



Maryland
Department of
the Environment

Growing and Supporting Maryland's Natural Climate Solutions

**30TH ANNUAL MARYLAND LAND CONSERVATION
CONFERENCE**

October 4, 2023



Nature-based Solutions

Approaches that **work with and enhance nature** on land and sea, providing **benefits** for both **human wellbeing** and **biodiversity**.





Nature-based Climate Solutions

Can **avoid greenhouse gas emissions** and **enhance carbon sinks** on land and in the sea as well as **build resilience and aid adaptation** to climate change for both nature and people.



Natural climate solutions: cost-effective, scalable and viable

We must cut 30 gigatons a year of carbon emissions by 2030 if we are to keep global temperature increase well below 2 degrees Celsius. Nature can reduce more than one-third of the emissions to meet this goal if countries invest in carbon-storing forests, grasslands, wetlands and farmlands.



- **Protecting** current lands (existing area, **avoid loss** to current sinks)
- **Managing** current lands (existing area, **create larger sinks**)
- Identifying lands for **restoration** (new area, **create new sinks**)



MD GHG Reduction Planning

Timeline to Achieve Maryland's Climate Goals



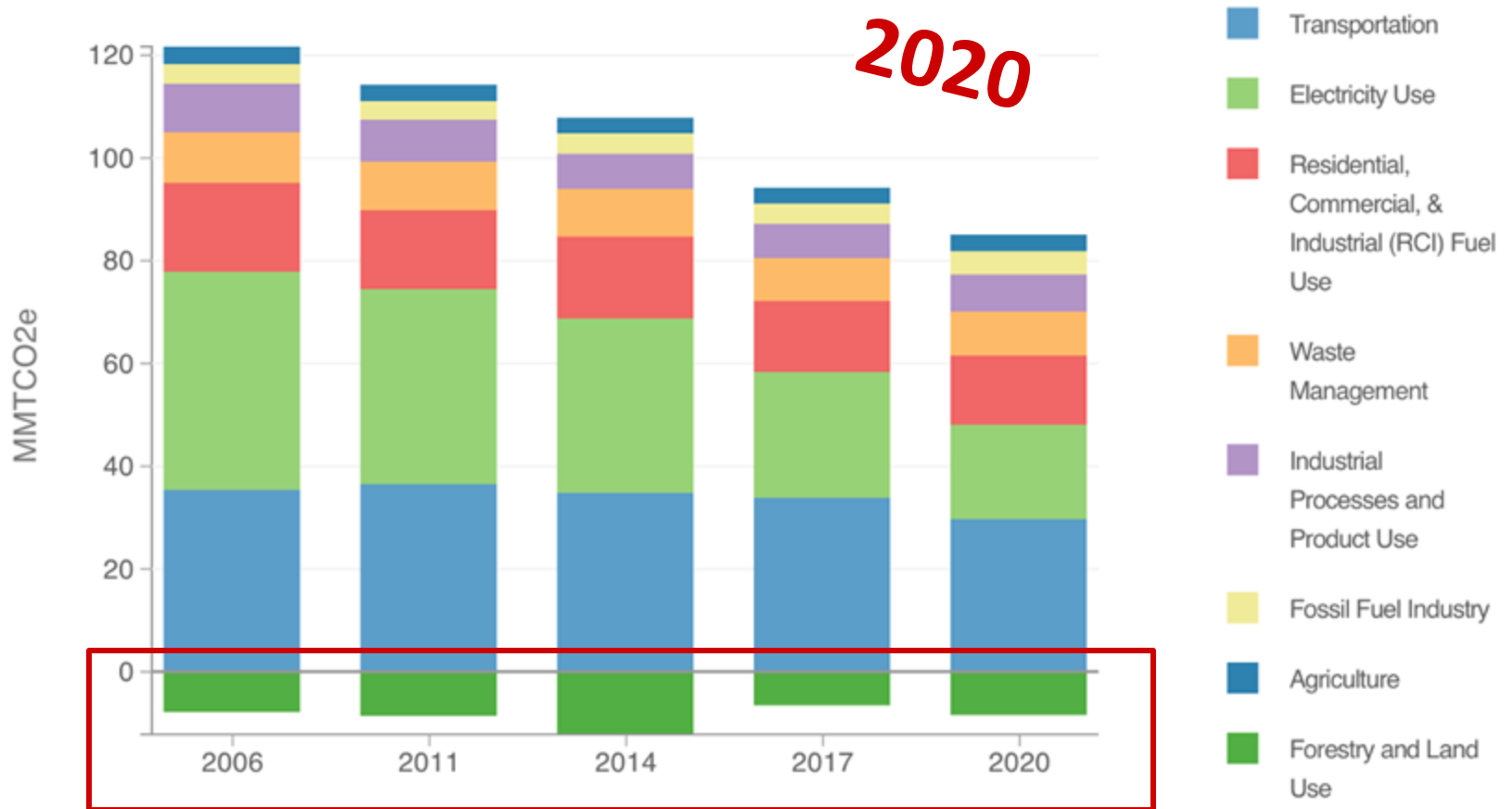
<https://mde.maryland.gov/programs/air/ClimateChange>



MD GHG Reduction Planning



Maryland GHG Emissions Trend by Sector
(Use filtering to select GWP and drilldown sectors and gases)



Solutions that remove carbon from the atmosphere and store it!



