

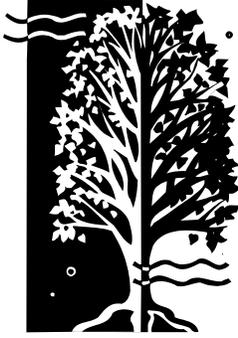
**RECOMMENDATIONS
FOR THE
2003 DIRECTIVE ON
EXPANDED
RIPARIAN FOREST
BUFFER GOALS
IN THE CHESAPEAKE WATERSHED**

**Presented to the
CHESAPEAKE EXECUTIVE COUNCIL**

**By the
CHESAPEAKE BAY PROGRAM
FORESTRY WORKGROUP**

DECEMBER 2003





Chesapeake Bay Program Forestry Workgroup

December 9, 2003

To the Members of the Chesapeake Executive Council:

The riparian forest buffer goals have represented a significant achievement on behalf of the Chesapeake Bay Program and the natural resource community. They exemplify what true partnerships can achieve. In 1996, we committed to restoring 2,010 miles of riparian forest by the year 2010. Working collaboratively, we have surpassed that goal well before the deadline.

We want to continue to actively and ambitiously restore riparian forests. The new targets that this Directive presents obligates us to continue to restore over 900 miles of buffers in the Chesapeake Bay watershed each year for the next seven years. This is a significant commitment of efforts and investments on behalf of the states of Maryland, Pennsylvania, Virginia, and the District of Columbia. Federal and state agencies, conservation groups, and local governments need to recommit to water quality protection through riparian forest buffer restoration/installation. Continued resource limitations could limit our progress in this important Bay restoration effort.

We have also expanded the scope of our work on riparian forests through this Directive by placing a new emphasis on the monitoring and maintenance of newly restored buffers to ensure their survival; by encouraging an increase in tree canopy in urban areas; and by promoting the protection of buffers on public lands and in programs that protect ecologically significant private lands from development. We believe that these new directions will enhance the contributions of riparian buffers towards restoring the health of the Bay watershed.

This new Directive represents not only our dedication to continue our restoration and conservation efforts, but also our follow through on the *Chesapeake 2000* commitment to establish a new, expanded goal for buffer restoration mileage. We believe this Directive will contribute significantly toward restoring the health of the Chesapeake Bay.

Sincerely,

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CHESAPEAKE EXECUTIVE COUNCIL

DIRECTIVE NO. 03-01

EXPANDED RIPARIAN FOREST BUFFER GOALS

*W*e, the members of the Chesapeake Executive Council, hereby reaffirm our commitment to restoring the Chesapeake Bay, in part, by protecting and restoring riparian lands along the watershed's thousands of miles of stream and shoreline. Scientific evidence indicates that riparian forest buffers offer the greatest range of benefits of any riparian land use. Such benefits include improved downstream and instream habitats, reduced nutrient and suspended sediment levels and moderated water temperatures, and improved value such as foraging, migration, spawning, nursery and nesting habitat for a variety of wildlife. Based on this evidence, we support increased efforts in the conservation, restoration, and maintenance of forested riparian buffers.

WE ARE PROUD of the progress that each of our jurisdictions has made in achieving the goal set in 1996 fully eight years ahead of the 2010 schedule. To capitalize on the momentum we have created, we commit to the following:

