NEW JERSEY FORESTRY AND WETLANDS

BEST MANAGEMENT PRACTICES

MANUAL

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INTRODUCTION

The **New Jersey Forestry and Wetlands Best Management Practices Manual** is a practical, comprehensive guide outlining the best methods for implementing forest management in the state. This manual provides information for foresters, landowners and others involved in forestry-related activities about the simple, practical methods that can be applied to help minimize the environmental impact of forestry operations.

Forestry Best Management Practices, commonly referred to as BMPs, are designed to minimize soil erosion, protect water quality by preventing non-point source pollution, enhance fish and wildlife habitat and improve recreational opportunities. A BMP, as defined by the Clean Water Act of 1987, is any method, measure or practice used to protect, maintain and preserve water quality.

BMPs are developed from standard silvicultural, soil conservation and water resource guidelines. Silvicultural guidelines, which are used to control the establishment, growth, composition, health and quality of forests and woodlands, are designed to perpetuate the timber resources. Soil conservation guidelines are used to provide protection against soil erosion, and water resource guidelines are used to provide protection from non-point source pollution and siltation. Non-point source pollution is any pollution not traceable to a single identifiable source.

How to protect New Jersey's wetlands while practicing forestry activities is an integral part of this manual. Under the 1987 New Jersey Freshwater Wetlands Protection Act (FWPA), normal harvesting of forest products in accordance with a forest management plan approved by the State Forester is exempt from the requirement of a wetland permit. The plan must meet the minimum standards necessary for protecting and maintaining New Jersey's forested wetlands, as well as the water quality of the surface waters within these wetlands. Normal silvicultural activities, such as seeding, cultivating, minor drainage and road construction, are exempt from the requirement of a wetland permit without an approved plan, as long as the practices are conducted in accordance with the BMPs listed within this manual and are part of an ongoing forestry operation.

Specific information about wetland regulations and how they might affect silvicultural practices in your woodland area, are addressed in the Wetlands section. BMPs recommended specifically

Best Management Practices are necessary in the forest management process. Both the state and public land owners must be committed to incorporating the most current, up-to-date stewardship principles in the management of natural lands for the continued health, diversity and productivity of ecological systems.

Bass River State Forest

for wetland areas are incorporated throughout the document.

Since the vegetative cover, soil characteristics, topography, geology and hydrology vary widely within the state, the following BMPs cited in this manual are designed specifically for New Jersey's four major physiographic sections: Hudson Valley, Lower New England, Northern Appalachian Piedmont and the Upper Atlantic Coastal Plain.

Because of the uniqueness and different concerns and constraints of each woodland site, this manual is not intended to prescribe specific management procedures and objectives throughout New Jersey, but to provide a matrix of management elements from which individual management practices can be developed. Many of the recommendations within this manual will evolve over time as forestry knowledge and technology advance.

Freshwater wetlands provide essential breeding, spawning, nesting and wintering habitats for a major portion of New Jersey's fish and wildlife, including migrating birds, endangered species and commercially and recreationally important wildlife.

WETLANDS

Forested wetlands are found throughout New Jersey and are considered one of the state's vital natural resources. They provide many benefits including: flood storage capacity; flood velocity reduction; ground - water recharge opportunities; nutrient and sediment control; wildlife habitat; recreational opportunities; and timber supply.

Wetlands occur in depressions along rivers, lakes, streams and coastal waters subject to periodic flooding. They are frequently transition areas between a well-drained upland and the open waters of lakes, rivers, streams and bays. Many wetlands develop in distinct depressions or basins that can be readily observed. Others may occur in almost imperceptible shallow depressions that cover many acres. They also may be associated with groundwater seeps. In many instances, a qualified forester or natural resource manager can readily identify a wetland area. However, consultation with a qualified wetland scientist and the DEP is recommended when detailed wetland identification is needed.

Water is a dominant factor determining the nature of the soil development and the types of plant and animal communities living in the soil and on its surface. Water creates severe physiological constraints for all plants and animals except those that are adapted for life in water or in saturated soil.

Numerous factors influence the wetness of an area, including precipitation, stratigraphy, topography, soil permeability and plant cover. All wetlands usually have at least a seasonal abundance of water. This water may come from seasonal fluctuation in groundwater level, direct precipitation, overbank flooding, surface water runoff from rain, snow melt or from tidal flooding. The duration and frequency of inundation and soil saturation vary from permanent flooding or saturation, to irregular flooding or saturation.

Wetlands are defined by, and possess the following three essential characteristics or parameters:

• ***Wetland hydrology*** — The degree of flooding, or the permanent or periodic inundation and saturation of the soil by surface or groundwater at a frequency and duration sufficient to support a prevalence of wetland vegetation. The presence of water for a week or more during the growing season typically creates anaerobic conditions. These conditions affect the types of plants and soils that develop in wetlands.

• ***Wetland vegetation*** (hydrophytes) — Vegetation adapted to growth and reproduction under periodically saturated root zone conditions during at least a portion of the growing season.

• ***Hydric soils*** — A soil that is saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation. Alluvial land, as mapped by soil surveys, or other soils exhibiting hydric characteristics, also are considered a hydric soil for wetland identification.

Of the three technical criteria for wetland identification, wetland hydrology is often the least exact and most difficult to establish in the field, largely due to annual, seasonal and daily fluctuations.

As the technical basis for delineating wetlands in New Jersey, the state Department of Environmental Protection (DEP) uses the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands,* which was compiled in 1989. Any subsequent amendments to the manual are recognized as well.

This manual was prepared by an interagency committee with members from four federal agencies: the US Army Corps of Engineers (ACOE); the Environmental Protection Agency (EPA); the US Fish and Wildlife Service (USFWS); and the NRCS.

The state also recognizes the *New Jersey Pinelands Comprehensive Management Plan,* a local wetland delineation criteria manual created to supplement the federal manual. For more information on the *New Jersey Pinelands Comprehensive Management Plan,* contact the New Jersey Pinelands Commission at (609) 894-9342.

REGULATIONS AND PROCEDURES FOR WETLANDS AND BUFFERS

The Freshwater Wetlands Protection Act (FWPA) regulates forestry activities conducted within forested wetlands and transitional areas. Specific forestry activities have been granted a conditional exemption of the requirement of needing a wetlands permit.

The FWPA regulates all freshwater wetlands. Newly created and isolated wetlands — regardless of size — also are regulated, provided they meet the three parameter wetland delineation methodology. In addition to wetland areas, their associated buffers or transition areas come under regulation of the FWPA. The width of the buffer area is based on the resource value of the wetland.

- Buffers of 150 feet are established for wetlands of exceptional resource value. Those wetlands are documented habitat of certain endangered or threatened species, or are adjacent to FW1 and FW2 trout production waters or their tributaries.
- Ordinary resource value wetlands require no buffer. These wetlands include: ditches and swales; detention basins; and small isolated wetlands surrounded by at least 50 percent development.
- Buffers of 50 feet are required adjacent to wetlands of intermediate resource value. These buffers are associated with all other wetlands.

To obtain the forestry exemption from the FWPA, a proposed forest management harvest within a wetland, or its regulated upland transition area, must be detailed in a forest management plan that has been approved by the State Forester. If a harvest is not in an approved plan, it is subject to regulation under the FWPA and may be considered a violation.

Woodland owners implementing normal harvesting of forest products, in accordance with a forest management plan approved by the State Forester, are not required to obtain a wetland permit to work in forested wetlands. In New Jersey, normal silvicultural activities, ongoing as of 1987, are exempt from the requirement of a wetland permit without an approved forest management plan, as long as the practices are conducted in accordance with the best management practices listed within this manual. These practices include activities such as: thinning; tree planting; seeding; cultivating; minor drainage; harvesting for the production of food and fiber; upland soil and water conservation practices; the maintenance of drainage ditches; the construction or maintenance of forest roads; and fencing (Society of American Foresters).

The DEP, through the Land Use Regulation Program, has established a procedure to obtain a formal letter of exemption for these activities. This document is not required before conducting normal harvesting activities approved by a forest management plan, but may be helpful to ensure compliance with the law. To obtain a letter of exemption, contact a representative from the DEP's Land Use Regulation Program at (609) 292-0060.

To administer the forestry exemption, the Land Use Regulation Program works in cooperation with the DEP's Division of Parks and Forestry, Bureau of Forest Management. The bureau will assist anyone proposing a forest practice in a regulated wetland or buffer area to obtain an approved forest management plan prior to conducting the work.

Anyone submitting a forest plan to the State Forester for approval for harvesting of forest products in a regulated freshwater wetland or upland buffer area should submit two copies of a proposed management plan to a regional forester of the DEP's Bureau of Forest Management. The plan is to include the following information:

1. Landowner's name, address and telephone number
2. Applicant's name, address and telephone number
3. If the applicant is not the landowner, they must submit the authority for requesting the wetland forestry approval
4. Map of total land owned in contiguous block including:
   a. Forest types delineated with acres
   b. Land use classification
   c. Soil types and erodibility / erosion control procedures
   d. Percent slope
   e. Stream's location
   f. Filter and buffer strips
   g. Proposed harvest area clearly defined on a map with acreage including:
      - *Loading deck location*
      - *Stream crossings*
      - *Proposed skid trails*
5. Description of forest products to be harvested including:
   a. Volume cords, MBF (1000 board feet)
   b. DBH (diameter at breast height) classes
   c. Age classes
   d. Heights
   e. Number of trees, etc. when harvesting is to take place
   f. Dates when harvesting will take place
6. Regeneration practices and other intermediate management practices recommended of the proposed harvest area
7. Proposed harvest area clearly delineated on the ground
8. Statement indicating how seed trees will be marked at DBH and at stump (if applicable)
9. Individual BMPs to be used
10. Statement concerning threatened and endangered species (State if none exist

on the site. If threatened and endangered species do exist, assess impact of activity and outline mitigation steps.) For more information on threatened and endangered species, contact the state Natural Heritage Program at 609-984-0097.

11. Assessment of impacts to reach and flow of any water courses, and explanation how reach and flow will be maintained.
12. Wetland clearly marked on forest map.

