Overview of VM0047 v1.1

June 4, 2025

Photo by Lisa Murray. Bale Mountains Eco-Region REDD+ Project, Ethiopia (Verra Project 1340).

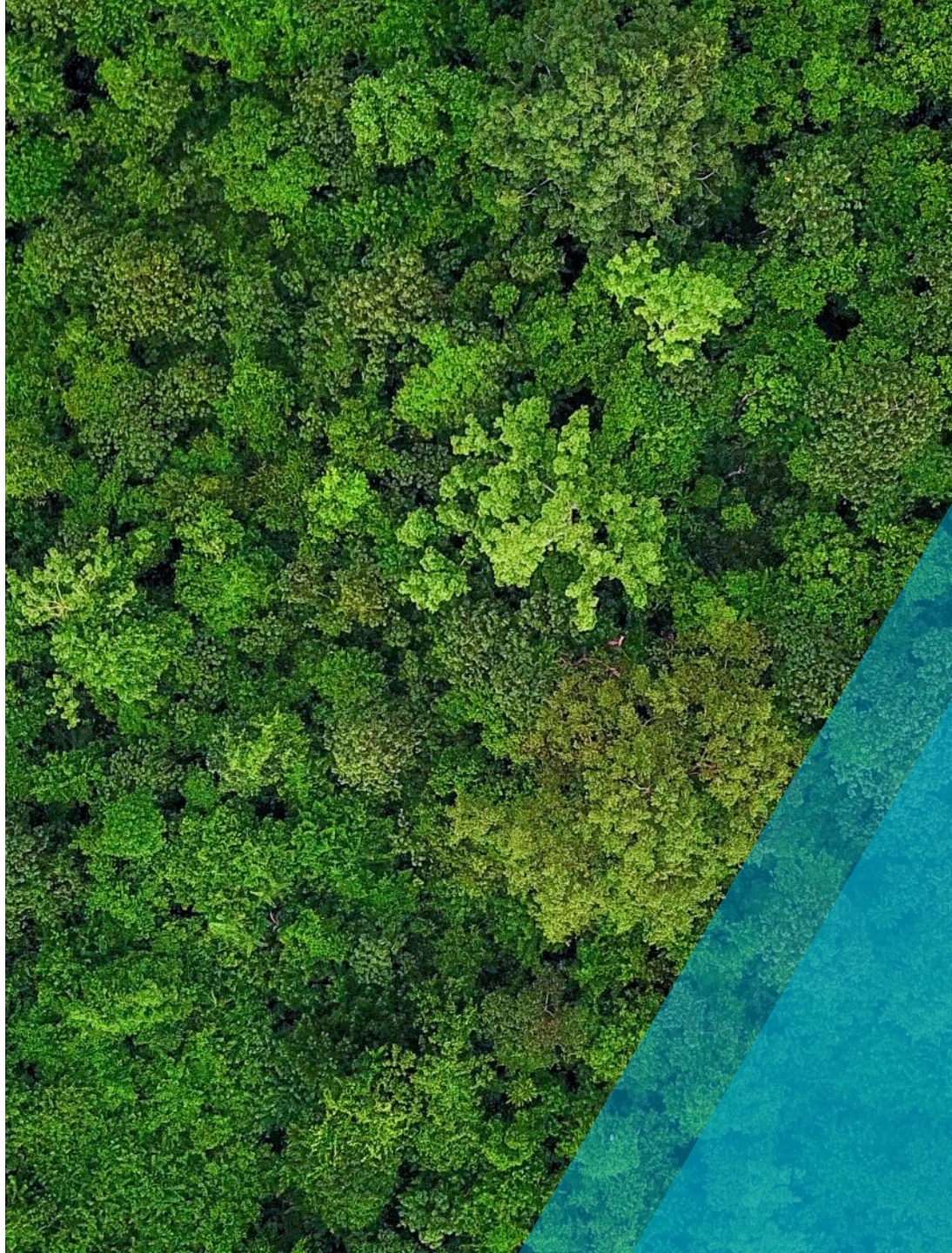
AGENDA

- Introduction to VM0047
- Overview of revision process
- Technical descriptions of revisions
- Questions (as time allows)

