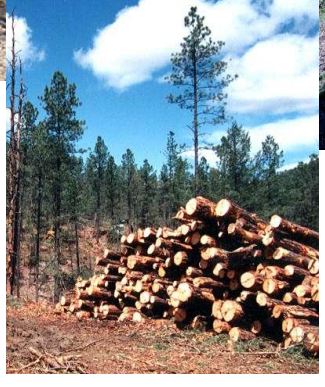
NEW MEXICO FOREST PRACTICES GUIDELINES



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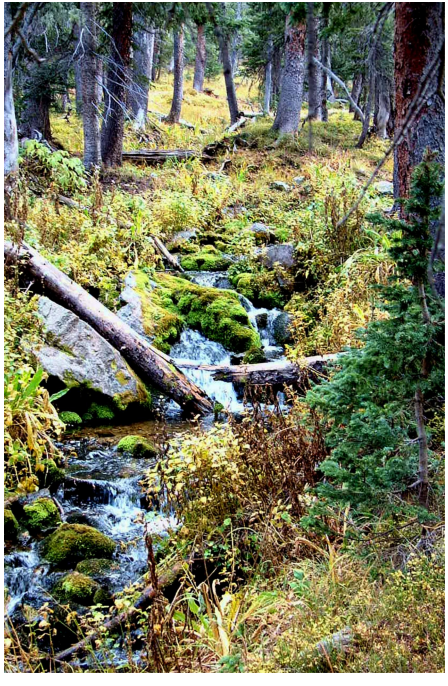
NEW MEXICO STATE FORESTRY



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INTRODUCTION

New Mexico's forests provide beauty, raw material for lumber production, clean air, habitat and food for many kinds of wildlife, storage for water, and areas for grazing and recreation. With the proper management, one or all of these elements can be provided to the landowner while still maintaining a healthy forest environment.

If you work in the forest, own forest land, or are interested in New Mexico's forests, this publication is for you. It contains Best Management Practice (**BMP**) guidelines and offers reasons for **BMPs**. An understanding of why to apply these practices along with common sense will address most situations you may encounter.

Recognizing private property rights and the diversity of landowner goals, the commercial harvest requirements and these related practices and guidelines are intended to help the landowner meet their objectives while adequately protecting or improving watersheds statewide. Please read the Forest Harvest Practices Standards (section 9) within the Commercial Harvest Requirements (NMAC 19.20.4, page 7) carefully as all standards must be followed whenever a single tree from the commercial forest species list is severed in New Mexico, even if it is not sold.

Whatever the landowner's objectives might be, these guidelines offer proven techniques that will help them protect and manage their forest resources in a sustainable manner while providing additional benefits for other New Mexicans such as clean water and abundant wildlife habitat.

Advice on the application of these guidelines and information not provided here can be obtained by contacting the nearest Energy, Minerals and Natural Resources Department (EMNRD) Forestry Division District Office (District Office). A list of District Offices can be found on page 125. You may also contact the State Forester's office at P.O. Box 1948, Santa Fe, New Mexico 87504-1948, phone: (505) 476-3325.

COMMERCIAL TIMBER HARVESTING REQUIREMENTS

TITLE 19 NATURAL RESOURCES AND WILDLIFE
CHAPTER 20 FOREST MANAGEMENT
PART 4 COMMERCIAL TIMBER HARVESTING REQUIREMENTS

19.20.4.1 ISSUING AGENCY: Energy, Minerals and Natural Resources Department, Forestry Division.
[19.20.4.1 NMAC - N, 1/1/2002]

19.20.4.2 SCOPE: This part applies to persons, partnerships, associations, corporations, and other entities engaged in harvests of commercial forest species on non-municipal or non-federal lands after the effective date except for those harvests permitted in accordance with 19.20.2 NMAC.
[19.20.4.2 NMAC - N, 1/1/2002]

19.20.4.3 STATUTORY AUTHORITY: This part is adopted pursuant to the authority granted the Energy, Minerals and Natural Resources Department in NMSA 1978, Section 9-1-5 and in the Forest Conservation Act, NMSA 1978, Sections 68-2-1 to 68-2-25.
[19.20.4.3 NMAC - N, 1/1/2002]

19.20.4.4 DURATION: Permanent.
[19.20.4.4 NMAC - N, 1/1/2002]

19.20.4.5 EFFECTIVE DATE: January 1, 2002, unless a later date is cited at the end of a section.
[19.20.4.5 NMAC - N, 1/1/2002; A, 6/29/2007]

19.20.4.6 OBJECTIVE: 19.20.4 NMAC's objective is to require appropriate harvesting practices of commercial forest species be conducted in a manner that supports forest practices that assist in forest fire prevention and suppression and the control of forest pests, and maintain and enhance forest health to ensure the continued economic benefits of forests and forest resources to New Mexico.
[19.20.4.6 NMAC - N, 1/1/2002; A, 6/29/2007]

19.20.4.7 DEFINITIONS:

A. **"**Act" means the Forest Conservation Act, NMSA 1978, Sections 68-2-1 to 68-2-25.

B. "Alternate practice" means a forest practice standard used in place of a specific requirement in the forest harvest practices standards, 19.20.4.9 NMAC. The applicant may request to use an alternate practice in the harvest permit application or at a later time. The alternate practice is not effective until the division provides written approval.

C. "Applicant" means the owner.

D. "Basal area" means the cross sectional area of the stem at diameter at breast height or at diameter at root collar of all trees in a stand, generally expressed as square units per unit area (*e.g.* square feet per acre).

E. "Cessation of harvest activities" means absence of harvesting within a cutting unit for six consecutive days.

F. "Closed road" means a road constructed for the harvest that will be closed upon the harvest's completion.

G. "Commercial forest species" means:

SCIENTIFIC NAME	COMMON NAME
Abies concolor	white fir
Abies lasiocarpa	subalpine fir
Abies lasiocarpa var. arizonica	corkbark fir
Cupressus arizonica	Arizona cypress
Juniperus coahuilensis or erythrocarpa	redberry juniper/rose-fruited juniper

Juniperus deppeana	alligator juniper
Juniperus monosperma	one seed juniper
Juniperus osteosperma	Utah juniper
Juniperus pinchotii	Pinchot juniper/redberry juniper
Juniperus scopulorum	Rocky Mountain juniper
Picea engelmannii	Engelmann spruce
Picea pungens	Colorado blue spruce
Pinus aristata	bristlecone pine
Pinus arizonica	Arizona pine
Pinus cembroides	Mexican piñon
Pinus discolor	border piñon
Pinus edulis	piñon
Pinus engelmannii	Apache pine
Pinus flexilis	limber pine
Pinus leiophylla	Chihuahuan pine
Pinus monophylla	singleleaf piñon
Pinus ponderosa	ponderosa pine
Pinus strobiformis	southwestern white pine
Populus tremuloides	quaking aspen
Pseudotsuga menziesii	Douglas-fir
Quercus spp.	oak species when in tree form or when harvested with other commercial forest species

H. "Construction project" includes clearing of right of ways for utilities, pipelines, fences or roads, except for roads facilitating harvesting of commercial forest species; clearing for construction of residences or businesses with an approved building permit; or clearing related to the development of other regulated industries such as mining or landfills.

I. “Continuing violation” means that a permittee or responsible person or entity has received a notice of deficient condition and has failed to take corrective action.

J. “Contract harvester” means a person or entity, other than the owner or the owner’s direct employees, harvesting commercial forest species.

K. “Contractor” means a person or entity that the applicant or permittee has reached an agreement with to harvest or purchase commercial forest species.

L. “Cutting unit” means an area within the forest harvest practice plan not exceeding 300 forested acres. The designation of each unit is based on the topography of the area to be harvested, the number of persons to be engaged in the harvest, transportation, climate and other relevant factors. The applicant shall divide an area larger than 300 forested acres into two or more cutting units, unless the division determines that a larger area is appropriate because of the topography, equipment or the harvest’s objectives and number of persons to be participating in harvest activities.

M. “Damaged trees” means trees over three feet in height not intended for harvest that, as a result of the harvest, are damaged or knocked down to the extent that mortality or serious deterioration is likely to occur or partially pushed over so as to result in permanent lean or visible damage to the root system.

N. “Deficient condition” means a harvest activity not in conformance with the act, 19.20.4 NMAC or a harvest permit. It also means the failure to have statements of understanding for each person or entity conducting major harvest activities.

O. “Diameter at breast height” means the tree’s outside bark diameter measured at four and one half feet above the forest floor on the tree’s uphill side. For the purposes of determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

P. **“**Diameter at root collar” means the diameter of the tree’s trunk measured outside the bark at ground level.

Q. “District forester” means the supervisory forester of one of the six district offices located in Bernalillo, Capitan, Chama, Cimarron, Las Vegas and Socorro.

R. "Division" means the New Mexico energy, minerals and natural resources department, forestry division or forestry division personnel.

S. **"**Erosion control measure" means a method of reducing soil erosion including seeding, using mulch or slash for ground cover, reducing slope of roads and skid trails, installing water bars, crowning roads, outsloping roads, dipping roads with lateral relief ditches, culverts and avoidance of excessive slopes.

T. "Evidence of ownership" means a deed or other document, recorded with the county clerk in the county where the commercial forest species are located, containing a property description included in the harvest permit application evidencing ownership of the land surface or the right to control the land including harvesting commercial forest species, or a timber deed including the commercial forest species subject to the harvest permit application. Evidence of ownership does not include commercial forest species purchased through a contract, purchase agreement or similar document that indicates that the commercial forest species' ownership will transfer after the trees are harvested.

U. **"**Excessive slope" means a slope of more than 40 percent over a ground distance of 80 yards or more.

V. "Felling equipment" means equipment used to sever the tree stem from its stump such as chainsaws, feller-bunchers and harvesters.

W. "Firewood" means any part or portion of a tree that has been cut and removed from its original location and is to be used for heating or cooking in an open pit, grill, fireplace or stove. Firewood does not mean wood that is used in biomass facilities to create electricity or thermal heat or wood that is used to create ethanol.

X. "Forest" means an area of at least one acre with at least 10 percent tree crown cover.

Y. "Gully erosion" means erosion caused by water accumulating in narrow channels and removing the soil from the channel to depths of one foot or more and that carries sediment downstream.

Z. "Harvest or harvesting" means activities related to removing a commercial forest species or its products from the property where the activities are occurring, including: constructing haul roads and skid trails; cutting and severing, pushing over, plucking, chipping or masticating standing trees; skidding or removing trees to landings; transporting the tree or wood products from the cutting site or landing; installing erosion control measures; or supervising or directing such activities. Harvest or harvesting does not mean digging commercial forest species that are planted and

cultivated for balled and burlap stock, landscaping or live Christmas trees; or removal by any means during maintenance, renovation or removal of a windbreak.

AA. "Harvest permit" means the harvest permit application, the forest harvest practice plan and the harvest permit approval letter.

BB. "Intermittent watercourse" means a stream or reach of stream, as shown on a United States geological survey 1:24000 scale topographic map or as otherwise identified on the property by the division or the owner, that contains water only at certain times of the year, such as when it receives flow from springs, melting snow or precipitation.

CC. "Lake" means an inland body of freshwater, but does not include stock ponds or windmills.

DD. "Landowner" means a person or entity, or the person or entity's agent, owning or having a right to control the surface of the land where the commercial forest species to be harvested are located.

EE. "Lateral yarding distance" means the maximum distance perpendicular to each side of a cable within which a log can be attached for yarding.

FF. "Leave trees" means those trees to be left in the cutting unit after the harvest is completed.

GG. "Long butting" means the cutting of a portion of the main stem that does not meet the utilization standards provided in Subsection H of 19.20.4.9 NMAC.

HH. "Lop and scatter" means a hand method of removing the upward-extending branches from tops of felled trees to keep slash low to the ground, to increase the decomposition rate, to lower the fire hazard or as a pretreatment prior to burning.

II. "Major harvest activity" means felling trees; skidding or yarding; and construction of roads, skid trails and landings.

JJ. "Mineral soil" means the portion of the soil immediately below the litter and duff layers.

KK. "Multiple cutting unit permit" means a harvest permit for an area with two or more designated cutting units.

LL. "Municipal lands" means the territory a municipality has incorporated or annexed pursuant to NMSA 1978, Sections 3-2-1 *et seq*., Sections 3-3-1 *et seq*. or Sections 3-7-1 *et seq*.

MM. "Noxious weed" means a plant species that is not indigenous to New Mexico and that has been targeted pursuant to the Noxious Weed Management Act, NMSA 1978, Section 76-7D-1 *et seq.* for management or control because of its negative impact on the economy or the environment.

NN. "Owner" means the landowner, unless there is a timber deed owner who owns the commercial forest species that are the subject of the harvest permit application. Then the timber deed owner is the owner.

OO. "Perennial watercourse" means a stream or river, or reach of a stream or river, as shown on a United States geological survey 1:24000 scale topographic map or as otherwise identified on the property where the harvest will occur by the division or the owner, that contains water continuously throughout the years in all years; its upper surface, generally, is lower than the water table of the region adjoining the stream or river.

PP. "Permittee" means an owner to whom the division issues a harvest permit.

QQ. "Personal delivery" means delivery to the individual personally; or if the individual is absent, delivery to a person residing at the individual's usual residence who is over the age of 15 years.

RR. "Public road" means a highway or road open for public motor vehicle access including federal highways, state highways, state roads, county roads and United States forest service roads.

SS. "Pre-commercial thinning" means thinning that is made as an investment in the future growth of a stand of trees where the owner does not sell or exchange for service the utilized trees.

TT. **"**Responsible person or entity" means a person, partnership, corporation, association or other entity, other than the owner, required to sign a statement of understanding or, when Subsection A of 19.20.4.8 NMAC does not require a harvest permit, that have an active role in major harvest activities or a management role that may impact the harvest.

UU. "Rill erosion" means erosion that cuts a number of small channels less than one foot in depth into the soil by water moving over and concentrating in low places in the soil surface.

VV. "Rub tree" means a tree used as a pivot in cable yarding or on skid trails to protect the remaining trees during extraction.

WW. “Silviculture” means the theory and practice of controlling forest establishment, composition, growth or harvesting.

XX. “Skid trail” means a path built for log skidding or caused by skidding equipment’s use.

YY **“**Slash” means branches, boughs or pieces of a tree’s main stem severed or damaged as a result of the harvest.

ZZ. “State forester” means the director of the energy, minerals and natural resources department, forestry division or the state forester’s designee.

AAA. “Statement of understanding” means the statement that persons, partnerships, corporations, associations or other entities that have an active role in major harvest activities or a management role that may impact the harvest shall sign verifying that they are aware that they must comply with the act, 19.20.4 NMAC and the harvest permit. A supervisor of a business entity conducting harvest activities may sign a statement of understanding accepting responsibility for the entity’s employees performing major harvest activities.

BBB. “Streamside management area” means the area near a lake, perennial or intermittent watercourse or a wetland designated for special protection in the forest harvest practice plan.

CCC. “Timber deed owner” means the owner of a timber deed recorded with the county clerk in the county where the commercial forest species are located. It does not include a person, corporation, partnership or other entity that has agreed to purchase commercial forest species through a contract, purchase agreement or similar document with title to be transferred after the trees are harvested.

DDD. “Tree” means a woody perennial plant usually having a single main stem generally with few or no branches on its lower part; however, species such Gambel oak (quercus gambelii) and one seed juniper (juniperus monosperma) may be multi-stemmed and species such as fir (abies), spruce (picea) and juniper (juniperus) may have many branches on the stem’s lower part.

EEE. “Utilization” means the removal of trees, tree stems or portions of trees from areas within the harvest permit boundaries.

FFF. "Water bar" means a drainage structure such as a ditch, mounded earth or staked log installed across the entire width of a road or skid trail at an approximate 30-degree downslope angle that diverts water runoff into adjacent undisturbed areas.

GGG. "Wetland" means an area that is inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions in New Mexico.

HHH. "Working days" means Monday through Friday, excluding state holidays.

[19.20.4.7 NMAC - N, 1/1/2002; A, 6/29/2007; A, 9/14/2007]

19.20.4.8 HARVEST PERMITS:

A. ACTIVITIES REQUIRING HARVEST PERMITS: An owner shall obtain a harvest permit before harvest activities, except those listed in Subsection B of 19.20.4.8 NMAC, are conducted in the following circumstances:

(1) harvests in an area of 25 acres or more of forest, or a combination of areas totaling 25 acres or more of forest in a calendar year if the harvest sites are on the same or adjacent property; or

(2) harvests in an area of less than 25 acres of forest in one calendar year if:

(a) the owner has been convicted of a criminal violation associated with harvest activities within the previous three years; or

(b) the owner is contracting with or employing a person or entity on the harvest that has been convicted of a criminal violation associated with harvest activities within the previous three years.

B. ACTIVITIES NOT REQUIRING HARVEST PERMITS: Owners are not required to obtain a harvest permit for:

(1) cutting firewood for personal use;

(2) cutting firewood for sale in compliance with 19.20.4.9 NMAC on up to 75 acres of forest in a calendar year or a combination of areas totaling up to 75 acres or more of forest in a calendar year if the harvest sites are on the same or adjacent property;

(3) cutting Christmas trees;

(4) pre-commercial thinning conducted in compliance with 19.20.4.9 NMAC;

(5) harvest activities related to construction projects such as pipeline or powerline installation or maintenance, construction pursuant to a building permit, fence building or construction of roads unrelated to harvest activities;

(6) clearing for defensible space within 100 feet of a building;

(7) harvests for wildland urban interface projects or hazardous fuel reduction projects if conducted pursuant to a contract with the energy, minerals and natural resources department that requires compliance with 19.20.4.9 NMAC;

(8) harvests conducted under a division funded or administered landowner assistance program in compliance with 19.20.4.9 NMAC; or

(9) rangeland or meadow restoration performed according to a conservation plan reviewed by a soil and water conservation district and conducted in compliance with 19.20.4.9 NMAC where the owner does not sell or exchange for services the trees that are harvested during the restoration or the resulting wood products.

C. APPLICATION FOR HARVEST PERMIT:

(1) An owner shall file an application for a harvest permit in the district office in the district where the harvest will take place for approval at least 30 calendar days before the proposed harvest is to start. The owner may begin harvest activities when the division issues the harvest permit and the permittee or responsible person or entity gives appropriate notification.

(2) The harvest permit application shall include the following, if applicable:

(a) the owner's name;

(b) a legal description of the land where the harvest will occur;

(c) sale name;

(d) evidence of ownership;

(e) the owner's mailing address (if the commercial forest species to be harvested are owned under a timber deed, the harvest permit application shall include names and mailing addresses of both the timber deed owner and the landowner);

(f) the owner's e-mail address, if available (if the commercial forest species to be harvested are owned under a timber deed, the harvest permit application shall include e-mail addresses of both the timber deed owner and the landowner);

(g) the names, mailing addresses and, if available, e-mail addresses of persons or entities that will directly manage the harvest;

(h) the time schedule for harvesting (*i.e.* beginning and ending dates);

(i) if the commercial forest species to be harvested are owned under a timber deed, the timber deed owner shall consult with the landowner about the land management goals and objectives included in the forest harvest practice plan; the landowner shall approve roads constructed for the harvest that will not be closed at the end of the harvest;

(j) statements of understanding;

(k) a forest harvest practice plan; and

(l) the owner's signature and the date of application.

D. FOREST HARVEST PRACTICE PLAN: The forest harvest practice plan shall include the following information:

(1) Harvest Description: The harvest description shall include the following:

(a) a description of the current stand condition including types of tree species, any insect and disease occurrence and the stocking level (*e.g.*, an estimate of trees per acre or square feet of basal area and average diameter at breast height or diameter at root collar, or green tons per acre, as applicable);

(b) the owner's land management goals and harvest objectives such as forest management, forest production, wildlife habitat, dwarf mistletoe control, improved forage for wildlife or livestock or type conversion; the division

shall consider a forest harvest practice plan inadequate unless it contains a silviculturally sound method of achieving the described land management goals and objectives that complies with the act and 19.20.4 NMAC;

(c) the harvest permit boundaries and cutting units to be established as shown on a United States geological survey topographic map with a scale no larger than 1:24000 (*e.g.*, 7.5 minute quadrangle);

(d) the access route to and from the harvest permit area to a public road;

(e) identification of excessive slopes located within the cutting unit;

(f) identification of lakes, perennial or intermittent watercourses or wetlands located within the cutting unit on a United States geological survey topographic map with a scale no larger than 1:24000;

(g) a description of the proposed harvest method such as seed tree, shelterwood, single tree or group selection or patchcut;

(h) a description of the equipment the permittee or responsible person or entity will use during the harvest such as chainsaw, feller-buncher, skidder, delimber, plucker, forwarder or chipper;

(i) the residual stand condition including types of tree species and an estimate of trees per acre and the trees' average diameter at breast height, or, if applicable, diameter at root collar; if the harvest method is a patchcut a description of the size of the area to be harvested, by length and width, and the adjacent stand's height; and

(j) a description of the regeneration method such as natural regeneration, natural seeding or vegetative reproduction, or artificial regeneration, planting, reasonably calculated to ensure adequate forest regeneration if forest regeneration is the land management objective; if artificial regeneration is to be used the description shall include: when the planting will occur, the tree species to be planted, the seed source of the seedlings, the number of seedlings to be planted per acre, the method of seedling protection and site preparation.

