Chester River Integrated Strategic Plan (C.R.I.S.P)

A Strategic Management Plan for Maryland's Middle Chester River Watershed

Developed April 2015

(This plan is intended to foster an adaptive management approach to addressing stressors of water resources in the Middle Chester River Watershed and should be updated every five years.)

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Mission Statement

The objective of the Chester River Integrated Strategic Plan (C.R.I.S.P.) is to bring the Middle Chester River Watershed (MCRW), in eastern Maryland, under USGS Water Quality Targets for fishable and swimmable rivers by 2030, and to create a sustainable infrastructure for water quality upkeep.

Executive Summary

The Middle Chester River Watershed (MCRW) was first identified on Maryland's 303(d) Impaired Water's list in 1996 as being impaired by excess sediments, nutrients, and bacteria. Subsequently, in 2002, PCBs (toxins) in fish tissue and evidence of biological impacts were added by the Maryland's Department of the Environment (MDE). In 2006, the Environmental Protection Agency (EPA) approved a Total Maximum Daily Load (TMDL) of nitrogen and phosphorous for the Middle Chester River. Although this TMDL was modified in 2008, overall load allocations for the watershed were not changed. Although the issues referenced above have been recognized by multiple stakeholder groups working in the watershed, progress toward the TMDL goals and 303d delisting has been minimal in recent years.

It is the intent of the C.R.I.S.P. to facilitate the achievement of the TMDL goals and realizing fishable and swimmable water by 2030 by describing and encouraging strategies that have been previously proven through implementation in other watersheds. These strategies, described in more detail later in this plan, include but are not limited to utilizing a community based approach, consolidating the efforts of multiple organizations into a greater effort to be overseen by a newly created Waterfund, targeted implementation of Urban and Agricultural best management practices (BMP), periodic monitoring of effects of management decisions, and the continual adaptation of plan strategies based on the most current available data at a given time.

Watershed Characteristics

The MCRW is comprised of a 15.3 km (9.5 miles) section of the Chester River and approximately 151 km^2 (30,400 ac) of surrounding land area. It encompasses portions of Kent and Queen Anne's Counties, Maryland. Specifically, the watershed is comprised completely by the drainages of the following tidal tributaries of the Chester River: Morgan Creek, Radcliffe Creek, Rosin Creek, Fishing Creek, and Hambleton Creek (Fig 1). The Chester River, and consequently the MCRW, flows directly into Chesapeake Bay at its confluence near Eastern Neck National Wildlife Refuge.

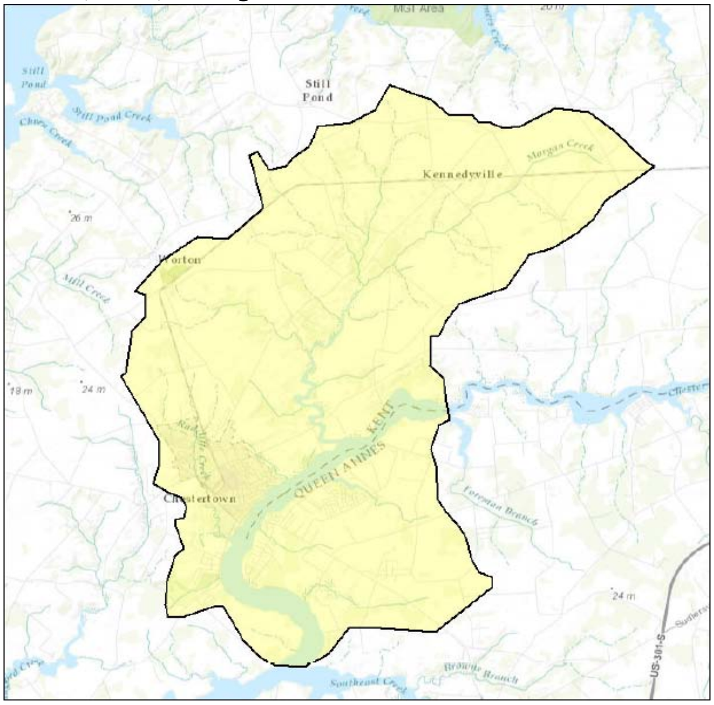

Figure 1. Map of Middle Chester River Watershed boundary including main roads and waterways.

