Conservation Sheet #655 **August 2003**

Establishing Forest Harvest Trails and Landings

NRCS Natural Resources Conservation Service

Properly constructed forest harvest trails and landings provide access for forest management, help prevent erosion, and increase the wildlife and recreational value of the forest.

Planning

Proper planning and design of forest harvest trails and landings are essential to minimize adverse affects to soil, water, plants, wildlife and human values in the harvest area. Layout and design of harvest trails, access road, landings and their components (also referred to as decking and yarding areas) should be done well in advance of the harvest and should consider such items as: soil type(s), surface drainage, topography, time of the year, cultural or historic values, size and limitations of equipment as well as any negative impacts on wildlife. Special consideration should be given to streams, wetlands, and other sensitive areas as well as threatened, endangered wildlife or plant species that may be present in the proposed timber harvest area. Federal, state and local laws and regulations should be reviewed and complied with. Certain Michigan Public Acts protecting wetlands, inland lakes and streams and their tributaries may require permits for activities associated with establishing and maintaining forest harvest trails and landings.

General Specifications Guide

Landings, Decking and Yarding Areas:

These areas are used for the temporary storage, collecting, processing and loading of forest products before leaving the harvest site.

- Locate suitable sites for these areas before establishing harvest trails and access roads if possible. Maximum utilization and efficiency is obtained when landings are spaced approximately 900 feet apart. Preferred sites include flat ridge tops and other slightly sloping well-drained areas that are closest to access or haul road and to the stand(s) being harvested. Use soil survey and topographic maps to assist in locating landings and yarding areas. Soils with a permanent or seasonal high water table should be avoided whenever possible. Divert water away from access roads and harvest trails so runoff does not enter the landing area. ***(Refer to Michigan NRCS Std. 362-Diversion for details.)***

- Do not locate landings or yarding areas within 200 feet of streams, ponds, lakes or wetlands. If this cannot be avoided, construct temporary sediment basins or install filter strips, berms or sediment fences around perimeter to contain sediment and filter runoff.

- Grade landing and yarding areas after use to remove ruts and facilitate surface drainage.

- Seed all critical areas and landings after use. **(*Refer to Michigan NRCS Standard 342-Critical Area Treatment and 655- Harvest Trails and Landings for seeding recommendations.)*** Allow small landings and yarding areas where erosion hazard is slight to revegetate naturally by covering bare areas with logging debris such as wood chips, bark and small branches. Wildlife plantings may be considered as an addition to or alternative to the critical area treatment. Select plants that are non-invasive. ***(Refer to Michigan NRCS Standard 645- Upland Wildlife Habitat Mgt. for species selection.)***

Forest Haul or Access Roads
wheeled and tracked vehicles
This type of road is designed for low speed seasonal use for both. ***Refer to Michigan NRCS Std. 560 - Access Road for details.***

- Locate access roads as close to the contour as possible. A 2 to 10 percent grade is considered optimum with a minimum width of 10 to 12 feet. Short, steep sections slightly over 10 percent are permissible but shall not exceed 300 feet in length. Restrict traffic during the wet season. Do not locate within Zone 1 of Riparian Forest Buffer. ***(Refer to Michigan NRCS Std. 391-Riparian Forest Buffer.)*** A well-planned road/trail system should disturb less than 10 percent of the forest area**.**
- Install broad-based dips, (see *Figure 1*) culverts, rock chutes and other measures as needed to safely convey surface water away from roadbed.
- Install cross drainage according to *Figure 2*.

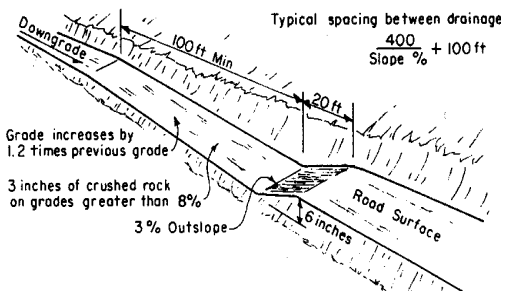

Figure 1- **Use broad-based dips on roads with grades of 10% or less.**

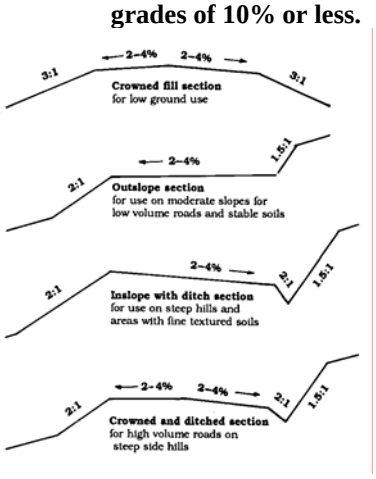

Figure 2- **Typical Road Cross-Sections**

***Table 1*- Distance between broad-based dips**

Road Grade (%)	Distance (ft.)
2-4	300-200
5-7	180-160
8-10	150-140

Harvest trail design guidelines:

Harvest trails (also known as skid trails) are designed for periodic or temporary use during the harvesting operation.

