CLIMATE ACTION RESERVE

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Forest

Project Protocol

Climate Action Reserve
601 West 5th Street, Suite 650
Los Angeles, CA 90071
www.climateactionreserve.org

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Acknowledgements

Lead Author

John Nickerson

Staff

Derik Broekhoff
Kristen Garcia
Mark Havel
Amy Kessler
Robert Lee
Heather Raven
Jon Remucal
Sarah Wescott
Katharine Young

Workgroup

Name	Organization
Connie Best	The Pacific Forest Trust
Dave Bischel	California Forestry Association
Louis Blumberg	The Nature Conservancy
Steve Brink	California Forestry Association
Ann Chan	The Pacific Forest Trust
Florence Daviet	World Resources Institute
George Gentry	California Board of Forestry
Bruce Goines	United States Forest Service
Katie Goslee	Winrock International
Greg Giusti	University of California Extension
Sterling Griffin	Scientific Certification Systems
Caryl Hart	California State Parks
Eric Holst	Environmental Defense Fund
Robert Hrubes	Scientific Certification Systems
Nick Martin	Winrock International
Ed Murphy	Sierra Pacific Industries
Mark Nechodom	United States Forest Service
Jeanne Panek	California Air Resources Board
Michelle Passero	The Nature Conservancy
Tim Pearson	Winrock International
Tim Robards	California Department of Forestry and Fire Protection
Emily Russell Roy	The Pacific Forest Trust
Bob Rynearson	W.M Beaty & Associates
Gary Rynearson	Green Diamond Resources
Jayant Sathaye	University of California, Berkeley
Kimberly Todd	United States Environmental Protection Agency
Doug Wickizer	California Department of Forestry and Fire Protection

Technical Support

Nancy Budge	QB Consulting
Jordan Golinkoff	The Conservation Fund

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Abbreviations and Acronyms

C	Carbon
CH_4	Methane
CO_2	Carbon dioxide
CRT	Climate Reserve Tonne
FIA	USFS Forest Inventory and Analysis[1]
FPP	Forest Project Protocol
FRAP	CAL FIRE Fire and Resource Assessment Program
GHG	Greenhouse gas
lb	Pound
IFM	Improved Forest Management
N_2O	Nitrous oxide
PF	Professional Forester, in the case of California, a “Registered Professional Forester”
PIA	Project Implementation Agreement
Reserve	Climate Action Reserve
RPF	Registered Professional Forester, a person registered to practice professional forestry in California
USFS	United States Forest Service

[1] http://fia.fs.fed.us/program-features/rpa/

1 Introduction

The Forest Project Protocol (FPP) provides requirements and guidance for quantifying the net climate benefits of activities that sequester carbon on forestland. The protocol provides project eligibility rules; methods to calculate a project's net effects on greenhouse gas (GHG) emissions and removals of CO_2 from the atmosphere ("removals"); procedures for assessing the risk that carbon sequestered by a project may be reversed (i.e., released back to the atmosphere); and approaches for long term project monitoring and reporting. The goal of this protocol is to ensure that the net GHG reductions and removals caused by a project are accounted for in a complete, consistent, transparent, accurate, and conservative manner and may therefore be reported to the Climate Action Reserve (Reserve) as the basis for issuing carbon offset credits (called Climate Reserve Tonnes, or CRTs).

The Reserve is a national offsets program working to ensure integrity, transparency and financial value in the North American carbon market. It does this by establishing regulatory-quality standards for the development, quantification and verification of GHG emissions reduction projects in North America; issuing carbon offset credits known as CRTs generated from such projects; and tracking the transaction of credits over time in a transparent, publicly-accessible system. Adherence to the Reserve's high standards ensures that emissions reductions associated with projects are real, permanent and additional, thereby instilling confidence in the environmental benefit, credibility and efficiency of the U.S. carbon market.

Only those Forest Projects that are eligible under and comply with the FPP may be registered with the Reserve. Section 9 of this protocol provides requirements and guidance for verifying the performance of project activities and their associated GHG reductions and removals reported to the Reserve.

1.1 About Forests, Carbon Dioxide, and Climate Change

Forests have the capacity to both emit and sequester carbon dioxide (CO_2), a leading greenhouse gas that contributes to climate change. Trees, through the process of photosynthesis, naturally absorb CO_2 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 CO_2 into the atmosphere. The quantity and rate of CO_2 that is emitted may vary, depending on the circumstances of the disturbance. Forests function as reservoirs in storing CO_2.Depending on how forests are managed or impacted by natural events, they can be a net source of emissions, resulting in a decrease to the reservoir, or a net sink, resulting in an increase of CO_2 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 also play a positive and significant role to help address global climate change. The Reserve's FPP is designed to address the forest sector's unique capacity to sequester, store, and emit CO_2 and to facilitate the positive role that forests can play to address climate change.

2 Forest Project Definitions and Requirements

For the purposes of the FPP, a Forest Project is a planned set of activities designed to increase removals of CO_2 from the atmosphere, or reduce or prevent emissions of CO_2 to the atmosphere, through increasing and/or conserving forest carbon stocks.

A glossary of terms related to Forest Projects is provided in Section 10 of this protocol. Throughout the protocol, important defined terms are capitalized (e.g., “Reforestation Project”).

2.1 Project Types

The Reserve will register the following types of Forest Project activities.

2.1.1 Reforestation

A Reforestation Project involves restoring tree cover on land that is not at optimal stocking levels and has minimal short-term (30 years) commercial opportunities. A Reforestation Project is only eligible if:

1. The project involves tree planting or removal of impediments to natural reforestation, on land that:
    a. Has had ten percent or less tree canopy cover for a minimum of ten years; or
    b. Has been subject to a Significant Disturbance that has removed at least 20 percent of the Project Area’s live biomass in trees.
2. No rotational harvesting of reforested trees or any harvesting of pre-existing carbon in live trees occurs during the first 30 years after the project start date unless such harvesting is needed to prevent or reduce an imminent threat of disease. Such harvesting may only occur if the Project Operator provides the Reserve with a written statement from the government agency in charge of forestry regulation in the state where the project is located stipulating that the harvesting is necessary to prevent or mitigate disease.
3. The tree planting, or removal of impediments to natural reforestation, does not follow a commercial harvest of healthy live trees that has occurred in the Project Area within the past ten years, or since the occurrence of a Significant Disturbance, whichever period is shorter.
4. The project does *not* employ broadcast fertilization.
5. The project does not take place on land that was part of a previously registered Forest Project, unless the previous Forest Project was terminated due to an Unavoidable Reversal (see Section 7).

A Reforestation Project may involve subsequent tree harvesting and other silvicultural activities.

Reforestation Projects may be eligible on both private and public lands.

2.1.2 Improved Forest Management

An Improved Forest Management Project involves management activities that maintain or increase carbon stocks on forested land relative to baseline levels of carbon stocks, as defined in Section 6.2 of this protocol. An Improved Forest Management Project is only eligible if:

1. The project takes place on land that has greater than ten percent tree canopy cover.
2. The project employs natural forest management practices, as defined in Section 3.9.2 of this protocol.
3. The project does *not* employ broadcast fertilization.
4. The project does not take place on land that was part of a previously registered Forest Project, unless the previous Forest Project was terminated due to an Unavoidable Reversal (see Section 7).

Eligible management activities may include, but are not limited to:

- Increasing the overall age of the forest by increasing rotation ages
- Increasing the forest productivity by thinning diseased and suppressed trees
- Managing competing brush and short-lived forest species
- Increasing the stocking of trees on understocked areas
- Maintaining stocks at a high level

Improved Forest Management Projects may be eligible on both private and public lands.

2.1.3 Avoided Conversion

An Avoided Conversion Project involves preventing the conversion of forestland to a non-forest land use by dedicating the land to continuous forest cover at existing or increased stocking levels through a conservation easement or transfer to public ownership. An Avoided Conversion Project is only eligible if:

1. The Project Operator can demonstrate that there is a significant threat of conversion of project land to a non-forest land use by following the requirements for establishing the project's baseline in Section 6.3 of this protocol.
2. The project does *not* employ broadcast fertilization.
3. The project does not take place on land that was part of a previously registered Forest Project, unless the previous Forest Project was terminated due to an Unavoidable Reversal (see Section 7).

An Avoided Conversion Project may involve tree planting, harvesting, and other silvicultural activities as part of the project activity.

Avoided Conversion Projects are eligible only on lands that are privately owned prior to the project start date.

2.2 Forest Owners and Project Operators

A Forest Owner is an individual or a corporation or other legally constituted entity, city, county, state agency, or a combination thereof that has legal control of any amount of forest carbon[2] within the Project Area. Control of forest carbon means the Forest Owner has the legal authority to effect changes to forest carbon quantities, e.g., through timber rights or other forest management or land-use rights. Control of forest carbon occurs, for purposes of satisfying this protocol, through fee ownership and/or deeded encumbrances, such as conservation easements.

[2] See definition of Forest Carbon in glossary.

Multiple Forest Owners may exist with respect to a single Forest Project, since control of forest carbon may be associated with fee ownership or through one or more deeded encumbrances that exist within a Project Area, any one of which may convey partial control of the project's forest carbon. Any unencumbered forest carbon is assumed to be controlled by the fee owner. Individuals or entities holding mineral, gas, oil, or similar *de minimis*[3] interests in the forest carbon, are precluded from the definition of Forest Owner.

A Project Operator must be one of the Forest Owners. The Project Operator is responsible for undertaking a Forest Project and registering it with the Reserve, and is ultimately responsible for all Forest Project reporting and attestations. The Project Operator executes the Project Implementation Agreement (see Section 3.6) with the Reserve.

Where any Forest Owner chooses to exclude the forest carbon it controls from becoming part of the Forest Project, the project's baseline must demonstrate the exclusion as a legal constraint.

In all cases, the Project Operator must secure an agreement from all other Forest Owners that (1) assigns authority to the Project Operator to undertake a Forest Project, subject to any conditions imposed by any of the other Forest Owners to include or disallow any carbon they control; and (2) waives any right on the part of the Forest Owners to seek damages, penalties, costs, losses, expenses, or judgments from the Reserve arising from or in any way connected with the Forest Project, except as explicitly provided for in the PIA.

The Reserve maintains the right to determine which individuals or entities meet the definition of "Forest Owner."

The Project Operator may engage an independent third-party project developer to assist or consult with the Project Operator and to implement the Forest Project. All information submitted to the Reserve on behalf of the Project Operator shall reference the Project Operator, who is responsible for the accuracy and completeness of the information submitted, and for ensuring compliance with this Forest Project Protocol.

2.3 Forest Project Aggregation

Eligible Forest Projects[4] may be aggregated to improve cost-effectiveness while maintaining rigor in overall carbon inventory accounting. Individual Forest Projects can benefit through participation in an aggregate by meeting carbon inventory confidence standards across an aggregate, rather than within each project. This reduces the sampling intensity required within each project to meet statistical confidence requirements. Similarly, verification of aggregated projects is considered across the broader population, which reduces the verification costs to individual Project Operators participating in an aggregate. An aggregate consists of two or more individual Forest Projects enrolled with an Aggregator. For more information, please refer to the Guidelines for Aggregating Forest Projects.

[3] *de minimis* control includes access right or ways and residential power line right of ways.
[4] As described in the Guidelines for Aggregating Forest Projects available on the Reserve website.

3 Eligibility Rules and Other Requirements

In addition to the definitions and requirements described in Section 2, Forest Projects must meet several other criteria and conditions to be eligible for registration with the Reserve, and must adhere to certain requirements related to their duration, crediting period, and management activities.

Section 3.1	Project Location	→	*U.S., U.S. Territories (reforestation and avoided conversion only), and tribal areas*
Section 3.2	Project Start Date	→	*No more than six months prior to project submission*
Section 3.3	Additionality	→	*Exceed legal requirements*
		→	*Meet performance standard*
Section 3.4	Project Crediting Period	→	*One hundred year crediting period*
Section 3.5	Permanence	→	*One hundred years following the issuance of CRTs*
Section 3.6	Project Implementation Agreement	→	*Project Operator executes PIA with the Reserve*
Section 3.7	Qualified Conservation Easement	→	*Optional*
Section 3.8	Regulatory Compliance	→	*Compliance with all applicable laws*
Section 3.9	Sustainable Harvesting and Natural Forest Management	→	*Ongoing compliance with the requirements for the project's assessment area(s)*

3.1 Project Location

All Forest Projects located in the United States of America are eligible to register with the Reserve provided they meet all other eligibility requirements described in this protocol. Reforestation Projects and Improved Forest Management Projects may be located on private land or on state or municipal public land. Avoided Conversion Projects must be implemented on private land, unless the land is transferred to public ownership as part of the project. All projects can be transferred from private to public lands, whereby the public entity acquires all terms and conditions described in this protocol.

All Improved Forest Management Projects that are on public lands as of the project's start date must be approved by the government agency or agencies responsible for management activities on the land. This approval must include an explicit approval of the project's baseline, as determined in Section 6, and must involve any public vetting processes necessary to evaluate management and policy decisions concerning the project activity.

Forest Projects on federal lands may be eligible if and when their eligibility is approved through a federal legislative or regulatory/rulemaking process. Forest Projects in tribal areas must demonstrate that the land within the Project Area is owned by a tribe or private entities.

Companion documents to Version 4.0 of the Forest Project Protocol contain data tables, equations, and benchmark data applicable to projects located in the United States. The Reserve may add approved equations and models as they are developed in future versions of the Forest Project Protocol.

The methods required by this protocol for estimating baseline carbon stocks for Forest Projects cannot currently be applied outside the United States, as they rely on U.S.-specific data sets and models, particularly for Improved Forest Management Projects. Reforestation and Avoided Conversion are eligible in U.S. Territories, as they do not depend on the U.S.-specific data sets mentioned above.

3.2 Project Start Date

The start date of a Forest Project is the date on which an activity is initiated that will lead to increased GHG reductions or removals relative to the Forest Project's baseline. The following actions identify the project start date for each project type:

- For a Reforestation Project, the action is the planting of trees, the removal of impediments to natural regeneration, or site preparation for the planting of trees, whichever comes first.
- For an Improved Forest Management Project, the action is initiating forest management activities that increase sequestration and/or decrease emissions relative to the baseline, or transferring the Project Area to public ownership (see further guidance below).
- For an Avoided Conversion Project, the action is committing the Project Area to continued forest management and protection through recording a conservation easement with a provision to maintain the Project Area in forest cover or transferring the Project Area to public ownership where the Project Area will be maintained in forest cover.

Projects must be submitted to the Reserve within 6 months of their project start date.[5]

An Improved Forest Management project's start date must be linked to a discrete, verifiable action that delineates a change in practice relative to the project's baseline. Project Operators may choose to identify one of the following actions:

- Recordation of a conservation easement on the Project Area. The project start date is the date the easement was recorded.
- Transferring of property ownership (to a public or private entity). The project start date is the date of property transfer.
- Submitting the project to the Reserve.[6] The project start date is the date of submittal, provided that the project completes verification within 30 months of being submitted. If the project does not meet this deadline, it must be resubmitted under the latest version of the protocol; it will not retain the initial submittal date and will be subject to any new project start date requirements.

[5] See the Reserve's Program Manual for requirements for listing a project with the Reserve, available at http://www.climateactionreserve.org/how-it-works/program/program-manual/.

[6] Submitting a project to the Reserve is considered an initiation of a commitment to employ practices that will maintain or grow net carbon stocks for the duration of the FPP's commitment period, per the requirements of the FPP and signing the Project Implementation Agreement (PIA).

Project Operators must affirm the action denoting the project start date by providing documentation. Adequate documentation could include deeds of trust, title reports, conservation easement documentation, dated forest management plans, and/or contracts or agreements.

3.3 Additionality

The Reserve strives to register only projects that yield surplus GHG emission reductions and removals that are 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's Program Manual (available at http://www.climateactionreserve.org/how/program/program-manual/).

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

1. *Legal Requirement Test*. Forest Projects must achieve GHG reductions or removals above and beyond any GHG reductions or removals that would result from compliance with any federal, state, or local law, statute, rule, regulation, or ordinance. Forest Projects must also achieve GHG reductions and removals above and beyond any GHG reductions or removals that would result from compliance with any court order or other legally binding mandates including management plans (such as Timber Harvest Plans) that are required for government agency approval of harvest activities.

   Deeded encumbrances, such as timber deeds or conservation easements, may effectively control forest carbon, such that there may be multiple Forest Owners within the Project Area. Deeded encumbrances are considered legally binding mandates for the purposes of the legal requirement test, unless they are recorded within a year of the Forest Project's start date with clear agreement from all Forest Owners.

   Deeded encumbrances may contain terms that do not directly refer to forest carbon, but that nevertheless restrict the effect the ability of any one Forest Owner to change forest carbon stocks. These terms must be interpreted with respect to their effect on forest carbon for the purposes of the legal requirement test and baseline determinations. Where the terms of deeded encumbrances are not explicit with regards to forest carbon, the following assumptions shall be made:
   a. Restrictions or references related to canopy cover, basal area, density, volume, carbon or biomass apply to standing live and dead trees of all species.
   b. Carbon in other pools (soil, litter, duff, shrubs, etc.) is assumed to be associated with the other defined terms, such as trees.
   c. Terms related to forest (tree) growth apply to growth in all tree species.

2. *Performance Test*. Forest Projects must achieve GHG reductions or removals above and beyond any GHG reductions or removals that would result from engaging in Business As Usual activities, as defined by the requirements described below (Section 3.3.2).

   Project quantification (Section 6) further ensures that forest projects are additional via checks on financial feasibility.

3.3.1 Legal Requirement Test

The legal requirement test is satisfied if the following requirements are met, depending on the type of Forest Project.

3.3.1.1 Reforestation Projects

At the Forest Project's initial verification, the Project Operator must sign the Reserve's Attestation of Voluntary Implementation form indicating that the project's reforestation activities are not legally required (as defined above) and were not legally required at the time of the project's start date.

Modeling of the project's baseline carbon stocks must reflect all legal constraints, as required in Section 6.1 of this protocol.

3.3.1.2 Improved Forest Management Projects

At the Forest Project's initial verification, the Project Operator must sign the Reserve's Attestation of Voluntary Implementation form indicating that the Forest Project is not legally required (as defined above) and was not legally required at the time of the project's start date. For the purposes of the attestation, the "Project" is defined as maintaining onsite carbon stocks at or above their current levels (at the time the attestation is signed) for at least 100 years.

Modeling of the project's baseline carbon stocks must reflect all legal constraints in effect at the time of the project's start date, as required in Section 6.2 of this protocol.

3.3.1.3 Avoided Conversion Projects

At the Forest Project's initial verification, the Project Operator must sign the Reserve's Attestation of Voluntary Implementation form indicating that the Forest Project's planned forest conservation activities are not legally required (as defined above) and were not legally required at the time of the project's start date.

Modeling of the project's baseline carbon stocks must reflect all legal constraints, as required in Section 6.3 of this protocol.

3.3.2 Performance Test

The performance test is satisfied if the following requirements are met, depending on the type of Forest Project.

3.3.2.1 Reforestation Projects

A Reforestation Project that occurs on land that has had ten percent or less tree canopy cover for at least ten years automatically satisfies the performance test.

A Reforestation Project that occurs on land that has undergone a Significant Disturbance satisfies the performance test if:

1. The Forest Project corresponds to a scenario in Appendix B, Table B.1, indicating that it is "eligible" (as determined by the guidance in Appendix B); or
2. The Forest Project occurs on a type of land that has not historically been involved in or allowed timber harvesting. (Examples of such land include municipal or state parks.)

3.3.2.2 Improved Forest Management Projects

An Improved Forest Management Project automatically satisfies the performance test. Project activities are considered additional to the extent they produce GHG reductions and/or removals in excess of those that would have occurred under a Business As Usual scenario, as defined by the baseline estimation requirements in Section 6.2.1.

3.3.2.3 Avoided Conversion Projects

An Avoided Conversion Project satisfies the performance test if the Project Operator provides a real estate appraisal for the Project Area (as defined in Section 4) indicating the following:

1. *The Project Area is suitable for conversion*. The appraisal must clearly identify the highest value alternative land use for the Project Area and indicate how the physical characteristics of the Project Area are suitable for the alternative land use.
2. The appraisal must conform with the following minimum standards[7]:
    a. Appraisal reports shall be prepared and signed by a Licensed or Certified Real Estate Appraiser in good standing.
    b. Appraisal reports shall include descriptive photographs and maps of sufficient quality and detail to depict the subject property and any market data relied upon, including the relationship between the location of the subject property and the market data.
    c. Appraisal reports shall include a complete description of the subject property land, site characteristics and improvements. Valuations based on a property's development potential shall include:
        i. Verifiable data on the development potential of the land (e.g., Certificates of Compliance, Tentative Map, Final Map).
        ii. A description of what would be required for a development project to proceed (e.g., legal entitlements, infrastructure).
        iii. Presentation of evidence that sufficient demand exists, or is likely to exist in the future, to provide market support for the development.
        iv. Where conversion to commercial, residential, or agricultural land uses is identified as the highest value alternative land use, the appraisal must demonstrate that the slope of Project Area land is compatible with the alternative land use by identifying two areas with similar average slope conditions to the Project Area that have been converted within the past ten years in the project's Assessment Area. Alternatively, the Project Area must have an average slope less than 40 percent.
        v. Where conversion to agricultural land use is anticipated, the appraisal must provide:
            1) Evidence of soil suitability for the type of expected agricultural land use.
            2) Evidence of water availability for the type of expected agricultural land use.
            3) Where conversion to mining land use is anticipated, the appraisal must provide evidence of the extent and amount of mineral resources existing in the Project Area.
        vi. Where conversion to residential, commercial, or recreational land uses is anticipated, the appraisal must also describe the following information:
            1) The proximity of the Project Area to metropolitan areas
            2) The proximity of the Project Area to grocery and fuel services and accessibility of those services
            3) Population growth within 180 miles of the Project Area
    d. Appraisal reports shall include a statement by the appraiser indicating to what extent land title conditions were investigated and considered in the analysis and value conclusion.

[7] Adapted from Sections 5096.501 and 5096.517, Public Resources Code, State of California.

e. Appraisal reports shall include a discussion of implied dedication, prescriptive rights or other unrecorded rights that may affect value, indicating the extent of investigation, knowledge, or observation of conditions that might indicate evidence of public use.
f. Appraisal reports shall include a separate valuation for ongoing forest management prepared and signed by a certified or registered professional qualified in the field of specialty interest. This valuation shall be reviewed and approved by a second qualified, certified or registered professional, considered by the appraiser, and appended to the appraisal report. The valuation must identify and incorporate all legal constraints that could affect the valuation of both the ongoing forest management.
g. The appraisal must provide a map that displays specific portions of the Project Area that are suitable for the identified alternative land use. (For example, an appraisal that identified a golf course as an alternative land use must specify the approximate acres suitable for fairways, greens, clubhouses, and outbuildings.). The smaller of the two areas identified in the appraisals must be used.

3. *The alternative land use for the Project Area has a higher market value than maintaining the Project Area for sustainable forest management.* The appraisal for the property must provide a value for the current forest land use condition of the Project Area and a fair market value of the anticipated alternative land use for the Project Area. The anticipated alternative land use for the Project Area must be at least 40 percent greater than the value of the current forested land use.

The appraisals must be conducted in accordance with the Uniform Standards of Professional Appraisal Practice[8] and the appraiser must meet the qualification standards outlined in the Internal Revenue Code, Section 170 (f)(11)(E)(ii).[9]

3.4 Project Crediting Period

The baseline for any Forest Project registered with the Reserve under this version of the Forest Project Protocol is assumed to be valid for 100 years. This means that a registered Forest Project will be eligible to receive CRTs for GHG reductions and/or removals quantified using this protocol, and verified by Reserve-approved verification bodies, for a period of 100 years following the project's start date.

3.5 Permanence

Project Operators must monitor and verify a Forest Project for a period of 100 years following the issuance of any CRT for GHG reductions or removals achieved by the project. For example, if CRTs are issued to a Forest Project in year 99 following its start date, monitoring and verification activities must be maintained until year 199. All Forest Projects must undergo an initial site visit verification to register with the Reserve. After the initial verification, all Forest Projects must undergo a site visit verification at least once every six years. The only exception

[8] The Uniform Standards of Professional Appraisal Practice may be accessed at: http://commerce.appraisalfoundation.org/html/2006%20USPAP/toc.htm

[9] Section 170 (f)(11)(E) of the Internal Revenue Code defines a qualified appraiser as
"an individual who:
(I) has earned an appraisal designation from a recognized professional appraiser organization or has otherwise met minimum education and experience requirements set forth in regulations prescribed by the Secretary,
(II) regularly performs appraisals for which the individual receives compensation, and
(III) meets such other requirements as may be prescribed by the Secretary in regulations or other guidance."

to this rule is for Reforestation Projects, which may defer a second site visit verification beyond six years, at the Project Operator's discretion. The third and subsequent site visit verifications for Reforestation Projects must continue on a six-year cycle.

There are three possible exceptions to this minimum time commitment:

1. A Forest Project automatically terminates if a Significant Disturbance occurs,[10] leading to an Unavoidable Reversal that reduces the project's standing live tree carbon stocks below the project's baseline standing live tree carbon stocks. Once a Forest Project terminates in this manner, the Project Operator has no further obligations to the Reserve.
2. A Forest Project may be voluntarily terminated prior to the end of its minimum time commitment if the Project Operator retires a quantity of CRTs, as specified under Retiring CRTs Following Project Termination, below.
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 Project Operator to retire a quantity of CRTs, as specified under 'Retiring CRTs Following Project Termination' below.

Retiring CRTs Following Project Termination

1. For a Reforestation or Avoided Conversion Project, the Project Operator must retire a quantity of CRTs from its Reserve account equal to the total number of CRTs issued to the project over the preceding 100 years.
2. For an Improved Forest Management Project, the Project Operator must retire a quantity of CRTs from its Reserve account equal to the total number of CRTs issued to the project over the preceding 100 years, multiplied by the appropriate compensation rate indicated in Table 3.1.
3. For any project seeking to terminate project activities on only a portion of the project area, the change must be treated as a potential Avoidable Reversal. If it is determined that the revision to the project area would lead to an Avoidable Reversal, then credits must be retired as described in Section 7.3.2. Improved Forest Management projects must also apply the early termination compensation rate in Table 3.1 below. If the revision to the project area would lower standing live carbon stocks below baseline levels, then this will be considered a complete project termination.
4. In addition:
    a. The retired CRTs must be those that were issued to the Forest Project, or that were issued to other Forest Projects registered with the Reserve.
    b. The retired CRTs must be designated in the Reserve's software system as compensating for an Avoidable Reversal.

[10] The natural disturbance shall not be the result of intentional or grossly negligent acts of any of the Forest Owners.

Table 3.1. Compensation Rate for Terminated Improved Forest Management Projects

Number of Years that have Elapsed Between the Start Date and the Date of Termination	Compensation Rate
0-5	1.40
6-10	1.20
11-20	1.15
21-30	1.10
31-50	1.05
>50	1.00

3.6 Project Implementation Agreement

For a Forest Project to be eligible for registration with the Reserve, the Project Operator is required to enter into a Project Implementation Agreement (PIA) with the Reserve. The PIA is an agreement between the Reserve and a Project Operator setting forth: (i) the Project Operator's obligation (and the obligation of its successors and assigns) to comply with the Forest Project Protocol, and (ii) the rights and remedies of the Reserve in the event of any failure of the Project Operator to comply with its obligations. The PIA must be signed by the Project Operator before a project can be registered with the Reserve. It must be signed by all entities that are fee simple owners of the Project Area property. The PIA is recorded and submitted after the Reserve has reviewed the verification documents and is about to register the project.

3.7 Use of Qualified Conservation Easements or Qualified Deed Restrictions

A Qualified Conservation Easement is a conservation easement that explicitly (1) refers to, and incorporates by reference, the terms and conditions of the PIA agreed to by the Project Operator, thereby binding both the grantor and grantee – as well as their subsequent assignees – to the terms of the PIA for the full duration of the Forest Project's minimum time commitment, as defined in Section 3.5 of this protocol; (2) makes all future encumbrances and deeds subject to the PIA; and (3) makes the Reserve a third party beneficiary of the conservation easement.

A Qualified Deed Restriction is a deed restriction that ensures that the Project Implementation Agreement runs with the land and explicitly (1) refers to, and incorporates by reference, the terms and conditions of the PIA agreed to by the Project Operator, thereby Project Operator— as well as their subsequent assignees to the terms of the PIA for the full duration of the Forest Project's minimum time commitment, as defined in Section 3.5 of this protocol; (2) makes all future encumbrances and deeds subject to the PIA; and (3) makes the Reserve a third party beneficiary of the deed restriction. A deed restriction is not "qualified" if it merely consists of a recording of the Project Implementation Agreement or a notice of the Project Implementation Agreement, as such a recording is already required by the Project Implementation Agreement. The Reserve maintains the discretion to determine whether a deed restriction meets the terms to be considered a Qualified Deed Restriction.

Qualified Conservation Easements or Qualified Deed Restrictions may be voluntarily employed with any project type. Projects that choose to employ Qualified Conservation Easements or Qualified Deed Restrictions have reduced obligations to the Reserve's CRT Buffer Pool, as described in Section 7 and Appendix A.

Qualified Conservation Easements and Qualified Deed Restrictions must be recorded no earlier than one year before a project's start date. If a Qualified Conservation Easement or Qualified Deed Restriction was recorded more than one year prior to the start date, the limits imposed by the easement or deed restriction on forest management activities must be considered as a legal mandate for the purpose of satisfying the legal requirement test for additionality (Section 3.3.1) and in determining the project's baseline (Section 6).

3.8 Regulatory Compliance

Each time the Forest Project is verified, the Project Operator must attest that the project is in material compliance with all applicable laws relevant to the project activity. For this protocol, instances of non-compliance are likely to be considered "material" if they directly pertain to the management of project carbon stocks. Project Operators are required to disclose in writing to the verifier any and all instances of material non-compliance of the project with any law. If a verifier finds that a project is in a state of material non-compliance, then CRTs will not be issued for GHG reductions that occurred during the period of non-compliance. Non-compliance solely due to administrative or reporting issues, or due to "acts of nature," will not affect CRT crediting.

3.9 Sustainable Harvesting and Natural Forest Management Practices

Forest Projects can create long-term climate benefits as well as provide other environmental benefits, including the sustaining of natural ecosystem processes. To be in conformance with this protocol, Forest Projects must:

1. Employ sustainable long-term harvesting practices, both within their Project Area and on other forest landholdings controlled by the Project Operator and its Affiliate(s) within the project's Assessment Area(s), as described in Section 3.9.1. Forest landholdings are considered "controlled" by the Project Operator if the Project Operator owns the land in fee, or has been deeded timber rights on it.
2. Employ Natural Forest Management practices within the Project Area, including meeting species composition, forest structure, and age and habitat distribution requirements, as described in Section 3.9.2.
3. Maintain or increase standing live carbon stocks over the project life, as described in Section 3.9.3.

3.9.1 Sustainable Harvesting Practices

At the time commercial harvesting is initiated on any of the forest landholdings controlled by the Project Operator and its Affiliate(s) within the project's Assessment Area(s), the Project Operator and its Affiliate(s) must employ and demonstrate sustainable long-term harvesting practices on all of its forest landholdings within the project's Supersection(s), including the Project Area, using one of the following options:

1. Certification under the Forest Stewardship Council, Sustainable Forestry Initiative, or Tree Farm System certification programs. Regardless of the program, the terms of certification must require adherence to and verification of harvest levels which can be permanently sustained over time.

