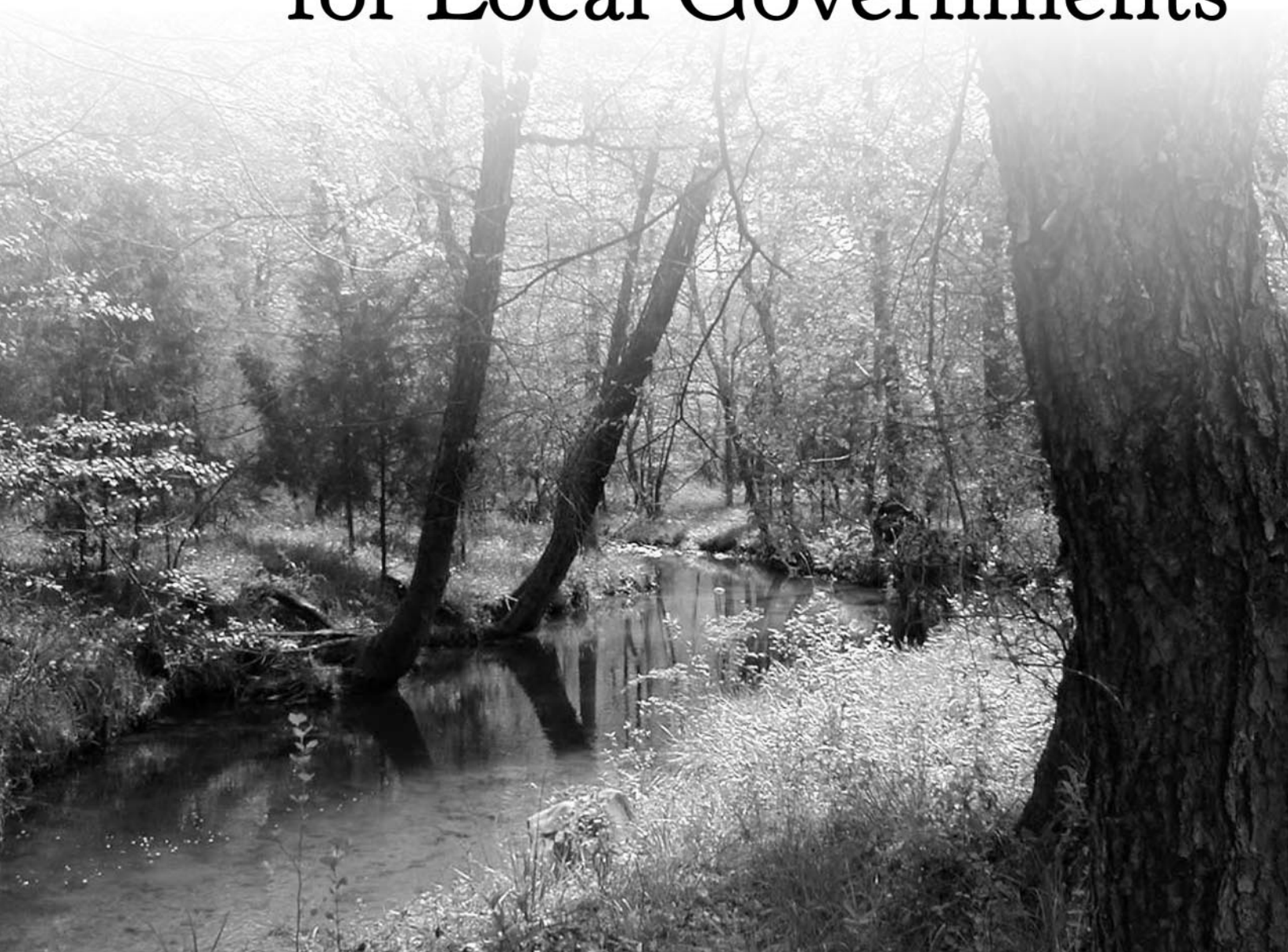
UNIVERSITY of VIRGINIA

A Stream Corridor PROTECTION STRATEGY for Local Governments



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A Stream Corridor Protection Strategy for Local Governments

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INTRODUCTION

As efforts to protect the Chesapeake Bay have expanded, there has been a growing awareness that the fate of the Bay does not lie simply in the hands of the fishermen who ply its fertile waters, the industries or power plants along its shores, or the people who make the Bay and nearby environs their home. The Bay's rivers and streams are its arteries and serve as nursery grounds for important commercial fishery stock, such as eels or blue crabs. Increasingly, it is recognized that the rivers and streams that feed the Bay must also be clean and healthy, if the Bay is to regain much of its former life and productivity.

'Chesapeake 2000' Bay Agreement

The Chesapeake Bay Program, formed in 1983 by the first *Chesapeake Bay Agreement*, is a unique regional partnership leading and directing the restoration of the Chesapeake Bay. The Bay Program partners include the states of Maryland, Pennsylvania and Virginia; the District of Columbia; the Chesapeake Bay Commission, a tri-state legislative body; the U.S. Environmental Protection Agency (EPA), which represents the federal government; and participating citizen advisory groups.

For nearly twenty years the Bay Program partners have sought to protect and restore this unparalleled resource. The second *Chesapeake Bay Agreement*, adopted in 1987, established a vision for the Bay's restoration. Its goals included proposed reductions of harmful nutrients. In 1992, the Bay Program moved upstream, with strategies for attacking nutrients at their sources in the Bay's tributaries. The Chesapeake Executive Council (CEC) – composed of the Governors of Maryland, Pennsylvania and Virginia; the Mayor of Washington, D.C.; the EPA Administrator; and the Chair of the Chesapeake Bay Commission – signed five directives in 1993 that addressed key areas to be restored. These areas included the tributaries, toxics, underwater Bay grasses, fish passages and agricultural nonpoint source pollution. In 1994, the partners outlined initiatives to restore aquatic, riparian and upland habitats, reduce nutrients in the Bay's tributaries and reduce toxics, emphasizing the prevention of pollution.

Throughout the 1990s, the Bay Program developed programs to engage local governments in the Bay restoration effort, established priorities for land, growth and stewardship throughout the Bay region, set goals to increase riparian forest buffers, renewed commitments to reduce nutrients in the Bay, expanded wetlands protection and broadened its support for community-based watershed restoration efforts.

On June 28, 2000, the CEC signed *Chesapeake 2000* – a comprehensive and far-reaching Bay Agreement that will guide the Bay Program partners through the year 2010 in their combined efforts to continue to restore and protect the Chesapeake Bay. *Chesapeake 2000* outlines ninety-three commitments, detailing protection and restoration goals critical to the health of the Bay watershed. It pledges to increase riparian forest buffers, preserve additional tracts of land, restore oyster populations and protect wetlands. *Chesapeake 2000* focuses on improving water quality as the most critical element in the overall protection and restoration of the Bay and its tributaries.

In recognition of the importance of these arteries, *Chesapeake 2000' Bay Agreement* includes a number of goals related to Bay tributaries, such as: "By 2002, ensure that measures are in place to meet our riparian forest buffer restoration goal of 2,010 miles by 2010."

The agreement also calls for local watershed management plans to be devised and implemented by 2010 in two-thirds of the Bay's watershed. Goals for the reduction of nutrient loadings, standards for aquatic life and other criteria are also found in the new Bay Agreement.

Commitment 2.2 of the Chesapeake 2000 Bay Agreement

"By 2010, work with local governments, community groups and watershed organizations to develop and implement locally supported watershed management plans in two-thirds of the Bay watershed covered by the Agreement. These plans should address the protection, conservation and restoration of stream corridors, riparian buffers and wetlands for the purpose of improving habitat and water quality, with collateral benefits for optimizing stream flow and quality."

Audience for and Use of This Guide

This guide is intended for local government planners, engineers, planning commissioners, boards of supervisors and city and town councilors. Secondary audiences include environmental groups, civic groups, neighborhood associations and others who may use the guide to plan projects or to suggest programs to their elected officials and government staffs. The guide may also be of interest to those engaged in funding decisions, in order to help them develop funding priorities.

This guide was developed to help local government staff and others formulate a protection strategy for their stream(s), in order to protect the health of their communities and, ultimately, of the Chesapeake Bay. It can also be utilized to help local governments develop a process for meeting Commitment 2.2.

for developing watershed plans. The guide is intended as a reference tool, a primer for project planning and a guide for the development of new tools to protect and restore stream corridors.

Appendices

Some readers may want more background on a particular state program or on relevant regulations and management approaches. To avoid the problems of providing too much information to readers who already have extensive knowledge, the following background information has been placed in a series of appendices at the end of the guide:

- Appendix A provides a resources and references for topics discussed in the guide.
- Appendix B describes federal, regional and state programs.
- Appendix C covers relevant legislation and agreements.
- Appendix D is a Glossary of Terms used in this guide.

CHAPTER 1

The Benefits of Local Stream Protection

Streams serve as the circulatory system for our land. The system (the hydrologic cycle) moves water through the environment as surface water, ground water and vapor, and also stores it in vegetation. Once water falls from the sky as rain onto the land, it drains from that land into a particular river or body of water. That land area is known as a watershed. Taking care of our streams requires taking care of a watershed's land, since land runoff is a principal source of stream pollution. For instance, the U.S. Environmental Protection Agency (EPA) estimates that more than half of all stream pollution comes from land runoff, which can contain pollutants such as sediment, oil, fecal material, fertilizers and pesticides.

Stream corridors provide vital networks for wildlife and, in many urban areas, streams are their last remaining habitat. Streams surrounded by a healthy mix of native vegetation including grasses, shrubs and trees can be buffered from the effects of surrounding land uses, which might otherwise harm the stream.

This chapter provides an overview of why it is important to protect streams and the values and functions that they provide. Understanding stream values (such as flood control) and ensuring that their functions (such as water storage and transport) are not hindered are critical to achieving a successful stream protection strategy.

Watershed:

An area of land that drains into a particular river or body of water. The watershed includes its associated groundwater. High land forms serve as watershed divides. Several watersheds together form a drainage basin.

Stream Functions and Values

Streams and floodplains are not only landscape features they also perform important functions, such as the storage and transportation of land runoff. Understanding how streams function is critical to the adoption of feasible strategies for their management.

All too often, planners and elected officials only consider the need to more effectively manage stream channels after a flood event, when they must deal with the costs associated with emergency repairs and the loss of property and lives. They fail to realize that the causes of increased flooding and stream damage are often the result of changes to the watershed's land development patterns, which may have modified the hydrologic regime so that storm flows peak higher and faster than before, causing greater in-stream bank erosion, stream bed scouring and habitat damage.

Streams normally change their course over time, sometimes dramatically, due to natural causes such as hurricanes or avalanches. However, dramatic changes can also be wrought by the sudden paving of portions of the watershed. Increasing the amount of pavement in a watershed, or even changing land use from forests to fields, can greatly increase discharge to streams, since both of these greatly reduce land permeability and soil storage. Eventually, a stream will adjust to a new equilibrium, but this may take many years, or even decades, to achieve. A stream's channel, sediment load and physical patterns, such as its sinuosity (curviness), must re-adjust to flows that are higher and/or suddenly carrying increased sediment and debris. A stream will work to gain a new equilibrium to match altered rates of runoff from the land.

The notion that streams perform physical functions can be understood by thinking about the valleys caused by the process of erosion, whereby streams carry away the sediment and organic matter washed from mountains and serve to carve pathways through our landscape, changing in response to floods, geologic uplift, human alterations, climatic changes and other factors. Events such as floods also serve an important function in deposition of rich soils within the floodplain that nourish the floodplain's vegetation, which in turn nourishes wildlife. Understanding how streams function is key to devising a successful approach to protecting them. For example, an approach that does not factor in the natural tendency of the stream to flood may result in loss of property and even lives. In urban watersheds, people

Stream Functions and Values

For People

- Drinking water
- Recreation
- Industrial uses
- Transportation
- Ecotourism
- Views and waterfronts
- Floodwater retention
- Agricultural soil deposition
- Aesthetic values
- Cultural values

For Wildlife:

- Habitats for fish, animals
- Corridors for safer passage
- Water sources

may not have left room for a stream to change its pattern because the floodplain has already been developed.

The Need for a Stream Corridor Protection Strategy

There are many reasons a locality may decide to develop a strategy to protect a particular stream or the tributaries of an entire watershed. Regulatory drivers, such as the new Total Maximum Daily Load (TMDL) and Stormwater provisions of the federal *Clean Water Act*, or the need to provide clean water supplies under provisions of the federal *Safe Drinking Water Act* may heighten the need to protect surface waters. Alternatively, the need to conform with state provisions, such as Virginia's *Chesapeake Bay Preservation Act* or Maryland's *Critical Area Act* may require local governments to engage in watershed protection.

Clean Water Act

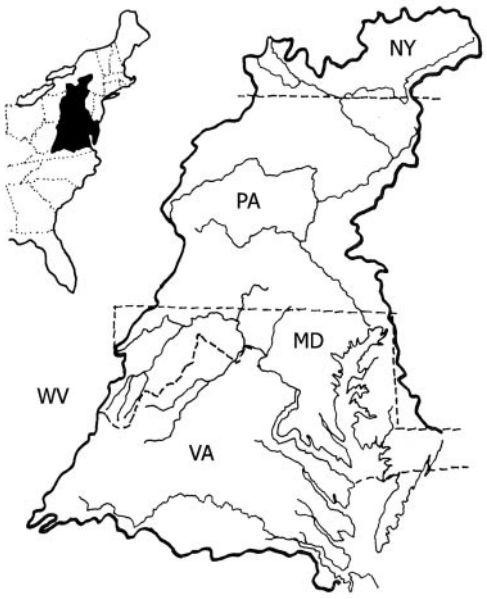
Government agencies at the federal, regional, state and local level have been taking a greater interest in preventing the impact of excess stormwater, as new requirements for controlling stormwater come into play. The federal *Clean Water Act (CWA)* requires that cities and urbanized counties with populations greater than 100,000 people develop stormwater management plans and obtain discharge permits for stormwater outfalls. As a result, municipalities which fall under these requirements are having to implement new controls for stormwater runoff and can no longer simply allow runoff to flow directly into streams though stormwater discharge pipes.

Other new regulatory requirements that are now taking effect include the Total Maximum Daily Load (TMDL) Program under the federal CWA, which requires that states set pollution control plans for impaired rivers and streams. (For more on TMDLs and other regulations, see Appendix C).

These new programs may cost states and municipalities millions of dollars to tackle. Planning now allows local and state agencies to take a phased approach to addressing stream problems and will not only save money over the long term, but will also allow more creative and effective solutions to these problems. Examples of how potential solutions can be applied are found throughout this guide.

Regional and Multi-State Restoration/Protection Goals

There are also regional and multi-state requirements that drive watershed protection efforts. With a 64,000 square mile drainage basin encompassing Maryland, Pennsylvania, Virginia, the District of Columbia and parts of New York and West Virginia, the health of the Chesapeake is directly dependent upon the quality of the streams that feed it.



Bay drainage map

The *Chesapeake 2000* Bay Agreement signed by the Governors of Maryland, Virginia, Pennsylvania and the Mayor of the District of Columbia's establishes voluntary goals for stream protection across the basin. For example, it calls for each jurisdiction to develop guidelines by 2001 for the aquatic health of streams and to develop stream corridor restoration goals based on local watershed management planning by 2004. This guide can assist planners, watershed managers and elected officials effectively implement such planning.

Local Values of Stream Protection

Apart from regulatory drivers, a locality also may decide to improve stream protection measures to enhance or protect economic values. One example of this would be if a town wants to promote tourism using a riverwalk promenade that depends on a clean and healthy waterway. Nature-based tourism, or '*ecotourism*,' is another economic rationale that can lead to efforts to protect streams. For example, Virginia's Nelson County is a largely rural, mountainous county that is continually seeking to promote its 'natural heritage' as a way to bring needed tourism dollars to the county. A key aspect of promoting heritage tourism in Nelson County is protecting the health of the Rockfish River for uses such as fly fishing and canoeing.

Community values may serve to form the principal driving force for stream protection. For example, a community-level initiative led to the creation of Minimum In-Stream Flow (MIF) standards for Virginia's Maury River in the mid 1990s, Citizens wanted to ensure that fishing, boating and ecological health would not be harmed by low flows resulting from excessive water withdrawals.

Pressures of development

While the Clean Water Act (CWA) has done much to protect streams and rivers from the runoff of large industrial and municipal dischargers, the rapid pace of development in the Bay's watersheds has resulted in more paved surfaces. These have caused higher runoff, which carries contaminants that are harmful to surface and ground water. It is estimated that the population east of Interstate 95 will continue to grow rapidly on the lands closest to the Chesapeake Bay. This population boom will make the goal of protecting and restoring the Chesapeake all the more difficult.

Protecting streams and rivers from the impact of population growth will not only help to protect the Bay, but also the quality of life for local residents, businesses and stream-dependent fish and wildlife. As growth occurs, the demand for drinking water supplies increases. Streams that may not have been consid-

ered a priority are suddenly eyed as the key to new development. Also, as communities grow, groundwater sources may dissipate as limited aquifers are tapped by more wells. As our understanding about contaminants has expanded, so have the standards required to prevent the contamination of public drinking water supplies.

Community strategies

Communities should look to implementing protection strategies now, in order to ensure the safety of future drinking water supplies, fifty percent of which come from surface water. In the long run, it is much less expensive to ensure that today's land uses do not harm the future of the stream as a source of drinking than it is to try to restore the quality of the stream after it has been degraded.

Whether a locality seeks to protect streams for regulatory, economic or ecological reasons, the approach taken must incorporate a thorough understanding of the stream's ecological functions and the values people place on those functions. This is not only critical to ensuring that the goals of a stream protection strategy are met, but also to designing projects of an appropriate scale, focus and approach. Those communities that devise successful stream protection strategies today will not only reap the rewards of healthy, desirable communities, but will also avoid expensive clean-up costs in the future. Failure to plan is planning to fail.

Why Adopt a Stream Corridor Protection Strategy?

While federal and state programs mandate requirements for stream protection, such as prohibitions against dumping, streams cannot be protected adequately simply through adherence to federal and state regulations. Despite the protections afforded by the *CWA*, enforcement of statutes is often lacking because of inadequate staffing and resources to police violations. Also, problems may be caused, not by willful destruction or harm, but by lack of awareness on the part of property owners or local governments.

An example of this was a sediment problem in a northern Virginia creek that was caused by lack of requisite erosion control measures on the part of a county utility project. Another example was when a local creek suffered a mysterious annual fish kill. It turned out to be the result of a private swimming club emptying chlorinated water directly to the creek without using a holding pond to allow the water to dechlorinate. In both cases, the law was adequate; it was enforcement that was lacking. A stream protection strategy can serve to build awareness and compliance with existing regulations. In both cases described above, community volunteers trained in stream regulations found and reported the violations led to solving these long-standing pollution problems.

When devising a stream protection strategy, it is equally important to consider the need to plan for future protection. For example, a local Soil and Water Conservation District is currently laying plans for the protection of a creek in the Middle James River Watershed, so that watershed development will not preclude using it as a drinking water source in the future. The district is not seeking to halt development *per se*, but working to put conservation measures in place now, to mitigate excessive runoff from future development.

Local Planning Issues

Many local planning issues are linked to stream protection, so local groups need to understand how these relate to local protection measures. For example, in Charlottesville, Virginia, the debate over whether or not to ban free-roaming dogs from several city parks was more complex than simply an issue of public safety. Moore's creek, which borders some of the parks, is on the state's 303(d) list for clean-up because it contains fecal contamination in excess of state and federal standards. Thus, proposals for 'dog parks' along the creek would need to consider the impact on the mandated clean-up plan, in order to avoid adding more fecal contaminants to the creek. In the past, local government officials might not have considered the impact of the *CWA* on a city dog ordinance, but this is not the case today.

In a similar vein, local governments need to coordinate their activities across jurisdictional boundaries. For example, rapidly developing areas in Virginia are increasingly looking to fill water needs via inter-basin water transfers. One county may eye a stream for future drinking water supplies while an upstream county may be planning to site a future wastewater treatment plant on the same stream. Or, two states may share a large water basin, such as the Anacostia River, which drains a large portion of Maryland and the District of Columbia, or the Potomac, which is drained by D.C. and Virginia and portions of West Virginia. Cooperation and effective stewardship are needed by all states and localities, especially when watersheds are shared. The future of the Chesapeake Bay depends on a shared commitment and effective stream protection strategies by all municipalities within its drainage.

Watershed divides are easy to discern in areas such as the Blue Ridge Mountains.

Regional Planning Issues

Regional approaches to government, such as through Planning District Commissions, cannot solve watershed management needs, since these districts don't always match watershed boundaries. Moreover, as non-regulatory bodies, planning districts can only provide advice; and the advice and related technical assistance they give varies greatly, depending on available staffing and funding. Creative partnerships are often needed between jurisdictions to ensure that a watershed-level strategy is developed.

Fiscal Considerations

From a fiscal standpoint, the cost of putting off anticipated problems does not defray costs but actually *increases* them,

sometimes far in excess of the amount that would have been expended initially. For example, the costs of treating drinking water can be far less if a community adequately zones areas for watershed protection now, so that expensive water treatment, land purchases and easements can be avoided in the future.

Similarly, setting aside land now to allow for natural functions may cost less than their man-made equivalent, such as large flood control structures. An often-cited example concerns the wetlands associated with the Charles River in New England. A cost-benefit analysis performed in 1972 by the U.S. Army Corps of Engineers showed that purchase and protection of existing riparian wetlands on the Charles River would prevent $17 million in annual flood damage costs, because the riparian wetlands were far more cost-effective for flood control than the engineering alternatives originally proposed by the Corps (National Wildlife Federation, 1997). The wetlands remain protected today and continue to abate flooding, purify the water and recharge the drinking water source aquifer, while providing critical habitats for myriad plant, animal, fish and bird species.

CHAPTER 2

Assessing a Stream's Current Condition and Future Impacts Upon It

Approaches to stream protection can either be comprehensive, encompassing all streams in a jurisdiction, or they can be limited to addressing issues in a particular watershed. In both cases, it is important to understand the current health of a stream, in-stream uses, land uses within the drainage area and how future plans may affect stream health.

Assessing a Stream's Current Condition

Unfortunately, when considering a stream's current condition, land managers, regulators and scientists often lack the data they need to make the best decisions. If a stream has not been monitored recently, or at all, there may be little or no data available about its condition. Even if there is annual monitoring, it may not adequately identify the true, long-term health of the stream, or it may be missing a contaminant that is not identified by the usual suite of tests. The following list provides an overview of the types of data one might assess in considering stream health. While it might be tempting to monitor everything in this list, there will be practical realities of time, funds and staffing. Which parameters should be measured will depend, in part, on the goals for your strategy and what you determine you need to know before beginning.

Considerations for Assessing a Stream's Condition

The following aspects of a stream corridor should be considered, in order to gain a picture of its current condition:

Physical and biological characteristics

- *Drainage area:* The land area draining to the stream(s), which makes up its watershed.
- *Stream health:* Measurement of the stream's chemical and biological parameters, its habitat and water flow, and the characteristics of its riparian vegetation.
- *Wildlife and fish:* Animals and fish in the stream, especially rare, threatened or endangered species.
- *Riparian condition:* Stream buffer width, vegetation types, stream bank stability, floodplain uses and condition, and tree canopy coverage.
- *Channel stability:* Measurements of the stream's channel and floodplain, including delineation of floodplains and flood-prone areas, the degree of sinuosity and channel type.
- *Erosion potential:* Locations and percentages of steep slopes, especially areas with highly erodable soils, which may contribute to excessive siltation of the stream.

Land uses and zoning

- *Land uses:* Watershed land uses and zoning, including current land uses and the potential for those uses to impact the stream; for example, an oil tank farm that may be subject to spills.
- *Runoff potential:* The percentage of imperviousness, measured by paved area and compacted soils in high use areas, which affects rates and volumes of runoff and water quality.
- *Protected areas:* The percentage of land under permanent protection; for example, conservation easements and National Park lands.
- *Disturbed areas:* Areas with disturbed land needing remediation, such as abandoned surface mines that have not been reclaimed.
- *Flood damage mitigation:* The percentage of land within the 100-year floodplain that is available to mitigate flood waters, versus the percentage of developed land.

Cultural uses

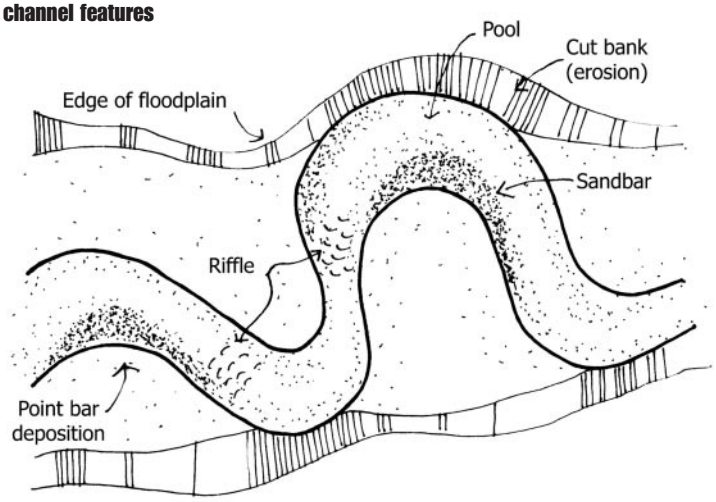
- *Significant sites:* Historical or culturally significant sites, such as historic locks, dams and Native American encampments.
- *Recreational uses:* Recreational uses, such as fishing, hiking, boating and access points.

Historic sites, such as this lock along the Rivanna River, are important to include in any stream inventory.

Health of a Stream's Aquatic Life

There are several factors than can affect the health of a stream's aquatic life, such as the makeup of the stream's water chemistry. For example, acidity levels may affect the type of algae present, which in turn affect the type of aquatic insects and fish that can thrive there. Similarly, lower oxygen levels and higher temperatures can provide breeding grounds for the development of waterborne diseases. A sound monitoring program should seek to combine measurements of the stream's chemical, biological

stream channel features



and physical health, in order to accurately assess problems with and threats to the stream, and to design an effective remediation or protection strategy.

Measuring aquatic life

The composition and distribution of a stream's aquatic life provides an indication of the stream's health. Fish are a useful indicator of this. The distribution of juvenile fish within a stream can indicate its health, as can the distribution and wealth of fish species. Other methods, such as fish tissue analysis, can also be used to determine if there are sources of toxic pollutants in the stream.

The *Index of Biological Integrity* is one measure used to evaluate the diversity of a stream's aquatic life. Organisms, such as *macroinvertebrates* (aquatic insects and their larvae) and crustaceans, can provide useful indicators of a stream's condition. Many, such as the winter stonefly, are very sensitive to pollutants and some agencies use their relative abundance and diversity, or their absence, as an indicator of stream health. Biological monitoring of aquatic organisms may also show impairments missed by other methods. For example, a 1988 study done by the Ohio Environmental Protection Agency states that, while the presence of a water pollution impairment in a stream was detected 64 percent of the time using just chemical monitoring, biological monitoring showed impairment 94 percent of the time when the stream was impaired.

Reference conditions

Water quality standards for a stream's aquatic life are based upon *reference conditions*. A stream within the general area, though not necessarily within the same watershed, and which is considered to be representative of optimal local ecological conditions, is used to devise a standard, against which other streams can be compared. The advantages of this system are that it allows different standards for tidal streams, coastal plain streams and mountainous headwater streams. These three types of stream naturally vary in terms of their populations of macroinvertebrates, fish, and plant species and habitat conditions.

However, the reference condition approach has limitations. If there are no healthy streams in the region, as may be the case in a heavily urbanized or suburban area, standards may be set lower than are desirable or possible. Also, human interpretation of those reference standards can vary and may be erroneous.

Habitat Concerns

In addition to the need to meet minimum water quality standards, habitat should also be considered as a critical aspect of stream health. A stream may meet chemical water quality standards but lack the requisite habitat needed to support certain fish species, such as trout that require deep pools, runs, riffles and overhanging roots and vegetation to provide cover from predators. In addition, high stormwater flows may be scouring the stream bed and banks, preventing colonization by aquatic insects or the development of fish spawning beds.

