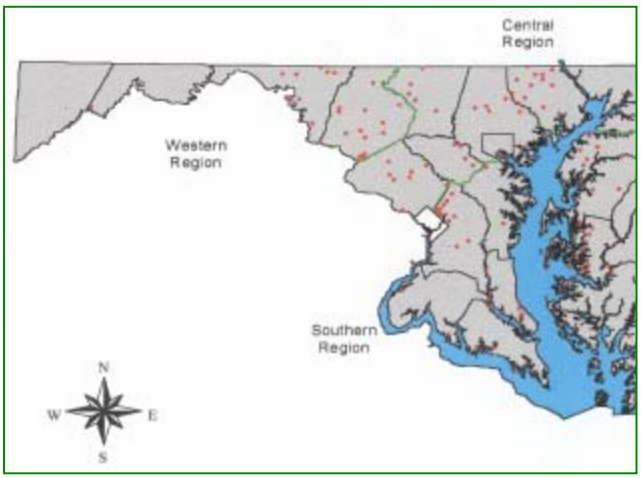
Riparian Forest Buffers: A Restoration Solution for Maryland's Chesapeake Bay Program

BACKGROUND

A decade ago, the Maryland Department of Natural Resources (MD DNR) Forest Service established restoration of the Chesapeake Bay, our nation's largest estuary, as one of its agency priorities. Their view is that forests can be a solution to many of the Bay's problems. Working to protect and restore riparian forest buffers has brought the Maryland Forest Service back to its roots in watershed management.

Forests are important to watershed health and clean water, and riparian forest buffers are a key feature for watershed protection. Historically, forests thrived on nearly all stream banks and shorelines in Maryland. Now, planting new buffers on cleared agricultural and urban lands will help protect and restore the Bay's watershed, reduce agricultural and urban pollution, and protect wildlife, fish, and aquatic life.



Locations of Riparian Forest Buffer Sites.

In 1996, as part of the Chesapeake Bay Program, the State of Maryland made a commitment to plant 600 miles of buffers by 2010. As of 2001, 580 miles have been planted. However, with more than 2 million trees planted to date, no comprehensive effort to measure plant survival and growth had been made. In addition, more information was needed regarding how well these buffers are working to address key objectives, such as providing shade and reducing water temperature for fish.

During the summer of 2000, 130 riparian forest buffer sites were randomly chosen for measuring survival and success.

There were 23 sites selected in the Western Region, 39 sites in the Central Region, 31 sites in the Southern Region, and 37 sites in the Eastern Region.

GOALS

The goals of this project are to:

- Document tree survival on buffer sites statewide.
- Repair buffers with survival problems to assure adequate stocking statewide.
- Provide baseline information on key habitat and water quality measures for monitoring effectiveness of forest buffers in the Upper and Lower Monocacy.
- Focus outreach to encourage landowners to establish buffers in temperature-limited streams in the Upper and Lower Monocacy.

METHODOLOGY

In order for the Maryland Forest Service to accomplish its goals studies were made in the following areas:

- Monitoring Buffer Success
- Survival rate
- Species composition
- Tree type and planting technique
- Targeting temperature needs for fisheries
- Future Riparian Buffer Monitoring and Planting needs

MONITORING BUFFER SUCCESS

Restoring a forest is more than planting trees. Many buffer sites have been farmed for centuries or are on highly disturbed urban soils. Therefore, the conditions for tree survival are not always ideal.

One problem that compelled the Maryland Forest Service to initiate this project was the need for better information on how newly planted buffers were developing.

"Foresters have been planting vigorously for years now, and we need to know what their successes are in order to help future tree growth," said Dr. Anne Hairston-Strang, Forest Hydrologist, and Maryland Project Lead.

Since 1999, the Northeastern Area and the Northeastern Area Association of State Foresters have sponsored a cooperative challenge grants program to promote watershed health and restoration through the conservation, restoration, and sound stewardship of trees and forests.

Are there an adequate number of trees to create forest-like conditions? How well are they growing? Is there a good diversity of natural species? It was time to stop and take a hard look at the past in order to guide future efforts.