(2) Erosion Management: Description of the erosion management measures that the permittee or responsible person or entity will take to comply with Subsection D of 19.20.4.9 NMAC.

(3) Skid Trails: Description of how the permittee or responsible person or entity will treat skid trails and landings to control erosion and comply with Subsection E of 19.20.4.9 NMAC.

(4) Roads: Description of road location, road erosion control measures and post-harvest maintenance or closure. The description shall contain sufficient detail to indicate compliance with Subsection F of 19.20.4.9 NMAC. If a road will be closed after harvest, the description shall identify the closure method and erosion control measures.

(5) Streamside Management Area: Description of the streamside management area designating the area to be included and describing the measures that the permittee or responsible person or entity will take to comply with Subsection G of 19.20.4.9 NMAC. If an existing road is located within a streamside management area, the applicant shall include a description of the road's location.

(6) Slash Treatment: Description of the means of treating slash, such as lop and scattering or pile burning, to comply with Subsection I of 19.20.4.9 NMAC.

(7) Fire: Description of the precautions the permittee or responsible persons or entities will take during the harvest and the modifications to harvesting operations they will take during periods of high, very high and extreme fire danger. Description of how the permittee or responsible person or entity will react to a fire caused by harvest activities including the equipment that the permittee or responsible person or entity will locate on the harvest site and use if a fire starts and notice to local fire departments and the division. Additionally, if the permittee or responsible persons or entities will burn slash, a description of whether they will broadcast or pile burn the slash and the precautions that they will take when the burning occurs. Precautions shall include obtaining necessary permits for burning and notifying the local governments and fire departments prior to burning.

(8) Excessive Slopes: Description of how the permittee or responsible person or entity will meet forest harvest practices standards on excessive slopes.

E. HARVEST PERMIT ISSUANCE OR DENIAL:

(1) Within 30 calendar days after receipt of the harvest permit application, the division shall either:

(a) issue a harvest permit approval letter including such conditions or recommendations as the division may deem necessary provided the harvest permit application contains the information required by Subsections C and D of 19.20.4.8 NMAC, the applicant has submitted the statements of understanding and the planned harvest is expected to comply with the act and 19.20.4 NMAC; or

(b) deny the harvest permit application in writing for the following reasons:

(i) the harvest permit application does not contain the information required by Subsections C and D of 19.20.4.8 NMAC;

(ii) the applicant is not the owner or the holder of a power of attorney or other authority sufficient to make decisions affecting the commercial forest species subject to the harvest permit application;

(iii) a material misrepresentation or false statement is included in the harvest permit application;

(iv) the proposed harvest would not comply with the act or 19.20.4 NMAC; or

(v) the applicant or contractor currently has a continuing violation.

(2) If the division denies the harvest permit application, the applicant may provide additional information to complete the harvest permit application or revise the harvest permit application to comply with the forest harvest practices standards. The applicant shall submit the additional information or revisions for reconsideration. If the division finds that the additional information or revisions correct the defects in the harvest permit application it shall issue the harvest permit. The division shall either issue the harvest permit or uphold the denial of the harvest permit application within 30 calendar days after receiving the additional information or revisions.

(3) When the division issues a harvest permit to a timber deed owner, the division shall provide a copy of the harvest permit to the landowner by first class mail or personal delivery.

F. STATEMENTS OF UNDERSTANDING:

(1) A person, partnership, corporation, association or other entity that has an active role in major harvest activities or a management role that may impact the harvest shall sign a statement of understanding in a form provided and developed by the division. This includes the owner, the owner's direct employees, consultants involved in the harvest, contract harvesters and other contractors or subcontractors.

(2) Anyone who must sign the harvest permit application or a statement of understanding shall comply with the act, 19.20.4 NMAC and the harvest permit. A supervisor of a business entity may sign a statement of understanding for the business entity's employees if the supervisor accepts responsibility for the employees' actions. Failure to keep

statements of understanding current with the participation of new personnel or entities may result in violations or permit revocation.

(3) The statement of understanding shall be a division-provided form that includes:

(a) information identifying the person signing the statement such as name; birth date; social security, federal tax identification number or driver's license number; address and telephone number and, if applicable, the person's authority to sign for a partnership, corporation, association or other entity; the person's own employees; or the partnership, corporation, association or other entity's employees;

(b) the signature of the person signing the statement and date; and

(c) a statement that the person is aware that the person must comply with the act, 19.20.4 NMAC and the harvest permit and shall be accountable as provided for in 19.20.4 NMAC for such compliance and acknowledges that the person has read and understands the requirements of 19.20.4 NMAC and the harvest permit; if a person is signing on behalf of partnership, corporation, association or other entity, a statement that the entity is aware that it must comply with the act, 19.20.4 NMAC and the harvest permit and shall be accountable as provided for in 19.20.4 NMAC for such compliance; if a person is signing on behalf of the person's employees or a partnership, corporation, association or other entity's employees, a statement that the person is aware that the person is accepting responsibility for the person's own employees or the entity's employees and shall be accountable for the employees' compliance with 19.20.4 NMAC and the harvest permit.

G. PERMIT REVISIONS:

(1) The division may order revision of a harvest permit if it appears, after inspection, that the land management goals and objectives are not being met, if deficient conditions are occurring or if there are mistakes in the harvest permit.

(2) The owner may request revision of the harvest permit if there are mistakes in the harvest permit, ownership will change or other conditions make changes appropriate. The owner shall revise the permit during the harvest as needed to keep it current with operations.

(3) The owner may request the division revise the harvest permit to include additional acreage if the acreage is located in an area that is adjacent to or in close proximity to the area included in the current harvest permit, the land management goals and objectives and the proposed harvest operation are similar to those in the current harvest permit, the cover type is the same as the cover type in the current harvest permit and the same roads will be used to access the harvest area.

(4) The division shall approve or deny the owner's request for revision of the harvest permit within 30 calendar days after the request's receipt.

H. HARVEST PERMIT EXTENSIONS: When unforeseen circumstances beyond the permittee's control prevent completion of the harvest or a portion of the harvest activities as required by 19.20.4 NMAC within the time limits provided in the harvest permit, the division may, upon the permittee's written request, grant in writing additional time for completion of the harvest not to exceed one year. The division may grant no more than three such extensions.

I. NOTIFICATIONS: A permittee or responsible person or entity shall inform the division prior to or, in no case later than 48 hours following the event, either by telephone, in person or in writing of the following actions taken under the harvest permit:

(1) commencement or completion of major harvest activities in a cutting unit; or

(2) when a unit is complete and the permittee is requesting the unit be closed.

[19.20.4.8 NMAC - N, 1/1/2002; A, 6/29/2007]

19.20.4.9 FOREST HARVEST PRACTICES STANDARDS:

A. APPLICABILITY: The forest harvest practices standards apply to harvests of commercial forest species, regardless of the acreage, except for activities listed in Subsection B of 19.20.4.8 NMAC that do not specifically require compliance with 19.20.4.9 NMAC.

B. MULTIPLE CUTTING UNITS: Unless the division provides written approval, the owner, permittee or responsible person or entity shall not commence harvesting under a multiple cutting unit harvest permit in a third cutting

unit unless they have completed forest harvest practices standards, except for burning of slash piles, on at least one of the previous two active units.

C. MARKING:

(1) The division may require the permittee to mark the cutting unit boundary with flagging or tree marking paint if needed to meet the forest harvest practice plan's requirements.

(2) The division may require the permittee to mark leave trees or the trees to be cut with tree marking paint if needed to meet the land management goals and objectives in the forest harvest practice plan, particularly if the harvest method is group or single tree selection.

D. EROSION MANAGEMENT:

(1) The owner, permittee or responsible person or entity shall implement erosion control measures to minimize channelized flow erosion such as rill and gully erosion.

(2) Erosion Control Measures:

(a) Time Limit: The owner, permittee or responsible person or entity shall install erosion control measures as soon as practical but no later than 30 calendar days after the cessation of major harvest activities within the cutting unit.

(b) Placement: The owner, permittee or responsible person or entity shall place water bars or other erosion control measures on closed roads and skid trails with mineral soil exposed by harvest activities. The owner, permittee or responsible person or entity shall place water bars at the locations or intervals and at the height and width necessary to minimize erosion considering grade, sidehill drainage, soil texture and structure, vegetation and other pertinent factors.

PERCENT GRADE MINIMUM INTERVALS FOR WATER BARS

PERCENT GRADE	MINIMUM INTERVAL
0.0 -- 4.9	150 feet
5.0 -- 9.9	130 feet
10.0 -- 14.9	75 feet

15.0 -- 40.0 50 feet

The division may require additional water bars if the minimum intervals will not sufficiently minimize erosion. The division may require fewer water bars if a combination of soil properties, depth of duff layer or amount of slash or other cover will minimize erosion.

(3) Seeding:

(a) Time Limit: After cessation of major harvest activities within a cutting unit and at the time best calculated to produce maximum germination, but in no event later than 180 calendar days following the cessation of major harvest activities within a cutting unit, the owner, permittee or responsible person or entity shall seed closed roads, skid trails, landings and areas of mineral soil exposed by harvest activities within the cutting unit, unless the division has approved other erosion control measures. Appropriate site preparation shall take place prior to seeding. For example, soil preparation would be needed prior to seeding a hard packed road that is to be closed upon completion of harvesting.

(b) Seed Mix: The owner or permittee shall obtain the division's prior approval for the seed mix to be used. The seed mix shall be suitable for the land management goals and objectives specified in the forest harvest practice plan and shall not introduce noxious weeds. The owner or permittee shall provide proof of the purchase date, the seed mix viability and germination rate. The owner or permittee may use the certification tag from the bag if it provides the required information.

E. SKID TRAILS AND LANDINGS:

(1) Skid Trails:

(a) The owner, permittee or responsible person or entity shall not locate skid trails on excessive slopes unless the owner or permittee shows that it is technically or economically infeasible to remove the felled trees by other means.

(b) Skidding shall not destroy a stream channel or bank or reduce the stream channel's capacity to carry water.

(c) Skidding is not allowed within watercourses. Skidding shall not take place across perennial watercourses unless the owner or permittee shows that it is technically and economically infeasible to remove felled trees

by other means. If the division approves skidding across a perennial watercourse, the owner, permittee or responsible person or entity shall limit skidding to designated crossings. Crossings shall be at a right angle to the main channel and the approach to the crossing shall be at a minimal grade. The owner, permittee or responsible person or entity shall divert drainage at a distance from the stream that provides filtering of sediment.

(d) The owner, permittee or responsible person or entity should plan skid trails in advance to minimize damage to the residual stand, soil compaction and erosion.

(e) The owner, permittee or responsible person or entity should flag skid trails so skidder operators can easily follow them.

(f) The owner, permittee or responsible person or entity should keep skid trails as narrow as possible.

(2) Landings: The owner, permittee or responsible person or entity:

(a) shall provide adequate drainage for the landing and ensure that runoff does not discharge directly into a watercourse; and

(b) should plan landings in advance.

F. ROADS:

(1) The owner, permittee or responsible person or entity shall:

(a) design, construct and maintain roads used or constructed for a harvest of commercial forest species to minimize erosion and impact on soils and vegetation in areas adjacent to the road;

(b) construct and maintain roads to drain properly and not cause gully erosion; the division may require the owner, permittee or responsible person or entity to take action if rill erosion is frequent and the depth exceeds three inches;

(c) outslope or ditch roads on the uphill side and provide appropriate surface drainage by using adequate cross drains, ditches, drivable dips, culverts, water bars, diversion ditches or other structures demonstrated to be equally effective;

(d) construct and maintain roads so the stream channel or bank is not destroyed and the stream channel's capacity to carry water is not diminished; and

(e) design road widths excluding any portion not intended for travel to sufficiently carry the anticipated traffic load with reasonable safety, but not to exceed 24 feet.

(2) Road location, design and construction shall address:

(a) building the fewest roads necessary for the harvest;

(b) locating the road to fit the topography to minimize alteration of natural features;

(c) avoiding road construction along or within narrow canyons;

(d) building roads on locations away from streams such as benches, ridge tops and the tops of slopes unless there is no feasible alternative;

(e) the stability of slopes where roads are cut;

(f) avoiding slopes of 60 percent or greater; and

(g) keeping the road grade to a minimum, usually less than 10 percent.

(3) Road construction: The owner, permittee or responsible person or entity shall:

(a) not use organic debris as a fill material;

(b) prior to construction, remove and utilize or treat as slash trees or portions of trees within the road corridor;

(c) not windrow trees or portions of trees within the road corridor, unless used as filter strip and are less than three feet in height;

(d) remove debris in stream channels that is added during construction (natural materials may be used as part of a sediment control structure);

(e) deposit organic debris and surplus soil and rock where runoff will not be carried into a lake or watercourse;

(f) size culverts, if used, to handle a minimum 25-year flood event; in determining the appropriate size consider debris potential and the potential for increased runoff from a reduction in vegetation resulting from the harvest; and install them to prevent blockage and erosion of fill materials at the outlet;

(g) install bridges where drainage structures cannot carry the water flow; and

(h) divert road drainage at a distance from the stream that provides filtering of sediment such as through the use of cross drains.

(4) The owner, permittee or responsible person or entity shall close roads intended for closure when the cutting unit closes unless needed for other cutting units. Upon closure, the owner, permittee or responsible person or entity shall treat the road to control erosion and remove stream-crossing structures.

G. REQUIREMENTS FOR STREAMSIDE MANAGEMENT AREAS:

(1) Streamside management areas shall include the area within 50 feet of the ordinary high water mark of a lake or wetland or within 50 feet of both high water marks for a perennial or intermittent watercourse. When a preexisting road is within 50 feet of the ordinary high water mark the streamside management area ends at the road's edge nearest to the watercourse. The owner, permittee or responsible person or entity shall minimize disturbance in the streamside management area.

(2) The owner, permittee or responsible person or entity shall not harvest within 50 feet of the ordinary high water mark of a lake or watercourse or within 50 feet of both high water marks of a perennial or intermittent watercourse, unless the division has approved an alternate practice pursuant to 19.20.4.10 NMAC for activities such as riparian restoration or hazardous fuel reduction.

(3) Within streamside management areas, the owner, permittee or responsible person or entity:

(a) shall not locate landings;

(b) shall design and flag skid trails in advance to minimize disturbance;

(c) shall not construct new roads unless the permittee or owner shows that it is technically or economically infeasible to construct the road elsewhere or that the damage to the environment would be greater if the road was constructed elsewhere; if the division approves construction of a new road within a streamside management

area, in addition to other requirements in Subsection F of 19.20.4.9 NMAC, the owner, permittee or responsible person or entity shall limit stream crossings to those that are essential with crossings at a right angle to the main channel and the approach to the crossing at a minimal grade; and

(d) should use directional felling.

H. TREE UTILIZATION:

(1) Unless contract or market conditions require different utilization standards that are included in the harvest permit, the owner, permittee or responsible person or entity shall utilize

(a) commercial forest species to a minimum six-inch top diameter (inside bark) except that harvesting for other than lumber production shall utilize trees to a minimum four-inch top diameter (outside bark); and

(b) the tree's main stem as stated above in Paragraph (1) of Subsection H of 19.2.4.9 NMAC when the net scale of the severed log or section of the main stem is more than 50 percent of the total gross volume using the Scribner Decimal C log scale table.

(2) Long Butting: Long butting is prohibited except when resulting from removal of defects up to the limit of Paragraph (1) of Subsection H of 19.20.4.9 NMAC.

(3) Stump Height: Stump height shall be half the diameter of the tree where severed or 12 inches, whichever is less, on the uphill side except when immovable objects such as rocks or other trees prevent operation of felling equipment. The owner, permittee or responsible person or entity shall ensure that stumps less than eight inches in diameter shall have a flat, horizontal top surface.

I. SLASH:

(1) The owner, permittee or responsible person or entity shall treat slash and damaged trees in a cutting unit, unless piled, to stand no higher than three feet above ground level, unless chipped or within one quarter of a mile of a structure. Chipped slash shall not exceed two inches in depth. The owner, permittee or responsible person or entity shall treat slash within one quarter of a mile of a structure to stand no higher than two feet above ground level.

(2) The owner, permittee or responsible person or entity shall:

(a) construct slash piles for safe and efficient burning; to be free of mineral soil and to cause no more than minimal soil sterilization; and

(b) locate slash piles to avoid damage to the residual stand.

(3) The owner, permittee or responsible person or entity shall treat slash, unless piled, no later than 30 calendar days from the movement of harvest operations out of the subject cutting unit into another cutting unit under a multiple cutting unit permit, or no later than 30 calendar days following the cessation of major harvest activities within the cutting unit, whichever occurs first. In any event, the time shall not exceed 365 calendar days from the start of harvesting within the cutting unit. The owner, permittee or responsible person or entity may allow piled slash to cure, but shall burn it no later than the end of the next winter burning season following the cessation of major harvest activities within that cutting unit. If weather conditions prevent piled slash from being burned by the end of the next winter burning season, the owner or permittee may request an extension of time.

(4) For the purpose of creating a fuel break along public roads, the owner, permittee or responsible person or entity shall eliminate slash greater than two feet in length or larger than one inch in diameter at the large end and within 50 feet of either side of the center line of a public road by chipping, burning, removal or equivalent means within 365 calendar days of cessation of major harvest activities within the cutting unit.

(5) Unless incorporated into a sediment control structure, slash is not allowed within the ordinary high water mark of an intermittent or perennial watercourse, lake or wetland.

J. COARSE WOODY DEBRIS RETENTION AND RECRUITMENT: Where available, the owner, permittee or responsible person or entity shall retain one to five scattered down logs per acre in a variety of stages of decomposition, with preference for down logs that have a diameter at breast height of 15 inches or greater and a length of 15 feet or greater. If scattered down logs are not available but unmerchantable trees have been harvested, the owner, permittee or responsible person or entity may scatter one to five unmerchantable trees per acre, with preference for logs that have a diameter at breast height of 15 inches or greater and a length of 15 feet or greater.

K. LOG DECKS: The owner, permittee or responsible person or entity shall remove log decks no later than 365 calendar days from the start of harvesting within the cutting unit.

L. CABLE YARDING: The following requirements apply to cable yarding:

(1) The yarding system shall have lateral yarding capabilities, using a carriage that can maintain a fixed position on the skyline during lateral pulls and shall keep one end of the log suspended above the ground during in-haul.

(2) The owner, permittee or responsible person or entity shall use uphill yarding unless the yarder cannot be located on a ridge top, bench or on top of a slope. If the owner, permittee or responsible person or entity must use downhill yarding, they shall suspend the leading end of the log above the ground.

(3) The applicant shall include corridor design in the harvest permit application and the owner, permittee or responsible person or entity shall mark actual corridors on the ground prior to clearing and felling. Cable corridors shall not be closer than an average of 75 feet, center to center, at a point one-half way to the end of the corridor where radial corridors are required; and an average of 140 feet where parallel corridors are used. No more than four cable corridors shall radiate from a single yarder position.

(4) The owner, permittee or responsible person or entity shall initially cut cable corridors to a maximum 12-foot width, prior to felling in the cutting unit, to allow passage of the carriage and turn of logs. Corridors shall not exceed 20 feet in width after yarding is completed and the owner, permittee or responsible person or entity has removed the rub trees.

(5) The owner, permittee or responsible person or entity shall fell harvested trees except corridor trees along the contour or diagonally to the slope to facilitate yarding and reduce damage to the residual trees.

(6) When topography and ground conditions permit, the owner, permittee or responsible person or entity shall pull logs endwise from where they are felled. Lateral yarding distance shall be limited to no more than 75 feet.

M. DAMAGE: The owner, permittee or responsible person or entity shall remove trees damaged by harvest activities or treat them as slash. If the damaged trees were intended to be leave trees then the harvest is not in compliance with the harvest permit. If a leave tree is damaged the division may require that the owner, permittee or responsible person or entity leave additional trees as leave trees or require other means of regeneration.

