Erosion Control
Staying Out of Murky Waters

Grand Rapids, MN
December 2, 2014

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Brock White
Dahlman Consulting
Iron Range Resources & Rehabilitation Board
Itasca Community College
Minnesota Erosion Control Association
Minnesota Department of Natural Resources
Minnesota Logger Education Program
U.S. Forest Service
University of Minnesota Extension

Housekeeping

Introductions

Facilitators/Presenters:

John Chapman
MN Erosion Control Association

Charlie Blinn
University of MN Extension

Dick Rossman
MN DNR

Brad Jones
Itasca Community College

Julie Miedtke
University of MN Extension

David Chura
Minnesota Logger Education Program

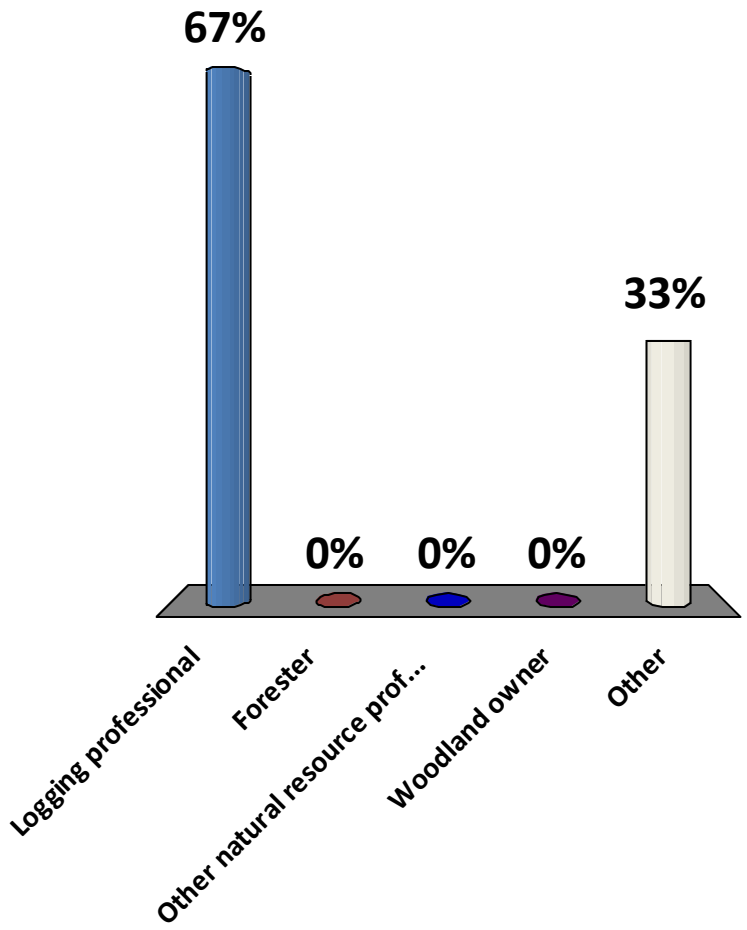
Each participant should have a response device

Let’s practice

Use your response device to answer the question on the following slide.

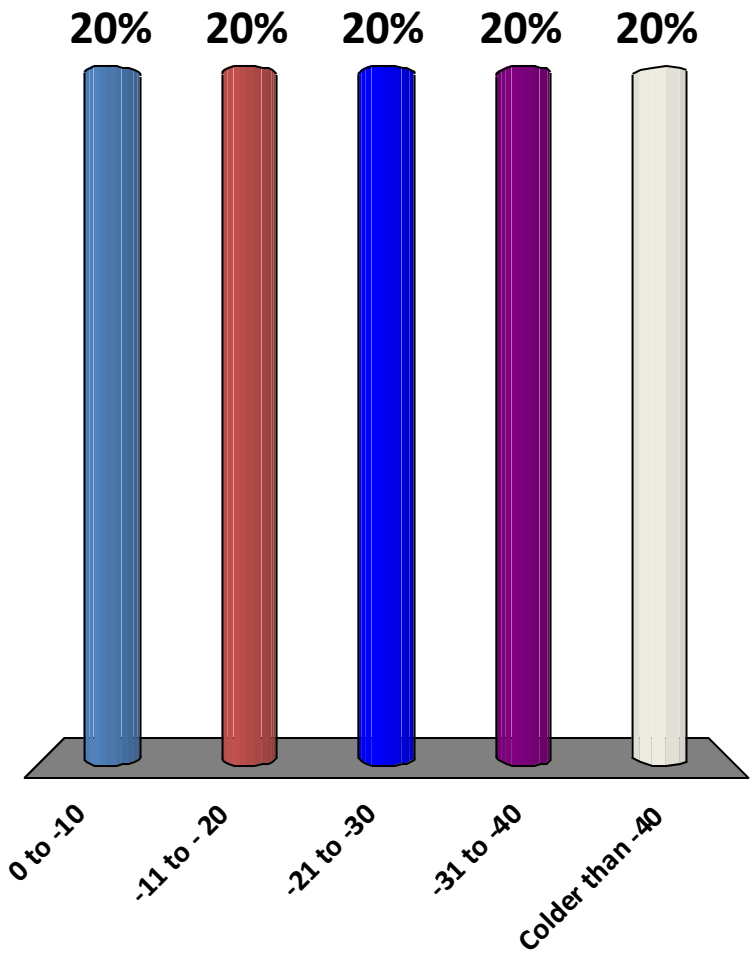
Which of the following best describes you?

