



Maryland
Department of
the Environment

Innovative MS4 Forestry Financing and Crediting Strategies

April 6, 2022



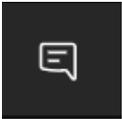
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Agenda & Speakers

- Agenda
 - MD FFIT Overview
 - Funding Mechanisms
 - Restoration Crediting
 - Co-Benefits
 - Case Studies
 - GIS Examples
- Speakers
 - Adrianna Berk, Tetra Tech
 - Mark Sievers, Tetra Tech
 - Liz Hiett, Tetra Tech (Tech Support)
- Q&A Session
 - Type questions in chat



The purpose of this webinar is not to demonstrate how to operate MD Forest Financing Implementation Tool (MD FFIT), but to demonstrate the benefits of including forest planting in restoration efforts.

This webinar is being recorded. An email will be sent to participants with this presentation and a link to the recording.



Poll Question

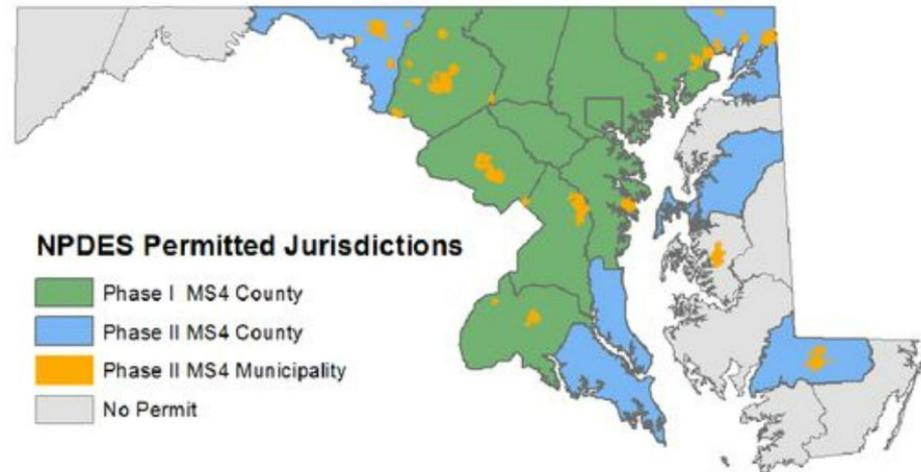
- Have you used MD FFIT?





Context – Forestry as Important BMP

- MD has a robust NPDES MS4 permit structure covering ~70%; permits are restoration drivers; jurisdictions can choose which best management practices (BMPs) to install
- MS4s: Municipal separate storm sewer system permits
 - Restoration requirements
 - Retrofit untreated acres
 - Equivalent impervious acres
 - Bay restoration
 - Phase I MS4s
 - Population over 100K
 - Permit 1st issued 2013–2014
 - Annual restoration budgets exceed \$300M
 - Phase II MS4s
 - Issued 2018



[Image credit: MDE](#)



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Maryland Forest Financing Implementation Tool (MD FFIT) Overview



Where to Find MD FFIT

- Maryland Forest Financing Implementation Tool (MD FFIT)
 - Calculator for those seeking loans to fund forestry efforts and earn restoration credits
 - <https://mde.maryland.gov/programs/water/TMDL/DataCenter/Pages/TMDLStormwaterToolkit.aspx>

NEW! Maryland Forest Financing Implementation Tool (MD FFIT)

Maryland Forest Financing Implementation Tool (MD FFIT), a calculator designed to assist MD local governments, counties, and their partners seeking loans to fund forestry efforts and earn restoration credits for permits. The video shows how MD FFIT can be used to review different implementation scenarios, evaluate how much a forestry project would cost, estimate how many MS4 credits and environmental co-benefits can be achieved. The slides in the video and a user guide are also below.

- Maryland Forest Financing Implementation Tool (MD FFIT)
- MD FFIT User's Guide
- MD FFIT Training Presentation Slides
- MD FFIT Live Walkthrough and Demo (leaving MDE)
- MD FFIT Brochure





MD FFIT in Nutshell

- Tool developed to promote forestry planting and show its advantages
- Calculator can assist local governments seeking below-market interest rate loans to fund forestry efforts and earn restoration credits
- Explore potential interest payments based on different interest rates
- Tie different programs together
 - Municipal separate storm sewer system (MS4)
 - Total maximum daily load (TMDL) restoration
 - Habitat/natural resources
 - Source water protection
- Benefits
 - Allows permittees to look for cost-effective measures
 - Quantify co-benefits



Image credit: MDE



MD FFIT in Nutshell



Example questions that can be answered by MD FITT

- How many acres can I restore with \$1M?
- What will it cost to restore 250 acres?
- How many trees do I need to plant?
- What MS4 equivalent impervious acres (EIA) credit can I receive?
- How much TN & TP reduction (in lbs)?
- How cost effective is tree planting?



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Funding Mechanisms to Support Restoration



Funding Overview

- Types of funding
 - Federal
 - State
 - Local / Other
- Each type has limitations
 - Review terms (e.g., matching funds requirements)
- More than one type of funding can be used
 - Some funding mechanisms can be combined with other funding mechanisms, some cannot





Funding Mechanisms (Partial List)

| Source | Type | Program & Resources (Weblinks) |
|--|-------------------------------|---|
| Federal programs | Grants & low-interest loans | Summary Fact Sheet |
| State – MD Dept. of the Environment (MDE) | Grants & loans | MDE Water Quality Financing Administration (WQFA) |
| State – MDE | Grants | MDE 319 Program |
| State – MD Dept. of Natural Resources (DNR) | Grants | DNR Grants Gateway |
| State – DNR | Grants & cost-share programs | DNR Forestry Opportunities |
| State – MD Dept. Of Agriculture (MDA) | Agricultural grants | MDA Buffer Initiative |
| Nonprofit – Chesapeake Bay Trust (CBT) | Forestry & restoration grants | CBT Grants & Opportunities and Planned Program Schedule |
| Nonprofit – National Fish and Wildlife Foundation (NFWF) | Chesapeake Bay grants | NFWF Chesapeake Bay Stewardship Grants |



Right Time to Fund Restoration – Federal

- Clean Water State Revolving Fund (CWSRF)
 - Low-interest loans
 - Initial funds from federal sources
 - Loan payments go to the state, which uses those funds to provide other CWSRF project loans
 - Re-direct small percent of CWSRF to nonpoint source (NPS) projects
 - Riparian forest buffers
 - Drinking Water State Revolving Fund
- Bipartisan Infrastructure Bill
 - \$141M to Maryland
 - \$43M added to CWSRF Program
 - Includes stormwater (including trees)
 - 49% loan forgiveness



