.2. Management Risk II – Conversion of Project Area to Alternative Land Uses

High values for development of housing and/or agriculture may compete with timber and carbon values and lead to a change in land use that affects carbon stocks. The risk of conversion of any Activity Area to other non-forest uses is related to the probability of alternative uses, which are affected by many variables, including population growth, topography, proximity to provisions and metropolitan areas, availability of water and power, and quality of access to the Activity Area. Moreover, due to the inherent governance requirements and legal restrictions that regulate land-use decisions, projects that occur on public, communal, or ejidal lands are at a lower risk as well as areas with an additional protected status such as Natural Protected Areas.

Table G.4 Risk of Conversion to Alternative Land Use

Applies to all projects	
Identification of Risk	Contribution to Reversal Risk Rating
Protected areas including National Parks, Biosphere Reserves, Natural Protected Areas, National Monuments, Sanctuaries, protected areas of flora and fauna, and Ramsar Sites	4%
Public lands (non-protected areas)	6%
Private lands (non-protected areas)	8%

G.2.3. Management Risk III – Over-Harvesting

Favorable timber values, among other reasons, may motivate some project managers to realize timber values at the expense of managing carbon stocks for which offsets have been credited. Additionally, reversals can occur as the result of harvest associated with fuels treatments. Only projects with IFM activities account for the risk of over-harvesting as illegal harvesting is accounted for separately.

⁷³ Aligned with the ARB Tropical Forest Standard requirements.

Table G.5 Risk of Over-Harvesting

Applies to all projects	
Identification of Risk	Contribution to Reversal Risk Rating
Projects with IFM Activity Areas: Public lands	4%
Projects with IFM Activity Areas: Private lands	4%
Projects with no IFM Activity Areas	0%

G.3. Social and Political Risk

Social risks are considered to be minimal on public and private lands.

Table G.6 Social Risk

Applies to all projects	
Identification of Risk	Contribution to Reversal Risk Rating
Public and private lands	2%

Political risks exist due to changing government policies, regulations, and general economic conditions. The risks of political actions leading to reversals are low but could be significant, particularly for projects on public lands.

Table G.7 Political Risk Identification

Applies to all projects	
Identification of Risk	Contribution to Reversal Risk Rating
Private projects: Panama Default Political Risk ⁷⁴	2%
Public lands	8%

G.4. Natural Disturbance Risk

Natural disturbances can pose a significant risk to the permanency GHG reductions and removals. Natural disturbance risks are only partially controllable by management activities. Management activities that improve resiliency to wildfire, insects, and disease can reduce these risks. Management activities that shift harvesting practices from live sequestering trees to trees that have succumbed to natural disturbances reduce or negate the reversal depending on the size and location of the disturbance.

G.4.1. Natural Disturbance Risk I – Wildfire, Disease, or Insect Outbreak

Wildfire, disease, or insect outbreak have the potential to cause significant reversals, especially in certain carbon pools. These risks can be reduced by certain techniques including reducing

⁷⁴ Calculated by the AFOLU Non-Permanence Risk Tool and The World Bank Institute Worldwide Governance Indicators.

surface fuel loads, removing ladder fuels, adding fuel breaks, and reducing stand density. However, these techniques cannot reduce emission risk to zero because all landowners will not undertake fuel treatments, nor can they prevent wildfire from occurring. Strategies implemented to reduce fuel loads can also improve resiliency to disease or insect outbreak.

Table G.8 Natural Disturbance Risk I – Wildfire, Disease, or Insect Outbreak

Applies to all projects	
Identification of Risk	Contribution to Reversal Risk Rating
Forest Project that has conducted fire risk reduction work on the Project Area that contributed to lowering the fire risk for the entire Project Area as confirmed through a project's Forest Management Plan and/or certification with domestic or internationally recognized forest certification programs. The methodology for how the project-specific assessment is being applied must be submitted as part of the project report. Mangrove Restoration and Reforestation as well as Agroforestry activities are also included in this category, regardless of whether fire risk reduction work has been performed.	4%
Forest Project that has not conducted fire risk reduction work on the Project Area	6%

G.4.2. Natural Disturbance Risk II – Other Episodic Catastrophic Events

A major wind-throw event (hurricane, tornado, high wind event) has the potential to cause a reversal, especially in certain carbon pools.

Table G.9 Natural Disturbance Risk III – Other Episodic Catastrophic Events

Applies to all projects	
Identification of Risk	Contribution to Reversal Risk Rating
Default Risk Contribution from Other Catastrophic Events	6%

G.5. Summarizing the Risk Analysis and Contribution to Buffer Pool

Use the table below to summarize the Forest Project's reversal risk rating based on land ownership. As indicated above, certain categories are based on further project specific information, such as activity type or implementation of specific risk mitigation activities. Moreover, the reversal risk rating is based on the Reserve's adaptive management of the Buffer Pool and programmatic assessment of ongoing risk, and the Reserve may adjust the Buffer Pool contributions accordingly overtime.