A. Logging professional
B. Forester
C. Other natural resource professional
D. Woodland owner
E. Other



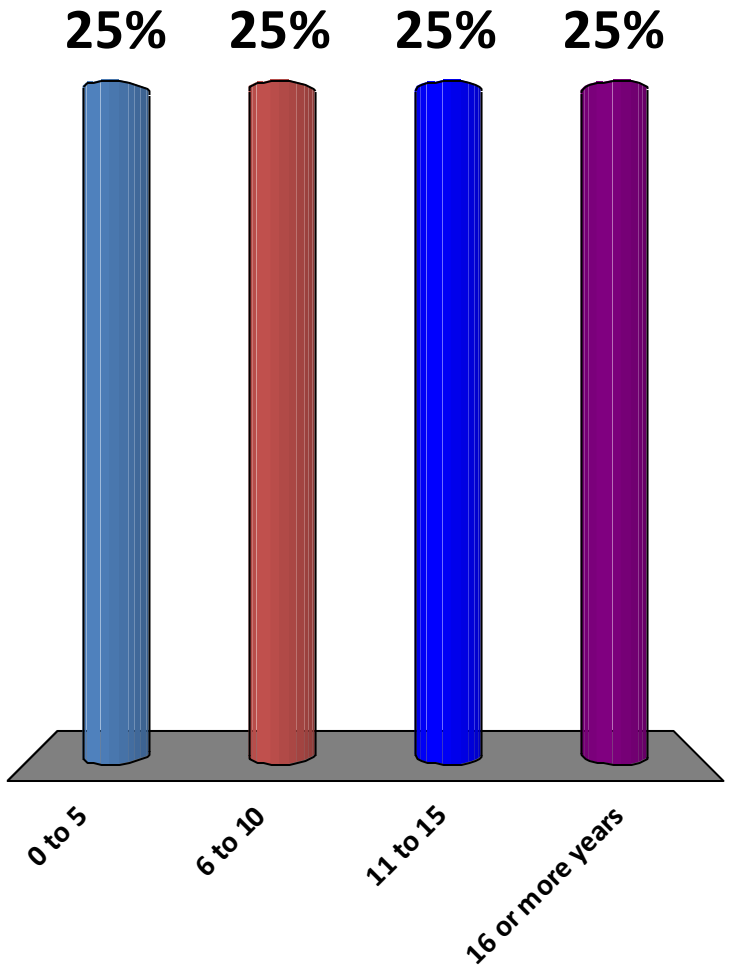
What is the coldest temperature you have ever worked in?

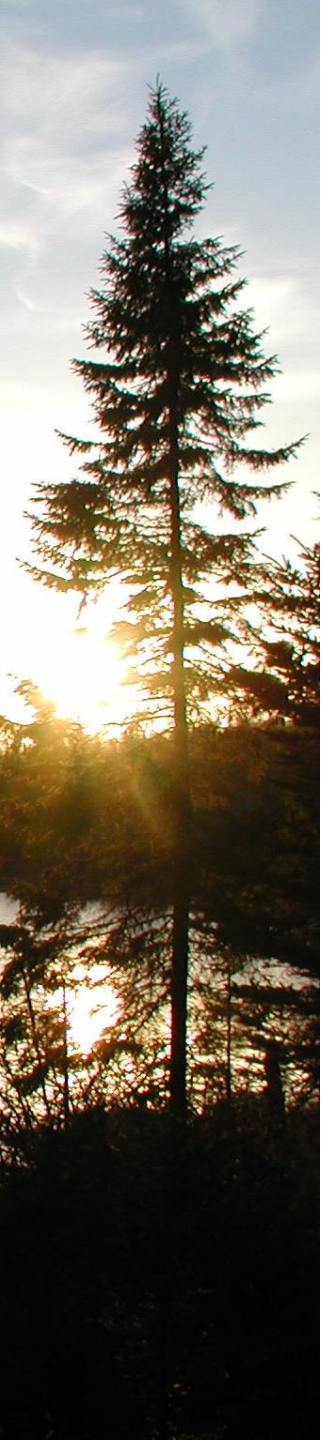
A. 0 to -10
B. -11 to - 20
C. -21 to -30
D. -31 to -40
E. Colder than -40



How many years of experience do you have erosion control?

A. 0 to 5
B. 6 to 10
C. 11 to 15
D. 16 or more years





Erosion Control Workshop

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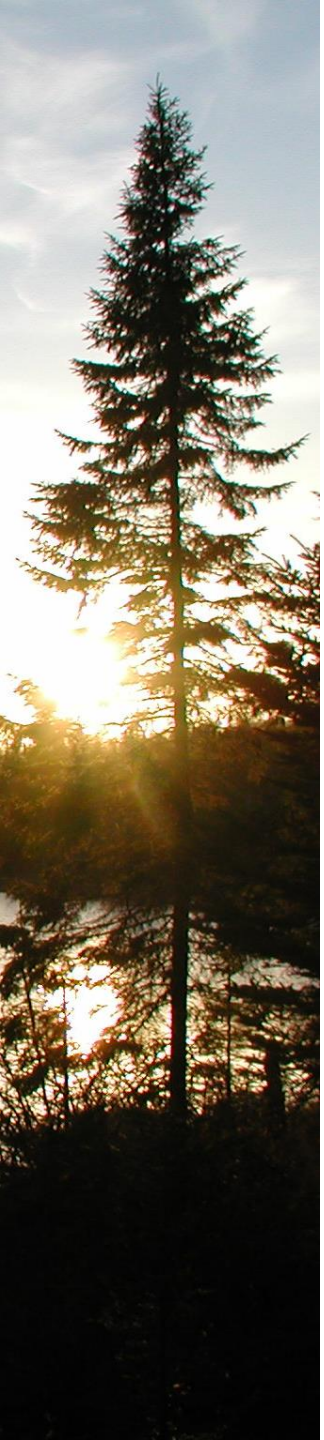
Itasca Community College

Dick Rossman



Why is Erosion Control important to me?