Funding – CWSRF

- CWSRF loans can offer better terms than conventional loans
 - Terms: interest 1.0% instead of 5% for other loans
 - Periods of 3, 5, 10, 20, 30, 40 years
 - Potential milestones could trigger Principal and Interest (P&I) forgiveness
- [New EPA NPS guidance](#)

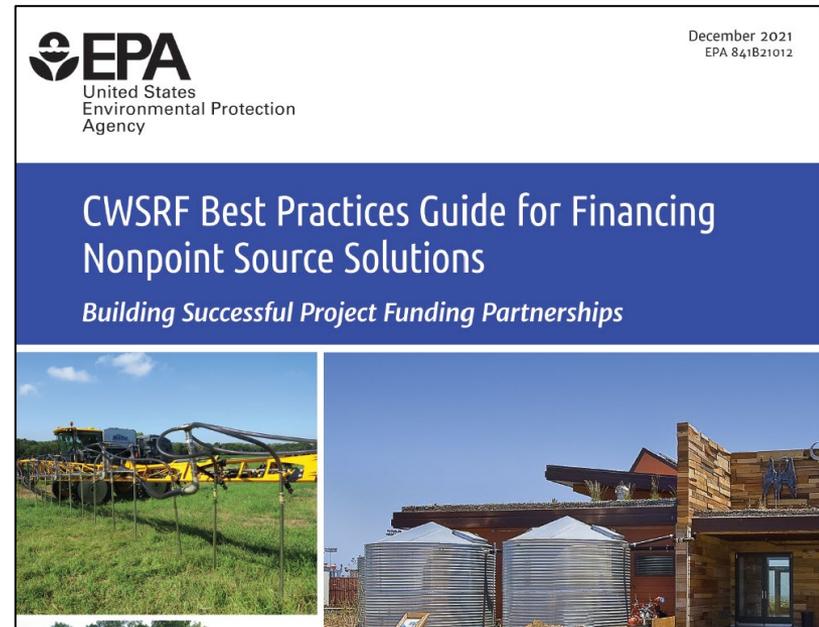


Image credit: EPA



Funding – CWSRF Costs Savings

- Fixed budget not to exceed \$1M. What are financing options?
 - Conventional loan at 2% interest
 - Only \$820,000 available for project
 - $\$820,000 \times 2\% \times 20$ years compounded annually = \$180,000 in interest
 - CWSRF funding at 0%
 - Entire \$1M would be available for the project
 - Equivalent to receiving a \$180,000 grant or 18% savings
 - As market rates rise, SRF is an even better bargain

Table 3-1. Market rates and grant equivalence in CWSRF*

| | | SRF Rate | | | | | |
|-------------|------|----------|------|------|------|------|------|
| | | 0.0% | 1.0% | 2.0% | 3.0% | 4.0% | 5.0% |
| Market Rate | 2.0% | 18% | 9% | - | | | |
| | 3.0% | 26% | 18% | 9% | - | | |
| | 4.0% | 32% | 25% | 17% | 9% | - | |
| | 5.0% | 38% | 31% | 24% | 16% | 8% | - |
| | 6.0% | 43% | 36% | 30% | 23% | 16% | 8% |
| | 7.0% | 47% | 41% | 35% | 29% | 22% | 15% |

Source: CWSRF NPS Guidance, page 15



Funding – How MDE Allocates CWSRF

- CWSRF is competitive

- Scored and ranked based on

- TN reduction, effectiveness, cost efficiency, & number of acres restored
- Mitigation of particular problems (e.g., public health, pollution, flooding) or compliance with TMDL/efforts to restore impaired waters

- To receive most load reduction points, need 2,000 lb TN reduction

- 25 points versus 15 or 5 points for lower reductions

| | Land Use Change | Acres needed for 2,000 lb TN |
|----------------|-----------------|------------------------------|
| Riparian (RFB) | Crop to RFB | 56 |
| | Pasture to RFB | 82 |
| | Hay to RFB | 91 |
| | Turf to RFB | 139 |
| | Average | 92 |



MDE's CWSRF – Application Timeline

- Timeline of CWSRF Applications and Awards
 - **Applicants submit application to MDE (Dec–Jan)**
 - MDE scores applications (Feb–Apr)
 - Projects selected for funding; budgets for loan and grant drafted (Apr–May)
 - Draft documents released for public comment, including Project Priority List (PPL) and Intended Use Plan (IUP) (May/Jun)
 - Capital budget submitted to Maryland Department of Budget and Management (DBM) (Jul)
 - Final PPL, IUP, and application for federal funds submitted to EPA for review/approval (Jul–Sep)
 - DBM hearing of capital budget (Sep)
 - **Applicants notified if receiving SRF loan financing (Oct)**
 - DBM prepares documents for Department of Legislative Services (DLS) (Sep–Dec)
 - Capital budget released by DLS in January (one year after application submittal deadline)
 - DLS hearing of capital budget (Feb)
 - Legislature approves capital budget (Apr/May)
- Applicants must conduct programmatic requirements before Board of Public Works approval and receipt of state grant funds (~1.5 years after application)
- [Water Quality Financing \(maryland.gov\)](http://maryland.gov)



Right Time to Fund Restoration – State Tree Solutions Now Act of 2021 (HB991)

- Climate mitigation goal
 - 5 million trees by end of 2031
 - 500K trees for urban, underserved communities
 - Remainder for large lots = reforestation
 - \$15M/year (2022–2031)
 - First year funding
 - \$10M for urban tree planting or equipment
 - \$2.5M each for DNR and MDA
- CBT's [Urban Trees Grant Program](#)
 - Solicitation closed 3/3/22; awards and planting to start 7/1/22
- Trees in addition to [2030 Greenhouse Gas Emissions Reduction Act Plan](#) commitments



Image credit: MDE



Funding – Local Leverage

- Local sources can be paired with CWSRF and other federal/state funds as a funding match:
 - Utility fees (stormwater and *ad valorem*)
 - County/municipal capital improvement program (CIP) budgets
 - General obligation (GO) bonds
- Build a team and bring your stakeholders together
 - Dept. of Finance, Dept. of Public Works, Sustainability Office
 - Partner with groups that can help you move forward with your plan (such as non-government organizations [NGOs])
- Example of leveraging funding
 - [Bellemeade walkable watershed project in Richmond, VA](#) leveraged CBT *Green Streets, Green Jobs, Green Towns (G3)* funding and foundation funding to get 100% design plan funding
 - Then leveraged four funding sources for the implementation phase



Funding – Reducing Costs/Building Incentives

- Ways to reduce costs
 - Use volunteers to plant/maintain
 - Work with other county/municipal agencies and NGOs
 - Share funding responsibilities
 - Provide or use incentives for businesses, NGOs, residents
 - Credits on stormwater utility fees
- Cost savings can make forest planting and buffers feasible
- Economic benefits
 - Allow larger incentive payments to property owners
 - Keeps restoration dollars in the local community
 - Add to local economy (planting and maintenance)



Strategy for Smaller Jurisdictions

- **Problem:** Resource constraints (e.g., do not have a forestry program)
- **Solution:** Decentralize activities to promote efficiency





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Questions on Funding Mechanisms?