Net-zero Means Full Integration of NWL

Natural and Working Lands (NWL)



Assessment and Planning Tools

Emissions Inventory



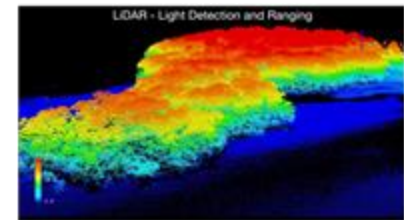
Reduction Plan



Progress Tracking



Improved Science





Net-zero Means Full Integration of NWL

Assessment and Planning Tools

Emissions Inventory



actual/known
carbon
impacts

Reduction Plan



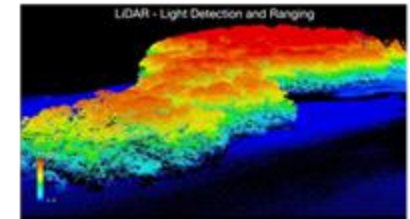
known state and federal programs +
potential scale of implementation +
projected C benefits

Progress Tracking



actual/known
program
implementation

Improved Science



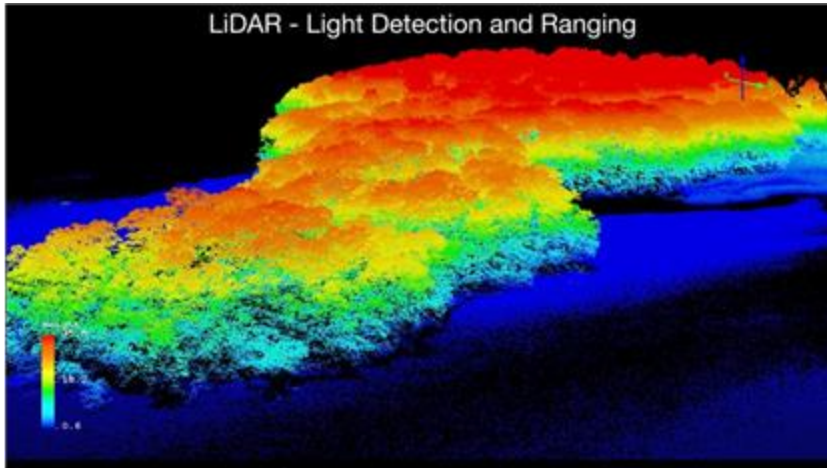
Helps us harmonize
outcomes from
past (2006) to
future (2045)