N. TRASH AND LITTER: The owner, permittee or responsible person or entity shall remove all human-made trash and litter resulting from harvest and transportation activities from the harvest area and properly dispose of it.

O. SPILLS: The owner, permittee or responsible person or entity shall comply with 20.6.2.1203 NMAC with respect to discharge of oil or other water contaminant, in such quantity as may with reasonable probability injure or be detrimental to human health, animal or plant life or property, or unreasonably interfere with the public welfare or property use. The owner, permittee or responsible person or entity shall not service trucks, graders, dozers, felling equipment or other equipment where spills may contaminate soils, wetlands, lakes or watercourses.

P. MARKING OF LOG BUTTS:

(1) The owner, permittee or responsible person or entity shall mark one to five logs per load, if being transported in log form, or mark the load with a sign readable from 30 feet if the wood product is transported in another form such as chips, with the following information in the color of paint assigned to the district where the harvesting is occurring:

(a) if a harvest permit is required, with the two letter designator assigned by the district and the sequential load number (*i.e.* JV 011); or

(b) if a harvest permit is not required, with the landowner's first and last initials or the initial's of the ranch or property name and the abbreviation of the county in which the harvest is occurring (*i.e.*, if the landowner is Bill Smith and the harvest is occurring in San Miguel county the mark would be BS/SM).

(2) The following colors are assigned to the districts:

(a) Bernalillo - orange
(b) Capitan - red
(c) Chama - black
(d) Cimarron - blue
(e) Las Vegas - green
(f) Socorro – white.

Q. FIRE EQUIPMENT:

(1) The owner, permittee or responsible person or entity shall:

(a) have a long handled shovel; pulaski, McLeod or combi-tool; and a five-pound capacity ABC dry chemical fire extinguisher available at the harvest location when harvesting is occurring;

(b) ensure that each skidder, feller-buncher, delimber, dozer, log truck, etc. is equipped with a long handled shovel and a five-pound capacity ABC dry chemical fire extinguisher; and

(c) ensure each passenger vehicle, light truck or medium truck up to 40,000 GVW is equipped with a long handled shovel and a two and one half pound capacity ABC dry chemical fire extinguisher.

(2) The owner, permittee or responsible person or entity shall ensure that the tools and fire extinguishers are in good working condition.

[19.20.4.9 NMAC - N, 1/1/2002; A, 6/29/2007]

19.20.4.10 ALTERNATE PRACTICES: An applicant or permittee may request to use an alternate practice in place of a specific requirement in the forest harvest practices standards, 19.20.4.9 NMAC, so long as equivalent or better protection regarding fire, insect and disease control and erosion control measures is provided. The request to use an alternate practice shall describe the mitigation measures that the applicant or permittee will take so that the division can determine that the proposal offers equivalent or better protection. The division shall make the decision to grant or deny the use of an alternate practice within 30 calendar days after the request's receipt. The division's written approval or disapproval shall state the reasons why the division granted or denied the request. The division shall not allow the applicant or permittee to use an alternate practice if it is known to result in violation of other applicable state laws. The permittee may appeal the denial of a request to use an alternate practice to the state forester pursuant to Subsection A of 19.20.4.13 NMAC.

[19.20.4.10 NMAC - N, 1/1/2002; A, 6/29/2007]

19.20.4.11 WEATHER CLOSURES: The division may temporarily close roads built for harvest activities, close streamside management areas or suspend harvesting when adverse weather conditions exist such as flooding, heavy rain or snowmelt.

[19.20.4.11 NMAC - N, 1/1/2002]

19.20.4.12 VIOLATIONS:

A. NOTICE OF DEFICIENT CONDITION: The division may issue a notice of deficient condition for violation of the act, 19.20.4 NMAC or a harvest permit. The division may issue a notice of deficient condition for violations that harm the forest or forest resources and will require the permittee or responsible person or entity to cease the violation and take corrective action to repair the deficient condition.

(1) The division may serve upon the permittee or responsible person or entity a notice of deficient condition if:

(a) there is a violation of the act, 19.20.4 NMAC or a harvest permit; or

(b) the violation or activity creates harm or the potential for harm to the forest or forest resource.

(2) The notice of deficient condition shall set forth:

(a) the specific nature of the violation charged or harm to the forest or forest resources;

(b) the specific course of action needed to correct such violation;

(c) the date such correction shall be completed; and

(d) the recipient's right to a hearing to review the notice of deficient condition.

(3) The division shall serve the notice of deficient condition upon the permittee or responsible person or entity by personal delivery or certified mail return receipt requested. If the notice is not served upon the permittee the division shall provide a copy to the permittee by first class mail or personal service.

B. REVOCATION OF A HARVEST PERMIT:

(1) The state forester may revoke a harvest permit for the following:

(a) refusal to allow the division to enter and inspect a permitted area;

(b) failure to timely complete corrective action after receiving a notice of deficient condition;

(c) discovery that any of the reasons for harvest permit application denial exists; or

(d) failure to keep statements of understanding current.

(2) To proceed with revocation of a harvest permit the division shall schedule a revocation hearing and provide written notice of intent to revoke to the permittee by personal delivery or certified mail return receipt requested at least 10 working days before the date set for the hearing. The written notice of the intent to revoke shall include the hearing's date, time and location.

(a) The hearing shall be held before the state forester.

(b) The division shall provide evidence as to the reasons to revoke the harvest permit and the permittee may provide evidence as to the reasons not to revoke the harvest permit.

(c) Oral testimony at the hearing shall be made under oath. The division shall make a tape or stenographic record of the hearing.

(d) If the state forester finds that a preponderance of the evidence supports revocation, the state forester shall revoke the harvest permit.

(e) The state forester shall issue a written final decision within 10 working days after the close of the hearing or deadline for the submission of additional materials following the hearing.

[19.20.4.12 NMAC - N, 1/1/2002; A, 6/29/2007]

19.20.4.13 ADMINISTRATIVE REVIEW:

A. DENIAL OF PERMITS, REQUEST TO USE ALTERNATE PRACTICES OR PERMIT REVISIONS:

(1) To request review of the denial of a harvest permit application, use of alternate practices or a harvest permit revision, an applicant or permittee shall submit a written request for review, which includes the reasons for requesting review, to the state forester within 15 calendar days after the issuance and provide written notice to the district office that denied the harvest permit application, use of alternate practices or harvest permit revision. If the applicant submitted additional information or revisions to the harvest permit application pursuant to Paragraph (2) of Subsection E of 19.20.4.8 NMAC the time period starts with the last denial.

(2) The applicant or permittee and the district office shall submit written statements to the state forester within 10 working days after the applicant or permittee submits the request for review.

(3) The state forester shall base the review decision on the written statements unless the applicant or permittee or the district office requests the opportunity to call witnesses or make oral arguments within 10 working days after the applicant or permittee submits the request for review. A request for a hearing shall explain the need for witness testimony or oral argument. If the applicant or permittee or the district office asks to make oral arguments or call witnesses, the state forester may set a hearing to be held within 10 working days after receiving that request and provide notice of the hearing date, time and location to the applicant or permittee and the district office. Oral testimony shall be made under oath. The division shall make a tape or stenographic record of oral argument or witness testimony.

(4) The state forester shall issue a written final decision, including findings of fact and conclusions of law, within 10 working days after the date for submission of written statements, or a hearing, if any, and send copies to the applicant or permittee and the district office.

B. NOTICE OF DEFICIENT CONDITION:

(1) To request review of the issuance of a notice of deficient condition the permittee or responsible person or entity shall submit a written request for a hearing, which specifically states the reasons for the review, to the district forester within 10 working days after the notice's receipt. If the district forester issued the notice of deficient condition, then the district forester from another district shall conduct the hearing.

(a) The district forester shall consult with the permittee or responsible person or entity to set a hearing to be held within three working days after the request's receipt.

(b) The district forester shall issue a written decision within five working days after the hearing.

(c) The permittee or responsible person or entity may appeal the district forester's decision to the state forester by submitting a written request for review to the state forester within 10 working days after the decision and providing written notice to the district forester.

(2) The permittee or responsible person or entity and the district forester shall submit written statements to the state forester within 10 working days after the permittee or responsible person or entity submits the request for review.

(a) The state forester shall base the review decision on the written statements unless the permittee or responsible person or entity or the district forester requests the opportunity to call witnesses or make oral arguments

within 10 working days after the permittee or responsible person or entity submits the request for review. A request for a hearing shall explain the need for witness testimony or oral argument.

(b) If the permittee or responsible person or entity or the district forester asks to make oral arguments or call witnesses, the state forester may set a hearing to be held within 10 working days after receiving that request and provide notice of the hearing date, time and location to the permittee, responsible person or entity and the district forester. Oral testimony shall be made under oath. The division shall make a tape or stenographic record of oral argument or witness testimony.

(c) The state forester shall issue a written final decision, including findings of fact and conclusions of law, within 10 working days after the date for submission of written statements, or a hearing, if any, and send copies to the permittee, responsible person or entity and the district forester.

[19.20.4.13 NMAC - N, 1/1/2002; A, 6/29/2007]

19.20.4.14 FIRE RESTRICTIONS: Whenever the state forester declares restrictions on use of lands or use of fire within an area permitted under 19.20.4 NMAC, the restrictions shall apply to harvesting. If these restrictions require that harvesting stop, it shall not be considered a cessation of harvesting pursuant to 19.20.4 NMAC.

[19.20.4.14 NMAC - N, 1/1/2002; A, 6/29/2007]

19.20.4.15 CRIMINAL PENALTIES:

A. Following the procedures in 19.20.4.12 NMAC does not limit the division in its ability or authority to issue citations or otherwise enforce the possible criminal penalties for violating the act, 19.20.4 NMAC or a harvest permit.

B. Violation of the act, 19.20.4 NMAC or a harvest permit is a misdemeanor punishable by a fine of not more than $1000 or by imprisonment in the county jail not to exceed one year or both for each violation, NMSA 1978, Section 68-2-17.

[19.20.4.15 NMAC - N, 1/1/2002; A, 6/29/2007]

HISTORY OF 19.20.4 NMAC: [RESERVED]

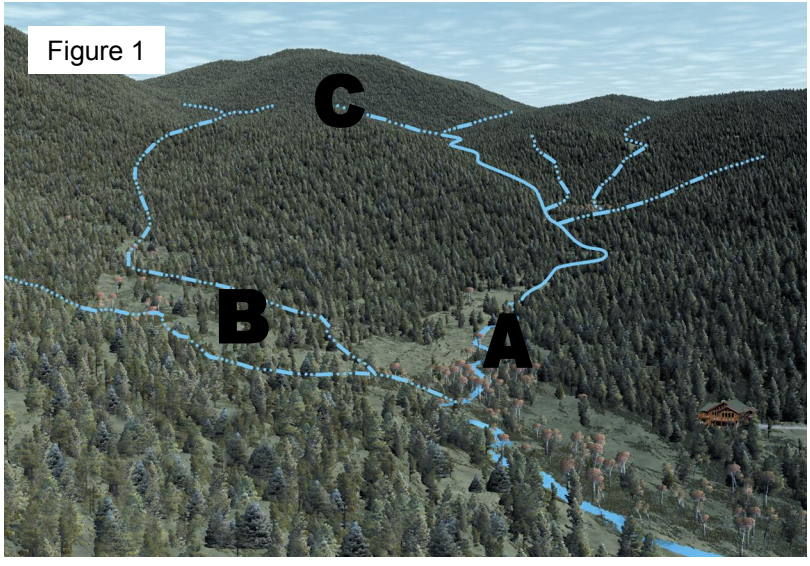
WATERSHEDS

Towns and cities throughout New Mexico depend on ground and surface water collected within forested watersheds for their domestic public water supply. Forest lands act as collectors and purifiers of clean water; protecting these sources is the responsibility of forest landowners, forest managers, and timber operators.

A watershed is a land area that is drained by a single stream, river or drainage network of stream channels and includes all the land within the entire drainage area. Watersheds range in size from a few acres to drainages that are thousands of square miles. For example, the Rio Grande Watershed originates in the San Juan Mountains of southern Colorado, covers 1.9 million acres in New Mexico and culminates in Texas. The state's five main watersheds are the Pecos, San Juan, Gila, Rio Grande, and Canadian, all of which can be divided into smaller sub-drainages.

What are the Parts of a Watershed?

A watershed is a network of surface streams, underground water flows, and other water bodies. Surface streams that flow year-around are called **perennial** [A in Figure 1] streams. **Intermittent** [B in Figure 1] streams only flow part of a year, typically in response to snowmelt. **Interrupted** streams are those that disappear underground only to reappear downstream. **Ephemeral** [C in Figure 1] streams flow only in response to precipitation. **Washes**, similar to ephemeral streams, are dry streambeds in the desert that flow only after significant rainfall, usually associated with monsoonal activity. An **arroyo** is "a watercourse that conducts an intermittent or ephemeral flow, providing primary drainage for an area of land of forty acres or



larger, or a watercourse which would be expected to flow in excess of one hundred cubic feet per second as the result of a 100 year storm event" (New Mexico Drainage Ordinance). (Note: a 100 year storm event is one which has a 1 percent chance of occurring in any given year.) Any one stream or watershed includes some or all of these aforementioned components.

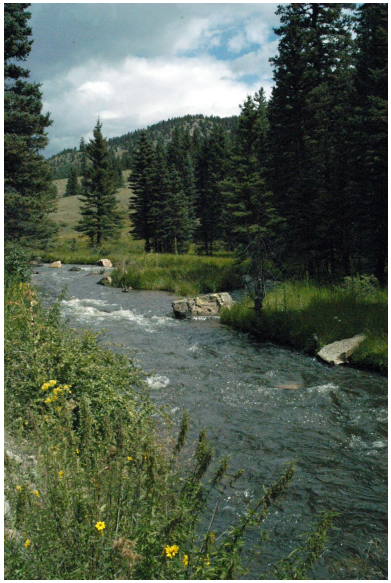
Other parts of the watershed collection system include:

- Surface and subsurface water source areas. Their location is not always obvious, but understanding their function is important.
- Riparian and wetland areas, including cienegas.

Another type of water delivery system that should be protected so as not to impede, pollute, or alter the flow of water, is the **acequia**, or water ditch system, used in agricultural irrigation to move water from streams and rivers to the fields. These could be earthen ditches, lined with cement, or even partially conveyed by pipe.

Why Protect Water Quality?

Human and animal communities depend on good quality water for their livelihoods. Damage to streams and increased sedimentation degrade water quality and aquatic habitat. Sediment is fine particles of soil, sand, and pebbles that may be carried by ephemeral, intermittent, or perennial stream channels and later deposited when the flow slows or stops, conceivably in an eddy or where a stream enters a lake or pond. Sediment-laden water is unsuitable for human consumption, recreational purposes, and many industrial applications. Downstream users of water also incur costs, including reduction in reservoir and irrigation ditch capacity and damage to irrigation pumps. Important water quality considerations in addition to sediment levels are conductivity, dissolved oxygen (DO), pH, turbidity, total suspended solids (TSS), and temperature. Poor harvesting methods can affect all of these factors, thus impacting aquatic habitat and overall water quality.



What Can Go Wrong in a Watershed?

Timber harvesting, road building, and site preparation can affect the quality and quantity of water flowing through a watershed. Wildland fires can also lead to erosion. Roads, skids trails, and landings can act as man-made stream channels carrying sediment when improperly planned, located, or constructed.

Poor timber harvesting practices can cause excessive disturbance of vegetation and topsoil, which will limit filtering capacity and affect surface

water infiltration. Runoff generally increases in speed and volume as it flows down slope and when concentrated can tear away soil, destroy roads, load streams with sediment, damage stream-banks, and degrade or even destroy aquatic habitat.

BMP Minimize the number of roads constructed in a watershed through comprehensive road planning, recognizing intermingled ownership, and foreseeable future uses.

BMP Plan landings and skid trails in the proper location. Landings should be relatively flat and have undisturbed ground vegetation as a buffer to any drainage. Skid trails should be more cross slope than up/down slope, properly waterbarred and seeded when no longer in use. See the Roads section (page 53) for more information on road construction and closure.

BMP Establish soil moisture and wetland limitations for equipment operation and vehicle use.

BMP Restoration of the watershed to a level of resiliency will reduce the potential for non-point source pollution (i.e. riparian buffers, restoration of native species).

BMP Safety equipment should be used and precautions taken to prevent starting fires during harvesting or road construction.

WHAT ARE RIPARIAN AND WETLAND AREAS?

Riparian areas are often defined as transition zones between aquatic and upland environments. Riparian areas have distinct and often different vegetation from uplands but possess characteristics of both aquatic and upland habitats and are the sites of significant material, nutrient, and energy transfer between aquatic and upland habitats. Riparian areas are supported by perennial and intermittent streams, where the water supply to drive these important functions is typically available at or near the surface, and may also be found in ephemeral drainages where water is available only after rainfall events or snowmelt.

The number of ecological functions and processes, and the degree to which they are served, are much greater in perennial and intermittent streams than in ephemeral streams. Therefore, management, restoration, and regulatory emphasis and/or priority should be placed on perennial and intermittent streams. The ecological and economic importance of riparian areas far outweighs their representation in the arid western landscape. Usually, distinct differences in vegetation community composition and structure make delineation of riparian areas fairly straightforward. If during planning the harvest it is uncertain whether an area is a riparian area, planners should consult a resource professional, such as foresters at the nearest District Office (page 125).

Wetlands have the following characteristics:
(1) at least periodically the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year. *Note: hydrophytes are plants capable of growing in water or waterlogged soils/substrates; hydric soils are waterlogged soils that support plant growth; non-soil is a non-vegetated substrate like a mudflat or rock outcrop.*

Both riparian areas and wetlands contain different plants than the adjacent areas. In some places the transition from the riparian or wetland area is a sharp contrast and other times it is less noticeable. Please contact the nearest District Office (page 125) for assistance in defining riparian and wetland areas and their management concerns. More information can also be found on the Forestry Division website: www.nmforestry.com, under Forest Management.

What Makes Riparian and Wetland Areas Unique?

Their mix of water, plant cover, and food is rare and diverse compared to the rest of the watershed. For some animals, the presence of water makes a riparian or wetland area their preferred or solo habitat. Most amphibians live on land and return to water to breed, spending much of their lives in

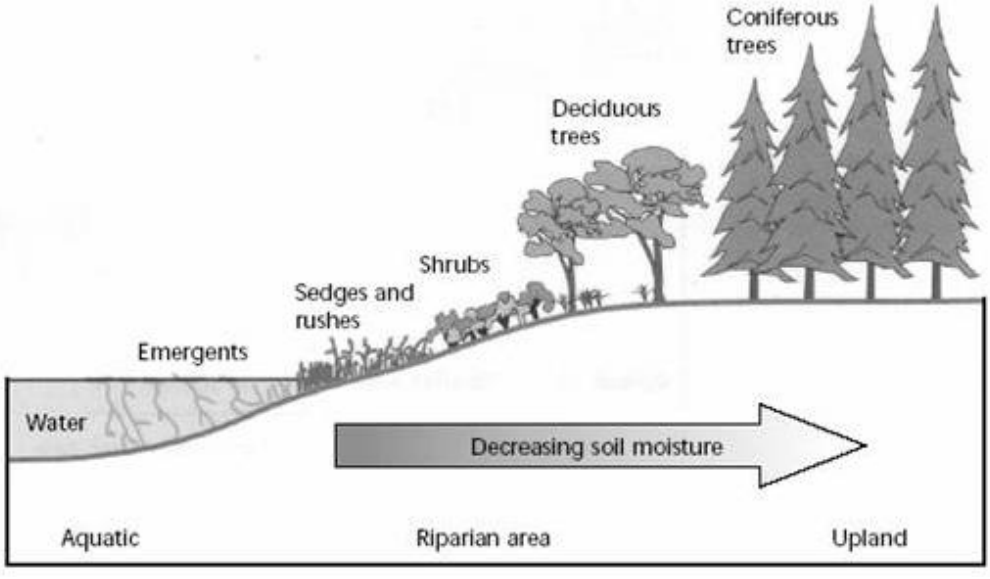
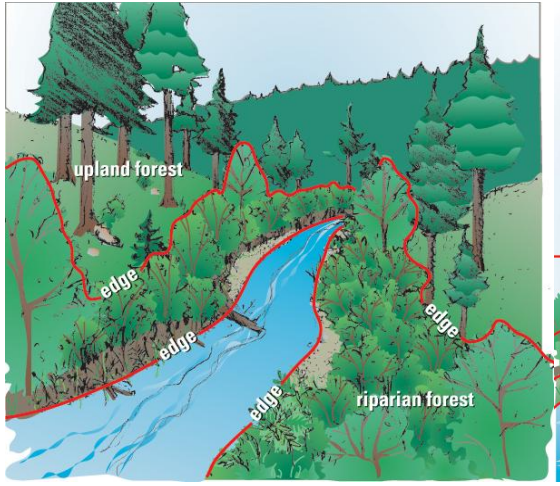


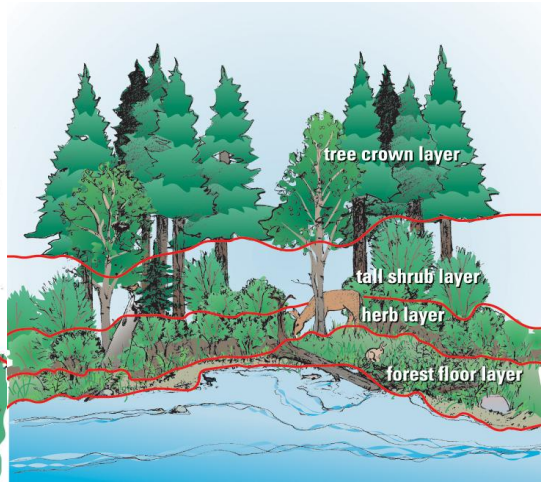
Figure 2 Illustration of moisture gradient in a typical riparian ecosystem (from Stevens et al.1995:2)

these areas. Open water and a high water table combine to produce higher humidity, more shade and unique air movement. Frequently, riparian and wetland areas support a greater number of individuals, as well as a greater number of species, when compared to other parts of the watershed. Furthermore, the wet soils of a riparian or wetland area encourage the growth of soil microbes that can break down chemical pollutants into harmless organic compounds, thus filtering polluted water.