To review and gain approval for the proposed forest practice, a site inspection must be arranged with a representative of the Bureau of Forest Management. If the plan is approved, it will be stamped approved by a regional forester and returned with a letter to verify that approval. Once this process is complete, the proposed forest harvest is in compliance with the wetland forestry permit exemption as long as the plan is followed accurately.

It is important to understand that the proposed forest practice is still subject to all other applicable local, state and federal regulations. Once any forest practice starts, it may still be subject to a wetland violation if the practice or harvest diverts from the approved BMP or harvesting plan.

Forestry activities proposed as part of any approved plan must not:

- Have an adverse impact on a state or federally listed endangered or threatened species;
- Impair the flow and circulation patterns of the freshwater wetlands or state open waters;
- Reduce the extent of freshwater wetlands or state open waters;
- Violate the plan outline and intent during implementation.

Streamside Management Zones (SMZ) are special management areas adjacent to ponds, lakes, marshes or perennial and intermittent streams, which require specific management practices. These areas often are most susceptible to non-point source pollutants.

SECTION I

STREAMSIDE MANAGEMENT ZONES

The purpose of a Streamside Management Zone (SMZ) is to protect a water body from adjacent land-use activities by providing a relatively undisturbed vegetative zone to trap and filter out sediments and other pollutants before they enter the water resource.

In addition to protecting water resources, SMZs also have benefits, including: maintaining the proper water temperature of a stream; providing a wildlife corridor for improved wildlife movement; and serving as an aesthetic buffer or screen to minimize the visual impact of silvicultural activities.

The width of a SMZ is determined through on-site evaluation. Variation in topography or other conditions along a water course or surrounding body of standing water may require changes in the SMZ width. Generally, the steeper the slope, the wider the SMZ, and the more gentle the slope, the narrower the SMZ. Similar standards apply for erodible soils: the more erodible the soil, the wider the SMZ, and the less erodible the soil, the narrower the SMZ (Georgia Forestry Commission 1990).

The width of a SMZ should range from at least 25 feet on each side of a streambed in slightly erodible soils, to 50 feet in severely erodible soils where slopes perpendicular to the stream are 10 percent or less.

Figure No. 2 on Page 3 contains generalized width recommendations based on slope and erosion hazard. Forest managers should be aware of special site conditions such as, the depth of soil to the water table, the degree of management being practiced (e.g. harvesting), or the vigor of the streamside vegetation, that may require a change in the width of the SMZ from what is generally recommended.

BEST MANAGEMENT PRACTICES FOR STREAMSIDE MANAGEMENT ZONES

In an area such as the Northern Appalachian Piedmont section, where slopes vary greatly, SMZs should range from at least 40 feet wide in slightly erodible soils and 11 percent slopes, to 130 feet wide in severely erodible soils and 20 percent slopes. Where slopes exceed 20 percent, such as in the Lower New England and Hudson Valley sections, the SMZ should range from at least 70 feet wide in slightly erodible soils to a minimum of 200 feet wide in severely erodible soils. (Refer to map on inside back cover.)

Incorporate SMZs into your forest management plan during the initial planning stage. It is important to note, that the recommendations listed below are specifically for SMZs, and should not be applied in other areas.

1. A site evaluation is necessary to determine the proper SMZ width. Listed below, are standard, **minimum** SMZ width recommendations:
   - For slopes 0 - 10 percent, the minimum SMZ width should be 25 feet.
   - For slopes 11 - 20 percent, the minimum SMZ width should be 40 feet.
   - For slopes 21 - 45 percent, the minimum SMZ width should be 70 feet.
2. Harvest or fell trees away from streams, lakes, ponds or marshes to prevent logging slash and organic debris from entering the water resource (unless debris placement is specifically prescribed for the enhancement of fish and wildlife habitat).
3. Protect trees that provide necessary stream bank stabilization and shade.
4. Avoid rutting and soil compaction by limiting logging equipment use within the SMZ.
5. Use harvesting systems that minimize soil disturbance. (Refer to the Society of American Forester's Forestry Handbook for detailed information.)
6. Remove all debris from marshes, streams, lakes and ponds (unless specific fish or wildlife habitat will be enhanced, as confirmed by DEP's Division of Fish Game and Wildlife).
7. Locate new roads or trails, of any kind, outside the SMZ. Restrict road construction to areas where stream crossings are absolutely necessary.
8. Keep fire out. (See Section IX, Forest Protection, for more information.) *In some situations a light prescribed fire through the SMZ causes less damage than constructing a fireline adjacent to the SMZ.*
9. Avoid any type of mechanical site preparation and machine planting. Hand planting or direct seeding is recommended.

10. Locate portable sawmill sites and log decks on well-drained sites at least 50 feet outside the SMZ.
11. Application of pesticides is acceptable as long as they are applied by a certified applicator. Ground application vehicles should not enter the SMZ. (See Section VII, Forest Pesticides, for more information.)
12. Avoid using fertilizers.
13. Stabilize all areas that may be subject to erosion at the close of a forestry operation. The following forestry practices are recommended and can be used alone or in combination for adequate erosion protection and control: grading, seeding, riprap, straw mulch, baled straw diversion, brush barriers, water bars, jute mats, gravel and geotextile fabric.

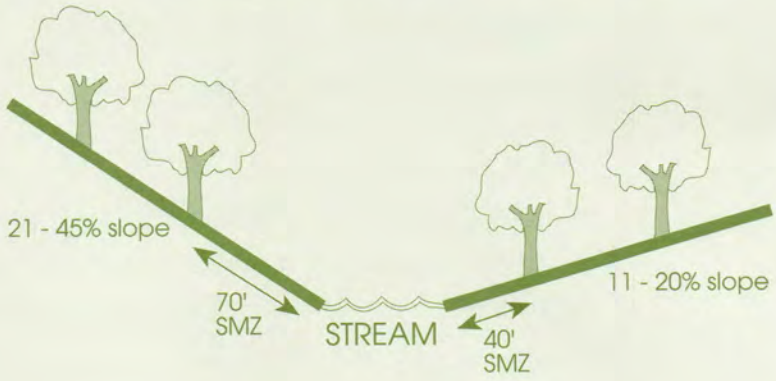
All streamside management zone widths meet or exceed specifications recommended in the most recent data available from the U.S. Department of Agriculture's Forest Service.

The width of the SMZ is measured in lineal feet from the pond, lake stream or marsh, to the road, skid trail or other surface disturbance.

GENERALIZED STREAMSIDE MANAGEMENT ZONES

SLOPE	Severely Erodible Soils		Slightly Erodible Soils		Slightly Erodible Soils		Severely Erodible Soils
0 - 10%	50'	---	25'	STREAM BED	25'	---	50'
11 - 20%	130'	---	40'		40'	---	130'
21 - 45%	200'	---	70' ***		70'	---	200'

****Example of Streamside Management Zone Width*



Formulas for Determining SMZ Width

Slope distance in feet =

43 + 1.39 (slope %)
without a brush barrier
or

32 + 0.40 (slope %)
with a brush barrier

FIGURE 2

SECTION II

FILTER STRIPS

Filter strips are defined as undisturbed areas consisting of natural vegetation and litter, such as leaves, brush and branches, located between a wetland or water course, truck roads, skid trails, and harvest or loading areas. Filter strips are most effective when placed in close proximity to the activity most often being used outside the SMZ.

Filter strips are used to help slow the velocity of water runoff so that any sediment load is dropped into the filter strip, thereby preventing it from washing into the adjacent wetland or water course. Filter strips also are important in helping to maintain water temperature and preserve wildlife habitat.

1. Plan filter strips prior to the implementation of a harvest schedule.
2. Filter strips should increase in width as slopes adjacent to wetlands or streams increase.
3. Restrict equipment operation in filter strip areas.
4. Construct or maintain a filter strip between disturbed areas and wetlands or water courses.

SECTION III

STREAM CROSSINGS

Stream crossings represent the point at which a forest road or skid trail comes in contact with a body of water. The purpose of a stream crossing is to provide a stable bottom or surface that allows for equipment to cross intermittent or perennial streams without increasing stream sedimentation.

Stream crossings, if not properly constructed, have the potential to adversely affect the quality of water resources through erosion, and should be avoided if possible. Advance planning will reduce or eliminate the number of crossings necessary.

The Flood Hazard Area Control Act Rules (NJAC 7:13) regulate construction within and/or adjacent to the 100-year flood plain of non-delineated streams or the flood hazard area of delineated streams. The intent of these regulations is: to minimize losses and damage to public and private property caused by land uses and channel modifications which, at times of flood, increase flood heights and/or velocities; safeguard the public from the dangers and damage caused by materials being swept into nearby or downstream lands; protect and enhance the public health and welfare by minimizing the degradation of stream water quality from point and non-point pollution sources; and protect wildlife and fisheries by preserving and enhancing water quality and the environment of the stream channel and flood plain. According to Flood Hazard Area Control Act Rules, the construction of permanent structures such as bridges, culverts or fords is regulated. These structures are typically needed to access a stand of trees.

In the case of temporary crossings, the DEP may issue a letter of no jurisdiction rather than a permit. For permanent crossings a Stream Encroachment Permit will be required. If a permit is required, the forest manager should work with the local Soil Conservation District and the DEP to find a satisfactory solution without expending a lot of energy, time and expense.

Additional information regarding sedimentation control and the construction and use of bridges, culverts or fords can be obtained from publications developed by the USDA Forest Service and the Natural Resource Conservation Service (NRCS) — previously known as the Soil Conservation Service (SCS). For more information on stream encroachment regulations, call (609) 777-0454.

Endangered and threatened bird species have made a remarkable recovery over the past 20 years due to improved water quality, habitat protection and state management efforts.

