



RIPARIAN FOREST BUFFERS

LINKING LAND AND WATER

U.S. EPA Region III
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The Chesapeake

Chesapeake Bay Program

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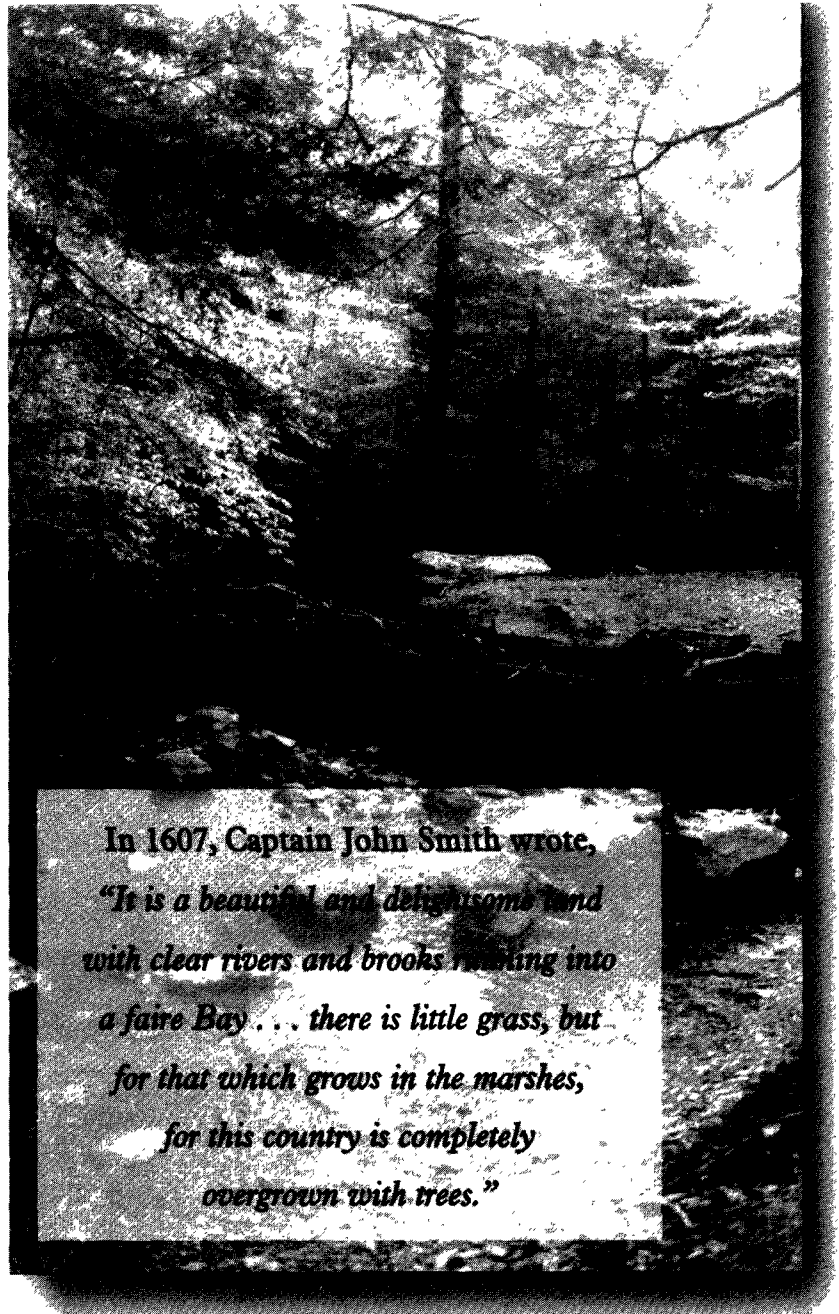
INTRODUCTION

Almost four centuries have passed since the first colonists arrived on the shores of the Chesapeake Bay, finding a vast forest covering the land from Virginia to New York. These forests served as a living filter and regulator of the Bay's environment. However, agricultural expansion and the growth of our cities and towns have brought dramatic changes to the landscape. Today, less than 60% of the watershed is forested, and this loss is correlated with declining water quality in the Bay and its rivers. Of particular concern is the loss of riparian forests that border the more than 100,000 miles of streams and shoreline in the Bay watershed. Nearly 50% of these streamside forests have been converted to other land uses or degraded, and more continue to be lost.

Research has shown that riparian forests provide a wealth of beneficial ecological functions which, in the Bay watershed, translate downstream into a healthier Bay. In particular, trees that grow along the shore help to filter runoff and groundwater, removing pollutants like nutrients, sediment, and pesticides. Streamside forests also reduce the downstream impacts of floods and shade the stream, thus moderating water temperature and oxygen.

Conserved and managed as buffers, riparian vegetation can dramatically reduce the impacts of land use activities. Although healthy streamside vegetation of any kind is desirable, forests provide the greatest number of benefits and highest potential for reaching the Bay's water quality and living resource goals. In fact, reductions in nutrients and sediment of 30-90% can occur when runoff and groundwater pass through a riparian forest buffer.

Lowering harmful concentrations of nitrogen, phosphorus and sediments from agricultural and urban areas is a primary focus of the Chesapeake Bay Program. Finding ways to reduce the amount of these nutrients that enter the Bay and its rivers while enhancing habitat critical to the Bay's living resources is essential. Streamside forest buffers provide one common sense solution.

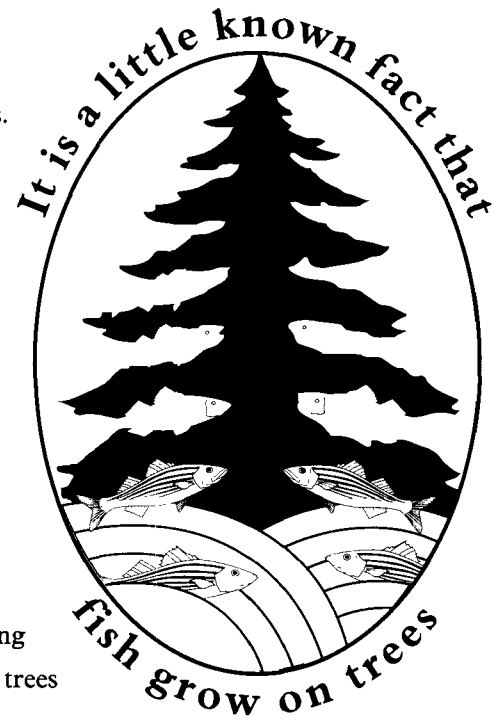


In 1607, Captain John Smith wrote,
*"It is a beautiful and delightsome land
with clear rivers and brooks running into
a faire Bay . . . there is little grass, but
for that which grows in the marshes,
for this country is completely
overgrown with trees."*

riparian area • the area of land adjacent to a body of water—stream, river, marsh, or shoreline; forms the transition between the aquatic and terrestrial environment.

