

Introduction and Overall Goals

Richmond County, Virginia is located on Virginia's Northern Neck and is bounded on the west by the Rappahannock River. The county seat is the Town of Warsaw located at the intersection of VSH-3 and US-360. Richmond County is primarily a rural county, economically dependent on agriculture and forestry. As of the 2000 census the population of the county was 8,809 nearly what it was a century ago.

Beginning in 2008, Richmond County in partnership with Virginia's Department of Conservation and Recreation began work on designing a locality based Tributary Strategy Program through a grant from the National Fish and Wildlife Foundation. The project outcomes were to produce a reduction of 25,566 pounds of nitrogen, 1,477 pounds of phosphorous, and 585 tons of sediment in addition to defining and developing some guidance for development of a local program. Because not all undertakings of a local program are assumed to be instantly relatable to pollution load reduction a number of other milestones were developed:

- an assessment of Richmond County's comprehensive plan and county codes and ordinances,
- modeling of various land use scenarios using the Chesapeake Bay Model and Community Viz,
- Engaging local leaders and the community to raise awareness of the impacts of various land use practices on the integrity of natural resources and explanations as to how local ordinances and comprehensive planning can address the assigned loads.

Included in this effort was the implementation of agricultural and urban BMPs to reach to produce the pollution reductions listed above in this paragraph.

Project Review and Recommendations

The best way to develop the program guidance/protocol is to examine the process as applied in Richmond County by exploring the success and shortcomings of work toward each milestone, project component and ancillary efforts along the way through all phases of the project.

The combination of project milestones and components that have bearing on local program development included:

- Local jurisdiction nutrient/sediment allocation
- Assist in county comprehensive plan review
- Assist in local code and ordinance performance review
- Conduct a county-wide stream health and chemical condition review
- Develop a state of the environment report

- Meshing water quality tools to assist with local jurisdictional operations, development, and planning.
- Urban and agricultural BMP implementation
- Define parameters/guidance/protocol of a local tributary strategy program

Milestone: Assign Nutrient Load Allocation

During project development, it was planned to use Phase 5.0 of the Chesapeake Bay Program (CBP) watershed model to develop the local nutrient allocation. As the project began, it became apparent that Phase 5.0 was not complete and as such would not be available for use during this project. At the time of writing, the Bay Program has moved past Phase 5.0 and forward onto Phases 5.1, 5.2, and 5.3. It was not possible to develop nutrient loading allocation at a county wide scale during the phased model development. The Bay program just recently (August, 2010) provided draft allocations at the state level derived from Phase 5.3. The project has had to rely on Phase 4.3 allocations that were developed during the Commonwealth's second tributary strategy development efforts. These figures have no correlation with the current model version and were produced as aggregated source sectors for nitrogen, phosphorous and sediment.

***Shortcoming:** The Chesapeake Bay Program's development effort for the watershed model has been an iterative process that even in the most recent phases has seen changes in BMP efficiencies and landuse acreages and types. Though the model is viewed as state of the science it is developed to work at and likely functions best at the 64,000 square mile scale that covers the entire Chesapeake Bay. The Bay Program and its partners will, eventually, finalize state level allocations as a part of the Chesapeake Bay TMDL. When that is done it will be possible to derive a target pollution cap for localities. Even at that time there is no way to reconcile the land use/land cover data used in the CBP model, growth and development patterns/projections or the BMP implementation data employed in the model and used to develop allocations with actual local conditions and data. Without a way to reconcile this information at a locality scale any allocation/pollution target derived is of a diminished value for use in local planning and un-relatable to local conditions, on the ground levels of implementation or land available for treatment.*

***Protocol/Guidance:** It is the recommendation of the project that local allocations, if derived from the CBP Watershed Model, are used for relative discussion and that the majority of local planning is based on local data, conditions and levels of implementation. It will have the highest likelihood of actual implementation and have the greatest impact locally.*

It is understood that some kind of target needs to be set for localities or local jurisdictions to use in planning. But, how to best define that target is of the greatest debate. While it will be possible to do so using the Chesapeake Bay model it is not proving to be the best way to develop local water quality protection and pollution reduction strategies. A nutrient allocation/target can provide a locality a relative sense of their contribution in comparison to other regions but actual allocations can be

impacted by other factors than derivation by the model and its equations. In short, state level policy that may be impacted by administration position and other factors can lead to shifting allocations both geographically or among pollution sources. These processes can lead to perceived inequities or concern over unfair apportionment of “the problem”. In addition, and as stated, the Watershed Model can not provide local data to support local planning. The model can not define specific local water quality or define where a locality stands in terms of meeting water quality goals. At present it is not clear to what extent a local pollution allocation is binding or which components may be binding. All of these issues point to leaning heavy on a local pollution allocation as a potential barrier to success. If the local stakeholder has no buy-in on the validity of the target the likelihood of success in planning and implementation decreases.