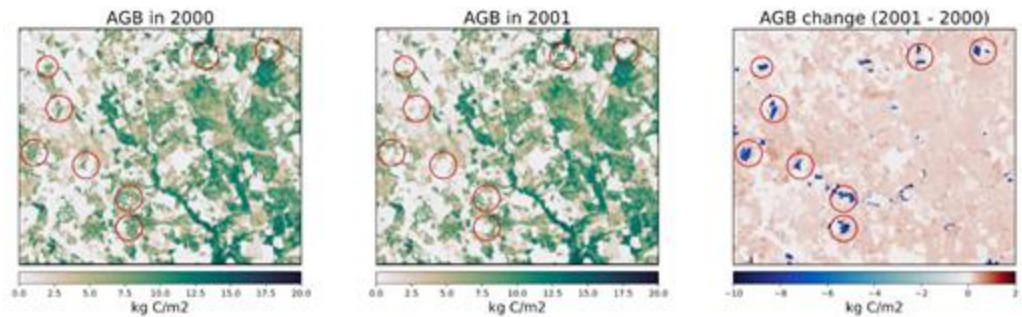
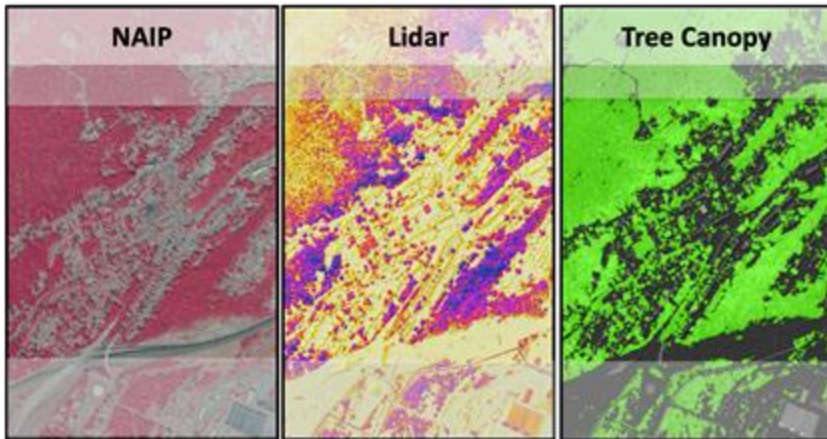
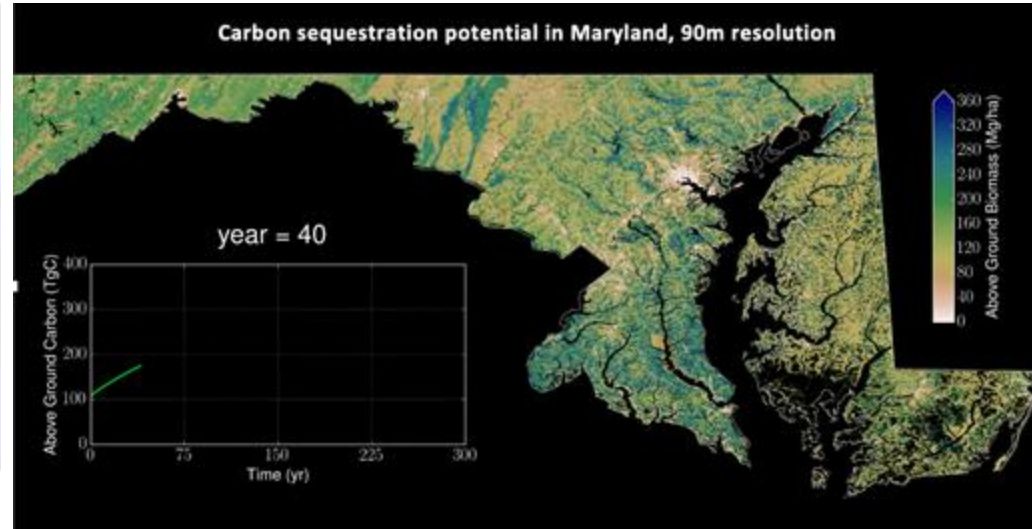
Connection to Global Science

Hurtt et al 2019, ERL
Ma et al 2021, ERL
Tang et al 2021, ERL
Hurtt et al 2023, in prep