- ❖ WE REAFFIRM OUR BELIEF that riparian forested buffers are critical to protecting the streams of the Chesapeake watershed, and as agreed to in the *Chesapeake 2000* agreement, we commit to a continued effort to maximize the miles of streambank and shoreline that are protected by any form of vegetated buffer, especially trees.
- ❖ WE RECOGNIZE THAT THERE IS A GREAT OPPORTUNITY to further improve water quality and living resource habitat by continuing to establish forest buffers on the many miles of streams yet to be restored. Our long term restoration goal is beyond our current capacity, so we must seek new public-private partnerships, and encourage the participation of our headwater state partners. We appreciate that our ultimate goal must be to enhance streams and their riparian forests in the years beyond 2010, preserving these buffers over the long-term once they are established.
- ❖ WE FURTHER RECOGNIZE THAT URBAN TREE CANOPY COVER offers stormwater control and water quality benefits for municipalities in the Chesapeake Bay watershed and can extend many riparian forest buffer functions to urban settings.
- ❖ WE BELIEVE THAT THE CHESAPEAKE BAY PROGRAM is uniquely positioned, as the premier watershed restoration program, to set ambitious goals and to marshal the resources necessary to achieve those goals, and we intend to continue to provide the leadership necessary to assure success.
- ❖ Building on our past commitments, WE COMMIT TO THE ADOPTION OF AN EXPANDED SET OF GOALS:
 - Enhance and sustain the integrity of aquatic ecosystems over the long term through conservation and restoration of forests along at least 70% of all streams and shorelines, which translates to about 26,000 miles of additional buffers in our jurisdictions with the near term goal of achieving at least 10,000 miles of riparian forest buffers by 2010. We expect that additional miles will be added to our near term goal based on the tributary strategies to achieve the nutrient and sediment allocations, due to be completed by April, 2004.
 - By 2010, work with at least 5 local jurisdictions and communities in each state to complete an assessment of urban forests, adopt a local goal to increase urban tree canopy cover and encourage measures to attain the established goals in order to enhance and extend forest buffer functions in urban areas.
 - Encourage increases in the amount of tree canopy in all urban and suburban areas by promoting the adoption of tree canopy goals as a tool for communities in watershed planning.

- ❖ WE THEREFORE DIRECT our agencies and we encourage our partners to begin immediately to accomplish the following:
 - Ensure, through monitoring and maintenance, that newly established forested buffers have a well-stocked stand of trees after 5 years.
 - Enhance and strengthen the restoration and conservation of riparian forest buffers, wherever possible, on public lands; and, in programs that protect private lands from development.
 - Advance our efforts to conserve existing riparian forests along all streambanks and shorelines in order to minimize loss.
 - Revise each Bay signatory's Riparian Buffer Implementation Plan with a focus toward the permanent protection of buffers and other program and policy opportunities for an enhanced buffer conservation and restoration program.
- ❖ WE FURTHER DIRECT our agencies and the Chesapeake Bay Program to seek ways to accomplish the following actions, which we believe will fundamentally enhance the ability to accomplish the goals stated above:
 - Ensure that an adequate level of technical service from state and federal agencies is available to landowners and communities for buffer restoration and conservation.
 - Provide for the continued use of the Conservation Reserve Enhancement Program as a critical component of riparian forest buffer restoration.

- Utilize existing federal and state incentive programs and develop new programs and partnerships to reach our riparian forest buffer restoration mileage goal and expand buffer widths beyond minimum requirements, promote the use of longer term contracts, encourage the planting of trees on a range of land uses, and emphasize maintenance of buffer vegetation and function.
- Use easements, tax policies, incentives, and other fiscal tools, to strengthen riparian forest conservation commitments.
- Target riparian forest buffer restoration for maximum water quality and wildlife habitat benefit, to the extent feasible, by seeking to increase contiguously forested stream corridors, protect headwater streams, target high nitrogen source areas, and integrate forest buffer restoration with fish passage, stream restoration, and living resource objectives.
- Promote the use of innovative restoration techniques, such as successional plantings, that increase wildlife habitat value and diversity.
- Expand the state of our knowledge about the role of urban tree canopy in supporting riparian buffer functions in cities and urbanizing communities. Develop science-based tools to quantify the benefits of an urban canopy for communities in the Bay watershed and research methods for crediting narrower buffers in urban areas.

December 9, 2003

CHESAPEAKE EXECUTIVE COUNCIL

FOR THE COMMONWEALTH OF VIRGINIA



FOR THE STATE OF MARYLAND



FOR THE COMMONWEALTH OF PENNSYLVANIA



FOR THE DISTRICT OF COLUMBIA



FOR THE UNITED STATES OF AMERICA



FOR THE CHESAPEAKE BAY COMMISSION



Recommendations for the 2003 Directive on Expanded Riparian Forest Buffer Goals

The 2003 Directive

STREAMSIDE OR “RIPARIAN” FOREST BUFFERS HAVE LONG BEEN RECOGNIZED as a vital part of the Chesapeake Bay ecosystem, providing multiple benefits both for water quality and wildlife. As part of the *Chesapeake 2000* agreement, Chesapeake Bay Program partners agreed to establish expanded goals for riparian forest buffer mileage in the Bay watershed by 2003.