LINKING LAND AND WATER

A stream cannot be defined solely by what is found between its banks. A stream and its riparian area function as one—linking land and water. Likewise, these stream corridors form the “circulatory system” for the Bay and help maintain its long-term health. Just as healthy streams are critical to restoring the Bay, riparian forests help maintain life in the streams. Riparian forests offer a tremendous diversity of habitat and are home to many ecologically important species such as amphibians, reptiles, and waterfowl. They offer travel corridors and nesting sites for birds and suitable spawning habitats for trout, shad, herring, alewife, and striped bass. Fallen trees create pools and shelter for fish, insects and crustaceans. Tree roots stabilize stream banks. Leaves provide a food source for insects and other invertebrates, who in turn are eaten by fish and birds. By anchoring the food web, providing cooler, more oxygenated water and creating pools and hiding cover, trees really do help fish grow.



Benefits of Riparian Forest Buffers

Leaf Food

Leaves fall into a stream and are trapped on woody debris (fallen trees and limbs) and rocks where they provide food and habitat for insects, amphibians, crustaceans and small fish which are critical to the aquatic food chain.

Fish Wildlife Habitat

Wooded stream corridors provide the most diverse habitats for birds, fish and other wildlife. Fallen logs and woody debris provide cover for fish while preserving stream habitat over time.

Nutrient Uptake

Fertilizers and other pollutants that originate on land are taken up by tree roots. Nutrients are stored in leaves, limbs and roots instead of reaching the stream. Through a process called “denitrification”, bacteria in the forest floor convert harmful nitrate to nitrogen gas, which is released into the air.

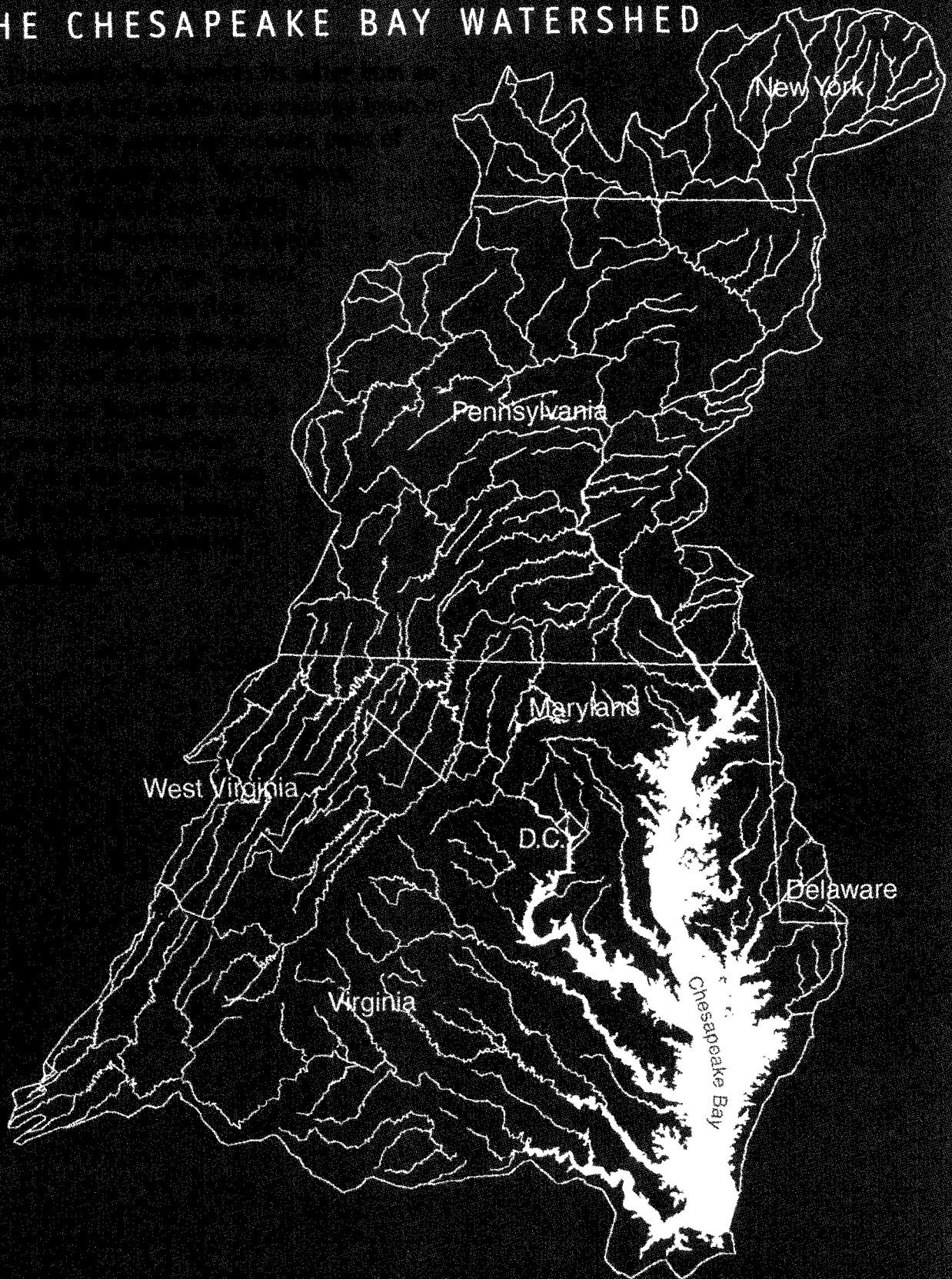
Canopy and Shade

The leaf canopy provides shade that keeps the water cool, retains more dissolved oxygen and encourages the growth of diatoms, beneficial algae and aquatic insects. The canopy captures rainfall and improves air quality by filtering dust from wind erosion, construction or farm machinery.

Filtering Runoff

Rain and sediment that run off the land can be slowed and filtered in the forest, settling out sediment, nutrients and pesticides before they reach streams. Forest infiltration and water storage can be 10-15 times higher than grass turf and 40 times higher than a plowed field.

THE CHESAPEAKE BAY WATERSHED



A SCIENTIFIC FOUNDATION

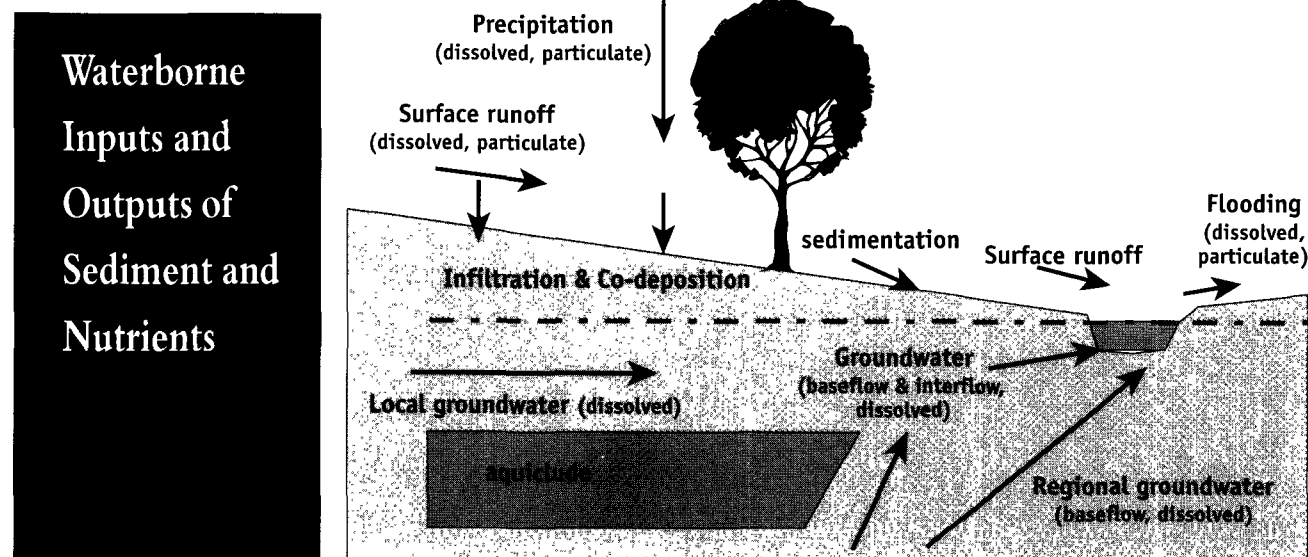
The science of riparian buffers is not entirely new. Over the last twenty years, scientists have shown that forests may provide solutions to a myriad of environmental problems. From cleaning the air and improving water quality to providing critical habitat and healthy soil, forests play a vital role in protecting and improving the overall health and resilience of a watershed.

