

Appendix E

Roads, Landings, and Skid Trails



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E. ROADS, LANDINGS, AND SKID TRAILS

E.1 Overview

Standards are practices from which MRC will not deviate unless one of the following conditions applies:

- MRC obtains approval of the wildlife agencies for explicit alternatives as described in Appendix E and in chapters 8-11 of our *HCP/NCCP*.
- MRC requires a minor modification or major amendment to the HCP/NCCP as described in section 1.13 and in Appendix A, *Implementation Agreement*.
- MRC applies adaptive management as described in Chapter 13, *Monitoring and Adaptive Management*.

Considerations are preferable methods that guide our choices of operation. The conservation measures specified in chapters 8-11 apply in addition to the standards and considerations presented in this appendix.

MRC adheres to standards for

- Design, construction, inspection, reconstruction, maintenance, decommissioning, and use of roads, skid trails, and landings.
- Minimization of road and watercourse crossing density in the plan area.
- Water drafting from watercourses or ponds.

Sections E.2 through E.6 address roads, landings, and watercourse crossings; section E.7, water drafting; and section E.8, skid trails and yarding.

E.2 Standards and Considerations for Road and Landing Design

Poor road design contributes to a significant percentage of mass soil movement and surface erosion on managed forestlands. Proper design of roads and landings prior to construction or reconstruction, therefore, can eliminate many potential erosion problems and environmental impacts. An efficient road system will minimize

- Hydrologic connectivity.
- Point source and surface erosion.
- Probability of mass wasting.
- Maintenance and construction requirements and costs.

MRC follows standards in all road and landing designs. We developed them from “state of the art” methods in the California Forest Practice Rules and the Handbook for Forest and Ranch Roads (Weaver and Hagans 1994), as well as from the experience of MRC road managers. Along with these core methods, MRC may incorporate information from Environmental Hazard Rating Reports (EHRs), the California Salmonid Stream Habitat Restoration Manual, and other data resources such as soil K factors. In addition, with the concurrence of the wildlife agencies, we will apply new technology and science as it becomes available from government, industry, or academic sources. Our intent is to continually improve sediment control as long as the new methods are financially acceptable.

E.2.1 Standards for road classification

1. **Permanent:** a road planned and constructed as an all-season component of the MRC transportation system. These roads, which are generally main haul roads out of a tract, have

- a. Surfaces suitable for trucks to haul forest products throughout the entire winter period.
- b. Permanent drainage structures at watercourse crossings to prevent turbid water from entering streams.
- c. Year-round use.
2. **Seasonal:** a road planned and constructed as a seasonal component of the MRC transportation system.
 - a. Commercial hauling is discontinued during the winter period, except when the risk of sediment delivery is low; for example, hauling may occur during the winter period on seasonal ridge roads which have no watercourse crossings and are hydrologically disconnected from any watercourse.
 - b. Access is for fire control, forest management, occasional harvesting of minor forest products, and other necessary activities.
 - c. Permanent drainage structures are located at watercourse crossings.
 - d. Moderate use occurs during the dry season.
3. **Temporary:** a road used only during timber operations. These roads, which are not main haul roads out of a tract, have
 - a. Surfaces adequate for seasonal logging.
 - b. Drainage structures, if any, which will be removed prior to the winter period or designed to be self-maintaining.
 - c. Low, sporadic use which periodically can become more intense.
4. **Decommissioned:** a road permanently removed from use. These roads
 - a. Are impassable to any motorized vehicle.
 - b. Provide permanent, maintenance-free drainage.
 - c. Minimize concentration of runoff, soil erosion, and slope instability.
 - d. Promote native conifer regeneration.
5. **Historic:** a road built before 1972 that is currently impassable, may not have been actively decommissioned, and for which there are no current or future plans to manage as part of the road system. These roads
 - a. Will not be opened, rehabilitated, or used, based on a review of the sediment delivery consequences and feasibility of repair.

EXAMPLE
MRC will not open and fix an historic road if doing so will deliver more sediment than leaving the road in its current condition.
 - b. Will include railroad grades from historic logging that are not currently converted to a haul road.
6. **Mainline:** major arteries for log transportation that are generally used at least 3 out of every 5 years. A mainline road is
 - a. Typically a permanent road, but can be seasonal.
 - b. Exempt from conservation measures for noise disturbance.
 - c. Mapped in the *HCP/NCCP Atlas*.

E.2.2 Standards for laying out roads and landings

1. Minimize watercourse crossings.
2. Follow the standards (C§8.2.3.1.8-1 and C§8.2.3.2.5-1) for road use and construction in AMZs:

EEZ

- MRC may use and maintain existing roads.

Class I, Large Class II, and Small Class II

- MRC may construct new roads and watercourse approaches within an AMZ if
 - The road does not parallel a watercourse.

- Each approach on either side of a watercourse does not exceed 200 ft in Class I and Large Class II AMZ and 150 ft in Small Class II AMZ.
- MRC may construct new roads exceeding 200 ft in the AMZ if
 - The road is not associated with a watercourse crossing.
 - The conservation measures in C§8.2.3.1.8-1 and C§8.2.3.2.5-1 are applied.

Class III

- MRC may construct new truck road crossings.
 - MRC may construct new roads that do not parallel an AMZ.
3. Set aside “key piece size” logs from all trees felled for new road construction within the AMZ of inner and middle bands of Class I and Large Class II watercourses and within the AMZ of small Class II watercourses; place the logs either in the vicinity of the new facilities or near watercourse sections deficient in LWD.
 4. Do not create new landings in the AMZ unless their specific placement has a lower risk for sediment delivery than other locations outside the AMZ; preferably allow only temporary landings.
 5. Follow the standards (C§8.2.1.8-1 and C§8.2.3.5-1) for construction of new landings within a Class I, Class II or Class III AMZ and consult with the wildlife agencies prior to construction.
 6. Do not construct roads near the bottoms of steep and narrow canyons or in areas with high hazard for mass wasting unless (a) MRC obtains approval of both a California Licensed Geologist and an individual knowledgeable in the relevant aquatic resources and (b) placement of the road at this point has a lower risk for sediment delivery than placement at other locations.
 7. Use logging systems that reduce excavation for roads and landings or placement of fills from roads and landings on dormant or historically active mass wasting features.
 8. Do not construct roads on inner gorge slopes of Class I or Class II watercourses unless
 - MRC notifies the wildlife agencies and CGS 60 days prior to submittal of a THP that proposes road construction across an inner gorge.
 - MRC includes with the THP a report submitted by a California PG/CEG of their investigation, evaluations, and recommendations according to Note 45 guidelines.
 - MRC either resolves any concerns raised by the wildlife agencies within 60 days of their receipt of the MRC notification or the wildlife agencies do not contact MRC within those 60 days.
 9. Do not construct roads or landings on historically active mass wasting features without the approval of both a California Licensed Geologist and an individual knowledgeable in the relevant aquatic resources.
 10. Avoid multiple cuts (i.e., switchbacks) if a hillslope is greater than 50%, unless working with a professional geologist.

E.2.3 Considerations in laying out roads and landings

1. Design road networks systematically to minimize total mileage.
2. Make road design conform to topography to minimize disturbance to the natural environment.
3. Do not construct roads through seeps, springs, or wet meadows unless the route is the only alternative that will minimize disturbance to these and other adjacent topographical features. Consult with MRC wildlife biologists prior to operations to determine if covered species are using the topographical feature. Drain seeps, springs, or wet meadows as

- close as possible to their original site.
4. Build roads on natural benches, flat slopes, and areas of stable soils using soil type (K-factor) maps to minimize effects on watercourses.
 5. Limit landings to the fewest number necessary to conduct yarding operations, so there will be the least amount of stand damage.
 6. Restrict landings to the minimum size necessary, based on equipment and worker safety requirements.
 7. Select road design consistent with the yarding systems used.
 8. Design roads to avoid, if feasible, other sensitive biological and habitat resources, namely plants, fish, and wildlife, in addition to the considerations given above.
 9. Avoid multiple cuts (i.e., switchbacks) if a hillside is greater than 50%, unless working with a professional geologist.

E.2.4 Standards for road prism

1. Construct new seasonal and temporary roads as single lanes, not to exceed 16 ft. (4.8 m) in width except where required below.
2. Construct traveled surfaces to a maximum width of 14 ft (3.6 m) unless MRC requires additional width for (a) alignment, (b) safety, and (c) equipment.
3. Narrow existing roads to a maximum width of 14 ft (3.6 m) at controllable erosion sites.
4. Locate turnouts at reasonable intervals along the road alignment and follow all OHSA safety guidelines so that a minimum excavation or fill will be required to increase the road width.
5. Avoid, where feasible, construction of through-cuts (in lengths greater than those specified for water breaks) in AMZs which are hydrologically connected to watercourses; rock through-cuts if such avoidance is infeasible.
6. Do not construct roads with a grade that exceeds 15%, although
 - a. MRC can construct pitches of up to 20% for 500 continuous feet (152.4 m).
 - b. MRC can exceed these percentages and distances if (i) there is no other access for harvesting of timber when considering sediment production and economic concerns (i.e., steeper road grades equate to less road construction and, therefore, less cost) or (ii) use of a gradient in excess of 20% will reduce road length and avoid a watercourse.
 - c. MRC will minimize construction of through-cut road prisms (in lengths greater than those specified for water breaks) on new roads with gradients greater than 15% and, to the extent feasible, will remove through-cuts on existing roads with gradients greater than 15%.
 - d. MRC will rock the surface of the through-cut when it is not feasible to limit the through-cut per E.2.4, 6c.
 - e. MRC may construct roads that have a gradient $\geq 20\%$ and a length of 500 ft or more within areas that may deliver sediment to a watercourse as long as we pave the roads to prevent runoff and sediment delivery.
7. Construct or reconstruct roads as full-benched cut (no fill) or remove fill prior to the winter period on slopes over 50% where cutbank stability is not an issue. Dispose of spoils not used in road construction in stable areas outside of an AMZ. Alternatively, construct roads with balanced cuts and fills, properly engineered or compacted in layers not to exceed a depth of 1 ft (.3 m). Optionally, remove fills on decommissioned and

- temporary roads with the slopes recontoured prior to the winter period. Refer to E.2.18 for information on spoil disposal.
8. Construct roads on slopes over 40% with key fill material more than 4 ft in thickness unless an alternative design is proposed by a California Registered Geologist or the road is constructed as full-benched (E.2.4, #8).
 9. End-haul materials to a stable location and, when slopes are over 50%, ensure that location is more than 100 ft from the boundary of an AMZ.
 10. Balance a road's cut-volume with its fill-volume, when roads are not full-bench construction.
 11. Design cut slopes to minimize exposure of mineral soil through use of the maximum grade that will ensure hill-slope stability.
 12. Employ maximum feasible road grades to limit road lengths in AMZs.
 13. Give preference to an out-sloped road prism as the design standard for all roads.
 14. Incorporate waterbreaks, such as rolling dips or waterbars, into out-sloped road prism design.
 15. Use in-sloped roads only where necessary to divert road drainage from an unstable area on the outside of a road or to allow for safe hauling operations.
 16. Use an insloped road prism when it is necessary to protect fill slopes (i.e., permanent water crossings) or prevent mass wasting from concentrated road drainage. On existing insloped roads with ditch-relief culverts, space the culverts along the road no more than 600-800 ft apart on road segments with gradients less than 4% or 400-600 ft apart on road segments with gradients greater than 4%. Shorten the spacing or re-locate the culvert, if gullies occur.
 17. Convert insloped roads to out-sloped, if feasible.
 18. Use crowned road prisms with ditches and ditch relief culverts on roads with flatter slopes and large traffic loads or on fills requiring a high level of road surface drainage.
 19. Use straw mulch, slash, or equivalent material on fill faces within an AMZ (E.10).
 20. Minimize through-cuts, especially long and steep cuts.