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Restoration and Equivalent Impervious Acres (EIA) Crediting



Credits – Non-Riparian

- Forest Planting
 - Turf to forest
 - ≥ 0.5 contiguous acre
- Conservation Landscaping
 - Turf to meadow
- Street Trees
 - Tree planting over an impervious surface
 - One tree = 0.01 acre
- Urban Tree Canopy
 - Tree planting over turf
 - One tree = 0.01 acre

Load Reductions and EIA Conversion Factor (EIA_f) for Non-Riparian Land Cover Conversion BMPs

| Land Cover Conversion BMP | Load Reduced (lbs/acre/yr) / Percent Reduction | | | EIA _f per Acre of Land Cover Converted |
|----------------------------|--|------------|-------------|---|
| | TN | TP | TSS | |
| Forest Planting | 11.12 / 83% | 1.78 / 85% | 2,805 / 79% | 1.1 |
| Conservation Landscaping | 5.24 / 39% | 0.53 / 25% | 0 / 0% | 0.37 |
| Street Trees | 3.1 / 9% | 0.76 / 11% | 1,404 / 7% | 0.4 |
| Urban Tree Canopy Planting | 3.2 / 24% | 0.5 / 24% | 206 / 6% | 0.28 |

Source: [Adapted from 2021 Guidance \(Table 9\)](#)



Credits – Riparian

- Riparian Forest Buffers (RFB)
 - Minimum width = 35 feet
 - Recommended = 100 feet
- Riparian Conservation Landscaping
 - Grassland buffers converted from managed turf land cover to a meadow use

Additional Load Reductions and EIA_f for Land Cover Conversion BMPs Implemented in a Riparian Area

| Land Cover Conversion BMP | Load Reduced (lbs/acre/yr) / Percent Reduction | | | EIA _f per Acre of Upland Treatment |
|---|--|------------|-------------|---|
| | TN | TP | TSS | |
| Forest Planting Upland Treatment | 3.22 / 25% | 0.71 / 50% | 1,606 / 50% | 0.41 |
| Conservation Landscaping Upland Treatment | 1.52 / 12% | 0.21 / 15% | 0 / 0% | 0.12 |

Enhanced Load Reductions and EIA_f for Riparian Land Cover Conversion BMPs

| Land Cover Conversion BMP | Load Reduced (lbs/acre/yr) / Percent Reduction | | | EIA _f per Acre of Land Cover Converted |
|-----------------------------------|--|------------|--------------|---|
| | TN | TP | TSS | |
| Riparian Forest Buffers | 14.34 / 107% | 2.5 / 119% | 4,411 / 124% | 1.5 |
| Riparian Conservation Landscaping | 6.75 / 50% | 0.74 / 35% | 0 / 0% | 0.5 |



Credits – Comparison

Load Reductions and EIA_f for Tree Planting

| Land Cover Conversion BMP | Load Reduced (lbs/acre/yr) / Percent Reduction | | | EIA _f per Acre of Land Converted |
|-----------------------------------|--|------------|--------------|---|
| | TN | TP | TSS | |
| Forest Planting | 11.12 / 83% | 1.78 / 85% | 2,805 / 79% | 1.1 |
| Conservation Landscaping | 5.24 / 39% | 0.53 / 25% | 0 / 0% | 0.37 |
| Street Trees | 3.1 / 9% | 0.76 / 11% | 1,404 / 7% | 0.4 |
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| Riparian Conservation Landscaping | 6.75 / 50% | 0.74 / 35% | 0 / 0% | 0.5 |

Source: Information compiled from tables on previous slides

TN, TP, and TSS Removal Efficiencies for Upland BMPs

| Rainfall Depth (inches) | TN Eff (%) | | TP Eff (%) | | TSS Eff (%) | |
|-------------------------|------------|-------|------------|-------|-------------|-------|
| | RR | ST | RR | ST | RR | ST |
| 1 | 59.7 | 35 | 69.9 | 54.9 | 74.9 | 69.9 |
| 1.1 | 61.1 | 35.75 | 71.45 | 56.15 | 76.6 | 71.45 |
| 1.5 | 65 | 38 | 75.95 | 59.7 | 81.5 | 75.95 |
| 2 | 66.8 | 39.1 | 78.2 | 61.4 | 83.9 | 78.2 |

Source: [Adapted from 2021 Guidance \(Table 3\)](#)



EIA Crediting – Summary

- EIA credit for select practices
 - Turf to forest = 1.1
 - Turf to RFB = 1.5
 - Agriculture to RFB = 1.5
 - Credit is not considered water quality trading (more info on next slide)
- Crediting [2014 Wasteload Allocation \(WLA\) Guidance](#) vs. [2021 WLA Guidance](#)
 - Phase I MS4s: Under 2021 MS4 Guidance
 - Modified to emphasize reforestation benefits
 - Increased EIA credit from 0.38 EIA/acre to 1.5 EIA/acre for RFB
 - Phase II MS4s: Under 2014 MS4 guidance
 - Possible to receive credit using 2021 WLA guidance with MDE review/ approval
 - Need to coordinate with the MDE SDSFM (Stormwater, Dam Safety and Flood Management Program)



Restoration – Who Gets Credits?

- Counties & Municipalities can get credit, if agreement with landowner
 - Simple agreement (or easement) that County can plant on private land and County gets credit
 - Recommend a legal document (for access, credit, etc.)
 - Ensure agreement in place before planting
 - Landowner should maintain stated number of trees for agreed upon time
 - Easement conveys with inheritance or sale of property
 - Maintenance / Inspections
 - Variable years of maintenance, then triennial inspections
 - If plant on agricultural land, recommend agreement between landowner and County/Municipality
 - MS4 gets restoration load reduction and EIA credit



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Questions on Restoration and EIA Crediting?