EDGES AND LAYERS IN RIPARIAN / WETLAND AREAS

An “edge” is where two different plant groups come together. In riparian and wetland areas there are two obvious edges. One occurs where riparian and wetland plants meet aquatic plants at the water’s edge. The other is where riparian and wetland forest plants end and upland forest plants begin.





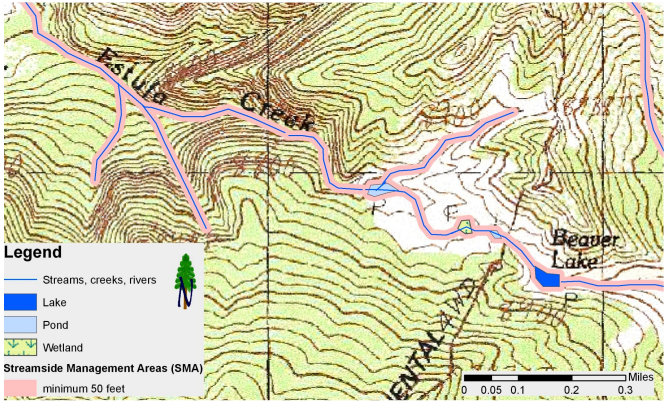
Edges give animals easy access to more than one environment. They offer greater variety of plant cover and more abundant food. For some animals, edges can be traps; places where they venture to feed or rest and are picked off by waiting predators.

BMP **No landings, roads or skidtrails should be located in a wetland. Most are not allowed in a riparian area depending on length of use and alternate practices approved by the Forestry Division. Equipment use should be limited in wetlands or areas of temporary saturated soils during periods of snowmelt, freezing and thawing.**

BMP **Contact the nearest District Office (page 125) for assistance in defining riparian and wetland areas and their management concerns.**

STREAMSIDE MANAGEMENT AREA

The Streamside Management Area (SMA) is a 50-foot minimum ***slope distance*** from a stream, lake, wetland area, or other water body that must be protected because of its special importance. (An SMA is illustrated on the map to the right.)



What is a SMA?

The function of a **SMA** is to protect water quality
along streams, lakes, and other water bodies by maintaining a natural sediment filter. The riparian "green zone" around streams, lakes, reservoirs, springs, and seeps represents an area that stays green long into the summer months. Recognizing riparian areas and knowing where they are in the forest will make protecting water quality within a **SMA** much easier.

The 50-foot minimum **SMA** often extends beyond the riparian area "green zone." This is important when slopes near streams are unstable, or when the riparian area is narrower than 50 feet.

BENEFITS OF SMAS

The SMA acts as an effective filter and retention zone for sediment.

1. The **SMA**, with its thick plant growth creates a mat of decomposing material on top of the soil. It is often damp because the water table is at or near the soil surface. The topsoil, covered with organic material, aids in conserving moisture. The sponge-like qualities of the **SMA** control the quantity of water flowing into the streams. Soils in this area absorb water during the wet seasons and slowly release moisture into the stream. This minimizes the effects of peak runoff and keeps streams from drying out sooner than usual.
2. The **SMA** provides filtering of surface runoff. An **SMA** acts as a trap, blocking sediment and other debris from entering the stream, lake, or reservoir. An adequate **SMA** protects the absorptive and filtering action of

the riparian area. The absorbent mat of forest humus, litter, and duff helps to trap sediment before it reaches the stream, ensuring good water quality.
3. Healthy **SMAs** control the quality of water coming from a watershed. We all depend on sediment free water for household use, irrigation, and healthy fisheries.

The SMA maintains shade; conserves aquatic and terrestrial habitats; protects stream channels and banks; and promotes flood plain stability.

When this last line of defense isn't working, sediment ends up in the stream causing water quality problems, loss of habitat, and potential flooding. Since timber harvesting activity occurs in many of New Mexico's watersheds it is important that water quality is protected by a healthy **SMA**.

What's wrong with sediment in the streams?

Trout and other fish reproduce by burying their eggs in stream bottom gravel. The eggs develop in the gravel and hatch into "sac fry." When the yolk is absorbed, the young fish emerge from the gravel. Sac fry and young fish can be choked by sediment. When too much sediment falls to the stream bottom it fills gaps

between the gravel and suffocates the fish. The streambed becomes cemented over. This layer of sediment traps the young fish without clean water, oxygen, or food. For those fish that survive, the sediment has an abrasive effect on their gill tissue.

Sediment also kills aquatic insects and algae, fills in resting pools, interferes with recreation, reduces light penetration, and increases thermal energy absorption. Sediment may carry and release chemical pollutants into streams

Other SMA Benefits:

SMAs and stream shade. Maintaining water temperature helps fish spawning. Without trees and overhanging shrubs, stream temperatures would be higher in the summer and colder in the winter. Some species of aquatic organisms would be unable to live in the streams. In the summer, cold water from shaded streams eventually flows into larger rivers and helps maintains their fish and aquatic life by keeping these waters cool downstream.

SMAs and food. Leaves and insects drop into streams from overhanging trees and shrubs. In fact, 90% of the food in forested streams comes from bordering vegetation. Even in large rivers, over 50% of the food consumed by fish is from streamside trees and other vegetation.

SMAs protect streambanks. Shrubs and trees stabilize

many streambanks. They anchor banks and protect them from erosion during periods of high water. Removing trees and shrubs and substituting shallow-rooted grasses can lead to streambank collapse and stream sedimentation.

SMAs and floods. Healthy SMAs stabilize floodplains. During times of high water, SMAs reduce the velocity of floodwaters. Their dense vegetation and deep humus slow down racing waters. Forest floodplains suffer less damage when SMAs are protected during timber harvesting activities.

Animals and birds rely on SMAs. Many birds use SMAs for breeding. Others hunt in healthy SMAs where food and cover are abundant. The reason is that SMAs supply a great variety of plants needed by birds and other wildlife. Grasses, shrubs, vines, and trees all grow well in the moist fertile soil. Turtles, beaver, muskrats, and water snakes thrive in SMAs. Deer, wood duck, and bear feed and seek cover in the thick vegetation. Eagles, owls, and songbirds occupy the trees. Pools supply breeding sites for frogs, toads, and insects. SMAs are also well-traveled wildlife corridors connecting one area to another.

SMAs and humans. We like **SMAs** too for a lot of reasons. The recreational activities that we enjoy in and around streams are many. All of us should be careful when we are around them.

SMAS and timber production. For those who grow and harvest trees, the fact is that trees often grow best in riparian areas. Trees respond to those deep, fertile, and moist soils. Timber harvesting and thinning activities must be modified within **SMAs** to protect the many benefits mentioned above. Alternate practices can be requested to meet specific management objectives such as riparian restoration or fire hazard reduction.

SMA BOUNDARIES

- Designate streamside management areas to provide stream shading, soil stabilization, sediment and water filtering effects, and wildlife habitat.
- "Stream" means a natural watercourse of perceptible extent with defined beds or banks which confine or conduct continuously or intermittently flowing water.
- Defined beds have a sandy or rocky bottom which result from the scouring action of water flow.
- The SMA encompasses a strip at least 50 feet wide measured from the ordinary (yearly average) high-water mark or definable bank of a pond or lake, or on each side of the stream or river. The width of the SMA may extend beyond the 50 feet to include riparian areas along the stream bottom and to provide additional protection in areas of steep slopes and erodible soils.
- Consult with forestry professionals (see District Offices, page 125), soil and water conservation specialists, or biologists if assistance is needed in setting appropriate SMA boundaries.

Marking SMA Boundaries

To be sure equipment operators have no question about the **SMA** boundary it should be clearly marked. Plastic flagging, degradable paint, or signs should be used at frequent intervals. A walk-through may also be appropriate before operations commence.

The purpose of marking a **SMA** is to be sure everyone working around a stream, lake, or other body of water knows the extent of the protected area.

Perennial streams are easy to identify. Intermittent streams can be more difficult to identify during dry periods. However, most intermittent streams are included on USGS topographic maps. Whether wet or dry, perennial or intermittent, during drought or wet years, streams should be protected with a **SMA**.

Individuals must be aware of wetlands by watching for water loving plants and plan activities and equipment locations accordingly. When a wetland is adjacent to a stream, the **SMA** should loop out to include any wetlands and provide protection. Proper **SMA** location requires practice and personal judgment.

HARVESTING IN SMAS

Use the following BMPs when performing restoration activities in the Streamside Management Area.

NOTE: an alternate practice is needed with your harvest permit to harvest within the SMA. If a harvest permit is not required, typical harvest activity is still not allowed in the SMA. Please contact the nearest District Office (page 125).

Because of the value of the SMA, timber harvesting or thinning in the SMA should only be done to remove invasive species or otherwise restore the health of the ecosystem.

Especially important are streambank trees and shrubs. They anchor the bank, shade the stream, provide food, supply cover for fish, and habitat for birds and other wildlife.

BMP **Leave snags and unmerchantable trees in the SMAs. They are habitat for many birds and animals.**

The following BMPS are required for an Alternate Practice (see Requirements, Section 19.20.4.10, page 32):

BMP **Directional falling should be done within SMA.**

BMP **Suspend the lead end of the log during skidding whenever possible**

BMP **Use cables to end line logs out of SMAs and wetlands when ground skidding systems are employed.**

BMP **Logs should be fully suspended when skyline skidding across a stream and above streambanks.**

BMP **Whole tree or tree-length yarding can reduce the need for slash disposal in the SMA.**

BMP **Keep slash out of water bodies by removing limbs and tops well above the stream high-water mark. Slash and other forest debris can clog and damage culverts and irrigation diversions; and decomposing slash can degrade water quality and habitat for fish and other aquatic animals.**

BMP **Leave trees on the bank that will eventually fall across the stream, helping to create a stair step of pools in the stream channel, providing a fish habitat component. Larger trees increase the benefits for the habitat.**

BMP **Protect SMAs with a slash free strip around the border**.

BMP **Do not service vehicles where chemicals, oil, or other toxic substances might contaminate soils, waterways, or waterbodies.**

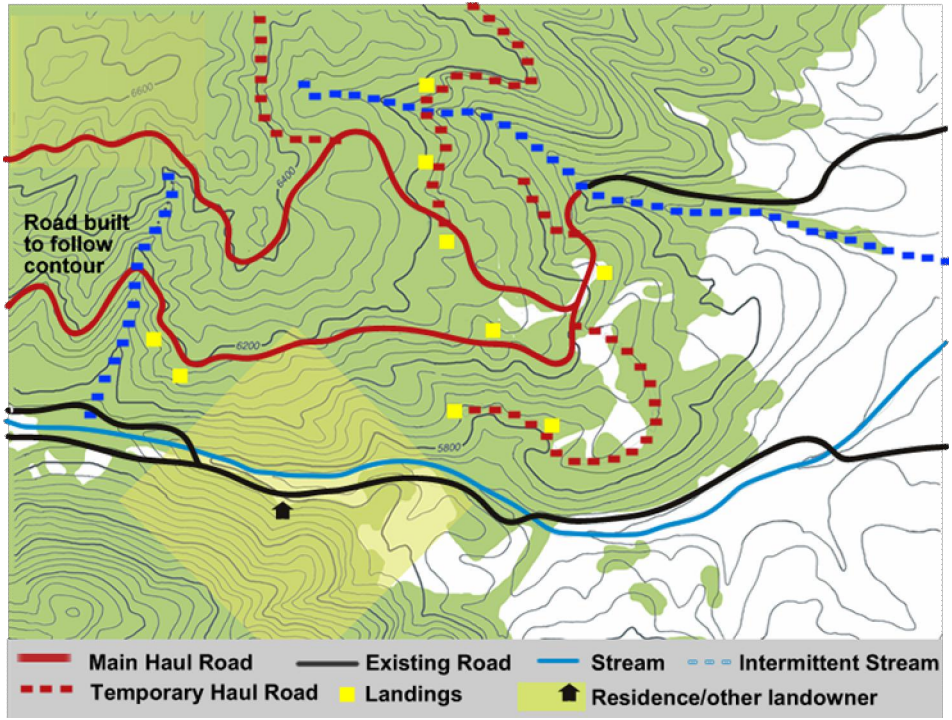
ROADS

Forest roads are the primary source of erosion on a timber harvest operation, causing up to 90 percent of the problem. This disproportionate share is attributable to 1) complete removal of vegetation and ground cover; 2) increased slope gradients on the cut and fills slopes; 3) loose fill materials; 4) concentration of surface runoff; 5) interception of subsurface flow by the cut slopes; and 6) compaction of the road surface. Hence, roads demand great deal of attention to minimize erosion and sedimentation.

A road system has been designated on the topographic map below. The area consists of mixed ownership and has some existing roads. To comply with **BMPs** and minimize the number of roads, surrounding landowners should be contacted during road planning to acquire use easements and reduce the potential number of new roads.

Planning, Design, and Location

- Properly design roads and drainage facilities to prevent potential water quality problems before construction starts.
- Minimize the number of roads constructed in a watershed through comprehensive planning, recognizing intermingled ownership, and future uses.
- Road design specifications should be included in a contract between the landowner and the road builder. The contract should include exact road locations, dimensions, erosion control and drainage features, stream crossing and structure specifications, season(s) of construction and use, a



maintenance schedule, road closure and re-vegetation procedures, and penalties for non-compliance. The more specific the road contract, the more protection there is for the resources and landowner.

- Fit the road to the landscape. This entails altering natural drainage patterns as little as possible by following contours and minimizing cuts, fill, and stream crossings. Utilize natural road building locations away from streams.
- Avoid problem areas such as flood zones, narrow canyon bottoms, wet areas and highly erodible or unstable soils. Do not locate roads on slopes more than 60 percent.
- Locate roads outside of the SMA, well away from streams, both perennial and intermittent, maintaining a buffer strip of undisturbed soil and vegetation between the road and stream for maximum protection of water quality. Width guidelines are given in Table 1 (page 56).
- Keep the road grade to a minimum, usually less than 10 percent. This can be exceeded for short distances where necessary. An easy grade prevents runoff from building up erosive force and also provides for safer and more efficient travel.
- Prevent the concentration of water on the road by designing adequate drainage features. Some suggested drainage methods are insloping and outsloping the road surface, and installation of grade dips and cross drains. Installation of these features is explained in the Construction Section (page 57).
- When a stream crossing is necessary, locate the site on a stable, straight portion of the stream. The approach to the crossing should be at a minimal grade and a right angle to the stream.

Leaving a buffer of undisturbed soil and vegetation on both sides of a stream is one of the most important and effective water quality protection measures that can be implemented. The buffer will help keep logging debris out of streams, filter sediment from runoff, prevent temperature increases by shading the stream, and stabilize the stream banks.

The effectiveness of a buffer strip is dependent on its width. However, it is impossible to provide a hard and fast width recommendation because of site differences in slope steepness, length, aspect, soil erodibility, vegetation type and density, and the presence of sediment barriers such as logs, slash, rocks, and depressions. Table 1 is simply a guide intended as a starting point from which to make effective width determinations for maximum water quality protection beyond the SMA.

Left: Road improperly constructed and drained.
Right: properly constructed and drained, rock surface may be needed.

TABLE 1. **BUFFER STRIP WIDTH GUIDELINES**

Slope of land above stream (Percent)	0	10	20	30	40	50	60	70
Buffer Strip Width, Each Side (horizontal distance in feet)	50	70	90	110	130	160	180	200

ROAD CONSTRUCTION

Control erosion during the construction process:

- Schedule construction activities to avoid heavy seasonal rains. Excavation operations may expose mineral soil which is highly susceptible to erosion. Soil stabilization and erosion control measures should be completed before the monsoon (thunderstorm) season of July, August, and September. Clear only that part of the route that can be completed in the current season.

- Minimize disturbance during construction activities by restricting machinery to the designated road. Clear vegetation to the width required for cut and fill slopes. Excessive removal of vegetation further increases erosion and is more costly. Keep machinery out of streams except when absolutely necessary for culvert installation and bridge construction. Round the top of cut slopes only when this will provide more stability than a vertical cut.

- During clearing operations, do not mix organic debris with fill materials. Trees and brush will eventually decay in the fill material causing the road surface to become unstable. Dispose of organic debris properly by utilization, piling and burning, chipping, or lopping and scattering. A good use for slash is to place it along fill slopes to slow runoff and trap sediment.

- Remove debris from stream channels that was added during construction. It is a good practice to remove all debris from channels for at least 100 feet upstream from culverts to reduce the chance of the culvert

becoming plugged. However, never remove well established logs from a stream, as this will likely cause accelerated channel erosion.

- Deposit surplus soil and rock in designated areas where sediment from this material will not threaten streams. Do not simply cast surplus material downslope from the road. This material is highly susceptible to erosion and may have future value as fill.

- Compact all fill material. This can be done simply by running a bulldozer up and down the fill slope where it is safe to do so. Large fills should be constructed and compacted in layers of approximately 18 inches. The slots made perpendicular to the slope in the soil by the bulldozer's tracks retard runoff and moisture, thus inhibiting erosion and encouraging re-vegetation. In addition, the chance of fill slumping and requiring expensive repair will be reduced.

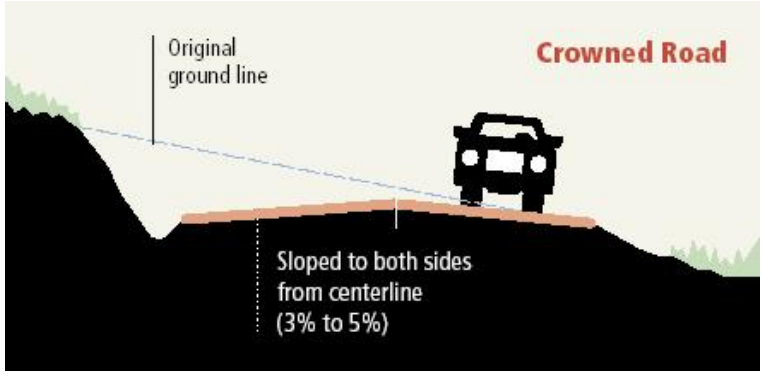
- Servicing and refueling machinery must be conducted well away from wetlands, lakes or watercourses. Fluids such as oil, diesel fuel, and antifreeze are easily washed or leached into streams and present a significant threat to water quality and aquatic life.

