

**CLIMATE FORWARD** ▶

# **The Role of Reforestation in Carbon Markets**

*A Review of Climate Forward's  
Reforestation Forecast Methodology V2.0*

June 16, 2022



A program of the **CLIMATE  
ACTION  
RESERVE**

# Speakers



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# Agenda

- Introduction to Climate Action Reserve and Climate Forward
- Overview of Reforestation Forecast Methodology
- Q&A



# Introduction to Climate Action Reserve & Climate Forward

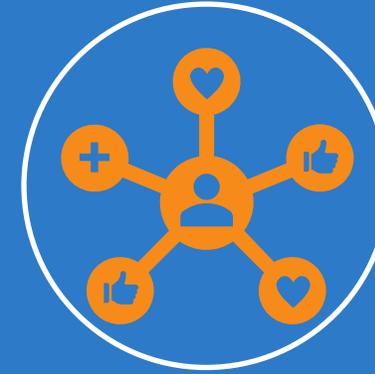




Regulatory-  
quality standard  
setting and credit  
generation



Publicly  
accessible web-  
based system



Comprehensive  
protocol  
development  
process

Working to ensure integrity, transparency, and financial value in the North American carbon market

# CLIMATE FORWARD ►

Climate Forward accelerates action on climate change by encouraging investment in projects that mitigate future greenhouse gas emissions



A program of the CLIMATE  
ACTION  
RESERVE

# Climate Forward:

*a carbon project registry*



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## Issues Forecasted Mitigation Units (FMUs) to projects that follow Reserve-approved methodologies

- Follows ISO 14064-2 and GHG Protocol for Project Accounting Standards
- Credits issued about one year after project commencement, for the forecasted climate benefit over the project's lifetime
- No long-term, ongoing monitoring, reporting and verification requirements



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## Expands the scope and scale of carbon project types

- Enormous potential for diverse, creative climate solutions



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## Tracks FMUs ownership and project activities in a publicly accessible database

- A registry of forward-looking GHG reductions to balance against forward-looking GHG impacts

# Accelerating Climate Mitigation: CLIMATE FORWARD

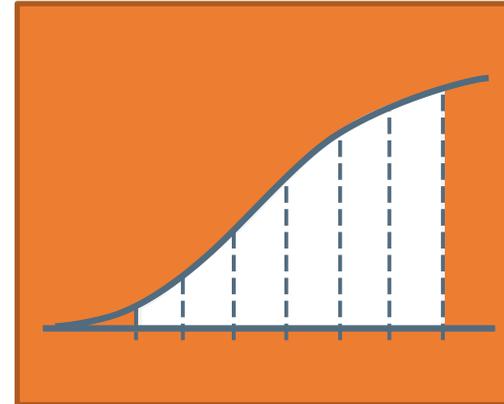
CLIMATE FORWARD ►

## Offsets / CRTs

### Climate Reserve Tonnes

1 CRT = 1 tCO<sub>2</sub>e of achieved reductions/removals

*Ex post*



Issued for **achieved**  
GHG removals



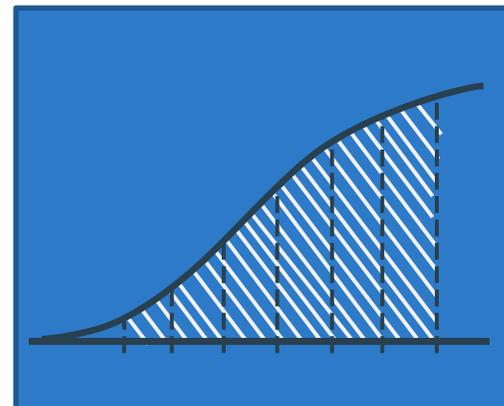
Used to mitigate any  
emissions

## FMUs

### Forecasted Mitigation Units

1 FMU = 1 tCO<sub>2</sub>e of anticipated reductions/removals

*Ex ante*



Issued for **forecasted**  
GHG removals



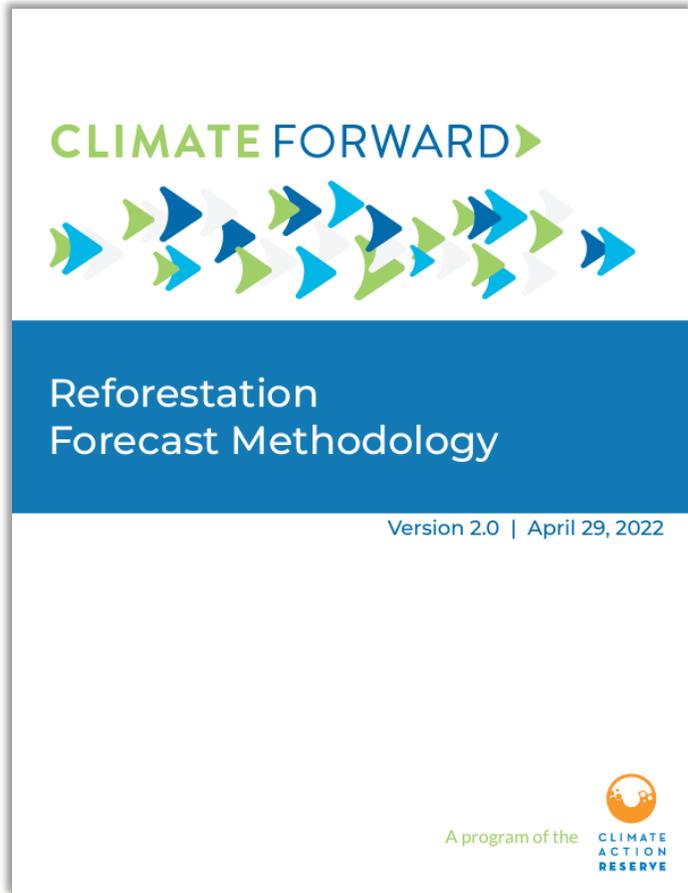
Used to mitigate  
anticipated emissions

# Overview of Reforestation Forecast Methodology



## Revisions from Reforestation Forecast Methodology V1.1 to V2.0

- Introduction of programmatic monitoring
- Clarification on future voluntary monitoring options, including transitioning to the Reserve's voluntary offset program
- Guidance for selecting default projections and proposing new projections
- Increased clarity and flexibility around conservation easement-related provisions
- Guidance regarding stacking with ecosystem services payments
- Addressed effects of pre-existing trees/seedlings/shrubs on baseline quantification
- Incorporation of soil carbon increases (limited situations)
- Revisions to standardized discounting
- Adjustments for non-seedling-based planting projects



Accounts for carbon sequestration associated with **the restoration of forest cover on sites where trees are not regenerating on their own.**  
**Credits issued on an ex ante basis**

Establishes eligibility rules, methods to calculate expected GHG removals, and procedures for reporting project information to the Reserve

Provides guidance for **independent confirmation** by a Reserve-approved confirmation body selected by the project proponent