Land Use

The MCRW consists of a mixture of land uses but is primarily dominated by agriculture (Figure 2, 3, Table 1). In fact, the MCRW is among those Maryland watersheds with the least impervious surface, lowest population density, least wetland loss, and highest soil erodibility. Consequently, water quality concerns in the watershed stem heavily from non-point source nutrient and sediment runoff that's typically associated with high agricultural densities. Even so, the MCRW encompasses the town of Chestertown, a large urban center by Eastern Shore standards, as well as a few other smaller residential hubs such as Worton and Kennedyville. Further, developed lands within the watershed are projected to increase substantially over coming decades, primarily at the expense of existing farmland. This knowledge of projected land use changes underlines the importance of developing prudent strategies to mitigate and avoid adverse development impacts before they arise. Excluding agriculture and urban areas, the watershed also includes small percentages of forests, permanent bodies of water, and wetlands.

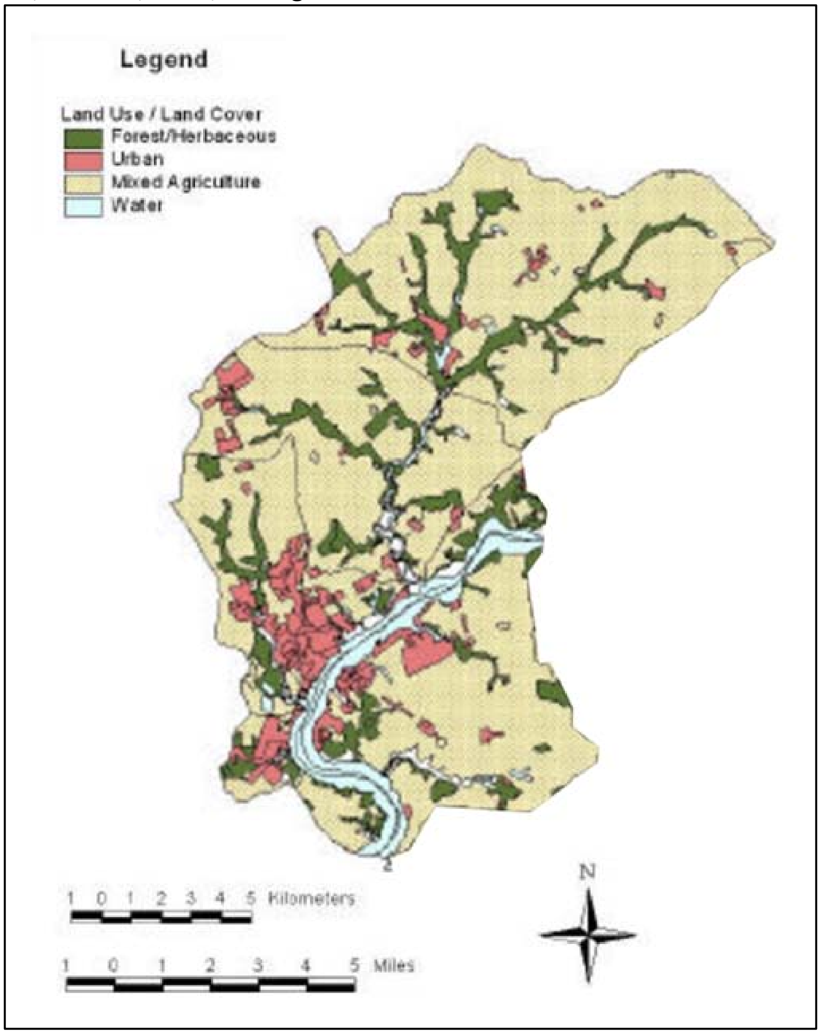

Figure 2. Map of land use/land cover in Middle Chester River Watershed.

