Maryland's Erosion and Sediment Control Standards and Specifications for Forest Harvest Operations

2005 Draft

Maryland Department of the Environment

Maryland Department of Natural Resources

and the

State Soil Conservation Committee

MDE

STATE OF MARYLAND DEPARTMENT OF NATURAL RESOURCES

2005 Maryland Erosion And Sediment Control Standards and Specifications For Forest Harvest Operations

Draft

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INTRODUCTION

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LIST OF TABLES

Table 1 - Summary Of Erosion And Sediment Control Plan Approval Options.....8
Table 2 – Broad Based Dip Spacing vs Road Grade 45
Table 3 – Rolling Dip Spacing vs Road Grade.....47
Table 4 – Water Bar Spacing vs Road Grade 50
Table 5 – Cross Road Drainage vs Road Grade 56
Table 6 – Straw Bale Dike Slope Length & Steepness Design Criteria.....84
Table 7 – Silt Fence Slope Length & Fence Length Design Criteria 87
Table 8: Nurse Crops (Temporary Seeding).....93
Table 9: Permanent Seeding Mixtures.....94
Table 10 - Area Determinations For Roads 97

LIST OF DIAGRAMS

Diagram 1.0 – Pre-Harvest Map 16
Diagram 2.0 – Stabilized Harvest Entrance 21
Diagram 3.0 – Streamside Management Zone, Statewide 34
Diagram 4.0 – Streamside Management Zone, Restricted To Lower Eastern Shore 41
Diagram 5.0 – Broad-based Dip 46
Diagram 6.0 – Rolling Dip 49
Diagram 7.0 – Water Bars 52
Diagram 8.0 – Water Turnouts 54
Diagram 9.0 – Pipe Culvert Installation 57
Diagram 9.1 – Open Top Box And Pole Culverts 58
Diagram 10.0 – Temporary Access Bridge 65
Diagram 10.1 – Temporary Access Bridge Construction Specifications 66
Diagram 10.2 – Temporary Access Bridge Construction Specifications Continued 67
Diagram 10.3 – Portable Skidder Timber Bridge Design 68
Diagram 10.4 – Portable Skidder Timber Bridge Design Material List 69
Diagram 10.5 – Portable Skidder Timber Bridge Design Isometric View 70
Diagram 10.6 – Portable Skidder Timber Bridge Design Sections 71
Diagram 10.7 – Portable Skidder Timber Bridge Design Notes 72
Diagram 11.0 – Temporary Access Culvert 75
Diagram 11.1 – Temporary Access Culvert Specifications 76
Diagram 12.0 – Temporary Access Ford 79
Diagram 12.1 – Temporary Access Ford Specifications 80
Diagram 13.0 – Logging Mats 82
Diagram 14.0 – Straw Bale Dike 85
Diagram 14.1 – Straw Bale Dike Specifications 86
Diagram 15.0 – Silt Fence 89
Diagram 15.1 – Silt Fence Specifications 90

LIST OF ABBREVIATIONS USED IN THIS DOCUMENT

BMP	Best Management Practice
COMAR	Code Of Maryland Regulations
DBH	Diameter Breast Height
DNR	Department Of Natural Resources
DNR-FS	Department Of Natural Resources-Forest Service
EPA	United States Environmental Protection Agency
FS	Forest Service
FT	Foot (Measurement)
H:V	Horizontal To Vertical (Slope)
LBS	Pounds
MD	Maryland
MAX	Maximum
MDE	Maryland Department Of The Environment
MDE-WMA	Maryland Department Of The Environment-Water Management Administration
MIN	Minimum
NRCS	Natural Resource Conservation Service
NTW	Nontidal Wetlands
NTWSSC	Nontidal Wetlands Of Special State Concern
P^2	Pollution Prevention
q.v.	(L. *Quod Vide* – Which See) See Also
SCD	Soil Conservation District
SF	Square Feet
SF	Silt Fence
SMZ	Streamside Management Zone
SQ FT	Square Feet
USGS	United States Geological Survey
WMA	Water Management Administration

TABLE OF CONTENTS

ACKNOWLEDGEMENTS ii
INTRODUCTION iii
LIST OF TABLES iv
LIST OF DIAGRAMS v
LIST OF ABBREVIATIONS USED IN THIS DOCUMENT vi
FOREST HARVEST OPERATIONS IN MARYLAND 1
History Of Maryland's Sediment Control Program 1
Legal Requirements 1
Waters Of The State 2
EROSION AND SEDIMENT CONTROL PLANS 4
Obtaining An Approved Erosion and Sediment Control Plan 4
Appropriate Plan Type: Standard Or Custom 4
Requirements Of The Standard Plan Erosion And Sediment Control Plan 4
Requirements Of The Custom Erosion And Sediment Control Plan 6
Requirements of the Streamside Management Zone And SMZ Plan 6
RELATED EROSION AND SEDIMENT CONTROL INFORMATION 9
Seven/Fourteen Day Stabilization Requirement 9
Responsible Personnel Certification (The "Green Card") Training 9
Delegation of Inspection and Enforcement Authority 9
Landowner Responsibility 9
WETLAND CONSIDERATIONS 10
Nontidal Wetlands (NTW) 10
Nontidal Wetlands Of Special State Concern (NTWSSC) 11
RELATED ISSUES 12
Waterway Construction Permits 12
County Permits 12
FORESTRY PRACTICES 13
Introduction 13
Forestry Activities - Water Quality Relationships 13
Facts About Forest Soil Erosion 14
Pre-Harvest Considerations 14
INTRODUCTION TO THE USE OF SPECIFICATIONS 17
SPECIFICATIONS FOR STABILIZED HARVEST ENTRANCE 19
SPECIFICATIONS FOR TRUCK HAUL ROADS 22
SPECIFICATIONS FOR SKID TRAILS 25
SPECIFICATIONS FOR LOG DECKS AND LANDINGS 27
STREAMSIDE MANAGEMENT ZONE (SMZ) 29
SPECIFICATIONS FOR STREAMSIDE MANAGEMENT ZONE (SMZ) – STATEWIDE 30
SMZ Plan Form 35
SPECIFICATIONS FOR STREAMSIDE MANAGEMENT ZONE (SMZ) – RESTRICTED TO THE LOWER EASTERN SHORE 37
SMZ Plan Form 42
SPECIFICATIONS FOR BROAD-BASED DIP 44

SPECIFICATIONS FOR ROLLING DIP 47
SPECIFICATIONS FOR WATER BARS 50
SPECIFICATIONS FOR WATER TURNOUTS 53
SPECIFICATIONS FOR CROSS ROAD DRAINAGE 55
TEMPORARY WATERWAY CROSSINGS 59
SPECIFICATIONS FOR TEMPORARY WATERWAY CROSSINGS – GENERAL REQUIREMENTS 60
SPECIFICATIONS FOR TEMPORARY ACCESS WATERWAY CROSSING – BRIDGE 63
SPECIFICATIONS FOR TEMPORARY ACCESS WATERWAY CROSSING – CULVERT 73
SPECIFICATIONS FOR TEMPORARY ACCESS WATERWAY CROSSING – FORD77
SPECIFICATIONS FOR LOGGING MATS 81
SPECIFICATIONS FOR STRAW BALE DIKE 83
SPECIFICATIONS FOR SILT FENCE 87
SPECIFICATIONS FOR REVEGETATION OF DISTURBED SOILS 91
GLOSSARY 98
APPENDIX A – EXAMPLES OF EROSION AND SEDIMENT CONTROL PLANS 108
STANDARD EROSION AND SEDIMENT CONTROL PLAN FOR FOREST HARVEST OPERATIONS IN MARYLAND (THE STANDARD PLAN) 109
APPLICATION – STANDARD EROSION AND SEDIMENT CONTROL PLAN FOR FOREST HARVEST OPERATONS 114
STANDARD PLAN – BASIC 115
STANDARD PLAN – COMPLEX 120
STANDARD PLAN – MANMADE DITCH ISSUES 125
SMZ PLAN 131
CUSTOM PLAN – NO WORK IN THE SMZ 133
CUSTOM PLAN – INCLUDES SMZ ISSUES 138
APPENDIX B – USDA CODE 342 143
APPENDIX C – SOIL CONSERVATION DISTRICT OFFICES 167
APPENDIX D – MDE CONTACTS 169
APPENDIX E – DNR MFS CONTACTS 170
APPENDIX F CRITICAL AREA 173
APPENDIX F.1 – CRITICAL AREA LOCAL OFFICES 174
APPENDIX F.2 – CHESAPEAKE BAY CRITICAL AREAS INFORMATION 175
APPENDIX G – WATERWAY AND WETLAND REGULATIONS 180
APPENDIX G.1 – GENERAL WATERWAY CONSTRUCTION PERMIT 181
APPENDIX G.2 – NONTIDAL WETLANDS FORESTRY ACTIVITIES 182
APPENDIX G.3 – NONTIDAL WETLANDS PLAN REVIEW AND APPROVAL FOR FORESTRY ACTIVITIES 186
APPENDIX H - REFERENCES 188

FOREST HARVEST OPERATIONS IN MARYLAND

History Of Maryland's Sediment Control Program

The General Assembly of Maryland recognized that the state's watersheds are great natural assets and resources. As a result of erosion and sediment deposition on the land and in the waters of the State, these waters are being polluted and despoiled to such a degree that aquatic plants and animals and recreational use of the waters of the State are being affected adversely.

To protect the State's natural resources, especially the waters, the general assembly passed laws requiring the Department Of The Environment to adopt criteria and procedures to implement the soil erosion control program. As created, the sediment control program places ultimate responsibility with the State but allows each county to establish its own local program. The local soil conservation district is designated as the technical expert for its county and as such reviews and approves the erosion and sediment control plans for private and local government projects. Essentially, any non-agricultural, land disturbing activity, is regulated under the sediment control program, including forest harvest operations.

The State's sediment control program recognizes that the failure to fully implement and maintain the approved erosion and sediment control plans has acute and cumulative effects on the environment. The program therefore provides for obtaining immediate compliance with the law when violations occur.

Legal Requirements

This document, the 2005 Maryland Erosion And Sediment Control Standards And Specifications For Forest Harvest Operations, offers guidance for forest harvest operations regarding erosion and sediment control practices required by Maryland law and regulation*. These practices have been developed to protect, maintain and enhance our natural resources. Any forest harvest operation that disturbs more than 5,000 square feet or 100 cubic yards of soil must have an approved erosion and sediment control plan.

There are four general environmental areas involving forest harvests in Maryland that have legal requirements. These are Erosion and Sediment Control, Nontidal Wetlands (See APPENDICES G.2 AND G.3.), Waterway Construction, (stream crossings, See APPENDIX G.1.), and Chesapeake Bay Critical Areas (See APPENDICES F.1 AND F.2.).

This document will treat in detail only the requirements for erosion and sediment control on forest harvest operations. The remaining three topics are introduced briefly here. For a more detailed explanation of these requirements, contact the local Soil Conservation District, the Department of Natural Resources - Forest Service, or the Maryland Department of the Environment. See the appropriate appendices for the specific contacts, addresses and phone numbers.

IMPORTANT: It must be noted here in the opening of this document that both the landowner

and operator have a legal obligation not to allow erosion and sedimentation to occur as result of their forest harvest operation especially when the situation results in pollution of water of the State.

*Persons directly affected by these requirements are directed to the latest versions of the Annotated Code Of Maryland (Environment Article, Title 4, Water Management, Subtitle 1 Sediment Control, §4-101 through 4-116) and the Code Of Maryland Regulations, COMAR (26.17.01.01 through 26.17.01.11)

Waters Of The State

The legal definition of waters of the State is fundamental to Maryland's efforts to protect the environment. A complete understanding of the definition is also necessary in order to fully and accurately utilize this document.

Section 4-101.1 (d) of the Environment Article, Annotated Code Of Maryland defines waters of the State as including:
(1) Both surface and underground waters within the boundaries of this State subject to its jurisdiction, including that part of the Atlantic Ocean within the boundaries of this State, the Chesapeake Bay and its tributaries, and all ponds, lakes, rivers, streams, storm drain systems, public ditches, tax ditches, and public drainage systems within this state, other than those designed and used to collect, convey, or dispose of sanitary sewage; and
(2) The flood plain of free-flowing waters determined by the Department of Natural Resources on the basis of the 100-year flood frequency.

This definition is broad and deep and is intended to be so. Any activity, anywhere in the state can have a negative impact on waters of the State. Therefore, the laws that regulate potentially polluting activities are binding in locations that the average person might not identify as "water". It became apparent many years ago that it is much more effective to protect water quality at its source than it is to attempt to clean it at its point of discharge. From this insight grew the concept of pollution prevention. Sound pre-harvest planning is an excellent example of pollution prevention. Because the definition of waters of the state is so pervasive, anyone conducting almost any activity must be alert to the possible impact to water quality as a result of their actions.

In addition to its function identifying what locations must be protected for water quality, the definition of waters of the State is used by this document to perform a second function. As you will see, the definition of waters of the State is pressed into service to help determine certain parameters.

No matter how carefully a law, regulation or standard and specification is written, there is always the potential for individual interpretation. The more people that use it, the more interpretations are made. This is complicated in a state such as Maryland. Maryland exhibits diverse physiographic regions. Natural features that are significant in one part of the State may be unknown elsewhere. This also makes crafting standards and specifications that are broadly applicable very difficult. In order to manage this tendency to interpret regulatory

requirements over a variety of environmental perspectives, it is incumbent upon the regulator to start with a fundamental, universal definition that due to long usage, is understandable to the majority of the regulated community. It is also desirable to ensure that any regulatory requirement has its basis in law (such as the definition of waters of the State). This adds to the requirement's legitimacy. Starting from this legal definition, it is possible, with careful modification of the recognized standard (in this case the definition of waters of the State), to utilize it to establish certain criteria. As you will see, a modified definition of waters of the State is used to determine the extent of the protective buffer areas (now know as Streamside Management Zones) required around bodies of water.

It is not MDE's intent (nor within its authority) to change the legal definition. The complete definition is binding in reference to protecting water quality. We are simply using a portion of a well understood definition to establish the limits of the SMZ.

EROSION AND SEDIMENT CONTROL PLANS

Obtaining An Approved Erosion and Sediment Control Plan

Maryland State law and regulations require that an erosion and sediment control plan be developed and approved before undertaking any earth disturbing activity in excess of 5,000 square feet or 100 cubic yards. This requirement applies to construction on residential, commercial, industrial, and institutional sites as well as on timber harvest projects. To assist loggers in meeting this erosion and sediment control requirement, the Maryland Department Of The Environment (MDE) and the Department of Natural Resources (DNR) have developed The Standard Erosion And Sediment Control Plan For Forest Harvest Operations In Maryland (the Standard Plan). This plan is intended to cover the most basic harvest sites and lists the general erosion and sediment control requirements for each harvest and may be obtained at any Soil Conservation District (SCD) office. For sites that exceed the basic limits of the Standard Plan, the applicant must have a Custom Erosion And Sediment Control Plan (the Custom Plan) designed specifically for the site and then submitted to the appropriate plan approval authority (the SCD) for review and approval. Additionally, should the harvest site include removing trees that are adjacent to a stream or other waters of the State, a Streamside Management Zone plan is required. The next four sections help the applicant to select the type of approval(s) needed for his specific site and what each requires.

Appropriate Plan Type: Standard Or Custom

It is anticipated that a significant portion of the forest harvest operations conducted in Maryland can be approved under the Standard Plan. The Standard Plan may be used if all of the following conditions are met:

1. Road cuts/fills are 3 feet or less (5 feet in Garrett, Allegany, Washington, & Frederick counties).
2. Grades for haul roads do not exceed 15 percent.
3. Landings are located on slopes 10 percent or less.
4. Grades for skid trails do not exceed 20 percent.
5. The site has no waters of the State in it or maintains an uncut and undisturbed Streamside Management Zone.

If any of these conditions or any other criteria of the standard plan cannot be met, a Custom Erosion And Sediment Control Plan listing practices necessary to prevent erosion and ensure site stabilization will have to be submitted to the appropriate plan approval authority (the SCD) for review and approval.

Requirements Of The Standard Plan Erosion And Sediment Control Plan

The potential for loss of sediment from a forest harvest site is greatest at three general locations: entrance to the site, forest access system (haul roads, skid trails and landings), and adjacent to watercourses. The Standard Plan, therefore, emphasizes sediment control in these areas. Instructions for installing the required sediment control practices are listed in the

specification sections of this document (See page to view the Standard Plan content and examples of plans that is based upon actual standard plans that have been reviewed and approved). The primary requirements for these areas are as follows.

1. Site Entrance - Access points to and from the site must be protected. Materials such as stone, wood chips, corduroy logs, wooden mats or other materials are available to minimize the soil or mud being tracked onto the road. It is also necessary to prevent the existing drainage pattern in the roadside ditch from being blocked or damaged by access to the site. A culvert placed underneath the entrance is the most effective way to maintain proper drainage.

2. Trails and Landings - Advanced pre-harvest planning of the location of roads, trails and landings is an effective way to minimize the potential for soil erosion. Locating roads and trails along natural contours and minimizing slopes will reduce the need for substantial cutting and filling operations.

   When planning the road system avoid stream crossings whenever possible as they create one of the greatest potentials for sediment pollution. If this cannot be avoided, a permit for a temporary access crossing will be required [Contact Maryland Department of the Environment (MDE) - Water Management Administration. See APPENDICES D and G.1]

3. Waterway Protection - Protecting watercourses from runoff and equipment damage is the most critical aspect of sediment control during harvest operations. Improper stream crossings, soil disturbance adjacent to streams, and logging debris left in streams may result in substantial sediment pollution and flooding.

   Use of the Standard Plan requires that uncut and undisturbed streamside management zones (SMZ) be maintained on all sides of any waters of the State. The width of the SMZ is dependent upon the slope of the land adjacent to the watercourse. If a harvest project includes the cutting of timber in the SMZ, additional approval is required. (See the following sections on the Custom Erosion And Sediment Control Plan and the Streamside Management Zone Plan.)

   Roads, trails and harvesting equipment are not allowed in the SMZ for projects approved under standard plans, except for access to approved stream crossings. (The appropriate plan approval authority, the SCD, may make exceptions for existing roads in the SMZ. Existing roads, if serviceable and not creating a pollution problem, may be utilized if identified on the plan and approved by the appropriate plan approval authority, the SCD.) A custom erosion and sediment control plan and/or a SMZ plan is required for harvesting in the SMZ because of the high potential for soil compaction, erosion and stream damage.

NOTICE: Additional Requirements - In addition to the practices listed for the above areas, it is necessary to stabilize certain portions of the harvest site with seed and mulch to prevent erosion. This requirement generally applies to roads, trails and landings. (See

SPECIFICATIONS FOR REVEGETATION OF DISTURBED SOIL.)

Requirements Of The Custom Erosion And Sediment Control Plan

Situations may arise when it is not possible, even with careful planning, to comply with all the requirements of the Standard Plan. If all the conditions of the Standard Plan cannot be met, it is necessary to have a Custom Erosion And Sediment Control Plan (the Custom Plan) prepared by a Maryland Licensed Forester. The Custom Plan must be reviewed and approved by the appropriate plan approval authority (for forest harvest operations this authority is typically the local soil conservation district).

It is important that two types of information be included in the Custom Plan. The first is the condition where the Standard Plan requirements cannot be met; and the second is the specific erosion and sediment control measure to be used. The location of this condition is to be described on a sketch of the job site (or whatever map is required by the appropriate plan approval authority, the SCD). Once this area has been identified, it is necessary to describe the practice or measure utilized to ensure adequate erosion and sediment control. For example, if road grades are to exceed fifteen percent, and turnouts are to be used to drain water from the road, the location of the turnouts will be noted on the plan sketch. To prevent water from the turnout from creating side bank erosion it may be necessary to install stone at the point where the water is discharged. The location of the stone will also be identified on the plan sketch.

Another example would be a landing that must be located on a slope exceeding ten percent. It may be necessary to install a silt fence or a straw bale dike on the downslope side of the landing to act as a sediment barrier. In this case, the location of sediment controls and the type of final stabilization to be used at the landing will be noted on the plan.

The appropriate plan approval authority (the SCD) may require certification of the Custom Plan by a professional engineer, land surveyor, landscape architect, architect, or Maryland Licensed Forester registered in the state that the plan has been designed in accordance with the appropriate erosion and sediment control ordinances, regulations, standards, and criteria.

The appropriate plan approval authority (the SCD) has the option to require a specific design if a particular situation demands it. (As an example, a haul road exceeds the maximum limits set in the specification. Under such a situation the appropriate plan approval authority (the SCD) may require a site specific design that demonstrates that the road will function as intended and remain stable.)

In summary, the important thing to remember is that it is necessary to identify the location and describe the specific erosion and sediment controls to be used wherever the Standard Plan requirements cannot be met.

Requirements of the Streamside Management Zone And SMZ Plan

It has long been accepted that the undisturbed forest is the best erosion and sediment control

measure for timber harvest activities. In such an area, it is anticipated that rainfall runoff exists in sheet flow condition and that any sediment laden runoff caused by the timber harvest operation will flow across the width of undisturbed forest, causing the suspended sediment to settle out before it reaches waters of the State.

Accordingly, the requirement to establish a Streamside Management Zone (SMZ) is intended for areas where harvestable timber exists right up to the edge of waters of the State. The SMZ is required around all waters of the State (with very limited exceptions explained below) in lieu of structural measures such as silt fence, diversion dikes and sediment traps.

Limited harvesting is allowed within the SMZ provided that a SMZ Plan is prepared by a Maryland Licensed Forester and approved by the appropriate plan approval authority (the SCD). The SMZ plan needs to be very specific in describing which trees are to be cut, what precautions for sediment control will be taken, and where the sediment controls will be located. The location of any harvesting within a SMZ must be identified on a sketch of the SMZ. The sediment controls to be used for waterway protection and topography within the SMZ must also be identified on this sketch. If a SMZ plan is required, it will be used in conjunction with The Standard Plan if all other Standard Plan criteria are met. If other conditions of the harvest necessitate a custom plan, requirements for harvesting within the SMZ will be made a part of that plan. (See SPECIFICATIONS FOR STREAMSIDE MANAGEMENT ZONE.)

The requirements for the SMZ are intended to be broadly applicable across the State. It is recognized that there may be unusual circumstances where the conditions necessitating a SMZ may not exist and strict adherence to the requirements will cause undue hardship to the timber harvester and the landowner <u>and</u> the intended purpose of the requirement will not be met. In order to address this specific circumstance, a separate specification has been developed. It outlines the specific conditions where a SMZ may not be required and lists the alternative erosion and sediment control measures that must be implemented in lieu of the SMZ. Timber harvests conducted in proximity to waters of the State greatly increase the potential for sediment pollution from the harvest activity. The potential for violation of erosion and sediment control and pollution laws, enforcement action and penalties increases as well. If you intend to harvest timber adjacent to waters of the State and the location does not require a SMZ, please pay careful attention to the alternative erosion and sediment control measures that are required.

Each site must be evaluated on its own individual characteristics and limitations. See APPENDIX A for a sample SMZ Plan.