Milestone: Comprehensive Plan Assessment and Revision/Engage Public

A preliminary assessment of Richmond County’s Comprehensive Plan showed several areas where improvement or strengthening of goals could lead to overall improvement of water quality and a reduction of nutrient loading. Further, the changes would bring the plan in line with the hopes and aspirations of County residents. The revision process has been lengthy however, the public support for the Plan’s new vision statement is high and could translate into support for water quality improvement measures. Planning activities are an example of actions that are of a critical nature to maintaining local resource integrity yet difficult to quantify their impact when developing model scenario. Local development and comprehensive planning is not an action that receives credit in the Bay Program’s watershed model.

Within a couple months of starting this project Richmond County’s Planning Commission appointed a citizen work group to undertake a Plan review/revision. This group met monthly developing a survey to query citizenry on the awareness and level of agreement with the current plan as well as their view on important characteristics of the community. As the grant project established itself, project members assisted the committee with revision and distribution of their survey and introduced the idea of citizen outreach via workshops and visioning sessions to the group. In order to assist in this effort, the committee, at the direction of project members, engaged Virginia NEMO (Network for the Education of Municipal Officers).

NEMO worked with the group to plan and implement a series of monthly facilitated workshops in the second half of 2009. These workshops focused on topics touched on in the survey taken by the county earlier in the year and covered: the importance of planning your community, growth and development trends in the County, natural resource conditions and economic impacts, and the nature of local economy. Attendance at these meetings ranged from 20-50 people. After each presentation a facilitated discussion took place in which attendees offered their thoughts, questions, and comments. The outcome of these workshops was a shared community vision developed and finalized in late 2009. This vision, along with meeting notes were reported back to the community after each meeting. From early 2009 through the end of project the citizen committee along with two project members met weekly to revise the comprehensive plan. As the overall grant period drew to a close, the committee was wrapping up its revisions to the

Comprehensive Plan and has forwarded those revisions to the Richmond County Planning Commission.

Success: *Richmond County is in the process of creating a truly viable Comprehensive Plan. The revisions to the plan raise the standing of natural resources so that as growth and development occurs in the locality condition or impact on the integrity of the resources are a consideration and places emphasis on the water quality issues.*

Using the Comprehensive Plan process as one of the main drivers of the project has yielded some encouraging results. Since the Comprehensive Plan addresses all issues regarding future land usage it has proven to be a great forum for introducing the notion that land use decisions directly affect water quality issues. Citizens and committee members have been receptive to this issue and have considered it as they make decisions about the plans goals and objectives. In Richmond County this process resulted in the development of the following goals and objectives, all of which can impact the integrity of natural resources or mitigate pollution that could impact local stream water quality:

- 1. Protect the integrity of historical and archeological sights:*** *The Northern Neck of Virginia has numerous historical sights that when preserved or protected from development can result in substantial parcels of land remaining in a natural state.*
- 2. Protect the health, integrity, and value of the natural resources and environment of Richmond County.***
- 3. Protect the quantity and quality of groundwater and drinking water of Richmond County.***
- 4. Protect rural character and the viability of farming, fishing, and forestry.***

Additional insight was gained on a couple of levels. One, critical to having objective discussion of local planning priorities is that parties have relevant local data, can agree current condition and a shared understanding of how things came to be. Second, to present natural resource information and discuss relevancy to local planning it must be related to and in context with the greater community profile.

Protocol/Guidance: *It is the recommendation of the project that a local tributary strategy program must work to link land use and water quality/natural resource integrity and have it used as a central focus of the institutional planning of a locality (mainly comprehensive planning). BMP implementation planning can not stand as a completely separate planning document. There are opportunities to improve goals and objectives and effect capital improvement planning that can improve local resources and work toward regional goals. Local natural resources have to be presented in a fashion that reflects current trends, conditions, impacts on economies and value as part of the community infrastructure. Impacting local planning through raising awareness on the linkages between land use and water quality and the need to plan for the development of a community is an integral component of developing strategies that support more regional goals such as meeting Chesapeake Bay water quality goals.*

Component: Assist with Chesapeake Bay Act Phase III local code and ordinance performance review

The Chesapeake Bay Preservation Act directs local governments to employ the criteria promulgated by the governing Board to ensure that the use and development of land in Chesapeake Bay Preservation Areas shall be accomplished in a manner that protects the quality of state waters consistent with the provisions of the Act. In those provisions language directs local government to review local codes for inclusion of specific standards that implement water quality performance criteria often referred to as Phase III.

