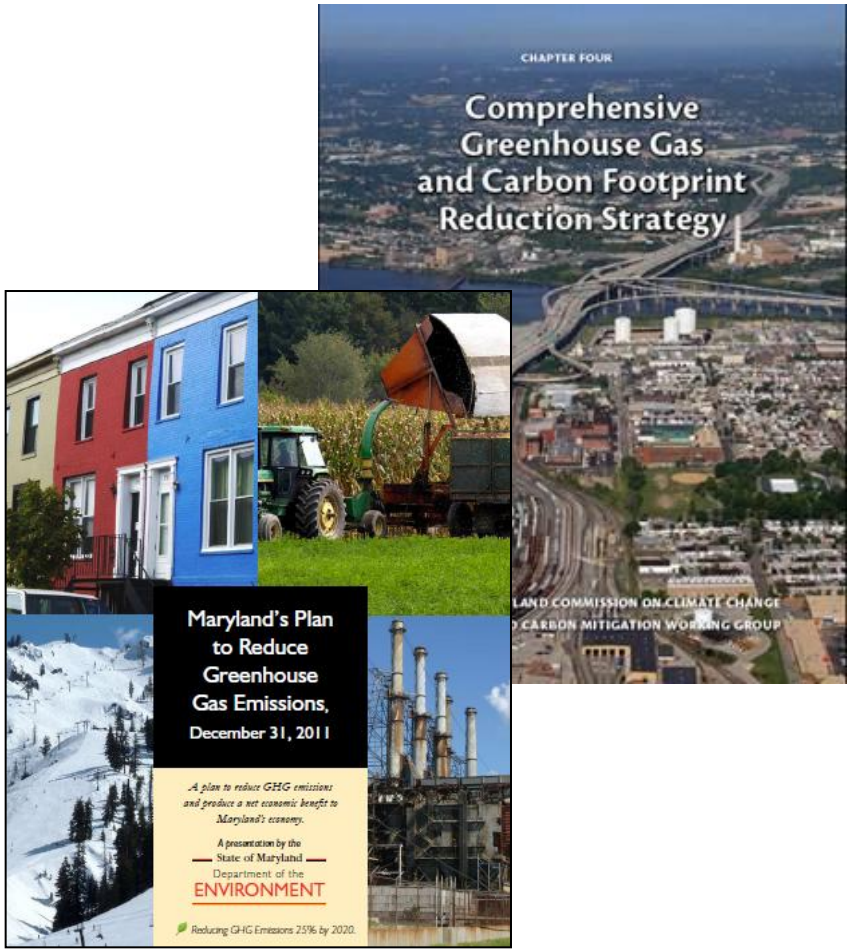
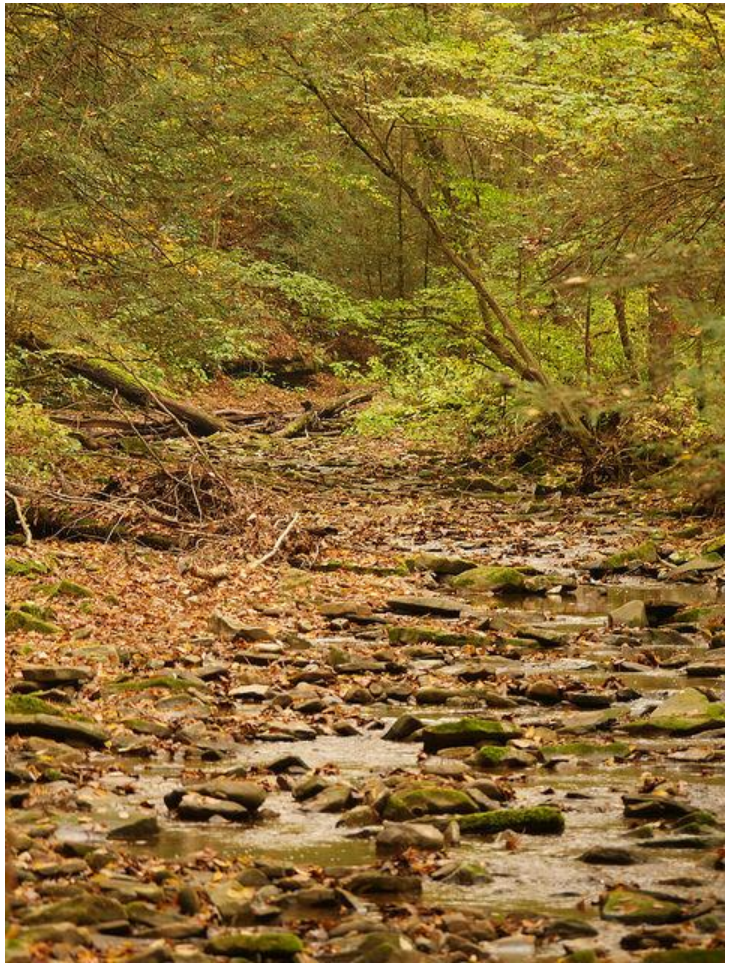
DNR's Implementation of GGRA Programs

