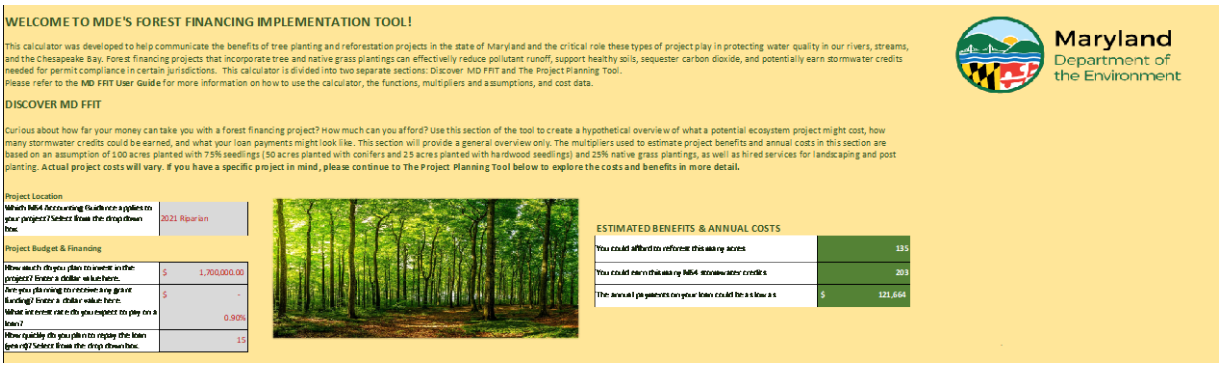
User Guide for Maryland's Forest Financing Implementation Tool

Welcome to the Maryland's Forest Financing Implementation Tool, or MD FFIT for short! This tool was developed for the Maryland Department of the Environment (MDE) Water Quality Financing Administration (MWQFA), in consultation with the Watershed Restoration Division within the Integrated Water Planning Program of the MDE Water and Science Administration (WSA). The Forest Financing Implementation Tool is part of a new initiative to launch a collaborative statewide forest restoration effort capitalized in part by Maryland's Water Quality Revolving Loan Fund, more commonly known as the "CWSRF."

Forest financing projects include reforestation practices to reduce nonpoint source pollutant loads in the Chesapeake Bay watershed. These practices are a cost-effective way to not only meet the TMDL targets and achieve the goals of the Maryland Phase III Implementation Plan, but also restore the overall integrity of watershed health across the state in both urban and rural environments. This tool is designed to be a project planning tool that will enable users to anticipate costs and consider financing needs and options available, as well as potential cost savings. Furthermore, it will also help community leaders, drinking water and wastewater utilities, watershed groups, and other stakeholders understand the benefits of investing in forest financing projects and communicate those benefits to decision makers.

The tool is divided into **two distinct and separate sections** which help project managers answer different questions. The first section, **Discover MD FFIT** (yellow) answers the question: *"How many acres can I restore if I have a fixed budget?"* This is a default scenario described below which provides valuable information about project acreage, credits, and estimated loan repayments for that size project. The **Project Planning** section (green), independently, addresses the question *"How much of a loan/grant mix do I need to get in order to restore a fixed number of acres?"* This scenario is entirely user defined. It uses user-provided project-based information to calculate a total project cost. It also provides crucial data on the cost of the loan required to do the project and data on efficiency per acre resulting from the project inputs.

Discover MD FFIT



Overview

This section of the tool is designed for users who do not yet have an actual forest financing project in mind but would like to explore how much forest restoration work might be accomplished on a budget, what loan repayment might look like, and what potential for earning Municipal Separate Storm Sewer System Permits (MS4) credits exists. These are hypothetical assumptions that use multipliers to generate **estimated benefits and annual costs** based on user inputs. These benefits will vary based on where your project is located. Information about MDE's MS4 Permits for projects following the 2021 MS4 Accounting Guidance ("2021 Guidance")[1] and those projects following the MS4 2014 Accounting Guidance ("2014 Guidance") can be found on the website.[2,3]

How to use

All cells in the tool that are shaded gray indicate a **User Input Field**. Inputs will either utilize a drop-down menu selection or will require a numerical entry made by the User. Most of the input fields are located along the left side of the User Interface.

On the right side of the tool, cells that are shaded dark green are the **Main Outputs** of the tool. You can see how these results change as you adjust the gray input fields.

Project Location – Use the drop-down menu to select whether the project will be within a riparian or non-riparian area, as well as selecting the guidance document appropriate for the MS4 jurisdiction (2021 Guidance or 2014 Guidance).

