Decision support tool for selecting alternative management practices in compliance with the Minnesota Buffer Law

A preliminary report to the Board of Water and Soil Resources
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by
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The Minnesota Buffer initiative, signed into law in April of 2016, provides protection of Minnesota surface waters by requiring permanent riparian vegetation at a width of 50 feet adjacent to public waters and 16.5 feet adjacent to public ditches. Alternative practices may be implemented in lieu of vegetative buffers if such practices provide at least as much water quality benefits as the prescribed buffer. This analysis provides a comprehensive review of available literature regarding alternative management practices and their effectiveness. A decision support tool has been created based on this literature review and provides options for selecting combinations of alternative management practices that provide comparable water quality benefits of a vegetative buffer. The Minnesota Phosphorus Index was utilized in 30 different landscapes in the state and provides expected baseline sediment and phosphorus export dependent on average upland soil texture, slope, and climatic considerations. In each region, three baseline management scenarios were explored that consider region-specific manure and fertilizer usage as well as tillage practices. The regional effectiveness of vegetative buffers was then analyzed; buffer contaminant removal rates were determined based on regional characteristics and further refined with site-specific slope and soil information. Finally the decision support tool uses these regionalized baseline contaminant exports coupled with site-specific buffer removal efficiencies as a benchmark for comparisons of alternative practice combinations. The overall goal of the tool is to define various combinations of suitable alternative practices that meet or exceed water quality benefits of a prescribed buffer and remain in compliance with the new law. The tool focuses on sediment and total phosphorus loss via overland flow, but other benefits of buffers such as infiltration and bank stabilization may also occur.

Table 1. Pollutant removal efficiency data for alternative BMPs

BMP name	NRCS practice code	Hillslope location/ Type	Avg. sediment removal %	Avg. Total Phosphorus removal %	Reference number
Contour Buffer Strips	332	Avoiding	87	64.5	3,14,41
Cover crops	340	Avoiding	62	39	10, 16, 18,19, 21, 26
No till/strip till	329	Avoiding	90	75	1,2,29
Contour Strip-cropping	585	Controlling	69	77.5	14
Grassed Waterways	412	Controlling	87	34	8
Terraces	600	Controlling	87.5	77.5	45
Filter Strips	***	Trapping	83.5	67	9, 31
Water and Sediment Control Basin WaSCoB	638	Trapping	81.5	77	12, 30
Constructed Wetland	658	Trapping	85	42	5,17,20, 33,35
Restored Wetland (Riparian)	657	Trapping	75	72.5	7, 13, 23,24
Side inlets (grade stabilization)	410	Trapping	64.4	62	32
***Filter strip design will be in compliance with buffer law, not NRCS practice					
Note: the above studies cite efficiency of removal values for field-scale BMPs treating varying quantities of water. They do not reflect the total volume of water treated or total load removed. Trapping BMPs that retain water can generally treat much larger volumes of water and therefore reomove much larger total loads of sediment or nutrients					