A Brief Analysis of Overall Success and Areas for Improvement at DNR

Reducing Maryland's GHG Emissions 25% by 2020



Overview



- Snapshot of all Programs Assigned to DNR
- More Detail on DNR's Programs
- Key Issues
- Working Group Discussion

DNR's Assigned Programs

Summary of DNR's Climate Reduction Programs

Number	Program	Reductions as Initially Designed ($MMtCO_2e$)	Reductions with Enhancements ($MMtCO_2e$)
I.1	Managing Forests to Capture Carbon	1.8	1.8
I.2	Planting Forests in Maryland	1.79	1.79
I.3	Creating and Protecting Wetlands and Waterway Borders to Capture Carbon	.43	.43
I.6	Increasing Urban Trees to Capture Carbon	.02	.02
I.7	Geologic Opportunities to Store Carbon	N/A	N/A
J.1	Creating Ecosystem Markets to Encourage GHG Reductions	.11	.11
J.6	Biomass for Energy Production	.33	.33
	Total Estimated Reductions	**4.37 MMT**	**4.37 MMT**

DNR Program Snapshots

- I.1 Managing Forests to Capture Carbon
  - *Goal:* Improve sustainable forest management on 30,000 acres of private land annually; improve sustainable forest management on 100 percent of State-owned resource lands; 50 percent of State-owned forest lands will be third-party certified as sustainably managed.
  - DNR is promoting sustainable forestry management practices on public and private lands.
  - Since 2006, 81,860 acres of forest stand improvements accomplished and 160,495 acres private forest management plans.
  - 211,000 acres have been certified with Dual Third Party Certification for Forest Sustainability.
  - Overall Success: Performing as designed.

- I.2 Planting Forests in Maryland
  - Goal: Achieve the afforestation and/or reforestation of 43,030 acres by 2020.
  - Between 2006 and 2014, 30,300 acres of trees had been planted or undergone natural revegetation on private lands.
  - Overall Success: Performing as designed.

- I.3 Creating and Protecting Wetlands and Waterway Borders to Capture Carbon
  - Goal: Restoration of 1,142 acres of wetlands on state and public land and planting 645 acres of streamside forest buffers on state and public lands.
  - To date, 1476 acres of wetlands restored; 800 acres of streamside buffers planted.
  - Overall Success: Exceeding established goals.

DNR Program Snapshots (Cont.)

- I.6 Increasing Urban Trees to Capture Carbon
  - Goal: By 2020, the overall goal is to plant 12,500,000 trees through the Forest Conservation Act, Marylanders Plant Trees, Tree-Mendous Maryland and 5-103 State Highway Reforestation Act planting programs.
  - To date, 5,214,302 trees planted (2006- 2014).
  - Overall Success: Performing as designed.

- I.7 Geologic Opportunities to Store Carbon
  - Goal: Identify and Assess Geologic storage Opportunities (Programmatic Milestone - No quantification Target Assigned)
  - DNR's Resource Assessment Service is currently evaluating total organic carbon content in western Maryland black shales (e.g., Marcellus), in prelude of determining the viability of these as storage units.
  - Characterization of potential permanent carbon storage units within different areas of the State. Deep well study of western Maryland and deep saline aquifers in Maryland's offshore areas.
  - Delineation and characterization of Maryland depleted deep gas storage fields as sites of permanent carbon storage.
  - Examination of potential development of stray gas migration into potable aquifers.
  - Current research is assessing the CO2 adsorption capacity of power plant combustion y-products and the organic shales and clays in the closest geologic formations.
  - Overall Success: Performing as designed.

DNR Program Snapshots (cont.)

- J.1 Creating Ecosystem Markets to Encourage GHG Emission Reductions
  - Goal: Establishment of ecosystem markets, creation of a tracking mechanism and development of protocols to assess/quantify GHG benefits of individual markets. (Programmatic Milestone - No quantification Target Assigned)
  - DNR has initiated a study to economically value a suite of ecosystem services for select habitats along an urban to rural gradient.
  - The net effect will be conservation of natural lands and reduction of GHG emissions.
  - The first phase of the study will be released in Q4 FY2015.
  - Overall Success: A preliminary analysis of ecosystem service benefits from typical forest and wetland

- J.6 Biomass for Energy Production
  - Goal: Develop policies that recognize wood as a preferred renewable energy source; recognize wood as the largest source of energy consumption in Maryland; offer incentives to utilize locally produced wood to meet thermal energy needs.
  - Working with partners MES, MEA, DBED and US Forest Service to facilitate the installation of wood energy systems.
  - Various projects are in earliest stages of investigation in Baltimore County and Baltimore City.
  - Additionally, both Ft. Meade and Andrews AFB are evaluating the opportunities for incorporating wood systems in their overall green energy transformations.
  - Overall Success: Performing as designed

More Detail:
I.1 Managing Forests to Capture Carbon

Program Description:

- Managing forests to capture carbon will promote sustainable forestry management practices in existing Maryland forests on both public and private lands.
- The enhanced productivity resulting from enrolling unmanaged forests into management regimes will increase rates of carbon dioxide sequestration in forest biomass, increase amounts of carbon stored in harvested, durable wood products which will result in economic benefits, and increased availability of renewable biomass for energy production.
- Enhanced forestry management in Maryland should contribute to a 1.8 MMtCO2e reduction in the State's GHG emissions by 2020.