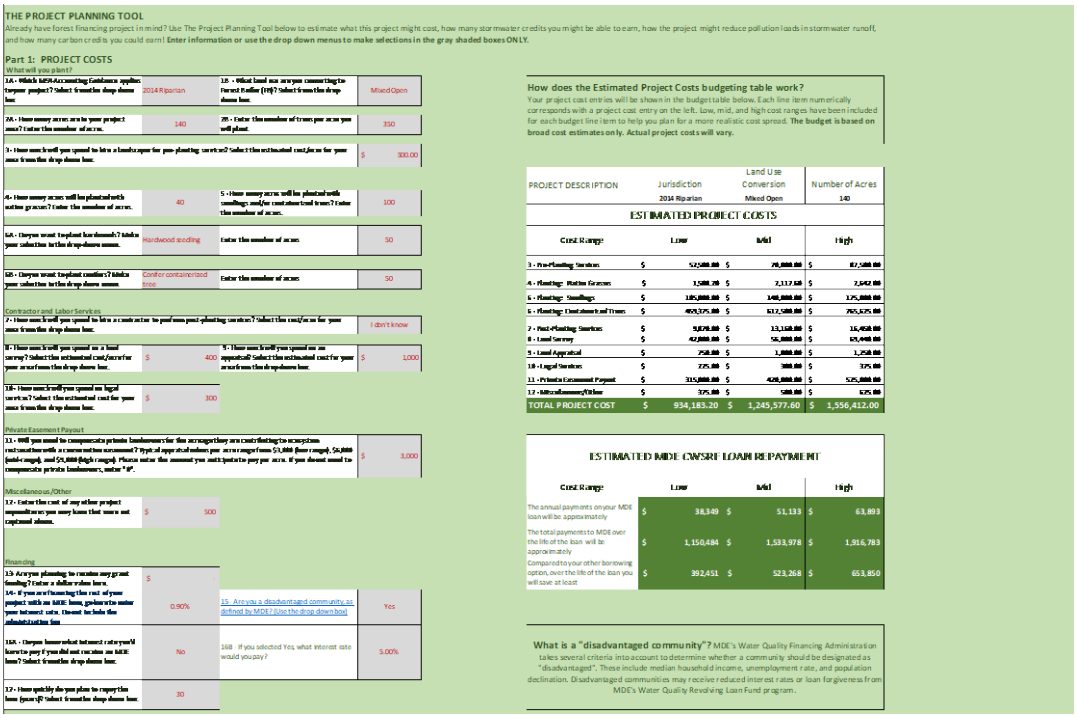
Project Budget & Financing – Enter the amount you want to spend on a forest restoration project, any grant funding you think you might receive, and the interest rate you expect to pay for a project loan. If you plan to use a MWQFA below market-rate loan for the project, refer to the MWQFA website for current interest rates. Use the drop-down menu to select how long (in years) you would like your loan term to be.

The Estimated Benefits and Annual Costs results tells you approximately how many acres you could afford to reforest. The calculation is based on cost per acre averages for a turf-to-forest project with 75 percent seedlings (a mix of conifers and hardwoods) and 25 percent native

[1] Note that although there is no "official" document entitled "2021 Guidance," we will refer to the document linked here as such because this guidance, which was originally issued in 2020, is expected to be finalized in 2021.
[2] https://mde.maryland.gov/programs/Water/StormwaterManagementProgram/Pages/storm_gen_permit.aspx
[3] https://mde.maryland.gov/programs/Water/StormwaterManagementProgram/Pages/NPDES_MS4_New.aspx

grasses, plus the cost of landscape services and post-planting care. Actual costs will vary based on the particulars of a project and landscape, but this provides a general estimate of the value of the effort. In addition, the tool tells you approximately how many MS4 stormwater permit compliance credits you could earn, and the estimated annual payments on a loan to finance the project.

Project Planning Part 1: Project Costs



Overview

This section of the tool is designed for users who are further along in the development of a forest restoration project and have a project scope in mind. This section of the tool uses grey **User Input Fields** to populate the Estimated Project Costs table and costs ranges from low, mid-range, and high are provided to enable the User to anticipate a variance of 25% from the mid-range value. The Estimated Project Costs table provides broad cost estimates only and actual project costs will vary. Multipliers used to derive the mid-range cost values are discussed in the **Tool Methodology** portion of this guide.

How to use

All cells in the tool that are shaded gray indicate a **User Input Field**. Inputs will either utilize a drop-down menu selection or will require a numerical entry made by the User. Cells that are shaded dark green are the **Main Outputs** of the tool. You can see how these results change as you adjust the gray input fields.

