

COMMERCIAL TIMBER VALUE OF STREAMSIDE MANAGEMENT ZONES IN MANAGED PINE AND HARDWOOD STANDS

William A. Lakel III, W. Michael Aust, C. Andrew Dolloff, and Elizabeth P. Sharp¹

Abstract—Streamside management zones (SMZs) are widely recommended for protection of water quality, but the costs associated with maintaining SMZs are not well documented. This project documented the commercial timber values of 16 watersheds in the Piedmont region and 16 watersheds in the Allegheny Plateau region before and after SMZs were established. Four blocks were established in each region, and 5 combinations of SMZ width (25, 50, and 100 feet) and harvest level (none versus 50 percent in the 50 and 100 feet SMZ widths) were installed in each block. The average value of the residual timber was greater in the Allegheny Plateau region (high value sawtimber species) than in the Piedmont (pine plantations with low grade hardwoods near streams). Overall, the partial harvests may be more sustainable in the Allegheny region due to the presence of desirable shade tolerant species, in contrast to the Piedmont where partial harvests favor lower-value species.

INTRODUCTION

Streamside management zones (SMZs) are widely recommended for the protection of water quality during and after forest harvesting (Blinn and Kilgore 2001, VDOF 2002). Research has indicated that SMZs can be important for collecting and filtering runoff from harvested sites as well as reducing thermal pollution from direct sunlight (Castelle and others 1994). It is also widely accepted that these riparian buffers have significant value as wildlife habitat. However, SMZ maintenance is a cost burden for landowners who leave them (Shaffer and others 1998). The timber volume in the SMZ remains unharvested and is often left susceptible to storm and insect damage, and SMZ acreage is generally lost to future production.

Most state BMP manuals recommend a variety of SMZ widths as well as partial harvests within SMZs (Blinn and Kilgore 2001). Few studies have examined the impact of varying SMZ widths and harvest levels on commercial timber values realized by landowners who harvest timber. Active management of SMZs could offer landowners opportunities to realize additional income from current and future harvests.

EXPERIMENTAL DESIGN AND SITE CHARACTERISTICS

This study includes a set of 32 total watersheds with 16 in the Allegheny Plateau in Randolph County, WV, and 16 in the Piedmont Plateau in Buckingham County, VA. Each area is treated as a separate incomplete block design with four blocks and four treatments. The SMZ treatments are (1) 25-foot-wide, (2) 50-foot-wide with no thin, (3) 50-foot-wide thinned, and (4) 100-foot-wide with no thin. SAS[®] software (SAS Institute, Cary, NC) was used to determine significant differences between treatment means by the Tukey procedure.

The Piedmont plateau of Virginia is typical of the Piedmont in the southeast in general. Elevations range from 200 feet above sea level to the east and 1,200 feet above sea level to the west. Local slopes occasionally exceed 30 percent. Extensive agriculture since the 1700s has led to severe soil erosion and

loss of significant site productivity. The watersheds are dominated by old field sites that were abandoned after the Civil War and reclaimed by native shortleaf pine (*Pinus echinata* Mill.) and Virginia pine (*Pinus virginiana* Mill.) as well as a mix of hardwood species such as white oak (*Quercus alba* L.), scarlet oak (*Quercus coccinea* Muenchh.), hickory (*Carya* spp.), red maple (*Acer rubrum* L.), and black gum (*Nyssa Sylvatica* Marsh.) (table 1). Non-native loblolly pine (*Pinus taeda* L.) plantations were initially planted in the 1970s (Gembroys 1974, Schultz 1997, USDA 2002, VanLear and others 2004).

The Allegheny Plateau of West Virginia has very little agricultural history, but the stands have been selectively harvested in the past century. Earlier logging methods involved animal power and narrow gauge railroads for transportation, but more recent harvesting activities have utilized bladed skid trails on steep slopes and rubber-tired skidding equipment. These bladed skid trail networks often lead to severe local erosion and stream sedimentation. Elevations range from 2,000 feet above sea level in the valleys to 3,000 feet above sea level on the ridge tops. Local slopes often exceed 60 percent. Dominant tree species are sugar maple (*Acer saccharum* Marshall), northern red oak (*Quercus rubra* L.), yellow poplar (*Liriodendron tulipifera* L.), and American beech (*Fagus grandifolia* Ehrh.) (table 1; Sharp 2003).

