

# Forest Practices Technical Note Number 7

## Version 1.0

### Avoiding Roads in Critical Locations

June 20, 2003

#### Objective

Technical notes are written to help resource professionals, in this case, engineers and foresters responsible for road location, design or repair. This note provides technical guidance to assist in placing roads outside of critical locations. It describes procedures for avoiding locations where roads are likely to damage water quality. It also provides information on ensuring access to forestlands. This note is written to help professionals identify critical locations and to reduce and nearly eliminate roads in the six most sensitive critical locations

#### Resource Issues

A Forest Practices Advisory Committee was assembled in 1999 to review existing forest practices and make recommendations to effectively protect salmon habitat and water quality. After review of the scientific and monitoring data, the FPAC made the following recommendation ***"The Department should develop clear decision-making criteria in guidance form for evaluating proposed road locations in areas where there is a high risk of landslides, surface erosion, or of direct physical alteration to streams, riparian areas, lakes, or wetlands."***

Certain, limited locations can have great impacts on water quality. Even with the best road construction techniques, roads in critical locations can have substantial effects on water quality and fish habitat. Therefore, careful road location is very important. The key here is to reduce or eliminate roads in the following locations:

- where fill is placed in stream channels
- in riparian management areas
- crossing wetlands
- on high landslide hazard locations, especially when rock is weak
- cutting across the toe of old landslide deposits above streams
- on steep slopes with easily eroded soils (granitics)

Roads in these locations are usually very expensive to build and maintain, and often cannot reliably provide long-term access to forestlands. However, sometimes there are cases where access requires construction through some of these locations. Where roads must cross these locations, extra effort is required to align roads to more suitable ground as quickly as possible, and to completely avoid the most sensitive critical locations.

**Critical Locations Approval Policy Approved by the Board of Forestry, March, 2002:** As authorized by OAR 629-625-0100 and 0200 (see the Appendix), before roads are constructed or reconstructed, the Department will work with operators and landowners to locate these roads away from critical locations to the extent possible.

***Critical locations include high landslide hazard locations, slopes over 60 percent with decomposed granite-type soils, within RMAs or within 50 feet of stream channels or lakes, or within wetlands.***

They are locations where direct impacts to streams are likely even when the best forest road building techniques (the road design and construction rules) are all used correctly.

This policy does not apply to active or inactive roads needing culvert replacement or grading. It does apply to reconstruction of abandoned or vacated roads, and to roads that have been removed by stream rerouting or large landslides. This policy applies to natural resource protection, and not to landslides and public safety, as more restrictive practices may apply to public safety.

For the most sensitive critical locations, the Department will not approve road construction or reconstruction in any of the following six (most sensitive) road locations\*. However, on a case by case basis, and with consultation by the Department's geotechnical specialists or hydrologist, the Department may approve roads in any of these six (most sensitive) road locations\*. To construct a road in any of these six locations\*, the landowner must demonstrate in a written plan that there are no safe, physically and economically achievable alternative methods to manage these lands and that all feasible steps to mitigate potential effects to water and aquatic resources will be taken.

**\*Six Highest Water Resource Impact Road Locations**

1. Any active stream channel, exclusive of stream crossings in compliance with OAR 629-625-320. This includes former roadbed locations that have become part of the stream channel due to channel migration. However, where stream erosion has eroded only the outside edge of an existing road, or in an isolated location runs down the former roadway, reconstruction can occur if the road is moved as far from the stream as practicable, and is of minimum useable width.
2. Locations parallel to, and within 50 feet of, a stream channel or within an RMA for a distance exceeding 500 feet per mile of road length, exclusive of stream crossings in compliance with OAR 629-625-320. However, the distance of 500 feet per mile can be exceeded where there are no other nearby alternatives and the road can be located far enough from the stream to not affect the minimum RMA leave tree requirements, and also to allow effective sediment filtering.
3. Locations crossing wetlands for a distance of greater than 500 feet.
4. High landslide hazard locations where rock is likely to be highly sheared or otherwise unstable so that it is not possible to excavate a stable cutslope. If such a cutslope failure may divert road surface drainage to a high landslide hazard location and could trigger a debris flow below the road, that road should not be constructed unless the operator demonstrates that the cutslope can be stabilized by buttressing or other means.
5. Locations cutting through the toe of active or recently active deep-seated landslide deposits and where a reactivated landslide would likely enter waters of the state.
6. Extremely dissected, steep slopes where it is not possible to fit the road to the topography with full bench end haul construction.