1. **Project Location and Land Use Conversion -** Use the drop-down menu to select whether the project will be within a riparian or non-riparian area, as well as its MS4 jurisdictional

classification (2021 Guidance or 2014 Guidance) in 1A. Use the drop-down menu to select the type of current land use that will be converted by the proposed forest restoration project in 1B. These include crop, pasture, hay, turf, or mixed open use. These land use conversions correspond to those identified in the MDE Water Quality Loan Fund (WQLF) program's project scoring criteria (page 2).

2. **Project Size and Density** – Enter the number of total acres that will be converted by the forest restoration projects in 2A. Enter the number of trees per acre you plan to plant in 2B.

Tip: The acreage and number of trees planted per acre determine the pounds of pollutants reduced, and therefore result in making an application more or less competitive in the scoring criteria. These inputs also impact the cost of materials and labor to implement your project. The number of trees per acre is set at 350 by default.

3. **Pre-Planting Services –** Professional landscapers are often used to assist with development of a planting plan by providing a menu of tree and native grass species that will perform best in the project area from which to make selections for your project. These services also often include site visits and soil preparation work prior to planting of seedlings, containerized trees, and seed mixes. If you plan to hire professional landscaping services to develop a planting plan, make your selection using the cost/acre ranges provided in the drop-down menu.

4. **Seedlings** – Reforestation with hardwood and conifer species is a proven strategy to reducing pollutant loads, improving soil structure and composition, providing habitat, and increasing terrestrial carbon sequestration. Enter the number of acres that you will plant with seedlings.

5. **Native Grasses –** Inclusion of native grasses (including wildflowers and legumes) offer an attractive option to reduce pollutant loads by reducing the need for fertilizer applications and increasing depth of the root structure to filter out nutrients more effectively and attract more microfauna and pollinators into these landscapes. Enter the number of acres that you will plant with native grasses. Note that the total acreage planted with seedlings and native grasses (4+5) cannot exceed the total acreage of the project.

6. **Seedlings or Containerized Trees** – Hardwood and conifer species may be planted from seedlings or using more mature containerized trees. Select whether you will use seedlings or containerized trees and the number of acres to be planted with each (6A and 6B). Note that the acreage must sum to the total acreage in 4, above, and cannot exceed the acreage of the project.

7. **Post-Planting Services** – To ensure that the living assets of the project achieve the highest survivability rate and are given the best chance to thrive for years to come, project owners often hire the services of third-party contractors who specialize in tree care. These activities may include, but are not limited to, mowing, spot spraying, feeding, mulching, and pruning. If you plan to employ a third party to provide these services, make your selection using the cost/acre

ranges provided in the drop-down menu.

8. **Land Survey** – You may need to undertake a land survey to delineate property boundaries, existing easements, or other site characteristics that may affect the forest restoration project. Make your selection using the cost/acre ranges provided in the drop-down menu.

9. **Land Appraisal -** If you will be compensating private landowners for easements granted for the forest restoration project you may need to hire an appraiser to get a fair market valuation of the land. Make your selection using the cost ranges provided in the drop-down menu.

10. **Legal Services –** If you will be compensating private landowners for easements granted for the forest restoration project, you may need to seek legal assistance to draft easement agreements or other legal documentation. Make your selection using the cost-ranges provided in the drop-down menu. The selected cost will represent the project-wide cost, not on a per acre basis.

11. **Private Easement Payout –** You may need to compensate private landowners for the acreage that they are contributing to the forest restoration project with a conservation easement. Typical payment amounts range from $3,000 - $9,000 per acre, dependent on the quality of the acreage prior to reforestation. Enter the amount you anticipate paying **per** acre. If you do not need to compensate private landowners, you may enter "0".

12. **Miscellaneous/Other –** If you anticipate any other costs related to the forest restoration project that were not captured in **User Input Fields 1 – 11**, you may enter the dollar value of those costs here.

13. **Grant Funding –** If you have received or applied for grant funding, enter the dollar value here.

14. **MDE Water Quality Revolving Loan Fund Assistance** – Click here to view the current interest rates offered by the Maryland Water Quality Revolving Loan Fund and enter the interest rate that you expect to receive.

15. **Disadvantaged Community** – The Maryland Water Quality Revolving Loan Fund program offers special loan rates and terms for communities who qualify for "disadvantaged" status. Click here to learn more about the criteria MDE uses to make this determination and whether you qualify. Make your selection using the drop-down menu.