In response to that commitment, the Chesapeake Bay Program Forestry Workgroup has developed the recommendations within this report for acceptance at the 2003 Chesapeake Executive Council Meeting. These recommendations, including a number of goals and related policy actions, are presented collectively as the 2003 Directive for Expanded Riparian Forest Buffer Goals. The proposed goals build on the existing riparian buffer initiative from 1996.

This report details these proposed goals, along with the related policy recommendations and the factors that shaped them.

Riparian areas are those lands adjacent to streams, rivers, and other bodies of water and serve as a transition between aquatic and upland environments. A forested riparian buffer helps to:

- **Maintain the integrity of stream channels and shorelines**
 - **Reduce the impact of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals**
 - **Supply food, cover, and thermal protection to fish and other wildlife**
-

History of Riparian Buffer Goals in the Chesapeake Bay Watershed

SINCE 1996, THE CHESAPEAKE BAY PROGRAM has energetically advanced a set of goals to protect and restore riparian forest buffers throughout the Bay watershed. Specifically, the Chesapeake Executive Council directed the Bay Program partners to restore 2,010 miles of forest buffers by the year 2010. The Council also adopted a number of policy recommendations to help Bay Program partners reach this goal. The recommendations included:

- Enhancing coordination among public and private programs;
- Promoting private-sector involvement;
- Enhancing incentives for landowners;
- Increasing the scientific understanding of riparian buffers; and
- Expanding educational outreach about the benefits of riparian buffers.

Partners in the Chesapeake Bay Program responded with vigor. Maryland, Pennsylvania, Virginia, the District of Columbia, and the federal government each created and launched individual plans to



The Bay Program goal for restoring 2,010 miles of forest buffers was met and exceeded in 2002, eight years ahead of schedule.

contribute to the forest buffer goal. They formed partnerships with landowners, local governments, and community organizations to advance a federal-state cooperative program known as the Conservation Reserve Enhancement Program (CREP). CREP provides financial incentives to reward farmers who restore riparian buffers on environmentally sensitive lands.

These and other efforts have led to resounding success: the goal for 2,010 miles of forest buffers was met and exceeded in 2002, eight years ahead of schedule. As of August 2003, more than 2,870 miles of riparian forest buffers have been restored throughout the Bay watershed.

Through regular progress updates, the Chesapeake Executive Council was able to anticipate early success for the 2010 forest buffer goal. As part of the *Chesapeake 2000* agreement, the Executive Council charged the

Chesapeake Bay Program with expanding its buffer goals by 2003.

This report addresses the Council's request by presenting new goals and policy recommendations to update and expand the riparian buffer initiative in the Chesapeake Bay watershed.

Developing the 2003 Recommendations

THE 2003 DIRECTIVE WAS SHAPED BY the lessons of past experience, as well as a series of technical analyses and the input of stakeholders throughout the Bay watershed. Both activities were conducted under the leadership of the Chesapeake Bay Program Forestry Workgroup.

Two rounds of stakeholder meetings took place in Pennsylvania, Maryland, and Virginia. The first round opened a dialogue about the potential opportunities and concerns involved with expanded forest buffer goals. The second series of meetings gathered feedback on seven specific proposed goals. Participants included the Pennsylvania Chesapeake Bay Advisory Council, USDA Natural Resources Conservation Service (NRCS), Chesapeake Bay Foundation and other conservation groups, Farm Service Agency, Farm Bureau, and county forestry boards, as well as state agency personnel, city representatives, private consultants, and extension agents.



The technical studies and stakeholder meetings provided both a scientific basis and an overall context for the 2003 recommendations.

The technical studies took place over the course of a year, drawing on existing data and conducting new investigations and analyses as needed. The primary goal was to quantify and evaluate important elements in the restoration initiative. These elements included, for example, the rate and cost of restoration progress; the effective placement of buffers to achieve desired results (targeting of priority watersheds); and the maximum possible implementation of forest buffers.

Additional detailed information on the development and potential implementation of these recommendations can be found in the Chesapeake Bay Riparian Forest Buffer Technical Support Document, available from the Chesapeake Bay Program office at 1-800-YOUR-BAY or online at www.chesapeakebay.net.

Key Findings

THE TECHNICAL STUDIES AND STAKEHOLDER MEETINGS provided both a scientific basis and an overall context for the 2003 recommendations. The most influential of these findings are detailed below.

1. For maximum ecosystem resiliency, forest buffers should exist on at least 70% of all shorelines and streambanks in the watershed.