VERRA

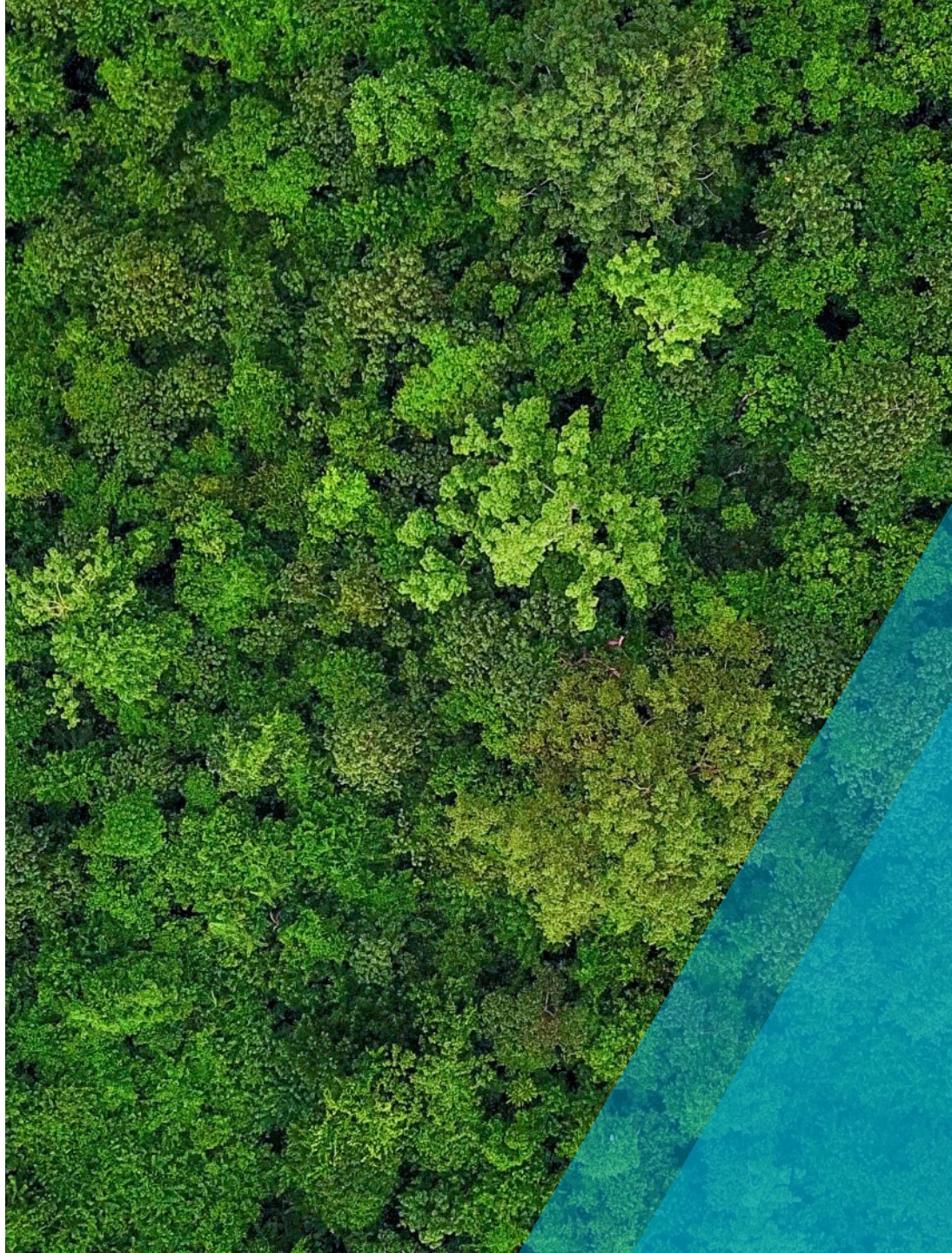
Introduction to VM0047

- Afforestation, Reforestation, and Revegetation = Nature-based carbon removals
- Two accounting approaches: Area-based and Census-based.
- First-of-its-kind dynamic performance benchmark that uses remote sensing
- 105 projects listed on the Verra registry from 40 different countries
- First ARR methodology approved for ICVCM Core Carbon Principles label.



Revision Process

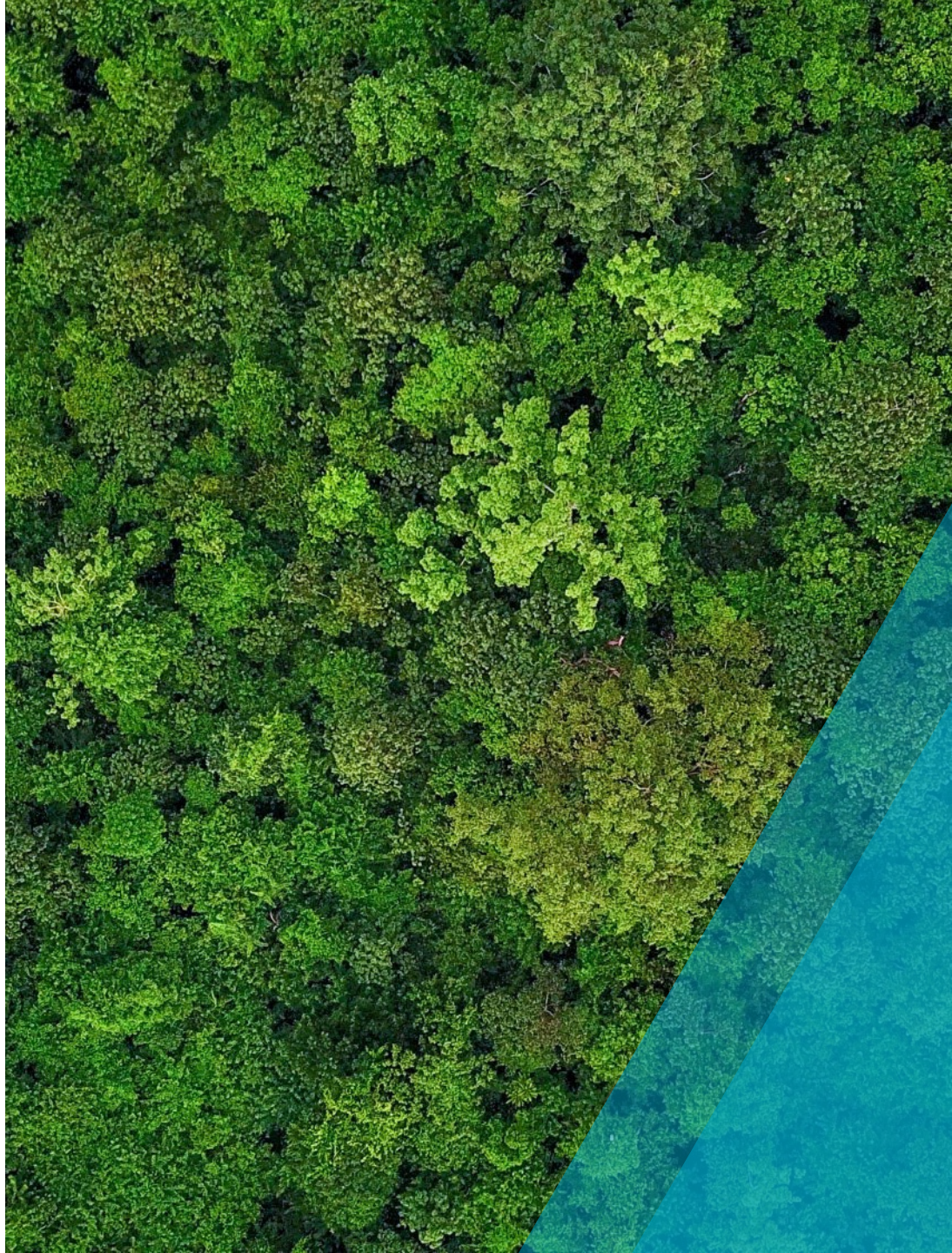
- Incorporates feedback received following the initial release and public comment feedback on draft revisions (May 2024 ~ 180 public comments).
- VM0047 v1.1 improves usability while maintaining rigor
- Expand applicability, enhance clarity, and incorporate corrections and added specificity.