Table 1 - Summary Of Erosion And Sediment Control Plan Approval Options

Harvesting specifications	Plan to Use
• Road cuts/fill 3 feet or less (5 feet in Garrett, Allegany, Washington, & Fredrick) • Haul road grades do not exceed 15% • Landings on slopes of 10% or less • Skid trail slopes do not exceed 20% • Uncut and undisturbed Streamside Management Zone	Standard Plan
• Harvests involving a NTW • Harvest involving a SMZ • Harvests involving haul roads with slopes between 15% and 20% for a maximum of 200', skid trails with slopes between 20% and 25% for a maximum of 200', or road cuts/fills greater than 3/5 feet. • In general any proposed activity that exceeds the limits set in the standard plan	Custom Plan
Harvests involving haul roads with slopes greater than 20%, skid trails with slopes grater than 25% and landings with slopes greater than 10%	Custom Plan with specific BMP design as directed by the Appropriate Plan Approval Authority (the SCD)
• Harvesting involving silvicultural activities within a SMZ	Custom Plan (including SMZ issues) Or Standard Plan Plus SMZ plan

RELATED EROSION AND SEDIMENT CONTROL INFORMATION

Seven/Fourteen Day Stabilization Requirement

COMAR provides that each erosion and sediment control plan, including those pertaining to forest harvest operations, contain language outlining site stabilization requirements. Briefly, this means that following completion of installation of all perimeter erosion and sediment controls and all cut and fill slopes steeper than 3:1 (H:V) stabilization must be accomplished within seven calendar days. For all other disturbance, stabilization must be accomplished within fourteen calendar days following completion of the activity.

Responsible Personnel Certification (The "Green Card") Training

The Annotated Code Of Maryland and COMAR require that the logger responsible for the installation and maintenance of erosion and sediment control measures complete a training course known as the Responsible Personnel Certification also called the "Green Card". The purpose of this training is to:

- Instruct loggers in the proper implementation and maintenance of erosion and sediment control practices
- Provide for a better understanding of the necessity to control pollution of waters of the State that results from the harvest operation

(For information on obtaining this required certification, contact the Maryland Forest Service. See APPENDIX E.)

Delegation of Inspection and Enforcement Authority

The State of Maryland offers each county the ability to enforce the minimum requirements of these laws and regulations within their own county system. This is referred to as delegation of enforcement authority. Some counties have increased the requirements contained in their standard plan in order to further reduce the impact of soil erosion and sedimentation on the environment from forest harvest operations. If you do not know the requirements of a particular county, contact the SCD office for that county or the local DNR Project Forester. For a list of county SCD office locations and phone numbers See APPENDIX C. Unless a county has requested and received delegation of enforcement authority, MDE has the responsibility to ensure these requirements are met.

Landowner Responsibility

When a harvest is planned on private property, it is necessary to go to the local SCD office to obtain the Standard Plan or have the Custom Plan approved. Harvests on State and Federal land require plan approval by MDE. A provision of the plan requires that the landowner also agrees to follow the erosion and sediment control requirements by signing the application. Assistance in preparing plans may also be obtained from the DNR - Forest Service offices. (See APPENDIX E. Also, see APPENDIX A to view the Standard Plan content and examples of a standard and a custom plan that are based on actual plans that have been reviewed and approved.)

WETLAND CONSIDERATIONS

Nontidal Wetlands (NTW)

The Maryland Nontidal Wetlands Protection Act and Regulations require the use of Best Management Practices (BMP) when logging in NTW. An approved erosion and sediment control plan for forest harvest operations in Maryland is required for forest harvest operations in NTW. When filing the Standard or Custom Erosion And Sediment Control Plan for a forest harvest operation in NTW, BMP must be included that will protect the wetland hydrology. The use of these BMP is necessary in the areas where soil conditions (saturated or inundated) are unable to support logging equipment without compacting or rutting the soil to the point of affecting the soil hydrology.

An applicant or a consultant must determine the presence of NTW on a site. This may be done by using county soil surveys to identify hydric soils, and consulting the Nontidal Wetlands Guidance Maps and aerial photographs. When walking the site, clues may include the observance of saturated soil conditions, drainage ways, ponded water or prevalence of wetland vegetation.

Forestry activities do not require a NTW permit from the Maryland Department of the Environment (MDE) if the land use remains as forestry. The regulations do require a person conducting forestry activities in NTW to implement BMP to protect NTW. These BMP must be incorporated into the Standard or Custom Erosion And Sediment Control Plan prepared by a Maryland Licensed Forester.

Forestry activities are the planting, cultivating, thinning, harvesting or any other activity undertaken to use the forest resources or to improve their quality or productivity. Activities that change NTW to another land use, including but not limited to agriculture or development, are not forestry activities.

Procedure for Forestry Activities

After December 31, 1990, a person conducting a non-exempt forestry activity in a NTW shall:

1. Submit to the local Soil Conservation District (SCD) or other appropriate plan approval authority an erosion and sediment control plan for forest harvest operations (the Standard or Custom Plan) prepared by a Maryland Licensed Forester that includes BMP that comply with the regulations before beginning the harvest;

2. Request that the SCD delineate or review and approve the delineation of the extent of NTW; and

3. Comply with the requirements of the approved plan.

Best Management Practices

The NTW regulations state that for forest harvest and regeneration practices, BMP include but are not limited to:

1. Designing stream crossings to have the shortest distance feasible.

2. Locating roads and log decks to minimize adverse wetland impacts.

3. Harvesting with specialized equipment when NTW soils and hydrology will be adversely affected.

4. Using mats or similar temporary structures to reduce compaction or rutting.

For more detailed information regarding forest harvests in NTW, contact the MDE - Water Management Administration - Wetlands and Waterways Program. This program issues the tidal and nontidal wetland authorizations commonly needed for forest harvest projects. (See APPENDICES D, G.2 AND G.3.)

Nontidal Wetlands Of Special State Concern (NTWSSC)

In Maryland, certain wetlands with rare, threatened, or endangered species or unique habitat receive special attention. The Maryland Department of the Environment (MDE) is responsible for identifying and regulating these areas that are designated as NTWSSC.

As with nontidal wetlands (NTW) not of special state concern noted above, forest harvests do not require a NTWs permit to work in NTWSSC. However, Best Management Practices (BMP) must be implemented. As part of the BMP strategy, a primary protection area may be established, in which no disturbance will occur. This protected area will be determined by a team consisting of: MDE and Department of Natural Resources staff, the Maryland Licensed Forester, and the landowner. When necessary, a secondary protection area will also be established, in which forest management practices are restricted to maintain the integrity of the primary protection area. (See APPENDIX G.2 and G.3.)

RELATED ISSUES

Waterway Construction Permits

The best practice in planning a timber harvest is to avoid having to cross any streams. If a stream crossing is unavoidable, as of December 1, 1997, the Maryland Department of the Environment - Water Management Administration (MDE – WMA), requires a Waterway Construction Permit for all stream crossings, regardless of drainage area or stream class, unless the stream channel and its 100 year floodplain can be bridged or spanned. Therefore, a Waterway Construction Permit is required for all in stream culvert or pipe installations.

The General Waterway Construction Permit (General Permit) is a simplified permit that may apply to stream crossings for a forest harvest operation except those designated as a Wild and Scenic River by the Department of Natural Resources. If a stream crossing has been identified on the harvest site, then a General Permit is required and Best Management Practices must be applied to that crossing. This permit is in addition to the requirement to obtain an approved erosion and sediment control plan from the appropriate plan approval authority (the SCD).

Temporary construction activities must satisfy the conditions contained in COMAR 26.17.04.10. A. And B. Information concerning these permits and construction activities may be obtained by calling the MDE - WMA, Wetlands and Waterways Program. (See APPENDICES D, and G.1.)

County Permits

Some counties in Maryland may not require a permit for forest harvest operations. In those counties, all that is necessary is to obtain an approved erosion and sediment control plan from the local Soil Conservation District office and any necessary stream crossing permits from the Maryland Department of the Environment - Water Management Administration. Some counties do, however, require that a county permit be obtained prior to the harvest. Procedures among the counties for obtaining this type of permit may vary and contact with the local county permitting office is necessary to determine what is needed.

FORESTRY PRACTICES

Introduction

A Best Management Practice (BMP) is any method or measure used to protect and preserve water quality including, but not limited to, control of water caused erosion. This document is intended to assist foresters, landowners and timber contractors in applying erosion control methods, measures or practices while harvesting and regenerating forests in Maryland.

Water quality problems caused by forestry operations can result from any of the following:

1. Access roads and skid trails associated with timber harvest and delivery.

2. Timber harvesting in progress or recently completed.

3. Site preparation.

4. Staging areas where harvested trees and other forest products are taken for processing or loading on trucks, barges or rail cars.

5. Forest fire control.

6. Trash, debris, oils, fluids from equipment and vehicle maintenance.

Forestry Bumps in Maryland encompass six basic goals in order to protect water quality.

1. To minimize surface runoff, soil erosion and sedimentation originating from any type of forestry-related soil disturbance.

2. To maintain the integrity of all stream beds and banks.

3. To prevent deposition of logging debris in stream beds.

4. To establish and maintain Streamside Management Zones (SMZ) along waters of the State that filter sediment from overland flow thereby minimizing sediment pollution to waters of the State.

5. To provide for rapid re-vegetation of all exposed mineral soil areas through natural processes supplemented by artificial re-vegetation where necessary.

6. To prevent chemicals, pesticides, fertilizers or petroleum products from entering or degrading (directly or indirectly) streams, ground water or surface water.

Forestry Activities – Water Quality Relationships

Facts About Forest Soil Erosion

In an undisturbed forest, energy is dissipated from raindrops as they hit the ground. Forest litter, organic matter and roots absorb this energy and prevent soil particles from being detached and transported to streams. An undisturbed, litter-covered forest floor and root mat serve to absorb rainfall energy that otherwise could erode the land and pollute streams. The forest floor, with a root system intact, covered by litter and forest debris is the best protection against erosion and resulting sedimentation. However, disturbance of the forest litter layer exposes mineral soil and compaction reduces infiltration. This results in an increased potential for erosion.

Because of exposed mineral soil, erosion problems arise from logging road and skid trail systems and from the removal of residual forest material during site preparation. Under these conditions, rainfall energy is not absorbed by the bare mineral soil. Research indicates that rain falling on scattered small patches of bare soil will not deliver sediment to streams unless these patches form unbroken pathways over long downhill distances. Correct silvicultural practices prevent formation of these unbroken pathways.

Anytime the intended harvest results in a disturbance to the litter covered forest floor and root mat, the natural erosion and sediment control measures are no longer adequate. The logger then is responsible for installing alternative erosion and sediment control measures (structural and / or procedural) to protect waters of the State from logging site runoff.

On logged forest land the highest erosion rates are most likely to occur on improperly located and maintained haul roads and skid trails. The expense of establishing a well designed road system pays off by providing an adequately drained road with moderate grades. Hauling time and the costs of equipment wear and repair are reduced. A well planned permanent road system enhances land value by providing easy access for recreation, fire suppression, and forestry and wildlife management activities. By increasing accessibility, the system will lower costs of future timber sales.

The first step in reducing erosion rates is informing the landowner and logger of measures that will reduce erosion and sedimentation from forestry activity. A well planned, permanent access system is a sound method of reducing erosion in areas that require frequent access.

Pre-Harvest Considerations

Definition

Pre-harvest planning is the collection of information about the area to be harvested. Use of this information can determine the best time and method used to harvest. An effective pre-harvest plan will take into consideration all aspects of a timber harvest which may lead to water quality degradation and plan for the implementation of Best Management Practices (BMP) that will minimize the adverse effects of the operation. Elements of pre-harvest planning must consider the need for obtaining all approvals and permits for the project.

Purpose

This exercise provides a plan prior to harvest that identifies an efficient harvest operation and maintains water quality through the use of one or a combination of BMP.

Condition Where Practice Applies

This practice applies where forest products are to be harvested.

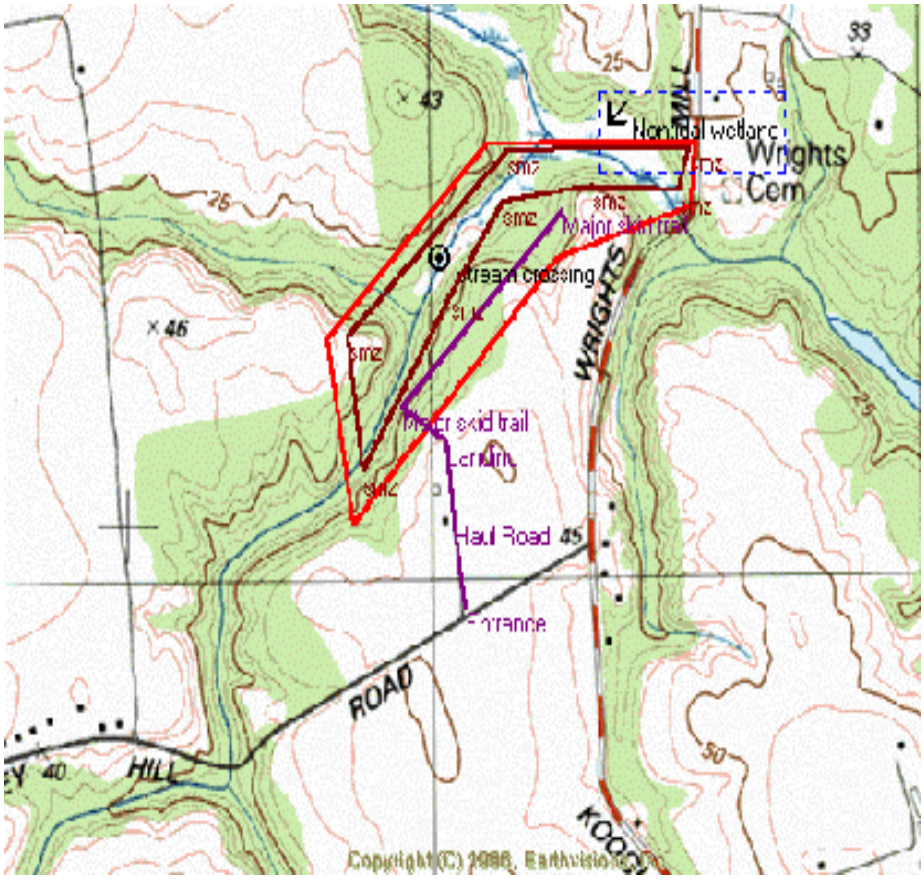
Specifications

The objective of pre-harvest planning is for the forester, landowner/manager and the logger to determine, based on conditions found on the site to be harvested, which BMP are necessary to protect water quality and how those BMP will be implemented. Depending on the site and nature of the harvest, the plan should include any or all of the following: property boundaries, streams and drainages, soil restrictions, slope, environmental concerns, approximation of main haul road and skid trail locations, potential log landings, portable sawmill locations, stream or drainage crossings, and Streamside Management Zone (SMZ). Timing of harvest and timber sale contract specifications should be included.

A walk through the harvest area with a topographic map will provide the operator greater insight to existing ground conditions. A site review will aid in determining potential road location, log landings, streams and wet areas. Obtain assistance with site review and contract provisions from the Department of Natural Resources - Forest Service. (See APPENDIX E.)

In some situations, such as existing roads adjacent to streams, the best practice to control sedimentation may not be covered by the standard practices in this document. In this case, a pre-harvest plan is to be discussed with a Maryland Licensed Forester and an alternative erosion control strategy developed prior to harvest. Contact the authorized inspection agency seven working days prior to beginning harvest to schedule an on-the-ground inspection of the property.

Diagram 1.0 – Pre-Harvest Map



Maryland's Erosion And Sediment Control
Standards And Specifications For
Forest Harvest Operations

INTRODUCTION TO THE USE OF SPECIFICATIONS

The pages that follow contain nineteen specifications for best management practices (BMP) intended for use on forest harvest operations. Five of the specifications (cross road drainage, general waterway crossing, and temporary bridge, culvert and ford) are drawn from general construction practices and are broadly applicable to many activities including forest harvest operations. Four more (harvest entrance, straw bale dike, silt fence and re-vegetation of disturbed soil) are derived from agricultural and urban erosion and sediment control practices and the remaining ten specifications are tailored to forest harvest operations.

Regardless of the origin of these nineteen specifications, they are all well proven with long years of successful use. When conscientiously implemented and maintained they meet the intent of Maryland's erosion and sediment control program and will keep your harvest site in compliance with the approved erosion and sediment control plan.

In order to become comfortable with the use of these specifications it is necessary to understand how they fit into the overall plan approval process. Primarily, the specifications are utilized by the Maryland Licensed Forester and the staff at the local soil conservation districts (SCD). The forester selects the specifications that are appropriate for the site in question and the SCD staff confirm these choices during the plan review and approval process.

Once the plan is approved, the on-site personnel who actually conduct the harvest will use the specification (as contained on the approved plan) to assist in proper BMP construction and maintenance. The inspection staff (local or state) will use the specifications to verify proper BMP implementation and maintenance. Both the on-site personnel and the inspector are restricted to what is outlined on the approved plan. If something more is needed the forester and the SCD review staff should become involved again.

By definition, specifications contain the established criteria that define how a BMP will be used. Having these defined criteria guides the use of the BMP by on-site personnel and serves to eliminate the potential for arbitrary use of the specifications by the regulatory staff. Once a specification is selected by the forester and approved by the SCD staff, there are only the issues of implementation and maintenance left for the on-site personnel. These issues are addressed in the conditions of the standard plan or in the sequence of construction of the approved custom plan.

A sound working relationship between the on-site personnel and the inspector allows time to review the plan and to agree on how it requires that the harvest be conducted. If a difference of interpretation develops, the specification will, in most cases, clarify the situation.

Each specification is made up of components that allow the on-site personnel to tailor the

BMP to a particular harvest site. A specification may contain references to circumstances that do not exist on your particular site. Practice and experience with the specifications will allow you quickly to become comfortable with correctly utilizing the applicable components of a specification as it relates to your site. It is your obligation to be aware of how a specification will be applied to your site. Likewise, it is your right to point out to the regulatory staff (plan reviewers or inspectors) how the required components of a specification relate to your site.

The specification for the stabilized harvest entrance provides an excellent example of how to utilize the specifications. Once the approved plan includes an entrance, the on-site personnel are obligated to implement it. The specification does however offer options that allow the on-site personnel latitude in selecting the material used to construct the entrance. The specification is designed to allow the on-site personnel to economically utilize the material on hand. The specification offers the choice of an aggregate pad (with an additional choice of stone or recycled concrete); mats (with additional choice of mat material); or wood chips (if acceptable to the appropriate plan approval authority, the SCD). Following this line of reasoning, once the type of entrance is selected there are requirements related to that choice. For instance, if the aggregate pad is selected, the stone must be two to three inches in size and laid down six inches thick over class SE geotextile.

The harvest entrance specification contains the additional contingency for maintaining existing drainage. Again, learning how to use the specification allows you to correctly disregard requirements that do not relate to your particular site. Maintenance of existing drainage is a legitimate component of the harvest entrance specification; however, if the location of your entrance does not cross a ditch you are not required to implement this aspect of the specification.

Throughout all nineteen specifications, you can find such components that are site specific. Common sense dictates whether or not a component of a specification is relevant to your site. Given the varying site conditions likely to be encountered, inclusion of a component in a specification is not by itself a sufficient basis for requiring that it be implemented.

SPECIFICATIONS FOR STABILIZED HARVEST ENTRANCE

Definition

A stabilized harvest entrance provides a pad or mat and drainage protection at any point where equipment will be entering or leaving a harvest site onto a public right-of-way.

Purpose

This practice reduces tracking of sediment onto roads and public rights-of-way and protects existing drainage patterns. Also provides a stable area for entrance into or exit from the site.

Condition Where Practice Applies

This practice applies any place where access to a forest harvest joins a public right-of-way.

Specifications

Each of the following practices provides acceptable stabilized entrances. Select the practice best suited to the particular harvest and availability of materials:

Aggregate Pad

1. Use two inch to three inch stone, or reclaimed or recycled concrete or its equivalent placed to a thickness of at least six (6) inches.

2. Geotextile Class "SE" shall be placed beneath the stone. The use of paper mill felts as underlayment may be substituted with the approval of the appropriate plan approval authority (the SCD).

Mats

1. Corduroy mats made from on-site material of six (6) inch minimum diameter.

2. Steel mats designed to support heavy equipment on the existing base.

3. Wooden pads or mats designed to support the equipment on the existing base. These may be constructed by cabling, nailing, or bolting together rough sawn timber that is two inch to eight inches thick. (See SPECIFICATIONS FOR LOGGING MATS.)

Minimum Size of Stabilized Entrances

1. Width shall be a ten (10) foot minimum, and shall be flared at existing road to provide a turning radius for any equipment using the entrance.
2. Length shall be a fifty (50) foot minimum.

Drainage Protection

1. Existing public road drainage shall not be blocked or damaged by access construction. Pipe culverts or a bridge shall be installed if necessary to maintain existing drainage.

2. The drainage pattern shall be restored to its original condition and stabilized upon completion of the harvest.

Exceptions

1. State and local jurisdictions may have requirements that exceed these minimum requirements for entrance to a public road. A grading or entrance permit may be required for a new entrance onto a county or State road. Obtain details from the plan approval or permitting authority.

2. Alternate materials and methods, such as wood chip entrances, may be used if they accomplish the objectives and are approved by the appropriate plan approval authority (the SCD).

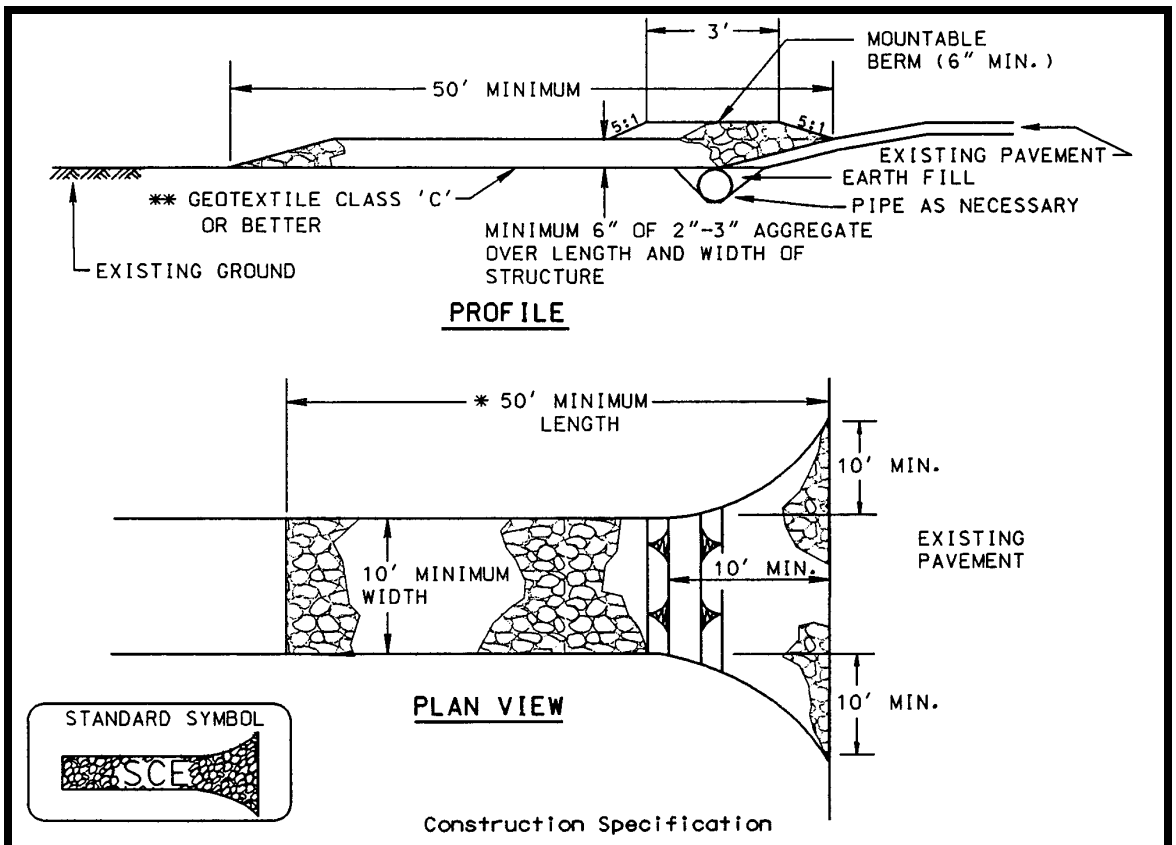
Maintenance

1. The entrance shall be maintained in a condition that will minimize tracking of sediment onto a public road. This may require periodic additional top dressing of aggregate or other material.