The development of the Phase III criteria was in process throughout the beginning of this project as it was subject to review and acceptance by the Virginia's Chesapeake Bay Local Assistance Board. In the spring 2009 the evaluation criteria were set and made available. Richmond County underwent an Advisory Code and Ordinance Review in fall of 2009 with the assistance of Virginia's DCR Division of Chesapeake Bay Local Assistance in preparation for a compliance review in January 2011.

Success: The advisory review is undertaken to identify or the lack of local ordinance provisions that address minimizing land disturbance, minimizing impervious land cover, and preserving indigenous vegetative cover. In addition there is a review of site plan review process.

The results of the review are that the County identified appropriate ordinances addressing the three performance criteria listed on the previous paragraph. Their sufficiency will be reviewed as a part of the 2011 compliance review. The plan review process was found to only meet one of six requirements. The county will be working with the County Board of Supervisors to prepare for the January 2011 compliance review.

In Virginia this requirement only carries weight in Tidewater localities (mainly east of the Interstate 95 corridor. The State has made it viable for all localities to consider and adopt the Bay Act.

Protocol/Guidance: It is the recommendation of the project that a local tributary strategy program should include a component of code and ordinance review for water quality performance. The Chesapeake Bay Preservation Act provides a broad template for developing suitable local approaches.

Component: Conduct county-wide stream health and chemical condition Review

Because bay scale modeling and data development is not at a scale useful for local planning the project worked to develop baseline data to establish current resource conditions focused on a comprehensive stream assessment. The intention was to use the information for public education, planning for tributary strategy BMP implementation, identify and assess effectiveness of BMP's already on the landscape and provide a baseline assessment for the County to monitor progress in the future.

The stream assessment was conducted by the VCU Center for Biological Diversity and took place in 2008-2009. As part of the assessment, the Center sampled for both water quality (chemistry) and biologic diversity. Testing took place at 54 sites throughout the County.

The biological data development is used with site physical condition to create a score for each site that is compared to a Virtual Stream Assessment (VSA). Streams that scored above 70% comparable to the VSA are considered healthy. Further, the Center developed a new category, Important Fishery Resources (IFR) to quantify and qualify the recreationally or economically important fish in the area. In examining the results of the stream assessment, it was determined (as mentioned above) that the County has many healthy stream resources.

The results of the assessment were:

- 12 VSA Healthy/IFR Identified Sites
- 2 VSA Healthy/ No IFR
- 43 IFR sites with VSA scores below 70%
- 20 Sites identified for elevated nutrient pollution or biologically compromised.

In concluding the stream analysis, the project members worked to develop BMP implementation strategies to assist in resource protection. The project members also worked to mitigate nutrient pollution in identified sites through targeted BMP implementation. The chemical water quality analysis proved useful in identifying sub watersheds where either BMP implementation was already in place and effecting or non-existent or possibly in place but providing resource protection.

***Success:** The ability to assess, at a jurisdictional scale, the comprehensive condition of natural resources, the level of threat their condition may be under and what is occurring on the adjacent landscape is a solid place to begin local planning and is where Richmond County is working from. Without this data planning for BMP implementation has to rely mostly on impaired waters data which does not provide all sides of the picture. The Bay Program watershed model does not provide data to fill the gap. The comprehensive nature of the data was very useful in the comprehensive plan civic engagement process serving as a way to link the impact of land use on resources. In Richmond County, the state of the resources were shown to be of relative high integrity. This reflects the nature of growth, development and characteristics of the economy for the jurisdiction. It lends value to the need to continue consideration and raise importance of natural resources in planning for the development of the community over the next decade.*

In addition, Richmond County now has a baseline for the water quality within their jurisdiction. The development of this data was vital for furthering the projects overall goal of developing a Locality Based Tributary Strategy.

***Protocol/Guidance:** It is the recommendation of the project that a local tributary strategy program strive to develop local comprehensive stream resource data and use as*

the basis for local planning across agencies and disciplines. The current Chesapeake Bay TMDL effort and the preceding Tributary Strategy efforts were disconnected from local conditions and planning. As an example, some BMP input decks were developed to an extent that not enough land identified for specific BMP implementation was even available.

Milestone: Develop a local State of the Environment Report

An early intent of the project was to develop a State of the Environment Report. This report did not end up being used as intended, a hand out for educational purposes. But, many of the components of the report were used as the basis for discussion during the civic engagement process and the review of the Richmond County Comprehensive Plan.