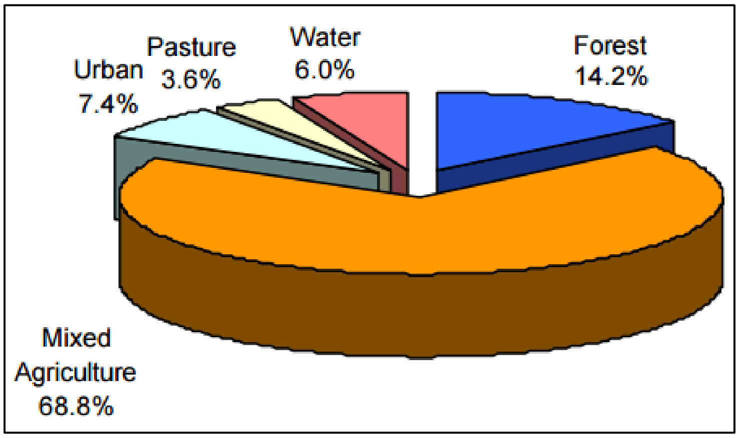

Figure 3. Proportions of 5 dominant land uses in the Middle Chester River Watershed (Maryland Department of the Environment).

Category	**Description**	**1997 Acres**
Agriculture	Cropland, Pasture, Ag Buildings	22,360
Forest	All woodlands and brush	4,272
Urban	All developed acres	2,461
Wetlands	Tidal and Emergent	506
Other	Gravel Pits & other bare ground	26
Total (Excluding Open Water)		**29,625**

Table 1. 1997 Land use data total acreage. Kent County portion of MCRW (Kent County Dept. of Planning and Zoning)

Interested Parties

There are several state and federal programs and agencies that will assist in achieving the desired outcome of this plan. For example, federal programs such as the National Pollutant Discharge Elimination System (NPDES) and the Farm Bill administered by the Natural Resources Conservation Service (NRCS) will undoubtedly assist in assuring acceptable pollution levels. Additionally, state level regulations and agencies such as Nutrient Management Plans as required by Maryland's Water Quality Improvement Act of 1998 will also be an important factor. Further, there are several local and non-profit groups working toward a healthy MCRW:

- **Kent Soil & Water Conservation District**
    - Based in Chestertown, MD, the conservation district partners with local, state, and federal agencies to help protect the waters of and around the Chesapeake Bay on Maryland's Eastern Shore
- **Upper Eastern Shore Tributary Strategy Team**
    - A division within Maryland's Department of Natural Resources, this section of the "Tributary Strategy Team" division focuses on rehabilitating the tributaries of the Chesapeake Bay and their watersheds on the Upper Eastern Shore of Maryland.
- **Chester River Association**
    - The CRA "Advocates for the health of the Chester River and the living resources it supports." This organization focuses on the Chester River itself, water health and rehabilitation events on a local scale, as well as community outreach and educational events. They also sponsor the local population to go out and directly test the waters of the Chester River.

- **Middle Chester River Partnership (MCRP)**
    - While the MCRP officially concluded its efforts in 2014 it included organizations such as Ducks Unlimited, Kent County Government, University of Maryland Sea Grant Extension, Washington College, Chester River Association, local contractors, Maryland Department of Natural Resources, and more. This team focused on implementing a range of practices known to impact water quality such as restoring wetlands, installing vegetated buffer strips, upgrading septic systems, advocating and funding green agriculture technology (i.e. GreenSeeker Equipment), and invasive species control, and more.

While the list above represents only a small portion of interested parties and relevant regulations working in the watershed, it reveals the array of government and non-government organizations, based both inside and outside of the watershed, that have a vested interest in conserving the resources of the MCRW. With all of these individual inputs, however, broader goals can easily be, and often are, overlooked. This highlights the need for one group or body to consolidate or oversee work in the region, as recommended later in this plan, to best influence future water trends.

TMDLs

The Middle Chester River Watershed (MCRW) was first identified on Maryland's 303(d) Impaired Waters list in 1996 as being impaired by excess sediments, nutrients, and bacteria. Subsequently, in 2002, PCBs (toxins) in fish tissue and evidence of biological impacts were added by the Maryland's Department of the Environment (MDE). In 2006, the Environmental Protection Agency (EPA) approved a Total Maximum Daily Load (TMDL) of nitrogen and phosphorous for the Middle Chester River. Although this TMDL was modified in 2008, overall load allocations for the watershed were not changed.

TMDL's are a standard of measurement used as a basis for achieving and maintaining water quality standards in a given watershed. Water quality standards include designated uses and the water quality criteria designed to support those use in a given watershed and include factors such as ability to support aquatic life, swim-ability, drink-ability, etc. The total combined point source and nonpoint source TMDL goals for the MCRW as defined and approved by EPA are 116,149 lbs/year nitrogen and 5,048 lbs/year phosphorous. As of 2006, the total actual average annual input for nitrogen and phosphorous in the MCRW was 275,437 lbs/year and 16,709 lbs/year, respectively. Considering these numbers, and assuming current nutrient inputs are comparable to 2006 inputs, in order for this plan to achieve acceptable water quality measures in the MCRW by 2030, an average reduction of approximately 10,600 lbs/year nitrogen and 775 lbs/ year phosphorous are required.

