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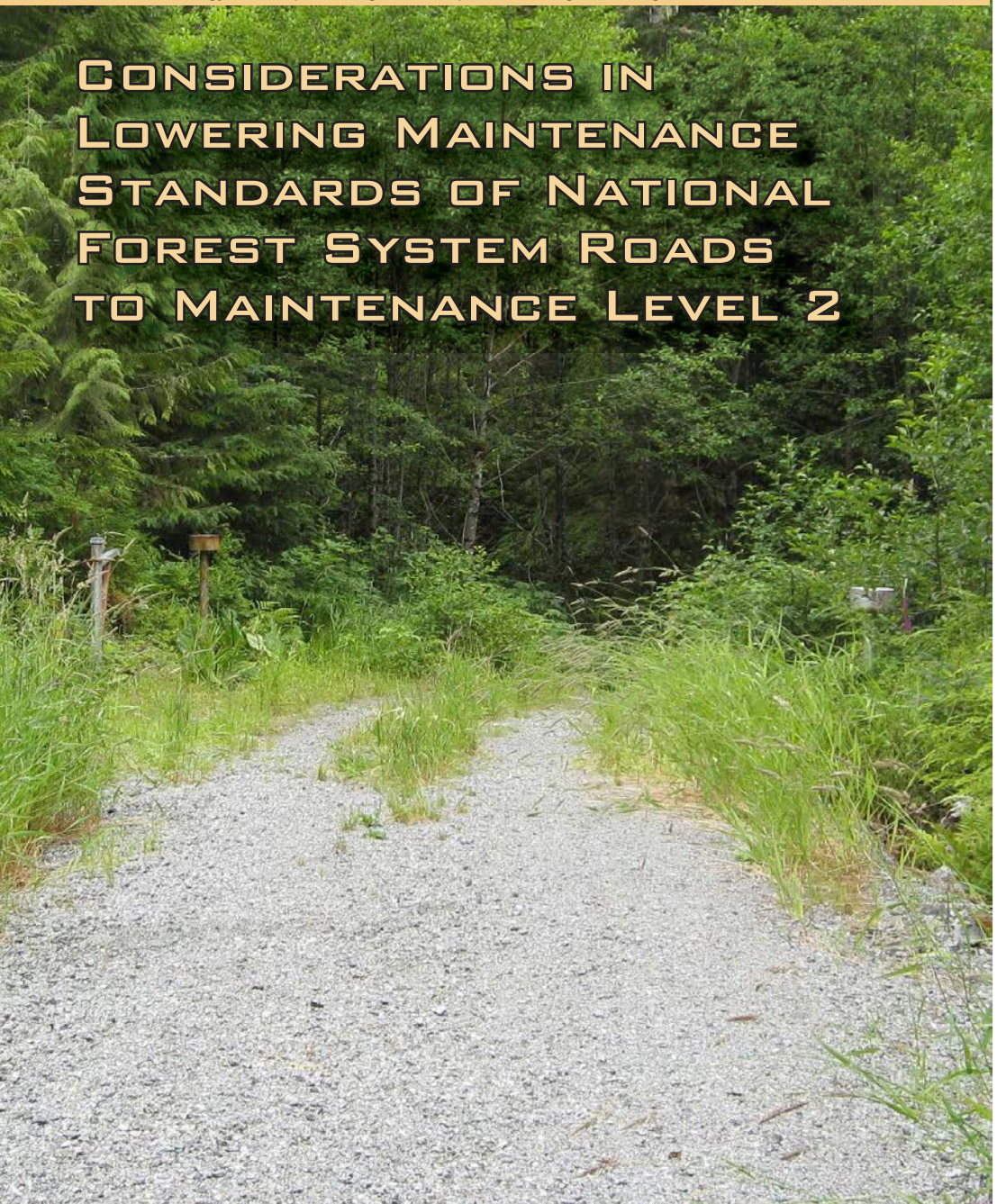
Considerations in Lowering Maintenance Standards of National Forest System Roads to Maintenance Level 2



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Considerations in Lowering Maintenance Standards of National Forest System Roads to Maintenance Level 2

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Section 1—Introduction

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The focus of this guide is on the safety aspects and considerations of lowering maintenance level (ML) 3, 4, or 5 National Forest System roads (NFS) to ML2.

The primary advantage of lowering the maintenance level of a road to ML2 is to reduce the cost of road maintenance. Several thousands of miles of ML3, 4, and 5 roads are being lowered to ML2 to meet this cost objective. Many of these ML2 roads will still exhibit the same physical characteristics of a higher maintenance level during the time it takes them to transition to ML2 characteristics. For example, many of these ML2 roads currently are passable by a standard passenger car, and have the signing and look-and-feel of a road being maintained at a higher level. During the transition, it is important to be aware of these physical characteristics and manage them accordingly. ML2 roads are neither intended nor maintained for standard passenger cars, but many of them are passable by standard passenger cars. User safety is a consideration on these roads as it is on all roads.

There is some confusion on how to manage the roads during the period of time it takes to transition to the physical characteristics of a ML2 road and no longer be passable by prudent drivers in standard passenger cars. This guide addresses some aspects of lowering road maintenance levels to ML2 that should be considered by Forest Service road managers in order to successfully decrease road maintenance while emphasizing user safety.

Section 2—Background

Section 2—Background

The Forest Service, an agency of the U.S. Department of Agriculture, is responsible for the management of over 373,000 miles of road across the Nation. This vast road network was developed primarily after World War II to provide access to multiple-use resources. The National Forest Roads and Trails Act authorized use of timber receipts to fund construction of roads needed for timber removal. This authority was used to construct the majority of the post World War II road-system expansion. Policy implementing the act restricted design standards on timber roads to standards, which a so called “prudent driver” would use to construct a logging road on its own private land. At the time, logging roads on private land used wooden bridges, design lives of 20 to 50 years, and very little aggregate surfacing. Private-land roads typically received administrative and commercial use, and little recreation use. Reflecting this, “prudent driver” standards assumed maintenance for commercial-haul traffic would cover most maintenance needs. On the national forests, roads intended for multiple use including extensive recreation use, were often constructed to prudent-driver standards as timber sale receipts were the only available funding.

In the latter part of the 20th century, the shortcomings of this type of system development became apparent. Environmental laws were passed, cumulative effects on watersheds were recognized, impairments to aquatic passage were recognized, recreation use increased 5-or-10 fold, and an ever-widening gap in funding appeared between annual maintenance needs and available revenues. While the traffic-generated component of the annual maintenance need has declined with the declining commercial traffic; the nontraffic-generated components, such as ditch cleaning, culvert cleaning, brush removal, signing, and traffic control, did not. In fact, because of the age of the infrastructure, the nontraffic-generated component of maintenance needs, such as pipe replacement, actually increased. It costs on average four times more annually to maintain a ML3 road than it does to maintain a ML2 road. The maintenance costs for ML4 and 5 roads are even higher. This is one of the primary reasons that the Forest Service is now in a planning process to identify a sustainable road system (travel analysis) and why so many national forests are considering lowering the maintenance levels on many of their roads.

All National Forest System roads should be maintained at a level that minimizes damage to adjacent resources and perpetuates roads for future resource-management needs. This is the only maintenance required on a ML1 road.

In addition to preventing damage to adjacent resources, a ML2 road also is maintained for use by high-clearance traffic.