Goals

- Improve sustainable forest management on 30,000 acres of private land annually;
- Improve sustainable forest management on 100 percent of State-owned resource lands;
- 50 percent of State-owned forest lands will be third-party certified as sustainably managed.

More Detail:
I.1 Managing Forests to Capture Carbon

Status:

- Since 2006, 81,860 acres of forest stand improvements accomplished and 160,495 acres private forest management plans.
- 211,000 acres have been certified with Dual Third Party Certification for Forest Sustainability. State Forest system (both Western MD and Eastern Shore) is currently 211,000 acres – all dual certified to SFI & FSC standards.
- The DNR Carbon Sequestration Pilot project has been implemented to assess forest planting and management techniques for approximately 174 acres of Maryland forests.
- MGS is monitoring on an annual basis.

Implementation:

Public Lands:

- Since 2006, 211,000 acres of State Forests have been certified with Dual Third Party Certification for Forest Sustainability to the Sustainable Forestry Initiative (SFI) and Forest Sustainability Certification (FSC) standards.
- DNR is working to develop similar sustainable forest management practices on State parkland and wildlife management areas.

Private Lands:

- Since 2006, 160,495 acres of Stewardship Plans, 99,933 acres of Sediment Control, and 81,860 acres of forest stand improvements (“Tree Planting”, “Timber Stand Improvements”, and “Wildlife Habitat” in the table below) for a total of 342,288 acres have been implemented on private lands.
- We are currently on track to meet our goal on by 2020.

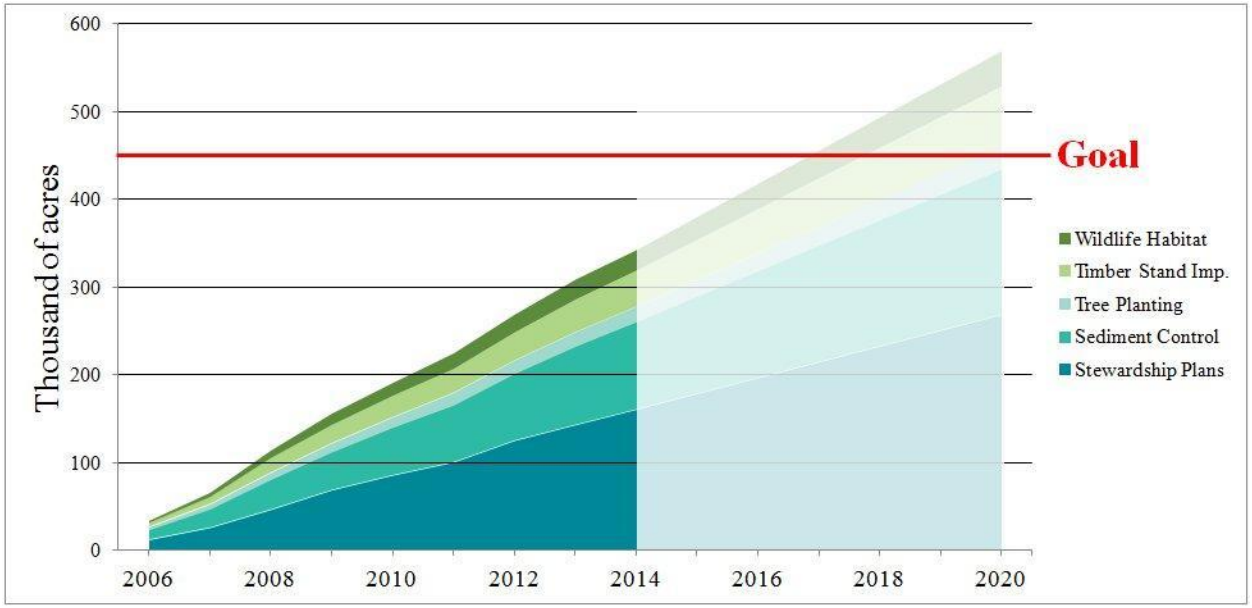
More Detail:
I.1 Managing Forests to Capture Carbon
On Private Lands

