Forest Carbon Offsets: An Introduction

06 October 2021

Aaron Holley, Conservation Forester
The Nature Conservancy in West Virginia

What are Forest Carbon Offsets?

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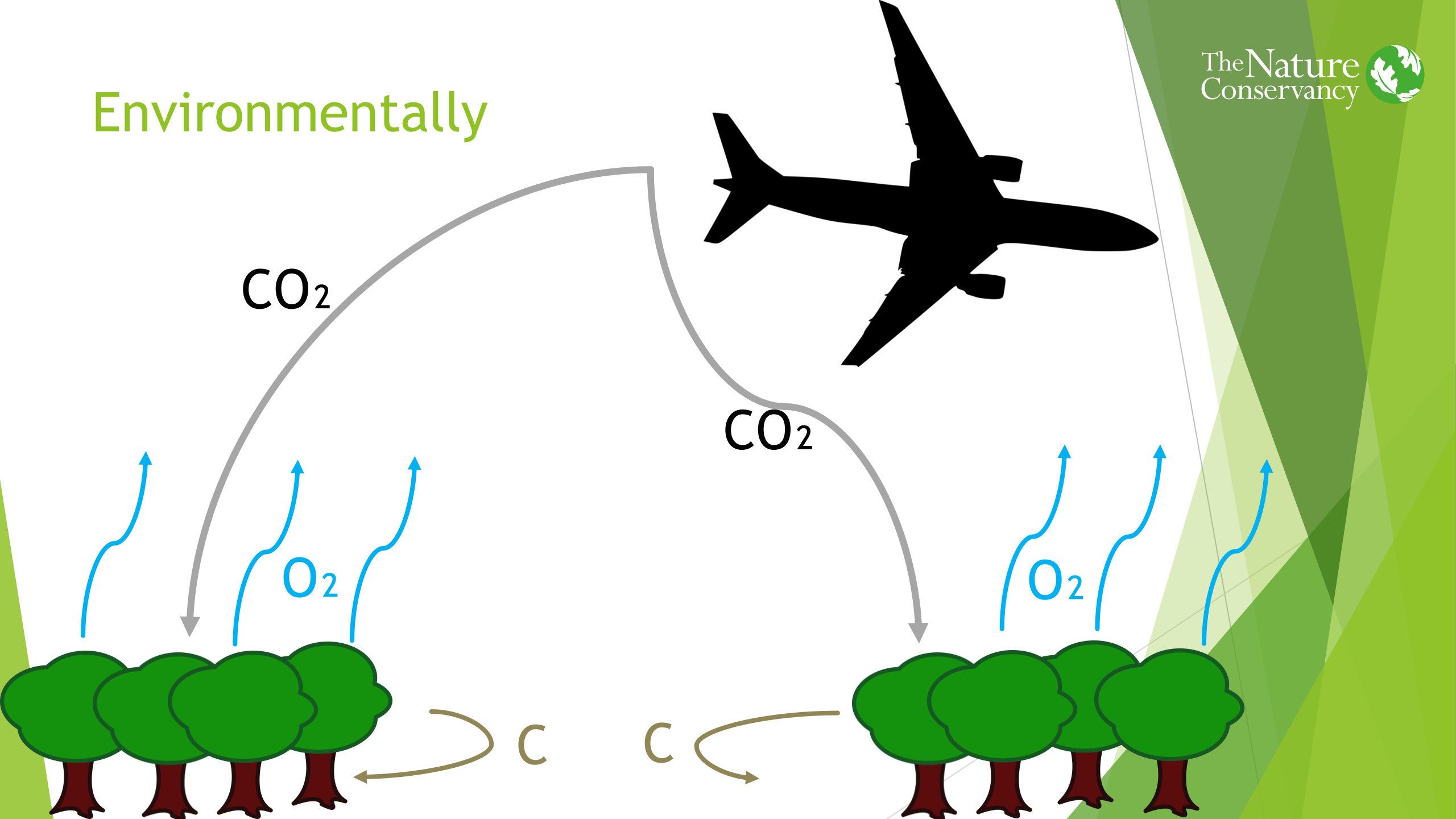
Environmentally



