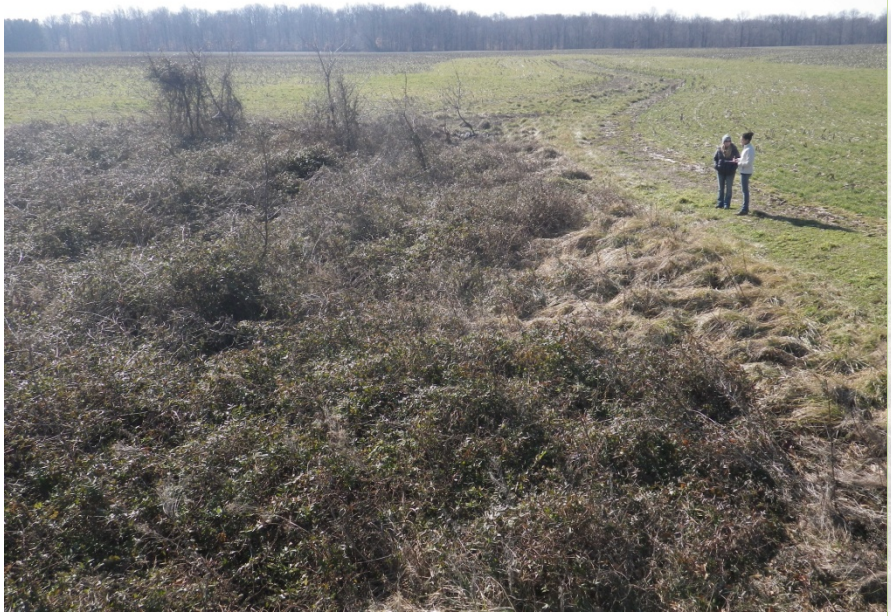
May 2013

Wye River Watershed Assessment: Pollution Reduction Opportunities and Community Engagement



The Wye River watershed is located on the Eastern Shore of Maryland. In this picture field teams consider potential water management solutions for the Chesapeake Bay.

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and

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Funded by:

National Fish and Wildlife Foundation

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Introduction

The Wye River watershed spans Talbot and Queen Anne's counties on the Eastern Shore of Maryland and is a complex of three tidal rivers: the main stem of the Wye, Wye Narrows, and the Wye East. These tidal rivers all surround the protected resource and centerpiece of conservation, Wye Island. The area is predominantly rural, but there are pockets with high levels of impervious cover such as institutional lands (e.g., Chesapeake College) and shopping centers (e.g., Queenstown Outlets). There are also more densely developed waterfront neighborhoods and towns (e.g., Hickory Ridge, Wye Mills) compared to typical rural residential development with low levels of impervious cover. The Wye River watershed has never been the subject of a comprehensive watershed characterization and this project is a first step in this effort.

Within this rural watershed there is great potential for pollutant load reduction, especially non-arable lands that offer opportunities for wetland creation and conservation easements. Talbot and Queen Anne's counties have 2017 and 2025 load reduction goals that have been established to meet nutrient and sediment Chesapeake Bay Total Maximum Daily Load (TMDL) requirements. These load reduction goals can be addressed through a concerted effort that focuses on the less densely populated rural areas, such as the Wye River Watershed. In addition, water quality in the Wye River complex will benefit from coordinated watershed assessment and protection efforts..

Midshore Riverkeeper Conservancy (MRC) is a nonprofit river advocacy program based in Easton, MD, that routinely collaborates with Talbot and Queen Anne's county staff, elected officials, and other stakeholders. MRC's primary goal in this Wye River watershed assessment is to identify opportunities to reduce pollution loads into the Wye River complex. MRC partnered with the Center for Watershed Protection (the Center) to conduct this Wye River Assessment. The Center conducted targeted stormwater retrofit training to a core team of project partners as a first step in this assessment. The Center also provided field forms and protocols to evaluate potential sites for pollution reduction and technical assistance specific to stormwater management solutions. MRC also evaluated opportunities for nutrient uptake practices.

The Wye River watershed is over 50,000 acres. The land use is predominately agriculture (35,000 acres), followed by forest (13,000 acres) and urban (2,000 acres). The area includes waterfront homes, smaller urban centers, and a mix of farming and land under preservation easements. Presently, the Wye River waters are impaired and listed on US EPA's 303 d list. Impacts include shellfish closures, decreased recreation, and health and safety issues associated with these water quality impairments that impact aquatic organisms, human health, and ecosystem services. Seasonal shellfish harvest restrictions have been in place since 1998 and were recently extended further down river. As a threat to public health, these closures directly impact human recreational opportunities, commercial and recreational harvest opportunities, tourism and overall water quality. Problems affecting the watershed include shoreline erosion, non-buffered areas, a wastewater treatment plant near Chesapeake College, a cannery known to contribute pollutant loads, and potential future development stressors. According to the US EPA's

Watershed Assessment, Tracking, and Environmental Results website (http://ofmpub.epa.gov/tmdl_waters10/attains_waterbody.control?p_list_id=MD-02130503&p_cycle=2004&p_report_type=T), the Wye River has a TMDL for fecal coliform and is impaired for nutrients and suspended sediments. But the state still needs TMDLs, according to the EPA's website, for Wye River nutrients and streams. Clearly, more assessments are needed to understand the impacts of these pollutants and potential solutions.