Year	Stewardship Plans	Sediment Control	Tree Planting	Timber Stand Imp.	Wildlife Habitat	Acres
2006	12,106	11,580	3,082	4,796	2,196	33,760
2007	13,630	9,799	2,661	3,300	2,456	31,846
2008	20,657	13,060	2,286	8,519	3,760	48,282
2009	22,228	9,037	2,234	4,188	4,327	42,014
2010	16,895	11,249	1,497	3,542	1,835	35,018
2011	14,866	10,479	2,428	2,778	3,149	33,700
2012	24,640	11,167	1,151	4,607	2,489	44,054
2013	17,822	13,252	1,166	5,171	2,627	40,038
2014	17,651	10,310	1,237	3,850	528	33,576
2015	18,000	11,000	1,500	4,500	2,800	37,800
2016	18,000	11,000	1,500	4,500	2,800	37,800
2017	18,000	11,000	1,500	4,500	2,800	37,800
2018	18,000	11,000	1,500	4,500	2,800	37,800
2019	18,000	11,000	1,500	4,500	2,800	37,800
2020	18,000	11,000	1,500	4,500	2,800	37,800
Total	**268,844**	**166,623**	**27,005**	**68,401**	**42,439**	**573,312**
Average Annual						38,220

Goal: 30,000 Acres/Year

More Detail:
I.1 Managing Forests to Capture Carbon

DNR is promoting sustainable forestry management practices in existing Maryland forests on public and private through a suite of efforts, policies and programs, including:



1. Public Lands/State Forest System:

- Dual Third Party Certification for Forest Sustainability on State Forests
  - WMAs & Parks, (eg. early successional habitat) (Currently working with WHS on several projects. Will begin developing Forest Stewardship plans on several Parks in 2015.)
  - Accelerated Pace of Silvicultural Activity (Audit Rec'd: Savage River State Forest will increase the number of sales from 14 to 20. We are working to decrease the backlog of timber sales.)
- State Forest Annual Workplans

More Detail:
I.1 Managing Forests to Capture Carbon

2. Private Lands:

- Technical Assistance – Forest Stewardship Plan Preparation
- Forest Stewardship Plan Implementation
  - Expanded Special Rivers Project
- Financial Assistance
  - State and Federal Cost Sharing
    - Woodland Incentive Program
    - Healthy Forests/Healthy Waters (Currently working on developing the next round of projects.)
    - Backyard Buffer Program
    - Environmental Quality Incentive Program
    - Conservation Reserve Enhancement Program
  - State and Federal Cost Sharing
    - TAXMOD – expanded eligibility (as of 10/27/14, 3 applicants from the expanded eligibility)
    - Forest Conservation & Management Program
    - Woodland Assessment Program

More Detail:
I.1 Managing Forests to Capture Carbon

Current /Recent Efforts

- Development & application of the UMCP remote sensing capability for forest carbon assessment.
    - Status: completed.

- Launch of NASA, USDA, & DOE climate science project for remote sensing, modeling and field-based measurements to quantify the carbon consequences of alternate development and management plans across rapidly changing forests in Maryland.
    - Status: pending funding approval

- DNR with other partners, including USFS, UMCES and UMD Extension to release topic related fact sheets and technical guidance on woodland and climate change stewardship principles.
    - Status: completed.

More Detail:
I.2 Planting Forests in Maryland

Program Description:

- Planting trees expands forest cover and associated carbon stocks by regenerating or establishing healthy, functional forests through practices such as soil preparation, erosion control, and supplemental planting, to ensure optimum conditions to support forest growth.

Goal:

- By 2020, the implementation goal is to achieve the afforestation and/or reforestation of 43,030 acres in Maryland by 2020.
- Achieving the 43,030 acre target should reduce GHG emissions in the State by 1.79 MMtCO2e by 2020.

Implementation:

- Between 2006 and 2014, 30,300 acres of trees had been planted or undergone natural revegetation on private lands.
- We are on track to achieve our goal of 43,030 acres by 2020.

More Detail:
I.2 Planting Forests in Maryland

Forest Planting and Regeneration on Private Lands

Year	Afforestation	Reforestation	Riparian Buffers	Private Natural	Total (acres)
2006	558	2,104	420	1,400	4,482
2007	334	1,991	336	1,400	4,061
2008	415	1,596	275	1,400	3,686
2009	531	1,497	206	1,400	3,634
2010	566	403	528	1,400	2,897
2011	1,231	639	558	1,400	3,828
2012	330	607	214	1,400	2,551
2013	286	602	278	1,400	2,566
2014	342	544	309	1,400	2,595
2015	400	700	400	1,400	2,900
2016	400	700	400	1,400	2,900
2017	400	700	400	1,400	2,900
2018	400	700	400	1,400	2,900
2019	400	700	400	1,400	2,900
2020	400	700	400	1,400	2,900
Total	**7,051**	**14,339**	**5,615**	**21,000**	**48,005**