However, it is only recently that this knowledge has been applied to pollution control.

Research studies have shown that riparian forest buffers can be an effective last line of defense against activities we undertake in managing the land, such as crop production, grazing, construction and urban

development. Because of their position in the landscape, riparian forests act as effective natural buffers, interacting with the flow of surface and groundwater from upland areas.

As a part of the *Chesapeake Bay Riparian Forest Buffer Initiative*, leading scientists were assembled to evaluate the state of our knowledge and the potential of riparian forest buffers. As a result of their efforts, the Bay Program published *Water Quality Functions of Riparian Forest Buffer Systems in the Chesapeake Bay Watershed*. Findings about nutrient cycling and riparian buffer system effectiveness, like those shown below, were a part of this research report. The *Initiative* was built on this foundation of science.



POTENTIAL REDUCTION OF SEDIMENT AND NUTRIENTS FOR DIFFERENT BUFFER SYSTEMS

Buffer Width (ft)	Buffer Type	Sediment Reduction (%)	Nitrogen Reduction (%)	Phosphorus Reduction (%)
15	Grass	61.0	4.0	28.5
30	Grass	74.6	22.7	24.2
62	Forest	89.8	74.3	70.0
76	Forest/Grass	96.0	75.3	78.5
95	Forest/Grass	97.4	80.1	77.2



THE CHESAPEAKE BAY RIPARIAN FOREST BUFFER INITIATIVE

The *Initiative* resulted from the efforts of concerned stakeholders, using emerging science and practical experience, in a collaborative effort to enhance riparian stewardship in the Bay's watershed. Led by the Bay Program's Forestry Workgroup, the *Initiative* sought consensus on a set of measurable goals and strategies to coordinate and enhance existing efforts, and on new policies that could improve communication, build partnerships among government agencies, private landowners and the public, and stimulate the development of new incentives for action.

Interest in riparian forest buffers is increasing nationally, and the Bay Program and its partners have begun what is considered the most aggressive riparian buffer restoration and protection program in the country. Issues related to riparian land use are often complicated ones. However, the use of riparian forest buffers, in conjunction with other land use practices, is one of the simplest and most valuable investments landowners and the public can make toward sustaining the Bay in the future.

From the 1994 Chesapeake Executive Council

Directive on Riparian Forest Buffers:

"We now recognize that forests along waterways, also known as 'riparian forests,' are an important resource that protects water quality and provides habitat and food necessary to support fish survival and reproduction. Used as buffers, riparian forests provide a means of helping us achieve our restoration goals in the Bay's tributaries."



Representatives from Maryland, Pennsylvania, Virginia and the District of Columbia, Chesapeake Bay Commission, and Environmental Protection Agency join in the planting of native trees as part of a forest buffer and greenway along the Susquehanna River in Harrisburg, Pennsylvania during the 1996 Executive Council Meeting.

DIRECTIVES AND THE PANEL PROCESS

In 1994, the Executive Council (EC) recognized that riparian forest buffers are an important resource that help achieve both nutrient reduction and habitat restoration goals. The EC provides governance of the Bay Program and includes the Governors of Maryland, Pennsylvania, and Virginia, the Mayor of the District of Columbia, the Administrator of the Environmental Protection Agency (representing federal agencies) and the Chair of the Chesapeake Bay Commission (a tri-state legislative body) as its members. By issuing Directive 94-1, the EC called on the Bay Program to increase its focus on riparian stewardship in the watershed.

The EC directed the establishment of a Riparian Forest Buffer Panel to develop future goals and policy recommendations for a watershed-wide effort to protect, maintain and restore riparian forest buffers. A diverse 31-member group was assembled representing federal, state and local government; scientists; land managers; and citizen, farming, forest industry, development and environmental interests. Following a set of guiding principles based on sound science and sensitive to the property rights and needs of individual landowners, the panel sought recommendations that were flexible and incentive-based. The Panel then met for 18 months, inviting all stakeholders to help shape the effort and to build consensus through a series of workshops and meetings.

In October 1996, the EC adopted the recommendations of the Panel and called upon each Bay Program partner to take actions that would establish buffers of all kinds, conserve existing forests, and increase efforts to restore streams and riparian areas.

GOALS: A KEY TO SUCCESS

Common goals brought together the many agencies involved and united efforts on a watershed scale. The EC set several important new goals:

Goal #1: To assure, to the extent feasible, that all streams and shorelines will be protected by a forested or other riparian buffer.

Goal #2: To conserve existing forests along all streams and shorelines.

Goal #3: 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.

To accomplish each of these goals, the EC recommended focused effort to address the following policy recommendations:

1. Enhance program coordination
2. Promote private sector involvement
3. Create and enhance incentives
4. Support research, monitoring, and technology transfer
5. Promote education and information

Coordinating committees gathered in each participating state and among federal agencies to create detailed, yet dynamic plans to meet the goals. Although comprehensive, the plans are flexible enough to adjust to a variety of landscapes and land uses. In urban areas, the plans focus on conservation and on managing development to preserve forested stream corridors. Where riparian forests have been cleared for farming, the plans focus on restoration and the opportunity to capture the benefits for buffering water quality. Changes in agricultural practices also provide opportunities for dramatic improvements in stream condition and habitat. On forest lands, the plans neither focus on conservation nor restoration, but rather on the management of the riparian forest to protect and enhance its value.

GOAL #1 • USE RIPARIAN BUFFERS

"To assure, to the extent feasible, that all streams and shore will be protected by a forested or other riparian buffer."

In stating this goal, the EC endorsed the universal need for full riparian management and the value of buffers as a management practice regardless of land use.

1994

MAY—The Chesapeake Bay Commission adopts Bay Program resolution to assess, evaluate and make policy recommendations to improve riparian forest maintenance and restoration.

JULY—*Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay* was signed and includes support for a forest buffer policy.

OCTOBER—Chesapeake Executive Council signs Directive #94-1, requesting a Riparian Forest Buffer Policy.

1995

FEBRUARY—The CBP Implementation Committee approves the Forestry Workgroup recommendations for organization of the Riparian Forest Buffer Panel.