In addition to preventing damage to adjacent resources, ML3, 4, and 5 roads also are maintained for travel by a prudent driver in a standard passenger car. The primary difference in maintenance between ML3, 4, and 5 roads is in user comfort and convenience. User comfort and convenience are not considered priorities on ML3 roads. ML4 roads provide a moderate degree of user comfort and convenience at moderate speeds; ML5 roads provide a high degree of user comfort and convenience. Refer to the Forest Service Handbook (FSH) 7709.59, chapter 62.3 and “Guidelines For Road Maintenance Levels” (Apodaca, et al. 2011).

Some of the considerations this guide will address are:

- Strategies for signing.
- Minimum maintenance needs.
- User expectations on ML2 roads.
- Strategies to speed up the physical transition to a ML2 road.
- Management of intermittent improvements to a ML2 road.

3.1. Sign Plan

A sign plan provides the framework for managing an effective and consistent sign program. It helps to identify what signs are needed so unnecessary signs are not installed and unnecessary signs installed prior to the plan can be removed. Also, it provides information for and commitment to a specific course of action. The initial sign plan may be developed from a map, but the final plan must be field verified.

When reducing a road to ML2, revisit the existing sign plan and revise it if necessary. This revision could be accomplished by developing a site-specific sign plan for individual or groups of roads. Consider the following:

- Are existing signs still necessary?
- What new signs might be necessary?
- When should unnecessary signs be removed?
- Are the user's expectations different now than they were before the maintenance level was lowered?
- What sign changes might be necessary initially?
- What sign changes might be necessary as the road physically deteriorates to a ML2 (high clearance) over time?
- Are guide signs still needed? If so, where should they be located to discourage passenger-car traffic or encourage high-clearance traffic?
- When to change route markers from horizontal to vertical?
- What are the safety issues that could develop as the road deteriorates over time?
- Will regulatory signs, such as speed limit or stop signs, be needed and enforced?
- What are the budget constraints?

Update sign plans annually or as physical or administrative changes occur. A sign plan is very critical when implementing the sign and poster program. Guidance on signing is found in Engineering Manual (EM) 7100-15, "Sign and Poster Guidelines for the Forest Service" and the "Manual on Uniform Traffic Control Devices" (MUTCD). Signs should complement and be consistent with the applicable motor vehicle use maps (FSM 7716.42).

Refer to the EM7100-15, chapter 2, for more detailed information on sign plans and documentation.

3.2. Sign Removal and Replacement

3.2.1. When should signs be removed?

Remove signs that have been identified as no longer necessary as a result of lowering ML3, 4, or 5 roads to ML2. Existing signs may be left in place until the next road-maintenance cycle if they will not cause confusion to the road user, present a safety risk, or interfere with management objectives (figure 3-1). This will help preserve funding for higher-priority work.

The following are examples of signs that may cause problems if left in place:

- A speed limit sign on a paved road when portions of the road have deteriorated and the recommended speed is less than the posted speed limit.
- A sign indicating a route to a destination when the road—or portions of the road—are no longer accessible by some vehicles, such as recreational vehicles, vehicles with trailers, or some standard passenger cars.
- A horizontal route marker on a ML2 road. (When this marker is removed it should be replaced with a vertical route marker.)
- A destination sign when the management intent is to discourage traffic.

Engineering judgment or an engineering study conducted by a qualified engineer is required before any traffic control devices are removed. See EM7100-15, chapter 3, for more detailed information on engineering judgment and engineering studies.

Figure 3-1—Forest identification sign on an ML2 road that has deteriorated and has not been replaced.

3.2.2. What signs should be replaced during routine maintenance?

3.2.2.1. Route markers

Route markers are the only signs required on a ML2 road. They are necessary for administrative purposes, and for the road user to identify a designated route shown on the motor vehicle use map. Replace horizontal route markers with vertical route markers after the decision has been made to lower a road to ML2 (figures 3-2 through 3-4).

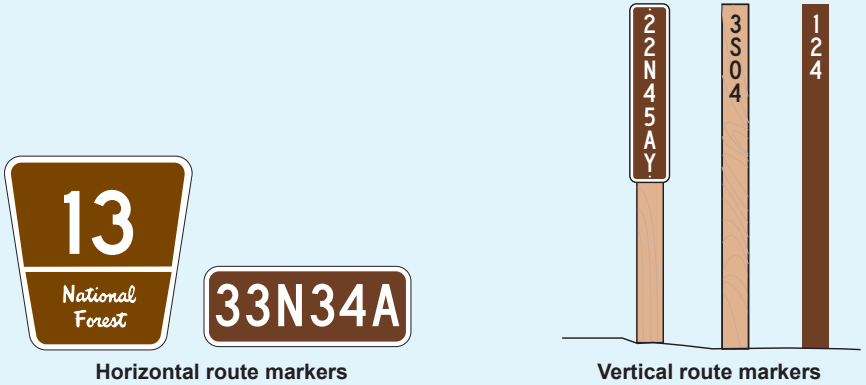

Figure 3-2—Horizontal and vertical route markers.

Figure 3-3—Vertical route marker on a ML2 road.

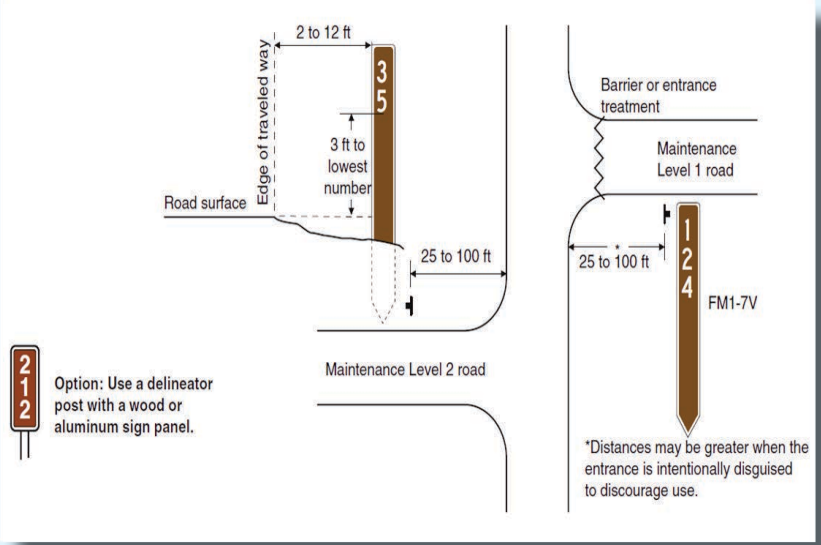

Figure 3-4— Installation guide for vertical route marker.

Figure 3-5— Horizontal route marker on a ML4 road.

Provide information to the public when necessary to help them understand the significance between vertical route markers for ML2 roads and horizontal markers for ML3, 4, or 5 roads. One way to provide this information is by showing the route-marker drawings in the forest visitor map and motor vehicle use map with a brief explanation of their significance (figure 3-6).

This is important because the motor vehicle use map does not distinguish between roads based on maintenance level. For example, a ML5 road may have the same designation on the motor vehicle use map as a ML2 road.

