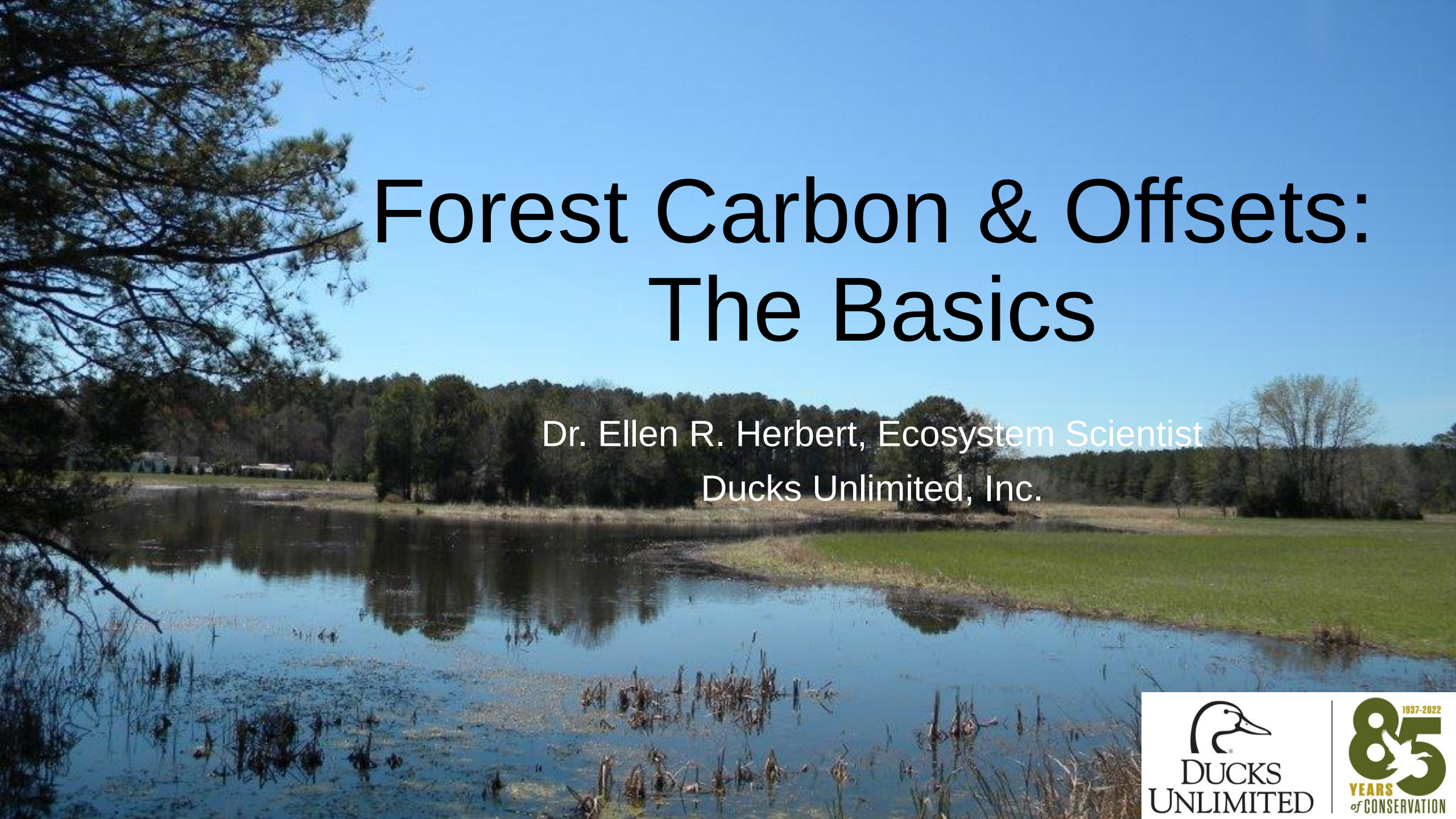

Forest Carbon & Offsets: The Basics

Dr. Ellen R. Herbert, Ecosystem Scientist

Ducks Unlimited, Inc.