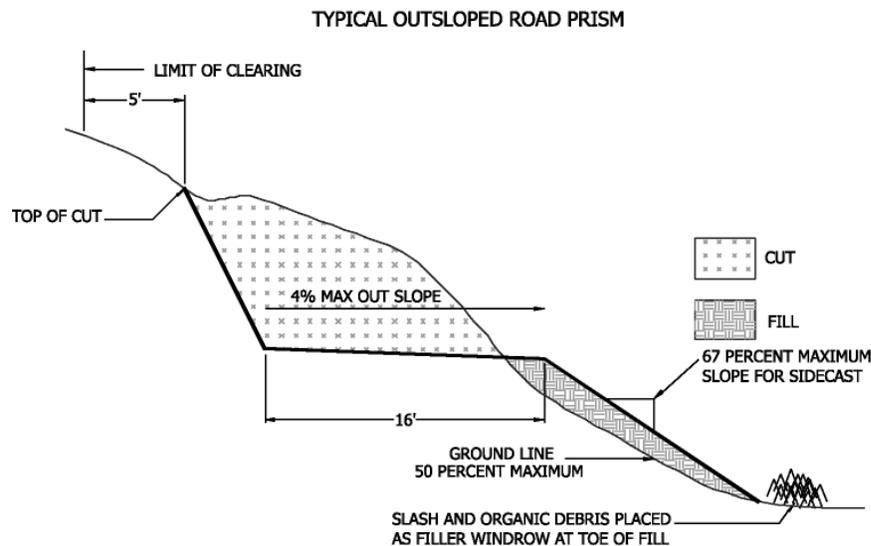


Figure E-1 Road Prism Diagram

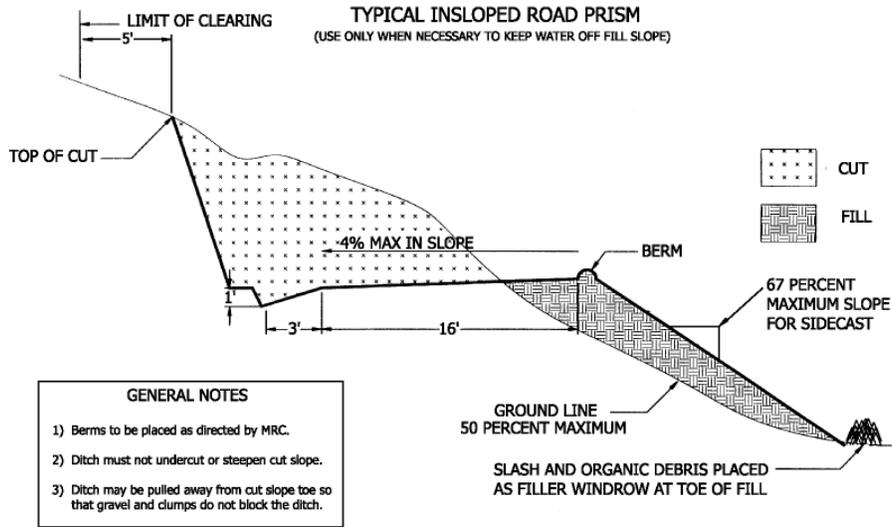


Figure E-2 Insloped Road Prism Diagram

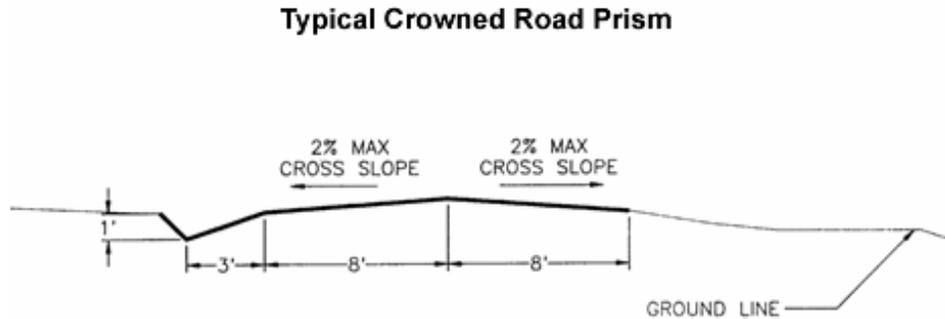


Figure E-3 Crowned Road Prism Diagram

E.2.5 Standards for road and landing surfaces

1. Ensure that rock used on road surfaces is of sufficient competence and depth based on the season, timing, and intensity of use and is not a source of sediment.
2. Stabilize road surfaces and inside road ditches within the AMZ to prevent sediment delivery (E.10):
 - a. Surface permanent roads within the inner and middle bands of Class I and Large Class II AMZ or within the AMZ of a Small Class II or Class III watercourses with rock or pavement to minimize fine sediment discharging into watercourses.
 - b. Rock or mulch with straw seasonal and temporary roads used during the year which are within the AMZ and without anticipated winter access.
 - c. Install waterbars on all other roads in the AMZ with anticipated winter access; space the waterbars at 50 ft intervals for grades over 5% and at 75 ft intervals for grades below 5%. Place additional filters (straw or slash) on outlets of waterbars or installed sumps. Lay 5 ft of straw along the drain side of a road and shape the road to minimize water concentration.

NOTE

The wildlife agencies or MRC may evaluate sediment delivery resulting from these conditions. If the amount of delivery from these conditions would exceed the amount from rocking the road, MRC will instigate alternative measures that are equivalent to rocking or straw mulching during winter; for example, MRC may rock a crossing or mulch an entire road surface. As new technology or techniques become available for determining sediment delivery, the wildlife agencies or MRC may consider their possible use within the plan area.

3. Treat landings within an AMZ per E.5.1 prior to October 15th or per winter standards (E.6.3 to E.6.5) after October 15th and adhere to the following standards for landing use within an AMZ:

Class I and Class II

- MRC may use an existing landing that does not require any reconstruction, if relevant conservation measures (C§8.2.3.1.8-1) are applied.
- MRC may construct new landings if relevant conservation measures (C§8.2.3.1.8-1) are applied and the wildlife agencies concur.

Class III

- MRC may use stable existing landings.
- MRC may construct new landings if relevant conservation measures (C§8.2.3.3.5-2) are applied and the wildlife agencies concur.

4. Surface permanent roads with rock or pavement to a minimum rock depth of 6 in. (15 cm) in order to allow year-round use.
5. Surface approaches to drafting locations on a watercourse with rock to avoid generation of sediment unless the approach is within the bankfull channel (i.e., on a gravel bar).
6. Surface roads used for log or rock hauling during the winter period with rock or pavement unless (a) the road does not cross a watercourse, (b) the road does not drain to a watercourse, and (c) the road is greater than 200 ft from a watercourse.
7. Treat the running surfaces of roads used for timber operations, e.g., by rocking, watering, chemically treating, asphaltting, and oiling, to prevent excessive loss of road surface materials.
8. Do not allow oil, asphalt, or chemical treatments to run into a watercourse.
9. Do not store or place oil, asphalt, or chemicals where potential spillage or leakage could run into a watercourse.

E.2.6 Standards for road and landing surface drainage

1. Use out-sloped roads with rolling dips as the preferred drainage structure for permanent and seasonal roads with grades less than 8% (Table E-1).¹
2. Use suitable energy dissipators (i.e., durable material sized to remain in place during high flows) on drainage structures and drainage facilities of roads or landings to prevent discharge on erodible fill or other erodible material.
3. Install slash, rock, rip-rap, or other suitable material prior to winter on the outlet of all road or landing drainage structures within 100 ft of a watercourse and with less than 90% vegetation buffer (i.e., less than 90% of the ground has vegetative cover). This will create a sediment trap or filter for a watercourse.

¹ Rolling dips are not adequate drainage structures for roads with grades over 8%. Road design and construction should locate breaks (i.e., points at which we can flatten the grade) to accommodate rolling dips on grades 9-15%.

4. Locate waterbreaks to prevent road drainage from discharging directly into a watercourse, wet area, seep, or spring, or onto mass wasting hazards. This requires discharge into some form of vegetative cover, duff, slash, rocks, or less erodible material wherever possible. Construct a waterbreak to provide for unrestricted discharge at its lower end, so that water will be spread and delivery of eroded soils will be minimized.
5. Do not direct drainage from roads or landing surfaces outside of the mass wasting feature, i.e., at or across the head, toe, or lateral margin of known mass wasting features.
6. Drain water that runs from wet areas, seeps, or springs onto a road to a stable location when there is (a) a safety hazard or (b) a risk for damage to road and landing surfaces or (c) potential for increased sediment delivery. Otherwise, do not disturb the wet area, seep, or spring.
7. Do not exceed the distances between waterbreaks outlined in Table E-2. Decrease waterbar spacing at locations where there is evidence that rills or sediment at the waterbar outlets exceed the filter capacity of the site.
8. Avoid concentration of 2 separate drainage areas into 1 channel (i.e., drainage piracy).
9. Construct rolling dips and road relief culverts to discharge water in a manner that prevents creation or enlargement of gullies and subsequent discharge of sediment to a watercourse.

Table E-1 Recommended Rolling Dip Dimensions

% Road Grade	Unload Approach Length (ft)	Reverse Grade Length (ft)	Depth Below Average Road Grade At Discharge Side Of Dip (ft)	Depth Below Average Road Grade At Inside Edge Of Dip (ft)
<6	55	15-20	0.9	0.3
≥6	65	15-20	1.0	0.2

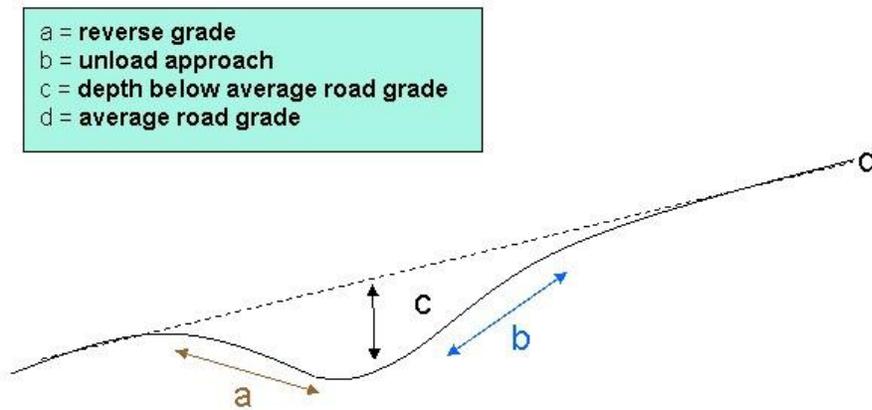


Figure E-4 Rolling Dip

Table E-2 Maximum Distance between Waterbreaks

Estimated Hazard Rating	Road or Trail Gradient			
	<=10%	11-25%	26-50%	>50%
Extreme	100 ft	75 ft	50 ft	50 ft
High	150 ft	100 ft	75 ft	50 ft
Moderate	200 ft	150 ft	100 ft	75 ft
Low	300 ft	200 ft	150 ft	100 ft

E.2.7 Standards for hydrological design

- Design all new watercourse crossings, such as bridges and culverts² which are to remain in place for one or more winter periods (except for vented fords), to a minimum hydraulic capacity in order to safely pass a flow with a return interval of 100 years, including sediment and debris load.
 - Install culverts at the same gradient as the natural stream channel, as feasible. If not feasible, armor outlets and install energy dissipators to protect the road fill.
 - Install culverts with a camber or slight hump (between 1.5 to 3 in. per 10 ft of culvert length) to counter the effects of sag once the culvert is buried in the streambed; center the camber under the middle of the pipe, when feasible.
 - Install culverts so that they are aligned parallel to the natural channel to avoid angular deviation.
 - Install culverts so that the width of the constructed channel above the inlet is not excessively wide; the constructed channel should not be more than 2x the diameter of the culvert, if feasible.
 - Use culverts that are at least as wide as the width of the active stream channel (i.e., the zone of active, annual streambed scour and deposition), particularly for small streams.
 - Extend culvert outlets at least 2 ft beyond the fill and preferably at least the length of 1 culvert diameter, if this is greater.
 - Size culverts using a HW:D ratio of 0.67 except for the following circumstances:
 - Culvert diameter is larger than the watercourse channel.
 - Culvert inlet is beveled or mitered to conform to the fillslope and sized to an HW:D ratio of 0.75.
 - Flared metal end section is installed.
 - Field conditions indicate that smaller culverts are likely to be successful.

NOTE
This may include measurements of bankfull cross-sectional areas of less than 0.33 of a calculated culvert diameter or other factors that may indicate that 0.67 is not necessary. At these locations, MRC will consult in advance with the wildlife agencies for concurrence on the culvert size. This consultation will include the rationale for not using a HW:D ratio of 0.67.

 - Culvert sizing, as measured on the discharge side of the culvert, increases by 6 in. for every 5 ft of fill above the culvert.

NOTE
This condition does not apply if the culvert sizing is adequate to pass a projected 150-year flood event, inclusive of sediment and wood loads.
- Upgrade, within the initial 30 years of the HCP/NCCP, watercourse culverts that currently could not pass a flow with a return interval of 50 years to one that will pass a

² Recommendations for culvert sizing are in Cafferata et al (2004).

flow with a return interval of 100 years. Upgrade all culverts with less than a 50-year return period to ones with a 100-year return period. Upgrade non-functioning culverts that have a 50- to 100-year flow return period to a 100-year flow return period. Leave remaining culverts in place until (a) a road inventory determines they are rusted through; (b) road and crossing inspections indicate they are in need of repair or replacement; (c) they are not passing flood flows; or (d) they are a priority for replacement to meet objectives for controllable erosion. Install diversion protection, when equipment is in the area, on culverts that do not meet a 50-year return flow and that are not scheduled for replacement based on criteria in 8.3.3.2.1, E.2.13, and E.2.14.