LiDAR - Light Detection and Ranging



Carbon sequestration potential in Maryland, 90m resolution



DEPARTMENT OF
GEOGRAPHICAL
SCIENCES





GHG Inventory - Forest Carbon

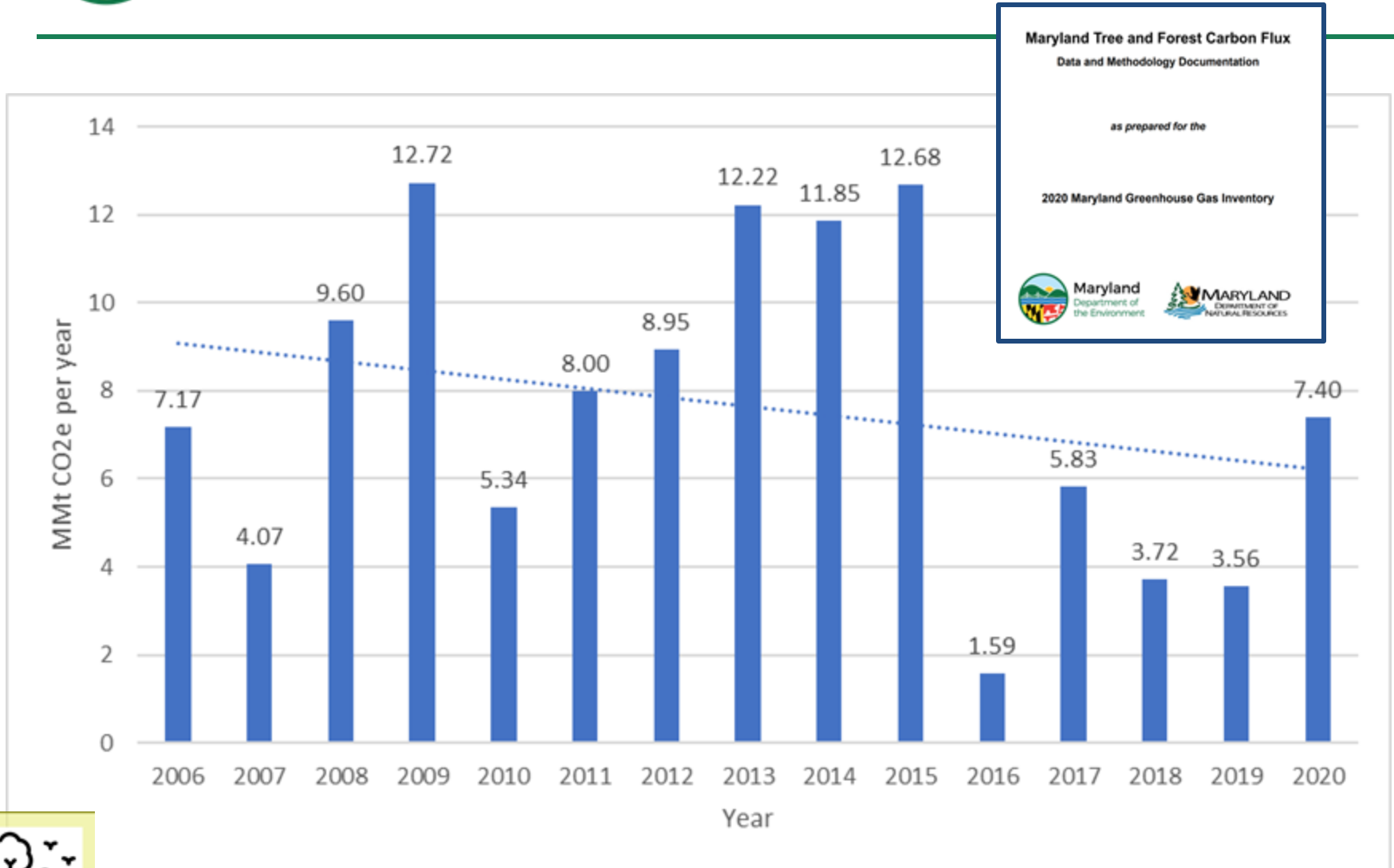
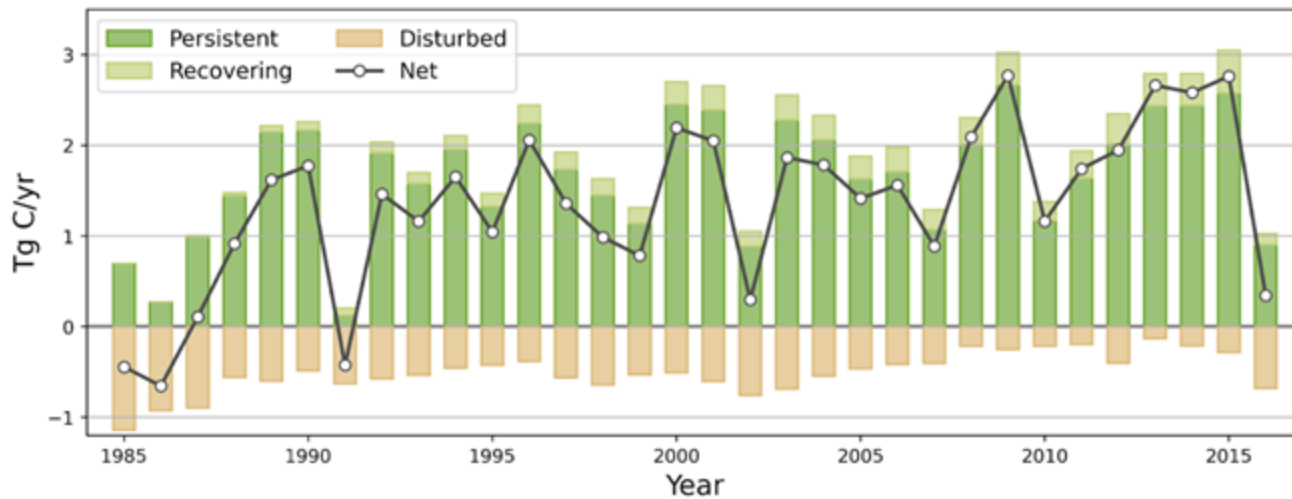


Figure 1. Trend of Forest Ecosystem Carbon Sequestration Per Year Over Time.