Achieving coverage on 70% of all shorelines and streambanks in the Bay watershed will require concentrated efforts to both conserve and restore riparian forest buffers. An additional 30,000 miles of forest buffers must be restored, and all existing forest buffers must be retained.

2. If buffer restoration continues at the 2002 rate, we will be able to restore nearly 10,000 miles of forest buffers by 2010.

The technical studies that support the 2003 Directive define the 2002 rate of restoration at approximately 936 miles per year. The 2002 rate of restoration was determined by examining the amount of mileage restored, the time period, and the amount of financial and technical resources dedicated to the effort.

3. We need stronger emphasis on urban buffers and tree canopy.

Widespread restoration of forest buffers in urban areas is difficult. However, urban tree canopy emerged as an important issue early in the stakeholder meetings. Participants stressed the need for urban tree plantings to improve water quality and to help make population centers more livable. Tree canopy differs from riparian buffers, but ample canopy coverage can serve many of the same functions in urban settings where restoring riparian areas may not be feasible. Therefore, many participants asked that urban plantings be encouraged as part of the forest buffer goals.

4. We need stronger support for conserving and maintaining existing forest buffers.

Newly planted forest buffers require at least seven years before they can provide the same benefits of a naturally existing buffer. However, stakeholders reported that the often time-consuming and costly tasks of buffer maintenance can prevent new buffers from reaching fully functional maturity, or discourage the planting of new buffers altogether. Therefore, supporting the conservation and maintenance of existing forest buffers is critical. Some stakeholders even felt that emphasis on a numeric goal should be lessened to allow for greater focus on the quality, conservation, and maintenance of existing buffers.

Additional information on the stakeholder meetings and technical studies is available in the Forestry Workgroup's Riparian Forest Buffer Technical Support Document.

Goals & Policies

The following new goals and policies are recommended for the 2003 Directive on Expanded Riparian Forest Buffer Goals. The goals and policies are presented in bold text, with background and explanatory comments below each.



To establish forest buffers on 70% of all streambanks and shorelines, we need to restore approximately 30,000 additional miles of riparian buffer and conserve all riparian areas that are currently forested.

Recommended Goals

- 1. Enhance and sustain the integrity of aquatic ecosystems over the long term through conservation and restoration of forests along at least 70% of all streams and shorelines in the watershed, which translates to about 26,000 miles of additional buffers in our jurisdictions, with the near term goal of achieving at least 10,000 miles by 2010.**

- Riparian forests contribute to the sustainability of aquatic ecosystems by helping to preserve and enhance water quality and wildlife habitat. Long-term conservation of forest buffers entails restoring, maintaining, and

monitoring these lands; it also requires ongoing protection to ensure that they continue to carry out their many functions. Conservation goals can be met through a number of acquisition strategies, such as conservation easements, purchase of development rights, and riparian buffer ordinances. Baltimore County, for example, has a Buffer Protection and Management Ordinance that defines minimum building setbacks, buffer width, appropriate uses of the buffer area, and management practices for the buffer area.

- At present, approximately 60% of the Bay's riparian areas are forested. To reach a long-term goal of 70% coverage in the entire watershed, we need to restore an estimated 30,000 additional miles of riparian buffer and conserve all riparian areas that are currently forested.

Two important notes accompany these figures:

- 1) These numbers reflect "buffer miles," not stream miles – that is, one buffer mile equals a mile of riparian area on one side of the stream.
- 2) Updated geographic data will soon be available, detailing the length of smaller streams in the watershed and the extent to which their riparian areas are currently buffered. When this is complete, both the total number of riparian miles available to be buffered and the percentage of area currently buffered will be affected. The number of available miles will likely increase; the percentage of current coverage could increase or decrease, depending on the amount of coverage already established on these streams.

- As this Expanded Riparian Forest Buffer Goal is enacted, Tributary Teams in each state are setting goals for this practice in combination with other practices that benefit water quality. The Tributary Team process, which is set to conclude in April 2004, when compiled for the entire watershed may indicate a number of riparian forests to be restored by 2010 that is greater than 10,000 miles.
- Restoring 10,000 miles by 2010 is an aggressive step towards the long-term, 30,000-mile goal. Meeting this goal will require a significant commitment of efforts and investments from Bay Program partners, including commitments to the funding and staffing levels needed to assist landowners and communities with their riparian forest efforts. This assistance is critical, and it covers a wide range of important activities, such as:
 - Advising and assisting landowners throughout the process
 - Preparing a site plan for conservation practices
 - Conducting and/or supervising the site preparation
 - Identification of appropriate species
 - Ordering the trees and tree shelters
 - Arranging contractors for tree planting
 - Final planning arrangements and supervision
 - Inspection of the planting
 - Reinforcement planting

In addition, administrative tasks include determining eligibility, rental rates, assisting with completing the contracts, and facilitating cost-share and incentive payments.