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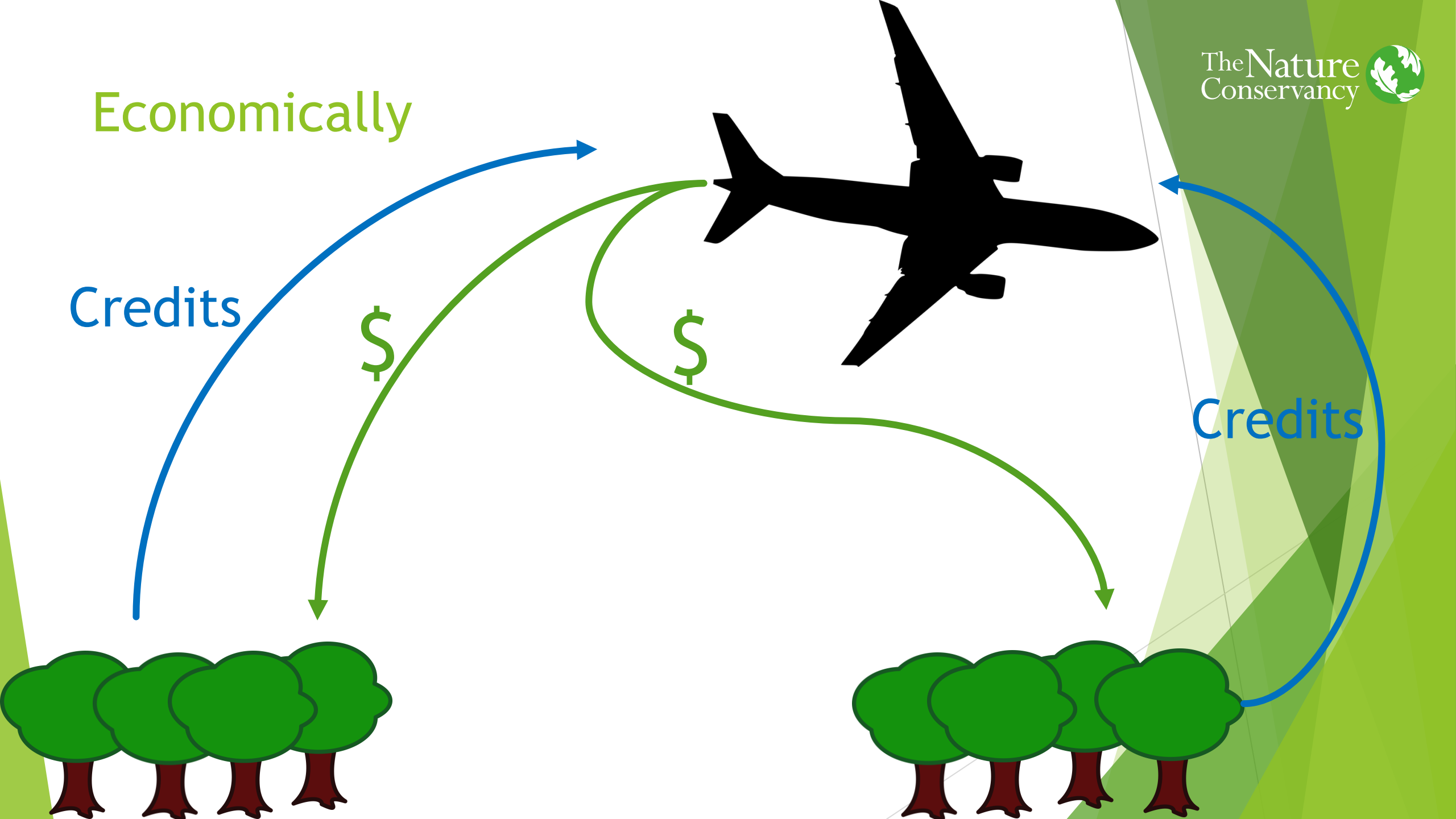
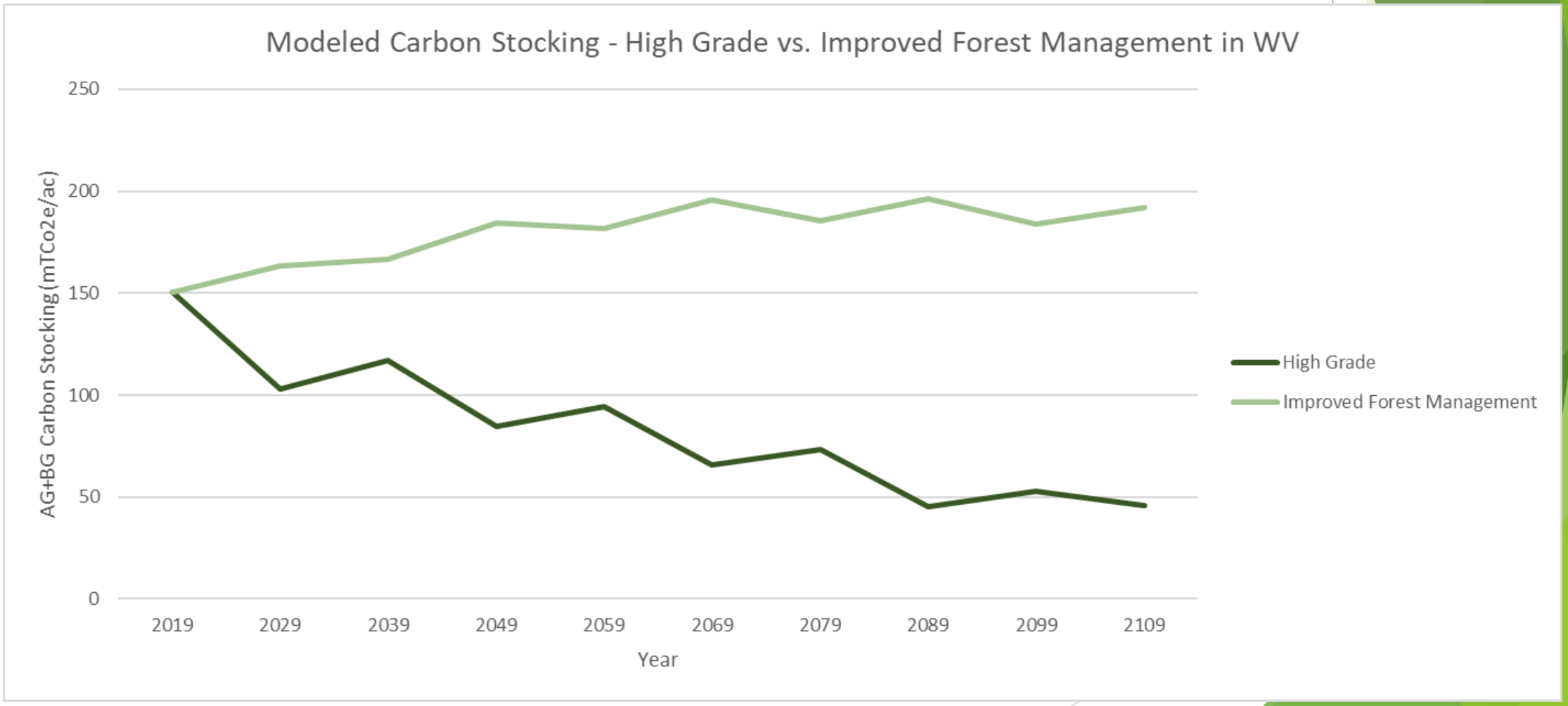
Economically