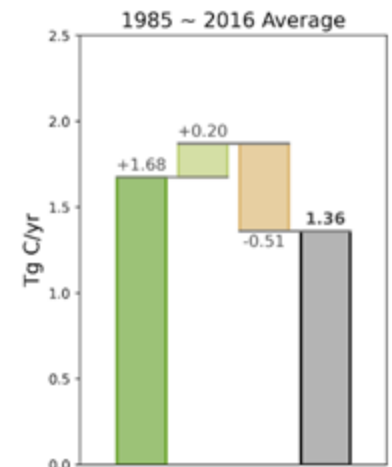


GHG Inventory - Forest Carbon

Beyond a single annual net flux #
Where and why is there change?



(a)



(b)





Tree Solutions Now Act of 2021



additional!

**5 million native trees
planted and maintained by 2031**



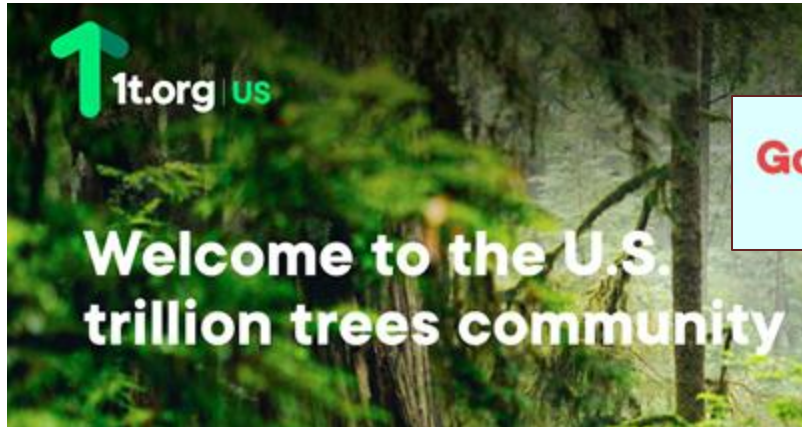
**500,000 trees planted
in urban underserved areas**

Support environmental justice
and equity





Connection to Global Goals



Goal: One trillion trees conserved, restored and grown globally by 2030.



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Department of
the Environment

Pledge by State of Maryland

State of Maryland - Growing Five Million Trees by 2030

Total Trees Pledged: 5,000,000

Supporting actions: Sustainable Forestry, Avoided Deforestation, Nursery Development, Data and Technological Tools, Science and Technical Assistance, Tree Protection through Management, Forest Product Markets and Innovation, Workforce Development, Environmental Education, Conservation Finance



ACHIEVING 5M TREES IS A MULTI-AGENCY EFFORT

Maryland Department of the Environment is coordinating the implementation of the **Tree Solutions Now Act of 2021** with leadership support from



Maryland
Department of
the Environment





Maryland's Five Million Trees Initiative

About Get Involved Register Trees Resource Library FAQs Gallery Contact Us

Five Million Trees in Maryland



Accelerate progress towards state climate mitigation goals

Increase **climate adaptation** and **resilience**

Improve **air** and **water quality**

Reduce **urban heat island effect**

Advance **sustainable forestry**

LEARN MORE AT [MDE.MARYLAND.GOV/5MTREES](https://mde.maryland.gov/5mtrees)





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Five Million Trees in Maryland



Our Progress So Far

See our statistics and data policies

July 2021-June 2023

Five Million Trees Tracking Dashboard

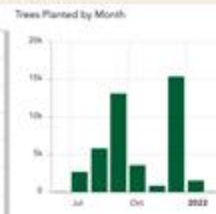
Last Update:
9/25/2023

Total Trees Planted
484,439

Total Trees Planted Underserved Areas
24,798



County	Trees Planted
Allegany	31,214
Anne Arundel	35,791
Baltimore City	2,001
Baltimore	14,120
Calvert	5,527
Caroline	4,132
Carroll	66,925



mde.maryland.gov/5Mtrees





Processing Tree Planting Data

01

Enable progress tracking and confirm eligibility criteria

- Number of Trees Planted
- Species Name(s)
- Planting Location

02

Support long term carbon monitoring and estimate forest carbon benefits

- Planting Date
- Tree Size

03

Track program efficacy and ensure no double counting

- Planting Partners
- Funding Sources

Additional collected data on **planting design and maintenance** can support longer term engagement with initiative participants and **sustained tracking of tree planting health**





MD Agricultural Soil Health

NRCS Practice Standards for Greenhouse Gas Emission Reduction and Carbon Sequestration