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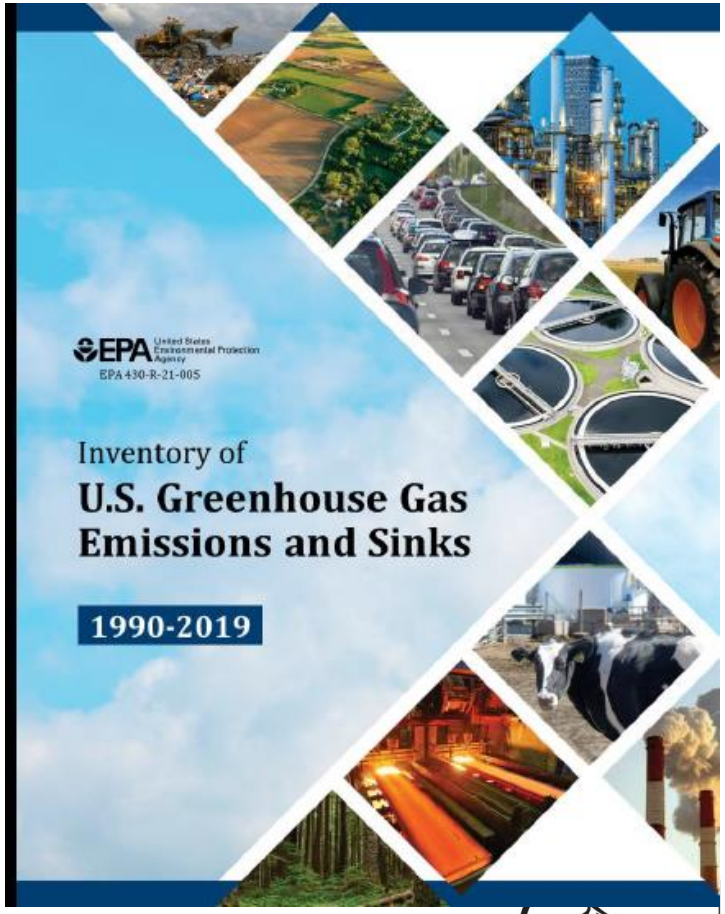
1937-2022 85 YEARS of CONSERVATION

Wetlands, Carbon, GHG's and Climate

- Why do we want to understand wetland carbon and GHG cycling?
  - IPCC
  - Paris Accord
  - Cap & Trade
  - National GHG Inventory
  - Public and private sector climate carbon reduction or neutrality commitments
  - Voluntary Offset Markets