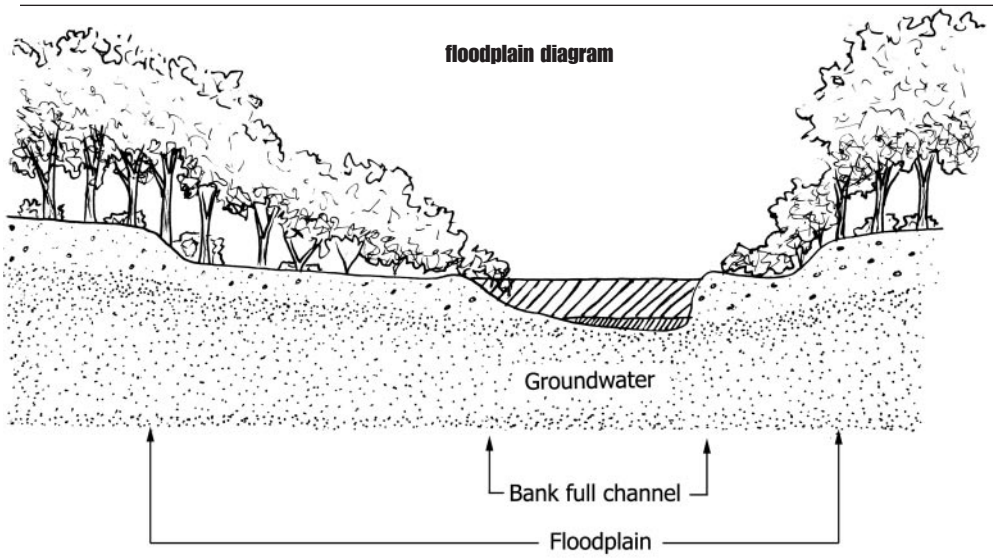
Morphology of the stream channel

A stream's habitat may also be impaired by physical alternations such as channelization, armoring the streams banks with concrete, metal or riprap, dredging the stream bottom, or putting in road crossings, culverts and stormwater outfalls. While these uses may be legal, they can impair water quality. Resource managers should consider options for their removal, mitigation or replacement with environmentally beneficial structures, such as bioengineered approaches.

The *morphology* of the stream channel – its shape, the percentage of its course consisting of riffles and runs, its sinuosity and the degree of stream *entrenchment* (carving of an over-deep channel and steep banks) – can all be measured to provide an indication of stream bank stability.

The stability of the stream will affect the rates of bank erosion, flooding and habitat quality. There are habitat restoration

floodplain diagram



approaches that can be taken to realign stream channels that have been altered by watershed development and high stormwater flows, or by prior efforts to straighten the channel. However, these efforts to work in-stream should not be undertaken without a complete understanding of a stream's morphology and flow or without adequate engineering studies. *Applied River Morphology* (see Appendix A) is an excellent reference tool for understanding and evaluating river morphology.

Riparian corridor habitats

A comprehensive approach to stream protection considers, not only in-stream health and habitat, but also the *riparian corridor* and related habitats. The riparian corridor includes:

- the stream,
- its banks and floodplain,
- associated vegetation.

Within the floodplain, existing riparian wetlands may be hydrologically linked to the stream and provide critical nursery grounds for amphibian species, such as salamanders and newts. Streamside vegetation contributes leaf litter to the stream, which is then utilized as food by aquatic insects, known as macroinvertebrates, which then serve as food for fish.

Stream vegetation often includes tree species that require moist environments, such as green ash, button bush alder and basket willow. Streams that lack adequate, native vegetation will suffer from changes in associated riparian animal life.

Use of Federal Standards for Stream Quality

A stream may meet established state and federal standards, but these standards may not match optimum ecological health. There can be several reasons for this:

- State environmental agencies designate streams for particular uses; these uses inform the standards that agencies require for discharges to those waters.
- A stream subject to heavy industrial usage may have industrial permits that are more lax than those for a healthy trout stream or for a source of drinking water.
- Generally accepted standards for discharge may be lower than a stream can optimally support. For instance, it is common to set a limit of 5.0 milligrams/litre (mg/l) of dissolved oxygen (D.O.) as a minimum water quality level, which must not be exceeded by discharges from a sewage treatment plant. However, some fish require a higher dissolved oxygen level; trout, for example, require 7.0 mg/l D.O.

Additionally, there are no federal standards for some pollutants. Sediment, for example, does not have a standard. Although streams naturally transport sediment, excess sediment in a stream is a pollutant, as it blocks light to aquatic vegetation, smothers benthic aquatic life and fills available habitat areas. Color is another pollutant for which there are no standards. A colored discharge that clouds water visibility also blocks sunlight needed by aquatic plants.

In addition to meeting legal requirements for water quality, a community may wish to set higher goals for the stream than the statutory minimum standards. For instance, if the county or city's Comprehensive Plan sets a goal of protecting potential water supplies, then protection measures, goals and standards may need to be strengthened beyond current minimum levels. The community may also designate a stream for additional protection because it is a popular trout fishing stream, an area where it plans to develop ecotourism, or simply a place of value to the community, even if there are no intended uses beyond preservation.

Assessing Future Impacts On a Stream

In addition to present conditions, it's necessary to catalog the potential impacts of future development or land use choices on a stream, in order to determine priority areas for projects or to determine the likelihood of success for your proposed strategy. You will need to consider any reasonably foreseeable changes or planned developments that may significantly impact land use, stormwater or the stream/corridor system.

When assessing future impacts on a stream, the following things should be considered:

- The percentage of watershed land that is zoned for future development and the type of development (e.g. parks or shopping malls) allowed under that zoning.
- The potential increase in impervious surfaces in the watershed arising from future development, including roads, parking lots and rooftops.
- Future demands on the water supply that might impact flows, such as new power plants or planned drinking water impoundments.
- Estimated increases or decreases in population and employment, which may or may not change imperviousness, based on allowed development patterns (for example, erecting taller buildings or more densely may reduce the level of imperviousness).

The gathering of this information may not be as daunting as it first appears and the following chart is designed to aid in locating this information. It may not be feasible to collect and analyze all of the suggested data, nor may it be necessary. For instance, in a relatively undeveloped watershed that is experiencing little or no growth, development patterns or water quality data may be of less concern than in a rural county that is being rapidly urbanized. Finally, the level of detail required depends upon the project. (For more on this see Chapter Three.)

Data Types	Sources								
	State Environment or Natural Resource Agencies	State Fish & Game Dept.	Soil and Water Conservation Districts	County or City Planning Dept.	US Fish & Wildlife Service	USGS or map store	Historical society, historic resources, local NGOs, & land trusts	Dept. of Forestry	Local Govt. Dept. of Engineering
Water chemistry	✕								
Biological data	✕	✕							
Habitat	✕				✕				
Endangered or threatened species	✕	✕			✕				
Channel	✕				✕				
Soils			✕						
Land uses			✕	✕					
Wetlands					✕				
Floodplain									✕
Forest cover								✕	
Buffers					✕			✕	
Topography						✕			
Water flow						✕			
Historical use							✕		
Land ownership				✕					
Easements	✕						✕		
Zoning				✕					
Future land use				✕					

CHAPTER 3

Deciding On a Protection Strategy

There are a range of ways you can protect a stream. However, before deciding which stream protection strategy to adopt, it's important to understand two key considerations that should be utilized in devising your strategy. Consider the degree to which your strategy:

- protects and/or restores native species, natural stream banks and maintains or improves existing water quality and quantity,
- protects existing non-harmful community uses, such as access for fishing or boating.

If you don't take these considerations into account, your project probably won't achieve its maximum potential benefits and community support.

To create an effective stream protection strategy, you need to consider *every* aspect of stream restoration, not just one or two aspects in isolation. For example, a conservation group sought to restore fish habitats by adding additional pools, runs and riffles to a suburban creek that suffered from extreme stormwater flows. However, the stormwater carried warm, contaminated street runoff into the creek, resulting in poor water quality and stream temperatures that were too high. Even though fish habitats were improved, water quality was still inadequate to support fish. The project failed to consider every aspect of restoring the stream.

If the group had fully considered all the necessary stream conditions, it would have realized that the project was unfeasible and saved a lot of wasted effort. The best approach would have been to address the need for improved stormwater management rather than to build fish habitat structures.

If you're going to implement a successful stream protection strategy, you need to develop a sound understanding of:

- existing baseline stream and riparian conditions,
- existing regulations to protect or restore the stream,
- future land use changes that may change watershed conditions by affecting land runoff and resultant stream flows or water quality,
- the effects of each change that you might make on the stream and riparian corridor.

These apply whether you are monitoring the effectiveness of an ordinance or regulatory framework or are monitoring the success of a particular project or site plan. If you want to ensure that you understand existing baseline conditions for the stream and its riparian corridor, you need to develop a monitoring mechanism to gather that data. The main way to do that is to monitor the stream over a period of time. There are a number of ways you can do this, which are outlined in Chapter Two. They will enable you to determine how your stream is doing and to assess progress toward any goals that you set for the stream.

Elements of a Stream Protection Strategy

Once you have assessed the baseline conditions for the stream, you need to create a strategy for protecting it. A typical strategy lays out the general aims of the protection program and its specific goals. These goals are then broken down into targeted objectives, which can be monitored and assessed periodically to see how well the goals are being achieved. The objectives are then broken down into particular actions; for example, a project to replant a specific stretch of river bank or a project to monitor outflow from a point source.

Thus, you have a strategy comprised of:

- Goals
- Objectives
- Actions

Your strategy will probably depend upon the extent of the problem, the resources you have available and the number of streams and watersheds affected. You may, for example, decide to

Sample Project Goals

- To achieve certain water quality standards.
- To enhance economic value.
- To provide recreational opportunities.
- To protect sensitive watersheds.
- To protect current or future water supplies.

Elements of a Stream Protection Strategy

concentrate on all the streams in one watershed, rather than dissipate your resources over the whole area of your jurisdiction. Alternatively, you may see protecting drinking water supplies as the number-one priority. So your strategy will be to protect streams that are drinking water sources.

Consider what you hope to achieve with your stream corridor strategy. Are you seeking to meet regulatory standards, protect historic or ecological resources, respond to increased flooding and property damage, promote tourism and recreation, or possibly combine current legal statutes so that they achieve a comprehensive approach?

Baltimore County's Water Ordinance

A comprehensive approach taken by Baltimore County, Maryland's Water Protection Ordinance (Article IX) calls for protection of water quality, streams, wetlands and floodplains and requires that all proposed developments prepare and submit for approval a plan that does not violate requirements for protection of surface and ground water and sets specific requirements for the protection of associated buffers, slopes and erodible soils, along with enforcement provisions and monitoring.

It is difficult to determine a strategy without first collecting some baseline data. You need to consider what data you need to collect. You will be able to do this once you've determined a strategy. This is a bit of a Catch 22 situation, but you do need to do preliminary data collection first, before you can really decide what your strategy needs to be. Once you've established your strategy and goals, you can then return and focus further data-gathering around those goals.

Determining the Strategy's Approach

When you are working out your stream protection strategy, you should ask yourself questions to determine the most effective strategy for achieving your objectives such as:

- Will the approach be site-specific? Will we design guidelines or regulations to achieve watershed protection for land-disturbing activities or proposed developments?
- Will we use zoning to protect specific areas such as developing overlay zones for near-stream areas and critical habitats?
- What do current regulations require? Do they require specific *best management practices* (BMPs), such as stream buffers or areas where some, or all, development is restricted?

Omnibus approach or retro-fitting?

An *omnibus* approach to stream management employs regulations that apply to all development permits. It may be useful for areas experiencing rapid growth, where additional environmental requirements for new development may be the most effective. On the other hand, *retro-fitting* existing sites will have the greatest impact in areas that have already been developed.

Voluntary approach

Regulations that apply to new development permit requests are likely to have little impact in developed urban areas. Requests for variances, planned unit development (PUD) applications or rezonings are ways for municipalities to influence land management practices, but these approaches are "hit or miss." In already developed areas, it may be critical to apply a *voluntary* approach. (See the *Anacostia Waterfront Initiative* inset box.) This requires a system of incentives and partnerships and may result in the greatest gain. Additionally, working with individual landowners who have political influence may increase program effectiveness.

Current initiatives and proposals

As you develop your strategy, it is critical to thoroughly understand what has already been studied, proposed and implemented for the watershed. You need to learn about other initiatives and decide whether you want to partner with them. You may be able to use findings from their studies and plans. There may be research conducted by a local community or resource agency that you could utilize. Taking time to conduct this analysis will prevent predictable problems, such as losing support for a good initiative because it didn't acknowledge prior work or studies.

Anacostia Waterfront Initiative

The District of Columbia is coordinating the Anacostia Waterfront Initiative to engage ten federal agencies in a voluntary clean-up and redevelopment strategy for the Anacostia. Since two-thirds of the Anacostia River's shores in the District are owned by federal agencies, over which the District has no legal jurisdiction, the District coordinated a Memorandum of Understanding (MOU) among the agencies, to engage in clean-up and coordinated development.

For example, the Navy is implementing a plan to retrofit its parking lots to add biofilters, which filter and clean runoff while also making the site more attractive.

On the other hand, if you choose not to take the approach of prior initiatives or studies, you should be careful to say why. Explain your rational for your new approach. For example, that regulatory requirements have changed or that you have a more effective solution for protecting the drinking water supply.

Setting Goals

You should set the goals for your strategy based upon the outcomes you are seeking. For example, if your strategy is to protect drinking water, one goal may be to protect and improve the health of every stream in a particular watershed. Another goal maybe to preserve a certain level of flow in every stream. Another may be to protect the quality of water recharging the aquifer. On the other hand, if your strategy is to promote tourism and recreation on healthy streams, your goals may include enhancing the economic value of the stream by improving its access for tourists or hikers.

Your goals might include meeting statutory requirements, providing substantial cost savings to protect future water supplies, meeting comprehensive plan goals, improving community safety by preventing downstream flooding, and so on. This justification will be important, not

only for the community, but also for the preamble to any new ordinances that have to be passed.

Mandated programs

Many programs begin in response to a mandated program from the federal, state or local level, such as Virginia's *Chesapeake Bay Preservation Act*, or take advantage of available funding, such as *Clean Water Act, Section 319* funding. (See Appendix C.)

For example, Baltimore County's Department of Environmental Protection and Resource Management's *Article IX: "Protection of Water Quality, Streams, Wetlands and Floodplains,"* clearly sets out legislative findings of fact, such as statutory authority under the federal *Clean Water Act (CWA)*, state statutes and the county's comprehensive plan. It also sets out other relevant codes, such as Sec. *26-278 of Article IX* that covers the preservation of natural or historical features. In this document, legislative intents are clearly spelled out. One intent is to: "Provide infiltration of stormwater and maintain base flow of streams." The scope to which these regulations apply is also clear. For example, the regulations apply to all proposed developments that did not have building permits prior to 1991.

While these are standard ordinances, the clarity with which they are articulated allows them to hold up to legal challenges and provides a defensible rational that can be understood by planners, developers, regulators and the general public.

Model ordinance language can be found on the Center for Watershed Protection's web site at http://www.cwp.org/ and by searching the web sites of other municipalities and state agencies. If you hope to utilize language from another local entity, it's always worthwhile to interview a local regulator or planner to learn how they might have modified or improved it in hindsight. You'll also want to consider how the language conforms with your own state and local statutes and take into account practical and political considerations when it comes to adoption and implementation.

Community-initiated programs

Other initiatives are the result of strong community support for environmental protection. Water quality and recreational opportunities along our waterways are increasingly becoming major concerns for many communities, especially in urban or suburban areas. Many of these people want to protect their streams and provide enhanced recreational access to them.

Whether your strategy is the result of legal requirements or a community initiative, it should attempt to address a range of stream protection issues, rather than limit itself to only one. This needn't be more expensive or time-consuming, because an holistic approach to stream management may save you a lot of money in the long run. If your county's land use zoning results in a severe drop in water quality and pollution of the aquifer, it could cost you a lot more to put right than if you had considered the full range of effects and potential benefits that a comprehensive approach may have achieved. Similarly, a local community may have equal concerns that could be met at the same time, providing long-term cost cutting and community support. For example, the stormwater program might include buffer zones that provide much-needed recreational facilities for a suburban area. Whatever the case, you should take the time to find out all the potential community goals that could be met by your strategy. There could be all sorts of added benefits that you haven't thought of.

As a result, your strategy should be flexible and open. The methods you employ should aim at achieving multiple goals, rather than a single goal. This will allow you to be more responsive to local community input and to altering your objectives and actions if you need to. For example, you might initiate a program in order to improve stormwater management, but then find that local people are just as concerned about habitat enhancement and fish restoration. You can then alter your actions to encompass all three concerns. An example of this approach is in Albemarle County, Virginia, where the stormwater ordinance includes guidelines for applying bioengineering techniques that improve fish and wildlife habitat.

Your goals will determine a project's specific objectives, its timing and the resources (e.g. staff, time, studies, and construction) needed to achieve it. For example, if you are drafting new regulations, clearly articulated goals are critical both to building support for your initiative and to ensuring that related objectives and actions will ultimately meet those goals.

Setting Objectives

The next question to consider is, "Based on your project goals (e.g. protect water quality) what are the objectives that will achieve those goals?" For example, are you seeking to protect water quality through restoration, enforcement, new zoning? One objective may be to develop a process for responding to future crises, such as chemical spills. Another might be to prevent your stream's listing under the federal *Clean Water Act, Section 303(d) as* not meeting designated uses.

Visit the resource with stakeholder groups to learn their concerns first hand. This waterman is explaining the challenges of managing and harvesting the Blue Crab in the Chesapeake Bay and its tributaries.

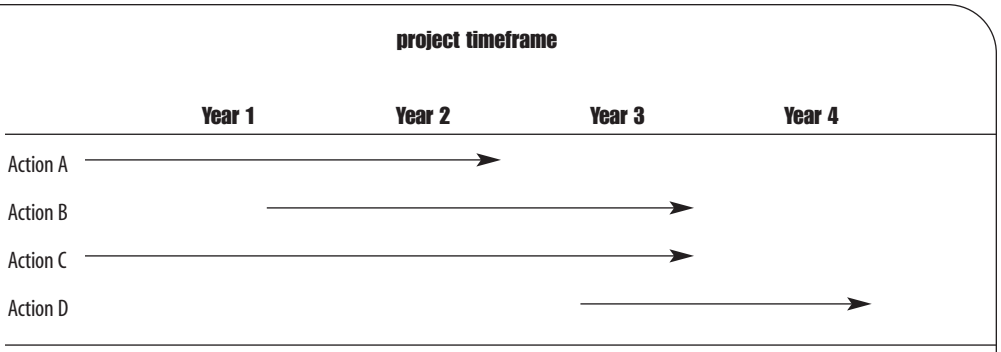
Whatever objectives you choose, they can go beyond simply responding to potential crises or statutory requirements. For example, if a stream is on your state's impaired waters list and requires the establishment of a management plan to clean it up, you might take the opportunity to identify and achieve related objectives, such as the restoration of riparian wetlands or establishment of riparian buffers. These other objectives are complimentary to the primary objective, because they will serve to clean the water, provide wildlife habitat and create opportunities for public recreation, visual enhancement and stormwater management.

Identifying key riparian protection objectives

The following list of key objectives will help you determine what specific objectives you may wish to adopt to achieve your goals. These objectives may not all be met by any one project. However, if you do consider them all, it will help ensure that you take a comprehensive approach to stream protection.

There are a number of key riparian objectives that every stream project needs to consider, especially when water quality protection or restoration is a primary goal:

- *Native communities:* Protect and restore native ecological communities – plant, animal and fish species indigenous to the stream.
- *In-stream habitat:* Protect and restore natural in-stream habitats – stream banks, in-stream substrate, vegetation, riparian vegetation and stream cover.
- *Stream form and function:* Preserve or restore the natural stream morphology consistent with local conditions, to ensure that stable stream banks and habitat are preserved.
- *Riparian habitats:* Protect and restore stream buffers.
- *Water quality:* Set standards for allowed uses or discharges that will maintain or improve existing water quality.
- *Stream flows:* Ensure adequate stream flow for animals, fish and recreation, that will prevent extreme stormwater flows by keeping impervious cover to less than 25% (ideally, to less than 15%) and that seek to provide additional infiltration areas.
- *Access:* Identify, protect and improve existing, appropriate access points and provide new access points, where appropriate, for people or animals.
- *Floodplain:* Restrict or prevent development within the 100-year floodplain and protect floodplain habitats.
- *Wetlands:* Protect and restore riparian and non-tidal wetlands, in order to ensure that water filtering, water storage and habitat functions are preserved.



Timeframe

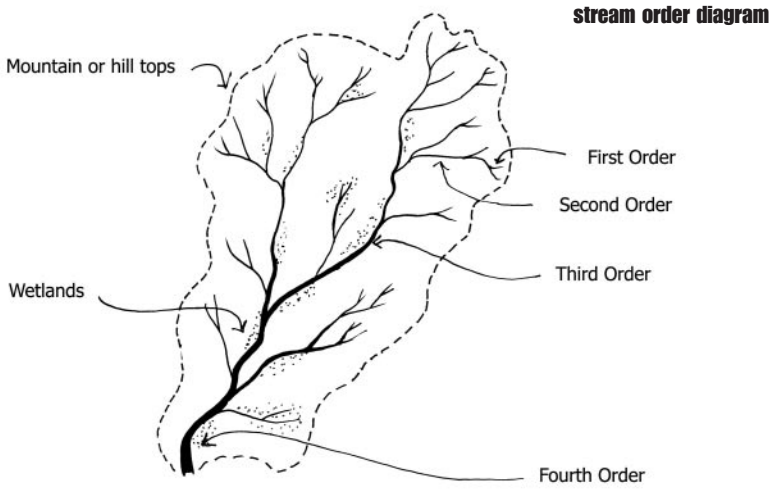
Your strategy should identify clearly when you plan to achieve specific actions that will achieve your goals and objectives as well as a timeframe for assessing your progress and modifying your project as needed. If you are taking a pilot or demonstration phased approach, be clear as to when you will take the project to full implementation (the whole watershed or county) and how it will be monitored and adapated as needed.

Project Scale and Scope

In order to work out an approach to stream protection, you need to decide whether the scope and scale of the project are appropriate. Will the approach seek to protect all the streams in a particular jurisdiction, for example, a county? Will it be limited to streams in ecologically sensitive areas? Or to locations set aside for preservation or new developments?

Whether you decide to take a broad approach that addresses all the streams in your locality or limit yourselves to a particular stream, it's still necessary to take a watershed-wide approach to any protection strategy. Watersheds vary in scale. The watershed of a small headwater stream could be as little as a few acres, but it may be part of a much larger river's watershed, say of 150,000 acres.

Another consideration is the size of the stream itself, which is defined by the size of the stream's watershed. Streams are often referred to by their relative position in the drainage network. Small headwater streams are *first-order streams*, larger streams fed by two or more first-order tributaries are *second-order*



streams, and so on. Watersheds can also be referred to in terms of their rank. *First-order watersheds*, for example, are emptied by first-order streams; *second-order watersheds* encompass the drainage area of a second-order stream and its tributaries. Different approaches may be needed to protect first-order headwater streams than to protect fifth-order rivers, which drain a much larger area.

A whole-watershed approach requires consideration of the watershed's drainage area, land uses, land cover, geology and hydrology. For instance, if a community decides to conduct a fish habitat restoration project, but does not consider the impact of stormwater runoff from a large shopping mall in the upland portion of the drainage, the project may fail. Similarly, a stream buffer enhancement program will not achieve water quality goals if stormwater pipes that discharge directly into the stream are not addressed.

Local communities need to consider whether the stream to be addressed flows through more than one jurisdiction, which is often the case. Regional entities, such as the Metropolitan Washington Council of Governments, which serves the Washington Metro region, can be helpful in coordinating joint initiatives. However, applying legal tools across jurisdictions is more complex and the best approach will probably be to utilize voluntary initiatives. In cases where a stream flows from one jurisdiction into another, you may need to work together to ensure effective management of the river. For example, if the downstream locality plans to utilize the water for drinking, fishing or recreation, the downstream jurisdiction might offer incentives to the upstream jurisdiction. It might offer to purchase development rights, share resources or revenues, plan joint tourism ventures or offer other incentives for cooperation.

Pilot or Demonstration Projects

You may wish to conduct a stream protection project on a pilot scale to test out new technologies or regulations before you begin the main project. For example, consider applying a new stormwater ordinance to one priority watershed first, or demonstrate a riparian easement program just for headwater streams before taking on the entire watershed. This will enable you to work out technical, legal and political issues on a smaller scale and ensure successful implementation of the full program in the future.

Another approach may be to conduct demonstration projects to provide replicable models or to field test approaches before implementing them throughout the watershed. A demonstration project can allow localities to experiment with implementation strategies and to direct limited resources to the most critical or endangered watersheds.

If you take this approach, conduct an assessment of the watersheds within the county or region to determine which streams would most benefit from a targeted approach. It's important to note that targeting the most endangered or polluted watersheds may not yield the greatest return, nor necessarily be a practicable model. For example, a watershed that has experienced some development, but where imperviousness is not yet exceeding levels that can support sensitive fish, such as trout, may be a more successful choice for a pilot approach than one which is already suffering from extreme development pressures.

The following table will help you decide what approach is applicable to your situation. There are some approaches for situations where time investment is high but technological resources are low. There are others where the opposite is true. And others where both are high. When reviewing the chart, keep in mind that ✕s refer to potential objectives. A stream buffer may improve water quality, but if high stormwater flows are not abated then the buffer may be largely ineffective in protecting or maintaining water quality.

Resources and Funding

The next question to consider is what resources will be needed. Will a low-

Stream Protection Approaches	Potential Objectives Achieved							
	Water quality	Protect sensitive areas	Fish	Wildlife	Water supply	Scenic views	Reduce floods	Recreation
Vegetated stream buffer	✕	✕	✕	✕		✕	✕	
Stormwater ordinance	✕		✕				✕	
Overlay zones		✕	✕	✕	✕	✕	✕	
Clustered development	✕	✕	✕	✕	✕	✕	✕	
Boat/fishing access								✕
Critical slope regulations	✕	✕	✕		✕			
Erosion/sediment regulations	✕		✕				✕	
Tax credits (open space, new technologies)	✕	✕		✕	✕	✕	✕	
Conservation easements	✕	✕	✕	✕	✕	✕		
Greenway trails	✕	✕						✕

maintenance solution, such as riparian forest buffers, provide a long-term solution to water quality problems, or not? It has been estimated that riparian buffers can remove twenty-one pounds of nitrogen per acre each year, at a cost of 30 cents per pound, and remove approximately four pounds of phosphorus per acre annually, at a cost of $1.65 per pound. Contrast this with a cost of $3 to $5 per pound – $10 million annually – spent by wastewater treatment facilities in the Washington D.C. area (*Chesapeake Bay Riparian Handbook, A guide for Maintaining and Establishing Riparian Forest Buffers*, May 1997).

You also need to consider how to "pick the lowest-hanging fruit," at least initially. You may be able to achieve some easy tasks relatively quickly. These will help you demonstrate early success and build community support.

You'll want to begin by considering the results of your resource inventory. For example, which areas are the most endangered and need to be protected before key habitats are lost? Which areas would it be cheaper to protect now, through purchasing fee-simple easements today, when land values are lower? The costs and potential benefits of each strategy should be documented before you begin, to help make the case to planning commissioners or boards of supervisors.

Considering the Adequacy of Existing Programs

A key question to consider at this juncture is whether you need to:

- create a new program
- strengthen an existing program by adding additional coverage or enforcement mechanisms
- create an overarching ordinance that applies to myriad related ordinances

This question can be answered in part by considering your objectives. If the streams you wish to protect are located in a rapidly developing watershed, it may be very effective to create an ordinance that applies to new developments. In an already developed watershed, however, this approach is unlikely to have far-reaching effects.

You may decide that it's more politically feasible to implement an ordinance on a pilot basis, in order to work out potential problems or to gain community acceptance. For example, you could apply a county stormwater ordinance or buffer program to a limited watershed or town in its first year, then expand it once the pilot stage has been completed.

You may find that, over time, your municipality has enacted piecemeal environmental protection regulations that leave gaps in coverage or, in some cases, provide conflicting guidelines or requirements. Rather than pass yet another piece of legislation, consider whether these myriad ordinances can be folded into one omnibus regulation, which can provide both universal coverage for relevant activities and a clear statutory authority for monitoring and enforcement. In states such as Virginia, you will need to ensure that your ordinance does not exceed the authority granted by the Legislature, as required by the Dillon Rule.

Holding workshops with the community can help to identify issues and build support for a strategy.

Assessing existing conditions

Whether or not the existing approach needs to be modified depends on how well it's doing. If the streams are still polluted, fish populations are not recovering and silt and sediment runoff are still high, then a new approach is clearly needed.

You can find this out by making a comprehensive review of existing regulations. The state of Pennsylvania, for example, created the *June 2000 Growing Smarter* initiatives. These amended the *Municipalities Planning Code* to consider land-use plans and zoning ordinances when issuing Department of Environmental Protection permits. This was because they felt that a more comprehensive approach was needed.