NOTE

Non-functioning culverts (a) contain rusted holes; (b) cause frequent aggradation above the inlet; (c) produce excessive scour at the outlet that cannot be mitigated by improved energy dissipation, or (d) no longer allow water to pass through.

3. Over-size, reinforce, or remove drainage structures and erosion-control features before the completion of the timber operation, when there is an immediate risk for sediment delivery. Examples of such risks are large or deep crossing fill volumes; high bed load transport in a watercourse; and high debris transport in a watercourse.
4. Construct or maintain permanent watercourse crossings and associated fills and approaches to prevent diversion of stream overflow down the road and to minimize fill erosion if (a) the drainage structure becomes obstructed; (b) road and crossing inspections indicate they are in need of repair or replacement; (c) they are not passing flood flows; or (d) they are a priority for replacement to meet objectives for controllable erosion.

E.2.8 Considerations for choosing watercourse crossing type

1. Employ temporary crossings when there is no need for pick-up access after completion of operations.

NOTE

In MRC experience, this is typically on road segments less than 0.75 miles long.

2. Employ fords, typically on Small Class II and Class III watercourses where log hauling occurs, if the channel is dry and pick-up access is needed after operations.
3. Design and install vented fords so that (a) minimal water flows and (b) all flow passes through the vent during hauling.

NOTE

MRC will design vented fords for (a) minimal winter flows; (b) flows through the culvert; (c) high flows; and (d) flows across a road surface. We will use vented fords in locations that may not receive adequate winter monitoring. Because plugging of the vent is likely, its capacity will not contribute to the 100-year design flow of a crossing.

4. Use culverts on Large Class II watercourses or on smaller watercourses if the channel is not dry during log hauling; install culverts so that they are accessible for winter monitoring and minor winter maintenance.
5. Give preference to bridges as the crossing device for all Class I watercourses.

NOTE

Consider use of bridges when other structures are not feasible or when a watercourse is at least 4 ft wide.

E.2.9 Standards for temporary watercourse crossings

1. Refer to standards in the MSAA.
2. Re-install temporary Class II and Class III crossings, which require activity in the active channel, after April 1, if the crossing is dry; otherwise, re-install the temporary crossings when the channel is dry or after May 15, whichever condition occurs first. Remove the temporary crossings before the threshold for cumulative precipitation is met.

NOTE

For temporary crossings installed prior to June 1, size the pipes to convey a 50-year storm.

3. Install temporary crossings with culverts on Class I watercourses after June 1.
4. Surface log stringer bridges with a layer of rock over filter fabric or straw to prevent any material from entering the active channel during use.
5. Do not install temporary crossings or construct watercourse crossing or upgrades on Class I watercourses prior to June 15 unless there is no activity within the channel; for example, MRC may place a bridge upon constructed abutments.
6. Size temporary crossings on Class I watercourses, installed before June 1, to pass a 50-year flow.
7. Construct temporary crossings on Class I watercourses to allow for movement of juvenile anadromous salmonids upstream or downstream of the crossing.
8. Use temporary crossings up to October 15; use of temporary crossings can occur after October 15 but they must adhere to the standards for the early winter period or to prescriptions within the MSAA.
9. Install culverts with rock or log fill when it is difficult to remove all fill material from locations that could deliver to a watercourse (e.g., watercourses with deep, incised, steep, or rough channel bottoms) or from flow that could transport fill downstream. Ensure culverts are of sufficient size to accommodate the largest projected flow during the period of their intended use. Clean or wash rock fill so that it is free of soil material. Construct crossings with log fill so that they can be removed with minimal disturbance to streambeds and banks. Cover log fills with filter fabric as well as straw mats or rock; surface the road with a local topfill. Excavate the top fill, prior to removal, with mechanized equipment or hand tools, as necessary, and place the fill where it will not enter the channel. Remove the logs so as to minimize further disturbance to the banks. Employ an alternative process meeting the same goals, if CDFG gives approval in advance.
10. Pump or divert water around a temporary crossing to prevent sediment from being carried down to a watercourse during the installation or removal process.
11. Restore, after use, the watercourse channel at the site of the temporary watercourse crossing to its approximate original configuration with all fill material removed from the site except for alluvial gravels.
12. Excavate fills in the watercourse crossing to form a channel that is wider than the natural channel and as close as possible to the natural watercourse grade and orientation.
13. Slope excavated material, and any resulting cut bank, away from the channel. Stabilize it by seeding, mulching, rocking, or other suitable treatment (see E.10) in order to prevent slumping and soil erosion.
14. Restore aquatic habitat features (e.g., LWD and boulders) removed during installation of temporary crossings or replace them in equal quantities on-site or near-site.
15. Re-spread, after culvert removal, alluvial gravels to approximate conditions prior to culvert placement.

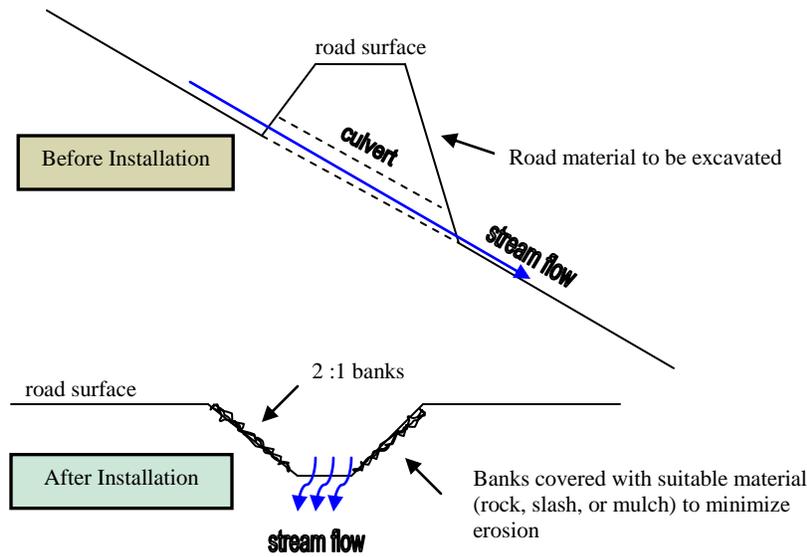


Figure E-5 Installation of Temporary Watercourse Crossing

E.2.10 Standards for fords

1. Refer to standards in the MSAA.
2. Do not install fords on Class I watercourses, except in very unique circumstances specified within the MSAA.
3. Do not haul logs or rock over a ford when there is flowing water across the surface, although light pick-up traffic is acceptable; allow an exception in the case of Class I fords, as specified in the MSAA.
4. Limit access over Class II fords for timber management to dry conditions in the watercourses during hauling periods. Limit use to ATVs or pick-ups, if conditions are not dry or if the running surface will be dried by installation of a vented ford or placement of rock over a temporary pipe.
5. Place a culvert, rock drain, or other water conveyance facility in Class II or Class III fords to convey sub-surface flow through the fill of the rocked ford if there is evidence of significant subsurface flow (i.e., exposed soil pipes above, at, or below the crossing) or evidence of year-round water flow from upstream seeps or springs.
6. Build a dip in the road at the axis of the rocked ford. Dish out the outside face of the fill material at the ford and armor it with rock large enough to withstand a 100-year flow. Size the rock to be non-transportable; rock size should exceed the size of the substrate upstream and downstream of the crossing under similar channel conditions (gradient, confinement, etc.).
7. Construct fords by excavating beneath the roadbed to form an exaggerated dip and spillway under the crossing. Employ the maximum feasible grades in the dip to allow the desired access for ATVs, pick-ups, and log trucks and to minimize the fill needed for the crossing. Provide in the final road alignment a dip with a cross sectional area greater than that required for a culvert at the same location (Table E-3).

Table E-3 Minimum Outlet Sizing at Permanent Fords

100-year Pipe Diameter (in.)	Equivalent Area (ft²)	Average Design Depth (ft)	Design Width (ft)
18	2	0.33	10
24	4	0.33	20
36	8	0.50	25
48	13	0.50	30
54	16	0.60	35
60	20	0.75	40
72	29	0.75	45
80	35	1.00	50
92	47	1.00	55

8. Surface the road with rock to at least a 6 in. (15 cm) depth. Armor the bed of the road with rock extending past the width of the dip (Table E-4).
9. Place a culvert, rock drain, or other water conveyance in the road fill to convey sub-surface flow through the fill of the rocked ford.
10. Rock the road surface for a distance of at least 5 times the channel width. If the channel width is 2 ft, for example, rock 10 ft on each side of the channel; for well-traveled roads, rock 25 ft on each side of the channel. Determine the channel width upstream of the crossing. Use at least 4-inch rocks laid to a depth of 6 in. on the road surface; compact the rock into the channel at the crossing.
11. Ensure that the ford fill is composed of competent rock, generally greater than 3 in. and containing less than 20% fines for crossings where (a) the drainage area is greater than 75 ac (measured at the crossing); (b) large amounts of fill (i.e., more than 100 yds³) are required; or (c) other on-site factors exist that require a heightened level of concern (e.g., a high likelihood of mass wasting or a highly unstable channel above the crossing).
12. Armor the road surface, road edge, and fill face wide enough to prevent flows from circumventing the channel and armored face, as well as from back-cutting the road. Include in the width the full extent of the road's outside edge that may receive flow if the channel adjusts after operations. Allow rock armoring to extend 2-6 in. above the outside edge of the road surface, but include a low point to control channel movements at the spillway thalweg.
13. Armor the downstream fill face with large rock capable of handling a 100-year flow event. Size the rock to be non-transportable; determine the size by reviewing the stream substrate upstream and downstream of the crossing. Generally, the rock should be 6 – 24 in. with a mean diameter of 12 in. Ensure there is a mix of different size rocks to fill the voids between the large rocks. If a fill face has a slope greater than 50%, place rocks into a deepened keyway at the bottom of the fill prism. Preferably place all keyways at least 24 in. below the outfall stream grade.
14. Do not replace or upgrade existing fords, if the ford is properly functioning.

NOTE

A functioning ford does not have significant back-cutting across the road surface and does not divert flows around the armoring on the fill face.

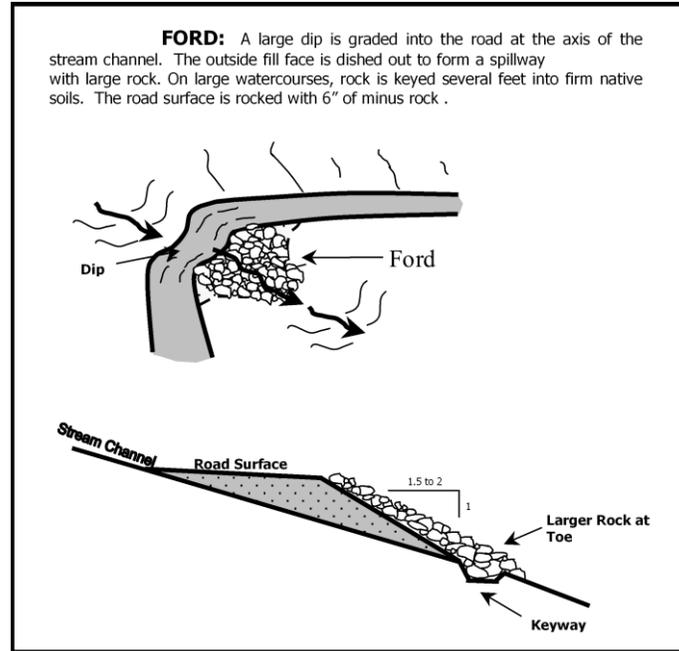


Figure E-6 Ford Diagram

E.2.11 Standards for vented fords

1. Do not haul logs or rock over a vented ford if there is flowing water across the surface; light pick-up traffic is acceptable.
2. Build a dip in the road at the axis of the vented ford. Dish out the outside face of the fill material at the ford and armor it with rock large enough to withstand a 100-year flow. Size the rock to be non-transportable. Determine the size by checking the substrate up and down the stream. Surface the road with rock to a depth of at least a 6 in. (15 cm). Armor the bed of the road with rock that extends past the width of the dip.
3. Design and install vented fords so that (a) minimal water flows, and (b) all flow passes through the vent during hauling. Create the dip at least 1.5 times the width of the upstream channel. Increase the width to slow down the water prior to going over the spill way and to prevent back cutting.

NOTE

MRC will use vented fords in locations that may not receive adequate winter monitoring.