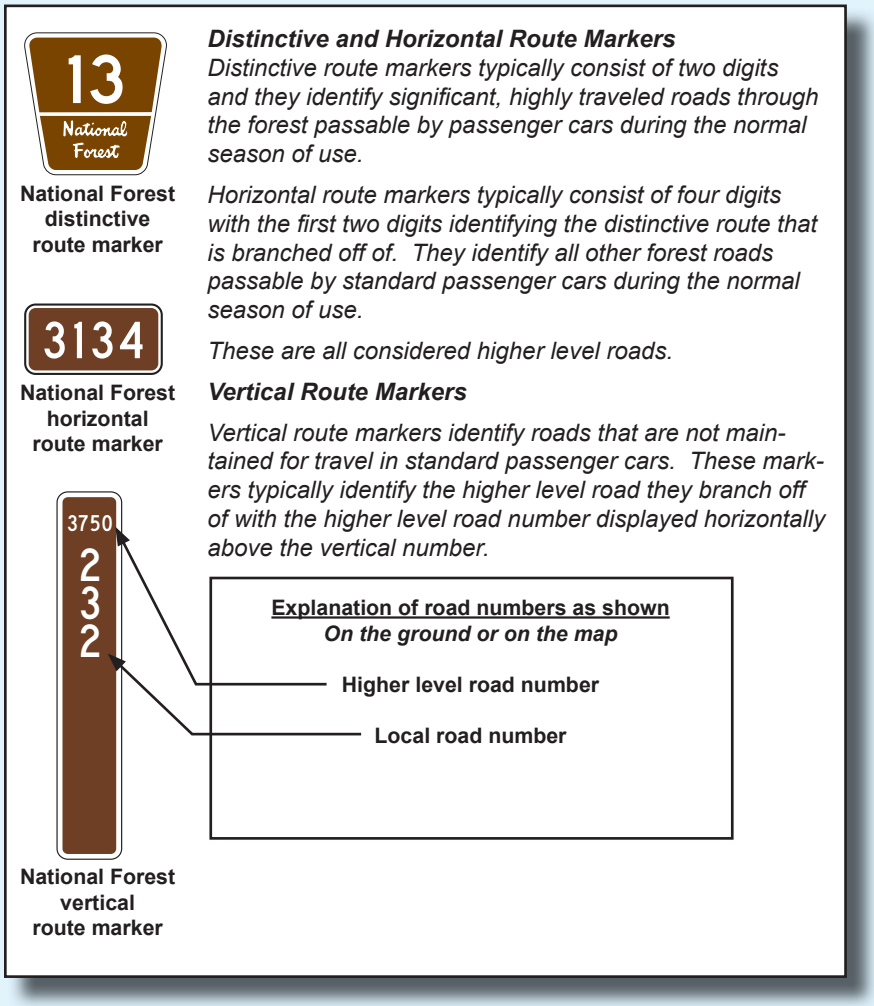

Figure 3-6 — Example of route-marker information (Region 6 motor vehicle use map).

3.2.2.2. Forest road destination signs

Use forest road destination signs to encourage traffic on National Forest System roads suitable for the type of traffic being encouraged. For example, forest road destination signs should not be placed at an intersection encouraging non-high-clearance traffic to turn onto a ML2 road. Typically, forest road destination signs are not used on ML2 roads, where route markers and current maps provide sufficient guidance.

Most forest road destination signs encouraging motor vehicle traffic should be removed after a road has been lowered to ML2 (figure 3-7). The intent is to not encourage traffic to travel to a destination where it cannot go. If forest road destination signs are necessary on a ML2 road for high-clearance traffic they should be placed up the road a sufficient distance from the intersection to not encourage standard passenger-car traffic to travel the road. An example of a forest road destination sign that might be necessary on a ML2 road is one that directs high-clearance traffic to an off-highway vehicle or high-clearance vehicle trailhead or campground (figure 3-8). The decision to install forest road destination signs should be based on an engineering-judgment recommendation.

Figure 3-7—Forest road destination signs for a ML2 road that have deteriorated and have not been removed. These signs should be removed to avoid confusion to the road user.

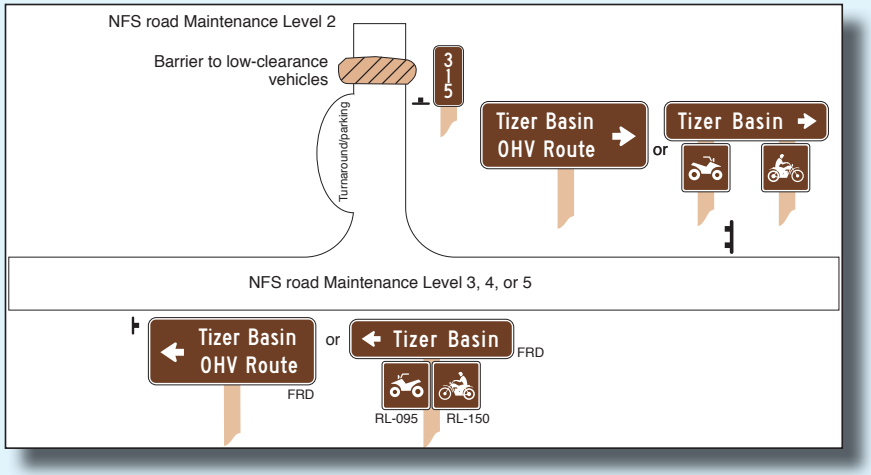

Figure 3-8—Placement of forest road destination signs on a ML2 road. This example shows a combination strategy of encouraging high-clearance traffic by using guide signs with a specific message for high-clearance traffic and discouraging passenger-car traffic by using the vertical route marker and entrance treatment.

3.2.2.3. Regulatory signs

Replace any regulatory signs that are still necessary after a road has been lowered to ML2. Pay particular attention to any existing speed limit signs and complete an engineering study to determine if these are still warranted. It is extremely rare to post a speed limit sign on a ML2 road.

It may be necessary to revisit any existing speed limit, STOP and/or YIELD signs before the scheduled routine maintenance period since they may not be necessary if the road has sufficiently deteriorated to effectively reduce the driving speed and traffic volume. Remove any regulatory signs that have been determined to be no longer necessary (figure 3-9). The decision to not replace a STOP, YIELD, or speed-limit sign should be based on engineering judgment or an engineering study performed by a qualified engineer.

Figure 3-9—The STOP sign is no longer in place on this paved ML2 road and this stop ahead symbol warning sign should be removed on the next maintenance cycle if it has been determined that the STOP sign is no longer needed. If engineering judgment determines the STOP sign is needed it should be replaced.

3.2.2.4. Warning signs, object markers, and delineators

Warning signs, object markers, and delineators call attention to unexpected conditions on or adjacent to a road and to situations that might not be readily apparent to road users. This is important to recognize in determining the need to replace these warning devices after a ML3, 4, or 5 road has been lowered to a ML2 road.

The hazards that required these devices probably still exist if the characteristics of the road have not changed appreciably from what they were as a higher-level road. A qualified engineer needs to determine what conditions exist that might continue to require the need for replacing these warning devices and not rely simply on the maintenance level of the road to determine if they are needed.

Warning signs, object markers, and delineators should be repaired, replaced, or left as is (if they are clean, legible, functional, and positioned properly to facilitate safe use) during routine maintenance cycles if the conditions that warranted them when the road was a ML3, 4, or 5 still exist. If the warranted conditions no longer exist then these warning devices do not need to be repaired or replaced and they should be removed. Engineering judgment or an engineering study conducted by a qualified engineer is required before any warning devices are not repaired, replaced, or removed.

The conditions that required warning signs, object markers, or delineators will probably diminish to the point where they are no longer necessary as the road is maintained continually for high-clearance traffic. This requires someone to assess the situation periodically and not rely solely on past judgments or reports.

The physical characteristics and low-traffic volumes on ML2 roads preclude the need for many—if any—warning signs, object markers, or delineators. In addition, users of ML2 roads meeting these physical characteristics and low-traffic volume are expected to drive with an expectation there will be no warning of hazards on the road ahead. They must drive in a prudent manner reflecting that expectation. Continued use of existing warning devices should be kept to a minimum.