Additionally, you should see whether, in fact, you already have good ordinances in place, but they are not fulfilling their promise because variances are often granted. You can work with elected officials to amend the ordinances and delete the number and kinds of special use permits or variances allowed.

Staffing

A final consideration is whether you have the staffing to implement the intent of an ordinance. For example, an ordinance that has clear enforcement requirements will not be effective if there are no staff to carry out inspections or enforce penalties for violators, especially for those who are repeat violators.

You should also consider what requirements you need to site, manage and monitor your approach. For example, in the case of stream buffers, although complex formulas involving slope, soil erodability, stream order and other factors can be used to determine ideal buffer widths, a lack of adequate staffing to apply these criteria may necessitate the use of a less scientific, but more practicable, uniform stream buffer width. If resources are low and political support for new ordinances is difficult to obtain, consider putting your energies and staff time into educating riparian landowners about the benefits of conser-

vation easements and sponsoring workshops to get voluntary participation.

Building Community Support

Agencies charged with stream protection, such as state natural resource management agencies and regulatory entities, are aware of the need to protect streams. However, county boards of supervisors, planning commissions, city councils, and other government entities may not have a vision or clear set of objectives for protecting local water resources. Although some communities are becoming aware of the need for stream protection as public water supplies dwindle and private wells dry up because of excessive withdrawals, it may be too late to consider a river as a drinking water supply once it has already been contaminated.

A stream protection strategy should incorporate important historic and cultural uses, such as this annual bateaux festival on Virginia's James River.

In addition to water supply and regulatory concerns, there are other users and constituencies you can look at, such as recreational users, river landowners, farmers, tourism bureaus, and local conservation groups, all of whom have concerns about how the river is used and protected. Sometimes, good ideas fail to move forward simply because there hasn't been an effort made in advance to engage the community.

You also need to talk to people who may be opposed to your ideas, to understand and deal with their concerns. Your community is likely to be made up of disparate interests, some of which may be in conflict with your proposals and some of which may be in agreement. Since much of the stream corridor and its watershed are likely privately owned, you need to meet with these landowners and address their needs and concerns as well.

Seek community buy-in to your proposed strategy or concept. Develop a strategy for full public participation that includes:

- community forums
- surveys
- leaflets or a newsletter
- phoning local landowners and asking their opinion
- writing letters to your local newspaper

There are many other ways in which you can involve the community in your process. Be imaginative!

You may gain greater community support by combining multiple project goals. You can also expand your base by meeting with other agencies and organizations to determine their needs and see whether a combined approach would meet everyone's objectives. For example, your local Parks and Recreation Department may need easements for a future greenway trail, or want boating or fishing access to the stream.

One of your objectives should be to engage the whole community in the discussion. You may find unexpected new angles on your strategy. For example, you may discover that boating access is a key concern and that adding some canoe launches will help build support for the project in the recreational community. You might achieve your water quality goals by limiting access to just a few protected access points, as opposed to multiple, unimproved access points throughout the stream corridor. Or you might find that a local historical society wants to emphasize historic locks and tow paths along the river. Expanding the project to include interpretive signage for cultural resources may help gain support from these groups, as well as provide additional educational benefits for the public.

Broadening your goals to include a wide range of concerns can bring in additional funding. For example, a project that includes a river trail may qualify for funds from the Federal Highway Administration under the *Transportation Equity Act for the 21st Century*. Adding historical interpretive signage may allow you to use other funding sources, perhaps from a state historic resources agency. You also stand a better chance of gaining the participation and respect of key riparian landowners by doing this. For example, the Rivanna River Greenway and Trail in Charlottesville, Virginia, was made possible through the combined vision of homeowners who lived along the river and who donated permanent easements across their land, and the city's Planning Department. These two groups worked together to make the vision a reality. The Rivanna River now forms the boundary for Riverview Park, a wonderful community asset flowing through the city's most visited park.

Holding a public event, such as a watershed forum, builds awareness of issues such as water supply, stormwater pollution, zoning, low impact development and other concepts that the community needs to understand. It can then help diverse interests to consider the community's priorities and approaches for addressing them. In the Rockfish River watershed in Nelson County, Virginia, a community watershed forum helped build community support for a stormwater ordinance – something the county didn't have before. Designing such an event and process is covered in the handbook *"Community Watershed Forums, A Planner's Guide"* (See Appendix A.)

You also may want to conduct a community survey of issues and concerns, a focus group, or an interview process with key stakeholder groups to evaluate areas of concern, misunderstandings and disagreement, as well as areas of consensus.

Concerns of Key Constituencies

As you consider your strategy for stream protection, be aware of common concerns voiced by key constituencies, such as farmers and urbanites. Agriculture occupies thirty percent of the land in the Chesapeake Bay watershed and is of critical concern for many stream buffer programs. However, many farmers are apprehensive about these programs and

Deciding on your goals, specific objectives and key tasks are critical elements of a successful strategy.

regulations. They fear mandatory requirements for a one-size-fits-all buffer width. So, when you create riparian buffer regulations, it's important to realize that farmers can implement other BMPs beside riparian buffers to achieve watershed protection goals. These include nutrient-removing cover crops and nutrient management plans.

For urban constituencies, pollutant removal is frequently cited as the main reason for installing urban stream buffers. However, for forested buffers to work effectively, water must cross them either as *sheetflow* or through shallow groundwater. Research has shown that it is difficult to maintain sheetflow over distances greater than 150 feet for pervious areas and 75 feet for impervious areas. In urban areas, impervious surfaces cause water to run off quickly into stormsewers or open channels that discharge directly to the stream, causing stream banks to erode and defeating the purpose of the buffer.

The primary reason why rural forested buffers work is that large pervious areas bordering a stream help water settle more evenly into the ground, allowing soil and vegetation to remove a greater amount of pollutants. Usually, some type of structural BMP is needed to help stormwater settle slowly and remove pollutants before they enter the stream. Although urban stream buffers are not as effective in removing stormwater pollutants which reach streams through storm sewers that discharge directly to streams, they are important for wildlife habitats, to stabilize eroding stream banks, and to provide aesthetic values and urban green space. If the urban buffer encompasses a headwater stream, spring or wetland area, it can significantly protect water quality at the source. For example, a small tributary of the Anacostia River in Washington D.C., whose spring and headwaters are bordered by forested national park lands, contains stoneflies – a pollution-sensitive aquatic insect that few people would expect to find in such a highly urbanized city.

When it comes to the creation of forested stream buffers, dense urban areas bring another set of concerns. In the District of Columbia's Department of Health, Watershed Protection Division's *Riparian Forest Buffer Strategy*, the following concerns were raised:

- Insufficient communication with, and training of, maintenance crews results in tree fatality and the mowing of protected areas.
- Vandals remove signs designating no-mow lines, remove trees and break fences.
- Animal herbivory was often overlooked and as a result, trees were not protected from animals at their most vulnerable stage of growth.
- There was an outcry that natural or "wild" areas provided habitat for criminal activities.

To address these issues, the Watershed Protection Division proposed the following solutions:

- Employ contractors for large riparian forest buffer restoration sites that are being established in the final phases of a contracted stream or wetland restoration. The benefit of this is that many contractors provide a time-limited warranty that protects their work. Since the first one to two years after planting is the most likely period for plant mortality, survival through this period ensures higher long-term survival rates.
- Where riparian forest buffer plantings border residential areas, employ planting designs that cater to community desires for a landscaped "look" and a landscape design that discourages criminal activity.
- Encourage volunteers to routinely monitor riparian planting sites for vandalism and other maintenance issues. The need for watering, weeding and replanting will provide yet another opportunity to involve the community in riparian stewardship.

CHAPTER 4

Tools for a Stream Protection Strategy

The following tools are intended to help local government staff, planners and others consider which approaches and strategies will be most effective in their locality. Some approaches require greater funding or technical capabilities, while others may require the adoption of new regulations or require a voluntary approach.

Advice on the effectiveness of the tools is derived from the advisory committee for this guide, as well as findings in the relevant technical literature. The approach, or combination of approaches, chosen depends upon legal requirements, staffing and technical capabilities, and political considerations. Detailed specifications for design are not contained herein, as they are abundant in other literature and are outside the scope of this guide. However, the following list of tools available in each state within the Chesapeake Bay drainage can help you determine which element or combination of approaches will help you reach your goals.

Of the three states that contain the Chesapeake Bay watershed, Pennsylvania provides the clearest authority for localities to create local stream protection ordinances. It does this through its *Municipalities Planning Code (MPC)*. This code gives primary responsibility for regulating land use and development to local municipalities. Under it, land can be zoned and designated for appropriate use. *Section 603* of the *MPC* specifically authorizes local governments to regulate, permit, prohibit, restrict and determine uses of land, including wetlands and riparian zones.

Amendments to the *MPC* in 1988 expressly gave local governments the authority to plan and zone for the protection of rivers. The code states that zoning ordinances must be designed to "promote, protect and facilitate… preservation of the natural, scenic, and historic values in the environment and preservation of forests, wetlands, aquifers and floodplains." (*MPC Article VI, § 603*). Also in 1988, the *Environmental Rights Amendment* of the Pennsylvania Constitution (*Act 1, Section 27 and 28*) was adopted. This amendment expressly gives local governments the authority to regulate the protection of streams and rivers.

In 2000, "Growing Smarter" initiatives were signed into the code through *Acts 67, 68* and *127*, which provide state agencies with additional legal authority to consider local zoning ordinances and comprehensive plans when making certain permit and funding decisions, such as for NPDES Stormwater Construction.

In Virginia, under the Dillon Rule, localities can only use the powers expressly granted to them by the state legislature. While this enables some degree of consistency in planning, it may also hinder application of some planning tools, such as the transfer of development rights, which is not allowed by the legislature. However, the Commonwealth of Virginia does provide authority for zoning by localities.

In some instances, there can be confusion when different state agencies oversee different regulations for similar issues. Often, these regulations contain different definitions for the same issue or process. For example, in Virginia "land development" is defined one way under the *Erosion Control Law*, while "development" has a different definition under the *Chesapeake Bay Preservation Act*. It can become administratively difficult for legal staff to sort out all the differences. Although this doesn't make the creation of stream protection ordinances impossible, it does require a strong commitment on behalf of local staff to ensure they have the required authority for implementation.

Tools That Apply To Every State

There are a number of tools that apply to every state in the Chesapeake watershed. These include easements, covenants, proffers and fee-simple purchases. With all of them, there are monitoring needs, but you can meet these needs partnering with a local non-profit agency or local volunteers.

Easements and covenants

A stream-protection ordinance may incorporate methods of perpetual land-use protection, such as easements or covenants. Baltimore County, Maryland, for example, requires dedication of a buffer either by easement or covenant. This dedication is required for construction permits in riparian areas. If, as in Baltimore County, buffers are dedicated free of charge to the local government, they can provide an economical way of providing protection to critical stream-side areas. Usually, such easements or covenants *do not* provide for public access to the dedicated portion of land. Although they could be written to ensure public access, such a policy would probably cause substantial resistance from private landowners.

Easements tailored for streams

While there are mechanisms and state-sponsored programs for easements, an easement program tailored for streams may be a useful approach. The need for a stream-based easement program is likely to arise because some easement programs seek large tracts of land (greater than 100 acres) and smaller, narrow, stream-corridor easements may not fit within the program's guidelines. In recognition of this, Virginia's Thomas Jefferson Soil and Water Conservation District holds riparian easements for streams to improve and protect water quality.

Non-profit river conservation organizations may be interested in holding narrow easements along rivers. Local gov-

ernments may consider partnering with these conservation groups to obtain easements and monitor them. For example, both the National Committee for the New River and Friends of the Rivers of Virginia hold conservation easements on the New River.

Continual monitoring

Local governments should be aware that simply holding an easement on a piece of land is not sufficient to ensure its protection – even if the easement was written expressly to provide for environmental protection. Local governments holding easements on land need to continually monitor them to confirm that landowners are complying with the terms of the easements. The drain on staff time required to monitor sites can be prohibitive. An alternative is to partner with a local non-profit agency, which will shoulder some, or all, of the responsibility for holding and monitoring easements. It may be necessary to provide them with grant funds to cover their time and for appropriate legal services.

Proffers

In Virginia, although buffers cannot be required of new developments unless under an existing ordinance, they can be offered as *proffers* by a developer. Proffers are only allowed in cases of rezoning and cannot be required by the government. Rather, they must be offered voluntarily by the developer. The community should make the case that the buffer would serve the public and spell out its purposes and guidelines, so that a developer is aware that he can proffer a buffer in exchange for exceptions to development restrictions.

Fee-simple purchase

In some cases, a local government may find it beneficial to purchase stream-side land outright. It might want to create a linear park with public access or a strategically important site with a high degree of environmental sensitivity or public value. The local government can purchase land from a voluntary seller.

An advantage of this approach over easement purchase is that the local government has complete control over the given parcel. Disadvantages are raising the funding required for the purchase and potentially needing to apply local government powers of eminent domain over unwilling sellers who hold key parcels.

Development Rights

There are two ways development rights can be used to protect streams and their buffer zones. The first is through *Transferable Development Rights (TDRs)* and the second is through *Purchase of Development Rights (PDRs)*.

Transferable Development Rights

TDRs occur between two entirely separate parcels of land. They are allowed in Pennsylvania, under its 2000 amendments to Act 247 and they are allowed in Maryland. For example, Montgomery County, Maryland, has implemented a TDR program since 1980 that has protected 39,180 acres. However, TDRs are not presently allowed in Virginia.

Since TDRs can cross municipal boundaries, municipalities can agree to set up sending and receiving areas from one jurisdiction to another. In this kind of system, *development credits* are sold by a landowner in a sensitive area (also called a *sending area*), in order to reduce the development potential for that land. They are given to a landowner in an area designated as appropriate for additional density (a *receiving area*). Local governments may choose to use TDRs if a required buffer is very wide and its regulations very strict.

While TDR programs are effective in preserving natural resources, they have been primarily used in urban settings. According to a study, their use has not been without problems or controversy. There must be clear sending and receiving areas. Where considerable sprawl exists within the sending area, it may be too late for a TDR program to be suc-

Sample criteria list for the purchase of development rights for stream corridors

Award 3 points if the land fully meets a criterion, 2 points if it mostly meets a criterion, 1 point if it somewhat meets a criterion and 0 points if it does not meet the criterion at all.

	The land is adjacent to a waterway that is significant for one or more of the following reasons: ■ It contains threatened or endangered species. ■ It contains critical resources, such as drinking water or trout habitat, a sensitive headwater stream, and so on.
	The land represents a diminishing resource; for example, it is the last remaining wildlife habitat along a creek.
	The land contains unique cultural and historical aspects; for example, it has historic locks and dams or Native American burial mounds.
	The land is subject to environmental hazards, making it a poor candidate for development; for example, it is subject to frequent flooding, poor drainage or unstable soils.
	The land is located far from an available or adequate infrastructure; for example, there are no adequate roads, sewer or septic systems, or water supply.
	The land represents a significant community resource; for example, it is currently being used by the community (e.g. for environmental education, fieldtrips or fishing).
	There is a high likelihood that the land will be developed in the next ten years.
	*Optional: Development rights can be purchased at an affordable (or below market) price.
	Total Points

TOTAL: 17 or more points = high priority for the purchase of development rights.
10-16 points = medium priority for the purchase of development rights.
Less than 10 points = low priority for protection.

cessful because residents within the receiving areas may object to the higher density necessary for a TDR program.

Purchase of development rights

PDRs are allowed throughout the Bay states. Their use is appropriate when it's not possible or politically desirable to remove development rights in buffer areas. This may be the case in areas where a more restrictive buffer is necessary to achieve environmental or social goals, such as protecting endangered mussels or Native American sites.

States vary greatly in the funding they provide for PDRs and some lack adequate criteria or funds to assess whether or not a site is suitable, or strategic enough, to acquire its development rights. If limited funds are available, development rights for riparian lands should not be based simply on who applies. Rather than responding to applications, criteria should be developed for environmental goals that are clearly delineated and ranked, so that most the appropriate sites are protected first. The table *Sample Criteria List for Purchase of Development Rights for Stream Corridors* lists the criteria you can utilize to develop your own ranking system for a PDR program.

Overlay Zoning

One of the most common ways to protect streams through local government law is to incorporate water protection provisions into an existing zoning ordinance. Usually, the protection measures are written into an *overlay zone* that is geographically specific to the stream. A local government can write this overlay district to incorporate values it wishes to promote. A river-based overlay district might include provisions for protecting historic, scenic and natural values. It could also create a new buffer by requiring buildings to be set back a certain distance from the stream or by placing restrictions on uses allowed by the "underlying" zones.

Mitigating set-backs

One way to mitigate the impact of setbacks and make them more attractive to developers is to allow them to include the buffer zone in their calculation of build-out potential, so that they are compensated for land protection with higher density allowances. On a large tract of land, removing a 200-400 foot strip of land along a stream from the calculation of the tract's buildable land can represent a significant loss to the developer.

Although such a regulation is likely to pass a legal "takings" test, it will be more politically acceptable if it includes such a compensatory benefit to the developer. By allowing the developer to include the buffer area within his calculation of total buildable land (for the purposes of determining build out), a local government can protect streams without limiting a developer's financial yield from a tract of land. Development rights are effectively transferred internally from the buffer area to the rest of the tract.

Also note that many local governments have landscaping ordinances for sites both near and distant from streams. Such ordinances could effectively require the planting and placement of appropriate native species within buffers.

Critical areas

When water-protection is not written into a zoning ordinance, the ordinance can provide for the protection of critical or sensitive areas, in much the same way that Maryland's *Critical Area Act* or Virginia's *Chesapeake Bay Protection Act* define critical areas. Loudoun County, Virginia and Montgomery County, Maryland use this approach. This legal tool probably requires a larger staff to define and review plans for specific critical areas and to monitor and enforce implementation.

In-stream habitat protection

Some local ordinances contain specific provisions designed to protect values located in the stream itself. Albemarle County, Virginia, for instance, has in-stream restrictions for the removal of woody debris, the creation of access points and for channel modification – all activities that could have a dramatic impact on in-stream habitats. In-stream regulations can also require bioengineering to restore disturbed habitats.

Water Quality Protection Ordinances

There are many different types of ordinances that can be used to improve water quality in local streams. The guidance offered here focuses primarily on the creation of stream buffer ordinances. However, other types of ordinances, such as stormwater management, open space development, and erosion and sediment control, bear mentioning. The Center for Watershed Protection offers helpful model and example ordinances. (See http://www.cwp.org)

Engaging the community in choosing the most appropriate tools for a protection "strategy will help to ensure community buy-in for a successful strategy.

Combining existing regulations

In some localities, there are existing regulations that restrict floodplain development and tree removal, or that protect critical habitats. These can result in the establishment of a *de facto* buffer zone. However, these regulations generally provide only piecemeal protection for the river system. For example, while floodplain development may be restricted, a lack of woody vegetation within the floodplain may reduce its ability to buffer the stream from land-use impacts. Alternatively, if the floodplain is protected but the stream's banks are severely eroded or have become channel-

ized and armored, goals for water quality and habitat protection may not be achieved.

Stand-alone ordinances vs. Zoning ordinances

When using ordinances to protect water quality, a fundamental question arises. Should protection measures occur through zoning or should there be a stand-alone ordinance? For most localities, the answer to this question needs to be based on the structure of the local government. In some areas, the creation of an overlay zone subject to the zoning review process might be the strongest means to ensure an effective ordinance. For other localities, individual regulations might be more effective.

Level playing field

Another question localities will need to ask when they create an ordinance is, does it create a level playing field? Often, efforts to mitigate problems such as urban stormwater create a situation where development becomes easier in outlying rural areas that are less regulated. When creating any ordinance, input from all affected parties, such as farmers, engineers and developers, is essential to ensure that the regulations address community values and do not unintentionally protect one area at the expense of another.

Enabling authority

Does your local government have the necessary authority to implement ordinances or is there already state legislation that you can utilize? Each state within the Chesapeake Bay drainage has a different mechanism by which it grants enabling authority to localities.

Stormwater management

However well planned, development increases the total area of roads, rooftops and sidewalks. These impervious surfaces all contribute to the volume of stormwater that reaches local streams during storms. Yet new development need not necessarily equate with greater runoff if creative methods are employed to prevent it.

Decreasing the effects of stormwater runoff is vital to maintaining the health of all waterways. Concentrated stormwater not only contributes greatly to erosion and flooding, but also carries with it greater amounts of dissolved and undissolved pollutants, such as oil, road salts and fertilizers.

Stormwater can be controlled either through prevention or through structural methods that help to hold the water in place before it flows to the stream. Stormwater management facilities are designed to prevent water flowing directly into the stream, to remove pollutants and to allow water to filter more slowly back into the ground. However, this approach is often impractical, especially in developed urban areas, such as Washington D.C., Baltimore and Richmond where more creative approaches are needed to trap and filter stormwater.

There are other ways to tackle this issue than building large *stormwater management ponds* (large regional ponds, often made by damming small streams) or putting in multiple small ponds. Instead, consider stormwater plans that focus on source prevention. There are many creative tools available for slowing or preventing runoff caused by construction. Rooftops, especially those on larger commercial structures, can be employed as storage and filter areas. They can be designed to hold water and slowly release it, mimicking natural rates of runoff. Also, they can be planted with vegetation to store and filter water and provide bird and butterfly habitats. For example, in retrofitting an old pump house to serve as an environmental education center, the Earth Conservation Corps in Washington D.C. added a "living roof." This demonstrates that even older buildings can be modified to reduce runoff. When creating stormwater management ordinances, both design and maintenance should be considered.

Because Best Management Practice (BMP) technologies change as time goes on, all criteria affecting design, sizing and performance should be written in a design manual that accompanies the ordinance, rather than being in the ordinance itself. This design manual can be kept up-to-date by the local stormwater management agency, negating the need to go through a legislative approval process when changes are made.

Stormwater BMPs can be expensive to create, but are relatively inexpensive to maintain. However, the low degree of continual maintenance can result in neglect. Stormwater ordinances require post-construction management plans that outline responsible parties and necessary maintenance practices. Some localities might want to consider ordinance language that encourages the use of maintenance easements.

Erosion and sediment control ordinances

Erosion and sediment control ordinances can serve as a primary way of addressing the problem of increased sedimentation caused during construction clearing and grading. However, communication and enforcement are central to an effective ordinance. Designers, engineers and contractors need to be educated about the importance of erosion control practices. This can be accomplished through technical documentation that accompanies the ordinance, along with other education methods such as workshops.

In Montgomery County, Pennsylvania a *Sediment Control Pre-Construction Notice* is sent to all contractors. This notice outlines the county's basic erosion control and stormwater requirements. Although it doesn't replace the actual permit and plan language, it serves as a reminder of basic responsibilities and obligations.

Along with strong communication about the necessity of erosion control comes the need for strong enforcement. To effectively enforce any ordinance, staff need to be able to inspect construction sites on a regular schedule.

Open space and cluster development ordinances

Open-space or conservation-based development ordinances address the need for natural and cultural resource protection by creating zones for both housing and undeveloped areas of the stream corridor. This type of concentrated development greatly reduces the amount of impervious cover on a site and helps to reduce the amount of clearing and grading needed during the construction process. Land areas that are left undeveloped can serve as recreational areas, stormwater management facilities and natural preserves.

Local governments experiencing development pressures can focus growth pat-

terns to protect stream and water resources. However, any ordinance needs to effectively balance economic and environmental factors, so that responsible development can be encouraged, not hindered.

Don't forget that any open spaces you create will require some degree of maintenance. Ordinance requirements should reflect the need for the future management of any natural areas set aside by compact development plans.

Additionally, planners should work with developers to link open spaces between developments, especially along stream corridors, so that wildlife passages are maintained and forested tracts are large enough to maintain ecological diversity.

Stream buffer ordinances

The ability of a riparian buffer to function to its full potential depends on how well the buffer is planned and designed. The following chapter describes the general components necessary for a stream buffer ordinance. This is an overview of the current literature. When designing buffer ordinances, environmental and engineering staff should always be consulted on the best approaches for stream buffer design for the locality.

Since local politics and land-use issues often change, it is important to have a flexible ordinance. Since, on average, ninety percent of buffer land is privately owned, it is essential to maintain flexibility, if you're going to meet different constituency needs and also protect water and habitat quality.

The following are general features of many effective stream buffer ordinances:

- Measurable criteria to delineate the origin and boundaries of the buffer.
- The establishment of a minimum stream buffer width: 100 feet, including the floodplain, is typically recommended.
- Clear delineation of the buffer, both at the site and in all land records.
- A zoned approach to land uses within the buffer (if appropriate).
- The ability to expand the middle zone to include steep slopes, wetlands and 100-year floodplains.
- Management guidelines for current and future owners of property in the buffer.
- Clear language delineating requirements for all development plans in the buffer.

For more on stream buffer design and regulation see Chapter Five.

CHAPTER 5

Creating and Managing Buffers

The first step in enacting a buffer ordinance is determining which streams will be affected. You can take any of a variety of possible approaches, based on project objectives, available staff and resources, and enforcement and legal considerations.

In this guide, *buffer* generally designates a forested buffer. Although forested buffers might not be the best solution in every area of the country, they were the original ecosystem found along the waterways of the Chesapeake Bay watershed and are thus the most appropriate habitats for addressing its water quality issues. (See the box *Why Forested Buffers?*)

In general, the inner edge of a buffer can be defined from the centerline of small first- or second-order streams. With wider, higher-order streams, buffer measurements usually begin at the top of each stream bank.

Identifying the Stream – The Perenniality Debate

One of the first things a local government must decide is which streams to include in the buffer program. One criterion is to include streams that flow year-round – perennial streams. Stream *perenniality* can either be determined according to USGS maps, field-determined evaluations, or a stream layer derived from a Geographic Information System (GIS). Another approach is to designate streams by watershed acreage; for example, all streams of at least X number of acres will be included in the buffer program.

It's important to note that some of the smaller headwater streams (first order) may not show up on USGS topographic maps, yet it's critical to protect them. Identifying and delineating these smaller streams may require time from local government field personal or in partnership with state agencies, such as the Department of Forestry or your local Soil and Water Conservation District.

Methods for Determining Buffer Width

There are several methods for determining the width of a buffer. You can either choose a uniform width or a buffer that changes along with stream order. Alternatively, you can employ state-designated uses, landscape features or multiple values that take all factors threatening water quality into account.

Uniform Width

One method of defining buffers throughout a locality is to establish a single, required width for all streams. This is probably the easiest method for local governments and the regulated community to adhere to, inasmuch as it doesn't require scientific knowledge among staff members, complicated legal regulations, or an inventory of landscape features. It's also easy to spot violations.

On the other hand, the method's lack of scientific specificity with regard to width and landscape features may be difficult to defend. Furthermore, it may

Why Forested Buffers?

Forests trap and hold sediment, filter surface and groundwater flows and shade streams to keep temperatures lower and dissolved oxygen higher. In addition, they contribute leaf litter as food for aquatic insects, which in turn are eaten by fish.

Overhanging tree roots provide fish with cover from predators and habitat for other insects. Streamside forests are also vital habitats for wildlife such as kingfishers and beaver.

Historically, the Chesapeake Bay drainage area was primarily covered by forests. Native Americans used trees for firewood and canoes and maintained some lands as fields, but it was during the population boom of Colonial settlement that massive forest clearing took place. Colonial lumber exports for ship building, clearing lands for agriculture and the later use of charcoal for steam engines led to a dramatically altered landscape. In the early 1900s only 30 to 40 percent of the land was covered in forests. However, during the last century, much of the forests base has recovered. By the late 1970s, forested land had risen to 60 percent of the land cover.

While forest area has increased since the turn of the century, the condition of that forest needs to be considered. Fragmentation – the breaking up of forest lands into ever smaller parcels for subdivisions, shopping malls and roads disrupts wildlife corridors and changes the ecosystem, altering tree species and forest health. More edges are created which allow greater opportunities for invasive species to encroach on the forest. Forests are also suffering from disease and invasions from pests such as the pine beetle and the gypsy moth.

Additionally, while more land is forested today than during the turn of the century, forested land along streams is often lacking because farmers use that land for grazing or crops. In Nelson County Virginia for example, while the vast majority of the mountains are forested, most of the Rockfish River's buffer is one tree wide and root systems are inadequate to hold banks in place resulting in severely eroded 10—foot high steep, slumping banks which contribute tremendous sediment loads to the creek and fill in spaces used by aquatic insects and fish. This is one reason why the Bay agreement calls for 2,010 more miles of forested stream banks by 2010 in the Bay' watershed.

not provide effective stream protection in areas with steep slopes, erodable soils or other sensitive habitats.