Because plugging of the vent is likely, its capacity will not contribute to the 100-year design flow of a crossing.

4. Rock the road surface 5 times wider than the channel. If the channel width is 2 ft, for example, rock 10 ft on each side of channel, or, in the case of well-traveled roads, 25 ft on each side of the channel. Determine the channel width upstream of the crossing. Rock the road surface with at least 4-inch rock at an approximate depth of 6 in. Compact the rock into the channel at the crossing
5. Armor the fill faces with rock large enough to accommodate a 100-year flow. Size the rock to be non-transportable, generally 6 -24 in. with a mean diameter of 12 in. Determine the size by checking the substrate up and down the stream. Provide for a mix of different size rocks to fill the voids between any large rocks. Place rocks in a deepened keyway at the bottom of the fill prism, if the downstream fill face is over 50%.
6. Extend, if desirable, rock armor 2-6 in. above the outside edge of the road surface; create the armor wide enough to prevent erosion to the sides of the armoring and back cutting.

7. Size vents (typically culverts) to minimize the fill volume in the crossing while allowing for passage of a 10-year flow. Use multiple pipes (no less than 12 in. in diameter) rather than single pipes in order to minimize fill in the crossing.
8. Ensure that vents are not steeper than the natural gradient of the channel.

E.2.12 Considerations for fords

1. Use rocked fords as the preferred structure for intermittent or ephemeral watercourses or for lightly traveled watercourse crossings.

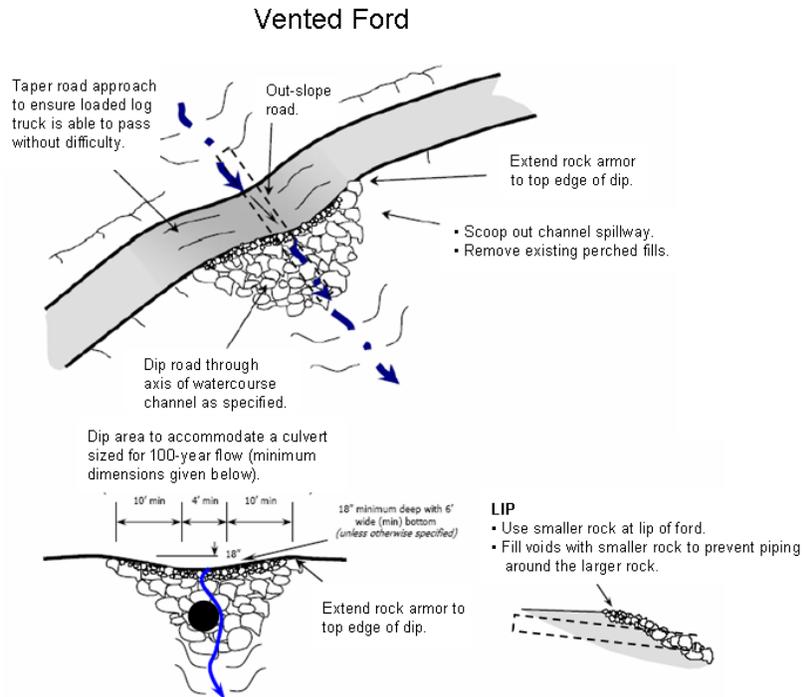


Figure E-7 Vented Ford³

E.2.13 Standards for watercourse culverts

1. Refer to conditions of the Master Streambed Alteration Agreement (MSAA).
2. Allow for (a) upstream and downstream passage of fish or listed aquatic species during any life stage and (b) the natural movement of bedload to form a continuous bed through the culvert, when installing permanent culverts in Class I watercourses (NMFS 2001).
3. Install oversize culverts, drop inlets, trash racks, or similar devices when there is evidence that soil and other debris is likely to significantly reduce culvert capacity below design flow in order to minimize culvert blockage.
4. Do not use drop inlets and trash racks on Class I watercourses.
5. Design watercourse culverts so that, if they plug, the water is diverted directly across the road and back into the watercourse channel. If the culverts already exist without this

³ MRC modified an illustration from an undocumented source to create this graphic. The intent of a “vented ford” is to allow normal year-round low flows to run through the culvert, while larger flows “over-top” the culvert. In larger flows, the vented ford acts as a rocked ford crossing.

- design or a site cannot incorporate this design in the construction, then build a rolling dip to catch the diverted water, if the culvert plugs, and send it back into the channel.
6. Place energy dissipaters at the outlet of watercourse culverts and downspouts, unless they hinder fish passage or suitable channel armor is present (i.e., bedrock or boulder channel). The energy dissipaters should be a sufficient distance from the outlet of the culvert to slow the flow and prevent scouring or erosion.
 7. Anchor each downspout at the culvert and at its base. Downspouts should not exceed 20 ft (6 m) in length. Anchor downspouts at intervals no greater than 10 ft (3 m). Use a stable anchor that may include, but is not limited to, pipe, t-posts, concrete re-bar, wooden beams, and logs.
 8. Ensure that half-round downspouts, if installed, are (a) at least one size larger than the culvert; (b) sized to accommodate the entire design flow from the culvert; (c), in line with the culvert; (d) securely attached to at least 3 ribs in the culvert; and (e) not cut or otherwise modified to create a hinge.
 9. Place rock or other suitable armor material around the inlet of a watercourse culvert. Construct rip-rap, when used, to remain in place during 100-year flows and to extend at least as high as the top of the culvert. Extend rip-rap as “wing walls” on inlets for a sufficient distance upstream to prevent bank erosion.
 10. Taper or flare inlets on watercourse culverts with diameters greater than 30 in (.7 m).
 11. Leave in place culverts with a 50-100 year flow, if they are functioning and subject to periodic inspection (E.2.7, #2).
 12. Avoid installation of culverts with angles.
 13. Compact fill faces by tractor-walking, if site-specific conditions permit; otherwise, compact fill faces with a vibra-compacter, an excavator, or equivalent tools.
 14. Slash or mulch fill faces; do not exceed an 80% slope, unless the fill faces are armored with rock, rip-rap, or concrete blocks.
 15. Protect fill faces at inlets and outlets, which will be exposed to the design flow, from stream flow erosion by armoring that consists of graded rock rip-rap or other non-erodible material and by design (e.g., concrete head wall). Rip-rap culvert outfalls, if necessary, in a U-shaped channel, with clean material of sufficient size to remain in place during a 100-year peak flow event. Set rip-rap in the active channel downstream of the culvert below stream grade in order to allow the natural accumulation and transport of bedload at stream grade.
 16. Counter-sink culverts, if the natural channel grade is less than 3%, in order to allow for aggradation in the channel.

E.2.14 Standards for ditch-relief culverts

1. Ensure new ditch-relief culverts are at least 18 in. (45 cm) in diameter.
2. Place ditch-relief culverts at least at a grade 2% greater than the contributing road prism or a minimum of 10% so they are self-cleaning. Place the culverts with the inlet at a skew of 30-35% to the normal road alignment in order to improve water flow into the culvert.
3. Space ditch-relief culverts 600-800 ft apart (182-243 m) on road segments with gradients less than 4%.
4. Space ditch-relief culverts 400-600 ft apart (121-182 m) on road segments with gradients greater than 4%.
5. Allow no more than 150 ft between ditch-relief culverts, if a road has more than a 10% gradient and is within 300 ft of a watercourse.
6. Create less distance between ditch-relief culverts if soils or geology indicate that discharge may create a new channel or scour an existing channel.

7. Ensure (a) that spacing between ditch-relief culverts is sufficient to prevent water discharge onto road-fill and (b) that there is enough filter material to prevent sediment transport to a watercourse.
8. Place energy dissipaters (i.e., durable material sized to remain in place during high flows) at the outlet of ditch-relief culverts or downspouts. Extend energy dissipaters a sufficient distance from the outlet of the culvert to slow the flow and prevent scouring or erosion unless the culvert discharges to a stable location with little risk of surface or gully erosion.
9. Design ditch-relief culverts with controllable sediment so that, if they plug, the water is diverted directly across the road. If the culvert already exists without this design or a site cannot incorporate this design in the construction, then build, if feasible, a rolling dip to catch the diverted water (in the event the culvert plugs) and send it across the road.
10. Use downspouts if there is annual monitoring, with maintenance performed as needed. Anchor each downspout at the culvert and at its base. Downspouts should not exceed 20 ft (6 m) in length. Anchor downspouts at intervals no greater than 10 ft (3 m) using a stable anchor. This may include, but is not limited to, pipe, t-posts, concrete re-bar, wooden beams, and logs.

E.2.15 Standards for bridges

1. Follow standards set forth in the MSA.
2. Select bridge spans that avoid encroachment of bridge abutments or piers into floodprone areas, unless there are other design considerations such as the need for protecting large amounts of fill for the abutments. Consult with the wildlife agencies prior to construction, if there are design considerations like the one cited.
3. Suspend bridges, where possible during installation, across the watercourse using cables and heavy equipment or cables and corner blocks to avoid altering the stream bed and bank and crossing the wetted channel with heavy equipment.
4. Place the bottom or toe of the bridge abutment so that the channel of the watercourse under the bridge is at least 1.25 times the width of the bankfull channel.
5. Provide erosion protection for bridge abutments, piers, and watercourse banks influenced by the hydraulic conditions of the bridge, at least up to the level of a 100-year flow or to the edge of the terrace or the topographic bench the bridge rests on.
6. Dip built-up approaches to allow floods to flow over and around them.
7. Align bridges perpendicular to the channel unless the road approach would require additional cutting or soil-disturbance in the hillslope to facilitate this alignment.
8. Design approaches to bridges to prevent surface runoff and sediment from draining directly onto the bridge deck or into the watercourse. Incorporate road drainage into the bridge approaches to divert road runoff and filter sediments. Rock or pave approaches to prevent sediments from draining onto the bridge deck or into the watercourse.
9. Incorporate guardrails or bumper rails into the bridge to safeguard bridge traffic.
10. Do not exceed 1:1 grade on bridge abutments unless the abutment is bedrock. A bridge abutment grade of 2:1 is preferable. If bridge abutment approaches exceed a 1:1 grade, then use a retaining wall or other geotechnical design to stabilize the abutment slope.
11. Ensure that the freeboard (i.e., the distance between the water level and the lowest part of a bridge superstructure) exceeds 100-year flow levels, unless there are other design considerations, approved by the wildlife agencies, such as the need for large amounts of fill for the abutments.
12. Ensure that the surfacing material for log stringer bridges is screened, washed, durable, clean rock if it is not otherwise planked, plated, or paved; erect side-boards to retain the surfacing materials on the running surface.

E.2.16 Considerations for bridges

1. Give preference to a bridge as a watercourse crossing on a Class I streams.

NOTE

Over 90% of the time, MRC gives preference to a bridge for a Class I crossing.

2. Consider a bridge for streams other than Class I.
3. Consider a bridge if a watercourse crossing requires a culvert with 48 in. (1.2m) or greater diameter.

E.2.17 Standards for fill material for landings

1. Do not place fill for landings on slopes greater than 50%, unless there is no risk for sediment delivery.
2. Apply these standards on slopes greater than 40%, with fills greater than 4 ft (1.2 m) in vertical height at the outside of the landing:
 - a. Construct fills on a bench, excavated at the proposed toe and wide enough to compact the first lift.
 - b. Compact fills to prevent sediment discharge in approximately 1 ft (.3 m) lift from the toe to the finished grade; compact fills, if possible, to 90%.
 - c. Preclude all organic material from fills.

E.2.18 Standards for spoil piles, borrow areas, or soil disposal

1. Control erosion in areas where there are large expanses of bare soil, such as spoil piles, borrow sites, and rock pits. Proper location, excavation and topographic development of spoil disposal sites and rock pits are key elements in assuring controlled drainage and in minimizing erosion and sediment problems. When placed on slopes, spread soils in lifts and compact them to develop strength in the materials.
2. Do not locate spoil piles (a) near streams or where sidecast, tailing, or sediment-laden runoff can reach a watercourse or (b) within an AMZ unless topography prevents runoff from entering a watercourse.
3. Cover spoil piles in AMZs to minimize risk of sediment delivery to watercourses.
4. Stockpile, if possible, the overburden from a rock pit or borrow area for re-distribution over the site in order to take advantage of an on-site seed-bank.
5. Identify possible disposal sites in advance to minimize impacts to biologically sensitive areas under emergency conditions or routine road maintenance

E.2.19 Standards for rock pits

E.2.19.1 Use of existing rock pits

MRC will excavate, load, sort, crush, blast, or conduct other activities involving rock according to the following standards.

E.2.19.1.1 Restrictions for winter conditions

Early winter

1. Cease operations when there is sufficient precipitation to generate overland flow off the road and deliver sediment to a watercourse.
2. Resume operations only under the following conditions: (a) there has been ½ in. or less rainfall in the previous 24-hour period;⁴ and (b) there has been no rain in the current 24-hour period.