"We hope to see crown closure in 10 years," Hairston-Strang said. "A canopy forming is the first step in looking and acting like a forest."

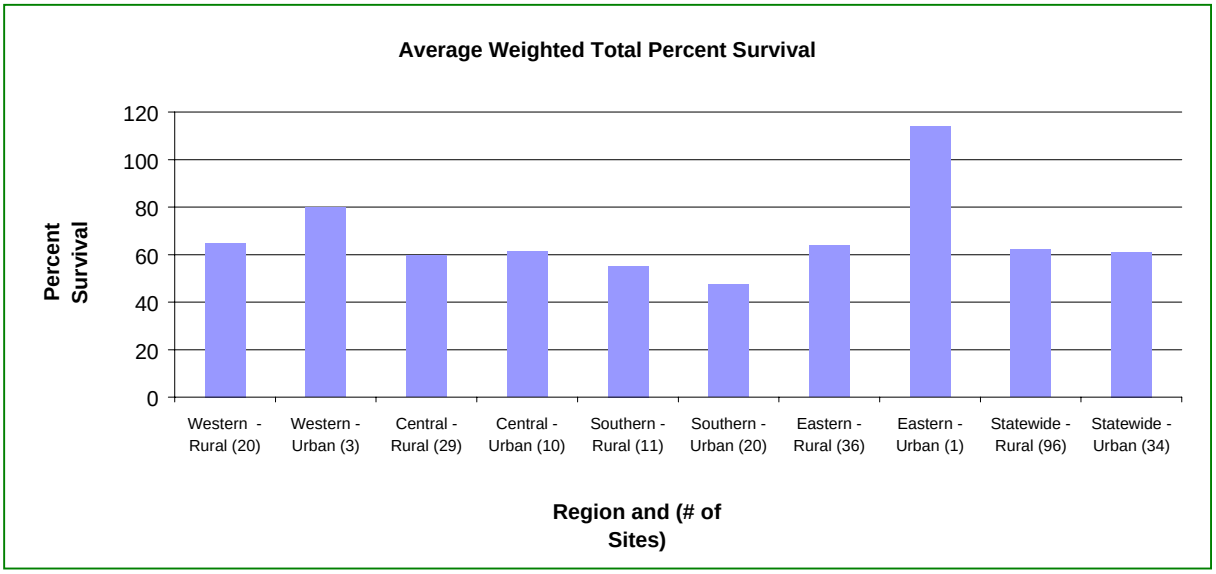
In 1999, the Maryland Forest Service received a grant from the USDA Forest Service to begin looking for answers to these questions by examining past buffer planting efforts in the State. The information that is documented through this project will enable foresters and land managers to better plan and manage riparian forest buffer plantings.