- Protection of the resource
  - Clean water
  - Soil productivity
- Public perception
- Reduces pressure for regulation –
  - Voluntary BMPS vs. Regulatory
- Avoids legal issues/fines
- Safe transportation system
- Forest certification

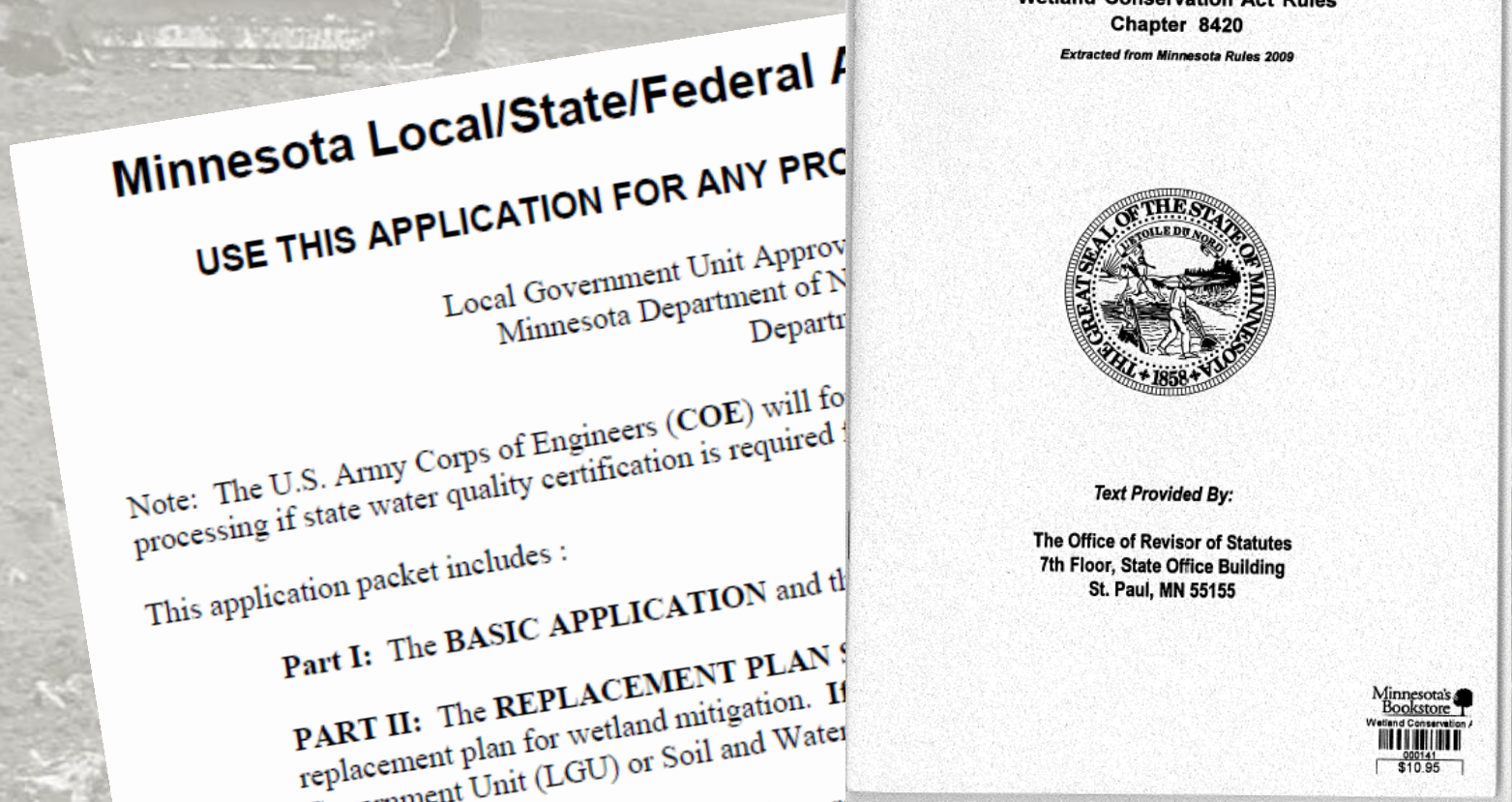
We Interact with Wetlands and Waterbodies Everyday

- **2011 Guideline Monitoring Data:**
  - **90%+** of sites had a wetland or waterbody on or adjacent to the site or access route
  - **50%** of access roads crossed a wetland or waterbody
  - **200+** temporary crossings with skid trails

84 sites monitored in 2011

Regulatory Programs

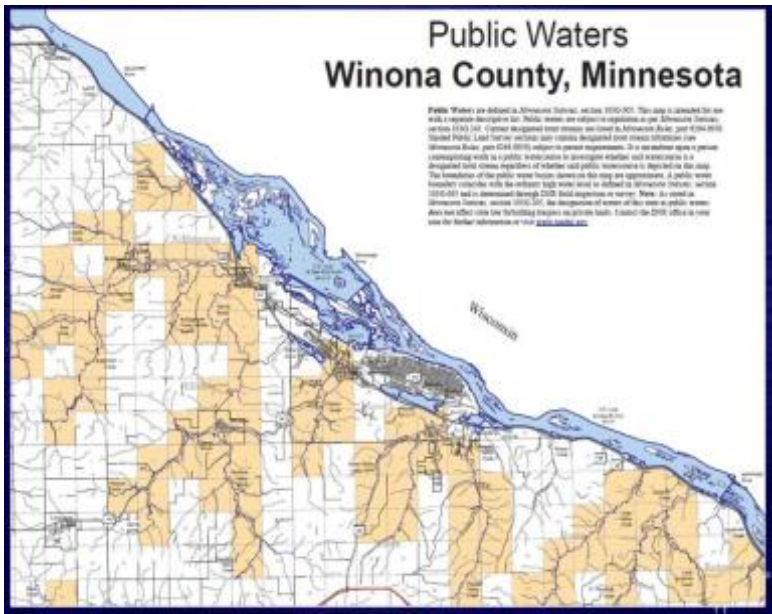
contain requirements for erosion control on forest management sites



DNR Public Waters

- What are public waters?
  - Those waters of the state identified as public waters or wetlands under Minnesota Statutes, sections 103G.005, subdivisions 15 and 15a, and 103G.201.
    - Generally Lakes, streams & type 3,4 & 5 wetlands >10 acres
- Administered by DNR Division of Waters & Ecological Resources
- Public waters inventory maps

  http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/download.html



Who needs public water work permit?