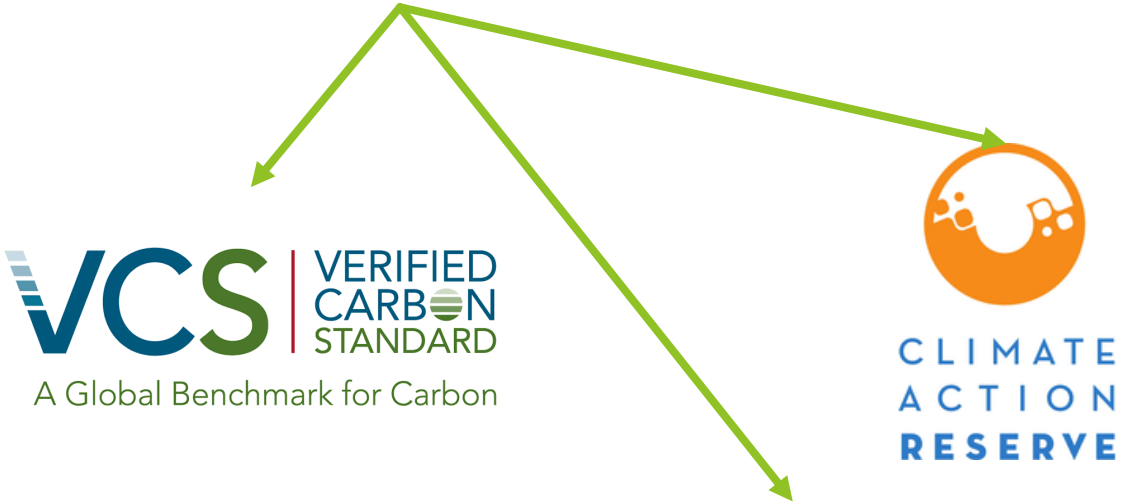


How Can Foresters Increase Carbon Sequestration/Reduce Carbon Emissions?



Who Defines and Issues Carbon Credits?

Voluntary



VCS VERIFIED CARBON STANDARD
A Global Benchmark for Carbon

CLIMATE ACTION RESERVE

American Carbon Registry

Regulatory

CALIFORNIA AIR RESOURCES BOARD

The Pillars of a Carbon Offset Program

- **Real** – Is the carbon physically being sequestered? – No double counting!
- **Measurable** – Can the sequestered carbon be measured scientifically?
- **Permanent** – Is the carbon sequestered permanently?
- **Additional** – Is carbon sequestered above and beyond what is required and practiced?
- **Net of Leakage** – Is the carbon project causing increased carbon loss elsewhere?
- **Conservative** – Are claimed credits less than or equal to actual?
- **Verified** – Can the carbon sequestration be independently audited and verified?

How do we Calculate Forest Carbon Offsets?

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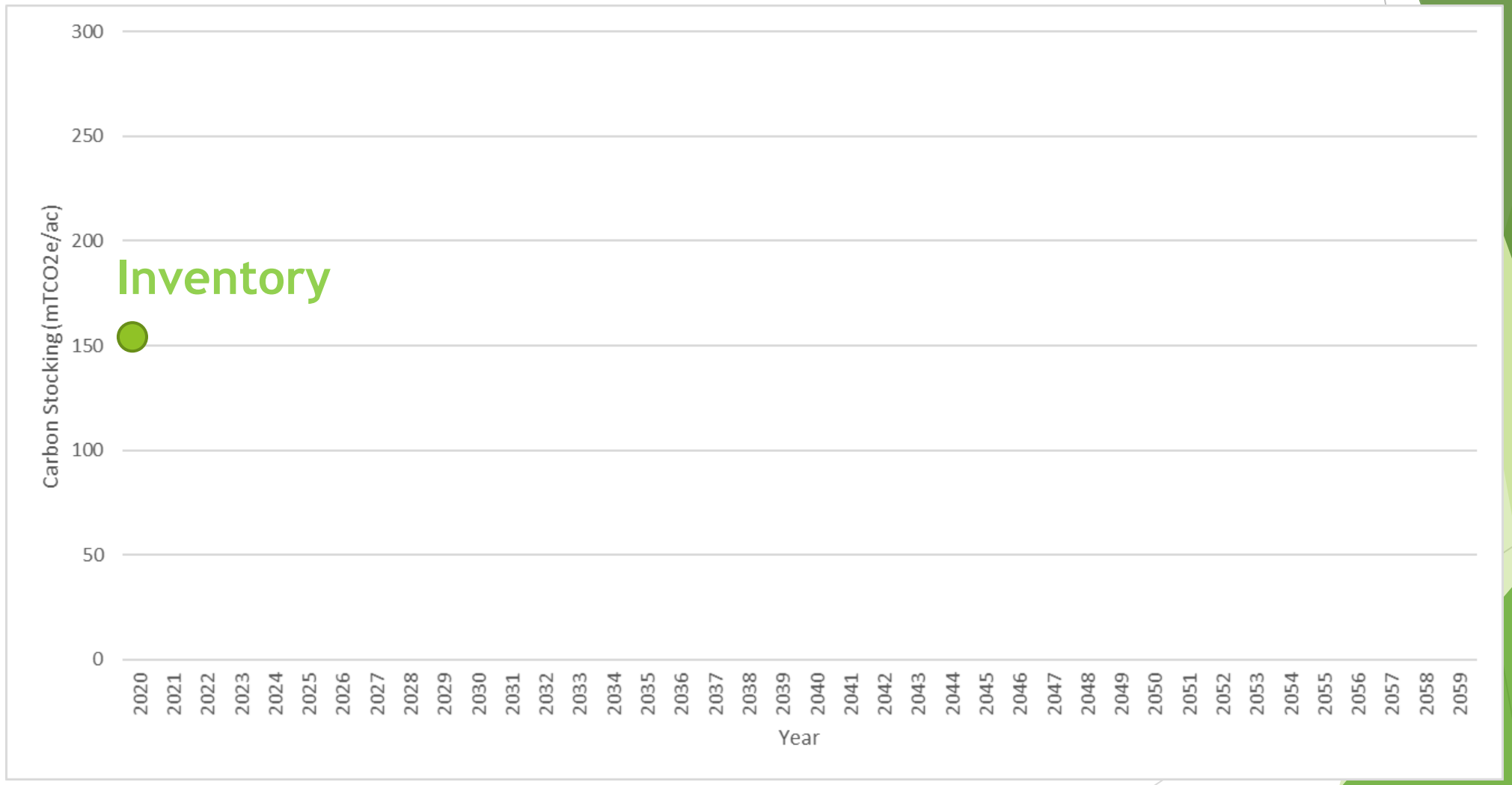
How are Forest Carbon Offset Credits Calculated?

