Erosion Control Best Management Practices for Logging and Forestry

Dick Rossman Minnesota DNR
John Chapman University of Minnesota
March 11, 2015
A Primer on Logging and Forestry
Skidder
Harvester
Erosion Problems

Cleared Land needs cover

Haul Roads Need Stabilization
Common Erosion Management Practices
Harvest and Landing Area

• Scattered slash cover,
Roads

• Grading, Shaping, diversions
Water Bar Installation

Berm tied into embankment

\[ \text{30-45} \degree \]

water

3\% outslope

90\degree

Cross-section

1 ft

3 - 4 ft

3 - 4 ft

3 - 4 ft
Forest Management
Erosion Control Regulations
and
BMP Compliance

Dick Rossman Minnesota DNR
March 11, 2015
Regulatory Programs

Minnesota Local/State/Federal

USE THIS APPLICATION FOR ANY PROJECT

Local Government Unit Application
Minnesota Department of Natural Resources

Note: The U.S. Army Corps of Engineers (COE) will process if state water quality certification is required.

This application packet includes:

Part I: The BASIC APPLICATION and

Part II: The REPLACEMENT PLAN
replacement plan for wetland mitigation in Local Government Unit (LGU) or Soil and Water Conservation District (SWCD) jurisdiction.

Board of Water and Soil Resources
Wetland Conservation Act Rules
Chapter 8420

Extracted from Minnesota Rules 2009

Text Provided By:
The Office of Revisor of Statutes
7th Floor, State Office Building
St. Paul, MN 55155
Silvicultural Exemptions

• Forestry exemptions are available for:
  – USACE section 404 permits
  – WCA wetland replacement
  – MnPCA Stormwater permits

• Generally exempts from:
  – Permit application & fees
  – Wetland replacement
  – SWPPP development / approval
  – Some Paperwork

• Does not exempt from the water quality protection measures, including the need to use BMPs
Construction Storm Water Permit

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

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.

Must use appropriate erosion control measures to prevent sedimentation.
Forest Management Guidelines
Implementation & Monitoring

Stream and Wetland Crossings

- Avoid crossing streams and wetlands 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

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

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 & concentrated flow)
  - Evidence of erosion – if so is sediment reaching water body?
Filter Strip - Results

- 602 Filter Strips monitored on 84 sites
- 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% of those skid trails had little or no exposed soil (< 5% distributed)
- 98% - no evidence of sediment reaching a waterbody
Opportunities for Improvement

- Avoid placement of roads, skid trails or landings in filter strips.
- Avoid bare soils in filter strips and ensure that appropriate erosion control is implemented such as scattered slash, mulching, seeding, or sediment barriers.
- Fix up pre-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.
Crossings & Approaches

What do Guidelines say...

Stream and Wetland Crossings

Avoid crossing streams and wetlands whenever possible.

A. No Wetlands Impacted (Recommended)

B. Wetlands Impacted (Not Recommended)

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
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 (84 sites)

• 278 Crossings:
  – 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 or erosion control, only 12 had them installed and 38 had erosion evident

• 98% had no evidence of sediment reaching a wetland or waterbody
Opportunities for Improvement

• 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 with bare soils
• 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 the Water Bar Spacing guide.

- Some segments have potential to impact water quality.

<table>
<thead>
<tr>
<th>Water Bar Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope</td>
</tr>
<tr>
<td>2%</td>
</tr>
<tr>
<td>5%</td>
</tr>
<tr>
<td>10%</td>
</tr>
<tr>
<td>15%</td>
</tr>
<tr>
<td>25%+</td>
</tr>
</tbody>
</table>
Segments

What do Guidelines say...
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.

**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**

<table>
<thead>
<tr>
<th>Slope</th>
<th>Spacing between water bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>2%</td>
<td>250ft</td>
</tr>
<tr>
<td>5%</td>
<td>130ft</td>
</tr>
<tr>
<td>10%</td>
<td>80ft</td>
</tr>
<tr>
<td>15%</td>
<td>50ft</td>
</tr>
<tr>
<td>25%+</td>
<td>40ft</td>
</tr>
</tbody>
</table>

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

Minnesota’s Forest Management Guidelines
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.

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.

Minnesota’s Forest Management Guidelines

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

• All 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 no exposed soil, then erosion hazard is minimized.
Segments - Results

• 378 segments (84 sites)

• 50% needed WD/EC
  – 2/3 had practice in place

80 % skid trail, 18% roads, 1% landings
Opportunities for Improvement

• 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 practices 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 monitoring sites

• 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 & segments
Table ____: Frequency and type of erosion occurring on various site features

<table>
<thead>
<tr>
<th>Feature Type</th>
<th>Total features</th>
<th>Erosion evident</th>
<th>Type of erosion occurring (#)</th>
<th>Volume range</th>
<th>Sediment reaching water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sheet</td>
<td>Rill</td>
<td>Gully</td>
</tr>
<tr>
<td>Cultural Resources</td>
<td>2</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Steep Slopes</td>
<td>29</td>
<td>1 (3%)</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Landings</td>
<td>180</td>
<td>34 (19%)</td>
<td>33</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Segments</td>
<td>378</td>
<td>47 (12%)</td>
<td>34</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Filter strips*</td>
<td>602</td>
<td>36 (6%)</td>
<td>36</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Approaches</td>
<td>657</td>
<td>39 (6%)</td>
<td>34</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**Volume of Erosion – where erosion occurred**

- **Volume of erosion (cubic feet)**
- **Number of occurrences**
BMP Program Cycle

- **BMP Development**
- **Training**
- **Research**
- **Monitoring**

**BMP Development**
- Stream and Wetland Crossing
- Water bars
- Water flow installation

**Training**
- Classroom lectures and discussions
- Field tours and hands-on activities

**Research**
- Data collection and analysis
- Environmental monitoring

**Monitoring**
- Continuous tracking and evaluation
- Feedback and adjustments

**Sustainable Minnesota Forest Resources**

**Map and Diagrams**
- Forest management and conservation
- Site-specific planning and implementation
Training

• http://www.mlep.org/onlineerosionintro.htm
Welcome to the Erosion Control workshop web page!

The workshop educated participants on the appropriate selection, installation and maintenance of erosion control practices on logging roads, trails and landings. Participants learned when and where erosion control practices are needed, how to determine the appropriate practice for a specific site situation, and proper installation and maintenance of practices. Participants were also exposed to new erosion control techniques and materials not commonly seen within forest management in Minnesota.

Focus during the workshop was given to erosion control practices on approaches to wetland and stream crossings (both on access roads and skid trails), steep sections of roads and skid trails with exposed soil, and roads or skid trails and landings where construction has exposed soil to erosion (i.e., where cut and fill has created steep side-slopes or ditches). Additionally, focus was given to installation and maintenance of erosion control practices on roads and timber sales during active operations.

Videos:

Introduction: Erosion Control & Water Diversion
Earth Berm Water Bar
Slash Water Bar
Slash Mat
Lead Off Ditch
Polyacrylamides (PAM)
Erosion Control Blanket
Silt Fence & Biologs
Fabrics
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