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Tree Planting Co-Benefits

Includes all tree planting:
riparian forest buffers, forest planting,
urban tree canopy, and street trees



Co-Benefits of Tree Planting

- Watershed health
 - Improved water quality
 - Improved air quality
 - Source water protection
- Forest health and resiliency
 - Carbon sequestration
 - Wildlife habitat
 - Increased biodiversity
- Benefits to public
 - Recreation
 - Employment opportunities
 - Education & outreach
 - Mental and physical well-being
 - Reduced heat island effects
 - Energy savings
- Benefits of landowners
 - Increased land value
 - Potential source of revenue (easements)
 - Opportunities for entrepreneurship
 - Improved hunting grounds
 - Improved public relations
 - Giving back

i-Tree tools and video

Growing for 20 years in Ohio, USA, one red maple can:

- Intercept 27,000 gallons of rainfall and avoid 4,800 gallons of runoff
- Remove 3,100 lbs of CO₂ from the atmosphere
- Reduce the emissions of 5,500 lbs of CO₂ and 30 lbs of air pollution from a power plant
- Save 570 kWh of electricity and 20 MMBtu of fuel for cooling and heating
- Filter 15 lbs of ozone, nitrogen dioxide, and sulfur dioxide from the air we breathe

Sources of Information

- [DNR Ecosystem Services valuation](#)
- [GREEN VALUES STRATEGY GUIDE: Linking Green Infrastructure Benefits to Community Priorities](#)
- [National Forest Foundation](#)
- [Green Forest Works](#)



MD FFIT Co-Benefit Estimates

| | Total Nitrogen (lbs/year) | Total Phosphorus (lbs/year) | Total Suspended Solids (lbs/year) |
|--|------------------------------|--------------------------------|--------------------------------------|
| HOW MUCH POLLUTION COULD BE REDUCED BY DOING THIS PROJECT? | 717.00 | 125.00 | 220,550.00 |

| | Earned when Trees < 10 Years old | \$ Value of Carbon Credits Earned | when Trees Mature (>10 Years old) | \$ Value of Carbon Credits Earned |
|---|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| HOW MANY CARBON CREDITS COULD YOU EARN BY DOING THIS PROJECT? | 33 | \$ 97.50 | 120 | \$ 360.00 |

| | Volume of Raw Water Treated per day (MG/day) | % of NTU Reduced | Estimated Treatment Cost Savings per MG treated | Estimated Annual Cost savings from reduction in NTU |
|--|--|------------------|---|---|
| HOW MUCH COULD YOU SAVE ON DRINKING WATER TREATMENT COSTS BY DOING THIS PROJECT? | 5 | 5 | \$ 1.00 | \$ 1,825.00 |

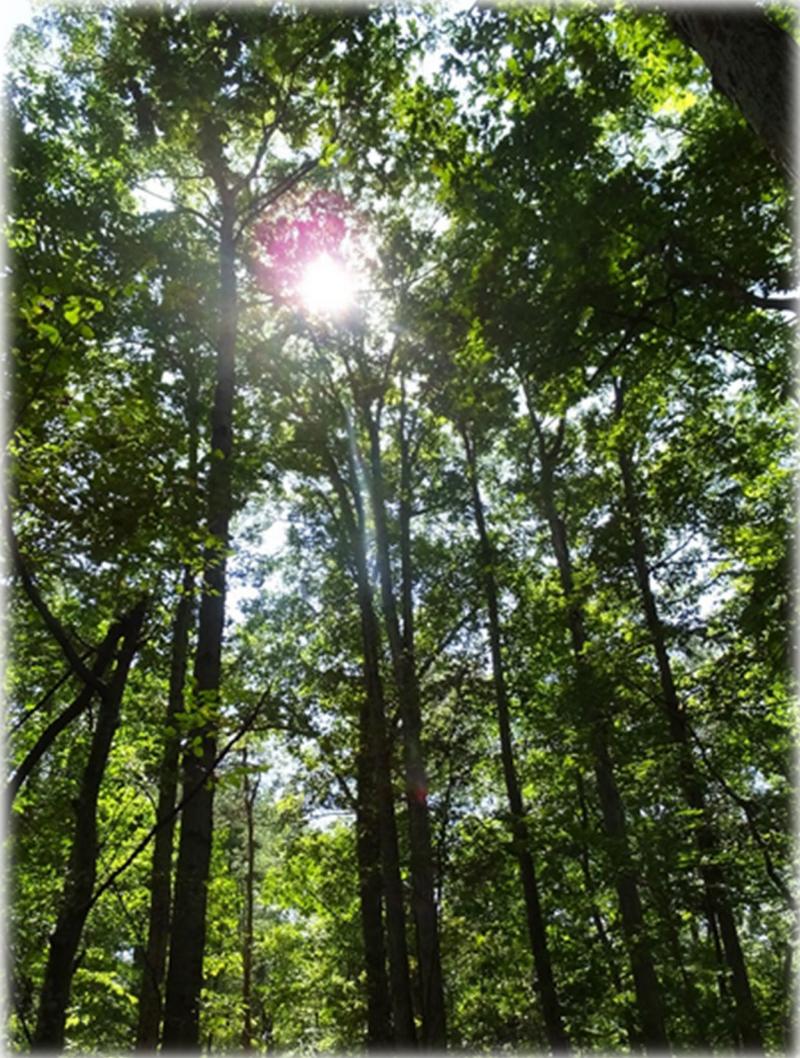


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Case Studies



Case Studies



- #1. CWSRF vs. bank loans
 - Compare loans' interest payment
- #2. Forest planting vs. structural BMPs
 - Compare of BMP load reductions, EIA crediting, and cost effectiveness
- #3. CWSRF ranking
 - Compare competitiveness in CWSRF ranking



Case Study #1 – CWSRF vs. Bank Loan

- MD FFIT Assumptions

- Plant 50 acres with seedlings
 - 100 trees/acre; 50/50 hardwood/conifer
- Contractor/other fees
 - Default values for most
 - \$6,000 private easements payments/acre
 - \$95,850 miscellaneous
- CWSRF 0.90% loan vs. other loan 5.00% for 30 years



- [State Revolving Loan Fund Interest Rates](#)

- Standard WQFA Interest Rate: 0.90% (excluding admin) (3/2022)
- Disadvantaged Community Rate: 0.40% (excluding admin) (3/2022)



Case Study #1 – Results

- Scenario cost = \$601,350
 - Savings of \$432,974 interest payments over the life of the loan
 - Pay \$139,236 in interest versus \$572,210
 - Annual repayment savings can be used to increase incentives or to fund additional restoration projects

| ESTIMATED MDE CWSRF LOAN REPAYMENT | | | |
|---|------------|------------|------------|
| Cost Range | Low | Mid | High |
| The annual payments on your MDE loan will be approximately | \$ 18,515 | \$ 24,686 | \$ 30,842 |
| The total payments to MDE over the life of the loan will be approximately | \$ 555,440 | \$ 740,586 | \$ 925,271 |
| Compared to your other borrowing option, over the life of the loan you will save at least | \$ 324,731 | \$ 432,974 | \$ 540,948 |



Updated BMP Cost Study

2021 Stormwater BMP Cost Analysis

- Urban BMPs costs and cost efficiency
 - Impervious acre and total drainage area
 - Tree planting \$/acre is low
 - Tree planting \$/ TN lb is low
- Disclaimer: MD FFIT uses different costs for tree planting.
 - Relative differences between BMP types could be used for relative comparisons.
 - MD FFIT can be customized to local information.