# Methodology introduction

*Ex ante* crediting shifts the project economics, helping to cover initial reforestation costs



# Project Proponent



An entity that is issued FMUs and is ultimately responsible for all project reporting and confirmation and has exclusive claim to C removals from the project



Project proponent is assumed to be owner of the land and trees



If not, must provide agreement with landowner granting the right to be issued credits to project proponent → Allows for aggregation across multiple landowners



# Overview of Reforestation Forecast Methodology

*Eligibility*



# Start Date & Crediting Period



## Start date

First date that trees are planted or site preparation initiated



## Submission deadline

Must be submitted for listing within 12 months of start date



## Crediting period

Period for which future projections of sequestered carbon are recognized for crediting

Varies based on forest community and land ownership, up to 100 yrs

Linked to permanence



## Project Location

Unlimited geography with approved tree seedling growth projections

- Currently forest communities in the US are approved
- Project proponents may propose additional forest community projections for approval for a fee

Appropriate for reforestation

- Site is ecologically appropriate for forest cover
- Intervention is necessary to establish forest cover
- Site is not at high risk for conversion to non-forest use

# Environmental & Social Safeguards

Must support/enhance native ecosystems

Initiate forest composed of diversity of native tree species

For communal lands: free, prior and informed consent required

Encouraged to voluntarily report any non-GHG benefits, including any alignment with the United Nations' Sustainable Development Goals

## Performance standard test



Not under forest cover for at least 10 years, or

Affected by natural disturbance within past 10 years, resulting in <25% canopy cover

## Legal requirement test



Project activities must not be legally required

Conservation agreements requiring reforestation must not pre-date the project start date by one year

## Enhancement payment stacking



Submitting a project based on the same practices that are being funded by the government or other parties via grants, subsidies or other similar payments, including ecosystem services payments

Generally, not prohibited but must obtain approval and guidance from the Reserve

If full cost is covered, likely not additional

# Permanence

## Climate Action Reserve's standard:



Climate benefits of GHG removals are realized when removals are permanent



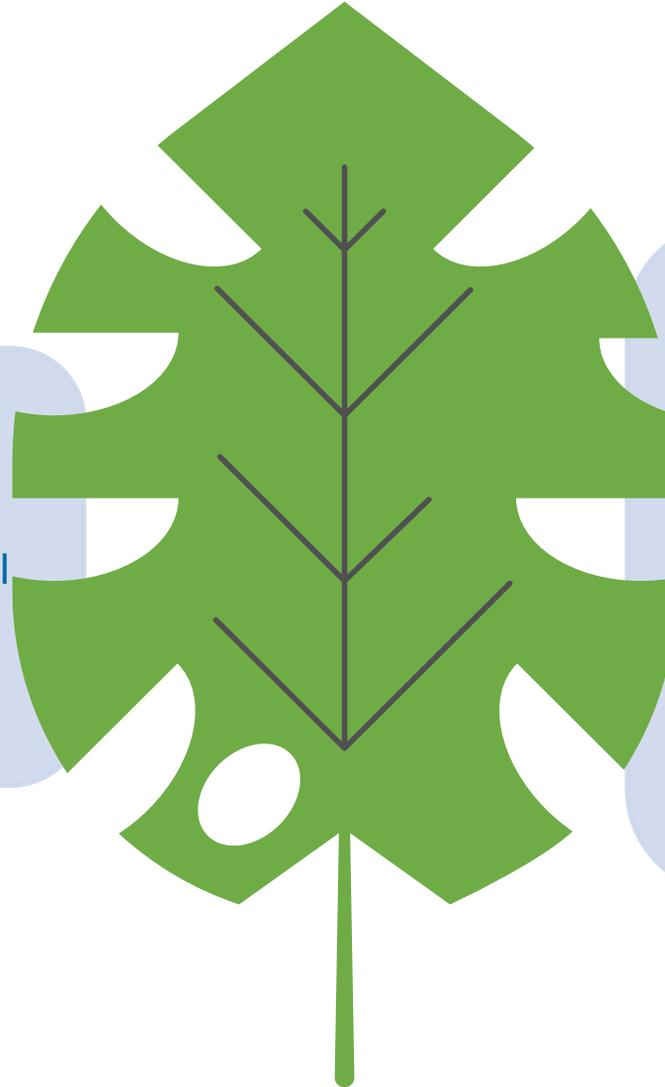
100 years = permanent

**How to apply this standard within an *ex ante* framework?**



## Tonne-Tonne Accounting

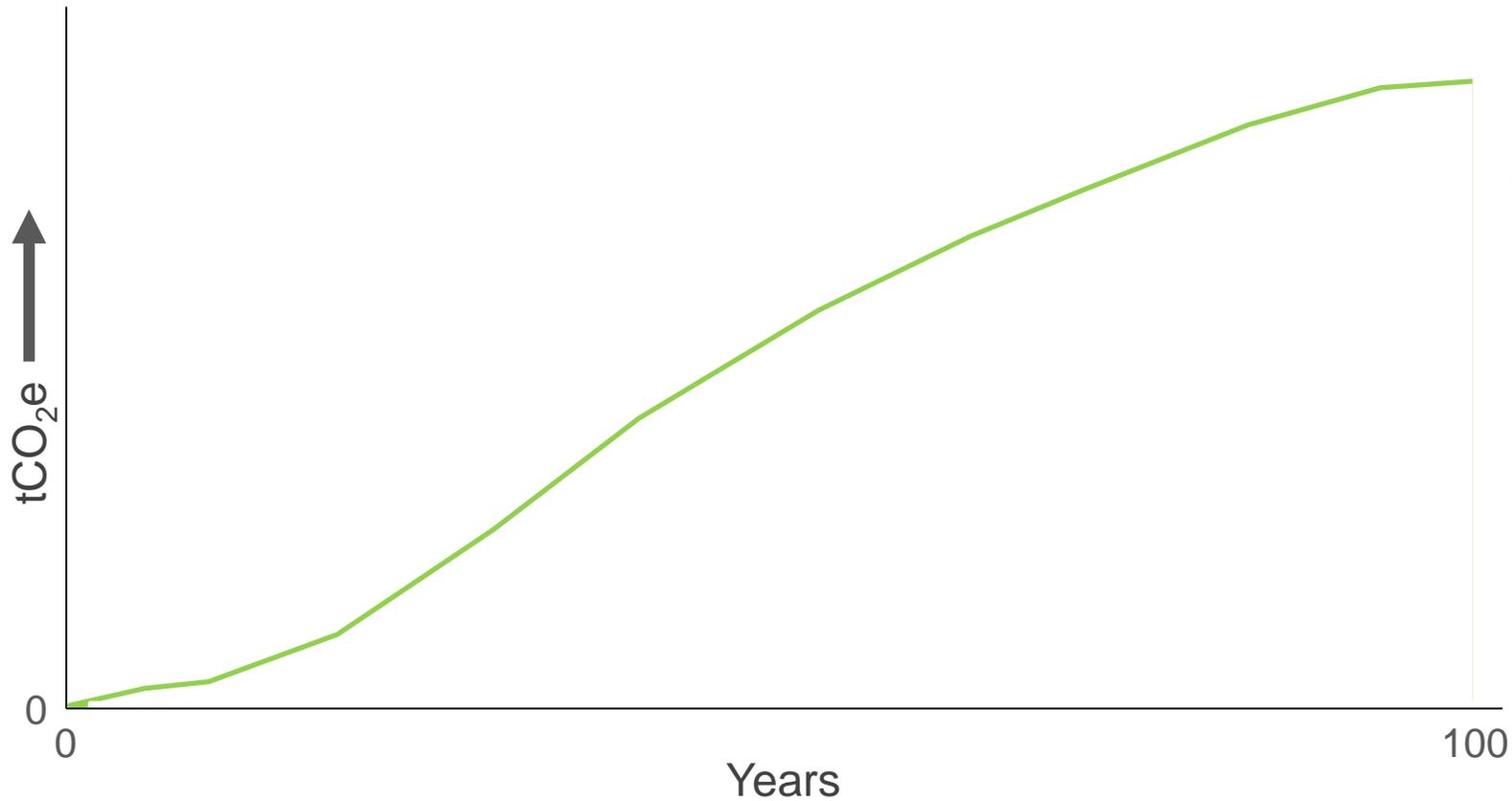
- 1 t CO<sub>2</sub> sequestered = 1 FMU
- When assured additional C will remain sequestered 100 years