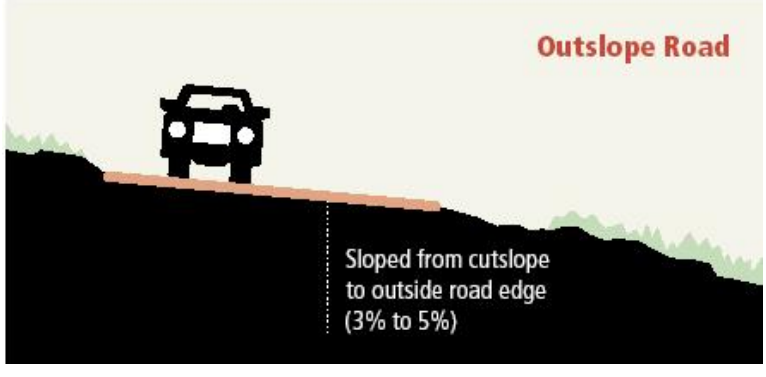
- Make certain the road surface is adequately drained. This can be accomplished in a number of ways depending on the site factors, the type and level of use, and the standard to which the road is built.

DRAINAGE PRACTICES

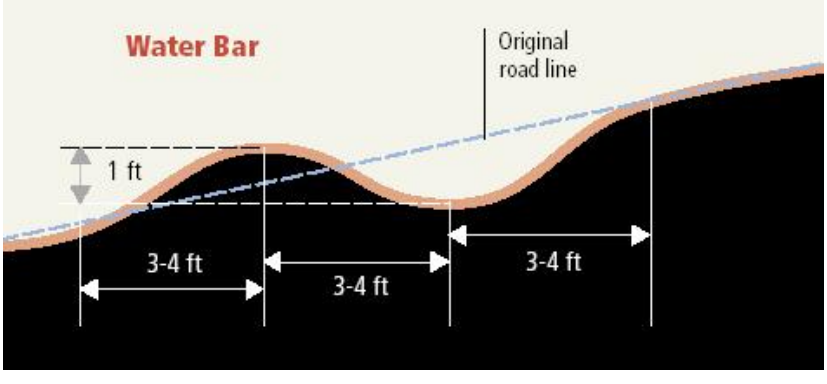
Crowned Road The center is built higher than the shoulders, allowing water to drain to both sides of the road. Effective on any grade of road when the road, ditches and drainage structures can be routinely maintained.

Outsloped Road Outsloping drains water uniformly across the road surface onto the fill slope. The road surface should be sloped outwards 2 to 4 percent or about 1/4 to 1/2 inch per
foot of width. No ditches are required for this method of drainage. Care should be taken to disperse water evenly over the fill slope. Cross drains should be added on outsloped roads before all stream crossings. Generally used on low use roads, for frequent maintenance may be required to prevent the road surface from becoming flat or insloped when a high use surface.





Outsloping, grade dips, open top culverts, and/or water bars can drain roads constructed on moderate slopes with light traffic loads. Though inexpensive to install, these methods may require frequent maintenance during periods of heavy use. This drainage method is not recommended on steep slopes or unstable soils for reasons of stability, safety and maintenance problems.



Water Bars

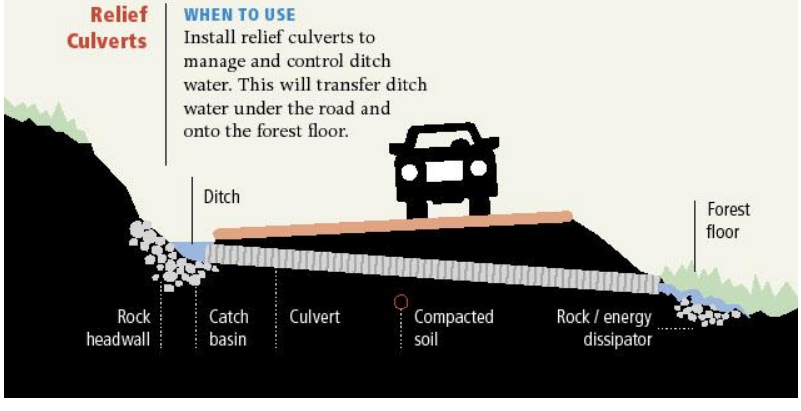
A water bar, drivable dip or grade dip is a broad, shallow depression built across a road at an angle sufficient to stop the flow of water and drain it to either a ditch, the forest floor or a vegetated surface.

Short-based dips are practical only on roads with light traffic at slow speeds. There are no standard length or depth dimensions for grade dips, but they must interrupt the normal road grade enough to prevent runoff from passing over the top of the structure, and also shallow enough for traffic to pass over easily. In any case, a water bar is not easy to construct and requires an experienced equipment operator. One dimension that should be adhered to in order to ease water movement from the road is the dip must be outsloped about 3 percent.

The dip must also extend the full width of the road, from the top of the cut slope to the outside shoulder. Graveling the structure aids in maintaining its shape. Grade dips, which are a type of cross drain, should be

spaced following recommendations in Table 2 (page 62). Finally, rocks and slash placed at the outlet of the dip will slow runoff and spread sediment over a wider area.

Insloping is more permanent, safer, and requires less maintenance than previously discussed drainage methods. However, an insloped road requires an inside ditch and relief culvert or cross drains to transfer the water to the downslope side, and is consequently somewhat more expensive to construct. Relief culverts can be grade dips or open top culverts, but if the road receives heavy traffic, conventional metal culverts are preferable. See the Culvert section (page 64) for proper installation procedures.



Relief culverts must be angled down grade 30 degrees and outsloped 2 to 4 percent to facilitate water movement and self-cleaning. A ditch plug of earth, rock, or masonry must be installed immediately down grade from the culvert inlet to stop water flow down the ditch and direct it into the culvert. If the culvert discharges onto a fillslope, a downdrain may be necessary to avoid erosion of fill material. Rocks and slash placed at the culvert or downdrain discharge will slow runoff and spread sediment. Relief culverts, water bars and cross drains should never discharge into a stream channel; rather, the runoff should be dispersed over vegetated areas.

TABLE 2 SPACING FOR WATER BARS AND GRADE DIPS

4% Road Grade

	North & East Aspect									South & West Aspect								
LOCATION OF ROAD	TOP 1/3 OF SLOPE			MIDDLE 1/3 OF SLOPE			BOTTOM 1/3 OF SLOPE			TOP 1/3 OF SLOPE			MIDDLE 1/3 OF SLOPE			BOTTOM 1/3 OF SLOPE		
PARENT MATERIAL*	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F
STEEPNESS OF SIDESLOPE ABOVE ROAD (%)																		
80	145	121	95	127	103	77	109	85	59	129	105	79	111	87	61	93	69	43
70	140	116	90	122	98	72	104	80	54	124	100	74	106	82	56	88	64	38
60	135	111	85	117	93	67	99	75	49	119	95	69	105	77	51	83	59	33
50	130	106	80	112	88	62	94	70	44	114	90	64	96	72	46	78	54	28
40	125	101	75	107	83	57	89	65	39	109	85	59	91	67	41	73	49	23
30	120	96	70	102	78	52	84	60	34	104	80	54	86	62	36	68	44	18
20	115	95	65	97	73	47	79	55	29	99	75	49	81	57	31	63	39	13
10	110	86	60	92	68	42	74	50	24	94	70	44	76	52	26	58	34	8

Adjustments for Table 2 above: If road grade is 2% add 15 feet;
if road grade is 6% subtract 8 feet;
if road grade is 8% subtract 15 feet;
if road grade is 10 % subtract 24 feet.

***Parent Material Classification**

Course (C)	**Medium (M)**	**Fine (F)**
Hard Sediments	Granite	Andisite
Shale (hard)	Sandstone	Andesite porphyry
Slate	Gneiss	Limestone (soft)
Argillite	Schist	Loess
Rhyolite	Sand	Shale (soft)
Rhyolite porphyry	Glacial Silt	
Limestone (hard)		
Basalt		
Basalt porphyry		
Quartzite		
Conglomerate		
Gravel		

BMP Divert road drainage before all stream crossing. A cross drain should be installed up grade, on both sides of stream crossings.

CULVERTS

Determine the culvert diameter necessary to handle expected high flows, using a design to handle at least an historic 25-year storm event. The repairs on a road washed out because of an undersized culvert will be far more expensive than the extra money spent on a larger culvert. There are a number of ways to compute expected peak flows, all with different degrees of accuracy.

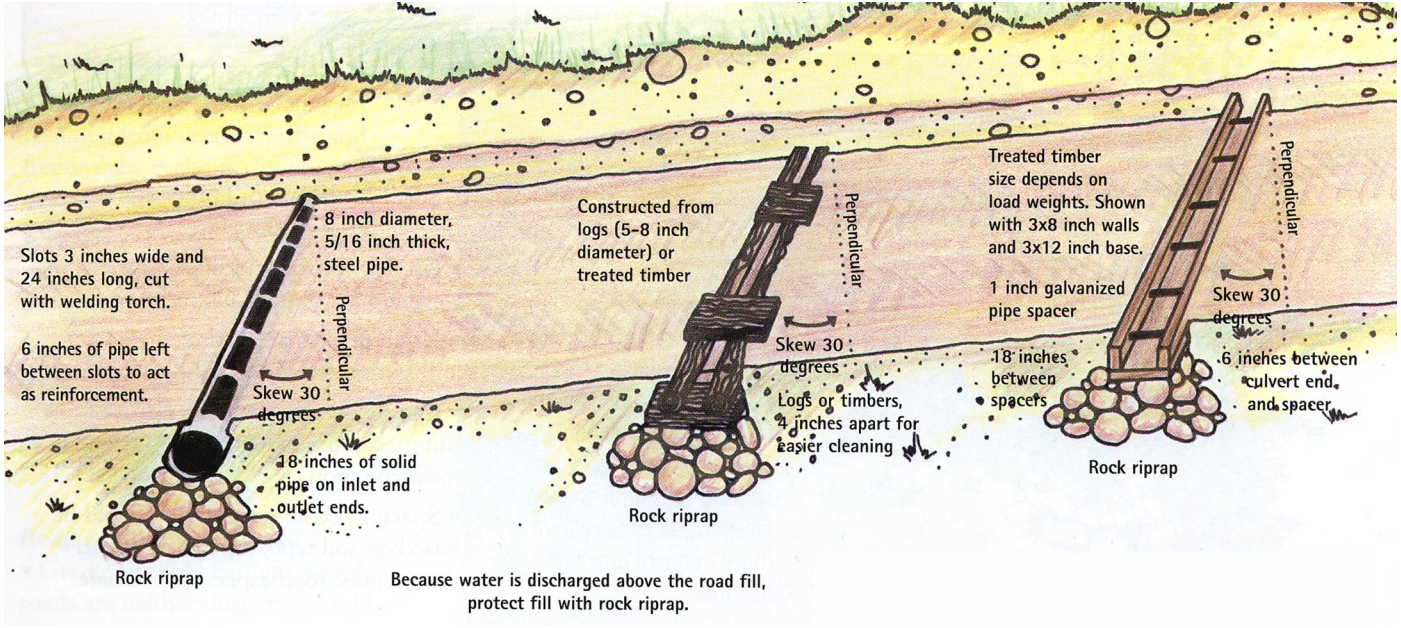
The "Hasty Method" involves three simple measurements, and provides a 100 percent safety factor, although it tends to overestimate necessary culvert sizes. First, measure the width of the channel at the bottom and the high water mark in feet. Next, measure the depth of the channel at the high water mark, also in feet. Then simply add the widths and multiply the height to obtain the cross-sectional area of the culvert needed. The culvert diameter can be found in Table 3.

***TABLE 3* CROSS-SECTIONAL AREA AND DIAMETER OF ROUND CULVERTS**

Area (sq. ft)	1.25	1.8	3.1	4.9	7.1	9.6	12.6	15.9	19.6	23.8	33.2	38.5	44.2
Diameter (in.)	15.0	18.0	24.0	30.0	36.0	42.0	48.0	54.0	60.0	66.0	78.0	84.0	90.0

Types of Culverts

Open top culverts can be constructed inexpensively from rough-sawn lumber or small logs. The culverts are installed at a 30 degree down grade angle and outsloped. Open top culverts should be considered a temporary measure since they will eventually rot.

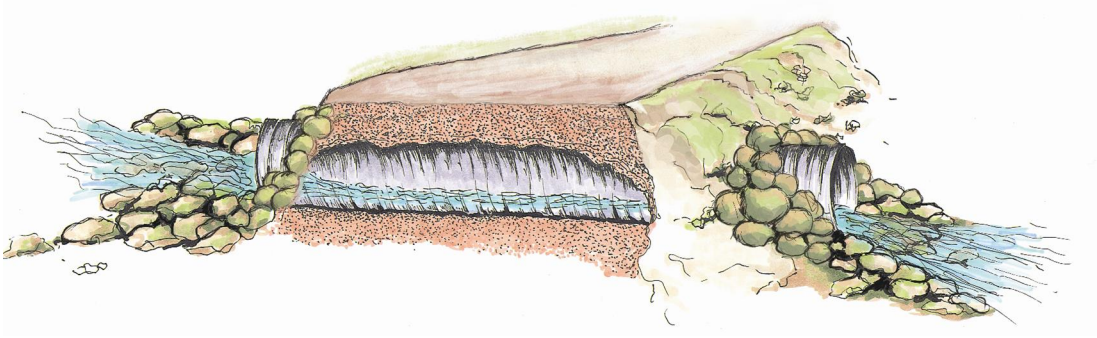


In addition, they require maintenance to keep them clear and keep the road surface even with the top of the culvert. A shallow gravel fill on either side of the culvert will lessen maintenance requirements. As with any cross drain, rocks and slash should be placed at the outlet to slow runoff and spread sediment. Size of the culverts, of any type, should follow recommendations in Table 3 (page 64). Care must be taken to disperse the discharge from these cross drains through vegetation. This practice is important in protecting streams and will also prevent erosion of fill material.

Seed cut and fill slopes with appropriate grass species. This is a very effective erosion control and road stabilization practice. District Offices (page 125) have lists of approved seed mixes and application rates. Mulching steep slopes with hay, straw or woodchips will provide temporary erosion protection and aid in the establishment of grasses by providing shade and reducing evaporation and soil moisture. It is recommended that the landowner or responsible person not start seeding between August 1st and November 1st due to the short growing season and the possibility of frost heaving after germination. Where possible, cover broadcast seed by raking or harrowing.

Implement erosion control practices as soon as possible during and after construction. Most erosion occurs immediately after disturbance when soil is freshly exposed. In addition, regular inspections should be made throughout construction to assure road design criteria are being met.

Culvert Installation



- The culvert must be long enough to extend at least one foot beyond the fill. This will prevent blockage of the culvert inlet and erosion of fill material at the outlet.

- Align the culvert exactly with the stream, on the existing grade, and at the depth of the streambed. The objective is to change the natural conditions of the stream as little as possible. If the culvert changes the direction of the stream flow even slightly, there will be increased channel erosion. If a culvert is installed at a steeper grade than the stream, it will accelerate the flow and cause erosion at the outlet. However, the grade must be steep enough to prevent sedimentation in the culvert.

- Culverts on fish-bearing streams must be installed to allow fish passage so as not to isolate populations. If a culvert is installed above the streambed, it will be undercut (picture to left) and all fill material may be eventually lost and fish passage is impossible.

- Fill should be well compacted to half the diameter of the culvert, and fill over the culvert should be to a depth of half the diameter but not less than one foot. Compaction will prevent water from seeping around the culvert and washing away the fill material. Fill over the culvert must be deep enough to prevent damage from heavy vehicles. If more than one culvert must be installed side by side, they should spread half their diameter so that the fill may be compacted between them.

- Protect the fill material around the culvert inlets and outlets with riprap. Deep fills or culverts on large streams may require more elaborate protection such as wingwalls constructed of concrete or gabions.

Road Maintenance

- Inspect newly constructed roads after the first good rain to insure all drainage structures and erosion control features are functioning properly. Gullies forming on cut and fill slopes should be filled in and the drainage formed. Corrective maintenance is easiest and least expensive to perform before road damage becomes great.

- Restrict or prohibit use of roads during wet periods, depending on the stability of the road surface. The ruts formed by use during these periods will concentrate water, accelerate erosion, and may seriously damage the road. In addition, logging costs are increased considerably in wet weather due to inefficiency and damage to roads.

- Grade the road surface as needed to correct washboarding and rutting. Maintain the proper inslope, outslope, or crown, and reshape grade dips. Ditches should be disturbed only if they are becoming clogged with sediment. Apply gravel to spots on the road that are persistently wet.

- Inspect drainage structures frequently. Culverts and ditches should be cleared of sediment and debris.

- Control livestock grazing in order to establish and maintain vegetation on cut and fill slopes.

- Application of chemicals to roads to reduce dust should be limited to those road sections where dust will cause major discomfort. Applications should be avoided where road runoff discharges into or near a stream.

Road Closure

Remove stream crossing structures on roads to be permanently closed. Culverts and bridges that are not maintained may become plugged with debris and will eventually cause fill material to be washed out, thus degrading the stream. If carefully removed, culverts can be reused at another site.

Outslope the road surface at least 5 percent. This will enable natural drainage pattern to become partially reestablished.

Construct water bars to divert runoff. Minimum legal spacing is found in Table 4 (page 70).

A water bar is most easily constructed with equipment by mounding soil from the skid trail or closed road surface 1 to 2 feet high at about a 30-degree downgrade angle. It must extend from the toe of the cut slope to the outside edge of the road. The water bar will divert water from the road and usually requires no subsequent maintenance.
Seed all exposed soil (see Requirements, Section 9, Standards beginning on page 22). The Division's District Offices (page 125) have lists of approved seed mixes and application rates. Ripping the compacted road surfaces aids in establishing the grass, but it should be done with discretion, as the loose soil is highly susceptible to erosion.

Prevent unauthorized vehicle access to closed roads by means of gates, large water bars, rocks, logs, or slash.

TABLE 4 **WATER BAR SPACING, MINIMUM LEGAL REQUIREMENTS**

ROAD GRADE (PERCENT)	0.0 - 4.9 %	5.0 - 9.9 %	10.0 - 14.9 %	15.0 - 24.9 %	25.0 - 40 %
WATER BAR INTERVAL	150 feet	130 feet	75 feet	50 feet	25 feet

TIMBER HARVESTING

Timber harvest planning is more than deciding how to cut trees. The harvest design must take into account the long-term effects of harvesting on fish, wildlife, water, and other resources.

When planning your harvest, consider the following:

- What is the best size and method of harvest to meet the management objectives?
- What are the effects of this harvest when combined with other activities in the same watershed?
- What are the potential effects of the harvest on water quality?
- Where are the slopes, drainages, streams, and other physical features located?
- Are there critical areas that will require special attention?
- How will the harvest affect fish and wildlife habitat?
- What kind of forest will be grown after the harvest? How quickly will the site be reforested?

Proper harvesting practices remove timber efficiently, protect site productivity and resources, provide for prompt regeneration with desirable species, and improve or maintain forest health.

HOW MUCH CAN BE CUT?

Each acre of land can support only a certain amount of tree volume in a healthy sustainable manner and is dependent on the site productivity and resources. This is referred to as optimum

stocking when managing for timber production. Stocking is a measurement of the amount of area trees take up in the forest and is described using the term basal area. Basal area (BA) for each tree is calculated by measuring its diameter at breast height (DBH). The BA of all the trees is added to calculate square-feet of BA per-acre, the total surface area occupied by trees on each acre. Figure X shows how BA is measured.

Each management objective is likely to have a range of BA/acre that should be targeted during thinning or harvests. The actual number of trees that can be cut to reach the target will depend on the sizes of trees that are on each acre. Table 5 lists the BA for trees of specific size DBH.

