Forest Management and Water Quality

A Position of the Virginia Division Society of American Foresters

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Position

The Virginia Division Society of American Foresters (VASAF) supports continuing efforts to ensure that the waters of the Commonwealth are not negatively impacted by potential erosion and sedimentation from forest management activities. The VASAF therefore endorses the current silvicultural water quality law, and supports increased emphasis and funding of enforcement efforts. Because practices that protect water quality depend on site-specific factors, the VASAF further recommends that both the development and application of forestry best management practices (BMPs) remain science-based, but discretionary.

Issue

Assuring Virginia' water quality by preventing erosion and sedimentation associated with forest management requires balancing regulatory controls and operational flexibility. Virginia's current policy, reflected in Virginia Law (§10.1-1181.1 to 1181. Va. Code Ann.), rigorously polices water quality while permitting managers the discretion to implement site-specific pollution prevention techniques. Forestry BMPs play a crucial role in striking this balance, and efforts to replace the current discretionary model with mandatory, prescriptive, and formulaic BMPs are undesirable from a scientific, professional forestry perspective.

Background

The Federal Water Pollution Control Act of 1972 and its amendments provided the impetus for formal development of forestry Best Management Practices (BMPs). Therefore, in the Eastern United States, the states primarily developed forestry best management practices (BMPs) with the primary goal of maintaining or improving water quality (Alabama Forestry Commission, 1993; Delaware Forestry Association, 1982; Florida Department of Agricultural and Consumer Services, 1993; Georgia Forestry Commission, 1993; Kentucky Division of Forestry, 1992; Louisiana Department of Agriculture and Forestry, 1988; Maine Department of Conservation, 1992; Maryland Department of Natural Resources, 1992; Mississippi Forestry Commission, 1995; New York Department of Environmental Conservation , 2000; North Carolina Division of Forest Resources, 1989; Ohio Forestry Association, 1986; South Carolina Forestry Commission, 1994; Texas Forestry Association, 1989; University of Tennessee Agricultural Extension Service, 1995; Vermont Department of Forestry, Parks, and Recreation, 1987; Virginia Department of Forestry, 2002). In several states a secondary goal is to include maintenance of site productivity, a logical development since site productivity is linked to nutrient losses that may be accelerated by leaching or soil erosion.

BMP Programs

There are three distinct types of forestry BMP programs for private lands in the eastern United States. Some states, particularly those in the Northeast have programs that are administered under regulatory (mandatory) forest practices acts. On the other end of the spectrum, most states in the Deep South have totally voluntary BMP programs. The third category of BMPs, the quasi-regulatory, has aspects of both the regulatory and voluntary program (Shepard, 1994). For example, the Virginia BMP program has voluntary BMPs, but the landowner and logging contractor are subject to fines under an anti-sediment law. Federally owned lands, such as national forests, operate under federal BMPs, which meet or exceed state recommendations. Two sets of federal BMPs also apply to privately owned wetland forests; 15 federal BMPs apply to road construction activities in wetlands and six BMPs apply to the establishment of pine plantations in jurisdictional wetlands. Regardless of the regulatory or voluntary nature of the state forestry BMP program, almost all of the BMP manuals address the following categories: Pre-harvest Planning, Forest Roads, Yarding areas (Decks, Landings), Skid Trails, Harvest Operations, Sensitive Areas (wetlands, sinkholes), Stream Crossings (Fords, Bridges, Culverts), Streamside (or riparian) Management Zones (SMZs), Site Closure, and Site Preparation (Aust, 1994). Aust et al. (1996) compared the benefits and costs of regulatory and voluntary BMP programs and concluded that a voluntary BMP program combined with inspections provided the best combination of benefits and costs.

BMP Efficacy

There is a considerable body of research results that indicates that forest operations are compatible with clean water and sustained productivity, particularly if forestry best management practices are employed (Aust and Blinn, 2004). Table 1 provides a list of 30+ reviews of water quality and site productivity research relating to forest harvesting operations that have been published in the last 30 years. Research results indicate BMPs that minimize soil and litter layer disturbance, facilitate rapid regeneration, and control overland flow of water effectively minimize negative water quality effects of harvesting and site preparation. In general, research results regarding the effects of forest harvesting and site preparation on water quality reveal the following sequence of events:

1. Timber harvesting reduces transpiration and increases water yield from the site during the growing season.
2. The increased soil disturbance and water movement caused by timber harvesting results in slight, but measurable increases in stream sediment and nutrients. It is interesting to note that forest hydrologists often report harvest related sediment losses in kg/ha/year, when losses under 0.5-1 Mg/ha/yr are considered to be near geologic erosion rates. Furthermore, in most instances, the increased erosion rates associated with forest harvesting in the eastern United States are well below the 2200 kg/ha/year to 11000 kg/ha/year erosion rates that are deemed acceptable and sustainable from agricultural lands (Yoho, 1980).
3. As vegetation recovers, the transpiration increases and bare soil is covered. This generally occurs 2 to 5 years following harvest, and results in water quantity and quality recovery.
4. In general, when site preparation increases the exposure of bare soil and removes more vegetation, it accentuates water quality problems, especially where sufficient slopes exist.
5. Most water quality problems associated with forest harvesting are actually problems caused by poorly designed and constructed roads and skid trails, inadequate closure of roads and skid trails, stream crossings, excessive exposure of bare soil, or lack of adequate Streamside Management Zones.