Problem Matrix

Problem	Goals	Solution	Potential Players
Nonpoint Source Pollution- Nutrient input (Phosphorus/Nitrogen), Dissolved Oxygen	Lower to USGS target levels	Enforce TMDL levels, work with AG to bring about BMP	Conservation District, waterfund, NRCS, FSA, Chester River Assoc., Ducks Unlimited, TNC
Point Source Pollution- Enterococcus (bacteria), Total Suspended Solids Levels	Lower to USGS target levels	Work toward TMDL levels, clean-up activities, watershed restoration. Identify and eliminate direct pollution sources (NPDES)	Conservation District, waterfund, NPDES
Lack of Monitoring	Establish ability to effectively monitor river, and actively interpret results	Lobby for USGS to install monitoring station in region, with consistent upload to their public access site	USGS, Washington College, UMD Ag Ext.,
Land Use Change	Create a watershed capable of adapting to changing land use	Improved natural barriers, legislation which takes watershed into account	Local community, lawmakers (Federal, State, Local)
Organization of Efforts	Create a centralized, organized effort	Establish a Waterfund and Water Manager	Local Conservation District

Point-Source and Non-Point source Nutrient Loadings

Sources of Phosphorous and Nitrogen in the Middle Chester Catchment		
	Total Phosphorous	**Total Nitrogen**
Agriculture	71.7%	82.3%
Point Source	18.8%	6.7%
Urban	4.2%	3.8%
Pasture	3.1%	3%
Atmospheric Deposition	2.0%	3%
Forest	0.2%	1.2%
Source: Maryland Department of the Environment. 2006		

Table 2.

Nonpoint Source Pollution

Non-point source pollution contributes by far the largest source of N and P into the Upper Chester River, with agriculture contributing over 90% of the load. Point source pollution contributes less than 1%. The origins of non-point source N and P in the Middle Chester river reflect the more urbanized watershed, however agriculture still contributes 85% of N and 74% of P (Table 2).

Without improvements to agricultural practices, total N and P loads will not be reduced. CRISP proposes working with individual agricultural interests to ensure agriculture best management practice (BMPs) per Farm Bill incentive programs to improve timing and levels of fertilizer use and placement as well as on-the-ground management practices (Figure 4) in the watershed. BMPs are implemented and often subsidized through governmental programs. These subsidies help alleviate some of the concerns of local farmers who are hesitant to affect their output, and often local organizations who have existing relationships with Ag interests are used to help smooth transitions to new technology.

CRISP also proposes to develop sub-catchment level workshops, education and outreach programs to assist farmers to improve agricultural practices. Where convincing farming interests to implement new and often costly measures may meet resistance, by running outreach programs and increasing general knowledge the potential benefits of watershed restoration will hopefully become more apparent. Financially beneficial options can be explained and information can be made available to affected parties, instead of forcing the changes wholesale.

CRISP is also advocating for improvements to riparian sections to reduce sediment and nutrient loading in the Middle Chester River. On top of this, wetland restoration or even creation to reduce direct nutrient and pollution loading is recommended where possible given land use. This strategy is outlined further under the section Land Use Change.

Parameter	**Status - 1997 to 1999 Data**	**Trend 1985 to 1999**
Total Nitrogen	Poor	No Trend
Total Phosphorus	Poor	Improving (29%)
Algae: Abundance	Poor	Improving (22%)
Dissolved Oxygen (Summer, Bottom Waters)	Poor	No Trend
Water Clarity	Poor	Improving (53%)
Suspended Solids: Total	Poor	No Trend

Table 3. Status and trends of water quality parameters in the MCRW, 1985-1999.