- Recognizes time-value of CO<sub>2</sub> sequestered through end of crediting period
- 1% of 100-year climate effect issued per year tonne remains sequestered (0.01 FMU per tonne per year)
- When C will remain sequestered for <100 years

## Tonne-Year Accounting

# Permanence



Projections show expected increases in timber volume and C stocks



Ideally, stocks would be maintained for 100 years after being sequestered

# Permanence



Perpetual conservation agreement/easement



100-year permanence is assured



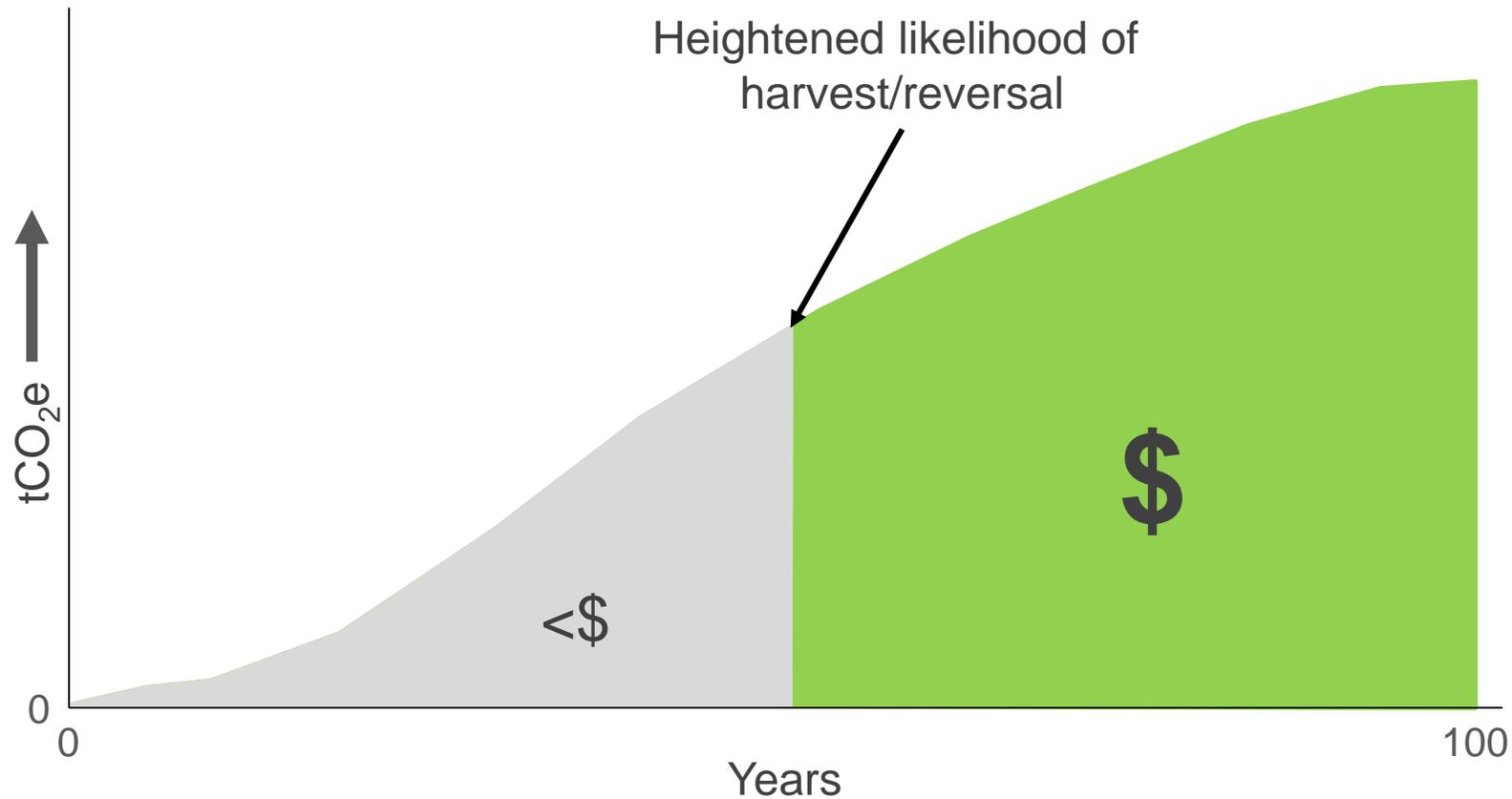
1 tCO<sub>2</sub>e = 1 FMU  
&  
100-yr crediting period

Similar for public lands managed to maintain forest cover, but crediting period typically shorter

## Conservation agreement terms

Requirement	Description	Notes
<b>Agreement holder</b>	Agreement held by qualified conservation agreement holder that is a governmental agency or a non-governmental accredited by relevant governing body, where applicable (e.g., Land Trust Alliance)	Conducts long-term monitoring of conservation agreement terms
<b>Forest cover</b>	Project area must be dedicated to forest cover	Required for at least the length of the permanence period for the project
<b>Reforestation after disturbance</b>	If site experiences a natural disturbance (e.g., wildfire) with >50% tree canopy loss, site will be reforested	Allows for passive reforestation (letting trees regrow on their own). Reforestation required after each of at least two such disturbances.
<b>Harvest limits (optional)</b>	During crediting period, harvesting only for forest health, safety or salvage; must increase quadratic mean diameter of trees; may not reduce canopy cover <60% on any 10 acres	Harvest limits must be applicable for the length of the crediting period, after which harvest must be limited to growth  If not included, project-specific modeling must be performed based on any included harvest limits