Qualitative Ranking N=Neutral	Practice Code	Practice Standard and Associated Information Sheet	Beneficial Attributes
<p>GHG Benefits of this Practice Standard</p>	327	Conservation Cover (Information Sheet)	Establishing perennial vegetation on land retired from agriculture production increases soil carbon and increases biomass carbon stocks.
	329	Residue and Tillage Management, No Till/Strip Till/Direct Seed (Information Sheet)	Limiting soil-disturbing activities improves soil carbon retention and minimizes carbon emissions from soils.
	379	Multi-Story Cropping	Establishing trees and shrubs that are managed as an overstory to crops increases net carbon storage in woody biomass and soils. Harvested biomass can serve as a renewable fuel and feedstock.
		Windbreak/Shelterbelt Establishment (Information Sheet)	Establishing linear plantings of woody plants increases biomass carbon stocks and enhances soil carbon.
		Silvopasture Establishment	Establishment of trees, shrubs, and compatible forages on the same acreage increases biomass carbon stocks and enhances soil carbon.
		Forage and Biomass Planting (Information Sheet) Multi-Story Cropping	Deep-rooted perennial biomass sequesters carbon and may have slight soil carbon benefits. Harvested biomass can serve as a renewable fuel and feedstock. woody biomass and soils. Harvested biomass can serve as a renewable fuel and feedstock.
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GHG Inventory - Ag Soil Carbon

- High rates of BMP adoption by MD farmers
- Incomplete representation by EPA National Data
- Goals using **state-specific** data:
 - 1) historical annual agricultural soil fluxes (2006-2021)
 - 2) method to quantify annual soil fluxes for future inventories
 - 3) estimated future soil fluxes under a range of planning scenarios
- Credit farmers for progress, identify next best BMPs



COMET
Farm

USDA United States Department of Agriculture
Natural Resources Conservation Service

Colorado
State
UNIVERSITY

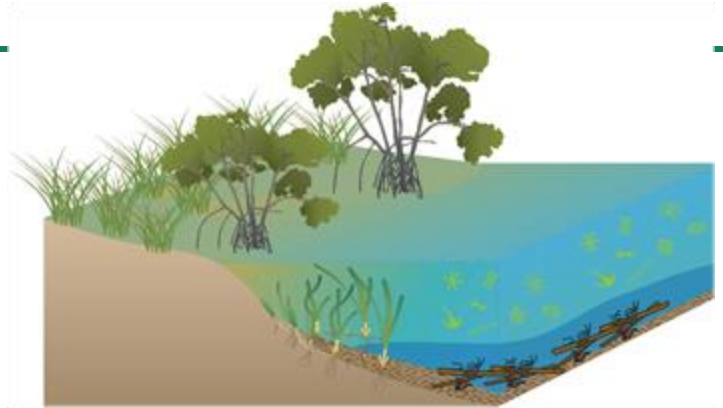
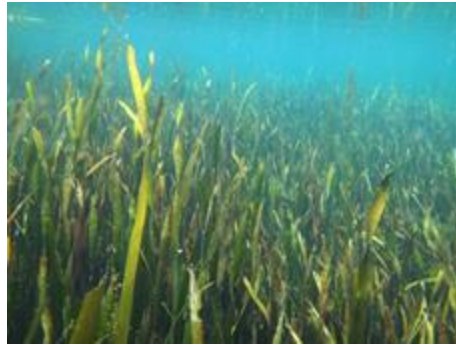
Sierra View Solutions

UNITED STATES
CLIMATE ALLIANCE

STATES UNITED FOR CLIMATE ACTION



MD Blue Carbon Ecosystems



- Existing marsh
- Seagrass
- Area that could be hydrologically connected to create/restore salt marsh
- Drowned marsh
- Eroded marsh
- Migration space marsh
- Hydrologically connected due to SLR