2. All sediment, spilled, dropped or tracked onto a public right-of-way must be removed immediately and returned to the site.

3. When necessary, truck wheels must be cleaned to remove sediment prior to exiting onto a public right-of-way.

Diagram 2.0 – Stabilized Harvest Entrance



Construction Specification

1. Length - minimum of 50' (*30' for single residence lot).

2. Width - 10' minimum, should be flared at the existing road to provide a turning radius.

3. Geotextile fabric (filter cloth) shall be placed over the existing ground prior to placing stone. **The plan approval authority may not require single family residences to use geotextile.

4. Stone - crushed aggregate (2" to 3") or reclaimed or recycled concrete equivalent shall be placed at least 6" deep over the length and width of the entrance.

5. Surface Water - all surface water flowing to or diverted toward construction entrances shall be piped through the entrance, maintaining positive drainage. Pipe installed through the stabilized construction entrance shall be protected with a mountable berm with 5:1 slopes and a minimum of 6" of stone over the pipe. Pipe has to be sized according to the drainage. When the SCE is located at a high spot and has no drainage to convey a pipe will not be necessary. Pipe should be sized according to the amount of runoff to be conveyed. A 6" minimum will be required.

6. Location - A stabilized construction entrance shall be located at every point where construction traffic enters or leaves a construction site. Vehicles leaving the site must travel over the entire length of the stabilized construction entrance.

SPECIFICATIONS FOR TRUCK HAUL ROADS

Definition

Truck haul roads are part of a road system, temporary or permanent, installed for transportation of wood products from the harvest site by truck. Usually this is an unsurfaced, single lane road with turnouts (wide spots) and is installed by grading with a bulldozer or other mechanical equipment where cuts and fills may be needed.

Purpose

An efficient transportation system is necessary to effectively protect the forestland and water quality when removing forest products from the harvest site, developing the forest for recreation, accessing the area for forest fire suppression, or implementing other needed forest management activities. Properly located and constructed roads will provide safety, higher vehicle speeds and longer operating periods while reducing operating and maintenance costs.

Condition Where Practice Applies

This practice applies where the area to be cut and volume per acre makes it necessary and economically feasible for an operator to install a road system.

Specifications

1. Sound pre-harvest planning allows placement of the haul roads on the flattest ground available and avoids the problems associated with road building on extreme slopes. Roads shall follow the contour as much as possible. Normally, grades shall remain between 2% and 15%. However, grades are permitted to be as steep as 20% for distances not exceeding 200 feet. If steeper grades are necessary, practices must be approved and used to prevent concentrated water flow that causes gullies.

   Water diversion by cross drainage (interception of surface water on the road) is often needed to keep excess water off the steeper grades. (See SPECIFICATIONS FOR CROSS ROAD DRAINAGE)

2. Cross intermittent or perennial streams as close to a right angle to the stream as possible, using bridges, culverts or rock fords. Structures shall be sized and placed so as not to impede fish passage or stream flow. (See SPECIFICATIONS FOR TEMPORARY STREAM CROSSINGS.).

3. Install water turnouts prior to a stream crossing to direct runoff to undisturbed areas of the Streamside Management Zone (SMZ). Road gradients approaching water crossings are changed to disperse surface water at least 25 feet from the stream. Locate roads outside of the SMZ (with the exception of stream crossings). (See SPECIFICATION FOR SMZ.) (Use of fords is only acceptable as described in the

Specification For Temporary Stream Crossings.)

4. Outslope the entire width of the road where road gradient and soil type will permit. Usually inslope the road toward the bank as a safety precaution on sharp turns, road gradients of 15%, and on clay, or slippery soils. Use cross road drainage on insloped or crowned roads to limit travel distance of runoff water.

5. Where roads are insloped or crowned, broad-based or rolling dips shall be placed within the first 25 feet of upgrade if gradients begin to exceed 2% for more than 200 feet.

6. Place roads on side slope to avoid level ridge tops. Avoid wet floodplain soils where drainage is difficult to establish.

7. On truck haul roads that intersect main highways, gravel, wooden mats or other means shall be used to keep mud off the highway. (See SPECIFICATIONS FOR STABILIZED HARVEST ENTRANCE.)

8. Provide a minimum width of 10 feet for a single track road. Increase width as necessary at curves and turnouts.

9. Vertical road bank cuts normally are not to exceed three (3) feet in height. This restriction on vertical road bank cuts is increased to five (5) feet in Garrett, Allegany, Washington, and Frederick counties. Any cuts that exceed these limits require special measures to ensure that the created slopes remain stable. These special measures shall be approved by the appropriate plan approval authority (the SCD).

   Road bank cuts more than five feet high are normally sloped to at least a 3:1 ratio, but shall in no case exceed a 2:1 ratio, and are stabilized, in accordance with the 7/14 day requirements, to prevent erosion.

10. Good road drainage shall be maintained. Ensure good road drainage with use of properly constructed and spaced turnouts, broad-based dips, rolling dips, culverts or bridges. Turnouts will be constructed so water will be dispersed and will not cut channels across the SMZ. (See SPECIFICATIONS FOR WATER TURNOUTS.)

11. For cross drains install riprap or native stone, if suitable, at the outlets of culverts or dips to dissipate velocity and to limit the disturbance.

12. If necessary to ensure that roads dry out, cut trees alongside of the road to allow sunlight to reach the wet surface. This practice is known as “daylighting”.

Maintenance

1. Restrict traffic on roads during wet conditions. Use of wooden mats and gravel may allow operations during wet soil conditions. Haul only during dry weather on wet soils, erodible soils, or road gradients exceeding 10% that do not have erosion protection.

2. Keep roads free of obstructions, ruts, and logging debris to allow free flow of water from road surface.

3. Control the flow of water on the road surface by keeping drainage systems open at all times during logging operations.

4. Inspect the road at regular intervals to detect and correct maintenance problems.

5. When all silvicultural activities are completed, re-shape the roadbed to ensure that drainage systems are open.

6. Upon completion of the operation, depending upon slope, all haul roads with exposed soil must either be: graded or backdragged; or graded or backdragged and seeded and mulched (See SPECIFICATIONS FOR REVEGETATION OF DISTURBED SOIL.).

SPECIFICATIONS FOR SKID TRAILS

Definition

A skid trail is an unsurfaced, single lane, trail or narrow road usually narrower and sometimes steeper than a truck haul road.

Purpose

This practice allows logs, tree lengths, or other roundwood products to be transported from the stump to a common landing or concentration area.

Conditions Where Practice Applies

This practice is used where harvesting products requires centralization for sawing or loading on trucks or trailers and where topography and size of operation make skidding the primary and most economical means of collecting trees, logs or other roundwood products.

Specifications

1. Locate log landings first and lay out skid trail approaches with grades 20% or less. Sound pre-harvest planning allows the location of major skid trails so as to avoid the problems associated with trail building on extreme slopes, minimize damage to the residual stand, reduce erosion and sedimentation, and provide the most economical method for skidding products.

2. Normally, gradients shall not exceed 20%. However, grades are permitted to be as steep as 25% for distances not greater than 200 feet. If steeper grades are necessary, practices must be approved and used to prevent concentrated water flow that causes gullies.

3. Typically, skid trails will be located outside the Streamside Management Zone (SMZ). If any equipment will be used in the SMZ (other than for stream crossings with an approved Waterway Construction Permit) a Custom Erosion And Sediment Control Plan or a SMZ Plan, prepared by a Maryland Licensed Forester, and approved by the appropriate plan approval authority (the SCD) will be required. Skid trails located within the SMZ shall be utilized so as to minimize disturbance to the humus layer. Skid trails located within the last 50 feet (adjacent to the body of water) shall be used only a limited number of times. Repair of damage to humus layer and stabilization shall be in accordance with the requirements set by this manual. (See SPECIFICATIONS FOR SMZ AND REVEGETATION OF DISTURBED SOILS).

4. Where crossings are needed, cross drains (culverts) are used to protect banks and water quality. Use methods such as layers of poles (corduroy) along the approach to provide temporary bank protection.

5. Cross perennial or intermittent streams, or drainage ditches that lead to natural drainage ways with bridges or culverts of acceptable design. Use of fords is only acceptable as described in the specifications for temporary stream crossings. Logs shall not be skidded through intermittent or perennial streams. Stream crossings will require a Waterway Construction Permit. Contact Maryland Department of the Environment - Water Management Administration for permitting information (See APPENDIX D.). Bridges are the preferred method for crossing streams.

6. Approaches to water crossings shall be as near to right angles to the stream direction as possible.

7. Avoid long steep grades; climb upslope on a slant or zigzag pattern.

8. Upon completion of skidding, the areas subject to erosion shall have water bars or other cross drainage structures installed immediately (See SPECIFICATIONS FOR WATER BARS.).

9. Any exposed soil resulting from the construction of the skid trail shall be stabilized in accordance with the 7/14 day criteria. This includes cut and fill slopes steeper than 3:1 and any perimeter slopes and sediment controls (See SPECIFICATIONS FOR REVEGETATION OF DISTURBED SOIL.)

10. Upon completion of the operation, depending upon slope, all skid trails with exposed soil must either be: graded or backdragged; or graded or backdragged and seeded and mulched (See SPECIFICATIONS FOR REVEGETATION OF DISTURBED SOIL.)

SPECIFICATIONS FOR LOG DECKS AND LANDINGS

Definition

Decks and landings are areas where logs are collected at the end of skid trails and haul roads. Also included are concentration yards near mills.

Purpose

This practice establishes a centralized location where harvested timber products are collected for sorting and/or loading on trucks.

Condition Where Practice Applies

This practice applies where harvest area is large enough to necessitate concentrating materials for loading.

Specifications

1. This practice generally results in disturbance of the soil surface. Properly locate decks, landings and portable mill sites to minimize the chances of erosion or sedimentation.

2. Locate decks and portable mill sites in advance of road construction.

3. Locate portable mills and decks at least 50 feet from the upper limit of the Streamside Management Zone.

4. Sound pre-harvest planning will allow placement of landings and decks on optimal slopes and avoid the problems associated with building in extreme locations. Decks and yards must be located on reasonably level, (3 to 10 percent) well drained ground. If the site does not have any area with a slope of at least 3 percent, landings shall be located on the maximum slope of the site. If grades steeper than 10% are necessary, practices must be approved and used to prevent concentrated water flow that cause gullies.

5. Provide for adequate drainage on approach roads and trails so that surface water does not drain onto the deck area and cause ponding.

6. Provide a diversion ditch around the uphill side of decks to intercept the flow of surface water and direct it away from the deck.

7. Locate residue piles (sawdust, slabs, etc.) outside of wet weather drainages so that water from residue will not drain into adjacent streams or bodies of water.

8. Upon completion of the operation, depending upon slope, all decks, landings and

portable mill locations with exposed soil must either be: graded or backdragged; or graded or backdragged and seeded and mulched (See SPECIFICATIONS FOR REVEGETATION OF DISTURBED SOIL.).

STREAMSIDE MANAGEMENT ZONE (SMZ)

Two options are available to govern forest harvest operations in the streamside management zone. The first is valid statewide. The second is for use only in the lower four counties of the Eastern Shore and then only under specific conditions.

Please review the options carefully relative to the specific circumstances of you harvest and select the option best suited them.

SPECIFICATIONS FOR STREAMSIDE MANAGEMENT ZONE (SMZ) – STATEWIDE

Definition

A streamside management zone is an area of 50 feet or more, based on steepness of adjacent slopes, on both banks of any waters of the State. The SMZ provides extra precautions when carrying out forest harvests and protects stream bank stability and water quality.

Purpose

The purpose of the SMZ is to provide a relatively undisturbed zone to trap, settle and filter out suspended sediments before these particles reach the stream.

Conditions Where Practice Applies

This practice applies along all waters of the State throughout Maryland.

PLEASE NOTE: If a forest harvest operation occurs in Dorchester, Somerset, Wicomico, or Worcester counties see the next specification and utilize the specification best suited to the individual circumstances of the harvest.

Specifications

1. SMZs shall be marked and maintained on all sides of waters of the State. For the purposes of establishing the limits of the SMZ, waters of the State shall not include the 100 year floodplain and natural and manmade systems that convey stormwater runoff only in direct response to precipitation events.

   Waters of the State shall typically include all perennial streams and intermittent streams. Perennial and intermittent streams are streams whose flow includes a permanent, seasonal, or temporary groundwater component (i.e. the base level of the stream is at or below the local water table). Such streams flow for days, weeks, or months after the most recent rainfall, or flow year round. Many, but not all such features are identified on United States Geological Survey 7.5 Minute Series (Topographic) maps as solid and dotted-dashed blue lines (i.e. Blue Line Streams). Any erosion and sediment control plan for a site that includes a blue line stream must provide for a SMZ on the stream.

   It is possible that perennial and intermittent streams exist that are not shown as blue line streams on the topographic maps. Perennial and intermittent streams that exist on a forest harvest site but are not shown as blue line streams also must have a SMZ installed and maintained during the harvest. In cases where streams exist but are not mapped, the Maryland Licensed Forester, in conjunction with the appropriate plan

approval authority (the SCD) must identify these streams, show them on the SMZ plan, and provided the appropriate width management zone. The topographic maps are generally accurate enough to identify the larger valleys associated with unmapped perennial and intermittent streams.

The minimum width of the zone shall be 50 feet. This applies to adjacent land with no slope; where sloping land is encountered, the SMZ width shall be established using the formula presented later in this section.

2. No new roads are permitted in the SMZ except to access a stream crossing authorized by an approved Waterway Construction Permit. If the only activity in the SMZ is the installation of an approved waterway crossing and its approaches, a SMZ plan is not required.

   The appropriate plan approval authority (the SCD) may make exceptions for existing roads that are located within the SMZ. Existing roads, if serviceable and not creating a pollution problem, may be utilized if identified on the SMZ plan and approved by the appropriate plan approval authority (the SCD).

3. Skid trails are permitted within the SMZ. Skid trails within the SMZ shall be utilized so as to minimize disturbance to the humus layer. Skid trails located within the last 50 feet (adjacent to the body of water) shall be used only a limited number of times. Repair of damage to the humus layer within the SMZ and stabilization of the SMZ following the harvest shall be in accordance with the requirements set by this manual. (See SPECIFICATIONS FOR REVEGETATION OF DISTURBED SOILS).

4. Certain activity is permitted in the SMZ if authorized by a SMZ plan designed in accordance with the following criteria:
   a. The SMZ plan will be prepared by a Maryland Licensed Forester.
   b. A sketch showing the location of needed erosion and sediment control measures will be provided.
   c. Stream crossings shall be avoided where possible. When needed the crossings shall be shown on the sketch.
   d. The sketch of the SMZ shall show any road leading to the SMZ and skid trails within the SMZ.
   e. Damage to the humus layer will be minimized. Damage is defined as the impairment of the usefulness of the humus layer in controlling sediment laden stormwater runoff caused by the harvest operations.
   f. Damage to the humus layer will be repaired immediately and stabilized. Damage is defined as the impairment of the usefulness of the humus layer in controlling sediment laden stormwater runoff caused by the harvest operations. Repair is defined as returning the humus layer to pre-harvest conditions.
   g. Exposed soil within the SMZ, resulting from the harvest operation, will be stabilized with seed and mulch within 7 days of the disturbance.
   h. Fertilizer shall not be used.

i. Use of logging equipment will be limited; dispersal skidding and use of low ground pressure equipment are encouraged.
j. SMZ plans may provide for harvesting within the last 50 feet (adjacent to the body of water). Felled timber shall be removed by cable, non-vehicular means, extended reach equipment, or by skidder using a limited number of passes. Limited number of passes is defined as ceasing the use of a skid trail before the humus layer is compacted or otherwise disturbed. The use of low ground pressure equipment is strongly encouraged.
k. The objective of the SMZ is to maintain an effective wooded buffer. The basal area will not be reduced below 60 square feet per acre of trees 6 inches or greater in diameter measured at 4.5 feet above the ground (diameter breast height, dbh). Where there is a sound silvicultural basis, the SMZ may be clearcut. The clearcut must be part of the SMZ plan prepared by a Maryland Licensed Forester and approved by the appropriate plan approval authority (the SCD). When a clear cut is authorized, the SMZ Plan shall specify that perimeter controls be implemented as close to the body of water as practical prior to the start of and maintained during the harvest. Acceptable perimeter control includes silt fence, straw bale dike, approved vegetated buffer of a specified width, or an earth berm. Other practices may be approved by the appropriate plan approval authority.
l. All harvested tree limbs and tops will be removed from the stream to prevent stream blockage. Material originating outside of the SMZ shall not be deposited within the SMZ.
m. Individual trees to be cut will be marked at eye level and also where the mark will remain on the stump after cutting. (This requirement does not apply to clearcut operations.)
n. The method of harvest to ensure sufficient regeneration will be specified in the SMZ plan.
o. Harvesting restrictions will be implemented during adverse weather conditions.
p. Trees shall be felled away from the stream banks.

5. Sawmill sites and decks shall be located outside the SMZ.

6. Energy dissipaters such as riprap at cross drain culvert outlets or discharge points shall be installed where needed. Do not block water flow when using these structures.

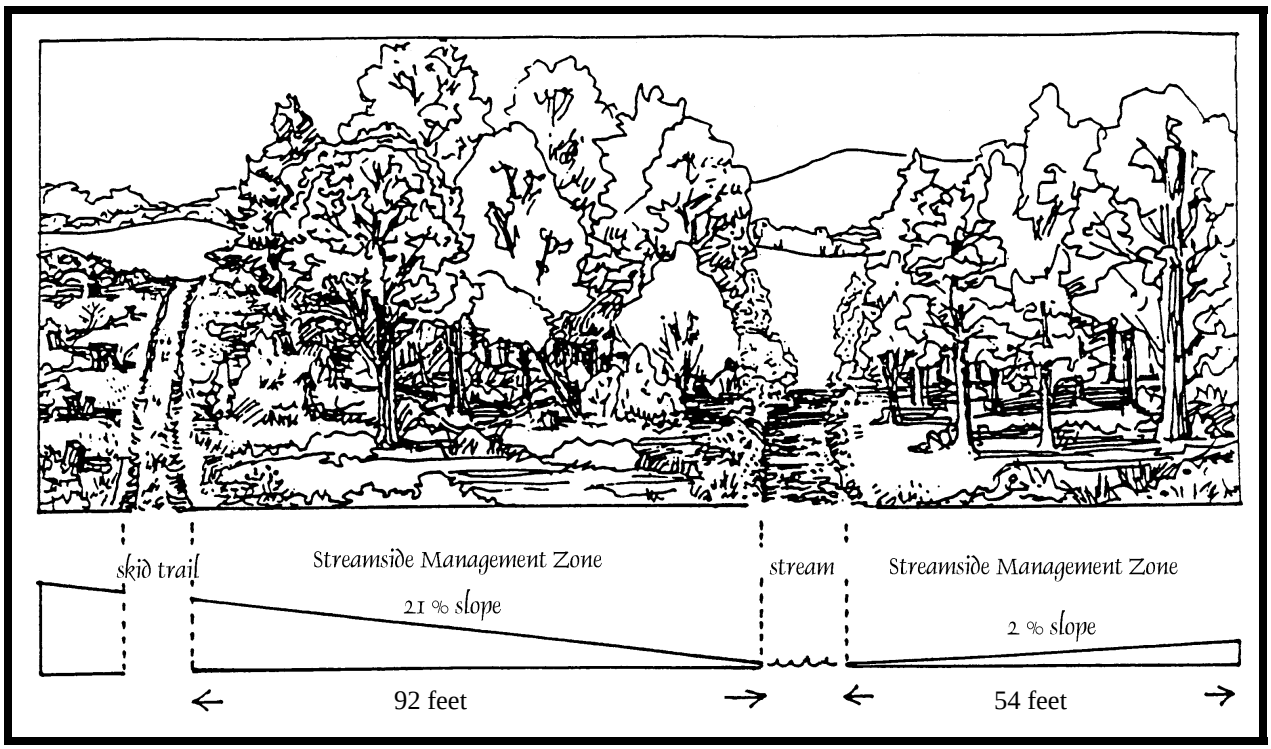
7. To intercept and properly discharge runoff waters from truck roads and skid trails leading to an SMZ, refer to individual specifications for drainage structures (See SPECIFICATIONS FOR BROAD BASED DIP, ROLLING DIP, WATER BARS, AND CROSS ROAD DRAINAGE).

8. Stream crossings shall be constructed in accordance with the specifications provided later in this document. (See SPECIFICATIONS FOR TEMPORARY STREAM CROSSINGS AND APPENDIX G.1.)

9. Any proposed activity within the SMZ shall not contaminate the watercourse with sediment or any other pollutant (e.g. equipment fluids).

A recommended SMZ plan form immediately follows the diagram of the SMZ in this specification. It may be used to apply for a SMZ plan. Other formats may be required by the appropriate plan approval authority (the SCD).

Diagram 3.0 – Streamside Management Zone, Statewide



SMZ horizontal width is measured in linear feet from the edge of the pond, lake, or stream bank to the upper limit of the zone.

The SMZ widths shall be maintained during the entire harvest operation. They are determined by the following formula established by forest researchers for effective SMZ widths:

50 feet + (2 feet x % slope) = SMZ width
(To A Maximum Of 150 Feet)

Examples: (See diagram above)		
21% slope		2% slope
50’ + (2’ x 21%) = 50' + 42’ = 92' SMZ		50 + (2’ x 2%) = 50' + 4' = 54' SMZ

SMZ Plan Form

The form on the following page is an example of one acceptable type. Other types are permissible. Check with the appropriate plan approval authority

STREAMSIDE MANAGEMENT ZONE (SMZ) PLAN

Landowner's Name: _____

Address: _____

Location: _____

(Attach a map indicating the location of streamside management zone, waterways, planned stream crossings, roads, main skid trails, and landings)

Area in streamside management zone (SMZ): _____ acres.

Width of SMZ (each side of stream):
Range (min. – max. width) _____ feet; Average Width _____ feet.

Boundary of SMZ is marked with _____ (color) _____ (paint or flagging).

Predominant species: _____
Percent of loblolly pine _____%; Virginia pine _____%; yellow-poplar _____%.

Current stocking density (basal area):
Range (min. – max.) _____ sq. ft./acre; Average _____ sq. ft./acre.

Average stocking to be retained: _____ sq. ft./acre. (Normally > 60 sq. ft. in trees > 6" dbh.)

Trees to be harvested are marked with _____ color paint at eye level and on base.
Type of harvest within SMZ: _____
Thinning, Selection, Shelterwood, Clearcut (Clearcutting allowed if stand is >25% Loblolly or Va. Pine, or Yellow-Poplar)
Regeneration will be from: _____
Advanced reproduction, seed, sprouts, planted seedlings, or N/A
This SMZ Plan is used in conjunction with the "Standard Erosion and Sediment Control Plan" for this operation. All limitations for harvesting timber within a SMZ, as described in "Specifications for Streamside Management Zone (SMZ)", will be followed. Additional comments may be attached.