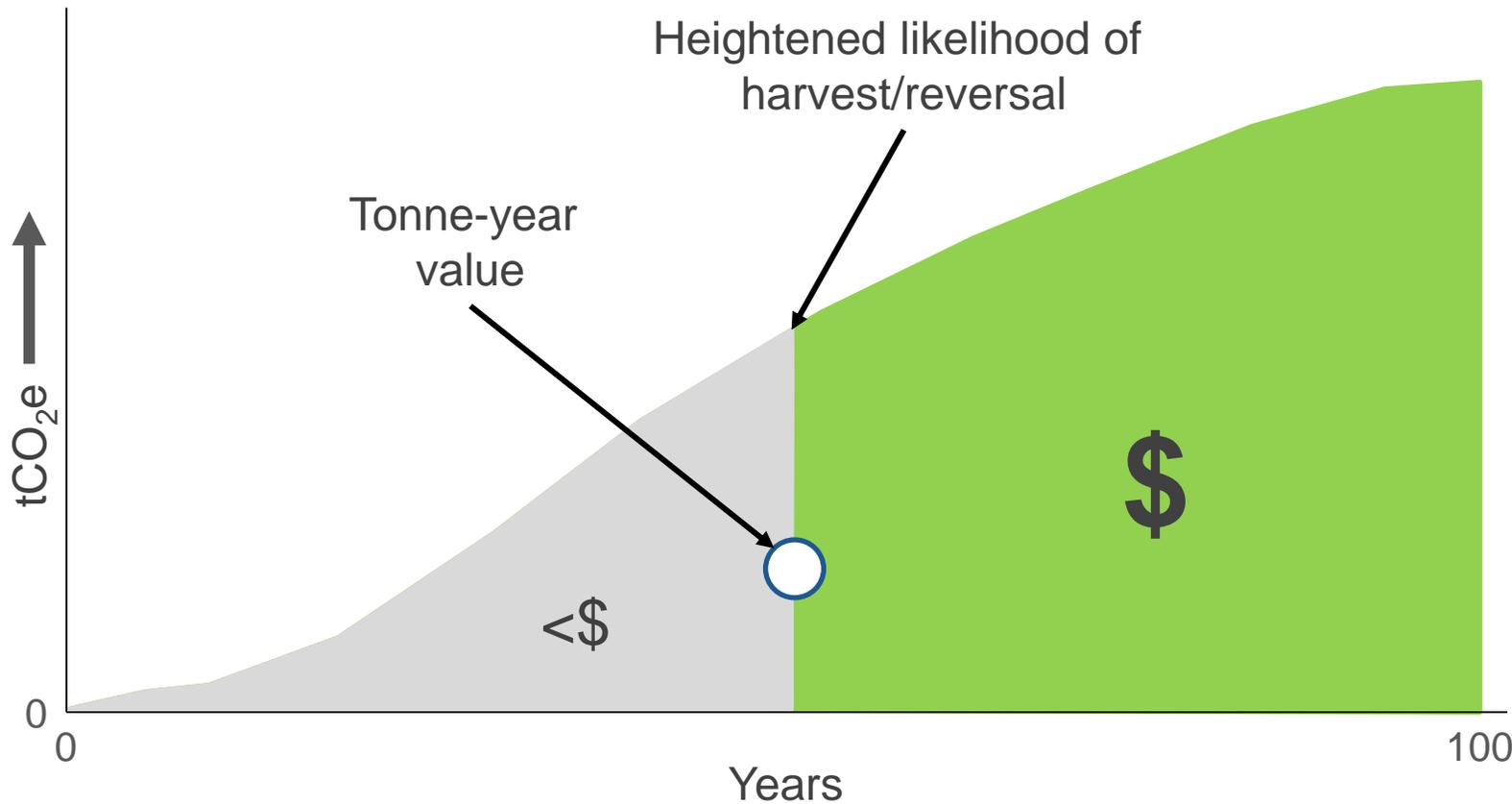
# Permanence



If 100-yr storage not assured, crediting period limited based on risk of reversal from timber harvest

Likelihood of harvest increases once trees reach merchantable sizes and/or growth rates decline

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If 100-yr storage not assured, crediting period limited based on risk of reversal from timber harvest

Likelihood of harvest increases once trees reach merchantable sizes and/or growth rates decline



End of crediting period = point of increased likelihood of harvest & Tonne-year accounting applied: 1% for each year each tCO<sub>2</sub>e expected to remain sequestered

## Additional measures to ensure projected C stocking achieved and provide FMU integrity

Confirmation occurs at least 1 year after seedling planting/site prep

### Standard deductions applied to ensure programmatic integrity

	Programmatic Ex Ante Risk Discount	Permanence Risk Pool Contribution
<b>Intent</b>	Address risk of project being intentionally abandoned (e.g., harvest, conversion) or underperforming relative to projections	Address risk of unintentional reversals (e.g., wildfire), similar to buffer pool contributions for offset program
<b>Deduction</b>	Maximum of 10%, scaled to length of crediting period relative to 100 years (e.g., 50yr crediting period → 5% discount).  Maximum lowered to 5% if incorporating conservation agreement with minimum terms that help to secure ongoing forest cover	

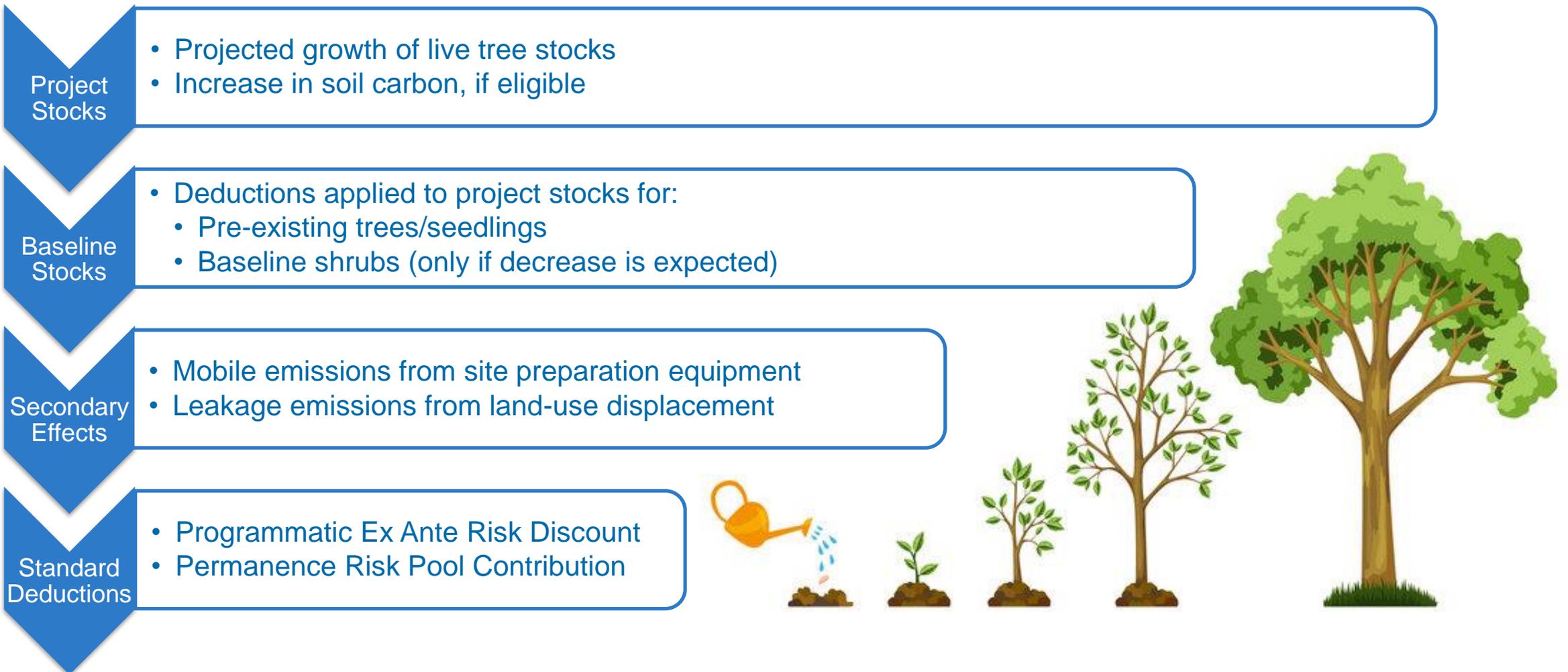
# Overview of Reforestation Forecast Methodology