Grace Periods and Versions

Grace periods for VM0047 v1.0

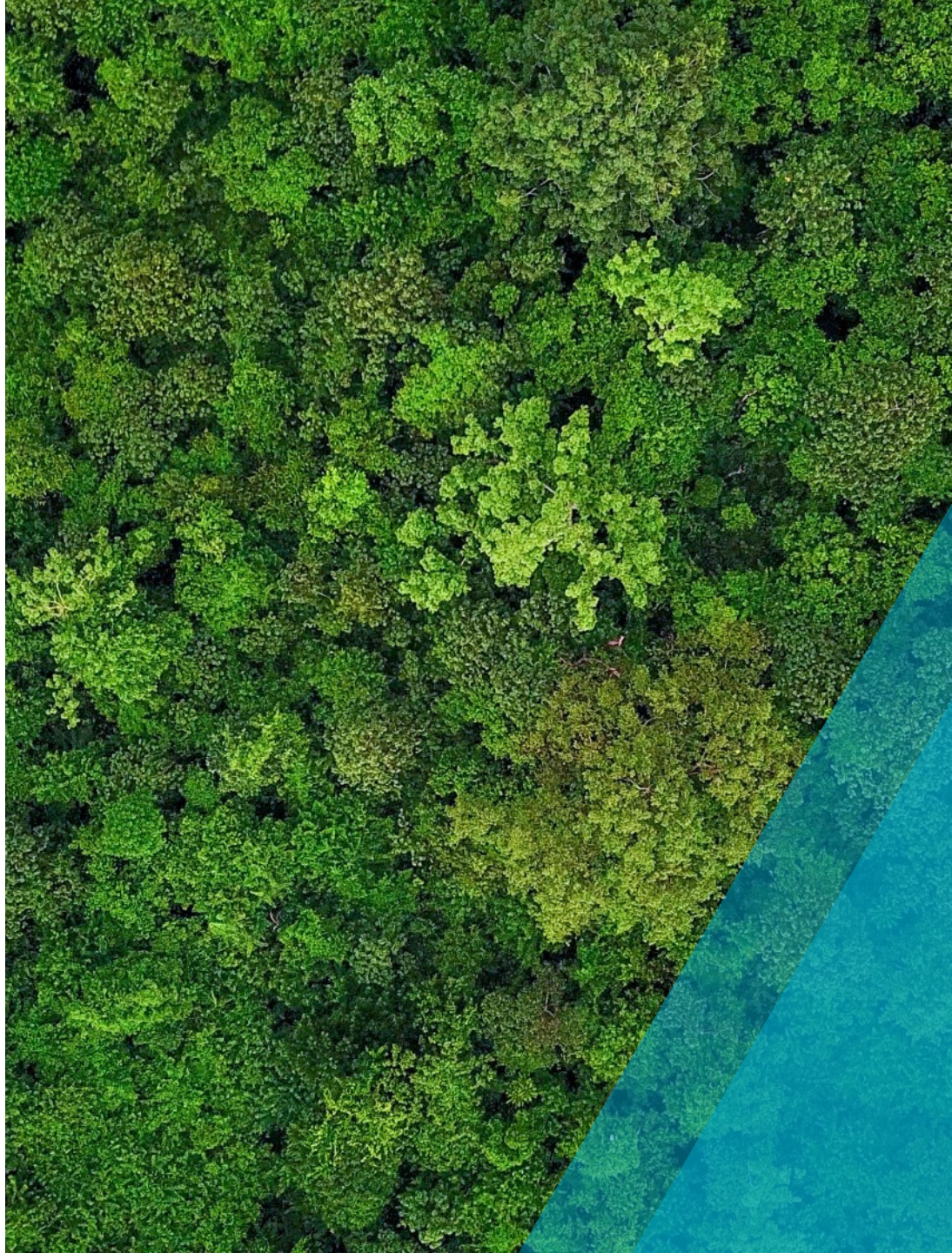
- Projects using VM0047 v1.0 must use the updated, correction and clarification (C&C) version, released May 14, 2025.
- Proponent must request pipeline listing status of Under Validation by Dec 31, 2025
- Proponent must request registration by Dec 31, 2026.



Grace Periods and Versions - cont.

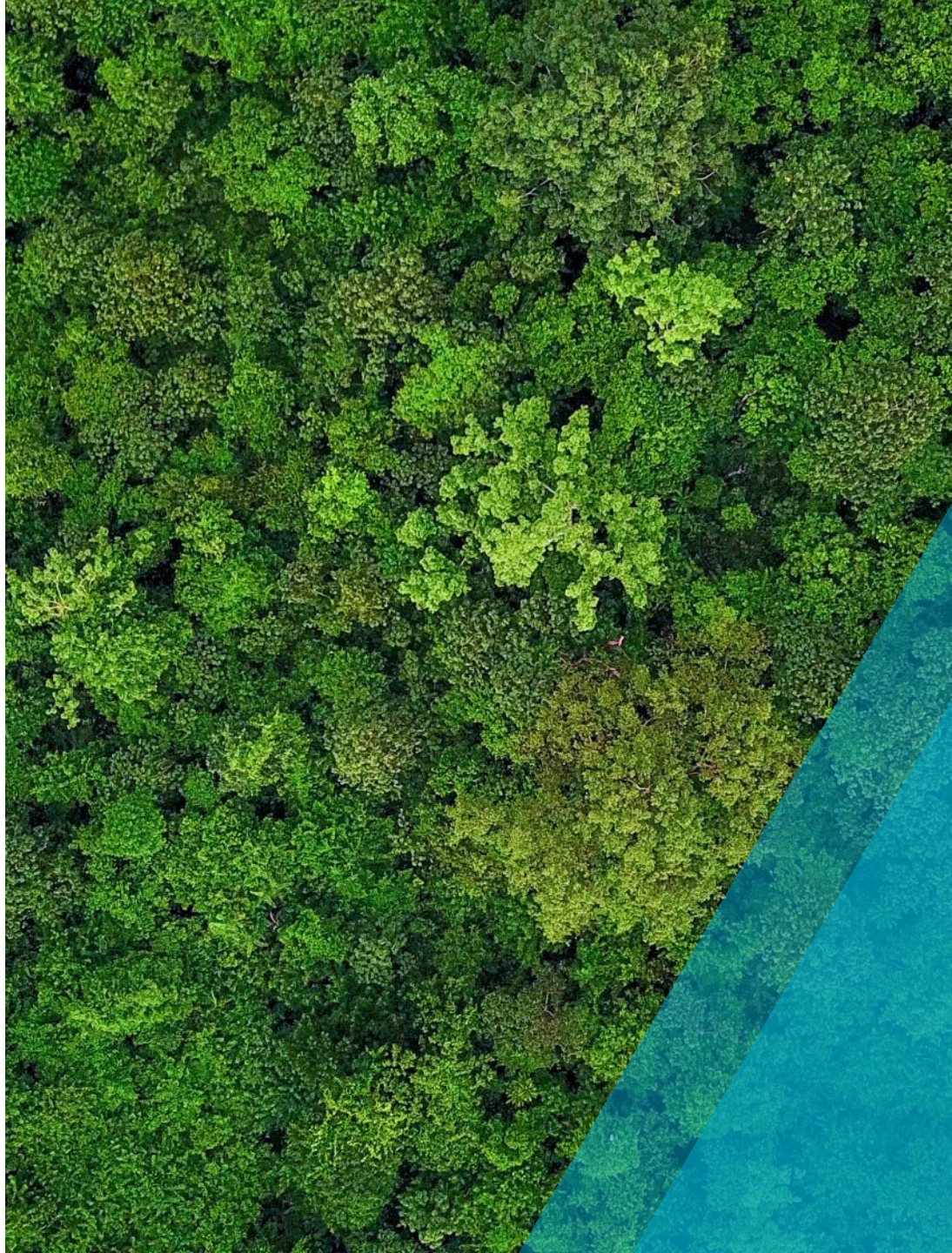
Projects that have yet to register:

- All projects may use VM0047 v1.1
- Project under validation using v1.0 may update to v1.1
- Verra will accept the updated PD under v1.1 as part of the normal review