BEST MANAGEMENT PRACTICES RECOMMENDED FOR STREAM CROSSINGS

1. Stabilize stream banks at crossings during and after harvesting. Seeding, hay or straw, riprap, filter fabric or mulching can be used to help stabilize streambanks. A guide to standard stabilization practices can be obtained through the NRCS.
2. Approach a stream crossing perpendicular to the stream as much as possible. Construct bridges and culverts at points of a stream where the water channel runs straight.
3. Plan stream crossings at the narrowest section of a watercourse. Do not impede water flow with any stream crossings.
4. Use a crossing site with gentle slopes leading to low stable banks and a firm stream bottom.
5. To help ensure the least disturbance to the stream bank, water channel or adjacent SMZ, construct stream crossing structures, such as permanent or temporary bridges, culverts or fords, with the structural capacity to safely handle expected vehicle loads and traffic volume. Place the bottom of a culvert at the same elevation as the bottom of the stream and at approximately the same slope.
6. Use culverts or bridges where an unstable stream bottom would be damaged.
7. Use properly sized culverts for small streams (See Culvert Table on Page 7).
8. Do not disturb the spawning or migration movements of aquatic species when constructing a stream crossing. For streams that are used for fish migrating or spawning areas, bridges or arch culverts, which retain the natural stream bottom and slope, are preferred over pipe culverts. Multiple culverts can be used to provide fish passage in streams that have wide ranges of water flow (EPA 1993).
9. Temporary bridges are recommended for small stream crossings on temporary access roads (EPA 1993).
10. When temporary stream crossings are used, remove culverts and log crossings at the completion of operations.
11. Limit the use of fords to areas where the streambed has a firm bottom or where the bottom has been armored with stable material; where the approaches are both low and stable enough to support traffic; where fish are not present during low water flow; and where the water depth is no more than three feet (Ontario Ministry of Natural Resources, 1988: Hynson et al., 1982). When using fords, do not use asphalt or other petroleum-based materials . Do not use logs or logging slash as a permanent ford. A ford should not affect normal stream elevation.
12. Stabilize soil around all culverts and bridges (Table 2). Seeding, mulching, riprap, filter fabric or large stones are recommended for use around bridges

and culvert inlets and outlets to help prevent erosion.

13. When installing culverts and/or constructing bridges and fords, follow recognized and approved installation and construction methods. Information on these methods can be obtained from the NRCS and from the Society of American Forester's Forestry Handbook.
14. Extend the length of the culvert pipe so that both ends are at least a foot beyond the edge of the fill material.
15. Occasionally inspect culvert pipes to avoid plugging with leaves and debris (EPA, 1993).

TABLE 1

CULVERT SIZE

Diameter of Pipe Needed in Inches

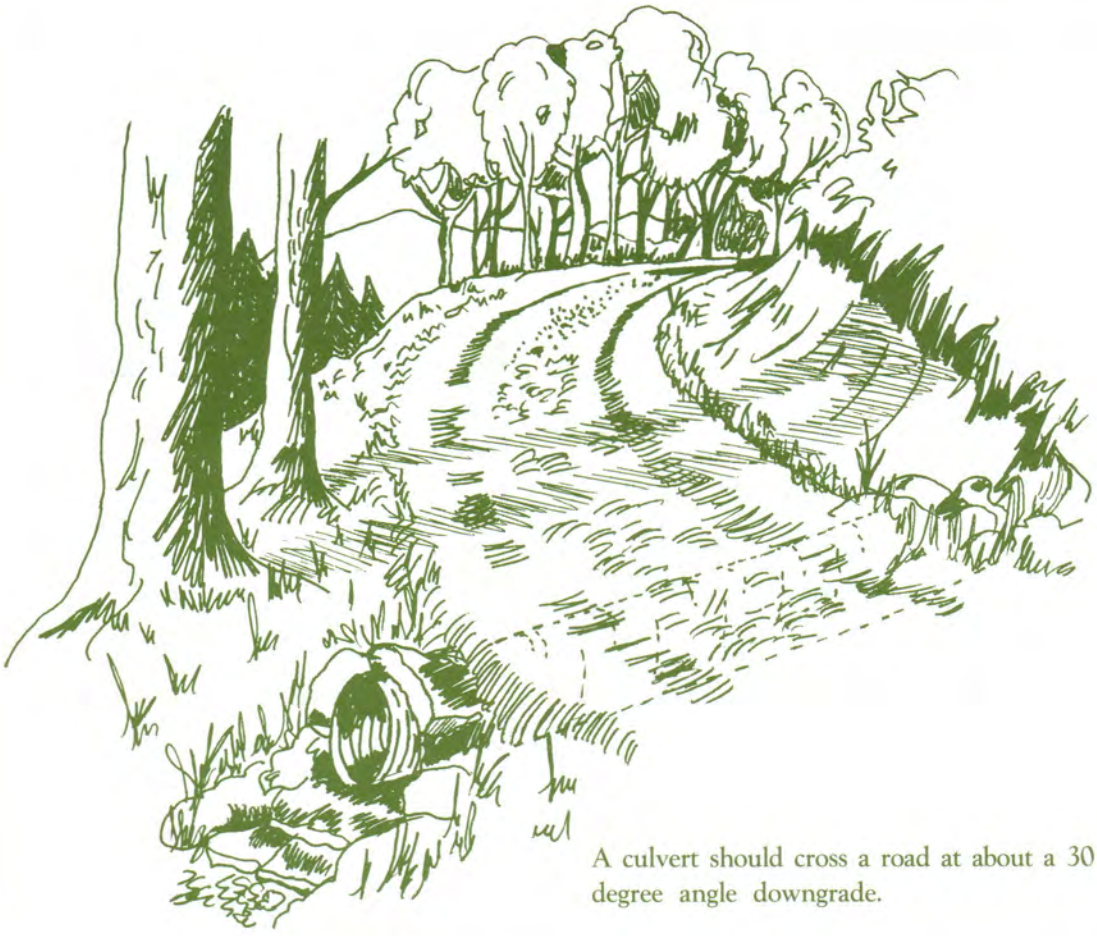
Acres Drained	*Light Soils*			*Medium Soils*			*Heavy Soils*		
Slope	Flat 0-5%	Mod. 5-15%	Steep 15+%	Flat 0-5%	Mod. 5-15%	Steep 15+%	Flat 0-5%	Mod. 5-15%	Steep 15+%
2	15	15	15	15	15	15	15	18	18
4	15	15	15	15	15	18	21	21	21
6	15	15	15	15	18	21	21	27	27
8	15	15	15	15	18	21	24	27	30
10	15	15	15	18	21	24	27	30	36
20	15	15	15	21	24	30	30	36	42
30	15	15	15	21	27	36	36	42	48
40	15	15	15	24	30	36	42	48	54
50	15	15	18	27	36	42	42	48	
60	15	15	18	27	36	42	42	54	
70	15	18	18	26	36	42	48	54	
80	15	18	21	30	36	48	48		
90	15	18	21	30	36	48	48		
100	15	18	21	30	42	48	48		
150	18	21	24	36	42	54	54		
200	21	21	27	36	48				
250	21	24	27	42	48				
300	21	27	30	42	54				
350	24	27	30	42	54				
400	24	27	36	48					

For example:
A tract that has medium soils and is located on medium slopes, which range from 5-15 percent, would require a culvert size of 36 inches for a crossing site that drains 80 acres.

Note:
Pipes with diameters less than 18 inches are subject to occasional plugging. All pipes require occasional inspection for debris.

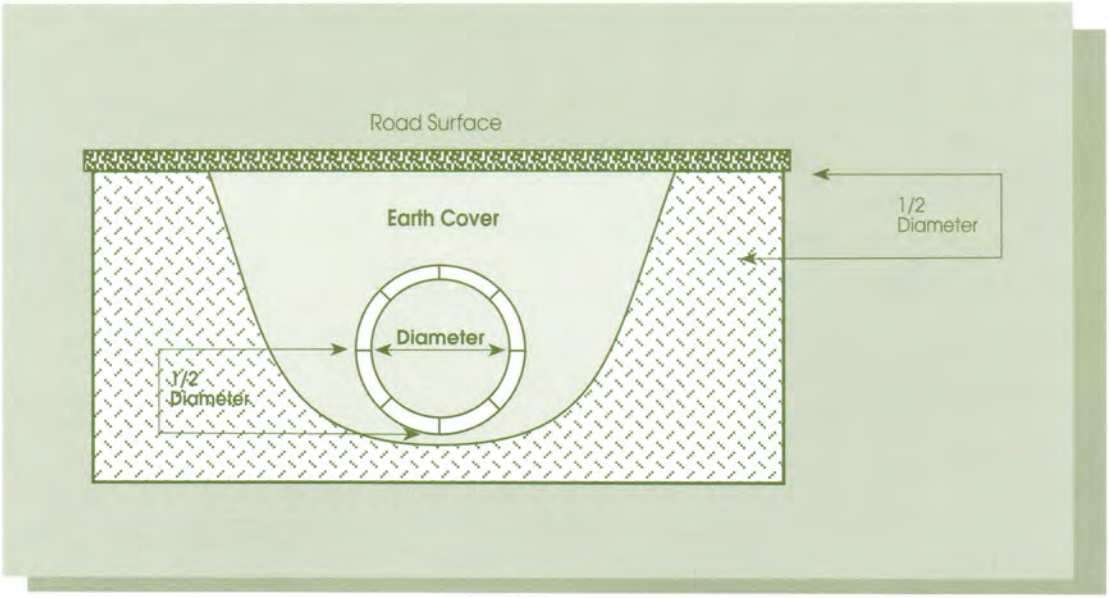
Culvert Installation:
Soil should be hand-tamped at least halfway up the side of the pipe. Space between pipes in a multiple culvert should be half of the pipe diameter. Soil cover over pipes also should be half the culvert diameter in depth, but not less than a foot.

FIGURE 3
CULVERT INSTALLATION (GEORGIA FORESTRY COMMISSION 1988)



A culvert should cross a road at about a 30 degree angle downgrade.

CULVERT CROSS SECTION



Properly constructed and maintained access roads are an integral part of forest management in New Jersey. Access roads are necessary for timber removal, fire suppression, fire protection and other routine management and recreational activities. A well-planned, efficient transportation system can be constructed with minimal forest degradation and can help ensure the protection of water quality.