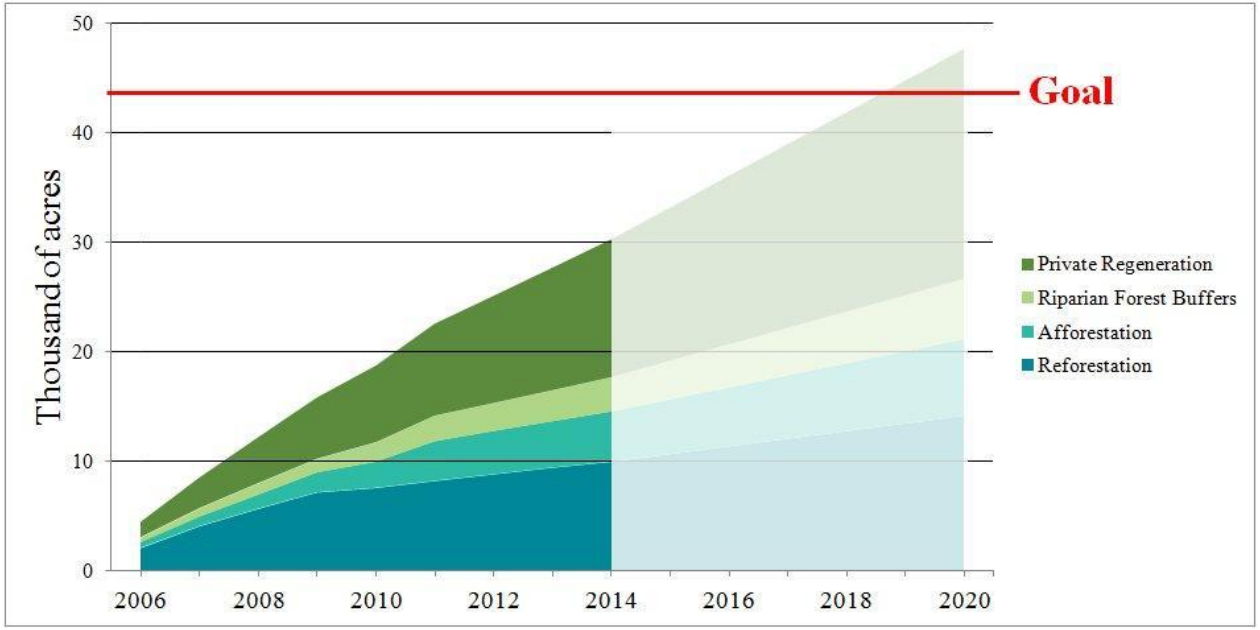
More Detail:
I.2 Planting Forests in Maryland

Implementation Plans:

- DNR implementing this program through a suite of efforts, policies and programs, including:

1. Public Lands:

- State Forest System Annual Workplan Implementation



More Detail:
I.2 Planting Forests in Maryland

2. Private Lands

- Technical Assistance
  - Forest Stewardship Plan Implementation
  - FCA Implementation
- Financial Assistance
  - Rural Lands: State and Federal Cost Sharing
    - Woodland Incentive Program (WIP –MD Forest Service)
    - TAXMOD (MD Forest Service; as of 10/27/14, 3 applicants from the expanded eligibility.)
    - Environmental Quality Incentive Program (EQIP – Federal/NRCS)
    - Conservation Reserve Enhancement (CREP – Federal/NRCS)
  - Urban Lands: Public/Private Partnerships
    - Tree-Mendous/Arbor Day
    - Marylanders Plant Trees/Private Nurseries (Additional $150,000 has been received from OAG)
    - Lawn to Woodland (e.g. National Arbor Day Foundation, etc.) (Kicked off in spring 2014 with 14.3 acres planted. Planning for 105 acres in spring 2015 and at least 70 in 2016.)
    - Small Community UTC Grants (Possibly Spring 2015)
    - MD Urban & Community Forestry Council Grants
    - Expanded eligibility for Reforestation Law funding on to private land (Initial Lawn To Woodland plantings used this fund source.)

Current/Recent Efforts: Lawn to Woodland" pilot. Program kicked off April 2014. A total of 14.3 acres planted. Planning for 105 acres in spring of 2015.

More Detail: I.3 Creating and Protecting Wetlands and Waterway Borders to Capture Carbon

Riparian Forest Buffers (acres)	
2006	420
2007	336
2008	275
2009	206
2010	528
2011	558
2012	214
2013	278
2014	309
2015	77
Total	3,124

- Goal: Restoration of 1,142 acres of wetlands on state and public land and planting 645 acres of streamside forest buffers on state and public lands.
- To date, 1476 acres of wetlands restored; 800 acres of streamside buffers planted.
- Overall Success: Exceeding established goals.