MRC and the Center focused on identifying top retrofit opportunities for total nitrogen (TN), total phosphorus (TP), and sediment reduction (total suspended solids or TSS) in the watershed. MRC gathered a total of 24 local collaborators to support the project, assembled a core team of seven stakeholders to participate in the trainings and field assessments, examined five priority property locations and, with technical assistance from the Center, assessed 17 potential retrofit sites. MRC will continue to build on these project findings throughout 2013 as it works to implement the projects included herein and to identify more.

Methods and Community Engagement

MRC led a stakeholder kick off meeting on November 28, 2012 that was attended by 18 stakeholders (see Appendix A). During this meeting, MRC presented a PowerPoint introducing the project goals and objectives, received feedback, and provided the attendees the opportunity to join the rural retrofit training session and/or the project core team. Individuals who joined MRC staff on the core project team included representatives from Queen Anne's County Soil Conservation District, Queen Anne's Planning and Zoning, The Nature Conservancy, and University of Maryland Sea Grant Extension.

The Center led a Rural Retrofit Training session on December 20, 2012, at the Chesapeake Bay Environmental Center in Grasonville, MD. See Appendix B. The Rural Retrofit Assessment (RRA) was introduced (see Appendix C), basic watershed and stormwater concepts were discussed, and a field reconnaissance was conducted at Wye Ferry Rd, the Kudner Farm, and the Queenstown Outlets. After the training day, MRC led two additional field reconnaissance efforts: on February 15 to the Wye Parish Church property and Chesapeake College, and on February 26 to Chesapeake College again. The Center and MRC communicated through emails and conference calls to discuss priority retrofit opportunities, project deliverables, and timeframes throughout the project.

Community engagement included targeted communication with collaborators identified in the proposal phase such as the Talbot and Queen Anne's county staff, Maryland Sea Grant Extension, and Chesapeake College. In addition, during the project training and field work, MRC collaborated with Wye Parish Church, Hughes Center for Agroecology, Soil Conservation Districts in both Talbot and Queen Anne's Counties, agricultural landowners Billy and Meta Boyd of Wye Mills, Bennett Point Improvement Association, and Friel's Lumber.

MRC held a stakeholder meeting April 23rd to provide these report findings, discuss the outcomes and future efforts, and plan the next steps for implementation. MRC continues community engagement with

residents in the watershed, project collaborators, and local governments. This engagement has facilitated communication and built relationships that will support implementation efforts for the priority projects identified in this report as well as future Wye River watershed efforts on target to follow later in 2013.

Assessment Protocol

The Center's Retrofit Reconnaissance Investigation (RRI) manual (Schueler et al., 2007) was developed for and is generally used in urban watersheds (see Appendix D). In order to better fit the needs of the Wye River Watershed, the Center developed a Rural Retrofit Assessment (RRA) to identify top pollution reduction projects in areas with rural residential development and low levels of impervious cover. Both of these assessment protocols were used in the Wye River assessment, depending on the urban or rural context of the particular property.

Stormwater retrofits are structural stormwater management practices that can be used to address existing stormwater management problems in a watershed. These practices are installed in upland areas to capture and treat stormwater runoff before it is delivered to the storm drainage system. They are an essential element of a holistic watershed restoration program that can result in improved water quality, increased groundwater recharge, channel protection, and flood control. Stormwater retrofits can address existing problems and help establish a stable, predictable hydrologic regime by regulating the volume, duration, frequency, and rate of stormwater runoff. In addition, stormwater retrofits can serve as demonstration projects that are visual centerpieces to educate residents and build community interest in watershed restoration.

For this project, MRC identified five priority property locations and the core team participated in three field assessment days and examined 17 potential retrofits or opportunities for nutrient removal practices. For each site visit the core team gathered retrofit site information, considered the feasibility of the retrofits or practices to be implemented, took photographs, and recorded findings on the appropriate field forms, either the RRI or the RRA. Factors such as drainage catchment area, impervious cover, available space, utility impacts, land ownership, and other site constraints were considered. All the information gathered from the three days of field reconnaissance was then provided to the Center. The Center compiled and summarized all field reconnaissance as follows:

- Assessed the potential retrofit sites using a spreadsheet based database
- Developed write ups for each site that included the site picture, demonstrated the potential retrofit location, and provided general notes
- Estimated the MAST pollutant removal for each practice and noted any MAST limitations
- Estimated cost using data from Costs of Stormwater Management Practices in Maryland Counties (King and Hagan 2011) and additional cost information where appropriate
- Evaluated the projects using professional judgment and based on feasibility and conversations with MRC

- Developed planning level Auto CAD concepts for the priority retrofit sites

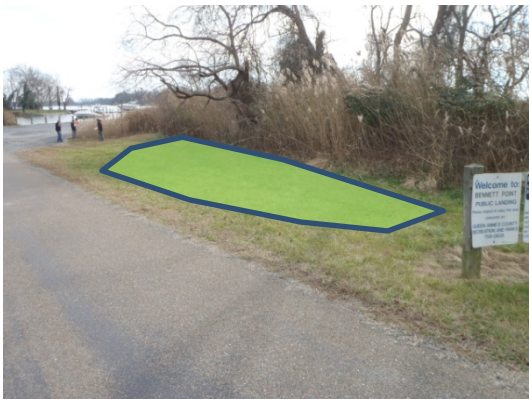
Field forms are provided in Appendix E. Five priority retrofits among the 17 sites assessed were selected based on professional judgment and clustering of practices; however, pollutant load reduction, feasibility of implementation, landowner cooperation, funding opportunities, public visibility as a demonstration project, and accessibility were also considered. Additional information about these priority stormwater retrofit projects can be found in the "Concept Design" section.