16. **Interest Rate –** If you would like to compare the projected interest you might pay to MDE with another form of financing (commercial bank, bond, other) and you know what interest rate you expect to receive, select "Yes" in 16a to make your selection using the drop-down menu. Then enter a whole number in 16b to indicate the expected interest rate you would like to compare to MDE's rate. Look to the output (green box) to see the potential savings in avoided interest that are calculated compared to MDE's current market rate.[4] This would be equivalent to one of

[4] https://mde.maryland.gov/programs/Water/WQFA/Pages/InterestRates.aspx

the best municipal market rates possible (AAA). Most borrowers are unable to receive such a low market rate. Therefore, your savings are likely to be substantially higher than the savings you see calculated in the Estimated MDE WQRLF Loan Repayment table. Please note that if you select "No," in box 16a, then a comparative rate and consequent savings will not be calculated.

17. **Loan Term –** Use the drop-down menu to select the loan term that you prefer for the forest restoration project. It is a best practice for the loan term to be equal to or less than the expected life of the asset. The useful life of these types of forest restoration assets under Chesapeake Bay Program standards ranges from 10 to 80 years. For the purposes of this tool, the useful life of the asset will be calibrated to the maximum allowable SRF loan term, which is 30 years.

The tool utilizes the data entered to provide Estimated Project Costs for your project, including low, mid-range, and high-cost ranges. These outputs are the heart of the Project Planning Tool (green portion) of the tool and can help project managers estimate how much various parts of the project will cost. Furthermore, the Estimated MDE CWSRF Loan Repayment section (just below Estimated Project Costs) provides the user with estimated annual and total costs of repaying an MDE below-market-rate loan, as well as the total cost savings compared to other financing options, such as bank or bond financing. The information in these two sections can help to answer some of their most critical questions project managers have while planning a project.

Project Planning Part 2: Project Benefits

Part 2: PROJECT BENEFITS

STORMWATER PERMITS AND CREDITS

For projects following the 2021 Guidance, calculations for the estimated number of MS4 credits that may be earned by the project are based on Estimated Impervious Acre (EIA) land cover conversions for both forest plantings and conservation landscaping (including native grasses) in non-riparian and riparian areas as determined by MDE in their 2021 "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated Guidance". For projects following the 2014 Guidance, there is no functional equivalent for "conservation landscaping" (including native grasses), nor is there differentiation between MS4 credits available for reforestation of urban pervious areas in a riparian vs. non-riparian area.

"TURF" OR "MIXED USE" CONVERSION PROJECTS: HOW MANY MS4 STORMWATER CREDITS COULD YOU EARN BY DOING THIS PROJECT?	38
"CROP", "HAY", OR "PASTURE" CONVERSION PROJECTS: HOW MANY MS4 STORMWATER CREDITS COULD YOU EARN BY DOING THIS PROJECT?	N/A

ANTICIPATED ENVIRONMENTAL BENEFITS

Forest financing projects can provide and protect wildlife habitat, and improve local water quality by filtering out sediment, organic matter, fertilizers and other pollutants. These projects can also effectively capture carbon. How could your project benefit Maryland's environment?

	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	Total Suspended Solids (lbs/year)
HOW MUCH POLLUTION COULD BE REDUCED BY DOING THIS PROJECT?	622.00	44.00	80,000.00

The Power of Trees. On average, one acre of new forest can sequester about 2.5 tons of carbon annually. Trees reach their most productive stage of carbon storage at about 10 years at which point they are estimated to absorb 48 pounds of CO_2 per year.

	urban Trees < 10 Years old	$ Value of Carbon Credits Earned	urban Trees Mature (>10 Years old)	$ Value of Carbon Credits Earned
HOW MANY CARBON CREDITS COULD YOU EARN BY DOING THIS PROJECT?	228	$ 682.50	840	$ 2,520.00

Drinking Water Source Protection. Forest financing projects that involve reforestation activities can also protect surface and groundwater drinking water resources from contamination. Turbidity is caused by elevated Total Suspended Solids present in raw water that is treated for potable uses and it directly impacts the annual cost of treatment and chemicals. This value is measured in Nephelometric Turbidity Units (NTU). Please enter the volume of raw water treated per day at your facility and adjust the percent of NTU reduction you hope to achieve in the gray shaded boxes below to see the impact on water treatment costs. These cost savings are estimates only and based on data provided by the user. Actual cost savings will vary.