SECTION IV

ACCESS ROAD

Access to forest land is often accomplished through the use of existing or newly constructed roads. When not properly constructed, roads are considered a major source of erosion from forested lands, contributing, according to several studies up to 90 percent of the total sediment production from forestry operations. In addition to increasing erosion, poorly constructed roads also can reduce and degrade wildlife and fish habitats.

Access systems should generally be designed to minimize the total number of roads; the miles or acres used in their construction; the size and number of landings; the number of skid trail miles; and the number of water course crossings particularly in sensitive watersheds (EPA, 1993). According to the FWPA, construction and maintenance of forest roads must not impede the flow and circulation patterns and chemical and biological characteristics of freshwater wetland areas.

Permanent roads are constructed to provide year-round access for forestry operations and fire protection, and become a permanent part of the forested landscape. Temporary roads are constructed to provide access into a specific areas for a particular operation. Once the operation is complete, temporary roads should be closed and/or stabilized.

Additional information regarding the design and maintenance of access systems, as well as information on erosion control can be obtained from the USDA Forest Service and the NRCS.

BEST MANAGEMENT PRACTICES FOR ACCESS ROAD MAINTENANCE AND CONSTRUCTION

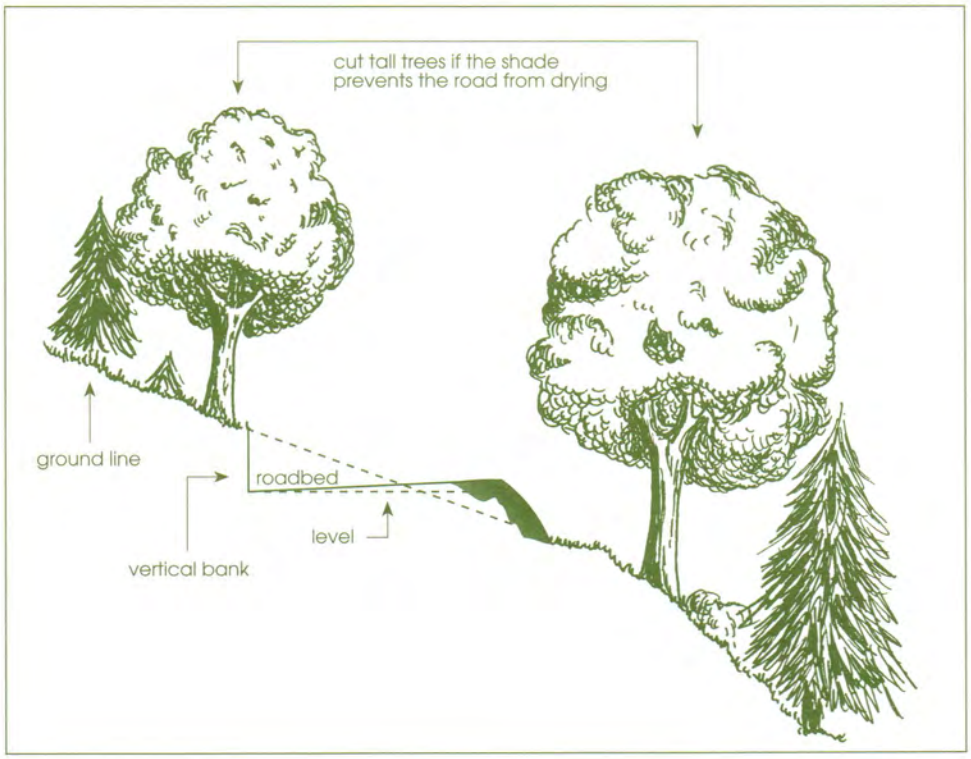
1. Locate access roads outside the SMZ and wetlands, unless no other alternative exists.
2. When available, use existing roads to help minimize the total amount of road construction necessary for forestry operations.
3. Stabilize exposed soil on roads within the SMZ. (Contact the NRCS for stabilization practices.)
4. Build roads to follow the contour of the land.
5. In a moderately sloping terrain, road grades should be less than 10 percent, with optimal grades between 3 and 5 percent. In steep terrain, short sections of road at steeper grades may be used as long as the grades are broken at regular intervals (Larse, 1971).
6. Vary road grades frequently to minimize the amount of road surface water flow entering culvert and road-drainage ditches. Grade variation also will help reduce road surface erosion and concentrated culvert discharges (Larse, 1971).
7. Keep roads free of obstructions, ruts and logging debris so that water can flow freely from the road surface.
8. To help ensure proper road-surface drainage, construct roads on the sides of ridges or water divides. Roads should not be constructed on the top of ridges where water tends to collect, resulting in poor drainage.
9. Locate roads above flood plains and wet areas.
10. Use temporary roads in forested wetlands. Temporary roads may be constructed using mats, logs or log slabs. Fill roads should only be used in wetlands when no other practical alternative exists. All roads employing the placement of fill must be removed once the land use changes from forestry to another use. Ponding will be considered a violation.
11. In wetlands, use geotextile fabric under fill to minimize sub-surface soil and water flow disturbance.
12. To ensure proper road-surface water drainage, construct access roads so that water flow is directed to the outside of the road. A standard practice used to achieve outside drainage is outsloping (Fig. 4).
13. Use insloping when constructing a road where road gradients are greater than 15 percent; toward sharp turns; or when constructed on clay and/or slippery soils. In such cases, the use of an under-road culvert positioned at a 30 degree angle to ensure proper inside road drainage is recommended (Fig. 4).
14. Construct roads wide enough to handle necessary forestry equipment (usually about 12 to 14 feet in width).
15. Avoid road construction during wet periods.
16. Good road drainage can be ensured

through the use of properly constructed and spaced water turnouts; water bars; broad-based dips; rolling dips; ditches; culverts; and bridges.

A. Use broad-based dips at appropriate intervals to channel water off the road (Fig. 5). The bottom of these dips should be outsloped slightly at approximately three percent to allow for the removal of surface water.
B. Use water bars only when retiring temporary access roads (Fig. 6).
C. Locate and install water turnouts before a stream crossing to disperse runoff water through undisturbed areas of the SMZ (Fig. 7).
D. Do not channel water from roadside drainage ditches directly into a stream. If a ditch comes in close proximity to a stream, end the ditch and divert the runoff away from the stream and into the SMZ.

17. Do not locate road fills in close proximity to a public water supply intake.
18. If a road is to be seeded during construction, do not compact the final layer of road surface. This will help create better conditions for an acceptable seed bed (EPA 1993).
19. Cover roads with gravel, grass, wood chips, or crushed rocks where the road grade has increased the potential for surface erosion.
20. Use road materials, such as gravel or crushed rocks of the appropriate size and particle hardness, to protect road surfaces from rutting and eroding under heavy traffic during wet periods. Ditch runoff should not be visibly turbid during these conditions (EPA, 1993).
21. Use natural road materials, such as stone, sand or other soil aggregates that do not contain hazardous material or high sulfide ore (EPA, 1993).
22. Shade trees along road sides can be removed to help dry out road beds.
23. When access roads intersect public highways, use gravel, wooden mats, or a combination of geotextile and gravel (or other means) to help keep mud off highway entrances.
24. Restrict traffic on access roads during unfavorable conditions, such as wet soil. Gravel, wooden mats, or a combination of geotextile and gravel may be used to help facilitate operations during these wet periods. Under extreme conditions, silt fencing may be required.
25. Restrict construction activities and staging of fill to the construction of right-of-way access roads or to adjacent uplands out of wetlands or their transition zones.
26. When all forestry activities are complete, close and stabilize temporary access roads. Stabilizing may include: cleaning ditches; mulching and seeding the road bed (Table 2); laying brush barrier riprap; installing silt fences; and/or constructing water bars.
27. Use gates or other barriers to completely close roads to travel and restrict access to unauthorized persons (Pruett, 1978).
28. Periodically inspect closed roads to ensure that vegetation stabilization measures and drainage structures are operating efficiently (Hyson etal., 1982; Rothwell, 1978). Conduct reseeding, mowing, patching, resurfacing and drainage structure maintenance as needed.

FIGURE 4
PROPERLY CONSTRUCTED ROAD CROSS SECTION



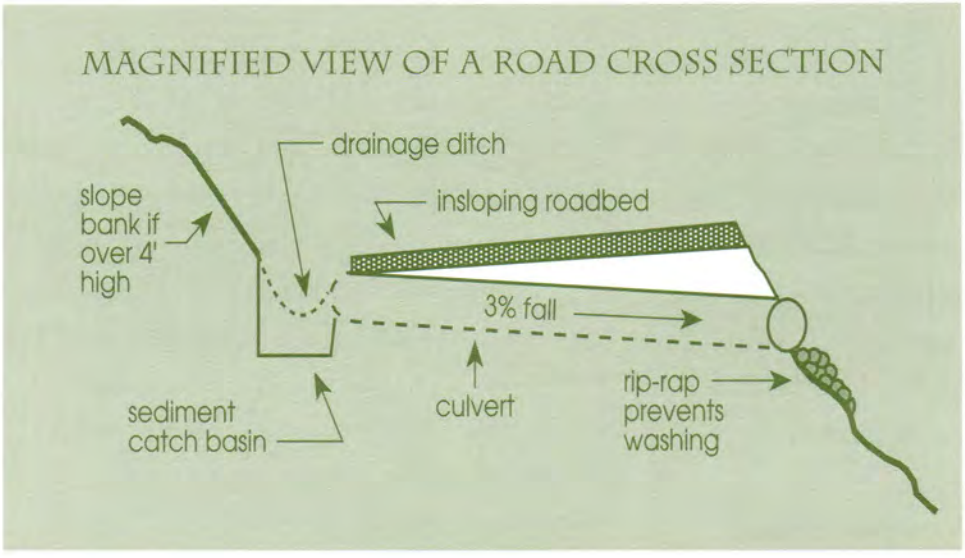


FIGURE 5
BROAD BASED DRAINAGE DIPS (GEORGIA FORESTRY COMMISSION 1988)