- Keep grades flat -less than 15% if possible.
- Locate harvest trails outside of Zone 1 of Riparian Forest Buffer. ***(Refer to Michigan NRCS Std. 391- Riparian Forest Buffer.)***
- Locate harvest trails approximately 200 feet apart using herringbone, circular or other pattern that fits topography.
- Any harvest trail that requires crossing of a stream will require a bridge or a culvert of acceptable design. Design approach to stream at 90-degree angle of the stream if possible. Contact Michigan DEQ for permit requirements.
- Avoid rocky places, low, wet areas and high water table soils. Skidding should be across the slope or on the contour.

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- Install water bars at about a 30-degree angle down slope on skid trails to prevent erosion. *Refer to Figure 3 and Table 2...*

- Seed cut and fill areas and other critical areas as soon as practical. ***(Refer to Michigan NRCS Standard 342-Critical Area Planting for details.)***

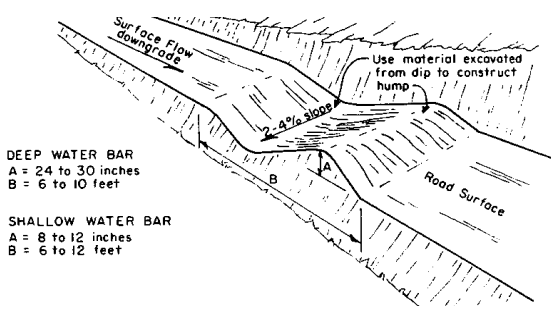


***Figure 3*- Typical cross section of water bar**

***Table 2* – Space water bars closer as slope increases**

Trail Grade -%	Distance –Ft.
2	250
5	135
10	80
15	60
20	45

- Construct open-top culverts according to *Figures 4 and 5.* Note: Broad-based dips, water bars, and box culverts are best suited to any harvest trails and access roads that will receive regular, periodic, continued use. Protect outlets of open-top culverts, broad-based dips, and water bars with stone, grass sod, brush, logs, or other materials that will reduce the velocity of the runoff and control scouring.

***Figure 4* – Open-top culvert on trail effectively handles low volumes of water.**

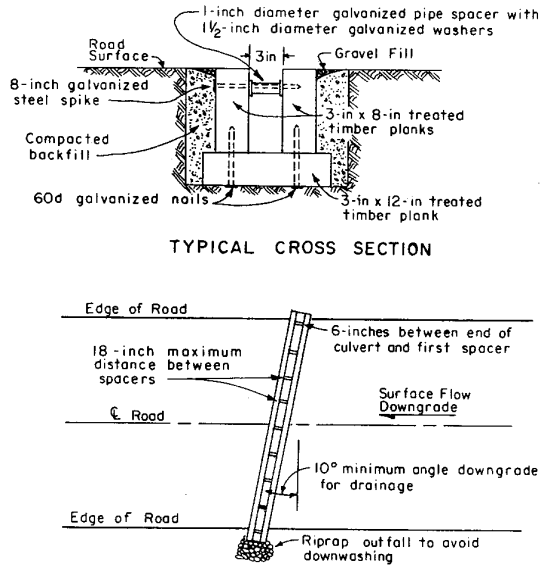


***Figure 5* – Design of wooden open-top culvert**

Protection of Watercourses, Wetlands And Other Sensitive Areas

Harvest trails, access roads, log landings and yarding areas may become a source of runoff that may carry sediment to environmentally sensitive areas.

- Maintain native grass filter strips between disturbed areas (roads, harvest trails, landings, etc.) and watercourses, wetlands and other sensitive areas to protect water quality and reduce off-site delivery of sediment. See *Table 3* below for minimum widths of a native grass filter strip.