*Quantification*



# Quantifying GHG Removals

## Comparison of project stocks to baseline stocks, projected forward throughout the crediting period



# Live Tree C Quantification

Based on growth projections—defaults provided by the Reserve

**Guidance for  
selecting default  
projection(s) to  
use:**

Species composition  
(forest type)

Tree establishment  
conditions (e.g.,  
planting density)

# Live Tree C Quantification

If no matching default projection or default seems inappropriate, new projection(s) may be proposed

Reviewed and approved by the Reserve

Use of approved model (project-specific projections)

Demonstrate how modeling is appropriate and conservative

If proposing use of tonne-year accounting in new jurisdiction, must also propose how crediting period length is determined, based on increased likelihood of harvest.

# Live Tree C Quantification

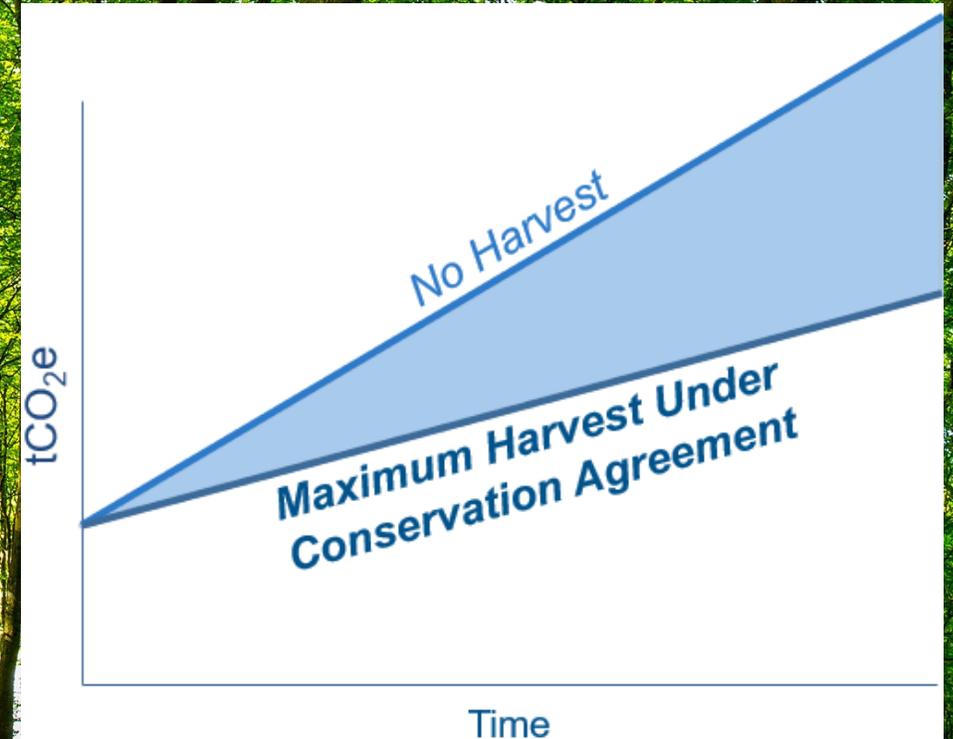
Conservation agreement may include timber harvest limits designed specifically for management goals of landowner

Must include all other required terms in conservation agreement

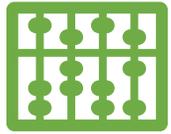
Use approved growth model to project changes to future live tree C

Demonstrate how modeling is appropriate and conservative

Model harvesting as aggressively as possible under the conservation agreement



# Project Soil C Quantification



Soil C can be included for credit quantification

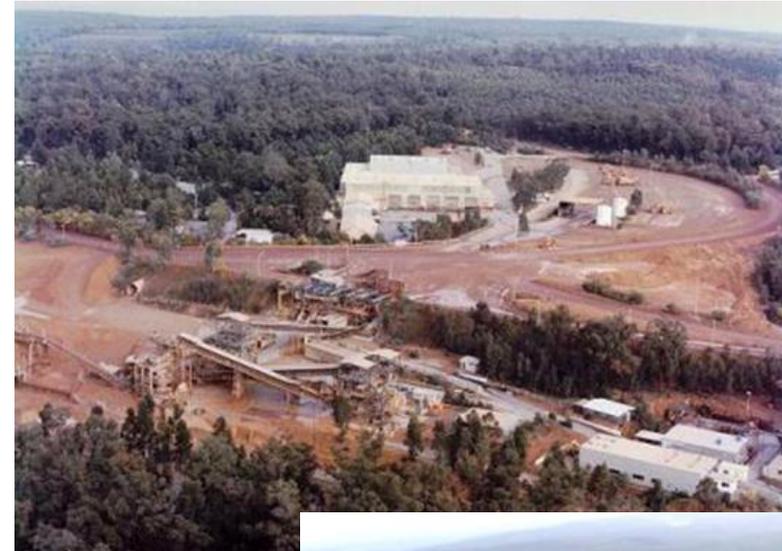


Only applicable under specific circumstances

- Initially, only mine reclamation sites
- Others may be eligible in the future (e.g., mangrove reforestation)