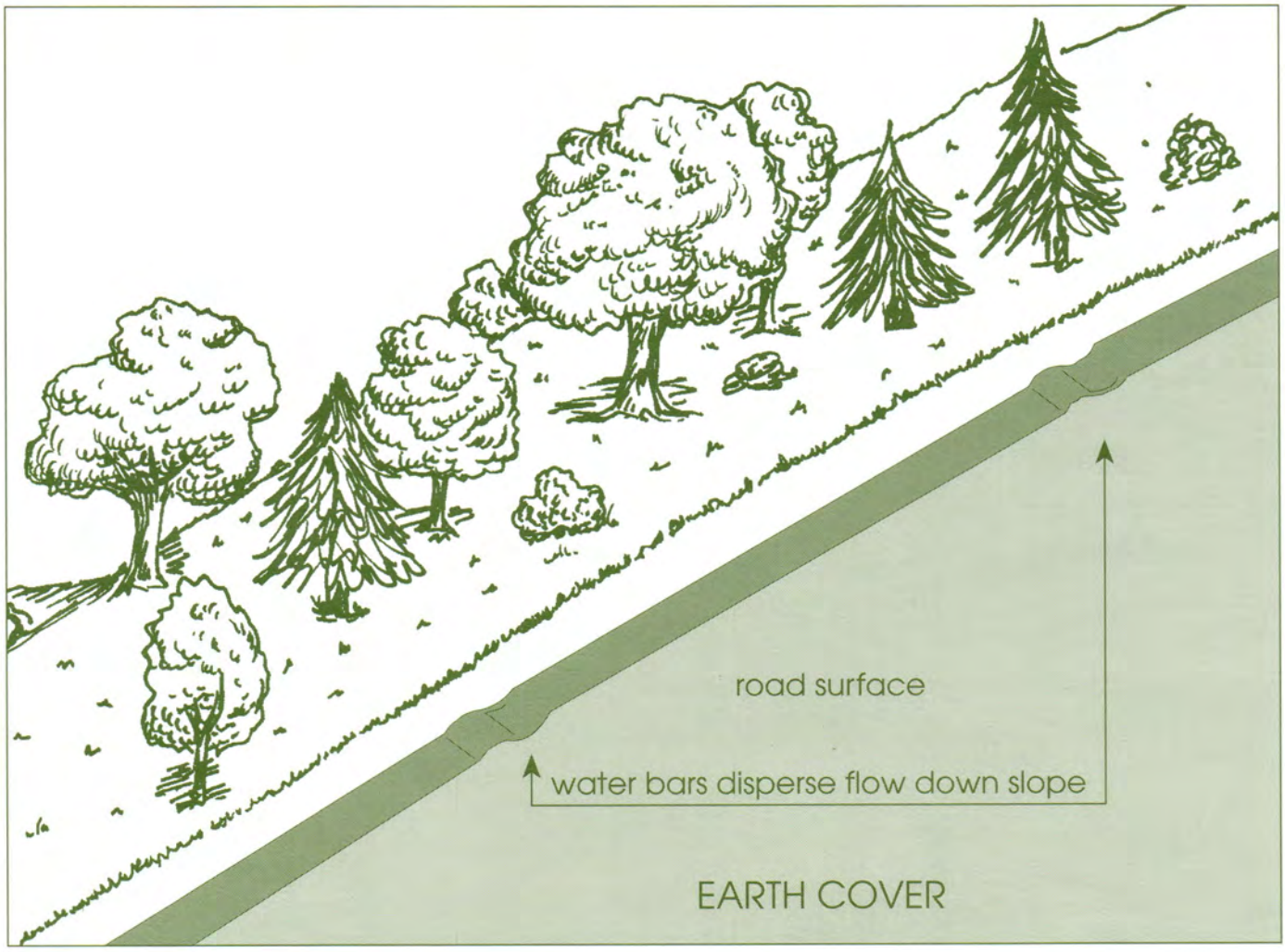
SPACING FORMULA

$$\text{Spacing} = \frac{400'}{\%\ \text{of slope}} + 100$$

EXAMPLES OF BROAD BASED DIPS SPACING DISTANCE

Road Grade (percent)	Approximate Spacing Distance Needed Between Dips (feet)
1	500
2	300
5	180
10	140
12	135

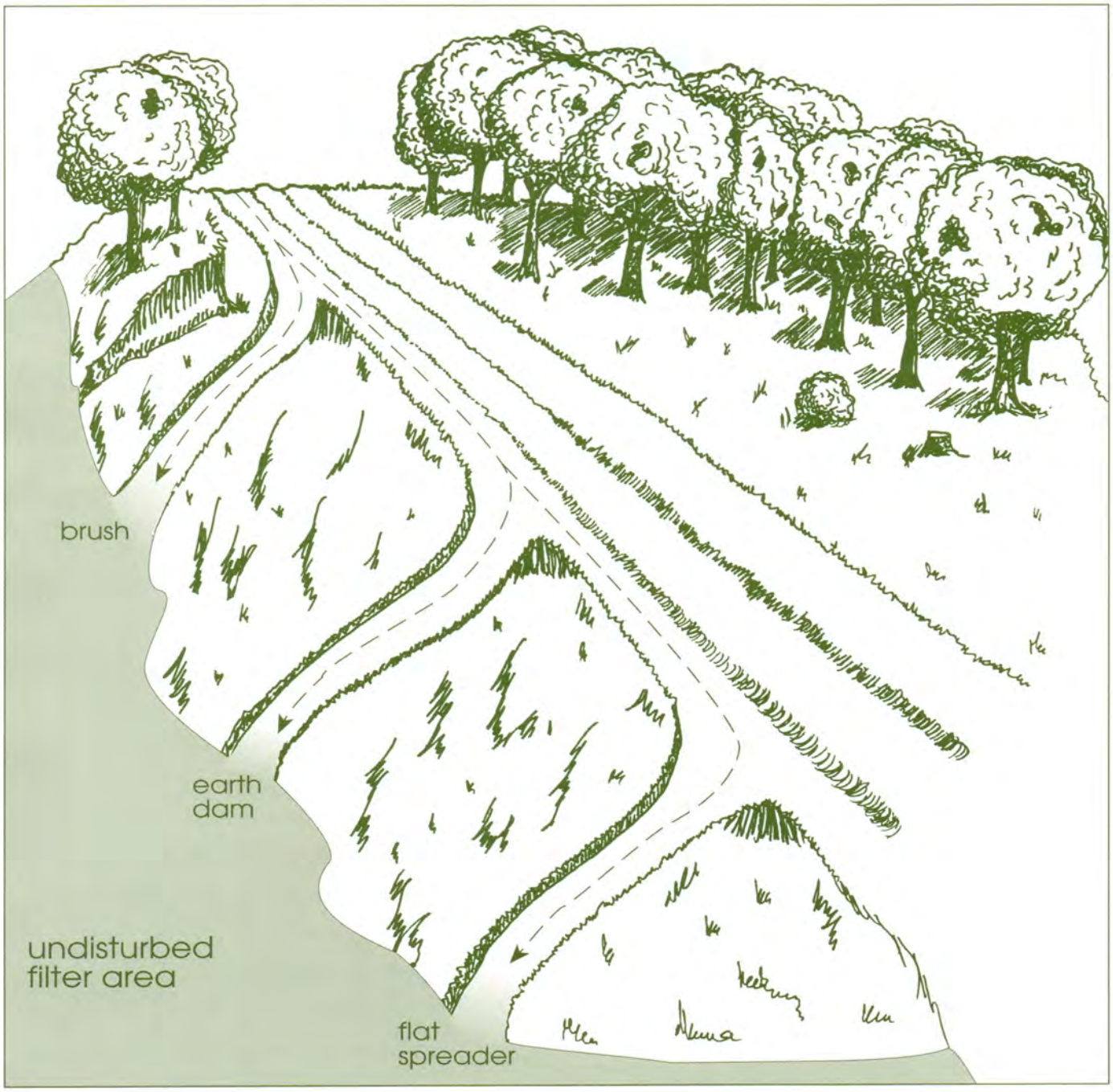
FIGURE 6
PROFILE OF AN ABANDONED SKID TRAIL SHOWING WATER BARS



EXAMPLES OF WATER BAR SPACING

Road Grade (percent)	Approximate Distance Needed Between Water Bars (feet)
1	400
2	245
5	125
10	78
15	60
20	45
30	35
40	30

FIGURE 7
WATER TURNOUT



Water turns down slope from access road.

The principal means of managing a forest for a desired result, such as timber management, improved wildlife management or watershed protection, is by cutting trees to control the composition and/or density of the forest, while avoiding the risks of adverse impacts on the natural environment.

SECTION V

TIMBER HARVESTING

The practice of applied forest management is divided into two primary branches of silviculture: intermediate cuts and regeneration cuts. Intermediate cuts are various treatments implemented during the development of the forest stand from the reproduction stage to maturity. The objective of an intermediate cut is to improve the existing stand, regulate the growth of the stand and provide early financial returns without any effort directed toward regeneration (Smith, 1962). Regeneration cuts are performed to harvest the timber crop and create environmental conditions favorable for reproduction.

In addition to sediment production, harvesting can create an accumulation of organic debris, which may be washed from the forest floor and enter water resources. Harvesting, if not properly applied, also can result in thermal pollution, when the removal of the forest canopy over a stream causes a raise in the water's temperature. When harvesting is properly planned and applied, the cutting of trees for a prescribed silvicultural purpose will minimize adverse impacts on the environment. Trees and other vegetation will grow back naturally and soil disturbance will be limited. When managing a forest, it is important to develop a forest management plan that addresses areas to be harvested; any forest roads to be constructed; and the timing of the activity.

The type of system best suited for harvesting in terms of the landowner's objectives and system impact on site quality should be determined during the initial planning stage. Potential water quality and habitat impacts should be considered when selecting a silvicultural system. Yarding systems, site preparation methods, and any pesticide applications also should be addressed during pre-harvest planning.