***Table 3*- Minimum filter strip widths for filtering runoff from trails, landings and haul roads.**

Land Slope of Area Above Filter Strip (%)	Filter Width of Strip (Ft.)
0-8	20
9-15	30
>15	40

- If possible, use an alternative route to avoid crossing a stream with a haul road or harvest trail. Fords are rarely suitable and should not be used on streams used for domestic water supply or streams that support a fishery.

- Bridge streams to reduce the potential for sediment loading. Use of a portable bridge that can be removed after the harvest is completed should be considered before installing permanent bridges or culverts.

- Crossings should be established at right angles to the stream where the channel is straight and unobstructed. The roadway over the centerline of the stream should be higher than the roadway at the approaches. Bridges should be designed to support the class of vehicle or equipment used on the road.

- Access roads and harvest trails should be constructed to slope up and away from stream crossings to prevent water from the stream entering the roadbed during flood stages. Divert up-slope road runoff into a catch basin. ***Refer to Michigan NRCS Standard 638-Water and Sediment Control Basin***.

- Permanent culverts should be sized in accordance to procedures set forth in Chapter 3 of the NRCS Engineering Field Manual. ***Refer to Michigan NRCS Standard 410-Grade Stabilization Structure*.**

- Temporary culverts (squash and round type) may be installed according to *Figure #6.* See *Figure #7* and *Table #4* to obtain quick sizing for temporary culverts.

- Remove temporary bridges and culverts as soon as they are no longer necessary for logging activities. The stream shall be immediately reshaped to its original cross-section with all slopes properly stabilized.

- Federal, State and local laws govern activities that impact wetlands, streambeds, lakes and other riparian areas. <u>Always check with the Michigan DEQ before attempting to do work in or adjacent to these sensitive areas.</u>

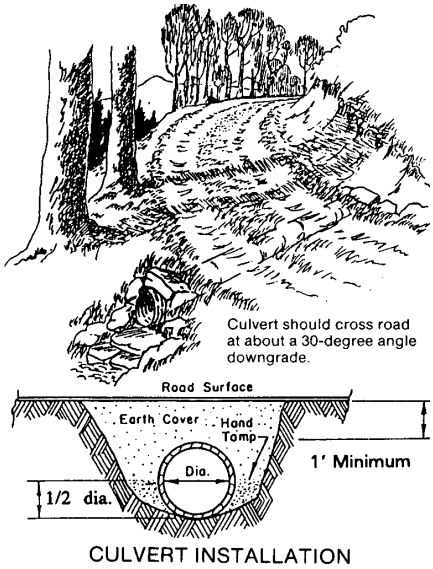
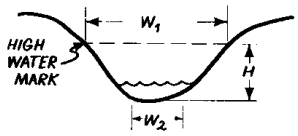


***Figure 6* – Corrugated Metal Pipe (CMP), Plastic or Concrete culverts may be used to pass water under trails and haul roads.**



W_1 - CHANNEL WIDTH AT HIGH WATER FT.
W_2 - CHANNEL WIDTH AT BOTTOM FT.
H - HEIGHT OF HIGH WATER ABOVE CHANNEL BOTTOM FT.

CULVERT AREA WITH 100% SAFETY FACTOR SQUARE FEET = $H \times (W_1 + W_2)$

Figure 7 **– Quick method for sizing temporary culverts**

Table 4 **– Culvert End Area and Diameter**

CULVERT END AREA & DIAMETER

End Area (square feet)	Diameter (inches)
1.80	18
3.10	24
4.90	30
7.10	36
9.60	42
12.60	48
15.90	54
19.60	60
23.80	66
28.30	72
33.20	78
38.50	84
44.20	90

References Used to Develop This Conservation Sheet:

Permanent Logging Roads for Better Woodlot Management; Publication No. NA-FR-18; USDA Forest Service, State and Private Forestry, Northeast Area; Broomall, Pennsylvania; 1978.

Woodlands of the Northeast, Erosion and Sediment Control Guides; USDA Soil Conservation Service, Northeast National Technical Center and USDA Forest Service, Northeast Area State and Private Forestry; Broomall, Pennsylvania; 1977.

Soil Erosion and Sedimentation Control Guidelines for Forestry; Commonwealth of Pennsylvania, Department of Environmental Resources; Harrisburg, Pennsylvania.

Forestry Handbook, Second Edition; Society of American Foresters; John Wiley and Sons, Inc. 1984.