Conservative default soil C sequestration rates applied



# Baseline Tree Assessments

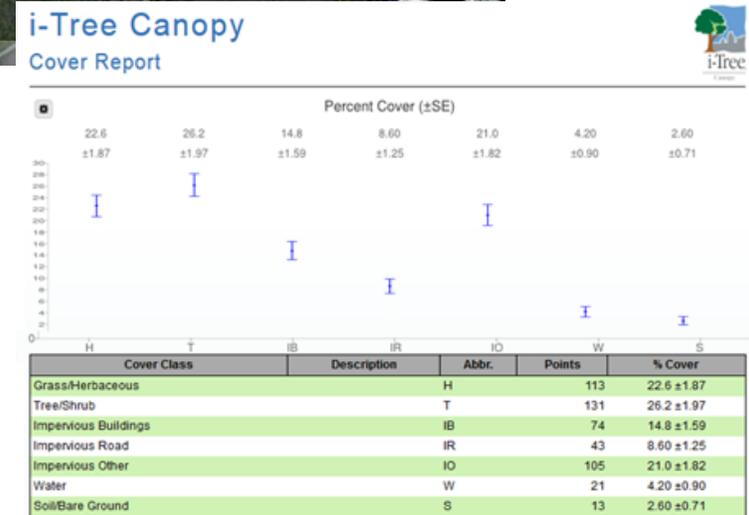
## Percentage deduction applied to project C stocks

### Pre-existing trees

- Canopy cover assessment using i-Tree Canopy
- % deduction based on % canopy cover

### Pre-existing natural regeneration (seedlings)

- Only for no site preparation performed
- Pre-planting photo plots
- % deduction based on expected contribution to future forest cover (pre-defined categories)



# Baseline Shrub Quantification



## Conservative safeguard

No credits awarded for increases in shrub stocks, only a deduction for decrease in stocks



## Estimate pre-project shrub stocking

- Shrub cover assessment via i-Tree Canopy
- Estimate of average shrub height (by 3-foot height classes)
- Default biomass-to-area ratio by height class



## Results compared to projected shrub stocking



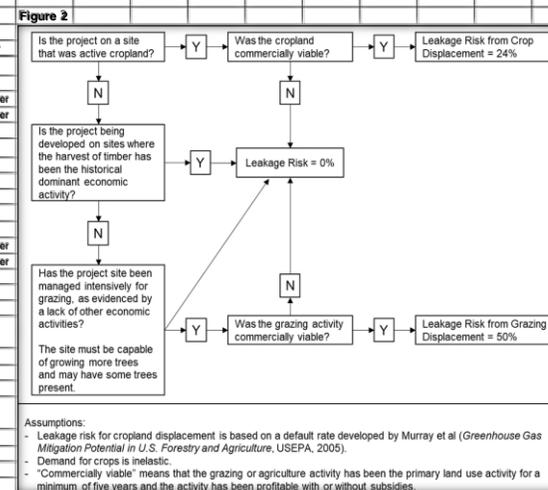
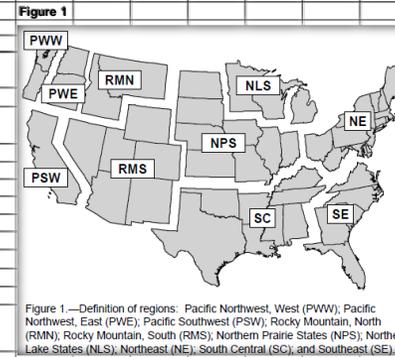
# Quantifying GHG Removals

GHG removals/FMUs are calculated in the Reforestation Communities Data File

## Input required:

- Landowner type
- Length of conservation agreement (if applicable)
- Forest type and area
- Baseline trees
  - Canopy trees
  - Natural regeneration
- Shrub cover (pre- and post-start date)
- Soil C inclusion eligibility
- Activity-shifting leakage rate

If the project comprises more than 4 strata and/or multiple landowner types, please contact the Reserve for a project-specific version of the Data File		
	Data determined by project proponent at project initiation	
	Data calculated automatically	
<b>Total FMUs to be issued, net of programmatic ex ante risk discount and permanence risk contribution</b>	[Enter data below]	Rounded down to nearest integer
<b>[Optional] Estimate of tonne-year value of carbon sequestered by a specified future date (years after project start date)</b>		For estimation purposes only. FMU issuance not based on these estimates.
Year of interest (number of years after project start date)		Red numbers indicate year of interest is beyond the crediting period for the stratum
Tonne-year value at year of interest (t CO <sub>2</sub> e) - Stratum 1	[Enter year of interest]	
Tonne-year value at year of interest (t CO <sub>2</sub> e) - Stratum 2	[Enter year of interest]	
Tonne-year value at year of interest (t CO <sub>2</sub> e) - Stratum 3	[Enter year of interest]	
Tonne-year value at year of interest (t CO <sub>2</sub> e) - Stratum 4	[Enter year of interest]	
Tonne-year value at year of interest (t CO <sub>2</sub> e) - Total		
<b>Project-wide variables</b>		
Landowner type	[Select landowner type]	
Duration of conservation easement (in years, up to a maximum of 200; enter value only if the project employs an eligible non-perpetual conservation easement)		
Growth rate threshold	[Select landowner type]	
CMAI discount threshold	[Select landowner type]	
<b>Stratum 1</b>		
<b>Variables</b>		
Forest type	[Select forest type]	See Figure 1 for applicable geography for forest types including regional designation at the end of their name (e.g., Aspen-Birch RMS)
Forest type acres		
Assumed year of heightened harvest risk	[Select forest type and landowner type]	
Per acre gross FMU value from live tree C at end of crediting period	[Select forest type and landowner type]	
Project conditions related to inclusion of soil C quantification		Only project areas located on reclaimed mine sites are currently eligible to include soil C for FMU quantification purposes
Per acre FMU value from soil C at end of crediting period		
Per acre gross FMU value at end of crediting period	[Select forest type and landowner type]	
<b>Baseline Factors</b>		
Pre-existing tree canopy cover (%)		From Tree Canopy analysis for tree canopy cover
Pre-existing regeneration factor (S <sub>i</sub> )		From Natural Regen Photo Plots' tab
Combined baseline tree deduction	[Enter data above]	From Shrub Photo Plots' tab
Shrub cover % prior to start date		From Tree Canopy analysis for shrub canopy cover
Shrub cover % after start date		From Tree Canopy analysis for shrub canopy cover
Average shrub height (ft)		
Ratio estimator (RE <sub>i</sub> ) (tCO <sub>2</sub> e/acre)	[Enter data above]	
Baseline shrub biomass (tCO <sub>2</sub> e/acre)	[Enter data above]	
Shrub biomass at end of crediting period (tCO <sub>2</sub> e/acre)	[Enter data above]	
Shrub biomass deduction (tCO <sub>2</sub> e/acre)	[Enter data above]	
Per acre FMU value at end of crediting period, net of baseline factors	[Enter data above]	
<b>Secondary Effects</b>		
Shrub cover % prior to site prep (if no site prep, enter 0)		From Tree Canopy analysis for shrub canopy cover
Shrub cover % after site prep (if no site prep, enter 0)		From Tree Canopy analysis for shrub canopy cover
Mobile emissions from mechanical site prep	[Enter mechanical site prep info]	
Activity-shifting leakage rate (see Figure 2)	[Select rate from Figure 2]	
Emissions from activity-shifting leakage	[Select activity shifting leakage rate]	
Per acre FMU value at end of crediting period, net of baseline factors and secondary effects	[Enter data above]	
<b>Standardized Deductions</b>		
Programmatic Ex Ante Risk Deduction	[Enter data above]	
Permanence Risk Pool Contribution	[Enter data above]	
Per acre FMU value at end of crediting period, net of baseline factors, secondary effects and standardized deductions	[Enter data above]	
<b>Total FMUs to be issued for forest type</b>	[Enter data above]	
<b>Stratum 2</b>		