## Science and Monitoring

There are several models that attempt to relate the impacts from roads to streams using the density of roads on the landscape (miles of road per square mile of land). One problem with using road density to evaluate potential watershed-scale effects of roads is that, depending on road size, design, location, construction and maintenance techniques, roads can have very different effects on water resources. Road-related landslides that enter stream channels are uncommon if hillslope steepness is less than 50 percent (Robison et al., 1999). Chronic delivery of sediment to stream channels is rare on ridge- top roads, while most streams adjacent to roads have a high potential for chronic sediment delivery (Skaugset and Allen, 1998). Washouts are more common on roads with undersized drainage structures, high fills, and long steady grades (Weaver and Hagans, 1994).

All of these factors are independent of road density. For example, the study areas with the greatest road densities identified in the ODF “Storm Impacts of 1996” study had the fewest road washouts, and the lowest volume of road-associated sediment delivery to streams as compared to the other six study areas (Robison et al. 1999). Therefore, the FPAC report concluded that the road area disturbed in “critical locations” is a much better indicator of cumulative effects than is road density.

Roads parallel to streams that fill in the channel constrict flow. Observations after floods indicate that these constrictions can result in much stream bank and road-fill erosion. Fill placed in channels also directly reduces aquatic habitat. Roads very close to streams offer few opportunities to filter sediment (see Forest Practices Technical Note 8). Similarly, fills in wetlands reduce wetland area and can sometimes alter wetland drainage.

Full bench end haul road construction has been shown to reduce the occurrence of shallow, rapidly moving landslides in most cases (Robison and others, 1999). However, to be truly effective, road drainage must not flow onto high landslide hazard locations below the roads. If the materials exposed by a high cut are weak, cutslope failure is fairly likely. Cutslope failure can result in diversion of drainage water to high landslide hazard locations below the road. Similarly, roads cutting through the toe of an old deep-seated landslide undercut the slide area and can result in reactivation of movement.

The recently completed compliance monitoring study found that the vast majority of new roads are not in critical locations (Robben and Dent, 2002). Exclusive of stream crossings, no new roads were located below the high water level of streams. Only 0.6 percent of roads crossed high risk sites (now called high landslide hazard locations), and another 0.6 percent were located on wetlands, seeps, or springs. No new roads were located in riparian management areas (although 1.4 percent of existing roads were located in RMAs). These results show current practices are avoiding roads on critical locations through the use of alternative locations.

## Identification of Critical Locations

**Stream channels** include the bed and banks, to the edge of the active channel. These are areas with little or no vegetation older than one year.

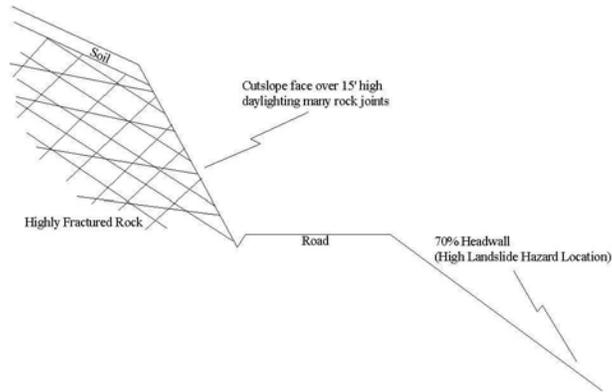
**Riparian management areas (RMAs)** are designated by OAR 629-635-0310 and, for fish-bearing streams and medium and large non-fish bearing streams, are between 50 and 100 feet wide. For most small Type N streams, while no merchantable vegetation is required in an RMA, protection of soils around streams is always required. Refer to the publication **Oregon's Forest Protection Laws** for detailed information on riparian management areas.