- Anyone changing the course, current, or cross-section of public waters entirely or partially, by any means.
  - **Filling, Excavation, Structures, Restoration, Water level controls, Bridges, culverts & outfalls, Drainage, Mining**
  - **No Silvicultural exemption!**

Activities that do not require a permit are identified in Appendix H of the Guidebook

* Low water fords (**with conditions**)
* Temporary bridges (**with conditions**)

Wetlands Conservation Act (WCA)

- **Purpose:**
  - Achieve **"no net loss"** in quantity, quality and biological diversity of wetlands in MN
  - Avoid direct or indirect impacts on wetlands
  - Replace wetland values where avoidance of activity is not feasible or prudent.
- Requires an Approved Wetland Replacement Plan for impacts that do not qualify for an **exemption or no-loss**

WCA Exemptions

- Agricultural Activities
- Drainage
- Federal Approvals
- Restored Wetlands
- Incidental Wetlands
- Utilities; Public Works
- Forestry
- Approved Development
- De Minimis
- Wildlife Habitat

Clean Water Act – Section 404 Program (COE)

- **Regulates** "discharge" of dredged or fill material in "Waters of the US"
  - Includes moving material around within wetland
- Administered by U.S. Army Corps of Engineers

- **Requirements:**
  - Sequencing: **avoid – minimize – replace**
  - Requires mitigation of impacted wetlands **before** proceeding (similar to WCA)

- There is a **Silvicultural exemption**

Construction Storm Water permit (MPCA)

- **MPCA** is responsible for implementing the EPAs National Pollutant Discharge Elimination System (NPDES) including Construction Storm Water permits.
- The **NPDES** Stormwater Program regulates stormwater discharges from various activities **including road construction**
  - Designed to prevent stormwater runoff from washing harmful pollutants (**including sediment**) into local surface waters such as streams, rivers, lakes or coastal waters

Who Needs an NPDES/SDS Permit

- Landowner or operator for any construction activity disturbing:
  - One acre or more of soil.
  - Less than one acre of soil if that activity is part of a "larger common plan of development or sale" that is greater than one acre.
  - Less than one acre of soil, but the MPCA determines that the activity poses a risk to water resources.
  - **Permit needed even if there are no wetlands or water bodies in close proximity**
- There is a **Silvicultural exemption**

Silvicultural Exemptions

- **Forestry exemptions are available for:**
  - COE section 404 permits
  - WCA wetland replacement
  - MnPCA Stormwater permits
- **Generally exempts us from:**
  - Permit application & fees
  - Wetland replacement
  - SWPPP development / approval
  - Some Paperwork
- **Does not exempt us from the regulation rules, including the need to use BMPs**

WCA Exemption Qualifiers

- **Must use appropriate erosion control measures to prevent sedimentation of water.**

- **Must comply with all applicable federal, state and local requirements & guidelines**

LGU guidance for silvicultural exemption

MPCA Stormwater
Forestry Exemption

- Forest roads constructed primarily for silvicultural activities are exempt from the need to obtain NPDES permit coverage.

- **Must use appropriate erosion control measures to prevent sedimentation.**

- Forest roads constructed for multiple uses (e.g. rural residential access, hunting access, general recreation) are outside the scope of the exemption and require permit coverage

404 Silvicultural Exemption

FARM, FOREST, OR TEMPORARY MINING ROADS

Pursuant to Section 404 of the Clean Water Act (33 USC 1344) and Federal Regulations (33 CFR 323.4), **certain discharges have been exempted from requiring a Section 404 permit. Included in this exemption is construction or maintenance of** farm roads, **forest roads**, or temporary roads for moving mining equipment. **To meet this exemption, such roads must be constructed and maintained in accordance with the best management practices (BMPs) to assure that flow and circulation patterns and chemical and biological characteristics of waters of the United States are not impaired**, that the reach of the waters of the United States is not reduced, and that any adverse effect on the aquatic environment will be otherwise minimized.

Source: USACE Road Exemption Summary

Local & Regional Rules & Ordinances

Watershed Districts

http://www.mnwatershed.org/

Joint Powers Boards

Mississippi River Headwaters Board

http://mississippiheadwaters.org/

St Louis River Board

http://www.stlouisriver.org/index.html

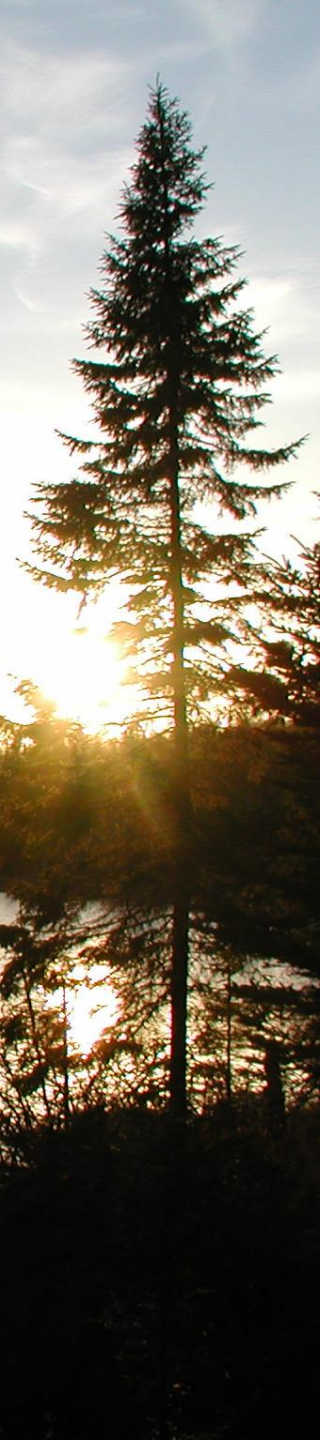
Minnesota River Joint Powers Board

http://mrbdc.mnsu.edu/org/mrbd/index.html

What are your Responsibilities?