A uniform width approach could be used to establish a minimum for all streams, along with "drivers" that automatically require a larger buffer. Examples for these 'drivers' are trout streams, the presence of threatened species and nearby higher-density developments.

Width is a key consideration in whether or not the buffer can be counted towards meeting the Bay Agreement's goal of 2,010 miles of additional stream buffers by 2010. Under the Bay Agreement, the buffer should be at least 35 feet wide from the top of the bank to the buffer's uphill edge and contain at least two tree species, shrubs or a combination of both. In Virginia, the *Chesapeake Bay Preservation Act* requires 100-foot wide buffers for the eighty-four tidewater localities that are covered by the Act and provides enabling legislation for stand-alone ordinances for the remaining localities. In Maryland, the *Critical Area Law* requires a minimum one hundred-foot buffer for all new development. This buffer must consist of natural vegetation and must stretch from the mean high-water line of tidal waters, or the edge of tidal wetlands and tributary streams.

Stream Order Method

A second method of defining buffer width is according to stream order, employing wider buffers for higher-order streams. This method requires a local government to provide information to landowners in the form of a map identifying streams by their order. This may cause disputes about those identifications.

This method for defining buffer width, like the single-width method, fails to take specific landscape features into account. Furthermore, it doesn't allow for lesser-order streams that have more potential to harm water quality than some higher-order streams, because of surrounding land uses, proximity to drinking water intake supplies, water uses, slope steepness, and so on.

State-Designated Uses

Another method for determining appropriate buffer width relates to existing state-designated water uses. This method applies the legally-designated use of the water resource, rather than the potential for harm, as the basis for defining buffers. For example, a stream which serves as a drinking water source would require wider buffers.

This method has no real scientific underpinning, other than the notion that "wider buffers offer more protection." It pays no attention to the actual composition or use of the land around the water resource. This method also fails to address the way in which streams and watersheds work together as part of a larger system. However, this method is relatively easy for a local government to implement, since it does not require extensive research. It may require mapping different stream designations for stream usage in the watershed.

Landscape Features

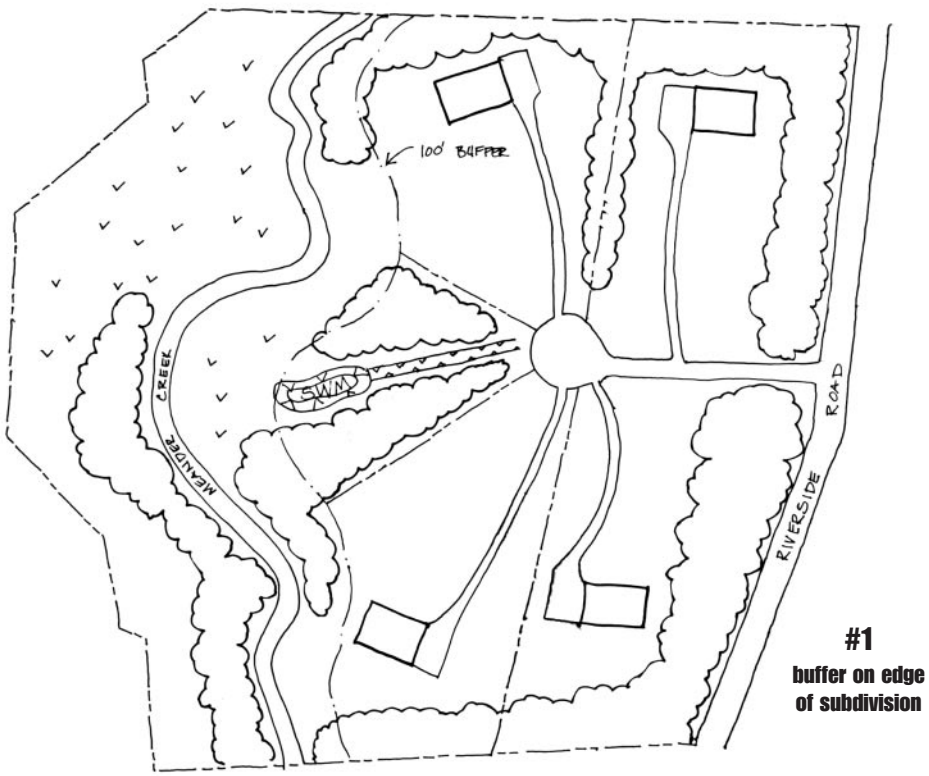
Using features in the landscape, such as soils, slopes, wetlands and floodplains is another method that is often used to determine the width of a buffer zone, in conjunction with other approaches. Sometimes, land features add extra width to the buffer, as in the case of wetlands and floodplains, which can be used to define the limits of the buffer.

This method requires careful inventories and violations may be difficult to spot. It also makes for a complicated review process. To achieve intended goals, this method should be implemented in tandem with other methods, such as single-width, stream-order or drainage-basin methods.

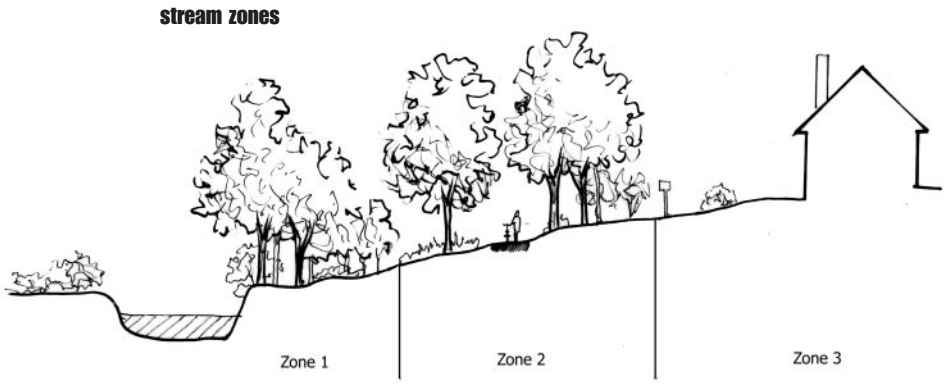
Multiple Values

The most scientifically based buffer definition method is a multiple-value approach that uses a mathematical formula to take all of the factors threatening water quality into account. Since this method also happens to be the most time- and resource-intensive, it is best suited to a well-staffed planning office.

Baltimore County, Maryland, employs this method of buffer-delineation. It combines slopes and uses to determine buffer width. For example, a slope of 0-15 percent for trout-use waters requires a buffer of 150 feet, while the same stream-use classification with a slope of greater than 25 percent requires a 200-foot buffer. Montgomery County also has established recommended buffers



#1
buffer on edge of subdivision



Zone One:

Undisturbed forest adjacent to the stream, no tree harvesting, some uses, such as footpaths.

Zone Two:

Managed as forest with some passive uses allowed, such as parkland and limited harvest of mature trees.

Zone Three:

Allowed as grassland, residential yards or stormwater management.

for wetlands, springs and seeps that fall outside their stream protection areas.

Stream Zones

One approach to defining stream buffers and allowed uses is to have zones with defined functions and uses:

- The first zone (the streamside zone) is closest to the stream and almost no uses are permitted except mature forest.
- A second zone allows for some regulated uses in the buffer, such as selective harvesting of some trees, as long as best management practices (BMPs) are followed.
- A third zone allows for somewhat compatible uses, such as residential and recreation uses or stormwater retention.

The zone approach is used as a way to acknowledge existing uses while providing for a wider buffer, in return for some use of the buffer space in the outer region (zones two and three). It's important to note that, as trees age, they become less effective at nutrient uptake, which is why some programs advocate or allow the harvesting of mature trees in the second zone. However, some forest ecologists note that the presence of mature trees that eventually fall and decay provide an important nutrient source for the forest. While their continual harvest may improve nutrient uptake by leaving only younger trees, it harms other functions provided by decaying material.

Usually, the actual width of the buffer is more important than whether or not it incorporates a zoned approach, especially for the undisturbed portion closest to the stream. If the stream is unstable and suffering from failing banks and high rates of bank undercutting, then trees may be lost at a high rate, necessitating a wider buffer to maintain even minimal canopy coverage. It's also important to note that a buffer will be largely ineffective in solving stream over-enrichment problems if high volumes of stormwater are piped directly to the stream, as is often the case in urban and suburban areas.

Montgomery County, Pennsylvania, calls for Zone Two to be a minimum of 50 feet wide from the edge of Zone One, or to extend to the edge of the 100-year floodplain, whichever is greater.

Zone widths and uses vary

Although a three-zone buffer system is suggested by the Chesapeake Bay Program, the widths and specific uses allowed in each zone vary between localities. For example, while the state of Pennsylvania recommends the use of three zones in its statewide Stream ReLeaf Program, Montgomery County, Pennsylvania, recommends only two zones in its guidance for a Riparian Corridor Conservation District Ordinance, with Zone One designated as a minimum of 25 feet of undisturbed forest and Zone Two designated for passive uses, such as wildlife sanctuaries, passive areas of park land and trails that adhere to state trail design codes. It also allows conditional use permits for livestock crossings, public utilities, campgrounds, golf courses and several other uses. Baltimore County, Maryland, also follows the two-zone approach, rejecting a passive, or third, zone. Their guidance concentrates on managing for multiple values beyond nutrient removal and includes water quality, heterogeneity for aquatic and terrestrial communities, and maintenance or enrichment of biological diversity. As a result, their management objectives require that a buffer generally remain undisturbed.

Managing Buffers

Effective management of the buffer is just as important as proper siting. A forested buffer that allows inappropriate uses that impair its functionality can render it largely useless. If the buffer is not monitored and maintained it may suffer from high rates of tree disease, encroachments, livestock trespass, harvest or moving of vegetation that impede or negate its ability to protect the stream.

Design Options and Requirements

It is a good idea not to include many design details, such as vegetation types and placement, in a stream buffer ordinance. This information is subject to continual change based on local experience and emerging technologies. As described earlier, an accompanying design manual or design guidance document, which does not require a formal ordinance revision when technical items are added or deleted, may be more practical. Just as federal and state level agencies adopt acts, and then regulations, local governments can utilize two tiers – ordinances (equivalent to acts) and design manuals (equivalent to guidelines).

Management and Maintenance

Though forested buffers are relatively inexpensive to maintain, they do require

care once established. New seedlings need to be tended, invasive species need to be removed, erosion gullies need to be fixed, and at times, selected harvesting can be done. Thus, when creating buffer ordinances, it's important to identify a specific list of structures, practices and activities that should and should not be permitted in a forest buffer within the ordinance.

Management Plans

A local government may require management plans for certain disruptive land uses within a riparian buffer. Common uses for which a management plan may be required are silviculture, agriculture and mining, though others exist as well.

A local government with limited resources may not be able to handle the review process necessary for this requirement. An alternative is to require that such uses meet the standards of a state agency – such as the local Soil & Water Conservation District office or the Department of Forestry. This removes the responsibility of review from the local government, while still providing some level of oversight for potentially harmful activities. Even with the help of these agencies, however, responsibility for monitoring and enforcement may fall to the local government. Thus, the mechanism and funding for oversight must be determined prior to beginning a new program.

Permitted Uses

Buffers may accommodate the following uses without a substantial loss of effectiveness, provided that the impacts of such uses are mitigated.

Limited harvest of trees, berries, and other non-timber forest products

Even though a forested buffer is more effective than buffers with other types of vegetation, a local government may choose to allow the selective harvesting of trees, berries and other forest products without significant damage to water quality. Clearing of dead trees and non-indigenous plant species may also be undertaken. Clearing of trees for "views" should be discouraged, unless it can be shown that such clearing will not significantly reduce water quality.

Local governments with proper resources for review may require a silviculture management plan or may require that a plan meet approval from the local Soil and Water Conservation District.

Stream crossings

Most buffer ordinances allow for the placement of essential utilities within the buffer area, such as storm sewer interceptors or other pipes. An effective buffer ordinance requires that care be taken when doing this, so that their impact doesn't work against the purpose of the buffer. For example, a wide swath caused by a power line that is sprayed with herbicides may have a major impact on the buffer's function.

Other crossings, such as for cattle, can be employed using approaches that restrict the crossing to an adequate, but narrow passage and require some armoring of the crossing, such as logs anchored in the stream bed to prevent gullying. Consult the Natural Resources Conservation Service or a local Soil and Water Conservation District for technical guidelines and sources of grants for construction.

Recreational uses

Depending on its goals, a local government may wish to allow recreational uses within the buffer space. These may involve docks, piers, boat access and trails. These types of buffer incursions should be designed with maximum sensitivity to the purpose and function of buffers. Trails should be limited in scale, to provide access and recreation without deleterious impacts on water quality, such as erosion and accelerated runoff. Six-foot-wide trails constructed of *crusher run*, which is somewhat permeable, may be used to minimize trail impacts and meets ADA requirements for projects funded by the Federal Highway Administration's *Transportation Equity Act for the 21st Century*.

Restricted Uses

The following practices and activities should be restricted within Zones 1 and 2 of a forested buffer, except with approval by local natural resource or planning agencies.

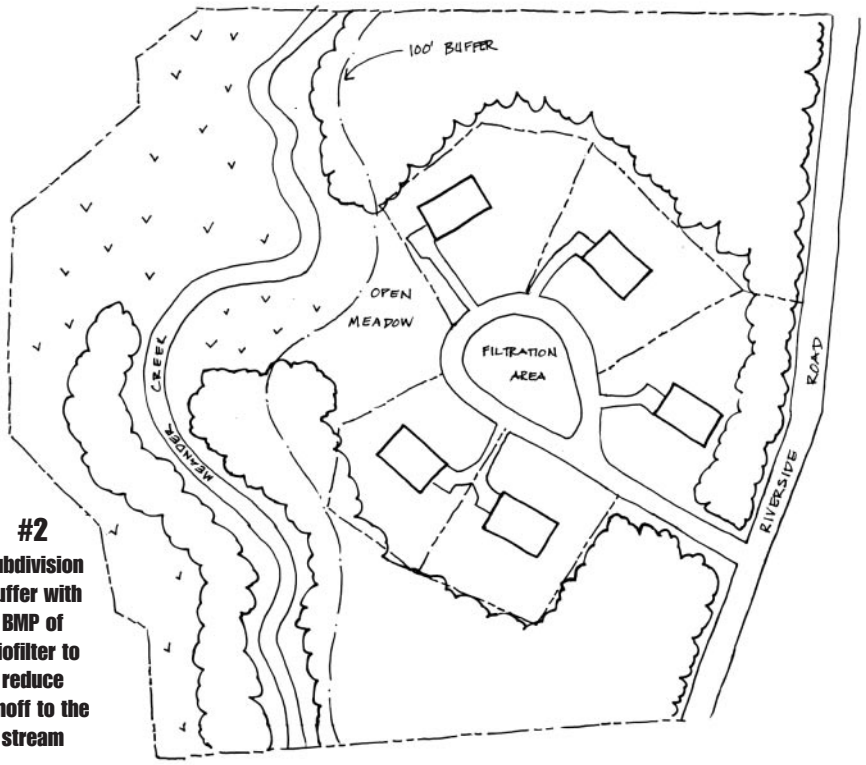
Vegetation removal

In Virginia, the Chesapeake Bay Local Assistance Department (CBLAD) administers the *Chesapeake Bay Act* and provides a manual with requirements for a buffer's composition. For example, it must be planted in woody vegetation or managed to lead to succession by woody vegetation; also, it must be planted with a variety of vegetation of indigenous trees, shrubs and grasses to enhance the quality and quantity of cover, erosion control, pollution reduction and wildlife food value. It also provides a list of acceptable native plant and tree species, which is useful for land managers. This approach could be used alongside tax-credits or reimbursements, such as the those provided by the Conservation Reserve Enhancement Program. (See Programs in Appendix B.)

If a locality wishes to create a particularly far-reaching ordinance that delineates the types and placement of vegetation, it should also allow for the removal of noxious weeds. It's recommended that this information be included in an accompanying design manual. To do so, the ordinance should spell out what constitutes a weed, in order not to provide an excuse for pulling or mowing beneficial, native riparian plants, such as boxelder or basket willow. The general rule of thumb is that, if some work or maintenance is allowed in the buffer, the type of work should be spelled out. For example, *Section 9VAC10-20-130.b.1* of Virginia's *Bay Preservation Act* allows for tree removal or pruning in order to provide for lines of sight, "as long as they are replaced with other vegetation that is equally effective in retarding runoff, preventing erosion and filtering non-point source pollution…"

Agriculture and livestock

Agricultural uses within the buffer are generally not compatible with sound buffer functioning, but may exist if they are pre-existing and are allowed through a "grandfather" provision. Appropriate application of BMPs may allow agriculture to coexist with healthy streams if adequate set-backs from the water are implemented. Many local governments are working to protect agriculture within their jurisdiction and local governments can require the submission of an agricul-



#2 subdivision buffer with BMP of biofilter to reduce runoff to the stream

tural conservation and management plan that includes BMPs, either to the local government or to the local Soil & Water Conservation District.

A buffer ordinance should require that appropriate measures are taken to manage cattle access to streams. Ideally, access should be only at certain points and those points should be managed to prevent the dispersal of manure into the stream. In many cases, controlled and stabilized access points improve cattle safety.

Prohibited Uses

The following uses should be expressly prohibited within the buffer. These prohibitions are in addition to those which are already illegal. For example, dumping fill material into a flowing stream is a violation of the federal *Clean Water Act*, so the buffer ordinance need not mention dumping restrictions.

Mining

Mining and its by-products represent a process wholly inconsistent with the purpose of buffers. Pre-existing mining operations within a proposed buffer should be mitigated as much as possible. Neither new mining nor expansion of existing mines should be allowed within a stream buffer.

In Virginia, the Department of Mines, Minerals and Energy allows sand and gravel mining in the buffer. However, most development regulations do not allow mining within an established buffer zone.

Commercial uses

In most cases, local governments have to accommodate pre-existing commercial uses – water-related and non-water-related; pre-existing and new-by-right – within the buffer area. An effective ordinance plans for mitigating the impact of such uses. In general, however, non-water related uses should be prohibited within the buffer space.

Residential uses

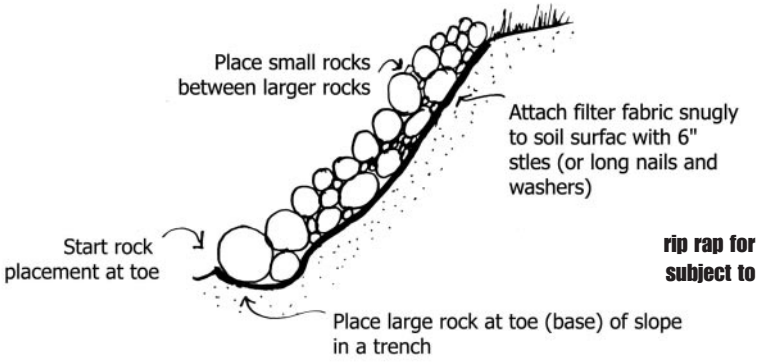
As with commercial uses, a local government may have to accommodate many pre-existing houses and lot divisions in the buffer area. Local governments may wish to consider fee-simple purchase, the purchase of easements or the use of eminent domain to acquire strategic buffer land when regulation is not possible. However, the purchase of land may not be an affordable option and eminent domain carries unavoidable political problems and requires proof that all reasonable avenues for purchase have been exhausted.

A more feasible approach is to discourage, or not allow, new residential construction within the buffer. Clearing trees for lawns and "views" should be prohibited, unless it can be proven (preferably by a trained landscape architect, biologist or other professional) that such clearing will not reduce the overall ability of the buffer to protect water quality. If a certain area of open space is required, the buffer area can be designated as common space.

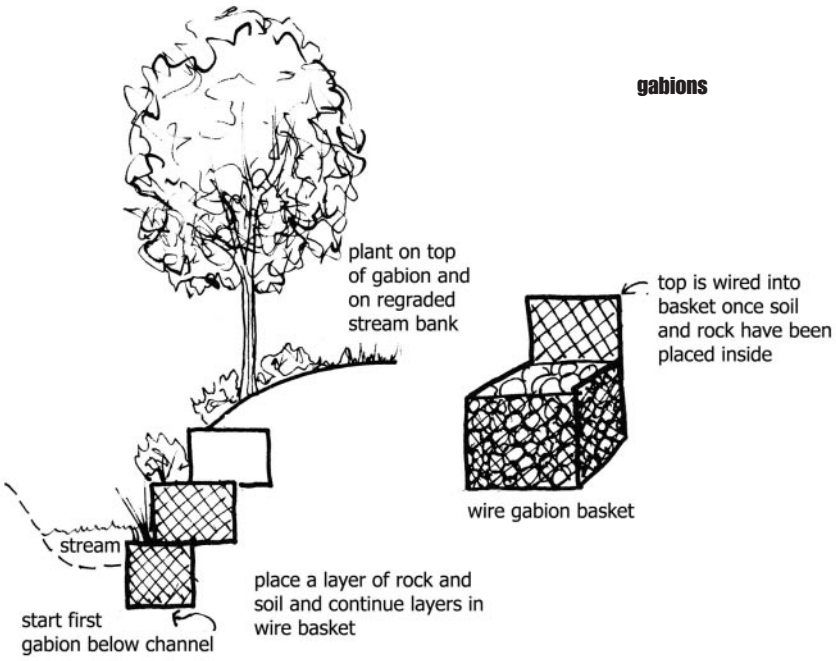
Best Management Practices to Improve Buffer Performance

Some agencies that require buffers don't allow credit for the buffer as a Best Management Practices (BMPs). For example, Virginia's Chesapeake Bay Local Assistance Department does not provide credit for the installation or maintenance of required buffers. However, adding BMPs to improve buffer performance, such as enhancing tree and shrub density or adding native species within the buffer, may be eligible for credit.

Best Management Practices are used to mitigate the effects of land development or agriculture. The ones discussed in this



rip rap for protecting areas subject to extreme erosion



gabions

guide fall into two main categories: stream buffer BMPs and stormwater BMPs. Stream buffer BMPs are those which directly effect the form and function of the stream buffer. Stormwater BMPs are those which help counteract the forces of stormwater runoff. There are many excellent handbooks and a lot of technical assistance on the selection, performance and installation of BMPs. The following provide some basic principles to consider in devising your strategy, but you will still need to consult technical manuals, agency staff and consultants when choosing or requiring specific approaches.

When dealing with high stormwater flows, consider that buffers generally have the capacity to treat only ten percent of total runoff since most stormwater runoff flows directly into streams through stormwater pipes and smaller tributaries. Stormwater runoff impacts streams by causing bank erosion as well as carrying sediment from overland runoff into streams. Stormwater from streets, parking lots and rooftops, also raises stream temperature and carries harmful street pollutants, such as oil, into streams.

Selecting BMPs

There are two approaches to applying a BMP. It may be *performance-based*, which assumes that a BMP will remove a certain percentage of runoff, sediment, and so on. Or it may be *outcome-based*, where measurements ensure that the impact on a stream or wetland meets pre-determined standards.

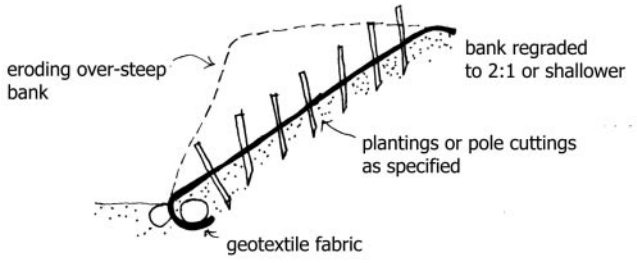
An outcome-based measure is more likely to ensure that the BMP is having the intended effect. However, most local government and state agencies don't have resources to conduct the necessary monitoring to ensure standards are being met. Some states specify which BMPs can be used to meet program goals, based on the assumption that certain BMPs have been shown to remove X percent of pollutants. While the effectiveness of a BMP varies depending on site conditions and proper installation, specifying which one is acceptable is an easy way to provide an enforceable guidance to local developers and other land managers.

When selecting BMPs, carefully identify the desired remediation effect for the stream corridor (for example, an expected percentage reduction in stream bank erosion, or expected decrease in nitrate levels). Next, identify the causes of the problem. This can be a difficult task, especially in urban areas where nonpoint source pollution can come from diffuse sources. However, even a general idea of the sources will help you select an appropriate BMP. You should also decided whether a technology- or a standards-based approach is most appropriate.

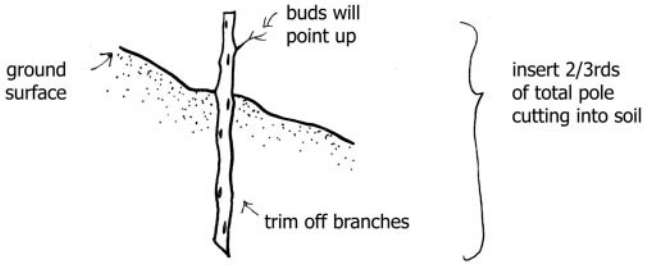
Once these issues have been identified, consult the local government's engineering department or an engineering firm to determine the most appropriate BMPs for your approach.

In-Stream Management

Although creating stream buffers is a BMP in itself, there are BMPs specific to the stream channel. If a stream has been damaged by excessive flows from overland runoff or stormwater piped directly to the stream, a buffer will not solve the



live stakes to restore riparian vegetation



problem by itself. Stormwater management requires a comprehensive approach, which includes trapping and filtering stormwater before it reaches the stream in stormwater ponds, biofilters, grassed swales and other stormwater measures.

Once stormwater problems are mitigated, in-stream techniques can help to repair prior damage. These techniques require careful application of engineering principles by consulting with a qualified geomorphologist and hydrologist. You also need to get all applicable permits from state and federal agencies for work in the stream channel or on its banks. These in-stream BMPs help enhance and protect any buffers that have been put in place.

We have listed numerous bioengineering and structural techniques that are used for stream bank restoration projects, such as fascines, live cribwalls, or riprap. *Bioengineering* combines biological (live plants) and engineering (structural) methods to provide a stream bank stabilization method that performs natural stream functions without habitat destruction. These techniques have existed for hundreds of years, but were abandoned with the advent of concrete and large machines, which were used to channelize and pave streams.

In the past twenty years, bioengineering methods have been gaining in popularity in the United States as a way to repair degraded streams, protect land structures close to streams such as power lines, and restore stream habitat. These BMPs are best used for direct stream restoration projects overseen by an engineer or geomorphologist who is familiar with riparian evaluation and design. There are several useful resources covering these methods in Appendix A. They are listed here to provide the reader with a basic familiarity of some of the methods available:

- *Brush layering:* Live branch cuttings, crisscrossed on trenches between successive benches of soil.
- *Gabions:* A wire rectangular basket filled with rocks and anchored against the stream bank to prevent erosion. Gabions are best covered with soil and grasses or shrubs to avoid harm to wildlife and improve aesthetics.
- *Live cribwalls:* A hollow, structural wall used for bank and slope stabilization formed by mutually perpendicular and interlocking members (usually timber), into which live cuttings are inserted, along with soil to stabilize roots.
- *Live fascines:* Sausage-like bundles of riparian woody plant cuttings used to stabilize stream banks, generally planted and staked into trenches parallel to the stream.
- *Live staking:* Cuttings, usually at least one inch in diameter, from living trees that are inserted into stream banks to stabilize the slope.
- *Riprap:* Stones of varying sizes that are used to stabilize the stream bank. They can be used at the toe of the bank in conjunction with methods mentioned above. Riprap should be hand-placed (not dumped) and stones should be somewhat larger than those generally transported by a two-year storm flow.

Stormwater BMPs

Other types of BMPs can help address the effects of stormwater runoff. These include such practices and structures as stormwater management ponds, constructed wetlands, grassed swales and public education programs, all of which can help retard and filter runoff prior to it reaching the buffer.

There are two different types of stormwater management practices. The first uses preventive measures – source control and nonstructural practices – to mitigate stormwater pollution. The second uses control measures – known as treatment practices – such as bioretention basins, sand filters and wet ponds.

As stated previously, control measures should be specified within accompanying design manuals to ensure that the science behind the BMP is up-to-date.

Preventive Measures

Preventive measures, sometimes called *source controls*, are management techniques that reduce the exposure of materials to stormwater, thus limiting the

BMP methods	General	Construction	Agriculture
Landscaping	✕	✕	
Preserving existing vegetation		✕	
Stormwater management agreements		✕	
Clearing limits		✕	
Prevent erosion on temporary and private roads		✕	
Terraces			✕
Diversions			✕
Cover cropping			✕
Conservation tillage			✕
Contour plowing			✕
Crop rotation			✕

amount of pollutants and sediment that are picked up during a storm. The creation of stormwater or buffer ordinances is really the first line of preventive measures. This is because it's generally easier and less expensive to reduce the amount of contaminated stormwater entering the system than to prevent high stormwater flows or to repair a stream after damage has been done.