	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 YOUR SAVE ON DRINKING WATER TREATMENT COSTS BY DOING THIS PROJECT?	5	5	$ 1.00	$ 1,825.00

This section of the Forest Financing Implementation Tool uses all the User Input Fields from Part 1 of the Project Planning section to automatically generate a summary of the benefits that may be realized by doing the project. These benefits include:

- **Stormwater Permits Compliance Credits** – These may be earned for MS4 jurisdictions undertaking "turf" and/or "mixed open" land conversion projects. For agricultural land conversion projects, equivalent impervious area credit is also available but at a lower value than

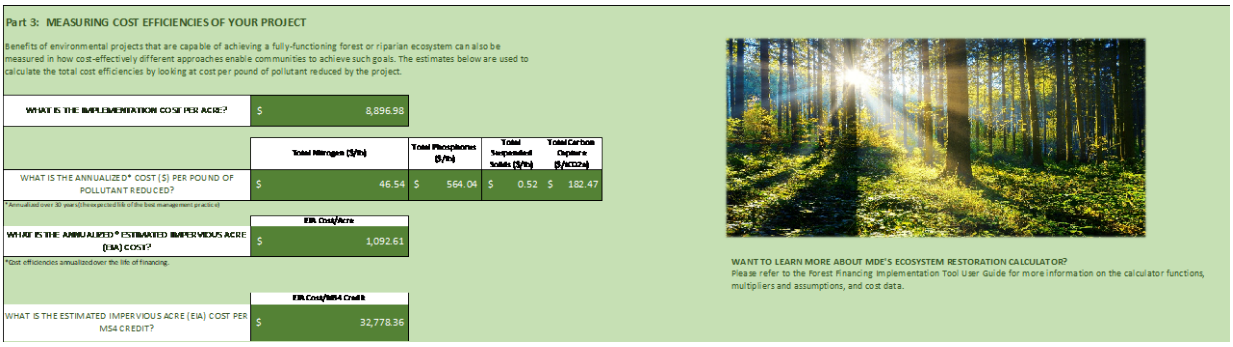
conversion of other land uses.

- **Pollution Reduction** – Forest restoration projects that include reforestation and native grass plantings are highly effective at filtering out sediment, organic matter, fertilizers, and nutrients like nitrogen and phosphorus. This section of the tool demonstrates the total amount of Total Nitrogen, Total Phosphorus, and Total Suspended Solids that the forest restoration project may be capable of achieving in pounds per acre annually.

- **Carbon Sequestration** – Reforestation increases terrestrial carbon sequestration by adding to the planet's net carbon storage and helps moderate climate change by slowing the growth of carbon emissions in the atmosphere. In a carbon market, each ton of carbon sequestered is equal to one carbon credit with an average price of $3.00 per ton of carbon dioxide equivalent (tCO2e). On average, one acre of new forest can sequester about 2.5 tons of carbon annually.[5]

- **Drinking Water Source Protection** – Forest restoration projects have a direct impact on surface and groundwater resources that are used for drinking water supplies provided. By reducing Total Suspended Solids, drinking water utilities can save money on annual treatment and chemical costs as a benefit from reforesting areas surrounding raw water intakes. Money saved at the drinking water utility means money earned for public water system rate payers. This tool allows users to explore how reductions in Total Suspended Solids (measured in Nephelometric Turbidity Units (NTU)) affect drinking water treatment costs by entering the volume of raw water treated per day and the percentage of NTU reduced by the project.

Project Planning Part 3: Measuring Cost Efficiencies



It is important to be able to make the case for investing in forest restoration projects to community leaders and other decision makers. Demonstrating the environmental benefits, such as pollutant load reductions, is a fundamental part of that business case. The other is demonstrating how cost-effective the project is in achieving such goals. This section of the tool uses data from the User Input Fields and environmental benefit quantifications to calculate the implementation cost per acre, annual cost per pound per acre of pollution reduction, and cost

[5] Forest Trends' Forest Marketplace (2017). Unlocking Potential: State of the Voluntary Carbon Markets 2017. Available at https://www.cbd.int/financial/2017docs/carbonmarket2017.pdf.

of Equivalent Impervious Acres for MS4 credit annualized over the expected life of the forest restoration asset (30 years). By running the numbers using MD FFIT, a user can quickly estimate these important metrics; easily save the spreadsheet as a PDF; and then immediately attach the document to an email to partners, funders and other stakeholders for their review and information.

Forest Financing Implementation Tool - Methodology

Learn more about how forest restoration project benefits and cost efficiencies are derived for pollutant load reductions, how MS4 credits are calculated, the proportional relationship between Total Suspended Solids and drinking water treatment costs, calculating carbon credits, and measuring cost efficiencies.

Project Cost Range Estimates

Part 1 of the Project Planning Tool includes User Input Fields for contractor and professional services including landscaping, post-planting care and maintenance, land surveys, appraisals, and legal services. The cost ranges provided in the drop-down menus were developed using real-world cost data provided by a number of representative service providers.