Table G.10 Project Contribution to the Buffer Pool Based on Risk

Risk Category	Contribution from Risk Descriptions Above	
	Private Lands	Public Ownership
Financial Failure	6% or 8%	4% or 6%

Illegal Forest Biomass Removal ⁷⁵	2% or 4%	2% or 4%
Conversion ⁷⁶	4% or 8%	4% or 6%
Over-Harvesting	0% or 4%	0% or 4%
Social	2%	2%
Political	4%	8%
Wildfire, Disease, or Insect Outbreak	4% or 6%	4% or 6%
Other Catastrophic Events	6%	6%

G.5.1. Completing the Risk Rating Analysis

The project's reversal risk rating is calculated as follows:

Equation G.1 Buffer Pool Contribution Rate (Reversal Risk Rating)

$$\begin{aligned}
 \text{Reversal Risk Rating} &= 100\% \\
 &- [(1 - \text{FinancialFailure}\%) \times (1 - \text{IllegalForestBiomassRemoval}\%) \\
 &\times (1 - \text{Conversion}\%) \times (1 - \text{OverHarvesting}\%) \times (1 - \text{Social Risk}\%) \\
 &\times (1 - \text{Political Risk}\%) \times (1 - \text{Wildfire / Disease / InsectOutbreak}\%) \\
 &\times (1 - \text{OtherCatastrophicEvents}\%)]
 \end{aligned}$$

Projects with a permanence commitment less than the 100-year permanence requirement have a lower risk of reversal due to having a shorter period of time in which the carbon must be secured. Moreover, the crediting for projects with a permanence commitment less than 100-years is adjusted according to their permanence commitment relative to 100-years per Appendix F, resulting in fewer credits to be at risk of a reversal each reporting period. For these reasons, the Buffer Pool contribution is adjusted based on the commitment period relative to the 100-year permanence requirement according to Equation G.2.

Equation G.2 Buffer Pool Contribution Rate for Projects with a Permanence Commitment Less than 100-years

RR	=	$(CL_y)/100 * RR_{initial}$	
<i>Where,</i>			
CL_y	=	Length of commitment into future from current reporting period y that secures all sequestered carbon	Years
$RR_{initial}$	=	Reversal risk rating calculated per Equation G.1	%
RR	=	Adjusted reversal risk rating to be inserted into Equation 6.2	%

⁷⁵ Calculated based on implementation of forest management plan and/or international forest certification programs.

⁷⁶ Areas with a national or state protected status are considered to be at a lower risk of conversion regardless of landownership type.

Appendix H. Redistribution of Buffer Pool Contributions

As discussed in Section 6, Forest Projects receive an economic incentive to ensure against reversals, based on redistributions of Buffer Pool contributions or Buffer Pool dividends. As projects demonstrate ongoing compliance, a percentage of their Buffer Pool contribution may be redistributed overtime based on the tonne-year value of the project's credits in the Buffer Pool.

Tonne-year accounting principles are used to quantify the time-value of carbon stored as a relative proportion of the 100-year permanence requirement. For each year a tonne of CO₂e is sequestered and maintained out of the atmosphere, the tonne produces an atmospheric benefit. The full atmospheric benefit of a credit is realized 100 years after the date the tonne of CO₂e was initially sequestered. The partial atmospheric benefit that is realized each year is quantified by the radiative forcing coefficient, for which the Reserve applies a simplified 1% per year. Thus, each year a tonne of CO₂e is held out of the atmosphere, it provides an atmospheric benefit of approximately 1% relative to the atmospheric benefit of a tonne of CO₂e held out of the atmosphere for 100 years. As tonnes of CO₂e are maintained out of the atmosphere over time, the portion of the credit that has already provided an atmospheric benefit shift from being "at risk" of reversal to "not being at risk" of reversal.

Under this Protocol, tonne-year accounting principles are applied to the long-term management of the Buffer Pool, such that Buffer Pool contributions are redistributed overtime as dividends as credits shift from being at risk to not being at risk of a reversal. Since both the credits held in the Buffer Pool and credits issued to the Forest Owner provide atmospheric benefits each year they are maintained, the tonne-year value of credits held in the Buffer Pool relative to the tonne-year value of total credits issued remains constant over time.