More Detail:
I.6 Increasing Urban Trees to Capture Carbon

Program Description:

- Trees in urban areas directly impact Maryland's carbon budget by absorbing GHG emissions from power production and vehicles, reducing heating and cooling costs and energy demand by moderating temperatures around buildings, and slowing the formation of ground level ozone as well as the evaporation of fuel from motor vehicles.

- Implementation is supported by several other MD laws and programs that include outreach and technical assistance for municipalities to assess and valuate their urban tree canopy, assist communities with establishing urban canopy goals, and plant trees to meet those goals.

Jobs and the Economy:

- The Increasing Urban Trees Program is estimated to support 375 jobs worth $8.4 million in wages, and a net economic benefit of $286 million (Regional Economic Studies Institute of Towson University, 2012).

(Photo Credit: Parks and People Foundation)

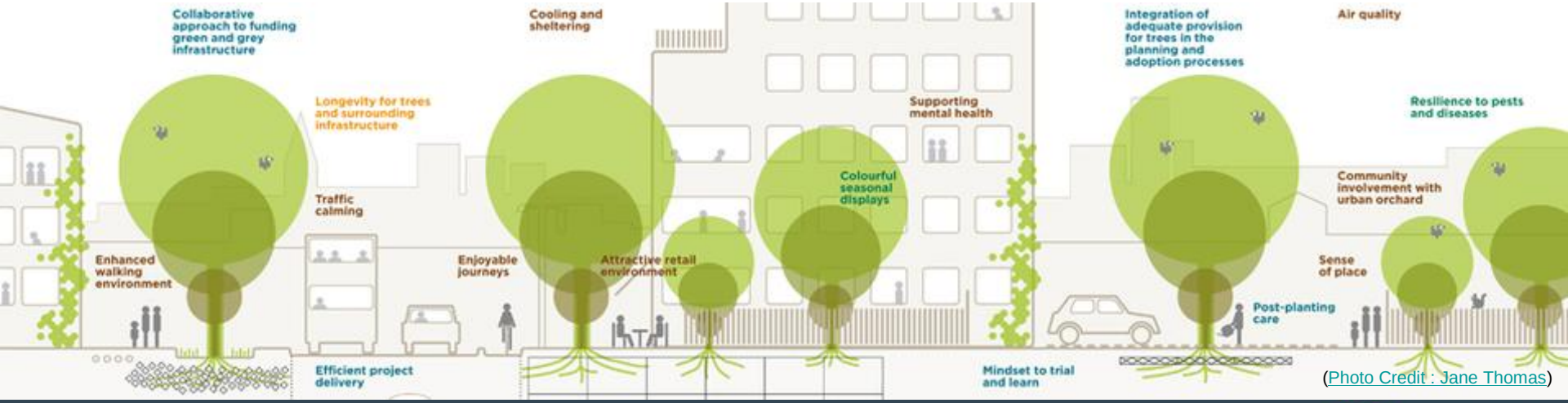
More Detail: I.6 Increasing Urban Trees to Capture Carbon 2020 Goals and Reductions

2020 Goals :

- Plant 12.5 million trees in urban areas
- Progress reports updated annually and due on Sept. 30th

Carbon Reductions :

- Increasing urban trees in Maryland should contribute to a 0.02 MMtCO2e reduction in the State's GHG emissions by 2020. No enhancements have been identified for this program.



(Photo Credit : Jane Thomas)