The report contained information about Richmond County's general and environmental characteristics. Information was presented about agriculture, forestry, wildlife, historically significant resources, the VCU stream assessment, shoreline conditions, climate, water supply and pollution, impervious surfaces in the county and land use.

Success: While this report was not utilized as initially intended it became apparent that the initial idea was a little underdeveloped. Much of the information pulled together served as a very important informational resource but the concept of what may be most beneficial has broadened into the development of a community profile. The profile needs to include the natural resource information but also include and relate the resource information to other important aspects of the community including; cultural resources, population trends, development trends, impervious cover and land use/cover trends economics trends.

Protocol/Guidance: It is the recommendation of the project that a local tributary strategy program develop a comprehensive community and natural resource profile. The profile can serve as a baseline of information to support and link local planning efforts supporting the identification of related priorities across separated planning processes.

Milestone: Meshing water quality modeling tools with local jurisdiction operations, development and planning

Throughout the project, members worked to develop and evaluate tools that could be used by local decision makers in development of a tributary strategy. In developing and evaluating each of these tools considerations were given for ease of use, accuracy, and overall cost. The ability to transfer any technology developed in this project to all localities was a critical factor. It is possible that a county specific water quality model could be developed but, given the cost of such a venture the ability to transfer such a model to other localities is restrictive. It was the project partners' intent to avoid a situation as such.

The project was proposed utilizing a modeling tool (Scenario Builder) developed by the Bay Program to allow for local BMP implementation and land use change scenario development, but that work was never completed by the Bay Program. The project explored other modeling options to use as a surrogate to the Scenario Builder but none proved viable. Included in this effort were:

- a review of a storm water BMP optimization process which worked well at the local scale but due to cost and specialization required to develop did not seem appropriate and lacked an agriculture component
- BasinSim, a program developed by the Virginia Institute of Marine Sciences to estimate loading of watersheds. This program can be found for free on the internet and requires an accurate accounting of land use types in the locality to be run. BasinSim does provide mean monthly loading for a given watershed specifically by land cover type but the inability to change the runoff co-efficient of land types to replicate the pollution mitigating effect of implementing BMP's.
- especially impressive with was the CommunityViz extension for ArcGIS. This extension is used to model growth and maximum build out under current zoning or proposed zoning changes. The cost for the extension is minimal and it is user friendly. By running build out scenarios decision makers can see first hand the total build out of their county under current zoning rules. It is possible that the tool could be used for specific impacts and then further predictive modeling applied to those outputs but the project did not have the technical capability to develop predictive models.

One issue that brought the project to a bit of an impasse in developing a predictive tool is the need for accurate agricultural BMP location and area treated data. While this data is captured at the local level access to all the important attributes are restricted.

The project did establish that the data collected (water chemistry and biologic condition) combined with landcover/landuse data and what ever BMP implementation data (focused on area treated) available serve as the best tools for local planning. Predictive capacity is not critical. The stream assessment data allows for prioritizing resources for protection and improvement in a number of ways; Sites of concern due to elevated nutrients based on water chemistry samples, healthy sites (stream assessment sites that score at greater than 70% comparability score as calculated in VCU's INSTAR application), restoration potential sites (sites that score in the 60-70% VCU INSTAR range), and compromised sites (sites scoring at less than 60% comparability). Using this data in conjunction with the land use/ land cover data developed during the project has been a very effective planning approach for BMP implementation scenarios.

Project partners also identified opportunities to use CommunityViz in planning application and effectiveness of zoning and ordinances to protect components of the County's natural resources while still meeting community needs for residential housing and growth.

One of the most valuable efforts throughout the project was digitizing a County land cover GIS layer. This tool was created using ArcGIS 9.3 and the most recent aerial photos available. In development of this layer, the land was classified into the following categories:

- Forest
- Urban or Built Up Land
- Agriculture
- Barren Land
- Water
- Wetland

After being classified into one of the categories above, the land cover was then further classified if possible. For instance, Forest land may have been further classified as evergreen, deciduous, or mixed depending on its composition. After segregating land cover types, areas for each type of land cover were calculated. If this layer is maintained by the county moving forward, they will be able to have an accurate picture of development patterns and land cover conversions in their county.

Developing this layer took a significant amount of time and might not be possible for every locality to attempt. In that case, developing land cover for designated growth areas or areas with compromised environmental features may prove useful.

Another important component that was developed by project members was a BMP tracking database. While not complete, due to information sharing issues, this database allows for a real world location to be assigned to each BMP. In marking the location, type, and lifespan of each BMP allows decision makers access to better information. It is hoped that this information will be used to target impaired or underserved watersheds. Further, this information allows for decision makers to help in prioritizing BMP cost share program implementation. If completed it would give a total picture of the amount of BMP implementation in the County, information that may be needed if a nutrient cap or mandatory measures were ever required.