APRIL—Riparian Forest Buffer Panel meets.

JUNE—Riparian Technical Support Team forms.

SEPTEMBER—Panel hosts Agricultural Issues Forum.

NOVEMBER—Panel hosts Issues Buffers Forum.

1996

FEBRUARY—Panel hosts Economics Forum.

MARCH—Panel hosts Forestry/Public Land Issues Forum.

MAY—First draft of Panel Report.

JUNE/AUGUST—Public meetings are held with stakeholders.

JULY—Chesapeake Bay Foundation announces goal of 1500 miles of new riparian forest buffers in the watershed by 2005.

SEPTEMBER—Second draft of Panel Report.

OCTOBER—Executive Council adopts Panel Report and sets goals for riparian buffers and riparian forest conservation and restoration.

DECEMBER—Riparian forest buffer information video completed.

1997

MARCH—Secretary of Agriculture announces national goal to establish two million miles of conservation buffers (including riparian forests) by 2002.

APRIL—Riparian Forest Buffer Plan Coordinating Committee begins implementation planning.

MAY—Chesapeake Bay Riparian Handbook published.

MAY—Forestry Workgroup hosts first riparian buffer systems training session.

JUNE—Secretary of Agriculture, Vice President Gore, and Governor Glendening announce a \$200 million CREP program to support buffer planting in Maryland. The first incentive program of this kind in the nation.

1998

JANUARY—2500th copy of the riparian forest buffer video is mailed (now in 30 states and 4 foreign countries).

APRIL—American Forests announces "Global ReLeaf for the Chesapeake Bay".

JUNE—State and Federal implementation plans complete.

GOAL #2 • CONSERVE RIPARIAN FORESTS

"To conserve existing forests along all streams and shorelines."

There is no substitute for conserving existing riparian forests as buffers. Without conservation, net losses of streamside forest buffers will continue to occur. Protecting the ecological function and stability of a riparian system prevents the need for expensive investments in restoration of degraded streams. In addition, losses of mature riparian forest value and function are rarely offset completely by planting on a 1:1 basis. Conservation is of primary importance and the *Initiative* builds on a variety of existing federal, state, and local regulatory programs which help protect existing riparian buffers.

Since existing buffers are at a risk of being lost through local development, much of what can be done to conserve them is most feasible at the local level. Local jurisdictions are on the "front line" in making decisions about land use planning and zoning guidance, which can direct activities away from sensitive and valuable streamside areas. Conserving riparian forests means building local support for riparian corridor protection and helping local governments to develop and to apply new conservation tools and incentives.

GOAL #3 • RESTORE RIPARIAN FORESTS

"To increase the use of all 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."

Beyond the urgency to conserve existing riparian forests is the need to undo many of the mistakes of the past. Although not a panacea, dramatic improvements can occur through simple replanting of a riparian forest. Restoring riparian forest buffers in degraded areas also can pay high dividends for stream habitat improvement. In order to achieve 2010 miles of forested stream and shoreline, Maryland, Pennsylvania, Virginia and the federal government committed to individual goals. Maryland and Pennsylvania each will restore 600 miles, Virginia will restore 610 miles, and 200 miles will be restored on federal lands and in the District of Columbia. This represented a 3-fold increase in existing restoration efforts. In attempting to restore missing or inadequate buffers, agencies and community or watershed-based groups will work with landowners to survey streams, identify priority needs and develop projects.

LOCAL WATERSHED ACTION

Ultimately, success will depend as much on cultivating a new “riparian stewardship ethic” among landowners and communities as it will on planting trees. Considering that most of the land along the rivers and streams in the basin is divided among hundreds of thousands of individual landowners and private communities, the effort strongly promotes creating voluntary incentives and raising public awareness.

Local watershed-based plans can identify participants, target problems and solutions more effectively, and solidify commitments from landowners. Successful volunteer projects already have proven that many small efforts can add up to big improvements in stream and watershed health.



POLICY RECOMMENDATIONS

RECOMMENDATION 1

Enhance Program Coordination and Accountability

“Establish mechanisms to streamline, enhance, and coordinate existing programs related to buffers and riparian system conservation.”

Riparian conservation and restoration are the responsibility of a number of federal, state and local agencies and are of interest to numerous private organizations. Likewise, effectively working with landowners, communities and decision-makers requires an understanding of relevant programs and a variety of technical skills and resource information. Whether focusing on water quality, habitat, bank stabilization or recreation, increased interaction will allow for more consistency in buffer efforts.

Improved coordination at the federal, state and watershed level can lead to more efficient use of resources, allowing for different efforts to support each other. The intent of Recommendation One is to have Bay Program partners review, evaluate and modify existing approaches in order to simplify processes, enhance participation, streamline implementation and ensure that they support the goals of stream and riparian forest buffer protection and conservation. It encourages the development of strategies to effectively coordinate the many programs involving riparian buffers.

ACTIONS AND INNOVATIONS

RIPARIAN COORDINATING COMMITTEES

In determining how to best meet the challenge and guide the development of strategies to meet the EC goals, the states have formed individual coordinating committees. These committees vary in size from a dozen to more than 50 members. They represent a diversity of interests in each state including natural resource management; agriculture; forestry; building and land development; watershed advocacy; hunting and fishing; education; federal, state and local government; business and industry; landowners; land trusts; and conservancies. These committees have been valuable in helping different interests to work together.

RECOMMENDATION 2

Promote Private Sector Involvement

Two guiding principles of the *Initiative* are encouraging voluntary participation and increasing partnerships. Private sector involvement is essential to expand the reach of riparian forest conservation and restoration activity. The intent of this recommendation is to encourage partnership efforts between business, non-governmental organizations and citizen groups to improve outreach and education, and to increase funds available for stream and buffer restoration projects. It embraces the participation of groups such as watershed organizations, land trusts and conservancies. Businesses and private organizations serve a valuable role in working with landowners and land managers to conduct stream surveys, to plant riparian buffers, to establish demonstration sites, to facilitate training, and to build grass roots support for Bay Program goals.

"Build partnerships with the private sector to help support the promotion and implementation of riparian forest buffer retention and restoration activities."

ACTIONS AND INNOVATIONS

"GLOBAL RELEAF" FOR THE CHESAPEAKE BAY

American Forests (AF), the nation's oldest citizen conservation organization, is an important partner in the effort to restore and protect forests in the Bay region. As part of its national tree-planting effort, AF initiated "Chesapeake ReLeaf." AF has committed to generate enough private sector support to plant one million trees in the Bay region by the year 2000, complimenting the Bay Program's goal of restoring 2,010 miles of streamside forests by the year 2010.



HERCULES BUILDS BUFFERS

In Hopewell, Virginia, Hercules Inc.—a cellulose derivatives manufacturer—recently was awarded a *Businesses for the Bay* Excellence Award for its pollution prevention efforts. In addition to having implemented activities designed to prevent pollution, Hercules partnered with its community to build riparian buffers and started a nursery to provide stock for riparian buffer planting. It is the first private nursery planted in Virginia for public streambank restoration projects. *Businesses for the Bay* is the Bay Program's voluntary pollution prevention program for businesses in the Bay region.