- While there may be less expensive methods of restoring buffers on agricultural land (for example, using volunteer programs), most forest buffers are placed using CREP. Restoration costs using CREP vary between \$765 and \$1590 per acre, including technical assistance provided by state and federal agencies. When measured by the mile, costs of CREP range depending on width. For example:
 - An average buffer width of 100 feet (covering 12 acres) costs \$9,180 to \$19,080 per mile.
 - A minimum buffer width of 35 feet (covering 4 acres) costs \$3,060 to \$6,360 per mile.

New programs using public-private partnerships could also be put in place in order to help achieve this aggressive goal. Such partnerships, where corporations improve their image by supporting programs such as tree planting, have great potential for getting resources to do restoration, and/or generating funding to have the work done.

2. By 2010, work with at least 5 local jurisdictions and communities in each state to complete an assessment of urban forests, adopt a local goal to increase urban tree canopy cover, and encourage measures to attain the established goals in order to enhance and extend forest buffer functions.

- Tree canopy is the area that, when viewed from above, is occupied by tree crowns – the leaves, branches, and stems of trees. Because of the vastly modified hydrology in urban and

suburban areas, urban trees and their canopy serve as a line of defense for a stream, much like riparian buffers in more rural settings. Tree canopy cover intercepts falling rain, absorbs and stores water, reduces runoff, protects soil from erosion, filters pollutants, improves air quality, and cools the air.

- Canopy cover goals are typically expressed as the percentage of an area to be covered by tree crowns. There are a number of ways to set such goals. For example:
 - Urban areas in Maryland have a target of 40% overall coverage.
 - Some cities, such as Manassas, Virginia, have minimum canopy requirements for new development included in their city code. Manassas requires 15-20% canopy coverage in residential areas and 10% in commercial areas.
 - American Forests recommends that urban areas strive for 40% canopy overall, 50% canopy in suburban residential areas, 25% canopy in urban residential areas, and 15% canopy in commercial areas.

Progress toward these goals may be measured using aerial photographs, satellite images, and/or ground surveys.

To achieve increased canopy cover, a jurisdiction should strengthen tree protection policies, replace dying trees, and identify vacant areas to plant new trees. While planting trees in urban areas can be expensive, the costs are offset by the trees' mitigating impact on stormwater systems, the reduced cost of energy needed to heat and cool buildings, improved air quality, and enhanced quality of life in communities.

3. Encourage increases in the amount of tree canopy in all urban and suburban areas by promoting the adoption of tree canopy goals as a tool for communities in watershed planning.

4. Ensure, through monitoring and maintenance, that newly established buffers have a well-stocked stand of trees after 5 years.

- Restoring a forest on crop or pasture land requires time, care, and investment. Threats from drought, invasive plants, and animal pests can make maintenance crucial.
- The original number of trees planted and the definition of a well-stocked stand vary by state. Depending on the use of tree tubes, tree species, and other factors, a certain percentage of mortality is expected. Details are provided in the Riparian Forest Buffer Technical Support Document.
- Landowners are primarily responsible for maintenance of planted buffers. A percentage of CREP payments are provided to cover some of these costs.
- Currently, the Natural Resources Conservation Service conducts a site review to see that trees have been planted. However, further monitoring for maintenance needs is generally the

responsibility of the state agency in charge of reforestation. The amount of monitoring currently being conducted varies widely by state.

5. Enhance and strengthen the restoration and conservation of riparian forest buffers, wherever possible, on public lands and in programs that protect private lands from development.

- Public lands should lead by example, serving as models of riparian stewardship for private lands. Conservation and restoration should be encouraged on all types of public lands, including those that are owned by the states, local jurisdictions, and the federal government.
- Programs that provide long-term protection of private lands from development can be tailored to maximize their stewardship of riparian buffers. Examples include:
 - Farmland protection;
 - Conservation easements;
 - Tax policies (such as credits for tree planting, retention, or easement expenses);
 - Purchase of development rights; and
 - Development practices that promote buffer retention (such as density compensations, pollution removal credits for buffers in stormwater management plans, more flexible use of buffer resources, and off-site mitigation or buffer trading within existing regulatory programs).