A final tool required for success is local buy in and ability to access local knowledge. These two aspects proved to be extremely valuable in development of the urban BMP component of the project. Without local support and knowledge it is unlikely that the project would have achieved success.

***Set Back:** The project was not able to develop a predictive model. Not all was lost in the effort, the Richmond County project members were able to evaluate different options and determine that the capacity to predict environmental endpoints is not an absolute requirement for developing a local tributary strategy component. Accurate land use land cover data supported with data relevant to local stream condition can serve planning efforts well.*

***Protocol/Guidance:** It is the recommendation of the project that a local tributary strategy program not dwell on the ability to predict the results of implementation*

strategies and to focus on developing and using accurate local data. It is fairly well accepted that the actions defined as BMPs do as they intend, either mitigating pollution to allow streams to recover or protect the current condition. While predicting which BMP may best serve a given scenario is useful it will never be the only consideration in f an approach. Many other factors and landscape features impact this process as well.

Milestone: Define and Develop Parameters of Local Tributary Strategy Program

Protocol/Guidance: It is the recommendation of the project that a local tributary strategy program that local tributary strategy programs, which will now likely be referred to as Chesapeake Bay TMDL Phase 2 Watershed Implementation Plans, will need to be flexible. It may be best to establish this program at the locality level but factors/situations may exist that suggest a regional or watershed approach may best suit some areas of the Commonwealth

The important parameters of a local program have been identified, in this project, as follows (including some qualifying comments):

- 1. Jurisdiction Nutrient Reduction Target or Pollution load cap**
 - a. Real value of this number, in terms of effective local implementation, is undetermined at this time.
 - i. Level of implementation required to meet model targets are so high the targets could be a barrier to positive dialogue on developing strategies to improve and protect natural resources.
 - ii. The Phase 4.3 allocation suggests an approximate doubling of current effort (if not even higher) would be required to meet targeted reduction which is not likely to occur.
 - iii. Lack of local buy in on target or cap validity may become a major barrier to progress in protecting or improving water quality
- 2. Accurate, up to date land use/land cover**
 - a. Relatively easy to obtain, requires staff and financial resources to maintain but is not out of the question. Would need to be developed on a five year basis to allow for the development and review of trends both geographically and temporally.
- 3. Accurate accounting of agricultural and urban BMP implementation data**
 - a. There is a great deal of concern over the data provided by the Bay Program watershed model. Project partners were not able to reconcile this data with real world implementation in terms of location and level of implementation
 - i. The inability to obtain accurate agriculture BMP data has been identified as a major barrier to developing predictive model component of a local program.
 - b. The urban component is relatively easily established in Richmond County due to County rural characteristic. Many localities will have some accounting of urban BMPs
- 4. Current water quality and biologic integrity data** used to asses a jurisdiction's surface water system

- a. The Bay Program watershed model does not provide local water quality or stream resource condition. This is a critical component for building the case for conservation at the locality level. This should be a high priority at the state level but does not appear to be.
5. **Modeling/predictive capabilities**; apply land use/land cover and BMP implementation scenarios and estimate environmental endpoints
 - a. The project was proposed utilizing a modeling tool developed by the Bay Program to allow for local BMP implementation and land use change scenario development, but that work was never completed by the Bay Program.project to the
 - b. Because accurate agricultural BMP location and area treated data is an issue we arrived at a bit of an impasse in the developing a predictive component of a local modeling tool
 - c. We have established that the data collected (water chemistry and biologic condition) can be used to plan and develop strategies for BMP installation.
6. **Review of planning and codes/ordinance** with regard to performance for water quality and natural resource community integrity
 - a. There are opportunities for comprehensive plan review in each locality every five years.
 - b. Raising awareness of the County leaders and the community on the links between land use and water quality are an important component of the plan review process.
 - c. Using Phase III of the Chesapeake Bay Preservation Act as a template conduct a review of codes and ordinances with regard to water quality performance. This is a requirement of the tidewater localities of Virginia that fall under the geographic scope of the Bay Act. The checklist used can serve as a template for code and ordinance review in all localities.
7. The local program will have to develop an **implementation strategy**. This project has not gone as far as establishing this strategy to the point of meeting allocations but protocol for planning for BMP implementation for both agricultural and urban BMPs have been developed. This level of planning will be required as Phase 2 of the Chesapeake Bay TMDL is developed I 2011.

Appendix A: Tributary Strategy Development Locality Toolbox/Worksheet

[To Be Developed]^[cr1]