| | Unit Cost (\$/acre) | Unit Cost (\$/ imp acre) | Lifespan (yr) |
|-----------------------------|---------------------|--------------------------|---------------|
| Total + 1 Yr O&M | | | |
| Forest Planting | \$12,027 | -- | 30 |
| Wet Pond | \$18,780 | \$63,254 | 30 |
| RR BMP Mix | \$58,344 | \$192,759 | 20 |
| Stream Restoration | \$615 (\$/LF) | | 20 |

Data Source: UMCES 2021

Cost Analysis of Stormwater and Agricultural Practices for Reducing Nitrogen and Phosphorus Runoff in Maryland

by:
Elizabeth Price, Taylor H. Flemming, and Lisa Wainger
University of Maryland Center for Environmental Science

for:
Greg Busch and Jeff White, Project Managers
Maryland Department of the Environment
MDE Agreement # U00P8400697
UMCES #32133

UMCES Technical Report # TS-772-21
Ref. No. [UMCES] CBL 2021-064
(Revision of UMCES Technical Report #TS-730-19)

March 2021



University of Maryland
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CHESAPEAKE BIOLOGICAL LABORATORY

Image credit: UMCES 2021



Case Study #2 – BMP Comparisons

- MD FFIT Assumptions
 - Plant 50 acres with seedlings
 - 100 trees/acre; 50/50 hardwood/conifer
 - Contractor/other fees
 - Default values for most
 - \$6,000 private easements payments/acre
 - \$95,850 miscellaneous over cost length of project
 - 30-year lifespan
- TMDL Implementation Progress and Planning (TIPP) Tool Assumptions
 - Wet pond/wetland and runoff reduction (RR) practices
 - $P_e = 1$ inch (i.e., runoff depth treated)
 - 68% impervious treated
 - Statewide loading rates
 - Stream Restoration
 - Planning rates
 - BMP unit costs from 2021 Stormwater BMP Cost Analysis
 - Assumed no land costs
 - Median total costs plus 1 year O&M
 - MD FFIT total costs include 1 year O&M in total cost
 - Calculated cost by drainage acre and impervious acre, then averaged for cost in case study





Case Study #2 – Results

Load Reductions from Case Study #2 (50 Acres of Tree Planting)

| | TN (lbs/year) | TP (lbs/year) | TSS (lbs/year) | EIA (acres) |
|-----------------|---------------|---------------|----------------|-------------|
| RFB | 717 | 125 | 220,550 | 75 |
| Forest Planting | 556 | 89 | 140,250 | 55 |

- Next few tables explore how much stream restoration, wet ponds, or runoff reduction (e.g., bioretention, swales) practices would be needed to meet load reductions above
 - Different amounts of implementation for TN, TP, and TSS
- Then tables on total costs and cost efficiency

Estimated Stream Restoration Needed to Meet Forest Load Reductions

| Units | Riparian Forest Buffer | | | Forest Planting | | |
|-------------|------------------------|-------------------|--------------------|-------------------|-------------------|--------------------|
| | Meet TN reduction | Meet TP reduction | Meet TSS reduction | Meet TN reduction | Meet TP reduction | Meet TSS reduction |
| Length (LF) | 9,560 | 1,831 | 889 | 7,413 | 1,309 | 566 |
| EIA (acres) | 191.2 | 36.62 | 17.78 | 148.26 | 26.18 | 11.32 |



Case Study #2 – Results

Estimated Total Drainage Area Needed to Meet Forest Load Reductions (acres)

| Practice | Riparian Forest Buffer | | | Forest Planting | | |
|------------|----------------------------|----------------------------|-----------------------------|----------------------------|----------------------------|-----------------------------|
| | Acres to meet TN reduction | Acres to meet TP reduction | Acres to meet TSS reduction | Acres to meet TN reduction | Acres to meet TP reduction | Acres to meet TSS reduction |
| Wet Pond | 197.72 | 115.40 | 51.74 | 152.88 | 82.32 | 33.08 |
| RR BMP Mix | 66.15 | 74.24 | 41.45 | 51.45 | 52.92 | 26.46 |

Estimated Impervious Drainage Area Needed to Meet Forest Load Reductions (imperv. acres)

| Practice | Riparian Forest Buffer | | | Forest Planting | | |
|------------|----------------------------|----------------------------|-----------------------------|----------------------------|----------------------------|-----------------------------|
| | Acres to meet TN reduction | Acres to meet TP reduction | Acres to meet TSS reduction | Acres to meet TN reduction | Acres to meet TP reduction | Acres to meet TSS reduction |
| Wet Pond | 134.50 | 78.50 | 35.20 | 104.00 | 56.00 | 22.50 |
| RR BMP Mix | 45.00 | 50.50 | 28.20 | 35.00 | 36.00 | 18.00 |

50 acres of RFB = TN load reduction of 717 lb/yr

50 acres of forest planting = TP load reduction of 89 lb/yr



Case Study #2 – Results

Examining the costs to meet the load reductions for 50 acres of RFB/forest plantings.

Estimated Total Costs to Meet Forest Load Reductions (Total Costs & 1 year of O&M)

| Practice | Riparian Forest Buffer | | | Forest Planting | | |
|-----------------|------------------------|-------------|-------------|-----------------|-------------|-------------|
| | TN | TP | TSS | TN | TP | TSS |
| Riparian Buffer | \$601,350 | \$601,350 | \$601,350 | -- | -- | -- |
| Forest Planting | -- | -- | -- | \$601,350 | \$601,350 | \$601,350 |
| Wet Pond | \$6,110,353 | \$3,566,265 | \$1,599,141 | \$4,724,734 | \$2,544,087 | \$1,022,178 |
| RR BMP Mix | \$6,266,794 | \$7,032,736 | \$3,927,191 | \$4,874,173 | \$5,013,435 | \$2,506,718 |
| Stream Rest. | \$5,879,400 | \$1,126,065 | \$547,350 | \$4,558,995 | \$805,035 | \$348,090 |

Note: Riparian buffer and forest planting costs are MD FFIT medium cost estimate.

Magnitude Difference Between Costs for Other Practices Compared to RFB/Forest Planting

| Practice | Riparian Forest Buffer | | | Forest Planting | | |
|--------------|------------------------|------|-----|-----------------|-----|-----|
| | TN | TP | TSS | TN | TP | TSS |
| Wet Pond | 10.2 | 5.9 | 2.7 | 7.9 | 4.2 | 1.7 |
| RR BMP Mix | 10.4 | 11.7 | 6.5 | 8.1 | 8.3 | 4.2 |
| Stream Rest. | 9.8 | 1.9 | 0.9 | 7.6 | 1.3 | 0.6 |

Note: Values are the magnitude of difference between traditional practice costs and RFB/forest planting costs, not percent.