==========

Prepared by: _____
(MD Licensed Forester) Printed Name Signature Date

Agreed to by: _____
(Landowner) Printed Name Signature Date

Approved by: _____
(Soil Conservation Dist.) Printed Name Signature Date

SPECIFICATIONS FOR STREAMSIDE MANAGEMENT ZONE (SMZ) – RESTRICTED TO THE LOWER EASTERN SHORE

Definition

A streamside management zone is an area on both banks of any waters of the State. As discussed in this specification, the zone is typically 50 to 60 feet wide. The SMZ provides extra precautions when carrying out forest harvests and protects stream bank stability and water quality.

Purpose

The purpose of the SMZ is to provide a relatively undisturbed zone to trap, settle and filter out suspended sediments before these particles reach the stream.

Conditions Where Practice Applies

This practice is restricted to certain waters of the State that are located in Dorchester, Somerset, Wicomico, or Worcester counties.

PLEASE NOTE: If a forest harvest operation occurs in any other county there may be different SMZ requirements. See the previous specification and utilize the specification that is appropriate to the individual circumstances and location of the harvest.

Specifications

1. SMZs shall be marked and maintained on all sides of waters of the State. For the purposes of establishing the limits of the SMZ under this specification, waters of the State shall not include the 100 year floodplain, man-made ditches created and managed under a public drainage association, or natural and man-made systems that convey stormwater runoff only in direct response to precipitation events. Other man-made ditches (see definition in the Glossary) may, under specific circumstances, be granted a variance from the requirement for a SMZ. In order to protect water quality, any such man-made ditch that is granted a variance from the SMZ requirement shall have erosion and sediment control measures installed prior to and maintained during the harvest. The variance and associated erosion and sediment control measures shall be approved by the appropriate plan approval authority (the SCD).

   Waters of the State shall typically include all perennial streams and intermittent streams, unless otherwise explicitly granted a variance and approved by the appropriate plan approval authority (the SCD). Perennial and intermittent streams are streams whose flow includes a permanent, seasonal, or temporary groundwater component (i.e. the base level of the stream is at or below the local water table). Such streams flow for days, weeks, or months after the most recent rainfall, or flow year round. Many, but not all such features are identified on United States Geological Survey 7.5 Minute Series

(Topographic) maps as solid and dotted-dashed blue lines (i.e. Blue Line Streams). Any erosion and sediment control plan for a site that includes a blue line stream must provide for a SMZ on the stream unless explicitly granted a variance in accordance with this specification. Certain blue line streams shown on the topo maps may in fact be Public Drainage Association ditches and consequently are not subject to SMZ requirements.

It is possible that perennial and intermittent streams exist but are not mapped. In cases where such streams exist but are not mapped, the Maryland Licensed Forester, in conjunction with the appropriate plan approval authority (the SCD) must identify these streams. The topographic maps are generally accurate enough to identify the larger valleys associated with these unmapped streams. Once identified these streams must be either:

- Documented as meeting the criteria for a variance from the SMZ requirement, or
- Provided with a SMZ of the appropriate width.

Areas adjacent to waters of the State determined not to require a SMZ, in accordance with this specification, shall be identified on the standard erosion and sediment control plan or custom erosion and sediment control.

The minimum width of the zone shall be 50 feet. This applies to land with no slope; where sloping land is encountered, the SMZ width shall be established using the formula presented later in this section.

2. No new roads are permitted in the SMZ except to access a stream crossing authorized by an approved Waterway Construction Permit. If the only activity in the SMZ is the installation of an approved waterway crossing and its approaches, a SMZ plan is not required.

   The appropriate plan approval authority (the SCD) may make exceptions for existing roads that are located within the SMZ. Existing roads, if serviceable and not creating a pollution problem, may be utilized if identified on the SMZ plan and approved by the appropriate plan approval authority (the SCD)

3. Skid trails are permitted within the SMZ. Skid trails within the SMZ shall be utilized so as to minimize disturbance to the humus layer. Skid trails located within the last 50 feet (adjacent to the body of water) shall be used only a limited number of times. Repair of damage to the humus layer within the SMZ and stabilization of the SMZ following the harvest shall be in accordance with the requirements set by this manual. (See SPECIFICATIONS FOR REVEGETATION OF DISTURBED SOILS).

4. Certain activity is permitted in the SMZ if authorized by a SMZ plan designed in accordance with the following criteria:
   a. The SMZ plan will be prepared by a Maryland Licensed Forester.
   b. A sketch showing the location of needed erosion and sediment control measures will be provided.

c. Stream crossings shall be avoided where possible. When needed the crossings shall be shown on the sketch.
d. The sketch of the SMZ shall show any road leading to the SMZ and skid trails within the SMZ.
e. Damage to the humus layer will be minimized. Damage is defined as the impairment of the usefulness of the humus layer in controlling sediment laden stormwater runoff caused by the harvest operations.
f. Damage to the humus layer will be repaired immediately and stabilized. Damage is defined as the impairment of the usefulness of the humus layer in controlling sediment laden stormwater runoff caused by the harvest operations. Repair is defined as returning the humus layer to pre-harvest conditions.
g. Exposed soil within the SMZ, resulting from the harvest operation, will be stabilized with seed and mulch within 7 days of the disturbance.
h. Fertilizer shall not be used.
i. Use of logging equipment will be limited; dispersal skidding and use of low ground pressure equipment are encouraged.
j. SMZ plans may provide for harvesting within the last 50 feet (adjacent to the body of water). Felled timber shall be removed by cable, non-vehicular means, extended reach equipment, or by skidder using a limited number of passes. Limited number of passes is defined as ceasing the use of a skid trail before the humus layer is compacted or otherwise disturbed. The use of low ground pressure equipment is strongly encouraged.
k. The objective of the SMZ is to maintain an effective wooded buffer. The basal area will not be reduced below 60 square feet per acre of trees 6 inches or greater in diameter measured at 4.5 feet above the ground (diameter breast height, dbh). Where there is a sound silvicultural basis, the SMZ may be clearcut. The clearcut must be part of the SMZ plan prepared by a Maryland Licensed Forester and approved by the appropriate plan approval authority (the SCD). When a clear cut is authorized, the SMZ Plan shall specify that perimeter controls be implemented as close to the body of water as practical prior to the start of and maintained during the harvest. Acceptable perimeter control includes silt fence, straw bale dike, approved vegetative buffer of a specified width, or an earth berm. Other practices may be approved by the appropriate plan approval authority.
l. All harvested tree limbs and tops will be removed from the stream to prevent stream blockage. Material originating outside of the SMZ shall not be deposited within the SMZ.
m. Individual trees to be cut will be marked at eye level and also where the mark will remain on the stump after cutting. (This requirement does not apply to clearcut operations.)
n. The method of harvest to ensure sufficient regeneration will be specified in the SMZ plan.
o. Harvesting restrictions will be implemented during adverse weather conditions.

p. Trees shall be felled away from the stream banks.

5. Sawmill sites and decks shall be located outside the SMZ.

6. Energy dissipaters such as riprap at cross drain culvert outlets or discharge points shall be installed where needed. Do not block water flow when using these structures.

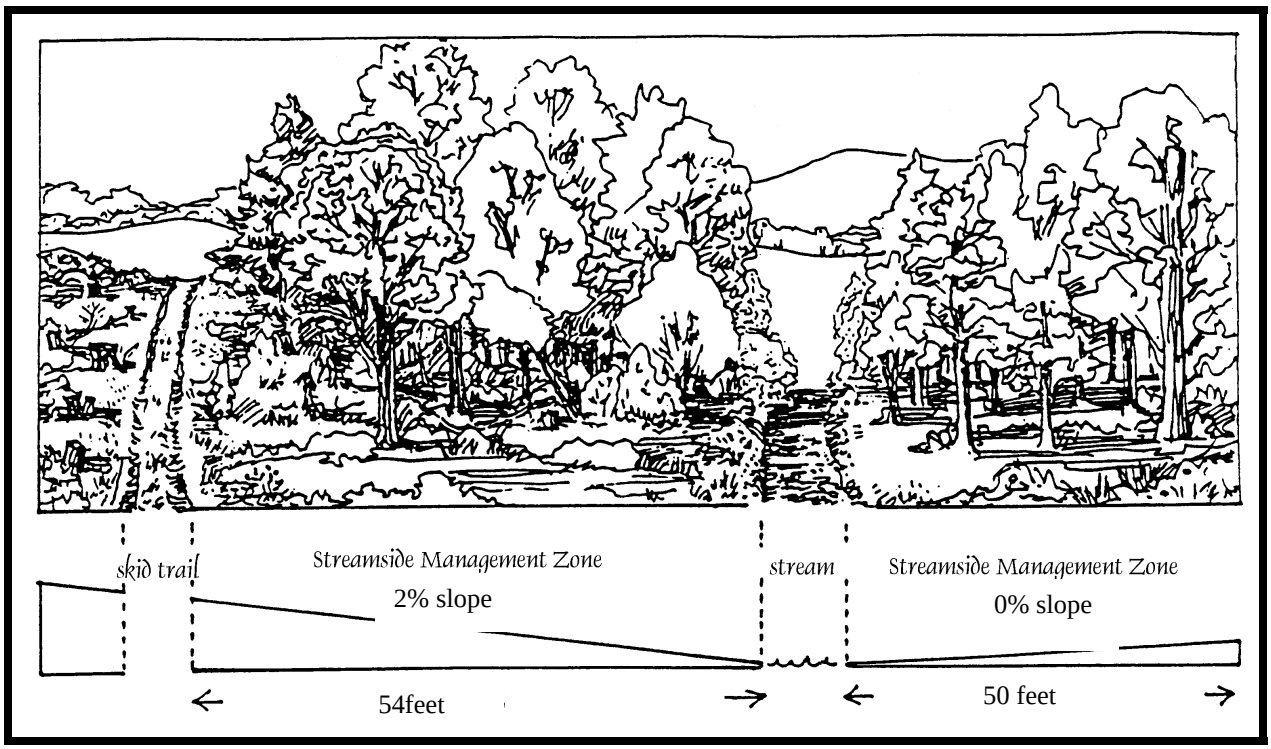
7. To intercept and properly discharge runoff waters from truck roads and skid trails leading to an SMZ, refer to individual specifications for drainage structures (See SPECIFICATIONS FOR BROAD BASED DIP, ROLLING DIP, WATER BARS, AND CROSS ROAD DRAINAGE).

8. Stream crossings shall be constructed in accordance with the specifications provided later in this document. (See SPECIFICATIONS FOR TEMPORARY STREAM CROSSINGS AND APPENDIX G.1.)

9. Any proposed activity within the SMZ shall not contaminate the watercourse with sediment or any other pollutant (e.g. equipment fluids).

A recommended SMZ plan form immediately follows the diagram of the SMZ in this specification. It may be used to apply for a SMZ plan. Other formats may be required by the appropriate plan approval authority (the SCD).

Diagram 4.0 – Streamside Management Zone, Restricted To Lower Eastern Shore



SMZ horizontal width is measured in linear feet from the edge of the pond, lake, or stream bank to the upper limit of the zone.

The SMZ widths shall be maintained during the entire harvest operation. They are determined by the following formula established by forest researchers for effective SMZ widths:

50 feet + (2 feet x % slope) = SMZ width
(To A Maximum Of 150 Feet)

Examples: (See diagram above)		
2% slope		0% slope
50’ + (2’ x 2%) = 50' + 2’ = 54' SMZ		50 + (2’ x 0%) = 50' + 0' = 50' SMZ

SMZ Plan Form

The form on the following page is an example of one acceptable type. Other types are permissible. Check with the appropriate plan approval authority

STREAMSIDE MANAGEMENT ZONE (SMZ) PLAN

Landowner's Name: _____

Address: _____

Location: _____
(Attach a map indicating the location of streamside management zone, waterways, planned stream crossings, roads, main skid trails, and landings)

Area in streamside management zone (SMZ): _____ acres.

Width of SMZ (each side of stream):
Range (min. – max. width) _____ feet; Average Width _____ feet.

Boundary of SMZ is marked with _____ (color) _____ (paint or flagging).

Predominant species: _____
Percent of loblolly pine _____%; Virginia pine _____%; yellow-poplar _____%.

Current stocking density (basal area):
Range (min. – max.) _____ sq. ft./acre; Average _____ sq. ft./acre.

Average stocking to be retained: _____ sq. ft./acre. (Normally > 60 sq. ft. in trees > 6" dbh.)

Trees to be harvested are marked with _____ color paint at eye level and on base.
Type of harvest within SMZ: _____
Thinning, Selection, Shelterwood, Clearcut (Clearcutting allowed if stand is >25% Loblolly or Va. Pine, or Yellow-Poplar)
Regeneration will be from: _____
Advanced reproduction, seed, sprouts, planted seedlings, or N/A
This SMZ Plan is used in conjunction with the "Standard Erosion and Sediment Control Plan" for this operation. All limitations for harvesting timber within a SMZ, as described in "Specifications for Streamside Management Zone (SMZ)", will be followed. Additional comments may be attached.
==========
Prepared by: _____
(MD Licensed Forester) Printed Name Signature Date

Agreed to by: _____
(Landowner) Printed Name Signature Date

Approved by: _____
(Soil Conservation Dist.) Printed Name Signature Date

SPECIFICATIONS FOR BROAD-BASED DIP

Definition

This structure is a dip and reverse slope in a road surface with an out slope in the dip for natural cross drainage.

Purpose

This practice provides cross drainage on insloped truck roads. This prevents buildup of excessive surface runoff and subsequent erosion.

Conditions Where Practice Applies

This practice applies where truck haul roads and heavily used skid trails have a gradient of 10% or less. This practice is not for use for cross draining spring seeps, or intermittent or perennial streams.

Broad-based dips are very effective in gathering surface water and directing it safely off the road. Dips are placed across the road in the direction of water flow. This type of structure allows normal truck speeds without adding stress to the vehicle.

Specifications

1. Installation takes place following basic clearing and grading for roadbed construction.

2. Begin construction by locating the discharge point; usually a low point in the road grade.

3. Compact the area and cover the dip with 3 inches of #2 stone (nominal dimension 2 inches) for conveyance of stormwater runoff and roadbed protection. The stone is not necessary if the roadbed is composed of shale or bedrock.

4. Place stone at the discharge point of water being channeled from the road surface.

5. All side cast material shall be stabilized with seed and mulch.

6. A 20-foot long, 3% reverse grade is constructed into the existing roadbed by cutting from upgrade of the dip location.

7. The cross drain outslope will be 3% maximum.

8. To reduce water velocity use an energy dissipater such as riprap or in most cases, a level area at the outfall of the dip where the water can spread.

9. Spacing of broad-based dips will be determined by the following formula:

Spacing = 400' / Slope % + 100' (Note: Refer to spacing table.)

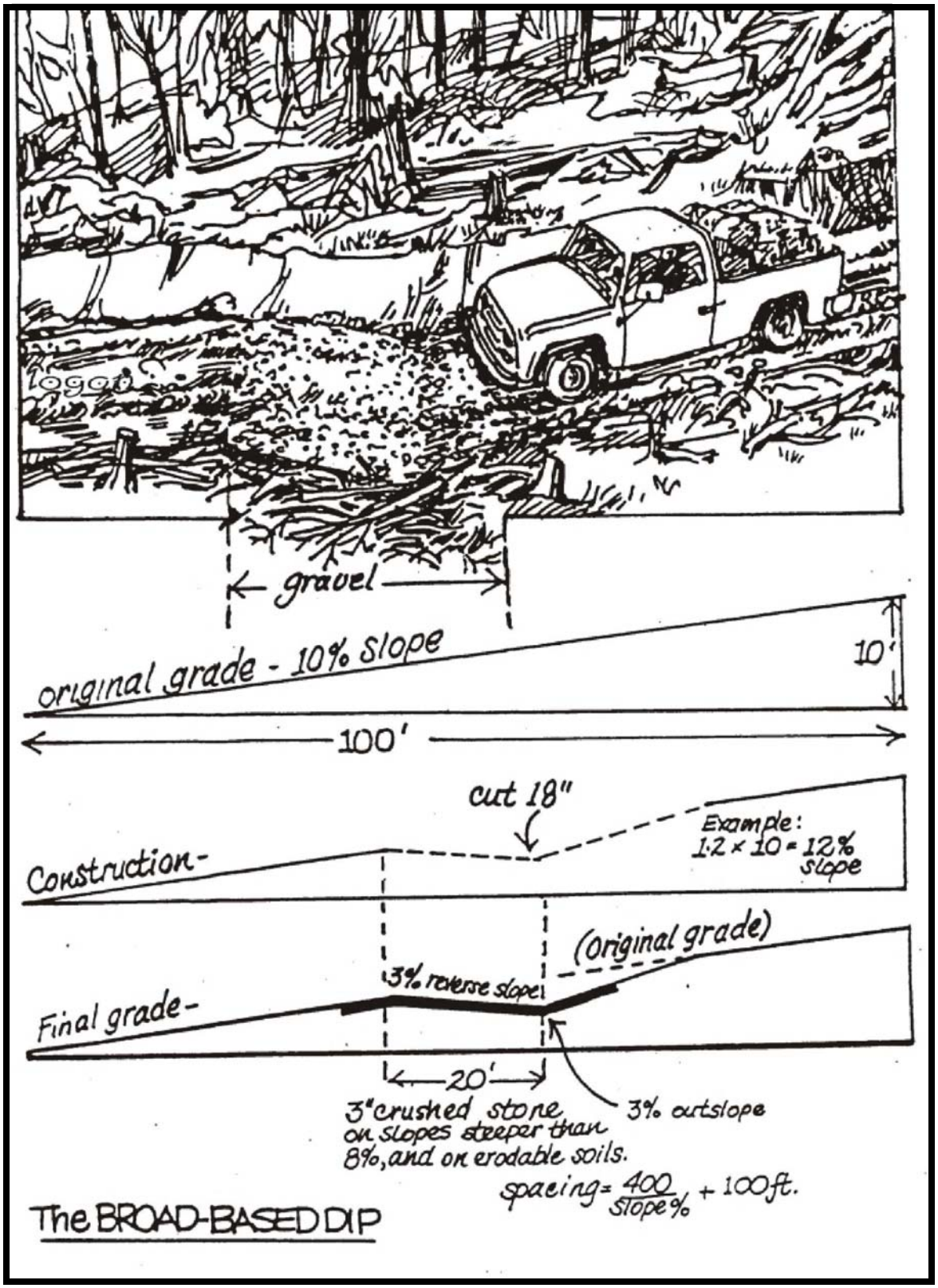
For example: 400 ft. / 8% + 100' = 50 ft. + 100 ft. = 150 ft. apart
Or see Table 2.

Table 2 – Broad Based Dip Spacing vs. Road Grade

Road Grade (Percent)	Spacing Between Dips (feet)
2	300
3	235
4	200
5	180
6	165
7	155
8	150
9	145
10	140
12	135

An inherent problem in construction of a broad-based dip is recognizing that the roadbed consists of two planes rather than one unbroken plane. One plane is the 20-foot reverse grade toward the uphill road portion and outlet. Another plane is the grade from the top of a hump or start of a downgrade to the outlet of the dip. Neither the dip nor the hump is to have a sharp, angular break but is to be rounded to allow a smooth flow of traffic. These dips do not damage loaded trucks, or slow vehicle speed. Dips require minimal annual maintenance and continue to function years after abandonment. Only the dip is outsloped to provide sufficient break in grade to turn the water.

Diagram 5.0 – Broad-based Dip



SPECIFICATIONS FOR ROLLING DIP

Definition

This structure is a dip and reverse slope in a road surface with an outslope in the dip for natural cross drainage. This structure is to be used on roads that are too steep for broad-based dips.

Purpose

This practice provides cross drainage on insloped truck roads. This prevents excessive surface runoff and subsequent erosion.

Conditions Where Practice Applies

This practice applies where truck haul roads and heavily used skid trails have a gradient of 15% or less. This practice is not for use for cross draining spring seeps, or intermittent or perennial streams.

Specifications

1. Installation takes place following basic clearing and grading for roadbed construction on skid trails.

2. A 10-foot to 15-foot long, 3% to 8% reverse grade is constructed into the existing roadbed by cutting from upgrade to the dip location and using cut material to build up the mound for the reverse grade.

3. Spacing of rolling dips will determined by the following formula:

Spacing of broad-based dips will be determined by the following formula:

Spacing = 400' / Slope % + 100' (Note: Refer to spacing table.)

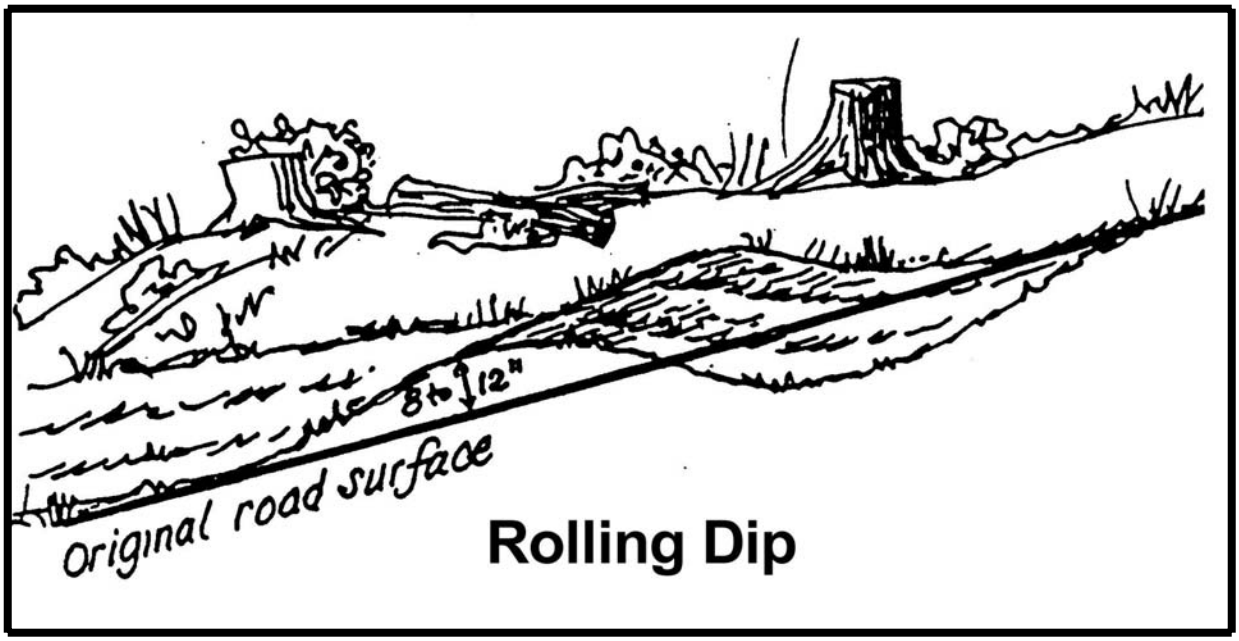
For example: 400 ft. / 8% + 100' = 50 ft. + 100 ft. = 150 ft. apart
Or see Table 3.

Table 3 – Rolling Dip Spacing vs. Road Grade

Grade of Road (Percent)	Distance Between Rolling Dips (feet)
2 – 5	180
5 – 10	150
10 – 15	135

15 +		120

Diagram 6.0 – Rolling Dip



SPECIFICATIONS FOR WATER BARS

Definition

A water bar is a post-harvest trench and berm constructed across a road or trail. On sandy soils, the trench is usually reinforced with a pole. This structure can also be called a water break.