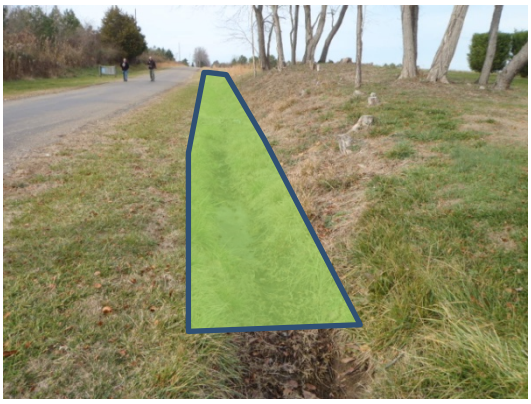
Given that this Rural Retrofit Assessment is a new technical assistance tool, we recognized areas for improvement in both the training and the selection of core team members. During the classroom training it would be helpful to include a discussion and slides that provide written descriptions and photos of common practices and retrofits and the circumstances in which they are appropriately applied so that core team members will have a clear understanding of their implementation in the field. Ideally, after classroom training, it would be useful for team members to visit a site with constructed practices. In addition, it is beneficial when core team members already have a level of expertise or understanding of best management practices for the evaluated land use. Otherwise there can be a large knowledge gap that may be difficult to fill in one day of training.

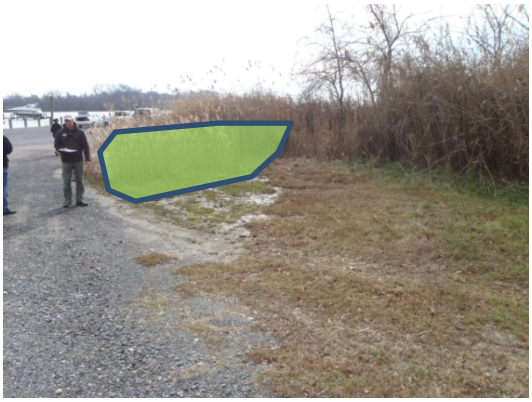
Field Sites

Field assessment sites, pollution reduction estimates, and cost estimates are provided here for the Wye River watershed. At a total of five priority property locations included in this assessment, we evaluated 17 potential sites for pollution remediation. Among those 17 potential sites the core team identified opportunities to install eleven different types of stormwater retrofits or best management practices. See Table on p. 18. The following write-ups briefly describe the proposed practice at each site. Highlights in the photographs show the areas being considered for a practice. These write ups also describe the site, logistics, and any constraints or special considerations, where appropriate.

SITE RRA_001: WYE FERRY LANDING – NEAR 201 WYE FERRY ROAD







Top Left: Potential wet swale (practice A). Picture taken from Wye Ferry Road looking southeast.

Top Right: Potential wet swale (practice B). Picture taken from Wye Ferry Road looking west.

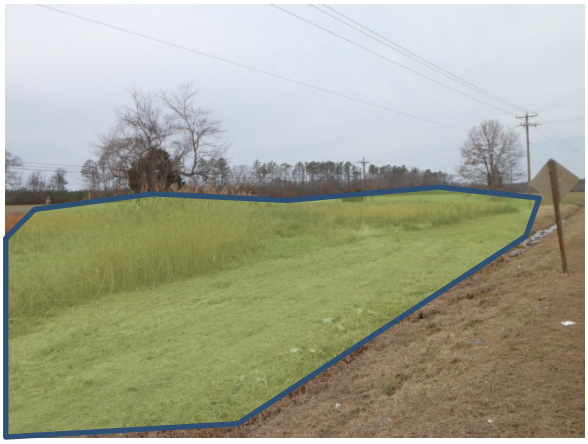
Lower Left: Potential wetland (practice C). Picture taken from Wye Ferry Road looking southeast.

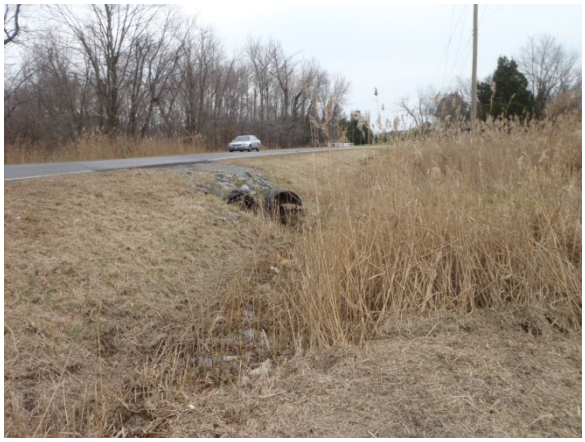
Proposed Retrofit:

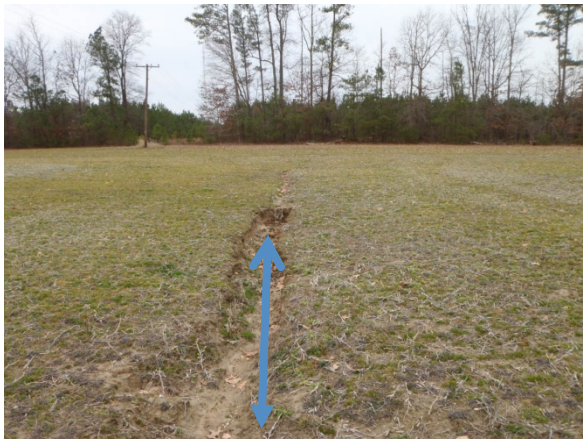
Construct two wet swales on the south and north sides of the Wye Ferry Road (practices A and B). Both retrofits would consist of a series of small check dams allowing water to pond in the existing/modified conveyance system. Practice A would be behind the existing "welcome" sign and would be a relatively short and wide practice. Practice B would be longer with several check dams implemented in the ditch on the north side of the road.