3.3. Addition of New Signs, Object Markers, and Delineators

New signs, object markers, and delineators may be necessary after a road has been lowered to ML2. Some factors to consider include user expectations, the road's condition, entrance management treatments, and whether the road is still passable by a standard passenger car. Remove these new signs, object markers, and delineators when engineering judgment or an engineering study determines that the conditions that required them no longer exist.

3.3.1. Regulatory signs

New safety-related regulatory signs, such as STOP, YIELD, and speed limit, are needed very rarely on a road that has been lowered to ML2. The need for new regulatory signs shall be based on engineering judgment or an engineering study.

3.3.2. Warning signs, object markers, and delineators

The physical characteristics and low-traffic volumes on a road that has been lowered to ML2 preclude the need for many—if not all—warning signs, object markers, or delineators. Use of these warning devices should be kept to a minimum.

An expectation may have been established by the primary users at the higher-maintenance level, and some time may be needed for the users to gain an awareness of the changes. It might be necessary to warn of these changes with signs.

When maintenance is reduced to ML 2—and a road undergoes physical changes over time—these changes may not be consistent throughout the road. For example, the entrance and some portion of the road extending up some distance may be open and inviting to passenger-car traffic, but other sections may have begun to narrow and roughen up due to sloughs, slides, vegetation, and erosion. These conditions may require new signs, object markers, or delineators. This need shall be based on engineering judgment or an engineering study.

3.3.2.1. NO TRAFFIC SIGNS (W18-1)

This warning sign may be used only on unpaved, low-volume roads to advise users that no traffic signs are installed along the distance of the road (figure 3-10). If used, the sign may be installed at the point where the road user would enter the low-volume road or where the road user might need this information (MUTCD, 5C.12).

Figure 3-10—W18-1.

A W7-3aP, W16-2P, or W16-9P supplemental plaque with the legend NEXT XX MILES, NEXT 500 FEET, or AHEAD may be installed below the W18-1 sign when appropriate (figure 3-11).

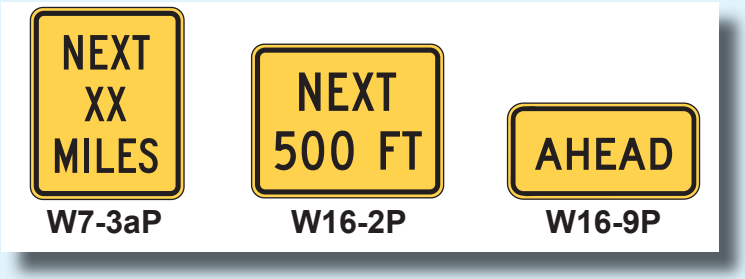

Figure 3-11—Supplemental plaque.

Situations where these signs may be used:

- When a road has been transitioned to a lower maintenance level and existing signs have been removed and advance warning of a change in traffic signs is necessary to warn users who historically have relied on these signs. When the change in signage is no longer considered to be new—or has been in place for a maximum of 12 months—the sign should be removed.
- When a signed road segment transitions to a nonsigned road segment.

Other than these situations, this sign should not be used where it has been determined that signs are not needed. Normally, this sign is not used on ML2 roads.

3.3.2.2. NO TURNAROUND AHEAD (FW14-1a)

Use this warning sign to warn road users at the last turnaround on a road without an outlet or that terminates in a dead end (figures 3-12 and 3-13). If there are no adequate turnarounds, the sign may be placed at the entrance to the road.

Figure 3-12—FW14-1a.

If used, place this sign at a location that gives drivers of large commercial or recreational vehicles an opportunity to turn around.

Use this sign to discourage use by large commercial or recreational vehicles on a ML2 road with no entrance management and the road appears accessible at the entry, but deteriorates the farther in you travel.

Figure 3-13—NO TURNAROUND AHEAD sign placed at a location that provides an adequate turn-around opportunity.

3.3.2.3. ROUGH NARROW ROAD (FW5-1b) and ROUGH ROAD (W8-8)
Use these warning signs when a road abruptly changes to these conditions. Generally, they are not intended to be used on a road that is maintained for high-clearance traffic, but if a paved or aggregate-surface road has been lowered to a ML2 and allowed to deteriorate naturally it may be necessary to warn the road user.

Use of supplemental plaques, such as XX MILES AHEAD, are recommended (when necessary) to avoid a situation where a vehicle cannot be turned around.

Use of a supplemental plaque, such as NEXT XX MILES, may be necessary to warn road users of the length of the condition so they can make an informed decision as to whether to continue on, especially if it is unreasonably long (figures 3-14 through 3-17).

Figure 3-14—FW5-1b and W8-8.

Figure 3-15—Old NARROW ROUGH ROAD sign on a paved ML2 road that narrows and gets rougher a short distance ahead. The NARROW ROUGH ROAD sign has been replaced with the ROUGH NARROW ROAD sign in EM7100-15, 2012

Figure 3-16—Sometimes it may be necessary to install a sign on the left side of the road if ground conditions do not permit installation on the right side, such as the case with this ROUGH ROAD sign. Installing the sign at the beginning of the road provides the user an opportunity to turn around before starting up the rough road. Gates are required to have retroreflective alternating red and white tape, red and white striped barricade markers (FBM- R and L), or a Type 4 marker on the side or sides that will be facing oncoming traffic when the gate is closed.

Figure 3-17—Paved road reduced to ML2. Warning signs may be necessary as the pavement begins to deteriorate and break up.

3.3.2.4. NOT SUITABLE FOR PASSENGER CARS (FW5-1e)

Use this warning sign to warn road users when it is not apparent at the beginning of a ML2 road that it is not suitable for passenger-car traffic (figures 3-18 through 3-20). This will allow the road user to make an informed decision as to whether to continue or seek an alternate route. Display the distance ahead message in feet or miles.

Alternative vehicle types, such as trailers, vehicles with trailers, recreational vehicles, and so forth, can be substituted for 'passenger cars.'

Figure 3-18—FW5-1e.

Figure 3-19—Install a NOT SUITABLE FOR PASSENGER CARS XX MILES AHEAD sign close to the beginning of the road and/or at the beginning of an adequate turn-around location as shown here.

Figure 3-20—Install a NOT SUITABLE FOR PASSENGER CARS sign to discourage passenger-car traffic at the beginning of a ML2 road or just before an adequate turn-around location.

3.3.2.5. Object markers

The use of devices, such as object markers, to warn of encroachments into the roadway may be necessary on ML2 roads (figure 3-21). A common situation for their use is for fill failures that have encroached into the road, especially in areas of limited-sight distance (even at very-low speeds).

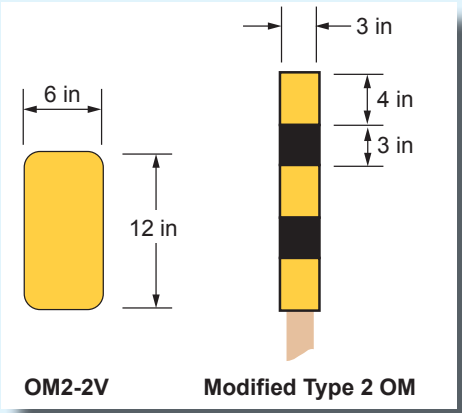

Figure 3-21—Object markers; (a) OM2-2V; (b) Modified Type 2.

Delineators also may be needed as guidance devices in areas of abrupt road narrowing caused by failures that have reduced the width of the road (figure 3-22). Refer to EM7100-15, chapter 3D, for delineator positioning and spacing.

Figure 3-22—This section of road was narrowed by a large-flood event and delineators were installed to guide users through the section.