Case Study #2 – Results

Estimated Annual Cost Efficiencies to Meet Forest Load Reductions (\$/lb/# lifespan yr)

| Practice | Riparian Forest Buffer / Forest Planting | | | | Lifespan (yr) |
|-----------------|--|----------|-----------|-----------|---------------|
| | \$/TN/yr | \$/TP/yr | \$/TSS/yr | \$/EIA/yr | |
| Riparian Buffer | \$28 | \$160 | \$0.09 | \$267 | 30 |
| Forest Planting | \$36 | \$225 | \$0.14 | \$364 | 30 |
| Wet Pond | \$284 | \$951 | \$0.24 | \$1,514 | 30 |
| RR BMP Mix | \$436 | \$2,816 | \$0.89 | \$6,963 | 20 |
| Stream Rest. | \$410 | \$452 | \$0.12 | \$1,538 | 20 |

Magnitude Difference Between Cost Efficiencies for Other Practices Compared to

| Practice | Riparian Forest Buffer | | | | Forest Planting | | | |
|--------------|------------------------|------|-----|------|-----------------|------|-----|------|
| | TN | TP | TSS | EIA | TN | TP | TSS | EIA |
| Wet Pond | 10.1 | 5.9 | 2.7 | 5.7 | 7.9 | 4.2 | 1.7 | 4.2 |
| RR BMP Mix | 15.6 | 17.6 | 9.8 | 26.1 | 12.1 | 12.5 | 6.2 | 19.1 |
| Stream Rest. | 14.7 | 2.8 | 1.3 | 5.8 | 11.4 | 2.0 | 0.8 | 4.2 |

Note: Values are the magnitude of difference between traditional practice costs and RFB/forest planting costs, not percent.



Case Study #2 – Result Summary

- Need significant RR practices to meet equivalent load reductions
- Get more EIA from RFB/forest planting than from most practices for same load reductions
- Estimated costs for RFB are 10 times less for same TN reduction than wet ponds, RR BMP mix, and stream restoration
- Cost efficiency for EIA credit is much less for RFB and forest planting, especially against RR BMP mix



Case Study #3 – CWSRF Loan

- You are going for CWSRF Loan
 - To get max points for load reduction, you need > 2,000 lb TN reduced based on MDE ranking procedures
- Determine restoration needed for 2,000 lb TN
 - MD FFIT Assumptions
 - 100 trees/acre; 50/50 hardwood/conifer
 - Contractor/other fees
 - Default values for most
 - \$6,000 private easements payments/acre
 - \$272,792 miscellaneous for RFB; \$352,860 miscellaneous for forest planting over cost length of project
 - 30 yr lifespan
 - TIPP Assumptions
 - Wet pond/wetland and runoff reduction practices
 - $P_e = 1$ inch (i.e., runoff depth reduction)
 - 68% impervious treated
 - Statewide loading rates
 - BMP unit costs – 2021 Stormwater BMP Cost Analysis
 - Assumed no land costs
 - Median total costs plus 1 year O&M
 - » MD FFIT total costs include 1 year O&M in total cost
 - Calculated cost by drainage acre and impervious acre, then averaged for cost in case study



Case Study #3 – Results

Load Reductions from Case Study #3 to Meet 2,000 lb TN Reduction

| | Acres Planted | TN (lbs/year) | TP (lbs/year) | TSS (lbs/year) | EIA (acres) |
|-----------------|---------------|---------------|---------------|----------------|-------------|
| RFB | 139.5 | 2,000.43 | 348.75 | 615,335 | 209 |
| Forest Planting | 180 | 2,001.60 | 320.40 | 504,900 | 198 |

Estimated Drainage Area Needed to Meet 2,000 lb TN Reduction

| Practice | Total Acres | Impervious Acres |
|------------|-------------|------------------|
| Wet Pond | 550.52 | 374.50 |
| RR BMP Mix | 184.34 | 125.40 |





Case Study #3 – Result Summary

Estimated Costs Needed to Meet 2,000 lb TN Reductions

| Practice | Estimated Total Costs | Estimated Annual Cost Efficiencies | | | | Lifespan (yr) |
|-----------------|-----------------------|------------------------------------|----------|-----------|-----------|---------------|
| | \$ | \$/TN/yr | \$/TP/yr | \$/TSS/yr | \$/EIA/yr | |
| Riparian Buffer | \$1,677,767 | \$28 | \$160 | \$0.09 | \$267 | 30 |
| Forest Planting | \$2,164,860 | \$36 | \$225 | \$0.14 | \$364 | 30 |
| Wet Pond | \$17,013,585 | \$284 | \$951 | \$0.24 | \$1,514 | 30 |
| RR BMP Mix | \$17,463,466 | \$436 | \$2,816 | \$0.89 | \$6,963 | 20 |

Note: Total costs = 1 year of O&M

Riparian buffer and forest planting costs are MD FFIT medium cost estimate.

- Wet ponds/RR BMP mix
 - 10 times higher than RFB
 - 8 times higher than forest planting





Case Study #3 – Result Summary

- Need significant RR practices to meet 2,000 lb TN reduction
- Get more EIA for RFB/forest planting than for RR practices
- Estimated costs for RFB are 10 times less
- Cost efficiency for EIA credit is much less for RFB and forest planting, especially against RR BMP mix





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Questions on Case Studies?





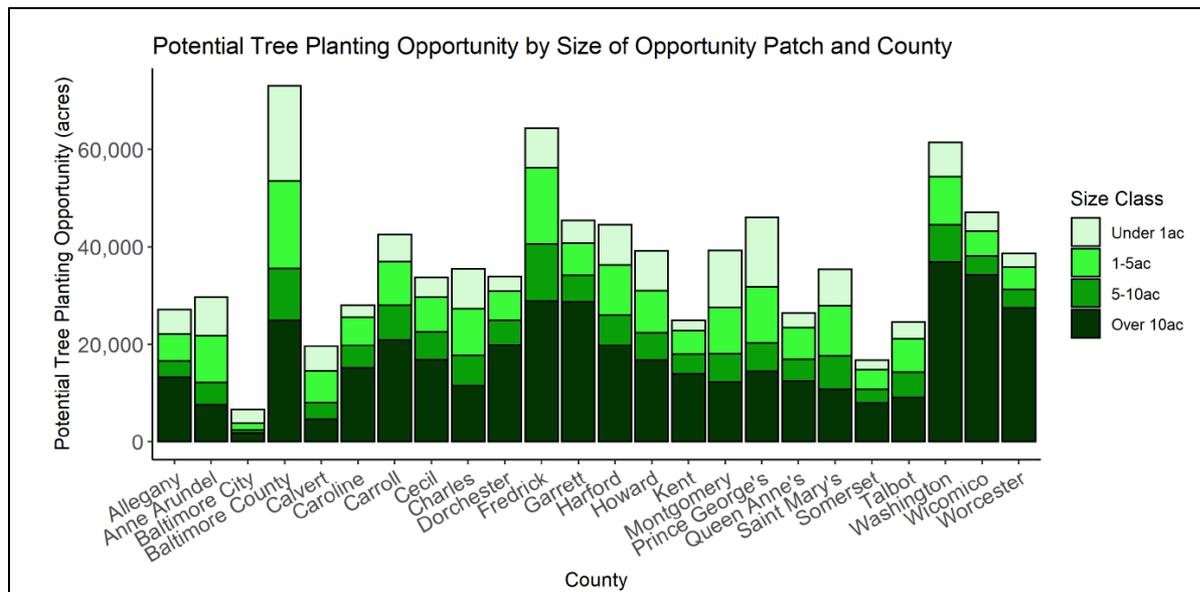
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GIS Examples