**Wetlands** are defined by OAR 629-600-0100 as areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, swamps, bogs, and other similar areas, but do not include water developments.

**High landslide hazard locations** are defined by OAR 629-600-0100 (31) as specific sites that are subject to initiation of shallow, rapidly moving landslides. The specific criteria for determination of these sites is found in 629-623-0100 (3) as

- (a) The presence, as measured on-site, of any slope in western Oregon (excluding competent rock outcrops) steeper than 80 percent, except in the Tye Core Area, where it is any slope steeper than 75 percent; or
- (b) The presence, as measured on-site, of any headwall or draw in western Oregon steeper than 70 percent, except in the Tye Core Area, where it is any headwall or draw steeper than 65 percent.
- (c) Notwithstanding the slopes specified in (a) or (b) above, field identification of atypical conditions by a geotechnical specialist may be used to develop site specific slope steepness thresholds for any part of the state where the hazard is equivalent to (a) or (b) above. The State Forester shall make the final determination of equivalent hazard. **Refer to Forest Practices Technical Note 2 for more information on identification of high landslide hazard locations.**

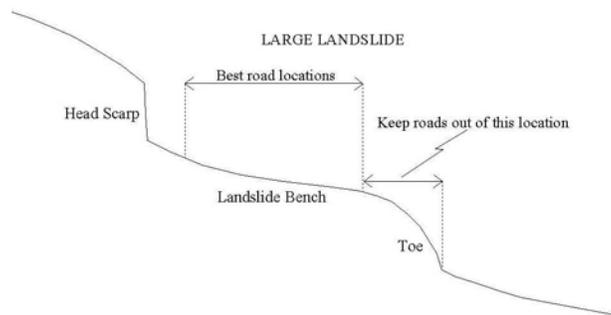
**Unstable rock** is highly fractured, and contains open or soft bedding and joints making connected, large open blocks in the rock mass (**Figure 1**).



**Figure 1. High cutslope in unstable rock**

Unstable rock is often difficult to identify prior to construction. Evidence of unstable rock includes large cutslope failures in existing roads or irregular shaped rock outcrops close to the proposed road. Geotechnical examination is usually needed to make the final determination of unstable rock.

**Active or recently active deep-seated landslides** contain scarp(s), a main landslide body, and a toe (Figure 2). The toe area of active landslides is steep and generally contains bare areas.



**Figure 2. Locating roads on an existing deep-seated landslide**

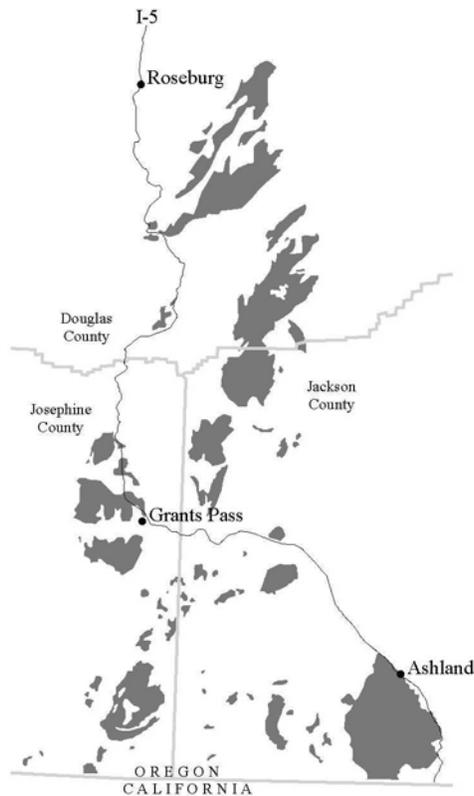
**Extremely dissected terrain** includes very steeply sloped areas with closely spaced ridges and headwalls. These lands are so irregular that if a full bench end haul road is constructed, it would contain curves so sharp they could not be used by log trucks.