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Section 4—Maintenance

The maintenance activities for a ML2 road are limited to those necessary for resource protection and to provide access for high-clearance traffic. An exception to this is when the economics of commercial haul may result in a higher level of maintenance, such as very smooth and dust-free road surfaces, and wider clearing limits (see section 7 for additional details).

Maintain ML2 roads to be open for use by high-clearance traffic. Passenger-car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic-control devices generally are not provided (see section 3 for details). If it is necessary to blade a ML2 road to provide access for passenger-car traffic, such as to a trailhead, then the appropriate maintenance level would be ML3 or higher.

Lowering operating speeds to meet the conditions is important on a ML2 road. This can be accomplished by not overmaintaining or improving the road beyond its maintenance level. A road surface becomes less accessible for passenger-car traffic as the road deteriorates; potholes, ruts, or washboarding are created and fills settle. This is acceptable—and should be encouraged—as long as management objectives for the road are being met, unacceptable environmental damage is prevented, and the road-drainage system and streams are hydrologically disconnected. Only use graders on a ML2 road if necessary to protect the resources and not to provide a smooth-driving surface. A dozer generally produces a more desirable outcome than a grader. All of these surface conditions help to lower operating speeds, which typically will reduce the probability and severity of a crash and bring operating speeds in alignment with actual conditions.

Clean and maintain culvert cross drains, drainage dips, and lead-off ditches on ML2 roads for resource needs but not to provide access, comfort, or convenience for passenger-car traffic.

Section 4—Maintenance

Maintenance prescription guidelines for ML2 roads are as follows (figures 4-1 through 4-5):

Traveled way. Log-out and brush only as necessary to provide passage for high-clearance traffic. Maintain road prism for drainage and to provide for passage of high-clearance traffic. Traveled way should not be bladed to provide a smooth-driving surface. Protrusions and rutting up to 6 inches may be present if not inhibiting desired drainage patterns.

Shoulder. Shoulder is usually not defined and maintenance is not required unless necessary to maintain structural integrity of the roadway, drainage functionality, or access for high-clearance traffic.

Drainage. As necessary to keep drainage facilities functional, prevent unacceptable environmental damage, and provide passage for high-clearance traffic. Outslopes and dips, rather than ditches and cross-drain culverts, are the preferred roadway drainage treatment for ML2 roads.

Roadway. Manage vegetative cover as needed for planned traffic. Remove and/or repair slides and/or slumps as needed for access with high-clearance vehicles and to control resource damage. Ramping over slides or slumps is an acceptable alternative if erosion and risk of future failure of the road is not an issue.

Roadside. Generally no work is required. Refer to FSH 7709.59, chapter 40, for direction on danger trees located on roadsides.

Structure. Maintain all structures to provide for the passage of planned traffic.

Traffic service. Install and maintain route markers; warning, regulatory, and guide signs; and other traffic-control devices to provide for planned traffic and an appropriate traffic-management strategy.

Figure 4-1—Potholes are developing on a ML2 road. This road condition helps discourage passenger-car traffic and is acceptable if the road and stream are hydrologically disconnected.

Figure 4-2—The surface on this ML2 road is more than adequate for high-clearance traffic at low speed and there is no evidence of erosion. The vegetation on the shoulders is acceptable and does not encourage passenger-car traffic. If the vegetation begins to close off access to the road for high-clearance traffic or equipment needed to maintain the road some clearing may be necessary. The grass growing on the road surface is acceptable.

Figure 4-3—The surface on this road is extremely rough, but it is still passable by high-clearance traffic at low speeds and discourages passenger-car traffic. No additional surface maintenance is required unless unacceptable environmental damage due to erosion or widening occurs.

Figure 4-4—Material from the cutbank on this ML2 road has settled into the roadway and has been ramped over. This is adequate for high-clearance traffic and discourages passenger-car traffic.

Figure 4-5—Material from the cutbank on this ML2 road has settled into the roadway and left in place. The road template still allows passage by a high-clearance vehicle and leaving this material helps discourage passenger-car traffic.

For additional information on all maintenance levels refer to “Guidelines for Road Maintenance Levels” (Apodaca et al. 2011).

Section 5—User Expectations on ML2 Roads

Section 5—User Expectations on ML2 Roads

When managing a road that has been lowered to ML2, consider user expectations. These expectations are guided by the physical characteristics of the road and not by the maintenance level. Many users do not have knowledge of what Forest Service maintenance levels are or what the maintenance level of a particular road is. It is important to know who the users are and how the lowering of a road to ML2 might affect their expectations.

5.1. Road Surface

Road surface smoothness is not a consideration on ML2 roads and—over time—if the road is maintained to a ML2 standard the road surface smoothness will change. Until the surface condition changes to a rougher condition more suited to high-clearance traffic, the passenger-car driver may have a higher expectation when driving on the road (figures 5-1 and 5-2). This results in a higher degree of reliance on traffic-control devices for conditions that warrant them.

Figure 5-1—A ML2 road that still looks and drives like a much higher-level road. User expectations on this road would be fairly high even though it is a ML2. If a ML2 road, such as this one, continues to be bladed to provide a smooth riding surface and is not allowed to deteriorate, raise it to a higher maintenance level.

Figure 5-2—A ML2 road that is not passable by a standard passenger car. The user expectation on this road would be low because it is obvious that it is not passable by a standard passenger car. A vertical route marker would give further evidence of a lower-standard road. Ruts in the road are acceptable if they are hydrologically disconnected from the stream system.

5.2. Speed

The conditions on a ML2 road are suitable for high-clearance traffic at prudent driving speeds that are typically less than 15 miles per hour (mph). A ML2 road that is passable by a standard passenger car and permits prudent driving speeds—much in excess of 20 mph—gives the road user the expectation of a higher-level road. This could result in a higher degree of reliance on traffic-control devices until the speeds are lowered due to a rougher road surface, increased vegetation encroaching on the traveled way, woody debris allowed to remain in the roadway, or other physical factors. A higher speed also results in an increased risk for vehicle damage or physical injury if an accident does occur (figures 5-3 and 5-4).

Figure 5-3—A ML2 road with a prudent-driver speed of 50 mph due to the smooth road surface and wide traveled way. User expectations on this road would be high, and the risk and severity of an accident would be higher than on a ML2 road with prudent-driver speeds less than 15 mph. ML2 roads with these attributes would have a greater need for traffic-control devices.

Figure 5-4—A ML2 road with a prudent-driver speed less than 15 mph due to the rough road surface and encroaching brush. In this situation user expectations would be low and traffic-control devices would not typically be expected. At these speeds the risk and severity of an accident also would be low, which further decreases the need for traffic-control devices. If the vegetation begins to close off access to the road for high-clearance traffic or equipment needed to maintain the road some clearing may be necessary.

5.3. Type of User (Prudent Driver)

The typical user of a road that is not suitable for passenger-car traffic (ML2) usually has a lower expectation of relying on traffic-control devices because of the low speeds, rough road surface, limited sight distance, reduced-traffic volume, and other factors. If a ML2 road's physical aspects allow or even encourage passenger-car traffic the type of user and his/her expectations generally change. The reliance on—and expectation of—traffic-control devices increases. The users of a ML2 road that is not suitable for passenger-car traffic tend to be hunters, wood gatherers, 4-wheel drive enthusiasts, and generally more local travelers. When the ML2 road has the attributes of a passenger-car road, the potential for nonlocal users—with higher expectations—increases. These factors need to be considered when managing a road that has been lowered to ML2.

