

Minimum slope percent for installation of drainage and erosion control structure recommendations in States near Minnesota.

State	Minimum slope % (distance between structures in parenthesis)	Notes
Wisconsin PUB-FR-226 2003	1(450 ft.)	Listed for drainage, erosion control “as needed”
Illinois	1 (400 ft.)	none
Michigan	2 (250)	none
Indiana	2 (250) 1-2 (250-500)	1-2 range is for water bars on skid trails, 2% for roads
New York	2 (250)	Cites USDA 1998
Maine	2 (250)	none
USFS – Landowners Guide to building forest access roads (USDA 1998)	2 (250)	Cites Kochenderfer 1970
Ontario	Undefined	“sufficient to control water velocity”

**2% road grade is generally recommended for drainage, which would then make 2% the default for erosion control.

Interpretation

All states in proximity to Minnesota (and others nationally) have very similar guidelines for erosion control on skid trails and roads. The 2% slope that triggers recommendation for erosion control is a de facto national standard that is based on controlled experimental studies and principles of physics.

Percent of road and skid trail segments with slopes between 2-5% for each monitoring period and the mean across periods.

Monitoring years	Road Segments 2-5%	Skid trail Segments 2-5%
2000-2002	35.4	7.0
2004-2006	41.7	31.9
2009	54.8	12.3
Mean	44.0	17.0

Percent erosion control implementation on road and skid trail segments for monitoring years 2004-2006 and 2009.

	Segments where erosion control needed	Segments with erosion control	Segments with erosion evident	Segments where sediment reached waterbody
Roads				
2004-06	92.2	33.1	74.5	4.7
2009	78.6	15.2	84.8	9.1
Mean	85.4	24.2	79.6	6.9
Skid trails				
2004-06	90.4	34.2	33.3	0.5
2009	72.5	48.0	39.0	1.0
Mean	81.5	41.1	36.2	0.8

Interpretation

Changing the erosion control recommendation to slopes >5% as suggested would exclude almost half of the segments on roads from erosion control, but less than 20% for skid trails (upper table). Monitoring data has consistently shown that erosion occurs when structures are not installed, in particular for road segments due to reduced vegetative cover and infiltration. Road segments are also more likely to deliver sediment to a waterbody compared to skid trails, likely due to a lower level of erosion control implementation on roads. Considering that almost half of road segments are <5% slope, the low level of erosion control implementation on roads, and the greater likelihood of erosion occurrence and sediment delivery, it is not justifiable to modify the guideline for road segments. It may be justifiable to change the recommendation for skid trails given that most slopes are >5%, and evidence of erosion from skid trails is much lower (likely due to greater vegetative cover and water infiltration). There would likely still be some level of erosion from skid trail segments, but risks to water quality would be low if skid trails are not in close proximity to water features.

Other considerations

Although the FMG's are voluntary, the erosion control guidelines are associated with a regulatory framework, as the Wetland Conservation Act requires limiting impacts to the hydrological and biological characteristics of wetlands (General section of guidebook, pg. 22). To qualify for an exemption to WCA, roads must "use appropriate erosion control measures to prevent sedimentation of water" and "comply with other applicable...requirements, includingwater quality best management practices as presented in *Protecting Water Quality and Wetlands in Forest Management: Best Management Practices in Minnesota*". It is not clear to me if reference to the original BMP guidelines would preclude changing the guidelines in the new FMG guidebook, but inclusion of the word prevent would suggest that every reasonable action should be taken to reduce erosion.

In the scoping comments, the submitter of this recommended change stated that "The guidelines call for incorporating water diversion structures on all road and skid trail segments during construction and at closure.". This statement is not accurate, as the guidelines clearly state in a number of places that erosion control should only be implemented where appropriate or needed (General section, pg. 81; timber harvesting section, pg. 31). Monitoring protocols reflect this, as contractors assess whether or not erosion control is necessary for every segment evaluated (Dahlman and Rossman, 2010). The submitter also stated that implementation was difficult due to timing constraints, as it was not possible to place slash and water bars after equipment had been removed from the site. Slash and water bars are only a few of the possible structures that can be used for erosion control. Other structures, such as broad based dips, can be installed during road construction and still allow for the transport of wood and equipment.