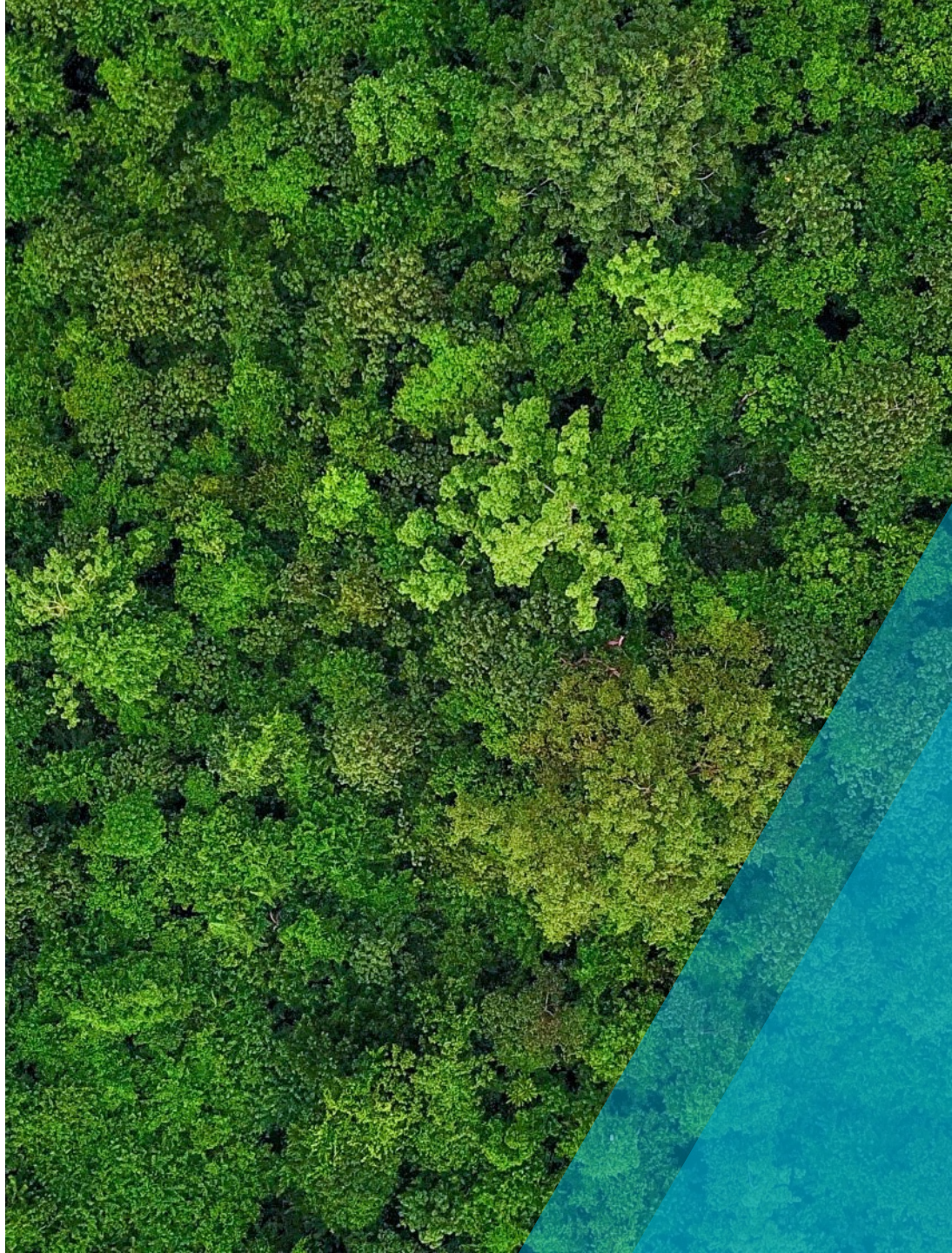
Upcoming Releases

- Submitting VM0047 v1.1 to ICVCM to ensure continued alignment with Core Carbon Principles (CCP) in Q2
- Example worksheet containing guidance to calculate the dynamic performance benchmark found in Appendix 1
- Revising ARR Leakage Module (VMD0054) expected out in Q3
- Long-term average tool - expected in Q4



VM0047 v1.1 – Revision Overview

- Existing Forest Cover
- Census-based planting density
- Census and spacing requirements
- Pre-existing woody biomass
- Removal of pre-existing woody and dead wood biomass
- Project start dates and t=0 measurements
- Exclusion Conditions
- Annualized Carbon Removals
- Ex-ante projections for crediting period
- Dynamic performance benchmark and stocking index
- Uncertainty – Appendix 3
- Significance of carbon pools - Appendix 2



Existing Forest Cover

Area-based approach

Section 1

VM0047 v1.1

VM0047 v1.0 C&C

"Project activities must establish, increase, or restore vegetative cover in non-forest areas (applicable to both approaches), or ***activities must enhance forest carbon stocks in areas with existing forest cover that have not been managed for wood products in the past ten years*** *(applicable to the area-based approach only)"*

- Projects that occur on lands that meet the definition of forest are now allowed under the area-based in v1.0 and v1.1.
- Land must not have been managed for wood products at any point in the last 10 years.
- This clarifies that restoration of under-stocked forests (due to degradation, deforestation, or natural disasters) are eligible under the area-based approach.
- Creates more opportunities for forest restoration.
- Projects will have to outperform a matched dynamic performance benchmark.

Planting density

Census-based approach

Section 4.3

VM0047 v1.1

VM0047 v1.0 C&C

" 2) The pre-project land use is maintained throughout the project lifetime (e.g., where projects occur on agricultural land, agricultural production continues).

3) Planting density does not exceed 50 planting units per hectare. The planting density limit applies proportionally to the size of each instance…"

- Threshold designed to avoid land-use change.
- Census-based approach is no longer limited to one hectare; it can be applied at any scale.
- Area-based approach can now be applied to instances that are less than one hectare and have more than 50 planting units per hectare.