**Effective sediment filtering** is the horizontal distance required for drainage water to settle into soil before entering waters of the state. Guidance on sediment filtering can be found in Forest Practices Technical Note 8 (Road Drainage).

**Economically achievable** means that over time, a positive economic return can be returned from management activities.

**Decomposed granite-type soils** are found in portions of southwest Oregon (in areas from east of Roseburg, south to Ashland, and to about 10 miles west of Grants Pass) (**Figure 3**). Granite is also found in parts of northeast Oregon, although in this part of the state, it may not be decomposed. The soils of concern contain rock fragments that can be easily crushed and are usually light colored. These soils are easily eroded because they contain few binding fines (little or no clay or loam).

The most important field tools are very simple and include your eyes and a clinometer, abney, or similar device.

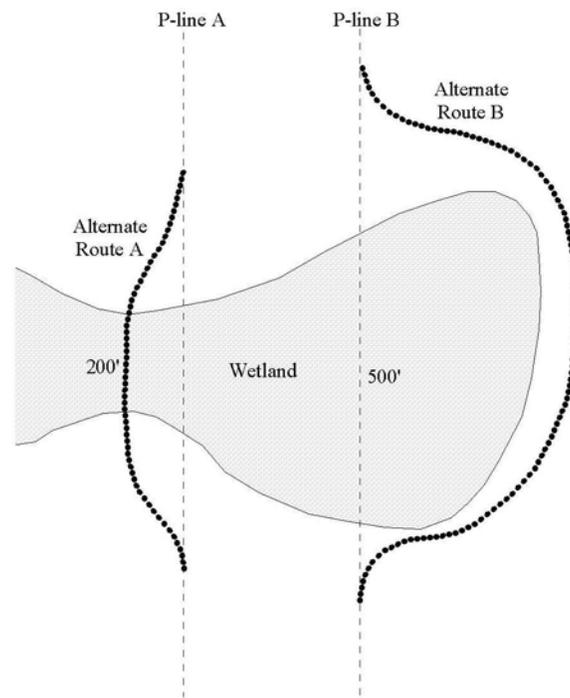


**Figure 3. Decomposed granite locations in southwest Oregon**

**Avoiding Critical Locations:** The most effective way to avoid critical locations is to perform careful on-the-ground reconnaissance and identify all critical locations along the "P" line during road layout. While office tools like air photos and maps can be of some use, field reconnaissance is needed to make the final identification of these locations.

It is important to observe landform (shape of the ground), and use exposed areas (nearby roadcuts, windthrow holes and stream-banks) to evaluate soil and rock. Knowledge of local vegetation is critical, especially wet-site vegetation, as these are the best indicators for wetlands. **Figure 4** illustrates two alternatives for crossing wetlands. When the shortest location is close to a narrow spot in the wetland ("P" line A), modify the road location to take

advantage of the shortest crossing distance. When the shortest location crosses a wide area of wetland, reroute the road around the wetland ("P" line B).



**Figure 4. Road location around or through a wetland**

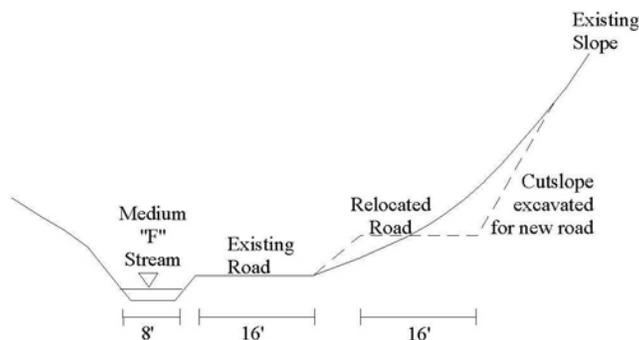
Deep-seated landslides are best recognized by the shape of the ground surface (**Figure 2**). **Note that tree lean and pistol butting are not reliable indicators of landslide activity.** The toe of large landslides, and other locations where slopes break sharply steeper (edge of benches), often contain weaker soil so roads requiring large cuts or fills should be located away from these areas as quickly as possible (**Figure 2**).