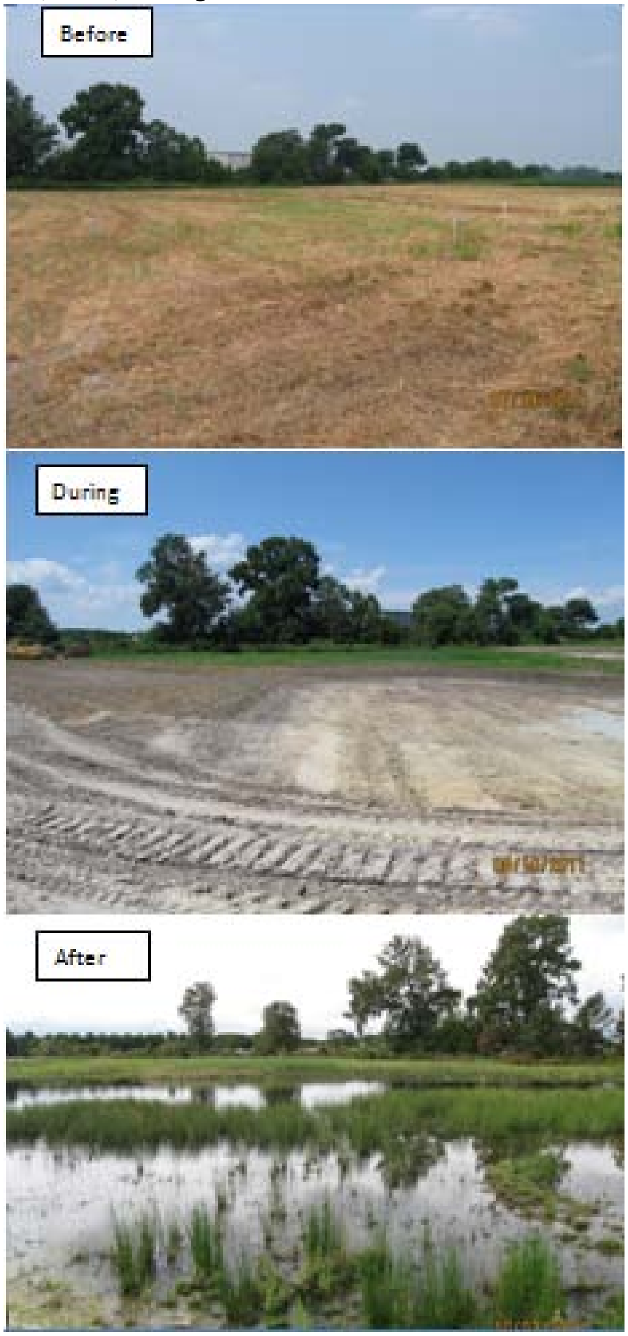

Figure 4. Example of wetland restoration BMP implemented by the Middle Chester River Partnership.

Point Source Pollution

Two municipal waste water treatment plants discharge into the Upper Chester River, and three into the Middle Chester. In addition, one industrial point source discharges into the Middle Chester. The elevated P loads from point-sources in the Middle Chester reflect the more urbanized catchment, with almost 19% of P in the Middle Chester River coming from point source pollution.

CRISP proposes seeking Federal funding to upgrade the waste water treatment plants to tertiary treatment standard to reduce the P and N being discharged into the Middle Chester River. In addition, the industrial discharge from Chestertown Foods Inc should be addressed as part of the overall upgrades to wastewater treatment. CRISP recommends that the construction of stormwater detention ponds be made mandatory in any new urban development to help reduce sediment and nutrient loadings from urban areas. -NPDES

Lack of Monitoring

Enacting water improvement and restoration techniques is the main goal of CRISP, but the ability to monitor water conditions, evaluate change, and interpret the results of these actions is key in the effort to continually update this plan moving forward. Without consistent, reliable water quality monitoring there is no way to accurately determine the effectiveness of any of the actions, which would therefore result in a low probability of continued water quality improvement.

The United States Geological Survey, (USGS), implements and maintains a nationwide network of water gauges in all forms of water bodies, and therefore should be the point of contact regarding installation of new gauges within the MCRW. The USGS already has the online framework to collect and delineate information gathered at these gauges, and readily provides information on water temperature, discharge, conductance, dissolved oxygen, pH, and turbidity on a 15 minute timescale through most of their gauges. In addition, weekly tests of the indicators identified above should be requested, namely nutrient loads (nitrogen and phosphorus), and enterococcus (bacteria) levels.