2. Adherence to a renewable long-term (50 years minimum) management plan that demonstrates harvest levels which can be permanently sustained over time and that is sanctioned and monitored by a state or federal agency (for federal lands only).
3. The use of silvicultural practices (if harvesting occurs) that maintain canopy cover averaging at least 40 percent, as measured on any 20 acres of the Project Operator's and its Affiliate(s') landholdings within the project's Supersections(s), including the Project Area.[11] Exceptions may be granted by the Reserve where it can be demonstrated that the harvest openings are intended to restore plantations to forest conditions with greater species diversity. The Project Operator is not responsible for harvest openings that preceded their ownership if the previous ownership had no direct business affiliation with the current ownership.
4. Adherence to a deeded conservation easement(s) with terms that ensure growth equals or exceeds harvest over time.

This requirement shall be met always during the project life and is assessed at each site visit verification. Failure to meet this requirement will result in all Reserve account activity being suspended until it is met.

Project Operators and their Affiliate(s) who acquire new forest landholdings within the project's Assessment Area(s) have up to five years to incorporate such acquisitions under their certification or management plan, or otherwise must abide immediately by the terms of the Sustainable Harvesting Practices, whether or not such land is contiguous with the Project Area.

3.9.2 Natural Forest Management

All Forest Projects must promote and maintain a diversity of native species and utilize management practices that promote and maintain native forests comprised of multiple ages and mixed native species within the Project Area and at multiple landscape scales ("Natural Forest Management").

The following key requirements shall apply to all Forest Projects regardless of the silvicultural or regeneration methods that are used to manage or maintain the forest:

1. Forest Projects must show verified progress (verified at scheduled site visit verifications) towards native tree species composition and distribution requirements described below, consistent with the forest type and forest soils native to the Assessment Area.
2. Forest Projects must manage the distribution of habitat/age classes and structural elements, as described below, to support functional habitat for locally native plant and wildlife species naturally occurring in the Project Area.

Forest Projects must incorporate the criteria for Natural Forest Management throughout the project life. The information provided in Table 3.3 shall be used to determine if the Forest Project meets the criteria for engaging in Natural Forest Management. This evaluation must be completed and verified at a Forest Project's initial verification and at all subsequent verifications. Forest Project carbon stock inventories (requirements for which are found in the Quantification Guidance on the FPP webpage) should be used as the basis of these assessments where applicable. Forest Projects that do not initially meet Natural Forest Management criteria but can

[11] Areas impacted by Significant Disturbance may be excluded from this test.

demonstrate progress towards meeting these criteria at the times identified in Table 3.3 are compliant with the protocol.

1. Species Composition

All Forest Projects are required to establish and/or maintain forest types that are native to the Project Area. For the purposes of this protocol, native forests are defined as those forests occurring naturally in an area, as neither a direct nor indirect consequence of human activity post-dating European settlement.

For the purposes of the FPP, the definition of native forests for each Assessment Area is based on reference metrics provided in an Assessment Area Data File, a companion document to the FPP available on the Reserve's website. The planting of native species outside of their current distribution is allowed up to 5% of the overall native species requirement as an adaptation strategy due to climate change. Plantings that will result in more than 5% of native species from beyond their current distribution must be done in accordance with a state or federally approved adaptation plan, or a local plan that has gone through a transparent public review process. In all cases, the Project Operator must obtain a written statement from the government agency in charge of forestry regulation in the state where the project is located stipulating that the planting of native trees outside their current range is appropriate as an adaptation to climate change. The specifications for meeting the requirements for species composition are included in Table 3.3.

2. Forest Structure

A variety of silvicultural practices may be employed in the Project Area during the course of a Forest Project, though the protocol does not endorse any particular practice. Any practices employed, however, must meet a minimum set of standards to ensure environmental integrity associated with a balanced distribution of age and habitat classes across the landscape, as well as certain structural elements within the forest.

Harvesting may be conducted within forest projects using a variety of silviculture methods. However, to ensure harvest practices maintain habitat refugia, even-aged rotations are limited to the following guidelines in Table 3.2.

Table 3.2. Even-Aged Management Retention Guidelines

Harvest Retention (Square Feet Basal Area/Acre of All Species)	**Maximum Size of Harvest Block** (Acres)
0	40
>= 15 < 20	60
>=20 < 25	80
>=25 < 30	120
>= 30 < 40	400
>= 40 < 50	600
>=50	Unlimited

Where any harvest occurs in harvest blocks where the harvest retention is less than 50 square feet of basal area per acre, additional harvesting may only occur within 300 feet of the harvest area (with less than 50 square feet basal area per acre) if the harvest retention of the additional harvest exceeds 50 square feet of basal area per acre. This requirement shall remain in place until the regeneration within the original harvested area (i.e., with retention less than 50 square feet basal area per acre) achieves a height of five feet or is five years old.

On a watershed scale up to 10,000 acres, all projects must maintain, or make progress toward maintaining, no more than 40 percent of their forested acres in ages less than 20 years. Areas impacted by a Significant Disturbance are exempt from this test until 20 years after reforestation of such areas.

The protocol does not override a landowner's obligation to abide by applicable laws and regulations, including any governing forest practice rules that may be more stringent. Regardless of the silvicultural practice employed, landowners must fulfill their commitment under the protocol to permanently maintain or increase onsite standing live carbon stocks (i.e., the carbon in live trees within the Project Area) as specified in Section 3.9.3.

Structural elements such as standing dead trees and lying dead wood are features typically found in natural forests. They provide a variety of benefits, including wildlife habitat. Management of Forest Projects must ensure that standing dead trees and lying dead wood are present on the Project Area at certain minimum levels in accordance with the requirements outlined in Table 3.3.

Table 3.3. Evaluation Criteria to Test if a Forest Project Meets the Requirement for the Establishment and Maintenance of Native Species and Natural Forest Management

Criteria	Assessment	Application Rules
Native Species		
Project consists of at least 95% native species, or demonstrates continuous progress over 50 years toward 95% native species, based on the sum of carbon in the standing live pool. The assessment shall be conducted using estimates of stems per acre for Reforestation Projects for the first 12 years of a reforestation project and basal area per acre for Improved Forest Management, Avoided Conversion Projects, and Reforestation Projects over 12 years.	Assessed at initial verification from inventory data. Assessment during site visit verifications must demonstrate continuous compliance with goal (if already met) or continuous progress toward the goal (if not yet met).	Applies to all project types throughout the project life. If criterion is not met within 50 years, all the Forest Project's Reserve account activity will be suspended until the criterion is met.

Composition of Native Species		
Improved Forest Management, Avoided Conversion Projects, and Reforestation Projects older than 12 years. No single species' prevalence, measured as the percent of the basal area of all live trees in the Project Area, exceeds the percentage value shown under the heading 'Composition of Native Species' in the Assessment Area Data File maintained on the Reserve's website. **Early Reforestation (Less than 12 years)** To the extent seed is available, and/or physical site characteristics permit, Reforestation Projects must achieve a mixture of native species no single species' prevalence, measured as the percent of all live tree stems in the Project Area, exceeds the percentage value shown under the heading 'Composition of Native Species' in the Assessment Area table in the Assessment Area Data File maintained on the Reserve's website. **All Projects** Where the Project Area naturally consists of a single species dominance, the Project Operator may obtain a letter from the State Forester or his/her representative stating that the Project Area's species diversity is reflective of background natural species diversity (despite any inconsistencies with the Assessment Area Data File). Projects must show continuous progress toward criteria. These criteria must be met within 50 years, except in cases where a variance has been granted at the initial verification, a Significant Disturbance has impacted species diversity, or natural mortality takes a project out of compliance	Species composition is assessed at initial verification from inventory data. Species composition is also assessed during the project at each site visit verification.	Applies to all project types throughout the project life. All the project's Reserve account activity will be suspended until the criterion is met (excluding the aforementioned exceptions).
Distribution of Age Classes		
On a watershed scale up to 10,000 acres (or the Project Area, whichever is smaller), all projects must maintain, or make progress toward maintaining, no more than 40 percent of their forested acres in ages less than 20 years. (Areas impacted by Significant Disturbance may be excluded from this test.) Applies to all project types at first commercial harvest. Project must show continuous progress toward criterion. This criterion must be met within 25 years	Age classes are assessed during project life at each site visit verification.	All Reserve account activity will be suspended until the criterion is met.
Structural Elements (Standing and Lying Dead Wood)		
Project Operators must ensure that dead wood is recruited and maintained in sufficient quantities, as described below. **Option I**. Monitoring dead wood throughout Project Area. Project Operators may maintain inventories of lying dead wood as part of their normal inventory processes. Where inventory measurements are used to demonstrate	Assessed during project at each site visit verification.	Applies to all project types throughout the project life. All Reserve account activity will be suspended until the areas verified since the previous site-verification meet the requirement.

compliance with this requirement, monumented plots or line transects must be used so the plot data can be verified. Dead wood measurements must achieve a minimum statistical confidence of +/- 30% at 1 Standard Error. The combination of standing dead and lying dead wood shall be retained at average per acre values at quantity levels identified in the Assessment Area data file. If dead material does not exist at the quantities identified in the Assessment Area data file, dead trees shall be recruited as described below for Option II. **Option II**: Monitoring dead wood on harvested areas. The assessment of sufficient lying and standing dead material shall be made in areas harvested since the last site verification. **For portions of the Project Area that have been harvested under normal circumstances (not salvage harvested):** The combination of standing dead and lying dead wood shall be retained at average per acre values at quantity levels identified in the Assessment Area data file within each harvested unit. If dead material does not exist at the required levels within the harvest units, live trees shall be retained and tagged with aluminum tags at three times the amount identified in the Assessment Area data file minus whatever quantity does exist within each harvest unit. **For portions of the Project Area that have been salvage harvested:** The combination of standing dead and lying dead wood shall be retained at a combined four tonnes per acre on average within each harvest unit. Verification that the requirement has been met shall be conducted using the methodology for verification of dead material transects found on the Quantification Guidance on the FPP webpage. **Option III:** No harvesting Projects without any harvesting activities within the project area do not need to monitor specifically for structural elements.		

3.9.3 Promotion of the Onsite Standing Live Carbon Stocks

To promote and maintain the environmental benefits of Forest Projects, the Reserve requires that the standing live carbon stocks within the Project Area be maintained and/or increased during the project life. Therefore, except as specified below, the Reserve will not issue CRTs for quantified GHG reductions and removals achieved by a Forest Project if the Forest Project's monitoring reports – over any ten-year consecutive period – indicate a decrease in the standing live carbon stocks.

Exceptions to this policy are allowed where reductions in standing live carbon stocks are important for maintaining and enhancing forest health, environmental co-benefits, or the long-term security of all carbon stocks; where reductions are due to non-harvest disturbances; or where reductions are required by law. Note that these exceptions in no way change or affect the Reserve's policies and requirements related to compensating for reversals, as detailed in Section 7.3.

Forest Project standing live carbon stocks that have decreased over a ten-year period may continue to receive CRTs issued by the Reserve for verified GHG reductions and removals if, and only if, the decrease in standing live carbon stocks is due to one of the following causes:

1. The decrease is demonstrably necessary to substantially improve the Project Area's resistance to wildfire, insect, or disease risks. The Project Operator must document the risks and the actions that will be taken to reduce the risks. The techniques used to improve resistance must be supported by relevant published peer reviewed research.
2. The decrease is associated with a planned balancing of age classes (regeneration, sub-merchantable, and merchantable) and is detailed in a long term environmentally responsible management plan. The Project Operator must demonstrate, using documentation submitted to the Reserve at the time of the Forest Project's registration, that the balancing of age classes, resulting in a decrease in the standing live carbon stocks, was planned at the initiation of the Forest Project (Figure 3.1).

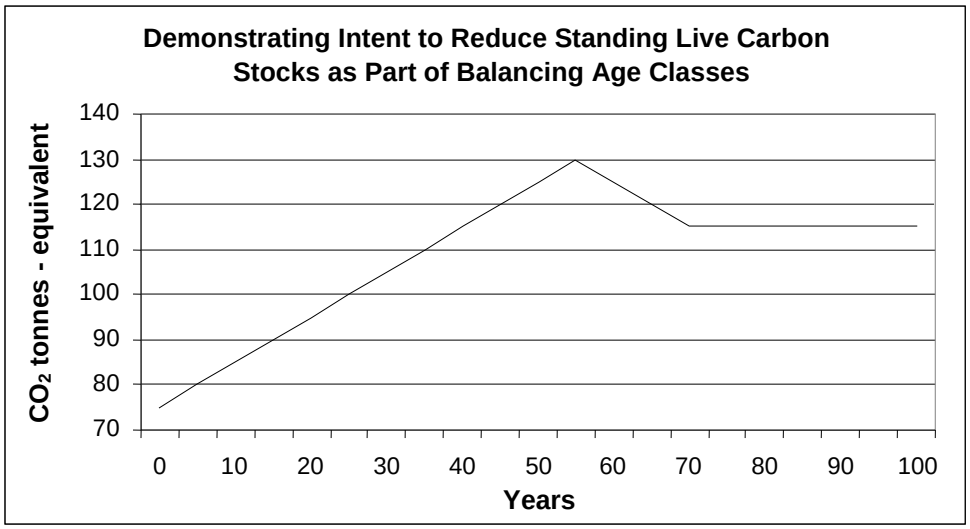


Figure 3.1. Example of Reducing Standing Live Carbon Stocks as Part of Balancing Age Classes

3. The decrease is part of normal silviculture cycles for forest ownerships less than 1,000 acres. Inventory fluctuations are a normal part of silvicultural activities. Periodic harvest may remove more biomass than the biomass growth over the past several years. At no time shall the Forest Project's inventory of carbon in the standing live carbon stocks fall below the Forest Project's baseline carbon stock estimates for the standing live carbon stocks, or 20 percent less than the Forest Project's standing live carbon stocks at the project's initiation, whichever is higher. Documentation submitted to the Reserve at the time the Forest Project is registered must indicate that fluctuations in the Forest Project's standing live carbon stocks are an anticipated silvicultural activity and that the overall

trend will be for standing live carbon stocks to increase or stay the same over the life of the project (Figure 3.2).

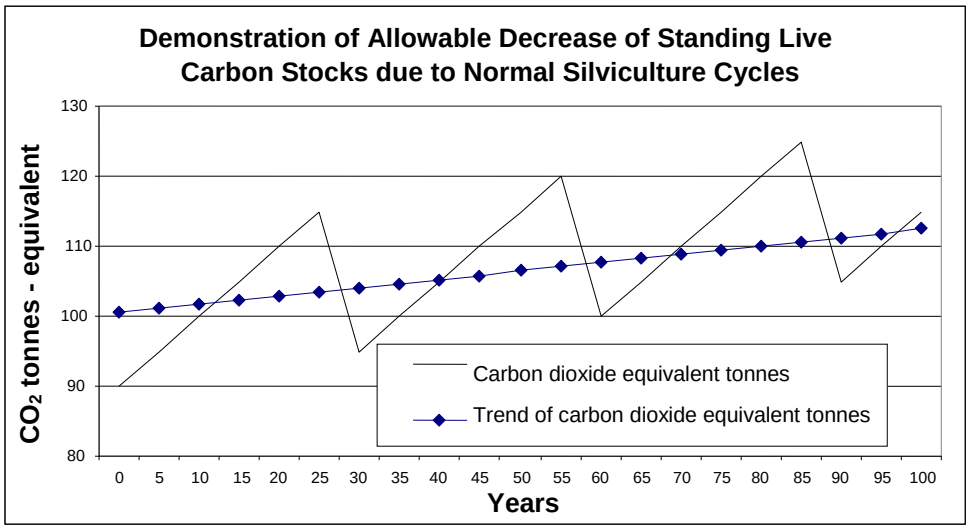


Figure 3.2. Example of Allowable Decrease of Standing Live Carbon Stocks due to Normal Silviculture Cycles

4. The decrease is part of a non-harvest disturbance, including wildfire, disease, flooding, wind-throw, insect infestation, landslides, or as otherwise approved by the Reserve.

4 Identifying the Project Area

The geographic boundaries defining the Project Area must be described in detail at the time a Forest Project is listed on the Reserve. The boundaries must be defined using a map, or maps that displays public and major private roads, major watercourses (fourth order or greater), topography, towns, and Public Land Survey Townships, Ranges, and Sections or latitude and longitude. The maps must be of adequate resolution to clearly identify the required features.

Once a project's Supersection(s) has been identified, Assessment Area(s) must be determined. A project may do this by comparing dominant species present in the project inventory to the list of native species provided in the Assessment Area Data File. Projects may also utilize Landfire Existing Vegetation Types (EVT) to determine the most appropriate Assessment Areas for the project. EVT descriptions must be used to identify the species descriptions that most closely match the native species provided in the Assessment Area Data File. The Reserve also reserves the right to provide a spatially explicit map of Assessment Areas to be used for identification purposes. The Project Area may also extend across multiple Assessment Areas within a Supersection (see Guidance for Determining Common Practice on the Assessment Area Data webpage), and across no more than two adjacent Supersections.

A Geographical Information System (GIS) file depicting the Project Area must be submitted to the Reserve with the project. The file must be submitted in the KML file format. The Project Area can be contiguous or separated into tracts or distinct polygons. Additionally, the current assessor's parcel identification numbers associated with the project area must be submitted to the Reserve.

For Improved Forest Management Projects, the geographic boundaries may be defined such that non-forested areas, or areas not under forest management, are excluded from the Project Area.

For Reforestation Projects, the Project Area must be on land that has had less than ten percent tree canopy cover for a minimum of ten years, or that have been subject to a Significant Disturbance that resulted in at least 20 percent of the carbon stocks being emitted. Reforestation Projects may submit a provisional project boundary that must be amended to the actual areas reforested within the provisional project boundary by the second site visit verification.

For Avoided Conversion Projects, the Project Area is defined through the required appraisal process. The Project Area must be determined following the guidance in Table 4.1 based on the type of anticipated conversion.

Table 4.1. Project Area Definition for Avoided Conversion Projects

Conversion Type	Project Area Definition
Residential	The boundary of the parcel or parcels that have been appraised as having a 'higher and better use' in residential development.
Agricultural Conversion	The boundary of the parcel or parcels that have been appraised as having a 'higher and better use' in agricultural production.
Golf Course	The boundary of the parcel or parcels that have been appraised as having a 'higher and better use' as a golf course. This is to include forested areas within 200 feet of fairways, greens, and buildings.
Commercial Buildings	The boundary of the parcel or parcels that have been appraised as having a 'higher and better use' in commercial buildings. This is to include forested areas with 200 feet of suitable building sites.

Once the Project Area is defined, the Supersection(s) and Assessment Area(s) comprising the project must be identified. Whereas the physical location of the project determines the relevant Supersection(s), the species composition of the Project Area determines which Assessment Area(s) comprises the project. A project's Supersection(s) is identified by comparing the spatial data delineating the Project Area with spatial data representing the Supersections established by the Reserve (available on the Assessment Area Data webpage). Assessment Area(s) are determined by comparing dominant species present in the project inventory to the list of native species provided in the Assessment Area Data File. Projects may also utilize Landfire Existing Vegetation Types (EVT) to determine the most appropriate Assessment Areas for the project. EVT descriptions must be used to identify the species descriptions that most closely match the native species provided in the Assessment Area Data File. The Reserve also reserves the right to provide a spatially explicit map of Assessment Areas to be used for identification purposes.

The Project Area may extend across multiple Assessment Areas within a Supersection (see Guidance for Determining Common Practice on the Assessment Area Data webpage), but may be distributed across no more than two adjacent Supersections.

4.1 Project Configuration and Limitations

To ensure Project Areas are representative of the Forest Owner's general forest management, Improved Forest Management projects must include all forested areas within an area no smaller than an area defined by 3rd order watersheds or the entire area owned by the Forest Owner, whichever is smaller. Exceptions may be provided if approved by the Reserve. Non-forested areas (brush, rocks, range, etc.) may be excluded from all project types. Forest Projects can consist of disparate polygons (areas).

4.2 Project Area Acreage

Project acreage shall be based on area calculations derived from GIS analysis, such as ArcGIS or Google Earth. GIS data are generally considered to be improvements over strict adherence to county parcel acreages as they are based on correcting property boundaries to geographic characteristics and/or property corners as described in property deeds or official survey notes. A KML (Google Earth) file depicting the Project Area shall be included with the PDD.

The project must list the county assessor's parcels (APs), the portion of each AP included in the project (as a percentage), the sum of acres derived from the county tax records for all included APs, and the sum of acres derived from the GIS analysis. The sum of acres should be compared between the AP and GIS sources, with the lesser of the two used for the project area.

If there is a significant discrepancy between AP and GIS acres, the Project Operator may work with the county assessor to resolve any disputed AP acres.

4.3 Modifying the Project Area

It is possible for project activities to be terminated on a portion of the Project Area. These adjustments must be treated as Avoidable Reversals, as described in Section 3.5. If a project proceeds with terminating the project on a portion of the Project Area, a new KML file must be provided to reflect the new Project Area. An addendum to the Project Design Document (PDD) must also be submitted to reflect this change, and the new legal description of the project will be recorded with the next PIA or PIA Amendment after the change has been verified. The inventory for the modified Project Area will be assessed during the next regularly scheduled site visit verification, unless it is determined that an Avoidable Reversal has taken place, in which case, the guidance in Section 7.3.2 must be followed.

5 GHG Assessment Boundary

The GHG Assessment Boundary defines all the GHG sources, sinks, and reservoirs that must be accounted for in quantifying a Forest Project's GHG reductions and removals (Section 6). 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 CO_2 emissions, and mobile combustion GHG emissions. 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 GHG removals) or its "Secondary Effects" (i.e., unintended changes in carbon stocks, GHG emissions, or GHG removals caused by the Forest Project).[12] Secondary Effects may include increases in mobile combustion CO_2 emissions associated with site preparation, as well as increased CO_2 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 following the methods described in Section 6.

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

5.1 Reforestation Projects

Table 5.1. GHG Assessment Boundary – Reforestation Projects
All optional pools included in Forest Project must independently meet minimum confidence requirements for inclusion.

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
Primary Effect Sources, Sinks, and Reservoirs						
RF-1	Standing live carbon (carbon in all portions of living trees)	Reservoir / Pool	CO_2	*Included*	**Baseline:** Modeled based on initial field inventory measurements **Project:** Measured by field measurements and updating forest carbon inventory	Increases in standing live carbon stocks are likely to be the largest Primary Effect of Reforestation Projects. For baseline estimation purposes, pre-existing trees must be distinguished from planted trees. Since pre-existing and new trees are easy to distinguish for several decades after tree planting, pre-existing trees do not need to be inventoried until the Project Operator first seeks verification of GHG reductions and removals (subsequent to the project's initial site visit verification and registration).

[12] 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.

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
RF-2	Shrubs and herbaceous understory carbon	Reservoir / Pool	CO_2	*Included for site preparation activities*	**Baseline:** Measured and assumed to be static with start date inventory estimates **Project:** Estimated decrease at project initiation with site preparation and assumed static thereafter	Shrubs and herbaceous understory may constitute a significant portion of carbon affected by Reforestation Projects as part of site preparation.
RF-3	Standing dead carbon (carbon in all portions of dead, standing trees)	Reservoir / Pool	CO_2	*Included for project activities*	**Baseline:** N/A **Project:** Measured by updating forest carbon inventory. Does not include pre-existing dead and dying trees at project commencement.	Reforestation Projects are often implemented following disturbance events. Dead trees may continue to fall, become lying dead wood, and contribute to a reversal, even though the primary effect of planting trees continues to increase over time. The protocol requires recruitment and retention of dead material, including standing dead wood as a structural element, so further quantification is not required for standing dead carbon present at project commencement. Minimum volume thresholds are stated to meet Natural Forest Management criteria. (See Section 3.9.2). However, projects must measure planted trees that become standing dead trees, as this is part of the project's primary effect. Projects should define the project year in which standing dead carbon will begin to be measured in the Project Design Document.
RF-4	Lying dead wood carbon	Reservoir / Pool	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Lying dead wood may constitute a significant amount of carbon affected by Reforestation Projects as part of site preparation. However, it is assumed that a comparable quantity of lying dead wood will decompose over the course of the 100-year modeled baseline. Since no significant change is expected between the baseline and project scenarios, lying dead wood will be accounted for through the Natural Forest Management criteria. For Natural Forest Management criteria, the protocol requires recruitment and retention of dead material, including lying dead wood as a structural element. Minimum volume thresholds are stated to meet Natural Forest Management criteria. (See Section 3.9.2).
RF-5	Litter and duff carbon (carbon	Reservoir / Pool	CO_2	*Excluded*	**Baseline:** N/A	Carbon from litter and duff may be affected by Reforestation Projects

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
	in dead plant material)				**Project:** N/A	as part of site preparation, but the emission source is assumed to be *de minimis.*
RF-6	Soil carbon	Reservoir / Pool	CO_2	*Included*	**Baseline:** Assumed to be static with start date inventory estimates **Project:** Emissions from project activities estimated with standardized guidelines in the Soil Quantification Guidance on the FPP webpage	Soil carbon may constitute a significant portion of carbon affected by reforestation projects. All projects must use standardized guidance to account for potential soil carbon emissions associated with management activities.
RF-7	Carbon in in-use forest products	Source / Sink	CO_2	*Included*	**Baseline:** Estimated from modeled harvesting volumes **Project:** Estimated from measured harvesting volumes	Included because many Reforestation Projects will significantly increase carbon storage in in-use forest products relative to baseline levels. Treated as a "source/sink" because forest product carbon is quantified according to the change in harvesting volumes, relative to baseline levels, in each year. Of this change (increase or decrease), only the average amount of carbon expected to remain stored for 100 years is included in the final quantification of annual net GHG removals/emissions. This approach accounts for CO_2 emissions from decomposition or disposal of wood products (see SSR RF-17).
RF-8	Forest product carbon in landfills	Reservoir / Pool	CO_2	*Excluded when project harvesting exceeds baseline* *Included when project harvesting is below baseline*	**Baseline:** Estimated from modeled harvesting volumes **Project:** Estimated from measured harvesting volumes	Because of significant uncertainties associated with forecasting the quantity of forest product carbon that will remain stored in landfills, landfill carbon is excluded from quantification in years when project harvesting volumes exceed baseline volumes. Landfill carbon is included, however, in years when project harvesting volumes are below baseline levels. This case-dependent exclusion or inclusion is necessary to ensure that total GHG reductions and removals caused by the Forest Project are not overestimated.
Secondary Effect Sources, Sinks, and Reservoirs						
RF-9	Biological emissions from site preparation activities	Source	CO_2	*Included*	**Baseline:** N/A **Project:** Quantified based on measured carbon stock changes in included reservoirs as part of site preparation (see above)	Biological emissions from site preparation are not quantified separately, but rather are captured by measuring changes in included carbon reservoirs (shrubs and herbaceous understory; soil carbon where applicable). Reforestation Projects are not eligible if harvesting of live trees

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
						(standing live carbon) has occurred within the Project Area within the last 10 years.
RF-10	Mobile combustion emissions from site preparation activities	Source	CO_2	*Included*	**Baseline:** N/A **Project:** Estimated using default emission factors	Mobile combustion CO_2 emissions from Reforestation Project site preparation activities can be significant relative to total GHG reductions/removals. In general, this protocol assumes that combustion emissions in the U.S. will be controlled under a regulatory cap-and-trade program in the near future, and can therefore be ignored in the context of Forest Project GHG accounting. Since these emissions are not currently capped, however, and because site preparation is a one-time event rather than an ongoing source of emissions, mobile combustion emissions are included in the GHG Assessment Boundary for this version of the Forest Project Protocol.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in CH_4 emissions from mobile combustion associated with site preparation activities are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in N_2O emissions from mobile combustion associated with site preparation activities are not considered significant.
RF-11	Mobile combustion emissions from ongoing project operation and maintenance	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** 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. In addition, this protocol assumes that such emissions will be controlled under a regulatory cap-and-trade program in the near future, meaning that changes in activity due to the Forest Project will have no effect on total net emissions.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	CH_4 emissions from mobile combustion associated with ongoing project operation and maintenance activities are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	N_2O emissions from mobile combustion associated with ongoing project operation and maintenance activities are not considered significant.
RF-12	Stationary combustion emissions from	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Stationary combustion CO_2 emissions from ongoing project operation and maintenance could

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
	ongoing project operation and maintenance					include GHG emissions associated with electricity consumption or heating/cooling at Project Operator 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. In addition, this protocol assumes that such emissions will be controlled under a regulatory cap-and-trade program in the near future, meaning that changes in activity due to the Forest Project will have no effect on total net emissions.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	CH_4 emissions from stationary combustion associated with ongoing project operation and maintenance activities are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	N_2O emissions from stationary combustion associated with ongoing project operation and maintenance activities are not considered significant.
RF-13	Biological emissions from clearing of forestland outside the Project Area	Source	CO_2	*Included*	**Baseline:** N/A **Project:** Estimated using default land-use conversion factors for non-project land	Reforestation Projects on land currently used for grazing or growing crops may cause displacement of these activities to other lands, leading to a reduction in carbon stocks on those lands (e.g., due to clearing of trees and shrubs). The shift may be either a market or physical response to the project activity. Emission associated with shifting land uses are estimated using default "leakage" factors, as detailed in Figure 6.1.
RF-14	Biological emissions/ removals from changes in harvesting on forestland outside the Project Area	Source / Sink	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Reforestation Projects will tend to 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 other lands. Carbon stock increases on other lands are excluded from the GHG Assessment Boundary, however, because it is not possible to ensure their permanence. Reforestation Projects are not expected to cause an increase in harvesting on other lands (except where clearing is involved for other land uses, per SSR RF-13), so this potential effect is also excluded

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
						from the GHG Assessment Boundary.
RF-15	Combustion emissions from production, transportation, and disposal of forest products	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	This protocol assumes that combustion emissions will be controlled under a regulatory cap-and-trade program in the near future. Thus, for most of a Forest Project's duration, changes in activity due to the project will have no effect on total net emissions due to production, transportation, and disposal of forest products. These emissions are therefore excluded from the GHG Assessment Boundary.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Combustion-related CH_4 emissions related to changes in the production, transportation, and disposal of forest products are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Combustion-related N_2O emissions related to changes in the production, transportation, and disposal of forest products are not considered significant.
RF-16	Combustion emissions from production, transportation, and disposal of alternative materials to forest products	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in forest-product production may cause consumers of these products to increase or decrease their consumption of substitute materials (such as alternative building materials, including cement or steel). In many cases, alternative materials will have higher combustion GHG emissions associated with their production, transportation, and/or disposal than wood products. This protocol assumes, however, that combustion emissions will be controlled under a regulatory cap-and-trade program in the near future. Thus, for most of a Forest Project's duration, changes in activity due to the project will have no effect on total net emissions due to production, transportation, and disposal of alternative materials. These emissions are therefore excluded from the GHG Assessment Boundary.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Combustion-related CH_4 emissions related to changes in the production, transportation, and disposal of alternative materials are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Combustion-related N_2O emissions related to changes in the production, transportation, and disposal of alternative materials are not considered significant.

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
RF-17	Biological emissions from decomposition of forest products	Source	CO_2	*Included*	**Baseline:** Quantified as a component of calculating carbon stored for 100 years in wood products (SSR RF-7) and landfills (SSR RF-8) **Project:** Quantified as a component of calculating carbon stored for 100 years in wood products (SSR RF-7) and landfills (SSR RF-8)	CO_2 emissions from the decomposition of forest products are built into calculations of how much forest product carbon will remain in in-use wood products and in landfills, averaged over 100 years (see SSR RF-7 and Quantification Guidance on the FPP webpage).
			CH_4	*Excluded*	**Baseline:** N/A **Project:** 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. This protocol assumes that landfill CH_4 emissions will be largely controlled in the near future due to federal and/or state regulations. 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.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Decomposition of forest is not expected to be a significant source of N_2O emissions.