GIS Analysis

- GIS tools can help discover potential areas for trees
- MDE and DNR Forest Service can provide technical assistance
- MD DNR created Potential Tree Planting Opportunity
 - Identifies the GIS layers, potential sources, and data processing
 - Identifies areas to exclude (e.g., airports, power lines)
 - Methodology available on request



Note: Used 2013/2014 data
Image credit: MD DNR



GIS Analysis – Data Types

- Land use/cover
 - Sources
 - MDE, MDP
 - Chesapeake Bay Program
 - Chesapeake Bay Conservancy
 - 2017/2018 data will be out shortly
 - Types
 - Tree canopy
 - Residential, commercial...
 - Mixed open/agriculture
- Boundaries
 - Property parcels
 - Municipal properties
 - Schools, parks
 - Political boundaries
- Streams
- Aerial photos
- Manmade Structures
 - Airports
 - Power lines
 - Railroads
 - Buildings
- MD DNR included
 - Ecologically Sensitive Areas/
Rare Species Habitat
 - Agricultural Area on Prime
Farmland
 - Grassland Important Bird Areas
(IBAs)
 - Sea level rise



GIS Analysis – Example

- Overlay land cover/use and property owners
- Identify large areas of turf or open space
 - Municipal/Institutional
 - Verify not parks, athletic fields
 - Industrial/Commercial
 - Nonprofit
 - Residential
 - Agriculture
- Look for exclusions (e.g., airports, power lines)
- Verify against aerial photos

Ag land appears to be active and have riparian buffers, but potential opportunity.

0.75 acres on residential property

2.85 acres on church property. Additional opportunity behind pond.

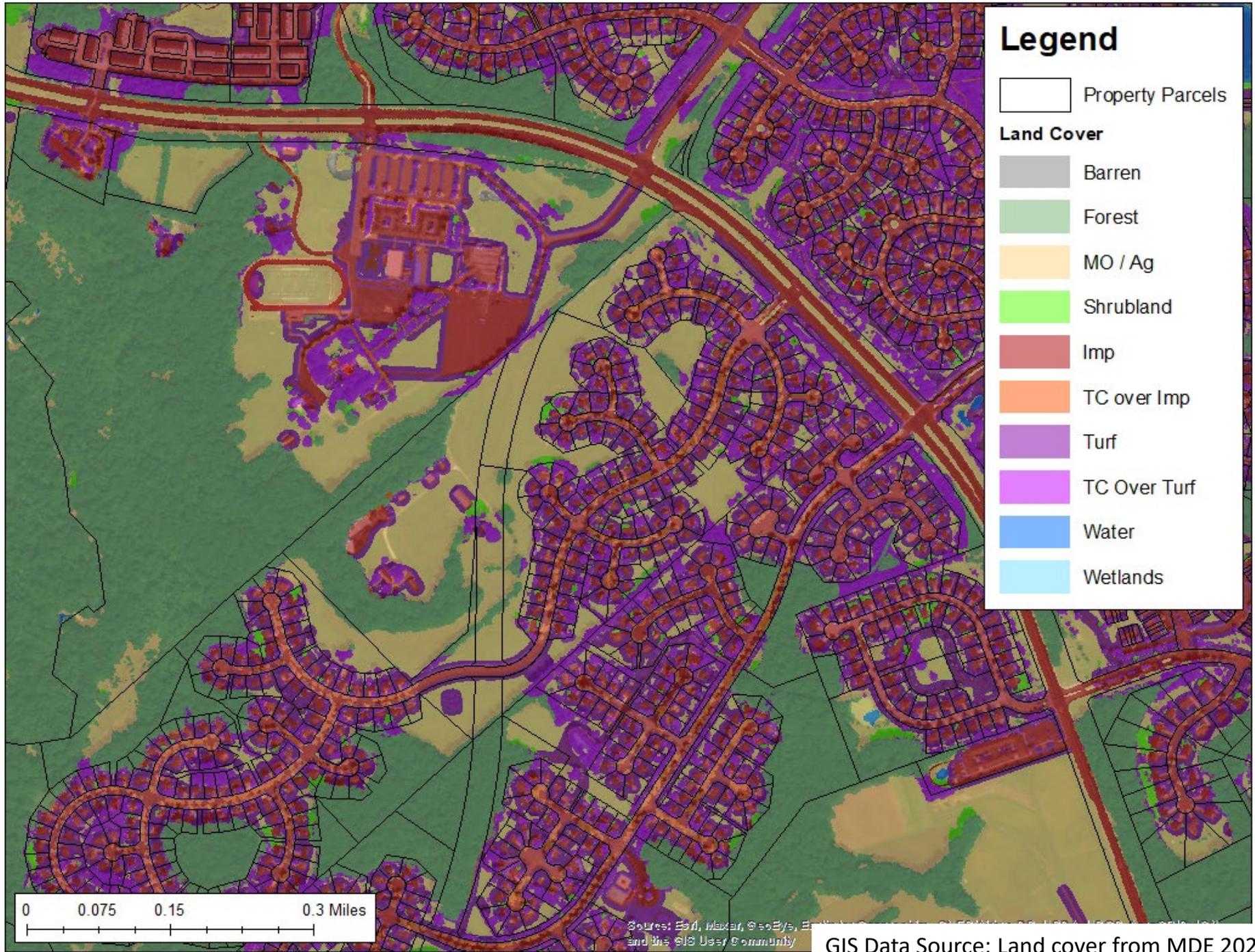
2.5 and 0.9 acres on ag property

0.75 acres on commercial property

2.3 acres behind residential. Keep grass to south for recreational area

0 0.1 0.2 0.4 Miles

Source: Esri, Maxar, ©eEye, Earthstar © geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the © User Community

