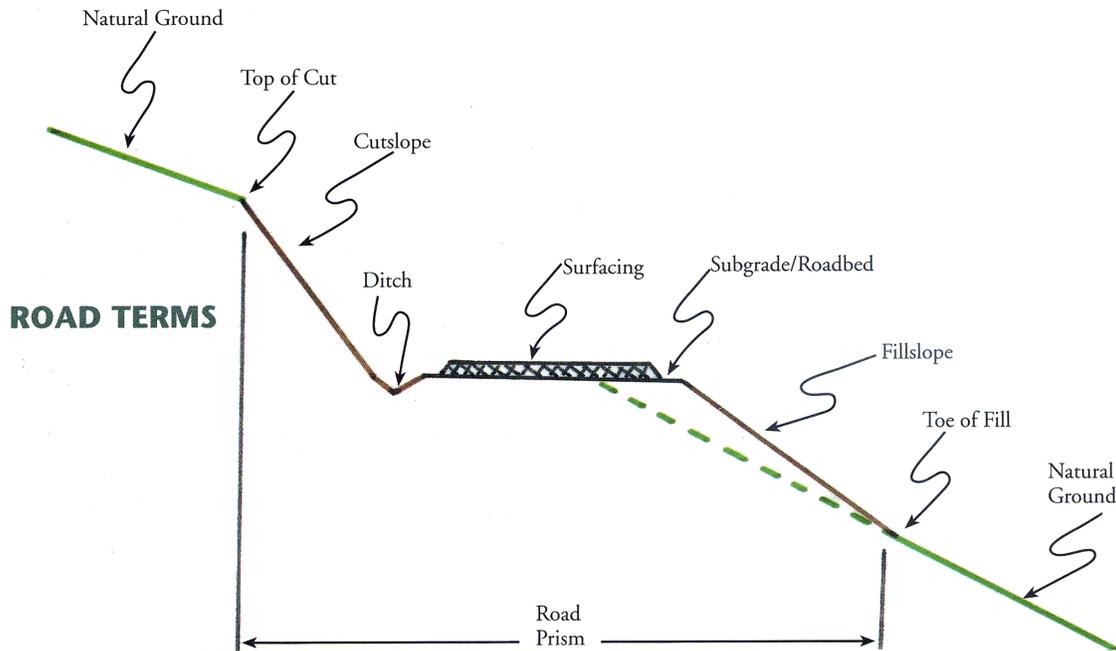


# Oregon Department of Forestry



## State Forests Program

## Forest Roads Manual

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# Forest Engineering Roads Manual

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State Forests Program Director  
State Forests Program Staff Engineer  
Area Director  
Assistant District Forester/Unit Forester  
Timber Sale Layout Personnel  
District Engineer  
Project Administrator  
Geotechnical Specialist

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Roads provide essential access for the active management of the resources found on state-owned forest lands. Forest management, timber removal, recreation, and fire protection, as well as other activities, are all heavily, if not totally, dependent on road access into the forest.

Besides being an asset, roads are recognized as sources of erosion and sedimentation, impact wildlife and aquatic habitats, remove valuable timberland from production and require significant work and expense to build and maintain. For these reasons, an environmentally sound, economically efficient and effective road management program must be utilized on state-owned forest lands.

## Road Management Policy

The goal for the management of forest lands owned by the Board of Forestry is to secure the greatest permanent value to the citizens of Oregon as described in OAR 629-035-0000 through 629-035-0100. The goal for the management of Common School Forest Land is to obtain the greatest benefit for the people of Oregon as described in the Oregon Constitution.

**Therefore, it is the policy of the Department of Forestry to establish and maintain a road system that will facilitate securing the greatest permanent value on Board of Forestry lands and obtaining the greatest benefit on Common School Forest Lands. This policy is implemented through activities in transportation planning, road**

**design, road construction and improvement, road maintenance and closing or vacating unneeded roads.**

## **Purpose of the Manual**

The purpose of this manual is to provide guidance and standards for road management on state-owned forest lands. The manual contains information that is considered to be the current state-of-the-art. As additional information becomes available through research and monitoring the manual will be updated.