Proposed retrofit C is a wetland, which would take advantage of a flat/low lying area that is heavily influenced by tidal waters. The goal would be to replace the existing phragmities with more native vegetation as well to enhance the nutrient removal in the area with slight excavation allowing water to pond for a longer period of time.

SITE RRA_002: KUDNER FARM – NEAR 915 BENNETT POINT – WEST SIDE OF ROAD







Top Left: Potential wetland (practice A & B). Picture taken from Bennett Point Road looking northwest.

Top Right: Potential wetland outlet. Picture taken from west of Bennett Point Road looking southeast.

Lower Left: Existing head cut (practice C). Picture taken from west of Bennett Point Road (middle of the field) looking west.

Proposed Retrofit:

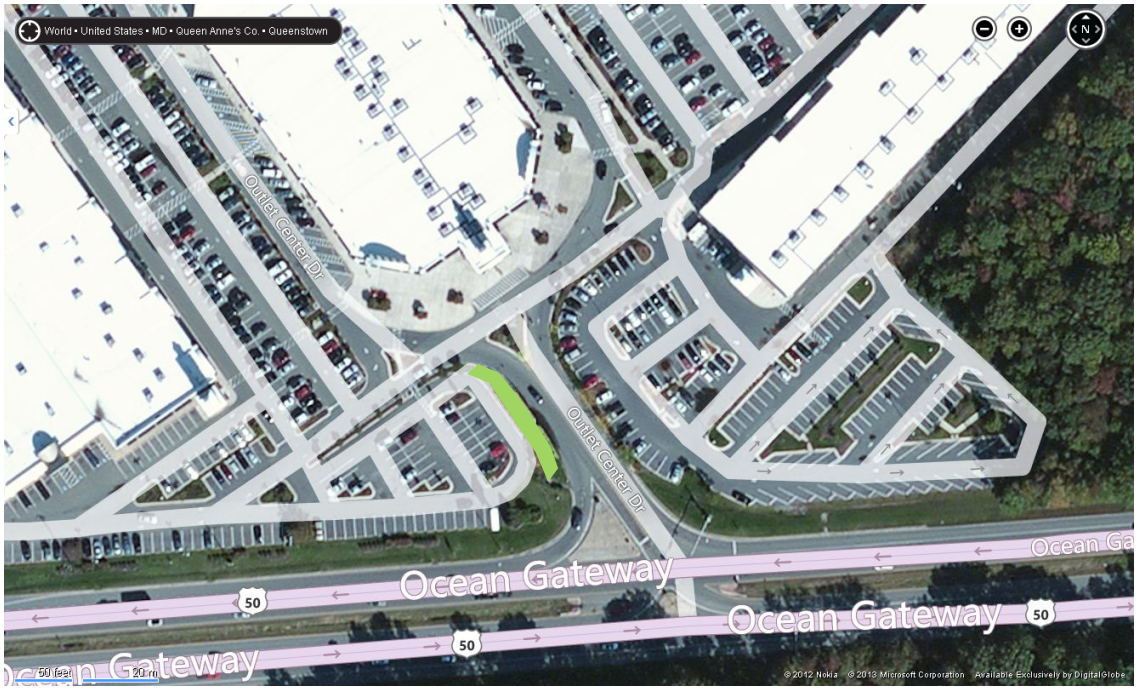
The primary practice proposed here is a large wetland (practice A & B). There are two options for the drainage area. Option A would encompass nearly 80 acres draining to it and would include regrading the long ditch running parallel to Bennett Point Rd, while option B drains 34 acres and does not regrade the ditch. A constructed conveyance originating from the roadside ditch above the wetland would divert stormwater into the wetland for treatment. A complete site survey would need to be completed to determine the full extent of the drainage area and wetland.

In addition to the structural improvements suggested, alternative crop selection is also encouraged. By planting switchgrass, for example, in select and appropriate locations, additional pollution reduction

may occur. This land cover conversion can be applied in a Watershed Implementation Plan and switchgrass can be a commodity crop and be used as a source of income for the landowner.

Practice C is a simple, and very minor, project to widen the drainage channel and restore appropriate grade so the channel can sufficiently handle runoff and stabilize the soil.

SITE RRI_003: QUEENSTOWN OUTLET MALL – WEST SIDE OF OCEAN GATEWAY ENTRANCE

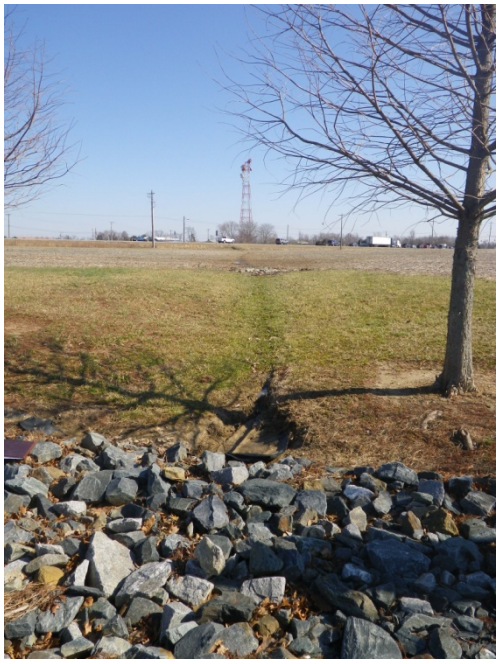


Potential dry swale location. Picture taken from Bing Maps.