CHAPTER 6
Monitoring and Maintenance

Monitoring and maintenance are critical components of any stream protection strategy, as they are the mechanisms for determining and evaluating its success. For example, if a goal of the strategy is to protect fish habitat, an evaluation of existing fish habitat and fish species should be conducted before the strategy begins, before goals are established for enhancing or increasing that habitat, and before a timetable is drawn up for monitoring fish and their habitats. Targets for habitat protection or improvement should be set, along with benchmarks to evaluate success along the way and contingency plans if those goals are not met.

Components of an Effective Monitoring Plan

There are a number of specific components for monitoring the success of the projects or objectives of your stream protection strategy. These are:

- Specific management objectives for the project or program.
- Monitoring methods tied to achieving management objectives; for example, conducting in-stream biological and chemical testing for projects intended to improve stream health.
- A clear methodology and schedule for conducting monitoring of the site (or sample sites).
- A reporting mechanism: Who conducts the monitoring, and who receives and evaluates results?
- Milestones for achieving project objectives.
- A process to reassess or repair failing projects.

Monitoring BMPs

If specific management practices, such as forested buffers, are installed as part of a stream protection strategy, then staff should monitor the performance of the BMP to ensure it is working. For example, if trees were planted to restore a forest buffer, the survival rate should be measured at least annually, and preferably at least biannually – say in spring and fall. Plans and funds should be available to replace lost trees or do site repair work.

Fifty percent of trees and shrubs should survive longer than two years. If the government is funding a private site, it may be necessary to provide funds or technical assistance for monitoring and reporting. For example, if a stream restoration project is protecting one side of the stream while causing the other bank to erode, new engineering and installations may be needed. Or, if the project is designed to fence cattle from a stream, some annual documentation should be supplied that fences are intact and the project is on-going. Depending on the scope of the project, inspections and enforcement may be needed to ensure that project goals are met.

Using intermediate indicators and milestones

One approach to monitoring is to use intermediate indicators and milestones to measure a strategy's success. If an indicator species is used, it should be one that can be clearly linked to the management strategy. A sample goal for a river habitat restoration plan might use the presence of brook trout as an *indicator* of success and the number of additional trout spawning in the creek by Spring 2004 as a *milestone* for its achievement.

As an example of including indicators and milestones in your strategy, consider the following. The goal of the strategy is to improve water quality to Muddy Creek by 2005. A specific objective is to "Restore 200 miles of riparian forest buffer to Muddy Creek by 2002." One of the milestones of the strategy is an X increase in the number of brook trout per mile by Spring 2004. Indicators of success are water quality and in-stream habitat, which are monitored to ensure that they are maintained or increased. If benchmark indicators are not achieved, there should be predetermined remedial actions to ensure that the goals are met in the future.

BMP Maintenance

When working with private landowners, it's important to include a maintenance schedule along with "allowed and restricted activities." For instance, if grant funds have been provided by a government entity for planting trees or if tax reductions (use-value taxation) have been provided, it's reasonable to require that the site be maintained. In the case of Licking Hole Creek in Albemarle County, Virginia, the landowner did allow a steam buffer and bioengineering project to be installed properly. However, he had previously had a lawn

Sample Steps for planning your strategy

1. Name of the project
Happy Trout Watershed.

2. Establish a goal for the project
The following project goal is based on an assessment of current conditions: To improve water quality in Happy Trout Creek.

3. Establish a specific objective
Objective A. of this project is as follows: To restore 100-feet-wide forested buffers on both sides of the stream with native species of trees and shrubs on twenty linear stream miles.

4. Establish specific tasks to achieve objective
- Implement riparian easement and planting program with county landowners.
- Purchase lands from those unwilling to donate easements.
- Assess and plant buffers as needed, to improve pollution removal and wildlife habitat.

5. Establish an implementation and monitoring plan
- *Monitoring Baseline:* Measure and establish a current baseline of trees and shrubs for each project area. Devise a plan to restore trees and shrubs (with review and approval by project sponsors, as required).
- *Implementation:* Install planting project and record location, number and species of installed trees and shrubs.
- *Ongoing monitoring:* Revisit site at six-month intervals and record survival rates (this can be done for the entire area or for predetermined sample plots intended to represent the entire plot).
- *Maintenance plan:* For losses greater than 60 precent, repair and replant as needed, according to buffer maintenance manual.

6. Consider providing funds or contingency plans to provide repair or reinstallation if the project is found to be unsuccessful.
Establish a project endpoint, as appropriate. For example, will five years of successful buffer revegetation be considered a success, or is the project to be inspected in perpetuity?

down to the stream's edge and he consistently mowed the young trees after installation. Fortunately, this did not kill the trees, but it did prevent growth of sufficient canopy to shade the stream. A maintenance agreement, which restricted mowing, could have prevented this problem.

Other Maintenance Methods

There are several other techniques you can employ to monitor and maintain a stream.

Posting a bond
You can post a bond to ensure that the goals of the project are met. For example, the bond may require that a certain number or percentage of trees survive to a specified year and that, if not, remediation or replanting can be required of the developer or responsible landowner.

Pre-assessment and post-assessment
For goals related to water quality, the quality of water in the stream should be assessed before and after the project. There are many methods that can be employed to do this. It may take years for a severely impaired watershed to recover.

Consult with state environmental monitoring agencies to find out what data they have for your stream and whether they are willing to include monitoring of your stream in their regular inventory. For example, while your local government or county may not have funds to implement a fish-monitoring program, you may be able to coordinate with your state's Fish and Game Department to include your stream in their next monitoring cycle. Alternatively, you may be able to partner with a local university that has equipment and laboratory facilities to assess your stream. For example, entomology students at the Virginia Polytechnic and State University provide biological sampling assistance to local stream conservation groups.

Clearly recorded buffer boundaries
Stream buffers can face tremendous pressure from encroachment and disturbance. These disturbances include tree removal, conversion to lawns, filling and dumping. Often, these practices happen because buffer boundaries are invisible to local landowners, contractors and local government officials. This is due in great part to the lack of recorded boundaries on official maps and the lack of landowners who are educated about the structure and function of stream buffers.

Designers and planners are often to blame for this oversight. Frequently, during the creation of site plans, buffers are delineated on final or conceptual plans but not on construction documents. This greatly increases the risk that contractors will encroach upon or disturb buffers in the course of their work. Local governments also often fail to record buffer boundaries on official maps. Without this information, local governments cannot look systemically at the current system of buffers or easily evaluate the impact of future developments on stream systems. Within an ordinance, language should be included that specifies how buffers are recorded on all plats. This information should include the dimensions of the buffer.

To address problems caused by contractors, maintenance crews and the public in general, some localities are now using signs in the field to mark off buffers. The sign lets people know that it is an environmentally sensitive area and gives a contact for more information. In Virginia, Albemarle County's Department of Engineering and Public Works used funding from the state's Chesapeake Bay License Plate Grant to help support a Buffer Sign Program. Virginia's Chesterfield and Henrico Counties use Resource Protection Area signage to identify buffer protection areas.

Evaluation and Enforcement

Although riparian buffers are usually on private property, it's still recommended that ordinances specify procedures for establishing protective covenants, such as a conservation easement where a landowner does not wish to take responsibility for the maintenance of the buffer. This is particularly true in the case of subdivisions, where a cluster development might create a "no-man's-land," where management issues are not clear once the lots are sold. It's also important that all land lease agreements contain information regarding the location of and management requirements for the buffer.

If the project is not successful – for example, if water quality goals are not met or tree survival rates are below a specified benchmark – there should be requirements in place for remedial activities. As mentioned earlier, a bond could be posted, in which case project success (for example, the tree survival rate) would need to be met for a period of years. Alternatively, if the project is installed by government contractors, the maintenance schedule should specify repair and replacement rates.

Facilities agreements

When a project is installed because it was required by an ordinance, then a *facilities agreement* can be implemented. A facilities agreement calls for the property owner or manager to maintain the site according to design specifications and performance. It stipulates the conditions for inspection and enforcement, as well as the steps necessary for remediation and responsibilities for any necessary repairs.

Techniques to Maintain the Integrity of Storm and Wetland Buffers

Planning Stage

- Require buffer limits to be present on all clearing/grading and erosion control plans.
- Record all buffer boundaries on official maps.
- Clearly establish acceptable and unacceptable uses for the buffer.
- Establish clear vegetation targets and management rules for different lateral zones of the buffer.
- Provide incentives for owners to protect buffers through perpetual conservation easements, rather than through deed restrictions.

Construction Stage

- Pre-construction stakeout of buffers to define the Limit of Disturbance (LOD).
- Set the LOD based on the drip-line of the forested buffer.
- Conduct a pre-construction meeting to familiarize contractors and foremen with the LOD and buffer limits.
- Mark the LOD with a silt fence barrier, signs or other methods to exclude construction equipment.

Post-Development Stage

- Mark buffer boundaries with permanent signs (or fences) describing allowable uses.
- Educate the local property owner/homeowner association on the purpose, limits and allowable uses of the buffer.
- Conduct periodic "bufferwalks" to inspect the condition of the buffer network (using volunteers, where possible).
- Reforest grass or lawn buffers.

Source: "Invisibility of Stream/Wetland Buffers: Can Their Integrity be Maintained?" Watershed Protection Techniques. Vol 1, Issue 1, pages 19-21, Center for Watershed Protection.

CHAPTER 7
Case Studies

There are many approaches to developing a plan to protect streams and, as mentioned earlier, myriad reasons for needing or choosing to do so. The following case studies demonstrate how different jurisdictions in the Bay Watershed have approached stream protection. In reviewing these case studies, you are likely to find situations, issues and conditions similar to your own, whether you are a small local government or a large municipality.

Each project is broken down into the following sections:

- *Trigger issues:* The concerns or legal requirements that led to the project.
- *Process:* The steps that involved groups took to implement the project.
- *Contact information:* Information to contact the project's supervisors.

The following case studies are found in this chapter:

Maryland

- Regulations for the Protection of Water Quality, Streams, Wetlands and Floodplains, Baltimore County
- Resource Protection Overlay Zone, Charles County
- "Let's Be Partners…Water Pollution: What We Can Do to Reduce and Prevent It", Baltimore County
- City of Gaithersburg Environmental Standards, Gaithersburg

Virginia

- Stream Assessment/Watershed Management Program, Henrico County
- Difficult Run Riparian Project, Fairfax County
- Green Infrastructure Plan, Loudoun County
- Water Protection Ordinance, Albemarle County
- SWAMP – Southern Watershed Management Program

Pennsylvania

- Citizen Volunteer Monitoring Program
- Donegal Creek Restoration Project, Lancaster County
- Guidebook for Riparian Corridor Preservation, Montgomery County

Regulations for the Protection of Water Quality, Streams, Wetlands and Floodplains, Baltimore County, Maryland

Trigger Issues

Over 2000 miles of streams flow through Baltimore County, half of which flow directly into drinking water reservoirs. These streams feed Baltimore City's three drinking water reservoirs, which supply over 1.8 million citizens in the Baltimore region. To protect their resources, the county established an *Integrated Watershed Management Program (IWMP)*. This program focuses efforts on seven key IWMP elements: land preservation and growth management; resource protection (regulations); environmental restoration; facility maintenance; water quality monitoring; watershed management planning and ecosystem research; and education and citizen participation. Stream buffers play a key part in the county's restoration projects and regulatory efforts. The IWMP has evolved to provide a framework for integrating watershed scales, agency functions and federal/state mandates.

Process

Wetland and stormwater issues in the county in the mid-1980s demonstrated the need for a regulatory approach to stream protection. In 1988, the County's Water Quality Steering Committee made recommendations for a regulatory program. In 1989, staff created an Executive Order which was developed into formal regulations under the *Regulations for the Protection of Water Quality, Streams, Wetlands and Floodplains* in January 1991. The development industry was involved in the negotiations and this helped to gain County Council approval.

The goal of the regulations is to protect the county's riparian and aquatic ecosystems, thereby protecting water quality. These regulations help maintain stream health because they apply to all land development in the county (specifically land subdivision, land clearing for development and construction) and agriculture, forestry and mining. The regulations apply to:

- all new developments
- timber harvesting activities that are not in an approved Forest Management Plan
- all lands that are causing, or contribute to, stream pollution, erosion and sedimentation, or the degradation of stream habitats (unless the land is agricultural and has an approved Soil and Water Conservation Plan)

The county's regulations call for specific design standards for forested buffers and building set-backs. Forested buffers are defined as:

"…a forested strip of land extending along both sides of a stream and its adjacent wetlands, floodplain, and slopes. The forest buffer width shall be adjusted to include contiguous, sensitive areas, such as steep slopes or erodible soils, where development or disturbance may adversely affect water quality, streams, wetlands, or other water bodies. This adjustment shall be accomplished by evaluating the poten-

tial of a site for impacts that result from runoff, soil erosion, and sediment transport." Sec. 14-341

Buffer width is determined by stream classification and formulas for evaluating steep slopes and erodible soils. The minimum buffer width is between 75 and 100 feet on each side of the channel. The default width for each stream is set based on its water use classification. Buffers are described by 'metes and bounds' on recorded plats and restrictive use covenants are recorded in the official land records.

In addition to requiring the demarcation of riparian buffers on development plans, the regulations also require the management of existing buffers by restricting activities such as soil or vegetation disturbance, filling, dumping, using motorized vehicles and pesticide usage (except for the spraying of noxious weeds).

When asked about the advice he would give to other localities, Don Outen of the Department of Environmental Protection and Resource Management said that two key elements of the project were:

- Looking at functions that streams provide and using buffers as a tool to protect those functions.
- Working closely with the development community to create the program and ensuring that the standardization, convenience and certainty that developers require were included.

Contact:

Donald Outen , Baltimore County Department of Environmental Protection and Resource Management, 401 Bosley Avenue, Towson, MD 21204 (410) 887-5683

Resource Protection Overlay Zone, Charles County, Maryland

The Charles County, Maryland, zoning ordinance was changed to create overlay zones for the protection of streams and adjacent sensitive areas.

Trigger Issues

In response to development pressures, the Charles County Comprehensive Plan Citizen's Advisory Committee identified stream valleys and natural resources as an area of primary concern for their 1990 Comprehensive Plan.

Process

The Citizen's Advisory Committee realized that, in order to protect stream valleys, it would need to create a number of additional regulatory mechanisms. To this end, it determined that the language in the County zoning ordinance should be updated and should include development standards necessary to protect environmentally sensitive areas and establish a stream valley protection program.

In 1992, the county implemented a Resource Protection Overlay Zone (RPZ) in the revised County Zoning Ordinance. The main goal of the RPZ is to protect water quality. It functions by creating a zone for all the major stream valleys, which is superimposed on county zoning maps. This overlay zone identifies the streams and their adjacent sensitive areas, including floodplains, nontidal wetlands, steep slopes and habitat areas. The RPZ sets performance standards for all new developments and sets buffer widths based on stream order.

Several uses are allowed within the buffer zone, provided that certain conditions are met and the buffer zone is not compromised. These include:

- agricultural uses
- timber harvesting
- recreational access
- non-motorized trails
- utility lines

Contact:

Karen Wiggen, Charles County Office of Planning and Growth Management, Charles County Government Building, P.O. Box 2150, La Plata, MD 20646 (301) 645-0540

"Let's Be Partners…Water Pollution: What We Can Do to Reduce and Prevent It", Baltimore County, Maryland

This county-wide effort by Baltimore County, Maryland, is designed to educate its citizens about the importance of stream corridor protection.

Trigger Issues

The Baltimore County Department of Environmental Protection and Resource Management (DEPRM) is very proactive in stream buffer protection. Their *Regulations for the Protection of Water Quality, Streams, Wetlands and Floodplains* were some of the earliest examples of proactive planning approaches to stream buffer quality. However, DEPRM also realizes that the task of reducing water pollution is greater than the government alone can handle. Citizen-based education is a key part of any large-scale stream preservation effort.

Process

To address the need for education on water quality and stream buffer preservation, the DEPRM has created a multimedia environmental education program called *"Let's Be Partners…Water Pollution: What We Can Do to Reduce and Prevent It."* It is offered free of charge to schools and citizen community groups throughout the county.

The program is tailored specifically to Baltimore County and frames a watershed approach for local stream awareness. The goals of the program are to address the causes of water quality degradation in Baltimore County, to outline the current efforts that are being made to address pollution and to explain efforts that citizen and business groups can undertake to address pollution in local streams, drinking water reservoirs and the Chesapeake Bay.

To maximize the program's audience, the program was designed to be adaptable for a variety of ages, abilities, interests and time constraints. It also is geared to citizen reduction of nutrient, toxic, and sediment pollution that reaches local streams, drinking water reservoirs and the Chesapeake Bay via number of reasonable, cost-saving ideas that anyone can employ.

The program addresses the following topics:

- Water Pollution: what it is, and how it enters the waterway (point and non-point sources).
- Effects of pollution: loss of valuable resources.
- What specifically can be done:
  - by government agencies at all levels?
  - by individual citizens, families and school groups?
  - by businesses, neighborhoods, and communities?
- Where to get further information.

Contact:

Department of Environmental Protection and Resource Management, 401 Bosley Avenue, Towson, MD 21204 (410) 887-5683

City of Gaithersburg Environmental Standards, Gaithersburg, Maryland

The City of Gaithersburg occupies ten square miles in Montgomery County, Maryland, and is situated thirteen miles north of Washington D.C. It has a population of approximately 54,000.

Parties and Roles

An Environmental Guidelines Committee was created to develop the city's environmental standards. The committee consisted of staff and citizens from a variety of city departments and committees, as well as representatives from the neighboring city of Rockville, regional governmental agencies, local engineering and development firms and local non-profits.

City staff performed most of the research and development for the environmental standards. Other regional organizations provided technical expertise and guidance during the development process. Such organizations include the Maryland-National Capital Park and Planning Commission, the Forest and Wetland Conservation Association, Environmental Quality Resources, Montgomery County Department of Environmental Protection, the City of Rockville, Quadrangle Development Committee, Rodgers & Associates, the Metropolitan Washington Council of Governments, the Montgomery Soil Conservation District and the Izaak Walton League of America.

Trigger Issues

In 1994, city planning staff were struck by the fact that, although the city had many environmental ordinances for issues such as forest conservation, sediment and erosion control, stormwater management and floodplain management, a residential development proposal that met these development standards still threatened an impaired stream. In response to citizen concerns over this issue, the City Council directed the city Planning Department to create environmental guidelines for developments.

Process

In 1994, the city started a series of biweekly meetings to create environmental guidelines. At the table were local developers, Planning Commission representatives, City Council members, environmental consultants, regional and county environmental professionals and city staff.

Using other authorities' ordinances as a guideline

During the meetings, environmental guidelines that had been developed by the surrounding jurisdiction of Montgomery County were used as a model. It was felt that these guidelines were comprehensive and that they would help developers who operated in both Montgomery County and the City of Gaithersburg.

After five months, the committee issued the first draft of the *City of Gaithersburg Environmental Guidelines*. The document was divided into two sections:

- Natural Resources Inventory (NRI)
- Standards for Development

Natural Resource Inventory

Environmental information about a proposed development site is first gathered during the Natural Resources Inventory (NRI). The NRI is a complete analysis of existing natural resources and includes a map and a submitted narrative report describing:

- streams and floodplains
- stream buffers
- topography
- soils
- wetlands
- forests and trees
- danger reach/dam break analysis
- threatened and endangered species
- species in need of conservation
- existing wildlife
- special protection areas
- cultural resources
- stream quality
- noise pollution
- significant views and vistas

The environmental standards are applied in the site plan review process, in order to protect the environmental features identified in the NRI. They are also considered in the formulation of staff recommendations to the Planning Commission.

Standards for Development

The standards for development regulation is based on the principles of comprehensive watershed management and protection and include the following management strategies:

- The encouragement of judicious use of land to limit impervious surfaces and maintain wetlands, floodplains, seeps, bogs, and so on, in their natural condition.
- The establishment of protected slope areas that address slope gradient, soil erodability and proximity to stream channels.
- The use of stream buffers, the widths of which depend on the stream's state-use designation, the gradient of adjacent slopes, and the presence of erodible soils.
- New or creative techniques that can be demonstrated to accomplish the same goals as the specific standards can be considered, in conjunction with waiver requests.

- The protection of both upland and riparian forest resources.
- The recognition and protection of the ecological significance and functions of headwater areas.
- Baseline monitoring to understand and protect the city's stream systems.
- The provision of healthy forest and tree cover for the purpose of maintaining water quality, preserving wildlife habitat, preventing erosion, mitigating air pollution, controlling water temperature and enhancing community amenities in an urbanizing environment.
- Adherence to the state's erosion and sediment control standards.
- The provision for stormwater management structures, storm drainage systems and other facilities in a manner that respects the integrity and the natural equilibrium of stream systems.
- The incorporation of BMPs into land disturbance activities.

Environmental standards

The 1995 Environmental Standards for Regulation was incorporated into the site plan review process and were relatively successful. The standards have been a beneficial tool for identifying problems and opportunities during the development process. They offer a clear and comprehensive method for developers and staff to evaluate important natural features of a site and the potential impacts of development. In addition, the standards incorporate mitigation measures, in order to create flexibility and balance growth with natural resource protection.

However, since the standards were not adopted as regulations, they did not have the weight of law and were not fully enforceable. In addition, although the original standards had an implementation section, a waiver process was not clearly identified and therefore waivers were granted on an ad hoc basis.

In 1998, an independent consultant reviewed the city's environmental standards and recommended they be written as a regulation, to allow for enforcement. Staff and the Environmental Affairs Committee began a comprehensive review of the Environmental Standards and proposed several changes to strengthen the city's environmental protection measures. In addition, the process involved an outside review by the Maryland National Capital Park and Planning Commission, the City of Rockville, the City of Bowie, the United States Humane Society, the Izaak Walton League and several engineering firms. The Environmental Standards for Development were rewritten as a regulation and were adopted in November 2001. They incorporate a comprehensive waiver process with a detailed description of instances for when a waiver is required, specific criteria that must be fulfilled for a waiver to be granted and compensation requirements for granted waivers.

Contact:

Erica Shingara, City of Gaithersburg, 31 South Summit Avenue, Gaithersburg, MD 20877 (301) 258-6310 or www.ci.gaitherburg.md.us

Stream Assessment/Watershed Management Program, Henrico County, Virginia

Henrico County borders the city of Richmond on the west, north, and east and lies between the James and Chickahominy rivers. One third of Richmond's metropolitan area is located in the county. The county's Assessment and Watershed Management Program began with a countywide stream quality assessment. The assessment led to the establishment of a stormwater quality general fund and a method for prioritizing stream restoration projects in Henrico County, Virginia.

Trigger Issues

In 1993, Henrico County decided to apply the *Chesapeake Bay Preservation Area (CBPA) Designation and Management Regulations* to the entire county to satisfy NPDES requirements. After working with Bay Act criteria for a number of years, many different and varied best management practices (BMPs) began to be utilized in development projects. Some of the BMPs were found to be more effective than were others. In fact, an early study showed that eighty nine percent of pollutant removal from the streams was achieved by just 65 percent of the BMPs.

This led the county to conduct a review of the 35 percent of BMPs that were ineffective. These were primarily located in subdivisions and redevelopment sites and were some of the most costly to install. The county concluded that a new program was needed to better use the resources spent on water quality.

Process

To help maximize resources for water quality enhancement and to satisfy regulatory requirements mandated by the CBPA, Henrico County developed its *Stream Assessment/ Watershed Management Program* in two phases:

- Phase One developed protocols for stream assessment and implemented them on two pilot watersheds.
- Phase Two entailed a county-wide stream assessment.

The countywide assessment was targeted at streams with drainage areas greater than 100 acres. A total of 440 stream miles were assessed – a job that took eight two-person teams five weeks to complete in fall 2000. In addition surveying habitat, each team took an inventory of the utility lines, pipe discharge, erosion problems, channeling and so on. Digital photos of these were then sites and data were then added to the county GIS system.

Management areas

The assessment efforts resulted in the designation of specific management areas which allow the county to target various stormwater management measures for different development activities. One such measure was the establishment of a county stream restoration fund, which is funded by development fees levied on certain management areas.

Identifying areas in need of restoration

Additionally, the assessment resulted in a countywide identification of more than 900 stream segments in need of restoration. To help prioritize restoration efforts, the impaired segments were ranked using criteria such as development within the watershed, the condi-

tion of upstream and downstream segments and overall stream condition.

As in most counties, one of the stumbling blocks to restoration efforts is that most critical stream segments identified by the program fall on private land. Restoration efforts were possible only through cooperation between the county and landowners. It's hoped that funds collected through development fees will help the county restore these streams.

Contact:

Keith White, P.E., Henrico County Department of Public Works, Environmental Division, P.O Box 27032, Richmond, VA 23273 (804) 501-4393

Difficult Run Riparian Project, Fairfax County, Virginia

Difficult Run and its tributaries define the largest watershed in Fairfax County and cover a total of 56,566 acres. Its waters flow into the Potomac River, which is a major tributary of the Chesapeake Bay. The county was founded in 1742. Historically, the river was used by the Dogue Indians and has an extensive history of use by early settlers for milling grain and lumber. The Difficult Run project is targeted throughout fourteen miles of the urban stream's watershed.

Trigger Issues

Like many counties, Fairfax is under increasing development pressure. The county's population is projected to increase by 216,510 over the next twenty years. This growth has led to a host of water quality problems. One such case was Difficult Run, which began to show symptoms of stress from nonpoint source runoff caused by an increase in impervious surfaces such as roads, roofs, sidewalks and parking lots. These symptoms included increased stream water temperatures and severely eroded stream banks.

Process

The Difficult Run Riparian Project was created as a means, not only to address the stream's problems, but also to raise awareness within the county about the importance of urban riparian buffers and their conservation. Since its inception, the project has developed into a watershed-wide reforestation effort that fosters partnerships between federal, state and local agencies and the citizens of Fairfax County. The project's implementation includes:

- identification of target sites
- reforestation of the chosen areas
- a watershed-wide education and outreach program

To aid in site identification, a workgroup including the Virginia Department of Forestry, the Metropolitan Washington Council of Governments, Fairfax County Park Authority and the Soil and Water Conservation District developed a protocol for evaluating riparian buffers. The protocol developed a scoring system based on fifteen land-use and environmental characteristics that are used to prioritize reforestation and restoration needs.

Identification and reforestation efforts began along the Difficult Run mainstem and included planting 15,000 tree and shrub seedlings on 140 acres. The project has since expanded to include Difficult Run's tributaries.

Community education

Education efforts included a *Water Quality Tips* mailing that was sent to civic and homeowner association presidents. The list was formulated in response to a suggestion presented at the Difficult Run Roundtable Meeting.

Contact:

Judy Okay, Coordinator, Difficult Run Riparian Restoration Project, Virginia Department of Forestry, 12055 Government Center Parkway, Suite 904, Fairfax, VA 22035 (703) 324-1489

Green Infrastructure Plan, Loudoun County, Virginia

As part of a nineteen-month revision to its Comprehensive Plan (adopted 23 July 2001), Loudoun County integrated protection measures for its "Green Infrastructure" in the Revised General Plan. These measures include the protection of an integrated stream corridor system and the creation of a River and Stream Corridor Overlay District.

Trigger Issues

Loudoun County is the home of Dulles International Airport. Since the 1960s, the population has increased from 20,000 to 185,000, causing tremendous pressures on the county's natural resources and infrastructure.

Loudoun County's tremendous growth rate mandated that earlier planning strategies undergo a critical reevaluation. Former policies were no match for the market dynamics that were quickly eroding the county's rural character. Although the county's (1993) Scenic Creek Valley Buffer and Floodplain Overlay District ordinances were already in place, planning officials realized that a new comprehensive approach was needed if the county's natural resources were to be protected.

Process

Loudoun County's newly approved Revised General Plan outlines a framework for comprehensive natural resource protection by organizing the county's environmental, natural and heritage resources into one related system called the Green Infrastructure.