5.2 Improved Forest Management Projects

Table 5.2. GHG Assessment Boundary – Improved Forest Management Projects

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
Primary Effect Sources, Sinks, and Reservoirs						
IFM-1	Standing live carbon (carbon in all portions of living trees)	Reservoir / Pool	CO_2	*Included*	**Baseline:** Modeled based on initial field inventory measurements, regulatory environment, and financial feasibility **Project:** Measured by field measurements and updating forest carbon inventory	Increases in standing live carbon stocks are likely to be the largest Primary Effect of Improved Forest Management Projects.
IFM-2	Shrubs and herbaceous understory carbon	Reservoir / Pool	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Shrubs and herbaceous understory constitute a relatively small proportion of carbon stocks in an Improved Forest Management project.

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
IFM-3	Standing dead carbon (carbon in all portions of dead, standing trees)	Reservoir / Pool	CO_2	*Included*	**Baseline:** Assumed to be static based on initial field inventory measurements **Project:** Measured by updating forest carbon inventory	Improved Forest Management Projects may significantly increase standing dead carbon stocks over time. The protocol requires recruitment and retention of dead material, including standing dead wood as a structural element. Minimum volume thresholds are stated to meet Natural Forest Management criteria. (See Section 3.9.2).
IFM-4	Lying dead wood carbon	Reservoir / Pool	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Lying dead wood is highly variable and it is therefore difficult to achieve accurate estimates. It also constitutes a minor portion of forest carbon. With required retention for Natural Forest Management (see below), it is a conservative programmatic measure not to include it. For Natural Forest Management criteria, the protocol requires recruitment and retention of dead material, including lying dead wood as a structural element. Minimum volume thresholds are stated to meet Natural Forest Management criteria. (See Section 3.9.2).
IFM-5	Litter and duff carbon (carbon in dead plant material)	Reservoir / Pool	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in this reservoir are unlikely to have a significant effect on total quantified GHG reductions/removals. It is a conservative programmatic measure not to include it.
IFM-6	Soil carbon	Reservoir / Pool	CO_2	*Included for emissions estimates*	**Baseline:** Assumed to be static with start date inventory estimates **Project:** Emissions from project activities estimated with standardized guidelines in found in the Quantification Guidance on the FPP webpage.	Soil carbon is not anticipated to change significantly as a result of most Improved Forest Management activities. However, all projects must use standardized guidance to account for potential soil carbon emissions associated with management activities.
IFM-7	Carbon in in-use forest products	Reservoir / Pool	CO_2	*Included*	**Baseline:** Estimated from modeled harvesting volumes **Project:** Estimated from measured harvesting volumes	Included because many Improved Forest Management Projects may significantly change carbon storage in in-use forest products relative to baseline levels. Treated as a “source/sink” because forest product carbon is quantified according to the change in harvesting volumes, relative to baseline levels, in each year. Of this change (increase or decrease), only the

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
						average amount of carbon expected to remain stored for 100 years is included in the final quantification of annual net GHG removals/emissions. This approach accounts for CO_2 emissions from decomposition or disposal of wood products (see SSR IFM-17).
IFM-8	Forest product carbon in landfills	Reservoir / Pool	CO_2	*Excluded when project harvesting exceeds baseline* *Included when project harvesting is below baseline*	**Baseline:** Estimated from modeled harvesting volumes **Project:** Estimated from measured harvesting volumes	Because of significant uncertainties associated with forecasting the quantity of forest product carbon that will remain stored in landfills, landfill carbon is excluded from quantification in years when project harvesting volumes exceed baseline volumes. Landfill carbon is included, however, in years when project harvesting volumes are below baseline levels. This case-dependent exclusion or inclusion is necessary to ensure that total GHG reductions and removals caused by the Forest Project are not overestimated.
Secondary Effect Sources, Sinks, and Reservoirs						
IFM-9	Biological emissions from site preparation activities	Source	CO_2	*Included*	**Baseline:** N/A **Project:** Quantified based on measured carbon stock changes in included reservoirs (SSR IFM-6, where applicable)	Biological emissions from site preparation are not quantified separately, but rather are captured by measuring changes in included carbon reservoirs (soil carbon, where applicable). For other carbon reservoirs, changes are unlikely to have a significant effect on total quantified GHG reductions/removals.
IFM-10	Mobile combustion emissions from site preparation activities	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Mobile combustion CO_2 emissions from site preparation are not expected to be significantly different from baseline levels for Improved Forest Management Projects. In addition, this protocol assumes that combustion emissions in the U.S. will be controlled under a regulatory cap-and-trade program in the near future, meaning that changes in activity due to the Forest Project will have no effect on total net emissions.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in CH_4 emissions from mobile combustion associated with site preparation activities are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in N_2O emissions from mobile combustion associated

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
						with site preparation activities are not considered significant.
IFM-11	Mobile combustion emissions from ongoing project operation and maintenance	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** 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. In addition, this protocol assumes that such emissions will be controlled under a regulatory cap-and-trade program in the near future, meaning that changes in activity due to the Forest Project will have no effect on total net emissions.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in CH_4 emissions from mobile combustion associated with ongoing project operation and maintenance activities are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in N_2O emissions from mobile combustion associated with ongoing project operation and maintenance activities are not considered significant.
IFM-12	Stationary combustion emissions from ongoing project operation and maintenance	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Stationary combustion CO_2 emissions from ongoing project operation and maintenance could include GHG emissions associated with electricity consumption or heating/cooling at Project Operator 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. In addition, this protocol assumes that such emissions will be controlled under a regulatory cap-and-trade program in the near future, meaning that changes in activity due to the Forest Project will have no effect on total net emissions.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in CH_4 emissions from stationary combustion associated with ongoing project operation and maintenance activities are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in N_2O emissions from stationary combustion associated with ongoing project operation and maintenance activities are not considered significant.

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
IFM-13	Biological emissions from clearing of forestland outside the Project Area	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Improved Forest Management Projects are not expected to cause significant shifts in alternative land uses that might lead to clearing of forestland.
IFM-14	Biological emissions/ removals from changes in harvesting on forestland outside the Project Area	Source / Sink	CO_2	*Included / Excluded*	**Baseline:** N/A **Project:** Estimated "leakage" factor applied to the difference in harvested carbon relative to baseline based on the magnitude of that difference relative to baseline harvest amounts	Improved Forest Management Projects may either increase or decrease harvesting relative to baseline levels. If harvesting is reduced in the Project Area, harvesting on other lands may increase to compensate for the lost production. This "leakage" effect is included in the GHG Assessment Boundary. If harvesting is increased in the Project Area, harvesting on other lands may decrease in response to the increased production. The reduction in harvesting may lead to increased carbon stocks on other lands. Carbon stock increases on other lands are excluded from the GHG Assessment Boundary, however, because it is not possible to ensure their permanence.
IFM-15	Combustion emissions from production, transportation, and disposal of forest products	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	This protocol assumes that combustion emissions will be controlled under a regulatory cap-and-trade program in the near future. Thus, for most of a Forest Project's duration, changes in activity due to the project will have no effect on total net emissions due to production, transportation, and disposal of forest products. These emissions are therefore excluded from the GHG Assessment Boundary.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Combustion-related CH_4 emissions related to changes in the production, transportation, and disposal of forest products are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Combustion-related N_2O emissions related to changes in the production, transportation, and disposal of forest products are not considered significant.
IFM-16	Combustion emissions from production, transportation, and disposal of alternative materials to forest products	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in forest-product production may cause consumers of these products to increase or decrease their consumption of substitute materials (such as alternative building materials, including cement or steel). In many cases, alternative materials will have

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
						higher combustion GHG emissions associated with their production, transportation, and/or disposal than wood products. This protocol assumes, however, that combustion emissions will be controlled under a regulatory cap-and-trade program in the near future. Thus, for most of a Forest Project's duration, changes in activity due to the project will have no effect on total net emissions due to production, transportation, and disposal of alternative materials. These emissions are therefore excluded from the GHG Assessment Boundary.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Combustion-related CH_4 emissions related to changes in the production, transportation, and disposal of alternative materials are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Combustion-related N_2O emissions related to changes in the production, transportation, and disposal of alternative materials are not considered significant.
IFM-17	Biological emissions from decomposition of forest products	Source	CO_2	*Included*	**Baseline:** Quantified as a component of calculating carbon stored for 100 years in wood products (SSR IFM-7) and landfills (SSR IFM-8) **Project:** Quantified as a component of calculating carbon stored for 100 years in wood products (SSR IFM-7) and landfills (SSR IFM-8)	CO_2 emissions from the decomposition of forest products are built into calculations of how much forest product carbon will remain in in-use wood products and in landfills, averaged over 100 years (see SSR IFM-7 and Quantification Guidance on the FPP webpage).
			CH_4	*Excluded*	**Baseline:** N/A **Project:** 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. This protocol assumes that landfill CH_4 emissions will be largely controlled in the near future due to federal and/or state regulations. Thus, changes in forest-product production are assumed to have no significant effect on future CH_4 emissions

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
						from anaerobic decomposition of forest products in landfills. These emissions are therefore excluded from the GHG Assessment Boundary.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Decomposition of forest is not expected to be a significant source of N_2O emissions.

5.3 Avoided Conversion Projects

Table 5.3. GHG Assessment Boundary – Avoided Conversion Projects

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
Primary Effect Sources, Sinks, and Reservoirs						
AC-1	Standing live carbon (carbon in all portions of living trees)	Reservoir / Pool	CO_2	*Included*	**Baseline:** Modeled based on initial field inventory measurements and expected land-use conversion rates **Project:** Measured by field measurements and updating forest carbon inventory	Preservation and/or increases of standing live carbon stocks and/or soil carbon stocks relative to baseline levels are likely to be a large Primary Effect of Avoided Conversion Projects.
AC-2	Shrubs and herbaceous understory carbon	Reservoir / Pool	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in this reservoir/reservoir are unlikely to have a significant effect on total quantified GHG reductions/removals. Additionally, it is a conservative programmatic measure to exclude shrubs and herbaceous understory carbon.
AC-3	Standing dead carbon (carbon in all portions of dead, standing trees)	Reservoir / Pool	CO_2	*Included*	**Baseline:** Assumed to be static based on initial field inventory measurements **Project:** Measured by updating forest carbon inventory	Avoided Conversion Projects may significantly increase standing dead carbon stocks over time. The protocol requires recruitment and retention of dead material, including standing dead wood as a structural element. Minimum volume thresholds are stated to meet Natural Forest Management criteria. (See Section 3.9.2).
AC-4	Lying dead wood carbon	Reservoir / Pool	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Exclusion of lying dead wood is programmatically conservative for accounting of total quantified GHG reductions/removals, since project activities most likely will lead to increases in lying dead wood carbon. Lying dead wood is highly variable and is difficult to measure accurately, and therefore challenging to achieve confidence with estimates

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
						For Natural Forest Management criteria, the protocol requires recruitment and retention of dead material, including lying dead wood as a structural element. Minimum volume thresholds are stated to meet Natural Forest Management criteria. (See Section 3.9.2).
AC-5	Litter and duff carbon (carbon in dead plant material)	Reservoir / Pool	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Exclusion of litter and duff carbon is programmatically conservative for accounting of total quantified GHG reductions/removals, since project activities most likely will lead to increases in litter and duff carbon. Litter and duff is highly variable, difficult to measure accurately, and therefore challenging to achieve confidence with estimates.
AC-6	Soil carbon	Reservoir / Pool	CO_2	*Optional for reporting project benefits* *Included for reporting project emissions*	**Baseline:** When included, assumed to have emissions and emission rates according to soil order and baseline conversion activity **Project:** Emissions calculated using standardized guidance in the Soil Quantification Guidance on the FPP webpage. Project Operators may opt to quantify net removals or avoided emissions by updating forest soil carbon inventory	Soil carbon is likely a large primary effect of an Avoided Conversion Project. It is conservative to exclude the conversion effect on soil from the project accounting, which is why it is optional. All projects must use standardized guidance to account for potential soil carbon emissions associated with project management activities. If Project Operators choose to quantify net removals or avoided emissions from soil carbon, they may do so by undertaking and updating a soil carbon inventory.
AC-7	Carbon in in-use forest products	Reservoir / Pool	CO_2	*Included*	**Baseline:** Estimated from modeled harvesting volumes **Project:** Estimated from measured harvesting volumes	Included because many Avoided Conversion Projects may significantly change carbon storage in in-use forest products relative to baseline levels. Treated as a "source/sink" because forest product carbon is quantified according to the change in harvesting volumes, relative to baseline levels, in each year. Of this change (increase or decrease), only the average amount of carbon expected to remain stored for 100 years is included in the final quantification of annual net GHG removals/emissions. This approach accounts for CO_2 emissions from decomposition or disposal of wood products (see SSR AC-17).
AC-8	Forest product carbon in landfills	Reservoir / Pool	CO_2	*Excluded when project harvesting exceeds baseline*	**Baseline:** Estimated from modeled harvesting volumes	Because of significant uncertainties associated with forecasting the quantity of forest product carbon that will remain stored in landfills, landfill carbon is excluded from quantification in years when project harvesting volumes

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
				Included when project harvesting is below baseline	**Project:** Estimated from measured harvesting volumes	exceed baseline volumes. Landfill carbon is included, however, in years when project harvesting volumes are below baseline levels. This case-dependent exclusion or inclusion is necessary to ensure that total GHG reductions and removals caused by the Forest Project are not overestimated.
Secondary Effect Sources, Sinks, and Reservoirs						
AC-9	Biological emissions from site preparation activities	Source	CO_2	*Included*	**Baseline:** N/A **Project:** Quantified based on measured carbon stock changes in included reservoirs (SSR AC-6, where applicable)	Biological emissions from site preparation are not quantified separately, but rather are captured by measuring changes in included carbon reservoirs (soil carbon, where applicable). For other carbon reservoirs, changes are unlikely to have a significant effect on total quantified GHG reductions/removals.
AC-10	Mobile combustion emissions from site preparation activities	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Mobile combustion CO_2 emissions from site preparation (including land-use conversion activities) are likely to be higher in the baseline than under project. These emissions are therefore excluded from the GHG Assessment Boundary in order to be conservative. In addition, this protocol assumes that combustion emissions in the United States will be controlled under a regulatory cap-and-trade program in the near future, meaning that changes in activity due to the Forest Project will have no effect on total net emissions.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Differences in CH_4 emissions from mobile combustion associated with site preparation activities are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Differences in N_2O emissions from mobile combustion associated with site preparation activities are not considered significant.
AC-11	Mobile combustion emissions from ongoing project operation and maintenance	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** 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. In addition, this protocol assumes that such emissions will be controlled under a regulatory cap-and-trade program in the near future, meaning that changes in activity due to the Forest Project will have no effect on total net emissions.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in CH_4 emissions from mobile combustion associated with ongoing project operation and maintenance activities are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A	Changes in N_2O emissions from mobile combustion associated with ongoing

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
					Project: N/A	project operation and maintenance activities are not considered significant.
AC-12	Stationary combustion emissions from ongoing project operation and maintenance	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Stationary combustion CO_2 emissions from ongoing project operation and maintenance could include GHG emissions associated with electricity consumption or heating/cooling at Project Operator facilities, or at facilities owned or controlled by contractors. These emissions are unlikely to be significantly different from (or will be lower than) baseline levels and are therefore not included in the GHG Assessment Boundary. In addition, this protocol assumes that such emissions will be controlled under a regulatory cap-and-trade program in the near future, meaning that changes in activity due to the Forest Project will have no effect on total net emissions.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in CH_4 emissions from stationary combustion associated with ongoing project operation and maintenance activities are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in N_2O emissions from stationary combustion associated with ongoing project operation and maintenance activities are not considered significant.
AC-13	Biological emissions from clearing of forestland outside the Project Area	Source	CO_2	*Included*	**Baseline:** N/A **Project:** Estimated using default forestland conversion factors	Avoided Conversion Projects may cause land-use pressures to shift to other forestlands, causing biological emissions that partially negate the benefits of the project.
AC-14	Biological emissions/ removals from changes in harvesting on forestland outside the Project Area	Source / Sink	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Over time, Avoided Conversion Projects will tend to 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 other lands. Carbon stock increases on other lands are excluded from the GHG Assessment Boundary, however, because it is not possible to ensure their permanence. Avoided Conversion Projects are not expected to cause an increase in harvesting on other lands over the long run (except where clearing is involved for other land uses, per SSR AC-13), so this potential effect is also excluded from the GHG Assessment Boundary.
AC-15	Combustion emissions from production, transportation,	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	This protocol assumes that combustion emissions will be controlled under a regulatory cap-and-trade program in the near future. Thus, for most of a Forest

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
	and disposal of forest products					Project's duration, changes in activity due to the project will have no effect on total net emissions due to production, transportation, and disposal of forest products. These emissions are therefore excluded from the GHG Assessment Boundary.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Combustion-related CH_4 emissions related to changes in the production, transportation, and disposal of forest products are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Combustion-related N_2O emissions related to changes in the production, transportation, and disposal of forest products are not considered significant.
AC-16	Combustion emissions from production, transportation, and disposal of alternative materials to forest products	Source	CO_2	*Excluded*	**Baseline:** N/A **Project:** N/A	Changes in forest-product production may cause consumers of these products to increase or decrease their consumption of substitute materials (such as alternative building materials, including cement or steel). In many cases, alternative materials will have higher combustion GHG emissions associated with their production, transportation, and/or disposal than wood products. This protocol assumes, however, that combustion emissions will be controlled under a regulatory cap-and-trade program in the near future. Thus, for most of a Forest Project's duration, changes in activity due to the project will have no effect on total net emissions due to production, transportation, and disposal of alternative materials. These emissions are therefore excluded from the GHG Assessment Boundary.
			CH_4	*Excluded*	**Baseline:** N/A **Project:** N/A	Combustion-related CH_4 emissions related to changes in the production, transportation, and disposal of alternative materials are not considered significant.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Combustion-related N_2O emissions related to changes in the production, transportation, and disposal of alternative materials are not considered significant.
AC-17	Biological emissions from decomposition of forest products	Source	CO_2	*Included*	**Baseline:** Quantified as a component of calculating carbon stored for 100 years in wood products (SSR AC-7) and landfills (SSR AC-8) **Project:** Quantified as a component of calculating carbon	CO_2 emissions from the decomposition of forest products are built into calculations of how much forest product carbon will remain in in-use wood products and in landfills, averaged over 100 years (see SSR AC-7 and Quantification Guidance on the FPP webpage).

SSR	Description	Type	Gas	Included or Excluded	Relevant to Baseline or Project	Justification/Explanation
					stored for 100 years in wood products (SSR AC-7) and landfills (SSR AC-8)	
			CH_4	*Excluded*	**Baseline:** N/A **Project:** 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. This protocol assumes that landfill CH_4 emissions will be largely controlled in the near future due to federal and/or state regulations. 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.
			N_2O	*Excluded*	**Baseline:** N/A **Project:** N/A	Decomposition of forest is not expected to be a significant source of N_2O emissions.

6 Quantifying Net GHG Reductions and Removals

This section provides requirements and guidance for quantifying a Forest Project's net GHG reductions and removals. The Reserve will issue Climate Reserve Tonnes (CRTs) to a Forest Project upon confirmation by an ISO-accredited and Reserve-approved verification body that the Forest Project's GHG reductions and removals have been quantified following the applicable requirements of this section (see Section 9 for verification requirements).

For each type of Forest Project, quantification proceeds in seven steps:

1. **Estimating baseline onsite carbon stocks.** The baseline is an estimate of what would have occurred in the absence of a Forest Project. To establish baseline onsite carbon stocks, the Project Operator must model 100 years of carbon stock changes in each of the Forest Project's required and selected optional onsite carbon pools (identified in Section 5). Modeling must be based on inventoried carbon stocks at the time of the Forest Project's initiation (or when first inventoried as is allowed for Reforestation Projects), following the applicable requirements in this section. Onsite carbon stocks are inventoried following the requirements described in the Quantification Guidance on the FPP webpage. Modeling of onsite carbon stocks over time must be conducted following the requirements in this section and the guidance in the Quantification Guidance. Baseline onsite carbon stocks are estimated over a Forest Project's entire crediting period (100 years) at the time of the project's initiation and are not modified thereafter, except for reconciliation of project baselines to changes in inventory estimates associated with inventory methodology updates.
2. **Estimating baseline carbon in harvested wood products.** In conjunction with modeling baseline onsite carbon stocks, the Project Operator must forecast any harvesting that would have occurred in the baseline and convert this to an average annual harvesting volume. From this, the Project Operator must determine the amount of carbon that would have been transferred each year (on average) to long-term storage in wood products. Baseline harvesting is forecasted following the guidance in this section and carbon stored in wood products must be calculated following the requirements in the Quantification Guidance.
3. **Determining actual onsite carbon stocks.** Each year, the Project Operator must determine the Forest Projects' actual onsite carbon stocks. This must be done by updating the Forest Project's forest carbon inventory for the current year, following the guidance in this section and in the Quantification Guidance. The estimate of actual onsite carbon stocks must be adjusted by an appropriate confidence deduction, as described in the Quantification Guidance.
4. **Determining actual carbon in harvested wood products.** Each year, the Project Operator must report any harvesting in the Project Area and from this determine the amount of carbon transferred to long-term storage in wood products. Carbon stored in wood products must be calculated following the requirements available in the Quantification Guidance.
5. **Calculating the project's Primary Effect.** Each year, the Project Operator must quantify the actual change in GHG emissions or removals associated with the Forest Project's intended ("Primary") effect, as defined in Section 5. For any given year, the Primary Effect is calculated by:

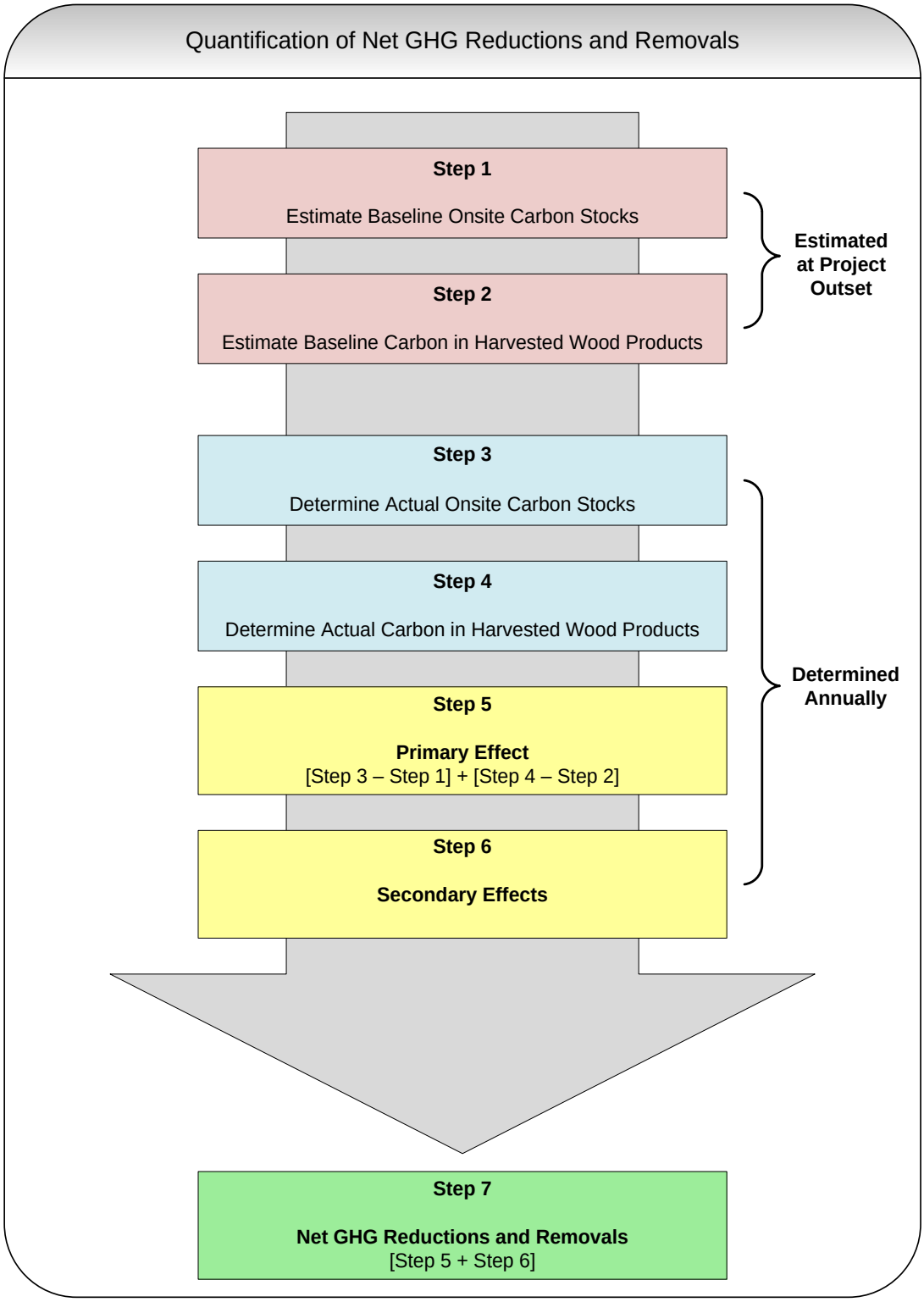
   a. Taking the difference between actual onsite carbon stocks for the current year and actual onsite carbon stocks for the prior year[13]
   b. Subtracting from (a) the difference between baseline onsite carbon stocks for the current year and baseline onsite carbon stocks for the prior year[14]
   c. Adding to (b) the calculated difference between actual and baseline carbon in harvested wood products for the current year (see Equation 6.1)

6. **Quantifying the project's Secondary Effects.** Each year, the Project Operator must quantify the actual change in GHG emissions or removals associated with the Forest Project's unintended ("Secondary") effects, as defined in Section 5. Requirements and guidance for quantifying Secondary Effects are provided below for each type of Forest Project.
7. **Calculating total net GHG reductions and removals.** For each year, total net GHG reductions and removals are calculated by summing a Forest Project's Primary and Secondary Effects. If the result is positive, then the Forest Project has generated GHG reductions and/or removals in the current year. If the result is negative, this may indicate a reversal has occurred (see Section 7).[15]

Requirements and guidance for how to perform quantification steps 1 to 4 for each Forest Project type are presented in the remainder of this section.

The required formula for quantifying annual net GHG reductions and removals is presented in Equation 6.1. Net GHG reductions and removals must be quantified and reported in units of carbon dioxide-equivalent (CO_2e) metric tons.

[13]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.
[14] See footnote 13.
[15] A reversal occurs only if: (1) total net GHG reductions and removals for the year are negative; and (2) CRTs have previously been issued to the Forest Project. If calculated GHG reductions and removals are negative and no CRTs have been issued to the project since its start date, then the result should be treated as a "negative carryover" to GHG reduction calculations in subsequent years (variable N_{y-1} in Equation 6.1). This may happen, for example, because the confidence deduction applied to actual onsite carbon stocks can result in actual values being less than baseline values in a Forest Project's initial years.


Quantification of Net GHG Reductions and Removals
Step 1
Estimate Baseline Onsite Carbon Stocks
Step 2
Estimate Baseline Carbon in Harvested Wood Products
Estimated at Project Outset
Step 3
Determine Actual Onsite Carbon Stocks
Step 4
Determine Actual Carbon in Harvested Wood Products
Step 5
Primary Effect
[Step 3 – Step 1] + [Step 4 – Step 2]
Step 6
Secondary Effects
Determined Annually
Step 7
Net GHG Reductions and Removals
[Step 5 + Step 6]

Equation 6.1. Annual Net GHG Reductions and Removals

$$\boldsymbol{QR_y = \left[(\Delta AC_{onsite} - \Delta BC_{onsite}) + \left(AC_{wp,y} - BC_{wp,y}\right) + SE_y\right] + N_{y-1}}$$

Where,			Units
QR_y	=	Quantified GHG reductions and removals for year y	CO_2e
$AC_{wp,\,y}$	=	Actual carbon in wood products produced in year y that is projected to remain stored for at least 100 years (i.e., $WP_{total,\,y}$ derived for actual harvest volumes following the guidance in the Quantification Guidance)	CO_2e
$BC_{wp,y}$	=	Annual baseline carbon in wood products that would have remained stored for at least 100 years (i.e., $WP_{total,\,y}$ derived for baseline harvest volumes following the guidance in the Quantification Guidance)	CO_2e
SE_y	=	Secondary Effect GHG emissions caused by the project activity in year y	CO_2e
N_{y-1}	=	Any negative carryover from the prior year (occurs when total quantified GHG reductions are negative prior to the issuance of any CRTs for the project– see footnote 15, p. 44)	CO_2e

And,

$$\boldsymbol{\Delta AC_{onsite} = \left(AC_{onsite,y}\right)\left(1 - CD_y\right) - \left(AC_{onsite,y-1}\right)\left(1 - CD_{y-1}\right)}$$

Where,			
$AC_{onsite,\,y}$	=	Actual onsite carbon as inventoried for year y (y may be less than a year for the first reporting period following the start date)	CO_2e
$AC_{onsite,\,y-1}$	=	Actual onsite carbon as inventoried for year y-1	CO_2e
CD_y	=	Appropriate confidence deduction for year y, as determined following the Quantification Guidance	%
CD_{y-1}	=	Appropriate confidence deduction for year y-1, as determined following the Quantification Guidance	%

And,

$$\boldsymbol{\Delta BC_{onsite} = \left(BC_{onsite,y}\right) - \left(BC_{onsite,y-1}\right)}$$

Where,			
$BC_{onsite,\,y}$	=	Baseline onsite carbon as estimated for year y (y may be less than a year for the first reporting period following the start date)	CO_2e
$BC_{onsite,\,y-1}$	=	Baseline onsite carbon as estimated for year y-1	CO_2e

Note: The term SE_y in Equation 6.1 reflects market responses to changes in wood-product production. The general assumption in this protocol is that modifying harvest in a Forest Project relative to baseline harvesting levels will lead the market to compensate via modifications to harvesting levels by other landowners. The greater the change in harvest by a Forest Project relative to baseline levels, the greater the response by the market to compensate. Section 6.2.6 describes in detail the calculation required to account for such market responses.[16]

[16] For conservativeness and ease of accounting, these wood-product market "leakage" effects are ignored for Reforestation Projects and Avoided Conversion Projects, since overall these projects will tend to result in increased harvesting relative to the baseline. Market leakage effects are accounted for under Improved Forest Management Projects, however, as described in Section 6.2.6.

6.1 Reforestation Projects

6.1.1 Estimating Baseline Onsite Carbon Stocks

To estimate baseline carbon stocks for a Reforestation Project, the Project Operator must:

1. Provide a qualitative characterization of the likely vegetative conditions and activities that would have occurred without the project, taking into consideration any laws, statutes, regulations, or other legal mandates that would encourage or require reforestation on the Project Area. The qualitative assessment shall include an assessment of the commercial value of trees within the Project Area over the next 30 years. The qualitative assessment must be used as the basis for modeling baseline carbon stocks (step 3).
2. Inventory carbon stocks affected by site preparation prior to any site preparation activities, following the Quantification Guidance for sampling carbon pools affected by site preparation for Reforestation Projects.

   For carbon stocks not affected by site preparation, the inventory may be deferred, as described below.
3. Perform a computer simulation, once an inventory is obtained, that models the carbon stocks (from required and any selected optional pools) for 100 years following the project's start date, based on the qualitative characterization of what would have occurred without the project. The Project Operator must follow the requirements and guidance for modeling contained in the Quantification Guidance, incorporating any conditions and constraints specified in the qualitative characterization of the baseline (step 1, above). The computer simulation must model the expected growth in carbon stocks associated with pre-existing trees in the Project Area (i.e., those not planted as part of the Forest Project).