Census and spacing requirements

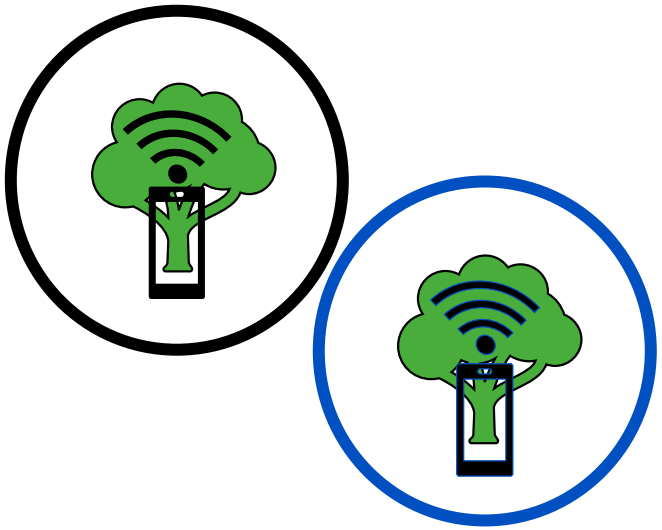
Census-based approach

Section 4.3

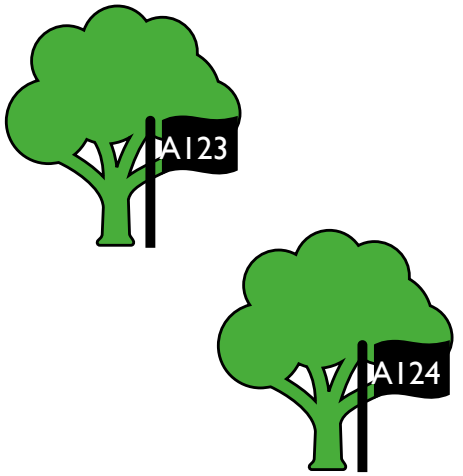
VM0047 v1.1

VM0047 v1.0 C&C

In the census-based approach, all planting units must be identifiable in the field using one of two methods:



- GPS points may be used where the spacing between individual planting units is greater than or equal to the positional accuracy of the Global Positioning System (GPS)



- Physical marker with a unique ID

Planting unit buffers

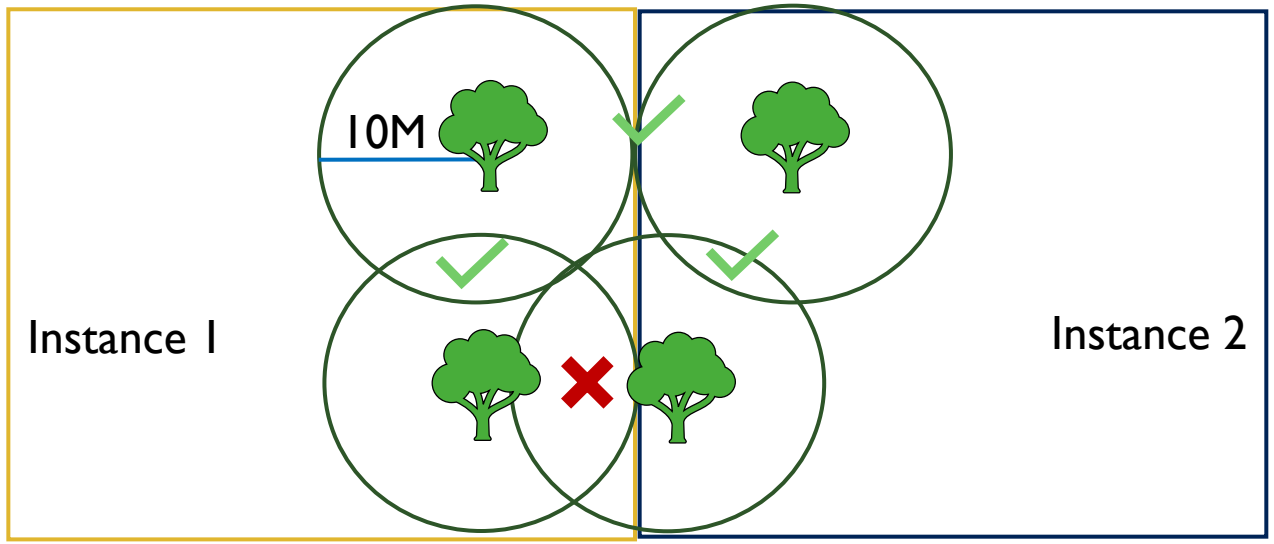
Census-based approach

Section 5.2

VM0047 v1.1

VM0047 v1.0 C&C

In the census-based approach, each planting unit has a 10-meter radius buffer. Together, these buffers define the accounting boundary of a project activity instance. Buffers may overlap within the same instance but must not overlap with the boundary of another census- or area-based instance. This separation between instances prevents double-counting.



Pre-existing woody biomass

Area-based approach

Sections 4,

Section 8.2.1.2

VM0047 v1.1 ✓

VM0047 v1.0 C&C ✗

Quantification of pre-existing woody biomass is required under the area-based approach. The stock difference method is used to quantify carbon stock changes and requires a t = 0 estimate…

*3) Where pre-existing woody biomass was disturbed before plot-based sampling, **a remote sensing-based estimate may be used** … The remote sensing estimate of pre-existing woody biomass must meet the following conditions:*

a) The model predicts aboveground woody biomass using a stocking index-based regression model (see Appendix 1).

b) The upper 90% confidence bound of the model's prediction interval is used as the t = 0 biomass estimate to account for uncertainty.

c) The model is significantly correlated with aboveground biomass, supported by published or peer-reviewed studies, or statistically validated with direct measurements from the same ecoregion as the project's ecoregion.

d) The spatial resolution is at least as fine as that of the remote sensing approach selected for the stocking index and meets all requirements listed in the parameter table for the stocking index in Appendix 1.

Removal of pre-existing woody and dead wood biomass

Area-based approach

Sections 4,

Section 8.2.1.2

VM0047 v1.1

VM0047 v1.0 C&C

Pre-existing woody biomass

The removal of pre-existing woody biomass is allowed as part of site preparation where all of the following conditions are met:

i) A t = 0 estimate has been established through plot-based sampling or remote sensing.

ii) The biomass removed from the project site is considered a waste product with no commercial value.

iii) Removal does not involve the clearing or harvesting of natural forests (primary or secondary), native tree species, or commercially viable timber species.

Where a project meets these requirements, the removal of pre-existing biomass does not constitute a harvesting activity and therefore does not require the project to apply the long-term average. However, this does not preclude the application of the long-term average if harvesting occurs at any point in the future.

Dead wood

- Removal of dead wood is now allowed as part of site preparation. However, it is only allowed when a plot-based sampling to establish an estimate at t=0 is done prior to the removal of dead wood. Removal of dead wood must be considered an immediate project emission.