- Know the rules
- Determine if permit is needed or exempt
- Do the paperwork
- Plan & Implement BMPs
- Follow up to ensure BMPs are functioning

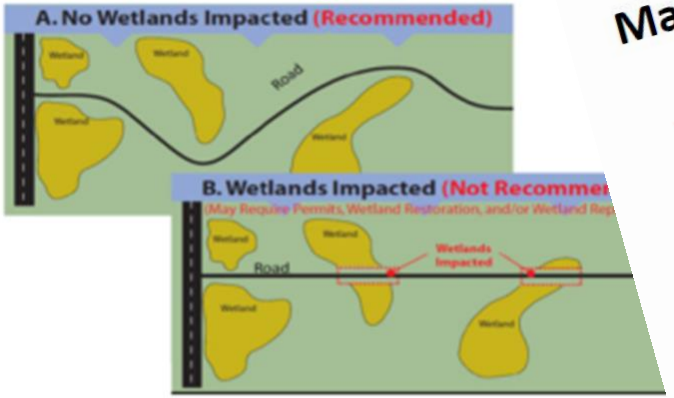
Forest Management Guidelines & Implementation Monitoring



Minnesota Forest Management Guidelines Quick Reference Pocket Guide

Stream and Wetland Crossings

✓ Avoid crossing streams and wetland whenever possible



✓ Utilize the following general guidelines when installing crossings.

- Minimize the number of crossings
- **Design approaches to divert water away from stream or wetland**
- Install crossings at 90-degree angle
- Install at firm soil/bank areas
- **Install at low gradient and short slopes**
- Maintain the cross-sectional area of a stream
- **Use erosion control on all approaches**
- Reshape and stabilize crossings after use

Stream and Wetland Crossings

Timber Harvesting and Forest Management Guidelines on Public and Private Forest Land in Minnesota

Photo Copyright 2008 MNDNR

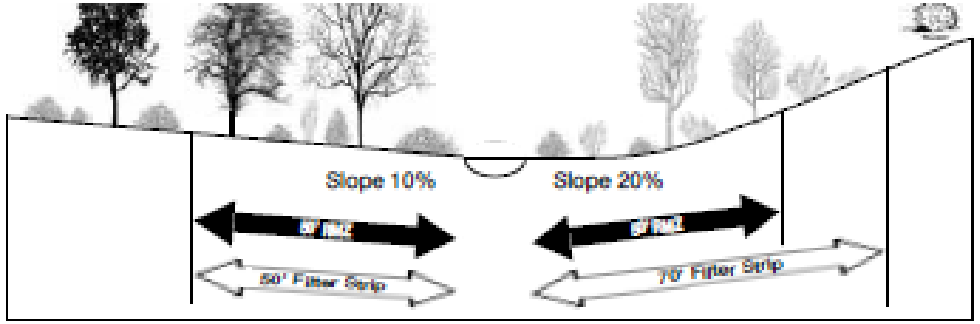
2009 Monitoring Implementation Results

A report by the Minnesota Department of Natural Resources

Respectfully submitted to the Minnesota Forest Resources Council

Filter Strips

A filter strip is the area of land adjacent to a water body that traps sediment before it reaches surface water. Harvesting is permitted in a filter strip as long as the integrity of the filter strip is maintained.



Schematic showing the distinction between RMZs and filter strips. The width of the filter strip and RMZ if present may be the same or different depending on slope and water feature type.

Apply filter strips to all perennial and intermittent streams, lakes, open water wetlands, non-open water wetlands, seasonal ponds, seeps, and springs.

- Minimum filter strip width is 50 feet for slopes less than 10%. Increase the width by 2 feet for each slope percent above 10%.
- Limit soil disturbance in the strip to less than 5% of the area and do not concentrate at any one location.
- Minimize compaction in all filter strips.
- Avoid placing roads, skid trails, and landings in filter strips.

Filter Strip – metrics

- All wetlands and water bodies are mapped and visited to evaluate condition of filter strip
- Evaluators look at:
  - Filter strip width (slope & distance)
  - Bare soil exposure
    - If so are WD / EC installed to divert water off bare soils
  - Presence of roads, landings or skid trails in F-strip
  - Rutting (bare soil & concentrates flow)
  - Evidence of erosion – if so is sediment reaching water body?