Deferral of Initial Inventory for Carbon Stocks Not Affected by Site Preparation

The inventory of carbon stocks that are not affected by site preparation may be deferred until a Reforestation Project's second site visit verification. By the second site visit verification, the Project Operator must provide an estimated inventory of all required carbon stocks by using an approved growth model or a stand table projection methodology, as described in the Quantification Guidance, to derive an estimate of standing live carbon stocks in pre-existing trees (i.e., those not planted as part of the Forest Project) at the time of the Forest Project's start date. The Project Operator must demonstrate that applying the approved growth model or stand table projection to the estimated tree records representing the start date condition produces a result within five percent of current inventory data for pre-existing trees.

If the inventory of these carbon pools is deferred, the timing of the second site visit verification is at the discretion of the Project Operator (it may be deferred for more than six years). Reforestation Projects for which an initial inventory is deferred are not eligible to receive CRTs until after the second site visit verification where the start date inventory and the current inventory as of the second site visit verification are verified.

6.1.2 Estimating Baseline Carbon in Harvested Wood Products

If harvesting of the pre-existing trees would be expected to occur in the baseline, the following steps must be performed:

1. Use a model (see the Quantification Guidance) to determine the *average* amount of carbon in standing live carbon stocks (prior to delivery to a mill) that would have been harvested in each year of the baseline over 100 years. The result will be a uniform estimate of harvested carbon in each year of the baseline. This estimate is determined at the project outset, using the same biomass equations used to calculate biomass in live trees, and will not change over the course of the project.
2. On an annual basis, determine the amount of harvested carbon that would have remained stored in wood products, averaged over 100 years, following the requirements in the Quantification Guidance.

6.1.3 Determining Actual Onsite Carbon Stocks

Actual carbon stocks for Reforestation Projects must be determined by updating the Project Area's forest carbon inventory. This is done by:

1. Incorporating any new forest inventory data obtained during the previous year into the inventory estimate. Any plots sampled during the previous year must be incorporated into the inventory estimate.
2. Using an approved model to "grow" (project forward) prior-year data from existing forest inventory plots to the current reporting year. Approved growth models are identified in the Quantification Guidance. Guidance for projecting forest inventory plot data using models is also provided in the Quantification Guidance.
3. Updating the forest inventory estimate for harvests and/or disturbances that have occurred during the previous year.
4. Applying an appropriate confidence deduction for the inventory based on its statistical uncertainty, following the guidance in the Quantification Guidance.

6.1.4 Determining Actual Carbon in Harvested Wood Products

Perform the following steps to determine actual carbon in harvested wood products:

1. Determine the actual amount of carbon in standing live carbon stocks (prior to delivery to a mill) harvested in the current year (based on harvest volumes determined in Section 6.1.3).
2. Determine the amount of actual harvested carbon that will remain stored in wood products, averaged over 100 years, following the requirements in the Quantification Guidance.

6.1.5 Quantifying Secondary Effects

For Reforestation Projects, significant Secondary Effects can arise from two sources:

1. Combustion emissions associated with machinery use in site preparation.
2. The shifting of cropland or grazing activities to forestland outside the Project Area (which may be both a market and/or physical response to the project activity), which is accounted for over the life of the project.

To quantify combustion emissions associated with site preparation, Project Operators must use the appropriate standard emission factor from Table 6.1 corresponding to the level of brush

cover associated with the site preparation area, multiplied by the number of acres treated (Equation 6.2).

Mobile combustion emissions must be added to Secondary Effect emissions (SE_y in Equation 6.1) in the first reporting period of a project. If this results in a negative amount for total net quantified GHG reductions and removals in year one (QR_1), the negative amount must be carried over into future years (N_{y-1} in Equation 6.1) until sufficient GHG reductions and removals are accrued to achieve a positive balance. Negative GHG reductions and removals due to site preparation emissions are *not* considered a reversal (Section 7.1).

Equation 6.2. Combustion Emissions Associated with Site Preparation

$$\boldsymbol{MC_y = (-1)\times (EF_{mc}\times PA)}$$

Where,			Units
MC_y	=	Secondary Effect emissions due to mobile combustion from site preparation	CO_2e
EF_{mc}	=	Mobile combustion emission factor from Table 6.1	CO_2e
PA	=	Size of the site preparation area	acres

Table 6.1. Mobile Combustion Emissions for Reforestation Projects

Site Prep - Reforestation Projects		
Emissions Associated with Mobile Combustion Average Metric Tons CO_2 per Acre		
Light	**Medium**	**Heavy**
25% Brush Cover	50% Dense Brush Cover	> 50% Brush Cover, stump removal
0.090	**0.202**	**0.429**

To quantify emissions from the shifting of cropland and grazing activities each year, Project Operators must determine the appropriate “leakage” risk percentage for the project following the decision tree in Figure 6.1. The leakage risk percentage must only be determined once, at the outset of the project. Each year, this percentage must be applied to the net increase in onsite carbon stocks to determine the annual Secondary Effects due to shifting of cropland or grazing activities (Equation 6.3).

Equation 6.3. Emissions from Shifting Cropland and Grazing Activities

$$\boldsymbol{AS_y = (-1)\times L\times (\Delta AC_{onsite} - \Delta BC_{onsite})}$$

Where,			Units
AS_y	=	Secondary Effect emissions due to shifting of cropland or grazing activities	CO_2e
L	=	Leakage risk percentage, as determined from Figure 6.1	%
ΔAC_{onsite}	=	Annual difference in actual onsite carbon as defined in Equation 6.1	CO_2e
ΔBC_{onsite}	=	Annual difference in baseline onsite carbon as defined in Equation 6.1	CO_2e

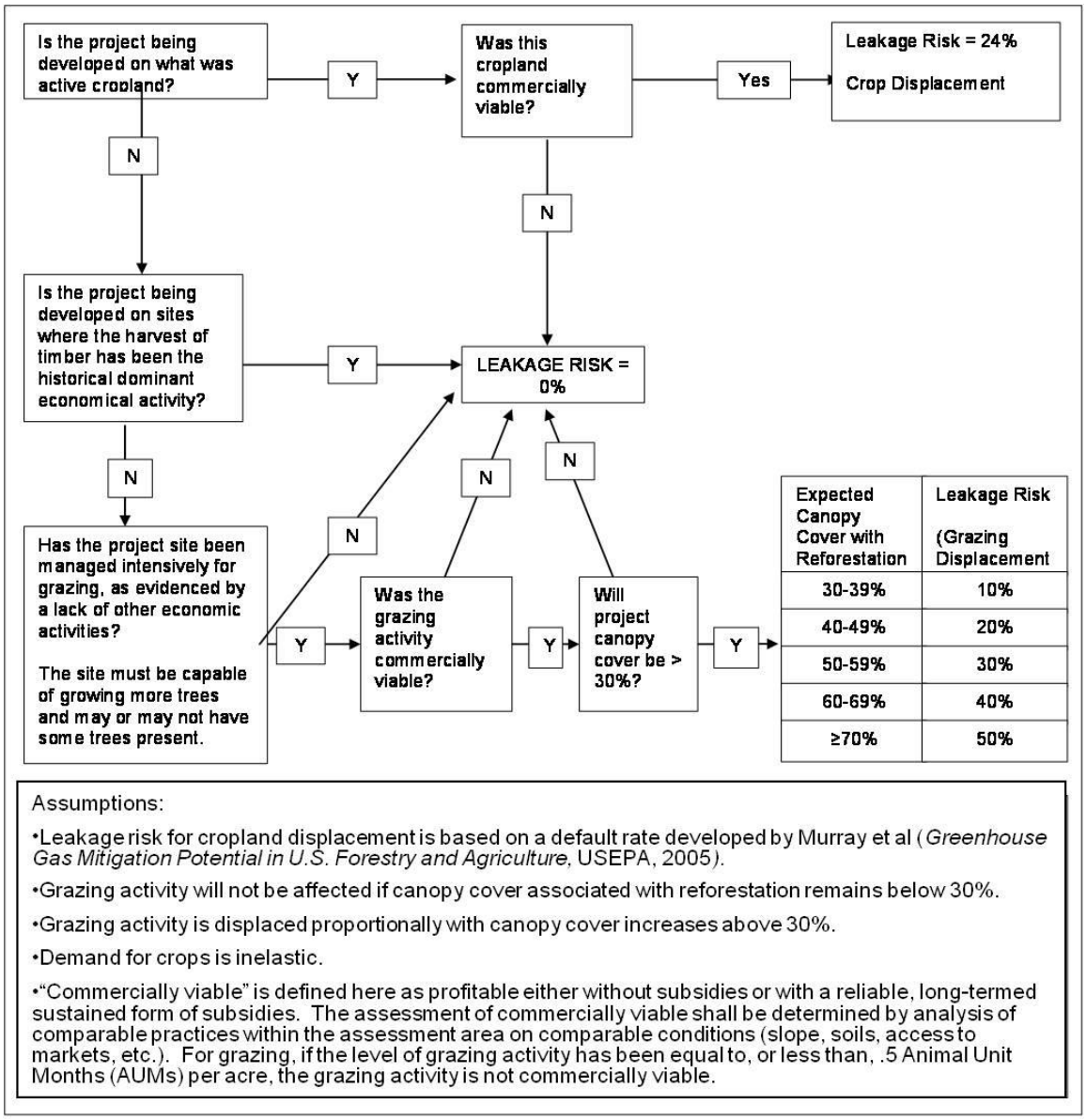


Figure 6.1. Activity Shifting ("Leakage") Risk Assessment for Reforestation Projects

Total Secondary Effect emissions for Reforestation Projects are calculated as follows (Equation 6.4). The value for Secondary Effect emissions will always be negative or zero.

Equation 6.4. Total Secondary Effect Emissions

$$SE_y = (AS_y + MC_y) \text{ or 0, whichever is lower}$$

Where,			Units
SE_y	=	Secondary Effect GHG emissions caused by the project activity in year *y* (Equation 6.1)	CO_2e
AS_y	=	Secondary Effect emissions due to shifting of cropland or grazing activities	CO_2e
MC_y	=	Secondary Effect emissions due to mobile combustion from site preparation	CO_2e

6.2 Improved Forest Management Projects

Improved Forest Management Projects that take place on private land – or on land that is transferred to public ownership at the time the project is initiated – must estimate baseline onsite carbon stocks following the requirements and procedures in Section 6.2.1. Improved Forest Management Projects that take place on land that was publicly owned prior to the project start date must estimate baseline onsite carbon stocks following the requirements and procedures in Section 6.2.2. Requirements for determining baseline carbon in harvested wood products, determining actual onsite carbon stocks, determining actual carbon in harvested wood products, and quantifying Secondary Effects are the same for all Improved Forest Management Projects.

6.2.1 Estimating Baseline Onsite Carbon Stocks – Private Lands

The baseline approach for Improved Forest Management Projects on private lands applies a standardized set of assumptions to project-specific conditions.

The following steps must be followed to estimate baseline carbon stocks:

1. Determine the inventories of aboveground standing live carbon stocks, belowground standing live carbon stocks, and aboveground and belowground standing dead carbon stocks for the Project Area.
2. Model a 100-year growth and harvest regime reflecting legal and financial constraints. The result is a *preliminary unadjusted baseline* for carbon stocks that reasonably reflects the harvesting opportunities present within the Project Area.
3. Standardize the *preliminary unadjusted baseline* for aboveground standing live carbon stocks by averaging the annual values or, if legal constraints require stocks to increase over time, constructing an upward sloping straight line to the apex of the legal constraints and averaging annual values thereafter. Baseline carbon stocks for other carbon pools must be similarly standardized. This results in the *standardized unadjusted baseline* for reported carbon stocks.
4. Apply performance standard criteria to adjust the aboveground standing live portion of the *standardized unadjusted baseline*. The result is a *standardized adjusted baseline* for aboveground standing live carbon stocks.
5. Proportionally adjust other reported carbon stocks to match the *standardized adjusted baseline* for aboveground standing live carbon stocks.
6. Combine the results of Step 4 and Step 5 to produce the *final baseline* for all onsite carbon stocks.

For all calculations in this section, all values for “carbon stocks” should be expressed in metric tons of CO_2-equivalent.

Step 1 – Inventory Carbon Stocks within the Project Area

The start date inventory of standing live aboveground carbon stocks, separated into aboveground and belowground portions, and the start date inventory of standing dead carbon stocks, with aboveground and belowground portions combined, must be determined following the Reserve’s Quantification Guidance.

In the formulas throughout this section, initial carbon stocks are denoted by the variable PUB_0 (i.e., the *preliminary unadjusted baseline* at time zero).

Step 2 – Model Growth and Harvesting Over 100 Years

The *preliminary unadjusted baseline* for onsite carbon stocks must be estimated through a modeling exercise. The modeling exercise must use the inventories of the carbon from Step 1 as a starting point for modeling. The *preliminary unadjusted baseline* will consist of each of the following carbon pools that are maintained separately during this stage of baseline development:

- Aboveground standing live
- Belowground standing live
- Standing dead (aboveground and belowground)
- Harvested aboveground and belowground standing live
- Bole portion of harvested aboveground and belowground standing live

To determine the *preliminary unadjusted baseline,* model the initial inventory of *aboveground* standing live carbon stocks through a series of growth and harvesting scenarios over a 100-year timeframe. Modeling must be conducted using an approved growth model, as identified in the Modeling Carbon Stocks section of the Quantification Guidance. Modeling of the growth and harvesting scenarios must reflect all legal requirements that constrain the ability to harvest carbon stocks. In addition, harvesting assumptions must reflect realistic financial constraints.

Standing dead carbon stocks shall be assumed to remain static throughout the modeling process. Exceptions may be provided, at the Reserve's discretion, if compelling justification can be provided that standing dead carbon stocks are likely to fluctuate substantially as part of the project's baseline.

Step 3 - Modeling Legal Constraints

All legal constraints that affect the ability to manage carbon stocks must be included in the model design. The *preliminary unadjusted baseline* must represent a growth and harvesting regime that fulfills all legal requirements. Voluntary agreements that can be rescinded, such as rental contracts and forest certifications, are not legal constraints. Habitat Conservation Plans (HCPs) and Safe Harbor Agreements (SHAs) that are in place more than one year prior to the project's start date shall be modeled as legal constraints. HCPs and SHAs that are approved after the date one year prior to the project's start date are not considered legal constraints for baseline modeling and may be disregarded.

Legal constraints include all laws, regulations, and legally-binding commitments applicable to the Project Area at the time of the project's initiation that could affect carbon stocks. Legal constraints include:

1. Federal, state/provincial, or local government regulations that are required and might reasonably be anticipated to influence carbon stocking over time including, but not limited to:
    a. Zones with harvest restrictions (e.g., buffers, streamside protection zones, wildlife protection zones)
    b. Harvest adjacency restrictions
    c. Minimum stocking standards

2. Forest practice rules, or applicable Best Management Practices established by federal, state, provincial or local government that relate to forest management.
3. Other legally binding requirements affecting carbon stocks including, but not limited to, covenants, conditions and restrictions, and other title restrictions in place prior to or at the time of project initiation, including pre-existing conservation easements, HCPs, SHAs, and deed restrictions, excepting an encumbrance that was put in place and/or recorded less than one year prior to the project start date, as defined in Section 3.7.

For Forest Projects located in California, the *preliminary unadjusted baseline* must be modeled to reflect all silvicultural treatments associated with timber harvest plans (THPs) active within the Project Area at the time of the project's initiation. All legally enforceable silvicultural and operational provisions of a THP – including those operational provisions designed to meet California Forest Practice Rules requirements for achieving Maximum Sustained Production of High Quality Wood Products [14 CCR 913.11 (933.11, 953.11)] – are considered legal constraints and must be reflected in baseline modeling for if the THP will remain active. For portions of the Project Area not subject to THPs (or over time periods for which THPs will not be active), baseline carbon stocks must be modeled by considering any applicable requirements of the California Forest Practice Rules and all other applicable laws, regulations, and legally binding commitments that could affect onsite carbon stocks. On a case-by-case basis, the California Department of Forestry and Fire Protection (CAL FIRE) may assist Project Operators in identifying minimum carbon stocking levels that would be effectively required under California Forest Practice Rules.

Step 4 - Modeling Financial Constraints

Harvest assumptions included in the model must be financially viable. The Project Operator must demonstrate that the growth and harvesting regime assumed for the *preliminary unadjusted baseline* is financially feasible through a financial analysis of the anticipated growth and harvesting regime that captures all relevant costs and returns, taking into consideration all legal, physical, and biological constraints. Cost and revenue variables in the financial analysis may be based on regional norms or on documented costs and returns for the Project Area or other properties in the project's Assessment Area.

A financially viable project is defined in this protocol as a project that has a net present value of at least $0 using a discount rate of 4%. This would indicate a management regime that does not lose money in the practice of performing long-term forest management activities, including road management, watercourse restoration, fuels management, etc. Inputs to the analysis include the volume of species harvested, logging and hauling costs, delivered log prices, and forest management costs. A calculation workbook for this analysis will be made available by the Reserve, but use of this tool is optional.

Step 5 - Generate a *Standardized Unadjusted Baseline*

The periodic modeled outputs from the *preliminary unadjusted baseline* must be standardized according to the following guidance for each carbon pool. The result will be a *standardized unadjusted baseline* for each carbon pool (including both aboveground and belowground portions of standing live and dead carbon stocks).

Aboveground standing live carbon stocks: The periodic modeled outputs for aboveground standing live carbon stocks must be either averaged or converted to a straight-line approximation reflective of legal constraints.

If legal constraints do *not* result in an upward trend in aboveground standing live carbon stocks, then the periodic model outputs must be averaged using Equation 6.5.

If legal constraints do result in an increasing trend of aboveground standing live carbon stocks, beginning at the project start date, then the periodic model outputs may be standardized using a straight-line approximation, as defined in Equation 6.6. The approximation must consist of two line segments. The first of the line segments must initiate at the initial inventory at the project start date and terminate at the point where carbon stocks reach their highest legally required level. The second segment is a straight line with a constant value, defined by the terminus of the first line segment, for the balance of the 100-year modeling timeframe.

Equation 6.5. Formula for Averaging *Preliminary Unadjusted Baseline* Carbon Stocks

For all years *y*, $SUB_y = \frac{\sum_{y=0}^{100} PUB_y}{100}$

Where,			Units
SUB_y	=	*Standardized unadjusted baseline* for aboveground live carbon stocks (and other related and reported carbon stocks as shown below) value for year *y (*including the start date at y=0*)*	tCO_2e
PUB_y	=	*Preliminary unadjusted baseline* value for year *y.* PUB_0 represents the initial aboveground live and standing dead carbon stocks at the project start date	tCO_2e

Equation 6.6. Formula for Approximating *Preliminary Unadjusted Baseline* Carbon Stocks as a Straight-Line Trend

For years *y* < Y, $SUB_y = SS + y \times \frac{ES-SS}{Y}$

For years *y* ≥ Y, $SUB_y = ES$

Where,			Units
SUB_y	=	*Standardized Unadjusted Baseline* value for year *y*	tCO_2e
Y	=	Time in years between the project start date and the year at which the highest legally required stocking level is reached for aboveground standing live carbon stocks. This is determined by modeling a forest growth and yield simulation that includes legal and financial constraints (in Step 2, above)	years
SS	=	Starting stocks = PUB_0	tCO_2e
ES	=	Ending stocks = The highest legally required stocking level, as determined in Step 2	tCO_2e

Belowground standing live carbon stocks: The belowground portion of the standing live carbon stocks must be standardized in the same way as the aboveground standing live carbon stocks, i.e., either averaged (Equation 6.5), or calculated with an upward-sloping line to a potential terminus (Equation 6.6).

The aboveground and belowground portions of standing dead carbon stocks: Standing dead carbon stocks shall be set at the quantity of carbon stocks present in the standing dead carbon stock pool at the project start date. Exceptions may be provided, at the Reserve's discretion, if

compelling justification can be provided that standing dead carbon stocks are likely to fluctuate substantially as part of the project's baseline. Standing dead stocks are not adjusted based on adjustments to the standing live carbon stocks, but should be combined with the *standardized unadjusted baseline* for aboveground standing live carbon for the purpose of applying the performance standard criteria in Step 4 below.

Carbon stocks in the aboveground and belowground portions of standing live trees harvested for wood products: The carbon stocks shall be calculated as the average of the periodic outputs for the entire 100-year modeling if the aboveground live tree carbon stocks do not result in an upward trend.

If the carbon stocks in aboveground standing live carbon stocks results in an upward trend, the carbon stocks shall be calculated as an average from the start date to the highest point of the aboveground standing live carbon stocks. A separate average of carbon stocks in both the aboveground and belowground portions of standing live trees harvested for wood products between the highest point of the aboveground standing live carbon stocks and the end point of the 100-year modeling shall be calculated, as applicable.

Carbon stocks in the bole portion of trees harvested for wood products: The carbon stocks shall be calculated as the average of periodic outputs for the entire 100-year modeling if the aboveground live tree carbon stocks do not result in an upward trend.

For upward-sloping lines, the values shall be based on the carbon stocks harvested to the legal constraint terminus and be based on the average carbon stocks from the terminus to the balance of the 100-year modeling (if applicable).

Step 6 – Apply Performance-Standard Criteria

Once the components of the *standardized unadjusted baseline* are determined in Step 3, the aboveground standing live and standing dead components must be adjusted to conform to a set of performance standard criteria, as described below. The result is a *standardized adjusted baseline* for aboveground standing live and standing dead carbon stocks. Other reported carbon pools are adjusted in Step 5.

The performance standard criteria establish minimum aboveground standing live and standing dead carbon stock values for the baseline in each year, regardless of what is legally and financially viable. The elements of the performance standard are:

- *The High Stocking Reference:* The High Stocking Reference is a measure of carbon stocks in aboveground standing live and standing dead biomass over the 10 years preceding the project start date. It governs baseline carbon stocks in certain instances where aboveground standing live carbon stocks have declined prior to the start date. See further guidance below on how to determine the High Stocking Reference.
- *Comparison of initial carbon stocks to Common Practice*: If the *standardized unadjusted baseline* for aboveground standing live carbon stocks was averaged (i.e., it was determined according to Equation 6.5), then the *standardized adjusted baseline* may depend on how the initial carbon stocks compare to Common Practice levels (see guidance below for how to determine Common Practice). For projects whose initial carbon stocks are above Common Practice, the *standardized adjusted baseline* for aboveground standing live and standing dead carbon stocks may not be below Common Practice. For projects whose initial carbon stocks are below Common Practice, the

standardized adjusted baseline for aboveground standing live and standing dead carbon stocks may not be below either (1) the initial inventory level or (2) the High Stocking Reference, whichever is greater. See Equation 6.7 and Equation 6.8 below.

The procedure for determining the *standardized adjusted baseline* depends on whether the *standardized unadjusted baseline* for aboveground standing live carbon stocks was determined as an average (i.e., according to Equation 6.5), or an upward sloping straight-line trend (i.e., according to Equation 6.6).

Where the *standardized unadjusted baseline* for aboveground standing live carbon stocks was determined using Equation 6.5:

- If the project's initial aboveground standing live and standing dead carbon stocks (PUB_0) are above Common Practice, use Equation 6.7 to determine the *standardized adjusted baseline*
- If the project's initial aboveground standing live and standing dead carbon stocks (PUB_0) are below Common Practice, use Equation 6.8 to determine the *standardized adjusted baseline*

In both cases, values must be determined for all years, *y*, starting with zero (the start date of the project) and ending with 100.

Equation 6.7. Determining the *Standardized Adjusted Baseline* for Aboveground Live and Standing Dead Carbon Stocks Where Initial Stocks Are at or Above Common Practice

$$\boldsymbol{SAB_y = MAX(CP, PUB_0, SUB_y)}$$

Where,			Units
SAB_y	=	*Standardized adjusted baseline* for aboveground standing live and standing dead carbon stocks value in year *y*	tCO_2e
CP	=	Common Practice (determined according to the guidance below)	tCO_2e
PUB_0	=	Initial aboveground standing live and dead carbon stocks per acre within the Project Area (as determined in Step 1)	tCO_2e /acre
SUB_y	=	Value of the *standardized unadjusted baseline* for year *y,* as determined in Step 5	tCO_2e

Equation 6.8. Determining the *Standardized Adjusted Baseline* for Aboveground Live and Standing Dead Carbon Stocks Where Initial Stocks Are Below Common Practice

$$\boldsymbol{SAB_y = MAX(MAX(HSR, PUB_0), MIN(CP, SUB_y))}$$

Where,			Units
SAB_y	=	*Standardized adjusted baseline* for aboveground standing live and standing dead carbon stocks value in year *y*	tCO_2e
HSR	=	"High Stocking Reference" for the Project Area. See guidance below for how the HSR is determined	tCO_2e
CP	=	Common Practice (determined according to the guidance below)	tCO_2e
PUB_0	=	Initial aboveground standing live carbon stocks per acre within the Project Area (as determined in Step 1)	tCO_2e /acre
SUB_y	=	Value of the *standardized unadjusted baseline* for year *y,* as determined in Step 5	tCO_2e

Where the *standardized unadjusted baseline* for aboveground standing live and standing dead carbon stocks was determined using Equation 6.6:

- The *standardized adjusted baseline* (SAB*y*) may be determined according to Equation 6.6, substituting SAB*y* for SUB*y* and using the formula in Equation 6.9 to determine starting stocks.

Equation 6.9. Formula for Determining Starting Stocks for the *Standardized Adjusted Baseline*

$$SS = MAX(PUB_0, HSR)$$

Where,			Units
SS	=	Starting stocks for use in Equation 6.6	tCO_2e
PUB_0	=	Initial aboveground standing live and standing dead carbon stocks per acre within the Project Area (as determined in Step 1)	tCO_2e /acre
HSR	=	"High Stocking Reference" for the Project Area. See guidance below for how the HSR is determined	tCO_2e

Determining the High Stocking Reference

The High Stocking Reference is defined as 80 percent of the highest value for aboveground standing live carbon stocks per acre within the Project Area during the 10-year period preceding the project start date. To determine the High Stocking Reference, the Project Operator must document changes in the Project Area's aboveground standing live and standing dead carbon stocks over the 10 years prior to the initiation of the project, or for as long as the Project Operator has had control of the stocks, whichever is shorter. Figure 6.2 presents a graphical portrayal of a High Stocking Reference determination.

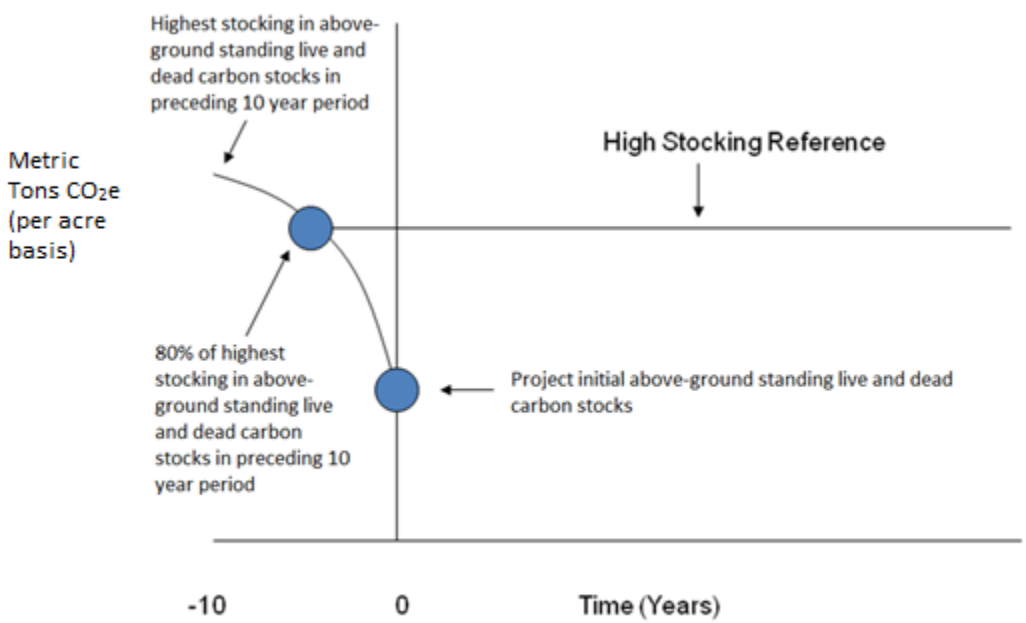


Figure 6.2. Determining a Project Area's High Stocking Reference

*It is possible for the High Stocking Reference to be higher than Common Practice, even where initial live and standing dead tree carbon stocks for the project are below Common Practice.

Determining Common Practice

Common Practice refers to the average stocks of aboveground standing live and standing dead carbon associated with the Assessment Area(s) covered by the Project Area. The Common Practice statistic applicable to a project can be found by consulting the Assessment Area Data File on the Reserve's FPP webpage. If the Project Area covers multiple Assessment Areas, Common Practice must be calculated as the average of the values for each Assessment Area, weighted by the percentage of the Project Area that falls within each Assessment Area.

Common Practice statistics are calculated from United States Forest Service Forest Inventory and Analysis (USFS FIA) program. The Reserve will update the Common Practice statistics in the Assessment Area Data File periodically. The frequency of updating Common Practice statistics will be subject to the availability of new USFS FIA data, but will be no more frequent than once every five years. The Reserve will announce any forthcoming updates to the Common Practice statistics before they are released, and any updates will not be retroactive.

Step 7 – Proportionally Adjust Other Reported Carbon Stocks

The *standardized adjusted baseline* for other reported carbon stocks must be determined by adjusting carbon stock values to reflect the *standardized adjusted baseline* for aboveground standing live and standing dead carbon stocks. The guidance for adjusting the other reported carbon stocks is shown in Table 6.2.

Table 6.2. Guidance for Adjusting Other Carbon Pools

Carbon Pool	Relationship to Adjustments of Aboveground Live Carbon Stocks	Adjustment
Belowground Standing Live Carbon Stocks	Directly Proportional	$\boldsymbol{SAB_{bg,y} = (SAB_{ag,y}/SUB_{ag,y}) \times SUB_{bg,y}}$ *Where,* $SAB_{bg,y}$ = *Standardized Adjusted Baseline* for belowground standing live carbon stocks in year *y* $SAB_{ag,y}$ = *Standardized Adjusted Baseline* for aboveground standing live carbon stocks in year *y* $SUB_{ag,y}$ = *Standardized Unadjusted Baseline* for aboveground standing live carbon stocks in year *y* $SUB_{bg,y}$ = *Standardized Unadjusted Baseline* for belowground standing live carbon stocks in year *y*
Aboveground and Belowground Standing Dead Carbon Stocks	N/A	No adjustment is conducted. Aboveground and belowground standing dead carbon stocks remain constant with inventories of aboveground and belowground standing dead carbon stocks at the project start date. Exceptions may be allowed as described previously. Standing dead carbon stocks are not adjusted based on changes to standing live carbon stocks, but must be used in the comparison to Common Practice.