Shaffer and Meade (1997) conducted a study that made it is emphatically clear that BMPs relating to preharvest planning, forest roads, skid trails, decks, and streamside management zones have a tremendous potential to affect water quality. However, the as indicated by the "loggers choice" studies and various surveys of BMP compliance, BMPs are not always properly employed. We need to ensure that landowners, loggers, and foresters have adequate opportunities for BMP training. We need to further refine BMPs such as streamside management zone specifications in order to encourage sound silvicultural management. We also need to emphasize sound practices of road location, design, and construction. These areas are of critical importance and we should ensure that landowners and operators have access to this information.

Table 1. Partial listing of other literature reviews and summaries relating to hydrology, water quality, and productivity for timber harvests on sites in the eastern US.

Reviewers	General description

Hydrology/Water Quality

Aust and Blinn, 2004	Effects of Forest Harvesting on Water Quality
Binkley and Brown, 1993	Forest Management and NPSP in the U.S.
Binkley et al., 1999	Water Quality and Forest Fertilization, US, Canada, Europe
Castelle et al., 1994	Riparian Buffer Requirements for Water Quality, U.S.
Golden et al., 1984	Silviculture, BMPs, and Water Quality in the SE
Hornbeck et al., 1993	Forest Management and Water Yield in the NE U.S.
Hornbeck et al., 1997	Water Research, Hubbard Brook Experimental Forest, NH
Hubbard and Lowrance, 1994	Riparian Buffer Strips, Coastal Plain, Georgia
Ice et al., 1997	Silvicultural impacts on water quality in US
NCASI, 1994	Forest Operations and BMPs in the SE
NCASI, 2001	Forest Operations and Water Quality in the NE
Patric, 1978	Harvesting Effects for Eastern Mountain Hardwoods
Patric et al., 1984	Sediment Yield from Forest Operations, US.
Patric, 1976	Soil Erosion for the Eastern Forests
Richardson and McCarthy, 1994	Silvicultural and Agricultural Effects on NC Pocosins
Shepard, 1994	Silvicultural Impacts on Water Quality in SE Wetlands
Sopper, 1975	Timber Harvesting and Water Quality in US
Sun et al., 2001	Timber Management Effects on Hydrology of SE Wetlands
Swank and Crossley, 1988	Forest Hydrology Research at Coweeta Hydrology Lab, NC
Yoho, 1980	Summary of Forest Operations and Sediment, SE

Productivity

Allen and Campbell, 1988	Recommended Management of Wetland Sites, SE
Bates et al., 1989	Harvesting Effects on Aspen, Lakes States
Burger and Kelting, 1999	Soil Quality Indicators of Sustainability, SE
Conner, 1994	Forest Management Effects on SE Wetland Productivity
Fox, 2000	Sustained Productivity in Intensively Managed Forests, SE
Greacen and Sands, 1980	Compaction of Forest Soil, US
Kelting et al., 1999	Sustainable Productivity, Wet Flats in Eastern US
Morris and Lowery, 1988	Site Preparation and Soil Effects, SE
Nambiar, 1996	Sustained Productivity and Forest Management
Powers and Morrison, 1996	Sustained Productivity Research Needs, US
Reisinger et al., 1988	Harvesting Effects of Soil Properties, SE

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ABOUT THE SOCIETY

The Society of American Foresters, with about 17,000 members, is the national organization that represents all segments of the forestry profession in the United States. It includes public and private practitioners, researchers, administrators, educators, and forestry students. The Society was established in 1900 by Gifford Pinchot and six other pioneer foresters.

The mission of the Society of American Foresters is to advance the science, education, technology, and practice of forestry; to enhance the competency of its members; to establish professional excellence; and to use the knowledge, skills, and conservation ethic of the profession to ensure the continued health and use of forest ecosystems and the present and future availability of forest resources to benefit society.

The Society is the accreditation authority for professional forestry education in the United States. The Society publishes the *Journal of Forestry*; the quarterlies, *Forest Science*, *Southern Journal of Applied Forestry*, *Northern Journal of Applied Forestry*, and *Western Journal of Applied Forestry*; *The Forestry Source*, and the annual Proceedings of the Society of American Foresters national convention.