BEST MANAGEMENT PRACTICES RECOMMENDED FOR TIMBER HARVESTING

1. Follow SMZ best management practices when implementing timber harvesting practices within a SMZ.
2. One of the following five major silvicultural systems or variations recognized by the Society of American Foresters must be employed when harvesting forest products:
   • Clearcutting • Selection • Coppice
   • Seed-Tree • Shelterwood
   A detailed definition of each of the five major silvicultural systems is provided in the SAF's Forestry Handbook.
3. Use an organized harvest schedule to improve productivity and minimize the short-term impact of harvesting operations. Schedule harvesting operations at problem sites, such as areas with soft grounds or steep slopes, and during times when the ground is dry or frozen.
4. During adverse weather conditions, move harvesting operations to well-drained, relatively level sites.
5. Do not operate any equipment in perennial or intermittent stream channels, lakes, ponds or marshes.
6. Use low-ground pressure track machines in wetlands.
7. When harvesting, keep stumps low and use all marketable material.
8. Keep slash height to three feet or less.
9. Fell all hanging trees.
10. Use extreme care to avoid petroleum product spills.
11. Provide adequate supervision for logging crews.
12. Special considerations may be necessary on sites where rare and endangered species are identified and the proposed harvesting practice may have an adverse effect on the species present.
13. Keep slash 100 feet or more from all roads, trails or fire breaks.

SKID TRAILS

1. Skid trails should be well-planned to help minimize damage to the residual tree stand and reduce erosion and sedimentation. Avoid skidding in freshwater wetlands as much as possible.
2. Whenever possible, skid along the contour of the land.
3. Avoid skidding on slopes greater than 40 percent.
4. Skid with ends of logs raised to reduce gouging (EPA, 1993).
5. Design trails to minimize impact on residual trees. Use low quality "bumper trees" along trail to help protect desired trees. Avoid sharp turns, and use gradual curves.
6. Winch logs off steep slopes verses skidding them off steep areas.
7. On steep, erosion-prone slopes, keep the use of skid trails and skidder traffic to a minimum.
8. Execute skidding on steep slopes on a gradual grade using a zigzag pattern, rather than straight up the slope. Avoid gradients greater than 15 percent. If steeper grades are necessary, water bars, water diversions, grade breaks with water diversions, culverts or other practices must be used to prevent concentrated water flow, which may cause gullying.
9. Alternate skidding between several different skid trails instead of one primary trail. This will help minimize soil exposure and disturbance.
10. Use skidding methods that will prevent excessive soil compaction and channelized erosion during times when soils are saturated. Harvest erosion-prone or steep slopes during either dry weather or when the ground is frozen or snow covered.
11. In wetlands, use high flotation tires when appropriate and keep skid loads light.
12. Reinforce sections of soft ground with cut slash and/or corduroy road sections.

13. When skidding activities are complete, grade, seed and mulch areas subject to erosion (Table 2). If necessary, install water bars to ensure soil stabilization (Fig. 6).
14. Leave logging debris on exposed soil, dry washes and at points of concentrated drainage on skid trails and roads.
15. Compare skid trail length and number to haul road length and number to find the method that will cause the least soil disturbance (EPA, 1993).

LOG DECKS AND PORTABLE SAWMILL SITES

1. Determine and locate sites for log decks and portable sawmills before road construction. These sites should be located in areas that will help minimize skid trail and haul road mileage (Rothwell, 1978).
2. Construct decks and yards on well-drained, gently sloping sites of no more than five percent.
3. Adequate drainage on approach roads will prevent road drainage water from entering the landing area (EPA, 1993).
4. If landings will be used during wet periods, protect the surface with suitable material, such as wooden matting or gravel surfacing (EPA, 1993).
5. To avoid sedimentation from landings, install drainage structures, such as water bars, culverts or ditches (EPA, 1993).
6. A temporary diversion ditch around the uphill side of decks can be used to help intercept the flow of water and direct it away from the deck.
7. Construct log decks no larger than what is required to handle necessary loading activities.
8. Keep sites organized to improve productivity and visual impact.
9. Site prepare and plant or seed log decks and portable sawmill sites when harvesting operations have been completed (Table 2).

Site preparation, a silvicultural tool, refers to those techniques used to prepare areas for seedling establishment of a desired tree species and to control the growth of undesirable vegetation.

SECTION VI:
SITE PREPARATION

Areas recently harvested occasionally require site preparation actions in order to establish a new stand of trees. There are two types of site preparation: mechanical and chemical. Properly executed, site preparation can achieve the following objectives:

- Ameliorate soil characteristics to enhance seedling establishment;
- Allow newly established seedlings to get a growing head start over potentially competing vegetation;
- Improve access for planting, and create additional planting micro-sites;
- Clear a site of logging debris (American Cyanamid Company, 1991).

These objectives can be met through the combination or use of any one of the two site preparation methods. Bulldozing, root raking, disking and other mechanical methods are commonly used to create soil disturbance to enhance conditions for tree regeneration. Although site preparation activities are done for reforestation purposes, they initially can create large areas of disturbed soils. If properly performed, site preparation activities can be used to prevent unnecessary soil erosion and maintain water quality.

BEST MANAGEMENT PRACTICES RECOMMENDED FOR SITE PREPARATION

1. Analyze and plan the site preparation job, taking into account all aspects of the SMZ.
2. Use drum choppers or herbicides at sites with highly erodible soils. Use only EPA approved wetland pesticides. *Refer to Section VII for more information about the proper use of forest pesticides.*
3. When drum chopping, chop up and down the slope so the depressions made by the cleats and chopper blades are located on the contour of the land to help reduce the occurrence of channeled surface erosion.
4. Drum chop perpendicular to a wetland or a water body.
5. In wetlands, use drum choppers or disks rather than straight blades.
6. When windrowing, locate debris on the contour of the land. Leave breaks in the windrows to allow safe access for fire control or other activities. When possible, use haystack piling instead of windrows.
7. When slopes are discernible, construct planting beds and implement disking activities along the contour of the land.
8. Do not connect planting beds to drainage ditches or other waterways.
9. Do not pile debris into wetland areas.
10. Avoid heavy site preparation, such as K-G blading, root raking and disking, on slopes greater than 30 percent.
11. On slopes greater than 10 percent, leave a natural buffer strip of 25 feet or more along the edge of roads and roadside ditches during site preparation to catch soil particles.
12. Damage to forested slopes can be minimized by not operating mechanical site preparation equipment when soils are saturated, during wet weather, or in periods of ground thawing (EPA, 1993).
13. In wetlands, do not alter groundwater or surface water hydrology.
14. Maintain natural drainage.

SECTION VII

FOREST PESTICIDES

Pesticides for forest purposes are valuable, practical tools when used in accordance with the labeling instructions. The use of pesticides is regulated on both the state and federal level.

Integrated Pest Management (IPM) is recommended by the Bureau of Forest Management, the state Department of Health, the USDA's Forest Service, the EPA and the General Services Administration as a method of reducing exposure to hazardous pesticides while still controlling pests effectively. IPM uses a combination of monitoring, implementing physical, biological and mechanical controls and, if necessary, applying the least hazardous chemical pesticide to people, property and the environment.

The label on all products contains specific information regarding permitted uses; methods of application; rates of application; timing of application; environmental conditions suitable for application; and any other information required for the use of the product.

Restricted pesticides can only be applied by trained and certified applicators. The law requires certified applicators to use all chemical products only as directed in accordance with the label and in a careful and prudent manner.

BEST MANAGEMENT PRACTICES RECOMMENDED FOR PESTICIDE USE

1. Follow IPM principles and all state and federal laws regarding the proper use or disposal of pesticides. For information, contact the DEP's Office of Pesticide Control at (609) 530-4011.
2. Use pesticides only as directed on the label.
3. Refer to SMZ best practice recommendations regarding the use of pesticides in these areas.
4. For aerial spray applications, maintain and mark a buffer area of at least 50 feet around all ponds, lakes, streams and marshes to avoid drift or accidental application of chemicals directly into surface water (EPA, 1993).
5. Do not apply pesticides when wind conditions may increase the possibility of significant drift (EPA, 1993).
6. If possible, avoid applying pesticides when temperatures are high and relative humidity is low. These conditions increase the rate of evaporation and may enhance the loss of volatile pesticides.
7. Locate mixing and loading areas where pesticide residues will not enter streams or other bodies of water. Clean all mixing and loading equipment thoroughly after each use. Do not rinse equipment into wetlands or open waters.
8. Base pesticide selection on site factors and pesticide characteristics (EPA, 1993).
9. Do not store herbicide containers on site.
10. Use equipment that sprays the chemical only to the target areas.

Section VIII:

REFORESTATION

Reforestation includes the planting of tree seedlings and direct seeding. Hand planting and direct seeding do not normally cause any type of site disturbance that could produce adverse environmental impacts. However, machine planting can expose mineral soil, creating a slight concern for erosion.

BEST MANAGEMENT PRACTICES RECOMMENDED FOR REFORESTATION

1. Machine plant, subsoil and sod scalp along the contour of the land.
2. Hand plant steep slopes, highly erodible sites and wetlands.
3. Distribute seedlings evenly across each site.
4. Use seedlings specifically adapted to the site.
5. Refer to the recommended practices in the SMZ section regarding machine planting in these areas.