The Green Infrastructure comprises four groups:

Group One: Natural Resource Assets

- river and stream corridors
- scenic rivers and the Potomac River
- surface and ground water resources
- geologic and soil resources
- forests, trees and vegetation
- plant and wildlife habitats

Group Two: Heritage Resource Assets

- historic and archaeological resources
- scenic areas and corridors

Group Three: Open Space Assets

- greenways and trails
- parks and recreation
- public school sites
- open space easements

Group Four: Complementary Elements

- air quality
- lighting
- the night sky

Identifying environmental infrastructure

The aim of the Revised General Plan is to look at the Green Infrastructure first and then apply conservation design to all development and redevelopment in the county. This is accomplished, in part, by guiding developers to first identify the environmental infrastructure of a piece of land before outlining where structures, roads, and lot lines will be located. Density credit is provided for all Green Infrastructure elements, so those areas of a site that are not identified as part of the county's Green Infrastructure can be developed at full density, equal to the density potential of the gross area of the site.

River and stream corridors

The Plan clearly establishes river and stream corridors as the largest element of the County's Green Infrastructure. The plan targets rivers and streams that drain areas of 100 acres or more and have corridors that include the following components:

- Associated 100-year floodplains and adjacent steep slopes: a 50-foot protective management buffer is established to protect the corridor, the floodplain and adjacent steep slopes. A 100-foot minimum stream buffer protects the streams when the 100-year floodplains, adjacent steep slope areas and the 50-foot Management Buffer are not greater than the minimum stream buffer.
- Riparian forests.
- Wetlands.
- Historic, cultural and archaeological resources that fall within the corridor.

River and Stream Corridor Overlay District

To protect these river and steam corridors, the county plans on revising its zoning and subdivision ordinances and facility standards manual, and adopting a River and Stream Corridor Overlay District (RSCOD).

Density development transfer

Loudoun County also contains two scenic rivers, as designated by the Scenic Rivers Program of Virginia. These are Catoctin Creek and Goose Creek, both of which flow into the Potomac River. These two creeks and the Potomac River will be protected by a 300-foot no-build buffer, or the RSCOD, whichever is greater. The county will also protect its water supply reservoirs with a 300-foot no-build buffer or the RSCOD, whichever is greater. The plan allows for a density development transfer from the no-build buffer. To ensure the protection, conservation and restoration of an integrated stream system, the plan also looks to the source of its streams and calls for the protection of headwaters originating in the county's mountains.

Contact:

Mark J. Moszak, Loudoun County Department of Planning, 1 Harrison Street SE, 3rd Floor, P.O. Box 7000, Leesburg, VA 20177-7000 (703) 777-0246

Water Protection Ordinance, Albemarle County, Virginia

Albemarle County had already established a long history in water quality management when they undertook the creation of a comprehensive water protection ordinance.

Trigger Issues

Beginning in the 1970s, Albemarle County protected its drinking water reservoirs, introduced stormwater retention provisions, implemented state-mandated erosion control measures and created a stream buffer program based on the *Chesapeake Bay Preservation Act*. As a result, there were a confusing number of standards and ordinances that designers, developers and county staff had to reconcile. In addition, water quality treatment practices were not applied uniformly to development sites and innovative stormwater practices were not being utilized.

Process

To help streamline its water quality management program, the county embarked upon the task of creating a single, comprehensive ordinance that would:

- Streamline the process of development review for water-related items.
- Promote the use of a wider range of traditional and innovative BMPs and stormwater techniques.
- Provide a template for regional stormwater management, involving neighboring jurisdictions.
- Provide a framework for complying with NPDES regulations and developing a watershed-based approach to stormwater management.

Before it could develop a new ordinance, it was critical for the county to have an in-depth understanding of the need for improved water management. To meet this need, studies where undertaken, which showed that urban streams carried high pollutant loads after storm events. These results indicated a need to update and improve current water quality strategies.

Focus group

The study also provided the county with baseline data, against which future improvements and changes could be measured. In 1994, the county's Water Resources Committee decided to form a focus group to assist in the development of a new ordinance. The group consisted of developers, designers, environmental groups, government agency staff and other local decision-makers. The group met for almost two years and assisted significantly with efforts to develop a broad-based consensus for improving stormwater management.

Public review

The first draft ordinance was presented for public review and comment and was reviewed by county legal staff. Numerous subsequent drafts were created to integrated reviewers' comments. It was finally presented and adopted by the Board of Supervisors in early 1998.

Design manual

Since adoption of the ordinance, all new development plans have incorporated stormwater BMPs, including stream buffers. To help designers understand and choose different BMPs and perform the necessary calculations, a *Design Manual* was created.

The county is now working on a series of stormwater master plans that will adopt a watershed-based approach. In addition to on-site BMPs, the program will include stream buffer and stream bank restoration, regional BMPs, and education and outreach. These measures will

be a component of complying with new NPDES Phase II Regulations.

Contact:

Dave Hirshman, Water Resources Manager, Albemarle County Department of Engineering, 401 McIntire Road, Charlottesville, VA 22902-4596 (434) 296-5861

SWAMP – Southern Watershed Management Program, Virginia

The Southern Watershed of Virginia is located along the southern coastal region of Virginia and is approximately 325 square miles.

Trigger Issues

The effort to create a regional approach to watershed management was not new. Other cooperative initiatives in the area date back to the 1960s, '70s and '80s. In the mid-90s, however, the Hampton Roads Planning District Commission began to see an increase in pressure caused by the many environmental, economic and regulatory interests in the watershed.

Process

To help align these disparate interests, the *Southern Watershed Management Program (SWAMP)* was created. The goal of the project is to develop a cooperative local government approach for the management and protection of the Southern Watershed Area, with the intent of balancing environmental resources with economic development opportunities.

Six-phased plan

The SWAMP project has been organized on a yearly basis according to a six-phased plan. The first phase developed a framework for the cities of Chesapeake and Virginia Beach to work together on watershed management issues. This led to the creation of a Local Government Advisory Committee, which consisted of technical resource personnel from each locality and a representative from the Virginia Dare Soil and Water Conservation District.

Phase Two tasks included the completion of a survey of agencies working in the Southern Watershed Area and the creation of a Water Quality Task Force (WQTF). The WQTF was charged with analyzing existing water quality data, evaluating current methods and procedures used to monitor water quality, and making recommendations for future actions.

In 1996, during Phase Three, the project became eligible for funding as a Special Area Management Plan from the Virginia Coastal Program. These funds enabled the SWAMP project to continue collecting both technical and stakeholder-related data, create an Agency Roundtable and review development controls used by the cities of Chesapeake and Virginia Beach.

During Phase Four, the partnership continued to work on the programs established in Phase Three, such as water quality data analysis, BMP research and education, sustainable economic development initiatives and public involvement.

Phases Five and Six focused on applying the research done in the first four phases to program initiatives. Two such initiatives were a mapping project to show options for the area's Mitigation Strategy and its Rural Area Preservation Program.

Memorandum of Agreement

Today, the major efforts in SWAMP are focused on developing policy based on the research in earlier phases of the project. In particular, a Memorandum of Agreement (MOA) has been completed, which deals with water-use conflicts on the North Landing River. Project staff are also currently in the process of developing a similar agreement for Back Bay and are developing an MOA that deals with wetland mitigation issues in the Southern Watershed.

Eric Walberg, principal planner on the project, suggests that other localities wishing to use a similar approach should start by attempting to build communication and a good working relationship between local, state and federal agencies involved in land use and management decisions. He adds that mapping and data collection are also critical to the management process.

Contact:

Eric Walberg, AICP, Principal Physical Planner, Hampton Roads Planning District Commission, 723 Woodlake Drive, Chesapeake, VA 23320 (757) 420-8300

Citizen Volunteer Monitoring Program, Pennsylvania

This is a statewide effort by the State of Pennsylvania to help citizens take part in stream monitoring programs.

Trigger Issues

The need for stream quality data in Pennsylvania is extensive; no one government office can gather all the information it needs to identify the critical areas in its jurisdiction. Data needs are especially strong after large storms and for assessing water resources in remote areas. By partnering with local citizen groups, government agencies are better equipped to effectively manage and protect state water resources.

Process

The Pennsylvania Department of Environmental Protection (DEP) created the Citizen Volunteer Monitoring Program (CVMP). This program is geared to help organizations and individuals understand water quality issues and the techniques needed to collect quality data.

The goals of the CVMP are:

- To foster stewardship by giving communities the tools they need to meet their own goals related to water resources.
- To give the DEP a better understanding of water resources by receiving quality-assured data from volunteers.

The CVMP has also created partnerships with other organizations, including:

- The Volunteer Environmental Monitoring Panel (VEMP)
- The Keystone Watershed Network
- The Alliance for Aquatic Resources Monitoring
- The Pennsylvania Organization for Watershed and Rivers
- River Network

- The Stroud Water Research Center
- The Delaware Riverkeeper
- The Canaan Valley Institute
- The Environmental Alliance for Senior Involvement

These partnerships are designed to facilitate the set up of statewide networks and databases for monitoring results.

The aim of the partnership effort between VEMP and River Network was to create a handbook to help citizens with their monitoring efforts. The handbook offers citizen groups a unique study design process, which supports a choice of monitoring methods based on each group's goals.

Additional services offered by CVMP are:

- Training programs for volunteer monitors.
- A services information clearinghouse for volunteer monitors.
- Identification of partnership opportunities with DEP programs.
- An annual, Statewide Snapshot of Water Quality that takes place over ten days during which time groups can send their data to the DEP for inclusion in an annual report.

Contact:

Diane Wilson, Citizen Volunteer Monitoring Program, Pennsylvania Department of Environmental Protection, Bureau of Watershed Management, P.O. Box 8555, Harrisburg, PA 17105-8555 (717) 787-3730

Donegal Creek Restoration Project, Lancaster County, Pennsylvania

Located thirty-five miles from the Chesapeake Bay, Lancaster County, Pennsylvania, is an agricultural area comprised primarily of dairy farms, many owned by Amish. Donegal Creek is a limestone trout stream located in the northwest corner of the county. The Donegal Restoration project is a partnership effort to restore the native trout habitat along a predominantly privately owned local creek using a "demonstration project" approach.

Trigger Issues

Intensive agricultural practices and dairy cattle farming around Donegal Creek caused significant degradation. Though it was formerly a trout stream, native trout had not been seen for over thirty years. Signs of stream degradation included:

- stream bank erosion
- excessive nutrient levels
- lack of native vegetation
- a sediment-laden substrate
- a wide, shallow channel, formed because of accelerated erosion and resulting sedimentation

Process

To bring the stream back to health, the Donegal Creek Restoration Project was created. The project's main objective was to restore the creek to a trout stream. However, a majority of lands targeted for restoration were in private ownership. This proved to be a large stumbling block. Many of these landowners were cattle farmers who allowed their cattle unrestricted access to the stream, causing much of the erosion and sedimentation.

Demonstration fence

Original efforts for stream restoration included the creation of a *demonstration buffer protection fence* along both sides of a 1000-foot stretch of the creek. It was erected by Donegal Fish and Conservation members, aided by Conservation District staff. A Conservation District tree sale provided money for the construction, and it used volunteer labor and donated materials. The demonstration fence was built on a highly visible spot along the West Branch of the Creek.

In 1994, additional funding became available from Trout Unlimited and the Pennsylvania Department of Environmental Protection. Further funds were provided in 1996 by the Environmental Protection Agency, through a *Clean Water Act* grant.

Two-phase project

The project had two main phases:

- Education of landowners.
- Implementation of stream restoration projects.

Education

To initiate the education portion of the project, staff from the Conservation District visited each of the twenty-three landowners affected by the project. Staff helped to assess land immediately adjacent to the creek to determine impacts to the stream and to approaches that could enhance both the stream and the farmers' agricultural practices. Education efforts paid off, as evidenced by the participation of nineteen of the twenty-three landowners.

Implementation

The partnership then initiated a number of stream restoration projects, including:

- stream bank fencing and cattle crossings
- fish enhancement structures
- stream bank stabilization
- riparian buffer strips

The primary approach sought to restore trout to the stream by limiting cattle access. After securing landowners support, fences and trees were installed, along with fish enhancement devices, stabilizing eroded stream banks, and narrowing and deepening the stream to improve flow and reduce stream temperature.

To help reduce nutrient levels and increase the amount of native vegetation, stream buffers were planted along the banks. However, because of the small size of the farms and fields, the buffer width was narrowed to a range of 10-35 feet, instead of the recommended 75-100 foot width.

The final result was enhancement and protection of 6.7 miles along Donegal Creek. The original goal of reintroducing native trout was met when the fish successfully spawned in the headwaters!

Contact:

Don Robinson, Lancaster County Conservation District, 1383 Arcadia Road, Lancaster, PA 17601-3149 (717) 299-5361

Guidebook for Riparian Corridor Preservation, Montgomery County, Pennsylvania

Montgomery County, Pennsylvania, is located approximately twenty miles west of Philadelphia's city center and is home to the historic Valley Forge. This project involved the creation of a model overlay ordinance.

Trigger Issues

In the early 1990s, Montgomery County started a $100 million open space initiative. The cornerstone of the initiative was an open space program that provided money to the county's sixty-two municipalities for the acquisition of open space areas. The initiative also included funding for county parks and trails and grants to conservation organizations. To receive funds for open space protection and enhancement, municipalities were required to create written plans. This highlighted the need to find methods, other than acquisition, to achieve conservation goals.

The county's review of its municipalities' plans showed that there was significant interest in protecting stream corridors as important natural features. To protect these natural features, the localities initially looked to methods like open space development (also known as conservation subdivisions, or cluster developments). These, and other, conversation ideas were written up in county plans, but it more was needed to ensure that municipalities could reach their stream corridor protection goals.

Process

To help the municipalities reach stream protection goals, the county put together a task force to create the *Guidebook for Riparian Corridor Protection*. The taskforce included representatives from the Natural Resources Conservation Service, the Soil and Water Conservation District, the local natural resource conservation organization, municipal officials and representatives of the legal community. The bulk of the guidebook comprised a model overlay ordinance that outlined the central features needed to create a successful local stream protection ordinance in Pennsylvania.

Creating two buffer zones

Using the specifications outlined in the USDA publication *Riparian Forest Buffers* as a resource avoided most of the problems involved in developing a new ordinance. One problem that did arise concerned agricultural lands. Many farms in Montgomery County are small, averaging about 100 acres in size, so every acre counts. Regulations mandating extensive buffer widths threatened farmers' ability to earn an adequate profit. In recognition of this, the ordinance outlines two zones for stream buffers and allows agriculture in the second zone.

What is a stream?

Review of the guidelines caused different municipalities to confront the problem of defining a "stream." Some localities used soil survey information, combined with defined drainage areas, others used U.S. Geological Survey information, and some relied on local knowledge.

Since the issue of defining perennial streams can be contentious, the county didn't want the issue to inadvertently restrict stream preservation efforts. Therefore, the model ordinance allowed municipalities to be flexible in their approach to stream definition and identification.

Three-pronged approach

In general, the county recommends municipalities follow a three-pronged approach to stream protection:

- Acquisition through fee-simple purchase or easement.
- Land use controls, such as open space development, transfer of development rights and overlay districts, to protect land proposed for development.
- Land stewardship education via workshops, flyers, and brochures.

Contact:

Eric Jarrell, Montgomery County Planning Commission, Court House, P.O. Box 311, Norristown, PA 19404-0311 (610) 278-3745

APPENDIX A
Resource List

This appendix lists a variety of resources for:

- riparian conservation
- land planning
- stream ecology and restoration
- wetlands
- web sites

Riparian Conservation

"Better Site Design: An Assessment of Better Site Design Principles for Communities Implementing Virginia's Chesapeake Bay Preservation Act" Source: Center for Watershed Protection, 8737 Colesville Rd., Suite L105, Silver Spring, Md. 20910; or call (410) 461-8323; or e-mail mrrunoff@usapipeline.com. ($35)

"A Guide to the Bay Act (Virginia's Chesapeake Bay Preservation Act Program)" Source: Chesapeake Bay Local Assistance Department; or call (800) 243-7229.

"Guidebook for Riparian Corridor Preservation" Source: Montgomery County Planning Commission, Norristown, Pennsylvania, 19404-0311 or call (610) 278-3745

"Riparian Forest Buffers" 1996 White Paper. Source: Alliance for the Chesapeake Bay; or call (800) YOUR-BAY or on-line at http://www.chesapeakebay.net/serach/pubs.htm (free)

"The Architecture of Urban Stream Buffers" from Watershed Protection Techniques, Vol. 1., No. 4, Summer 1995. Source: Center for Watershed Protection, 8737 Colesville Rd., Suite L105, Silver Spring, Md. 20910; or call (410)461-8323 (note: magazine no longer published, call for article copy.)

"Forest and Riparian Buffer Conservation: Local Case Studies from the Chesapeake Bay Program" 1996. Produced by the Forestry Workgroup Nutrient Subcommittee. Source: USDA Forest Service, Northeastern Area State and Private Forestry, Chesapeake Bay Program, 410 Severn Ave, Suite 109, Annapolis, MD 21403; or call (800) 968-7229. (free)

"Riparian Forest Buffers: Function and Design for Protection and Enhancement of Water Resources" 3rd edition, 1996. Produced by the U.S. Forest Service. Source: U.S. Government Printing Office call 1(866)512-1800. Stock No. 001-001-00657-2. ($9).

"Chesapeake Bay Riparian Handbook: A Guide for Establishing & Maintaining Riparian Forest Buffers" Provides technical assistance for field personnel including detailed information on the planning, design, establishment, and maintenance of riparian forest buffers in the Chesapeake Bay Watershed. Source: Chesapeake Bay Program at (800) YOURBAY; or online at http://www.chesapeakebay.net/search/pubs.htm. (Free)

"Forest and Riparian Buffer Conservation: Local Case Studies from the Chesapeake Bay Program" A collection of case-studies that highlight accomplishments of local governments and citizen organizations to restore and protect community forests including innovative riparian buffer and forest conservation programs. Source: Chesapeake Bay Program at (800) YOUR-BAY; or online at http://www.chesapeakebay.net/search/pubs.htm. (Free)

Land Planning

"Greenways: A Guide to Planning, Design and Development" 1993. Source: Island Press, Box 7, Covelo, CA 95428; or call (800) 828-1302. ISBN No. 1-55963-137-6 ($35 paperback)

"Greenways for America" 1990. Source: The Johns Hopkins University Press, Hampden Station, Baltimore, Md. 21211; or call (410) 516-6956. ($21.95 hardcover)

"Site Planning for Urban Stream Protection" 1996. Source: Metropolitan Washington Council of Governments, 777 N. Capitol St. N.E., Suite 300, Washington, D.C. 20002-4226; or call (202) 962-3256. Publication #957-08 ($35)

"Beyond Sprawl – Land Management Technology to Protect the Chesapeake Bay" A "how-to" guide for local governments on six land-use management techniques that can be used to achieve community goals, preserve local natural resources and protect the Chesapeake Bay. Source: Chesapeake Bay Program at (800) YOUR-BAY; or online at http://www.chesapeakebay.net/search/pubs.htm. (Free)

"Better Models for Development in Virginia" A guide to creating, maintaining and enhancing livable communities in Virginia. Written for elected officials, planning commissioners, developers and interested citizens, the book sets out six principles and 25 key ideas for better development in Virginia. Source: The Conservation Fund at (703) 525-6300; or online at http://www.conservationfund.org. ($15)

"The Practice of Watershed Protection: Techniques for Protecting and Restoring Urban Watersheds" A compilation of 150 articles on all aspects of urban watershed protection from *Watershed Protection Techniques*. Source: Center for Watershed Protection, (410) 461-8323; or online at http://www.cwp.org. ($80)

"Rapid Watershed Planning Handbook" Includes a comprehensive approach for developing a cost-effective watershed plan, management options, analysis

tools and watershed plan case studies. Source: Center for Watershed Protection, (410) 461-8323; or online at http://www.cwp.org. ($40)

"Collaboration: A Guide for Environmental Advocates" 2001 by E. Franklin Dukes and Karen Firehock, the guide is useful for determining if a collaborative approach is appropriate for resolving environmental issues, including processes and tips for designing and implementing collaborative approaches. Source: Institute for Environmental Negotiation, 164 Rugby Rd, P.O. Box 400179, University of Virginia, Charlottesville, VA 22904-4179 http://www.virginia.edu/~envneg/ien_projects_past_feat.htm#guide (Free PDF copies available online; bound copies $8)

"Community Watershed Forums: A Planner's Guide" 2002 by Karen Firehock, Fran Flanigan and Pat Devlin describes how to plan and host community forums to engage your community in watershed planning. Source: Institute for Environmental Negotiation, 164 Rugby Rd, P.O. Box 400179, University of Virginia, Charlottesville, VA 22904-4179 http://www.virginia.edu/~envneg/ien_projects_past_feat.htm#forum. (free on line or paperback $25)

"A Guide for Fundraising Assistance" 1999 A landowner's guide for enhancing wildlife habitat and improving water quality using a variety of public and private conservation programs. Source: Maryland Department of Natural Resources, Watershed Restoration Division, 580 Taylor Ave., E-2, Annapolis, MD 21410; or call (410) 260-8810 or (800) 989-8852. (free)

"Preparing a Sensitive Areas Element for the Comprehensive Plan: A Method for Protecting Streams and Their Buffers, 100-Year Floodplains, Habitats of Threatened and Endangered Species, and Steep Slopes" 1993. Source: Maryland Department of Planning, 301 West Preston Street, Baltimore, Maryland 21201-2365; or call (410) 767-4551. Publication #93-04. ($2)

Stream Ecology and Restoration

"Restoring Streams in Cities: A Guide for Planners, Policymakers, and Citizens" A.L. Riley, 1998. The book explains urban stream restoration concepts that can be utilized by citizens, mayors, county commissioners, flood-control engineers and others interested in improving local waterways. Source: Island Press, Box 7, Department 2NET, Covelo, CA, 95428; or call (800)-828-1302. ($35.00 paperback)

"Water in Environmental Planning" 1978. Technical reference for watershed planning principles. Source: W.H. Freeman and Co., 4419 West 1980 South St., Salt Lake City, Utah 84104; or call (800) 877-5351. ISBN No. 07167-0079-4. ($87.95, plus shipping and handling)

"Enhancing Stream Corridors: A Community Handbook for Stream Stewardship", updated 2002. The Community Handbook for Stream Stewardship provides citizens with a "crash course" in the science behind stream systems, the basic principles and planning of stream bank enhancement, and the techniques used to assess a watershed and inventory the health of a site. The handbook also explores various ways to enhance stream banks and grazed rangeland, including the participation in land-use planning and the installment of improvement techniques. Source: Izaak Walton League of America, Save Our Streams Program, 707 Conservation Lane, Gaithersburg, Md. 20878-2983; or call (301) 548-0150 or (800) BUG-IWLA. (call for price)

"Applied River Morphology" 1996. Technical publication that outlines the fundamental principles of river function and the classification of natural rivers, depicting major stream types. Useful for watershed management, ecosystem assessment, habitat evaluation for fish, river restoration and reduction of non-point source pollution. Source: Wildland Hydrology Books, 1481 Stevens Lake Rd., Pagosa Springs, CO. 81147; or call (970) 264-7100. ($89.95 plus shipping and handling)

"Better Trout Habitat: A Guide to Stream Restoration and Management" 1990. Source: Island Press, Box 7, Covelo, CA 95428; or call (800) 828-1302. ($30)

"Clearing and Grading Strategies for Urban Watershed" 1996. Source: Information Center, Metropolitan Washington Council of Governments, 777 N. Capitol St. N.E., Suite 300, Washington, D.C. 20002-4226; or call (202) 962-3256. ($25)

"Consensus Agreement on Model Development Principles to Protect Our Streams, Lakes, and Wetlands" 1998. Source: Center for Watershed Protection, 8737 Colesville Rd., Suite L105, Silver Spring, MD. 20910; or call (410)461-8323; or e-mail mrrunoff@usapipeline.com.

"Stream Corridor Restoration: Principles, Processes, and Practices" Source: The National Technical Information Service, at (800) 553-6847. NTIS Order Number: PB98-158348INQ (ISBN-0-934213-59-3) ($71 plus shipping)

"A View of the River" 1994. An excellent description by Dr. Luna Leopold of his lifetime of working to understand and conserve rivers. Easily understood by the lay audience. Source: Harvard University Press, 79 Garden St., Cambridge, MA 02138; or call (800) 448-2242. ($52.60 plus shipping)

"Stream Channel Reference Sites: An Illustrated Guide to Field Technique" A 61-page technical guide on establishing permanent reference sites for gathering data about the physical characteristics of streams and rivers. Source: U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station, Publications, 3825 E. Mullberry, Fort Collins, Colo. 80524; or call (970) 498-1100. General Technical Report 145 (Free)

"Aquatic Entomology" 1981. Reference manual of aquatic insect larvae and their habitats. Contains excellent line drawings and color plates of the major taxonomic orders and families. Source: Anglers Art. P.O. Box 148, Plainfield, Penn. 17081; or call (800) 848-1020. ($44.95 plus shipping)

Wetlands

"An Approach to Improving Decision-Making in Wetland Restoration and Creation" 1992. Source: Island Press, Box 7, Department 5AU, Covelo, Cal., 95428; or call (800) 828-1302. ($47)

"Handbook for Wetlands Conservation and Sustainability" second edition 1998. A layperson's guide to wetland ecology and monitoring. 1996. Source: Izaak Walton League of America, Save Our Streams Program, 707 Conservation Lane, Gaithersburg, Md. 20878-2983; or call (301) 548-0150 or (800) BUG-IWLA or http://www.iwla.org ($47.50)

"Evaluating the Effectiveness of Forestry Best Management Practices in Meeting Water Quality Goals or Standards" 1994. Source: U.S. Forest Service, Southern Region, 1720 Peachtree Road, N.W., No. 846, Atlanta, Ga. 30367; or call (404) 347-2692. (Free)

"Protecting Wetlands: Tools for Local Governments" Tools that can be used by local governments to protect wetlands, riparian forest buffers or open space. Available free of charge from the Chesapeake Bay Program at (800) YOUR-BAY; or online at http://www.chesapeakebay.net/search/pubs.htm. (Free)

"Protecting Wetlands II: Technical and Financial Assistance Programs for Local Governments in the Chesapeake Bay Region" Supplements Protecting Wetlands I: Tools for Local Governments in the Chesapeake Bay Region, published by the Chesapeake Bay Program in 1997. Includes information on: federal programs; state wetland programs; federal and state technical assistance; cost-share programs; and subsidies available to private and local government conservation efforts. Source: the Chesapeake Bay Program at (800) YOUR-BAY; or online at http://www.chesapeakebay.net/search/pubs.htm. (Free)

Web Sites

Chesapeake Bay Program web sites

Bay Atlas – A mapping tool for the Chesapeake Bay watershed that provides customized maps of geographic information. http://www.chesapeakebay.net/wshed.htm

Environmentally Sensitive Design Database – An interactive tool for environmentally sensitive design practices. http://www.chesapeakebay.net/data/esdp/mtp1.cfm

General Websites

Surf your Watershed – An on-line tool for obtaining information on a particular watershed. http://www.epa.gov/surf

Green Communities – Provides step-by-step guidance for creating environmentally-friendly communities. http://www.epa.gov/greenkit/

The Center for Watershed Protection – Model environmental ordinances and publications covering topics such as better site design, stream restoration, stormwater, and watershed management planning. http://www.cwp.org

Rivers, Trails and Conservation Assistance Program – A National Park Service Program to help citizens and community leaders plan and advance locally-led conservation projects, including watershed management plans and strategies. http://www.ncrc.nps.gov/rtca/

Land Trust Alliance – Templates for conservation easements, land trusts and purchase of development rights, among other tools. http://www.lta.org

Transferable Development Rights – Fact sheet: http://ohioline.osu.edu/cd-fact/1264.html

The Maryland Stormwater Design Manual – A useful example of a stormwater design approach. For more information, go to http://www.mde.state.md.us/environment/wma/stormwatermanual

Wild and Scenic Rivers System – For information on the program, a listing of current wild and scenic rivers, information on the council and agency guidelines. Online at http://www.nps.gov/rivers/index.html.

Maps

National Wetland Inventory Maps Source: U.S. Geological Survey, Earth Science Information Center, 507 National Center, Reston, Va. 22902; or call (703) 648-6892 or (800) USA-MAPS. ($5 for paper, $6.50 for mylar composite, plus $3.50 shipping/handling)

Topographic Maps Source: U.S. Geological Survey, Earth Science Information Center, 507 National Center, Reston, Va. 22902; or call (703) 648-6892 or (800) USA-MAPS. ($4)

Topographic Maps Index Source: U.S. Geological Survey, Books and Open File Report Center, P.O. Box 25286, Federal Center, Denver, Colo. 80255; or call (800) USA-MAPS.