6. Advance our efforts to conserve existing riparian forest buffer along all streambanks and shorelines.

- Planting alone will not achieve our long-term goal. All existing riparian forest buffers must be nurtured and conserved, ensuring their development into mature and fully functioning buffers. Although current riparian forest policies support both conservation and restoration, recent efforts have focused largely on restoration. To fully achieve our goals, we need an increased, dedicated effort toward conservation of existing riparian buffers.

7. Revise each Bay signatory's Riparian Buffer Implementation Plan to further capture program and policy opportunities for an enhanced buffer conservation and restoration program.

- In 1998, each signatory state completed a Riparian Buffer Implementation Plan. These plans should be updated to address the expanded goals as set forth in the 2003 Directive. The revision process presents an opportunity for states to incorporate some of the lessons they have learned and to adapt their strategies to include new information and approaches.
- One area these revisions should address is the need for enhanced conservation of existing forest buffers. This might include strategies for landowner outreach or for using conservation tools such as easements, purchase of development rights, and tax policies.

Recommended Policies

1. Ensure that an adequate level of technical service from state and federal agencies is available to landowners and communities for buffer restoration and conservation.

- According to landowners, technical assistance is the single most important element of riparian forest buffer restoration. There are many organizations and agencies that work cooperatively to provide this assistance. These include state agencies, federal agencies, local jurisdictions, and non-profit organizations. Technical assistance and service is provided by many of these agencies depending on the specific assistance needs. Examples of technical assistance include: providing assistance in using CREP; providing advice on species selection, planting and maintenance; initiating paperwork; multiple visits to landowners; replanting, etc. For some states, an adequate level of assistance may require an additional 10 to 16 employees and/or current employees may require additional training in order to incorporate riparian forest buffer work into their other duties.

2. Provide for the continued use of the Conservation Reserve Enhancement Program (CREP) as a critical component of riparian forest buffer restoration.

- CREP is a voluntary incentive program for agricultural landowners, available in each of the signatory states. Through CREP, farmers can receive annual rental payments and cost-share assistance for land area set aside as buffer areas. The availability of this program was the most important reason for reaching the 2010 goal ahead of schedule. Its continued availability will be essential to reaching the expanded goals proposed in the 2003 Directive. CREP was reauthorized by the 2003 Farm Bill and will require advocacy from participating states in order to be reauthorized in 2007.

3. Utilize existing federal and state incentive programs and develop new programs and partnerships to expand buffer widths beyond minimum requirements, promote the use of longer-term contracts, encourage the planting of trees on a range of land uses, and emphasize maintenance of buffer vegetation and function.

- Currently, the signatory states require a minimum buffer of only 35 feet. However, wider buffers serve a greater variety of functions and are more likely to sustain them over time. To achieve and sustain a full array of water quality benefits, scientific literature recommends a buffer of at least 75 to 150 feet. Some habitat benefits may only be achieved by wider buffers. Ideal width varies by site and is best determined by assessing several factors, including:
 - The value of the resource being protected;
 - Site, buffer, and watershed characteristics;
 - The intensity of adjacent land uses;
 - The desired buffer functions; and
 - Landowner objectives and constraints.

Greater buffer width will entail a corresponding need for additional resources. However, a number of incentives can be used to promote and support wider buffers. Some possibilities include tax credits for tree planting, retention or expenses in easements, flexible land development practices (such as density compensations), and changes to CREP incentives. New incentives should be explored for further promoting riparian buffers that are wider than the minimum required width.

- The use of longer-term contracts with private landowners could protect buffer areas for longer periods of time while reducing the administrative workload.
- Riparian buffer restoration efforts have focused mostly on agricultural land. Incentive programs should encourage the planting of trees on other land types as well, such as urban and suburban areas.
- Maintenance is crucial to sustain many buffer functions. Without care – such as thinning and mowing – saplings and newly planted seedlings may face a number of threats, such as herbivory and competition for sun by other plants, especially invasive species. Mowing, weed control fabric, and herbicides are cost-effective mechanisms for controlling invasive plants and increasing tree growth.
- Maintaining riparian buffers also requires efforts to prevent channelization of water running through the buffer area. If the water remains diffused across the buffer, it will be more effectively absorbed and filtered.

