

WATERSHED SCIENCE BULLETIN



Journal of the Association of Watershed & Stormwater Professionals
A program of the Center for Watershed Protection, Inc.

SPRING 2011



**Integrating Climate Change Science into
Watershed and Stormwater Management**

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8390 Main St. 2nd Floor • Ellicott City, MD 21043 • 410-461-8323 (phone)
410-461-8324 (fax) • www.awsp.org • Bulletin@awsp.org

Watershed Science Bulletin (ISSN: 2156-8545) is the journal of the Association of Watershed and Stormwater Professionals (AWSPs), and is published semi-annually by the Center for Watershed Protection, Inc. (CWP).

KEY CONTACTS:

Co-Editors-in-Chief

Neely Law (nl@cwp.org)
Karen Capiella (kc@cwp.org)

Associate Editor

Lisa Fraley-McNeal (bulletin@awsp.org)

Sponsorship Coordinator

Erin Johnson (etj@cwp.org)

AWSPs Membership

(membership@awsp.org)

MISSION: The mission of the *Watershed Science Bulletin* (the *Bulletin*) is to synthesize research and experience from the numerous disciplines that inform watershed management and transmit this valuable information to researchers, regulators, practitioners, managers, and others working to protect and restore watersheds everywhere.

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POSTMASTER: Please send address changes to the Watershed Science Bulletin address listed above.

SUBSCRIPTIONS AND BACK ISSUES: Subscription is included for AWSPs members as part of member dues. The subscription rate for nonmembers is \$89/year. Single copies and back issues can be purchased for \$49 each. For a complete listing of back issues or to purchase a subscription, please visit www.awsp.org.

SUBMISSION: To submit an article, please visit www.awsp.org.

Graphic Design by Down to Earth Design, LLC (d2edesign.com)

Copyediting by Elizabeth Stallman Brown

Printed by the YGS Group, York, PA.

Cover photo courtesy of Lori Lilly,

Watershed Ecologist / Planner, Center for Watershed Protection

This photo was taken along Young's Bay estuary in Astoria, OR. The Young's Bay estuary is a component of the Columbia River estuary, a nationally significant estuary in the northwest corner of Oregon that supports some of the largest anadromous fish runs in the world and provides unique habitat for sensitive and endangered species.



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US Environmental Protection Agency Office of Wetlands, Oceans, and Watersheds

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Research Scientist, Wisconsin Department of Natural Resources

Jessica Whitehead, PhD

Regional Climate Extension Specialist, South Carolina Sea Grant Consortium /North Carolina Sea Grant

CENTER FOR WATERSHED PROTECTION STAFF CONTRIBUTORS

Hye Yeong Kwon, *Executive Director*

Deb Caraco, *Senior Watershed Engineer*

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Dave Hirschman, *Program Director*

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Lori Lilly, *Watershed Ecologist/Planner*

Chris Swann, *Watershed Planner/CIO*

Laurel Woodworth, *Stormwater and Watershed Planner*

Adaptive Approaches for Riparian Forest Management To Offset Climate Change Effects

Riparian forest buffers are corridors of trees and other vegetation located landward from the edges of waterways. Despite the many ecosystem benefits and services riparian buffers provide for watersheds, they continue to disappear from the landscape (see box). Although threatened primarily by land use conversion, riparian buffers are also impacted by invasive plant competition, drought, insects, disease, and wildlife damage. Climate change is an added stressor that may exacerbate these threats and may, itself, impact forest buffers.

Maryland's Critical Area Law and Virginia's Chesapeake Bay Act protect existing riparian forest buffers. Even with these efforts, however, it is not clear for most watersheds whether the net forest buffer area has increased. A 2006 study demonstrated that, over eight years, 1.1% to 5.2% of forest buffers area was lost to land use conversions in rapidly developing counties of Maryland, Pennsylvania, and Virginia.

Table 1. Suggested adaptive actions to offset climate change effects on riparian forest buffers.

Projected Climate Change Factors for Mid-Atlantic	Implications for Forest Buffers	Recommended Adaptive Actions and Practices
Increased frequency of floods, sea level rise, and land subsidence	<ul style="list-style-type: none"> Increased decline of riparian forest community diversity Loss of forest edge species undercut by flood surges Decreased habitat and shoreline stability 	<ul style="list-style-type: none"> Agencies, local organizations, and industry project managers should use flood-tolerant riparian species. Waterfront landowners and managers should use natural stabilization techniques to protect shorelines and streambanks. State and local governments are advised to modify forest buffer ordinances and criteria to extend forest buffer widths and plant farther upstream to protect against flooding and erosion.
Extreme, prolonged drought periods	<ul style="list-style-type: none"> Poor growth, development, and survival of young forest buffers Defoliation and mortality related to reduced soil moisture 	<p>Agencies, organizations, and industry project managers are encouraged to:</p> <ul style="list-style-type: none"> use healthy and vigorous tree stock of minimum diameter 6.33 mm (0.25 in) and use root and soil amendments to increase water availability for new plantings.
Increased temperatures	<ul style="list-style-type: none"> Species migration to cooler regions Increased numbers of forest pests Increased invasive plant species competition 	<ul style="list-style-type: none"> Agencies, organizations, and industry project managers are encouraged to practice "over-restoration," with a 10% increase in riparian cover to compensate for potential plant losses. Invasive monitoring and removal should be a key element of riparian forest management plans and policies for riparian landowners and managers. Guidelines are available from Maryland DNR, Division of Forestry. Federal agencies and research institutions should develop maps of endemic forest infestations by pests, disease, and nonnative plants to facilitate preemptive treatment.

The evaluation of potential risks to riparian forest buffer restoration and protection is limited by the sparse literature available on this topic. Despite the paucity of relevant literature, we found and reviewed 62 articles and reports on climate change and forestry. Based on this review, we developed a set of adaptive actions for the Mid-Atlantic region and introduced them to the Chesapeake Bay Forestry Work Group. The Work Group recognized the actions as appropriate to address future climate change impacts on riparian forest buffers (Table 1).

List of Sources

Okay, J., and T. G. Culbreth. 2010. *Riparian forest buffer management & protection to offset climate change effects. An annotated bibliography.* Prepared for the Chesapeake Bay Forestry Work Group.

For More Information

For more information regarding full citations or to download the entire annotated bibliography, visit the calendar item from the Forestry Work Group meeting on September 1, 2010 at <http://archive.chesapeakebay.net/calendar.cfm?eventdetails=10993>.

Contributors

Contributors to this vignette include Judy Okay, riparian specialist, Chesapeake Bay Program, Annapolis, Maryland, jokay@chesapeakebay.net, and Timothy G. Culbreth, Chesapeake watershed forester, Maryland Department of Natural Resources, Forestry Service.