5.4. Volume of Traffic

Roads that are not suitable for passenger-car traffic (ML2) typically have low-traffic volumes. This is due to the types of vehicles that can traverse ML2 roads and because ML2 roads do not provide access to heavily used areas of the national forest. A road that is lowered to ML2, but is still suitable for passenger-car traffic and has a history of use that is more typical of a higher-level road, needs to be managed for that use. When the road deteriorates to the point where it is not suitable for passenger-car traffic and/or the use patterns change, the traffic volume generally will decrease. This will help lower the expectation and need for traffic-control devices.

5.5. Motorized Mixed Use

Typically, motorized mixed use is associated more with ML2 roads that are not suitable for passenger-car traffic rather than with higher-level roads that are suitable for passenger-car traffic. Consequently, the expectations of the licensed driver on ML2 roads, which are not suitable for passenger-car traffic, are one of increased awareness to encountering unlicensed drivers. Roads that have been lowered to ML2, but are still suitable for passenger-car traffic, may run a higher risk of an accident if unlicensed drivers are allowed on the road too (i.e., designated for all motor vehicles on the motor vehicle use map). This might warrant the need for warning signs or an entrance treatment to discourage passenger-car traffic.

5.6. Highway Safety Program

Hazards on ML2 roads are not identified to the same degree as ML3, 4, or 5 roads by policy under FSH 7709.59, section 25, primarily because of low-operating speeds and reduced user expectations. However, road hazards and safety issues should still be considered, and traffic-control devices may be required. The need for warning and regulatory signs on a ML2 road should still be determined by engineering judgment or an engineering study, and any necessary traffic-control devices shall follow the requirements of the MUTCD and EM-7100-15. Generally, ML2 roads require few if any traffic-control devices, but this is influenced by the physical attributes of the road and user expectations rather than the maintenance level or the fact that these roads may not be subject to all of the requirements of Forest Service guidance on highway safety (FSM 7733; FSH 7709.59, chapter 40).

The typical road user rarely has any knowledge of the highway safety program, and not being subject to some of the requirements of the highway safety program does not lower the responsibility or liability to manage a ML2 road with respect to user safety.

Section 6—Strategies to Speed Up the Transition

Develope a transition plan before the management decision has been made to lower the maintenance level of a road from ML3, 4, or 5 to ML2. This will help ensure adequate consideration is given to user safety as the road physically transitions to a ML2, or to determine if steps are necessary to speed up this transition. Document the transition plan for a road in the comments section of the maintenance plan and the road management objectives.

ML3, 4, or 5 roads that have been lowered to ML2 will deteriorate over time by the elements or instabilities that occur as a result of external and internal factors, such as gravity, concentration of water, temperature variations, scour by wind and water, effects of traffic, the action of ice, erosion, change or loss of vegetation, and so forth. In some cases it may be desirable to speed up or supplement this natural deterioration, such as when the entrance to a ML2 road appears passable and even desirable to a passenger car, but conditions farther up the road present unacceptable risks.

Several methods can be used to speed up or supplement natural deterioration, and/or assist with entrance management to discourage passenger-car traffic until natural deterioration takes hold. Some key methods to consider are:

- Berms and road-template reduction.
- Roadside and roadway-vegetation treatment.
- Ditches and drainage treatment.
- Road-surface treatment.

Berms and ditches can be used for delineation, access control, and attenuation devices, but it is important to design and construct them to meet the need without creating a hazard.

6.1. Berms and Road Template Reduction

Berms can be used at the road entrance to discourage passenger-car traffic. The berms should be constructed to a height that will discourage access by a passenger car, but will allow passage by a high-clearance traffic without having it bottom out. The height depends on the width of the berm(s), but generally there is a height variation of less than 16 inches. Single berms usually are constructed across the full width of the road entrance to avoid allowing access around it. Multiple and staggered berms containing rocks (figures 6-1 and 6-2) are more effective than

a single berm. These individually do not have to be constructed across the full width of the road if they are placed close enough to discourage passenger cars. Vegetation can be added to help discourage accessibility and even disguise the entrance of ML2 roads where even high-clearance traffic is not encouraged (figure 6-3).

Figure 6-1—Multiple berms with rocks provide an effective entrance treatment.

Figure 6-2—A ML2 road with multiple small berms at the entrance and a ditch on the main road cuts across the entrance.

Figure 6-3—A berm with vegetation to help disguise the entrance.

Use berms to reduce the road template. They are most effective on extra-wide single-lane roads or roads that were constructed originally at 1½-to-2 lane widths. Use berms on the downhill shoulder of the traveled way to make the road narrow to a single lane (figure 6-4) and direct surface flow away from erosive fillslopes or sensitive areas, and allow it to be dispersed into the surrounding area. This reduced road width is less attractive to the passenger-car driver and better fits the characteristics of a ML2 road. Generally, these berms should be restricted to areas of need, such as close to the road entrance, as they require increased road-corridor width and excavation quantities, while adding weight to fills, and concentrating the water somewhere else.

Figure 6-4—Berm to reduce the road template and protect the fillslope.

6.2. Roadside and Roadway Vegetation Treatment

Typically, vegetation is used for erosion control and soil stabilization, but it also can be used to narrow a road making it less attractive to a passenger-car driver. Allowing vegetation to encroach over time narrows the road and decreases the sight distance, which in turn reduces the vehicle speed. Vegetation allowed to grow in the roadway also helps to reduce vehicle speed (figures 6-5 through 6-8). This decrease in vehicle speed helps to decrease or eliminate the need for warning signs.

Watering may be required for initial plant establishment, some fertilizer may be needed (though its use should be minimized), and some replanting or maintenance may be needed to enhance and speed up the treatment.

Things to consider:

- Do not maintain or brush ML2 roads where the management strategy is for them to naturally close to ML1 over time.
- Plan minimal brushing into the maintenance work for those ML2 roads that are really needed.
- Brush and tree encroachment leads to slower speeds and discourages passenger-car traffic.
- Site distance and speed desirable on a ML2 road.

Figure 6-5—The vegetation in the roadway on this ML2 road is acceptable since it allows for access for high-clearance traffic while discouraging passenger-car traffic. This is most effective in discouraging passenger-car traffic from starting up a road when it is apparent at the road entrance.

Figure 6-6—Allowing some vegetation to encroach into the traveled way is acceptable since it allows for access by high-clearance traffic while discouraging passenger-car traffic.

Figure 6-7—Allowing vegetation to continue growing in the middle of a ML2 road with a relatively smooth surface helps discourage travel by passenger-car traffic and helps to decrease vehicle speeds until the surface can deteriorate naturally.

Figure 6-8—When vegetation is allowed to grow in naturally it helps disguise the road and make it less attractive to passenger-car traffic.

6.3. Ditches and Drainage Treatment

6.3.1. Ditches

Ditches can be constructed at the entrance to ML2 roads to discourage passenger-car traffic and to narrow a road to a single lane (figures 6-9 and 6-10). Ditches need periodic maintenance to be efficient hydraulically, less of a risk for vehicles leaving the traveled way accidentally, and move water without erosion or damage to the adjacent land.

Without proper maintenance, a well-designed ditch can deepen due to downcutting. This could pose a higher risk to vehicles that accidentally leave the road and might not allow access for high-clearance traffic. Consider maintenance methods in the design of ditches so that they will be suitable for the methods and equipment that will be used for their maintenance. On very flat grades, a ditch that is not maintained can fill with sediment and debris or pond water, which allows water to infiltrate, saturate, and damage the road subgrade and make the ditch ineffective.

Ditches along the road near natural drainages, such as streams, should be discharged onto the forest floor, vegetation or a stable area rather than directly discharging into the natural drainage.