- Step 1: Inventory
- Step 2: Baseline Modeling
- Step 3: Project Monitoring

Step 1: Inventory



How are Forest Carbon Offset Credits Calculated?

$$mTCO2e = Biomass\,(lbs) \div 2{,}204.6\ \frac{lbs}{mT} \cdot 0.5 \cdot \frac{44}{12}$$

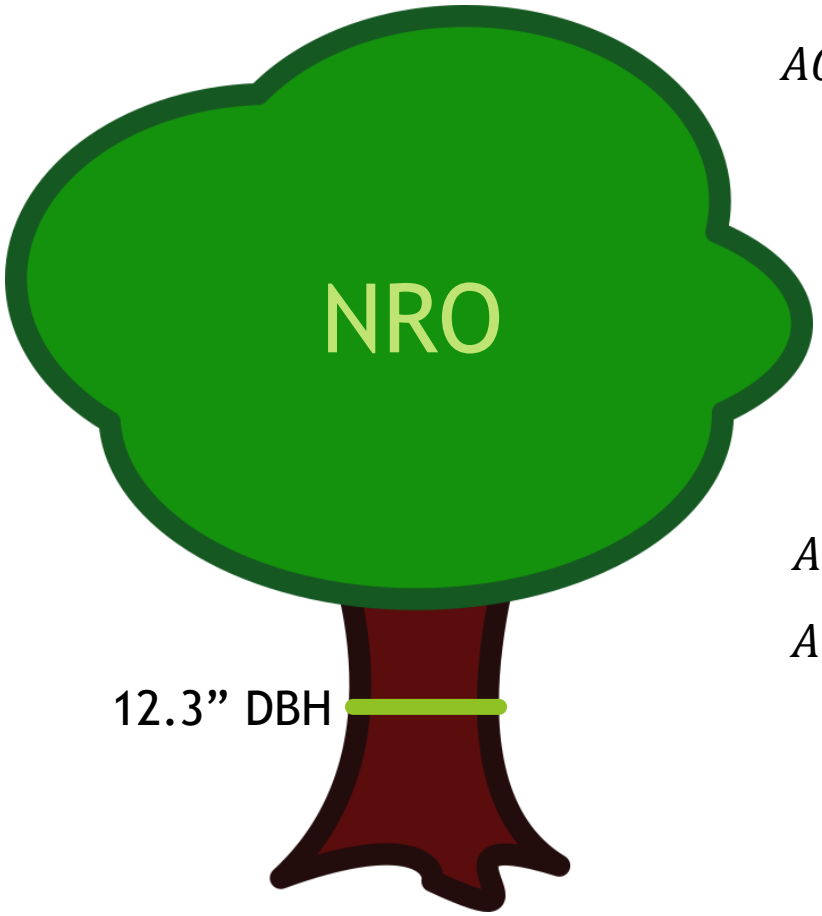
$f(DBH, HT)$

Conversion Factor

Proportion of biomass considered as carbon

Atomic weight conversion from C to CO_2

How is Forest Carbon Measured?