RECOMMENDATION 3

Enhance Incentives

A successful voluntary effort depends on expanding the array of incentives available to landowners, developers and managers. To accomplish this recommendation, Bay Program partners are working to identify creative funding sources, to develop and promote property, income and inheritance tax incentives and to strengthen funding options and availability. These efforts are intended to encourage broad participation and to energize local efforts. Incentives may take many forms, including small grants, cost-share payments, tax reductions, recognition for landowner cooperation, payment for supplies and materials, low interest loans, easement purchases, payments for land taken out of production, and provision of technical assistance.

"Develop and promote an adequate array of incentives for landowners and developers to encourage voluntary riparian buffer retention and restoration."

ACTIONS AND INNOVATIONS

TAX BREAKS FOR VIRGINIA LANDOWNERS WITH BUFFERS

In 1998, legislation was adopted authorizing tax breaks for riparian buffer lands in Virginia (HOUSE BILL #1419). Currently, *Water Quality Improvement Act* funds are available to reimburse localities for revenue losses due to buffer land tax breaks.

THE CONSERVATION RESERVE ENHANCEMENT PROGRAM

The *Conservation Reserve Enhancement Program* (CREP) establishes a federal-state partnership, targeting additional federal *Conservation Reserve Program* funds to provide enhanced incentives to farmers who restore wetlands and stream buffers on environmentally sensitive lands. Maryland's CREP commits to restore up to 70,000 acres of riparian buffers and retain many of them through conservation easements. Maryland was the first state to gain approval for an enhancement program. Federal and state funding for farmers may exceed \$200 million over a 15-year period. The Chesapeake Bay Foundation, Ducks Unlimited, and the US Fish and Wildlife Service have entered the partnership, promising to add additional cost-share funds wherever landowners plant trees or restore wetlands. Pennsylvania and Virginia also have proposed similar CREP programs.

PENNSYLVANIA GRANT PROGRAMS

The Pennsylvania Department of Environmental Protection is funding riparian buffer projects through two new small grant programs: the *Pennsylvania Stream ReLeaf Fund* mini-grant program, which is co-sponsored by *American Forests* and coordinated by the Alliance for the Chesapeake Bay, and the *Watershed Restoration and Assistance Program*, which supports a variety of watershed-based projects.

POLICY RECOMMENDATIONS *(continued)*

RECOMMENDATION **4**

Support, Research, Monitoring, and Technology Transfer

Though significant research exists on riparian buffers, there are many aspects of forest buffer retention and establishment which require additional study. Research into forest buffer functions, species adaptability, management practices, economics, and other issues will strengthen conservation and restoration actions. Equally important is the transfer of new research findings to technical specialists, land managers, decision-makers, and public groups. The intent of Recommendation Four is to encourage Bay Program participants to monitor riparian buffer programs, support existing research efforts, create innovative research opportunities, and utilize research and monitoring information as an educational tool. Establishing and monitoring riparian forest buffer demonstration sites will be a key tool for learning, and teaching others, about the use and effectiveness of buffers.

"Increase the level of scientific and technical knowledge of the function and management of riparian forest and other buffers, as well as their economic, social, ecological, and water quality values."

ACTIONS AND INNOVATIONS

TARGETING EFFORTS

The Maryland Department of Natural Resources is using an interactive *Integrated Watershed Analysis and Management System* to rank unbuffered stream reaches by potential to reduce nutrient pollution. Its components include nutrient load, stream order, adjacent land uses and existing forest cover. This targeting system will help Maryland establish and protect buffers in the locations where they can most effectively improve water quality and habitat and can support local watershed protection efforts.

SCIENCE AND EDUCATION — KEY ROLE FOR FEDERAL AGENCIES

Federal agencies are instrumental in gathering, evaluating and communicating scientific and inventory information on riparian forest buffers and in providing technical tools for public outreach, education and training. The USDA Forest Service, Cooperative Extension Service and US Fish and Wildlife Service have developed numerous informational and outreach documents, videos, training programs, brochures and fact sheets useful in communications. Federal agencies also have established demonstration projects and developed technical guidance such as the *Chesapeake Bay Riparian Handbook*.

RECOMMENDATION **5**

Promote Education and Information

In the long run, riparian stewardship will depend on the action of citizens and communities, landowners and managers, and the many individuals that influence decisions that affect the conservation or restoration of our riparian areas. People are motivated when they understand the benefits provided by riparian forest buffers and how they can take action to improve streams in their watershed. Public awareness stimulates volunteer efforts, enlists financial resources for riparian buffer projects, and builds political support. Many efforts are under way at the state and local levels to promote riparian conservation and tree planting. The intent of this recommendation is to support existing efforts and to create new tools and programs useful for education and outreach. Bay Program partners will develop educational curriculum for teachers, as well as outreach tools and professional training programs for local governments, landowners and developers. They also will highlight successful projects through various information and media efforts, using project visibility as another means to raise public awareness about the value of riparian forest buffers in watershed protection.

"Encourage Bay signatories to implement education and outreach programs about the benefits of riparian forest buffers and other stream protection measures."

ACTIONS AND INNOVATIONS

BUFFER TRAINING VIA SATELLITE LINKS STATES

The Maryland Cooperative Extension Service, USDA Forest Service and the Bay Program sponsored technical training to resource managers in a satellite broadcast format in 1998. The two-day training included on-site instruction and field exercises. Using interactive satellite broadcast technology, more than 15 states were able to participate. The training was held simultaneously at 45 sites and reached more than 1000 individuals.

BUFFER "TOOLKIT"

The Pennsylvania Stream ReLeaf Kit is a practical guide for grassroots organizations. This user-friendly manual is intended to stimulate interest in streamside reforestation projects. It presents useful materials to help volunteers develop a buffer planting project, including indigenous plant lists, sample planting schemes, varying forest buffer designs, a listing of nurseries with riparian stock, and maintenance tips to keep the vegetation healthy once the project is complete.

A COMMITMENT TO RIPARIAN STEWARDSHIP

In June 1998, Maryland, Pennsylvania, Virginia and the District of Columbia, with the federal agencies, completed individual plans for implementation of the *Initiative*. The plans map out how the goals will be met while being responsive to the unique needs of each state. Together, they comprise a watershed-based riparian buffer strategy.



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 builds on a number of its existing regulatory programs to achieve the goal of conserving forests. Hallmarks of the effort include a watershed approach, voluntary participation with incentives, monitoring the success of buffer planting efforts, and building new private partnerships.

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.



Pennsylvania Stream ReLeaf: A Plan for Restoring and Conserving Buffers Along Pennsylvania Streams

Extending efforts statewide, the Pennsylvania plan focuses on local community and watershed initiatives to accomplish streamside buffer restoration and conservation. State agencies will provide education, technical assistance and funding to watershed and conservation groups and to local governments through ongoing and new programs. Enhancing outreach, education and incentives are important parts of the plan. It serves as a guide, listing sources of assistance available from both government agencies and private non-profit organizations.

As the state's lead agency in implementing the initiative, the Pennsylvania Department of Environmental Protection is guided by a multi-agency steering committee and supported by its Bureau of Watershed Conservation and the Pennsylvania Department of Conservation and Natural Resources' Bureau of Forestry.