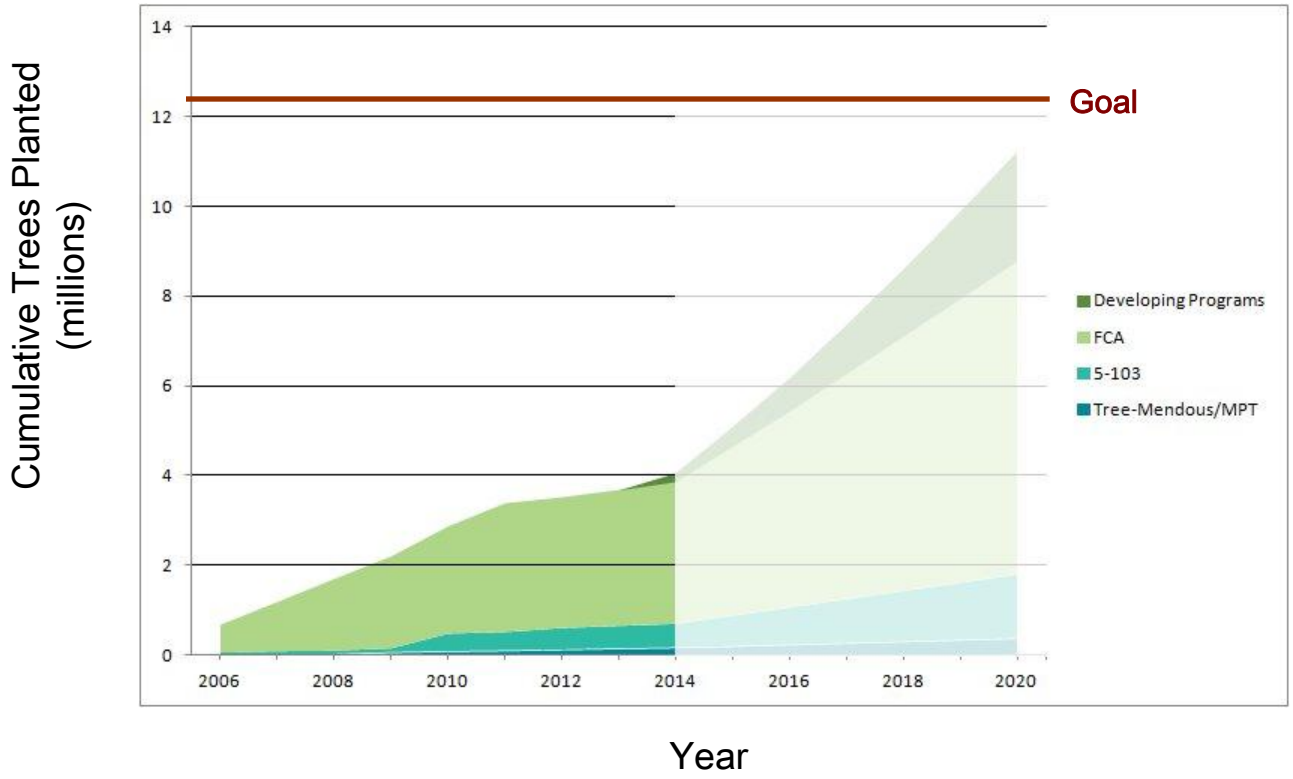
More Detail: I.6 Increasing Urban Trees to Capture Carbon Planting Progress

Urban Tree Planting (number of trees)					
Year	**FCA**	**5-103**	**Tree-Mendous / MPT**		**Totals**
2006	623,700	33,750	8,178		665,628
2007	473,400	27,000	6,057		506,457
2008	499,500	9,900	2,160		511,560
2009	450,900	13,950	39,020		503,870
2010	337,950	308,250	23,000		669,200
2011	481,050	15,750	17,200		514,000
2012	**42,300**	68,850	21,700		132,850
2013	**119,250**	23,850	23,800		166,900
2014	**140,580**	24,615	21,500		186,695
2015					
2016					
2017					
2018					
2019					
2020					
Totals	**3,168,630**	**525,915**	**162,615**		**3,857,160**

Not yet fully reported by counties

Note: Urban Tree data updated on Sept. 30 of each year. 2015 data will be available on or after 9/30/15.