Filter Strip – results

- 602 Filter Strips monitored
- Over all compliance 85%
- 6% (36) had roads within filter strip that did not cross wetlands or waterbody
  - 50% of these were pre-existing roads
  - 48% needed WD/EC but only 1 had practices installed
- 16% had Skid trails located within filter strip
  - 63% skid trails located within filter strips had little or no exposed soil (< 5% distributed), but eight skid trails located within filter strips had erosion occurring and four of these resulted in sediment into wetlands
- 98% - no evidence of sediment reaching a waterbody

Opportunities to improve implementation

- Avoid placement of roads, skid trails or landings in filter strips.
- If unavoidable, avoid bare soils and ensure that appropriate erosion control is implemented such as scattered slash, mulching, seeding, or sediment barriers
- Fix up existing roads especially when they are in close proximity to wetlands and waterbodies (filter strips)

Crossings & Approaches

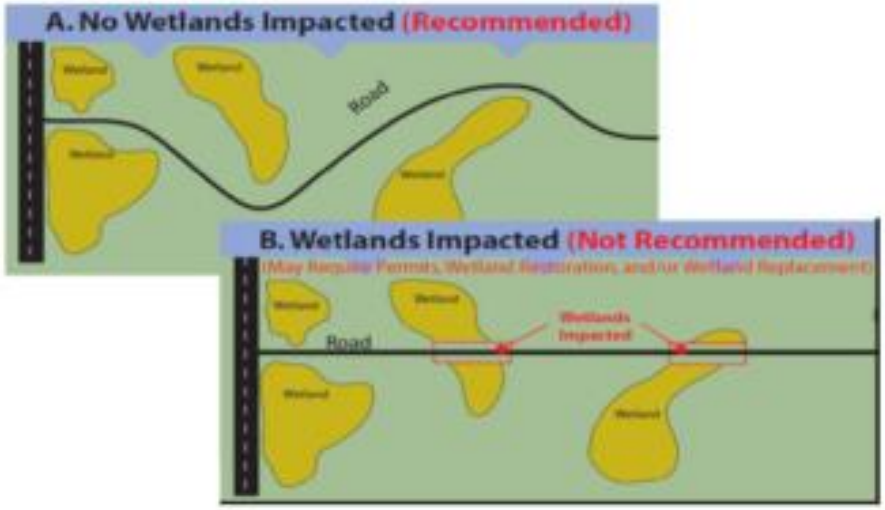
- **Crossings:** Sections of roads or skid trails where equipment crosses a wetland or waterbody.
- **Approaches:** The portion of a road or skid trail immediately leading into a wetland or onto the crossing of a wetland or waterbody.

What do Guidelines say…

Minnesota Forest Management Guidelines Quick Reference Pocket Guide

Stream and Wetland Crossings

✓ **Avoid crossing streams and wetlands whenever possible**



✓ Utilize the following general guidelines when installing crossings.

- Minimize the number of crossings
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- Install crossings at 90-degree angle
- Install at firm soil/bank areas
- **Install at low gradient and short slopes**
- Maintain the cross-sectional area of a stream
- **Use erosion control on all approaches**
- Reshape and stabilize crossings after use

Metrics for Approaches

- All crossings and approaches are visited and evaluated
- Evaluators look for:
  - Percentage of bare soils on approach
  - Slope & length of approach
  - Need for water diversion (based on slope, length & bare soils)
  - Presence of Water diversion / Erosion control
  - Was WD / EC installed correctly and functioning?
  - Is erosion occurring?
  - Is sediment reaching the wetland or water body?
  - Could crossing have been avoided?

- *Criteria for approaches that do not meet guidelines include:*
  - *Conditions that could result in sediment to wetland or water body*
  - *Bare soils susceptible to erosion*
  - *Rutting on approach*
  - *Erosion on approach*
  - *Lack of water diversion / erosion control were needed*

Crossings & Approaches

278 crossings, 657 Approaches

- 22% roads, 73% skid trails , 5% landings
- 657 approaches:
  - 90% in stable condition – not needing WD/EC
- Of the 64 approaches that needed water diversion/erosion control practices, only 12 (19%) had them installed and 60% had erosion evident

- 2% had evidence of sediment reaching wetland or waterbody

Approaches

Table 20: Condition of All Approaches				
	Roads	**Skid Trails**	**Landings**	**Total**
Total number of approaches (#)	139	493	27	657
Approaches - diversion practices not needed (#)	125	443	25	593
# Approaches - diversion practices needed (#)	**12**	**50**	**2**	**64**
# Approaches - diversion practices installed where needed	**6**	**6**	**0**	**12**
Rutted (# of total)	0	9	1	10
Erosion evident (# of total)	10	28	1	39
Sediment reaching waterbody (# of total)	**5**	**9**	**0**	**14**

Opportunities to improve implementation

- Redistribute tops and finer slash to approaches as operation progresses
- Monitor presence of bare soil on approaches and segments
- Install water diversion on all approaches especially those with bare soils and slope/length that triggers installation of water diversion practices
- Ensure that erosion control is sufficient to sustain through spring runoff and heavy summer rains

Segments

- A segment is a section of road, skid trail, or landing with a grade of ≥2%, and slope lengths sufficient to trigger installation of WD / EC as indicated in table ROAD-2 (Water Bar Spacing) page 30 of the roads guideline chapter.

- *Some segments have potential to impact water quality*

Water Bar Spacing	
Slope	Spacing between water bars
2%	250ft
5%	130ft
10%	80ft
15%	50ft
25%+	40ft

Segments

What do Guidelines say…

Prevent sedimentation by following these steps:

- Minimize soil disturbance and promptly re-vegetate
- Slow down and inhibit concentration of runoff
- Direct runoff to stable areas away from water
- Capture any sediment within the runoff

Install erosion control devices when the following conditions exist:

- At all approaches to stream and wetland crossings.
- When slope on landings, roads, and skid trails is greater than 2% and sedimentation of water and wetlands is possible.

This steep road experienced significant damage from erosion. Installation of erosion control structures at the top third of the slope and below that point as needed is one of the most effective ways to reduce erosion.

Utilize the following erosion control structures and others as appropriate:

Broad–based dips

- Useful for active haul roads with gentle slopes.
- Angle the dip perpendicular to the road and slope outward at 3% into vegetated area.

- Install at appropriate spacing depending on slope.