## **The Vision for Forest Roads on State-owned Forest Lands**

*(Note to the reader: The vision is written in the present tense as if we were already in the future and actually looking at the idealized forest road system on state-owned forest lands)*

The forest road system on state-owned forest lands is providing efficient, effective access that facilitates securing the greatest permanent value on Board of Forestry lands and obtaining the greatest benefit on Common School Forest Lands. The forest road system is managed actively, not passively. Roads are designed, constructed and maintained in the most cost-efficient manner, while providing a high level of protection to other natural resources. The amount of land occupied by roads is at a minimum. Fish are able to move upstream and downstream where roads cross streams. Roads are constructed in the best locations for carrying out anticipated activities, while minimizing the impacts on natural resources. The standard for roads in the forest is a suitable match for the terrain and type of access needed. The roads are effectively maintained to retain their longevity and to prevent adverse effects to natural resources. Unneeded roads are closed or vacated and, where appropriate, the land they occupied is returned to active forest management.

## **Guiding Principles for Road Management**

The guiding principles of state forest road management are presented here, with a brief explanation of each. These principles are some (certainly not all) of the most significant components of the “state-of-the-art” knowledge needed to ensure sound practices in forest road management. The reader is directed to the specific sections of this Forest Engineering Roads Manual for a more detailed explanation and application.

### **Guiding Principle 1. The amount of road on state-owned forest land will be the minimum necessary to achieve the goals of Forest Management Plans.**

Access through the forest is essential to achieve forest management goals. Access requirements are dependent on management goals, geographic location, harvest methods utilized, and other on-site factors. Minimizing total miles of road in the forest reduces road construction & maintenance costs, and reduces land taken out of the forest management base. Less road means less potential for adverse effects on other natural resources.

**Guiding Principle 2. New roads will be located to provide the best protection to natural resources and meet the objective of the road.**

Determining the best location for new forest roads is one of the first and most important steps in minimizing road impact problems. Road locations will fit the terrain. Ridge top locations are preferred over mid-slope roads. Modifying road grades to avoid undesirable locations will be used wherever possible. To the extent possible, roads will be located away from streams, wetlands, unstable areas, and sensitive resource sites. Alternative route locations will be considered on all new roads. The location that best protects natural resources and meets the objective of the road will be selected.

**Guiding Principle 3. High-risk sites will be avoided wherever possible. Where high-risk sites cannot be avoided, state-of-the-art design and construction practices will be used.**

The construction of road segments through high-risk sites will be avoided whenever possible through the use of alternate routes or different logging systems.

At times road locations will be necessary through high-risk sites. When this occurs, a geotechnical specialist will evaluate the location. In most cases, the geotechnical specialist will make site visits and develop site specific, state-of-the-art recommendations concerning the site. Those recommendations will be incorporated into the design and construction of the project.

The evaluation of both the risk of a landslide and the values at risk below the site is critical. The road may need to be relocated if either of the risks is considered too high.

**Guiding Principle 4. New roads will be located, designed and built for economically efficient and effective forest operations.**

Only roads that provide benefits that outweigh the costs of the roads will be constructed. Benefits from roads are measured both from financial gains and for achievement of overall management goals.

By coordinating transportation and forest management plans, a reduction in the total amount of road needed to accomplish management goals will be achieved.

**Guiding Principle 5. Roads will be designed to meet access needs, to have low impacts on natural resources and the forest, and to be economical to construct and maintain.**

Road design will match road use. This usually means limiting the width of the road to that necessary for the expected use. Minimizing road width and the resultant cut and fill slopes will minimize environmental impacts from roads.

The use of excavated material will be carefully considered in the design of roads. A balanced cut and fill cross section design will be used where slopes are gentle and stable. Where a balanced cross section design is not used, excess material will be used in fills

and/or to raise the road grade. A full bench end-haul design will be used where slopes are steep and risks of landslides are high.

Road designs will provide for proper drainage of surface water. Grade breaks, out-sloping, in-sloping, ditching, road dips, water bars and relief culverts are some of the techniques that must be considered.

Road surfacing will be included in the design of roads that will be subject to use during wet weather. The amount and type of road surfacing will be determined by the expected use of the road.

As mentioned in the Guiding Principle on Fish Passage, stream crossings will be designed to assure fish passage.