Commonwealth of Virginia Riparian Buffer Implementation Plan

The Virginia plan describes a strategy for meeting each of the five policy recommendations of the Riparian Forest Buffer Panel. It targets state assistance to support private landowners and participation of local governments as keys to the success of the initiative. The plan extends the initiative to a state-wide effort. Actions to evaluate new incentives, integrate riparian buffers into current state programs, build links with private industry, and enhance landowner and local government outreach efforts will help to broaden the use of riparian forest buffers. A state Riparian Advisory Committee has been formed, and each year the progress of the plan will be evaluated and strategies revised as needed to ensure goals are achieved. A comprehensive assessment of the plan will be conducted every three years.



Federal Agencies/ District of Columbia Plans

Federal lands and facilities comprise less than 5% 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 managed by one of four entities: the USDA Forest Service, the Department of Defense, the National Park Service or the US Fish and Wildlife Service.

Each of the major land management agencies has prepared a separate implementation plan targeted to its needs. These plans ensure that land and facility management guidelines will contain provisions to afford maximum protection of streams and streamside forests. The Forest Service and Department of Defense have identified specific areas for replanting riparian forest buffers.

Federal agencies will enhance the delivery of their many incentive programs for private landowners. The Bay Program's Federal Agencies Committee will track accomplishments.

The District of Columbia also will work to reduce the impacts of developed areas on streams and riparian areas and will work with Maryland and the federal agencies in targeted watersheds like the Anacostia River.

MONITORING AND TRACKING

Measuring Success

Monitoring and continuous data collection are crucial elements of the *Initiative*. Monitoring efforts often are needed at the site, stream reach, small watershed, or landscape-level. Monitoring helps us to learn about the success of conservation and restoration strategies and to determine their effectiveness in meeting specific water quality and habitat goals.

Monitoring and tracking the progress of the *Initiative* serves not only to keep a record of new riparian buffer miles restored, but to provide valuable information for improving the *Initiative's* overall performance. Tracking also supplies the data crucial to Bay Program indicators which illustrate bottom-line environmental results in the Bay restoration effort and provide a unique picture of the general health of the Bay and its watershed.

To successfully evaluate progress toward meeting the *Initiative's* goals, the current condition of riparian areas needed assessment. A Riparian Forest Buffer Inventory was completed for the Bay watershed in 1997. The

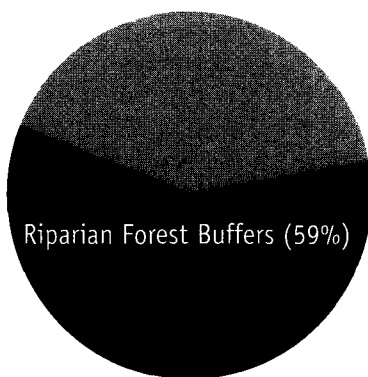
inventory used the EPA's Environmental Monitoring Assessment Program land cover data (1989–1991) and included an accuracy assessment protocol using aerial photography to verify its reliability. This Geographic Information System (GIS) technology was used to assess the status of riparian areas and to provide a baseline for information on riparian forest buffers in the watershed for the states and federal agencies.

The inventory provides riparian forest statistics for the Bay states and sub-watersheds within the basin.

For tracking trends, the Bay Program representatives defined conservation of riparian forest buffers as “a conservation width of at least 100 feet on each side . . . recommended for retention of existing riparian forests. Individual jurisdictions may choose to apply different widths in specific situations or to meet predetermined local needs.” Future assessments of riparian forests using this spatial analysis technology will be conducted at regular intervals.

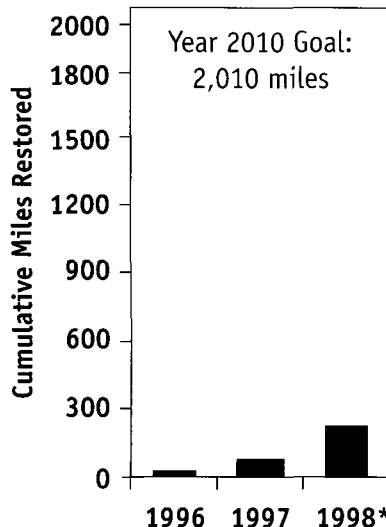
Environmental Indicator Riparian Forest Buffer Conservation and Restoration

Status of Bay Basin Streambanks and Shorelines: 1990s



Source: Chesapeake Bay Riparian Forest Buffer inventory (9/1/96) and CBP Data Center (6/22/98). There are a total of approximately 199,000 miles of streambank and shoreline in the Bay watershed.

Riparian Forest Buffer Restoration



*Through September 30, 1998
Source: Chesapeake Bay Program.

GOAL: Conserve existing forest along all streams and shorelines 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.

STATUS: As of 1990, approximately 59% of riparian areas in the basin were forested. Between 1996 and September 1998, 218 miles of riparian forest were restored.

However, a width for restoration was set at 35 feet or greater measured from the top of the bank to the outer edge of the restoration planting. A forest buffer of this width would meet minimum nutrient and aquatic system improvement needs while ensuring wide application. Therefore, restored buffers are tracked by counting each completed project.

The Bay states, District of Columbia, and the participating federal agencies have developed individual tracking systems based on uniform guidelines and criteria set by the Bay Program (below). Each state implementation plan includes tracking forms used to collect pertinent information about restoration projects, and each provides instructions for filing them. The forms are collected twice a year by

those overseeing the implementation of the plans and include restoration project location, mileage, site and planting information, and geographic referencing for adaptability into GIS systems.

BASELINE SUMMARY

State	Stream Miles ^(a)	Buffers 100' Both Sides ^(b)	Buffers 100' One Side	Buffers <100' One Side ^(c)
DC	51 (.05%)	11 (21.6%)	12 (25.5%)	38 (74.5%)
DE	1,091 (1%)	572 (52.4%)	638 (58.5%)	453 (41.5%)
MD	16,756 (14.9%)	8,032 (47.9%)	9,050 (54.0%)	7,706 (46.0%)
NY	8,015 (7.1%)	3,744 (46.7%)	4,353 (54.3%)	3,662 (45.7%)
PA	47,585 (42.2%)	26,938 (56.6%)	30,450 (64.0%)	17,135 (36.0%)
VA	34,381 (30.5%)	17,857 (51.9%)	20,065 (58.4%)	14,316 (41.6%)
WV	4,956 (4.4%)	2,582 (52.1%)	2,913 (58.8%)	2,042 (41.2%)
CB	112,835	59,737 (53.0%)	67,482 (59.8%)	45,352 (40.2%)

(a) The total length of stream and shoreline distance in each Bay state.

(b) The extent of stream length that has riparian forest cover at least 100 feet wide on *both* sides of the waterway.

(c) The extent of stream and shoreline that has *less* than 100 feet of forest cover. This figure plus the extent of buffer on one side equals 100% of total stream miles.