US EPA, 2020

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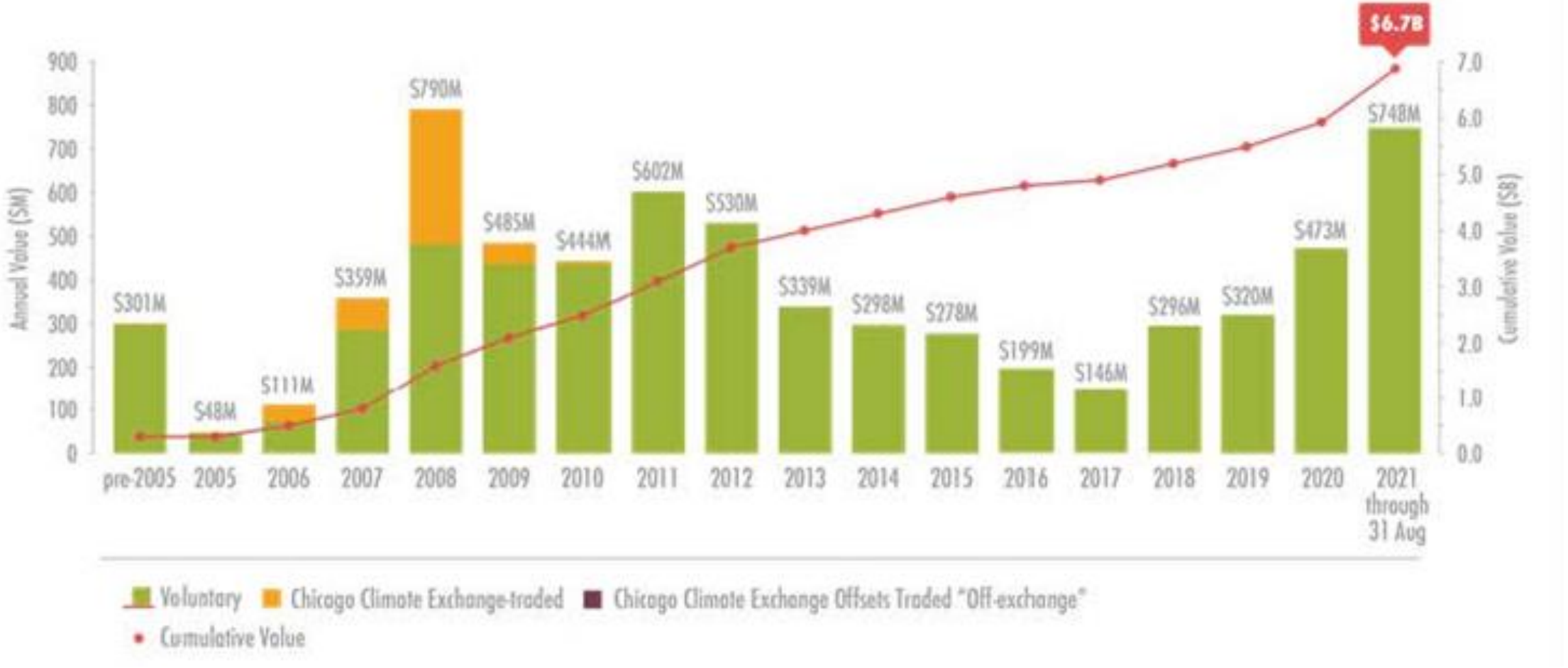
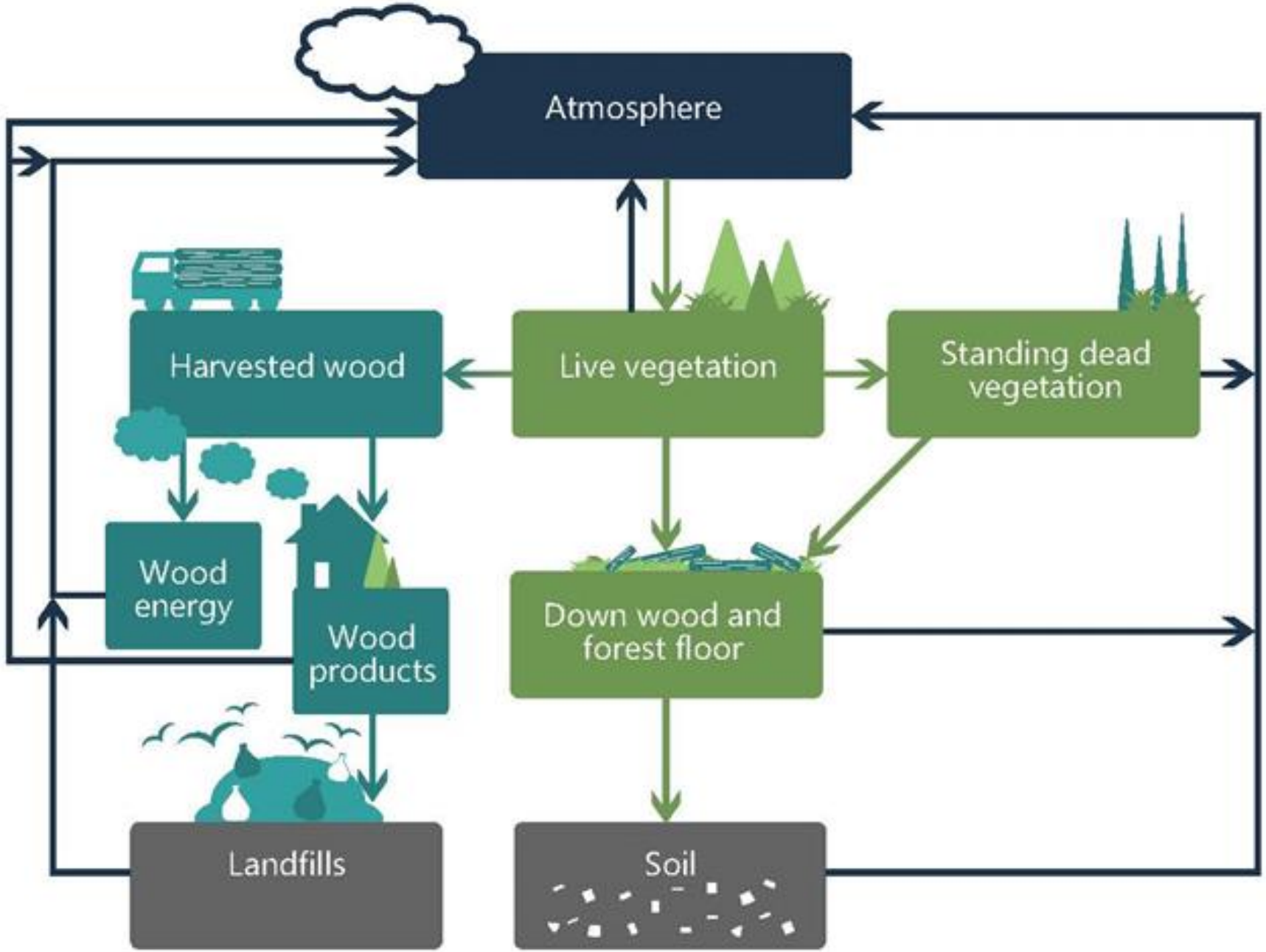
State of the Voluntary Carbon Market (Forest Trends 2021)




Atmosphere
Harvested wood
Live vegetation
Standing dead vegetation
Wood energy
Wood products
Down wood and forest floor
Landfills
Soil