Harvested Aboveground Standing Live Carbon Stocks	Inversely Proportional	$SAB_{ht,y} = \frac{(SUB_{ht,y}/SUB_{ag,y})}{(SAB_{ag,y}/SUB_{ag,y})}$ *Where,* $SAB_{ht,y}$ = *Standardized Adjusted Baseline* for harvested aboveground and belowground standing live carbon stocks in year *y* $SUB_{ht,y}$ = *Standardized Unadjusted Baseline* for harvested aboveground and belowground standing live carbon stocks in year *y* $SUB_{ag,y}$ = *Standardized Unadjusted Baseline* for aboveground standing live carbon stocks in year *y* $SAB_{ag,y}$ = *Standardized Adjusted Baseline* for aboveground standing live carbon stocks in year *y*
Harvested Bole Portion of Aboveground Standing Live Carbon Stocks	Inversely Proportional	$SAB_{htb,y} = \frac{(SUB_{htb,y}/SUB_{ag,y})}{(SAB_{ag,y}/SUB_{ag,y})}$ *Where,* SAB_{htb} = *Standardized Adjusted Baseline* for the bole portion of harvested aboveground and belowground standing live carbon stocks in year *y* $SUB_{htb,y}$ = *Standardized Unadjusted Baseline* for the bole portion of harvested aboveground and belowground standing live carbon stocks in year *y* $SUB_{ag,y}$ = *Standardized Unadjusted Baseline* for aboveground standing live carbon stocks in year *y* $SAB_{ag,y}$ = *Standardized Adjusted Baseline* for aboveground standing live carbon stocks in year *y*

Step 8 – Combine All Standardized Adjusted Baseline Components

The *Final Baseline* is the sum of *standardized adjusted baselines* for all reported *onsite* carbon stocks and must include:

- Aboveground standing live carbon stocks
- Belowground standing live carbon stocks
- Aboveground and belowground standing dead carbon stocks

The standardized adjusted baselines for harvested standing live carbon stocks (aboveground and belowground) and the bole portion of harvested standing live carbon stocks must be maintained separately from the carbon stocks listed above. The reporting of harvested carbon stocks is conducted separately from other reported carbon stocks.

6.2.2 Estimating Baseline Onsite Carbon Stocks – Public Lands

The baseline is developed for a public forest by determining carbon levels in the Project Area with the assumed condition that the entire forest is at a rotation age common for the forest community (by Assessment Area). The rotation ages are provided as default values and are found with the Assessment Area data. Where forest practice laws, or any other legal encumbrances, require specific management of forest stands at levels that exceed the age criteria mentioned above, the stands must be managed at sufficient stocking levels to ensure

compliance with the legal constraints. Project credits are determined by calculating the project's carbon stocks and subtracting the baseline stocks from them.

Using the Carbon Online Estimator (COLE[17]), select Forest Inventory and Analysis (FIA) plots using the "plots within this radius" tool. The circle developed must be centered within the Project Area. The radius of the sample area must be at least 100 kilometers. Following the guidance on the website, fetch the data within the circle. Next, filter the data using the 'Filter' tab on the website by selecting species in the 'Forest Type' menu bar that are found in the species list in the Assessment Area Data File for Assessment Area(s) the project is in. Click on the 'Reports' tab and submit the request to produce the 1605(b) report, which will be provided through a web interface. The report must be included as an appendix in the PDD.

Using Table 1 of the COLE 1605(b) report, the baseline for the project, barring any adjustments as part of the legal analysis (below), shall be determined by summing the live tree and dead tree values from the COLE 1605(b) report that correspond with the rotation length value found in Table 6.3. The 1605(b) values are given as metric tons of carbon per hectare and shall be converted into metric tons CO_2e per acre. The determination of rotation length is made using the Assessment Area Data File and identified for rotation length.

Table 6.3. Table Rotation Lengths

Rotation Length	Years
Short	30
Medium	40
Long	60
Extremely Long	70

6.2.2.1 Adjust for Legal Constraints

The baseline must exceed all legal constraints. A determination must be made whether the legal constraints that affect forest management within the Project Area require further adjustments to the initial baseline developed above, using the following steps:

1. Identify legal constraints affecting the Project Area.
    a. Identify and describe the legal requirements affecting the Project Area.
    b. Spatially identify (map) the areas to which the legal requirements apply within the Project Area to determine the affected acres.
2. Determine forest structure needed to comply with the legal requirements.
    a. Describe the forest structure needed to ensure compliance with the legal requirements affecting each area.
    b. Explain and justify the forest conditions and associated age class that meets the forest conditions identified for meeting the minimum criteria of the legal requirement. In no case shall the age class be less than the age class associated with the rotation length from Table 6.3.
3. Adjust baseline values
    a. Use the live and dead tree values associated with the age class from the COLE 1605(b) report that is associated with the previous step. The 100-year values for

[17] http://www.ncasi2.org/COLE/. After opening, zoom into project area on map and follow instructions to "get plots within this radius…". Once the data has been retrieved, the report can be obtained following the instructions on the site.

live and dead trees in the COLE 1605(b) report shall be used in cases where determinations of forest structure are not easily justified.

b. Develop a weighted average by multiplying the acres for each constraint class by the COLE 1605(b) values and dividing by the total acres to determine the adjusted baseline.

6.2.2.2 Estimate the Project's Harvested Wood Products

The estimate of harvested wood products shall be determined by multiplying the adjusted baseline (above) by 3%.

6.2.2.3 Determining the Final Project Baseline

The final baseline is determined by adding the estimated harvested wood products to the adjusted baseline. This value shall remain constant for the project life.

6.2.3 Estimating Baseline Carbon in Harvested Wood Products

To estimate the amount of baseline carbon transferred to long-term storage in wood products each year, the following steps must be performed:

1. Determine the *average* amount of carbon in standing live carbon stocks (prior to delivery to a mill) that would have been harvested in each year of the baseline over 100 years. The result will be a uniform estimate of harvested carbon in each year of the baseline. This estimate is determined at the project outset, using the same biomass equations used to calculate biomass in live trees, and will not change over the course of the project.
    a. For projects on private lands, the amount of harvested carbon must be derived from the growth and harvesting regime used to develop the baseline for onsite carbon stocks in Section 6.2.1.
    b. For projects on public lands, the amount of harvested carbon must be derived from the growth and harvesting regime assumed in the baseline for onsite carbon stocks derived in Section 6.2.2.
2. On an annual basis, determine the amount of harvested carbon that would have remained stored in wood products, averaged over 100 years, following the requirements in the Quantification Guidance.

6.2.4 Determining Actual Onsite Carbon Stocks

Actual carbon stocks for Improved Forest Management Projects must be determined by updating the Project Area's forest carbon inventory. This is done by:

1. Incorporating any new forest inventory data obtained during the previous year into the inventory estimate. Any plots sampled during the previous year must be incorporated into the inventory estimate.
2. Using an approved model or a stand table projection to "grow" (project forward) prior-year data from existing forest inventory plots to the current reporting year. Guidance for projecting forest inventory data is identified in the Quantification Guidance.
3. Updating the forest inventory estimate for harvests and/or disturbances that have occurred during the previous year. To allow some flexibility in updating the forest inventory during onsite verification years, a project may defer updating a small percentage of plots until the following reporting period, as detailed in the Quantification

Guidance. This will help streamline the sequential sampling process when recent disturbances have taken place.

4. Applying an appropriate confidence deduction for the inventory based on its statistical uncertainty, following the guidance in the Quantification Guidance.

6.2.5 Determining Actual Carbon in Harvested Wood Products

Perform the following steps to determine actual carbon in harvested wood products:

1. Determine the actual amount of carbon in standing live carbon stocks (prior to delivery to a mill) harvested in the current year (based on harvest volumes determined in Section 6.2.4).
2. Determine the amount of actual harvested carbon that will remain stored in wood products, averaged over 100 years, following the requirements in the Quantification Guidance.

6.2.6 Quantifying Secondary Effects

For Improved Forest Management Projects, significant Secondary Effects can occur if a project reduces harvesting in the Project Area, resulting in an increase in harvesting on other properties. Changes in energy-related emissions, which could result from a Forest Project causing consumers of forest products to increase or decrease their use of alternative materials, are not accounted for because it is assumed that energy sector emissions are accounted for by energy sector reporting.

The assumption under this protocol is that some Secondary Effects will occur because of project activities. However, the amount of Secondary Effects is dependent on how much harvesting occurs on the Project Area relative to the baseline scenario. Equation 6.10 must be used to estimate Secondary Effects for Improved Forest Management Projects. Per Equation 6.10, up to 80% of the difference between actual and baseline harvested carbon may be applied as Secondary Effects.

Recognizing that Secondary Effects from a project may be influenced by long term harvesting trends, the evaluation in Equation 6.10 considers cumulative harvest amounts since project inception. When less harvesting has occurred on the Project Area since project commencement relative to the amount harvested under the baseline scenario, the Secondary Effects value for the current reporting period may be either negative or positive, depending on how actual and baseline harvest amounts for the current reporting period compare. As a result, net GHG reductions for the reporting period are lowered when actual onsite harvested carbon for the year is less than the baseline amount.

When actual onsite harvested carbon during a reporting period is greater than the baseline amount, net GHG reductions are increased. This allows for deductions for prior negative Secondary Effects to be recouped. However, once actual cumulative harvest amounts exceed baseline cumulative harvest amounts, Secondary Effects are zero – under no circumstances shall the net balance of the Secondary Effects over the course of a project be positive.

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

Equation 6.10. Secondary Effects Emissions

If the Forest Project is based on management that includes ongoing timber harvests:

$$\boldsymbol{If} \sum_{n=1}^{y} (\boldsymbol{AC_{hv,n}} - \boldsymbol{BC_{hv,n}}) > 0, then\ \boldsymbol{SE_y} = \mathbf{0}$$

$$\boldsymbol{If} \sum_{n=1}^{y} (\boldsymbol{AC_{hv,n}} - \boldsymbol{BC_{hv,n}}) < 0, then\ \boldsymbol{SE_y} = (\boldsymbol{AC_{hv,y}} - \boldsymbol{BC_{hv,y}}) \times \boldsymbol{MIN}\left(\left|\frac{(\boldsymbol{AC_{hv,y}} - \boldsymbol{BC_{hv,y}})}{\boldsymbol{BC_{hv,y}}}\right|, \mathbf{0.8}\right)$$

Where,			Units
SE_y	=	Estimated annual Secondary Effects (used in Equation 6.1)	tCO_2e
$AC_{hv,n}$	=	Actual amount of onsite carbon harvested in reporting period n (prior to delivery to a mill)	tCO_2e
$BC_{hv,n}$	=	Estimated average baseline amount of onsite carbon harvested in reporting period n (prior to delivery to a mill), as determined in Step 1 of Section 6.2.3	tCO_2e
$AC_{hv,y}$	=	Actual amount of onsite carbon harvested in current reporting period *y* (prior to delivery to a mill)	tCO_2e
$BC_{hv,y}$	=	Estimated average baseline amount of onsite carbon harvested in current reporting period *y* (prior to delivery to a mill), as determined in Step 1 of Section 6.2.3	tCO_2e
y	=	Current reporting period (i.e., number of reporting periods completed since project start date)	
n	=	Reporting period (*n* = 1 to *y*)	

6.3 Avoided Conversion Projects

6.3.1 Estimating Baseline Onsite Carbon Stocks

The baseline for Avoided Conversion Projects is a projection of onsite forest carbon stock losses that would have occurred over time due to the conversion of the Project Area to a non-forest land use. Estimating the baseline for Avoided Conversion Projects involves two steps:

1. Characterizing and projecting a baseline
2. Adjusting the baseline based on conversion risk

Step 1 – Characterizing and Projecting the Baseline

Project Operators must characterize and project the baseline by:

1. Clearly specifying an alternative highest-value land use for the Project Area, as identified by an appraisal (required by this protocol). The appraisal must include accompanying documentation that demonstrates the type of anticipated land use conversion is legally permissible. Such documentation must fall into at least one of the following categories:
    a. Documentation indicating that the current land use policies, including zoning and general plan ordinances, and other local and state statutes and regulations, permit the anticipated type of conversion.

b. Documentation indicating that the Project Operator has obtained all necessary approvals from the governing county to convert the Project Area to the proposed type of non-forest land use (including, for instance, certificates of compliance, subdivision approvals, timber conversion permits, other rezoning, major or minor use permits, etc.).
c. Documentation indicating that similarly situated forestlands within the project's Assessment Area were recently able to obtain all necessary approvals from the governing county, state, or other governing agency to convert to a non-forest land use (including, for instance, certificates of compliance, subdivision approvals, timber conversion permits, other rezoning, major or minor use permits, etc.).

2. Estimating the rate of conversion and removal of onsite standing live and dead carbon stocks. The rate of conversion and removal of onsite standing live and dead carbon stocks must be estimated by either:
   a. Referencing planning documentation that has been approved and permitted by the appropriate planning department for the Project Area (e.g., construction documents or plans) that specifies the timeframe of the conversion and intended removal of forest cover on the Project Area; or
   b. In the absence of specific documentation, identifying a default annual conversion rate for carbon in standing live and dead carbon stocks from Table 6.4. The default value is subject to any legal constraints, which must be incorporated in modeling the project's baseline.

Table 6.4. Default Avoided Conversion Rates for Standing Live and Dead Carbon Stocks

Type of Conversion Identified in Appraisal	Total Conversion Impact	Annual Rate of Conversion
	This is the assumed total effect over time of the conversion activity on standing live and dead carbon stocks. (The total conversion impact is amortized over a 10-year period to determine the annual rate of conversion in the next column.)	This is the assumed annual rate of the conversion activity on standing live and dead carbon stocks. The percentages below are multiplied by the initial standing and dead carbon stocks for the project on an annual basis for the first 10 years of the project.
Residential	Estimate using the following formula: TC% = (min(1,(P*3) / PA)) *Where,* TC = % total conversion (TC cannot exceed 100%) PA = the Project Area (acres) identified in the appraisal P = the number of unique parcels that would be formed on the Project Area as identified in the appraisal * Each parcel is assumed to deforest 3 acres of forest vegetation	Estimate using the following formula: ARC = TC / 10 *Where,* ARC = % annual rate of conversion TC = % total conversion
Mining and Agricultural Conversion, including Pasture or Crops	90%	9.0%
Golf Course	80%	8.0%
Commercial Buildings	95%	9.5%

A computer simulation, based on 2a or 2b above, must be conducted to project changes in onsite standing live and dead carbon stocks over 100 years. The computer simulation of the onsite standing live and dead carbon stocks must approximate the identified rate of conversion over time to estimate changes in standing live and dead carbon stocks, beginning with the Project Area's initial onsite standing live and dead carbon stocks. If the projected conversion rate does not result in a complete removal of onsite standing live and dead carbon stocks, the baseline projection must account for any residual forest carbon value as a steady condition for the balance of a 100-year projection. See Figure 6.3 for an example of a projected decline in standing live and dead carbon stocks for a hypothetical project that avoids agricultural conversion, using an appropriate conversion rate from Table 6.5.

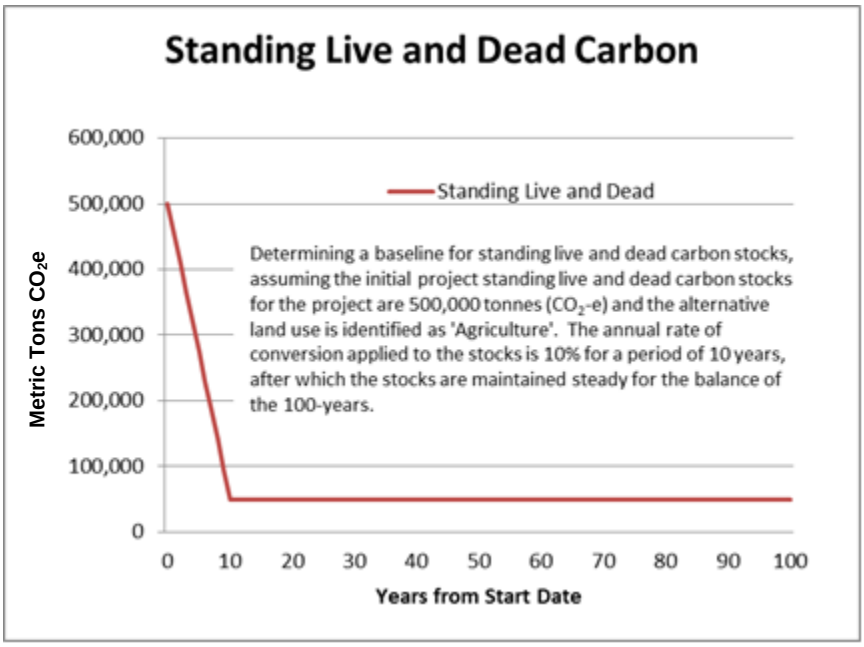


Figure 6.3. Example of an Avoided Conversion Project Baseline for Onsite Standing Live and Dead Carbon Stocks

3. Estimating the rate of soil carbon emissions (optional):
   With the exception of histosols, soil carbon emissions can only be quantified for conversion to agriculture at this time. Soil carbon emissions associated with conversion to residential and commercial are allowed for histosols as well. The amount of soil carbon and the rate of soil carbon emissions are dependent upon the soil type (Order) and the conversion activity. Emissions from soil carbon are estimated by applying the default emissions estimators from Table 6.5 below to the estimates of soil carbon in the Project Area. Table 6.5 provides an estimated percentage emitted as the result of conversion and presents the rate of emissions associated with each soil order.

Table 6.5. Soil Carbon Emissions Estimators by Soil Order

Soil Order		Alfisol	Andisol	Inceptisol	Mollisol	Spodosol	Ultisol	Histosol
Estimated Emissions Associated with Conversion Activity	Agriculture	30%	30%	30%	30%	30%	30%	80%
	Residential/ Commercial/ Industrial	0%	0%	0%	0%	0%	0%	80%
Rate of Estimated Emissions		100% in first 10 years	100% in first 10 years	100% in first 10 years	100% in first 10 years	100% in first 10 years	100% in first 10 years	10% per 10-year period

A weighted estimate of emissions must be conducted where more than one soil order is found in the Project Area.

Table 6.6. Example of the Computation of Weighted Soil Carbon Estimates

Soil Order and Project Acres	Estimated Soil CO_2e (t) per Acre	Rate of Emissions	Total Emissions	Soil Carbon Inventory and Emissions	Project Start Date	10 Years	20 Years	30 Years	40 Years	50 Years	60 Years	70 Years	80 Years	90 Years	100 Years
Histosols 500	285	8% of original inventory estimate every 10 years	80%	CO_2e Metric Tons Total	142,500	131,000	119,700	108,300	96,900	85,500	74,100	62,700	51,300	39,900	28,500
				Decadal Emissions	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	0
Ultisols 500	60	30% of original inventory estimate in first 10 years	30%	CO_2e Metric Tons Total	30,000	21,000	21,000	21,000	21,000	21,000	21,000	21,000	21,000	21,000	21,000
				Decadal Emissions	9,000	0	0	0	0	0	0	0	0	0	0
Totals															
1000	172.5			CO_2e Metric Tons Total	172,500	159,300	147,900	136,500	125,100	113,700	102,300	90,900	79,500	68,100	56,700
				Decadal Emissions	20,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400

The baseline trend of soil carbon stocks must be graphed to display the soil carbon stocks on an annual basis. Annual soil carbon emissions are derived from the decadal soil carbon emissions by dividing by ten. Figure 6.4 displays the baseline trend of soil carbon using the example presented in Table 6.6.

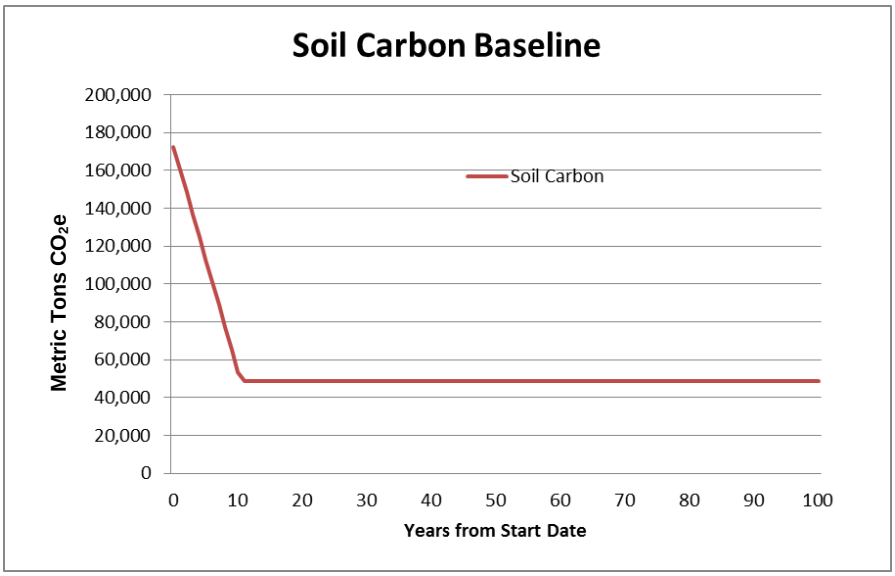


Figure 6.4. Example of an Avoided Conversion Project Baseline for Soil Carbon Stocks

The carbon stock trends for standing live carbon, standing dead carbon, and soil carbon are added together to determine a project baseline for the onsite carbon stocks. Figure 6.5 displays the baseline trend of soil carbon and standing live and dead carbon, using the example data provided above.

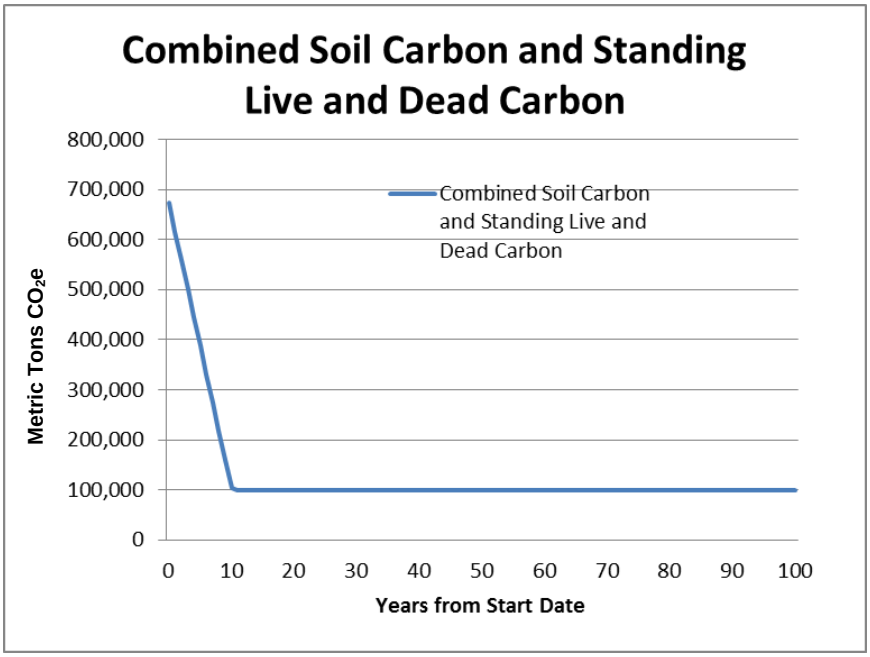


Figure 6.5. Example of an Avoided Conversion Project Baseline for the total Onsite Carbon Stocks

Step 2 – Adjusting the Baseline Based on Conversion Risk

If the fair market value of the anticipated alternative land use for the Project Area (as determined by the required appraisal) is *not more than 80 percent greater* than the value of the current forested land use, then the baseline must be adjusted to reflect uncertainty about the risk of conversion.

Equation 6.11. Conversion Risk Adjustment Factor

If 0.4 < ((VA / VP) – 1) < 0.8, **then** CRA = [80% – ((VA / VP) – 1)] x 2.5
If ((VA / VP) – 1) > 0.8, **then** CRA = 0%
If ((VA / VP) – 1) < 0.4, **then** CRA = 100%

Where,

CRA	=	Conversion Risk Adjustment factor
VA	=	Appraised fair market value of the anticipated alternative land use for the Project Area
VP	=	Appraised fair market value of the current forested land use for the Project Area

The baseline is adjusted by applying the Conversion Risk Adjustment factor to the unadjusted baseline determined in Step 1, using Equation 6.12 below.

Equation 6.12. Adjusted Baseline Onsite Carbon Stocks

$$\boldsymbol{BC_{onsite,y} = BLU_y + (IS - BLU_y) \times CRA}$$

Where,

			Units
$BC_{onsite,\ y}$	=	Adjusted baseline onsite carbon stocks in year y, for each of the 100 years calculated in the project's baseline	tCO_2e
BLU_y	=	Unadjusted baseline onsite carbon stocks in year y, for each of the 100 years calculated in the project's baseline (determine in Step 1, above)	tCO_2e
IS	=	Initial onsite carbon stocks at the project start date	tCO_2e
CRA	=	Conversion Risk Adjustment factor, as described above	%

6.3.2 Estimating Baseline Carbon in Harvested Wood Products

Harvesting is assumed to occur in the baseline over time as the Project Area is converted to another land use. To estimate the baseline carbon transferred to long-term storage in harvested wood products each year:

1. Determine the amount of carbon in standing live carbon stocks (prior to delivery to a mill) that would have been harvested in each year, consistent with the rate of reduction in baseline standing live carbon stocks determined in Section 6.3.1. This projection is determined at the project outset, using the same biomass equations used to calculate biomass in live trees, and will not change over the course of the project.
2. On an annual basis, determine the amount of harvested carbon that would have remained stored in wood products, averaged over 100 years, following the requirements in the Quantification Guidance.

6.3.3 Determining Actual Onsite Carbon Stocks

Actual carbon stocks for Avoided Conversion Projects must be determined by updating the Project Area's forest carbon inventory. This is done by:

1. Incorporating any new forest inventory data obtained during the previous year into the inventory estimate. Any plots sampled during the previous year must be incorporated into the inventory estimate.
2. Using an approved model to "grow" (project forward) prior-year data from existing forest inventory plots to the current reporting year. Approved growth models are identified in the Quantification Guidance. Guidance for projecting forest inventory plot data using models is also provided in the Quantification Guidance.
3. Updating the forest inventory estimate for harvests and/or disturbances that have occurred during the previous year. To allow some flexibility in updating the forest inventory, a project may defer updating a small percentage of plots until the following reporting period, as detailed in the Quantification Guidance.
4. Applying an appropriate confidence deduction for the inventory based on its statistical uncertainty, following the guidance in the Quantification Guidance.

6.3.4 Determining Actual Carbon in Harvested Wood Products

Perform the following steps to determine actual carbon in harvested wood products:

1. Determine the actual amount of carbon in standing live carbon stocks (prior to delivery to a mill) harvested in the current year (based on harvest volumes determined in Section 6.3.2).
2. Determine the amount of actual harvested carbon that will remain stored in wood products, averaged over 100 years, following the requirements in the Quantification Guidance.

6.3.5 Quantifying Secondary Effects

Significant Secondary Effects for Avoided Conversion Projects can arise if the type of land use conversion that would have happened on the Project Area is shifted to other forest land.

To quantify Secondary Effects for Avoided Conversion Projects, Project Operators must quantify Secondary Effect emissions using Equation 6.13. The value for Secondary Effect emissions will always be negative or zero.

Equation 6.13. Secondary Effects Emissions

$$\boldsymbol{SE_y = (-1)\times 3.6\% \times (\Delta AC_{onsite} - \Delta BC_{onsite})}$$ **or 0, whichever is lower**

Where,			Units
SE_y	=	Secondary Effect GHG emissions caused by the project activity in year y (Equation 6.1)	tCO_2e
ΔAC_{onsite}	=	Annual difference in actual onsite carbon as defined in Equation 6.1	tCO_2e
ΔBC_{onsite}	=	Annual difference in baseline onsite carbon as defined in Equation 6.1	tCO_2e

7 Ensuring the Permanence of Credited GHG Reductions and Removals

The Reserve requires that credited GHG reductions and removals be effectively "permanent." 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.

The Reserve ensures the permanence of GHG reductions and removals through three mechanisms:

1. The requirement for all Project Operators to monitor onsite carbon stocks, submit regular monitoring reports, and submit to regular third-party verification of those reports along with periodic verification site visits (as detailed in Sections 7 through 9 of this protocol) for the duration of the Project Life.
2. The requirement for all Project Operators to sign a Project Implementation Agreement with the Reserve, as described in Section 3.6, which obligates Project Operators to retire CRTs to compensate for reversals of GHG reductions and removals.
3. The maintenance of a Buffer Pool to provide insurance against reversals of GHG reductions and removals due to unavoidable causes (including natural disturbances such as fires, pest infestations, or disease outbreaks).

GHG reductions and removals can be "reversed" if the stored carbon associated with them is released (back) to the atmosphere. Many biological and non-biological agents, both natural and human-induced, can cause reversals. Some of these agents cannot completely be controlled (and are therefore "unavoidable"), such as natural agents like fire, insects, and wind. Other agents can be controlled, such as the human activities like land conversion and over-harvesting. Under this protocol, reversals due to controllable agents are considered "avoidable". As described in this section, Project Operators are required to identify and quantify the risk of reversals from different agents based on project-specific circumstances. The resulting risk rating determines the quantity of Climate Reserve Tonnes (CRTs) that the project must contribute to the Reserve Buffer Pool to insure against reversals.

7.1 Definition of a Reversal

Project owners must demonstrate, through annual reporting and periodic site visit verification, that stocks associated with credited GHG reductions and removals are maintained for a period of time considered to be permanent (i.e., 100 years). If the quantified GHG reductions and removals (i.e., QR_y in Equation 6.1) in a given year are negative, and CRTs were issued to the Forest Project in any previous year, the Reserve will consider this to be a reversal regardless of the cause of the decrease. Planned thinning or harvesting activities, for example, may cause a reversal if they result in a negative value for QR_y.

7.2 Insuring Against Reversals

The Reserve requires Project Operators to insure against reversals, based on a project-specific risk evaluation. Currently, insurance must take the form of contributing CRTs to the Buffer Pool administered by the Reserve. In the future, the Reserve anticipates that other insurance instruments may be available to insure against reversals.

7.2.1 About the Buffer Pool

The Buffer Pool is a holding account for Forest Project CRTs, which is administered by the Reserve. All Forest Projects must contribute a percentage of CRTs to the Buffer Pool any time they are issued CRTs for verified GHG reductions and removals. Each Forest Project's contribution is determined by a project-specific risk rating, as described in Section 7.2.2. If a Forest Project experiences an unavoidable reversal of GHG reductions and removals (as defined in Section 7.3), 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). The Buffer Pool therefore acts as a general insurance mechanism against unavoidable reversals for all Forest Projects registered with the Reserve.

7.2.2 Contributions to the Buffer Pool

Each time the Reserve issues CRTs for verified GHG reductions and removals achieved by a Forest Project, a certain percentage of those CRTs must be contributed to the Buffer Pool. The size of the contribution to the Buffer Pool will depend on the Forest Project's risk rating for reversals. For example, if a Forest Project is issued ten CRTs after annual verification, and the project's reversal risk rating is ten percent, then nine CRTs will be issued to the Project Operator's Reserve account and 1 CRT must be deposited in the Buffer Pool.

Project Operators must determine the reversal risk rating for a project by following the requirements and guidance in Appendix A. The risk rating must be determined prior to registration, and recalculated in every year the project undergoes a verification site visit (see Section 9.3.2).

Project Operators who record a Qualified Conservation Easement or Qualified Deed Restriction in conjunction with implementing a Forest Project will receive a lower risk rating (see Appendix A).

Project Operators may be able to reduce the risk rating through actions that lower the risk profile of their project. If a Forest Project's risk rating declines, the Reserve may distribute previously withheld Buffer Pool CRTs to the Project Operator in proportion to the reduced risk. Similarly, however, the Reserve may require additional contributions to the Buffer Pool if the risk rating increases, to ensure that all CRTs (including those issued in prior years) are properly insured.

7.2.3 Other Insurance Options for Reversals

It is the Reserve's expectation that other options to insure against reversals will develop for projects in the future. These options may include direct insurance. Alternative insurance mechanisms could be used to directly reduce the required Buffer Pool contributions for a project. The Reserve must review and approve alternative insurance mechanisms before they may be used.