Figure 6-9—The ditchline on the main road continuing through the intersection discourages passenger-car traffic on the ML2 road.

Figure 6-10—The ditchline on this ML3 road cuts through the intersection of a ML2 road discouraging passenger-car traffic.

6.3.2. Waterbars and rolling dips

Waterbars and rolling dips are used to intersect and divert the surface water running down a road to prevent concentrated waterflow from accelerating down a sloping road; to prevent excessive erosion until natural or planted revegetation can become established; and to divert water off a road.

Waterbars and rolling dips commonly are used on ML2 roads (figures 6-11 and 6-12). They both provide a low-cost method of drainage control where surface water running down the road may cause erosion, but waterbars are more effective at discouraging passenger-car traffic than rolling dips. Waterbars placed close to the beginning of a ML2 road are most effective at discouraging passenger-car traffic (figure 6-13).

Different design vehicles have different geometric requirements so that they can drive over a dip or waterbar without damaging the drainage structure or the vehicle. High-clearance vehicles can pass over drivable waterbars without causing damage. Low-clearance vehicles, such as passenger cars, require a longer, shallower rolling dip and a more gentle transition into and out of the dip. Generally, this type of structure should be avoided on a ML2 road to help discourage passenger-car traffic.

During commercial use, such as an active log haul, waterbars may need to be graded or smoothed out to facilitate driving a log truck over them. These longer and shallower dips may not work as well for water diversion and do not discourage passenger-car traffic. Therefore, once the haul is completed, it is important to reconstruct the waterbars in the road.

The dimensions shown in figure 6-11 are average and should be adjusted to conditions for proper drainage and to ensure that the waterbar is passable by high-clearance traffic.

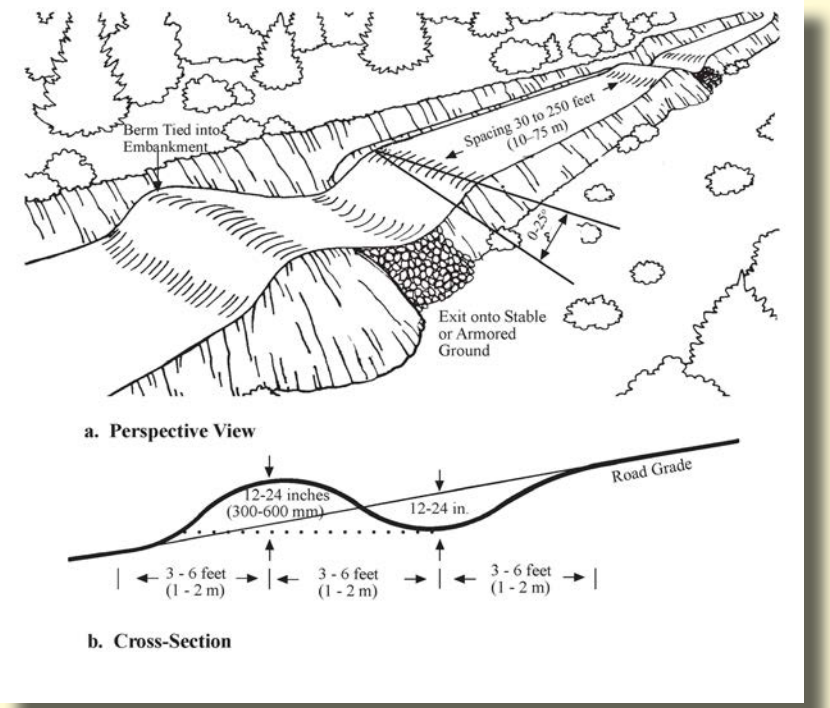

Figure 6-11—Drivable waterbar construction. Adapted from Wisconsin's Forestry Best Management Practices for Water Quality (1995).

Figure 6-12—Rolling dips usually cost less, require less maintenance, and are less likely to plug and fail than culvert cross-drain pipes, but they are less effective at discouraging passenger-car traffic than a waterbar.

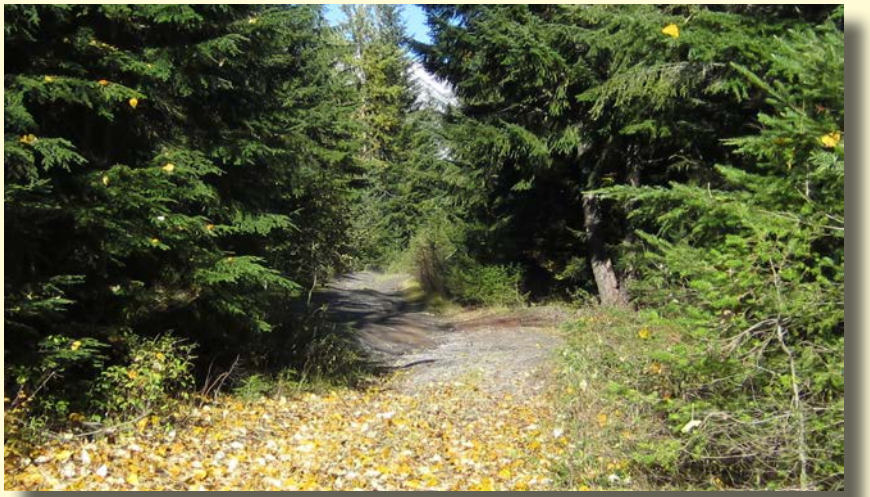

Figure 6-13—ML2 road with multiple waterbars at the entrance to discourage passenger-car traffic.

6.3.3. Low-water crossing

Low-water crossings, or fords, are an alternative when removing culverts for stream crossings on ML2 roads where road use is low, when much upstream debris is present, and streamflow conditions are appropriate (figure 6-14). Low-water crossings allow access for high-clearance traffic while discouraging passenger-car traffic. Like other hydraulic structures for stream crossings, they require specific site considerations and specific hydrologic, hydraulic, and biotic analyses.

Figure 6-14—Armored ford. This is on the high end of ford construction and generally exceeds the budgets and needs of most ML2 roads.

6.4. Road Surface Treatment

6.4.1. Surface roughening

Surface roughening or scarifying can be used to narrow the entrance of a ML2 road to a single lane by widening the shoulder at the intersection. This could help alert a driver of a road-condition change and help discourage passenger-car traffic. This technique also loosens the soil along the edge of the road for improved vegetation establishment, which over time also will serve to discourage access.

Surface roughening or scarifying also can be done on the full width of the road to discourage passenger-car traffic (figure 6-15). This can be done at the beginning of the road and continue as far up the road as necessary to meet management objectives.

Surface roughening and scarifying techniques can be applied to roads with an aggregate surface as well as a native surface (figure 6-16).

Limitations for surface roughening are:

- May not be suitable for steep grades.
- May temporarily increase erosion prior to vegetation establishment.
- Should be done across slope when needed to discourage rills.

Figure 6-15—Scarify the surface at the road entrance by using equipment.

Figure 6-16—Aggregate-surfaced road with scarified entrance.

6.4.2. Asphalt surface (including chip seal) treatment

To the general public, an asphalt-surface road typically encourages passenger-car traffic. It is important to be consistent with road management objectives and maintenance criteria on asphalt-pavement roads that are being lowered to ML2.

There are several methods to comply with the road management objectives and road maintenance criteria for an asphalt-surface road that is being lowered to ML2. One method is to allow the road surface to deteriorate naturally creating a rough, potholed surface, which may help discourage passenger-car traffic. While this surface is deteriorating, it may create risks to passenger-car traffic. It may be necessary to install warning signs or treat the entrance to discourage access by a standard-passenger car to reduce this risk until the deterioration is more consistent throughout the road (figure 6-17). It also is acceptable to use native materials to patch potholes minimally to lower risks for passenger-car traffic.