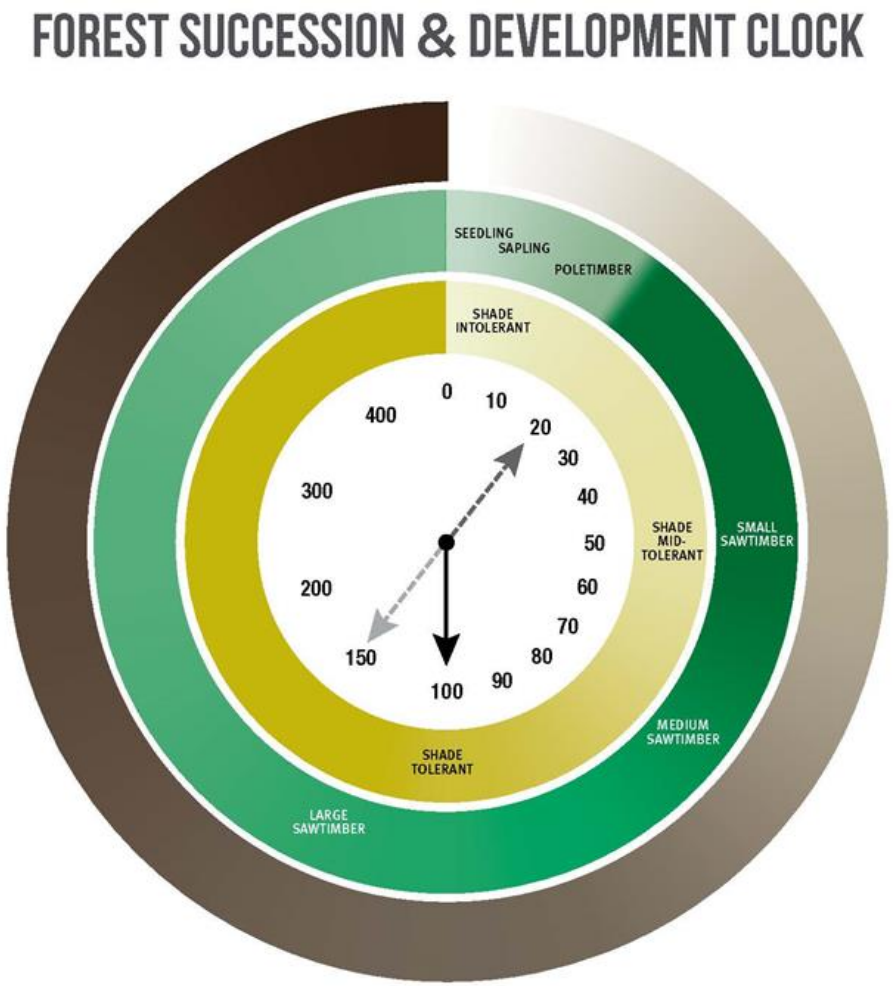
How we account for GHGs

- Annual SEQUESTRATION (carbon accumulation long-term/permanent)
  - Soil/Peat accumulation
  - Woody biomass annual growth

Sequestration = CO_2 in – CO_2 out = soil + woody biomass

- STOCK = Sequestration integrated over time

- Non-CO_2 FLUXES
  - Methane (CH_4)
  - Nitrous oxide (N_2O)
  - Water vapor



GHGs In a Common (CO_2) Currency

- To understand the role of forests the warming or cooling the climate though GHG regulation, we have to calculate the RADIATIVE BALANCE

$=CO_2$ sequestered – GHGs emitted

Table 3.1 Greenhouse gas characteristics

Sequester 30x CO2 = methane emission

Gas	Atmospheric lifetime[a] (year)	Radiative efficiency[b] (W m^{-2} ppb^{-1})	GWP	SGWP	SGCP
CO_2	~100[c]	1.37×10^{-5}	1	1	1
CH_4	12.4	3.63×10^{-4}	30[d]	45	45
N_2O	121	3.00×10^{-3}	265	270	270

Neubauer & Verhoeven, 2019.