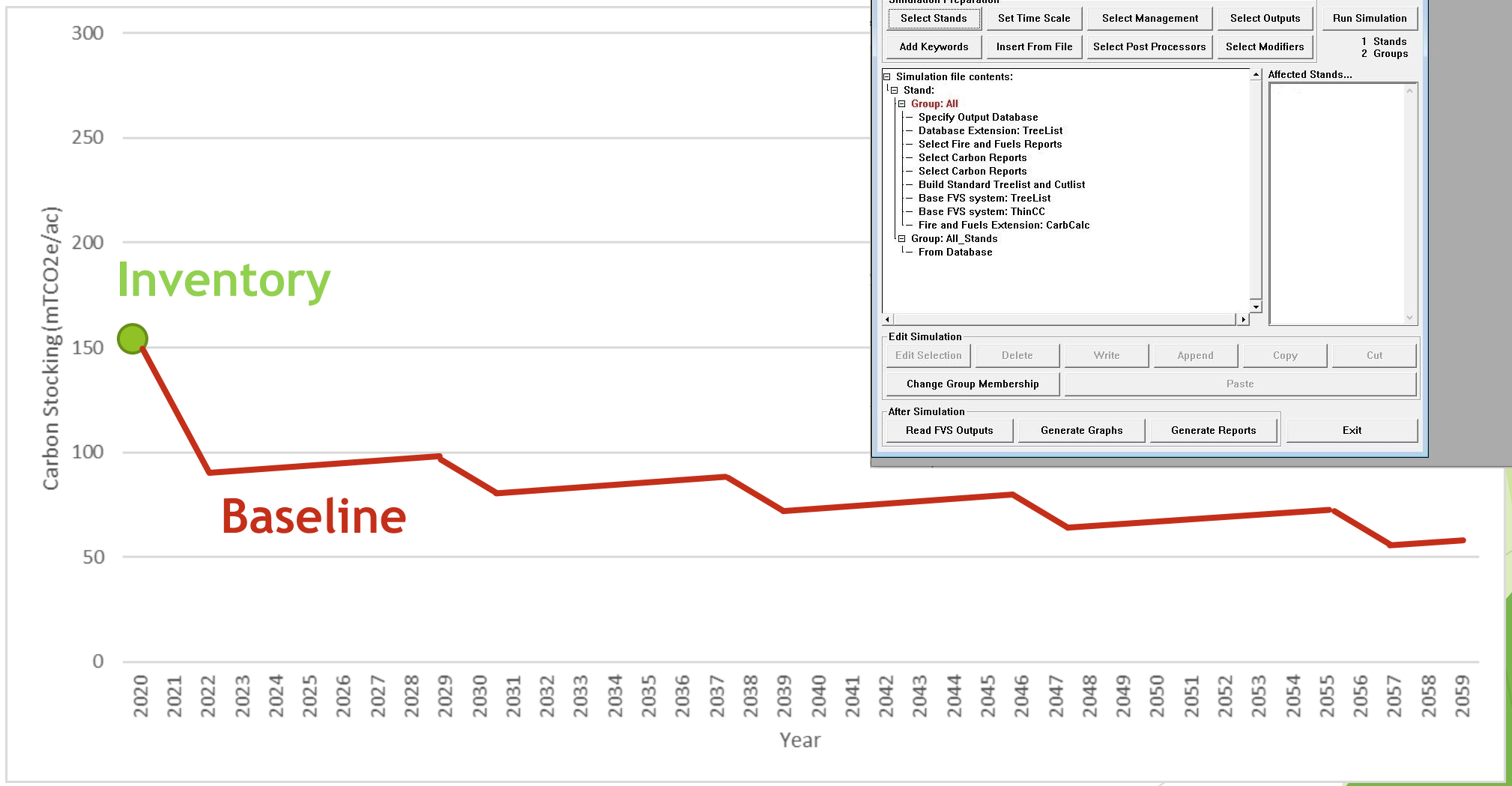
$$AG\ bm(kg) = \exp(-2.0127 + 2.4342 * \ln((12.3 * 2.54))$$

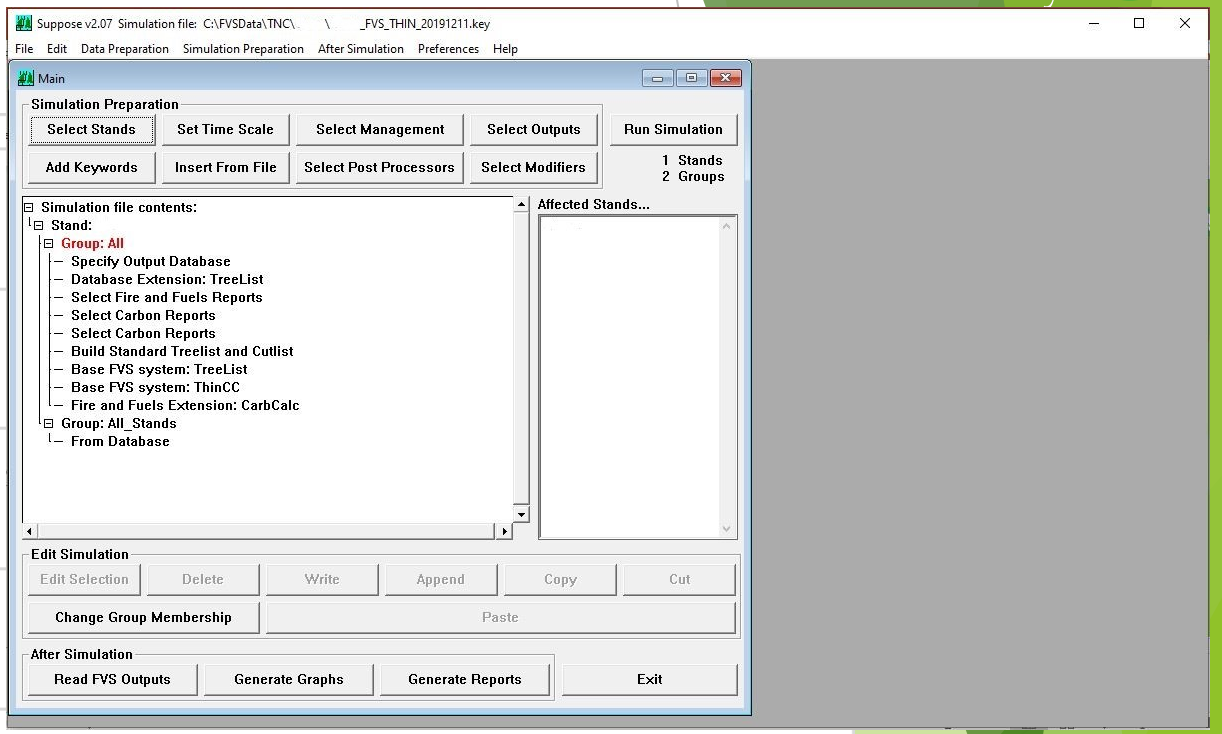
$$AG\ bm(kg) = 581.3\ kg = 1{,}281.5\ lbs$$