Service	Average Cost
Land Surveys	$400 - $1,000 per acre
Pre-Planting Professional landscaping	$2,000 per acre
Post-planting care and maintenance	$94 per acre
Appraisal	$1,000 - $3,000 on average, with some reports costing up to $8,000 per acre
Legal Services	$700 for the total project

Calculating Total Project Acres for MS4 Credits and Pollutant Load Reductions

According the to the Chesapeake Bay's approach to calculating acres that implement best management practices (BMP) like reforestation or native grass planting, implementation values are capped at the available load source. This means that a load source cannot go below zero. Also, the sum of BMPs for a load source cannot exceed the available area. If the BMP area exceeds the load source area, each BMP is reduced proportionally so that the sum of all the area equals the available area.[6]

For example, if you plant 60 acres of trees and spread native grass seed mix around the understory, you must use the following to calculate anticipated pollutant reduction loads:

[6] Chesapeake Bay Program (2009). Quick Reference Guide for Best Management Practices https://www.chesapeakebay.net/documents/BMP-Guide_Full.pdf

Total Acres for Load Source	Forest Cover	Understory Native Planting
60	90%	30%
Load Reduction Calculation Acres	**45**	**15**

In the above example, the two BMPs are mutually exclusive and when added together cannot exceed the available area (60 acres). Therefore, they are reduced proportionately so that 45 acres of the forest cover and 15 acres of the native grass plantings are applied to the available load source area. Pollutant load reduction multipliers were adapted from the Chesapeake Bay Program's Guide for Best Management Practices to reduce nonpoint source pollutants within the watershed.

Therefore, they are reduced proportionately so that X acres of the forest cover and Y acres of the native grass plantings are applied to the available load source area using the formula below:

(Forest Cover/(Forest Cover + Understory Native Planting)*Total Project Acres

Tip: Try different combinations and acreages (of forest cover, hardwoods, grasses, etc.) in the tool to see what gives you the biggest load reduction or habitat enhancement suitable for your area. With each change in inputs, the outputs will automatically change with associated costs.

Calculating MS4 Credits

The 2021 Guidance calculations for the estimated number of MS4 credits that may be earned by the project are based on Estimated Impervious Acre (EIA) land cover conversions for both forest plantings and conservation landscaping (including native grasses) in non-riparian and riparian areas as determined by MDE in their 2020 Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated Guidance.

The 2014 Guidance calculations for the estimated number of MS4 credits that may be earned by the project are based on EIA land cover conversions for reforestation of urban pervious areas ONLY. In the 2014 MS4 Stormwater Accounting Guidance[7], there is no functional equivalent for "conservation landscaping" nor is there differentiation between MS4 credits available for reforestation of urban pervious areas in a riparian vs. non-riparian area.

[7] Maryland Department of Environment (2014). Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated: Guidance for NPDES Stormwater Permits. https://mde.maryland.gov/programs/Water/StormwaterManagementProgram/Documents/NPDES%20MS4%20Guidance%20August%2018%202014.pdf

MS4 Credits Earned	2021 Guidance	2014 Guidance
Riparian Forest Planting	1.5	0.38
Non-Riparian Forest Planting	1.1	0.38
Agricultural Riparian and Non-Riparian Forest Planting	1.0	N/A
Riparian Native Grass Planting	0.5	N/A
Non-Riparian Native Grass Planting	0.37	N/A

Pursuant to MDE's Integrated Project Priority System, Equivalent Impervious Area (EIA) credits measured in units by the acre can be applied toward a permit for "turf" and "mixed open" land use conversion projects. These conversions result in the highest values. Agricultural land use conversion projects (e.g., pasture, hay, crop) can also achieve restoration credit but at a relatively reduced rate. MDE is eager to promote turf to forest conversions and build better habitat, while at the same time preserving valuable agricultural land. The tables below indicate the number of acres and total nitrogen (TN) pounds reduced that will produce the best ranking in the competitive scoring MDE uses to award SRF financing.

	LU	TN	Units	EIA
Non-Riparian	Crop to Forest	32.62	lbs TN/acre converted	
	Pasture to Forest	21.31	lbs TN/acre converted	
	Hay to Forest	18.83	lbs TN/acre converted	
	Turf to Forest	11.12	lbs TN/acre converted	✓
	Mixed Open to Forest	5.88	lbs TN/acre converted	✓
	Average	***17.95***	***lbs TN/acre converted***	

	LU	Acres needed for 2,000 lb TN	Units	EIA
Non-Riparian	Crop to Forest	61	acres	
	Pasture to Forest	94	acres	
	Hay to Forest	106	acres	
	Turf to Forest	180	acres	✓
	Mixed Open to Forest	340	acres	✓
	Average	***156.27***	***acres***	