Table 1—The five most important commercial timber species found in SMZs by physiographic region

Rank	Region	
	Allegheny Plateau	Piedmont Plateau
1	Sugar maple	Red maple
2	Yellow poplar	Blackgum
3	American beech	White oak
4	Basswood (<i>Tilia</i> spp.)	Scarlett oak
5	Yellow birch (<i>Betula lutea</i>)	Loblolly pine

¹ Instructor and Professor, respectively, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061; Project Leader, Coldwater Fisheries Unit, USDA Forest Service, Southern Research Station, Blacksburg, VA 24061; and Graduate Research Assistant, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.

Citation for proceedings: Connor, Kristina F., ed. 2006. Proceedings of the 13th biennial southern silvicultural research conference. Gen. Tech. Rep. SRS-92. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 640 p.

RESULTS AND DISCUSSION

There were no significant differences between different SMZ widths for residual dollar value per acre in the Allegheny Plateau. The average residual value across all un-thinned treatments was \$1,457.00 per acre. The thinned SMZ treatments had significantly less residual value (\$160.27 per acre) due to the 50 percent canopy removal during thinning. It is clear that a landowner can minimize residual SMZ value by leaving as little acreage as needed to protect water quality and selectively thinning SMZs where possible with the intent to remove the most valuable 50 percent of the canopy. Thinned SMZs still function with regard to water quality and wildlife habitat (Kochenderfer and Edwards 1990, VDOF 2002), and the less-dense canopy cover after thinning will likely encourage natural regeneration (Governo and others 2004). This subsequent regeneration may further enhance the filtering capacity, wildlife value, and future commercial value of the SMZ.

These sites demonstrate that there are significant opportunities for landowners to manage and harvest value from SMZs while adhering to BMPs in the Allegheny Plateau of West Virginia (table 2). These riparian zones will likely continue to produce higher value sawtimber on a continuous basis which can be selectively harvested again at the next rotation. The dominance of sugar maple, a shade tolerant species with high monetary value, is and will be a very important component in these SMZs. Future management options and timber values within SMZs will be largely dependent upon the commercial market for sugar maple (Sharp 2003).

The commercial value of residual timber across all SMZs was \$891.00 per acre in the Piedmont Plateau. These SMZs are dominated by low-value species like red maple, blackgum, and yellow poplar (Easterbrook 2005). The low overall value of these species made it difficult to thin significant amounts of timber revenue from the SMZs. In most cases, loggers would not thin SMZs even when required to do so. Logger reluctance

was due to a combination of environmental, production efficiency, and low timber value concerns. The site productivity in these areas tends to be higher than surrounding uplands, but lack of active management and desirable shade tolerant species composition also make future revenue from these SMZs marginal. Shorter rotations of the loblolly pine plantations on the surrounding uplands make it unlikely that slower-growing hardwoods in the SMZs will be available for selection at the next harvest.

These sites demonstrate that there are less significant opportunities for landowners to manage and harvest value from SMZs while adhering to BMPs in the piedmont of Virginia (table 2). These riparian zones will likely continue to produce lower-value red maple and blackgum without active management. Future harvest opportunities will largely be dependent upon the commercial market for hardwood pulpwood and small diameter hardwood logs.