Periodicals

Land and Water – A magazine covering topics such as erosion control, bioengineering techniques, landscaping and other watershed management issues. Source: Land and Water, P.O. Box 1197, Fort Dodge, Iowa 50501-9925 or call 515-576-3191. (One year subscription is $20)

Video

"Restoring America's Streams" 1996. This 28-minute VHS video explains stream processes and shows how to restore stream banks and habitat using vegetation and other non-traditional approaches. Source: Izaak Walton League of America, Save Our Streams Program, 707 Conservation Lane, Gaithersburg, Md. 20878-2983; or call (800) BUG-IWLA. ($21)

Monitoring

Designing Your Monitoring Program – A Technical handbook for community-based monitoring in Pennsylvania. This handbook provides step-by-step guidance on how to design a monitoring program: what to measure; where and when to sample; how to collect and analyze samples; how to use results; and so on. Contact: Pennsylvania Department of Environmental Protection, Bureau of Watershed Conservation, PO Box 8555, Harrisburg, PA 17105; or call (717) 787-5259.

Save Our Streams Volunteer Trainer's Handbook – A reference manual for monitoring and training volunteers to assess streams using the presence and diversity of aquatic insect larvae and instructions for developing a quality assurance plan. Source: Izaak Walton League of America, Save Our Streams Program, 707 Conservation Lane, Gaithersburg, Md. 20878-2983; or call (800) BUG-IWLA or on line at http//www.iwla.org ($19)

APPENDIX B

Federal, Regional and State Programs

Contacts are provided for each program described. To avoid duplication, state agencies are included in a list at the end of the state programs listing. If the project is found in a specific location on an agency web site, the direct link to that program is provided. However, web sites change often so please contact the agency directly if the link is not working. All links provided were valid as of July 2002.

Federal Programs

Conservation Reserve Program (CRP)

CRP provides annual rent payments to landowners with highly erodible land to allow them to remove that land from production and plant it with conservation species for at least ten years. It provides cost-share for tree establishment and other vegetative cover. To be eligible, farms must have grown commodity crops on the land two of the five most recent crop years.

Conservation Reserve Enhancement Program (CREP)

CREP is a refinement of the Conservation Reserve Program, which works as a state and federal partnership program to address water quality, soil erosion and wildlife habitat issues related to agricultural use. Farmers can receive annual rental payments and cost-share assistance to establish long-term, resource-conserving vegetative cover on eligible land through 10-15 year contracts.

Agricultural land is eligible if it can contribute to riparian buffers, wetland restoration or the repair of highly erodible land: land that has an erodibility index greater than 15 within 1000 feet of a stream or other water body. Farms must have planted crops on the land during two of the five most recent crop years.

Contact

Maryland: Local Farm Service Agency, local Soil Conservation District or the Maryland Farm Service Agency at: 8335 Guilford Road, Suite E, Columbia MD 21046; or call (410) 381-4550.

Pennsylvania: The Pennsylvania CREP is targeted at twenty counties in south-central Pennsylvania that drain into the Susquehanna and Potomac Rivers. Contact the local U.S. Department of Agriculture Service Centers or Soil and Water Conservation Districts.

Virginia: Virginia's program consists of two projects: The Chesapeake Bay CREP, which targets 25,000 acres within the Bay watershed; and the Southern Rivers CREP, which targets 10,000 acres in non-Bay drainage basins. The program is implemented through the Farm Service Agency (FSA). Contact the U.S. Department of Agriculture Service Centers, Soil and Water Conservation Districts, or Virginia Department of Conservation and Recreation.

Conservation Buffer Initiative

The Conservation Buffer Initiative encourages the use of conservation buffers by agricultural producers and other landowners in rural and urban settings, with a goal of 2 million miles (up to 7 million acres) of conservation buffers completed by 2002. The Natural Resources Conservation Service (NRCS) leads the initiative. Programs used for this effort include the continuous Conservation Reserve Program (CRP) sign-up, as well as the Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), Wetlands Reserve Program (WRP), Stewardship Incentives Program (SIP), and Emergency Watershed Protection Program (EWP).

Contact

http://www.nhq.nrcs.usda.gov/OPA/Buffers.html

Wildlife Habitat Incentives Program (WHIP)

WHIP is a voluntary program for private landowners to develop and improve wildlife habitat through technical assistance and cost-share payments to establish and improve fish and wildlife habitat. Participants who own or control land prepare and implement a wildlife habitat development plan. The Natural Resources Conservation Service (NRCS) provides technical and financial assistance for the establishment of wildlife habitat development practices, lasting from five to ten years.

Contact

Cooperative Extension Service, or local conservation district.
http://www.ftw.nrcs.usda.gov/pl566/WHIP.html

Stewardship Incentives Program (SIP)

SIP provides technical and financial assistance to encourage non-industrial, private forest landowners to keep their lands and natural resources productive and healthy. Qualifying land includes rural lands with existing tree cover or land suitable for growing trees, which is owned by a private individual, group, association, corporation, Indian tribe, or other legal private entity. Eligible landowners must have an approved Forest Stewardship Plan and own 1,000 or fewer acres of qualifying land. Authorizations may be obtained for exceptions of up to 5,000 acres.

Contact

USDA, Forest Service

http://www.nrcs.usda.gov/NRCSProg.html#Anchor-Stewardship

Environmental Quality Incentives Program (EQIP)

EQIP provides technical, educational, and financial assistance to eligible farmers and ranchers to address soil, water and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner, through implementation of a conservation plan that includes structural, vegetative and land management practices on eligible land. 5-10 year contracts are made with eligible producers; cost share provisions are possible.

Contact
USDA, Natural Resources Conservation Service http://www.nrcs.usda.gov/NRCSProg.html#Anchor-Stewardship

Wetland Reserve Program (WRP)

WRP is a voluntary program to restore and protect wetlands on private property. It offers three options:

- *Permanent easements:* Landowners receive the agricultural value of the land, up to a maximum cap, plus 100 per cent of the cost of restoring the land.
- *Thirty year easements:* Landowners receive 75percent of the easement value and 75percent cost-share on the restoration.
- *Restoration cost-share agreements with a minimum ten-year duration*: Landowners receive 75 percent of the restoration cost.

Contact
Wetlands Reserve Program at http://www.wl.fb-net.org/

Emergency Watershed Protection Program

This program responds to natural disasters by directing technical assistance to stream restoration. Examples of practices covered under this program are: removing debris, reshaping stream banks and re-seeding damaged areas. A local sponsor must submit a request for assistance.

Contact
Emergency Watershed Protection Program at http://www.attra.ncat.org/guide/ewp.htm

National Park Service, Rivers and Trails Conservation Assistance Program

The Rivers, Trails, and Conservation Assistance Program, also known as the Rivers & Trails Program or RTCA, is a community resource of the National Park Service. Rivers & Trails staff work with community groups and local and State governments to conserve rivers, preserve open space, and develop trails and greenways.

Contact
http://www.ncrc.nps.gov/programs/rtca/

Regional Programs

Chesapeake Bay Program

The Chesapeake Bay Program, formed in 1983 by the first *Chesapeake Bay Agreement*, is a unique regional partnership leading and directing the restoration of the Chesapeake Bay. The Bay Program partners include the states of Maryland, Pennsylvania and Virginia; the District of Columbia; the Chesapeake Bay Commission, a tri-state legislative body; the U.S. Environmental Protection Agency (EPA), which represents the federal government; and participating citizen advisory groups. The second *Chesapeake Bay Agreement*, adopted in 1987, established a vision for the Bay's restoration. Its goals included proposed reductions of harmful nutrients. In 1992 the Bay Program moved upstream, with strategies for attacking nutrients at their sources in the Bay's tributaries. The Chesapeake Executive Council – composed of the governors of Maryland, Pennsylvania and Virginia; the mayor of Washington, D.C.; the EPA administrator; and the chair of the Chesapeake Bay Commission – signed five directives in 1993 that addressed key areas to be restored. These areas included the tributaries, topics, underwater Bay grasses, fish passages and agricultural nonpoint source pollution. In 1994 the partners outlined initiatives to restore aquatic, riparian and upland habitats, reduce nutrients in the Bay's tributaries and reduce topics, emphasizing the prevention of pollution. On June 28, 2000, the EC signed *Chesapeake 2000* – a comprehensive and far-reaching Bay agreement that will guide the Bay Program partners through the year 2010 in their combined efforts to continue to restore and protect the Chesapeake Bay. *Chesapeake 2000* outlines 93 commitments detailing protection and restoration goals critical to the health of the Bay watershed. In pledging to increase riparian forest buffers, preserve additional tracts of land, restore oyster populations and protect wetlands, *Chesapeake 2000* focuses on improving water quality as the most critical element in the overall protection and restoration of the Bay and its tributaries.

The three program goals for the Chesapeake Bay Program's forestry work group are:

- To ensure, to the extent feasible, that all streams and shorelines will be protected by a forested or other riparian buffer.
- To conserve existing forests along all streams and shorelines.
- To increase the use of all riparian buffers and restore riparian forests on 2,010 miles of stream and shoreline in the watershed by 2010, targeting efforts where they will be of greatest value to water quality and living resources.

Contact
Chesapeake Bay Program, 410 Severn Avenue, Suite 109, Annapolis, MD 21403; or call (410) 267-5700 or (800)YOUR-BAY; or online at http://www.chesapeakebay.net.

State Programs – Maryland

Maryland Stream ReLeaf Plan

Maryland's Stream ReLeaf Plan is a performance-based strategy outlining goals, objectives, actions and performance measures for restoring and conserving riparian buffers. Maryland's plan involves working with Tributary Teams – watershed-based groups of local stakeholders in ten basins covering the state – and other watershed organizations to develop local efforts and commitments for buffer conservation and restoration.

Contact
Maryland DNR Stream Releaf Program at http://www.dnr.state.md.us/forests/streamreleaf.html

Maryland Critical Area Commission

In 1984, the Maryland General Assembly resolved to reverse the deterioration of the Bay's environment by enacting the *Chesapeake Bay Protection Act*. The Act required the sixteen counties, Baltimore City, and forty-four municipalities surrounding the Bay to implement a land-use and resource-management program designed to mitigate water pollution and loss of natural habitat, while accommodating the jurisdiction's future growth. The *Critical Area Act* designates all lands within 1,000 feet of tidal waters or adjacent tidal wetlands as the "Critical Area." The Act affects all those who live or own property within 1,000 feet of the Bay or its tidal waters.

Contact
Critical Area Commission, For more on the *Critical Area Act* and Commission see Appendix C.

Buffer Incentive Program

The Buffer Incentive Program encourages the planting and maintenance of forested buffers around the Chesapeake Bay and its tributaries. This program serves as an incentive for planting buffers on private land and helping defray the landowner's costs to establish and maintain them. Eligible lands are at least one acre, not more than fifty acres, and either:

- crop field
- pasture field
- other open or bare ground
- early successional vegetation

Land must be within 300 feet of a stream, river, pond, non-tidal wetland or other open water. A one-time payment of $300 per acre is provided upon verification of at least 65 percent seedling survival after one growing season.

Contact
Maryland DNR Forest Service buffer program at
http://www.dnr.state.md.us/forests/programapps/green.html

Income Tax Modification Program

The Income Tax Modification Program allows eligible participants to deduct double the cost of reforestation and timber stand improvement practices, less any cost-share assistance received through other programs. This is reported on the Maryland tax return as a subtraction from the federal adjusted gross income.

Practices receiving the modification must remain in effect for at least fifteen years. Periodic inspections will occur. If they are not maintained, the tax savings must be repaid. Participants must own or lease 10 to 500 acres of forest land capable of growing more than 20 cubic feet of wood per acre per year, and be available for the primary purpose of growing and harvesting trees. Christmas tree and ornamental tree operations are not eligible. Only forest management practices installed on 10 to 100 acres may receive the tax modification in any one year.

Contact
Maryland DNR Forest Service Income Tax Program at
http://www.dnr.state.md.us/forests/programapps/tax.html.

Forest Stewardship Program

This program provides land management assistance to private landowners, who account for ninety percent of Maryland's forest land. All owners of five or more acres of forest land, or non-forest land that could be planted with trees are eligible.

Contact
Maryland DNR Forest Service Forest Stewardship Program at
http://www.dnr.state.md.us/forests/programapps/steward.html.

Forest Conservation and Management Program (FCMP)

The FCMP encourages landowners to manage their forest land in return for a reduced and/or frozen property tax assessment. The program is a legal agreement between the landowner and the Department of Natural Resources and is recorded in the land records of the county in which the property is located. The landowner agrees to manage the forest land according to a management plan that is prepared for the property. The minimum acreage is five acres and the minimum length of the agreement is fifteen years.

Contact
Maryland DNR Forest Service FCMP Program at
http://www.dnr.state.md.us/forests/programapps/fcmp.html

Woodland Incentive Program

This program provides cost-share assistance for tree planting, site preparation and timber stand improvement practices. The program pays up to 50 percent of eligible practices and is available to owners of a minimum of 10 to a maximum of 500 acres that, when appropriate, has the potential to be harvested for products including logs, timber, pulpwood, firewood, woodchips, poles, piles, posts and other primary forest products.

Contact
Maryland DNR Forest Service.

Maryland Agricultural Water Quality Cost-Share Program (MACS)

The MACS program can provide up to 87 percent of the cost to install eligible best management practices (BMPs) to protect water quality. Stream protection practices, including riparian buffers, stream crossings, stream fencing, and alternative watering sources are among the twenty-nine BMPs eligible for cost-share funds.

MACS is administered by the Maryland Department of Agriculture, working in cooperation with local Soil Conservation Districts (SCD). The MACS program is available to any agricultural producer. Costs for installing BMPs vary, depending on the site, the scope of the problem, and local construction costs.

Contact
The local SCD office at
http://www.mda.state.md.us/resource/mawqcs10.htm.

Small Creeks and Estuaries Reserve Program

This program is administered by the Maryland Department of the Environment, which offers financial assistance to local governments for restoration measures that provide water quality and habitat benefits in streams and estuaries. Projects may be on private or public lands, but must be sponsored by a local government agency. Projects typically funded through this program include stream restoration, stream bank stabilization and streamside buffers. This program provides cost-share funds to counties and incorporated municipalities. Up to 50 percent of assessment, approved design and construction costs may be funded.

Contact
Maryland Department of the Environment, Water Management Administration; or call (410) 631-3728.

Chesapeake Bay Trust

The Chesapeake Bay Trust is a non-profit organization created by the Maryland General Assembly in 1985 to promote public awareness and participation in the restoration and protection of the Chesapeake Bay. The trust offers grants for wetland restoration, streamside forest buffer plantings, submerged aquatic vegetation and wildlife habitat enhancement projects proposed by non-profit organizations, community associations, civic groups, schools, and public agencies that contribute to the restoration of the Chesapeake Bay. Seventy-five percent of trust grants are for amounts of $5,000 or less.

Contact
Chesapeake Bay Trust, 60 West Street, Suite 200A, Annapolis, MD 21401 or call (410) 974-2941.

State Contacts:

Maryland Cooperative Extension Service
(301) 405-4579
http://www.agnr.umd.edu/CES

Maryland Critical Area Commission
(410)260-3460
http://www.dnr.state.md.us/criticalarea/index.html

Maryland Department of Natural Resources
(410) 260-8710
http://www.dnr.state.md.us

Maryland Department of Agriculture
(410) 841-5864
http://www.mda.state.md.us

Maryland Department of Planning
(410) 767-4500
http://www.mdp.state.md.us

Maryland Department of the Environment
(800) 633-6101
http://www.mde.state.md.us

Maryland Geological Survey
(410) 554-5500
http://mgs.dnr.md.gov/mgsindex.html

Maryland National Capital Park and Planning Commission
(301) 952-5401
http://www.mncppc.org

Maryland DNR Forest Service
(410) 260-8531
http://www.dnr.state.md.us/forests/
dvanhassent@dnr.state.md.us

State Programs – Pennsylvania

Growing Greener – Statewide

Growing Greener has restructured state spending policy to direct nearly $650 million over the next five years to the new Watershed Protection and Environmental Stewardship Fund. This is intended to protect watersheds, preserve farmland open space, invest in parks and outdoor recreation, reclaim abandoned mines and wells, and make improvements to the state's water and sewer infrastructure. The program provides grants to local governments, watershed groups and others for the protection of Pennsylvania's water resources, including the management of nonpoint sources of pollution.

Four different agencies are involved in helping communities "grow greener" under the Environmental Stewardship & Watershed Protection Act.

Contact
Growing Greener Grants Center at (717) 705-5400 or (877) PA-GREEN
E-mail: growinggreener@state.pa.us or http://www.dep.state.pa.us/growgreen/

Keystone Fund – DCNR

DCNR provides millions of dollars annually to meet the recreational needs of Pennsylvania's communities, preserve open spaces and natural areas, enhance the state's river resources and support the development of rail trails. The Pennsylvania Department of Conservation and Natural Resources manages all of the agency's grant partnerships with local governments and non-profit organizations and provides technical assistance to assist communities in accomplishing their goals.

Contact
Pennsylvania Department of Conservation and Natural Resources

Stream ReLeaf – DEP

Pennsylvania Stream ReLeaf is a statewide program sponsored by the Department of Environmental Protection to encourage streamside buffers throughout the Commonwealth. Pennsylvania seeks to reach its total streamside forest restoration goal of 600 miles of buffer within the Chesapeake Bay watershed drainage, which includes the watershed basins of the Susquehanna, Potomac, North East, Gunpowder and Elk.

The plan's goals are to restore streamside buffers on appropriate lands that border water bodies for both public and private lands. The buffers must be of sufficient quality to improve the waters along which they are established, conserve existing streamside buffers, or provide education and outreach about the importance of streamside buffers and their proper stewardship and track progress in restoring and conserving streamside buffers.

Contact
Contact the Department of Environmental Protection or visit the Stream ReLeaf web site: http://www.dep.state.pa.us/hosting/streamreleaf/toc.htm

Stream Improvement Program – DEP

DEP's stream improvement program offers assistance through the construction of small projects to prevent flooding, restore natural stream channels damaged in floods and to stabilize stream banks affected by erosion. To qualify for assistance, projects must provide direct benefit to homes, businesses or industrial structures. For a project to be approved, it must be hydraulically beneficial, economically feasible and environmentally sound. All stream improvement projects must be sponsored by a local or county government.

Contact

Department of Environmental Protection, Bureau of Waterways Engineering, Division of Project Evaluation, at (717) 783-1766.

Pennsylvania Stream Bank Fencing Program – DEP

Since 1988, Pennsylvania's Department of Environmental Protection (DEP), in cooperation with the Pennsylvania Game Commission, has administered a Stream bank Fencing Program. The program improves habitat along stream banks and water quality by keeping livestock out of streams. DEP provides landowners with fencing materials, installation and associated equipment to restrict livestock from the stream. There is also limited installation of constructed stream crossings, where livestock and farm equipment must cross the stream. The landowner is required to maintain the new fencing system for at least ten years. Technical services associated with the installation of these systems are provided by DEP's Bureau of Land and Water Conservation.

Contact

Pennsylvania's Department of Environmental Protection at http://www.dep.state.pa.us/ or contact the Pennsylvania Game Commission at http://sites.state.pa.us/PA_Exec/PGC/shouldkn.htm#LandManagement

Pennsylvania Rivers Conservation Program

This program conserves and enhances river resources through the preparation and implementation of locally initiated plans. It provides technical and financial assistance to municipalities and river support groups to carry out planning, implementation, acquisition and development activities. River grants are available to municipalities, counties, municipal and inter-municipal authorities and other groups to conserve and enhance river resources. Planning grants are available to identify significant natural and cultural resources, threats, concerns and special opportunities, and to develop river conservation plans.

Implementation grants are available to carry out projects or activities defined in an approved river conservation plan. Grants require a 50 percent match. A registry is established to recognize local river conservation efforts. Any municipality and appropriate organization (river support groups having 501(c)(3) not-for-profit status) are eligible to apply for grants. River conservation must be one of the group's primary purposes.

Contact

Department of Conservation and Natural Resources, Division of Conservation Partnerships, at: (717) 787-2316.

State Nonpoint Source Pollution Program – DEP

The Pennsylvania Nonpoint Source (NPS) Management Program 1999 update outlines the Commonwealth's plan to address nonpoint source pollution over the next four years and beyond.

Contact

Pennsylvania Department of Conservation and Natural Resources.

Citizen Volunteer Monitoring Program (CVMP)

Pennsylvania's CVMP helps organizations and individuals concerned about water quality to more quickly reach agreement on the nature of water quality issues, begin to share resources and plan for the future. The program fosters stewardship by giving communities the tools they need to meet goals related to water resources and to give DEP a better understanding of water resources by receiving quality-assured data from volunteers. For more on the program see the case example in Chapter Seven.

Contact

Pennsylvania DEP at http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/cvmp.htm

eFACTS

The new environment, Facility, Application, Compliance Tracking System (eFACTS) provides department-wide information from the Pennsylvania DEP on the multiple programs that regulate facilities and information to the public on permits issued by DEP and the status of pending permit applications.

Contact

http://www.dep.state.pa.us/efacts/welcome.asp

State Contacts

Commonwealth of Pennsylvania
http://www.state.pa.us

Pennsylvania Game Commission
(717) 783-4872
http://www.pgc.state.pa.us

Pennsylvania's Chesapeake Bay Education Office
(717) 545-8878
www.pacd.org

Pennsylvania Department of Conservation and Natural Resources
(717) 787-9306
http://www.dcnr.state.pa.us

Pennsylvania Cooperative Extension Service
(814) 865-6713
http://www.cas.psu.edu/docs/COEXT/COOPEXT.HTML

Pennsylvania Department of Agriculture
(717) 787-4737
http://www.pda.state.pa.us

Pennsylvania Department of Environmental Protection
(717) 787-2300
http://www.dep.state.pa.us

Pennsylvania Fish and Boat Commission
(814) 359-5185
http://www.fish.state.pa.us/

Riparian Buffer Initiative

This program seeks to ensure that an adequate buffer protects all streams and shorelines in the Commonwealth, through agency partnerships with organizations, businesses and private landowners, to establish, enhance and maintain riparian buffers.

The program seeks to restore 610 miles of missing or inadequate forest buffers in the state of Virginia by the year 2010. Buffers must be at least 35 feet wide from the stream bank, contain at least three different tree or shrub species or achieve regrowth from natural regeneration. Buffers resulting from fencing farm animals out of streams will also be counted towards the final 610 mile goal.

The program also seeks to conserve existing forest buffers and enhance program coordination and accountability. The Riparian Buffer Implementation Plan was published in July 1998.

Contact
DEQ at http://www.deq.state.va.us/watersheds/programs.html

Water Quality Management Plans

In accordance with *Section 208* and *Section 303(e)* of the *Clean Water Act*, the State Water Control Board has developed eighteen water-quality management plans, Many were developed in the 1970s. Although some have been amended and updated to reflect current conditions, many have now become outdated. These watershed plans need to address measures for the control of point sources and nonpoint sources of pollution, such as agricultural runoff. Future watershed plans also will contain the individual segment cleanup plans or their Total Maximum Daily Loads.

Contact
The Department of Environmental Quality at http://state.vipnet.org/dof/rfb/riparian/rwg/forms.htm

Agricultural Stewardship Program

Objectives of the program include educating farmers about environmental stewardship, strengthening their stewardship practices and identifying real water-quality problems. It wants to help farmers correct the problems in a commonsense manner that accommodates both the farmer and the environment through their local Soil and Water Conservation Districts to resolve. The *Agricultural Stewardship Act (ASA)* of 1996 gives the farmer an opportunity to correct a water quality problem voluntarily before any enforcement action is taken. Water quality problems concerning nutrients, sediment and toxics from agricultural activities are reported to the Virginia Department of Agriculture and Consumer Services (VDACS).

Contact
VDACS Office of Policy, Planning and Research; or call (804) 786.3538.

Nonpoint Source Program

The Department of Conservation and Recreation (DCR) is the lead agency in Virginia for coordinating nonpoint source pollution control programs, as set forth in *Section 10.1-104.1* of the *Code of Virginia*. This role includes the oversight of program development and implementation and interfacing with EPA to ensure that Virginia's program is in conformance with the requirements of the *Clean Water Act* of 1987. *Section 319* of this Act requires states to assess their state waters and identify those adversely affected by nonpoint sources of pollution. The DCR is also responsible for the management and distribution of federal and state funds for program implementation.

Virginia Agricultural BMP Cost-Share Program

This program funds up to 75 percent of the cost of implementing conservation practices to protect water quality. There is a maximum payment of up to $50,000 per farm. This program requires a minimum of 25 feet of fenced buffer around streams. The main benefits of this program are the stabilization of stream banks from livestock, the creation of forest buffers, and the reduction in nonpoint source pollution. The individual cost-share limit for all BMPs is $50,000.

Contact
Soil and Water Conservation Districts (SWCDs) local offices are online at http://www.dcr.state.va.us/sw/swcdlist.htm

Chesapeake Bay Restoration Fund (License Plate Program)

In 1992, the Virginia General Assembly established the Chesapeake Bay preservation license plate. The design included drawings of bay grass, oysters and crabs, and reads "Friend of the Chesapeake." The General Assembly's Virginia Division of Legislative Services administers the Chesapeake Bay Restoration Fund, which is funded from revenues of plate sales. Grants are available to state agencies, local governments, schools or nonprofit groups for environmental education and restoration projects.

Contact
Division of Legislative Services, General Assembly Building at (804) 786-3591.

Water Quality Improvement Fund

The Water Quality Improvement Fund (WQIF) was created to provide water quality improvement grants to local governments, Soil and Water Conservation Districts and individuals for point and nonpoint source pollution prevention, reduction and control programs. A primary objective is to fund grants that will reduce the flow of excess nitrogen and phosphorus into the Chesapeake Bay, through the implementation of the tributary strategies. The Virginia Department of Environmental Quality (DEQ) is responsible for administering point source grants and the Virginia Department of Conservation and Recreation (DCR) administers nonpoint source grants. WQIF funds are provided, in accordance with the guidelines, to help stimulate nonpoint source pollution reduction.

Contact
Virginia DEQ Chesapeake Bay Program at http://www.deq.state.va.us/bay/wqif.html or call (804) 698-4466.

Virginia's Stormwater Management Program (SWM)

Virginia's DCR implements the state's SWM program according to the Virginia Stormwater Management Act and Regulations, which are mandatory for all state agencies. The SWM legislation also enables localities to develop and implement comprehensive SWM programs on a watershed-wide basis. Stormwater management engineers help localities write ordinances and review them for consistency with state law and attendant regulations. Once a program is adopted by a local government, DCR staff provide technical assistance to ensure that minimum state criteria are satisfied and to promote innovative, cost-effective solutions for runoff, flooding and NPS problems.

Contact
Virginia DEQ at
http://www.deq.state.va.us/water/stormwtr.html or call 1-800-592-5482 (in Virginia) or (804) 698-4800.

Virginia Shoreline Erosion Advisory Service (SEAS)

DCR's Shoreline Erosion Advisory Service promotes shoreline and riverbank erosion control measures to protect private property and reduce sediment and nutrient loads into the Chesapeake Bay and other state waters, along with research to improve shoreline management techniques. The DCR provides technical advice about preventing sediment and nutrient loads from shoreline and stream bank erosion and riparian buffer management for landowners, local governments and environmental agencies.

Contact
Virginia DCR at
http://www.dcr.state.va.us/sw/seas.htm or call (804) 786-1712.

Coastal Nonpoint Source Pollution Control Program

The *Coastal Zone Management (CZM) Act* was amended in 1990 to address nonpoint source (NPS) pollution. Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990 requires that states with approved coastal zone management programs develop and implement coastal NPS pollution control programs restore and protect coastal water quality through the application of economically achievable BMPs, which are implemented through enforceable state policies and mechanisms.

The federal government defines state-enforceable policies and mechanisms as state and local regulatory controls and/or non-regulatory incentive programs combined with a state enforcement authority. The DCR is the lead state agency for the Coastal Nonpoint Source Pollution Control Program.

Contact
Mark Slauter, at (804) 692-0839. Email mslauter@dcr.state.va.us

CBLAD and Virginia's Bay Act Program

The Virginia General Assembly enacted the *Chesapeake Bay Preservation Act* in 1988. The Act is a critical element of Virginia's multifaceted response to the Chesapeake Bay Agreement. The Chesapeake Bay Local Assistance Department is the state agency that provides staff support to the local assistance Board in carrying out the requirements of the Bay Act. Each Tidewater locality must adopt a program based on the regulations adopted by the Local Assistance Board.

For more on the Bay Act in Virginia, "Legislation and Agreements" in Appendix C.

Contact
Chesapeake Bay Local Assistance Department.

Virginia's Citizen Monitoring Program

The state DEQ and DCR participate in citizen monitoring programs. The DEQ utilizes quality assured citizen collected data for its state water quality report. The state's volunteer monitoring program is run through a public private partnership with the DEQ, the DCR and the Izaak Walton League's Virginia Save Our Streams Program. Links to all three programs are found below.