$$AG\ mTCO2e = 1{,}281.5 \div 2{,}204.6 * 0.5 * \frac{44}{12}$$

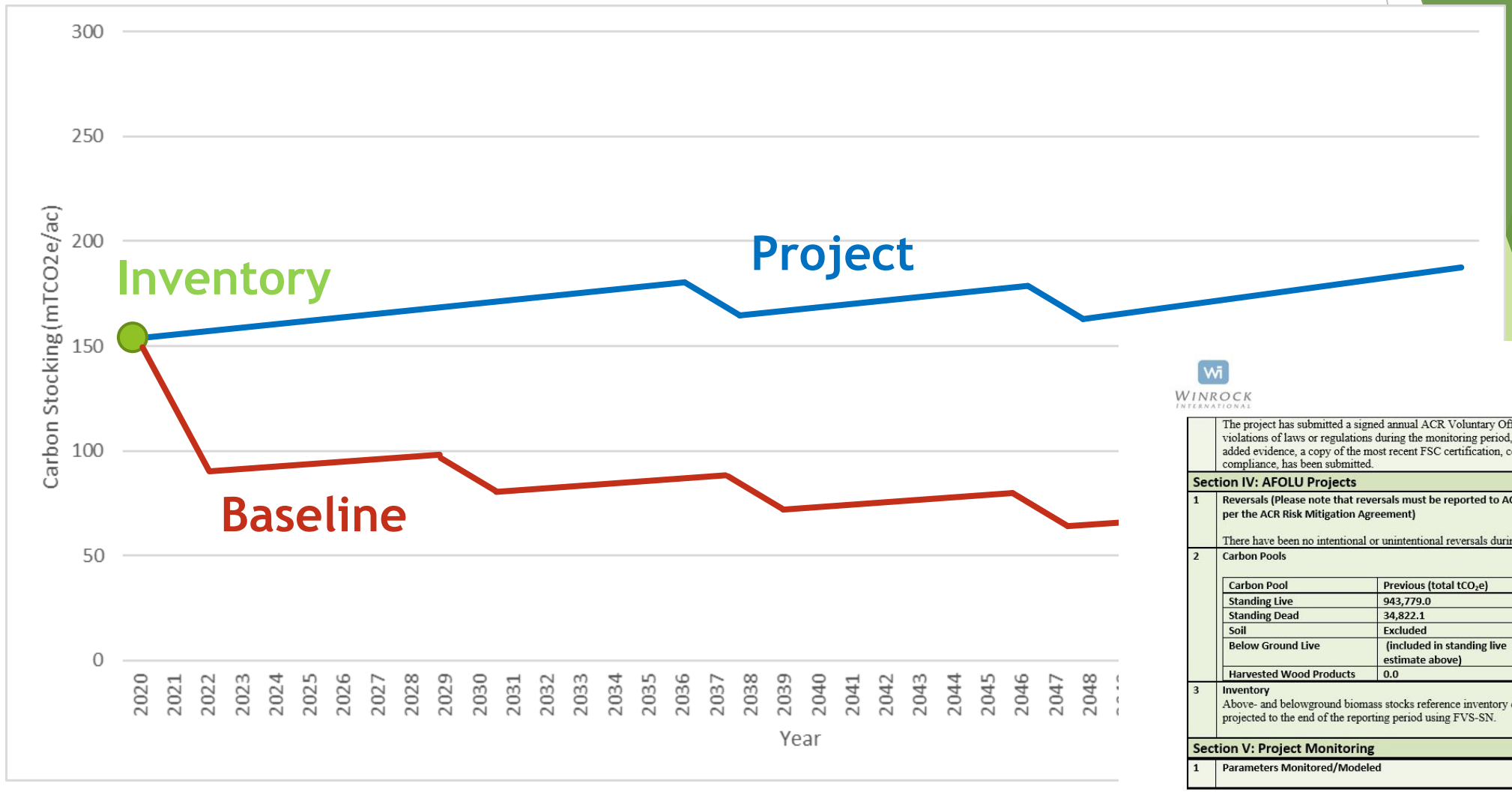
$$AG\ mTCO2e = 1.1\ mTCO2e$$

Step 2: Baseline Modeling





Step 3: Project Monitoring

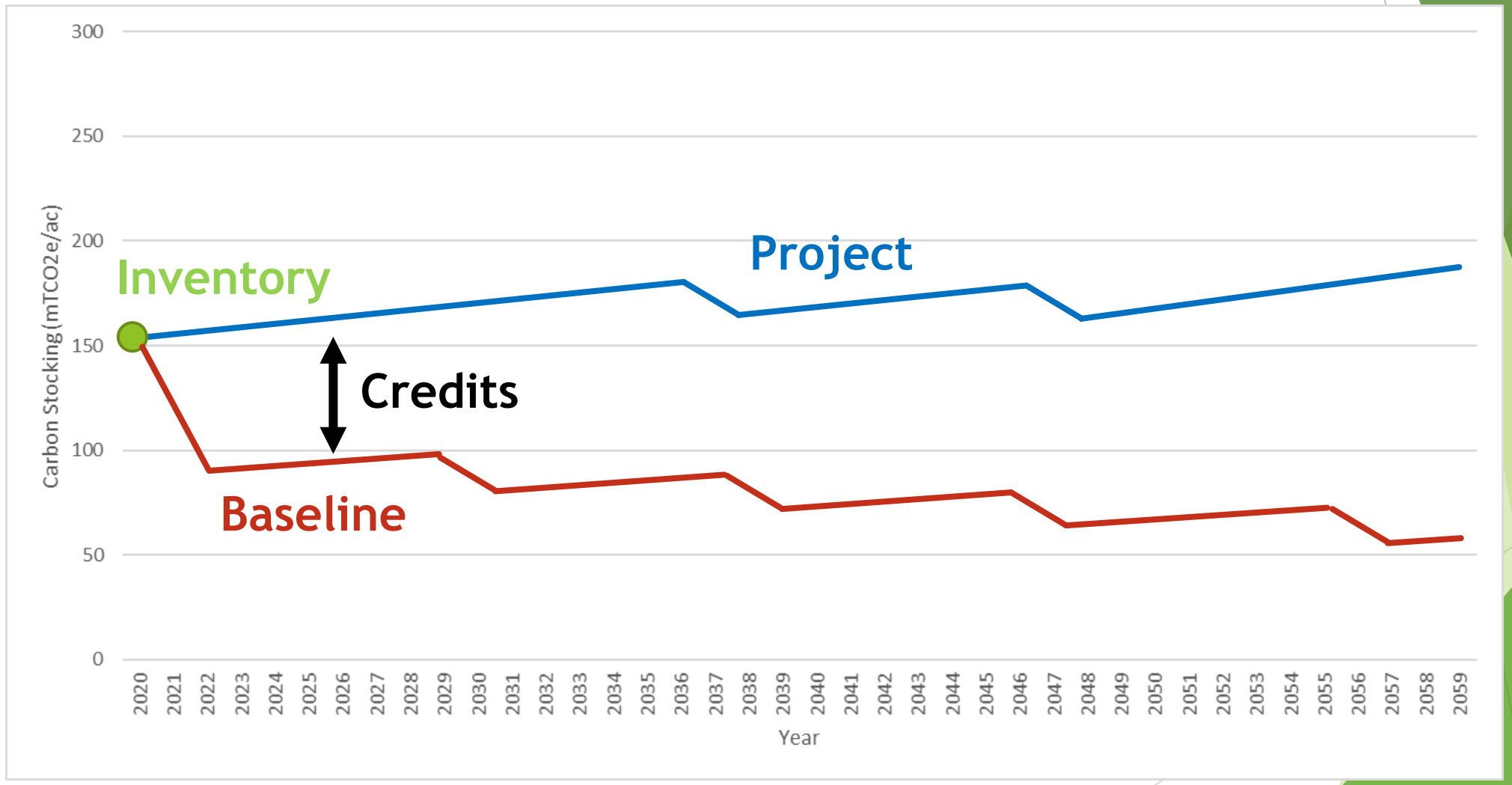


	The project has submitted a signed annual ACR Voluntary Offset Project Attestation, affirming no violations of laws or regulations during the monitoring period, to the best of TNC's knowledge. As added evidence, a copy of the most recent FSC certification, covering legal and regulatory compliance, has been submitted.
Section IV: AFOLU Projects	
1	**Reversals (Please note that reversals must be reported to ACR as soon as they are discovered per the ACR Risk Mitigation Agreement)** There have been no intentional or unintentional reversals during the reporting period.
2	**Carbon Pools**

Carbon Pool	Previous (total tCO_2e)	Current (total tCO_2e)
Standing Live	943,779.0	956,502.2
Standing Dead	34,822.1	34,822.1
Soil	Excluded	Excluded
Below Ground Live	(included in standing live estimate above)	(included in standing live estimate above)
Harvested Wood Products	0.0	0.0

3	**Inventory** Above- and belowground biomass stocks reference inventory data collected from 2015-2018 and projected to the end of the reporting period using FVS-SN.
Section V: Project Monitoring	
1	**Parameters Monitored/Modeled**

How are Forest Carbon Offsets Calculated?



1 carbon credit = 1 mTCO2e

How are Forest Carbon Offsets Calculated?

$$ERT_t = C_{ACR,t} = \left(\Delta C_{P,t} - \Delta C_{BSL,t}\right) \cdot (1 - LK) \cdot (1 - UNC_t) \cdot (1 - BUF)$$

ACR IFM v1.3, Eq. 20

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(Credits)

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(Credits) (Project – Baseline)

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(Credits) (Project – Baseline) (Leakage) (Confidence) (Reversal Buffer)

ACR IFM v1.3, Eq. 20

So, What?