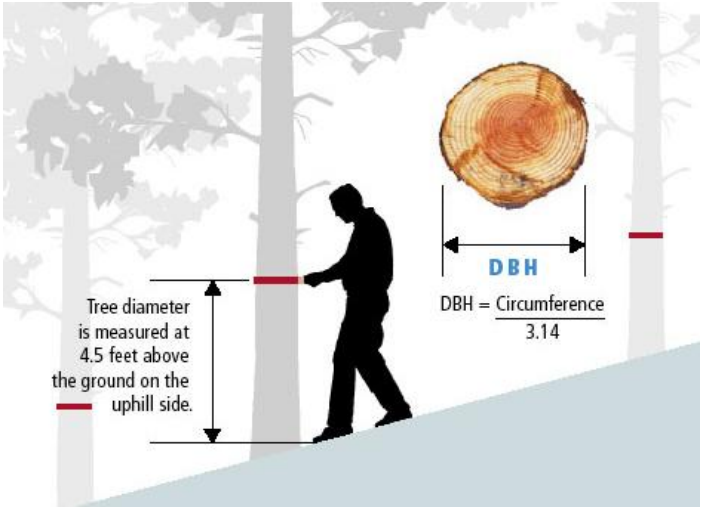


***TABLE 5* BASAL AREA PER TREE (SQ FT)**

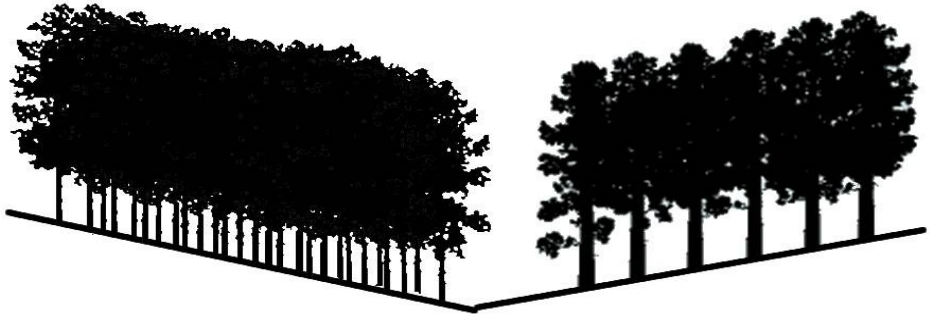
DBH	BA	DBH	BA	DBH	BA
6”	.20	24”	3.10	42”	9.60
8”	.35	26”	3.70	44”	10.60
10”	.55	28”	4.30	46”	11.50
12”	.79	30”	4.90	48”	12.60
14”	1.10	32”	5.60	50”	13.60
16”	1.40	34”	6.30	52”	14.80
18”	1.80	36”	7.10	54”	15.90
20”	2.20	38”	7.90	56”	17.10
22”	2.60	40”	8.70	58”	18.30

THINNING

Thinning is a silvicultural practice whereby some of the trees in an immature stand are removed in order to stimulate the growth of the remaining trees. Thinning redistributes nutrients and increases growth in the stand by providing more moisture and sunlight to the remaining trees.

There are many economic reasons why thinning should be used as a forest management tool.

- An increase in yield from greater tree growth is realized in future harvest.
- Some income can be realized at the time of thinning from the sale of material that has been removed from the stand. This material can be used for vigas, fence posts, fuelwood, cabins, furniture, biofuels, etc.
- Undesirable trees due to genetics or species can be removed, greatly enhancing the stand composition.
- Thinning can return ecosystem function to overcrowded forests, which can result in understory development, thus improving the forage for domestic animals, and providing habitat and food for wildlife.
- To reduce the risk of uncharacteristic fire.



Leave Tree Considerations Before cutting begins; the trees to be left should be marked. Proper spacing is important, but you should not leave a poor tree and take out a good one just for the sake of spacing. Spacing should be adjusted to accommodate a quality tree. Your local District Office can assist or train you in marking the trees to be left. Several factors should be considered when determining which trees to leave. Figure 9 demonstrates a young stand of ponderosa pine before and after thinning. Defective and suppressed trees should be removed to make room for the more vigorous trees.

- The first of these is the relative position of the tree and condition of its crown. The tree should have a well-developed crown and healthy looking foliage. It should not have a broken top.
- The "leave" tree should be free from insects and disease.
- The bole (trunk) on the "leave" trees should be straight, free from excess taper, free from large, bushy limbs, and have no evidence of biotic or mechanical damage.
- The spacing between "leave" trees is dependent on management objectives and forest types.
- Be careful not to damage the "leave" trees while felling those trees that are being cut.

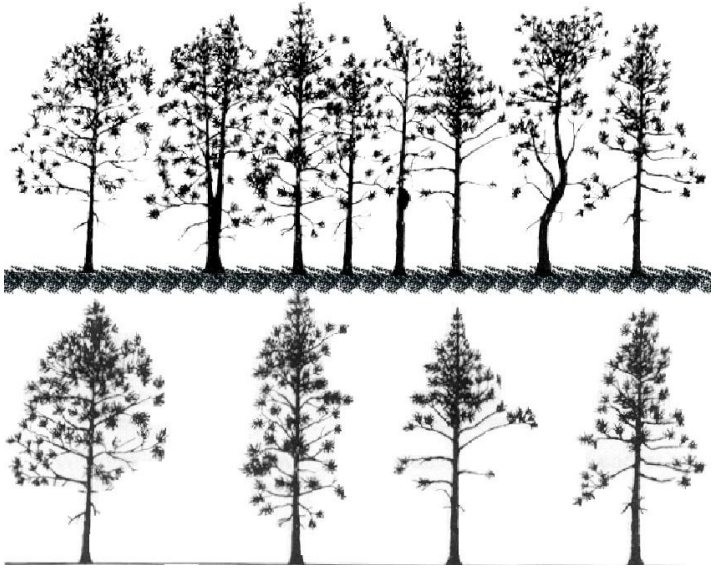


Figure 9.

- Keep your stumps low. Half the diameter of the tree where severed or 12 inches, whichever is less.
- Large slash should be moved away from the base of the tree, as it is breeding ground for harmful insects, and potential fuel for a fire.
- Slash should be spread out, with a maximum height not to exceed 36 inches; maximum of 24 inches within a quarter-of-a-mile from a structure. In high fire danger areas it may be necessary to remove slash completely, chip or masticate. Chips cannot exceed 2 inches in depth. Masticated material cannot exceed 6 inches in depth.
- If slash is placed in piles to be disposed of by burning, the piles should be located in large openings. This will prevent damage to the "leave" trees from excessive heat. To be manageable, slash piles should not be larger than 4 feet high and 6 feet in diameter and free of mineral soil for proper ventilation.

The nearest District Office (page 125) can provide a list of thinning contractors.

HARVESTING SYSTEMS

The harvesting method needs to be selected to meet environmental constraints, and should reflect the ultimate objectives of the landowner. The selection of the method to be used depends on the timber type and the terrain involved. Harvesting methods commonly used in New Mexico are Patch Cut, Seed Tree, Selection, and Shelterwood. It is recommended that you contact the nearest District Office (page 125) to help you select the method which will work best to meet your harvesting objectives. Below are considerations for each method.

Patch Cut

The patch cut method is an even-aged method that removes all of the trees in a given area and the area is artificially or naturally reforested. This method is usually applied to tree species which become established and grow well in conditions of full light exposure and which can develop well in even-aged stands such as Engelmann spruce and aspen.

Considerations:

- Reforestation should begin as soon as possible after the harvest, otherwise the open spaces created by the cut may become occupied with unfavorable vegetation and future reforestation may be difficult.
- From the aesthetic standpoint, patch cuts may be unsightly. To help avoid this, cut in irregular shaped patches so that the cutover areas blend with the natural variation of the forest stand.
- Be sure to locate cutting boundaries to minimize blowdown of the remaining trees in the forest. High risk blowdown areas include ridgetops, saddles in ridges, wet creek bottoms, and the upper steep south and west facing slopes not protected from the wind.
- Patch cutting in ponderosa pine is generally unacceptable unless conversion to pasture is desired or it is prescribed by a professional forester to control problems such as mistletoe outbreaks, etc.

- Patch cutting is generally not recognized as the primary method of cutting mixed-conifer stands (a mixture of ponderosa pine, limber pine, Douglas-fir, white fir, and some Englemann spruce).
- Patch cutting is generally the most desirable way to cut the spruce/fir type (a mixture of Engelmann spruce, sub-alpine fir and corkbark fir). Keep the patches less than 20 acres in size. The width of the patch should not exceed four times the height of the stand. In many cases spruce-fir have grown in patches that can be removed entirely.
- Since aspen need plenty of light to regenerate, patch cutting works very well for this species. The aspen seedlings sprout from suckers, which are shoots that come up from the root system of the previous stand. When the overstory is removed, by fire or harvest, the shoots are stimulated to grow and soon occupy the clearing. Elk fencing may be required to encourage regeneration.

Advantages:

- It allows the full use of all the trees in the area that are harvested, thereby increasing profit per acre at the time of harvest.
- It allows more economical logging methods to be used.
- It assures uniform spacing, full site utilization, and prompt establishment of a new stand if seedlings are planted.
- It allows the use of genetically improved seedlings and the opportunity to select the species to be grown.
- It cuts down on management operations and costs.
- Only the cutting boundaries have to be marked, not every tree which is to be cut.

Disadvantages:

- It can require a direct cost outlay for planting and possibly site preparation, which is not required when a system with natural regeneration is used.
- There are longer intervals between timber sales than with other harvesting methods.
- Care should be taken on areas where erosion could be a problem, such as on steep unstable slopes and near streams.
- The seedlings have to withstand greater environmental extremes, since there is no parent forest to protect them. These extremes include hot and cold wind, greater variations in ground temperature, and exposure to direct sunlight.

Seed Tree

When using the seed tree method, which is designed to establish an even-aged stand, all merchantable trees are harvested, except enough trees to provide adequate seed (6 – 10 per acre), which are left for the purpose of furnishing seed to restock the area naturally. The seed trees that are left should be a species which you desire to restock the stand. Also, the seed tree should be a healthy specimen which will improve the chances that the reproduction will be good quality. The seed trees are normally removed after an adequate amount of reproduction reaches the height of about three feet.

Considerations:

- Seed trees that are selected should be free from insects and disease, have high vigor, and indicate past productivity. Past productivity can generally be measured by observing the number of old cones underneath the tree.

- Since ponderosa pine requires a lot of sunlight to grow, the seed tree method is sometimes successful. The seed trees selected should be at least 12" in diameter. However, a problem lies in the fact that good seed years in which there is adequate soil moisture are not very frequent and impossible to predict.
- In the mixed-conifer type, the seed trees selected should be at least 10" in diameter. The seed tree method should not be used however, if there is a good chance that the seed trees will be subject to blow down, due to windy conditions.

Advantages:

- The cost of site preparation is lower.
- The cost of planting may be eliminated.
- It allows an economical method of logging while insuring an adequate seed source.
-

Disadvantages:

- The seed trees may blow down.
- Stocking levels and spacing between seedlings cannot be controlled, thereby making an early thinning necessary.
- The seedlings that become established in the understory can be damaged or killed while trying to remove the seed trees.
- Some of the best lumber producing trees must be left for a seed source, and the subsequent removal of the seed trees a later date is sometimes difficult or impossible to do because of the high cost of logging small volumes of timber per acre.
- A fair to good seed year with an adequate amount of soil moisture is necessary in order for the seeds to grow and sprout.

Selection

Using a selection method, timber is removed in small groups or by individual trees. This system is designed to create or maintain uneven-aged stands in which there are at least three distinct age classes. The selection system is inherently better at promoting regeneration of trees which are tolerant to shade and at protecting residual trees and new seedlings from climate challenges.

Considerations:

- Only the trees that are to be cut are marked.
- In especially windy areas with high risk of blow-down, the groups to be cut can be arranged in strips with each strip representing an age class older than the one before it.
- The selection system works well in uneven-aged ponderosa pine stands. Over-mature groups should be harvested and the area usually will regenerate naturally. Immature groups should be cut lightly to remove defective trees and to improve spacing. The patches created should range from one-half to one acre
- In ponderosa pine stands, the single-tree selection system, where individual mature trees are removed, is used more frequently than the group selection method. Success
- depends on progressively enlarging the openings through subsequent cuttings.
- In mixed-conifers, the selection system helps prevent the residual trees from blow down, where the danger of high winds exists. Keep the patches, created by group selection, no wider than the stand height. Generally, remove 20 to 30 percent of the stand in the initial cut. After 5 to 10 years, remove 20 to 30 percent again. Wait until the seedlings reach a height of two to three feet to make the last cut.
- In spruce-fir types, individual selection is generally not recommended. This is due to the high cost of logging and the damage imposed on the residual trees. Group selection can be used, however, the same precautions mentioned for patch cutting in the spruce-fir type should be observed.

Advantages:

- It provides a sustained yield (harvests of near equal volume at regular intervals).
- It provides more stable environmental conditions by providing continuous cover from the wind and sun. The soil retains more moisture. The reproduction is less subject to temperature extremes which would be found in larger openings created by other cutting methods.
- Using the selection system, there is less risk of losing the entire stand at once. This is because the selection system creates several different age classes and most insects and diseases do not attack all age classes of a given species at the same time. Therefore, there is always an adequate seed source to regenerate the stand.
- The selection system produces a forest that is more picturesque. Small natural openings are created by the group selection method. Under the individual selection method, the forest is opened up and is more accessible.

Disadvantages:

- More management operations are needed, since harvesting is spread out over time.
- There is greater expense and trouble in harvesting, because the same area must be visited several times to remove the merchantable wood, and care must be taken to protect the residual stand.
- There is usually some damage to the residual stand.
- The system can perpetuate dwarf mistletoe.

Shelterwood
The shelterwood method involves the gradual removal of the entire stand in a series of partial cuttings which may extend over the entire rotation. The cuttings usually resemble heavy thinnings, and natural regeneration usually follows.

In the shelterwood method, as its name implies, reproduction is established under the shelter portion of the old stand. The first cuttings create openings in the growing space of the stand in which the new crop can become established. A time arrives when this shelter becomes a hindrance rather than a benefit to the growth of seedlings. The remainder of the older stand is removed giving the new stand possession of the area.

The regeneration process is usually accomplished within a relatively short period of time. Where adequate reproduction has become established as a result of the natural opening-up of old-stands, a single cutting may be sufficient. Normally, the shelterwood method requires a minimum of two cuttings. Regardless of the number of cuttings, the largest, most vigorous, and best-formed individuals of the species you desire are left until the final cutting.

Considerations:
The sequence of operations may involve three different kinds of cuttings.

Preparatory Cutting: If natural reproduction is to start under an old stand, a supply of seed must be available. Site conditions must be favorable for germination of seed and establishment of seedlings. It is sometimes necessary to carry out preparatory cuttings to encourage the development of thrifty seed bearers, or to accelerate decomposition of humus layers.

Seed Cutting: The purpose of seed cutting is to open up enough growing space in a single operation to allow the establishment of seedlings.

Seed cutting should be done during a heavy seed year. Otherwise, undesirable vegetation may become established after the cutting. The best time of the year for this cutting comes after the seed has matured and before it germinates. The trees removed in the seed cuttings are the least desirable remaining in the stand.

Removal Cutting: Removal cuttings gradually remove seed trees after regeneration is established. The objective of this process is to ensure that a new crop fill the growing space as fast as the old crop relinquishes it. The shelterwood method is the best natural regeneration method for ponderosa pine in the Southwest.

Advantages:

- Reproduction is generally more certain and complete than with the seed-tree method because of the more abundant seed source and protection against damaging agencies provided by the overstory. The fact that the main harvest cuttings follow rather than preclude the establishment of reproduction is an important safeguard.
- The largest, best-formed trees are retained until after regeneration has been established.
- The average length of rotation may be shortened because one even-aged crop starts before the preceding one is harvested.
- Growing space is more fully utilized during the regeneration period than with other methods, so there is less loss of potential wood production.

- The accelerated growth of the overstory after seed cuttings enables trees of large diameters to put on growth more rapidly than in closed stands
- The method is superior to all others except the selection method with respect to protection of the site and aesthetic considerations.

Disadvantages:
- Logging may damage residual trees. Remaining trees also impede harvesting and site preparation.
- The method can be applied intensively only if there are markets for trees of small size or poor quality.
- The cost of logging is greater than when all the trees are cut in a single operation.

HARVESTING OPERATIONS

The type of harvesting operation you choose should be adapted to the site and be the most cost-effective. Choose what is best for protecting the resources, such as soil, water, fish and wildlife.

Ground-based:
Typically used on gentle terrain, on soils not wet or easily compacted, and in areas that accommodate good road access. Ground-based systems are generally used on slopes under 40% and for skidding distances less than 500 feet.

Rubber Tire Skidder: Single task equipment (only pushes or pulls logs) generally faster and less expensive than tracked skidder, can cause excessive soil damage in wet conditions.

Feller-buncher: A mechanical harvester that moves through the forest and harvests trees and piles them. They can reach into sensitive areas and thin individual trees with minimal damage to remaining trees, water, soil, or wildlife habitat.

Fully-Mechanized Harvesting Systems: Performs entire process (cutting, forwarding, bucking etc.) and requires fewer people to conduct harvesting operation.

MECHANICAL HARVESTING

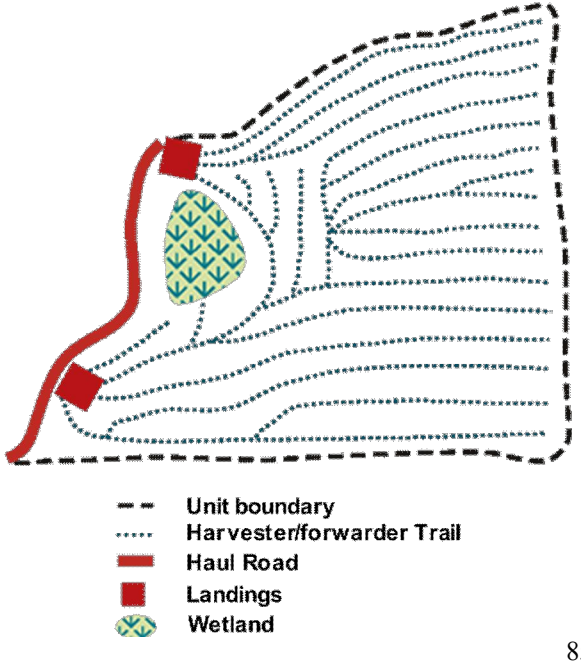
CUT-TO-LENGTH HARVESTING

The processor severs, delimbs, and cuts trees into logs that are sorted and stacked in the forest. The fowarder picks up the logs in the forest and transports them to trucks.

Advantages:

- Leaves slash (tree branches and tops) in the forest for nutrient cycling.
- Minimizes the need for access roads and log landings.

Typical Cut-to-length Harvest Layout



Topography Considerations

- Limited to terrain with less than 40 percent slope.

Soil Considerations

- Preferred system where soils are susceptible to compaction.
- Minimizes soil disturbance by confining machines to designated trails.
- Slash stays in the forest and acts as fertilizer.

Forest Stand Considerations

- Efficient method for commercial thinning.
- Moves short logs out of the forest rather than long logs.
- Useful for reducing wildfire hazard.

Equipment Used

- Tree processor
- Forwarder

Slash Disposal

- Slash is handled efficiently by the carpet of slash left by the processor.
- Usually complies with slash hazard requirements without additional treatment.

Reforestation Considerations

- Preferred in stands where additional tree seedlings are not wanted.

Economic Considerations

- Fewer roads may reduce overall harvest costs.
- This machinery is expensive and availability may be limited.

WHOLE TREE HARVESTING

A feller-buncher cuts and piles small bundles of trees. A tractor or grapple skidder drags the tree bundles to the landing with limbs and tops attached to the stem.

Advantages

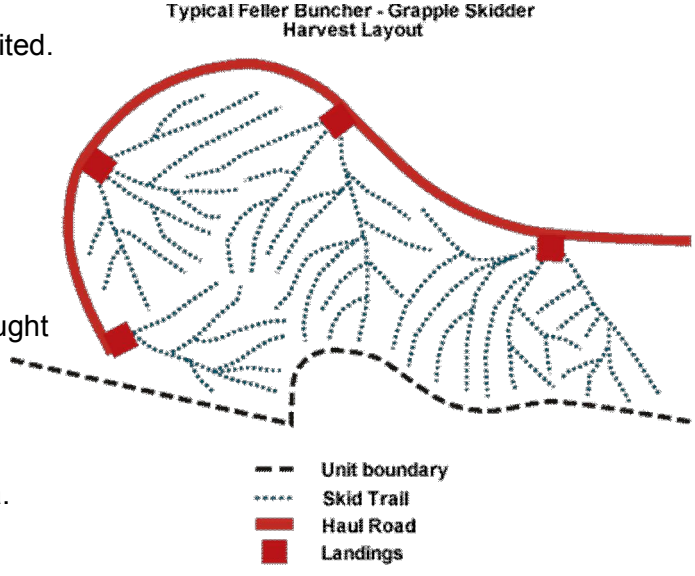
- Slash (tree tops, limbs, or rotted portions of logs) is brought to the landing or roadside where it is piled.

Topography Considerations

- Can be used on slopes up to 40 percent.
- Haul roads are usually at the bottom of the logging area.

Soil Considerations

- Potentially more soil disturbance than cut-to-length harvesting.



- Machines cover a greater portion of the area as they cut, stack, gather, and drag whole trees to the landing or roadside.
- Skid trails may become trenched and compacted from repeated use.

Forest Stand Considerations
- Efficient method for stand conversion without clearcutting.
- Potential damage to residual stand.

Slash Disposal
- Slash piles are burned later at a convenient time.
- Sometimes slash is returned to the forest and distributed for nutrient cycling.

Reforestation Considerations
- Dragging tree bundles leaves a seedbed for natural seeding.