Purpose

This is a post-harvest practice. It is used to intercept and divert side-ditch and surface runoff from roads or trails that will not have vehicular traffic. This practice is used to minimize erosion and provide conditions suitable for natural or artificial re-vegetation.

Conditions Where Practice Applies

This is a practice for use on road or trail grades where surface water runoff causes erosion of the exposed soil. Use only where there will not be any vehicular traffic. If there is a potential for vehicular traffic, use rolling dips.

Specifications

1. Determine proper spacing between water bars using the following formula:

$$1000 \div (\% \text{ grade} + 2.5) = \text{water bar spacing}$$

Table 4 – Water Bar Spacing vs. Road Grade

Grade of Road (%)	Approximate Distance Between Water Bars (ft)
2	230
5	135
10	80
15	60
20+	45

2. Water bars are to be at an angle of 30 to 45 degrees downslope to turn surface water off the road or trail.

3. Excavate a trench 3 to 4 inches below the surface of the road or trail with a 1 foot berm on the downhill side of the trench. Use spoil materials to develop the bar height.

4. The uphill end of the bar shall extend beyond the side ditch line of the road and tie into

the bank to fully intercept any ditch flows.

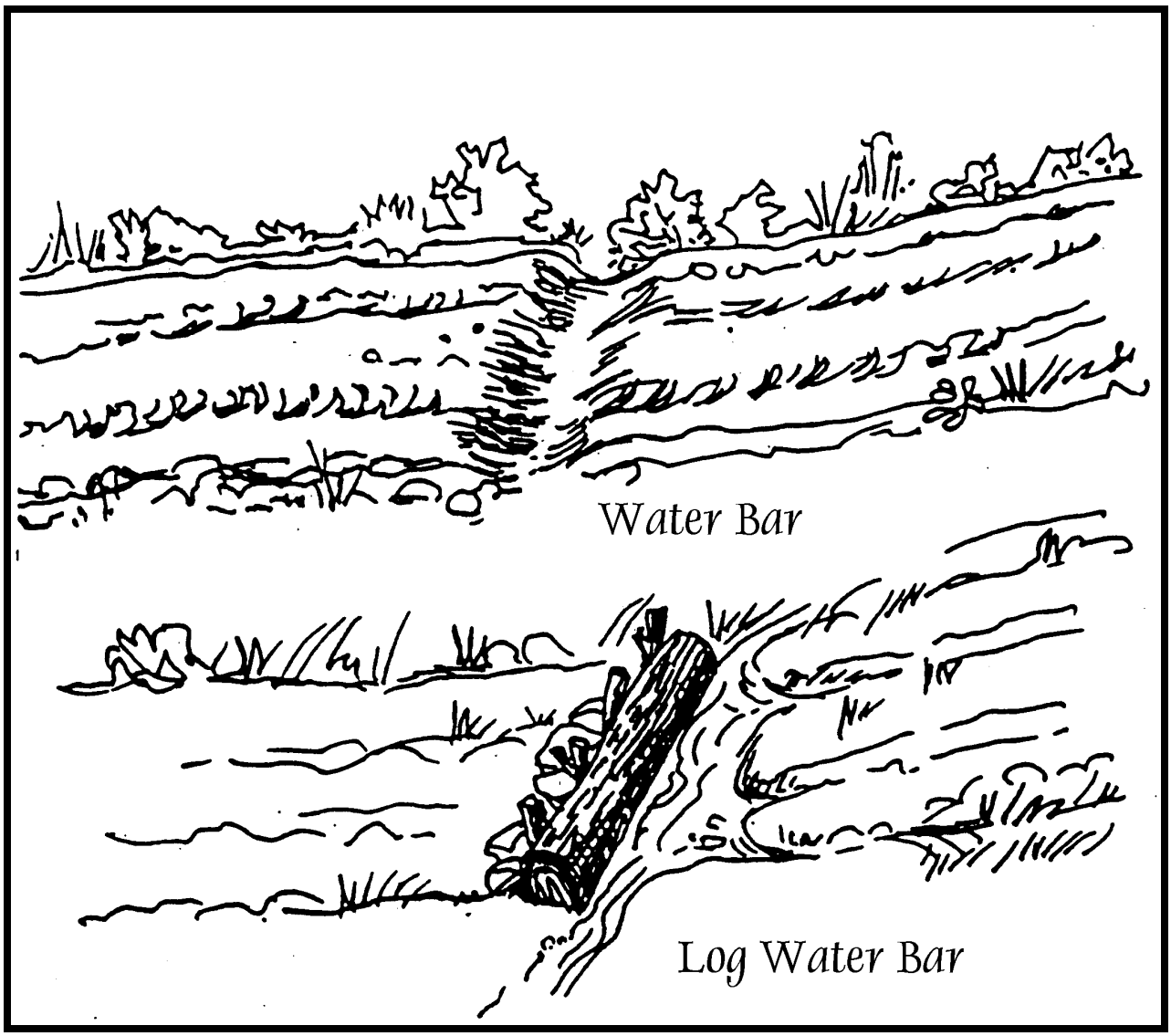
5. The outflow end of the bar is to be fully opened and extend far enough beyond the edge of the road or trail to safely disperse runoff water onto the undisturbed forest floor.

6. On sandy soils, a five to eight inch diameter pole shall be placed in the full length of the trench. This pole shall be pegged and covered with soil on the downslope side.

7. Ensure that the outlet is open and consider the need for energy dissipating water spreaders at or below drain outlet on sensitive areas.

8. Upon completion of the operation, exposed soil resulting from the creation of water bars must be seeded and mulched in accordance with the stabilization requirements for a haul road or skid trail. (See SPECIFICATIONS FOR REVEGETATION OF DISTURBED SOIL)

Diagram 7.0 – Water Bars



SPECIFICATIONS FOR WATER TURNOUTS

Definition

A water turnout, or diversion ditch, is a structure installed to move water away from the road and/or side ditch.

Purpose

This practice collects and directs road surface runoff from one side of the road away from the road and into undisturbed areas.

Conditions Where Practice Applies

This practice applies to any road or trail section where water could accumulate. The water shall be diverted into undisturbed areas so the volume and velocity is reduced on slopes.

Specifications

1. The turnout shall intersect the ditch line at an equal depth and be outsloped 1 to 3 percent.

2. On sloping roads, the turnout shall be 30 degrees to 45 degrees downslope.

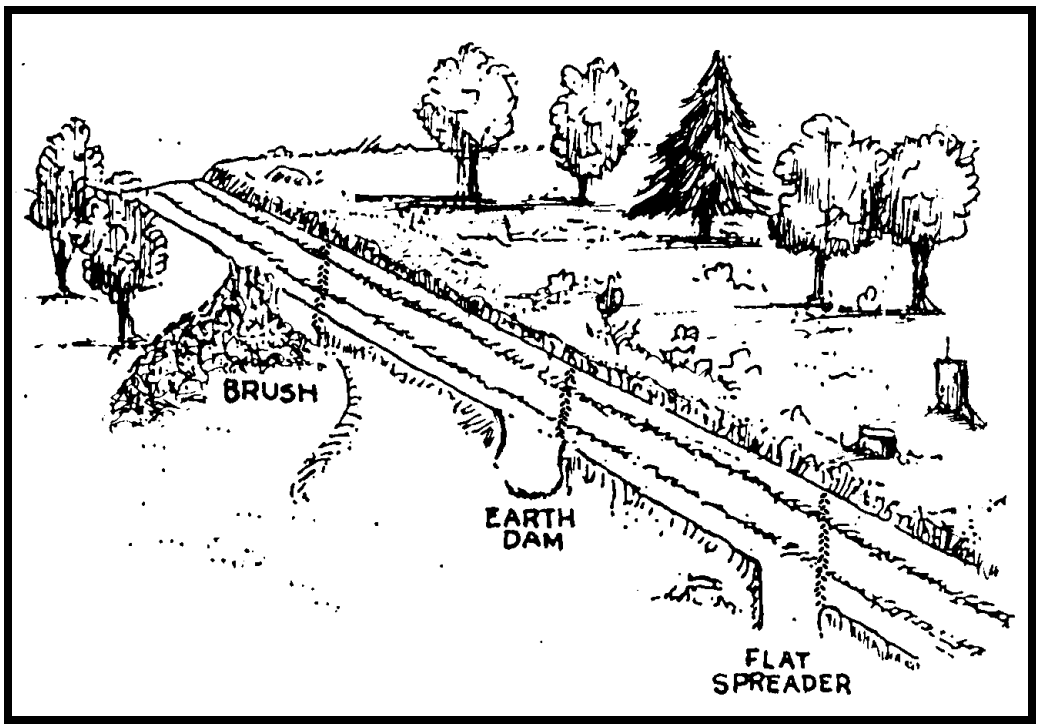
3. Turnouts shall be spaced to allow the roadbed to dry out and reduce the volume and velocity of side ditch waters.

4. Runoff water shall be spread at the outlet of the turnout.

5. Turnouts shall not feed directly into adjacent drainages or channels.

A buildup of drainage water in roadside ditches can gnaw at roadbeds, scour the road ditch itself, and transport soil particles downslope. Water turnouts will channel the water away from these roadside ditches and disperse it in areas adjacent to the road.

Diagram 8.0 – Water Turnouts



SPECIFICATIONS FOR CROSS ROAD DRAINAGE

Definition

This structure consists of corrugated metal pipe, wooden open top culvert, or other suitable material installed under truck haul roads or major skid trails to convey stormwater runoff and seeps from the roadside ditch to the adjacent forest floor.

Purpose

This practice collects and transmits water flows safely from side ditches or seeps under haul roads and skid trails without eroding drainage systems or road surfaces. These structures are to be used to control stormwater only and normally will be dry. If working with continuous flows, See SPECIFICATIONS FOR TEMPORARY STREAM CROSSINGS.

Conditions Where Practice Applies

Use culverts for any size operation where cross drainage of stormwater is needed for truck haul roads or major skid trails. In some cases, a temporary culvert is necessary for drainage crossing a smaller skid trail. Inspect permanent installations for obstructions prior to the close of a timber sale.

Specifications

Pipe Culvert

1. Pipe length shall be long enough so both ends extend at least one foot beyond the side slope of fill material.

2. A culvert shall be placed on a 2 percent to 4 percent grade to prevent clogging.

3. Installation shall be skewed 30 degrees to 45 degrees downgrade.

4. Where erosion occurs either upstream or downstream of the culvert, erosion protection shall be provided. This protection shall be in the form of riprap, filter cloth, soil stabilization matting, large stone, etc.

5. Culverts shall be firmly anchored and earth compacted at least halfway up the side of the pipe to prevent water from leaking around it. A minimum of half the culvert diameter (but not less than one foot) of fill shall be placed above the culvert. Erosion protection measures shall be employed on any earthen fill.

Open-Top Box Culvert

1. Open top box culverts shall not be used for handling intermittent or live streams or skid trail cross drainage.

2. Box culvert shall be installed flush or just below road surface and skewed at an angle of 30 degrees to 45 degrees downgrade.

3. Upper end shall be at grade with the side ditch and the lower side extended into the toe of upslope bank.

4. Outfall shall extend beyond the road surface with adequate riprap or other material to dissipate water velocity and to assure no erosion of fill material.

5. Cleanout maintenance is necessary to remove sediments, gravel and logging debris and allow normal flow of runoff water through the structure at all times.

Cross Road Drainage Spacing

Spacing = 400 ft. / Slope % + 100 ft. (Note: refer to broad-based dip spacing table.)
For example: 400 ft. / 8% + 100 ft. = 50 ft. + 100 ft. = 150 ft. apart

Table 5 – Cross Road Drainage vs. Road Grade

Grade Of Road %	Approximate Distance Between Structures
2	300
3	235
4	200
5	180
6	165
7	155
8	150
9	145
10	140
12	135

Diagram 9.0 – Pipe Culvert Installation

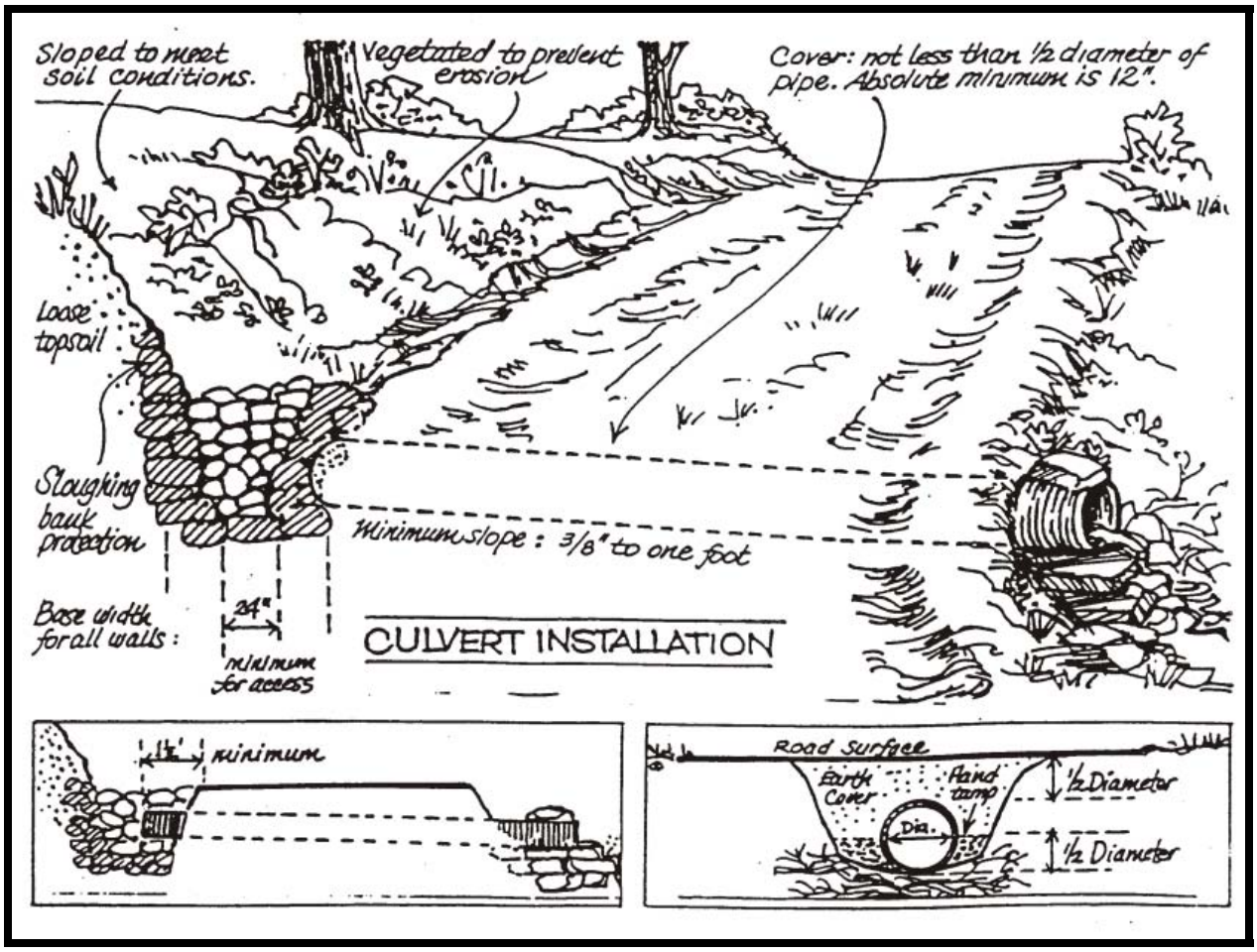
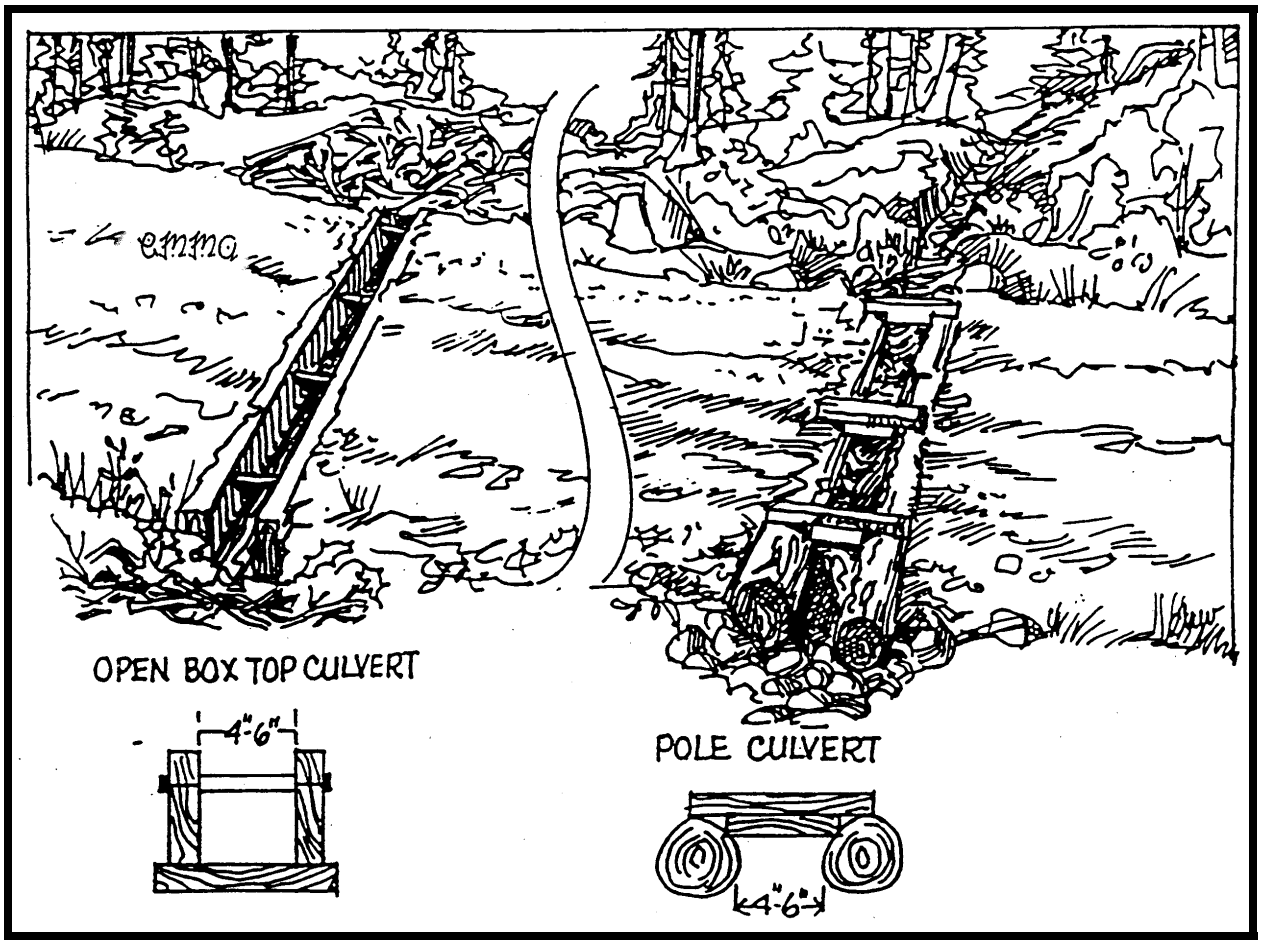


Diagram 9.1 – Open Top Box And Pole Culverts



TEMPORARY WATERWAY CROSSINGS

GENERAL REQUIREMENTS
BRIDGE
CULVERT
FORD

SPECIFICATIONS FOR TEMPORARY WATERWAY CROSSINGS – GENERAL REQUIREMENTS

Definitions

A temporary access waterway crossing is a structure placed across a waterway to provide access for harvest purposes for a period of less than one year. Temporary access crossings shall not be utilized to maintain traffic for the general public.

Purpose

The purpose of the temporary access waterway crossing is to provide safe, pollution free access across a waterway for harvest equipment by establishing minimum specifications for the design, construction, maintenance, and removal of the structure. Temporary access waterway crossings are necessary to prevent equipment from damaging the waterway, blocking fish migration, and tracking sediment and other pollutants into the waterway. Sound pre-harvest planning will allow crossings to be in service for the shortest practical period of time and removed as soon as their function is completed.

Condition Where Practice Applies

Any temporary access crossing shall conform to the technical requirements of these specifications as well as any specific requirements imposed by the MDE WMA Wetlands And Waterways Program permit (SEE APPENDICES D and G.1). The following specifications for temporary access waterway crossings are applicable in non-tidal waterways. The principle consideration for development of these specifications is concern for soil erosion and sediment control. Structural integrity and safety must also be considered when designing temporary access waterway crossings to withstand expected loads. The three types of temporary access waterway crossings are bridges, culverts, and fords.

General Specifications

1. In-stream excavation shall be limited to only that necessary to allow installation and removal of the practices as presented below and in the individual practice sections.

2. The construction of any specific crossing practice shall not cause a significant water level difference between the upstream and downstream water surface elevations. The order of preference for use of the individual practices is the bridge first (spanning the entire stream including its floodplain), next is the single pipe or pipe bundle culvert and the least preferred measure is the rock ford. Other practices are possible but shall be approved by the appropriate plan approval authority on a case by case basis.

3. The temporary waterway crossing shall be at right angles to the stream.

4. The centerline of both roadway approaches shall coincide with the crossing alignment centerline for a minimum distance of 50 feet from each bank of the waterway being crossed. If physical or right of way restraints preclude the 50 foot minimum, a shorter distance may be provided. All fill materials associated with the roadway approach shall be limited to a maximum height of 2 feet above the existing floodplain elevation. To the extent possible, the work on the approaches primarily within the floodplain shall be limited to grading to keep the road close to the existing grades.

5. A water diverting structure shall be constructed across the roadway on both roadway approaches at a 50 foot maximum on either side of the waterway crossing. This will prevent roadway surface runoff from directly entering the waterway. The 50 feet is measured from the top of the waterway bank. SEE SPECIFICATIONS FOR WATER TURNOUTS.

6. All crossings shall have one traffic lane. The minimum width shall be 12 feet with a maximum width of 20 feet.

7. Materials:
   a. There shall be no earth or soil materials used for construction within the waterway channel. State Highway Administration coarse aggregate designation Number 5, (¾ to 4 inches) also referenced as AASHTO designation Number 1, shall be the minimum acceptable aggregate size for temporary crossings. Larger aggregates will be allowed.
   b. Geotextile fabric is used to distribute the load, retain fines, allow increased drainage of aggregate, and reduce mixing of the aggregate with the sub grade soil.

Considerations For Choosing A Specific Practice

1. Select a standard design practice that will least disrupt the existing terrain of the stream reach. Consider the effort that will be required to restore the area after the temporary crossing is removed.

2. Locate the temporary crossing where there will be the least disruption to the soils of the existing waterway banks. When possible locate the crossing at a point receiving minimal runoff.

3. The physical constraints of the site may preclude the selection of certain standard practices.

4. The time of the year may preclude the selection of certain standard practices due to fish spawning or migration restrictions.

5. Vehicular loads, traffic patterns, and frequency of crossings should be considered in choosing a specific practice.

6. The standard practices will require varying amounts of maintenance. The bridge should

require the least maintenance, whereas the culverts and ford will probably require more intensive maintenance.

7. Ease of removal and subsequent damage to the waterway should be primary factors in considering the choice of a standard practice.

SPECIFICATIONS FOR TEMPORARY ACCESS WATERWAY CROSSING – BRIDGE

A temporary access bridge is a structure made of wood, metal, or other materials that provides access across an intermittent or perennial stream.