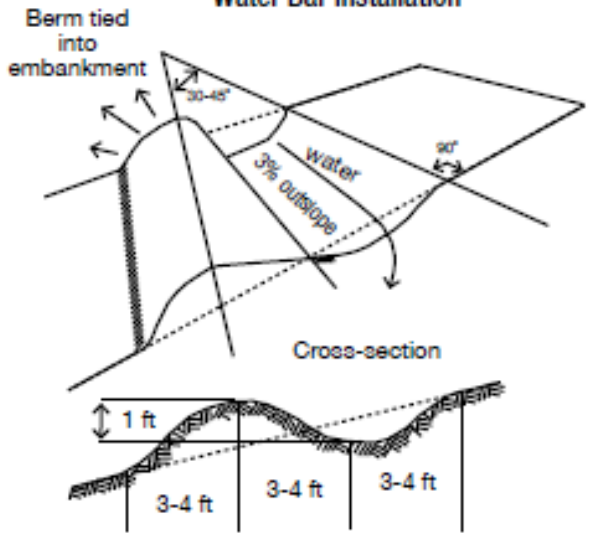
Slope	Space between dips
0-2%	500ft
3-4%	300ft
5-7%	180ft
8-10%	150ft
11-15%	130ft
16%+	110ft

Water bars

- Useful for closed roads, skid trails, and landings.
- Construct out of soil, logs, or other material.
- Install at appropriate spacing depending on slope.

Water Bar Spacing	
Slope	Spacing between water bars
2%	250ft
5%	130ft
10%	80ft
15%	50ft
25%+	40ft

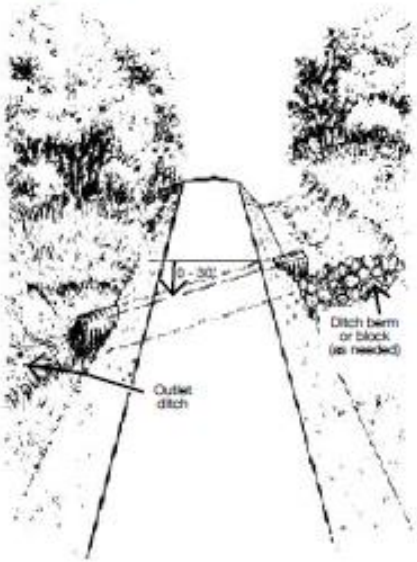
Water Bar Installation



- Construct a shallow trench (approximately 6 inches deep) on the upslope side of the bar to funnel runoff.

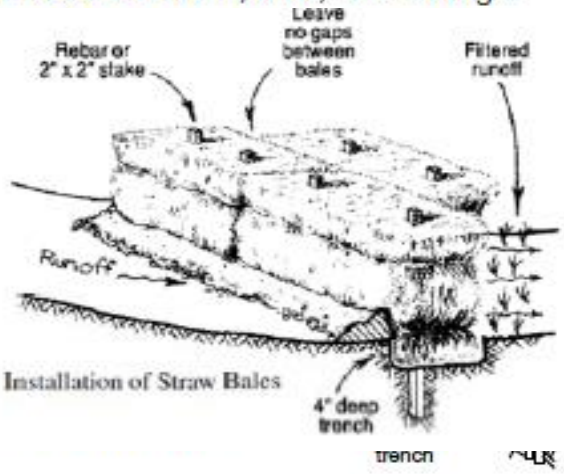
Cross-drain culverts

- Minimum diameter of 12 inches.
- Install at 2% grade steeper than the ditch.
- Direct outflow into vegetated area.
- Armor culvert inlet and outlet.



Straw bales and excelsior rolls

- Useful for closed roads, trails, and landings.



Brush and slash barriers

- Useful for active skid trails and during frozen conditions.

This slash barrier has good contact with the soil surface which will stop water from flowing down the skid trail.

This log barrier has poor contact with the soil surface which will allow water to flow under it and increase erosion further down the skid trail.

- Place scattered slash across the entire trail and at top of slope.
- Make sure slash has good contact with ground surface.

Stabilize bare soil areas with scattered slash, mulch, and native seed mixes as soon as possible following disturbance.

Scattered slash can be used to stabilize bare soil areas as shown on this skid trail.

Conduct follow up visits to make sure that erosion control structures are functioning properly.

Erosion control structures should be periodically checked and maintained to ensure they are properly functioning. Here, an improperly maintained culvert washed out of the road, creating sedimentation risks to water quality and inhibiting road traffic.

Segment metrics

- All segments are noted
- Segments are rated on whether WD / EC is needed, installed, working, and if erosion is occurring.
- Examples of WD / EC:
  - Water bars (soil, slash or logs, biologs)
  - seeding,
  - scattered slash,
  - mulching (wood chips or fine slash)…
  - Shaping of road including crowning and outsloping

  - If harvest results in no exposed soil then erosion hazard is minimized.

Segments - Results

- 378 segments

80 % skid trail, 18% roads,
1% landings

- 50% needed WD/EC
  - 2/3 had practice in place
- 3% - sediment to wetlands

Segments

Table 25: Condition of All Segments				
	Roads	**Skid trails**	**Landings**	**Total**
Total number of segments	67	**308**	3	378
Segments w/ potential to impact water quality (WQ segments)	26.9%	12.3%	100%	15.6%
Segments - WD/EC not needed	7.5%	**60.7%**	0%	50.8%
Segments – WD/EC needed	**92.5%**	39.3%	100%	49.2%
Segments with WD/EC installed where needed	**38.7%** of 62	**81.0%** of 121	33.3% of 3	66.1% of 186
Sediment reaching waterbody	6.0%	1.6%	66.7%	2.9%
# Segments – diversion practices needed	62	121	3	186

Opportunities to improve implementation

- Redistribute tops and finer slash to skid trail segments as operation progresses
- Install WD/EC on segments especially those with potential to impact water quality
- Install water diversion such as crowning or outsloping on road segments during operation
- Stabilize closed road segments with WD/EC
- Ensure that erosion control is sufficient to sustain through spring runoff and heavy summer rains