Proposed Retrofit:

A dry swale can be added to replace the existing mulched/landscaped swale. The addition of a dry swale (with associated underdrain) will reduce potentially damaging flows and should reduce scour/erosion along the channel. The underdrain can outlet into the existing catch basin. Though the drainage area to this location is not known – parking lot design is needed – the practice size would likely be limited by concrete infrastructure and the design would take up the entire existing area.

SITE RRA_CC1: CHESAPEAKE COLLEGE – NORTH SIDE OF CAMPUS

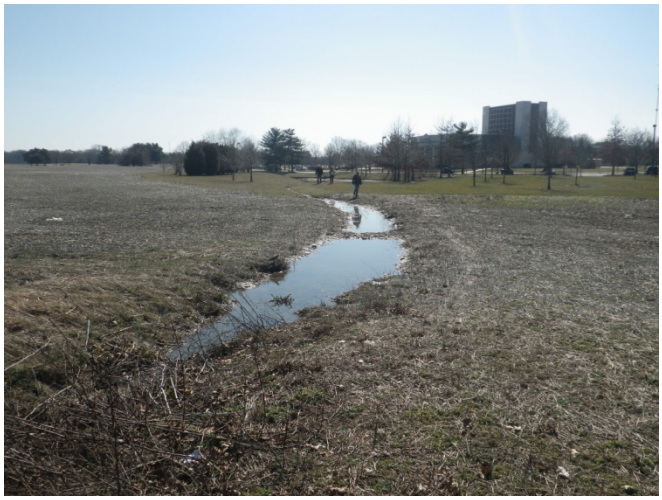


Proposed grass channel location – in the field past current turf. Picture taken from a stormwater pond on the north side of campus looking northeast.

Proposed Retrofit:

A long section of in-field drainage ditch is actively eroding. This section is directly connected to the stormwater pond on the north side of campus. Constructing a grass channel in place of the exposed ditch will reduce sediment load to the pond, increasing the life of the system, as well as enhancing water quality by limiting sediment movement off site.

SITE RRA_CC2: CHESAPEAKE COLLEGE – NORTH SIDE OF CAMPUS

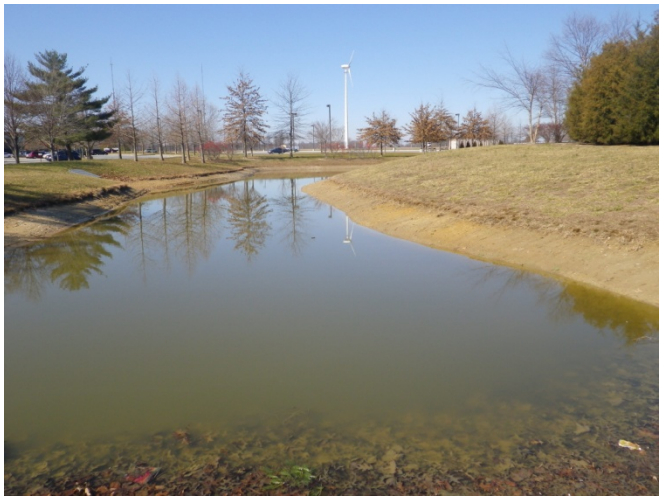


Proposed Rip-Rap stabilization location. Picture taken from north of the stormwater pond on the north side of campus looking south.

Proposed Retrofit:

This grass waterway is a high traffic area where agricultural equipment passes between the east and west portions of the field. Rip-rap stabilization is proposed along approximately 30 feet of this waterway to serve as an access point in addition to reducing erosion. This channel would also be re-graded to facilitate proper drainage. By planting additional vegetation within the swale, soil stabilization and nutrient uptake can be achieved.