Considerations

1. This is the preferred practice for temporary access waterway crossings. Normally bridge construction causes the least disturbance to the waterway bed and banks when compared to the other access waterway crossings. Disturbance to the stream banks shall be kept to a minimum.

2. Most bridges can be quickly removed and reused.

3. Temporary access bridges pose the least chance for interference with fish migration and may eliminate the need for additional permits.

Specifications

1. Construction, use, or removal of a temporary access bridge will not normally have any time of the year restrictions since construction, use, or removal should not affect the stream or its banks unless built with piers(s) in the water.

2. A temporary bridge structure shall be constructed at or above the bank elevation to prevent trapping floating materials and debris.

3. Abutments shall be placed parallel to and on stable banks.

4. Bridges shall be constructed to span the entire channel. If the channel width exceeds 8 feet, as measured from top of bank to top of bank, then a footing, pier, or bridge support may be constructed within the waterway. One additional footing, pier, or bridge support will be permitted for each additional 8 foot width of the channel. However, no footing, pier, or bridge support will be permitted within the channel for waterways less than 8 feet wide.

5. Stringers shall be sawn timber, pre-stressed concrete beams, metal beams, or other approved materials.

6. Decking materials shall be of sufficient strength to support the anticipated load. All decking members shall be placed perpendicular to the stringers, butted tightly, and securely fastened to the stringers. Decking materials must be butted tightly to prevent any soil material that has been tracked onto the bridge from falling into the waterway below.

7. Run-planking (optional) shall be securely fastened to the length of the span. One run-plank shall be provided for each track of the equipment wheels. Although run-planks are optional they may be necessary to properly distribute loads.

8. Curbs or fenders shall be installed along the outer sides of the deck to prevent tracked sediments from falling over the edge of the bridge.

9. Bridges shall be securely anchored at only one end using steel cable or chain. Anchoring at only one end will prevent channel obstruction in the event that floodwaters float the bridge. Acceptable anchors are large trees, large boulders or driven steel anchors. Anchoring shall be sufficient to prevent the bridge from floating downstream.

10. All areas disturbed during installation shall be stabilized within 7 calendars days of the disturbance.

Bridge Maintenance Requirements

1. Periodic inspection shall be performed by the user to ensure that the bridge, streambed, and stream banks are maintained and not damaged.

2. Maintenance shall be performed as needed to ensure that the structure complies with these specifications. This shall include removal and disposal of any tracked sediment or trapped debris. Sediment shall be disposed of outside of the floodplain and stabilized.

Bridge Removal And Cleanup Requirements

1. When the temporary bridge is no longer needed all structures including abutments and other bridging materials shall be removed.

2. Final cleanup shall consist of removal of the temporary bridge from the waterway, protection of banks from erosion, and removal of all construction materials. All removed materials shall be stored outside the waterway floodplain.

3. Removal of the bridge and clean up of the area shall be accomplished without construction equipment working in the waterway channel.

4. All areas disturbed during removal shall be stabilized within 7 calendar days of that disturbance.

Diagram 10.0 – Temporary Access Bridge

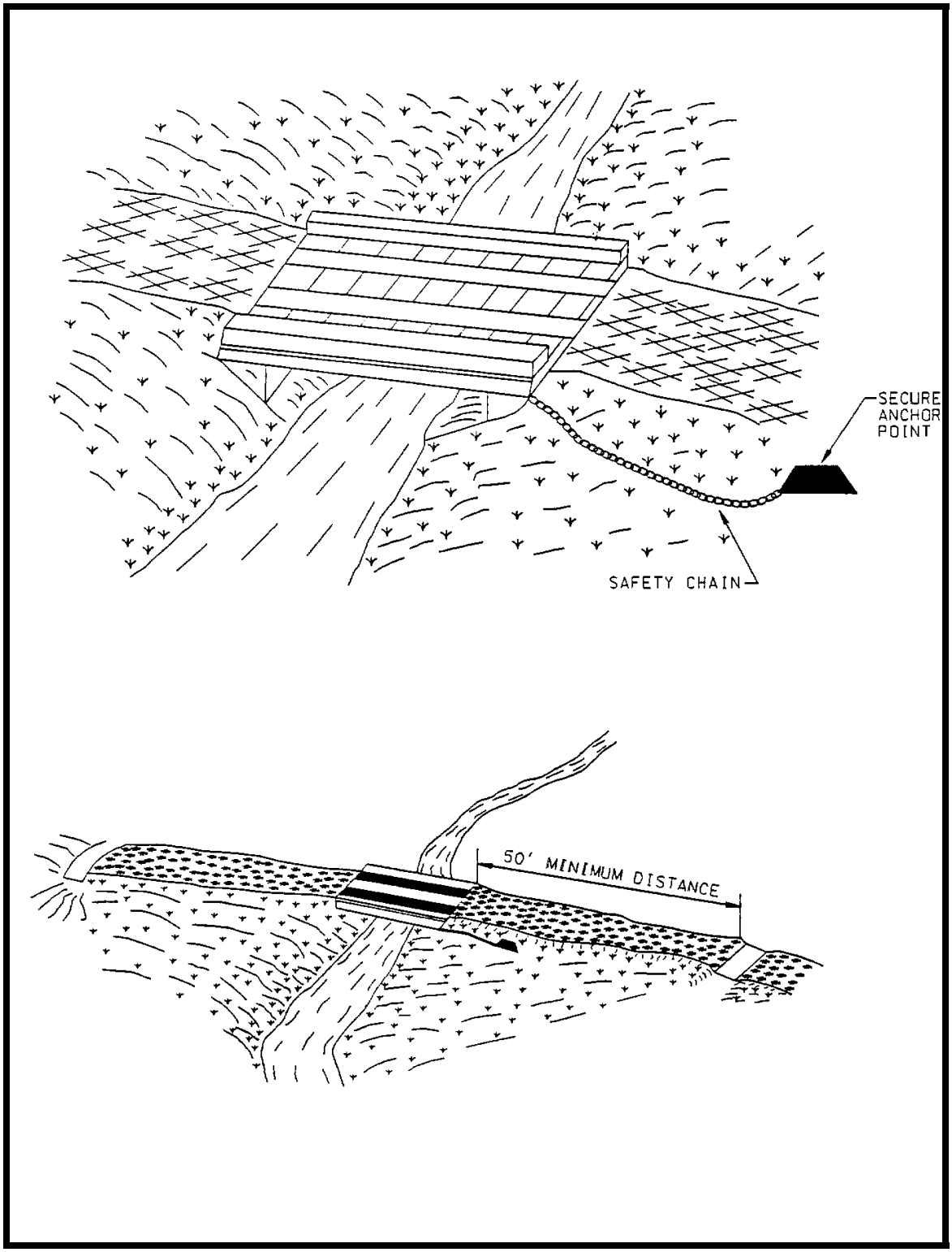


Diagram 10.1 – Temporary Access Bridge Construction Specifications

Construction Specifications

1. Restriction - Construction, use, or removal of a temporary access bridge will not normally have any time of year restrictions since construction, use, or removal should not affect the stream or its banks, unless the bridge is built with a pier(s) in the water.

2. Bridge Placement - A temporary bridge structure shall be constructed at or above the bank elevation to prevent the entrapment of floating materials and debris.

3. Abutments - Abutments shall be placed parallel to, and on, stable banks.

4. Bridge Span - Bridges shall be constructed to span the entire channel. If the channel width exceeds 8 feet, (as measured from top-of-bank to top-of-bank), then a footing, pier, or bridge support may be constructed within the waterway. One additional footing, pier, or bridge support will be permitted for each additional 8 foot width of the channel. However, no footing, pier, or bridge support will be permitted within the channel for waterways less than 8 feet wide.

5. Stringers - Stringers shall either be logs, sawn timber, prestressed concrete beams, metal beams, or other approved materials.

6. Deck Material - Decking materials shall be of sufficient strength to support the anticipated load. All decking members shall be placed perpendicular to the stringers, butted tightly, and securely fastened to the stringers. Decking materials must be butted tightly to prevent any soil material tracked onto the bridge from falling into the waterway below.

7. Run Planks (optional) - Run planking shall be securely fastened to the length of the span. One run plank shall be provided for each track of the equipment wheels. Although run planks are optional, they may be necessary to properly distribute loads.

8. Curbs or fenders - Curbs or fenders may be installed along the outer sides of the deck. Curbs or fenders are an option which will provide additional safety.

Diagram 10.2 – Temporary Access Bridge Construction Specifications Continued

9. Bridge Anchors - Bridges shall be securely anchored at only one end using steel cable or chain. Anchoring at only one end will prevent channel obstruction in the event that floodwaters float the bridge. Acceptable anchors are large trees, large boulders, or driven steel anchors. Anchoring shall be sufficient to prevent the bridge from floating downstream and possibly causing an obstruction to the flow.

10. Stabilization - All areas disturbed during installation shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard for "Critical Areas Stabilization With Permanent Seeding."

Diagram 10.3 – Portable Skidder Timber Bridge Design

WIT-02-0061

A Portable Skidder Timber Bridge Design

The USDA Forest Service San Dimas Technology and Development Center (SDTDC) and the Wood In Transportation (WIT) Program have developed a portable/temporary skidder bridge to cross drainages for field harvesting equipment. Its length is 16 feet, and width is 12 feet. It is constructed using three 4-foot-wide preconstructed laminated panels. The exterior panels have 8-inch wide by 8-inch high curbs making the travelway width 10 feet 8 inches. The bridge is designed to carry a 27,000-pound axle load, which equates to a Caterpillar 525 Skidder with an 8,000-pound grapple load. One major goal of this project was to design a lightweight easy to install bridge that would aid in minimizing erosion and sedimentation at stream crossings.

The panels are preassembled, and field equipment, such as a skidder can be used to install the bridge. The bridge rests on 4-inch by 8-inch sills. Each sill has guide plates to secure the panels in place.

Acceptable species and grades are shown in table 1. Any species of wood may be used providing its unfactored bending strength is at least 875 pounds per square inch. SDTDC evaluated bolted panels, but the panels can be glued or nail laminated (see note 1).

This bridge is structurally adequate for 3- or 5-axle log trucks. However, due to its narrow width, minimal curb system, and large live load deflection, log truck traffic should be limited to occasional trucks operating at low speeds.

Dynamic effects caused by rough approaches, or bumps at the ends of bridges, can significantly increase wear and damage to bridges. Approaches to bridges should be initially graded and maintained at a relatively smooth and level surface.

This project was completed by: James R. Bassel, Project Leader, USDA Forest Service, San Dimas, CA
Merv Eriksson, Structural Engineer, USDA Forest Service, Missoula, MT

For additional information, visit the Wood In Transportation website at *www.fs.fed.us/na/wit*, or call the National Wood In Transportation Information Center at (304) 285-1591.

USDA Forest Service

San Dimas Technology and Development Center

Wood In Transportation

Diagram 10.4 – Portable Skidder Timber Bridge Design Material List

FIELD EVALUATION

The Homochitto National Forest in Mississippi evaluated this design. The Forest used red oak common to the area. The bridge has been used on three different sales and has carried more than a million board feet of timber. The Forest was pleased that the drainages were not disturbed, and the contractor was able to save time by traveling over the drainages rather than around them.

Two men assembled the bridge panels in two days. Installation of the bridge panels at the site takes two men 30 minutes using standard field equipment.

Approximate Material Cost:

Wood	$1,500.00
Hardware	150.00
Total	$1,650.00

Forest Contact:
Lee Dunnan
National Forests in Mississippi
Homochitto Ranger District
Rt. 1, Box 1
Meadville, MS 39652
(601) 384-5876

SKIDDER BRIDGE MATERIAL LIST
For Three Bolted 4-foot Panels using 4-inch by 8-inch Timbers

Timber

Note: The design requires a bridge depth of 8 inches. Any width timbers that have that depth can be used (e.g., 2-in by 8-in, 3-in by 8-in, etc.). SDTDC used 4-inch by 8-inch timbers. Exterior laminations must be 4 inches thick due to countersinking.

40 4-in by 8-in by 16 feet rough sawn timber (see Table 1)

2 4-in by 8-in by 12 feet rough sawn timber for sills (can use 16 feet length)

Hardware for 4-foot panels

24 3/4-inch by 4-foot rods with threads, 6 inches each end

48 3/4-inch nuts (heavy hexagon)

48 3/4-inch malleable iron washers

Hardware for curbs

8 3/4-inch by 18-inch bolts

8 3/4-inch nuts (heavy hexagon)

16 3/4-inch malleable iron washers

Hardware for sill

12 3/4-inch by 10-inch lag bolts

12 3/4-inch malleable iron washers

Total Materials for Skidder Bridge

42 4-in by 8-in by 16 feet rough sawn timber (using 16 feet for sills)

24 3/4-inch by 4-foot rods with threads, 6 inches each end

8 3/4-inch by 18-inch bolts

56 3/4-inch nuts (heavy hexagon)

76 5/8-inch malleable iron washers

12 3/4-inch by 10-inch lag bolt

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September 2001

Diagram 10.5 – Portable Skidder Timber Bridge Design Isometric View

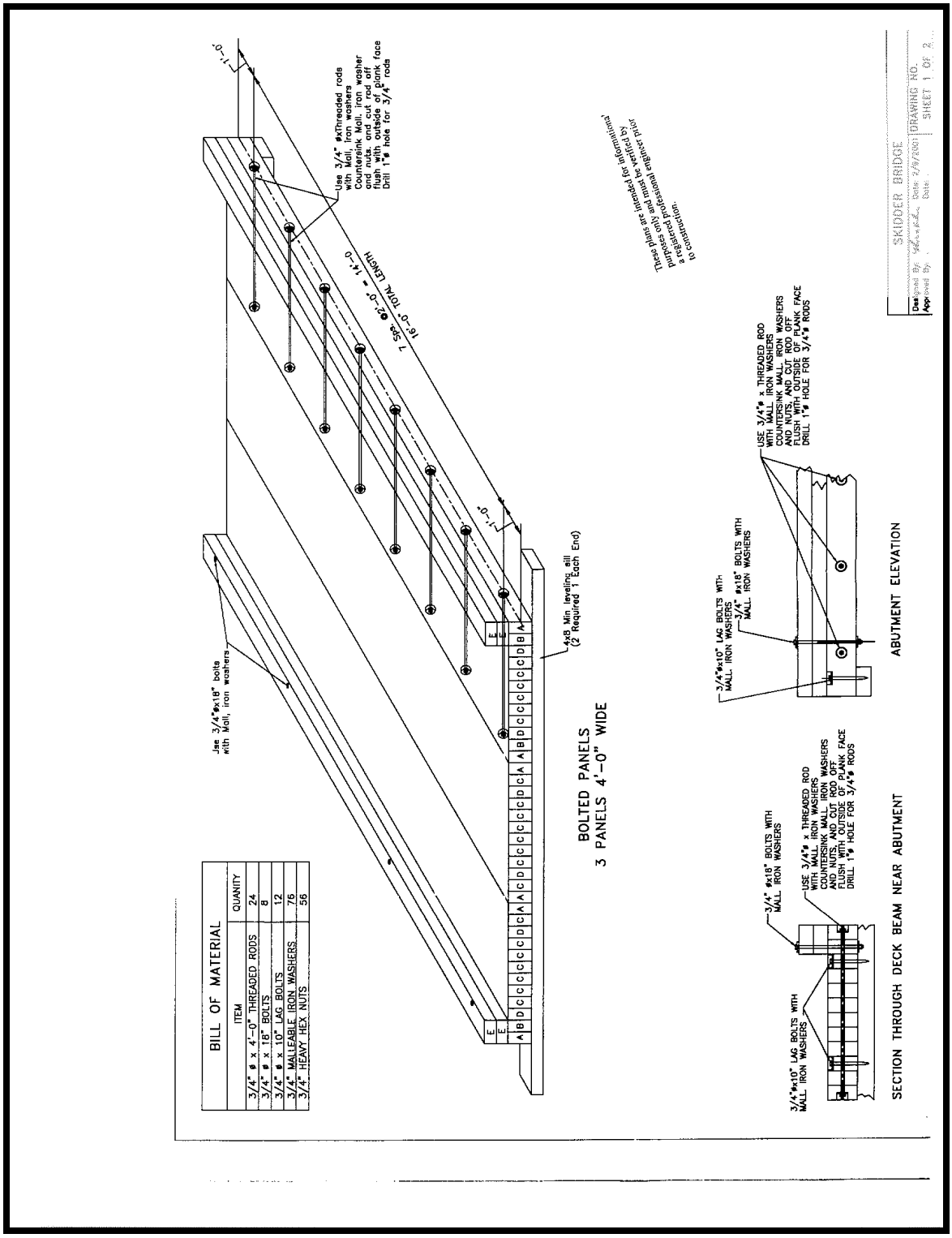


Diagram 10.6 – Portable Skidder Timber Bridge Design Sections

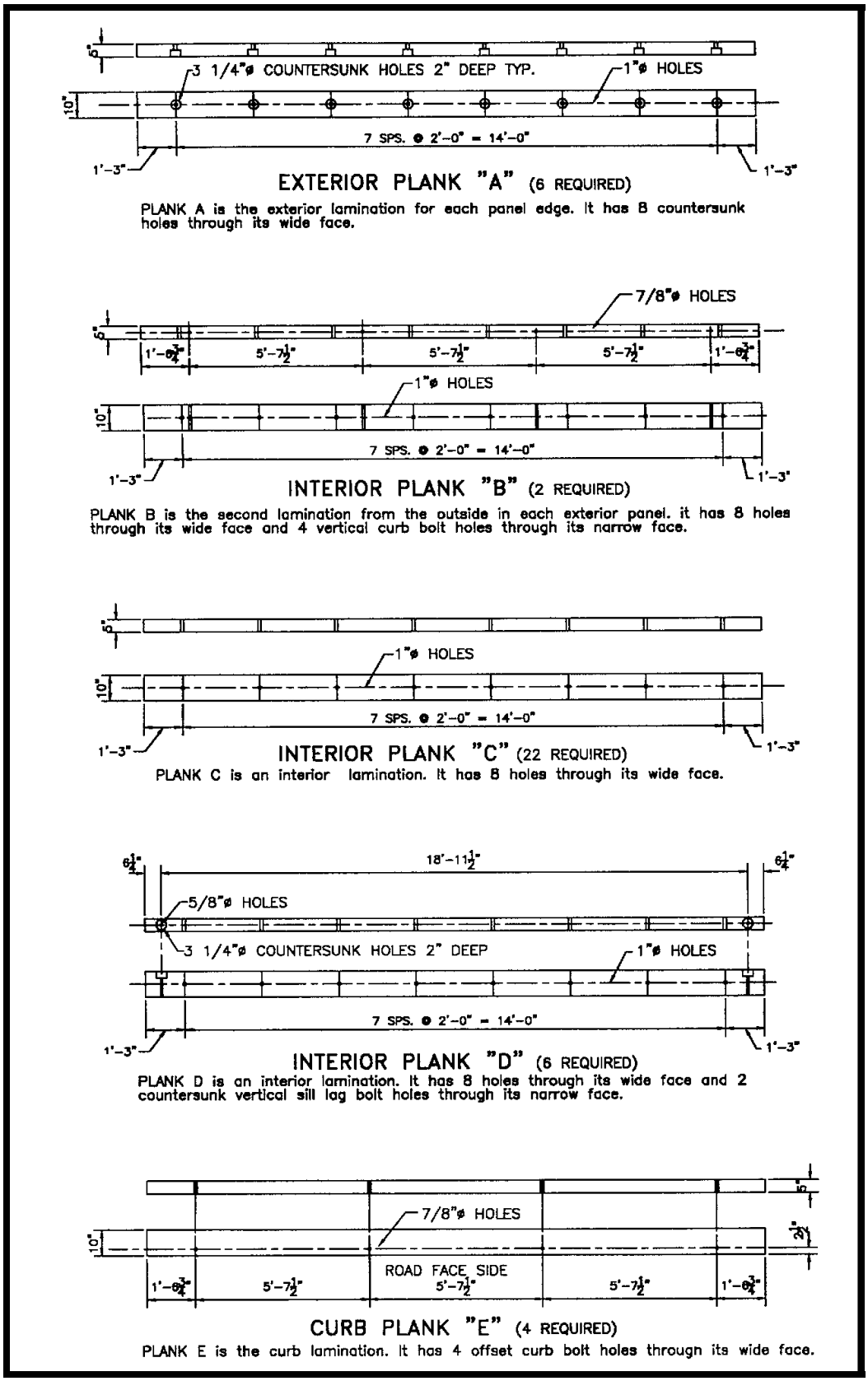


Diagram 10.7 – Portable Skidder Timber Bridge Design Notes

SKIDDER BRIDGE NOTES:

1. BRIDGE PANELS: Three panels, 48 inches wide shall be fabricated from 4–inch thick by 8–inch wide laminations. Exterior panels shall have 8–inch wide by 8–inch high guide curbs as shown. The panels are shown bolted together.

The panels can also be glued laminated or nail laminated. If glued laminated, the panels shall be fabricated in conformance with AASHTO M168 and ANSI/AITC A190.1 and shall be manufactured to an Industrial appearance using wet–use adhesives.

If nail laminated, each lamination shall be nailed using 10–inch deformed shank bridge spikes having a minimum shank diameter of 3/8" in pre–drilled ¼" diameter holes. The spikes shall be spaced at 12 inches and staggered at 2 inches from the top and bottom of the planks.

2. WOOD SPECIES AND GRADES : Any species of wood may be used providing its tabulated, or unadjusted, allowable bending stress is not less than 875 pounds per square inch. Examples of acceptable species and grades are shown in Table 1. Expected use and expected life span should be considered when selecting a species. High volumes of skidded timber may require a hard, high–density species.

3. PRESERVATIVES: If the panels are to be used more than 1 or 2 years the timber should be pressure treated with an approved preservative. The timber shall be treated in conformance with AWPA C14 (soil contact) and the Best Management Practices for the Using Treated Wood in Aquatic and Wetland Environments. Insofar as is practical, all lumber shall be cut, drilled, and completely fabricated prior to pressure treatment.

4. DESIGN LOADS: These bridges are designed to carry a 27,000–pound skidder axle load. This skidder load corresponds to a Cat 525 with an 8,000–pound grapple load. The bridge will also support an AASHTO Type 3 Truck (3–axle dump truck), an AASHTO Type 3–S2 Truck (5–axle logging truck), an AASHTO HS 20 Truck (highway load vehicle), or a track mounted vehicle having a load, per track, of up to 1,300 pounds per lineal foot. The bridge is designed assuming exclusively the exterior panels carry all wheel and track loads. Larger skidder or track mounted vehicle loads, or overweight trucks, will require redesigned panels or shorter spans.

5. DESIGN LIMITATIONS: Although the bridge is structurally adequate for standard highway 3– or 5–axle trucks, because of the narrow width, minimal height curb system, and large live load deflections; truck traffic should be limited to occasional trucks operating at low speeds (10 miles per hour or less).

6. DYNAMIC LOADING: Dynamic effects caused by rough approaches, or bumps at the ends of the bridge can significantly increase live loading, resulting in excessive wear and damage to the bridge. Approaches to bridges shoulc be graded, and maintained as a level–riding surface.

7. HARDWARE: Malleable iron washers shall be used under all nuts and bolt heads unless the bolts are timber or dome head. Bolts and lag bolts shall comply with the requirements of ANSI/ASME Standard B18.2.1–1981, Grade 2. Any other steel components shall comply with ASTM A36.