⁴ As reported by the National Weather Service for Fort Bragg

3. Install drainage structures and erosion control facilities if one of the following conditions apply:
 - **Condition A**
 - i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
 - ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
 - **Condition B**
Operation stoppage exceeds 24 hours.
 - **Condition C**
Winter operations have ceased.
4. Do not remove overburden during periods of soil saturation.
5. Cease removing overburden if 4 cumulative inches of rain has fallen in the water year.

Mid winter

6. Cease operations when there is sufficient precipitation to generate overland flow off the road and deliver sediment to a watercourse.
7. Resume operations only under the following conditions: (a) there has been ½ in. or less rainfall in the previous 24-hour period;³ and (b) there has been no rain in the current 24-hour period.
8. Install drainage structures and erosion control facilities if one of the following conditions apply:
 - **Condition A**
 - i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
 - ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
 - **Condition B**
Operation stoppage exceeds 24 hours.
 - **Condition C**
Winter operations have ceased.

Late winter

9. Cease operations when there is sufficient precipitation to generate overland flow off the road and deliver sediment to a watercourse.
10. Resume operations only under the following conditions: (1) there has been ½ in. or less rainfall 48 to 72 hours ago³; and (2) there has been no rain for the last 48 hours.
11. Install drainage structures and erosion control facilities if one of the following conditions apply:
 - **Condition A**
 - i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
 - ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
 - **Condition B**
Operation stoppage exceeds 24 hours.
 - **Condition C**
Winter operations have ceased.

Exception to Winter Operating Period

MRC may make an exception to the winter operating times only if we need to immediately prevent sediment delivery to a watercourse where the volume of sediment is greater than the volume produced from rock pit excavation.

E.2.19.1.2 Protection for covered species

1. Refer to the HCP/NCCP conservation measures regarding blasting near habitat of covered species: northern spotted owls (C§10.3.2.3.1-13, C§10.3.2.3.1-32); marbled murrelets (C§10.3.2.3.10-5, C§10.3.2.3.11-4, C§10.3.2.3.12-4), and Point Arena mountain beavers (C§10.3.3.3-11).
2. Refer to Appendices K, *Northern Spotted Owl Data and Protocols*, and Appendix L, *Marbled Murrelet Data and Protocols*.

E.2.19.1.3 Expansion of rock pit footprint

1. Conduct a rare plant survey prior to expansion of a rock pit or storage area for overburden.
2. Follow the survey and protection protocols for covered species described within Chapters 8-11.
3. Prepare an internal Archeological Report similar to those in a THP and record the survey in the MRC GIS.
4. Submit information on discovered sites to a professional archeologist for review and for potential mitigations.
5. Minimize the extent of the disturbed area necessary to produce the required rock material for 3 years or less.
6. Store overburden close to or on site so that it is available for reclamation operations.
7. Store overburden, if feasible, in a pit or below the grade of the rock pit floor to prevent sediment discharge to a watercourse.
8. Mulch overburden stored above the grade of the rock pit floor (E.10).
9. Adhere to the following guidelines for overburden storage if it is not stored in a pit with no run-off to a watercourse:
 - a. If the ground slope is 0-30%, store the overburden at least 50 ft from a Class I or Large Class II watercourse.
 - b. If the ground slope is 30-50%, store the overburden at least 75 ft from a Class I or Large Class II watercourse.
 - c. If the ground slope is more than 50%, store the overburden at least 100 ft from a Class I or Large Class II watercourse.
14. Consult with the wildlife agencies and obtain their approval for creation or expansion of any rock pit within 100 ft of a Class I watercourse or within 75 ft of a Large Class II watercourse.

E.2.19.2 Development of new rock pits**E.2.19.2.1 Pre-development field work**

1. Conduct a rare plant survey prior to rock pit development, including in prospective storage areas for overburden.
2. Follow the survey and protection protocols for covered species described within Chapters 8-11.
3. Prepare an internal Archeological Report similar to those in a THP and record the survey in the MRC GIS.
4. Submit information on discovered sites to a professional archeologist for review and for potential mitigations.
5. Avoid, if feasible, establishing new rock pits within the AMZ of a Class I or Class II watercourse. If avoidance is not feasible, submit to the wildlife agencies for their approval site-specific erosion control plans for proposed rock pits within the AMZ of a Class I or Class II watercourse including measures for (a) placement of erosion control structures (i.e., berms, waterbars, catch basins, etc.), (b) storage of

overburden, (c) storage of fuel, and (d) maintenance of heavy equipment. If MRC cannot reach consensus with the wildlife agencies, we will not establish the new rock pit.

E.2.19.2.2 New rock pits

1. Develop rock pits in accordance with the above measures for rock pit use.
2. Permit the removal of small amounts of gravel from gravel bars in accordance with the MSAA.
3. Follow the operational standards and restrictions specified in the MSAA.
4. Reclaim rock pits once mining operations are complete, according to site-specific conditions and the intended use of the site.
5. Apply the measures specified in Appendix E, *Roads, Landings and Skid Trails*, if the site is intended for a road or landing; otherwise, slope the site to stable angles.
6. Spread available overburden across the site and use it as a growth medium for planting native species.
7. Develop a site-specific drainage plan that will minimize the risk of sediment entering a watercourse.

E.3 Standards for Road and Landing Construction and Reconstruction

Road or landing construction or reconstruction will follow the design standards specified earlier in this appendix. In addition, the following rules will apply:

1. Follow the guidelines under E.2.3 for new roads within AMZs.
2. Follow the guidelines under E.2.3 and E.2.5 for new landings within AMZs.
3. Adhere to the default conservation measures for a particular terrain stability unit (TSU) identified, on the ground, by an RPF or PG, or for a mass wasting feature on which MRC may construct a road or landing (section 8.3.3).
4. Install the necessary protective structures on all culverts at watercourse crossings in which water is flowing at the time of installation. This should be concurrent with the placement of a crossing's fill material. Install other permanent drainage structures no later than October 15. Adhere to early winter period standards for construction and reconstruction of roads after October 15.
5. Do not bury organic waste, such as uprooted stumps, cull logs, accumulations of limbs and branches, or non-merchantable trees in the main body of road or landing fills. Use this solid waste, if necessary, to provide for downslope sediment filtration except at prepared crossings, including crossing approaches.
6. Restrict clearing limits to 60 ft (18 m) total - approximately, but not always, 30 ft (9 m) on either side of the centerline.⁵
7. Fell any tree over 12 in. (30.5 cm) dbh with more than 25% of the root surface exposed by road or landing construction, if necessary to ensure road safety and slope stability.
8. Construct roads or landings without overhanging banks.
9. Prevent the footing of a road or landing from rotting away by removing or scarifying the organic layer of the soils during road and landing construction (especially on slopes greater than 35%) and later placing the fill.
10. Remove overhanging or unstable concentrations of slash, woody debris, and soil along the downslope edge or face of roads or landings when located on slopes over 50% unless the slash piles are intended for winter burning.

⁵ Clearing limits are defined by side slope. Full bench roads on steep slopes need a longer upslope limit than length of cleared area below center line.

11. Seed, plant, mulch, remove, or treat sidecast or fill material with access to a watercourse or lake (see E.10).
12. Ensure that the slope created from sidecast or fill material is no steeper than 65%.

E.4 Standards for Road Inspections and Maintenance

E.4.1 Road inspection⁶ schedule

1. Conduct 5 inspections over 5 years after work completion on all seasonal roads and associated road points constructed, reconstructed, or decommissioned (Table E-4).
2. Do not survey sites if decommissioned roads no longer allow equipment access; instead, perform informational surveys on these decommissioned roads within 2 years to document problems for future decommissioning projects addressed as part of adaptive management.⁷
3. Conduct at least 1 inspection of a new temporary road each year for a period of 4 years following construction (Table E-4).
4. Inspect permanent roads annually.
5. Inspect all roads with permanent structures (culverts or bridges) during the road inventory update at 10-year intervals unless a road is decommissioned or has maintenance-free structures.⁸
6. Conduct informal inspections annually. Informal inspections are for roads actively being used beyond the 5-year timeline; MRC will record only problems areas.
7. Make repairs, using hand tools, at the time of discovery, if feasible, or within 24 hours after initial damage to the road surface, drainage facilities, water bars, or water crossings to eliminate the likelihood of related sediment reaching Class I, Class II or Class III waters.
8. Schedule repairs requiring more than hand tools during those times when heavy equipment can access the site—according to winter and wet weather operating guidelines.

Table E-4 Five-Year Road Inspection Schedule

Year	Inspections
1	<ul style="list-style-type: none"> • 3 inspections <ul style="list-style-type: none"> ▪ 1st inspection after the first significant rainfall or cumulative rainfall of 10 in. in the water year. ▪ 2nd inspection after the first streamflow with a 2-year or greater return interval or after April 1. ▪ 3rd inspection after May 31.
2	<ul style="list-style-type: none"> • 1 inspection after at least 25 in. of rainfall in the water year. <ul style="list-style-type: none"> ▪ Problem sites from previous years that have had rehab work done during the summer will follow the same schedule as Year 1
3	<ul style="list-style-type: none"> • No inspections, unless a large streamflow event occurs (>20 year return)
4	<ul style="list-style-type: none"> • No inspections, unless a large streamflow event occurs (>20 year return)
5	<ul style="list-style-type: none"> • 1 inspection after the last significant rain

TABLE NOTE

If a site fails or requires additional heavy equipment work during the inspection period, the 5-year timeline will be reset.

⁶ Inspections include viewing roads, landings, and drainage structures and checking that they function as designed (e.g., ensuring downspouts are operative).

⁷ This situation occurs when roads have been “re-contoured” to the degree that return access with equipment would essentially require construction of a new road.

⁸ Drainage structures that require no maintenance have no controllable erosion and no culverts.

E.4.2 Road and road point maintenance

1. Base decisions for road maintenance on inspections (Table E-3) and on the priority of the road repair (Table E.4).
2. Maintain all roads and road points, constructed or upgraded, at their road class designation (permanent, seasonal, temporary, and abandoned).
3. Do not sidecast material from road grading into watercourses.

E.4.3 Priority maintenance

MRC goals for priority maintenance are to

- Maintain all roads and road points to design standards.
- Comply with intended uses for all active roads and for restored road points.
- Perform restoration and enhancement work, as needed, to bring roads up to current design standards.
- Decommission roads that cannot be brought up to current design standards.

Table E-5 Road Priority Maintenance

Group	Priority Maintenance for Roads and Road Points
1	Roads and road points that have had upgrade or decommissioning work or are identified as having problems.
2	Roads and road points that are in active use by MRC but have had no recent (last 5 years) road work
3	Roads and road points that are not in active use and that MRC road inventory has identified as requiring maintenance.

TABLE NOTE

Groups refer to connected road segments in close proximity to each other. Groups are in order of priority; Group 1 is the highest priority.

Prioritization for maintenance will use the same priority list as road upgrades or decommissioning (8.3.3.2.1) to determine the order of maintenance work within each group. In some situations, a maintenance issue may be addressed from a lower group (i.e., Group 2) prior to finishing all of a higher group (i.e., Group 1). These situations typically occur when it is more efficient to make use of available equipment or personnel at a lower group site in the vicinity of a higher group site.

E.5 Standards for Road and Landing Decommissioning

The proper decommissioning of roads and landings can result in significant sediment reduction. Decommissioning of a road or landing

- Requires long-term maintenance-free drainage.
- Minimizes concentration of runoff, soil erosion, and slope instability.
- Promotes native vegetation regeneration.
- Prevents access by motorized vehicles.

E.5.1 Standards for road, skid trail, and landing decommission

1. Decommission a road, skid trail, or landing, preferably prior to October 15; after October 15, follow the standards for the early-winter period.
2. Notify CDFG is when there is a risk of impacts to stream bed, bank, active channel, or aquatic habitat, including risks of elevated sediment delivery to the bankfull channel.
3. Do not decommission roads in the mid-winter period.