**Guiding Principle 6. Temporary roads will be used to meet short-term access needs. When the need no longer exists, the temporary road will be vacated.**

Temporary roads can be used to minimize road density and associated impacts where resource concerns indicate a need. The use of temporary spurs and special construction practices that provide protection while planning to vacate the temporary road (at a later time) can serve a very specific and beneficial purpose. These roads must be planned and managed properly to ensure the desired environmental protection.

**Guiding Principle 7. Forest roads on state-owned forest lands will be designed constructed and maintained to provide effective and efficient drainage of surface water.**

Effective drainage systems are needed to protect both the environment (water quality and fish habitat) and the capital investment in the road. These systems must be included in the road design, ensured through road construction and maintained through road maintenance.

Sometimes the efficiency of getting water off the road is in conflict with environmental protection (sediment into streams), and proper design and maintenance may require specific problem solving for the site. For example, where the risk of landslides is high, the location of cross drainage must be carefully considered. The sections of this manual on Forest Road Design, Forest Road Construction, and Forest Road Maintenance discuss the concepts and strategies involved in road drainage.

**Guiding Principle 8. Fish passage will be provided where roads cross fish-bearing streams.**

Providing fish passage where roads cross fish-bearing streams will ensure that fish can access habitat. Forest Practices Act guidance on fish passage is the state-of-the-art and will be used for evaluating and deciding on proper design and construction of stream crossings.

Stream crossings for new road construction and road improvement projects will be designed and constructed using state-of-the-art practices. Ongoing repair or replacement of stream crossings on existing roads that do not provide adequate fish passage will be conducted systematically within the limitations of workload priorities and the availability of funds.

**Guiding Principle 9. Waste areas for depositing excess road excavation material will be located on stable sites.**

Where excess road excavation materials are generated, especially where full bench end-haul road construction design is used, waste areas for depositing excess road excavation materials are needed. Waste areas will be located on stable sites.

The proper selection of waste areas is critical. Waste area failures can have serious impacts on water quality and fish habitat. They are expensive to repair and difficult to mitigate.

Foresters or engineers, oftentimes aided by the geotechnical specialist, will thoroughly investigate potential waste area locations in order to ensure a high level of confidence in their stability. Uncertainties of geologic subsurface conditions will prevent complete confidence in the stability of waste area locations. Monitoring of waste areas after construction (during the first few winters) ensures timely action in the case of unrecognized slope instability.

**Guiding Principle 10. Rock pits and quarries will be designed and developed to provide for environmental protection and site reclamation.**

Design considerations for environmental protection include: drainage of the quarry floor, screening berms, filtering of surface water, proper location of stockpile and overburden, clearing limits, and other site-specific design mitigation. The Geotechnical specialist may be requested to assist in rock pit and quarry design.

At the conclusion of use, rock pits and quarries will be reclaimed to the extent practical.

**Guiding Principle 11. An active road maintenance program will be used to protect the capital investment in the road, to minimize adverse effects to water quality and aquatic habitat, and to provide for safe use of the road.**

Proper road maintenance minimizes the impacts roads have on natural resources and ensures that roads are available for their intended use. Road maintenance protects the State's investment in the transportation system. An active road maintenance program includes an ongoing and up-to-date inventory of road maintenance needs, a means of systematically addressing the needs, and a response to emergency situations. Road maintenance includes the repair and upkeep of the road prism, road surface, and road drainage. It also includes vegetation management along roads.

**Guiding Principle 12. Roads that are determined to be unnecessary for forest management will be vacated. In addition, roads that are causing or likely to cause serious environmental problems, very near fish-bearing streams, or have very high maintenance costs will be considered for vacating.**

Vacating roads, when appropriate, can reduce environmental impacts, lessen maintenance costs and move the transportation system toward the desired condition. Roads will be vacated when their use is judged to be unnecessary to forest management. In addition the following roads will be considered for vacating: roads where serious erosion is occurring or likely to occur, where the costs of adequate maintenance (over the long term) will exceed the cost of vacating, or where the road is very near a fish-bearing stream. The section of the manual on Forest Road Vacating describes the processes and techniques for vacating roads.