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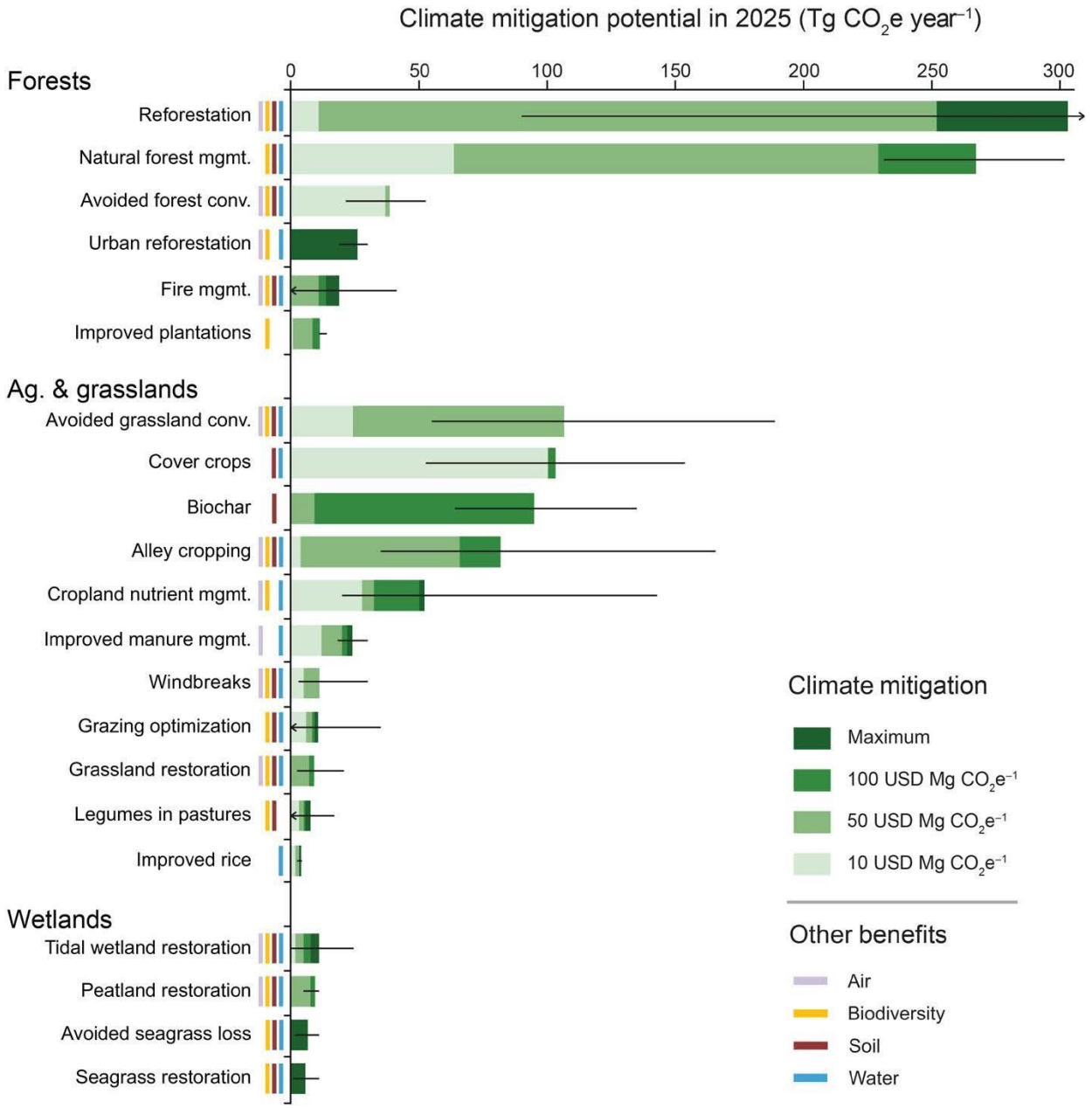
Natural Climate Solutions: Forest