Another treatment option is to rip up or remove the asphalt surface (figure 6-18). This can be done at the beginning of the road and continue as far up the road as is necessary to meet management objectives. Removal for at least the first 100 feet is recommended to be minimally effective.

The various treatments listed above have a range in application cost and effectiveness, so evaluating various alternatives should be considered as part of the decision process and weighed against available funding and management objectives.

Figure 6-17—ML2 road with deteriorating pavement. Warning signs may be necessary for sections such as this if the deterioration is not consistent throughout the road.

Figure 6-18—Rip or remove the asphalt surface at the entrance of a ML2 road.

Section 7—Managing Intermittent Improvements

Section 7—Managing Intermittent Improvements

When a ML2 road is improved to accommodate a temporary use, such as commercial use, give consideration to the effect this might have on user safety. Most ML2 roads experience only minor noncommercial traffic during those periods when they have been improved for commercial use and temporary traffic control signs may not be necessary. If noncommercial traffic is significant during periods of commercial use, it may need to be discouraged with temporary traffic-control devices, such as signs warning of timber harvest activities, or eliminated by an order (36 CFR 261), such as a closure to nonpermitted use and signed accordingly (figure 7-1). These measures may be necessary only during periods of increased noncommercial use, such as during hunting season, holidays, and weekends. They may be necessary during the entire period of commercial activity, if the road is improved to a level that encourages passenger-car traffic and noncommercial traffic increases significantly. New or additional regulatory and/or warning signs that were not needed before the ML2 road was improved may now be necessary. Some examples are:

- Curves that did not need warning signs before the improvement of the road because of the low speeds may now need signs due to increased speeds and encouraged passenger-car traffic.
- Intersections may now need YIELD or STOP signs, such as where the improved ML2 road intersects with a higher-level road.

It is important to consider that an improved ML2 road should be managed as if it was a higher-level road during the time its physical characteristics remain above ML2. A transition plan, which would include a site-specific sign plan should be developed before a ML2 road is improved, and implemented after the road has been improved and before commercial use has started. Another alternative would be to close the road to noncommercial use during the commercial-use period, and apply one of the strategies described in section 6 before the road is reopened. The decision to use a particular traffic-control device at a specific location should be made on the basis of an engineering study or the application of engineering judgment.

Policy in the Forest Service Manual (FSM) 7732.2 requires commercial users to be responsible for their commensurate share of maintenance needs. Under this policy, when public recreation use is restricted or eliminated on a road, commercial users are responsible financially for all maintenance for traffic, including the needs for safety and signing discussed above.

Figure 7-1—Variable Road Restrictions (FR5-11c) signs indicate specific times and/or days of use and modes of travel that are allowed or restricted. The information on these signs should be clear and concise to avoid confusion for the user. These signs should be designed on a case-by-case basis and shall be approved by the regional office.

Figure 7-2—Log haul on a road maintained temporarily at a higher-maintenance level.

Figure 7-3—ML2 road maintained at a higher-maintenance level for a log haul.

Section 8—Documentation Section 8—Documentation

Section 8—Documentation

The lowering of maintenance standards of National Forest System roads to ML2 should be documented through road management objectives (RMOs) approved by the line officer. Line-officer approval of RMOs certifies that management objectives are correctly documented rather than as a record of a new decision. Document RMOs as a permanent record that is readily available for use. Use the RMO Module of INFRA (the Forest Service infrastructure database) Travel Routes to record data.

While the electronic record in INFRA is used for day-to-day road management, the completed RMOs must be printed and signed in ink by the certifying line officer. RMOs are a key part of the Government's defense in the event of claims and litigation under the Federal Tort Claims Act. Courts generally do not accept electronic documentation as part of the defense. The written copy must be retained in the forest's files for a minimum of 5 years past the date of any revision to the RMO. Refer to the Forest Service Handbook 7709.59, chapter 11.3.

Glossary Section 9

9.1. Definitions

Engineering Judgment–An engineering judgment is the evaluation of available pertinent information, and the application of appropriate principles, standards, guidance, and practices as contained in the MUTCD, EM-7100-15, and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic-control device. It is less technical than an engineering study. Engineering judgment shall be exercised by a qualified engineer, or by an individual working under the supervision of a qualified engineer, through the application of procedures and criteria established by the qualified engineer. Engineering judgment shall be documented (EM-7100-15).

At a minimum an engineering judgment should have:

- Name and signature of person making the judgment.
- Conclusions made.
- Location of and date the work was done.

Engineering Study–An engineering study is a formal, analytical, and comprehensive analysis and evaluation of available pertinent information, and the application of appropriate principles, standards, guidance, and practices as contained in the MUTCD, EM-7100-15, and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic-control device. An engineering study shall be performed by a qualified engineer, or by an individual working under the supervision of a qualified engineer, through the application of procedures and criteria established by the qualified engineer. An engineering study shall be documented (EM-7100-15).

An engineering study may include:

- Accident history and analysis.
- Spot speed studies and curve speed studies.
- Traffic counts and classification.
- Existing and anticipated road conditions.

Maintenance Levels–Maintenance levels define the level of service provided by, and maintenance required for, a specific road. Maintenance levels must be consistent with road management objectives and maintenance criteria.

MUTCD–Manual on Uniform Traffic Control Devices.

Prudent Driver–A prudent driver is a person operating within their physical and mental limitations; with a properly equipped and maintained vehicle; and who always exercises due care for the road, traffic, lighting, and weather conditions (AASHTO's "Guidelines for Geometric Design of Very Low-Volume Roads (ADT<400)"

Public Road (FSM 7705)–A public road is a road under the jurisdiction of and maintained by a public road authority and open to public travel (23 U.S.C. 101(a)).

Public Road (FSM 7730.5)–A road that is:

- Available, except during scheduled periods, extreme weather, or emergency conditions.
- Passable by four-wheel standard passenger cars.
- Open to the general public for use without restrictive gates, prohibitive signs, or regulations other than restrictions based on size, weight, or class of registration (23 U.S.C. 101(a)(27); 23 CFR 460.2(c) and 660.103).

Qualified Engineer–A qualified engineer is an engineer who by experience, certification, education, or license is technically trained and experienced in the proper application of principles, standards, guidance, and practices for traffic-control devices, such as forest, regional, and national sign coordinators (EM-7100-15).

Standard Passenger Car–All sedans, coupes, and station wagons manufactured primarily for the purpose of carrying passengers and including those passsenger cars pulling recreational or other light trailers.

Note: References made to standard passenger car use and passage includes operation by a prudent driver.

Warrant–A warrant describes a threshold condition based upon average or normal conditions that, if found to be satisfied as part of an engineering study, shall result in analysis of other traffic conditions or factors to determine whether a traffic-control device or other improvement is justified.

A warrant is a set of criteria, which can be used to define the relative need for, and appropriateness of, a particular traffic-control device.

Warrants are not a substitute for engineering judgment. The fact that a warrant for a particular traffic-control device is met is not conclusive justification for the installation of the device.

Warrants should be viewed as guidelines, not as absolute values. Satisfaction of a warrant is not a guarantee that the device is needed. Conversely, the fact that a warrant is not fully satisfied does not constitute absolute assurance that the device could not serve a useful purpose. The application of warrants is effective only when combined with the knowledgeable engineering judgment considering all pertinent facts.

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Section 10—Reference Cited

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