8. INSTALLATION AND REMOVAL: Bridge panels may be prefabricated or assembled in place. Panels should be placed on, and attached to, the leveling sills as shown. Foundations should be leveled and compacted as necessary to provide a solid bearing surface for the leveling sill. Timber members and panels should be stored and handled so as not to damage the material. If damage does occur, exposed untreated wood should be field treated in accordance with AASHTO M 133.

TABLE 1

SPECIES GROUPS	VISUALGRADE*	EXT. PANEL WEIGHT (Lbs)**
Cottonwood	Select Structural	1,750
Doug Fir/Larch	No. 2	2,200–2,350
Hemlock/Fir	No. 1	1,500–2,150
Red Maple	No. 1	2,450
Southern Pine	No. 2	2,300–2,600
Spruce/Pine/Fir	No. 1	1,750–2,050
Western Woods	Select Structural	1,750–2,350

* Lumber must be graded.
** Weights assume creosote treatment and 20% moisture content.
Weights vary in multiple species groups

These plans are intended for informational purposes only and must be verified by a registered professional engineer prior to construction.

SKIDDER BRIDGE		
Designed By: [illegible] Date: 2/9/2001		DRAWING NO.
Approved By: . Date: .		SHEET 2 OF 2

SPECIFICATIONS FOR TEMPORARY ACCESS WATERWAY CROSSING – CULVERT

A temporary access culvert is a structure consisting of a section of circular pipe, pipe arches, or oval pipes of reinforced concrete, corrugated metal or structural plate that is used to convey flowing water though the crossing.

Considerations

1. Temporary culverts are used where:
   a. The channel is too wide for normal bridge construction, or
   b. Anticipated loading may prove unsafe for single span bridges.

2. This temporary waterway crossing practice is normally preferred over a ford type of crossing since disturbance to the waterway is only during construction and removal of the culvert.

3. Temporary culverts can be salvaged and reused.

Specifications

1. All culverts shall be strong enough to support their cross sectional area under the maximum expected loads.

2. The size of the culvert pipe shall be the largest pipe diameter that will fit into the existing channel without major excavation of the waterway channel or without major approach fills. If a channel width exceeds 3 feet, additional pipes may be used until the cross sectional area of the pipes is greater than 60% of the cross sectional area of the existing channel. The minimum size culvert that may be used is a 12 inch diameter pipe. In all cases, the pipes shall be large enough to convey normal stream flows.

3. The culverts shall extend a minimum of one foot beyond the upstream and downstream toe to the aggregate placed around the culvert. In no case shall the culvert exceed 40 feet in length.

4. Geotextile fabric shall be placed on the streambed and stream banks prior to placement of the pipe culvert(s) and aggregate. The geotextile fabric shall cover the streambed and extend a minimum six inches and a maximum one foot beyond the end of the culvert and bedding material. Geotextile fabric reduces settlement and improves the crossing stability.

5. The invert elevation of the culvert shall be installed on the natural streambed grade to minimize interference with fish migration (free passage of fish).

6. The culverts shall be covered with a minimum of one foot of aggregate. If multiple

culverts are used they shall be separated by at least 12 inches of compacted aggregate fill.

7. All areas disturbed during culvert installation shall be stabilized within 7 calendar days of the disturbance.

Culvert Maintenance Requirements

1. Periodic inspection shall be performed to ensure that the culverts, streambed, and stream banks are not damaged and that sediment is not entering the stream or blocking fish passage or migration.

2. Maintenance shall be performed as needed in a timely manner to ensure that structures are in compliance with these specifications. This shall include removal and disposal of any sediment or trapped debris. Sediment shall be disposed of and stabilized outside the waterway floodplain.

Culvert Removal And Cleanup Requirements

1. When the crossing has served its purpose, all structures including culverts, bedding and geotextile fabric materials shall be removed.

2. Final clean up shall consist of removal of the temporary structure from the waterway, removal of all construction materials, restoration of original stream channel cross section and protection of the stream banks from erosion. Removed material shall be stored outside of the waterway floodplain.

3. Removal of the structure and clean up of the area shall be accomplished without construction equipment working in the waterway channel.

4. All areas disturbed during culvert removal shall be stabilized within 7 calendar days of the disturbance.

Diagram 11.0 – Temporary Access Culvert

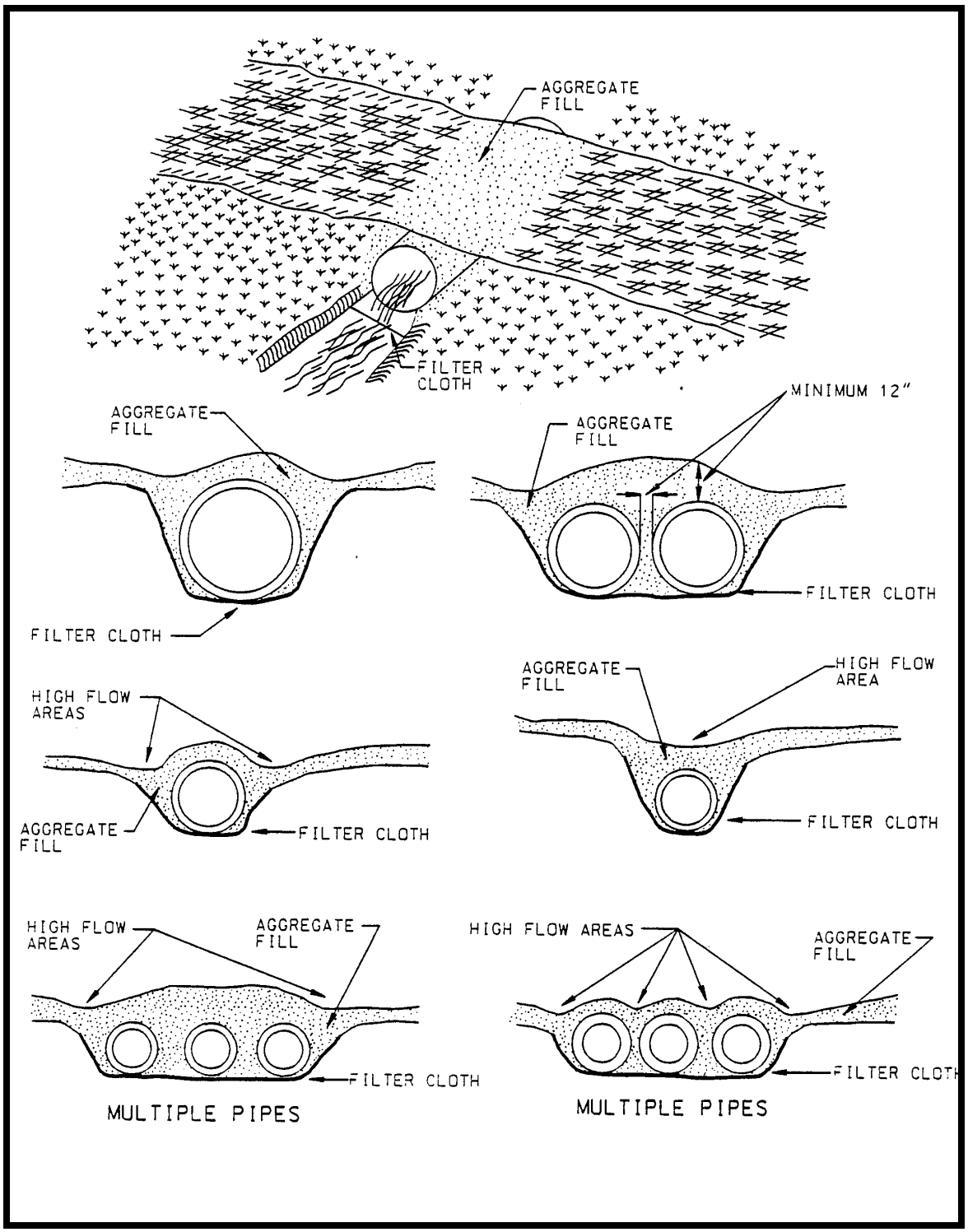


Diagram 11.1 – Temporary Access Culvert Specifications

Construction Specifications

1. Restrictions - No Construction or removal of a temporary access culvert will be permitted between October 1 through April 30 for Class III and Class IV Trout Waters or between March 1 through June 15 for non-trout waterways.

2. Culvert Strength - All culverts shall be strong enough to support their cross sectional area under maximum expected loads.

3. Culvert Size - The size of the culvert pipe shall be the largest pipe diameter that will fit into the existing channel without major excavation of the waterway channel or without major approach fills. If a channel width exceeds 3 feet, additional pipes may be used until the cross sectional area of the pipes is greater than 60 percent of the cross sectional area of the existing channel. The minimum size culvert that may be used is a 12" diameter pipe. In all cases, the pipe(s) shall be large enough to convey normal stream flows.

4. Culvert Length - The culvert(s) shall extend a minimum of one foot beyond the upstream and downstream toe to the aggregate placed around the culvert. In no case shall the culvert exceed 40 feet in length.

5. Filter Cloth - Filter cloth shall be placed on the streambed and streambanks prior to placement of the pipe culvert(s) and aggregate. The filter cloth shall cover the streambed and extend a minimum six inches and a maximum one foot beyond the end of the culvert and bedding material. Filter cloth reduces settlement and improves crossing stability.

6. Culvert Placement - The invert elevation of the culvert shall be installed on the natural streambed grade to minimize interference with fish migration (free passage of fish).

7. Culvert Protection - The culvert(s) shall be covered with a minimum of one foot of aggregate. If multiple culverts are used they shall be separated by at least 12" of compacted aggregate fill. At a minimum, the bedding and fill material used in the construction of the temporary access culvert crossings shall conform with the aggregate requirements cited in Section I.H.1. above.

8. Stabilization - All areas disturbed during culvert installation shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard for "Critical Area Stabilization With Permanent Seeding."

SPECIFICATIONS FOR TEMPORARY ACCESS WATERWAY CROSSING – FORD

A temporary access ford is a shallow structure placed in the bottom of the waterway over which the water flows while still allowing traffic to cross the waterway.

Considerations

Temporary fords may be used when bridge or culvert crossings are not possible and the streambed is armored with naturally occurring bedrock or can be protected with an aggregate layer in conformance with these specifications.

Specifications

1. The approaches to the structure shall consist of stone pads. Other materials shall be approved by the appropriate plan approval authority (the SCD). The entire ford approach (where banks were cut) shall be covered with geotextile fabric and protected with aggregate to a depth of 4 inches.

2. Fords shall be prohibited when the stream banks are 4 feet or more in height above the invert of the stream.

3. The approach roads at the cut banks shall be no steeper than 5:1. Spoil material from the banks shall be stored out of the floodplain and stabilized.

4. One layer of geotextile fabric shall be placed on the streambed, stream banks and road approaches prior to placing the bedding material on the stream channel or approaches. The geotextile fabric shall extend a minimum of 6 inches and a maximum of 12 inches beyond the bedding material.

5. The bedding material shall be coarse aggregate.

6. All fords shall be constructed to minimize the blockage of stream flow and shall allow free flow over the ford. The placing of any material in the waterway bed will cause some upstream ponding. The depth of this ponding will be equivalent to the depth of the material placed within the stream and therefore should be kept to a minimum height. However in no case shall the bedding material be placed deeper than 12 inches or one half the height of the existing banks whichever is smaller.

7. All areas disturbed during ford installation shall be stabilized within 7 calendar days of that disturbance.

Ford Removal And Final Cleanup

1. When the temporary structure has served its purpose it shall be removed completely.

2. Final clean up shall consist of removal of temporary ford materials from the waterway. All material shall be stored outside of the waterway floodplain.

3. The removal shall not create an impoundment or fish passage restriction.

4. Clean up shall be accomplished without construction equipment working in the stream channel.

5. The approach slopes of the cut banks shall not be backfilled.

6. All areas disturbed during ford removal shall be stabilized within 7 calendar days of that disturbance.

Diagram 12.0 – Temporary Access Ford

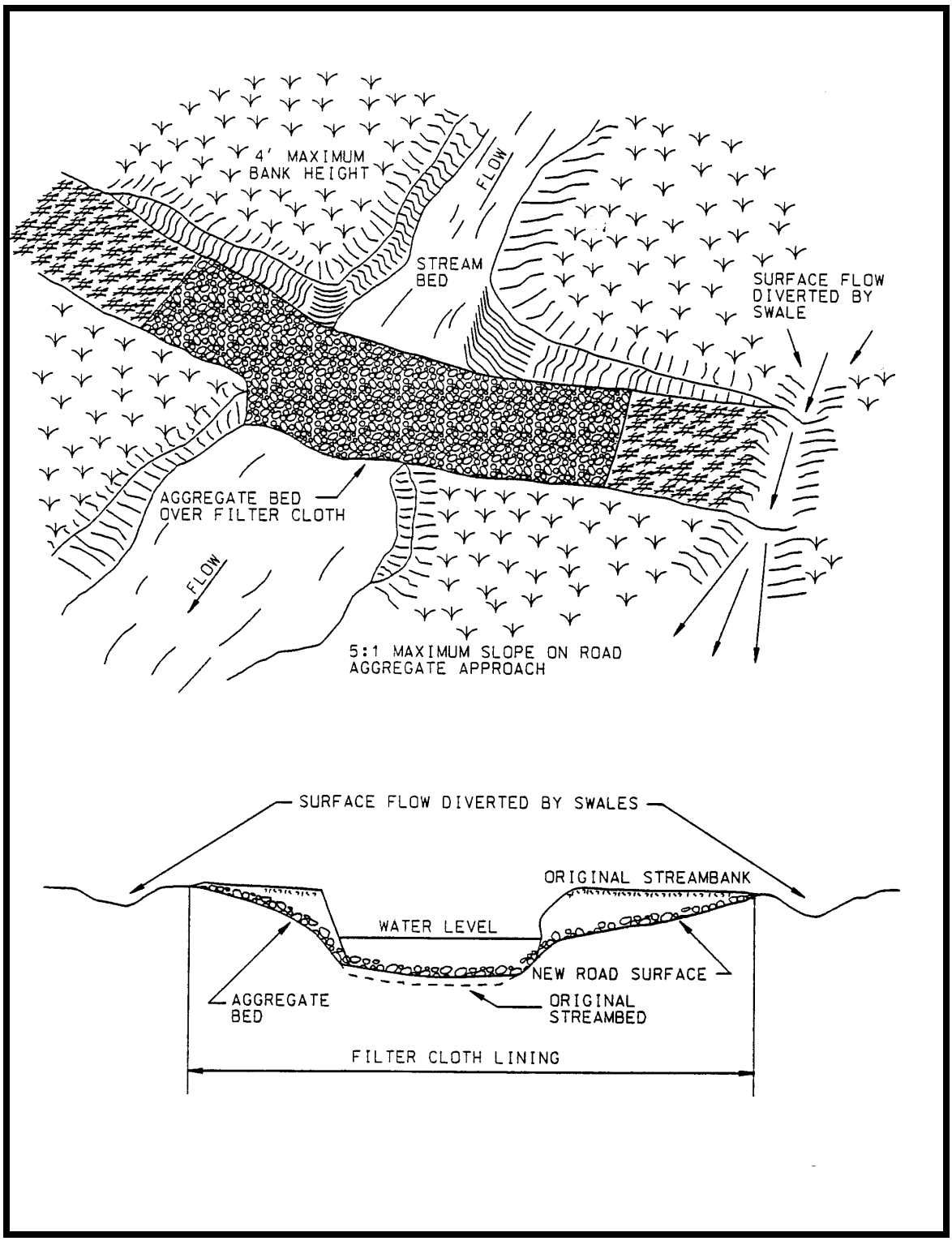


Diagram 12.1 – Temporary Access Ford Specifications

Construction Specifications

1. Restrictions - Use or removal of a temporary access will not be permitted between October 1 and April 30 for all Class III and Class IV Trout Waters. For other streams, use or removal of a temporary ford will be prohibited from March 1 through June 15 of each year because fish are spawning during this period.

2. The approaches to the structure shall consist of stone pads. The entire ford approach (where banks were cut) shall be covered with filter cloth and protected with aggregate to a depth of 4 inches.

3. Fords shall be prohibited when the stream banks are 4 feet or more in height above the invert of the stream and a bridge or culvert crossing can easily be constructed.

4. The approach roads at the cut banks shall be no steeper than 5:1. Spoil material from the banks shall be stored out of the flood plain and stabilized.

5. One layer of filter cloth shall be placed on the streambed, streambanks, and road approaches prior to placing the bedding material on the stream channel or approaches. The filter cloth shall extend a minimum of 6 inches and a maximum one foot beyond bedding material.

6. The bedding material shall be coarse aggregate or gabion mattresses filled with coarse aggregate.

7. Aggregate used in ford construction shall be SHA Class I.

8. All fords shall be constructed to minimize the blockage of stream flow and shall allow free flow over the ford. The placing of any material in the waterway bed will cause some upstream ponding. The depth of this ponding will be equivalent to the depth of the material placed within the stream and therefore should be kept to a minimum height. However, in no case will the bedding material be placed deeper than 12" or 1/2 the height of the existing banks, whichever is smaller.

9. Stabilization - All areas disturbed during ford installation shall be stabilized within 14-calendar days of that disturbance in accordance with the Standards for Stabilization With Permanent Seeding."

SPECIFICATIONS FOR LOGGING MATS

Definition

A logging mat is a portable fabrication usually of boards or timbers held together by bolts or cable to provide temporary protection of a forest harvest entrance or haul road.

Purpose

This practice protects the surface soil structure from excessive compaction and rutting.

Conditions Where Practice Applies

This practice applies to any part of the forest harvest access system where rutting could become an erosion or water handling problem. It is often used as a substitute for stone or other stabilizing materials at the entrance of a forest harvest site and isolated wet areas on haul roads or skid trails.

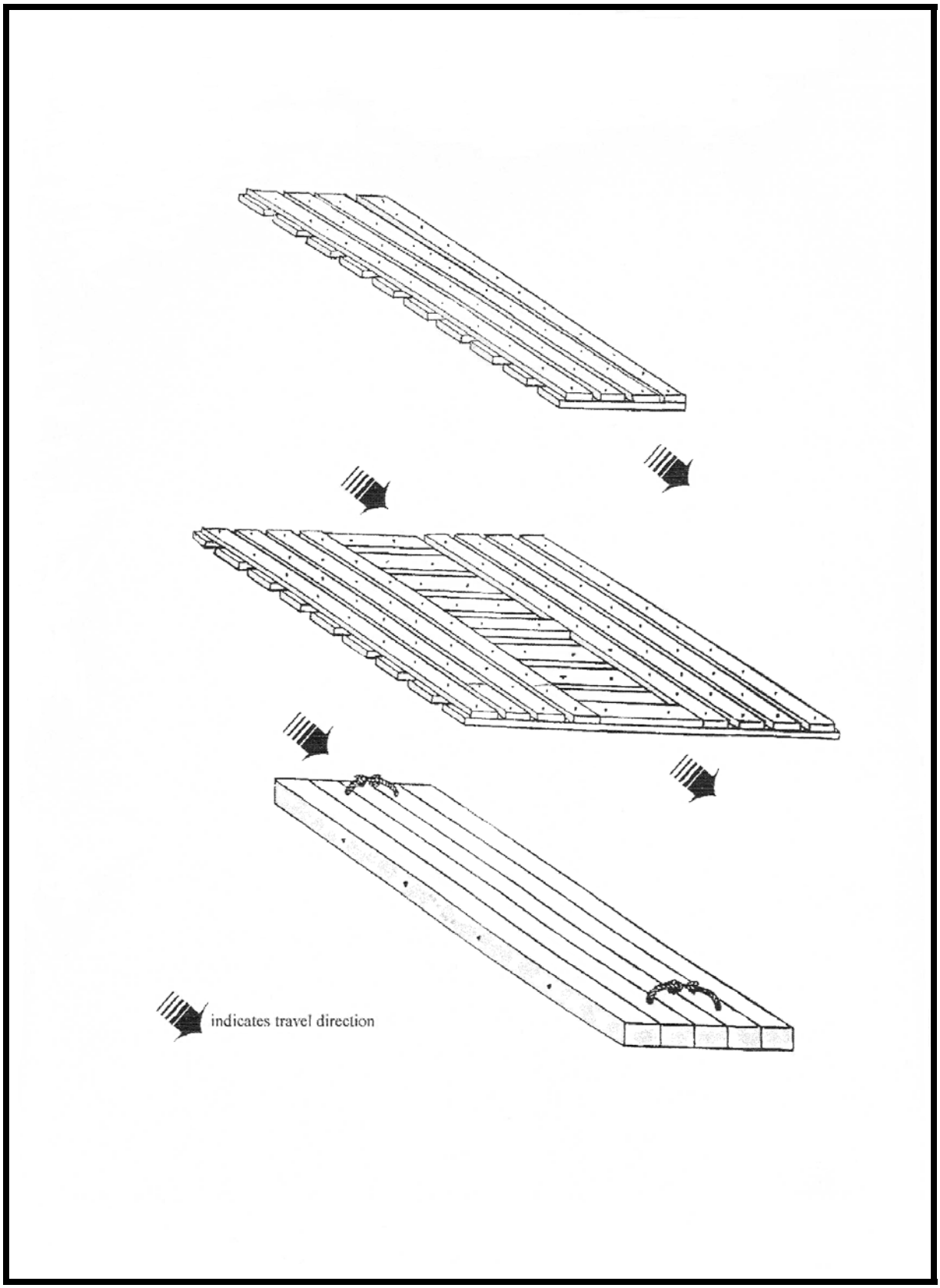
Specifications

1. Mats shall be placed end to end to form a continuous span for the entire length of the area to be protected.

2. Mats can be used as a substitute for or in conjunction with stone, gravel, wood chips, culverts, and other stabilizing material at the entrance to the harvest site.

3. Mats shall be inspected frequently and maintained or replaced as necessary to ensure their proper function.

Diagram 13.0 – Logging Mats



SPECIFICATIONS FOR STRAW BALE DIKE

Definition

A straw bale dike is a temporary barrier of straw or similar material used to intercept sheet flow.

Purpose

The straw bale dike filters sediment from runoff. The dike also intercepts sheet flow and slows the velocity of the runoff so that deposition of transported sediment can occur. The straw bale dike is used to intercept or direct sediment laden runoff so the deposition of transported sediment can occur. Do not use as a velocity check in ditches, swales, or in places where concentrated flow is intercepted.

Conditions Where Practice Applies

A straw bale dike is constructed where sediment laden runoff needs to be intercepted at the base of a disturbed slope. This practice is installed only where sheet flow conditions exist. The straw bale dike shall be maintained continuously and remain in place along the downgrade perimeter of disturbed areas until the disturbed areas are permanently stabilized.

The use of this practice is especially important where the forest floor is no longer in an undisturbed condition or the harvest has been granted a variance from the requirement to establish and maintain a Streamside Management Zone. Under these circumstances, structural perimeter control must be installed prior to the start of and maintained during the harvest.

Specifications

1. Bales shall be placed on the contour and in a row with the ends of each bale tightly abutting the adjacent bales. The straw bale dike shall be positioned to intercept sheet flow only, and shall never be used as velocity checks in areas of concentrated flow.

2. Each bale shall be entrenched in the soil a minimum of 4 inches and placed so the bindings are horizontal.

3. Bales shall be securely anchored in place by either two stakes or re-bars driven through the bale 12 to 18 inches into the ground. The first stake in each bale shall be driven toward the previously laid bale at an angle to force the bales together. Stakes shall be driven flush with the top of the bale.

4. Straw bale dikes shall be inspected frequently and after each rain event and maintenance performed as necessary. Replace bales when deteriorated.

5. All bales shall be removed when the site has been stabilized. However, bales may be left if used as part of the stabilization process. If bales are removed, the trench where the bales were located shall be graded flush and stabilized.