Evidence of Erosion

- Evaluators document visual evidence of erosion across site

- Evaluators look for gullies, rills, sheet erosion, debris dams, sediment plumes…

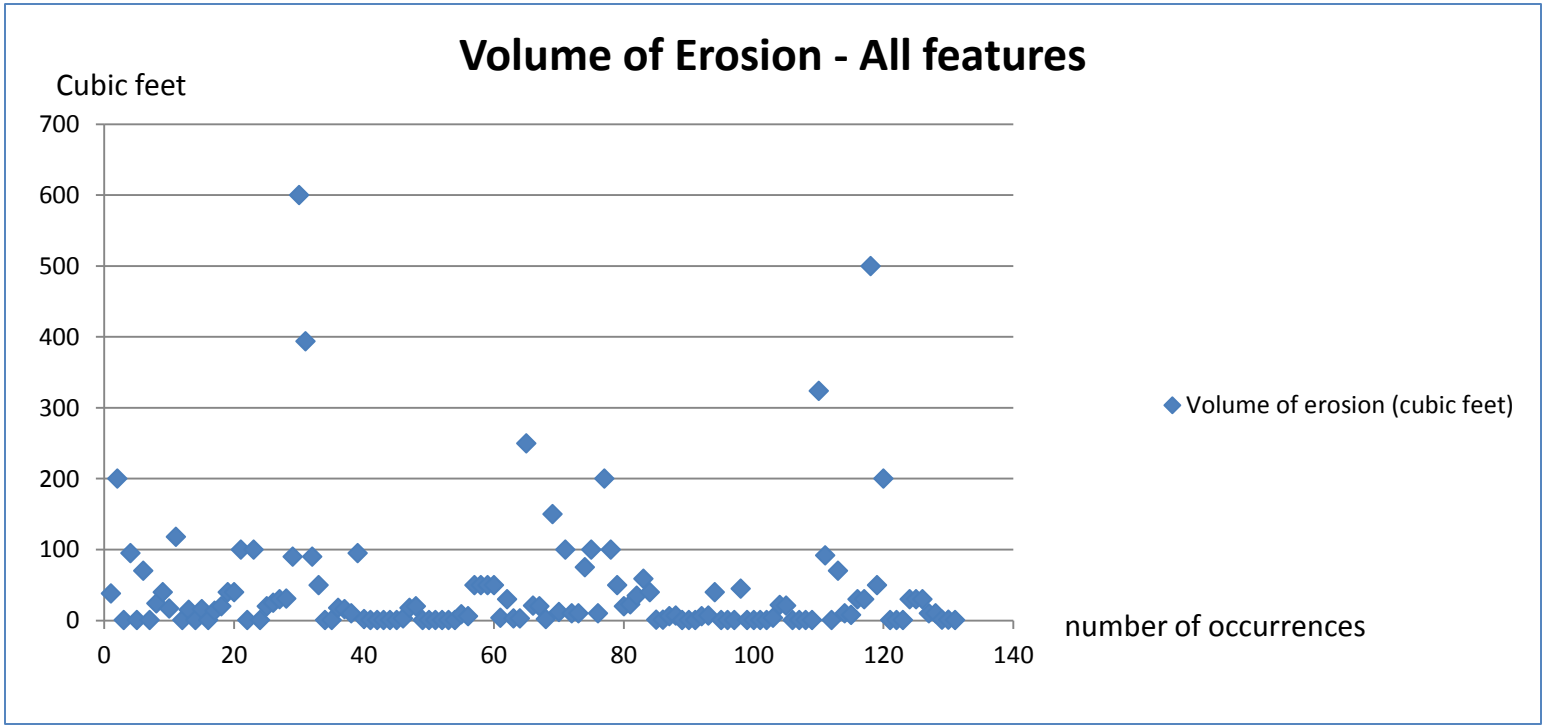
- Volume of erosion estimated by length, width and depth of eroded materials

Erosion Summary

(84 sites)

- 1848 individual locations evaluated
  - Landings, roads, skid trails, filter strips, approaches…
- 9% - evidence of erosion occurring
- 2% - sediment reaching wetland or waterbodies
- Highest frequency and volume on **landings**

Table ____. Frequency and type of erosion occurring on various site features							
	Total features	*Erosion evident*	*Type of erosion occurring (#)*			*Volume range*	*Sediment reaching water*
			Sheet	*Rill*	*Gully*		
Cultural Resources	*2*	*0*	*-*	*-*	*-*	*-*	*-*
Steep Slopes	*29*	*1 (3%)*	*1*	*-*	*-*	*Trace*	*0 (0%)*
Landings	*180*	*34 (19%)*	*33*	*-*	*1*	*Trace -600 ft3*	*1 (0.6%)*
Segments	*378*	*47 (12%)*	*34*	*13*	*0*	*Trace – 500 ft3*	*11 (3%)*
*Filter strips**	*602*	*36 (6%)*	*36*	*-*	*-*	*Trace - 30ft3*	*10 (0.6%)*
Approaches	*657*	*39 (6%)*	*34*	*3*	*2*	*Trace – 250 ft3*	*14 (2%)*



Summary

- We are dealing with situations were we need to utilize water diversion and/or erosion control on a daily basis
- Implementation of water quality BMPs is important to maintain a voluntary BMP program in Minnesota
- Various regulations require use of water diversion and/or erosion control even when silvicultural exemptions apply

- Most of the time we are doing a good job at Guideline implementation, but there are opportunities for improvement in important situations.

- Opportunities to improve guideline implementation include:
  - Installing erosion control on roads within filter strips and pre-existing roads
  - Installing WD/EC on approaches to crossings
  - Installing WD/EC on roads, skid trails & landing **segments,** particularly where segments have potential to impact water quality.
  - Installing erosion control practices during on-going operations rather than waiting for sale closer to install practices.