7.3 Compensating for Reversals

The Reserve requires that all reversals be compensated through the retirement of CRTs. If a reversal associated with a Forest Project was unavoidable (as defined below), then the Reserve will compensate for the reversal on the Project Operator's behalf by retiring CRTs from the Buffer Pool. If a reversal was avoidable (as defined below) then the Project Operator must compensate for the reversal by surrendering CRTs from its Reserve account.

7.3.1 Unavoidable Reversals

An Unavoidable Reversal is any reversal not due to the Project Operator's negligence, gross negligence or willful intent, including wildfires or disease that are not the result of the Project Operator's negligence, gross negligence or willful intent. Requirements for Unavoidable Reversals are as follows:

1. If the Project Operator determines there has been an Unavoidable Reversal, it must notify the Reserve in writing of the Unavoidable Reversal within six months of its occurrence.
2. The Project Operator must explain the nature of the Unavoidable Reversal and provide a verified estimate of onsite carbon stocks so that the reversal can be quantified (in units of CO_2-equivalent metric tons).
    a. Annual monitoring reports submitted for the project must provide observations of ongoing mortality. Based on such observations, an estimate of mortality related to the natural disturbance must be provided. Once mortality has stabilized to background levels, a full verified estimate of the onsite carbon stocks must be submitted to the Reserve, no later than 2 years following the occurrence. Exceptions to this timing may be made if the Reserve agrees that an extension is warranted, for example, if mortality has not stabilized. Observations submitted by the Project Operator are subject to oversight by the Reserve.

If the Reserve determines that there has been an Unavoidable Reversal, it will retire a quantity of CRTs from the Buffer Pool equal to the size of the reversal in CO_2-equivalent metric tons (i.e., QR_y, as specified in Equation 6.1).

7.3.2 Avoidable Reversals

An Avoidable Reversal is any reversal that is due to the Project Operator's negligence, gross negligence, or willful intent, including harvesting, development, and harm to the Project Area due to the Project Operator's negligence, gross-negligence, or willful intent. Requirements for Avoidable Reversals are as follows:

1. If an Avoidable Reversal has been identified during annual monitoring, the Project Operator must give written notice to the Reserve within thirty days of identifying the reversal.
2. Alternatively, if the Reserve determines that an Avoidable Reversal has occurred, it shall deliver written notice to the Project Operator. Within thirty days of receiving the avoidable reversal notice from the Reserve, the Project Operator must provide a written description and explanation of the reversal to the Reserve.
3. Within a year of notifying the Reserve of an Avoidable Reversal or receiving the Avoidable Reversal notice, the Project Operator must provide the Reserve with a verified estimate of current onsite carbon stocks.
4. Within four months of the Reserve's approval of the verified estimate of onsite carbon stocks, the Project Operator must retire a quantity of CRTs from its Reserve account equal to the size of the reversal in CO_2-equivalent metric tons (i.e., QR_y, as specified in Equation 6.1). In addition:
    a. The retired CRTs must be those that were issued to the Forest Project, unless those CRTs were previously retired for other purposes. Otherwise, the retired CRTs must be from other Forest Projects registered with the Reserve.

b. The retired CRTs must be designated in the Reserve's software system as compensating for the Avoidable Reversal.

7.4 Disposition of Forest Projects after a Reversal

If a reversal lowers the Forest Project's actual standing live carbon stocks below its approved baseline standing live carbon stocks, the Forest Project will automatically be terminated, as the original approved baseline for the project would no longer be valid. If the Forest Project is automatically 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 carbon stocks are still above the approved baseline levels, it may continue without termination as long as the reversal has been compensated. The project must continue contributing to the Buffer Pool in future years based on its verified risk rating.

8 Project Monitoring

This section provides requirements and guidance on project monitoring, reporting rules and procedures.

8.1 Project Documentation

Project Operators must provide the following documentation to the Reserve in order to register a forest project.

- Project Submittal form
- KML file
- Project Design Document
- Signed Attestation of Title form
- Signed Attestation of Regulatory Compliance form
- Signed Attestation of Voluntary Implementation form
- Verification Report
- Verification Statement
- Project Implementation Agreement

Project Operators must provide the following documentation each time a Forest Project is verified in order for the Reserve to issue CRTs for quantified GHG reductions.

- Monitoring report
- Calculation worksheet
- Verification Report
- Verification Statement
- Signed Attestation of Title form
- Signed Attestation of Regulatory Compliance form
- Signed Attestation of Voluntary Implementation form (Improved Forest Management projects only)
- Project Implementation Agreement Amendment

Project submittal forms can be found at http://www.climateactionreserve.org/how/program/documents/.

All reports that reference carbon stocks must be submitted with the oversight of a Professional Forester, for jurisdictions with a Professional Forester law or regulation, or a Certified Forester, managed by the Society of American Foresters (see www.certifiedforester.org) so that professional standards and project quality are maintained. Any Professional Forester or Certified Forester preparing a project in an unfamiliar jurisdiction must consult with a Professional Forester or Certified Forester practicing forestry in that jurisdiction to understand all laws and regulations that govern forest practice within the jurisdiction. The Reserve may evaluate and approve alternative certification credentials if requested, but only for jurisdictions where professional forester laws or regulations do not exist. This requirement does not preclude the project's use of technicians or other unlicensed/uncertified persons working under the supervision of the Professional Forester.

All projects shall submit a KML file depicting the Project Area that matches the maps submitted to depict the Project Area. The project's reported acres shall be calculated in accordance with

the requirements in Section 4.1. The Reserve will create a file of all verified forest carbon projects on Google Maps for public dissemination.

8.1.1 Forest Project Design Document

The forest Project Design Document (PDD) is a required document for reporting information about a project. The document is submitted at the initial verification. A PDD template has been prepared by the Reserve and is available on the Reserve's website. The template is arranged to assist in ensuring that all requirements of the FPP are addressed. The template is required to be used by all projects. The template is designed to manage the varying requirements based on project type.

Each project must submit a PDD at the project's first verification. The Project Operator must include a general description of the methodology that will be incorporated by the Project Operator to update their inventory estimates on an annual basis per guidance in the Quantification Guidance on the FPP webpage for the reported carbon pools.

PDDs are intended to serve as the main project document that thoroughly describes how the project meets eligibility requirements, discusses the quantification methodologies utilized to generate project estimates, outlines how the project complies with terms for additionality and describes methods for updating inventory estimates and how permanence will be addressed, including how project reversal risks are calculated. All methodologies used by Project Operators and descriptions in the PDD must be clear in a way that facilitates review by verifiers, Reserve staff, and the public. PDDs must be of professional quality and free of incorrect citations, missing pages, incorrect project references, etc.

8.2 Monitoring Report

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 reductions or removals achieved by a project have not been reversed. Project Operators must conduct monitoring activities and submit monitoring reports according to the schedule and requirements presented in Section 8.3. Monitoring is required for a period of 100 years following the final issuance of CRTs to a project for quantified GHG reductions or removals.

For Forest Projects, monitoring activities consist primarily of updating a project's forest carbon inventory, entering the updated inventory into the Forest Project's Calculation Worksheet, and submitting it to the Reserve at frequencies defined in Section 8.3. CRTs are only issued in years that the project data are verified, as described in Section 9.

A monitoring report must be prepared for each Reporting Period. Monitoring reports must be provided to verification bodies whenever a Forest Project undergoes verification. In addition, monitoring reports must be provided to the Reserve upon the completion of any Reporting Period for which verification will be deferred (e.g., if the Project Operator foregoes a desk-review verification). All monitoring reports are due within 12 months of the end of the Reporting Period. Monitoring reports must include an update of the project's calculation worksheet. The project's calculation worksheet includes:[18]

[18] Reforestation Projects, as described in Section 6.1, can defer the items that are marked with an asterisk until the second site visit verification.

1. An updated estimate of the current year's carbon stocks in the reported carbon pools. Specific methods used to update the forest inventory must follow the inventory methodology approved at the time the project is registered. Modifications to inventory methodologies must be approved in advance by the Reserve. Any changes in inventory estimates associated with the use of the modified inventory methodology will need to be reconciled with previously verified project inventory estimates and baseline projections. The updated estimate of carbon stocks is determined by:
    a. Including any new forest inventory data obtained during the Reporting Period.
    b. *Applying growth estimates to existing inventory.
    c. Updating inventory estimates for harvest and/or disturbances that have occurred during the Reporting Period.
2. *The appropriate confidence deduction for the forest carbon inventory, as determined at the last full site visit verification for the project (following the Quantification Guidance). The same confidence deduction must be used in interim years between verification site visits.
3. *An estimate of current-year harvest volumes and associated carbon in harvested wood products.
4. *Estimated mill efficiency, as determined following the Quantification Guidance.
5. *The baseline carbon stock estimates for all required and optional carbon pools for the current year, as determined following the requirements in Section 6 and approved at the time of the project's registration.
6. An estimate of Secondary Effects, following calculation steps and/or factors provided in Section 6 and approved at the time of the project's registration.
7. The uncertainty discount for Avoided Conversion Projects, as determined following the requirements of Section 6.3 and approved at project registration. (Once a project is registered with the Reserve, the uncertainty discount does not change.)
8. *A preliminary calculation of total net GHG reductions and removals (or reversals) for the year, following the requirements in Section 6.
9. *The project's reversal risk rating, as determined following the requirements in Section 7 and Appendix A. The risk rating is updated during each full site visit verification. Between verification site visits, the project's reversal risk rating does not change.
10. *A preliminary calculation of the project's Buffer Pool contribution.

In addition to data reported using the project calculation worksheet, the following must be submitted to the Reserve as part of a monitoring report.

For each Reporting Period:

1. A description of how the project meets (or will meet) the definition of Natural Forest Management (refer to Section 3.9.2), including progress on criteria that have not been fully met in previous years.

Conditional reporting, as pertinent:

1. *An explanation for any decrease over any ten-year consecutive period in the standing live carbon pool.

2. Any changes in the status of the Project Operator including, if applicable per Section 3.9.1, the acquisition of new forest landholdings.
3. If a reversal has occurred during the previous year, the report must provide a written description and explanation of the reversal, whether the Reserve classified the reversal as Avoidable or Unavoidable, and the status of compensation for the reversal.

8.3 Reporting and Verification Cycle

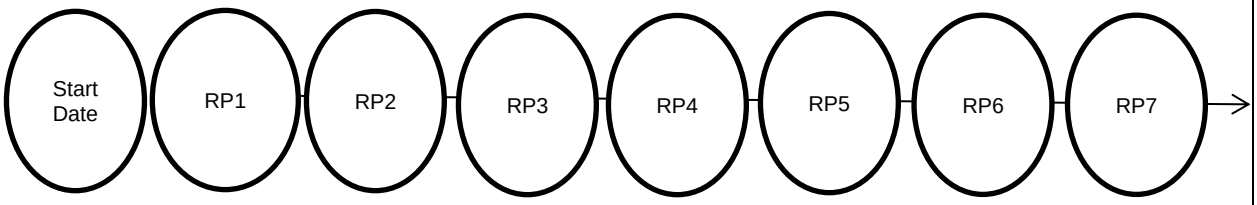
A Forest Project is considered automatically terminated (see Section 3.5) if the Project Operator chooses not to report data and undergo verification at required intervals.

8.3.1 Reporting Period Duration and Cycle

A Reporting Period is a discrete period of time for which a Project Operator quantifies and reports GHG reductions and removals, as well as required project data to the Reserve. The initial Reporting Period may cover any length of time, up to one year. Reporting Periods subsequent to the initial Reporting Period must cover 12 months of project activity. Harvested Wood Products should not be reported as of the project start date. Figure 8.1 displays the Reporting Periods in graphical form.

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.

Forest Reporting Period Schedule



Reporting Period	Project Start Date	1	2	3	4	5	6	7
Time from last report date	N/A	As desired to establish a reporting cycle (up to 1 year in length)	1 year	1 year	1 year	1 year	1 year	1 year
Site Visit Verification Required?	N/A	Yes	No[19]	No	No	No	No	Yes

Figure 8.1. Forest Project Reporting Schedule

8.3.2 Verification Cycle

All Forest Projects must be initially verified within 30 months of being submitted to the Reserve. The initial verification of all project types must include a site visit, confirm the project's eligibility, and confirm that the project's initial inventory and the baseline have been established in conformance with the FPP. Subsequent verification may include multiple Reporting Periods and is referred to as the "Verification Period." The end date of any Verification Period must correspond to the end date of a Reporting Period.

[19] A site visit verification may be required earlier, if the Project Operator chooses to establish a new confidence deduction or reversal risk rating.

Verification is required at specific intervals to ensure that ongoing monitoring of forest carbon stocks, inventory confidence, and risk ratings are accurate and up to date. Optional verification is at the Project Operator's discretion and may be conducted between required verifications for crediting (non-aggregated projects), to adjust the project's confidence estimate and/or risk ratings, among other rationale, based on changed management circumstances. The schedule of required verification is dependent upon the project type and whether the project is aggregated or non-aggregated. Details of verification scheduling requirements are provided in Sections 8.3.2.1 and 8.3.2.2.

Verification must be completed 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.

8.3.2.1 Minimum Required Site Visit Verification Schedule

Non-Aggregated Projects

Except as allowed for the second verification of Reforestation Projects, the Reserve requires that an approved third-party verification body verify all reported data and information for a Forest Project and conduct a site visit for the Verification Period that follows the end of every sixth reporting period following the initial Reporting Period. Site visit verifications are also required any time the Project Operator would like to establish new confidence deductions and/or reversal risk ratings. See Figure 8.1 above for an example of the verification schedule.

For Reforestation Projects, the second verification may be deferred indefinitely beyond end of the sixth reporting period at the discretion of the Project Operator. If deferred, the second verification must be a site visit verification.

Aggregated Projects

Site visit verifications must be conducted on a schedule such that at all times a minimum of 50 percent of the projects in the aggregate (rounding up in the case of an uneven number of projects) have successfully completed a site visit verification within the 12-month time allowance for the previous six years of reporting periods, and that 100 percent of the projects have successfully completed a site visit verification within the 12-month time allowed for the previous 12 years of Reporting Periods. These verification requirements are mandatory regardless of the mix of entry dates represented by the group of projects in the aggregate. The initial site visit verification required for entry into the aggregate may count to meet these site verification obligations.

A site visit verification is required to make an adjustment to the sampling error for a project. However, the confidence deduction may change without a site visit verification for the project if a new project is added to an aggregate, as this will result in a change to the target sampling error for all projects in the aggregate.

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 projects those projects that will have scheduled site visit verifications in order to meet these obligations. The process should utilize

random selection to the degree possible and still meet the six- and 12-year completion requirements. For example, in the case where there are ten projects that joined the aggregate in the first year, five of those projects should be chosen randomly and complete a site visit verification within 12 months following the sixth reporting period. The site visit verifications may be spread out through each six-year interval or scheduled in a more concentrated manner that economizes on verification expenses. Project Operators may be notified of a site visit verification prior to the year in which the verification is to take place.

The only exception is when a second site visit verification for a Reforestation Project is deferred for more than six reporting periods (see Section 6.1.1). In this case, the calculation of the percentages for meeting the six-year and 12-year minimums may be made by excluding the deferred Reforestation Projects from the totals. After the second site visit verification for a Reforestation Project, this exception is no longer allowed.

8.3.2.2 Desk Review Verification

Non-Aggregated Projects

In between site visit verifications, the Project Operator may choose to have an approved third-party verification body conduct a desk review of annual monitoring reports as an optional verification. CRTs may be issued for GHG reductions/removals verified through such desk reviews. Adjustments may not be made to inventory confidence deductions and/or risk ratings as part of the optional verification. Submission of annual monitoring reports to the Reserve is required even if the Project Operator chooses to forego desk review verification.

Desk review verifications are not permitted for Reforestation Projects between the initial and second site visit verifications if the Project Operator has opted to defer the second verification.

Aggregated Projects

Between site visit verifications, each Project Operator must submit annual project monitoring reports. Verification bodies must annually audit a sample of the annual monitoring reports, equivalent to the square root of the total number of participating projects in the aggregate, or the total number of participating projects divided by 12, whichever is higher (when rounded to the next highest whole number). As an example, an aggregate with 16 projects must have four project monitoring reports verified in a given year. Audited projects must be selected randomly, and must not include projects undergoing site visit verification for the year. Project Operators will not know when their annual monitoring reports will require verification. Since this is a random process, a Project Operator may have the annual report verified in consecutive years or when the project is verified with a required site visit.

Successful verification of a representative sample results in the crediting of all projects participating in the entire aggregate. If verification for a participating project is unsuccessful, the verification body must verify additional participating projects until the total number of successful verifications reaches the required number (as described above). If the required number of successful verifications has not been achieved within 12 months after the date the verification body submits a negative Verification Statement and Report to the Reserve for a project in the aggregate, crediting of all the participant projects in the aggregate will be suspended until the required number of successful verifications has been achieved. If material issues arise during verification of a participant project, the Project Operator will need to independently address the issues and required corrective actions using the same process taken with standalone projects.

The Reserve will not issue CRTs for a project in an aggregate that has an unsuccessful verification. As with other projects, if the project is not successfully verified within 12 months, the project account is suspended. If a participating project is not successfully verified within 36 months of a negative Verification Statement, the project will be automatically terminated.

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

Desk review verifications are not permitted for Reforestation Projects between the initial and second site visit verifications if the Project Operator has opted to defer the second verification.

8.3.3 Issuance and Vintage of CRTs

The Reserve will issue Climate Reserve Tonnes (CRTs) for quantified GHG reductions and removals that have been verified through either site visits, desk reviews, or in an aggregate through the aggregated method of site visits and desk reviews described above. A site visit verification may determine that earlier desk reviews overestimated onsite carbon stocks. A net downward adjustment to carbon stock estimates will be treated as a reversal (see Section 7.1). In this case, the Project Operator must retire CRTs in accordance with the requirements for compensating for a reversal (Section 7.3).

Reforestation Projects for which an initial inventory is deferred are not eligible to receive CRTs until after the second site visit verification.

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

8.4 Record Keeping

For purposes of independent verification and historical documentation, Project Operators are required to keep all documents and forms related to the project for a minimum of 100 years after the final issuance of CRTs from the Reserve. This information may be requested by the verification body or the Reserve at any time.

8.5 Transparency

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

9 Verification Guidance

This section provides guidance to Reserve-approved verification bodies for verifying GHG emission reductions associated with a planned set of activities to remove, reduce or prevent CO_2 emissions in the atmosphere by conserving and/or increasing forest carbon stocks.

This section supplements the Reserve's Verification Program Manual,[20] which provides verification bodies with the general requirements for a standardized approach for independent and rigorous verification of GHG emission reductions and 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.

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

1. Forest Project Protocol (this document)
2. Reserve 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 Forest Project verification bodies are eligible to verify Forest Project reports. To become a recognized Forest Project verifier, verification bodies must become accredited under ISO 14065. Information on the accreditation process can be found on the Reserve website at http://www.climateactionreserve.org/how/verification/how-to-become-a-verifier/.

The verification of reports that reference carbon stocks must be conducted with the oversight of a Professional Forester, for jurisdictions with a Professional Forester law or regulation, or a Certified Forester,[21] managed by the Society of American Foresters, so that professional standards and project quality are maintained. Any Professional Forester or Certified Forester verifying a project in an unfamiliar jurisdiction must consult with a Professional Forester or Certified Forester practicing forestry in that jurisdiction to understand all laws and regulations that govern forest practice within the jurisdiction. The Reserve may evaluate and approve alternative certification credentials if requested, but only for jurisdictions where professional forester laws or regulations do not exist.

9.1 Standard of Verification

The Reserve's standard of verification for Forest Projects is the Forest Project Protocol (FPP), the Reserve Program Manual, and the Reserve Verification Program Manual. To verify a land owner's initial Forest Project Design Document and annual monitoring reports, verification

[20] Found on the Reserve website at http://www.climateactionreserve.org/how/program/program-manual/.
[21] See www.certifiedforester.org.

bodies apply the verification guidance in the Reserve's Verification Program Manual and this section of the FPP to the requirements and guidance described in Sections 2 through 8 of the FPP.

This section of the protocol provides requirements and guidance for the verification of projects associated with the three Forest Project types defined in Section 2, i.e., Reforestation Projects, Improved Forest Management Projects, and Avoided Conversion Projects. All three project types involve planned activities that result in conserving and/or increasing forest carbon stocks. This section describes the core verification activities and criteria for each of the three Forest Project types that are necessary for a verification body to provide a reasonable level of assurance that the GHG removals or reductions quantified and reported by Project Operators 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 Project Operator to the Reserve addresses each requirement in the FPP, Sections 2 through 8. Project reporting is deemed accurate and correct if the Project Operator is in compliance with the Section 2 through 8.

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 at http://www.climateactionreserve.org/how/program/program-manual/.

9.2 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 5.1, Table 5.2, and Table 5.3 in Section 5 provide comprehensive lists of all GHG sources, sinks, and reservoirs that must be included in the quantification and reporting of GHG reductions and removals for the three Forest Project types.

It is the Project Operator's responsibility to ensure that verifications are conducted according to the minimum required schedule specified in Section 8.3.2. A Verification Report, List of Findings, and Verification Statement must be submitted within twelve months of the end of any verification period. Site visit verification requirements are described in Section 9.3.2. Desk review verification requirements are described in Section 9.3.3.

9.3 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 verification involving a site visit, or an optional annual verification involving a desk review. Both the initial verification and ongoing verifications must include review of the criteria for Natural Forest Management, inventory of onsite carbon stocks, assessment of carbon in harvested wood products, and review of reversal risk ratings. The following sections contain guidance for all of these verification activities.

9.3.1 Initial Verification

Initial verification includes verification that the Forest Project has met the FPP criteria and requirements for eligibility, Project Area definition, modeling baseline onsite carbon stocks, and calculating baseline carbon in harvested wood products. The initial verification must include a site visit. The verification body must assess and ensure the completeness and accuracy of all

required reporting elements for the Forest Project Design Document (Section 8.1.1). Initial verification items are presented in Table 9.1A through 9.1K.

At a Forest Project's initial verification, these items must be verified in addition to all the items required for a standard site visit verification, as detailed in Section 9.3.2.

9.3.1.1 Initial Eligibility

Verification bodies are required to affirm the project's eligibility according to the rules in this protocol. Tables 9.1A, 9.1B, and 9.1C provide the initial verification items concerning eligibility for the three different Forest Project types and include references to sections of this protocol where requirements are further specified.

Table 9.1A. Initial Eligibility Verification Items – Reforestation Projects

Verification Items		Supporting Documentation /Review Process	Section of FPP	Apply Professional Judgment?
1. Project Definition	a. Evidence exists of canopy cover < 10% for 10 years, or b. Evidence of significant disturbance provided. c. Project has demonstrated no consideration of commercial activities. d. No evidence exists for use of broadcast fertilization.	Addressed in PDD	2.1.1	Yes
2. Legal Requirement Test	Proof that a signed Attestation of Voluntary Implementation form is on file with the Reserve.	Consultation with Reserve	3.3.1.1	No
3. Performance Test	a. Reforestation Project that meets 1.a, or b. Meets 1.b and shows that the Forest Project corresponds to an "eligible" scenario in Appendix B, or c. Shows that the project occurs on a type of land for which the Project Operator has not historically engaged in or allowed timber harvesting.	Addressed in PDD	3.3.2.1, Appendix B	Yes (for 3.c)
4. Start Date	Identification of the date on which tree planting occurred or will occur, site preparation for the planting of trees occurred or will occur, or removal of impediments to natural regeneration occurred or will occur (whichever was or will occur first).	Addressed in PDD	3.2	No
5. Project Implementation Agreement	Proof that a Project Implementation Agreement (PIA) between the Project Operator and the Reserve has been signed and recorded in the county of interest.	Consultation with Reserve	3.6	No

6. Project Location	a. Project is in the United States of America or one of the Territories (Reforestation and Avoided Conversion only). b. Project is on private land, or c. If non-federal public lands, provide documentation showing approval by the government agency or agencies responsible, or d. If tribal land, provide documentation that demonstrates that the land within the Project Area is owned by a tribe or private entities.	Address in PDD	3.1	No

Table 9.1B. Initial Eligibility Verification Items – Improved Forest Management Projects

Verification Items		Section of FPP	Apply Professional Judgment?
1. Project Definition	a. Evidence is provided indicating the canopy cover exceeds 10%. b. No evidence exists for use of broadcast fertilization.	2.1.2	Yes (for 1.b)
2. Legal Requirement Test	Proof that a signed Attestation of Voluntary Implementation form is on file with the Reserve.	3.3.1.2	No
3. Start Date	Identification of a discrete, verifiable action that delineates a change in practice relative to the project's baseline.	3.2	No
4. Project Implementation Agreement	Proof that a Project Implementation Agreement (PIA) between the Project Operator and the Reserve has been signed and recorded in the county of interest.	3.6	No
5. Project Location	a. Project is located in the United States of America. b. Project is on private land, or c. If non-federal public lands, provide documentation showing approval by the government agency or agencies responsible, or d. If tribal land, provide documentation that demonstrates that the land within the Project Area is owned by a tribe or private entities.	3.1	No

Table 9.1C. Initial Eligibility Verification Items – Avoided Conversion Projects

Verification Items		Section of FPP	Apply Professional Judgment?
1. Project Definition	a. Proof that the project is/was on private land prior to project initiation. b. Proof that a conservation easement was recorded, or the land was transferred to public ownership. c. Demonstration that conversion out of forest is a significant risk (following the requirements of Section 6.3.1 – see also Table 9.1H). d. No evidence exists for use of broadcast fertilization.	2.1.3, 6.3.1	Yes (for 1.c and 1.d)
2. Legal Requirement Test	a. Proof that a signed Attestation of Voluntary Implementation form is on file with the Reserve. b. Documentation has been provided that demonstrates that the type of land use conversion anticipated by the project is legally permissible; documentation must fall into at least one of the three categories specified in Section 3.3.1.3.	3.3.1.3	No
3. Performance Test	Copy of real estate appraisal for the Project Area indicating conformance to criteria in Section 3.3.2.3.	3.3.2.3	No
4. Start Date	Identification of date on which a conservation easement that dedicates the Project Area to continuous forest cover was recorded or the Project Area was transferred to public ownership.	3.2, 3.7	No
5. Project Implementation Agreement	Proof that a Project Implementation Agreement (PIA) between the Project Operator and the Reserve has been signed and recorded in the county of interest.	3.6	No
6. Project Location	a. Project is located in the United States of America. b. Project is on private land, or c. If non-federal public lands, provide documentation showing approval by the government agency or agencies responsible, or d. If tribal land, provide documentation that demonstrates that the land within the Project Area is owned by a tribe or private entities.	3.1	No

9.3.1.2 Project Area Definition

Verification bodies are required to review the geographic boundaries defining the Project Area and their compliance with the requirements outlined in Section 4 of this protocol. These items are verified only at the project's initiation.

Table 9.1D. Project Area Definition Verification Items

Project Type	Verification Items	Section of FPP	Apply Professional Judgment?
1. All	Proof that a description, shapefile, and maps of the geographic boundaries defining the Project Area are on file at the Reserve. For Reforestation projects, the initial Project Area may be provisional until the second site visit verification in cases where the inventory has been deferred.	4, 8.1	No
2. Avoided Conversion	Project Area has been defined following the guidance in Section 4, Table 4.1 for the appropriate conversion type.	4	No

9.3.1.3 Modeling Baseline Onsite Carbon Stocks

Verification bodies are required to confirm that the Project Operator has developed a baseline characterization for onsite carbon stocks according to the requirements in this protocol. These items are verified only at the project's initiation.

Table 9.1E. Baseline Modeling Verification Items – Reforestation Projects

Verification Items		Section of FPP	Apply Professional Judgment?
1. Qualitative Characterization	Clear qualitative characterization of vegetative conditions and activities that would have occurred without the project.	6.1.1	Yes
2. Inventory of Onsite Carbon Stocks	a. An inventory of the Project Area's carbon stocks in required and optional pools has been conducted in accordance with the requirements and the Quantification Guidance (see Section 9.3.5 for further verification guidance). b. The inventory of carbon stocks has been deferred until the second site visit verification.	6.1.1, Quantification Guidance	Yes
3. Baseline Carbon Stock Modeling	a. A computer simulation has been conducted that models the carbon stocks in accordance with the requirements and guidance in Section 6.1.1 and the Quantification Guidance (see Section 9.3.7 for further verification guidance), or b. The computer simulation has been deferred until the project's second site visit verification.	6, 6.1.1, Quantification Guidance	Yes
4. Description of Forest Project Activities	A description has been provided of the management activities that will lead to increased carbon stocks in the Project Area compared to the baseline.	2	No

Table 9.1F. Baseline Modeling Verification Items – Improved Forest Management Projects – Private Lands

Verification Items		Section of FPP	Apply Professional Judgment?
1. Inventory of Onsite Carbon Stocks	An inventory of the Project Area's carbon stocks in required and optional pools has been conducted in accordance with the requirements and the Quantification Guidance (see Section 9.3.5 for further verification guidance).	6.2.1, Quantification Guidance	Yes
2. Compare Initial Aboveground Standing Live Carbon Stocks with the Minimum Baseline Level	a. The baseline analysis utilizes the correct value for Common Practice and the Minimum Baseline Level (for aboveground standing live carbon stocks) associated with the Assessment Area(s) covered the Project Area. b. Initial aboveground standing live carbon stocks have been estimated correctly following the requirements and the Quantification Guidance.	6.2.1, Determining Common Practice on the Assessment Area Data webpage, Quantification Guidance	No
3. Baseline Carbon Stock Modeling	A 100-year forest management simulation of standing live carbon stocks has been conducted in accordance with the requirements and guidance in Section 6.2.1 and the Quantification Guidance (see Section 9.3.7 for further verification guidance).	6.2.1, Quantification Guidance	Yes
4. Description of Forest Project Activities	A description has been provided of the management activities that will lead to increased carbon stocks in the Project Area compared to the baseline.	2	No

Table 9.1G. Baseline Modeling Verification Items – Improved Forest Management Projects – Public Lands

Verification Items		Section of FPP	Apply Professional Judgment?
1. Initial Forest Carbon Stock Inventory	An inventory of the Project Area's carbon stocks in required and optional pools has been conducted in accordance with the requirements and the Quantification Guidance (see Section 9.3.5 for further verification guidance).	6.2.2, Quantification Guidance	Yes
2. Baseline Carbon Stock Modeling	A 100-year forest management simulation of standing live carbon stocks has been conducted per the requirements in Section 6.2.2 and the Quantification Guidance (see Section 9.3.7 for further verification guidance).	6.2.2, Quantification Guidance	Yes
3. Description of Forest Project Activities	A description has been provided of the management activities that will lead to increased carbon stocks in the Project Area compared to the baseline.	2	No

Table 9.1H. Baseline Modeling Verification Items – Avoided Conversion Projects

Verification Items		Section of FPP	Apply Professional Judgment?
1. Initial Forest Carbon Stock Inventory	An inventory of the Project Area's carbon stocks in required and optional pools has been conducted in accordance with the requirements and the Quantification Guidance (see Section 9.3.5 for further verification guidance).	6.3.1, Quantification Guidance	Yes
2. Baseline Carbon Stock Modeling	a. An alternative highest-value land use for the Project Area has been clearly identified by the required appraisal. b. The rate of conversion and removal of onsite forest carbon stocks has been appropriately estimated in accordance with the requirements of Section 6.3.1, Step 1. c. A 100-year forest management simulation of standing live carbon stocks has been conducted per the requirements in Section 6.3.1, Step 1, and the Quantification Guidance (see Section 9.3.7 for further verification guidance).	3.3.2.3, 6.3.1	Yes
3. Discount for the Uncertainty of Conversion Probability	The Avoided Conversion Discount factor has been correctly calculated per Equation 6.6 in Section 6.3.1, Step 2.	3.3.2.3, 6.3.1	No
4. Description of Forest Project Activities	A description has been provided of the management activities that will lead to increased carbon stocks in the Project Area compared to the baseline.	2	No

9.3.1.4 Calculating Baseline Carbon in Harvested Wood Products

Verification bodies are required to confirm that the Project Operator has developed a baseline characterization for carbon in harvested wood products according to the requirements of this protocol and requirements and guidance in Section 6.2.1, Section 6.2.2, or Section 6.3.2, and the Quantification Guidance.