In addition to the USGS water quality gauges, local groups such as the Chester River Association often sponsor individuals or small groups to engage in water quality monitoring activities, and these efforts should be encouraged whenever possible. Public trainings on how to undertake these efforts should be held at regular intervals, and equipment can be kept at a central location and loaned out to groups for the specific purpose of reporting water quality data. This would be especially effective for educational groups who may want to bring a class out for hands-on training, for example, to learn firsthand how to test water quality. This achieves multiple goals, as it not only increases public knowledge, but also results in more water quality data being gathered for an ongoing database.

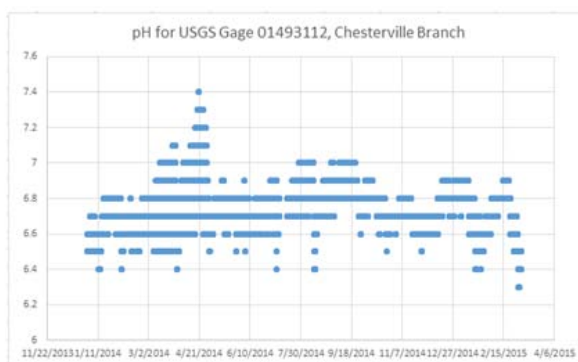

Figure 5. Visual graphic of water quality monitoring output.

Simply recording the water data is not enough to influence change, however, therefore this data should be translated into more useful forms such as graphs, charts, and other visual aids (Figure 5). The numerous possible water improvement actions that can be taken dictate the need for this, as evaluating water quality over long periods of time (5+ years) is the only means by which to reveal real trends and patterns. This will involve an individual, or group, collecting and interpreting the data themselves, and then disseminating it to the public as a final format. This reiterates the need discussed below for an overarching "waterfund" organization, so that a highly knowledgeable individual or group on the area can be responsible for interpreting the results using information from the surrounding area and land uses.

Land Use Change

One of the issues associated with improving water quality within the Chester River Watershed has been changes to the primary use for which land within the watershed is allotted for. As of 1997, a large majority of land within the MCRW was allotted for agricultural land, with developed residential and commercial lands and forested areas following behind it. It is important to ensure that the different anthropocentric land uses do not interfere with the overall quality of the watershed.

Agriculture is considered a permanent fixture to the MCRW, and is viewed as an important business within the watershed, but heavy farming activity presents the risk of chemical runoff into the watershed itself as nonpoint source pollution. Furthermore, areas that are heavily developed usually are composed of impervious surfaces, which restricts runoff drainage and may contribute to pollution. Other factors that may contribute to watershed decline in developed areas include local population density, historic wetland loss (which assumes that all hydric soils within the watershed were once considered wetlands), and soil erodibility, which as of 1997, of the 138 watersheds in Maryland, the MCRW is among those with the highest erodibility.

In order to ensure the watershed is protected among the different categories of land use, C.R.I.S.P. sets out to create a resilient watershed that is capable of adapting to the changing and varying uses of land. To accomplish this, the best option would be to reduce channelization or other water flow impacts. Reducing excessive development around the edges of the river serves to preserve the overall wetland quality. In more developed areas such as commercial centers or residents, efforts should be made to improve surface permeability, allowing water to runoff more safely and efficiently. For areas whose primary land use is agriculturally oriented, the primary effort should be focused on reducing nonpoint source pollution. This can be accomplished by planting natural riparian buffers along vulnerable stream sites. These buffers consist of natural wild plants that act to prevent agricultural pollutant runoff from entering streams. It would also be beneficial to physically block access of streams from cattle or other livestock in order to prevent further pollution from animal waste or destruction of shoreline and increased erosion via grazing.

The implementation of these strategies for land use optimization depends primarily on the cooperation of both the local community and state and federal legislature. The changes and strategies to be implemented by agriculture centers would need to be approved and enacted upon by the local farmers. These individuals could be given incentives in the form of government subsidies to comply with more efficient and watershed friendly practices. For developed and forested land areas, watershed protection practices would primarily fall to local state or federal lawmakers. These individuals should create legislation to reduce impervious surfaces in developed areas, as well as develop strategies to minimize wetland loss and soil erosion. These strategies will increase the overall health and resiliency of the MCRW and will help buffer against future changes.