Techniques for keeping roads away from critical locations are simple. They include relocating roads on alternative side of ridges or streams, use of steeper grades, other access points, or alternative logging techniques. In some cases, very steep road grades are needed (up to and over 20 percent for the six most sensitive critical locations), especially for roads that access only one or two harvest units.

This critical road location policy does not require locating roads on other landownerships, but may require alternative harvesting systems. It may be necessary to use an assist vehicle for safety reasons on such steep roads. In other cases, it may be necessary to use long span cable yarding and, in limited cases, helicopter yarding will be needed. The goal is to have as little of the road in critical locations as possible while maintaining forest access, and to build no new roads in the six most critical locations.

**Relocating existing roads away from critical locations:** Relocation of a road next to a stream can protect a major access route (**Figure 5**). When roads are relocated away from and above

the active channel before damage occurs, the Department can approve these relocations if they result in substantially less impact, even if some stretches are still located in RMAs or some of the other most critical locations. However, after damage (generally, road washing out during a large storm) occurs, the Department will adhere strictly to the critical road locations criteria if the stream has migrated and now flows down the former roadbed. An exception is erosion of an isolated location (removal of some outside fill, or less than about 25 feet of roadbed) where reconstruction can occur. Use rip-rap at steep slopes for any replacement fill in order to minimize fill placement in the channel.



**Figure 5. Relocating road in narrow canyon out of the active channel (still in RMA, but much better location)**

**Road Design for Critical Locations:** Locating roads in any of the six most sensitive critical locations or conditions may be allowed only under very limited circumstances. For an owner of several thousand acres, there must be no alternative access route available to a fairly large block of their ownership (at least several hundred acres). Road design must absolutely minimize road length in the six most sensitive critical locations. Consult with ODF resource specialists early in the road location process when considering roads in the most sensitive critical locations, especially if there may be other location alternatives. Special design elements such as retaining walls, excavator-placed rip-rap, and subsurface drainage may be necessary.

**Review of Roads in Critical Locations:** ODF geotechnical specialists are available to review road proposals that fit one of the six most sensitive critical locations. Geotechnical specialists will determine if alternative locations or logging techniques are feasible, and if other technical specialists are needed to review the proposal. The Department's hydrologist is available to review all locations in RMAs or filling of the active channel (exclusive of stream crossings). The Department's wildlife biologist is available to review roads crossing wetlands to identify locations that affect less wetland area. In addition, ODFW biologists will be consulted for roads that require placement of fill in Type F channels (exclusive of stream crossings).

Prior approval for road construction or reconstruction for roads with the six highest water resource impact characteristics (see page 2) will not be granted without a special written plan. This written plan must show that all alternatives have been carefully considered with compelling reasons for not using them. Compelling reasons should include a determination that long span cable yarding, helicopter logging, or other alternative techniques, or waiting for additional forest growth will result in an economic loss.

**Summary:** This policy applies to road construction and reconstruction. It does not apply to existing, functional roads. When preliminary road locations cross any critical location, evaluate alternative locations using different grades and alignments that will serve the intended road use. For the six most sensitive critical locations, use of very steep grades is often warranted. If steep grades or alternative alignments will not work, alternative logging techniques must be evaluated. If there are no alternative management options, a special written plan must be submitted and reviewed by the appropriate ODF technical specialist(s).