LITERATURE CITED

- Blinn, C.R.; Kilgore, M.A. 2001. Riparian management practices, a summary of state guidelines. *Journal of Forestry*. 99(8): 11-17.
- Castelle, A.J.; Johnson, A.W.; Conolly, C. 1994. Wetland and stream buffer size requirements - a review. *Journal of Environmental Quality*. 23: 878-882.
- Easterbrook, A.W. 2005. Unpublished masters thesis data. Blacksburg, VA: Virginia Polytechnic Institute and State University, Department of Forestry.
- Gembroys, S.R. 1974. The structure of hardwood forest ecosystems of Prince Edward County, Virginia. *Ecology*. 55: 614-621.
- Governo, R.; Lockaby, B.G.; Rummer, B.; Colson, C. 2004. Silvicultural management within streamside management zones of intermittent streams: effects on decomposition, productivity, nutrient cycling, and channel vegetation. *Southern Journal of Applied Forestry*. 28(4): 211-224.
- Kochenderfer, J.N.; Edwards, P.J. 1990. Effectiveness of three streamside management practices in the central Appalachians. In: Coleman, S.S.; Neary, D.G., comp. eds. *Proceedings of the sixth biennial southern silvicultural research conference*. Gen. Tech. Rep. SE-70. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 688-700.
- Schultz, R.P. 1997. The ecology and culture of loblolly pine (*Pinus taeda* L.). *Agric. Handb.* 713. Washington, DC: United States Department of Agriculture, Forest Service. 1-1 to 12-28 p.
- Shaffer, R.M.; Haney, H.L., Jr.; Worrell, E.G.; Aust, W.M. 1998. Forestry BMP implementation costs for Virginia. *Forest Products Journal*. 48(9): 27-29.
- Sharp, E.P. 2003. Watershed and streamside management zone characterization in the Allegheny plateau of West Virginia. Blacksburg, VA: Virginia Polytechnic Institute and State University, Department of Forestry. 194 p. Masters thesis.
- United States Department of Agriculture (USDA). 2002. Soil survey of Appomattox County Virginia. Natural Resources Conservation Service. [Not paged].
- Van Lear, D.H.; Harper, R.A.; Kapeluck, P.R.; Carroll, W.D. 2004. History of piedmont forests: implications for current pine management. In: Connor, K.F., ed. *Proceedings of the 12th biennial southern silvicultural research conference*. Gen. Tech. Rep. SRS-71. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 127-131.
- Virginia Department of Forestry (VDOF). 2002. Virginia's forestry best management practices for water quality. Fourth edition. 216 p.

Table 2—Mean production acreage and dollar value of merchantable timber lost per linear mile of SMZ for the Allegheny and Piedmont Plateau sites

Site	SMZ type	Acreage per linear mile	Value lost per linear mile
			---- \$ ----
Allegheny Plateau	25 feet	3.03	4,414.27
	50 feet	6.06	8,829.42
	50 foot thin	6.06	971.24
	100 feet	12.12	17,658.84
Piedmont Plateau	25 feet	3.03	2,699.73
	50 feet	6.06	5,399.46
	50 foot thin	6.06	5,399.46
	100 feet	12.12	10,798.92

United States
Department of
Agriculture

Forest Service



Southern
Research Station

General Technical
Report SRS-92

Proceedings of the 13th Biennial Southern Silvicultural Research Conference

Memphis, Tennessee
February 28–March 4, 2005

[Repeating text from the bottom of the page, tilted and partially obscured]

sil.vics \ 'sil-viks \ n pl but sing in constr [NL silva] : the study of forest trees esp. the life history, characteristics, and ecology of forest trees esp. stands

sil.vi.cul.tur.al \ ,sil-və-'kəlch-(ə-)rəl \ adj : of or relating to sil.vi.cul.tur.al.ly \ -ē \ adv

sil.vi.cul.tur.e \ 'sil-və-'kəl-cher \ n [F, fr. L silva, sylva forest culture] : a phase of forestry dealing with the development and care of forests — sil.vi.cul.tur.ist \ ,sil-və-'kəlch-(ə-)rəl \ n

sil.vics \ 'sil-viks \ n pl but sing in constr [NL silva] : the study of forest trees esp. the life history, characteristics, and ecology of forest trees esp. stands

sil.vi.cul.tur.al \ ,sil-və-'kəlch-(ə-)rəl \ adj : of or relating to sil.vi.cul.tur.al.ly \ -ē \ adv

sil.vi.cul.tur.e \ 'sil-və-'kəl-cher \ n [F, fr. L silva, sylva forest culture] : a phase of forestry dealing with the development and care of forests — sil.vi.cul.tur.ist \ ,sil-və-'kəlch-(ə-)rəl \ n

sil.vi.cul.tur.al but sing in constr [NL silva] : the study of forest trees esp. the life history, characteristics, and ecology of forest trees esp. stands

sil.vi.cul.tur.al.ly \ -ē \ adv

sil.vi.cul.tur.e \ 'sil-və-'kəl-cher \ n [F, fr. L silva, sylva forest culture] : a phase of forestry dealing with the development and care of forests — sil.vi.cul.tur.ist \ ,sil-və-'kəlch-(ə-)rəl \ n

Proceedings of the 13th Biennial Southern Silvicultural Research Conference

Edited by

Kristina F. Connor

Memphis, Tennessee

February 28-March 4, 2005

Hosted by

**Mississippi State University, Department of Forestry
USDA Forest Service, Southern Research Station**

Sponsored by

**Mississippi State University, Department of Forestry
National Association of Consulting Foresters of America
National Association of Professional Forestry Schools and Colleges
National Hardwood Lumber Association
Society of American Foresters
Southern Industrial Forest Research Council
USDA Forest Service, Southern Research Station**