Organization of Efforts

One of the problems facing water quality improvement and watershed restoration efforts across the nation is the large number of inputs, and the multitude of agendas and plans to clean up water sources. This is no different in the MCRW, as evidenced in the "Interested Parties" section above. On top of the sheer number of individual influences, stakeholder groups range in size from small, local charity organizations to state and even national level organizations and regulations enforced by groups as large as the EPA, and thus communication is often slow and arduous as needs are not the same on every level.

To address many of these problems, this plan advocates the formation of an entity of dedicated individuals focused solely on this watershed, and working to streamline its rehabilitation and conservation moving forward. This proposed group is referred to throughout the remainder of this plan as a "Waterfund." This Waterfund will help eliminate the problems described above, allowing for a more efficient adoption of water quality improvement techniques.

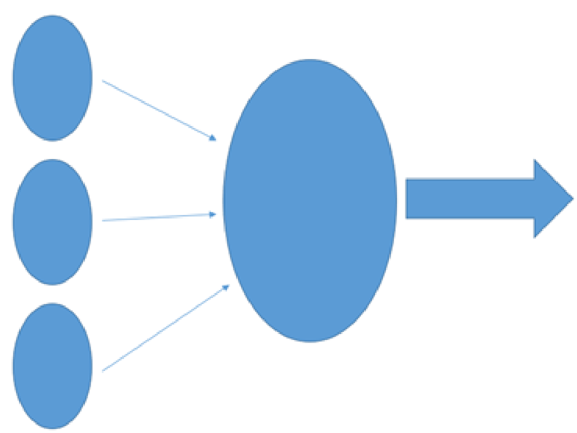

Figure 6. Visual representation of consolidating multiple stakeholder inputs into one Waterfund.

A good example of the possible advantages to having a Waterfund comes from the organizations listed above, and their possible contributions to an overall healthier MCRW. Long-term water quality improvements dictate that many layers of work be done simultaneously, and without coordination these efforts could become very repetitive, even redundant as multiple groups work toward the same goal. In the case of water quality monitoring, while more data is almost always a good thing, it may eventually become apparent that the level of incoming data is more than can be accommodated, or is beginning to overlap, and that efforts are better spent repairing on-the-ground conservation efforts elsewhere, for example. If these organizations worked independently of each other this overlap may never be noticed, and unnecessary and inefficient work could be undertaken toward a project where fiscal responsibility is a necessity for successful implementation.

On a similar note, having an established Waterfund to oversee all efforts to restore the MCRW could provide a funnel for available funds. Again, instead of agencies being disorganized, cooperative efforts would result in better fiscal responsibility. If the Waterfund is able to combine contributions or funding into a larger pot, many of the smaller scale items can still be accomplished without having to invest as much on overhead, and therefore, increased resources can be invested toward increasing the quality of additional conservation practices.

This allows for bigger ticket items to be funded, whereas they may not have been feasible otherwise. If a riparian buffer project cost $2 million, and 4 individual funds receive $500,000, on their own, none of them can afford to install the buffer. If the Waterfund is aware of each of these funded entities, however, it can easily bring them together to tackle the large project. As such, the possibility for larger scale work and accomplishments increases exponentially.

Lastly, a Waterfund, or one source of watershed oversight, allows for better communication between the different stakeholder groups including various levels of government. If NPDES permitting efforts need to communicate with local and state agencies, who then need information from 6 different non-profits or charities in the region, the amount of communication time alone could take months. However, if all parties involved know to turn to the Waterfund, it allows for one common target for their questions and answers, and the fund itself can help bring the information together to expedite the process.

This Waterfund may grow naturally out of the local Conservation District or other organization, but will likely have to exist separately to ensure efficiency. Hiring a head for the organization, or a “Riverkeeper” for the MCRW, to head this will be the first step, and from there it can be determined just how large the organization needs to grow to work effectively.

Conclusion

The Chester River Integrated Strategic Plan aims to bring the Middle Chester River under USGS water quality targets for fishable and swimmable rivers by 2030, and create a new and sustainable infrastructure to improve the resiliency of the watershed. In order to accomplish this, C.R.I.S.P. has identified the key issues that are affecting the watershed and has taken steps to rectify them, such as the presence of nonpoint and point source pollutants, lack of organized monitoring of the watershed, different solution needs for different uses of the land, and the coordination and organization of these strategic efforts. By following C.R.I.S.P. the continued health and safety of the Middle Chester River Watershed would be assured,enabling continued and sustainable use of the watershed for future generations.

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