Table 9.1I. Baseline Carbon in Wood Products Verification Items – Reforestation Projects

Verification Items		Section of FPP	Apply Professional Judgment?
1. Baseline Harvest Volume	If harvesting of any pre-existing trees would be expected to occur in the baseline, the *average* volume of harvesting in each year of the baseline over 100 years has been determined per the requirements and guidance in Section 6.1.2, the Quantification Guidance (see Section 9.3.8 for further verification guidance).	6.1.2, Quantification Guidance	No
2. Long-Term Storage in Wood Products	The average amount of carbon expected to be transferred to wood products each year and stored over the long-term (100 years) has been calculated following the requirements and	6.1.2, Quantification Guidance	No

	guidance of Section 6.1.2 and the Quantification Guidance (see Section 9.3.8 for further verification guidance).		

Table 9.1J. Baseline Carbon in Wood Products Verification Items – Improved Forest Management Projects

Verification Items		Section of FPP	Apply Professional Judgment?
1. Baseline Harvest Volume	The *average* volume of harvesting in each year of the baseline over 100 years has been derived from the growth and harvesting regime used to develop the baseline for onsite carbon stocks, following the requirements and guidance in Section 6.2.1 or 6.2.2, Section 6.2.3, the Quantification Guidance (see Section 9.3.8 for further verification guidance).	6.2.1, 6.2.2, 6.2.3, Quantification Guidance	No
2. Long-Term Storage in Wood Products	The average amount of carbon expected to be transferred to wood products each year and stored over the long-term (100 years) has been calculated following the requirements and guidance of Section 6.2.3 and the Quantification Guidance (see Section 9.3.8 for further verification guidance).	6.2.3, Quantification Guidance	No

Table 9.1K. Baseline Carbon in Wood Products Verification Items – Avoided Conversion Projects

Verification Items		Section of FPP	Apply Professional Judgment?
1. Baseline Harvest Volume	The volume of harvesting in each year of the baseline over 100 years has been derived from the harvesting regime assumed for the baseline for onsite carbon stocks, following the requirements and guidance in Section 6.3.2, the Quantification Guidance (see Section 9.3.8 for further verification guidance).	6.3.2, Quantification Guidance	No
2. Long-Term Storage in Wood Products	The amount of harvested wood that would be delivered to mills in each year has been determined, and the amount of carbon expected to be transferred to wood products each year and stored over the long-term (100 years) has been calculated following the requirements and guidance of Section 6.3.2 and the Quantification Guidance (see Section 9.3.8 for further verification guidance).	6.3.2, Quantification Guidance	No

9.3.2 Site Visit Verification

Site visit verification involves review of the Forest Project's carbon stock inventory estimates, relevant attestations, soil carbon emissions associated with management activities, risk of reversal ratings, and compliance with Natural Forest Management criteria. After a Forest Project's initial verification, subsequent site visits must assess and ensure accuracy in measurement and monitoring techniques and onsite record keeping practices.

Table 9.2. Site Visit Verification Items

Verification Items		Section of FPP	Apply Professional Judgment?
1. Attestation of Title	Proof that a signed Attestation of Title is on file at the Reserve for the dates of the verification period. In addition to reviewing this form, the verification body must conduct a review to confirm ownership and claims to GHG reductions/removals that have occurred over the verification period.	3.7	Yes
2. Attestation of Regulatory Compliance	Proof that a signed Attestation of Regulatory Compliance form is on file with the Reserve for the reporting period. In addition to reviewing this form, the verification body must perform a risk-based assessment to confirm the statements made by the Project Operator in the Attestation of Regulatory Compliance form.	3.8	Yes
3. Attestation of Voluntary Implementation	Proof that a signed Attestation of Voluntary Implementation form is on file with the Reserve for the reporting period. Required for every reporting period for Improved Forest Management projects, and for initial reporting periods only for Reforestation and Avoided Conversion projects.	3.3	No
4. Sustainable Harvesting Practices	a. Commercial harvesting has not commenced within the Project Area, or b. At the time commercial harvesting is initiated within the Project Area, the Project Operator meets sustainable harvest practices on all of its landholdings, as described in Section 3.9.1.	3.9.1	No
5. Change in Project Operator Landholdings	If the Project Operator has acquired additional forestlands outside of the Project Area, the Project Operator must incorporate the newly acquired land in their demonstration of sustainable long-term harvesting practices within 5 years of the acquisition.	3.9.1	No
6. Maintenance of Standing Live Carbon Pool	No decrease has occurred in the Project Area's standing live carbon stocks over any ten-year consecutive period not accounted for by allowable exceptions.	3.9.3	No
7. Natural Forest Management	Natural Forest Management eligibility criteria in Section 3.9.2 have been and continue to be met (see Section 9.3.4 for further verification guidance).	3.9.2	Yes
8. Estimates of Actual Onsite Carbon Stocks	a. An inventory of the Project Area's carbon stocks in required and optional pools has been conducted in accordance with the requirements in Section 6 and the requirements and guidance in the Quantification Guidance (see Section 9.3.5 for further verification guidance), or b. Inventory has been deferred until the second site visit verification for Reforestation Projects.	6.1.3, 6.2.4, 6.3.3, Quantification Guidance	Yes

Verification Items		Section of FPP	Apply Professional Judgment?
9. Estimates of Actual Carbon in Harvested Wood Products	The amount of harvested wood that has been delivered to mills over the reporting period has been determined correctly, and the amount of carbon expected to be transferred to wood products and stored over the long-term (100 years) has been calculated correctly, per the requirements in Section 6 and the requirements and the Quantification Guidance (see Section 9.3.8 for further verification guidance).	6.1.4, 6.2.5, 6.3.4, Quantification Guidance	No
10. Quantification of Primary Effect	Calculations for the Primary Effect are complete and accurate for both onsite carbon stocks and harvested wood products.	6	No
11. Quantification of Secondary Effects	Calculations for quantifying Secondary Effects are complete and accurate.	6.1.5, 6.2.6, 6.3.5	No
12. Reversal Determination	If a reversal has occurred, the type of reversal (avoidable or unavoidable) has been properly identified.	7.3	Yes
13. Reversal Risk Rating	Project's risk rating has been calculated following the requirements of Appendix A	Appendix A	No

9.3.3 Desk Review Verification

For reporting periods in between required site visits, project verification activities may consist of a desk review. During a desk review, the verification body will review the data in annual monitoring reports to check calculations and information for reasonability, accuracy, and completeness.

Table 9.3. Desk Review Verification Items

Verification Items		Section of FPP	Apply Professional Judgment?
1. Attestation of Title	Proof that a signed Attestation of Title is on file at the Reserve for the dates of the verification period. In addition to reviewing this form, the verification body must conduct a review to confirm ownership and claims to GHG reductions/removals that have occurred over the verification period.	3.7	Yes
2. Attestation of Regulatory Compliance	Proof that a signed Attestation of Regulatory Compliance form is on file with the Reserve for the reporting period. In addition to reviewing this form, the verification body must perform a risk-based assessment to confirm the statements	3.8	Yes

Verification Items		Section of FPP	Apply Professional Judgment?
	made by the Project Operator in the Attestation of Regulatory Compliance form.		
3. Attestation of Voluntary Implementation	Proof that a signed Attestation of Voluntary Implementation form is on file with the Reserve for the reporting period. Required for every reporting period for Improved Forest Management projects, and for initial reporting periods only for Reforestation and Avoided Conversion projects.	3.3	No
4. Maintenance of Standing Live Carbon Pool	No decrease has occurred in the Project Area's standing live carbon stocks over any ten-year consecutive period not accounted for by allowable exceptions.	3.9.3	No
5. Estimates of Actual Onsite Carbon Stocks	Reported onsite carbon stocks are within expected bounds given reported harvest, growth, and disturbance effects since the prior reporting period.	6.1.3, 6.2.4, 6.3.3, Quantification Guidance	Yes
6. Estimates of Actual Carbon in Harvested Wood Products	The reported amount of wood that has been delivered to mills over the reporting period is consistent with reported harvest levels, and the amount of carbon expected to be transferred to wood products and stored over the long-term (100 years) has been calculated correctly, per the requirements in Section 6 and the requirements and the Quantification Guidance (see Section 9.3.8 for further verification guidance).	6.1.4, 6.2.5, 6.3.4, Quantification Guidance	Yes
7. Quantification of Primary Effect	Calculations for the Primary Effect are complete and accurate for both onsite carbon stocks and harvested wood products.	6	No
8. Quantification of Secondary Effects	Calculations for quantifying Secondary Effects are complete and accurate.	6.1.5, 6.2.6, 6.3.5	No
9. Reversal Determination	If a reversal has occurred, the type of reversal (avoidable or unavoidable) has been properly identified.	7.3	Yes
10. Reversal Risk Rating	Reversal risk rating is the same used since the previous site visit verification.	Appendix A	No

9.3.4 Natural Forest Management

All Forest Projects must promote and maintain a diversity of native species and utilize management practices that promote and maintain native forests comprised of multiple ages and mixed native species at multiple landscape scales (Natural Forest Management). At a Forest Project's first site visit verification and at all subsequent site visit verifications, the verification body must evaluate the project against the Natural Forest Management criteria described in Section 3.9.2, referencing the most current Assessment Area Data File available on the Forest

Project Protocol webpage. Forest project carbon stock inventories (requirements for which are contained in the Quantification Guidance) should be used as the basis of these assessments where applicable. Forest projects that do not initially meet Natural Forest Management 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 9.4. Natural Forest Management Verification Items

Verification Items		Apply Professional Judgment?
1. Native Species	Completed inventory demonstrates that project consists of at least 95% native species. Must demonstrate continuous progress toward goal and criterion must be met within 50 years.	Yes
2. Composition of Native Species	a. Reforestation Projects: Documentation on planted mixture of species combined with natural regeneration meets composition of native species goals. Project must show continuous progress and criteria must be met within 50 years, unless an exception has been made through a letter from the State Forester as described in Section 3.9. b. Improved Forest Management and Avoided Conversion Projects: Completed inventory demonstrates distribution of average basal area of standing live tree species meets composition of native species goal. Project is not eligible unless it is demonstrated that management activities will enable this goal to be achieved over the project life or an exception has been made through a letter from the State Forester as described in Section 3.9.	Yes
3. Sustainability of Timber Resource	a. Documentation showing that the forest, including entity lands outside Project Area, is currently under one of the following: i. Third party certification under the Forest Stewardship Council or Sustainable Forestry Initiative/ Tree Farm System, or ii. A renewable long-term management plan sanctioned and monitored by a state or federal agency within a Reserve-approved Assessment Areas, or iii. For Project Operators and their affiliates that own 5,000 acres or less, uneven-aged silvicultural practices (if harvesting occurs) and canopy retention averaging at least 40% across the entire forestland owned by the Project Operator in the same Assessment Areas covered by the Project Area, as measured on any 20 acres within the Project Operator's landholdings found in any of these Assessment Areas, including land within and outside of the Project Area (areas impacted by Significant Disturbance may be excluded from this test), or iv. Possessing a deeded conservation easement(s) that contain terms that ensure growth equals or exceeds harvest over time. Verifiers should make a reasonable attempt to contact the steward of the conservation easement to confirm compliance. b. Completed inventory demonstrates the project maintains, or makes progress toward maintaining, no more than 40% of forested acres in ages less than 20 years. Project must show continuous progress and this criterion must be met within 25 years.	Yes
4. Structural Elements (Lying and Standing Dead Wood)	Completed inventory work demonstrates that lying and standing dead wood is retained in sufficient quantities and for sufficient duration depending on whether portions of the Project Area have undergone salvage harvesting.	Yes

9.3.5 Verifying Carbon Inventories

Verification bodies are required to verify carbon stock inventory estimates of all sampled carbon pools within the Project Area. Inventories of carbon stocks are used to determine the project baseline and to quantify GHG reductions and removals against the project baseline over time. Verification of carbon inventories consists of ensuring the Project Operator's sampling methodology conforms to requirements listed in the protocol and that the project's inventory sample plots are within specified tolerances when compared to the verifier's sample plots. Verification is effectively an audit to infer that the inventory estimate is sound. Verification of the project's onsite stocks must occur at each site verification and focus on ensuring that the project's inventory methodology is technically sound and that the methodology has been correctly implemented.

The project must meet the inventory standards in Table 9.6 prior to the verification body initiating field sampling activities. The verifier will install sample plots or re-measure existing monumented sample plots consistent with the objectives of a random, risk-based, and efficient approach.[22] In doing so, the verifier may weigh the probability of selecting strata and plots based on various criteria – including carbon stocking, access difficulty, and vegetation heterogeneity. Verifiers may choose to sample project plots within a given stratum with a cluster design. The selection of a stratum may use probability proportional to carbon stocks or probability proportional to the risk of errors (as hypothesized by the verifier).

9.3.5.1 Sequential Sampling for Verification

As a policy to ensure a trend of agreement with sampled data is sustained between the verifier and Project Operator, this protocol requires a sequential sampling method for verification of project estimates. Sequential sampling is intended to provide an efficient sampling method for verifiers to determine if randomly selected project measurements are within specified tolerance bounds established by the protocol.

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 done at the end of each sampling day or when convenient for the verification team, which will include the full set of plots measured in that timeframe.

Worksheets are provided for use by verifiers to assist in verifying sampled data. The verifier will review the descriptive statistics of the carbon stocks independently for each pool or combination of pools that is being reported for crediting (applicable pool) as shown below:

[22] For the purposes of this verification guidance the following terms and definitions apply:

1. Stand: An individual unit or polygon that is relatively homogeneous in terms of the carbon stocking within its borders. For live and dead trees, the determination of stand boundaries is usually based on forest vegetation attributes, such as species, size (age), and density characteristics. For soils, the determination of soil stand boundaries is made on similar soil orders.
2. Stratum: A group of stands that contain a similar attribute, such as vegetation or soils attributes.
3. Strata: Plural of stratum. The set of different groupings for a specific attribute, such as vegetation or soil.

- Standing live and dead trees
- Soil

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.

- Diameter Test: A comparison of diameter data between the verifier and the Forest Owner is conducted on a tree by tree basis until sequential sampling stopping 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 CO_2e/acre comparison.
- Height Test: Like the diameter test, a comparison of height data is performed between the verifier and the Forest Owner until sequential sampling stopping rules have been achieved, indicating that the verifier and Forest Owner measurements of height are aligned within acceptable tolerance levels. 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 CO_2e/acre comparison.
- CO_2e/acre: The testing of inventory data can only be satisfied when the CO_2e/acre comparison between the verifier and Forest Owner is completed. This test is conducted on a plot by plot basis using estimates of CO_2e/acre. The verifier's estimates of CO_2e/acre 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).

Separate worksheets have been developed to assess both monumented (paired) and non-monumented (unpaired) plots as well as for DBH, height, and CO_2e/acre. Worksheets are found on the Forest Project Protocol webpage.

The Reserve has established a ten percent allowance as an acceptable level of agreement between the verifier and the Project Operator, without adjusting the project estimates for uncertainty.

9.3.5.2 Inventory Estimates

The items in Table 9.5 are evaluations that should be made before the verifier goes to the field and analyzes the plots. If a project opts to utilize the Reserve's Standardized Inventory Methodology, the methodology need not be assessed beyond correct implementation.

Table 9.5. Inventory Methodology Verification Items

Verification/Evaluation Standards		Insert a 'Failure to Meet Standard' in any category below where the standards on the left are not met or clearly have not been implemented as described in the inventory methodology
1.a	Inventory methodology describes the methodology for plot location in the field. The plot locations are either random or systematic with a random initial point.	X
1.b	If inventory methodology describes a stratification design: The stratification methodology, including rules for stratification, is clearly defined. The stratification design is relevant for the sampling of biomass. In particular, the stratification design applies to all tree species without a bias for commercial tree species. Verifier shall randomly select 10% of the vegetation units, or strata polygons, by area, or 500 acres (whichever is least) to evaluate that the vegetation (or stratum) label assigned to the polygon is consistent with the stratification rules documented in the inventory methodology. The selection shall be made from a database or spreadsheet list of all vegetation (stratum) polygons within the project that have not experienced a harvest or disturbance that affects carbon stocks by more than 10%, using verifier judgment, within the past 10 years. Evaluation of post-harvest polygons and plots is described in 1.c. Evaluation for consistency shall be conducted through comparison with aerial photos or other remotely sensed data, and/or field observation. During evaluation, a verifier must use professional judgment to determine if a polygon is consistent or inconsistent with the stratification rules. Inconsistent means the existing vegetation (stratum) label is grossly incorrect to an extent that would substantially alter the associated carbon stocks. If more than 10% of the polygons evaluated are determined to be inconsistent with the stratification rules documented in the inventory methodology, the verification shall expand the assessment to an additional 10% of the vegetation units (stratum polygons), or an additional 500 acres (whichever is least) and expand the analysis, or determine that the project has failed to meet the standard.	X
1.c	Inventory methodology states how the inventory is updated on an annual basis to reflect growth, harvest, and other disturbances. An event is deemed to be a disturbance, whether natural or the result of human activities, if the event results in an estimated loss of more than 10% of the pre-disturbance carbon stocks in the applicable carbon pools. The methodology includes a process to: ▪ Update the inventory for harvest and other disturbances. The immediate updating of an inventory for disturbances will require that a tree list is assigned to the area disturbed, rather than developing a tree list from field measurements, to represent the area disturbed. This may occur by assigning a vegetation label (stratifying) and compiling the inventory so that the area disturbed obtains a tree list representative of the disturbed condition. For stratified inventories, this may be a solution that lasts many years until the forest vegetation is re-stratified due to changes from forest growth. Immediately	X

	updating an inventory may also occur by assigning a 'best-fit' tree list that represents the stand conditions to the plots that were affected by disturbance. This solution is a shorter term solution since the plots used to estimate the inventory have been affected. During all site visit verifications (following the initial site visit verification in cases where the project start date is the same year as the initial site visit verification),the Project Operator must provide a map(s) that displays areas where disturbance has occurred. For stratified inventories, a pre-disturbance map must display the vegetation stratum prior to the disturbance and a post-disturbance map must display the vegetation stratum following the disturbance. For non-stratified inventories, the disturbance map must display the underlying plots, if any, affected by the disturbance. For stratified inventories, a summary tree list associated with the updated vegetation strata shall be provided. For non-stratified inventories, tree lists shall be provided for each plot affected by disturbance. During site verification, verifiers shall randomly select a minimum of 10% of the vegetation polygons (strata polygons) or plots updated for disturbance, and determine if the assigned tree lists do not obviously overestimate the carbon associated with the forest structure remaining after the disturbance. Where plots are updated through assignment of a tree list (instead of assigning a vegetation stratum) following the disturbance, the verifier shall ensure all plots have been updated and the updated tree list is consistent with the forest structure remaining after disturbance. For non-stratified inventories, it is not acceptable for a Project Operator to simply remove disturbed plots from the inventory. The plots must be assigned a tree list to estimate the post-disturbance condition. It is acceptable to remove plots from an inventory that is strata-based upon disturbance that affects the plots. Tree lists resulting from stratification or assignment are determined to be inconsistent if the tree list would result in carbon stocks substantially above what in the verifier's professional judgment would associate with the post-disturbance condition. The determination for consistency can be made through an office review by comparing the assigned tree lists with the disturbance events. A verifier can choose to enhance their review for consistency by visiting disturbed sites in the field. To minimize the risk of inaccuracies to the inventory, no more than 10% of the plots used to characterize the project's inventory can be developed from estimated tree lists without increased scrutiny from verification. The plots assigned an estimated tree list must be appropriately coded in the inventory database so that they can be queried and isolated. Plots assigned with an estimated tree list are not to be used in sequential sampling efforts unless the number of plots with estimated tree lists exceeds 10%, in which case all plots, measured or estimated, must be available for random selection for sequential sampling during verification. ▪ Update the inventory for growth using and approved growth model or a stand table projection, as described in the Quantification Guidance. The inventory being verified is determined to be current using the update methodology.	

1.d	The inventory methodology has been implemented in a consistent manner since the project's inception. If changes have been made to the inventory methodology, such changes have been discussed and approved in writing by the Reserve.	X
1.e	The inventory methodology describes the volume and biomass equations used to compute the project's carbon stocks and these equations are consistent with those required by the protocol. Appropriate use of biomass equations is demonstrated.	X

Each applicable pool/combination of pools must meet the minimum precision threshold of +/- 20 percent at the 90 percent confidence interval. Project Operators can improve the precision of their estimates through additional inventory effort, but can only include it in their reporting after the confidence estimate has been verified. Projects must include the uncertainty adjustment associated with their most recent verification effort. The emissions associated with site preparation activities (soil, shrubs, and herbaceous understory) are not subject to the same sequential sampling requirements and shall be verified according to the guidance for estimating site preparation emissions for reforestation projects in the online Quantification Guidance.

Use of the Standardized Inventory Methodology (available on the Reserve's Forest Project Protocol webpage) will be considered to automatically meet the evaluation standards in Table 9.5 and does not need to be verified beyond ensuring proper implementation. The Reserve has also developed the Climate Action Reserve Inventory Tool (CARIT), an inventory management computer application that Project Operators may also optionally use to manage and update their forest inventories. The use of the Standardized Inventory Methodology does not obligate a Project Operator to use CARIT, nor does the use of CARIT obligate a Project Operator to use the Standardized Inventory Methodology. However, CARIT will only function properly if certain inventory standards are followed. Refer to the Quantification Guidance for more information.

9.3.5.3 Measurement Specifics for Verifiers

Verifiers must use the highest standard to conduct measurements during field measurements. Measurements utilized by verifiers during field inspections shall be consistent with the tolerance standards for measurements identified in the Quantification Guidance, with the following exceptions:

1. Verifiers shall measure the heights of all trees according to the height measurement used for the species-specific biomass equation on the Reserve's Forest Project Protocol webpage.
2. The use of regressions to estimate heights is allowable for Forest Operators; verifiers should measure each height for comparisons with Forest Operator's estimates.
3. Tools and methods used for distance measurements for plot boundaries should be accurate within 1"/30'.
4. Tools and methods used for distance measurements for height measurements must be able to obtain an accuracy of 6"/100'.
5. Rules for determining 'in'/'out' trees:
    a. All borderline trees should be measured to determine status as an 'in' or 'out' tree.
    b. Verifiers may encounter trees that are 'in' that were not measured by the Project Operator. 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 Project Operator measurement. Per the Quantification Guidance, inventory estimates developed by the Project Operator must include all trees 5 inches DBH and larger.

c. Additionally, the Quantification Guidance permits Project Operators to develop an inventory methodology with varying plot areas that are expanded on a per acre basis depending on the size of the plots and with varying DBH requirements for which trees are included in each plot. In such cases, trees that were determined to be too small to be included in a larger plot by the Project Owner, may have grown and now exceed the minimum threshold for inclusion in the larger plot.
d. To account for this limited growth, 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 7 inches DBH. Similarly, trees that were included by the Forest Owner in a plot with a certain expansion factor and, at the time of verifier audit, have not exceeded the threshold for being switched to a plot with a different expansion factor by more than 10%, shall continue to be entered in the plot determined by the Project Operator, such that the expansion values are consistent for the Project Operator and the verifier.
    i. This applies a reasonable cushion to Project Operators who apply the sampling methodology correctly, but through no fault of their own would otherwise be penalized due to forest growth changing measurement parameters. It should be noted that the cushion is minimal and will not relieve Project Operators from growth over long periods of time that would exceed these allowances. Hence, Project Operators need to base the re-measurement of the plots on an adequate timeframe to avoid verification problems with their inventory data.
    ii. 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.

6. Verifiers shall insert their own determination of species for each tree included in the verifier's inventory.

7. For defect and decay, verifiers may first consider the inputs of the Forest Owner and determine whether or not they were 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, not considered reasonable, or not recorded by the Forest Owner, the verifier shall insert their own determination.

9.3.5.4 Verifying a Stratified Inventory

Where the Project Operator's inventory is stratified, the strata to be verified may be selected by the verifier according to the presumed risk of measurement error or presumed risk of the effects of measurement error on the overall inventory estimate, as described above. Individual stands and/or plots must be independently selected using a random selection design. The verifier shall select three strata (or the maximum number of strata present) based on the verifier's evaluation of risk. The minimum number of passing plots is six consecutive passing plots, or the first passing plot after a minimum of twelve plots are measured.

9.3.5.5 Verifying a Non-Stratified Inventory

If the project is not stratified for each applicable pool, the verifier shall select the plots randomly (if plot locations can be relocated) or allocate the plots systematically or in clusters for efficiency. Where plots can be relocated, the plots available for selection shall adhere to the guidance in Table 9.5 (1.c) with regards to updating inventories based on disturbance events. If the verifier uses a cluster design as part of the systematic allocation of plots, the mean of the cluster accounts for one observation (plot). Plots may be measured and assessed one at a time or in reasonable batches that correspond to logistical realities such as crew-days of effort. Sequential sampling is passed when the first passing plot is reached after a minimum of thirty measured plots.

9.3.5.6 Verification Within a Stand

Plots or clusters must also be independently selected using a random or systematic design. No more than six plots or clusters can be assigned to a stand, unless the groups of plots required for verification exceed the number of stands that exist for the project.

There are two possible statistical procedures that can be applied to the stratum-level verifications. A paired test can be applied when plot locations can be found and it is statistically appropriate to use a paired test (i.e., plot measurements can be replicated). An unpaired test can be applied when plots cannot be relocated. The range of acceptable error (δ, delta) is fixed at ten percent for both tests.

Paired Plots

The statistical test is based on a comparison of the verifier's measurements of plots within a selected stratum, calculated as CO_2-e compared to the Project Operator's measurements of plots, which may include any adjustments for growth.

Use **α=0.05** and **β=0.20** to control for error.

The null hypothesis (H_0) is that the verification and project plots are equal.

1) Perform verification sampling on at least the minimum number of passing plots required in a sequence from Section 9.3.5.4.

2) If $\mathbf{n \geq ((Z_\alpha + Z_\beta)^2 \times S_n^2) / D^2}$ then stop and evaluate. Otherwise take another sample.

   n = Number of verification plots measured
   Z_α = α% N(0,1) = 1.645
   Z_β = β% N(0,1) = 0.8416
   S_n^2 = sample variance of the differences
   D = δ × project average estimate

3) If stopped, then evaluate.

   If $\bar{X}_N \leq K$ then accept H_0,
   If $\bar{X}_N > K$ then reject H_0.

   $\bar{X}_N$ = sample mean of the differences
   N = total number of plots measured
   $K = (Z_\alpha \times D) / (Z_\alpha + Z_\beta)$.

4) If H_0 was rejected then additional samples may be taken as long as the verifier is of the opinion that there is a chance that H_0 may be accepted based on the variability and trend observed.

Unpaired Plots

The statistical test is based on comparing the average CO_2e estimates for each stratum from the verifier plots to the Project Operator plots.

Use **α=0.05** to control for error; the β is not specified because we are constructing a confidence interval not a test. The null hypothesis (H_0) is that the verification and stratum averages are equal. The following procedure is appropriate for the unpaired test.

1) Perform verification sampling on at least the minimum number of plots required in a sequence from Section 9.3.5.5. Calculate n as the sum of the number of plots from both the stratum and the verification.

2) Calculate the following:

   $T_n = \bar{X}_P - \bar{X}_n$

   Where,
   $\bar{X}_P$ = stratum mean,
   $\bar{X}_n$ = verification mean after sample n.
   S_n^2 = sample variance of the verification plots,
   S_P^2 = sample variance of the stratum plots,
   D = δ × stratum average estimate.

3) If $\mathbf{n \geq (a^2/D^2) \times (S_n^2 + S_P^2)}$ then stop and evaluate. (Note: $n = n = n_P + n_V$). Otherwise take another sample.

4) If stopped, then evaluate. Construct a confidence interval $T_n \pm D$.
   If the confidence interval includes zero then accept H_0,
   Otherwise reject H_0.

5) If H_0 was rejected then additional samples may be taken until as long as the verifier is of the opinion that there is a chance that H_0 may be accepted based on the variability and trend observed.

If the stopping rule in step (3) above cannot be attained within 100 plots then apply a standard unpaired t-test comparison using alpha of 0.05 and beta of 0.80.

9.3.6 Step-by-Step Guidelines for Performing the Verification

Step1: Assigning Risk to Strata

The verifier must determine for standing live and standing dead trees if the Project Operator has stratified the Project Area into strata that reflect common characteristics that influence carbon stocks. The verifier may presume risk exists in the highest stocked strata, strata that are unique or difficult to access due to topographical, vegetative, or other physical barrier, strata that represent a large portion of the project's inventory due to the area they represent, or any other

risk perceived by the verifier. The determination of risk must be applied to the stratum as a unit and not individual stands of a given stratum.

Step 2: Selecting Strata Based on Risk

Based on the assessment of risk, the verifier will query or request that the Project Operator query the set of stands that are associated with the strata selected. The queried stands must have an identifier which can be based on the Project Operator's identification convention or one assigned by the verifier. Three strata must be selected, or the maximum number of strata stratified by the Project Operator for each pool. Table 9.6 displays an example of ordered strata for standing live and dead trees selected by stratum with random numbers assignments.

Table 9.6. Stands Selected by Vegetation Strata and Risk Class with Random Number Assignments

Stand Number	Stratum (from Project Operator or Verifier)	Risk Class	Order of Random Selection
2	Dense Intermediate Conifers	High Stocking	5
3	Dense Intermediate Conifers	High Stocking	3
4	Dense Intermediate Conifers	High Stocking	1
8	Dense Intermediate Conifers	High Stocking	8
9	Dense Intermediate Conifers	High Stocking	2
10	Dense Intermediate Conifers	High Stocking	1
15	Dense Intermediate Conifers	High Stocking	4
18	Dense Intermediate Conifers	High Stocking	7
Stand Number	**Stratum (from Project Operator or Verifier)**	**Risk Class**	**Order of Random Selection**
8	Dense Mature Conifers	High Stocking	4
9	Dense Mature Conifers	High Stocking	3
10	Dense Mature Conifers	High Stocking	5
15	Dense Mature Conifers	High Stocking	2
18	Dense Mature Conifers	High Stocking	1
Stand Number	**Stratum (from Project Operator or Verifier)**	**Risk Class**	**Order of Random Selection**
13	Medium Dense Mature Riparian	Difficult Access	2
14	Medium Dense Mature Riparian	Difficult Access	1
17	Medium Dense Mature Riparian	Difficult Access	3

Step 3: Planning and Implementing Field Verification Sampling

The selected stands should be mapped and labeled with the random number to assist in developing a strategy to perform field sampling activities. Up to six plots or clusters may be re-measured in a stand (if plots are monumented by the Project Operator) or installed (if plots are not monumented) in each stand. If the Project Area has not been stratified or there are less than three strata, the verifier shall locate the plots or clusters using a random process of their own design. For efficiency, it is acceptable for the verifier to relocate to a new area at the beginning of a day without having completed all the plots in the previous day.

Step 4: Determining if the Stopping Rules Have Been Met

The verifier must determine if the stopping rules have been met for each stratum after the measurement of each plot or at a minimum the end of each day. The Reserve provides tools to assist verifiers with determining if the stopping rules have been met or not. The tools are Microsoft Excel based and are distinct for paired designs and for unpaired designs.