SITE RRA_CC3A & CC3B: CHESAPEAKE COLLEGE – NORTH SIDE OF CAMPUS – STORMWATER POND

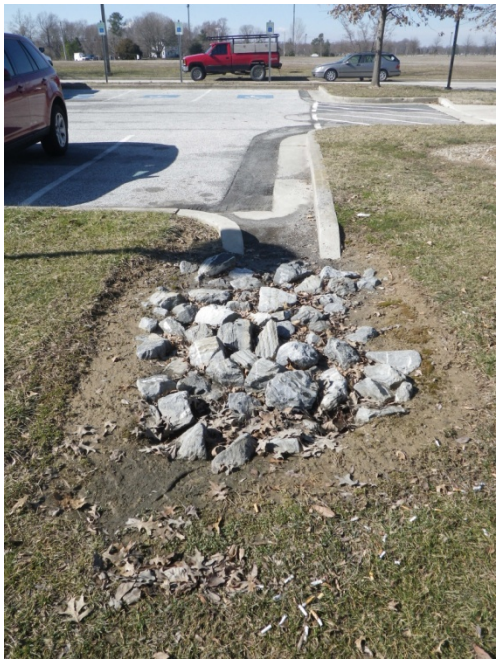


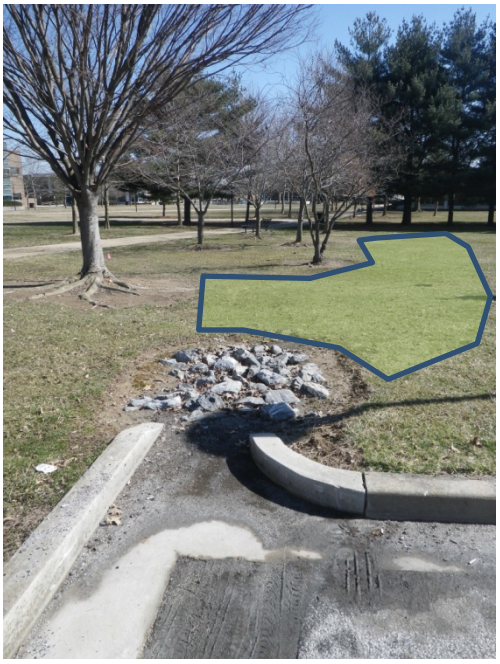
Proposed mowing exclusion and floating wetlands. Picture taken from east side of stormwater pond looking west.

Proposed Retrofit:

One or more floating wetlands are proposed in this pond (RRA_CC3A). In addition, to reduce maintenance costs and improve the quality of water entering the pond, a mowing exclusion is suggested for at least 20 feet around the pond (RRA_CC3B). In areas of this stormwater practice where a planting shelf exists, emergent aquatic vegetation would improve nutrient uptake, habitat opportunities, and pond aesthetics.

SITE RRI_CC4: CHESAPEAKE COLLEGE – NORTHWEST SIDE OF CAMPUS – NEAR PARKING LOT





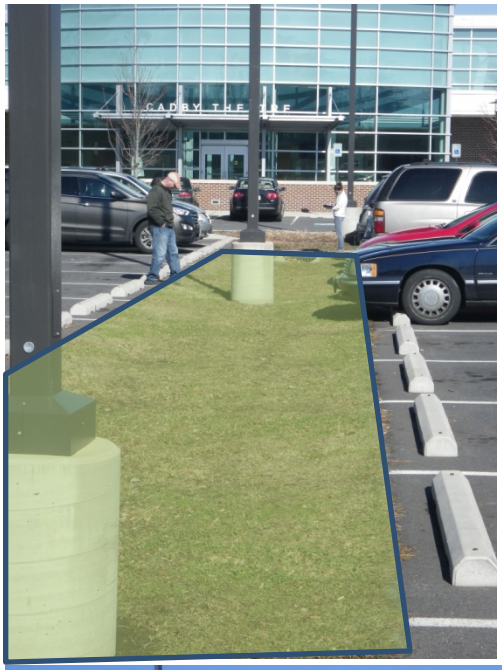
Left: Existing parking lot drainage. Picture taken from proposed bioretention area looking west.

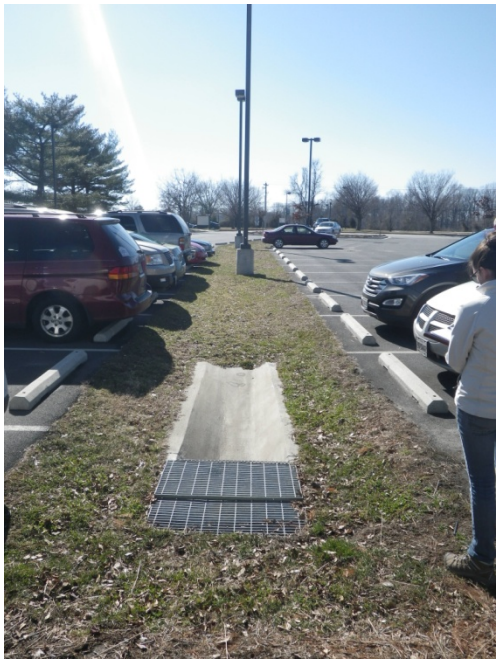
Right: Proposed bioretention area. Picture taken from northeast corner of parking lot looking east.

Proposed Retrofit:

A bioretention area can be installed in the lawn adjacent to the parking lot. The system can be designed such that the existing trees are not impacted by excavation. The underdrain can be routed to an existing yard drain to the east of the practice. Though this practice would be treating water from a relatively small drainage area, there is potential to use this as a demonstration site as it has high visibility; it is easily accessed from an adjacent walkway and parking lot.

SITE RRI_CC5: CHESAPEAKE COLLEGE – WEST SIDE OF CAMPUS – IN FRONT OF CADBY THEATER





Top Left: Proposed practice location. Picture taken from parking lot looking east.

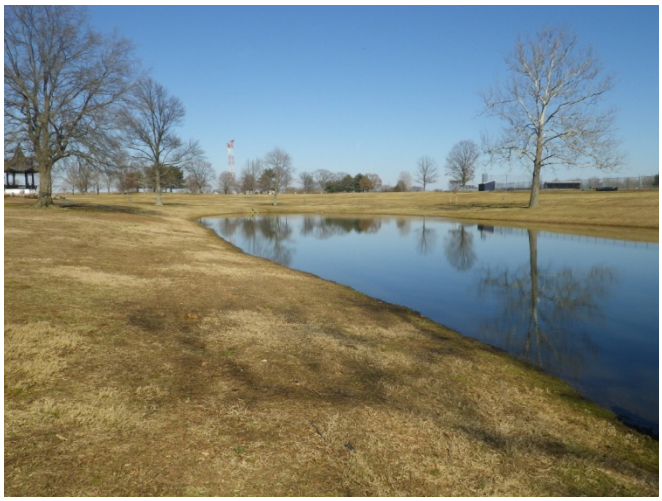
Top Right: Existing outlet. Picture taken from outlet of proposed practice looking west.