Economic Considerations
- Operating on steeper ground raises the harvest cost.
- Longer skid distances increase costs.
- Bunching trees reduces costs for handling small diameter trees.

BMP Locate skid trails to avoid concentrating runoff and provide breaks in grade. Locate skid trails and landings away from natural drainage systems and divert runoff to stable areas.

BMP Limit the grade of constructed skid trails on geologically unstable, highly erosive, or easily compacted soils to a maximum of 40 percent. Use mitigating measures, such as waterbars and grass seeding, to reduce erosion on skid trails.

BMP Tractor skid when compaction, displacement, and erosion will be minimized. Avoid tractor or wheeled skidding on unstable, wet, or easily compacted soils and on slopes that exceed 40 percent unless operation can be conducted without causing excessive erosion. Avoid skidding with the blade lowered. Suspend leading ends of logs during skidding whenever possible.

BMP Ensure adequate drainage on skid trails to prevent erosion. On gentle slopes with slight disturbance, a light ground cover of slash, mulch, or seed may be sufficient. Appropriate spacing between waterbars depends on the soil type and slope of the skid trails. Timely implementation is important.

BMP When existing vegetation is inadequate to prevent accelerated erosion before the next growing season, apply seed or construct waterbars on skid trails, landings, and fire trails. A light ground cover of slash or mulch will retard erosion.

CABLE YARDING HARVESTING

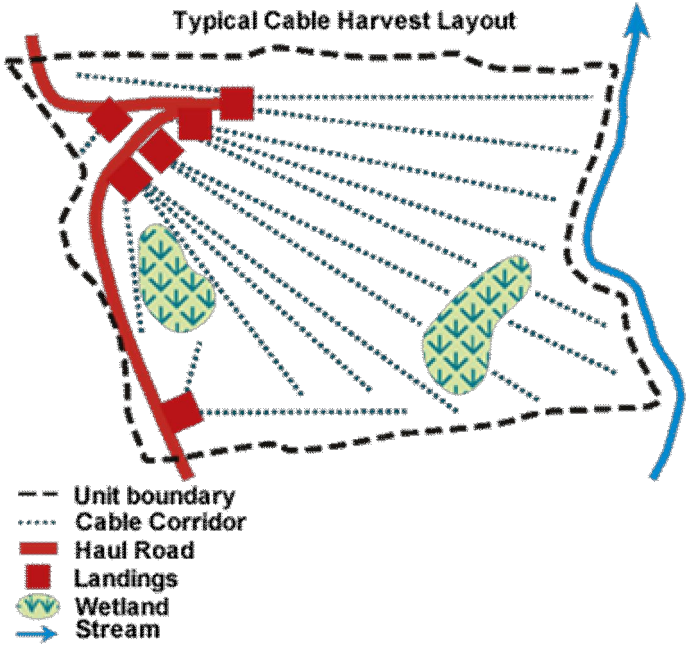
Cable systems are generally used on steep or broken topography, or on soil that is wet or easily compacted, where ground–based systems would be too damaging or unusable. Cable systems partially or completely suspend logs above the ground, protecting streams, unstable slopes, and riparian areas. Cable systems are typically used on slopes over 40% with yarding distances approximately 1000 feet.

Advantages

- Allows harvesting to occur on steep ground.
- Eliminates need for skid trails.
- Haul roads are usually at the top or the logging unit.

Topography Considerations

- 40 percent slopes and greater.
- Concave slopes allow more cable deflection and greater system efficiency.



Soil Considerations

- Significantly reduces soil compaction and disturbance.
- All equipment is confined to roads.

Forest Stand Considerations

- Used in partial cuts and clear cuts
- Difficult for commercial thinning.
- Difficult to reach sideways from the cable corridor.

Equipment Used

- Cable yarder
- Log loader
- Chainsaw

Slash Disposal

- More complicated than other systems.
- If clearcut, may require broadcast burning.

HELICOPTER HARVESTING

Aerial logging systems, while expensive, can be cost-effective in areas with extremely steep, sensitive, unstable, and uneven terrain where road construction and standard harvest methods could damage resources.

They are typically used on slopes 40-100%, and with yarding distances up to 5000 feet. Aerial logging systems are also used for high-value selective logging and in areas where the appearance of the landscape is especially important.

Advantages

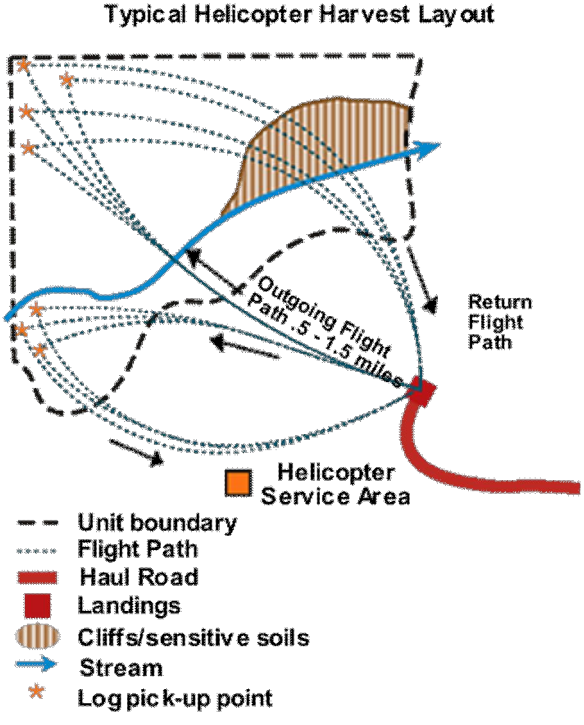
- Ability to harvest visually sensitive areas or areas that cannot be harvested with other systems. Areas with high recreational use, special wildlife habitat, riparian/wetlands, and geologic hazard locations are common.
- Slash (tree branches and tops) remains in the forest.
- The number of miles of roads may be reduced.

Topography Considerations

- It can be used on any type of terrain.

Soil Considerations

- Preferred where soils are susceptible to compaction.
- Minimizes soil disturbance because logs are fully suspended.



Forest Stand Considerations

- Efficient, but costly, method of commercial thinning.
- Weight of logs that a helicopter to safely lift is a limiting factor.
- Need large landing.
- Works well to reduce wildfire hazards.

Slash Disposal

- Typically, lop and scatter is used to reduce fire hazard. If inadequate, additional methods may be necessary and will be very costly due to no road access.

Reforestation Considerations

- Ground scarification during harvest is minimal and may not be adequate for successful natural regeneration.

Economic Considerations

- Fewer roads are needed.
- Sophisticated machinery used and larger crew size typically results in costs 3 to 4 times more than ground-based systems.
- Higher cost can make entire sales uneconomical when log markets are depressed.

BMP Minimize the number of landings to accommodate safe, economical operations.

BMP For each landing provide and maintain a drainage system to control the dispersal of water and to prevent sediment from entering streams.

MANUAL HARVESTING

Advantages
- Adaptable to smaller harvest locations.
- Generally less costly equipment.

Topography Considerations
- Can be used on slopes up to 40 percent.
- Haul roads are usually at the bottom of the logging unit.

Soil Considerations
- Designated skid trails confine machines to predesigned locations and reduce soil disturbance.
- Multiple trips on the same skid trail can result in a trench.
- Soil disturbance can be minimized by widely spaced skid trails. This requires hand pulling or a winch line to reach logs that are farther from the skidder.

Forest Stand Considerations
- Gives maximum flexibility to a variety of stand management goals.

Equipment Used
- Chainsaw
- Log skidder
- Log loader

Slash Disposal

- Allows for lop and scatter of slash in the forest.
- Alternatives to lop and scatter are more complicated; could involve pile and burn.

Reforestation Considerations

- Results in ground scarification, creating locations for natural regeneration or hand planting.

Economic Considerations

- Often more labor intensive.
- Generally, more roads are necessary.

BMP Design and locate skid trails and skidding operations to minimize soil disturbance. Using designated skid trails is one means of limiting site disturbance and soil compaction.

BMP Consider the potential for erosion and possible alternative yarding systems prior to planning tractor skidding on steep or unstable slopes.

WINTER LOGGING PRECAUTIONS

Winter logging on frozen ground is one way to avoid soil, watershed, and riparian and wetland damage. However, there are potential problems with winter logging.

1. Failure to mark riparian and wetland areas prior to snow cover may result in damage when operating unknowingly in these areas.
2. Failure to install adequate erosion control prior to spring runoff; i.e.drains should be punched in snow berms as the road is plowed.

WINTER LOGGING TIPS

Compact skid trail snow before skidding logs. This avoids damage to soils that may be wet or not completely frozen. **SMAs** can be totally obscured by heavy snow. Avoid confusion by marking boundaries before the first snow.

Winter thaws may occur. Don't take chances with soil compaction, rutting, and possible erosion. Expect temporary shut downs.

BMP Conduct winter logging operations when the ground is frozen or snow cover (generally more than one foot) to prevent rutting or displacement of soil. Be prepared to suspend operations if conditions change rapidly and when erosion hazard becomes high.

BMP Consult with operators experienced in winter logging techniques.

BMP Consider snow-road construction and winter harvesting in isolated wetlands and other areas with high water tables or soil erosion and compaction hazards.

BMP In wet unfrozen soil areas, use tractors or skidders to compact the snow for skid road locations, but only when adequate snow depth exists

SLASH TREATMENT

Slash is the accumulation of branches, treetops, and other woody debris usually associated with a timber harvest or thinning project. Slash can be either beneficial or detrimental to the productive ability of the site. It depends on how much slash has accumulated and what kind of timber species grows on the site. Usually, the disadvantages outweigh the benefits, and some kind of slash treatment is needed.

Disadvantages:

- It is a potential forest fire fuel, especially when the needles and small twigs are still attached to the branches.

- Slash accumulations can be an impediment when trying to construct fire lanes and fire breaks.
- Heavy accumulations can hinder the establishment and growth of most new seedlings by covering them with shade.
- It can cause serious build-ups in bark beetle populations, which like to live in freshly cut slash and timber.
- It is unsightly, especially along roadways and near population centers.
- It can be restrictive to livestock and wildlife in their grazing.

Advantages:

- The shade provided by moderate amounts of slash can be helpful in protecting seedlings from intense sun, wind, and temperature extremes. It can help tree species that need shade (such as Engelmann spruce and sub-alpine fir) to become established.
- It can help conserve the moisture in the soil.
- It increases the organic material in the soil when decomposed. However, this is a very slow process in New Mexico.
- Can be small animal habitat or used as fence rows to protect saplings in aspen patch cuts from over grazing by elk.

There are several ways to treat slash. Each method should be considered in relation to the slash problem at hand. If you are not sure of what method to use, consult the nearest District Office (page 125) for assistance. The following methods may be used to treat slash.

Lopping and Scattering

Lopping and scattering means slash is cut up into manageable pieces and scattered on the ground. This eliminates heavy slash accumulations. Slash height must follow Requirements in NMAC 19.20.4.9 (page 22).

Considerations:

- It gets the slash closer to the ground to aid in decomposition.
- Also, a fire does not burn well with slash near the ground as compared when heavy accumulations are stacked up with a lot of air space.
- It requires hard physical labor.

Chipping

Chipping slash requires the use of a chipping machine and hand labor. Slash is fed into the machine by an attendant, and is ejected as chips. It should be used where it is necessary to be rid of the slash, and where the cost of the machine and the labor is justified, such as along highways, near population centers, and near high use areas. Chip depth must follow Requirements in NMAC 19.20.4.9 (page 22).

Piling and Burning
Slash can be piled with a bulldozer equipped with a rake attachment or it can be piled by hand. These piles can then be burned when the slash has dried and favorable burning conditions are met. State and local burning regulations must be checked and must follow Requirements in NMAC 19.20.4.9 (page 22).

Considerations:
- Some small piles can be left unburned as wildlife habitat (1-3 per acre).
- It is most economical in the flat forest areas such as in the ponderosa pine type.
- Unburned windrows of slash can provide seedlings with protection from the elements.

Prescribed Fire
Fire can be used as economical tool to reduce slash in a thinned stand or after a timber harvest operation. Fire is also used to clean brush and debris from the forest floor, reduce over stocked stands, and manipulate plant cover for grazing and for wildlife purposes. When fire is used to burn only the spots where the accumulations of slash are heavy, it is termed spot burning. When entire areas are burned, this is termed broadcast burning. Broadcast burning usually results in all slash and ground vegetation being burned, including small established seedlings. However, the mineral soil is usually exposed, and this is good for new seed germination and seedling establishment.

BMP An unburned buffer strip at least 100 feet wide should be provided between prescribed burn areas and all bodies of water to reduce surface runoff into these areas.

Several variables directly affect the success or failure of a prescribed burn, and each must be separately considered before a prescribed burn can be applied. It takes the knowledge of a professional to determine how and when the fire should be applied. The nearest District Office (page 125) can provide information regarding prescribed fire.

The important factors which a forester considers concerning a prescribed fire include:

- Fuel Moisture. This influences ignition, flame propagation, and fire intensity.
- Vegetative condition. Is it green, growing, cured, or curing, or is it dormant?
- Fuel physical characteristics. What are the volume, size, arrangement, and continuity of the fuel?
- Fuel chemistry. The chemistry and the respective flammability vary from plant to plant.
- Weather. There are too many variables to mention here, but some of them include the windspeed, the relative humidity, and temperature. The weather variables all must be within a certain range before a prescribed fire should be ignited.
- Air quality controls. Are there local regulations concerning burning and air pollution within your area, besides the federal and state regulations already established?

REFORESTATION

When forest land is depleted, either by timber harvesting, wildland fire, insect outbreaks, or any other reason, it is usually in the best interest of the landowner to insure that new trees become established. The establishment

of these trees is called reforestation. Reforestation efforts vary slightly depending on the quality of the land and the way it was depleted. The three ways to reforest an area are:

- **The natural seeding method,** which is incorporated into a harvesting system, where trees are left to produce seeds which sprout and grow. This method was discussed under the Harvesting for Regeneration section.

- **The artificial seeding method,** in which seeds are spread on the ground by hand or from aircraft.

- **Seedling planting**, which is usually successful; although success depends on following the correct planting procedure.

The benefits from reforestation are many. When you plant trees, you are making a long-term investment. Someday the land, which otherwise could be barren and fruitless, will produce valuable forest products. Forested lands usually enhance aesthetic and recreational values. Also, forested land stores and filters water better than barren or grassed land and minimizes erosion.

Site Preparation

There are many factors that affect a successful reforestation attempt. The first of these to consider is preparation of the site, to create a favorable environment for the seedlings to grow. The site should be reforested soon after the harvest because with the passage of time competition from weedy vegetation increases. Also, the nature of the topsoil changes due to erosion and direct exposure to the sun, thereby

making reforestation more difficult. Slash treatments may be needed as part of the site preparation effort (See the Slash Treatment Section).

Brush control may be needed to eliminate competing vegetation which may occupy the site, overtop seedlings, and draw moisture and nutrients from the ground.

- **Chemical herbicides** are efficient and economical for this purpose; however, their use can be dangerous, so a trained licensed professional should be consulted prior to use. Contact the nearest District Office (page 125) or the New Mexico Department of Agriculture for information and assistance.

Mechanical methods may also be employed to eliminate brush. A bulldozer with a rake attachment is an effective mechanical method for removing brush, for getting roots out of the ground, and for breaking up compacted soil. Hand tools such as a mattock, pulaski, shovel, or hoe, can also be used. However, hand tools require hard manual labor, which may make this method more expensive than other methods.

Planting

Acquiring Tree Seedlings The first question is, "Where do I get tree seedlings?" The seedlings planted should be grown from a local seed source so they will be genetically compatible with the area they are to be planted. This will insure maximum survival and growth. Acquiring the correct seedlings involves the professional services of many individuals to collect seed and process, germinate and produce healthy growing seedlings. You should contact your local District Office (page 125) for information on the New Mexico Conservation Seedling Program. You may also visit us at our website at http://www.nmforestry.com. No

planting project should ever be undertaken unless advance planning has been completed to determine objecteives, desired species, planting methods and spacing.

Typically two types of seedling stock may be available from which you can choose:

- **Bareroot seedlings,** which have no soil on their roots and must be handled during their fall and winter dormant period.

- **Containerized seedlings,** which come in containers with their roots embedded in a soil plug. These seedlings do not have to be planted during the dormancy period. They are more expensive than bareroot stock. However, their survival rate is usually better, particularly in the drier forest regions of the Southwest.

Handling and Care of Seedlings
Seedlings are fragile living things and must be handled carefully, especially bareroot stock. Mistreatment of any one step, from the nursery until they are in the ground, could mean high seedling mortality. The following handling tips apply primarily to bareroot stock:

- If the seedlings are to be stored prior to planting, even for a day or two, they must be kept cool and moist. This means a temperature of 35° F and a relative humidity of 90%. A home refrigerator is a good storage device, provided the seedlings are kept moist.
- Handle the seedlings gently. They should be separated from one another carefully so that the entangled roots are not torn. Tearing the small root hairs can subject them to fungal infections.

- Keep them out of direct exposure to the sun and wind. The seedlings can dry out and die within minutes if so exposed.
- There is more flexibility with containerized stock. Since they are already growing from a soil plug, they do not have to be dormant when planting. Successful plantings in the drier regions of the state have resulted from planting containerized seedlings. However, as with bareroot seedlings, there must be adequate ground moisture or the seedling will not survive. Supplemental watering may be necessary to ensure survival during the first three years. Care should be taken to ensure the roots are not circling the root ball. Cut off any circling roots to the nearest straight section.

Season to Plant
Seedlings must be planted at the proper time or they will not survive.

Bareroot seedlings do the best when planted in the spring from April to May. This corresponds to the time when the ground is thawing and the seedling is dormant (before the buds begin to swell and grow). Spring planting projects should start with the south facing slopes because these slopes will thaw first and be ready for planting earlier.

Fall planting should be avoided, however, because the seedling roots generally do not have an adequate chance of becoming established, and are susceptible to frost heaving. North slopes should be planted first as they are first to freeze. Frost heaving is usually worse in compacted soils and results from successive freezing and thawing of water in the first few inches of soil. Ice crystals form during the nighttime hours, forcing the soil and the seedling upwards. Thawing during the daytime allows the soil to settle back to its original height, but the seedlings do not. If it is necessary to plant in the fall, do so in the months of November and December.

This is when the new buds have hardened off and the plant has entered dormancy. Fall rains should have wet the soil to at least a foot in depth.

Containerized seedlings can be planted in the spring during the months of March through May and in the fall between mid-September and mid-October. Planting should begin earlier in the southern part of the state at lower elevations during the spring and begin later in fall. Deciduous species shouldn't be planted in the fall, especially at high elevations (above 6500 feet), but conifers planted at higher elevations in mid September and early October have good survival rates.

Spacing
Seedlings need enough room to grow without competing with one another, however, there must be enough trees planted to insure complete re-forestation.

This means there should be proper spacing between the seedlings, usually about 8 to 10 feet apart or 400 to 600 trees per acre. Spacing can vary based on the shade tolerance / light needs of the seedlings. More shade tolerant trees can usually be planted closer together and some even require more shade to protect them from heat damage.

Spacing Guidelines
6ft. x 8ft. = 907 trees/ac | 8ft. x 8ft. = 680 trees/ac | 9ft. x 9ft. = 537 trees/ac | 10ft. x 10 ft. = 435 trees /ac

If your site is poor and you expect numerous trees to die, plant them a little closer together to insure that the number that survive per acre will be adequate to reforest the area. In general, the higher, wetter elevation

sites, where the spruce and fir grow, may be planted more densely than in the lower, drier elevation pine sites. To determine whether you are planting on a poor or good site, check with the nearest District Office (page 125).

Machine Planting
Machine planting is much faster and more economical than hand planting; but, planting machines can only be operated on moderate slopes free from large rocks, stumps, and excess slash. A machine can plant from 750 to 950 seedlings per hour. There are many types of mechanical tree planters available. Most are pulled by a wheeled tractor or a small bulldozer. Another type of machine is the planting auger. This machine is a portable drill and digs out a hole large enough for a seedling. Another person follows behind and plants the trees. This method is about twice as fast as ordinary hand planting, and is much faster on hard ground.

Hand Planting
Hand planting is much slower; but there are no terrain limitations because a tree can generally be planted anywhere a person can go. The planter should choose a favorable spot within the approximate spacing guide, such as near a stump, rock or bush, which would offer some shade and protection from southwest winds during the hot summer months. A good planter can handle about 70 to 80 tree per hour. Tools that are used in hand planting include a shovel, a western planting tool, a planting bar, or a power auger, and bag to carry the seedlings.