TABLE 2
GRASS AND LEGUME SEEDING ZONES (USDA 1977)

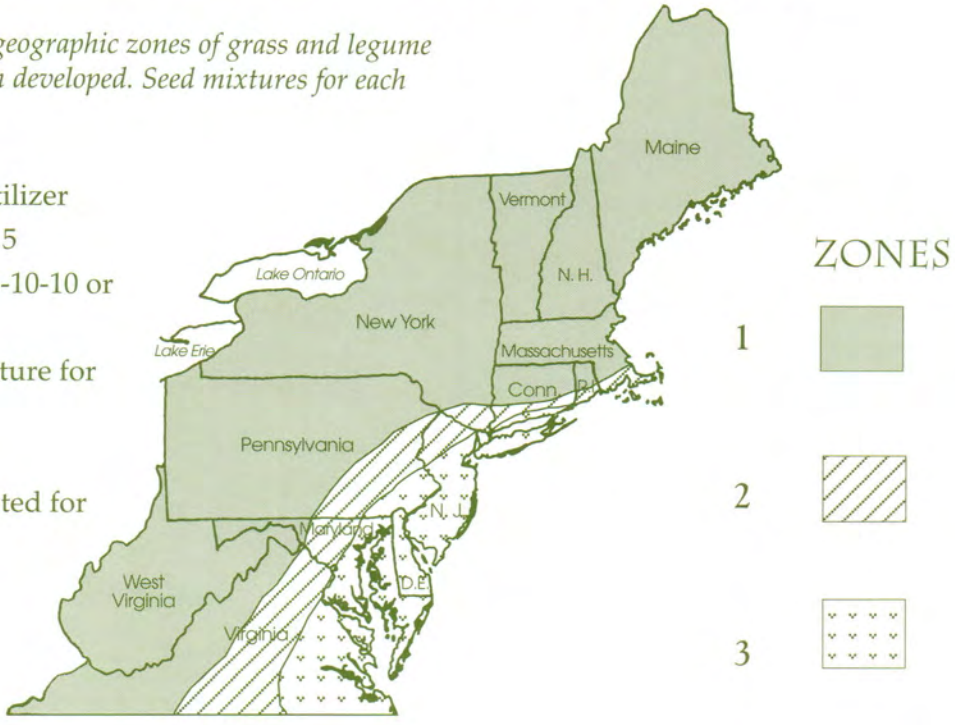
This map identifies the geographic zones of grass and legume seed mixtures that have been developed. Seed mixtures for each zone are shown on page 24.

1/ The suggested fertilizer rate for 2, 3, 4 and 5 is 400 lb./acre of 5-10-10 or 5-10-5.

2/ This is a good mixture for shady areas.

3/ Innoculate seed.

4/ This is better adapted for limestone soils.



SEED MIXTURES FOR EACH ZONE

	SEED MIXTURES 1/	LBS./ACRE	LBS./1,000 SQ. FT.	SOIL PH RANGE
Zone 1	1. Domestic ryegrass (temporary)	20	.45	4.5 - 7.5
	2. Creeping red fescue	20	.45	4.5 - 7.5
	Redtop	2	.05	
	Tall fescue	30	.45	
	3. Tall fescue 2/	20	.45	5.5 - 7.5
	Flatpea 3/	30	.65	
	4. Creeping fescue 2/	20	.45	4.5 - 7.5
	Birdsfoot trefoil 3/ 4/	8	.20	5.5 - 7.5
	Tall fescue	20	.45	4.5 - 7.5
	5. Crownvetch 3/	15	.32	5.5 - 7.5
	Tall fescue	20	.45	
	Creeping red fescue	20	.45	
	Redtop	2	.05	
Zone 2	1. Domestic ryegrass (temporary cover)	20	.45	4.5 - 7.5
	2. Tall fescue 2/	20	.45	5.5 - 7.5
	Sericea lespedesa 3/	15	.35	
	3. Tall fescue 2/	20	.45	5.5 - 7.5
	Flatpea 3/	30	.65	
	4. Weeping lovegrass	2	.05	5.5 - 7.5
	Sericea lespedesa 3/	15	.35	
Zone 3	1. Domestic ryegrass (temporary cover)	20	.45	4.5 - 7.5
	2. Weeping lovegrass	2	.05	5.5 - 7.5
	Sericea lespedesa 2/	15	.35	
	3. Weeping lovegrass	3	.07	4.5 - 7.5
	4. Tall fescue 3/	20	.45	5.5 - 7.5

Prescribed fire is a practical forest management tool to use in areas where dangerous accumulations of combustible fuels exist.

SECTION VII

FOREST PROTECTION

By varying the timing, frequency and intensity of prescribed burning — a silvicultural practice in which controlled fires are used to eliminate or reduce unincorporated organic matter on a forest floor — resource managers have learned to manipulate fire-caused changes in a forest to meet the needs of both plant and animal communities, while maintaining a healthy forest ecosystem (USDA Forest Service, 1989).

Wildfires that burn into areas where fuels have been reduced by prescribed burning cause less damage and are easier to control. However, poor planning and/or changing weather conditions can cause too much heat in a prescribed burn, completely destroying the humus layer and thereby exposing the soil to erosion (Georgia Forestry, 1988). Prescribed burning may be used to reduce the wildfire hazard either during pre-harvest or post-harvest, depending upon specific site conditions and logging schedules.

A permit program for prescribed burning is administered by the New Jersey Forest Fire Service. For more information or an application, call (609)292-2977.

BEST MANAGEMENT PRACTICES RECOMMENDED FOR FOREST PROTECTION

Prescribed Burning:

1. Use a trained crew to carefully plan and execute a prescribed burn.
2. To help ensure the protection of surface duff and root mat, which help prevent erosion, conduct prescribed burning when soil and fuel moisture is sufficient and weather conditions are favorable.
3. Prescribed burning must be accomplished in accordance with the following guidelines:
   - A. Time of Year Oct. 1st - March 15th
   - B. Air Temperature 0 - 60 degrees
   - C. Wind Direction NW - W- SW - N - S
   - D. Wind Velocity 5 - 10 mph
   - E. Relative Humidity 30 percent - 50 percent
   - F. Fine Fuel Moisture 5 percent - 10 percent
   - G. Spread Index 7 - 35
   - H. Build-Up Index 6 - 40
4. Refer to the recommended practices in the SMZ section regarding prescribed fire in these areas.

Firelines:

1. When possible, locate pre-suppression firebreaks along the contour of the land and avoid straight uphill/downhill placement.
2. Construct firelines along the perimeter of the burn area and along the perimeter of areas within a SMZ.
3. Use natural or in-place barriers, such as roads streams, lakes and wetlands, to help reduce the need for fireline construction in areas where construction of artificial firelines will result in excessive erosion and sedimentation (EPA, 1993).
4. Construct firelines at a grade of 10 percent or less where possible.
5. When grades of more than five percent develop, place water bars in firebreak lines at frequent intervals to slow and disperse surface water.
6. Construct simple diversion ditches or turnouts at necessary intervals to direct surface water off the plowed line and onto the undisturbed forest floor.
7. Construct firelines only as deep and wide as necessary to control the spread of the prescribed fire (EPA, 1993).
8. Where firelines enter or cross a drainage waterway parallel to a stream, construct a turnout that will disperse the runoff rather than directly channel it into the stream. Do not use firelines as drainage ditches.
9. Maintain the erosion control measures on firelines after the burn.
10. Avoid firelines in wetlands unless absolutely necessary.
11. Avoid extremely hot burns, which may cause the loss of all organic matter and increase erosion.

Wildfire Practices:

1. Since wildfire suppression lines are made in the stress of an emergency, implementation of BMPs should be left to the discretion of the landowner. However, after the fire has been extinguished, BMPs should be applied to help reduce erosion and sedimentation from soil exposure that may have resulted from fire suppression activities.
2. Whenever possible, avoid using fire-retardant chemicals in SMZs and over water courses. Avoid having runoff from fire-retardant chemicals enter into water courses as well.
3. Do not clean application equipment in water courses or locations that drain into water courses (EPA, 1993).

GLOSSARY

Access Road	A temporary or permanent woods road over which timber is transported from a felling site to a public road. Also known as a haul road.
Approaches	The entry and exit of a road or skid trail through a stream crossing.
Banks	The sides of a channel that hold or carry water.
Bedding	A site preparation technique whereby a small ridge of surface soil is formed to provide an elevated planting or seed bed. It is used primarily in wet areas to improve drainage and aeration for seedlings.
BMPs	Best management practices that are determined to be the most effective, practical means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality. A BMP is determined after a problem assessment and examination of alternatives has been conducted.
Brush Barriers	Slash materials piled at the top slope of a road or at the outlets of culverts, turnouts, dips and water bars.
Broad-Based Dip	A surface drainage structure specifically designed to tip water out of a dirt road while vehicles maintain normal haul speeds. Also known as a rolling dip.
Buffer Strip	A barrier of permanent vegetation established or left undisturbed downslope from disturbed forest areas to filter out sediment from runoff before it reaches a watercourse.
Channel	A natural stream that conveys water. A ditch or channel excavated for the flow of water.
Chopping	A mechanical treatment whereby vegetation is concentrated near the ground and incorporated into the soil. Chopping may be used to facilitate burning or to increase the organic component of the surface soil.
Clearcutting	A silvicultural system in which all merchantable trees are harvested over a specified area in one operation.
Commercial Forest Land	Forest land bearing or capable of bearing timber of commercial character, which is currently or prospectively available.
Contour	An imaginary line on the surface of the earth connecting points of the same elevation. A line drawn on a map connecting points of the same elevation.
Culvert	Either a metal or concrete pipe or a constructed box-type conduit through which water is carried under roads.
Deck	An area cleared to provide a site for loading logs onto a transport vehicle.
Decking	Rough or finished lumber used to provide a stable surface for roads, stream crossings or landings.
Disking	Breaking up plants (above and below ground portions), organic matter and soil in preparation to improve the ground for replanting and to reduce plant competition.
Drum Chopper	A device used for mechanical site preparation.
Dry Wash	A stream bed that carries water only during or immediately following rainstorms.
Erosion	The process by which soil particles are detached and transported by water, wind and gravity to some downslope or downstream point.
Erosion Classes **(Soil Survey)**	A grouping of erosion conditions based on the degree of erosion or on characteristic patterns. Applied to accelerated erosion, not to normal, natural or geological erosion.
Felling	The process of cutting down standing trees.
Fill	To raise the elevation of a surface by depositing material onto it.
Filtration Strip	A strip of land where vegetation, mulch or fabric is maintained or placed where it can intercept and prevent upland sediment and other pollutants from flowing into water.
Ford	Submerged stream crossing where tread is reinforced to bear intended traffic. A place where a stream may be crossed by a vehicle.
Forest Chemicals	Chemical substances or formulations that perform important functions in forest management, including fertilizers, herbicides, repellents and other chemicals.