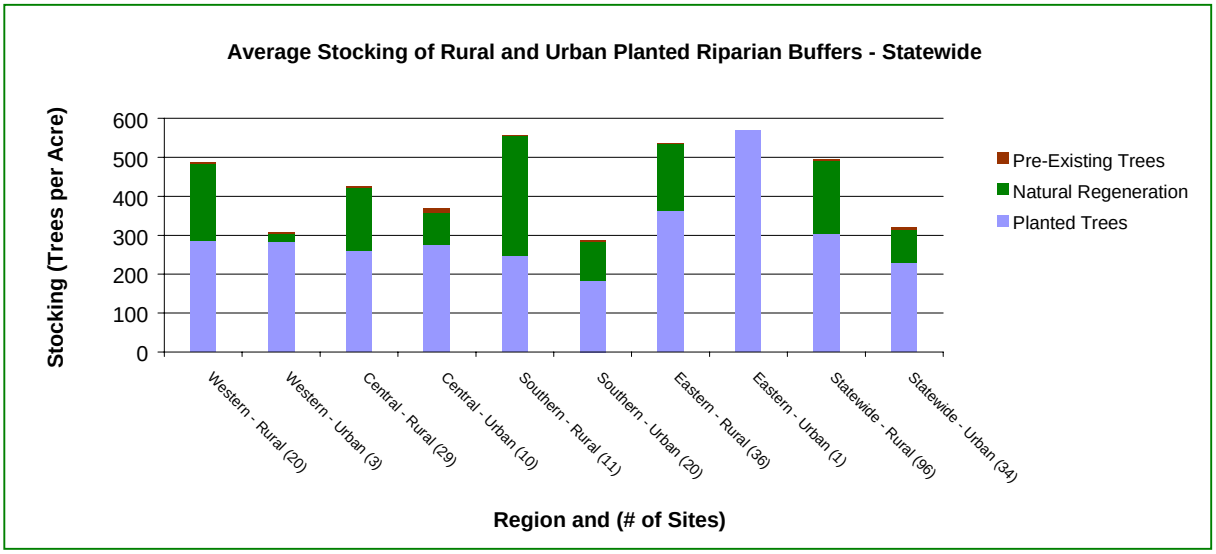
SURVIVAL RATE

Data collected as a result of this project indicates that most of the trees are surviving. The survival rate for planted trees is nearly 67 percent, a rate that appears fairly consistent across the regions of the State. There was little difference in overall survival rates between urban/community and rural planting sites.

It was documented that sites that were kept clear of invasive and noxious weeds and other problems, especially if maintained by the landowner, usually had better survival.

A minimum-stocking rate of 200 trees per acre was also a standard that had to be met, with a preferred stocking level of 400 trees per acre. Results show that this goal has generally been surpassed with at least 300 trees per acre and up to 600 trees per acre throughout rural and urban areas in all statewide regions. "The buffers are doing well," according to Hairston-Strang "especially considering the drought in 1999."

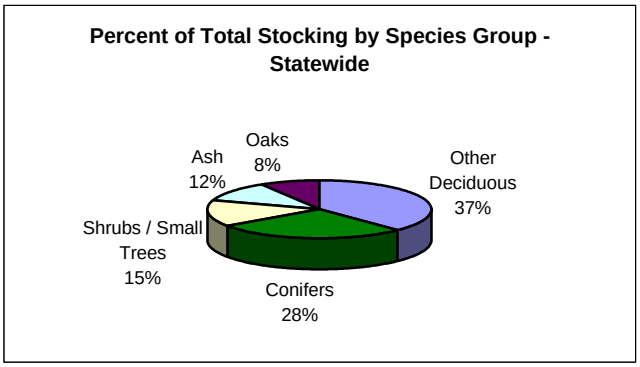




The first step in determining the success of a buffer is to look at the survival and condition of the trees and shrubs on the site. For example, have the planted trees survived? Planted trees did not completely account for these totals. Seeds carried into the buffer by wind, water, or birds also provided many new naturally growing tree seedlings.

SPECIES COMPOSITION

Tree species may have an impact on the economic and ecological value of the buffer and the future management expectations. It is also useful to know which species tend to be successful. The buffers generally had a diverse mixture of species, both planted seedlings and natural regeneration.



There were 79 species counted on the 130 sites, with an average of over eight species per site. The top 10 species resulting from both planting and natural regeneration were: loblolly pine, green ash, sweet gum, black walnut, boxelder, northern red oak, sycamore, dogwoods (silky, gray, red-osier, flowering), black cherry, and hawthorn.

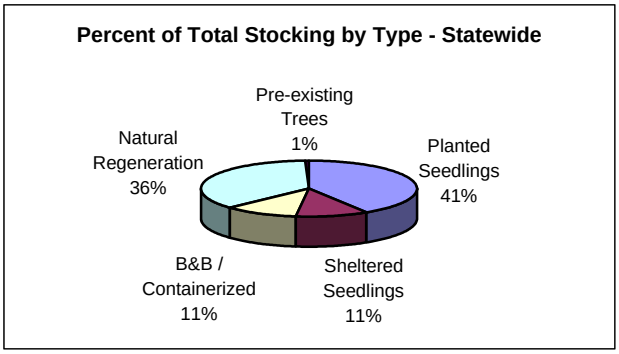
TREE TYPE AND PLANTING TECHNIQUE

There are other aspects to consider when determining if a forest is a healthy and productive one. During this project, foresters also focused on how trees were planted.