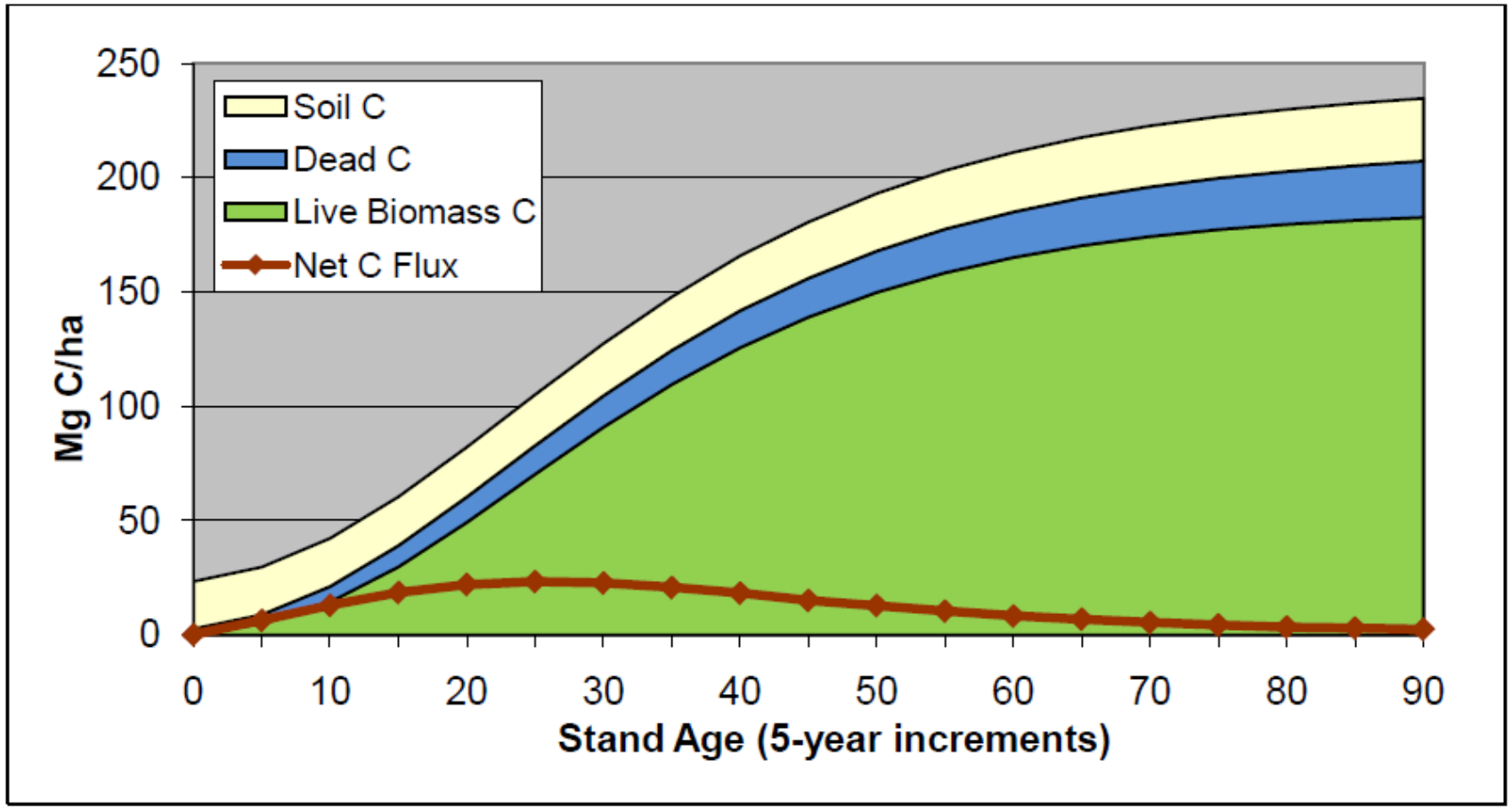
- Afforestation or Reforestation (A/R)
- Improved Forest Management (IFM)
- Avoided Forest Conversion (AC)