TNC's American Forest Carbon Initiative

	1 Working Woodlands (WW)	2 Forest Carbon Co-op (FCC)	3 Family Forest Carbon Program (FFCP)
Eligible land size (acres)	>2,000	200+	30-2,400
Number of LOs per project	1-3 landowners	>1 landowners	No maximum on landowners
Landowner payments	After carbon credits have been sold	After carbon credits have been sold	Before carbon credit development
Conservation timeline	Permanent conservation required	40 year carbon participation agreement required	10-20 year carbon participation contract required
Stage of development	Enrolled ~120K acres *(in operation since 2008)*	Pilot phase	9,500 acres enrolled (67 contracts) in PA

Source: Bain and Company

Family Forest Carbon Program

The Nature Conservancy

Traditional Forest Carbon Projects

1. Pays landowners for carbon sequestered
2. Monitors carbon values on every property
3. High costs for monitoring on a per-property basis
4. Achieves permanence through long-term contracts
5. Additionality determined from modeled baseline

Family Forest Carbon Program

1. Pays landowners to implement specific practices
2. Monitors practice implementation on every property; monitors carbon values on a landscape level using random sampling
3. Monitoring costs are high but spread across participating properties
4. Achieves permanence through sound intervention design and landscape level accounting
5. Additionality determined from observed baseline, updated with every verification cycle. "Extreme additionality."

Source: AFF

CALCULATING PROGRAM IMPACT

FIA PLOT

FIA MATCHED PLOT

FFCP MONITORING PLOT

FFCP ENROLLED PROPERTY

Rocky To

Norris

Clinton

Oliver Springs

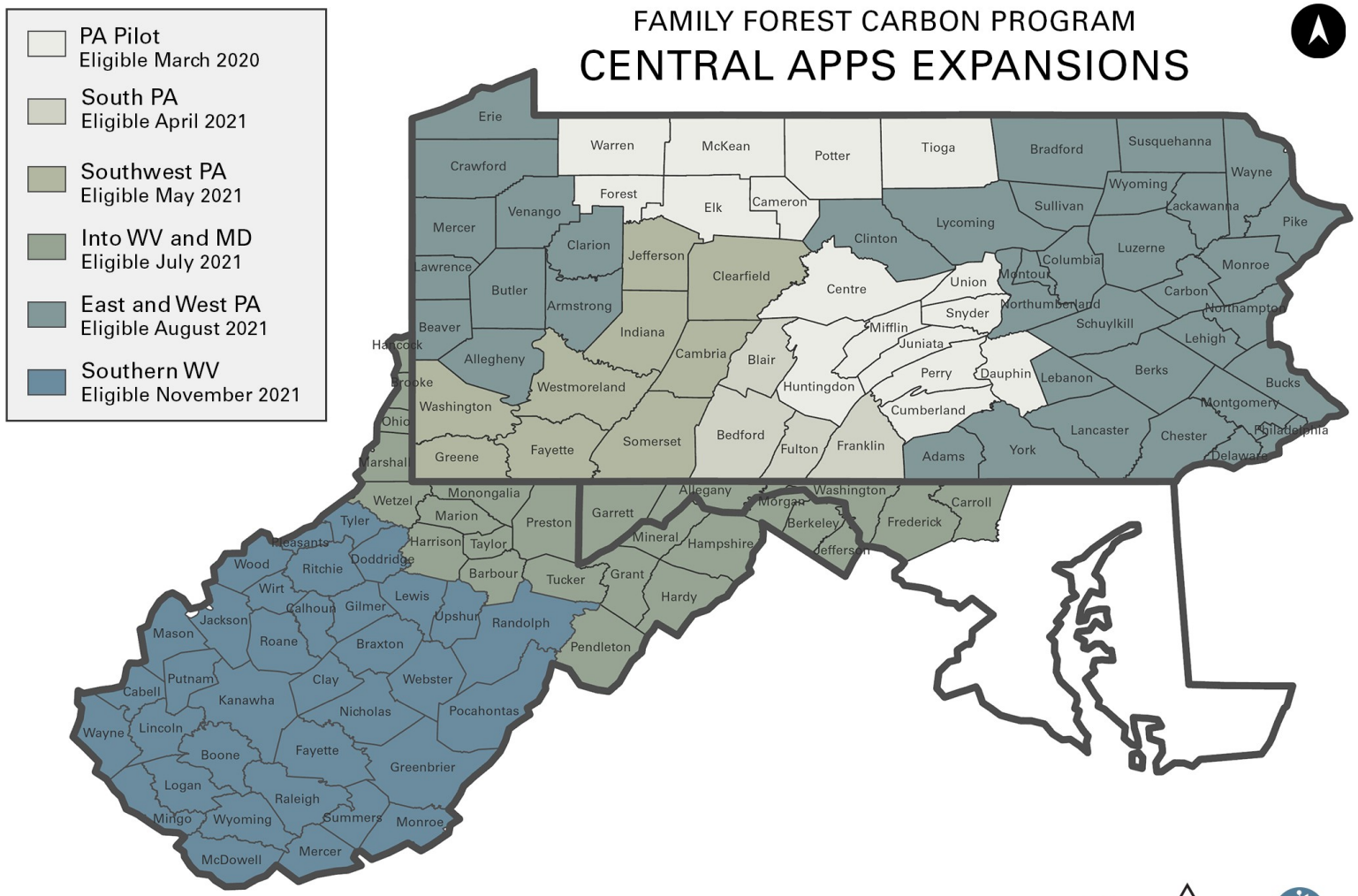
Oak Ridge

Powell

Farragut

Source: AFF

Family Forest Carbon Program



County and state boundaries sourced from the United States Census Bureau in 2021.
Disclaimer: Eligibility dates may change. Check familyforestcarbon.org for updated eligibility.
Last updated: May 13, 2021, by Lynn Riley, lriley@forestfoundation.org

Source: AFF

Are Forest Carbon Offsets Good?

- Incentivize improved forest management for improved forest health and longevity – long term goals
- Alternate source of revenue and economic impact
- Local benefit, global impact

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Questions?
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