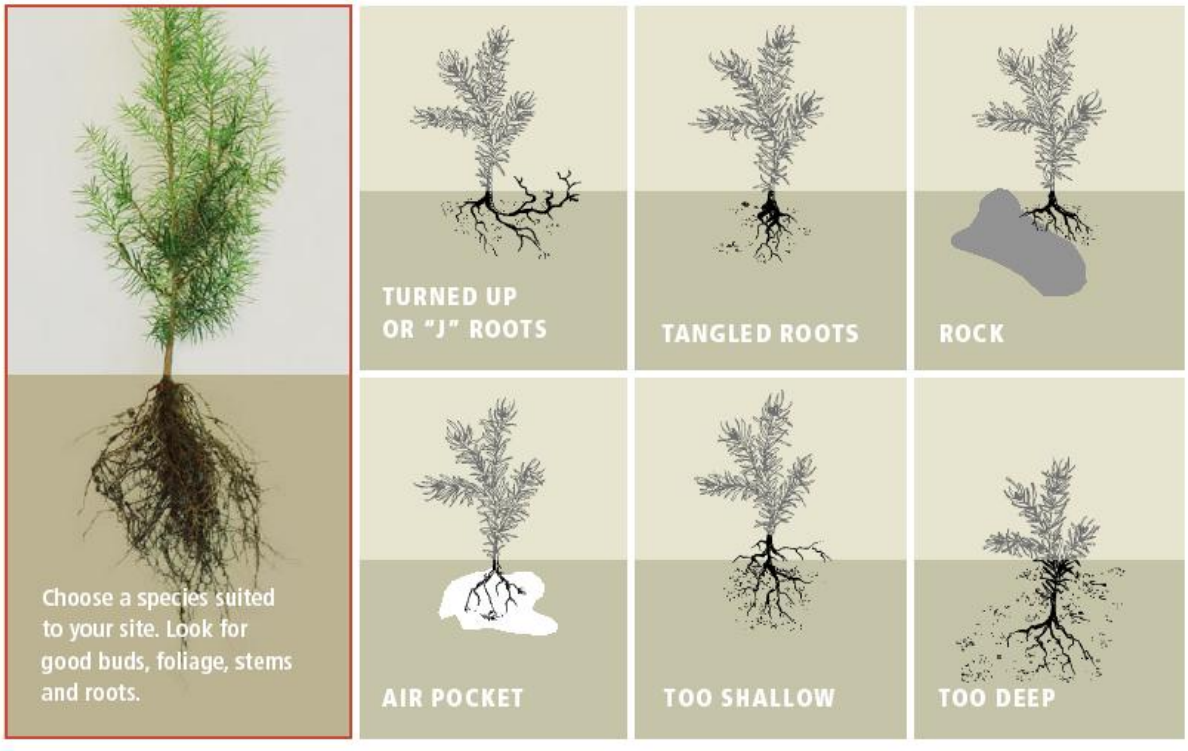
Planting Tips
Certain directions should be followed to assure seedling survival. The following are the most important tips to keep in mind:

- Keep the seedling roots out of direct sunlight and wind while planting. They should be put into the ground immediately after removal from the planting bag, otherwise they will dry out and die within minutes.

- Prepare the planting hole before removing the seedling from the bag.

- The seedling should not be planted too high, where the roots are exposed or too low where part of the twigs are buried beneath the ground level. Do not plant on top of a rock, where root growth will be hampered. If a seedling is planted in too shallow a hole, the roots become twisted or turned up (J-root) which results in eventual death of the seedling.

- The seedling should be planted straight up and down to prevent irregular growth of the stem will not occur. The soil should be free from rocks and debris to eliminate the possibility of air pockets.


Correct
Planting Errors
Choose a species suited to your site. Look for good buds, foliage, stems and roots.
TURNED UP OR "J" ROOTS
TANGLED ROOTS
ROCK
AIR POCKET
TOO SHALLOW
TOO DEEP

Survival After Planting The seedlings should be checked a few times a year for the first three or four years after planting. Are the trees surviving? Many different things can cause seedling mortality. The usual cause is poor handling and planting of the seedlings. However, environmental factors can also cause heavy losses. It pays to notice unhealthy and dying seedlings early. Proper treatment may reduce mortality. However, in cases where reforestation will be inadequate due to the death of many seedlings, additional trees may need to be planted.

The following may contribute to seedling mortality:

Frost heaving can occur with both bareroot and containerized seedlings during the first winter after planting. However, as mentioned before, the trees planted in the fall are the most susceptible. It will look like something has pulled the tree seedling out of the ground.

Insects and disease can attack the seedlings. It may take a trained eye to determine the cause of mortality in cases like these.

Moisture deficiency is the biggest cause of seedling death is the Southwest. This is something that may be unavoidable. If little or no rains come after a spring planting and the months following, the seedlings will die, no matter how much care was taken during planting. The only remedy for severe moisture stress is to water the trees. However, this is usually not feasible. Mulching the seedling and placing it in the shade of some larger object, such as a bush, stump, rock, or shingle gives it some protection against moisture deficiency.

Birds, rodents, deer, and other wildlife periodically like to eat the seedlings. Rodents may be chemically controlled. For deer, it may be necessary to place protective screens around the seedlings.

Domestic animals can destroy new seedlings by grazing or trampling. Livestock should be kept out of a newly planted area for two or three years after the planting.

Heat, sun, and wind can damage the thin bark around a young stem or desiccate young leaves. Try to plan the planting when there is a more favorable (cooler, wetter, calmer) period of weather forecasted. Otherwise, placing it in the shade of some larger object, such as a bush, stump, rock, or shingle gives it some protection against heat, sun and wind.

NOXIOUS WEEDS

A weed is any plant that interferes with the management objectives for a particular site, and noxious weed is "a plant species that is not indigenous to New Mexico and that has been targeted pursuant to the Noxious Weed Management Act for management or control because of its negative impact on the economy or the environment".

An invasive weed is generally a non-native aggressively growing plant that may or may not have a negative impact on the habitat it is invading. Invasive species have been known to spread at rates of about 5,000 acres per day in the West[1]. Weeds have invaded approximately 17 million acres of public lands and they quadrupled

[1] New Mexico State University, Resources Magazine, Winter 2000. "Invasive Weeds Know No Borders"

their range from 1985 to 1995. This value does not include the rate of spread on non-federal lands, so the rate of spread is actually much greater.

This section will refer to noxious weeds instead of invasive as that is the term defined by the New Mexico "Noxious Weed Management Act" (1998).

Noxious weeds may cause:

- Displaced native vegetation.
- Damaged watersheds.
- Increased soil erosion.
- Reduced opportunities for land use.
- Reduced recreational activities.

Managing Noxious Weeds

Lands managers who are developing a weed management program for these species should focus on four steps: prevention, early detection and rapid response, control and management, and rehabilitation and restoration.

Prevention: Keeping these weeds from becoming established in the state has the highest priority in management programs. Known infestations are to be contained and prevented from spreading.

Early Detection and Rapid Response: Not only is it important to recognize these plants before they become established, but it also is important to recognize them in the seedling stage rather than in the flowering or mature stage. Immediate action is necessary because a rapid response reduces the time and energy required

to keep populations in check. Once a plant has become established and set seed the management effort must increases. For resources on the identification of noxious weeds (or other plants) see the Resources section (page 124).

Control and Management: When developing a management plan, emphasis has to be placed on timely action. Management options will vary with weed species. Annual weeds can be effectively managed by timely cultivation. Certain noxious species can be controlled by biological techniques, although any use of biological control has to be cleared with the New Mexico Department of Agriculture prior to introduction as the biological control is often an insect introduced from the country of the weed's origin. Herbicides registered for noxious species have proven to be effective options. The key to an effective management plan is to integrate all the available options for the particular site or situation. Taking time to write down the plan and to evaluate the results will allow for the development of a long-term management program.

Rehabilitation and Restoration: As part of the management program, the site itself has to be considered. Anything that can be done to enhance the competitive ability of desirable plants on the infested site will improve the success of any noxious weed management program. If nothing is done to rehabilitate or restore the proper ecological function to the site once noxious weeds are removed, another undesirable species can take the place of the eliminated weed.

Cooperative Weed Management Areas (CWMAs)
CWMAs are a partnership of federal, state and local government agencies, tribes and pueblos, individuals and various interested groups cooperating to manage noxious plants in their defined area. CWMAs are generally based on county or Soil and Water Conservation District boundaries. A list of CWMAs with contact information

can be found on the New Mexico Department of Agriculture website (see Resources, page 124). Landowners, property managers and logging operators may find assistance in identification or noxious weed management issues from their CWMA.

BMP Wash tires, boots, and equipment before entering an infested site and before leaving to minimize spread of noxious weeds.

BMP Only use weed-free mulch or straw.

BMP Warn equipment operators to not drive through identifiable patches of noxious weeds that are in seed.

Classes of Noxious Weeds[2]

In developing a state program for addressing the noxious weeds situation, species have been assigned to classes A, B or C. All of the weeds are non-native to New Mexico.

Class A Weeds: species that are currently not present or have limited distribution within the state. Preventing new infestations and eradicating infestations have the highest priorities in the management plan.

[2] New Mexico Noxious Weed List, NMDA Memorandum to the General Public, September 20, 1999

Class A Weeds in New Mexico

Alfombrilla (*Drymaria arenarioides*)
Black henbane *(Hyoscyamus niger)*
Camelthorn (*Alhagi pseudalhagi*)
Canada thistle (*Cirsium arvense)*
Dalmatian toadflax *(Linaria genistifolia ssp. dalmatica)*
Diffuse knapweed (*Cenatuera diffusa)*
Dyer's woad *(Isatis tinctoria)*
Eurasian Watermilfoil (*Myriophyllum spicatum*)
Hoary cress (*Cardia draba)*
Hydrilla (*Hydrilla verticillata*)
Leafy spurge *(Euphorbia esula)*
Onionweed *(Asphodelus fistulosus)*
Perennial pepperweed (*Lepidium latifolium)*
Purple loosestrife *(Lythrum salicaria)*
Purple starthistle *(Centaurea calcitrapa)*
Scotch thistle (*Onopordum acanthium)*
Spotted knapweed *(Centaurea maculosa)*
Yellow starthistle *(Centaurea solstialis)*
Yellow toadflax *(Linaria vulgaris*)

Class B Weeds: species that are limited to a particular area of the state. In areas that are not infested, these species should be treated as class A weeds. In areas with severe infestations, management plans should be designed to contain the infestation and stop any further spread.

Class B Weeds in New Mexico

African rue *(Peganum harmala)*
Bull thistle *(Cirisium vulgare)*
Halogeton (*Halogeton glomeratus)*
Malta starthistle *(Centaurea melitensis)*
Musk thistle *(Carduus nutans)*
Russian knapweed *(Acroptilon repens)*
Poison hemlock (*Conium maculatum*)
Teasel (*Dipsacus fullonum*)

Class C Weeds: species that are wide-spread in the state. Management decisions for these species should be determined at the local level based on feasibility of control and level of infestation.

Class C Weeds in New Mexico

Field bindweed *(Convolvulus arvensis)*
Jointed goatgrass *(Aegilops cylindrical)*
Russian Olive (*Eleagnus angustifolia*)
Saltcedar (*Tamarisx sp.*)
Siberian Elm (*Ulmus pumila*)

PLANNING AND DESIGN ~ CHECKLIST FOR SUCCESS

The following checklist combines selected Commercial Timber Harvesting Requirements (Requirements) and other suggestions to help you achieve management objectives while protecting long-term investments and the natural resource. (**Not all of the Requirements and standards are addressed. Check with the nearest District Office (page125) for exact Requirements).**

- Develop a written long-range forest management plan
- Assemble property information:
  - · Topographic and stream type maps
  - · Soil survey
  - · Aerial photos
  - · Plant maps
- Identify property lines and harvest area boundaries
- Arrange for access and easements, if needed
- Plan harvest operations for time of year most appropriate for site
- Plan roads, skid trails, and landings that best fit the system, soils and terrain, and that minimize impacts to fish, water, and wildlife
- Consider physical features of each harvest site:
  - · Topography
  - · Slope stability

- Soils
- Domestic water supplies
- Riparian and wetland areas
- Tree species
- Existing roads and landings

- Identify areas needing protection:
  - Streams and wetlands
  - Riparian areas
  - Unstable slopes
  - Archeological, cultural, and historical sites
  - Domestic water supply
  - Sensitive wildlife habitat
- Consider opportunities to enhance and restore fish and wildlife habitat:
  - Keep understory vegetation whenever possible
  - Create snags from low quality trees
  - Leave wider riparian and wetland buffers
  - Retain downed logs and snags in excess of minimum required

- Select harvest system appropriate for:
  - Soil conditions
  - Terrain
  - Season
  - Time available for completing operation
  - Size of harvest area

- Type of harvest planned
- Areas needing special protection
- Minimal post-harvest protection

- Develop written contracts, assign responsibilities, obtain necessary permits
- Communicate plans with neighboring landowners
- Obtain burning permit if you plan to burn slash
- Contact the nearest District Office (page 125) or a consulting forester for assistance with developing a management plan, laying out timber harvests, marketing your timber, and finding a logger to accomplish your management objectives
- If needed, consult other resource professionals for additional advice and information on soils, fish, wildlife, and historical, archeological, and cultural sites

Left: Good water bar (rolling grade dip)**; Right:** No water bar, causing erosion**.**

GLOSSARY

This glossary is to help you understand terms used in the text. For exact legal definitions, see the Commercial Timber Harvest Requirements beginning on page 7 of this document.

Conifer: A cone-bearing tree with needles, such as pines, spruce, and fir.

Cross Drains: Installed structures, such as culverts and rolling dips that move water from one side of the road to the other.

Crowned Roads: Roads constructed with the highest point in the middle to off half the road to an inside ditch.

Deciduous: A tree which loses its leaves or needles in the fall and winter.

Downed logs: Larger diameter woody debris left on site after harvest to provide wildlife habitat.

Even-aged Harvest: Removing all merchantable trees at one time, or over a short period of time, to produce a stand of trees that are about the same age.

Forest: an area of at least one acre with at least 10 percent tree crown cover; or an area that can support trees at that level or higher stocking.

Forest Practice: Activities conducted on forest lands relating to growing, harvesting, or processing timber. These include road construction, maintenance, thinning, and salvage of trees, harvesting, reforestation, and brush control.

Forwarding: Using a fully mechanized harvesting system to pick up logs and haul them from the woods to the landing.

Insloped Roads: Roads constructed to slope toward the inside edge so water drains slowly over the edge, usually into a ditch.

Landing: Where logs are sorted, decked, and loaded onto trucks.

Natural Re-seeding: Letting on-site or nearby trees re-seed the harvest area.

Ordinary High Water Mark: Physical mark along the most streams that indicates height normally reached during average high flow.

Outsloped Roads: Roads constructed to slope toward the outside so water drains slowly over the outer edge.

Reforestation: Re-establishing a forest in an area where trees have been removed.

Riparian Management Area (RMA): Specific areas along rivers and streams where certain steps are taken to protect water quality, fish, and wildlife habitat.

Rolling Dip: A constructed break in the road grade to allow water to run off; a drivable water bar.

Scarify: To disturb the forest floor and topsoil in preparation for natural regeneration, direct seeding, or planting.

Skidding: Pulling logs with ground equipment or horses from the stump to the landing.

Stocking: The number and density of trees in a forest stand usually measured in basal area per acre. Stands are often classified as understocked, well-stocked or overstocked

Subgrade: Road surface shaped and graded before application of rock.

Temporary (Seasonal) Road: A forest road used for a portion of the year to take advantage of weather conditions.

Uneven-aged Harvest: Periodically removing merchantable trees of different ages and sizes, including thinning and salvage, to maintain a stand of mixed age classes.

Wetlands: Areas saturated or covered with water long enough and often enough that their soils and plants differ from those in nearby uplands.

Yarding: Moving logs by a cable system from the stump to a landing.

RESOURCES

General Forest Management

EMNRD-Forestry Division Santa Fe Office
1220 S. St. Francis Drive
Santa Fe, New Mexico 87505
(505) 476-3325
• Timber Staff and Stewardship Foresters available to provide on-site forest management advice customized to individual landowner needs.

Timber Harvests

EMNRD Forestry Division District Offices
For questions about:

- Forest Management
- Commercial Timber Harvest Requirements
- Consulting Forester information

Consulting Foresters
Contact a consulting forester for: timber sale assistance including layout, tree marking, supervision of harvest, and marketing.

USDA Natural Resources Conservation Districts
(Check telephone directory for local office)
• County Soil Survey Book (book describing soil types and limitations related to forestry activities).

New Mexico Cooperative Extension Service
Contact your local County Extension Office (Check telephone directory for local office)
• Provides educational programs and materials for forest owners and resource professionals. Check with your local County Extension Office for a list of publications and information about forestry education programs in your area.

Information on the Internet:

- Forest landowners will find several items of interest on EMNRD-Forestry Division's Home Page at: http://www.nmforestry.com
- Noxious weed information including identification tool and fact sheets at http://weeds.nmsu.edu
- Cooperative Weed Management Areas (CWMAs) at http://nmdaweb.nmsu.edu (use search - "noxious weed information")

EMNRD FORESTRY DIVISION
DISTRICT OFFICES

District I - CHAMA
HC 75, Box 100
Chama, NM 87520
(575) 588-7831

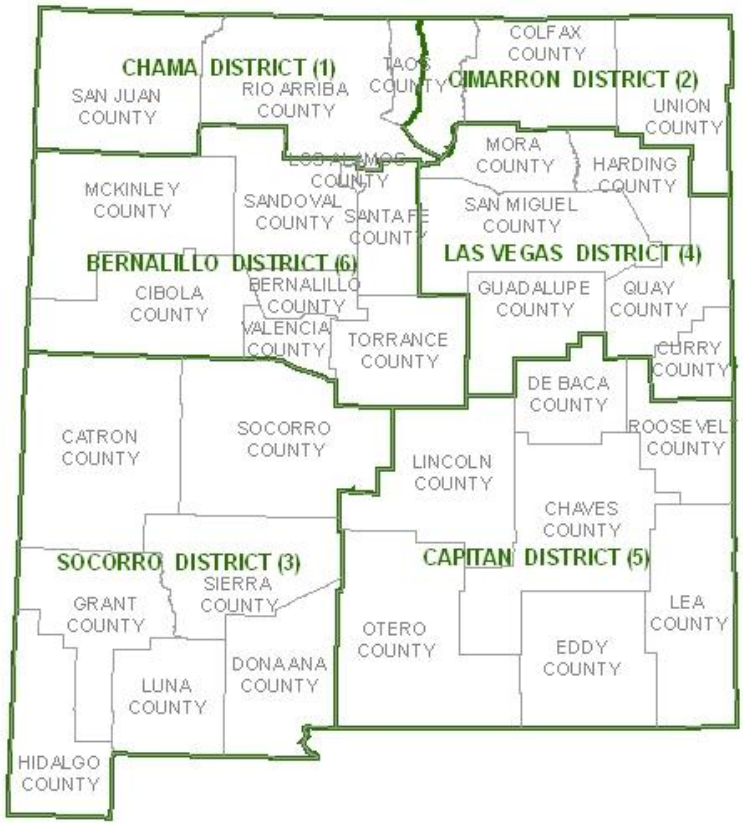
District 2 - CIMARRON
P.O. Box 5
Ute Park, NM 87749
(575) 376-2204

District 3 – SOCORRO
HC32, Box 2
1701 Enterprise
Socorro, NM 87801
(575) 835-9359

District 4 - LAS VEGAS
HC33, Box 109, #4
Storrie Lake State Park
Las Vegas, NM 87701
(505) 425-7472

District 5 - CAPITAN
P.O Box 277
Capitan, New Mexico
(575) 354-2231

District 6 - BERNALILLO
P.O. Box 458
Bernalillo, New Mexico
(505) 867-2334



Acknowledgements

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Montana State University Extension Service
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"Forest Practices Illustrated" by:
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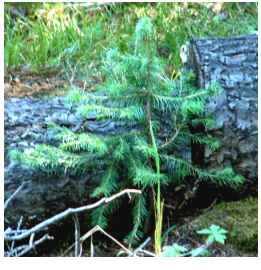
Washington State Department of Natural Resources

Riparian diagram:
Stevens, V., F. Backhouse, and A. Eriksson. Riparian management in British Columbia: an important step towards maintaining biodiversity. B.C. Min. For. and B.C. Min. Environ., Lands and Parks, Victoria, B.C. Work. Pap. 13/1995.



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