Bottom: Drainage area. Picture taken from upper end of drainage area looking northeast.

Proposed Retrofit:

A dry swale can be installed in the existing median. Since this area already conveys water, no changes to the overall grade would be needed. The streetlights are a constraint to implementation and it is not known, at this point, if a dry swale can be installed between them. Alternatively, the lights could be moved to the edge of the parking lot. The underdrain can be routed to the existing drain shown in the picture above.

SITE RRA_CC6A & CC6B: CHESAPEAKE COLLEGE – SOUTHEAST SIDE OF CAMPUS – BETWEEN TENNIS COURTS AND BASEBALL DIAMONDS



Proposed mowing exclusion and floating wetlands. Picture taken from northwest corner of pond looking east.

Proposed Retrofit:

A mowing exclusion at least 20 feet wide around the pond can be introduced in order to reduce maintenance costs as well as treating water (RRA_CC6A). That 20 foot border could be converted to a non-turf grass species undesirable to geese in order to prevent their waste from entering the water.

In addition, floating wetlands can be added to this pond, which will enhance nutrient removal (RRA_CC6B). The pond is 44,000 square feet in size. In the Table below, the cost estimate is based on 1800 square feet of floating wetlands. Literature on floating wetlands has cost estimates that vary widely: from $3 to $150 per square foot. MRC's experience has shown that $30 per square foot is a reasonable estimate.

In areas of this stormwater practice where a planting shelf exists, emergent aquatic vegetation would improve nutrient uptake, habitat opportunities, and aesthetics of the pond.

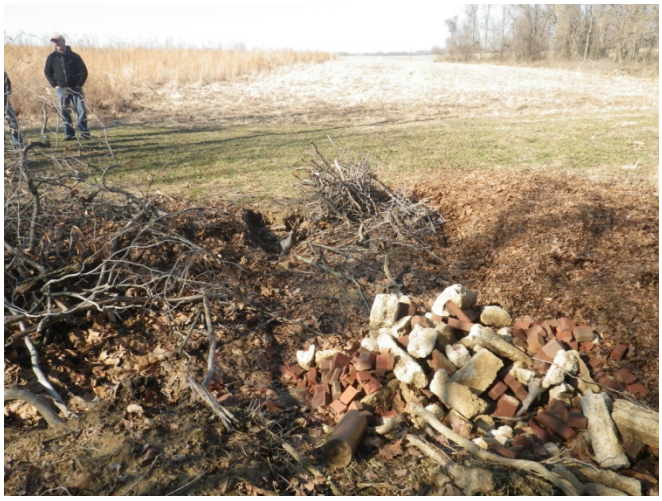
SITE RRA_WPC1: WYE PARISH CHURCH – APPROXIMATELY 400 FEET SOUTH OF OLD WYE CHURCH

Proposed regenerative stormwater conveyance location. Picture taken from briar patch looking east.

Proposed Retrofit:

To reduce gully erosion, a regenerative stormwater conveyance (RSC) system can be installed where water concentrates before entering the primary stream. The addition of grade control through the RSC will limit erosion and have an immediate impact on water quality directly below the practice. Information about RSC can be found through the Chesapeake Stormwater Network (http://chesapeakestormwater.net/wp-content/uploads/downloads/2012/02/Design-Const-of-RSCS-presentation.pdf)

SITE RRA_WPC2: WYE PARISH CHURCH – APPROXIMATELY 350 FEET WEST OF OLD WYE CHURCH



Proposed stabilization location. Picture taken from northeast corner of field looking west.

Proposed Retrofit:

To limit the continued impacts of this head cut at the edge of the stream, a stabilization and grade control structure can be added. Initial thoughts are that this could be fixed with a berm with a dewatering pipe behind it and a rock outfall where water is released into the stream.

Pollutant Reductions and Cost Estimates

Several types of pollution reduction practices are recommended on the properties evaluated during this Wye River Assessment. Table 1 includes the property location, site identification, practice type, planning level costs, and MAST pollutant load reduction estimates. MAST information offers the counties initial data to evaluate the Wye River for TMDL purposes and their WIPs. Priority projects can become part of the WIPs, and be readily implemented which will result in improved Wye River water quality. More detailed information for these MAST scenarios (land uses and information years used) can be found in Appendix F. The total load reductions estimated from proposed practices in Queen Anne County for TN, TP, and sediment are 429.7 lb/yr, 28.9 lb/yr, and 5640 lb/yr, respectively. The total load reductions estimated from proposed practices in Talbot County for TN, TP, and sediment are 9.3 lb/yr, 0.5 lb/yr, and 251 lb/yr, respectively.