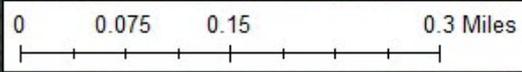


GIS Data Source: Land cover from MDE 2021

Work with church and affiliated school on turning turf to forest

3.45 acres on institutional property

Multiple opportunities on HOA / community association land



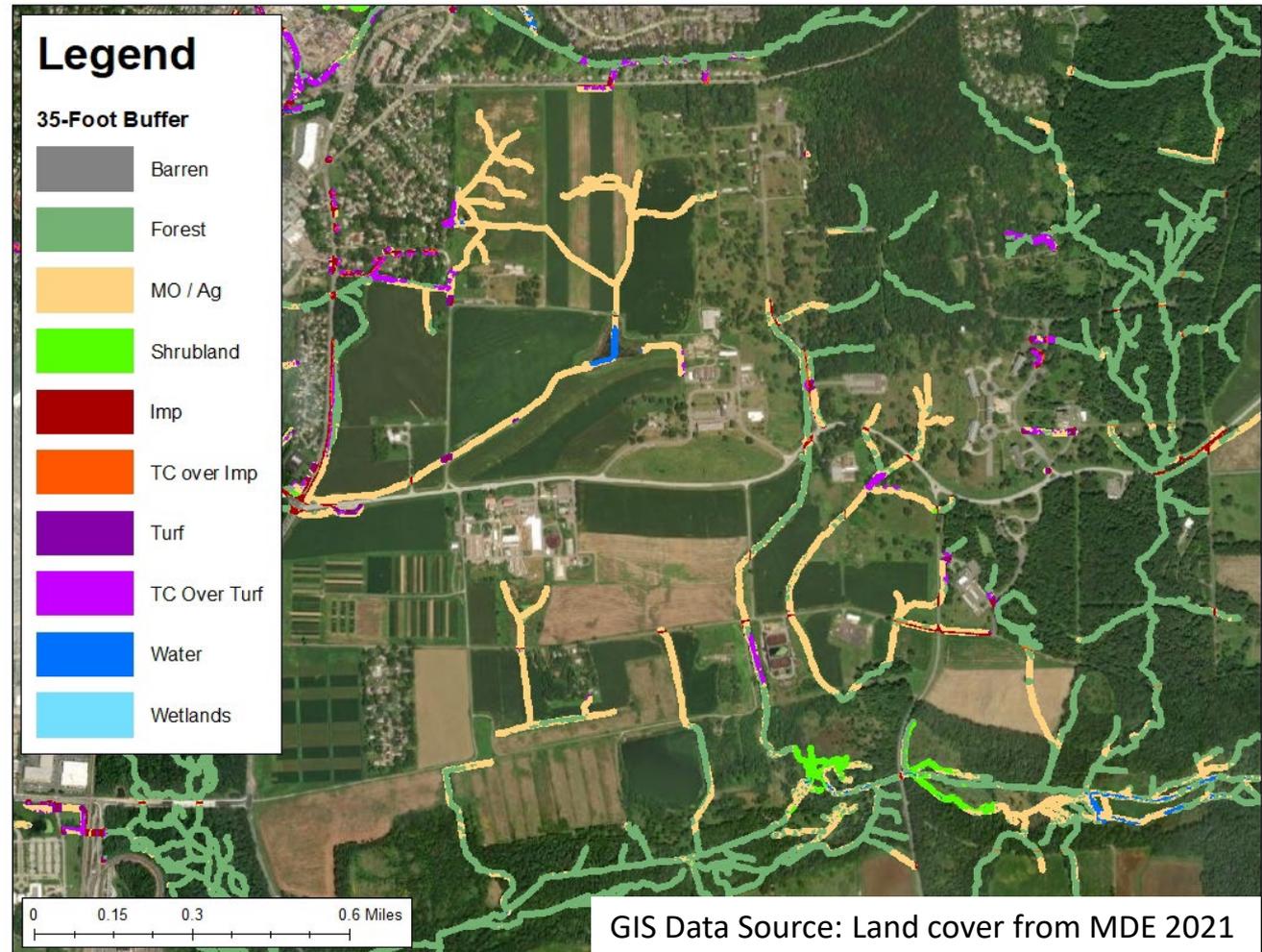
Source: Esri, Maxar, © GeoEye, Earthstar © Geographic, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community





GIS Analysis – Stream Buffers

- Create stream buffer
- Overlay with land use and property owners
- Identify non-forest areas in buffer





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Questions on GIS Analysis?





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Final Thoughts



Final Thoughts – Caveats

- Implementers can select and use any BMP they prefer
 - Forest planting is not the sole solution or appropriate everywhere
 - To make forestry work, implementers need to reach out to landowners, bundle the projects together, and implement in various areas, which can mean increased administrative needs
- MDE has two guidance documents operating at the same time
 - Permittees (Phase II MS4) under the 2014 Guidance can take advantage of the 2021 Guidance at the discretion of the MDE SDSFM (Stormwater, Dam Safety and Flood Management Program)



Final Thoughts – Incentives

- Incentives to the County/Municipality
 - Ratio of 1.5 EIA
 - Cost efficiencies better for forest planting/RFB than for traditional BMPs
 - No permitting required, which saves time and costs
- Incentives to the landowner
 - Significant per acre payments possible
 - State income tax subtraction for forest management costs
- Incentives to the public
 - Public health metrics from restoration activities
 - Habitat creation
- Incentives to business community
 - Tree stock, landscaping labor, and other materials can be obtained locally
 - Small minority business and youth work force development



Final Thoughts – Why Trees?

- Multiple funding sources
 - CBT grants, HB-991, and CWSRF
- Counties/Municipalities need to consider a mix of BMPs to meet load reductions
 - Trees can be cost effective part of this mix
- Opportunity to implement on private land
 - Reach out to large audience of landowners
 - County/Municipality can get credit, if agreement in place.
 - Incentives to private landowners
 - Landowners gets benefit of having trees installed and maintained for free
- Cost savings relative to other practices



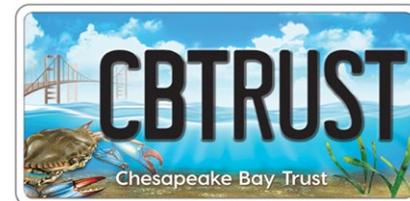
Remarkable Opportunity for Forestry

- Legislature supports funded initiative
- State agencies can support counties/ municipalities
 - Provide financial assistance (grant & loans)
 - Stretch grant dollars
 - MDE can assist with permit compliance goals
 - Build co-benefits through land conversion (turf → forest)
- State agencies can help counties/ municipalities to obtain
 - Technical assistance
 - New partners and markets
 - Increase program capacity
 - New planting programs
 - Tree seedlings
 - Maintenance
 - Coordination

[Maryland Commission for the Innovation and Advancement of Carbon Markets and Sustainable Tree Plantings](#)

- Established by the Maryland General Assembly as part of the Tree Solutions Now Act of 2021 (HB991)

In Partnership with
[Chesapeake Bay Trust \(CBT\)](#)





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Questions and Exit Poll

- Are you more likely to recommend trees as part of your restoration efforts after this talk?