The role of natural regeneration and the benefits of using tree shelters, balled and burlap or containerized saplings are significant in tree growth. Natural regeneration can also be an inexpensive regeneration method with native seed sources that are desirable for wildlife and biodiversity.

Thirty-six percent of trees counted throughout this project were from natural regeneration. Without the contribution of natural regeneration the average stocking levels for all regions would be below the preferred stocking levels.

“Trees grow if you don’t mow,” said Hairston-Strang. The survival rate, covering all types of planted stock, was 65 percent. With tree shelters, plastic tubes protecting the young trees from mowing, deer browse, and cold temperatures, survival rates were closer to 80 percent.



Including natural regeneration, sites averaged 488 trees per acre, close to the desired stocking levels.

TARGETING TEMPERATURES

Effectiveness of buffers is also a highly important subject for monitoring. Are the functions of water filtration, wildlife habitat and aquatic habitat being restored or maintained? This question was also a target of the project.

There is an important relationship between water temperature, fish habitat, and the quality of the buffer system. The Upper and Lower Monocacy Watersheds are located in areas that once supported extensive cold-water fisheries. Forests will help correct water temperatures in these streams making them suitable for trout reproduction.

The reproductive trout coldwater limit is 20 degrees Celsius. Trout can survive as long as there are temperature refuges for reproduction. Monitoring found that streams lacking forest cover routinely exceeded this threshold.

“We need to see substantial buffering here for more trout to reproduce,” Hairston-Strang said.

Streams along tributaries of the Upper Monocacy River were measured to determine warming and cooling trends and where buffers should be planted.

There have been some plantings along waterways in the Upper and Lower Monocacy Watersheds and two sets of temperature records were compiled based on the monitoring of these plantings. Additional monitoring is needed to determine which buffers would benefit the stream systems the most.

“Streams naturally warm downstream,” Hairston-Strang said, “and the buffers will determine how much or little the temperature will rise going downstream.”

Most of the streams will have to be buffered in order to enhance trout capacity. The project's goal within the next 10 years is to achieve restoration substantial enough to routinely see trout reproduction. The Monocacy is the focus of intensive restoration efforts as part of a Potomac Watershed Partnership with the USDA Forest Service.

The Maryland Forest Service will encourage landowners to voluntarily plant buffers.

FUTURE NEEDS

Ongoing problems for the buffers are noxious and invasive exotic weeds that compete with small seedlings. Maryland law requires the owner or manager of the land to control certain noxious weeds in order to prevent their spread.

"There can be repercussions for the landowner and the landscape if you let them grow all over the place," said Hairston-Strang.

Other significant problems may include drought, deer browse, vines, mowing damage, disease, and insects.

Further study in areas such as the benefits of using specific species of trees and/or shrubs, the impacts of noxious and invasive weeds, and the comparison of different planting methods on survival and success is still needed.

PARTNERS

This project has taken advantage of partnerships developed through the Maryland Stream ReLeaf Coordinating Committee including representatives from federal, state, and local agencies, environmental groups, farm and forest industry associations, and citizen groups. The partners involved in this project include the Maryland Department of Natural Resources (MD DNR) Watershed Restoration Division, Alliance for the Chesapeake Bay, MD Department of Agriculture Forest Health and Pest Management Division, and Trout Unlimited.

CONCLUSION

Results from this study indicate that the overall effort in replanting riparian forest buffers in Maryland in the past few years has proven successful. The buffers are helping meet the goals of restoring the Chesapeake Bay Watershed by reducing pollution and protecting wildlife and aquatic habitat.

The survival rate and species variation of the buffers have been excellent, especially considering the harsh conditions created by two summers of drought. The Maryland Forest Service has chosen successful planting techniques to ensure tree growth and plans to continue its study of the most effective species and planting methods.

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