4. Use easements, tax policies, incentives, and other fiscal tools, to strengthen riparian forest conservation commitments.

- Monetary benefits for buffer conservation and restoration actions are important for strengthening landowners' involvement and ongoing commitment to the conservation of riparian buffers.

5. Target riparian forest buffer restoration for maximum water quality and wildlife habitat benefit, to the extent feasible, by seeking to increase contiguously forested stream corridors, protect headwater streams, target high nitrogen source areas, and integrate forest buffer restoration with fish passage, stream restoration, and living resource objectives.

- Restoring and conserving riparian forest buffers in strategically targeted locations can maximize their benefits. Four possible criteria for selecting target areas are:
 - *Locations with great need or great potential for contiguous buffers.* By establishing forest buffers in a contiguous manner, terrestrial and aquatic wildlife habitat areas are better connected. This enhances the ability of species to migrate and to sustain a healthy population.

- *Headwater streams, which feed other streams and rivers.* Pollutants entering the stream system at the headwaters pass through all of the downstream miles; therefore, buffered headwaters means less pollution throughout the watershed. Also, because headwater streams are usually fairly small and heat up more quickly when exposed to sunlight, providing shade at the headwaters is of vital importance to maintaining a cool stream temperature that is conducive to aquatic species' habitat needs.
- *Areas where high levels of nitrogen are entering the waterways.* Nitrogen is one of the most prominent contaminants in the Bay watershed. Riparian forest buffers, however, can greatly reduce the quantity of nitrogen entering the system; thus, directing forest buffer restoration to areas known to be high nitrogen sources can be an effective strategy for reducing nitrogen input into the watershed.
- *Areas where forest buffer restoration can be integrated with fish passage, stream restoration, and living resource objectives.* Riparian forest buffers should not be restored or protected in a vacuum; rather, a comprehensive approach to stream corridor restoration could strategically align forest buffer restoration with efforts to restore fish passage, stream health, and living resource habitats.

6. Promote the use of innovative restoration techniques, such as successional plantings, that increase wildlife habitat value and diversity.

- Restoration techniques that incorporate a diversity of tree species and ages provide a greater range of potential habitat areas for wildlife. Structural and species diversity can be promoted by planting fewer, larger trees that serve as posts for birds of prey and sources of natural regeneration. While tree regeneration is taking place, the grass community becomes available habitat. Another type of successional planting entails planting trees over a number of years, a technique also known as uneven age management.
- These innovative restoration techniques can be promoted through the technical assistance provided by agencies at the state, local, and federal levels, as well as by non-profit organizations. To do this effectively, educational materials must be available and agency representatives must be trained and knowledgeable about such techniques.

7. Expand the state of our knowledge about the role of urban tree canopy in supporting riparian buffer functions in cities and urbanizing communities. Develop science-based tools to quantify the benefits of an urban canopy for communities in the Bay watershed and research methods for crediting narrower buffers in urban areas.

- Urban forestry is a promising and emerging area of science. Efforts to quantify the direct and indirect benefits of the urban forest on stormwater runoff and overall water quality are underway. Science-based tools are needed to compare the positive environmental effects of trees with the effects of other urban best management practices. Such tools could help

determine whether planting trees in an urban area helps to compensate for the lack of space available there for riparian forest buffers. Modeling is underway to better quantify the effect of tree canopy on the quantity of runoff and pollution in urban environments, the amount of water infiltrated and intercepted by the urban forest, the quantity of soil erosion and sedimentation prevented, and the changes in the urban heat island, energy use, and air pollution. Research is also needed to determine whether narrower buffers in urban areas may be credited for reducing nutrient loads.

Conclusion

Increasing riparian forest buffers is one of the most direct, effective means of protecting and restoring the vitality of the Chesapeake Bay and its watershed.

Partners in the Chesapeake Bay Program have mobilized around the riparian forest buffer restoration effort with extraordinary success. The progress to date is heartening, but we must not miss the opportunity to use our achievements, partnerships, and evolving knowledge base as a foundation for continued success.

By endorsing the proposed goals and policy recommendations of the 2003 Directive, the Chesapeake Executive Council will maintain the momentum of the riparian forest buffer initiative and accept the critical challenge of advancing quantifiable achievements for the future.