4. Block decommissioned roads, when necessary, using appropriate barriers to prohibit the use of motorized vehicles.
5. Out-slope road, skid trail, and landing surfaces and remove berms, unless (a) doing the work is likely to cause more sediment delivery than not doing the work or (b) doing the work would remove large amounts of established vegetation in close proximity to a watercourse.
6. Remove all watercourse crossings.
7. Employ salvage operations (see Appendix T) when covered fish species are present in Class I watercourses if MRC is decommissioning crossings that require heavy equipment in the water.
8. Excavate fills in the watercourse crossing to form a channel that is as close as possible to the natural watercourse grade and orientation, and that is wider than the natural channel.
9. Slope back excavated material and any resulting cut bank from the channel and stabilize it to prevent slumping and soil erosion. Stabilize this material by seeding, mulching, armoring with rock, or by other suitable treatments (E.10).
10. Re-establish natural flow paths of surface drainage.
11. Pull or shape fills or sidecast, where necessary, to prevent discharge of materials into watercourses.
12. Install appropriate waterbreaks or rolling dips to limit accumulated runoff from the road prism that may create increased erosion. Space waterbreaks according to specifications.
13. Scarify or rip road and landing surfaces to loosen compacted soil and facilitate regeneration, unless advanced regeneration on site is undisturbed by other decommission activities.
14. Ensure that decommissioned roads are re-vegetated by natural or artificial means with woody vegetation within 3 years after the decommissioning.
15. Create a breeding site for red-legged frogs if a decommissioned road had a documented breeding site; the site should be of similar dimensions, created in the most appropriate location, and as close to the original site as possible.
16. Plant a mix of native hardwood and conifer on disturbed areas where erosion can deliver to a watercourse; ensure the mix is appropriate for the vegetation type of the project area and is planted at the same density as in reforestation (conifer) or as occurs naturally (hardwood). Do not re-plant sections of old road bed which do not require decommissioning treatments or roadways that receive excessive shade.

E.6 Standards for Road and Landing Use

The appropriate use of roads, particularly during the winter period, is an important factor in road maintenance and sediment reduction. Road use restrictions are also important for limiting trespassing as well as disturbance and harassment of wildlife. This section presents general road-use restrictions, temporary road restrictions, and winter period restrictions. There are species-specific guidelines for northern spotted owls (C§10.3.1.3.1-10, C§10.3.1.3.1-11, C§10.3.1.3.1-17, C§10.3.1.3.1-27, C§10.3.1.3.1-34); for Point Arena mountain beaver (C§10.3.3.3-15, C§10.3.3.3-17, C§10.3.3.3-18); for marbled murrelets (C§10.3.2.3.1-10, C§10.3.2.3.1-14, C§10.3.2.3.1-16, C§10.3.2.3.1-20, C§10.3.2.3.1-30, C§10.3.2.3.1-38); and for red-legged frogs (C§10.2.2.3-2, C§10.2.2.3-3); and coastal tailed frogs (C§10.2.3.3-1). In addition, there are habitat-specific guidelines for wet areas, wetlands, wet meadows, seeps, and springs (C§8.2.3.5.1-1, C§8.2.3.5.1-2, C§8.2.3.5.2-3) and for rare plants (section 11.4.2.3).

E.6.1 Standards for general use

1. Restrict access to roads during the winter period; gates on roads leading into the MRC property will control access.

2. Close temporary roads and associated landings prior to the winter period, unless the guidelines for the early and late winter periods are followed.
3. Permit All Terrain Vehicle (ATV) use on temporary roads during the closure periods.
4. Patrol road closures (gates) and areas with frequent public contact.
5. Repair gates rendered ineffective by vandalism, especially gates where trespassing is prevalent, to reduce unauthorized access.
6. Grant permits for public access to MRC land and roads.⁹
7. Do not haul logs or rock or use heavy equipment on roads where restrictions apply for northern spotted owls (C§10.3.1.3.1-10, C§10.3.1.3.1-11, C§10.3.1.3.1-17, C§10.3.1.3.1-27, C§10.3.1.3.1-34).
8. Do not use heavy equipment or log trucks on seasonal roads during the mid-winter period unless repairs are needed or mid-winter guidelines can be met.
9. Allow the following exceptions to the operating measures for wet weather or winter: (a) hauling on a paved road or (b) use of heavy equipment for immediate road repair to prevent significant sediment delivery if left unattended.
10. Install waterbreaks (Table E.2) on seasonal roads prior to October 15, unless following standards for early and late winter periods:

Early winter	Interval from October 15 until streamflow responds directly to precipitation. This occurs when there is at least 4 in. of cumulative precipitation in the water year. ¹⁰
Mid winter	Interval from the end of early winter to March 31.
Late winter	Interval from April 1 to May 1.

E.6.2 Standards for temporary road use

1. Refer to MSAA and E.2.9 for specific standards of temporary road crossings.
2. Close temporary roads prior to October 15, if feasible.
3. Follow the standards for the early-winter period, if closing temporary roads after October 15.
4. Out-slope temporary road and landing surfaces and remove berms when not in use and prior to the mid-winter period.
5. Remove all watercourse crossings with culverts unless the watercourse crossing is left maintenance-free or there is no controllable erosion.
6. Pull or shape fills or sidecast, where necessary, when a road is not in use to minimize discharge of materials into watercourses due to failure of cuts, fills, or sidecast.
7. Install appropriate waterbreaks or rolling dips when a temporary road is not in use to limit accumulated runoff from the road prism that may increase erosion. Space waterbreaks to specifications in Table E.2.

E.6.3 Standards for early winter period

1. Conduct tractor yarding or use of tractors, graders, excavators, and other heavy equipment for construction of fire breaks, roads, landings, or tractor roads only during extended dry, rainless periods with low antecedent soil wetness (no more than ½ in. of rain in the previous 24-hour period, as reported by the National Weather Service for Fort Bragg) and when soils are not saturated.

⁹ The permit process allows MRC to maintain control over where and when the public enters our land, particularly during periods of closure (i.e., winter periods).

¹⁰ A water year begins October 1 of the preceding year and ends September 30. For example, the 2003 water year began in October 1, 2002 and ended September 30, 2003.

2. Do not haul or load logs, construct roads or landings, decommission roads, or use skid trails for a period of 24 hours after ½ in. of rain or more has fallen in the previous 24 hours, as reported by the National Weather Service for Fort Bragg.
3. Install drainage and erosion control facilities on all constructed skid trails and tractor roads prior to sunset if one of the following conditions apply:
 - **Condition A**
 - i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
 - ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
 - **Condition B**

Winter operations have ceased.
4. Provide mulch or cover (E.10) to soil disturbed by road or skid trail construction within the AMZ that exceeds 100 contiguous sq. ft., if one of the following conditions apply:
 - **Condition A**
 - iii. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
 - iv. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
 - **Condition B**

Winter operations have ceased.
5. Keep on hand at the work site materials to mulch or cover exposed soils for immediate deployment during this period.
6. Disturb or remove the organic layer of the soils during road and landing construction especially on slopes greater than 35% and prior to fill placement in order to prevent the footing of the road or landing from rotting away.
7. Limit the size of road, skid trail, and landing use or construction to (a) whatever the operator can complete within 24 hours, including application of all erosion control practices, if the National Weather Service forecasts rainfall for Fort Bragg in the next 3 days or (b) whatever the operator can complete in 3 days if there is no forecast of rain for the days of expected operation..
8. Stop tractor yarding or use of tractors, graders, excavators and other heavy equipment for construction of fire breaks, roads, landings, or tractor roads if (a) 4 in. of cumulative precipitation has occurred within the water year or (b) the National Weather Service forecasts for Fort Bragg a "chance" (30% or more) that precipitation will exceed this rain threshold. Sometimes, in the plan area, this occurs in early October, followed by extended dry periods up to November 15th. In these circumstances MRC may request, with approval of the wildlife agencies, an extension of logging activities until November 15th. This will allow MRC to complete some logging jobs and obviate the need to re-open the road system the following year in order to log the remaining volume.
11. Do not grade more than once to obtain a drier running surface on short lengths of road (i.e., a contiguous length of less than 0.25 miles) before reincorporating any resulting beam back into the road surface; grade at least 24 hours before any forecasted rainfall. Leave all graded materials on the running surface of the road or dispose of them in a place where there is no possibility of delivery to a watercourse. Cease hauling until the road is "truckable," i.e., in a condition that log trucks can operate, if it is necessary to grade more than ¼ mile.

9. Keep only one skid trail system¹¹ open per piece of skidding equipment during the early winter periods. Ensure that a skid trail system is not too large, namely that it can have drainage facilities and structures completely installed within 2 hours.
10. Construct new roads or skid trails in sections between watercourse crossing points and install all erosion controls and drainage systems on a section before moving on to construct additional sections.
11. Construct outsloping and rolling dips prior to moving onto the next section of road.
12. Do not construct new roads, skid trails, or landings when precipitation is sufficient to generate overland flow off the road, skid trail, or landing.
13. Haul logs on only one road (for each active landing), if a road has an unrocked surface.
14. Maintain hand-dug erosion control facilities.
15. Install drainage and erosion control facilities on all roads not used for hauling in the mid-winter period and stabilize road surfaces within the AMZ per the E.2.3.
16. Do not load and haul logs or conduct ground-based skidding of logs
 - a. When vehicles can create ruts¹² in the surface of a road, skid trail, or landing, i.e., when there is an indication of saturated soil.
 - b. When precipitation is sufficient to generate overland flow off the road and deliver sediment to a watercourse.

NOTE

- Do not resume road use under the above conditions until and unless the road surface is dry. A dry road is one in which moisture is less than or equal to that found during normal watering (dust abatement) treatments or light rainfall. Further, vehicles are not rutting a road surface or pumping fines causing a visible increase in turbidity in any drainage facility, construction/reconstruction site or road surface, any of which drains directly to Class I, II, or III waters.
 - Do not apply E.6.3 #17b to small wet segments (i.e., <30 ft (9 m) on an otherwise dry road, except when sediment may potentially deliver to a watercourse.
 - Repair any damage, from permitted use, to a road surface, drainage facility, water bar, or stream crossing within at least 24 hours if precipitation is forecast, in order to eliminate the likelihood of related sediment reaching Class I, Class II or Class III watercourses.
17. Permit light vehicles (e.g., crew trucks, pickups trucks, ATVs, quadra-tracts, and motorcycles) during periods of wet weather.
 - a. Limit access to ATVs whenever rutting of the logging roads would occur (so that runoff is carried along the ruts) or waterbars would be breached (so that they no longer would function as intended) as a result of use by light vehicles.
 - b. Make repairs, using hand tools, at the time of discovery, if feasible, or within 24 hours after initial damage to the road surface, drainage facilities, water bars, or water crossings to eliminate the likelihood of related sediment reaching Class I, Class II or Class III watercourses.

E.6.4 Standards for the mid-winter period

1. Do not conduct tractor yarding or heavy equipment use for construction of fire breaks, road reconstruction, landing construction, or construction of roads or skid trails.
2. Do not use landings within the AMZ for any forest harvest operations.
3. Do not construct, reconstruct, or abandon roads.
4. Do not use logging roads, tractor roads, or landings at any location where
 - a. Saturated soil conditions exist.
 - b. Stable logging roads or landings do not exist.

¹¹ A skid trail system consists of all skid trails that lead to one landing.

¹² MRC defines a rut as a depression caused by a vehicle's tires capable of conveying water and sediment along the road's running surface and possibly off the road prism and into a watercourse.

- c. Visibly turbid water from the road, landing, skid trail surface, or inside ditch may reach a watercourse or lake.
- 5. Limit the operation of log trucks and heavy equipment on roads and landings to permanent road surfaces with at least a 6 in. (15 cm) rock surface unless the road does not drain to a watercourse and (a) is a ridge-top road or (b) is greater than 200 ft from a watercourse.
- 6. Do not use tractors within an AMZ except for longlines from an existing road within the AMZ or from outside of the AMZ.
- 7. Permit upgrading of a road surface to rock if no measurable rainfall has occurred within the last 5 days and no rain is forecast for the next 5 days; maintain the road surface (i.e., patch rock for less than 100 contiguous feet) at intervals allowed for log or rock hauling.
- 8. Do not load or haul logs or rock when
 - a. Vehicles can create ruts in the surface of a road, skid trail, or landing, i.e., when there is an indication of saturated soil.
 - b. Precipitation is sufficient to generate overland flow off the road and deliver sediment to a watercourse.

NOTE

Once road use has ceased due to the foregoing conditions, do not resume use until and unless the road surface is dry. A dry road is one in which moisture is less than or equal to that found during normal watering (dust abatement) treatments or light rainfall. Further, vehicles are not rutting a road surface or pumping fines causing a visible increase in turbidity in any drainage facility which drains directly to Class I, Class II or Class III waters.

- 18. Permit light vehicles (e.g., crew trucks, pickups trucks, ATVs, quadra-tracts, and motorcycles) during periods of wet weather.
 - a. Limit access to ATVs whenever rutting of logging roads would occur (so that runoff is carried along the ruts) or waterbars would be breached (so that they no longer would function as intended) as a result of use by light vehicles.
 - b. Make repairs, using hand tools, immediately if feasible or otherwise within 24 hours after initial damage to the road surface, drainage facilities, water bars, or water crossings has occurred in order to eliminate the likelihood of related sediment reaching Class I, Class II, or Class III watercourses.
 - c. Perform emergency repairs when the risk for sediment delivery from the damage is higher than the risk for sediment delivery from the access for repair.