CHESAPEAKE BAY PROGRAM RIPARIAN FOREST BUFFER TRACKING GUIDANCE

Criteria and Guidance

Restoration	Buffer widths of 50–100 feet will be promoted as the appropriate width for optimizing a range of multiple objectives for water quality and fish habitat improvement. The width included for tracking purposes to meet the 2010 restoration goal will be 35 feet or greater.
Conservation	Conservation of existing forested streamside areas should result in buffers at least 100 feet wide.
Riparian Forest Buffer Composition	The buffer must contain at least two species of native, noninvasive woody trees and shrubs, or a combination of each. Natural regeneration is acceptable where nearby trees native to the area can provide a natural source of seeds, and where invasive plant species can be controlled.
Stream Definition	All intermittent and perennial channels, excluding man-made ditches, constitute a stream. Free-flowing stream and 1st and 2nd order streams are highest priority. Buffers along lake and pond shores and those established around wetlands also will be counted toward the 2,010 mile goal.
Measurement and Averaging	Progress will be measured in terms of streambank or shoreline miles. Riparian forest buffer averaging is allowable as long as the stream does not meander outside the buffer zone.

WHAT IS THE 3-ZONE RIPARIAN FOREST BUFFER MODEL?

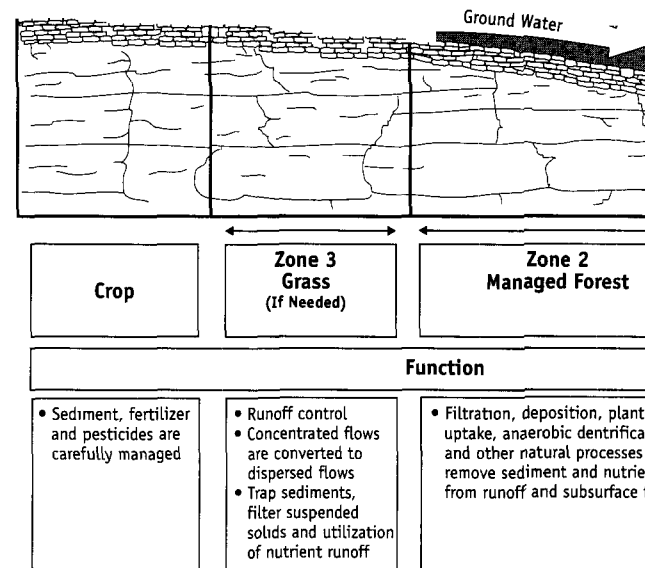
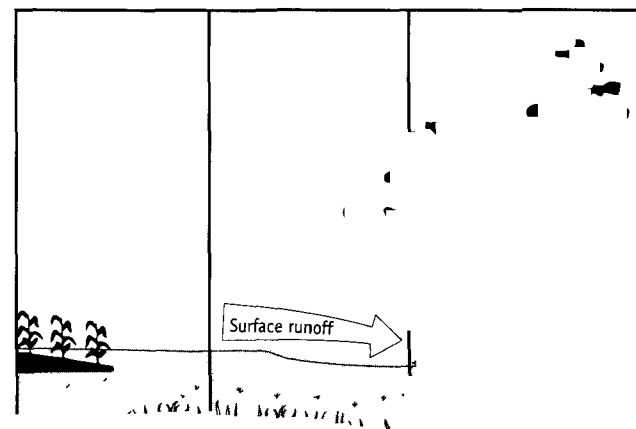
The three-zone buffer system is a concept to help plan and manage riparian forest buffers. It is a highly flexible system designed to achieve better water quality and protect the stream, as well as achieve other landowner objectives. A three-zone riparian forest buffer may not be necessary or achievable in every setting, but the model is a useful way to organize our thinking about riparian buffers. Riparian buffers will vary in character, size, and effectiveness based on environmental setting, management, and landowner objective.

Zone 1 is managed for the stream. It stretches upland from the streambank. Its primary purpose is to stabilize the stream bank and provide a source of food and habitat for aquatic organisms. This zone provides the greatest benefits along smaller streams where it provides maximum control of light and temperature conditions, holds the soil in place, and in many cases, removes nutrients.

Zone 2, directly landward from Zone 1, is managed to remove, store and transform nutrients, sediments and other pollutants which are carried to the stream in ground water and surface runoff. Pollution runoff may be reduced by 30–90% depending on site conditions. Although it can vary, the width of Zone 2 is critical to the removal of nutrients.

Zone 3 is the outer edge of the buffer. It contains control measures—typically grass filter strips—which slow runoff and filter sediments. Zone 3 helps prevent runoff from eroding channels into the buffer and helps protect the integrity of Zones 1 and 2.

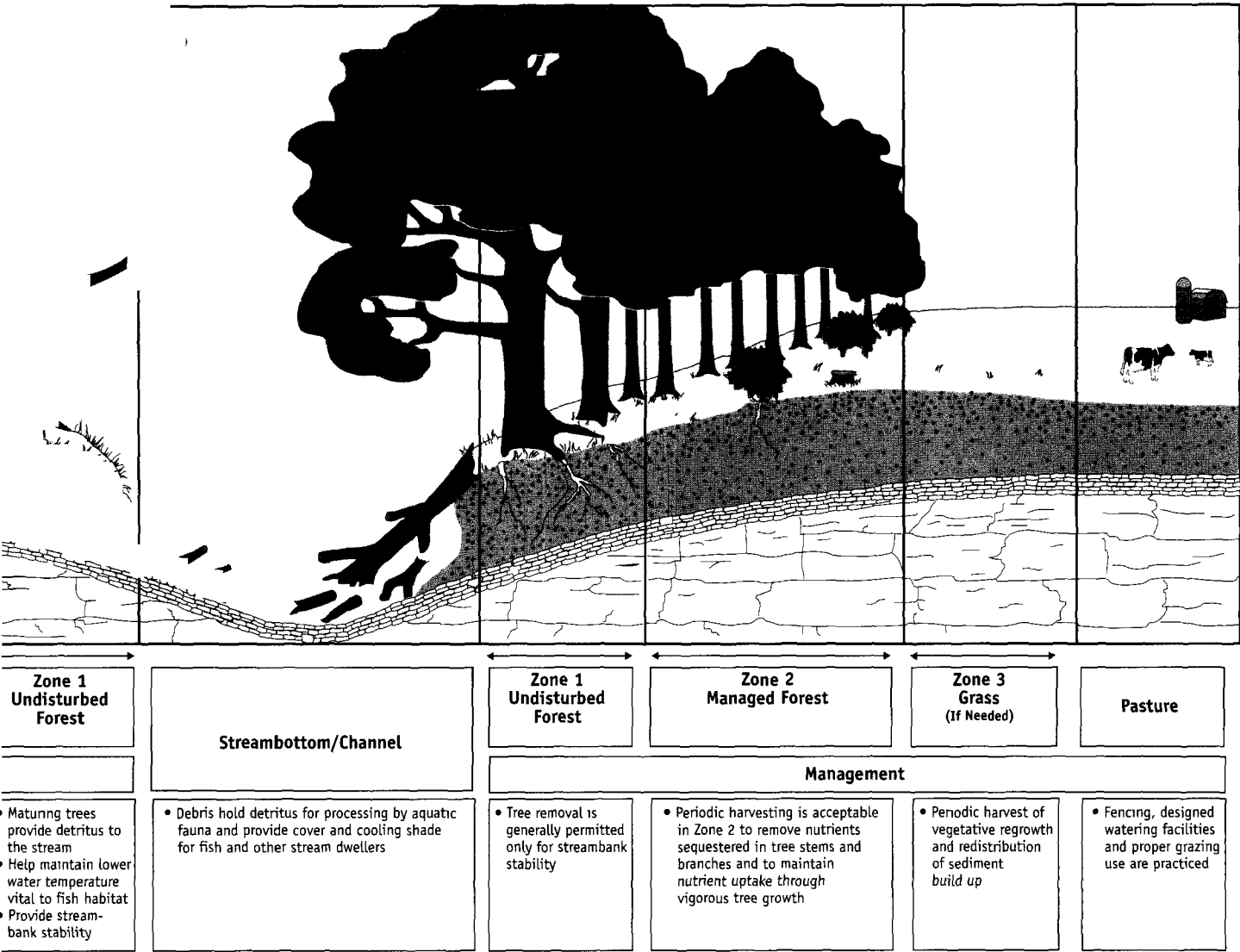
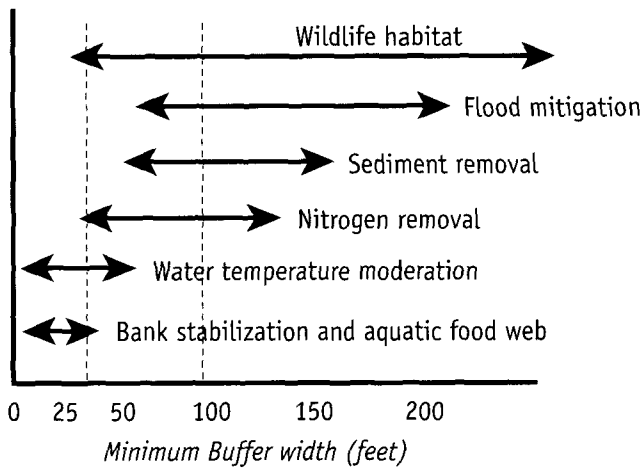
RIPARIAN FOREST BUFFERS: A Closer Look