Published by

**USDA Forest Service
Southern Research Station
Asheville, North Carolina
April 2006**

Preface

The 13th Biennial Southern Silvicultural Research Conference was held February 28–March 4, 2005, at the Hilton, Memphis, TN. This conference was the latest in a series of meetings designed to provide a forum for the exchange of research information among silviculturalists and researchers. Presentations emphasized research in wildlife ecology; pine silviculture; longleaf pine; nutritional amendments; vegetation management; site preparation; hardwoods: artificial regeneration; hardwoods: midstory competition control; growth and yield; water quality; forest health; fire; hardwoods: natural regeneration; and hardwood intermediate treatments. Field trips included visits to (1) the Ames Plantation to observe hardwood silviculture and wildlife management, and (2) the John M. Tully Wildlife Management Area to observe bottomland hardwood stand development and silviculture. The conference was attended by 335 people and had 115 oral and 59 poster presentations. James P. Shepard, Professor, Head and Graduate Student Coordinator, Department of Forestry, Mississippi State University, and Bruce Jewell, Assistant Director, USDA Forest Service, Southern Research Station, made the welcoming remarks.

Sponsors for the conference included Mississippi State University, Department of Forestry, Forest and Wildlife Research Center; National Association of Consulting Foresters of America; National Association of Professional Forestry Schools and Colleges; National Hardwood Lumber Association; Society of American Foresters; Southern Industrial Forest Research Council; and the USDA Forest Service, Southern Research Station. The steering committee for this meeting worked numerous hours to review abstracts, establish the program for oral and poster presentations, and make all necessary arrangements for the conference. Steering committee members included:

Andrew Ezell (Local Arrangements Chair) Mississippi State University, Department of Forestry, Mississippi State, MS	Brian Oswald (Moderator Selection) Steven F. Austin State University, Nacogdoches, TX
Kenneth Outcalt (Poster Session) USDA Forest Service, Southern Research Station, Athens, GA	Marty Spetich (Audio-Visual) USDA Forest Service, Southern Research Station, Hot Springs, AR
Dave Haywood (Meeting Announcements) USDA Forest Service, Southern Research Station, Pineville, LA	Norman Davis (Field Trips) Anderson-Tully, Vicksburg, MS
Eric Heitzman (Audio-Visual) University of Arkansas, Monticello, AR	Mary Anne Sword Sayer (Moderator Selection) USDA Forest Service, Southern Research Station, Pineville, LA
Brian Lockhart (Student Awards Judging Coordinator and Meeting Evaluation; Field Trips) USDA Forest Service, Southern Research Station, Stoneville, MS	Michael Blazier (Moderator Selection) Louisiana State University, Homer, LA
Don Bragg (Audio-Visual) USDA Forest Service, Southern Research Station, Monticello, AR	Callie Jo Schweitzer (Audio-Visual) USDA Forest Service, Southern Research Station, Huntsville, AL
	Andrew Londo (Audio-Visual) Mississippi State University, Department of Forestry, Mississippi State, MS

Partial funding for the conference was provided by the Southern Research Station and Mississippi State University. We gratefully acknowledge Mississippi State University's Department of Forestry for handling fiscal matters, hotel arrangements, and registration. Special thanks to all committee members for invaluable advice; to Lynne Breland for coordinating communications among the Forest Service, Mississippi State University, and the hotel; to Patricia Outcalt for creating and updating the conference Web page, to Jillian Donahoo and Gretchen Schafer for tracking abstracts and manuscripts; and to the Mississippi State University students who acted as drivers, set up poster boards, and helped with registration. The many people who contributed to the success of the field trips have our sincere thanks. We also gratefully acknowledge all those who helped judge student presentations and posters.

Special recognition is given to the moderators. They include: Nancy Herbert, Bruce Jewell, Dean Gjerstad, Tom Fox, Jimmie Yeiser, Harry Quicke, Andy Ezell, David Loftis, David Larsen, Tom Lynch, Jim Shepard, Noland Hess, Brian Oswald, David Van Lear, John Hodges, and Callie Schweitzer.

The 148 papers published in this proceedings were submitted by the authors in electronic media. Limited editing was done to ensure a consistent format. Authors are responsible for content and accuracy of their individual papers.

Kristina F. Connor
Program Chair
USDA Forest Service,
Southern Research Station,
Auburn, AL