# Overview of Reforestation Forecast Methodology

*Reporting and Confirmation*



## LISTING:



Project Submission form

Reforestation Project Goals form

Reforestation Project Conservation Agreement Screening Form (if applicable, not made public)

KML (map) file of project area

## CONFIRMATION:



Signed Attestation of Title form

Signed Attestation of Legal Additionality form

Signed Attestation of Regulatory Compliance form

Project Implementation Report (PIR)

Reforestation Communities Data File

Confirmation Report, and Confirmation Statement

From Confirmation Body: confirmation plan, sampling plan, and list of findings (not made public)



Must wait at least 1 year after completion of planting or site preparation activities

- Allows confirmation body to evaluate viability of newly established trees
- If seeds were planted, confirmation must wait until trees have an average height of 6 inches

Desktop review to evaluate PIR and companion documents

- Eligibility requirements
- Tree and shrub cover assessments
- Natural regeneration photo plots

Site visit to confirm reforestation activities

- Project area
- Seedling species diversity
- Density of viable seedlings – sampling by confirmation body determines if there is sufficient stocking, consistent with projections

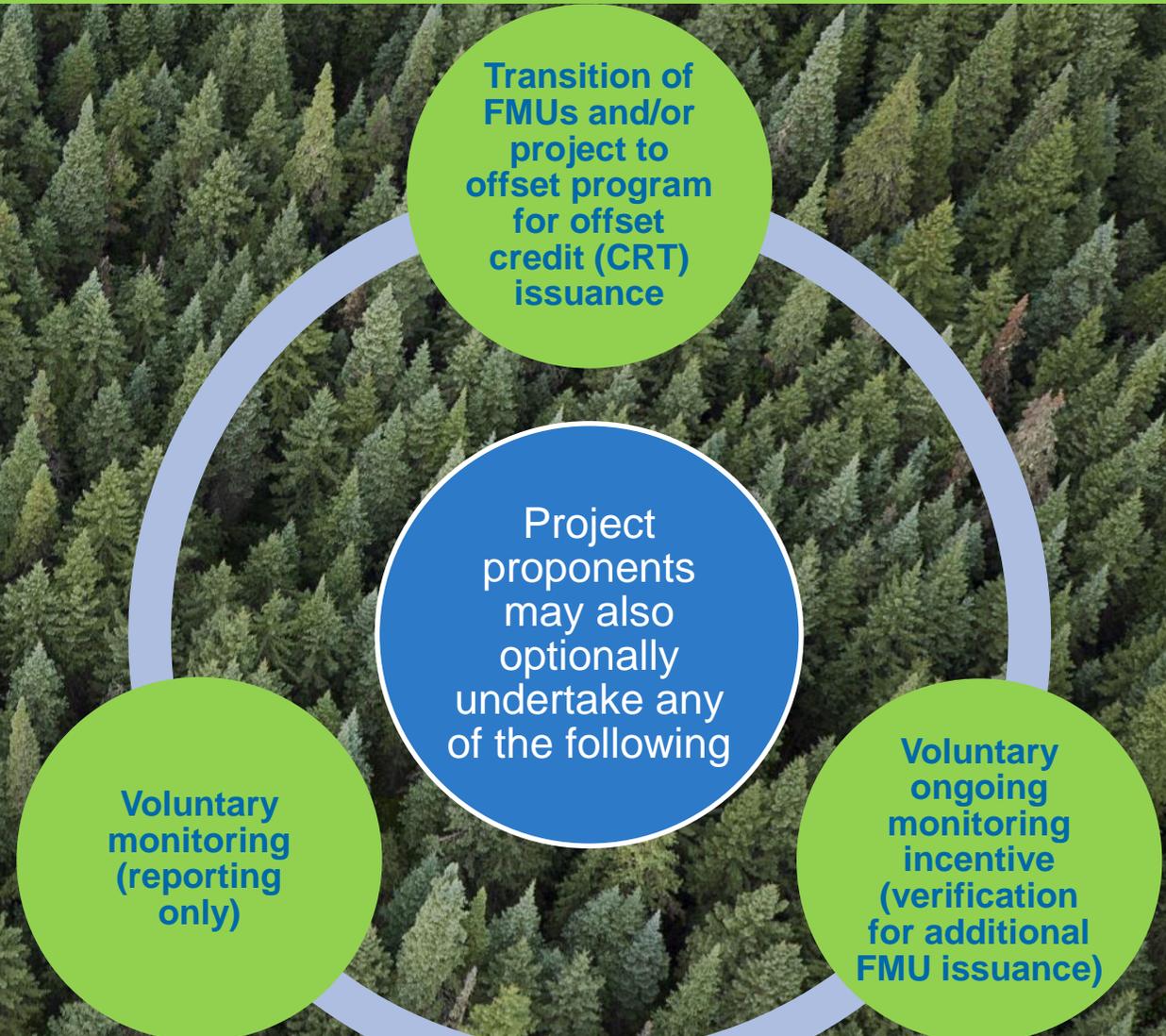
# Ongoing Monitoring Options



# Ongoing Monitoring Options

Climate Forward does not require ongoing monitoring, reporting and verification of projects beyond initial FMU issuance.