Project start dates and t=0 measurements

Area-based approach

Section 4.2

VM0047 v1.1

VM0047 v1.0 C&C

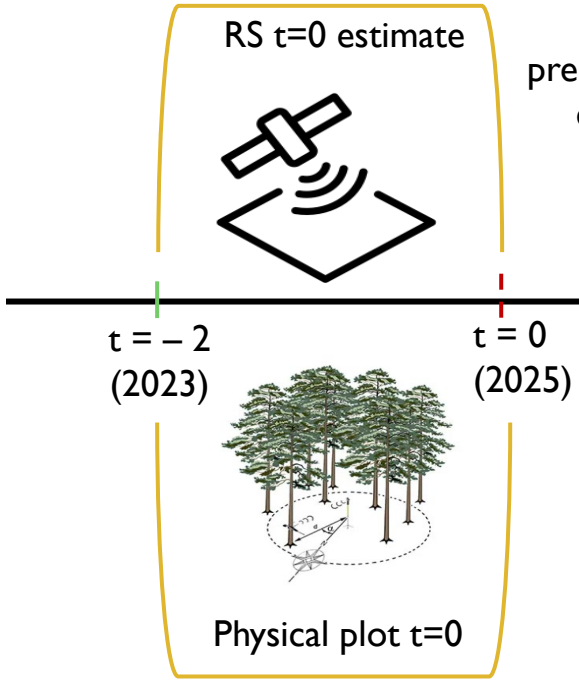
a) Where the project start date is initiated by site preparation (e.g., clearing invasive species), the following conditions must be met:

i) Before site preparation, project proponents establish t = 0 carbon stock estimates for all significant carbon pools.

ii) To ensure accuracy, t = 0 estimates are established no more than two years before the start date (e.g., if the start date is 2025, plots must have been established no earlier than 2023).

iii) Where plot-based measurements are not established before site preparation, a remote sensing-based estimate…may be used…pre-existing woody biomass.

Site preparation scenario (removal or disturbance of significant carbon pools)



Where t=0 plots were not established prior to site preparation that cleared of invasive species, remote sensing estimates of AGB and BGB pools at t=0 may be used

Project start date initiated in 2025 with site preparation that removed dead wood and SOC disturbance (plowing to plant trees) physical plot must have been established prior to clearing.

Project start dates and t=0 measurements

Area-based approach

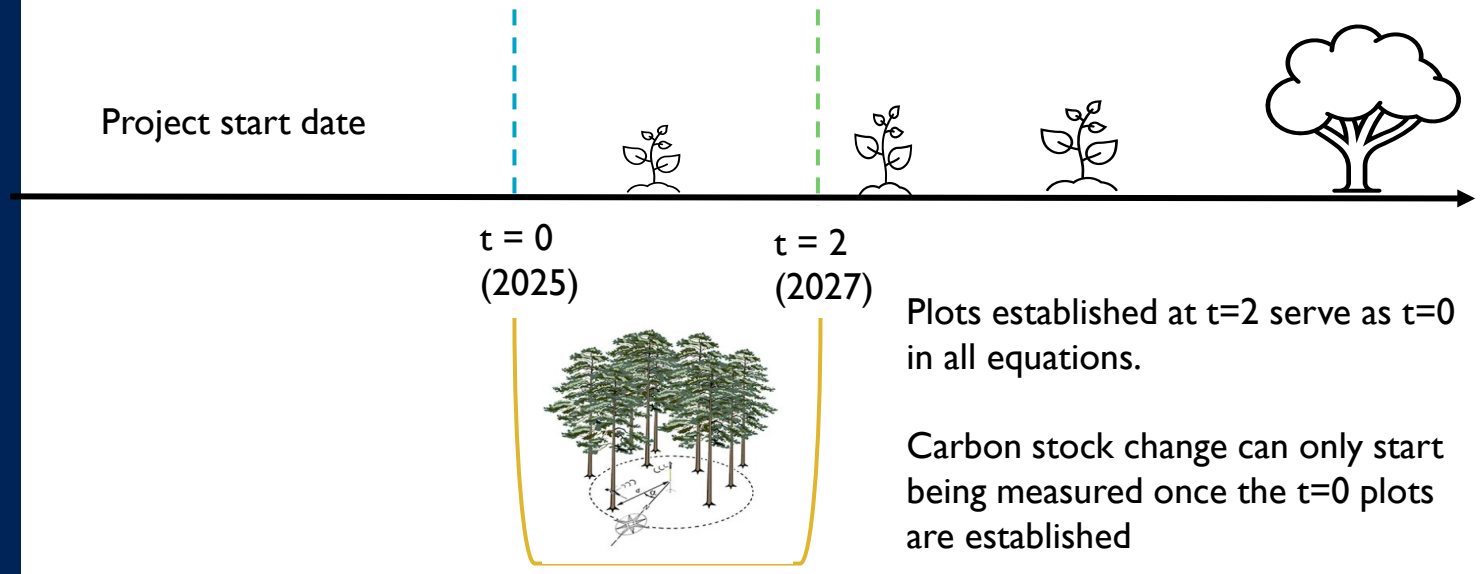
Section 4.2

VM0047 v1.1

VM0047 v1.0 C&C

Where the project start date is defined by a land use change date or where the project start ***did not include site preparation that caused a significant decrease in carbon stocks in monitored carbon pools*** *(e.g., pit planting without clearing existing vegetation) the following conditions must be met: i) The project proponent establishes t = 0 estimates within two years after the project start date (e.g., if the start date is 2025, plots must be established by 2027).*

Land acquisition/Assisted Natural Regeneration scenario



Plots established at t=2 serve as t=0 in all equations.

Carbon stock change can only start being measured once the t=0 plots are established

Physical plots must be used to establish t=0 estimate

Exclusion Conditions

Area-based approach

Section 4

VM0047 v1.1 

VM0047 v1.0 C&C 

*Project proponents are responsible for ensuring **full compliance with all VCS Program rules and requirements,** in addition to respecting the exclusion conditions. For example, where projects take place on land that was degraded within 10 years of the project start date, exclusion conditions are specified in Section 3.19 of the VCS Standard, v4.7*

This methodology is not applicable for projects using the area-based approach under the following conditions:

1. *The project occurs on lands that have met the definition of managed forest at any point in the 10-year period immediately preceding the project start date.*

2. *2) Clearing of pre-existing woody biomass involves timber harvesting or results in degradation of native ecosystems.*

Annualized Carbon Removals

Both approaches

Section 8.3

VM0047 v1.1

VM0047 v1.0 C&C

To calculate annualized carbon dioxide removals (CR_annualized), divide the total removals (CRt) in the monitoring interval by the length of the monitoring interval (x):

$$CR_{annualized} = \frac{CR_t}{x}$$

Where:

$CR_{annualized}$	=	Annualized carbon dioxide removals (t CO_2e/year)
CR_t	=	Carbon dioxide removals from the project activity over monitoring interval *t* (t CO_2e)
x	=	Length of the monitoring period (years)