Farigone et al. 2018

Afforestation/Reforestation

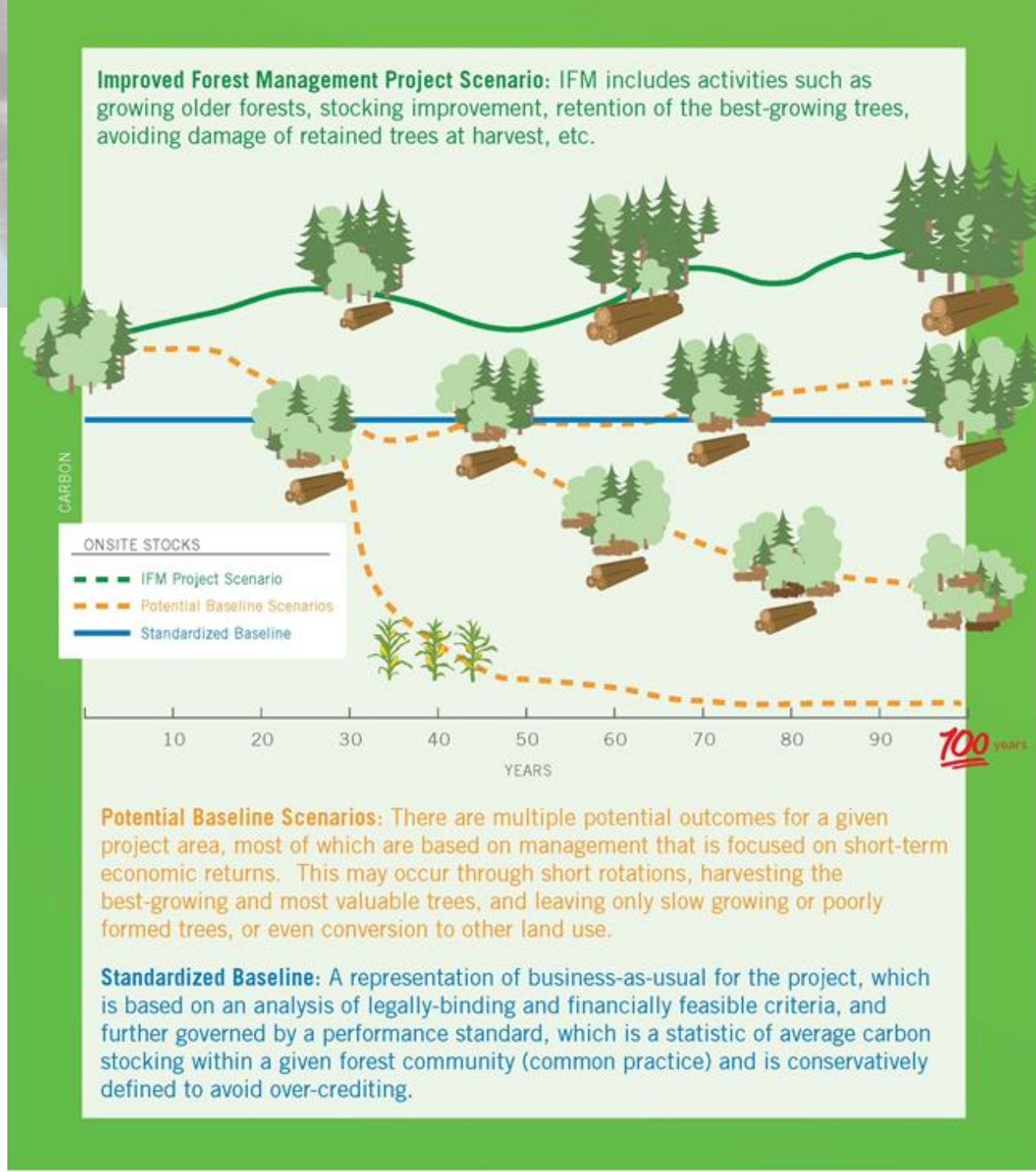
- Establishment of trees
- Lands must be degraded, have low stocking rates (<10% in some cases), and unable to revert to forest without intervention.
- Newer protocols may allow for more inclusive pre-project enabling conditions (e.g., interplanting and enhancement may be allowable).



Murray et al. 2009

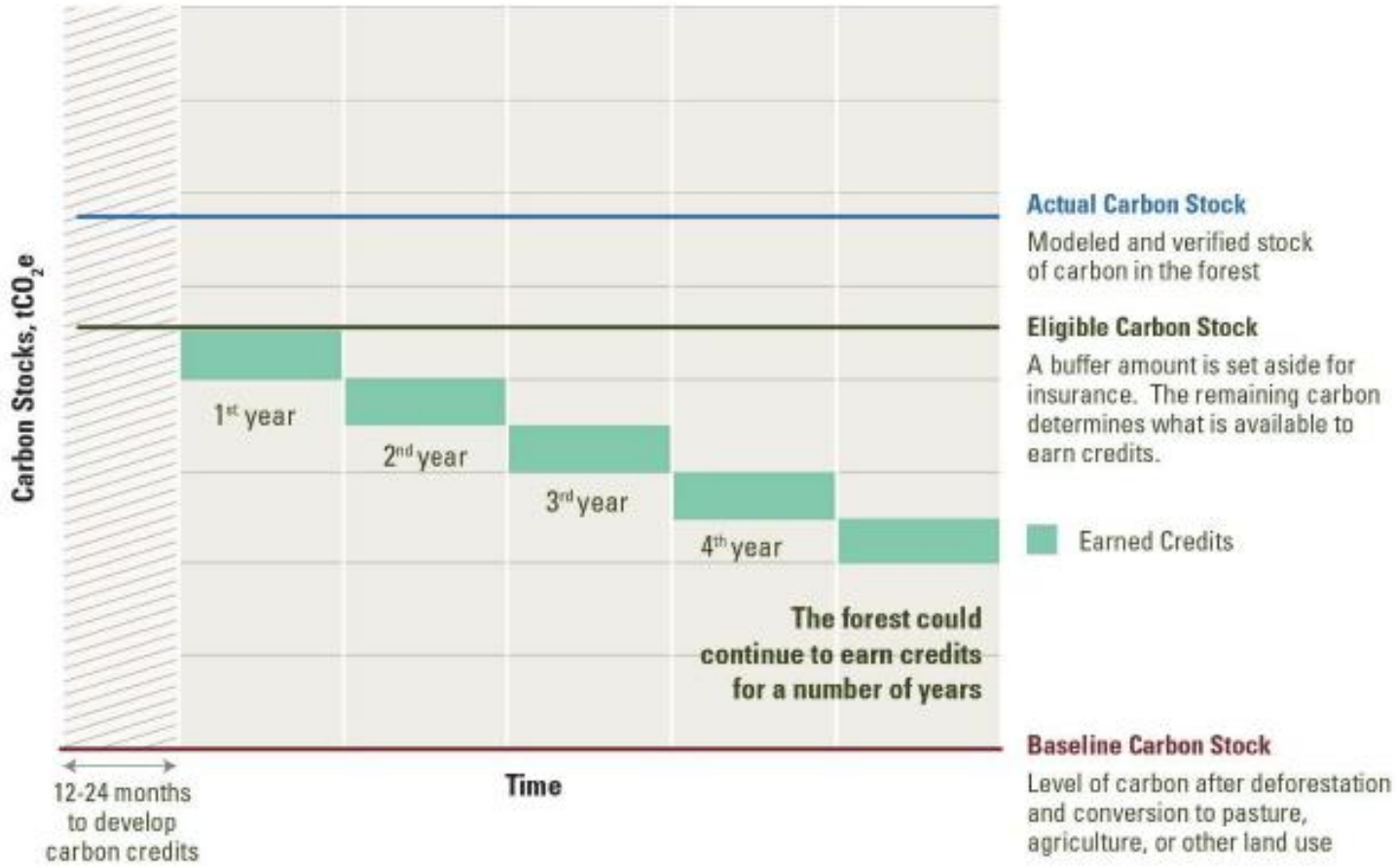
Improved Forest Management (IFM)

