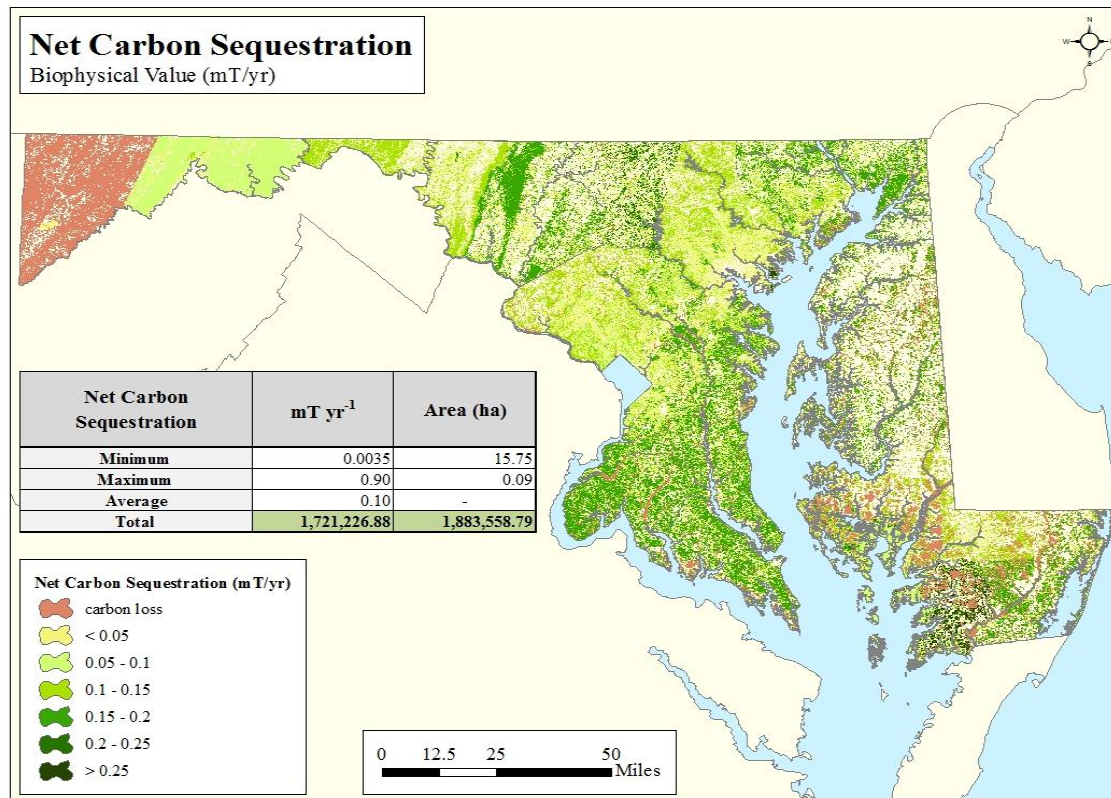# Updating the Forestry and Sequestration Programs for 2020-2030 Greenhouse Gas Reduction Act Goals

Elliott Campbell, PhD
Director, Center for Economic and Social Science

Forestry and Sequestration Programs

Total Forestry and Sequestration
- 4.55 MMtCO2e reduction (13% of total reduction by 2020)
- **Cumulative rather than annual total**

Managing Forests to Capture Carbon
- 1.8 MMtCO2e reduction

Planting Forests in Maryland
- 1.79 MMtCO2e reduction

Other programs: biomass to energy, ecosystem markets, wetland and waterways restoration, increasing urban tree canopy, and Ag. Land conservation make up the remainder of GHG reduction, ~ 1 MMT CO2e

Managing Forests to Capture Carbon

- Public lands: acreage certified under FSC and SFI (211,000 acres, have exceeded goal of 50% of state owned forest land)
    - All state forest land and currently dual certified
- Private Lands: acres undergoing forest management
    - Stewardship Plans (~18,000 acres per year)
    - Sediment Control (~ 11,000 acres per year)
    - Tree Planting (~ 1,500 acres per year)
    - Timber Stand Improvement (~ 4,500 acres per year)
    - Wildlife Habitat (~ 2,800 acres per year)
- Exceeding goal of providing sustainable forest management on 30,000 acres per year (currently averaging over 40,000)

Planting Forests in Maryland

- Current goal is establishing 30,000 acres of new forest land through afforestation or reforestation on public and private land

- Exceeded the goal (35,478 cumulative acres of forest established)

- Currently on track for ~45,000 new acres of forest by 2020

NASA/UMD Carbon Monitoring System

- Initiative designed to characterize, quantify, understand, and predict the evolution of global carbon sources and sinks through improved monitoring of carbon stocks and fluxes

- Maryland one of the first locations studied by the initiative

- Initiative seeks to serve policy goals and needs

- Other key partners- MCCC STWG, MD Forest Service

Questions that CMS Data Can help address:

- When combined with available land and programmatic funding, what is a realistic target reduction from the forestry sector?

- How well have our programs performed?

- What are the best regions of the state to target for tree plantings to maximize carbon uptake?