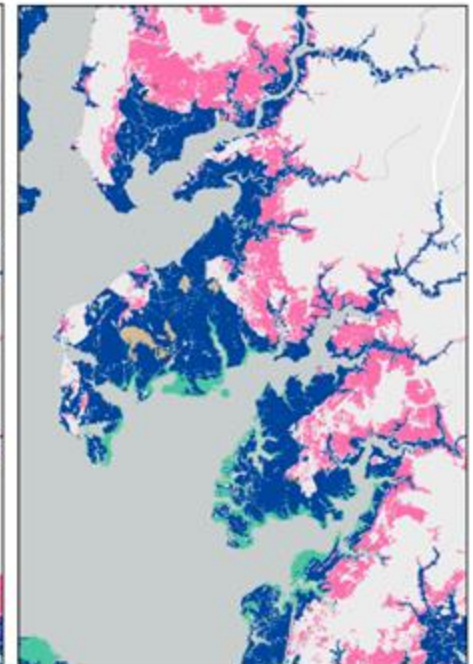
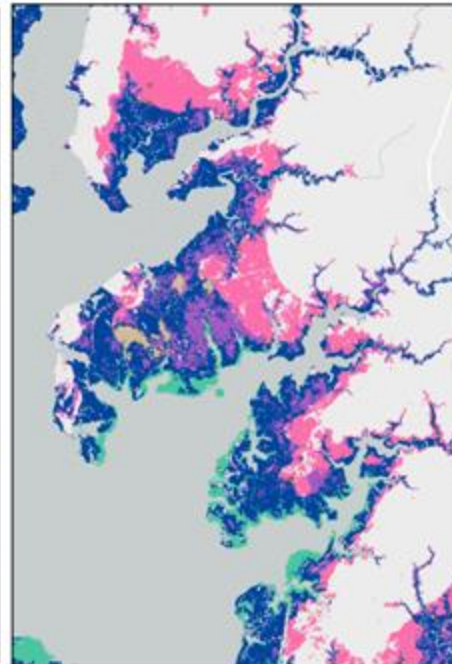
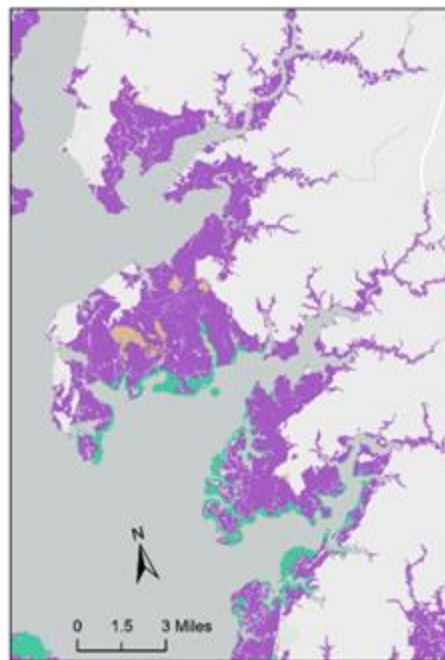


Image Credit: Warnell, presentation of USCA project preliminary results

SLR: projected sea level rise



GHG Inventory - Blue Carbon

Newly included in 2020 Targeted improvements:

1. mapping against salinity gradient
2. geographically refined rates of carbon sequestration and methane
3. submerged aquatic vegetation

Maryland Blue Carbon Flux: Estuarine Wetlands and Submerged Aquatic Vegetation Data and Methodology Documentation

as prepared for the

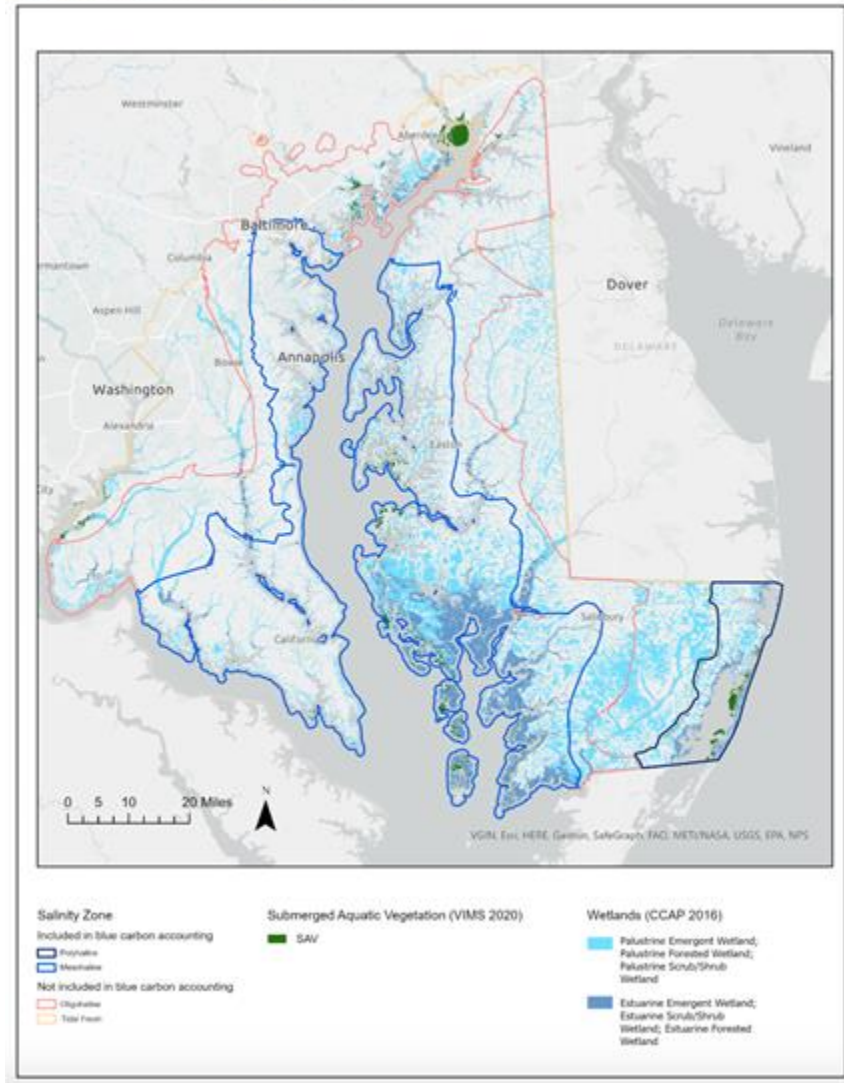
2020 Maryland Greenhouse Gas Inventory



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Figure 1: Wetland and SAV extent in Maryland