### **Sources of Additional Information**

Cornell, J. and K. Mills. 2000. Forest Road Management Guidebook. Forest Practices Program, Oregon Department of Forestry. 32 pp.

Forest Practices Advisory Committee. 2000. Report on Salmon and Watersheds. Report presented to the Oregon Board of Forestry. Oregon Department of Forestry.

Oregon Department of Forestry. 2003. Forest Practices Technical Note Number 2: High Landslide Hazard Locations, Shallow, Rapidly Moving Landslides and Public Safety: Screening and Practices

Oregon Forest Resources Institute. 2002. Oregon's Forest Protection Laws: An Illustrated Manual. 160 pp.

Robben, J. and L. Dent. 2002. Best Management Practices Compliance Monitoring Project: Final Report. Oregon Department of Forestry.

Robison, E. G., K. Mills, J. T. Paul, L. Dent, and A. Skaugset. 1999. Oregon Department of Forestry 1996 Storm Impacts Monitoring Project: Final Report. Forest Practices Technical Report 4. Oregon Department of Forestry, Salem, Oregon. 145 pp.

Skaugset, A. E. and M. M. Allen. 1998. Forest Road Sediment and Drainage Monitoring Project Report for Private and State Lands in Western Oregon. Unpublished report for ODF prepared by the FE Department at Oregon State University.

Weaver, W. E., and D. K. Hagens. 1994. Handbook for Forest and Ranch Roads. Mendocino County Resource Conservation District in Cooperation with the California Department of Forestry and the U.S. NRCS.

### **Oregon Department of Forestry Field Offices**

*For more information about the Oregon Forest Practices Act or the Forest Practice Rules, please contact your local Oregon Department of Forestry office which can be found at <http://www.oregon.gov/ODF/Working/Pages/FindAForester.aspx> or the headquarters office at 2600 State Street, Salem, Oregon 97310. 503-945-7200.*

## Appendix: Applicable Rules

### **PRIOR APPROVAL**

#### **OAR 629-625-100**

- (1) A properly located, designed, and constructed road greatly reduces potential impacts to water quality, forest productivity, fish, and wildlife habitat. To prevent improperly located, designed, or constructed roads, prior approval of the State Forester is required in the sections listed below.*
- (2) In addition to the requirements of the water protection rules, operators shall obtain prior approval from the State Forester before:*
  - (a) Constructing a road where there is an apparent risk of road-generated materials entering waters of the state from direct placement, rolling, falling, blasting, landslide or debris flow.*
  - (b) Conducting machine activity in Type F or Type D streams, lakes or significant wetlands.*
  - (c) Constructing roads in riparian management areas.*
- (3) In the Northwest Oregon and Southwest Oregon Regions, operators shall obtain prior approval from the State Forester before constructing roads on high landslide hazard locations.*
- (4) Operators shall obtain written prior approval from the State Forester of a written plan, as described in OAR 629-625-0320(1)(b)(B), before constructing any stream crossing fill over 15 feet deep.*
- (5) In addition to the requirements of the water protection rules, operators shall obtain prior approval from the State Forester before placing woody debris or boulders in stream channels for stream enhancement.*

### **ROAD LOCATION**

#### **OAR 629-625-200**

- (1) The purpose of this rule is to ensure roads are located where potential impacts to waters of the state are minimized.*
- (2) When locating roads, operators shall designate road locations which minimize the risk of materials entering waters of the state and minimize disturbance to channels, lakes, wetlands and floodplains.*
- (3) Operators shall avoid locating roads on steep slopes, slide areas, high landslide hazard locations, and in wetlands, riparian management areas, channels or floodplains where viable alternatives exist.*
- (4) Operators shall minimize the number of stream crossings.*
- (5) To reduce the duplication of road systems and associated ground disturbance, operators shall make use of existing roads where practical. Where roads traverse land in another ownership and will adequately serve the operation, investigate options for using those roads before constructing new roads.*