Carbon sequestration rates on Forest and Non-Forest lands in Maryland Counties

County	AGB (Mg C/ha/yr)						Below Ground C (Mg C/ha/yr) *						Soil Organic C (Mg C/ha/yr) *					
	max (F)	mean (F)	min (F)	max (NF)	mean (NF)	min (NF)	max (F)	mean (F)	min (F)	max (NF)	mean (NF)	min (NF)	max (F)	mean (F)	min (F)	max (NF)	mean (NF)	min (NF)
Kent	1.12	0.57	0.0	1.22	1.14	0.06	0.34	0.11	0.0	0.37	0.23	0.01	0.6	0.45	0.15	0.9	0.7	0.3
Charles	1.04	0.35	0.0	1.22	0.90	0.01	0.31	0.07	0.0	0.37	0.18	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Caroline	1.03	0.51	0.0	1.21	1.08	0.06	0.31	0.10	0.0	0.36	0.22	0.01	0.6	0.45	0.15	0.9	0.7	0.3
Allegany	0.83	0.17	0.0	0.98	0.64	0.01	0.25	0.03	0.0	0.29	0.13	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Baltimore city	1.02	0.45	0.0	1.22	0.32	0.00	0.31	0.09	0.0	0.37	0.06	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Frederick	1.07	0.38	0.0	1.22	0.91	0.01	0.32	0.08	0.0	0.37	0.18	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Worcester	1.10	0.54	0.0	1.22	1.07	0.01	0.33	0.11	0.0	0.37	0.21	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Talbot	1.08	0.57	0.0	1.22	1.07	0.06	0.33	0.11	0.0	0.37	0.21	0.01	0.6	0.45	0.15	0.9	0.7	0.3
Garrett	0.80	0.19	0.0	0.98	0.71	0.02	0.24	0.04	0.0	0.30	0.14	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Cecil	1.06	0.39	0.0	1.21	0.96	0.01	0.32	0.08	0.0	0.36	0.19	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Somerset	1.07	0.57	0.0	1.22	1.08	0.11	0.32	0.11	0.0	0.37	0.22	0.01	0.6	0.45	0.15	0.9	0.7	0.3
Washington	1.05	0.30	0.0	1.22	0.81	0.01	0.31	0.06	0.0	0.37	0.16	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Prince George's	1.03	0.45	0.0	1.19	0.73	0.01	0.31	0.09	0.0	0.36	0.15	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Baltimore	1.08	0.46	0.0	1.22	0.85	0.01	0.33	0.09	0.0	0.37	0.17	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Wicomico	1.05	0.52	0.0	1.20	1.01	0.01	0.31	0.10	0.0	0.36	0.20	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Carroll	1.07	0.44	0.0	1.22	0.91	0.05	0.32	0.09	0.0	0.37	0.18	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Montgomery	1.05	0.53	0.0	1.22	0.88	0.02	0.32	0.11	0.0	0.37	0.18	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Queen Anne's	1.12	0.54	0.0	1.22	1.09	0.06	0.34	0.11	0.0	0.37	0.22	0.01	0.6	0.45	0.15	0.9	0.7	0.3
Dorchester	1.12	0.56	0.0	1.22	1.08	0.05	0.34	0.11	0.0	0.37	0.22	0.01	0.6	0.45	0.15	0.9	0.7	0.3
Harford	1.05	0.47	0.0	1.22	0.98	0.02	0.32	0.09	0.0	0.37	0.20	0.00	0.6	0.45	0.15	0.9	0.7	0.3
St. Mary's	1.20	0.45	0.0	1.22	0.99	0.00	0.36	0.09	0.0	0.37	0.20	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Anne Arundel	1.12	0.50	0.0	1.22	0.79	0.00	0.34	0.10	0.0	0.37	0.16	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Calvert	1.10	0.48	0.0	1.22	1.02	0.04	0.33	0.10	0.0	0.37	0.20	0.00	0.6	0.45	0.15	0.9	0.7	0.3
Howard	1.11	0.47	0.0	1.22	0.92	0.01	0.33	0.09	0.0	0.37	0.18	0.00	0.6	0.45	0.15	0.9	0.7	0.3
MARYLAND	1.20	0.45	0.0	1.22	0.91	0.00	0.36	0.09	0.0	0.37	0.18	0.00	0.60	0.45	0.15	0.90	0.70	0.30

(F) Stands for forest and (NF) stands for Non-forest

* Estimates of soil organic carbon sequestration rates are preliminary and have not been vetted extensive

2020-2030 Projections

- Forest Management
  - Low: 35,000 acres per year
  - Medium: 50,000 acres per year
  - High: 60,000 acres per year
- Forest Planting
  - 2,000 acres per year
  - 3,000 acres per year
  - 4,000 acres per year
- Carbon Benefit (includes urban trees + avoided conversion)
  - Low: 1.26 MMTCO2e per year
  - Medium: 1.53 MMTCO2e per year
  - High: 1.78 MMTCO2e per year

Future Work Plan

- Available land for planting analysis- USGS 1 m land cover

- Refine carbon reductions from forest management- USFS Forest Vegetation Simulator

- Establish protocol for crediting carbon benefits of land conservation

- Monitor the science on net GHG from wetlands in Maryland

Recommendations

- Utilize best available scientific data on land based carbon sequestration and GHG emissions for existing GGRA programs, in collaboration with UMD/NASA CMS program, USFS, and the STWG

- Add program on carbon benefit of land conservation and avoided forest conversion through MD's forest conservation act

- Continue tracking progress of wetland restoration and biomass to energy but do not project a carbon reduction associated with these programs due to uncertainty in wetland methane emissions and establishment of biomass to energy facilities

- MDE, MDNR, and MDA adopt the term "Natural and Working Lands" to refer to all GGRA programs concerning land based carbon sequestration and avoided emissions of carbon or other GHG's. This will allow Maryland to better align with the effort coordinated by the US Climate Alliance

- Explore the potential impact of "carbon incentive payments" added to existing water quality funding programs