Ex-ante projections for crediting period

Area-based approach

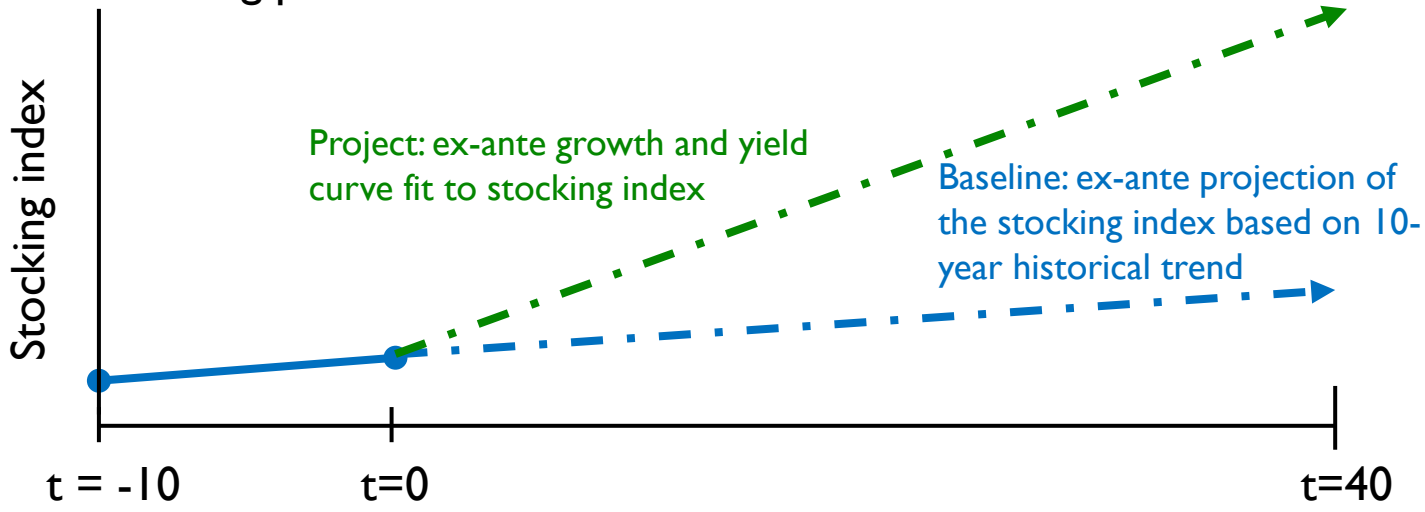
Section 8.7

VM0047 v1.1 ✓

VM0047 v1.0 C&C ✗

At validation, ex-ante estimates must be made for the length of the crediting period. Projected changes in biomass must be based on growth and yield models constructed with data and parameters that conservatively represent the project activity.

For the area-based approach the ex-ante projection of the baseline is forecasted as an extrapolation of the trendline of the control plot stocking index for the duration of the crediting period.



Note – Ex-ante projections of project and baseline carbon removals are used only as a demonstration of project viability and are never used for the purpose of crediting.

Dynamic performance benchmark and stocking index

Area-based approach

Appendix 1

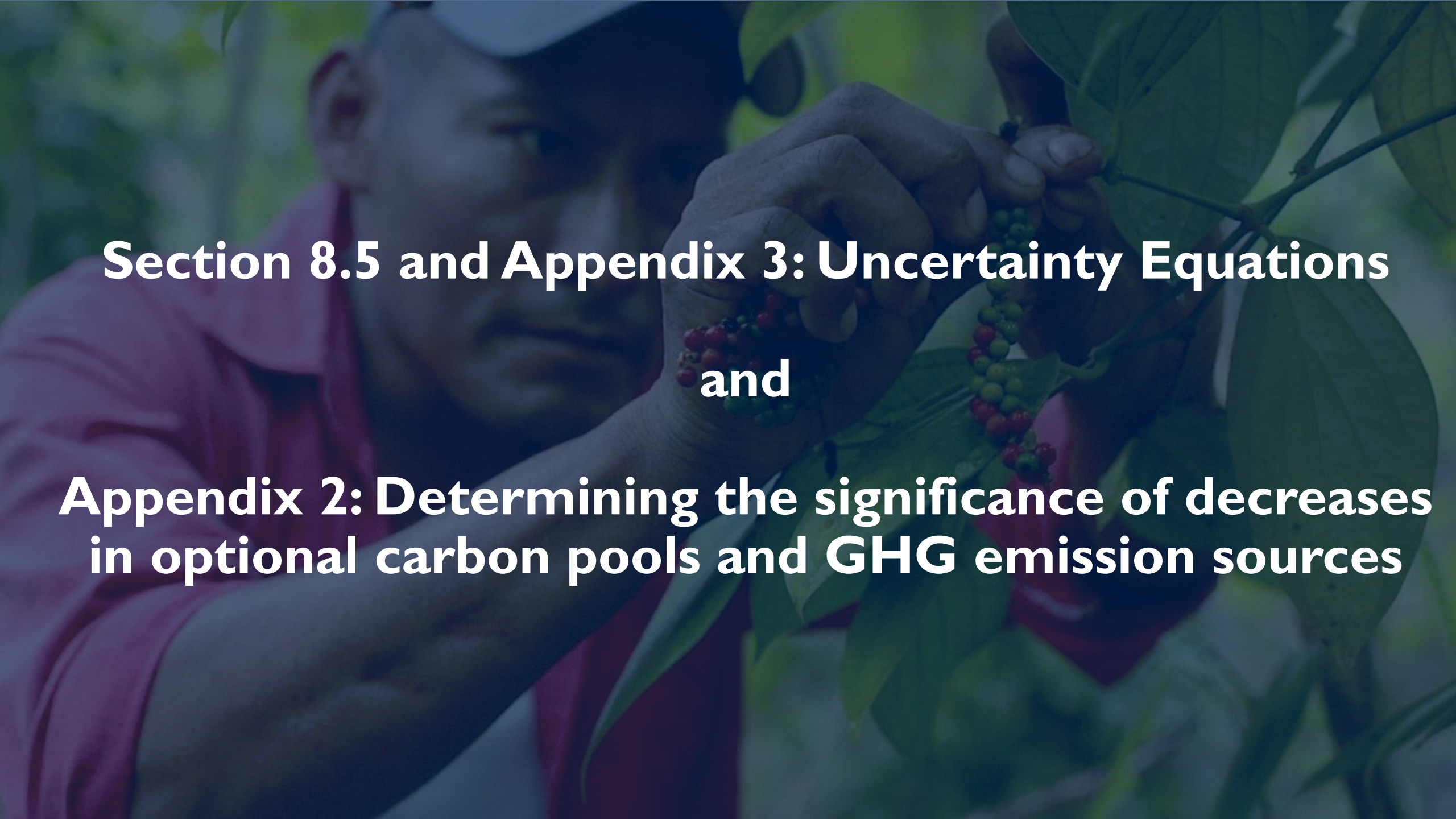
VM0047 v1.1

VM0047 v1.0 C&C

Note - If the project is stratified or is a grouped project where new instances are added in subsequent years, individual strata may contain fewer than 30 plots, provided the total sample size is at least 30.

The rate of increase in stocking index in the control (ΔSIcontrol,t) and project (ΔSIwp,t) plots is calculated in Equations (A5) and (A6) as the slope of the weighted least squares regression (WSLR) of the accumulated time series of SI values for the respective population of plots.