- Increase carbon stocks relative to a baseline scenario.
- Baseline scenarios represent “business as usual”, where timber is harvested to a level defined as “common practice”, or to maximize Net Present Value, depending on the protocol.
  - Extending rotation lengths
  - Increasing productivity by thinning diseased or suppressed trees
  - Reducing competition from brush or undesirable species
  - Improving the stocking rate in the forest
  - Minimizing disturbances or impacts from logging (Kaarakka et al. 2019).



Avoided Conversion (AC)

- Prevent the conversion of privately-owned forest to non-forest (e.g., agriculture or suburban development) through a restrictive covenant
- High burden of proof required to demonstrate that the proposed forest was at risk of conversion



Requirements of Carbon Projects

- **Real**. Projects have to meet standards for actually reducing emissions, including avoiding/minimizing negative leakage.
  - Leakage= refers to unanticipated CO2 emitting activities that are shifted to other areas as a result of a forest carbon project.
- **Additional.** Additionality means that CO2 sequestration would not have happened without the project.
- **Verifiable.** The offset project needs to be monitored and verified regularly by a qualified and independent third party.
- **Permanent.** Emissions reductions cannot be temporary and reversible. For Avoided Conversion projects, the use of conservation easements also contributes to permanence.*
  - **Buffer pool** – Fixed percentage of offsets that are set aside and placed in a reserve account based on a risk assessment (AFOLU working group – used by all protocols); risk reserve is held by registry in perpetuity unless it is part of a sliding buffer pool applied based on successful verifications and no reversals (VCS only) (source: Developing a Permanence Mechanism)
- **Enforceable.** Credit ownership has to be clearly established and tracked to avoid double counting.

Roles in Carbon Projects

- **Project Sponsor (also called Project Proponent)** plays a project management by scoping the forest carbon project opportunity and coordinating with project developers, landowners, consulting foresters, and land trusts.
- **Carbon project developer** develops the project by modeling carbon credits based on proposed activities relative to a baseline scenario. The developer has extensive technical expertise in modeling forest carbon, forest carbon protocols, registries' protocols. Developers also may provide project financing as well as feasibility and eligibility analysis.
- **Landowners** determine he/she/they want to implement a forest carbon project on property owned in fee title. If restrictive covenants like Conservation Easements exist on the property, or individual management rights like timber harvest have been granted to another party (like a land trust), then those entities are also involved in the forest carbon project (e.g. Forest Owner).
- **Verifiers** are third parties that are accredited by the American National Standards Institute to act on behalf of registries to conduct reviews (site visits) and/or review carbon project monitoring reports submitted by project proponents and verify the emissions reductions of a project after implementation. To ensure a high standard of quality, verifiers do not help developers with project plans if they are also planning to verify or validate the project later.
- **Registries** are entities that regulate the production and sale of carbon credits (e.g., Verified Carbon Standard, Climate Action Reserve, American Carbon Registry, California Air Resource Board). They develop peer-reviewed protocols for different types of carbon projects and regulate project performance by reviewing monitoring reports over the project lifespan. Registries ensure credits are serialized and not sold more than once.
- **Consulting foresters** inventory forests by conducting timber cruises to collect the data required for establishing existing stocks and modeling emissions reductions resulting from a carbon project.
- **Consumers** are entities that purchase carbon credits.