Forest Land	Land bearing forest growth, or land from which the forest has been removed but shows evidence of past forest occupancy. Land that is not currently being used for timber production.
Forest Practice	An activity relating to the growing, protecting, improving, harvesting or processing of forest tree species on forest land.
Grade	The steepness of a rise or fall in a road surface.
Hand Planting	Re-establishing vegetation by planting seed or seedlings into prepared planting holes in the ground.
Harrowing	A mechanical method of scarifying the soil to reduce competing vegetation and to prepare a site for seeding or planting.
Harvesting	The felling, skidding, loading and transporting of timber products, such as pulpwood, poles and sawlogs.
Haul Road	See Access Road.
Herbicide	Any substance or mixture of substances intended to prevent the growth of or destroy unwanted trees, bushes, weeds, algae and other aquatic weeds.
Intermittent Stream	A watercourse that flows in a well-defined channel during the wet seasons of the year, but not the entire year. Same as wet-weather stream.
K-G Blading	A device used for mechanical site preparation.
Live Stream	See Perennial Stream.
Log Deck	A place where logs or tree-length materials are assembled for loading and transporting. Also known as a log landing, log yard, brow or bunching area.
Logging	The felling and transportation of wood products from the forest to a delivery location.
Logging Debris	The unused and generally unmarketable accumulation in the forest of woody material, such as large limbs, tops, cull logs and stumps, which remain as forest residue after timber harvesting.
Mechanical Planter	A tree planting machine pulled by a tractor and manned by a person who places trees into the ground.
Mechanical Site Preparation	Use of heavy machinery, including bulldozers with special attachments that clear debris or incorporate it into the soil to improve planting, sprouting, growth and/or survival conditions for new forest trees.
Mulching	Any loose covering of forest soil with organic residues, such a grass, straw, or wood fibers, used to help prevent erosion and stabilize exposed soil.
Natural Regeneration	Young trees that originate from seed or sprouts of trees that do or did grow on the site.
Non-Point Source Pollution	Any pollution not traceable to a single identifiable source.
Perennial Stream	A watercourse that flows throughout the year or 90 percent of the time in a well-defined channel. Also known as a live stream.
Pesticides	Chemical materials that are used for the control of undesirable insects, diseases, vegetation, animals or other forms of life.
Prescribed Burning	The practice of using controlled fires to reduce or eliminate the unincorporated organic matter of the forest floor, or low, undesirable vegetation.
Regeneration	The young tree crop replacing older trees removed by harvesting operations or disaster. The process of replacing old trees with young trees.
Reforestation	The restocking of a forest stand through natural regeneration or artificially planted seed or seedlings.
Residual Trees	Live trees left standing after the completion of harvesting.
Retirement of Road	Preparing a road for a long period of non-use. Methods include mulching, seeding, installing bars, etc.
Riprap	A layer of rocks or rock fragments placed over exposed soil to protect it from erosive forces.
Root Raking	A device used for mechanical site preparation.

Rotation (Period)	The period of time to establish, grow and harvest a crop of trees at a specified condition of maturity.
Sidecast	The act of moving excavated material to the side, and depositing such material.
Silt Fences	Temporary barriers used to intercept sediment-laden runoff from small areas. Silt fences act as a strainer by trapping silt and sand on the surface of the fence while allowing water to pass through.
Silviculture	The art and science of cultivating forest crops, by controlling the establishment, growth composition, health and quality of forests and woodlands. Silviculture entails the manipulation of forest and woodland vegetation in stands and on landscapes to meet the diverse needs and values of landowners and society on a sustainable basis.
Site Preparation	A forest activity to remove unwanted vegetation and other material, and to cultivate or prepare the soil for reforestation.
Skidding	Short-distance moving of logs or felled trees along the surface of the ground, from the stump to the point of loading.
Skid Trail	A temporary, non-structural pathway over forest soil to drag felled trees or logs to a log landing.
Slash	Unmerchantable debris, such as brush, tree stems, tops, branches or leaves, that are left after a commercial timber harvest operation.
Soil	The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.
Streamside Management Zone	An area adjacent to the banks of streams and bodies of open water where extra precaution is necessary in carrying out forest practices in order to protect bank edges and water quality.
Temporary Access Roads	Roads not expected to be maintained longer than the activity for which they were installed to support.
Temporary Bridges	Usually consist of logs bound together and suspended above the stream, with no part in contact with the stream itself.
Thermal Pollution	A temperature rise in a body of water sufficient to be harmful to the aquatic life in the water.
Upland Runoff	Surface drainage water that flows from higher elevations of a landscape into the natural drainage system of a watershed.
Vee-Blading	A device used for mechanical site preparation.
Water Bar	A hump or small dike-type surface drainage structure, properly used only in closing abandoned roads to traffic, on firelines and abandoned skid trails.
Watercourse	A stream of water; river; brook; a channel of water. Can also be used to include bodies of open water.
Water Quality	A term used to describe the chemical, physical and biological characteristics of water, usually in respect to its suitability for a particular purpose.
Watershed Area	All land and water within the confines of a drainage divide.
Water Turnout	The extension of an access road's drainage ditch into a vegetated area to provide for the dispersion and filtration of stormwater runoff.
Wetlands	An area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation.
Wildfire	Uncontrolled fire occurring in forest land, brushland and grassland.

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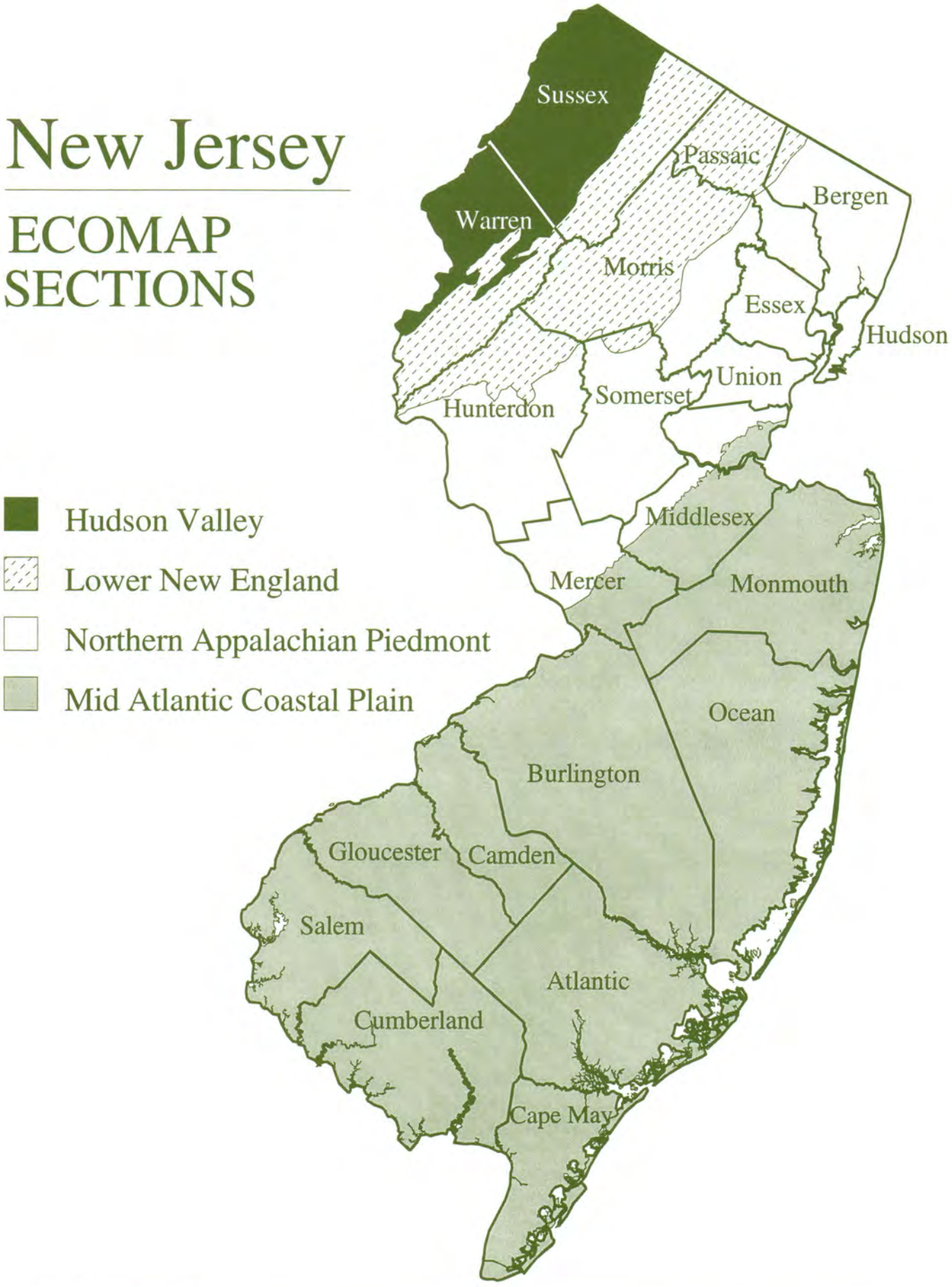
The ECOMAP for New Jersey is a product of a US Forest Service initiative to classify ecosystems of the United States into a National Hierarchical Framework. The classification is based upon broad similarities, including climate, geology, topography, soils, hydrology and vegetation.

New Jersey falls within the Humid Temperature Domain and contains portions of the Hot Continental and the Subtropical Divisions, which are further delineated into the Eastern Broadleaf (Oceanic) and the Outer Coastal Plain Mixed Forest Provinces. These two provinces crossing into New Jersey have been further delineated into the four sections indicated on the map. Geology is the primary factor in delineating the sections.

The New Jersey Bureau of Forest Management, New Jersey Geological Survey, the Natural Resource Conservation Service, the New Jersey Bureau of Water Monitoring and the Natural Heritage Program were key agencies in providing input in the refinement of this map. These sections will form the basis for ecosystem-based planning and management of the natural resources of New Jersey in the future.

New Jersey

ECOMAP SECTIONS



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STATE OF NEW JERSEY

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