	LU	TN	Units	EIA
Riparian (RFB)	Crop to RFB	35.84	lbs TN/acre converted	
	Pasture to RFB	24.53	lbs TN/acre converted	
	Hay to RFB	22.05	lbs TN/acre converted	
	Turf to RFB	14.34	lbs TN/acre converted	✓
	Mixed Open to RFB	9.1	lbs TN/acre converted	✓
	Average	***21.17***	***lbs TN/acre converted***	

	LU	Acres needed for 2,000 lb TN	Units	EIA
Riparian (RFB)	Crop to RFB	56	acres	
	Pasture to RFB	82	acres	
	Hay to RFB	91	acres	
	Turf to RFB	139	acres	✓
	Mixed Open to RFB	220	acres	✓
	Average	***117.45***	***acres***	

Tip: Seek advice from MDE's Sediment, Stormwater, and Dam Safety (SSDS) Program to confirm if maximum credit could be applied to your project and get further guidance.

Calculating Pollutant Load Reductions

Pollutant load reductions are determined by whether the project follows either the 2021 Guidance or the 2014 Guidance, and whether it is in a riparian or non-riparian area. Reforestation load reductions attained through the planting of coniferous or hardwood seedlings and/or containerized trees were based on assumptions provided in the 2021 Guidance. This captures Total Nitrogen (TN), Total Phosphorus (TP), and Total Suspended Solids (TSS).

For projects following the 2014 Guidance, these pollutant load reductions must be calculated using the 2014 Guidance based on values assigned to a metric called "Forestation on Pervious Urban (FPU)". The multipliers for pollutant load reductions per pound per acre per year are represented in the tables below.

Note: Because the permit types were issued at different times, the MS4 permits follow separate Guidance Documents (2021 Guidance[8] vs. 2014 for 2014 Guidance [9]) which rely on different assumptions. Thus, the load reductions for each will vary along with credit toward permit compliance depending on the permittee status.

REFORESTATION POLLUTANT LOAD REDUCTIONS IN A RIPARIAN AREA

MS4 2021 Guidance			MS4 2014 Guidance		
TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)
14.34	2.5	4,411	6.22	0.44	800

REFORESTATION POLLUTANT LOAD REDUCTIONS IN A NON-RIPARIAN AREA

MS4 2021 Guidance			MS4 2014 Guidance		
TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)
11.12	1.78	2,805	6.22	0.44	800

Native grass plantings offer an attractive option to reduce pollutant loads in turfed areas by reducing the need for fertilizer applications multiple times a year, increasing the depth of the root structure to filter out nutrients more effectively, as well as attracting more micro fauna into these landscapes. Pollutant load reductions for native grass plantings are based on the estimates provided for "Conservation Landscaping" from the 2021 Guidance (pp 15-16). These reduction values will be applied to both projects following the 2021 Guidance and 2014 Guidance pursuant to MDE staff instructions.

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8 https://mde.maryland.gov/programs/Water/StormwaterManagementProgram/Documents/2020%20MS4%20Accounting%20Guidance.pdf

9 https://mde.state.md.us/programs/water/StormwaterManagementProgram/Documents/NPDES%20MS4%20Guidance%20August%2018%202014.pdf

NATIVE GRASS POLLUTANT LOAD REDUCTIONS IN A RIPARIAN AREA		NATIVE GRASS POLLUTANT LOAD REDUCTIONS IN A NON-RIPARIAN AREA	
TN (lbs/year)	TN (lbs/year)	TN (lbs/year)	TN (lbs/year)
6.75	5.24	5.24	0.53

Carbon Sequestration

Young trees absorb CO2 at a rate of 13 pounds per tree each year. Trees reach their most productive stage of carbon storage at about 10 years at which point they are estimated to absorb 48 pounds of CO2 per year.[10]

Number of Trees Planted * CO2 lbs/year = Total Absorption Rate

Total Carbon Dioxide Equivalent (tCO2e) credits are earned on a per ton basis.

Total Absorption Rate/2000 lbs = tCO2e

The total value of tCO2e credits is $3.00 per credit.
The same formula is applied regardless of which MS4 guidance is being followed or whether the project is in a riparian or non-riparian area.