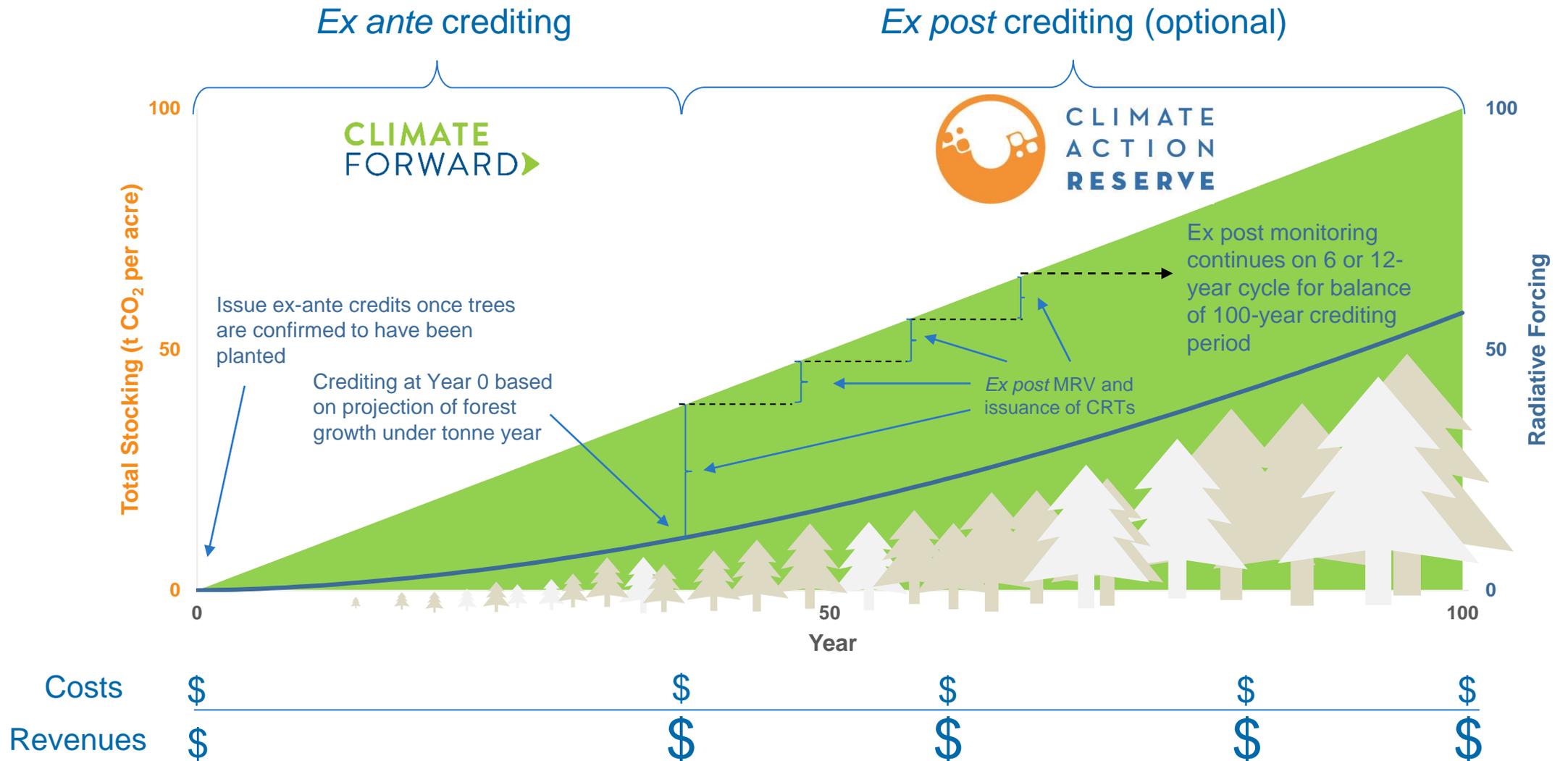
BUT the Reserve will be conducting programmatic monitoring of projects and, if deemed necessary to ensure the integrity of FMU issuances, adjusting the credits in the permanence risk pool (analogous to offset buffer pool) and modifying relevant methodologies.



# Ongoing Monitoring Options

	Voluntary monitoring (reporting only)	Voluntary Ongoing Monitoring Incentive	Transition of FMUs/Project to Offset Program
<b>Purpose</b>	Provide project status updates for transparency purposes	Show project has outperformed original FMU issuance	Transfer FMUs and project to the Reserve's voluntary offset program
<b>Registry</b>	Climate Forward	Climate Forward	Climate Forward → Climate Action Reserve
<b>Monitoring/ Reporting/ Verification</b>	Information provided to Climate Forward (optional template to be provided); Reviewed by Reserve staff for reasonableness; No confirmation/verification	Monitoring data provided to Climate Forward and undergo third-party verification; Requires guidance and approval from Reserve staff	Project must meet all monitoring, reporting and verification requirements of the complementary offset protocol
<b>Impact on existing credits</b>	No impact	No impact	Unretired FMUs transitioned to CRTs (up to amount verified)
<b>New credits issued</b>	Not applicable	FMUs	CRTs, including potential for additional CRTs for amount verified in excess of original FMU issuance

# Ex ante and ex post options



# How to Activate the Methodology in New Jurisdictions



# Activating the Methodology in New Jurisdictions


  
 United States Department of Agriculture
   
 Forest Service
   
 Northeastern Research Station
   
 General Technical Report NE-343
   


## Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimates for Forest Types of the United States

James E. Smith  
 Linda S. Heath  
 Kenneth E. Skog  
 Richard A. Birdsey

Need default projections for C stock increases for forest types in new jurisdiction or project-specific modeling proposed by project proponent

For US: default projections developed by US Forest Service or proposed by project proponent using FVS

B4.— Regional estimates of timber volume and carbon stocks for oak-pine stands with afforestation of land in the Northeast

Age years	Mean volume <i>m<sup>3</sup>/hectare</i>	Mean carbon density						Total nonsoil
		Live tree	Standing dead tree	Under- story	Down dead wood	Forest floor	Soil organic	
0	0.0	0.0	0.0	4.2	0.0	0.0	50.2	4.2
5	0.0	6.2	0.6	4.2	0.4	3.8	50.3	15.2
15	36.5	27.0	2.6	3.3	1.7	10.3	51.6	44.9
25	70.9	48.6	3.2	2.9	3.0	15.6	53.9	73.3
35	103.1	67.9	3.7	2.6	4.2	19.9	56.6	98.3
45	133.1	84.7	4.0	2.5	5.2	23.5	59.5	119.8
55	160.9	99.1	4.2	2.4	6.1	26.6	61.9	138.4
65	186.7	113.0	4.4	2.3	6.9	29.2	63.8	155.8
75	210.2	123.6	4.6	2.3	7.6	31.6	65.1	169.5
85	231.5	133.1	4.7	2.3	8.1	33.6	66.0	181.8
95	250.8	141.7	4.8	2.2	8.7	35.4	66.4	192.8
105	267.9	149.2	4.9	2.2	9.1	37.0	66.7	202.4
115	282.7	155.7	5.0	2.2	9.5	38.4	66.8	210.9
125	295.4	161.3	5.1	2.2	9.9	39.7	66.9	218.1



# Activating the Methodology in New Jurisdictions

## Criteria for approving new default projections

### Source

- Government agency, or
- Peer-reviewed journal article

### Description of modeling (model, parameters, and assumptions)

- Forest type/species
- Planting density
- Site productivity
- Geographic/climatic conditions

# Activating the Methodology in New Jurisdictions



Additionally, criteria for determining crediting period length must be established, based on combination of:

- landowner classes
- forest types
- economic considerations (tree size; rate of return vs. growth rate)

# Questions?



# Thank you!

Contact us: [info@climateforward.org](mailto:info@climateforward.org)

**SIGN UP** for our [program newsletter](https://climateforward.org/sign-up/) at <https://climateforward.org/sign-up/>