Contact
DEQ's Program is at
citizen@deq.state.va.us or

DNR's Program is at
http://www.deq.state.va.us/cmonitor/citizenmonitoringva.html

Virginia Save Our Streams is at
http://www.vasos.org/

State Contacts

Commonwealth of Virginia
(804) 786-2211
http://www.state.va.us/

Chesapeake Bay Local Assistance Department
(804) 225-3440
http://www.cblad.state.va.us/index.htm

Virginia Department of Environmental Quality
(800) 592-5482 or (804) 698-4000
http://www.deq.state.va.us

Virginia Marine Resources Commission
(757) 247-2200
http://www.state.va.us/mrc/homepage.htm

Virginia Cooperative Extension Service
(804) 524-5848
http://www.ext.vt.edu

Virginia Department of Forestry
(804) 977-6555
http://www.state.va.us/~dof/dof.htm

Virginia Department of Game and Inland Fisheries
(804) 367-1000
http://www.dgif.state.va.us/

Virginia Department of Conservation and Recreation
(804) 786-1712
Water quality information is at
(877) 42-WATER
http://www.dcr.state.va.us

State Programs – District of Columbia

Federal Agency Plans

Federal lands and facilities comprise less than five percent of the Bay's watershed, but they contain valuable stream and shoreline resources. In addition, a majority of riparian areas in the District of Columbia are on federal lands. Most federal lands in the watershed are man-

aged by one of four entities: the USDA Forest Service; the Department of Defense; the National Park Service; or the US Fish and Wildlife Service.

These entities have four goals for stream protection:

- *GOAL 1:* Coordinate the restoration and protection of riparian buffers throughout the District of Columbia.
- *GOAL 2:* Promote education and outreach to citizens, developers and District regulatory agency personnel to introduce the functional values of RFBs.
- *GOAL 3:* Monitor and maintain plantings to ensure buffer survival.
- *GOAL 4:* Further the protection of existing riparian forests in the District.

District of Columbia Contacts

Metropolitan Washington Council of Governments
(202) 962-3256
http://www.mwcog.org

District of Columbia Environmental Health Administration
(202) 645-6617
http://www.environ.state.dc.us

D.C. Office of Planning/Anacostia Riverwalk and Trail and Anacostia Waterfront Initiative
(202) 442-7600
http://planning.dc.gov/main.shtm

D.C. Water and Sewer Authority
(202) 787-2000
http://www.dcwasa.com

National Capital Planning Commission
(202) 482-7200
http://www.ncpc.gov

Organizations

The Alliance for the Chesapeake Bay has offices in Maryland, Virginia and Pennsylvania and publishes the *eBay Journal*. Available at MD: (410) 377-6270; PA: (717) 236-8825; VA: (804) 775-0951; or online at http://www.acb-online.org/

The Chesapeake Bay Foundation has offices in Maryland, Virginia and Pennsylvania. MD (410) 268-8816; PA: (717) 234-5550; VA: (804) 780-1392; or online at http://www.cbf.org

The Center for Watershed Protection is a non-profit firm providing consulting and technical assistance for land and riparian planning. (410) 461-8323; email: center@cwp.org; or http://www.cwp.org

The Low Impact Development Center is a non-profit firm that seeks to develop and provide information to individuals and organizations about proper site design techniques, which replicate pre-existing hydrologic site conditions or call (301)982-5559; or online at http://www.lowimpactdevelopment.org/

The Institute for Environmental Negotiation, University of Virginia provides consulting and planning services concerning disputes and planning for the natural and built environment. Institute for Environmental Negotiation, 164 Rugby Rd, P.O. Box 400179, University of Virginia, Charlottesville, VS 22904-4179 (434) 924-1970; or online at http://www.virginia.edu/~envneg/IEN_home.htm

Izaak Walton League's Virginia Save Our Streams Program, trains Virginians in water monitoring and coordinates a statewide network of volunteers at (540) 377-6179 or toll free at 1-888-656-6664; or online at http://www.vasos.org/ The national office of the Izaak Walton League of America also has many resources on streams and wetlands; call 1-800-BUG-IWLA.

APPENDIX C
Legislation and Agreements

Federal Legislation

Clean Water Act

The Clean Water Act (CWA) is a 1977 amendment to the *Federal Water Pollution Control Act* of 1972, which regulates the discharge of pollutants into waters of the United States. The law gives the Environmental Protection Agency the authority to set water quality standards and makes it unlawful for any person to discharge any pollutant from a point source unless a permit (National Pollutant Discharge and Elimination System – NPDES permit) is obtained under the Act.

Under the *Clean Water Act*, states and local governments have the ability to set standards that are more stringent than federal guidelines. It contains regulations mandating annual reporting on the condition of state waters. These sections are: *Section 303(d)*, which requires states to list all impaired or threatened water bodies; Section *305(b)*, which requires states to report state water quality information to Congress; and *Section 319*, which requires states to develop Nonpoint Source Management Programs and report progress to EPA.

Section 303(d) lists

The *Section 303(d)* list is a comprehensive public accounting of all impaired or threatened water bodies, regardless of the cause or source of the impairment or threat. An *impaired water body* is defined as one that does meet water quality standards. Violations might be caused by known or unknown sources of pollution. A *threatened water body* is one that currently meets water quality standards but for which existing data show that water quality standards will likely be exceeded by the time the next list is required to be submitted to EPA. A *Section 303(d)* list of impaired or threatened water bodies must be submitted to EPA by October 1 of every year, beginning in the year 2000.

Section 305(b) Report to Congress

Every five years the EPA transmits to Congress the *National Water Quality Inventory Report (305(b) Report*. This report is based on individual state reports that identify widespread water quality problems, and describe the various programs implemented to restore and protect state waters.

Clean Water Act Section 319

In 1987 Congress amended the *Clean Water Act* in order to establish the Section 319 Nonpoint Source Management Program. The aim of this program is to help state and local water quality management efforts. Under the Program states receive grant money to support nonpoint source management projects such as those offering technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring.

The Total Maximum Daily Load

The Total Maximum Daily Load (TMDL) requirement mandates that states set pollution control plans for their impaired rivers and streams. The TMDL requirements of the *Clean Water Act* allow states to create their own regulatory programs provided that they meet federal management and reporting requirements and are approved by the EPA. Once a program is established, the total allowable level for any pollutant is based on state standards.

Under TMDL regulations states must submit to EPA a list of impaired waters along with a TMDL of pollutants for each waterway and water body on the list. Once listed as an impaired water, states must also outline how a waterway will meet TMDL standards in the future. States have ten years to bring their water bodies into compliance but are allowed an additional five years if need can be proven. The challenge for most states is figuring out how to economically meet TMDL requirements.

TMDLs in Pennsylvania, Maryland and Virginia

TMDLs may affect only a segment of a river or an entire section. For example, the entire Anacostia River Watershed in Washington D.C. is considered 'impaired' and a TMDL must be completed and implemented for the entire river.

Pennsylvania

In 1997, Pennsylvania's Department of Environmental Protection (DEP) agreed to a twelve- year schedule to develop TMDLs for impaired streams listed on the *1996 Clean Water Act Section 303(d)* list. To this end, all unassessed streams in Pennsylvania will be assessed by the DEP within ten years. During this time, any stream segment that exceeds minimum standards will then be added to the *Section 303(d)* list (with a TMDL to follow).

As of 2001, 45,234 miles of 83,161 total stream miles in Pennsylvania were assessed. A total of 37,927 stream miles remain to be assessed in order to achieve comprehensive coverage, based on the current GIS coverage. Of the 45,234 miles assessed, 8,193 were found to be impaired or 18.1 percent of the total miles assessed. The two largest sources of reported impairment are agriculture, with 2,887 miles of reported impairment, and abandoned mine drainage, with 2853 miles reported. Sources of impairment include agriculture (34.5 percent), Acid Mine Drainage (34.4 percent) and Urban Runoff (14.5 percent).

During the development phase of a TMDL, DEP will estimate pollution reduction goals to meet water quality standards on a watershed basis. Local entities will then be responsible for developing an implementation plan to achieve the TMDL goals. After implementation,

the watershed will be re-surveyed to determine if the stream segment meets the water quality standards. As of December 31, 2001, 154 TMDLs (110 from the 1996 303(d) list) have been submitted by DEP and approved by EPA. For more information on Pennsylvania's program see http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/wqstandards.htm

Maryland

Currently in Maryland, there are approximately 350 sources of impairments for 130 water bodies. Thirty TMDLs have been developed and approved by EPA at the printing of this report and twenty more were up for approval in the spring of 2002. In the 2002 305(b) report, there are 8,768.9 miles of non-tidal rivers and streams. Of those 8,638 were assessed and 2,949.5 miles were found to be impaired for a total of 33.6% of the assessed stream miles.

The Maryland Department of the Environment (MDE) has been instrumental in the coordination between EPA and local governments, convening meetings in which municipalities can discuss their concerns and ask questions about the TMDL process. One of the products of this partnership has been a document entitled *Maryland's TMDL Development Program and Local Government Participation*. For a summary of this document see http://www.mde.state.md.us/tmdl/localgov.htm. For general information about TMDLs in Maryland, see http://www.mde.state.md.us/tmdl/; or call (at MDE) at (410) 631-4893.

Virginia

The Virginia Department of Environmental Quality is responsible for developing TMDLs over a ten-year schedule ending in 2010. Virginia has 50,239 miles of rivers and streams. A total of 9,700 of those stream miles have been assessed and 4,403 stream miles were found to be impaired or 44 percent of the total miles assessed. Virginia currently has 665 TMDLs to develop for its impaired waters by 2010. As of spring 2002, the EPA has approved TMDL assessments for 29 of those waters. By May 1, 2004 an additional 81 TMDL assessments must be completed. For more information see: http://www.deq.state.va.us/water/303d.html

Wild and scenic rivers

In 1968, Congress created the National Wild and Scenic Rivers System. There are four federal agencies charged with protecting and managing the nation's wild and scenic rivers:

- Fish and Wildlife Service
- U.S.D.A Forest Service
- Bureau of Land Management
- National Park Service

Today these agencies work together under the 1995 Interagency Wild & Scenic Rivers Coordinating Council Charter. The goal of the *Wild and Scenic Rivers Act* is to help protect the natural, cultural and historic resources association with the nation's rivers. Under the Act, each river has a unique designation and management plan.

To be eligible for inclusion in the system rivers must meet certain criteria set forth in Section 2(b) of the Act. Under this section, three classifications are stipulated:

- *Wild rivers:* Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shoreline essentially primitive and waters unpolluted. These represent vestiges of primitive America.
- *Scenic rivers:* Those rivers or sections or rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
- *Recreational rivers:* Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines and that may have undergone some impoundment or diversion in the past.

Regional Agreements

Chesapeake Bay Agreement

Bay Agreement of 1987 – called for a forty percent reduction by 2000 in nutrients reaching the main stem of the Bay.

1992 Amendments - committed to reduce nonpoint sources of nitrogen and phosphorous by 40 percent in the Bay's largest tributaries.

Chesapeake 2000 – calls for a reassessment of progress made to date and a recommitment to the original goals and recognizes additional steps to be taken to ensure that the original goals set up by earlier agreements are met.

The major incentive that drives the *Chesapeake 2000* agreement is the removal of the Chesapeake Bay from the federal list of impaired waters by the year 2010. To do this it calls for:

- The reduction of sediments and nutrients.
- Ambitious recovery goals for oysters and subaquatic vegetation.
- A sustainable crab catch.
- A measurable decrease in the rate of conversion of farms and forests to developed lands
- More effective community-based stewardship of the Bay's rivers and subwatersheds.

More information about the *Chesapeake 2000* Agreement and how it affects protection measures and management of watersheds and streams is found in Appendix B, regional programs.

State Legislation

There are myriad federal, regional, state and local government regulations in place that affect stream protection and restoration. Several acts in particular stand out as major state efforts to bring the goals of the Bay Agreement down to the state level: the *1984 Critical Area Criteria Planning Act* of Maryland, the *1988 Chesapeake Bay Preservation Act* of Virginia, *1992 Economic Growth, Resource Protection, and Planning Act* of Maryland, Maryland's *Smart Growth and Neighborhood Conservation Act* of 1997 and the *Rural Legacy Act*.

Maryland

The Chesapeake Bay Critical Area Law (Md. Code Ann. § 8-1801 et seq.)

In 1984 Maryland enacted a series of legislation that targeted the restoration of the Bay's ecosystems. Most significant of these was the *Critical Area Criteria Planning Act*. This act required significant changes in local land use laws for localities bordering the Bay. The act also established the Critical Area Commission, a 27-member panel charged with creating land management programs aimed at decreasing nonpoint source pollution.

Central to the act were the Critical Area Criteria, which established a set of minimum standards to be enacted by the localities, allowing localities some flexibility in tailoring the standards to their particular set of circumstances.

The law was enacted in 1984 to minimize adverse water quality impacts and to protect the Chesapeake Bay. It seeks to protect water quality, conserve valuable habitat and accommodate future growth in the least polluting manner by regulating activities and land use planning in what are defined as critical areas.

These areas include:

- the waters of the Bay
- the Bay's tidal wetlands and tributaries
- the area that lies within 1,000 feet of the landward boundary of state and private waters and wetlands

The act establishes a 100-foot vegetated buffer within the 1,000-foot critical area, within which specific activities are prohibited. Critical Areas fall into three categories:

- intensely developed areas
- limited development areas
- resource conservation areas

Each has a density limit and incorporated performance criteria that are directed to protecting water quality. These criteria were established by the Chesapeake Bay Critical Area Commission. Local governments are responsible for developing and implementing their own Critical Area resource protection programs, based on the requirements developed by the Critical Area Commission.

1992 Planning Act

In Maryland, counties are primarily responsible for local land use planning. Within this context, the *Economic Growth, Resource Protection, and Planning Act* was passed in 1992. The Act instructs local governments to adapt their plans to include a set of established policies that include concentration of development, protection of sensitive areas, and stewardship of the Chesapeake Bay.

The "Sensitive Areas Element," which is required for all plans, must describe how the jurisdiction will protect:

- streams and stream buffers
- 100-year floodplains
- endangered species habitats
- steep slopes
- other areas a jurisdiction wants to protect from the adverse impacts of development

Such planning must also conform to the 1984 *Critical Area Criteria Planning Act*.

Maryland Tributary Strategies

In 1995 the Maryland Tributary Teams were formed. They are comprised of federal, state, and local governments businesses, citizens, farmers and educators. The teams aim to protect the Chesapeake Bay watershed through the implementation of Maryland Tributary Strategies, the primary goal of which is to achieve a 40 percent nutrient reduction in each of Maryland's ten major watersheds by 2000. These strategies are now entering a phase of review and revision that is targeted for 2002.

1983 Chesapeake Bay Agreement

We recognize that the findings of the Chesapeake Bay Program have shown an historical decline in the living resources of the Chesapeake Bay and that a cooperative approach is needed among the Environmental Protection Agency (EPA), the State of Maryland, the Commonwealths of Pennsylvania and Virginia, and the District of Columbia (the States) to fully address the extent, complexity, and sources of pollutants entering the Bay. We further recognize that EPA and the States share the responsibility for management decisions and resources regarding the high priority issues of the Chesapeake Bay.

Accordingly, the States and EPA agree to the following actions:

1. A Chesapeake Executive Council will be established which will met at least twice yearly to assess and oversee the implementation of coordinated plans to improve and protect the water quality and living resources of the Chesapeake Bay estuarine systems. The Council will consist of the appropriate Cabinet designees of the Governors and the Mayor of the District of Columbia and the Regional Administrator of EPA. The Council will be initially chaired by EPA and will report annually to signatories of this Agreement.

2. The Chesapeake Executive Council will establish an implementation committee of agency representatives who will meet as needed to coordinate technical matters and to coordinate the development and evaluation of management plans. The Council may appoint such ex officio nonvoting members as deemed appropriate.

3. A liaison office for Chesapeake Bay activities will be established at EPA's Central Regional Laboratory in Annapolis, Maryland, to advise and support the council and committee.

December 9, 1983 Signatories:

For the Commonwealth of Virginia – Charles S. Robb, Governor

For the State of Maryland – Harry Hughes, Governor

For the Commonwealth of Pennsylvania – Mark Single, Lieutenant Governor

For the District of Columbia – Marion Barry, Mayor

For the United States of America – William Ruckleshaus, Administrator, U.S. Environmental Protection Agency

For the Chesapeake Bay Commission – Joseph V. Gartlan, Jr., Chairman.

Maryland's Tributary Teams' Mission Statement

In support of the Chesapeake Bay Agreements, the mission of the Maryland's Tributary Teams is to:

- Support and promote actions and policies to ensure a healthy watershed with abundant and diverse living resources.
- Through education, heighten awareness of each individual's impact on water quality.
- Promote implementation of projects that restore and protect living resources and water quality.
- Facilitate communication and coordination among governments, landowners, business, and all other citizens toward this common goal.

A major milestone in the teams' work was passed in July of 2000, when the *Maryland Chesapeake Bay Partnership Agreement* was signed by Governor Glendening and elected officials from Maryland's counties. The Tributary Teams' state and local government representatives first drafted this agreement. The counties agreed to work cooperatively to restore local watersheds and the Chesapeake Bay. They also committed to participate on the Tributary Teams, to help in the development of the revised Tributary Strategies, to address the goals of the Chesapeake 2000 Agreement, to support the development of Chesapeake Bay Program policies and to pursue funding and other incentives to support local government watershed restoration and protection programs.

When the *Maryland Chesapeake Bay Partnership Agreement* was signed, the Watershed Revitalization Partnership Fund was also started. The fund supports a grant program to be administrated through a partnership of the Maryland Department of Natural Resources (DNR) and the Maryland Department of Transportation (MDT). These funds are targeted to help locally sponsored stream restoration projects. The partnership expands on the existing DNR greenway, wetlands and stream restoration projects that are currently funded by the MDT through the *Transportation Equity Act for the 21st Century (TEA 21)*.

Virginia

Chesapeake Bay Preservation Act (Virginia Code § 10.1-2100 et seq.)

The Virginia General Assembly enacted the *Chesapeake Bay Preservation Act* in 1988 in order to establish a cooperative nonpoint source pollution program between the state and the eighty-four local governments of Tidewater, Virginia. The Bay Act Program is designed to improve water quality in the Chesapeake Bay and its tributaries by requiring wise resource management practices in the use and development of environmentally sensitive lands.

The Chesapeake Bay Local Assistance Board, which was created by the Act, is responsible for promulgating regulations that establish criteria for local Bay Act programs. The Board is also charged with ensuring that local comprehensive plans, zoning and subdivision ordinances and other land management programs are in compliance with the Bay Act Regulations. The Chesapeake Bay Local Assistance Department provides staff support to the Board in carrying out the requirements of the Bay Act and provides technical and financial assistance to localities.

Through the Bay Act, localities address nonpoint source pollution by identifying and managing identified Chesapeake Bay Preservation Areas. These lands are classified as either Resource Protection Areas (RPAs) or Resource Management Areas (RMAs). RPAs include tidal wetlands and shores, certain non-tidal wetlands and a 100-foot buffer adjacent to these features and along all perennial streams. Because these lands are so sensitive, development is limited to water-dependent uses and redevelopment. RMAs are sensitive lands contiguous to RPAs that, if improperly used or developed, can significantly degrade water quality. Development is not limited in RMAs, but must adhere to the eleven performance criteria specified in the regulations.

The Bay Act also requires that Tidewater localities address water quality issues through their comprehensive plans. Localities must include information and policies and implementation strategies regarding physical constraints to development, protection of potable water, shoreline and stream bank erosion, public access and redevelopment as specified in the Bay Act Regulations.

Water Quality Improvement Act (Code of Virginia §10.1-2118).

The purpose of the *Virginia Water Quality Improvement Act of 1997 (WQIA)* is to protect and restore the quality of state waters. Because this is a shared responsibility among state and local governments and individuals, the Water Quality Improvement Fund (WQIF) was created. The purpose of the fund is to provide water quality improvement grants to local governments, soil and water conservation districts and individuals for point and nonpoint source pollution prevention, reduction and control programs.

A primary objective of WQIF is to fund grants that will reduce the flow of excess nitrogen and phosphorus into the Chesapeake Bay through the implementation of the tributary strategies. Applicants for projects must first submit a grant application.

Virginia Tributary Strategies

The Virginia Tributary Strategy Program (VTSP) is a multi-agency effort to coordinate water quality management planning. Headed by the Department of Environmental Quality. It operates under the statutory guidance of Virginia's *1996 Tributary Strategy Law (Article 2 of Chapter 5.1)* and the *1997 Water Quality Improvement Act (Articles 1-4 of Chapter 2.1)*. The Tributary Strategy Law specifies the content and schedule for nutrient and sediment reduction plans. The Water Quality Improvement Act established cooperative point and nonpoint source pollution control programs and created the Water Quality Improvement Fund (WQIF), which is the primary source of state funds for the nutrient and sediment reduction actions identified in tributary strategies.

Under the Chesapeake Bay Agreement, Virginia has developed nutrient reduction strategies for each of Virginia's major Bay tributaries. The VTSP is a

voluntary program that provides scientific information on water quality issues, such as nutrient and sediment loads, to local officials, businesses, citizen groups and other stakeholders. Stakeholders are guided through a process of developing goals for nutrient and sediment reductions, identifying cost-effective practices for achieving these reductions, and implementing these practices. Each tributary strategy plan is designed to reflect the unique characteristics of the area.

In addition to Virginia's Tributary Strategies, the state Department of Conservation and Recreation has organized Watershed Conservation roundtables for each of Virginia's major watersheds. Roundtables are comprised of representatives from the DCR, and the Soil and Water Conservation Districts in addition to other state agencies, local governments, industries, citizens and existing watershed organizations. The goal of the roundtables is to provide a forum for creating watershed-based strategies for water pollution reduction.

Over the next decade, efforts under the VTSP will be focused on 'delisting' the Bay and its tidal tributaries from the state's *Section 303(d) Impaired Waters List*. This initiative stems out of the Chesapeake Bay Program and is designed to integrate this cooperative program with the regulatory TMDL Program under the *Clean Water Act*. As set forth in the recently signed *Chesapeake 2000 Agreement*, the Bay Program partners will work together to remove all impairments, particularly low levels of dissolved oxygen, from Bay waters by the year 2010.

This initiative includes the development of criteria, designated uses and water quality standards that will protect aquatic life in Bay waters based on needs of habitat, food and other requirements. These objectives will be achieved through even greater reductions of nutrients and sediments into Bay tributaries across the entire 64,000 square mile Chesapeake Bay Watershed.

Riparian Forest Protection for Waterways Tax Credit

This program provides a state income tax credit to Virginia landowners whose property abuts a waterway on which timber is harvested, but who refrain from harvesting for a period of fifteen years. The tax credit is an amount equal to 25 percent of the value of timber in that portion of the land retained as a buffer. The Virginia Department of Forestry monitors this program. Interested landowners should contact their local forestry office to apply. For more information see http://www.dof.state.va.us/rtcguide.htm

The Virginia Surface Water Management Area (SWMA) Act (1989) allows for the designation of a specified management area in which there is a history of low flow conditions. For these areas, a conservation plan is approved by the State Water Control Board to ensure that there are minimum flows during periods of drought. Once adopted, a SWMA requires permits for any new withdrawals more than 300,000 gallons/month and a surface water withdrawal certificate to continuous withdrawals (granted by the State Water Control Board). For more information visit DEQ's website at http://www.deq.state.va.us; or call (804) 698-4109.

Exceptional Surface Waters Designation

As required by the EPA, every state must establish a category of surface water equivalent to EPA's Tier 3 Outstanding National Resources Waters. In Virginia, an Exceptional Waters Category was adopted in 1992 to designate those waterways that have exceptional recreational status or contain significant aquatic communities and are located in an exceptional environmental setting. Criteria, nomination and designation processes, and restrictions for this designation can be found at http://www.deq.state.va.us/wqs/T3guid.html. Currently, only one water body, North Creek in Botetout County, has been designated an Exceptional Water in Virginia.

Pennsylvania

Because Pennsylvania did not enact legislation specific to the Bay Agreement it does not have the critical areas and Bay acts that were adopted in Virginia and Maryland. What is in place however is strong legislation that allows for local governments to plan for and protect their local waterways.

Pennsylvania's Municipal Planning Code

Pennsylvania's *Municipal Planning Code (MPC)* gives primary responsibility for regulating land use and development to local municipalities. Under this code land can be zoned and designated for appropriate use. *Section 603* of the MPC specifically authorizes local governments to regulate, permit, prohibit, restrict and determine uses of land, including wetlands and riparian zones. The Code states that zoning ordinances must be designed to "promote, protect and facilitate…preservation of the natural, scenic, and historic values in the environment and preservation of forests, wetlands, aquifers, and floodplains." (*MPC Article VI, § 603*)."Provisions added to the Code in 2000 gave additional planning powers to towns and counties.

The Growing Greener Program provided funds for land conservation, stormwater management, stream restoration and other water quality improvements. In 1988 the "Environmental Rights Amendment" of the Pennsylvania Constitution (*Act 1, Section 27 and 28*) was adopted. This amendment expressly gives local governments the authority to regulate the protection of streams and rivers.

Pennsylvania Tributary Strategies

The tributaries in the Commonwealth of Pennsylvania contribute a significant portion of the nutrient loads being transported to the Bay. Two of the Bay's major tributaries, the Susquehanna and Potomac Rivers, comprise 21,000 square miles of the Bay's 67,000 square mile drainage areas.

Pennsylvania formalized their efforts to meet the requirements set out in the Bay Agreement through their Nutrient Reduction Strategy, which is headed by the Pennsylvania Department of Environmental Protection. Pennsylvania's Strategy can be looked at in two parts: nonpoint and point source nutrient loads.

The majority of nonpoint source programs in Pennsylvania target the agricultural community, since it accounts for the majority of nonpoint nutrients deliv-

ered to the Bay by the tributaries within the state. The primary elements of the nonpoint strategy include:

- Nutrient management legislation
- The Conservation Practice Installation Program, which focuses on the installation of BMPs
- Agricultural initiatives, such as barnyard runoff controls and stream corridor protection
- Support for voluntary efforts
- Urban nonpoint source control initiatives, such as the Urban Erosion and Sedimentation Control Program and the Urban Stream Corridor Protection initiative

The Commonwealth's point source program focuses on:

- The phosphate detergent ban established in 1990
- Increased nutrient removal efficiencies at wastewater treatment facilities
- Private sector voluntary pollution prevention measures

Central to the Pennsylvania program is the tenet that no mandates or initiatives will be established for meeting target goals without supporting funding.

APPENDIX D

Glossary

303(d) list: State-wide lists of impaired streams that are not in compliance with state and federal standards

benthic: bottom (as in bottom-dwelling organisms)

BMP: best management practice

CBLAD: Chesapeake Bay Local Assistance Department (Virginia)

CBPA: Chesapeake Bay Preservation Area

CVMP: Citizen Volunteer Monitoring Program (Pennsylvania)

DEP: Department of Environmental Protection (Pennsylvania)

development credits: Allowances for higher density or other exceptions in exchange for environmental protections

EPA: Environmental Protection Agency

GIS: Geographic Information System, a series of map layers used to show land uses

LGSS: The Bay Program's Land, Growth and Stewardship Subcommittee

LOD: Limit of Disturbance

macroinvertebrates: Aquatic insects and larvae without a backbone, able to be seen by the unaided eye

MIF: Minimum In-Stream Flow standards

MPC: Municipalities Planning Code (Pennsylvania)

NPDES: National Pollutant Discharge Elimination System which regulates discharges to waters of the United States

overlay zone: Zoning which supercedes existing zoning

PDRs: Purchase of Development Rights

proffer: Something given in exchange for development variance such as donation of a building or road improvements

PUD: Planned unit development which requires a master development plan and generally additional requirements such as buffers around the development

receiving area: Area receiving additional densities in exchange for preservation of land elsewhere

RSCOD: River and Stream Corridor Overlay District

sending area: Area of land for which densities are reduced in exchange for development elsewhere, generally to protect sensitive areas such as headwaters

sheetflow: uniform flow of water in a sheet-like pattern, as opposed to in a gully

"takings" test: A legal test to determine if land has been taken without just compensation

TMDL: Total Maximum Daily Load, the maximum pollutant level for a stream that will allow it to meet water quality standards

TDRs: Transferable Development Rights

variance: A legally allowed exception to a statute, granted by a regulatory authority

USGS: United States Geological Survey

VEMP: Volunteer Environmental Monitoring Panel (Pennsylvania)