6. Straw Bale Dikes have a normal service life of three months. Replace bales as needed.

7. Straw Bale Dikes shall not be used on slopes exceeding 5:1.

8. The length of Straw Bale Dikes must conform to the criteria in the following table:

Table 6 – Straw Bale Dike Slope Length & Steepness Design Criteria

Slope	Slope Steepness	Slope Length	Dike Length
0% to 2%	Flatter than 50:1	300 Feet	500 Feet
2% to 10%	50:1 to 10:1	125 Feet	500 Feet
10% to 20%	10:1 to 5:1	100 Feet	500 Feet

Diagram 14.0 – Straw Bale Dike

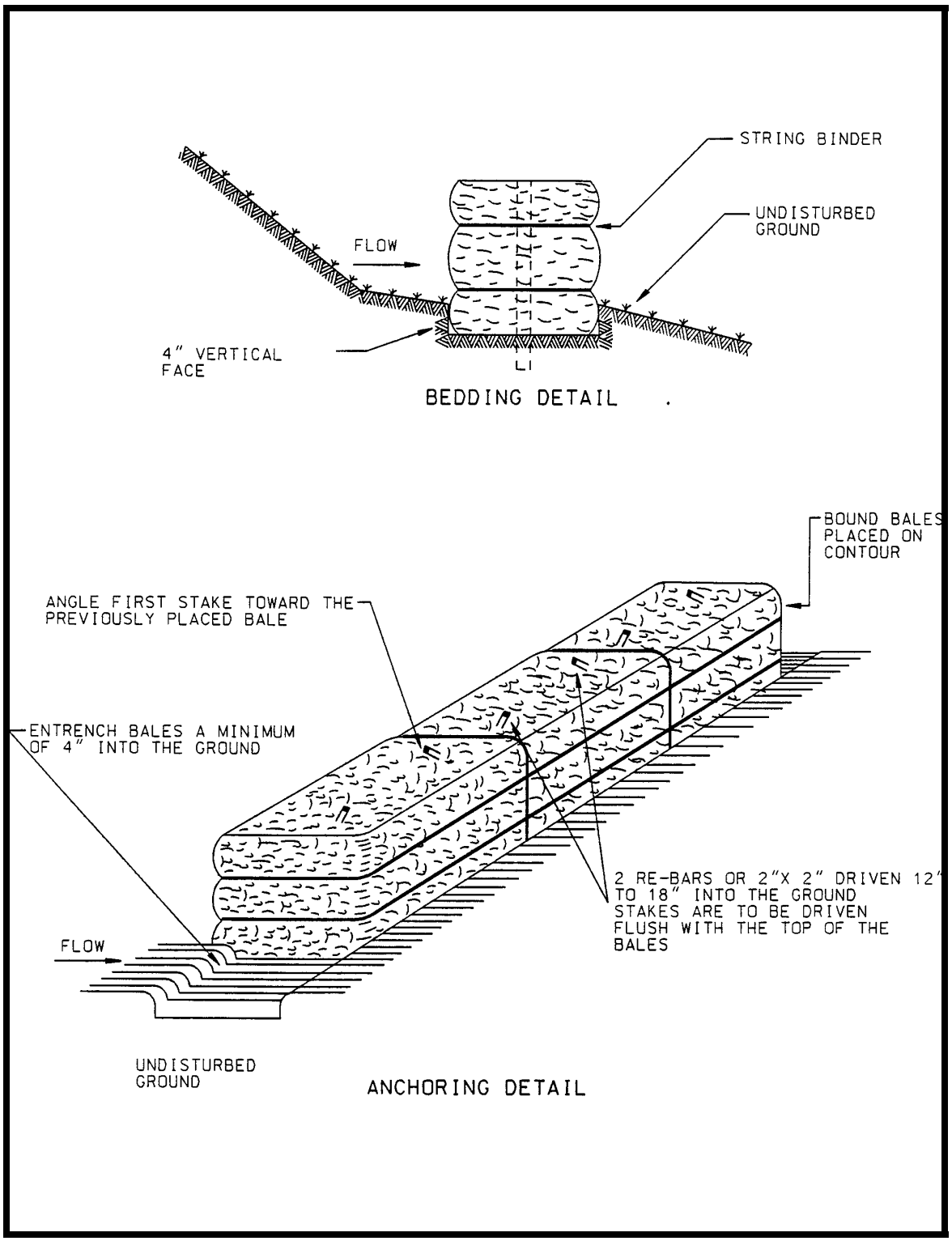


Diagram 14.1 – Straw Bale Dike Specifications

CONSTRUCTION SPECIFICATIONS

1. Bales shall be placed at the toe of a slope, on the contour, and in a row with the ends of each bale tightly abutting the adjacent bales.

2. Each bale shall be entrenched in the soil a minimum of 4 inches and placed so the bindings are horizontal.

3. Bales shall be securely anchored in place by either two stakes or re-bars driven through the bale 12 to 18 inches into the ground. The first stake in each bale shall be driven toward the previously laid bale at an angle to force the bales together. Stakes shall be driven flush with the top of the bale.

4. Straw bale dikes shall be inspected frequently and after each rain event and maintenance performed as necessary.

5. All bales shall be removed when the site has been stabilized. The trench where the bales were located shall be graded flush and stabilized.

SPECIFICATIONS FOR SILT FENCE

Definition

A silt fence is a temporary barrier of woven geotextile fabric used to intercept sheet flow from disturbed areas and to filter surface runoff.

Purpose

Silt fences filter sediment from runoff. The fence also intercepts sheet flow and slows the velocity of the runoff so that deposition of transported sediment can occur. Silt fences can be used to intercept sheet flow only. Do not use as a velocity check in ditches, swales, or in places where concentrated flow is intercepted.

The use of this practice is especially important where the forest floor is no longer in an undisturbed condition or the harvest has been granted a variance from the requirement to establish and maintain a Streamside Management Zone. Under these circumstances, structural perimeter control must be installed prior to the start of and maintained during the harvest.

Conditions Where Practice Applies

Silt fence is limited to intercepting sheet flow runoff from limited distances according to slope. Silt fence provides filtering and velocity dissipation to promote gravity settling of sediments.

Specifications

1. Silt fence shall not be used in rocky soils that prevent trenching.

2. Silt fence shall be placed on the contours.

3. The length of silt fences must conform to the criteria in the following table:

Table 7 – Silt Fence Slope Length & Fence Length Design Criteria

Slope Steepness (%)	Maximum Slope Length (ft)	Maximum Silt Fence Length (ft)
Less than 2	Unlimited	Unlimited
2 - 10	125	1,000
10 - 20	100	750
20 - 33	60	500
33 - 50	40	250
Greater than 50	20	125

4. In areas of less than 2% slope and sandy soils, maximum slope length and silt fence length will be unlimited.

5. Downslope from the silt fence shall be undisturbed ground.

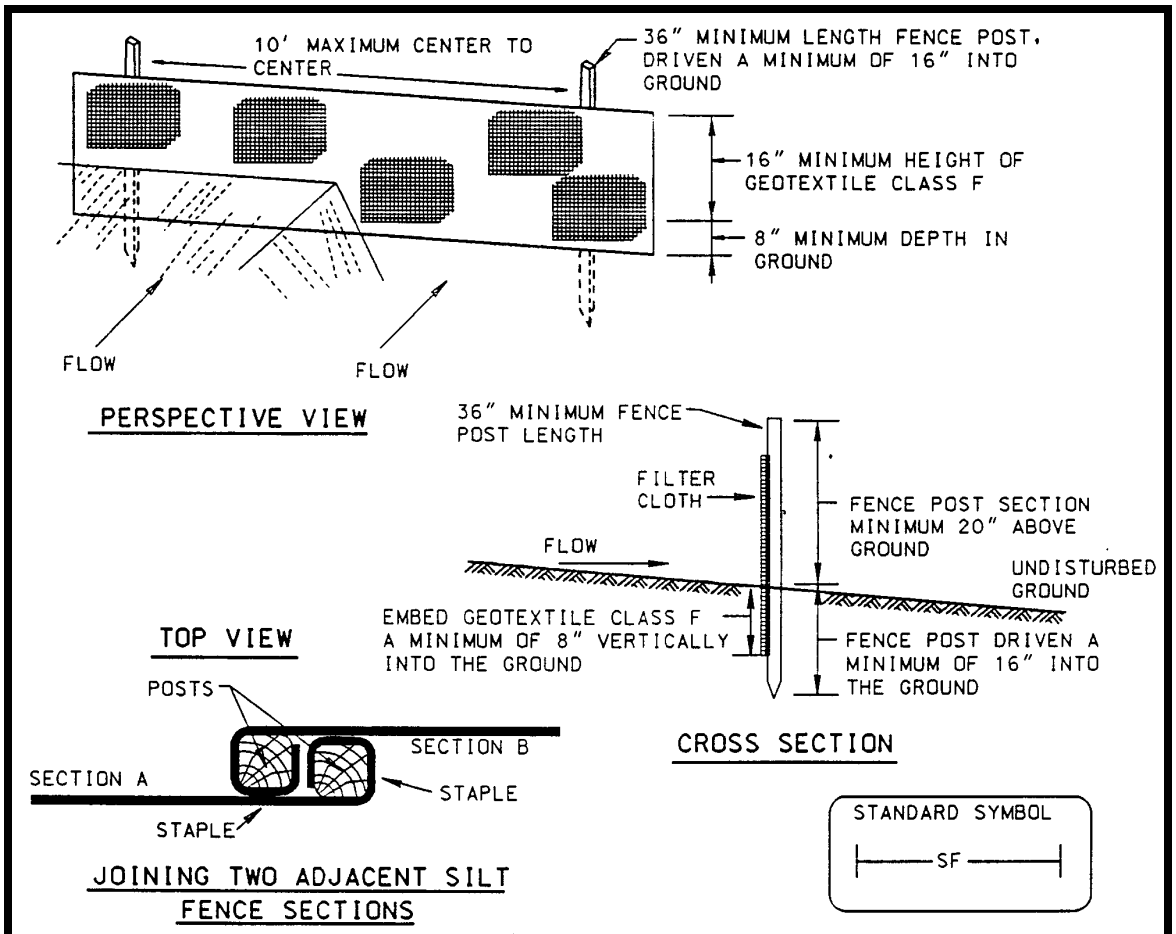
6. Fence posts shall be a minimum of 36 inches long driven 16" minimum into the ground. Wood posts shall be 1 ½ “ x 1 ½ “ (minimum) square cut, or 1 ¾" (minimum) diameter round and shall be of sound quality hardwood. Steel posts will be standard T or U section weighing not less than 1.00 pound per linear foot.

7. Geotextile shall be fastened securely to each fence post with wire ties or staples at top and mid-section and shall meet the requirements for Geotextile Class F [THIS SPEC HAS CHANGED WE SHOULD USE WHATEVER IS GOING TO GO INTO The 94 REVISIONS.

8. Where ends of geotextile fabric come together, they shall be overlapped, folded and fastened to prevent sediment bypass.

9. Silt fence shall be inspected after each rainfall event and maintained when bulges occur or when sediment accumulation reaches 50% of the fabric height.

Diagram 15.0 – Silt Fence



Construction Specifications

1. Fence posts shall be a minimum of 36" long driven 16" minimum into the ground. Wood posts shall be $1\frac{1}{2}$" x $1\frac{1}{2}$" square (minimum) cut, or $1\frac{3}{4}$" diameter (minimum) round and shall be of sound quality hardwood. Steel posts will be standard T or U section weighting not less than 1.00 pond per linear foot.

2. Geotextile shall be fastened securely to each fence post with wire ties or staples at top and mid-section and shall meet the following requirements for Geotextile Class F:

Tensile Strength	50 lbs/in (min.)	Test: MSMT 509
Tensile Modulus	20 lbs/in (min.)	Test: MSMT 509
Flow Rate	0.3 gal ft^2/ minute (max.)	Test: MSMT 322
Filtering Efficiency	75% (min.)	Test: MSMT 322

3. Where ends of geotextile fabric come together, they shall be overlapped, folded and stapled to prevent sediment bypass.

4. Silt Fence shall be inspected after each rainfall event and maintained when bulges occur or when sediment accumulation reached 50% of the fabric height.

Diagram 15.1 – Silt Fence Specifications

Silt Fence Design Criteria

Slope Steepness	(Maximum) Slope Length	(Maximum) Silt Fence Length
Flatter than 50:1	unlimited	unlimited
50:1 to 10:1	125 feet	1,000 feet
10:1 to 5:1	100 feet	750 feet
5:1 to 3:1	60 feet	500 feet
3:1 to 2:1	40 feet	250 feet
2:1 and steeper	20 feet	125 feet

Note: In areas of less than 2% slope and sandy soils (USDA general classification system, soil Class A) maximum slope length and silt fence length will be unlimited. In these areas a silt fence may be the only perimeter control required.

SPECIFICATIONS FOR REVEGETATION OF DISTURBED SOILS

Definition

This practice provides for re-vegetation of disturbed areas by establishing grass and/or legume vegetation on bare soil areas.

Purpose

This practice re-establishes vegetative cover on soil that was disturbed during the harvest process. Re-vegetation minimizes erosion and sediment export to watercourses. Consideration can be given to seeding mixtures beneficial to wildlife and shade tolerance.

Conditions When Practice Applies

On disturbed forestland areas where normal harvesting activities have exposed the soil and where it is explicitly required to vegetatively stabilize the area to prevent or mitigate erosion and sedimentation. Areas of special consideration include areas with highly erodible soils, steep slopes and long slope lengths.

Specifications

NOTE: These specifications are based upon NRCS code 342. The entire code is provided in the Appendix.

1. Site and Seedbed Preparation:
   Complete all grading and the loosening of compacted soil and install all water control measures prior to preparing a suitable seedbed.

   Upon completion of the harvest or a portion of the harvest, all disturbed areas (particularly roads, trails, and landings) located on slopes 10% or greater shall be graded or backdragged, seeded and mulched according to specifications. Disturbed areas on slopes less than 10% shall be backdragged and left in a condition that permits successful natural regeneration of vegetation. Seeding and mulching will be required on other critical areas.

   Soils with increased erosion potential that were exposed during harvest operations will be stabilized within 7 days of disturbance with seed and mulch. This includes areas:

   a. with slopes greater than 30%
   b. with slopes greater than 5% and within 50 feet of a water body.
   c. within 50 feet of other sensitive areas (i.e. property lines, protected habitat).

2. Lime and Fertilizer:
   Lime and fertilizer shall be applied at the completion of backdragging or final grading. Lime and fertilizer application rates are determined by soil type and soil acidity. (Application of fertilizer may be prohibited under certain circumstances and in certain locations. Observe all prohibitions stated elsewhere. See STANDARDS AND SPECIFICATIONS FOR STREAMSIDE MANAGEMENT ZONE.) The local County Extension Office will send soil samples for testing for a small charge. If soil tests are not used, apply one ton of lime per acre (45 lbs/1000 SF) and 500 lbs of 10-20-20 fertilizer per acre (10 lbs/1000 SF). The material shall be incorporated into the soil by surface roughening to prepare a seedbed. By using a soil test, appropriate, often lower, application rates are determined.

3. Seeding:
   Selected seed mixtures may be broadcast, drilled, or hydroseeded. Successful seedings are usually in the spring and fall. If broadcasting seed, small or light seed can be mixed with a filler (e.g. sawdust) to provide adequate distribution. Incorporate seed $^{1}/_{8}$ to ¼ inch deep by raking, dragging, cultipacking or tracking with heavy machinery. Avoid windy conditions.

4. Mulching:
   Mulch shall be applied to all seeded areas immediately after seeding.

   If grading is completed outside of the seeding season, mulch alone shall be applied and maintained until the seeding season returns when seeding is completed.

   When straw mulch is used, it shall be spread over all seeded areas at the rate of 2 tons per acre. Mulch shall be applied to a uniform loose depth of between one inch and two inches. Mulch applied shall achieve a uniform distribution and depth so that the soil surface is not exposed.

5. Maintenance:
   Once the vegetation is established, the site shall have 95% groundcover to be considered adequately stabilized. If the vegetation provides less than 40% ground coverage, re-stabilize following the original lime, fertilizer (if not prohibited), seedbed preparation, and seeding recommendations. If the vegetation provides between 40% and 94% ground coverage, overseeding and fertilizing (if not prohibited) using half of the rates originally applied shall be necessary.

   Mowing can be utilized to maintain roads which will be used in the future and/or maintain open areas for wildlife. When possible, delay mowing until late summer to allow wildlife nesting to be completed, then allow re-growth before winter. Prevent livestock grazing until plants are well established. Seeded areas must be protected from traffic, particularly during wet periods if rutting is to be prevented. Freshly seeded roads are particularly vulnerable to damage. Use gates, boulders, or logs to restrict vehicular access.

Table 8: Nurse Crops (Temporary Seeding) To Be Added To Permanent Seeding Mixes					
Mix	Recommended Cultivar	Seeding Rate		Soil Moisture Conditions	Remarks
		lbs./ac.	lbs./ 1000 SF		
Annual Ryegrass *Lolium perenne* ssp. *Multiflorum*	Common	10	0.3	Dry to moist	Planting dates: Western Maryland - August 1 to May 31 Piedmont - August 1 to April 30 Coastal Plain - August 15 to April 30
Barley *Hordeum vulgare*	Common	40	1.0	Dry to moderately dry	
Oats *Avena sativa*	Common	40	1.0	Dry to moist	
Wheat *Triticum aestivum*	Common	40	1.0	Dry to moderately dry	
Foxtail Millet *Setaria italica*	Common	10	0.3	Dry to moist	Planting dates: Western Maryland - June 1 to July 31 Piedmont - May 1 to July 31 Coastal Plain - May 1 to August 14
Pearl Millet *Pennisetum glaucum*	Common	7	0.2	Dry to moist	

TABLE 8 NOTE:

1. Select a nurse crop to add to the permanent seeding mix, based on the time of year for planting. Use only one nurse crop for each permanent seeding mix. Do not use a mixture of nurse crops.

Table 9: Permanent Seeding Mixtures							
Mix	Recommended Cultivar	Seeding Rate		Soil Moisture Conditions	Sun/ Shade Requirements	Wildlife Value	Remarks
		Lbs per acre	Lbs per 1000 sq ft				
1. SELECT ONE SPECIES OF FESCUE:							
Tall Fescue *Lolium arundinaceum* (formerly *Festuca arundinacea*) Or	Recommended MD turf-types[2/]	60	1.38				Tall fescue is more suitable for highly compacted areas and moist sites.
Hard Fescue *Festuca trachyphylla*	Common or Bighorn	40	0.92	Dry to moist	-	Low	Hard fescue has better shade tolerance.
AND ADD:							
Kentucky Bluegrass *Poa pratensis*	Recommended MD turf-types [2/]	40	0.92				For best results, recommend using a blend of 3 cultivars each for tall fescue and Kentucky bluegrass.
Perennial Ryegrass *Lolium perenne*	Blazer (II), Pennfine	20	0.46				
2. Creeping Red Fescue *Festuca rubra* var. *rubra*	Dawson, Pennlawn, Flyer, Fortess, Ruby, or Salem	30	0.69				
Chewings Fescue *Festuca rubra* ssp. *commutata*	Common	30	0.69	Very dry to moist	-	Low	
Kentucky Bluegrass *Poa pratensis*	Recommended MD turf-types [2/]	20	0.46				
OPTIONAL ADDITION							
Rough Bluegrass *Poa trivialis*	Common	15	0.34				Add rough bluegrass in moist, shady conditions.
3. Deertongue *Dicanthelium clandestinum*	Tioga	15	0.34	Dry to wet	-	Moderate	All species are native to Maryland.

Table 9: Permanent Seeding Mixtures							
Mix	Recommended Cultivar	Seeding Rate		Soil Moisture Conditions	Sun/ Shade Requirements	Wildlife Value	Remarks
		Lbs per acre	Lbs per 1000 sq ft				
Creeping Red Fescue *Festuca rubra* var. *rubra*	Dawson, Pennlawn, Flyer, Fortess, Ruby, or Salem	40	0.93				Use Virginia wild rye on moist, shady sites.
Virginia Wild Rye *Elymus virginicus* OR	Common	5	0.11				Use Canada wild rye on droughty sites.
Canada Wild Rye *Elymus canadensis*	Common	5	0.11				

TABLE 9 NOTES:

1. Sun - Shade Requirements:
   Full Sun - needs 6 or more hours of sunlight per day or 4 hours of midday sun
   Part Shade - needs 3 to 6 hours of sunlight per day
   Shade - needs less than 3 hours of sunlight per day

2. Turf-type cultivars of Tall Fescue and Kentucky Bluegrass shall be selected based on recommendations of the University of Maryland Cooperative Extension Service, Agronomy Mimeo 77. Recommendations in the April, 2000 publication are as follows:

   Kentucky Bluegrass -
   A. The following Kentucky bluegrass cultivars are suitable for general use, and are also noted for shade tolerance:

America	Brilliant	Compact	Liberator	Nuglade	Quantum Leap	SR 2000
Ascot	Champagne	Coventry	Moonlight	Princeton 105	Showcase	Unique

   B. The following Kentucky bluegrass cultivars are suitable for general use, and are also noted for tolerance of low maintenance conditions:

Barirus	Eagleton	Haga	Merit	Monopoly
Caliber	Freedom	Livingston	Midnight	Washington

   Tall Fescue - The following turf-type cultivars are suitable for general use:

Alamo E	Bulldawg	Debutante	Good-En	Micro DD	Rebel 3D	Scorpio	Titan 2
Apache II	Chapel Hill	Dominion	Grande	Millennium	Rebel III	Shenandoah	Tomahawk
Avanti	Chieftain II	Duke	Guardian	Olympic Gold	Rebel Jr.	Shenandoah II	Trailblazer II
Axiom	Chinook	Duster	Heritage	Oncue	Rebel Sentry	Southern Choice	Twilight II
Bandana	Cochise II	Eldorado	Houndog 5	Pixie	Red Coat	SR 8200	Virtue
Barlexus	Comstock	Empress	Jaguar 3	Pixie E+	Regiment	SR 8300	Watchdog
Barrington	Coyote	Falcon II	Lancer	Plantation	Rembrandt	Stetson	Wolfpack
Bonanza	Crossfire	Finelawn Petite	Leprechaun	Pyramid	Renegade	Tarheel	WPEZE
Bonanza II	Crossfire II	Genesis	Masterpiece	Rebel 2000	Reserve	TF6	Wyatt

Table 10 - Area Determinations For Roads

Road Length (ft)	Road Width (ft)					
	8	10	12	14	18	20
150	.01	.01	.01	.02	.02	.02
200	.02	.02	.03	.03	.04	.05
250	.05	.06	.07	.08	.10	.11
500	.09	.12	.14	.16	.21	.23
1000	.18	.23	.28	.32	.41	.46
1500	.28	.34	.41	.48	.62	.69
2000	.36	.48	.56	.64	.83	.92
2500	.46	.57	.69	.80	1.03	1.15
5000	.92	1.15	1.38	1.61	2.07	2.30
5280	.97	1.21	1.45	1.70	2.18	2.42

To determine amount of seeding material needed for a project, multiply the value in the above table by the recommended per acre application rate.

Example: 12 foot road surface, 1500 feet in length has an area of .41 acres.

Seed Type	Lbs./ac.	Ac.	Total Lbs.
Tall Fescue	60*	.41	25
Kentucky Bluegrass	40*	.41	16
		Total Seed Applied	41

*For example only. For actual seeding rates consult charts in this specification or appendix