The verifier must enter their data into the appropriate spreadsheet based upon use of a paired or unpaired test. It is required that the verifier apply the random order selection in the sampling process. 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 spreadsheet, the verifier must follow the random selection order in 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 full number of plots. Table 9.7 displays a hypothetical sampling schedule planned by the verifier and the hypothetical verification results. In this case, the sequential sampling is conditionally satisfied after Day 3 but requires the full set of randomly selected stands to be sampled up to the point of satisfying the sequential statistics, which is met after sampling Stand 3 on Day 4.

The statistical test is based on a comparison of the verifier's measurements of plots, calculated as CO_2e per acre compared to the Forest Owner's measurements of plots, which may include any adjustments for growth. The inventory verification is complete when the first plot passes after a minimum of 12 plots are measured, or when a minimum of 6 plots are identified as 'passing' in sequence in the Sequential Sampling Tool for plot CO_2e per acre (paired) or when the first plot passes after a minimum of 30 plots are measured (unpaired). Passing of the plot height and/or diameters (DBH) is not required to pass the inventory verification; however, as discussed above, verifiers may separately compare their measurements for height and diameter with the Forest Owner's measurements in the sequential sampling tool. When 6 consecutive plots are identified as 'passing' for either height or diameter, that input is then considered to have met sequential sampling requirements and verifiers may use the data provided for each tree from the Forest Owner's database for any additional data inputs needed for the CO_2e/acre comparison.

Table 9.7. Example of Randomly Selected Plots

Stand	Stratum (from Forest Owner)	Risk Class	Order of Random Selection	Sampling Schedule (Planned)	Verification Effort	Verification Results
4	Dense Intermediate Conifers	High Stocking	1	Day 3	Day 1	Inconclusive. Stand 9 sampled. Sequential sampling criteria not satisfied - More plots are needed
9	Dense Intermediate Conifers	High Stocking	2	Day 1	Day 2	Inconclusive. Stand 15 sampled. Sequential sampling criteria not satisfied - More plots are needed
3	Dense Intermediate Conifers	High Stocking	3	Day 4	Day 3	Inconclusive. Stand 4 sampled. Sequential sampling criteria satisfied but stand order must be satisfied. Stand 3 must be sampled
15	Dense Intermediate Conifers	High Stocking	4	Day 2	Day 4	Conclusive. Stand 3 sampled. Sequential sampling criteria is met and adherence to random selection is maintained
2	Dense Intermediate Conifers	High Stocking	5	Day 6	Further Verification Effort not Necessary	
10	Dense Intermediate Conifers	High Stocking	6	Day 5		
18	Dense Intermediate Conifers	High Stocking	7	Day 7		
8	Dense Intermediate Conifers	High Stocking	8	Day 8		

Finally, in addition to evaluating and verifying adherence to the Project Operator's inventory methodology, the verification body must verify the items in Table 9.8.

Table 9.8. Additional Verification Items for Inventory Methodology and Implementation

Verification Items		Apply Professional Judgment?
1. Inventory Update Processes	a. Project Operator's inventory document describes methodology for updating inventory data resulting from growth, harvest, and disturbances. Methodology adheres to acceptable forestry practices.* b. Harvest/Disturbance updates in inventory management system are implemented per the specified methodology and are representative of the harvest or disturbance. c. Growth is accounted for using an approved growth model or using a stand table projection, as described in the Quantification Guidance.	Yes

2. Biomass Equations and Calculations	a. The carbon tonnes per acre for a representative sample plot, computed using the Project Operator's calculation tools, replicate output computed by the verification body.** b. All conversions and expansions are accurate.	Yes

*A forest biometrician employed by the state in which the project is located, or a consulting forest biometrician may be consulted in the event of a dispute between the verification body and Project Operator. The written opinion of the forest biometrician, submitted to the Reserve as part of the verification report, shall be considered the authoritative word.

**The verification body must provide an (idealized) 'verification plot' consisting of all tree species in Project Area with varying heights and diameters existing within the Project Area. The plot need not correspond to an actual plot within the Project Area.

9.3.7 Baseline Modeling

To determine a Forest Project's baseline, computer models are used to project the Project Area's initial inventory of carbon stocks into the future under a set of constraints prescribed by this protocol (Section 6). Modeling must include assumptions about forest growth and harvest, as influenced by legal and financial constraints, and assumptions regarding the extent of harvest operations under Business As Usual conditions.

Verification bodies are required to verify the baseline estimate for the project at the initial site visit verification for Improved Forest Management Projects and Avoided Conversion Projects. Reforestation baselines may be verified at the second site visit verification.

Baseline modeling must incorporate initial inventory estimates and forecast how carbon stocks will change over the Forest Project's crediting period.

All reports that reference carbon stocks must be submitted by the Project Operator with the oversight of a Professional Forester. If the project is located in a jurisdiction without a Professional Forester law or regulation, then Certified Forester credentials managed by the Society of American Foresters (see http://www.certifiedforester.org) are required so that professional standards and project quality are maintained.

Table 9.9. Baseline Modeling Verification Items

Verification Items		Section of FPP	Apply Professional Judgment?
1. Document	A modeling document exists that contains all the verification items in this table.	9	No
2. Qualitative Characterization (Reforestation and Avoided Conversion Projects Only)	A sufficiently detailed qualitative characterization has been included in the modeling document that documents the general assumptions of the project's baseline. The qualitative assessment addresses the vegetative conditions and activities that would have occurred.	6.1, 6.3	Yes

Verification Items		Section of FPP	Apply Professional Judgment?
3. Model Choice and Calibration	a. The model used is an approved model. b. The Project Operator has provided a rationale for any model calibrations or a sufficient explanation of why calibrations were not incorporated. c. The Project Operator has provided a description of the site indexes used for each species and a sufficient explanation of the source of the site index values used.	Quantification Guidance	Yes
4.Legal Constraints	A list of legal constraints is provided that includes an accurate description of the type and effect of each constraint on the ability to harvest trees and the area constrained.	3.3.1, 6.1.1, 6.2.1, 6.3.1	Yes
5. Financial Constraints	a. A sufficient qualitative description is provided indicating that the harvesting activity modeled in the baseline is a financially viable activity. b. For Improved Forest Management projects, Project Operator has provided either a financial analysis of the anticipated growth and harvesting regime that captures all relevant costs and returns, taking into consideration all legal, physical, and biological constraints.	3.3.2, 6.1.1, 6.2.2, 6.3.1	Yes
6. Silviculture Guidelines	The silviculture guidelines incorporated in the model demonstrate all legal constraints are applied in the model. The silviculture guidelines must include: i. A description of the trees retained by species group ii. The level of retention iii. Harvest frequency iv. Regeneration assumptions	Quantification Guidance	No
7. Modeling Guidelines	a. Reforestation: Modeling is based on the qualitative characterization of the baseline and conducted per Section 6.1. b. Improved Forest Management: Modeling is conducted per Section 6.2. c. Avoided Conversion: Modeling is conducted per Section 6.3.	6.1, 6.2, 6.3	No
8. Modeling Outputs	a. The Project Operator has provided reports that display periodic harvest, inventory, and growth estimates for the entire Project Area presented as total carbon tonnes and carbon tonnes per acre. b. Estimates are within the range of expected growth patterns for the Project Area.	9, Quantification Guidance	Yes

9.3.8 Verifying Estimates of Carbon in Harvested Wood Products

Verification bodies are required to verify the estimates of carbon that are likely to remain stored in wood products over a 100-year period, as submitted in the Forest Project Design Document (for baseline estimates) and annual monitoring reports (for actual wood product production). Accounting for wood product carbon must be applied only to actual or baseline volumes of wood harvested from within the Project Area. Trees harvested outside of the Project Area are not part of the Forest Project and must be excluded from any calculations.

Table 9.10. Carbon in Harvested Wood Products Verification Items

Verification Items		Section of FPP	Apply Professional Judgment?
1. Carbon in Harvested Wood Delivered to Mills	a. Amount of wood harvested that will be delivered to mills has been estimated and reported. b. The appropriate wood density factor has been applied and/or water weight subtracted to result in pounds of biomass with zero moisture content. c. Total dry weights for all harvested wood have been calculated. d. Total carbon weight has been computed. e. The total has been converted to metric tons of carbon.	Quantification Guidance	No
2. Account for Mill Efficiencies	The correct mill efficiency factors have been used to calculate total carbon transferred into wood products.	Quantification Guidance	No
3. Wood Product Classification	The percentages of harvest by wood product class has been determined correctly with verified reports from the mill(s) where the Project Area's logs are sold; or by looking up default wood product classes for the project's Assessment Area(s); or if not available from either of these sources, by classifying all wood products as "miscellaneous."	Quantification Guidance	No
4.Calculation of In-Use and Landfill Carbon Storage	a. The average amount of carbon stored in in-use wood products over 100 years has been calculated correctly using the worksheets in the Quantification Guidance. b. The average amount of carbon stored in landfilled wood products over 100 years has been calculated correctly using the worksheets in the Quantification Guidance.	Quantification Guidance	No
5. Total Average Carbon Storage in Wood Products Over 100 Years	Total average carbon storage in wood products over 100 years for a given harvest volume has been calculated and reported.	Quantification Guidance	No

9.3.9 Verifying Calculations of Reversal Risk Ratings and Contributions to the Buffer Pool

At each site visit verification, Project Operators must derive a reversal risk rating for their Forest Project using the worksheets in Appendix A. The worksheets are designed to identify and quantify the specific types of risks that may lead to a reversal, based on project-specific factors.

Table 9.11. Reversal Risk Rating Verification Items

Verification Items		Section of FPP	Apply Professional Judgment?
1. Financial Risk	Use of a Qualified Conservation Easement or Qualified Deed Restriction, occurrence on public lands, or use of a PIA alone.	Appendix A.1	No
2. Management Risk	a. Management Risk I – Illegal removals of forest biomass. b. Management Risk II – Conversion of Project Area to alternative land uses. c. Management Risk III – Over-harvesting.	Appendix A.2	No
3. Social Risk	Social Risk.	Appendix A.3	No
4. Natural Disturbance Risk	a. Natural Disturbance Risk I – Wildfire. b. Natural Disturbance Risk II – Disease or insect outbreak. c. Natural Disturbance Risk III – Other episodic catastrophic events.	Appendix A.4	Yes
5. Completing the Risk Rating Analysis	Reversal risk rating calculated correctly using the formula in Appendix A.5.	Appendix A.5	No

9.4 Completing the Verification Process

After completing the core project verification activities for a Forest Project, the verification body must do the following to complete the verification process:

1. Complete a Verification Report to be delivered to the Project Operator (public document).
2. Complete a detailed List of Findings containing both immaterial and material findings (if any), and deliver it to the Project Operator (private document).
3. Prepare a concise Verification Statement detailing the vintage and the number of GHG reductions and removals verified, and deliver it to the Project Operator (public document).
4. Verify that the number of GHG reductions and removals, as well as the reversal risk rating, specified in the Verification Report and Statement match the number entered into the Reserve software.
5. Conduct an exit meeting with the Project Operator 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 Project Operator should schedule a second set of verification activities after the Project Operator has revised the project submission.

6. If a reasonable level of assurance opinion is successfully obtained, upload electronic copies of the Verification Report, List of Findings, Verification Statement, and Verification Activity Log into the Reserve.
7. Return important records and documents to the Project Operator for retention.

The recommended content for the Verification Report, List of Findings, and Verification Statement can be found in the Reserve's Verification Program Manual.[23] The Verification Program Manual also provides further guidance on quality assurance, negative verification statements, use of an optional Project Verification Activity Log, goals for exit meetings, dispute resolution, and record keeping.

[23] Available at http://www.climateactionreserve.org/how/program/program-manual/.

10 Glossary of Terms

Aboveground Live Biomass	Live trees including the stem, branches, and leaves or needles, brush, and other woody live plants aboveground.
Activity-Based Funding	The budget line items that are dedicated to agency accomplishments in vegetation management, including pre-commercial thinning, commercial thinning, harvest, hazard tree removal, hazardous fuel reductions, and other management activities designed to achieve forest sustainability health objectives.
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 Climate Action 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 3.1, and by achieving GHG reductions and removals quantified against an approved baseline, determined according to the requirements in Section 6.
Affiliate	An “affiliate” is defined as any person or entity that, directly or indirectly, through one or more intermediaries, controls or is controlled by or is under common control with the Forest Owner(s) participating in a project, including any general or limited partnership in which the Forest Owner is a partner and any limited liability company in which the Forest Owner is a member. For the purposes of this definition, "control" means the possession, direct or indirect, of the power to direct or cause the direction of the management and policies of a person, whether through the ownership of voting securities, by contract or otherwise, and “person” means an individual or a general partnership, limited partnership, corporation, professional corporation, limited liability company, limited liability partnership, joint venture, trust, business trust, cooperative or association or any other legally-recognized entity.
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 belowground root volume to be estimated using the aboveground bole volume.
Assessment Area	A distinct forest community within geographically identified ecoregions defined by the Reserve that consists of common regulatory and political boundaries that affect forest management. The size of the Assessment Areas is determined by efforts to achieve optimal statistical confidence across multiple scales using U.S. Forest Service Forest Inventory and Analysis Program (FIA) plots

	for biomass. Maps of the Assessment Areas and the associated data may be found on the Reserve's website.
Avoidable Reversal	An avoidable reversal is any reversal that is due to the Project Operator's negligence, gross negligence, or willful intent, including harvesting, development, and harm to the Project Area
Avoided Conversion Project	A type of Forest Project consisting of specific actions that prevent the conversion of forestland to a non-forestland use by dedicating the land to continuous forest cover through a conservation easement or transfer to public ownership.
Baseline	The level of GHG emissions, removals, and/or carbon stocks at sources, sinks or reservoirs affected by a Forest Project that would have occurred under a Business As Usual scenario. For the purposes of this protocol, a project's baseline must be estimated following standard procedures in Section 6.
Best Management Practices	Management practices determined by a state or designated planning agency to be the most effective and practicable means (including technological, economic, and institutional considerations) of controlling point and nonpoint source pollutants at levels compatible with environmental quality goals.[24]
Biological Emissions	For the purposes of the Forest Project 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.[25]
Bole	A trunk or main stem of a tree.
Broadcast Fertilization	A fertilizer application technique where fertilizer is spread across the soil surface.
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 (as defined in Section 7.3), 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).

[24] Helms. (1998).
[25] 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. Methodologies for determining these activities – and/or for approximating carbon stock levels that would have resulted from these activities – are provided in Section 6 of this protocol for each type of Forest Project.
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 aboveground or belowground 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 (2204.6 lbs) of CO_2 reduced or removed from the atmosphere.
Commercial Harvesting	For the purpose of this protocol, commercial harvesting refers to harvesting activities undertaken by a Forest Owner with the intent to deliver to a mill.
Common Practice	The average stocks of the live standing carbon pool from within the Forest Project's Assessment Area, derived from FIA plots on all private lands within the defined Assessment Area.
Even-Aged Management	Management where the trees in individual forest stands have only small differences in their ages (a single age class). By convention, the spread of ages does not differ by more than 20 percent of the intended rotation.
FIA	USDA Forest Service Forest Inventory and Analysis program. FIA is managed by the Research and Development organization within the USDA Forest Service in cooperation with State and Private Forestry and National Forest Systems. FIA has been in operation under various names (Forest Survey, Forest Inventory and Analysis) for 70 years.
Forest Carbon	The carbon found in forestland resulting from photosynthesis in trees and associated vegetation, historically and in the present. Forest Carbon is found in soils, litter and duff, plants and trees, both dead and alive.
Forest Management	The commercial or noncommercial growing and harvesting of forests.
Forest Owner	A corporation or other legally constituted entity, city, county, state agency, individual(s), or a combination thereof that has legal control (described in Section 2.2) of any amount of forest carbon within the Project Area

Forest Project	A planned set of activities designed to increase removals of CO_2 from the atmosphere, or reduce or prevent emissions of CO_2 to the atmosphere, through increasing and/or conserving forest carbon stocks.
Forest Project Design Document	A standard document for reporting required information about a Forest Project. The Forest Project Design Document must be submitted for review by a verification body and approved by the Reserve before the Forest Project can be registered with the Reserve.
Forestland	Land that supports, or can support, at least ten percent tree canopy cover 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.
GHG Assessment Boundary	The GHG Assessment Boundary defines all the GHG sources, sinks, and reservoirs that must be accounted for in quantifying a Forest Project's GHG reductions and removals (Section 6). 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 CO_2 emissions, and mobile combustion GHG emissions.
GHG Reductions and Removals	See definitions for Reduction and Removal.
Greenhouse Gas (GHG)	Gas that contributes to global warming and climate change. For the purposes of this Forest Project Protocol, GHGs are the six gases identified in the Kyoto Protocol: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).
Improved Forest Management Project	A type of Forest Project involving management activities that increase carbon stocks on forested land relative to baseline levels of carbon stocks.
Listed	A Forest Project is considered "listed" when the Project Operator 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 five inches and a minimum

	length of eight feet. 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 2204.6 pounds or 1.1 short tons.
Native Forest	For the purposes of this protocol native forests shall be defined as those occurring naturally in an area, as neither a direct nor indirect consequence of human activity post-dating European settlement.
Natural Forest Management	Forest management practices that promote and maintain native forests comprised of multiple ages and mixed native species at multiple landscape scales. The application of this definition, its principles, detailed definition, and implementation are discussed further in Section 3.9.2.
Non-Forest Cover	Land with a tree canopy cover of less than ten 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.
Non-Harvest Disturbance	Reduction in forest cover that is not a direct result of harvest, such as wildfire and insect disturbances.
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.
Professional Forester	A professional engaged in the science and profession of forestry. A professional forester is credentialed in jurisdictions that have professional forester licensing laws and regulations. Where a jurisdiction does not have a professional forester law or regulation then a professional forester is defined as having the Certified Forester credentials managed by the Society of American Foresters (see www.certifiedforester.org).
Project Area	The area inscribed by the geographic boundaries of a Forest Project, as defined following the requirements in Section 4 of this protocol. Also, the property associated with this area.

Project Life	Refers to the duration of a Forest Project and its associated monitoring and verification activities, as defined in Section 3.5.
Public Lands	Lands that are owned by a public governmental body such as a municipality, county, state or country.
Project Operator	A Forest Owner responsible for undertaking a Forest Project and registering it with the Reserve. The Forest Owner who executes the Project Implementation Agreement, as described in Section 2.2.
Qualified Conservation Easement	A qualified conservation easement must explicitly refer to the terms and conditions of the Project Implementation Agreement, apply to current and all subsequent Project Operators for the full duration of the Forest Project's minimum time commitment, as defined in Section 3.5 of this protocol.
Qualified Deed Restriction	A qualified deed restriction shall ensure that the Project Implementation Agreement runs with the land and applies to all current and subsequent Project Operators for the full duration of the Forest Project's minimum time commitment, as defined in Section 3.4 of this protocol, to be determined in the Reserve's reasonable discretion. A deed restriction is not "qualified" if it merely consists of a recording of the Project Implementation Agreement or a notice of the Project Implementation Agreement, as such a recording is already required by the Project Implementation Agreement.
Reduction	The avoidance or prevention of an emission of CO_2 (or other GHG). Reductions are calculated as gains in carbon stocks over time relative to a Forest Project's baseline (also see Removal).
Reforestation Project	A type of Forest Project involving the restoration of tree cover on land that currently has no, or minimal, tree cover.
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 (see Section 8) has been submitted by the Project Operator 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. Removals are calculated as gains in carbon stocks over time relative to a Forest Project's baseline (also see Reduction).
Reporting Period	The period of time over which a Project Operator quantifies and reports GHG reductions and removals.
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 Climate Action 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 ($\Delta AC_{onsite} - \Delta BC_{onsite}$) in Equation 6.1 is negative).
Secondary Effects	Unintended changes in carbon stocks, GHG emissions, or GHG removals caused by the Forest Project.
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[26] and changes in forest management.
Significant Disturbance	Any natural impact that results in a loss of least 20 percent of the aboveground live biomass that is not the result of intentional or grossly negligent acts of the Project Operator.
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 five inches and a minimum height of 15 feet. 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 aboveground live biomass, regardless of species, with a minimum diameter (breast height) of five inches and a minimum height of 15 feet (inventory methodology must include all trees five inches and greater)
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 uploaded and

[26] Metz, Davidson, Swart, & Pan. (2001).

	submitted to the Reserve's software system, and the Project Operator 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 five inches and a minimum height of 15 feet with no branches within three feet from the ground at maturity.[27]
Unavoidable Reversal	An unavoidable reversal is any reversal not due to the Project Operator's negligence, gross negligence or willful intent, including wildfires or disease that are not the result of the Project Operator's negligence, gross negligence or willful intent.
Uneven-Aged Management	Management that leads to forest stand conditions where the trees differ markedly in their ages, with trees of three or more distinct age classes either mixed or in small groups.
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 Project Operator has adhered to the requirements of this protocol.
Verification Period	The period of time over which GHG reductions/removals are verified. A verification period may cover multiple reporting periods. The end date of any verification period must correspond to the end date of a reporting period.

[27] Helms. (1998).

Appendix A Determination of a Forest Project's Reversal Risk Rating

Project Operators must derive a reversal risk rating for their Forest Project 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. Reforestation Projects that defer the verification of an inventory until the second verification shall defer the determination of a reversal risk rating until the second verification when the project has a verified inventory.

This risk assessment must be updated every time the project undergoes a verification site visit. Therefore, a project's risk profile and its assessment are dynamic. Furthermore, estimated risk values and associated mitigation measures will be updated periodically by the Reserve as improvements in quantifying risks or changes in risks are determined. Any adjustments to the risk ratings will affect only current and future year contributions to the Buffer Pool. The Reserve may, from time to time, transfer Climate Reserve Tonnes (CRTs) from the Buffer Pool to the Project Operator's account if the Reserve determines that previously assessed risk ratings were unnecessarily high. Alternatively, the Reserve may waive a Project Operator's future contributions to the Buffer Pool until excess contributions from previous years are recouped. If a Forest Project's risk rating increases, the Project Operator must contribute additional CRTs to the Buffer Pool to ensure that all CRTs (including those issued in prior years) are properly insured.

Risks that may lead to reversals are classified into the categories identified in Table A.1.

Table A.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	Default Risk
	Project Implementation Agreement (PIA) Subordination	Subordinating the PIA to mortgages or deeds on or affecting the Project	Default Risk
Management	Illegal Harvesting	Loss of project stocks due to timber theft	Default by Area
	Conversion to Non-Forest Uses	Alternative land uses are exercised at project carbon expense	Default Risk
	Over-Harvesting	Exercising timber value at expense of project carbon	Default Risk
Social	Social Risks	Changing government policies, regulations, and general economic conditions	Default Risk
Natural Disturbance	Wildfire	Loss of project carbon through wildfire	Project-specific Risk

Risk Category	Risk Type	Description	How Risk is Managed in this Protocol
	Disease/Insects	Loss of project carbon through disease and/or insects	Default Risk
	Other Episodic Catastrophic Events	Loss of project carbon from wind, snow and ice, or flooding events	Default Risk

A.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 employ a Qualified Conservation Easement or Qualified Deed Restriction, or that occur on public lands, are at a lower risk than projects with a PIA alone.

Table A.2. Financial Failure Leading to Bankruptcy

Applies to all projects		
Identification of Risk	**Contribution to Reversal Risk Rating**	
	PIA only	PIA combined with Qualified Conservation Easement or Qualified Deed Restriction or on public lands
Default Financial Risk	5%	1%

Table A.3. PIA Subordination

Applies to all projects		
Identification of Risk	**Contribution to Reversal Risk Rating**	
	PIA with “Subordination Clause Type II”	PIA with “Subordination Clause Type I”
Default Financial Risk	10%	2%

A.2 Management Risk

Management failure is the risk of management activities that directly or indirectly could lead to a reversal. Projects that employ a conservation easement or deed restriction, or that occur on public lands, are exempt from this risk category.

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 A.4. Risk of Illegal Removals of Forest Biomass

Applies to all projects	
Identification of Risk	**Contribution to Reversal Risk Rating**
United States Default Harvesting Risk	0%

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 Project 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 Project Area.

Table A.5. Risk of Conversion to Alternative Land Use

Applies to all projects	
Identification of Risk	**Contribution to Reversal Risk Rating**
With Qualified Conservation Easement or Qualified Deed Restriction that explicitly encumbers all development rights or on public lands	0%
Without Qualified Conservation Easement or Qualified Deed Restriction	2%

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 CRTs have been credited. Additionally, reversals can occur as the result of harvest associated with fuels treatments.

Table A.6. Risk of Over-Harvesting

Applies to all projects	
Identification of Risk	**Contribution to Reversal Risk Rating**
With Qualified Conservation Easement or Qualified Deed Restriction that explicitly encumbers timber harvesting associated with project stocks or on public lands	0%
Without Qualified Conservation Easement or Qualified Deed Restriction	2%

A.3 Social Risk

Social risks exist due to changing government policies, regulations, and general economic conditions. The risks of social or political actions leading to reversals are low, but could be significant.

Table A.7. Social Risk Identification

Applies to all projects	
Identification of Risk	**Contribution to Reversal Risk Rating**
United States Default Social Risk	2%

A.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.

Natural Disturbance Risk I – Wildfire

A wildfire has the potential to cause significant reversals, especially in certain carbon pools. These risks can be reduced by certain techniques including reducing 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.

Table A.8. Natural Disturbance Risk I – Wildfire

Applies to all projects	
Identification of Risk	**Contribution to Reversal Risk Rating**
Refer to the Assessment Area Data File for the project's risk rating	X%
If fuel treatments have been implemented for the Project Area, reduce the value above by the appropriate percent as indicated below.*	(X%) **x** Y%

* Depending on the level of fuel treatments the Y% is set as follows: project is actively implementing comprehensive fuel management plan, or implements a combination of fuel breaks in strategic areas and thinning from below across at least 30% of the project area = 50%, silviculture across at least 30% of the project area consists largely of thinning from below = 66.3%, project has installed fuel breaks in strategic areas = 82.6%, no fuel treatments = 100%.

Natural Disturbance Risk II – Disease or Insect Outbreak

A disease or insect outbreak has the potential to cause a reversal, especially in certain carbon pools.

Table A.9. Natural Disturbance Risk II – Disease or Insect Outbreak

Applies to all projects	
Identification of Risk	**Contribution to Reversal Risk Rating**
Default Risk Contribution from Disease or Insect Outbreak	3%

Natural Disturbance Risk III – 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 A.10. 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	3%

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

Use the table below to summarize the Forest Project's reversal risk rating. As indicated above, projects that employ a conservation easement or deed restriction, or that occur on public lands, are exempt from certain risk categories. Such Qualified Conservation Easements and Qualified Deed Restrictions must clearly identify the goals and objectives of the Forest Project according to the terms of this protocol.

Table A.11. Project Contribution to the Buffer Pool Based on Risk

Risk Category	Contribution from Risk Descriptions Above		
	Source	**PIA Only**	**PIA and Qualified Conservation Easement and/or a Qualified Deed Restriction and/or Public Ownership**
Financial Failure[28]	Default Risk -Remedies for reversals addressed in PIA	15% or 7%	11% or 3%
Illegal Forest Biomass Removal	Default Risk	0%	0%
Conversion	Default Risk - Remedies for reversals addressed in PIA	2%	0%
Over-Harvesting	Default Risk - Remedies for reversals addressed in PIA	2%	0%
Social	Default Risk	2%	2%
Wildfire	Calculated Risk from Table A.8	X% or (X% x Y%)	X% or (X% x Y%)
Disease or Insect Outbreak	Default Risk	3%	3%
Other Catastrophic Events	Default Risk	3%	3%

[28] When determining the appropriate risk rating for the Financial Failure Risk Category, use the higher value if intending to use PIA Subordination Clause Type I and the lower value if intending to use PIA Subordination Clause Type II. Please refer to the Project Implementation Agreement on the Reserve website for further information.

Completing the Risk Rating Analysis

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

$$100\% - \begin{pmatrix} (1 - FinancialFailure\%) \times (1 - IllegalForestBiomassRemoval\%) \times (1 - Conversion\%) \\ \times (1 - OverHarvesting\%) \times (1 - SocialRisk\%) \times (1 - Wildfire\%) \times (1 - Disease/InsectOutbreak\%) \\ \times (1 - OtherCatastrophicEvents\%) \end{pmatrix}$$

Appendix B Reforestation Project Eligibility

This appendix presents a standardized approach to determine whether reforestation activities on lands that have undergone a Significant Disturbance are likely to be Business As Usual – and therefore not eligible for registration with the Reserve – based on the net present value for the timber expected to be produced from reforestation. A Reforestation Project is considered Business As Usual if the net present value for expected timber is $0 or more according to standard assumptions underlying Table B.1.

To determine whether a Reforestation Project is eligible, perform the following steps:

1. Identify whether site preparation costs[29] are High or Low:
    a. Site preparation costs are High if:
        i. Competing species management (including mechanical removal and/or use of herbicides) has been or will be conducted on 50 percent or more of the Project Area; or
        ii. Soil ripping has occurred on more than 50 percent of the Project Area.
    b. Site preparation costs are Low for all other projects.
2. Identify the value of harvested products (High, Medium, Low, or Very Low) corresponding to the project's Assessment Area, from the lookup table in the most current Assessment Area Data File, available on the Forest Project Protocol webpage.
3. Identify the standard Rotation Age for the project's Assessment Area, from the lookup table in the most current Assessment Area Data File, available on the Forest Project Protocol webpage.
4. Identify the site class category for the Project Area. The category must be consistent with the stated site productivity in the project's submission form to the Reserve. Projects with mixed site classes must round to the nearest site class category based on a weighted average.
    a. Site Classes I and II are classified as 'Higher'.
    b. Site Classes III, IV, and V are classified as 'Lower'.
5. Determine whether the project is "eligible" or "not eligible" according to the identified site preparation costs, value of harvested products, rotation age, and site class, as indicated in Table B.1.

[29] All projects are assumed to have similar costs related to the cost of seedlings and planting; site preparation costs, however, can vary depending on circumstances.

Table B.1. Determination of Reforestation Project Eligibility

Site Preparation Costs	Value of Harvested Products	Rotation Age (Years)	Site Class	Eligibility	Scenario #
High Site Preparation	High	<60	Higher	Not Eligible	1
			Lower	Not Eligible	2
		>=60	Higher	Eligible	3
			Lower	Eligible	4
	Medium	<50	Higher	Not Eligible	5
			Lower	Not Eligible	6
		50 - 59	Higher	Not Eligible	7
			Lower	Eligible	8
		>=60	Higher	Eligible	9
			Lower	Eligible	10
	Low	<30	Higher	Not Eligible	11
			Lower	Eligible	12
		>=30	Higher	Eligible	13
			Lower	Eligible	14
	Very Low	>=30	Higher	Eligible	15
			Lower	Eligible	16
Low Site Preparation	High	<60	Higher	Not Eligible	17
			Lower	Not Eligible	18
		60 - 69	Higher	Not Eligible	19
			Lower	Eligible	20
		>=70	Higher	Eligible	21
			Lower	Eligible	22
	Medium	<50	Higher	Not Eligible	23
			Lower	Not Eligible	24
		50 - 59	Higher	Not Eligible	25
			Lower	Eligible	26
		>=60	Higher	Eligible	27
			Lower	Eligible	28
	Low	< 30	Higher	Not Eligible	29
			Lower	Not Eligible	30
		30 - 49	Higher	Not Eligible	31
			Lower	Eligible	32
		>=50	Higher	Eligible	33
			Lower	Eligible	34
	Very Low	>=30	Higher	Eligible	35
			Lower	Eligible	36
		<30	Higher	Not Eligible	37
			Lower	Not Eligible	38