E.6.5 Standards for the late winter period

- 1. Do not install temporary crossings, conduct watercourse crossing construction or upgrades on Class I watercourses prior to June 15 unless there is no activity within the channel, e.g., placing a bridge where the abutments have already been constructed.
- 2. Do not conduct tractor yarding or use tractors for construction of fire breaks, road construction/reconstruction, landing construction, or the construction of tractor roads within a Class I or Large Class II AMZ.
- 3. Do not use logging roads, tractor roads, or landings at any location where visibly turbid water from the road, landing, skid trail surface, or inside ditch may reach a watercourse or lake.
- 4. Do not load and haul logs or rock or conduct ground-based skidding of logs when
 - a. Vehicles can create ruts in the surface of a road, skid trail, or landing, i.e., when there is an indication of saturated soil.
 - b. Precipitation is sufficient to generate overland flow off the road and deliver sediment to a watercourse.

NOTE

Once road use has ceased due to the foregoing conditions, do not resume use until and unless the road surface is dry. A dry road is one in which moisture is less than or equal to that found

during normal watering (dust abatement) treatments or light rainfall. Further, vehicles are not rutting the road surface or pumping fines causing a visible increase in turbidity in any drainage facility, construction/reconstruction site or road surface, any of which drains directly to Class I, II, or III waters. This provision does not apply to use of a small segment of wet road (< 30 ft) on an otherwise dry road or when spot raking can control road soft spots. If any permitted use results in damage to the road surface, drainage facilities, water bars, or stream crossings, repair the damage within 24 hours after it occurs, or sooner if precipitation is forecast, to eliminate the likelihood of related sediment reaching Class I, Class II, or Class III waters.

5. Do not (a) load or haul logs or rock, (b) tractor yard, (c) construct roads and landings, or (d) abandon roads until at least 2 consecutive days elapse without rain, if one of the following conditions apply:
 - **Condition A**
The National Weather Service reports that 0.5 in. of rain has fallen in Fort Bragg in the previous 24-hour period; and
 - **Condition B**
Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
6. Resume operations after at least 2 consecutive days elapse without rain, if the following conditions apply:
 - **Condition A**
The National Weather Service reports that 0.5 in. of rain has fallen in Fort Bragg in the previous 24-hour period; and
 - **Condition B**
There has been no rain in Fort Bragg in the current 24-hour period.
7. Install temporary crossings only on one road per active landing on Small Class II or Class III watercourses.
8. Size temporary crossings on Small Class II or Class III watercourses to pass a 25-year flow.
9. Install drainage facilities and structures on all constructed skid trails and tractor roads prior to sunset if one of the following conditions apply:
 - **Condition A**
 - i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
 - ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
 - **Condition B**
Operation stoppage exceeds 24 hours.
 - **Condition C**
Winter operations have ceased.
10. Provide mulch or cover (E.10) on soil disturbed by road or skid trail construction within the AMZ that exceeds 100 contiguous sq. ft. and extends beyond the AMZ but is contiguous with the AMZ, if one of the following conditions apply:
 - **Condition A**
 - i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
 - ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
 - **Condition B**
Operation stoppage exceeds 24 hours.
 - **Condition C**
Winter operations have ceased.

11. Keep on hand at the work site materials to mulch or cover (E.10) exposed soils for immediate deployment during this period.
12. Keep open only one skid trail system per piece of skidding equipment during the late winter periods.
13. Ensure that a skid trail system can have drainage facilities and structures installed within 2 hours, i.e., that it is not too large.
14. Do not grade more than once to obtain a drier running surface on short lengths of road (i.e., a contiguous length of less than 0.25 miles) before reincorporating any resulting berm back into the road surface. Leave all graded materials on the running surface of the road or dispose of them in a place where there is no possibility of delivery to a watercourse. Cease hauling until the road is "truckable," i.e., in a condition that log trucks can operate, if it is necessary to grade more than ¼ mile.
15. Construct new roads in sections between watercourse crossing points and install all erosion controls and drainage systems before moving on to construct additional sections.
16. Construct outsloping and rolling dips prior to moving onto the next section of new road construction.
17. Do not proceed with construction when precipitation is sufficient to generate overland flow off the road and deliver sediment to a watercourse.
18. Use slash or mulch (E.10) to reduce soil loss prior to sunset if one of the following conditions apply:
 - **Condition A**
 - ii. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; or
 - iii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
 - **Condition B**

Operation stoppage exceeds 24 hours.
 - **Condition C**

Winter operations have ceased.
19. Install drainage and erosion control facilities prior to sunset according to the EHR high rating, if one of the following conditions apply:
 - **Condition A**
 - i. The National Weather Service forecasts for Fort Bragg a "chance" (30% or more) of rain within 24 hours; **or**
 - ii. Rain exceeds 0.25 in. in a 24-hour period at Yorkville (or the nearest reporting station).
 - **Condition B**

Operation stoppage exceeds 24 hours.
 - **Condition C**

Winter operations have ceased.
19. Permit light vehicles (e.g., crew trucks, pickups trucks, ATVs, quadra-tracts, and motorcycles) during periods of wet weather.
 - a. Limit access to ATVs whenever rutting of the logging roads would occur (so that runoff is carried along the ruts) or waterbars would be breached (so that they no longer would function as intended) as a result of use by light vehicles.
 - b. Make repairs, using hand tools, at the time of the discovery, if feasible, or within 24 hours after initial damage to the road surface, drainage facilities, water bars, or water crossings to eliminate the likelihood of related sediment reaching Class I, Class II, or Class III watercourses.

E.6.6 Standards for equipment maintenance and fueling

1. Fuel and maintain heavy equipment at least (a) 100 ft from a watercourse, spring, seep, or wet area; (b) 500 ft from a current activity center of a northern spotted owl territory; or (c) 0.25 miles from an occupied marbled murrelet site, unless equipment breaks and MRC must repair it in place.
2. Clean accidental spills immediately and dispose of hazardous waste according to applicable county, state, and federal laws.

E.7 Standards for Water Drafting

Water drafting is a general term that describes MRC operations for obtaining water for covered activities. Typically, the water is for dust abatement and road maintenance. The term *water impoundment* also describes specific water drafting activities. Within our HCP/NCCP, water drafting includes water impoundment,

During water drafting operations, MRC will follow the guidelines in the Master Streambed Alteration Agreement (Section VII), as well as the standards listed below. In situations where MRC cannot follow these standards, we will prepare a site-specific water-drafting plan and submit it to the wildlife agencies for approval.

For other water drafting guidelines affecting species and habitat, refer to the HCP/NCCP:

- Red-legged frogs (C§10.2.2.3-4, C§10.2.2.3-5).
- Wet areas, wetlands, wet meadows, seeps, and springs (C§8.2.3.5.1-10, C§8.2.3.5.1-11, C§8.2.3.5.2-11, C§8.2.3.5.2-12).

E.7.1 Class I and II watercourses, seeps, springs, wet lands/areas/meadows

1. Use screen mesh with the following specifications:
 - a. Size: $\leq 3/32$ in. for Class I watercourses and $\leq 1/8$ in. for Class II watercourses.
 - b. Approach velocity: ≤ 0.33 ft per second.
 - c. Pump rate: ≤ 350 gallons per minute.
2. Clean screens as often as necessary to maintain an approach velocity ≤ 0.33 ft per second.
3. Submerge screens completely.
4. Support screens above the streambed. Set the screen on top of instream objects, such as rocks or use any other means.
5. Rock approaches to water drafting sites that are within the inner or middle band of the AMZ, unless the road is on a gravel surface within the floodplain.
6. Rock approaches to the nearest upslope water bar or rolling dip to control sediment delivery.
7. Ensure that bypass streamflows are at least 2 ft³ per second and pump rate is no more than 10% of the instantaneous stream flow.
8. Do not reduce the volume of the pool at the intake by 10% or more.
9. Develop a water drafting plan to meet the following requirements if MRC cannot comply with E.7.1 #7 and #8:
 - a. Do not draft water when the depth of the immediate downstream riffle crest is ≤ 2.4 in.
 - b. Permit reduction of riffle crest depth below 2.4 in. at the outlet of the drafting pool if
 - i. Monitored by an RPF or hydrologist.

NOTE

MRC will monitor at intervals sufficient to detect when the drafting cut-off needs to occur.

- ii. Surface flow remains continuous over the riffle crest during the entire diversion episode.
 - iii. Diversion does not lower the flow over the next 2 downstream riffle crests more than ½ of their un-diverted depth.
 - iv. Diversion is limited to one site per stream and one truck at each site.
 - v. Diversion is ≥ 1 hour of riffle crest depth at unimpaired flow depths between diversion episodes.
- c. Do not decrease the wetted widths of habitat units by more than 25%. MRC will not draft water if the stream channel within 30 bankfull widths downstream of the drafting site is intermittent or goes intermittent as a result of a diversion.
 - d. Inspect the draw-down zones during the greatest effect of the diversion in the reach of the watercourse. An RPF will perform the inspection and CDFG may participate on-site. Such inspection will minimize the risk of salmonids stranding during subsequent diversion. Use streambed materials from the thalweg to fill, with a hand tool, any low spots that become isolated during the draw-down. Do not fill these areas until they are drained of water and confirmed to be free of covered species.
 - e. Do not decrease pool riffle crest velocity below 1.0 ft per second, unless riffle crest depth is below 2.4 in.
 - f. Do not divert if water temperatures exceed 18⁰ C at a location and coho salmon are present. Do not divert if water temperatures exceed 20⁰ C if steelhead are present. Measure water temperature at 1 ft depth or greater. Temperature criteria do not apply from sunset until 10 am the next morning. Place diversion intake, if feasible, downstream of the drafting pool's deepest point and at least 1/3 of the distance between that point and the downstream riffle crest.
 - g. Survey new or unsurveyed sites for development in Class II watercourses, wet areas, wetlands, wet meadows, seeps or springs for covered species during the optimum time for their detection. Conduct an initial habitat survey. If there is suitable habitat, survey from the intake downstream to the confluence of the next stream but not more than 1500 ft. Consult with the wildlife agencies prior to drafting if MRC detects covered species. Follow the conservation measures relevant to any detected covered species.
 - i. Do not reduce the wetted width more than 50% below the point of the diversion, measured upstream of the diversion tank flow.
 - ii. Ensure that bypass flows (instantaneous) are more than 50% of the unimpaired surface flow. Determining un-diverted and bypass flow for compliance monitoring may be difficult in many locations. Use buckets and stop watches, if meters do not work.
 - iii. Place the intake downstream of the drafting pool's deepest point, when channel morphology permits, at a point at least 1/3 the distance from the deepest point and the downstream riffle crest. Do not place the intake at the deepest part of the pool.

E.7.2 Ponds

1. Use a screen with a mesh size less than 1/8 in. and an approach velocity of 0.33 ft/sec or less.
2. Do not exceed a drafting rate of 350 gpm.
3. Do not reduce the average pool width by more than 10% when drafting from Class I ponds.

4. Do not reduce residual pool width or depth by more than 50% when drafting from Class II ponds hydrologically connected to watercourses (including subsurface flow).
5. Do not reduce average pool width (defined as the pool width at the start of drafting for the season) by more than 50% prior to July 1 or 80% on or after July 1, when drafting and re-drafting from hydrologically isolated Class II ponds.
6. Limit water drafting on documented red-legged frog breeding habitats (both natural and man-made):
 - a. Apply the date restrictions from E.7.2, #5.
 - b. Locate pump intakes away from emergent vegetation and elevated at least 6 in. above the substrate, if not using Class I designed screens.
 - c. Do not draft when egg masses of red-legged frogs are present.
7. Conduct pond maintenance and dredging after July 1 to allow red-legged tadpoles to metamorphose and leave the pond before disturbance.
 - a. Do not conduct vegetation management more than once every 3 years.
 - b. Limit vegetation management to 50% of a site's perimeter.
4. Build all new upslope ponds with drain fixtures in case bullfrogs invade.

