From Forest Nursery Notes, Winter 2009

223. © Methods to prioritize placement of riparian buffers for improved water quality. Tomer, M. D., Dosskey, M. G., Burkart, M. R., and James, D. E. Agroforestry Systems 75:17-25. 2009.

Agroforest Syst (2009) 75:17–25
DOI 10.1007/s10457-008-9134-5

Methods to prioritize placement of riparian buffers for improved water quality

Mark D. Tomer · Michael G. Dosskey · Michael R. Burkart · David E. James · Matthew J. Helmers · Dean E. Eisenhauer

Published online: 6 May 2008

Abstract Agroforestry buffers in riparian zones can improve stream water quality, provided they intercept and remove contaminants from surface runoff and/or shallow groundwater. Soils, topography, surficial geology, and hydrology determine the capability of forest buffers to intercept and treat these flows. This paper describes two landscape analysis techniques for identifying and mapping locations where agroforestry buffers can effectively improve water quality. One technique employs soil survey information to rank soil map units for how effectively a buffer, when sited on them, would trap sediment from adjacent cropped fields. Results allow soil map units to be compared for relative effectiveness of buffers for improving water quality and, thereby, to prioritize locations for buffer establishment. A second technique uses topographic and streamflow information to help identify locations where buffers are most likely to intercept water moving towards streams. For example, the topographic wetness index, an indicator of potential soil saturation on given terrain, identifies where buffers can readily intercept surface runoff and/or shallow groundwater flows. Maps based on this index can be useful for site-specific buffer placement at farm and small-watershed scales. A case study utilizing this technique shows that riparian forests likely have the greatest potential to improve water quality along first-order streams, rather than larger streams. The two methods are complementary and could be combined, pending the outcome of future research. Both approaches also use data that are publicly available in the US. The information can guide projects and programs at scales ranging from farm-scale planning to regional policy implementation.

Keywords Conservation planning · Conservation practices · Non-point pollution · Soil survey · Terrain analyses

M. D. Tomer (✉) · M. R. Burkart · D. E. James
USDA/ARS National Soil Tilth Laboratory,
2110 University Blvd., Ames, IA 50011, USA
e-mail: mark.tomer@ars.usda.gov

M. G. Dosskey
USDA/FS National Agroforestry Center, Lincoln,
NE, USA

M. J. Helmers
Department of Agricultural and Biosystems Engineering,
Iowa State University, Ames, IA, USA

D. E. Eisenhauer
Department of Biological Systems Engineering,
University of Nebraska, Lincoln, NE, USA

Introduction

Establishment of riparian buffers has been encouraged and financially supported by agricultural policies in the US, partly because riparian vegetation has the potential to improve water quality. Many field-scale studies have shown buffers can improve