The frequency of redistributions is based on adaptive management of the Reserve's Buffer Pool and programmatic assessment of ongoing risk. The below diagrams demonstrate an example of redistributions aligned with the six-year full verification cycle using a fixed credit issuance per year of 1,000 CRTs for simplification. The Reserve will publish any changes to its ongoing management of the Buffer Pool and calculated dividends distributions.

Table H.1 Credit Issuance and Buffer Pool Contributions with Periodic Dividends

Dividends Distribution Frequency		6 years							
Buffer Pool % Coverage (BP)		35%							
Radiative Forcing Coefficient (RFC)		1%							
	Reporting period	Equation	1	2	3	4	5	6	Description
A	Annual Credits Issued	CRT_n	1000	1000	1000	1000	1000	1000	CRTs issued for RP_n
B	Sum Credits Issued to Date	$\sum_{n=1}^y CRT_n$	1000	2000	3000	4000	5000	6000	Sum of CRTs issued from $RP_{n=1}$ to RP_y or sum of row A
C	Sum Credits at Risk to Date	$\sum_{n=1}^y (CRT_n - (CRT_n \times 1\% \times (RP_y - RP_n)))$	990	1,970	2,940	3,900	4,850	5,790	Sum of CRTs issued minus the realized tonne-year value from $RP_{n=1}$ to RP_y or sum of vertical values shown in Table H.2
D	Buffer Pool Annual Contribution (BPC)	$CRT_n * BP$	350	350	350	350	350	350	Buffer pool contribution for RP_n
E	Sum BP Contribution to Date	$\sum_{n=1}^y (CRT_n * BP)$	350	700	1,050	1,400	1,750	2,100	Sum of Buffer Pool contribution from $RP_{n=1}$ to RP_y or sum of row D
F	Net BP Contribution (after dividends)	$\sum_{n=1}^y (CRT_n * BP) - \sum_{y=6}^y (BPC \times 1\% \times (RP_y - RP_n))$	350	700	1,050	1,400	1,750	2,027	Sum of Buffer Pool contribution minus periodic dividends or row E - I
G	Buffer Pool TYV	$\sum_{n=1}^y (BPC_n - (BPC_n \times 1\% \times (RP_y - RP_n)))$	347	690	1029	1365	1698	2027	Sum of Buffer Pool contributions minus the realized tonne-year value of Buffer Pool contributions from $RP_{n=1}$ to RP_y or sum of vertical values shown in Table H.3
H	Annual Dividends Distributions	$BPC \times 1\% \times (RP_y - RP_n)$	4	11	21	35	53	74	Tonne-year value of Buffer Pool contributions from RP_n to RP_y or row E - G
I	Dividends Distributions: 6 years	$\sum_{y=6}^y (BPC \times 1\% \times (RP_y - RP_n))$	0	0	0	0	0	74	Periodic dividends distributions every 6 years based on the realized tonne-year value of Buffer Pool contributions from $RP_{n=1}$ to RP_y or row $H_{y=6}$

J	Percent BP Coverage (annual TYV)		35%	35%	35%	35%	35%	35%	% of CRTs issued minus the tonne-year value of CRTs issued related to Buffer Pool contributions minus the tonne-year value of Buffer Pool contributions or rows G/C
K	Percent BP Coverage (periodic dividends distributions)		35%	36%	36%	36%	36%	35%	% of CRTs issued minus the tonne-year value of CRTs issued related to Buffer Pool contributions minus the periodic dividends or rows F/C

For Table H.2 and Table H.3, the colors show the credits issued (Table H.2) or Buffer Pool credits contributed (Table H.3) each reporting period (RP_n) as credits realize the tonne-year value each year they are held out of the atmosphere (RP_y-RP_n). The vertical boxes show the sum of credits issued (Table H.2) or Buffer Pool credits contributed (Table H.3) minus the tonne-year value each year they are held out of the atmosphere (RP_y-RP_n) from RP_n through RP_y.

Table H.2 Tonne-Year Value of Credits Issued

Tonne-Year Value of Credits Issued (i.e., Credits still at Risk of Reversal)	Reporting Period					
	1	2	3	4	5	6
	1000	1000	1000	1000	1000	1000
RP 1	990	980	970	960	950	940
RP 2		990	980	970	960	950
RP 3			990	980	970	960
RP 4				990	980	970
RP 5					990	980
RP 6						990

Table H.3 Tonne-Year Value of the Buffer Pool Contribution

Tonne-Year Value of the Buffer Pool Contribution	Reporting Period					
	1	2	3	4	5	6
	350	350	350	350	350	350
RP 1	347	343	340	336	333	329
RP 2		347	343	340	336	333
RP 3			347	343	340	336
RP 4				347	343	340
RP 5					347	343
RP 6						347