More Detail:
I.6 Increasing Urban Trees to Capture Carbon



More Detail:
J.6 Biomass for Energy Production

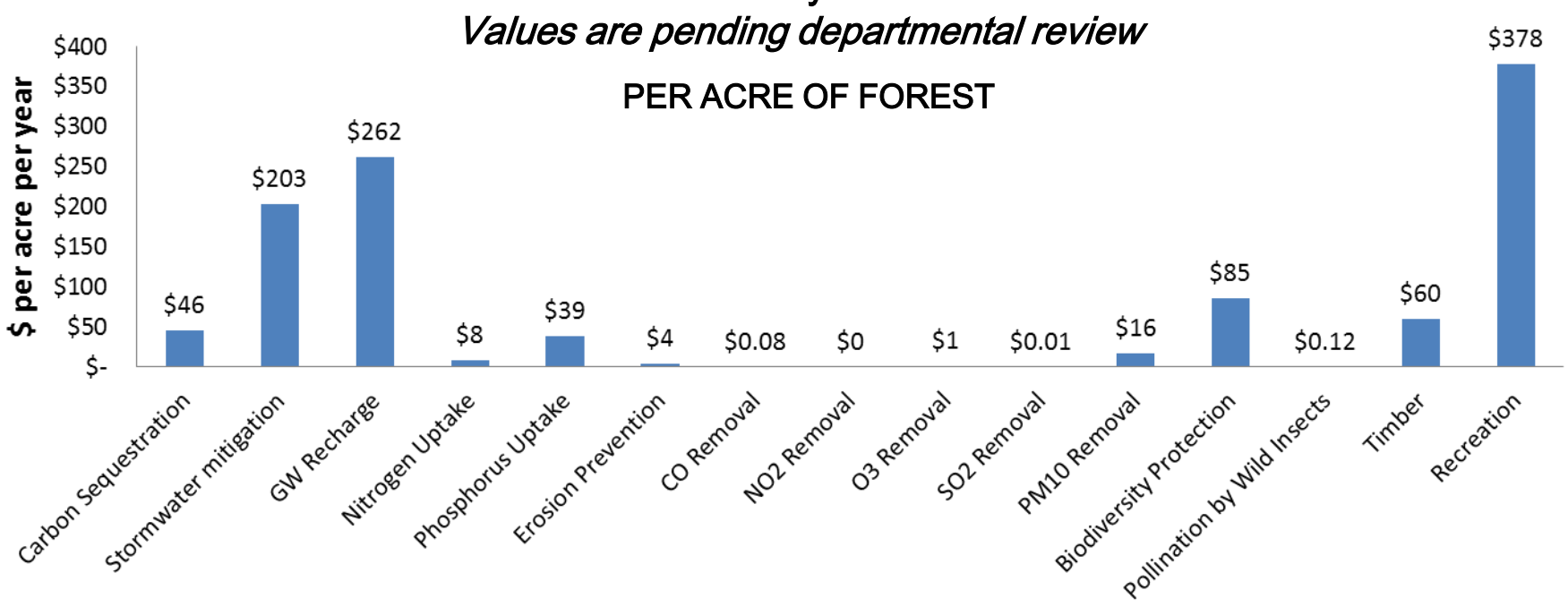
Potential Reductions from Wood Energy

- 1 ton wood fuel avoids 1,338lbs of CO_2 from oil.
- A typical school would annually displace 2,000 tons CO_2e.

Awareness of wood energy technology is the primary barrier. Actions needed:

1. Educate State agency leadership.
2. Develop policy supporting THERMAL energy.
3. Recognize wood as a preferred renewable energy source, on par with solar, geothermal, and wind.
4. Establish financial incentive programs.

More Detail: J.1 Creating Ecosystem Markets to Encourage GHG Emission Reductions



15 services that forests provide to humans have been economically quantified

Similar assessments have been completed for wetlands

Additional assessments are being conducted for stream buffers, urban forests, oyster reefs and SAV beds

More Detail:
I.7 Geologic Opportunities to Store Carbon

- Geologic Carbon Sequestration differs from other discussed sequestration methods as it captures the carbon at the source, transports it to the sequestration site, and then sequesters it.

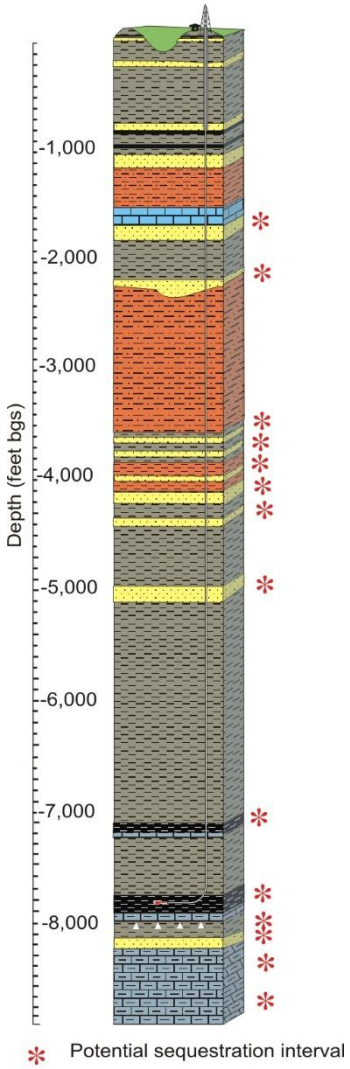
- Maryland is one of eight partner states in MRCSP (Midwest Region Carbon Sequestration Partnership) whose role is to identify, locate, and characterize potential geologic storage levels.

- More than 10 gigatonnes of storage capacity has been identified to be available within Maryland. (103 years of storage capacity at current CO2 estimated production rate of 97 million metric tons per year)

- Site testing is underway in Michigan and Ohio and completed in Kentucky. It has been proposed to attempt a site test on the Eastern Shore of Maryland; however, this is still in discussion.

- Resource Assessment along with 4 other Mid-Atlantic States, Battelle, and DOE are assessing the potential for permanent storage of carbon within deep saline aquifers and basalt structures in offshore areas. Potential is over 400 gigatonnes.

More Detail:
I.7 Geologic Opportunities to Store Carbon



- Currently Maryland Geological Survey (MGS) is identifying and characterizing geologic intervals in western Maryland that have sequestration potential.
- Depleted gas fields present the most immediate option for permanent storage of carbon dioxide in western Maryland.
- MGS is currently assessing the potential of utilizing black shales (e.g., Marcellus) as permanent sequestration locations as a logical reutilization of natural gas infrastructure should it be permitted.
- Deep saline aquifers within the onshore and offshore areas of Maryland's eastern shore have potential for significant quantities of permanent carbon storage (current estimate ~4.4 gigatonnes)
- RAS-MGS is currently studying the possibility of stray gas migration it potential for water well contamination within the Accident gas storage facility.

Working Group Discussion

- What programs should be the focus of our effort?
- Where are there untapped opportunities?
- Where could resources be better spent?
- Where are partnerships needed?
- Where else can the State show leadership?