The Chesapeake Bay Riparian Forest Buffer Panel adopted the following definition for riparian forest buffers:

“An area of trees, usually accompanied by shrubs and other vegetation that is adjacent to a body of water which is managed to maintain the integrity of stream channels and shorelines, to reduce the impact of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals, and to supply food, cover, and thermal protection to fish and other wildlife.”

Relationship of Riparian Functions and Minimum Buffer Widths



PRIORITIES FOR BUFFER LOCATION

To be most effective, riparian forest buffers should be planned and implemented on a watershed scale. Although most agree that riparian forest buffers have some value in any setting, there are some important considerations when establishing priorities.

- **Habitat**—Riparian forests are essential for some fish and wildlife. Targeting for habitat enhancement may be very different than for water quality.
- **Stream Size**—More than 70% of all stream miles are small headwater streams (order 1-2). These may be priority areas for reducing nutrients. Watersheds with high stream density also are likely to benefit most.
- **Continuous Buffers**—Establishing continuous riparian forest buffers in the landscape is given a higher priority than establishing wider but fragmented buffers. Continuity is important for stream shading, water quality and wildlife corridors.
- **Geography**—Research has shown that the ability of forest buffers to remove pollutants like nitrogen is determined by physiographic features. For example, pollutant removal efficiency may be highest in areas where soils and geology increase the total amount of water passing through the riparian area.
- **Degree of Degradation**—Streams in areas without forests, such as pastures, may benefit the most, while buffers on highly-altered urban streams may not be able to provide high levels of pollution control.
- **Land Use**—The way the land is used influences the design, width, and type of vegetation used to establish a buffer.



NEED MORE INFORMATION?

RIPARIAN FOREST BUFFER INITIATIVE

To find out more about the status of the Riparian Forest Buffer Initiative in your area or to see how you can get involved, please contact the riparian forest buffer coordinator in your state:

CHESAPEAKE BAY PROGRAM

Chesapeake Bay Program

410 Severn Avenue, Suite 109
Annapolis, MD 21403
(410) 267-5700
1 800 YOUR BAY

MARYLAND

Maryland Stream ReLeaf

Maryland Department of Natural Resources
Resource Management Service
580 Taylor Avenue, C-4
Annapolis, MD 21401
(410) 260-8100

Assisted By:

Maryland Department of Natural Resources Forest Service

580 Taylor Avenue, E-1
Annapolis, MD 21401
(410) 260-8531

PENNSYLVANIA

Pennsylvania Stream ReLeaf

Bureau of Watershed Conservation
Pennsylvania Department of
Environmental Protection
P.O. Box 8555
Harrisburg, PA 17105-8555
(717) 787-5259

Assisted By:

Pennsylvania Department of Conservation and Natural Resources

Bureau of Forestry
P.O. Box 8552
Harrisburg, PA 17105-852
(717) 787-2106

VIRGINIA

Virginia Riparian Implementation Plan

VA Department of Forestry
P.O. Box 3758
Charlottesville, VA 22903
(804) 977-6555

FEDERAL AGENCIES AND DISTRICT OF COLUMBIA

Federal Agencies Committee

Chesapeake Bay Program
410 Severn Avenue, Suite 109
Annapolis, MD 21403
(410) 267-5700
1 800 YOUR BAY

USEFUL WEB SITES

Riparian Buffer Zone Information

www.deal.unl.edu/agnic/

Riparian Forest Buffers in the Chesapeake Bay Watershed

www.chesapeakebay.net/facts/forests/ripfor.htm

Chesapeake Bay Riparian Forest Buffer Initiative

www.chesapeakebay.net/facts/forests/ripinit.htm
(for the federal agency/District of Columbia plan)

MD Department of Natural Resources Forest Service

www.dnr.state.md.us/forests

www.dnr.state.md.us:80/forests/streamreleaf.html
(for the Maryland StreamReLeaf Plan)

PA Bureau of Forestry and Department of Environmental Protection

www.dcnr.state.pa.us/forestry/forestry.htm

www.dep.state.pa.us/See&hear/streamreleaf/Stream_Releaf.htm
(choose Stream ReLeaf —for PA's Plan)

VA Department of Forestry

www.state.vipnet.org/dof/index.html

www.state.vipnet.org/dof/riparian.htm (Riparian Forest Buffers)

Society of American Foresters

www.safnet.org

Alliance for the Chesapeake Bay

www.acb-online.org

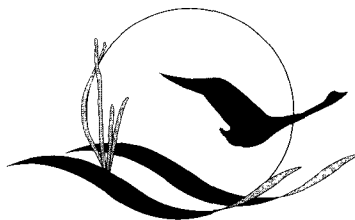
USDA Forest Service

www.fs.fed.us

CHESAPEAKE BAY PROGRAM

The Chesapeake Bay Program is a unique regional partnership leading and directing restoration of the Chesapeake Bay since 1983. The Chesapeake 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 US Environmental Protection Agency (EPA), which represents the federal government; and participating citizen advisory groups.

Since its inception, the Chesapeake Bay Program's highest priority has been the restoration of the Bay's living resources—its finfish, shellfish, Bay grasses, and other aquatic life and wildlife. Improvements include fisheries and habitat restoration, recovery of Bay grasses, nutrient reductions, and significant advances in estuarine science.



Chesapeake Bay Program

US Environmental Protection Agency
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