Planning level cost estimates were developed for each proposed retrofit. Planning level costs numbers are not intended to be a representation of actual costs. More detail on each project will be necessary to determine exact construction costs. The planning level costs are used only to allow some general comparison between practices. The per cubic foot cost estimates for each type of practice were adapted mainly from Costs of Stormwater Management Practices in Maryland Counties (King and Hagan, 2011), although information from the Center's Urban Stormwater Retrofit Practices Manual (Schueler et al., 2007) and professional judgment were used to refine the estimates, as needed. Costs for more rural/agricultural practices, which were not initially included in the King and Hagan report, were determined from a number of sources including the 2013 RSMeans Site Work & Landscape Cost Data book (Spencer, 2013) and work done by the University of Delaware (UDEL, 2006).

Table 1. Wye River watershed potential stormwater retrofits assessed in the field.						
Site ID	**Location**	**Practice**	**Planning Cost***	****MAST Nitrogen Reduction (lb/yr)**	****MAST Phosphorus Reduction (lb/yr)**	****MAST Sediment Reduction (lb/yr)**
RRA_001_A	Wye Ferry Road	Wet Swale	$1,597[a]	0.45	0	0
RRA_001_B	Wye Ferry Road	Wet Swale	$2,803[a]	0.98	0	0
RRA_001_C	Wye Ferry Road	Restored Wetland	$23,786[a]	0.19	0.03	6.08
RRA_002_A	Kudner Farm	Constructed Wetland	$151,150[a]	18.01	2.49	215.5
RRA_002_B	Kudner Farm	Constructed Wetland	$151,150[a]	18.01	2.49	215.5
RRA_002_C	Kudner Farm	In-Field Stabilization	$35[b]	0.03	0.00	0.4
RRA_002_ LandUse	Kudner Farm	Alternative Crop	Variable[++]	11.6 lb/ac	0.74 lb/ac	135.0 lb/ac
RRI_003	Queenstown Outlet Mall	Dry Swale	$5,016[a]	5.91	0.72	510.6
RRA_CC1	Chesapeake College	Grass Channel	$2,190[a]	2.70	0.10	36.5
RRA_CC2	Chesapeake College	Stabilization - Rip-Rap	$10,133[b]	0.77	0.03	10.4
RRA_CC3A	Chesapeake College	Floating Wetland Islands	$27,000[c]	N/A***	N/A***	N/A***
RRA_CC3B	Chesapeake College	Mowing Exclusion	$592[a]	5.57	0.23	46.8
RRI_CC4	Chesapeake College	Bioretention	$12,604[d]	0.23	0.05	37.7
RRI_CC5	Chesapeake College	Dry Swale	$11,709[a]	2.16	0.26	186.7
RRA_CC6A	Chesapeake College	Mowing Exclusion	$1,065[a]	0[+]	0[+]	0[+]
RRA_CC6B	Chesapeake College	Floating Wetlands	$54,000[c]	N/A***	N/A***	N/A***
RRA_WPC1	Wye Parish Church	Regenerative Stormwater Conveyance	$4,241[e]	2.00	0.25	200
RRA_WPC2	Wye Parish Church	Grade Control Structure	$1,000[f]	7.31	0.22	51.4

Table 1. Wye River watershed potential stormwater retrofits assessed in the field.						
Site ID	**Location**	**Practice**	**Planning Cost***	****MAST Nitrogen Reduction (lb/yr)**	****MAST Phosphorus Reduction (lb/yr)**	****MAST Sediment Reduction (lb/yr)**
*Sources for cost estimates: a – King and Hagan, 2011; b – Estimate based on Spencer, 2013; c – Webinar by BioHaven Floating Islands (3-15-13); d – Schueler et al., 2007; e – Novotney design in Charolettesville, VA; f – Estimate based on professional judgement. ** MAST estimates represent the closest possible match to the proposed retrofit. *** No similar practices are available in MAST. [+] Modeled as a filter strip, which is not considered different than the current land use (nonregulated pervious). [++] Depends on alternative crop produced.						

Lessons Learned

Some of the available BMPs in MAST are not compatible with practices called out in the field. Also, not all practices are implementable in all landscapes. Regenerative Stormwater Conveyance (RSC), for example, is set up as an urban BMP in MAST, but, in reality, the techniques used in the practice can be implemented in any setting. This is a common obstacle for the local governments. When the planned BMPs are unavailable in MAST it is common to use comparable BMPs in MAST and to note these details for the future planning and/or implementation.

Other practices, such as floating wetlands, cannot be modeled in MAST; however, an expert panel is planned to address this practice for possible inclusion in MAST. See the EPA CBP's "BMP Expert Panels Approved, Underway, or Planned" on ChesapeakeStat: http://stat.chesapeakebay.net/?q=node/130&quicktabs_10=3 for updated panel information. That said, MAST is a dynamic tool with relatively frequent updates. Because of this, perfect reproduction of model results through implementation of proposed practices is not expected.

Concept Designs

The priority stormwater retrofit projects were drawn in AutoCAD as a first step toward future full build designs. These initial concept designs will provide an engineering firm with the general sizing and placement for the proposed stormwater retrofit. Engineered systems, such as stormwater retrofits, require complete information about the surrounding area as well as constraints of the particular location. For stormwater management practices, in particular, detailed hydraulic calculations are required to ensure the appropriate materials are selected and there is a low probability of practice failure. No precise details or hydraulic calculations were completed with these concept designs. Therefore, these concept designs are not for construction. However, they can be a preliminary planning

step for implementation funds, and for surveys, final engineering designs, and/or construction. MRC and stakeholders will work to identify appropriate sites, collaborators, and funders for these top projects.

Concept designs for priority pollution reduction practices in the Wye River watershed are provided in Figure 1, Figure 2, and Figure 3.