Iterate with new 2031 and 2045 Targets

2020 GHG Inventory: How do our carbon sinks support our GHG goals? What are the dominate factors affecting change?

2022 Progress Report: Does actual implementation of activities align with what was planned? Why or why not?

New 2031 Plan: Do we need additional programs or policies to reach existing (or new) targets?

- *What is the technical potential for MD NWL by 2045?*
- *How can we connect to complementary goals?*

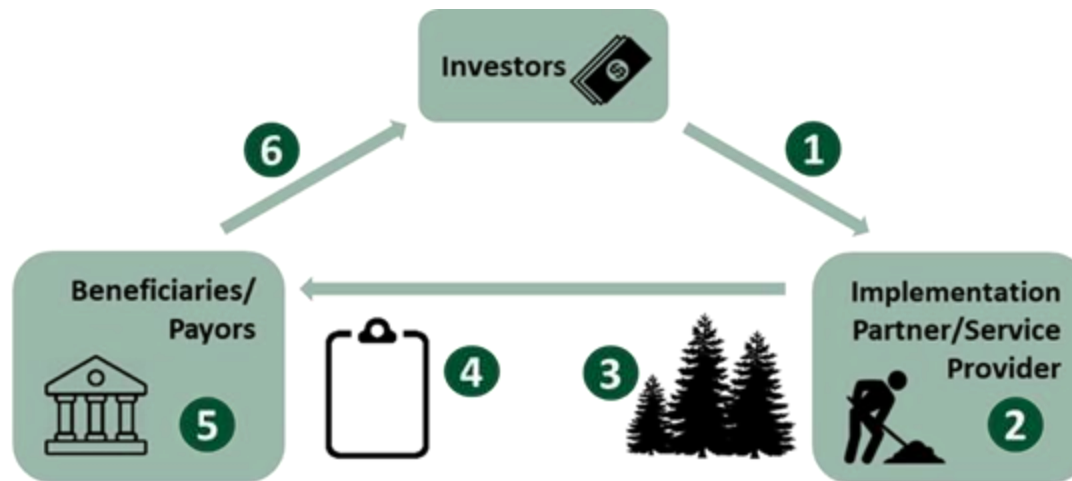


e.g., 10% of new trees must be planted in underserved urban areas (Equity and EJ)



Attracting Additional Investment

- Ground-breaking MD Conservation Finance Act
- New *Pay-for-Success* model for restoration finance
- Centers **quantified/verified** environmental outcomes



1 Investors provide the upfront capital to cover project costs

2 Implementation partner/service provider conducts project activities

3 Project delivers environmental, social, and financial outcomes

4 Independent evaluator measures outcomes using agreed-upon metrics

5 Beneficiaries/payors make payments to investors as outcomes delivered

6 Outcome payments made at rates contingent on project performance allow investors to recover principal and a return



Attracting Additional Investment

- More **ecosystem restoration** = more carbon benefits
- More **pay-for-success** = lower risk projects
- Better **science** = more cost-effective tracking
- Private **financing** = more options for implementation



Contact

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Links to more resources

June 2031 Pathway Report:

<https://mde.maryland.gov/GGRA>

GGRA Progress Report:

<https://mde.maryland.gov/GGRA>

GHG Emissions Inventory:

<https://mde.maryland.gov/programs/air/ClimateChange/Pages/GreenhouseGasInventory.aspx>

Trees and Forest Data and Methodology Documentation:

https://mde.maryland.gov/programs/air/ClimateChange/Documents/VIMAL/MD_ForestCarbon_Flux_Methodology_01.06.23.pdf

Blue Carbon Data and Methodology Documentation:

https://mde.maryland.gov/programs/air/ClimateChange/Documents/VIMAL/MD_BlueCarbon_Flux_Methodology_01.06.23.pdf

Agricultural Soil Carbon Project Brief:

https://mde.maryland.gov/programs/air/ClimateChange/Documents/VIMAL/MD_AgriculturalSoils_Flux_Project_01.06.23.pdf