Michigan Technical Note, Woodland No. 17 - Woodland Roads Planning, Design, Construction and Maintenance; USDA Soil Conservation Service; East Lansing, Mi.; 1982

Forestry Facts-Forest Roads, Steve Loladay, Wisconsin Dept. of Natural Resources, and Jeff Martin, Department of Forestry, University of Wisconsin. 1995.

A Guide to Planning and Constructing Forest Roads Systems, Ray Stoner and Terry McFall, USDA Natural Resources Conservation Service, Nacogdoches, Texas.

Water Quality Management Practices on Forestland, Michigan Department of Natural Resources, Lansing, Michigan, 1994.

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Reference/File Indices

Topic Application: Resource Series:

[ ] Construction	[ ] Agronomy
[ ] Design	[ ] Biology
[x] Job	[ ] Engineering
[ ] Information	[x] Forestry
[ ] Management	[ ] Hayland
[ ] _____	[ ] Livestock
[ ] _____	[ ] Pastureland
[ ] _____	[ ] Recreation

Harvest Trails and Landings Layout

Land user_____
Date _____

Address
_____
_____
Phone _____

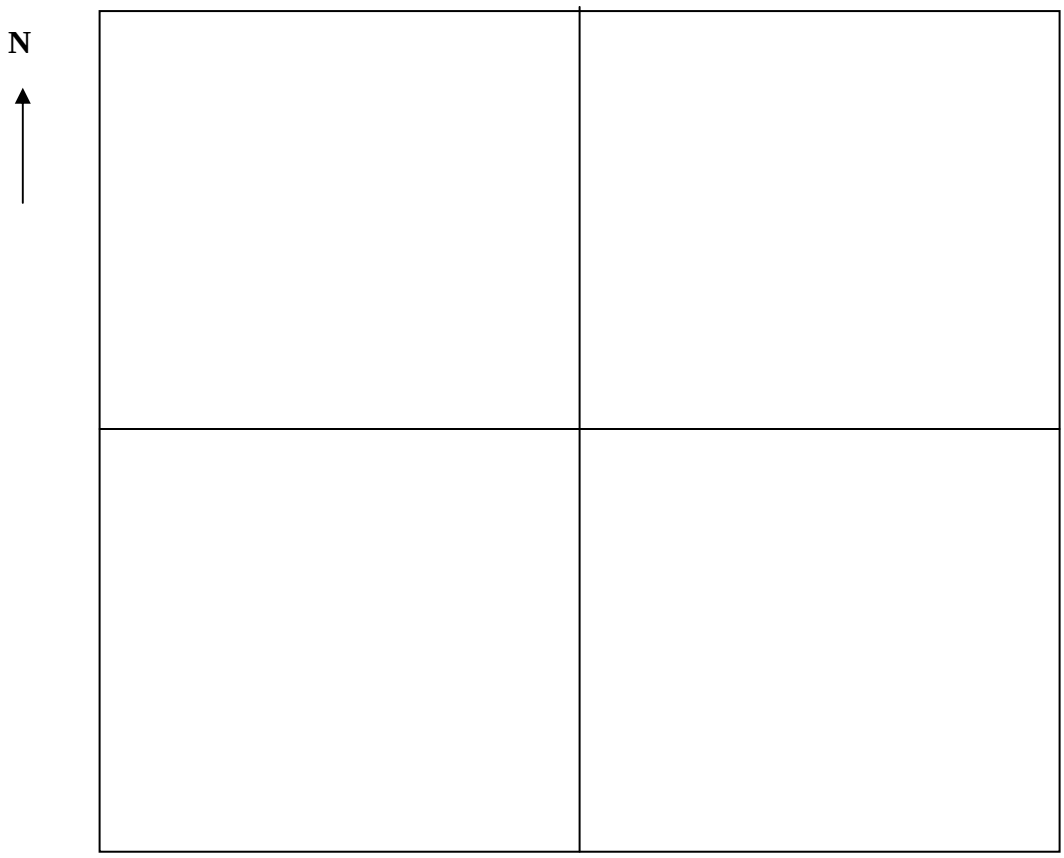
Harvest Trails: (ac.) _____
Water bar: No.)_____
Seeding: (Acs.) _____
Filter Strip(s):
(Acs.)_____

County_____
Location:
Twp._____Range_____
Sec._____

Access Road: (Ft.)_____
Culvert: (No.)_____

Broad-based Dip: (No.)_____
Landing: (Acs.) _____

Location of Components Needed:



Scale: _____