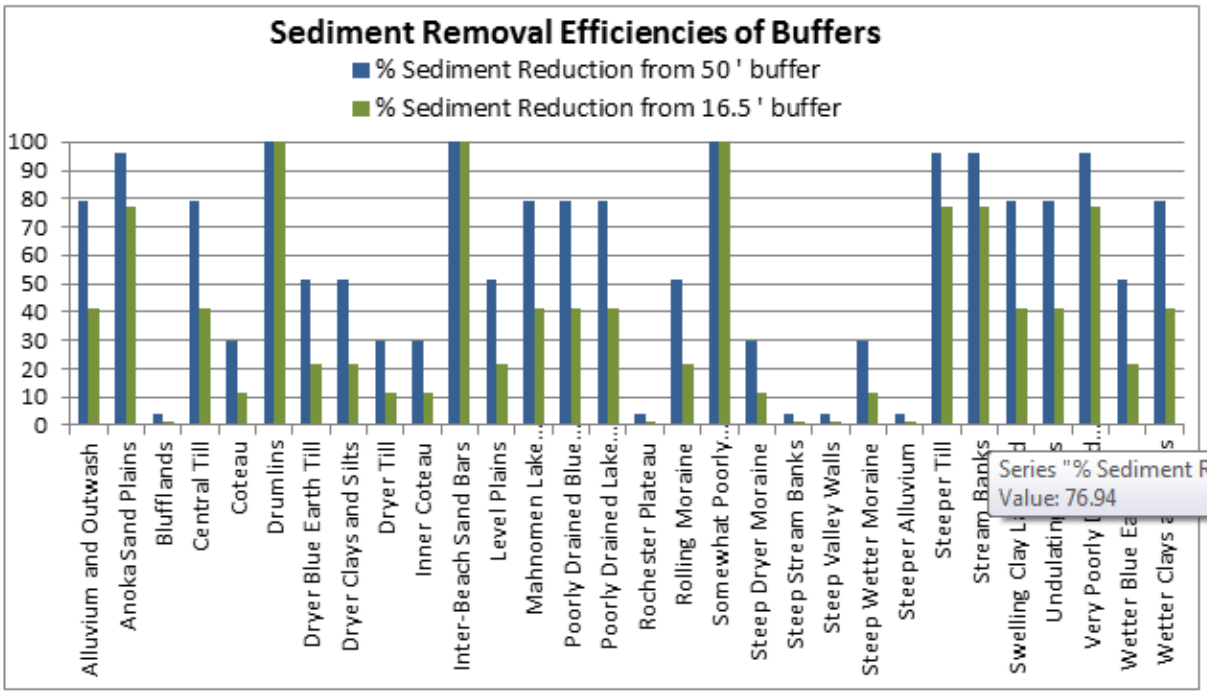

Figure 5. Sediment removal efficiencies of buffers in different agroecoregions.

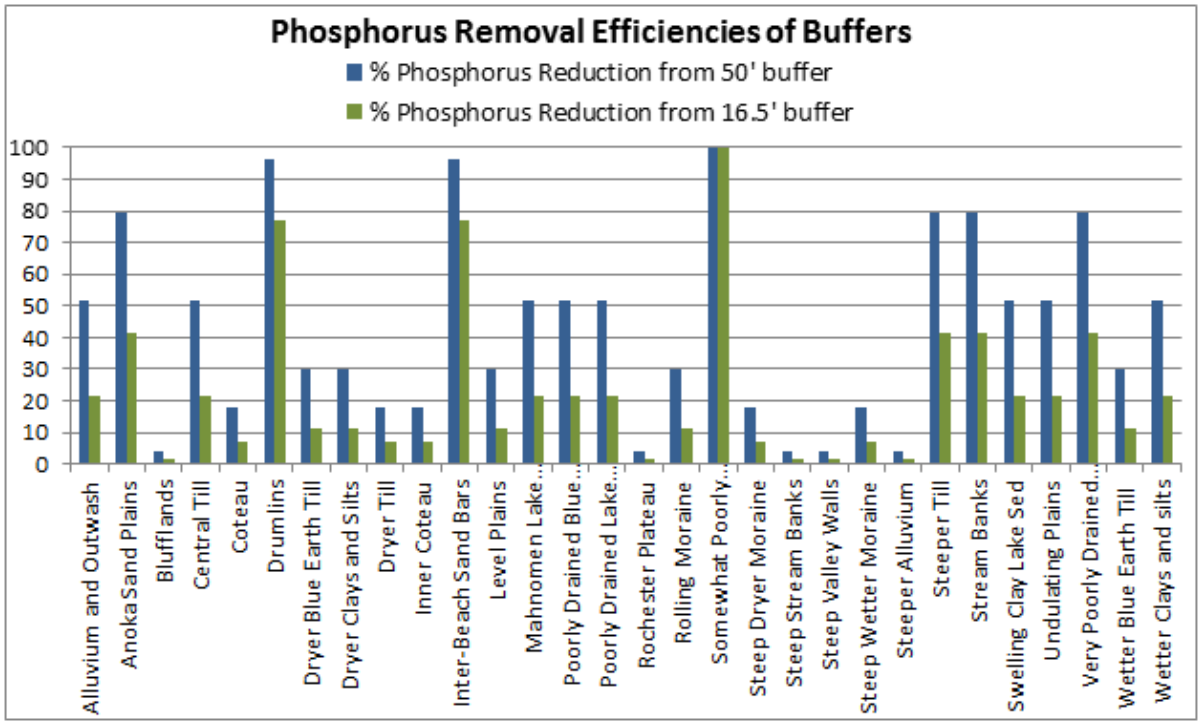

Figure 6. Phosphorus removal efficiencies of buffers in different agroecoregions.