- Equations A5 and A6 were added for clarity
- Updated the parameters table to clarify that the stocking index may include model-assisted, remotely sensed biomass maps that combine data from multiple sources. This change allows projects to use more accurate regional datasets while avoiding saturation issues common with NDFI in high-biomass areas.



Section 8.5 and Appendix 3: Uncertainty Equations

and

Appendix 2: Determining the significance of decreases in optional carbon pools and GHG emission sources

Uncertainty

Area-based approach

Section 8.5.1

VM0047 v1.1

VM0047 v1.0 C&C

Project proponents must use standard methods to estimate uncertainty when calculating changes in carbon stocks. The formula should be appropriate to the type of measurement used and be applied to each carbon pool p (representing woody biomass, non-woody biomass, dead wood, litter and SOC) included in the project.

New equations based on the monitoring approach selected by the project:

$$UNC_t = \text{MIN}\left(100\%, \text{MAX}\left(0, \left(T \times \frac{\sqrt{SE^2{}_{p,t=0} + SE^2{}_{p,t} - (2 \times \rho \times SE_{p,t=0} \times SE_{p,t})}}{\Delta C}\right) - 0.10\right) \times 100\right)$$

Where:

UNC_t	=	Uncertainty in cumulative removals through year t (%)
T	=	Critical value of a student's two-tailed t-distribution for significance level $\alpha = 0.1$
$SE_{p,t=0}$	=	Standard error of the mean carbon stock estimate at time $t = 0$ (t CO_2e)
$SE_{p,t}$	=	Standard error of the mean carbon stock estimate at time t (t CO_2e)
ρ	=	Correlation coefficient (rho) between carbon stocks at $t = 0$ and t (used only for permanent plots; term is set to zero for independent measurements between $t = 0$ and t)
ΔC	=	Mean change in carbon stocks between $t = 0$ and t (t CO_2e)

Uncertainty

Census-based approach

Section 8.5.2

VM0047 v1.1

VM0047 v1.0 C&C

Project proponents must use standard methods to estimate uncertainty when calculating changes in carbon stocks. The formula should be appropriate to the type of measurement used and be applied to each carbon pool p (i.e., representing AGB, BGB) included in the project.

$$UNC_t = \text{MIN}\left(100\%, \text{MAX}\left(0, \left(T \times \frac{\sqrt{SE_{p,t}^2 + (C_{total,t} \times \frac{U_{M,t}}{100})^2}}{C_{total,t}}\right) - 0.10\right) \times 100\right)$$

Where:

UNC_t	=	Uncertainty in cumulative removals through year *t* (%)
$U_{M,t}$	=	Percentage uncertainty in population size adjusted for mortality in the project scenario in year *t* (%)
t	=	1, 2, 3, ..., *t* years elapsed since the project start date
T	=	Critical value of a student's two-tailed t distribution for significance level α = 0.1

$$U_{M,t} = T \times \sqrt{\frac{M_t \times (1 - M_t)}{n_t - 1}} \times \frac{1}{1 - M_t} \quad (31)$$

Where:

$U_{M,t}$	=	Percentage uncertainty in population size adjusted for mortality in the project scenario in year *t* (%)
T	=	Critical value of a student's two-tailed t distribution for significance level α = 0.1
M_t	=	Mortality through year *t* (%)
n_t	=	Number of planting units sampled in year *t* (integer)
t	=	1, 2, 3, ..., *t* years elapsed since the project start date

Uncertainty – Appendix 3

- New Uncertainty equations based on the monitoring approach selected by the project (area-based):
  - Where projects switch approaches (e.g., independent inventories between t = 0 and t = 5, and then permanent plots are used from t = 5 onwards), the combined uncertainty between periods must be estimated using the steps shown in Appendix 3.

Step 5: Quantify the Final Uncertainty Deduction

$$UNC_t = \text{MIN}\left(100\%, \text{MAX}\left(0, \left(T \times \frac{SE_{\Delta C_{t0\rightarrow t}}}{\Delta C_{t0\rightarrow t}}\right) - 0.10\right) \times 100\right) \quad \text{(A16)}$$

Appendix 2 - Significance of carbon pools

- Expanded guidance to clarify the steps needed to determine the significance of decreases in optional carbon pools and GHG emission sources
- All *Es* may be deemed de minimis and excluded from quantification if their combined impact (in tCO2e) is less than 5% of the total amount of carbon removal expected from the project

Step 1: Determine Combined Significance of E_s

$$CSR = \frac{\sum E_s}{CR} \qquad (A9)$$

CSR	=	Combined significance ratio
CR	=	Total carbon dioxide removals expected from the project (tCO_2e)
E_s	=	Project emissions and decreases in optional carbon pools (tCO_2e)
s	=	1, 2, 3, ..., S sources of project GHG emissions and decreases in carbon pools

1) Where CSR < 0.05 (i.e., less than 5%), all optional sources are deemed de minimis.

2) Where CSR ≥ 0.05, proceed to Step 2 to determine which decreases in carbon pools and GHG emissions must be included.

Emission source / pool	tCO2e	Sum of Es	CSR
CO2e removals	2,500.00		
Non-woody vegetation clearing		150.00	
Fertilizer emissions		15.00	
Fire from non-project activities		10.00	
Total Sum	**2,500.00**	**175.00**	**7.0%**

Appendix 2 - Significance of carbon pools

- Expanded guidance to clarify the steps needed to determine the significance of decreases in optional carbon pools and GHG emission sources (Table 1 for the Area-based approach)
- All *Es* may be deemed de minimis and excluded from quantification if their combined impact (in tCO2e) is less than 5% of the total amount of carbon removal expected from the project

Step 2: Determine Significance of Individual E_S

For each E_S, calculate its relative contributions (RC_{ES}) to the total carbon pool decrease and GHG emissions sources (E_S):

$$RC_{Es} = \frac{E_s}{\sum E_s} \quad \text{(A10)}$$

1) Order E_S according to their ranks from largest source to smallest.
2) Add the sources starting from the largest. Stop when the cumulative total equals or exceeds 95%.
3) Include all the sources that add up to, or exceed, 95%.
4) Any remaining sources (those that make up the last 5%) may be excluded, but only if their combined impact is also less than 5% of total CR. If not, keep adding sources until that condition is met.

Significance of carbon pools

- Expanded guidance to clarify the steps needed to determine the significance of decreases in optional carbon pools and GHG emission sources (Table 1 for the Area-based approach)
- All *Es* may be deemed de minimis and excluded from quantification if their combined impact (in tCO2e) is less than 5% of the total amount of carbon removal expected from the project

Emission source / pool	tCO2e	Sum of Es	CSR	% of total Es	Rank
CO2e removals	2,500.00				
Non-woody vegetation clearing		150.00		86%	1
Fertilizer emissions		15.00		9%	2
Fire from non-project activities		10.00		6%	3
Total Sum	**2,500.00**	**175.00**	**7.0%**		

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THANK YOU

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Questions?