Drinking Water Source Protection Cost Savings

Various methodologies for measuring the cost savings that may be realized by drinking water utilities by reduced TSS and turbidity were considered, such as those presented by EPA in the Watershed Management Optimization Support Tool Benefits Module and Environmental Impact and Benefits Assessment for Final Effluent Guidelines and Standards for the Construction and Development Category. It was concluded that for the purposes of this Forest Financing Implementation Tool it would be most effective to illustrate the potential cost savings associated with forest restoration project efforts by examining the reduction of TSS, represented here as Nephelometric Turbidity Units (NTU). These assumptions are predicated on the proportional relationship between a 1% reduction in turbidity from an average level of 23.05 NTU will reduce chemical treatment costs (alum addition) by $0.20 per million gallons treated. For a monthly production of 22.35 million gallons, a 1% decrease in turbidity would reduce chemical costs by $534 annually for the average drinking water treatment plant.[11]

[10] http://urbanforestrynetwork.org/benefits/air%20quality.htm
[11] Dearmont et al (1998). Costs of water treatment due to diminished water quality: A case study in Texas. Water Resources Research, Vol. 34, No. 4, pp 849-853.
https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/98WR00213

Estimated Cost Savings = (Raw Water Treated GPD * Days in One Year) * (% of NTU Reduced * $0.20)

These cost savings are broad estimates only and determined by inputs provided by the User. Actual cost savings calculated after the project has been fully implemented will vary.

Calculating the Cost Efficiencies of the Project

The cost efficiencies for the proposed project were calculated based on MS4 jurisdiction and whether the project is in a riparian or non-riparian area. Cost efficiencies were calculated by dividing the total project cost per year (i.e. over the life of a forestry asset), divided by the pounds of pollutant reduced per year. Variables for this equation are informed by inputs provided by the User Input Fields in Part 1 of The Project Planning Tool section of the tool.

Cost Efficiency = (Total Project Cost/Useful Life of the BMP)/lbs of Pollutant Reduced per year

For example, for a Total Project Cost of $1,170,153.00, a 30-year useful life of the forest restoration asset, and 1704 lbs of N reduced per year:

Cost Efficiency = ($1,170,153.00/30 years) / 1704 lbs N per year

= $22.89/lb N

Cost efficiencies for Equivalent Impervious Acre (EIA) credits were calculated using two metrics: EIA cost per acre per year and EIA cost per MS4 Credit earned as shown below.
For example, using the assumptions above for a "turf" land use conversion project with a 30-year loan term:

EIA Cost/Acre/Year = ($1,170,153.00/170 MS4 Credits) / 30-year loan term

= $229.44 per acre

Using the same assumptions, cost efficiencies are also calculated for the estimated EIA cost per MS4 credit earned as follows:

EIA Cost/MS4 Credit = $1,170,153.00/170 MS4 Credits
= $6,883.25 per MS4 credit earned

Tip: Cost efficiency information is important in scoring successful projects in MDE's SRF Program and DNR Restoration Grants Gateway. A user can compare individual results to both programs' criteria for obtaining the highest scores at MDE's Integrated Project Priority System (IPSS)[12] and DNR's Guidance.[13]

[12] https://mde.maryland.gov/programs/Water/WQFA/Documents/FINAL%20WQ%20IPPS%20Rev%205.pdf
[13] https://dnr.maryland.gov/ccs/Documents/trustfund/FY22_Gateway-Solicitation.pdf

Tip: This per acre cost information is also highly valuable to compare the cost of reforestation to the relative implementation costs of other BMPs. See MDE's 2019 Report on the comparative costs of BMPs for further information.[14]

Supplemental Information Tabs

While MD FFIT is primarily intended to be used through the User Interface tab, it also contains several other tabs containing supplemental information and reference data used to calculate the Outputs. Users may wish to review the information contained in these tabs to better understand the Tool's formulae and its underlying assumptions. These tabs are locked by default to preserve the function of the Tool, but more advanced users may request an unlocked version by contacting MDE staff.

Note that the values in the Estimated Project Costs box of the User Interface are different than those in the supplemental "Example Project Budget" tab. The calculations Estimated Project Costs box of the User Interface relies more heavily on user inputs, including choices from dropdown menus (with options informed by market research) as well as specific values provided by the user. This data is used to populate the "Mid" estimates appearing in the table, which are then reduced or increased by 25% to produce corresponding "Low" and "High" estimates for each cost category.

By contrast, the information included in the Example Project Budget is primarily based on market research and estimated unit prices from real-world projects undertaken by various forestry programs in Maryland. The Example Project Budget provides a deeper dive into discreet planning, pre-planting and site preparation, as well as post-planting activities and associated unit costs that users of MD FFIT may use as a reference in their own project budget development if desired. Combined with project acreage and trees per acre inputs from the User Interface, this data is used to calculate Itemized and Total Costs for three different Project Options: Seedling + Native Grass seed plantings, Seedling + Native Grass Plugs, and Seedlings Only.

[14] https://bit.ly/2TranSY