E.7.3 Dust abatement plan

Dust abatement is a critical during harvest operations to reduce dust in the air and soil erosion from dusty roads. For decades, the most common form of dust abatement has been applying water from streams and rivers to logging roads via water-spray trucks. However, drafted water can lower available water for aquatic species in the streams. MRC will pursue reasonable and feasible alternatives for reducing the amount of water taken from watercourses for dust abatement, including the use of products such as lignin or magnesium chloride, as they become available and approved. In addition, we will minimize water drafting, by reducing the amount of water applied to roads when daily watering is unnecessary (e.g., on shaded roads) and watering at night to allow the soil to set. When preparing roads for harvest, we will:

1. Investigate additional Class 2 watercourses as potential sources of water drafting in order to reduce the amount of water taken from Class 1 watercourses.
2. Consider lignin or magnesium chloride for dust abatement under the following conditions:
 - a. On mainline roads where tracked equipment will not be operating on the road surface.
 - b. On road gradients that are generally less than 10% and have few tight turns for treatments to be effective.
 - c. On other surfaces where lignin or magnesium chloride treatments are more cost effective than water.
3. Consider other products that become available for road surface treatment, if their use is reasonable, feasible, and cost effective.
4. Plan harvest entries to use as few roads as possible by concentrating harvest operations in a given year and allowing multiple THPs to use the same haul road, if feasible.
5. Consider use of non-surface flow, if feasible, including off channel pools, existing wells, and springs which do not hydrologically connect to watercourses.
6. Water roads early or late in the day to reduce the evaporation rate of water on roads.
7. Coordinate harvest operations with Licensed Timber Operators (LTOs) to reduce watering of roads, e.g., schedule cable and tractor yarding units to use a road simultaneously.

E.8 Standards for Skid Trails and Yarding

The use of skid trails can significantly

- Increase the density of compacted surfaces.
- Alter natural drainage and flow paths.
- Increase sidecast or fill material available for erosion.
- Create, at times, hillslope instability.

Appropriate management of skid trails will minimize sediment delivery, particularly as compared to historic skid trail practices. Much of the skid trail network on the MRC property is associated with historic practices. In its future use of skid trails, MRC will follow the guidelines presented below.

E.8.1 Standards for skid trails

1. Limit skid trails in number and width to the minimum necessary for removal of logs.
 2. Use stable existing skid trails, where possible, instead of constructing new ones unless the existing trails pose greater risk for sediment delivery.
 3. Keep the number of watercourse crossings to a minimum.
 4. Use a prepared watercourse crossing, such as a bridge, culvert, or temporary culvert, to protect the watercourse from siltation, where tractor roads cross a watercourse in which water may be present during the life of the crossing.
 5. Exclude skid trail use in the following areas:
 - a. Class I and Class II AMZ unless (i) the skid trail is for a single entry for restoration and erosion control or (ii) the skid trail poses a lower risk for sediment delivery than alternative locations or alignments.
 - b. Toes of historically active rockslides or earthflows unless there is a field review by both a California Licensed Geologist, according to Note 45 of the California Department of Conservation, and an individual knowledgeable in the relevant aquatic resources.
 - c. Slopes steeper than 65%.
 - d. Slopes steeper than 50% where the hazard rating for soil erosion is high or extreme.
 - e. Slopes over 50% which lead without flattening to sufficiently dissipate water flow and trap sediment before it reaches a watercourse or lake.
- NOTE**
MRC can, in this instance, use skid trails once to control sediment.
6. Follow the conservation measures (C§8.3.3.1.2-1 through C§8.3.3.1.2-8) for inner gorge slopes.
 7. Limit skid trails to existing, stable skid trails, that do not require reconstruction, in the following areas:
 - a. Slopes between 50% and 65%, where the erosion hazard rating is moderate.
 - b. TSU 1, TSU 2, or TSU 3 that are not inner gorge slopes.
 - c. Toe of dormant rockslides or earthflows.
 - d. Historically active (active within the last 100 years) mass wasting features unless there is a field review approved by both a California Licensed Geologist, according to Note 45 of the California Department of Conservation, and an individual knowledgeable in the relevant aquatic resources of concern.
 8. Install all waterbreaks prior to October 15 unless MRC follows the standards for the early winter period.
 9. Do not disturb the soil, other than for road or landing maintenance intended to prevent erosion or mass wasting, with tractors or cables under excessively wet ground conditions that could result in substantial soil compaction and erosion.

10. Do not exceed the standards for distances between waterbreaks (see Table E-2).
11. Locate waterbreaks to allow water to be discharged into some form of vegetative cover, duff, slash, rocks, or less erodible material wherever possible; otherwise, decrease the spacing and add erosion-resistant materials to the outlets such as slash or straw.
12. Construct waterbreaks to provide for (a) unrestricted discharge at the lower end of the waterbreak so that water will not pool or overtop the waterbreak, and (b) unhindered spread of water to minimize erosion and encourage sediment to settle.
13. Cut waterbreaks diagonally, a minimum of 6 in. (15.2 cm) into the firm roadbed of the skid trail.
14. Construct waterbreaks to sufficient depth to prevent overland flow and concentration of water on the surface of a skid trail.
15. Space water breaks to control and distribute overland flow without causing rilling or gullies.
16. Keep a continuous firm embankment of at least 6 in. (15.2 cm) in height immediately adjacent to the down-road edge of the waterbreak cut.
17. Re-establish all natural drainage flow paths following skid trail use and assure no skid trail captures a natural watercourse.
18. Remove all watercourse crossings prior to October 15 or follow the standards for the early winter period.
19. Excavate fills in the watercourse crossing to form a channel that is as close as possible to the natural watercourse grade and orientation and that is wider than the natural channel.
20. Slope back excavated material and any resulting cut bank from the channel and stabilize it to prevent slumping and minimize soil erosion. Stabilize this material by rock-armorizing or by other treatments (E.10).
21. Treat per E.10 all bare areas, excluding roads, which are (a) at least 100 ft² and (b) within the AMZ or (c) beyond the AMZ but contiguous to it.

E.8.2 Standards for cable yarding erosion control

1. Install waterbreaks on a cable road only when the cable roads are (a) cut deeply enough to divert water and carry water for distances greater than 100 ft without dispersing or (b) able to deliver cable road runoff into a watercourse.
 - a. Space the waterbreaks at 100 ft intervals to ensure water disperses before becoming erosive.
 - b. Cut waterbreaks diagonally a minimum of 6 in. (15.2 cm) into the cable road and keep a continuous firm embankment of at least 6 in. (15.2 cm) in height immediately adjacent to the down-road edge of the waterbreak cut.
2. Install waterbreaks by hand if the ground site is not designated for heavy equipment.
3. Treat bare soil exposed by cable roads for at least 100 ft² that is (a) within the AMZ or (b) beyond the AMZ but contiguous with it.

E.9 Precipitation Threshold for Mid-Winter Period

The mid-winter period begins when streamflow responds directly to precipitation (i.e., rises above baseflow). During the first 5 years of the HCP/NCCP, the wildlife agencies may evaluate sediment delivery under these conditions. If there is no evidence of sediment delivery during operations performed in the early months of the mid-winter period, the wildlife agencies and MRC will consult to adjust the evaluation trigger, if necessary. To determine the mid-winter period, there may be a precipitation adjustment, i.e., 4 in. of cumulative precipitation in the water year. Adjustments to the total cumulative rainfall may more accurately reflect ground conditions

related to sediment control. After the first 5 years, the wildlife agencies and MRC may adjust the evaluation trigger based on climate trends over the 80-year term of the HCP.

E.9.1 Method for determining precipitation threshold

MRC uses the long term precipitation and streamflow record (1964-2001) from South Fork Caspar Creek. The South Fork Caspar Creek represents a small watershed (approximately 1700 ac) in coastal Mendocino County nested within MRC land. Smaller watersheds respond faster to precipitation than larger watersheds, therefore, use of a small watershed to define the threshold is more conservative. South Fork Caspar Creek is the gauged watershed that most closely reflects the vegetation and soil types in the HCP/NCCP plan area.

We calculated the mean daily precipitation and mean daily streamflow from 1964-2001. The 7-day average was calculated from the mean daily precipitation and streamflow to "smooth" the data set; average day-to-day values bounced somewhat over the 36 years. We summed the 7-day average of the daily average precipitation to provide the cumulative total through the early portion of the water year. Then we plotted the 7-day mean precipitation and streamflow as well as the lower 90% confidence interval.

E.9.2 Precipitation threshold for HCP/NCCP purposes

Based on the graph of the 7-day average cumulative precipitation and streamflow it appears that, on average, the week of Nov. 6 and Nov. 13 shows the first readily apparent deviation of streamflow above baseflow. This corresponds to a mean cumulative precipitation for the water year of 4.5 and 6.3 in. respectively. The lower 90% confidence interval is more conservative; in that case, streamflow response above baseflow for the weeks of Nov. 6 and Nov. 13 is from cumulative precipitation of 4.1 and 5.5 in. respectively. For the HCP/NCCP, MRC defines the threshold as 4 in. of cumulative precipitation occurring after October 1st in the water year (Figure E-8).

E.10 Standards for Surface Erosion Control

MRC will control surface erosion by using straw mulch, seeding, slash, rocks, or other non-erodible materials to minimize sediment delivery to watercourses. If using mulch or slash, we will cover at least 90% of the surface area to a depth of 1 in. or more with hand-laid straw. Under conditions of equal cost and availability, MRC will use weed-free straw, locally available mulch, or erosion matting. If MRC cannot obtain weed-free straw, we will conduct exotic control during the following spring.

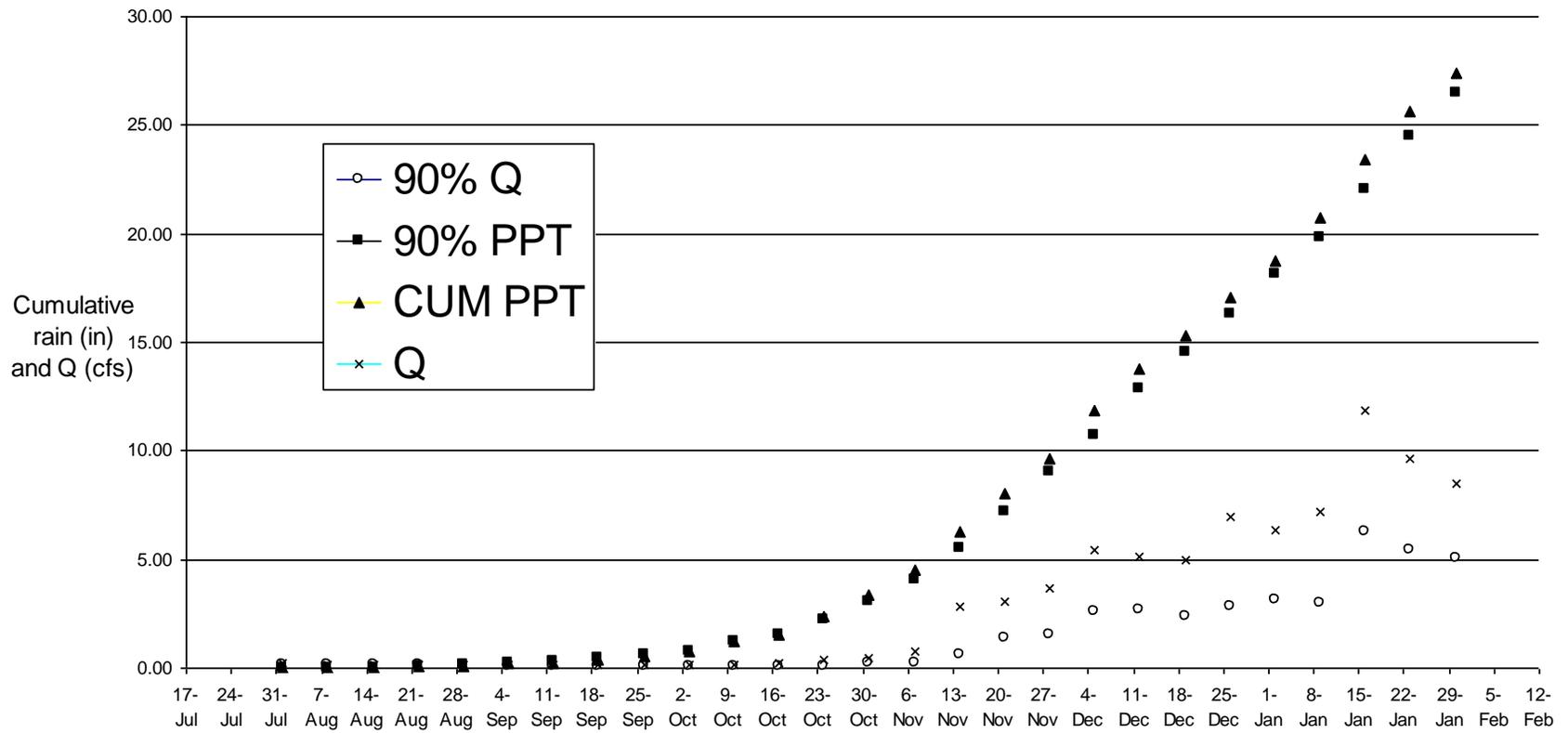


Figure E-8 Precipitation Threshold

