Best Management Practices for Water Quality
Bureau of Land Management California
September 2022

Summary

Water quality goals and objectives are established in Bureau of Land Management (BLM) Resource Management Plans (RMPs); and are required through all stages of project implementation. These goals are intended to meet or exceed applicable legal requirements including the Clean Water Act and California Porter-Cologne Water Quality Control Act. During site-specific project planning, conformance with RMPs is required. The project planning process is where Best Management Practices (BMPs) are evaluated for applicability and developed for the project.

This document is being produced by and for the BLM to aid in compliance with the federal Clean Water Act and Porter-Cologne Act. The State's Non-Point Source (NPS) Policy (2004) guides and describes the use of management practices to address NPS pollution. The State Water Boards hope to leverage this document in potential water quality focused permitting. Through these permits, BLM and the State will streamline the water quality permitting process and assure water quality standards are met for many projects on BLM land. Monitoring to ensure compliance will be part of the Federal Non-point Source permits.

BLM California has a long history of working with the State and other partners to improve water quality. However, documentation of these efforts was not standardized to allow efficient application, evaluation, or reporting across the state or to the State Water Boards. This BLM California BMP guidance was developed so that the agency can demonstrate compliance with the non-point source pollution requirements of the State of California. These Best Management Practices (BMPs) were produced as part of a program to enhance agency performance, consistency, and accountability in managing water quality consistent with the Federal Clean Water Act (CWA) and Porter-Cologne Act.

This document incorporates Best Management Practices for the US Department of Interior, Bureau of Land Management (BLM) Field and District Offices in California.
In summary, the BLM California BMP Program is a key piece of the agency's non-point source pollution control program for achieving and documenting water resource protection, demonstrating commitment to land stewardship and protection of water quality.

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Introduction

High-quality water is one of the most important natural resources on BLM lands. BLM lands are managed using a multiple-use approach with the goal of sustaining healthy terrestrial and aquatic ecosystems while addressing the need for resources, commodities, and services for the American people.

The pattern, magnitude, intensity, and location of land use and management activities influence water quality. When the surrounding terrestrial ecosystems are healthy and functioning properly, clean water benefits. Some land uses may protect or restore water quality, while others may degrade or pose risks to clean water. Excess sediment (turbidity and bedload), nutrients, temperature, pesticides, mine products, that have resulting effects on water chemistry and aquatic habitats, are the most significant water quality issues resulting from land uses and management activities on BLM lands in California. When projects and authorized activities are implemented using Best Management Practices (BMPs) that are designed to protect water quality, Waters of the State and the species, recreation, and communities that depend on them benefit.

Bureau of Land Management Resource Management Plans require compliance with the Clean Water Act. The Clean Water Act (33 U.S.C 1251 et seq.) requires the use of BMPs to reduce nonpoint source pollution to the maximum extent practicable. The BMPs are the primary controls for achieving water quality standards pertaining to nonpoint source pollution. Water quality standards are designed to protect designated beneficial uses for water such as salmonid spawning and rearing, resident fish and aquatic life, domestic water supplies, and water-contact and non-contact recreation. BMPs also serve to increase and improve BLM's responsiveness, transparency, and accountability in its collaboration for water quality management with the Regional Water Boards and local communities.

The BLM is responsible for implementing Best Management Practices on the lands it administers to meet the intent of the Clean Water Act and achieve compliance with the State of California's Porter-Cologne Water Quality Act and applicable Basin Plans (set by the Regional Water Quality Control Boards in California). A standardized set of BMPs is needed as an effective tool for the agency to accomplish the following:

- Minimize impacts to water quality through adaptive management. Detect and quickly diagnose any unanticipated changes that improve or impair water quality.
- Demonstrate compliance or a trend toward compliance with CWA permit requirements for 303(d) listed waterbodies and State of California TMDL management program.
- Improve communication about BLM water resource management strategies and accomplishments with regulators, our partners, and other stakeholders in water resources management and conservation.
- Improve National Environmental Policy Act analyses and compliance with other Federal laws such as the Endangered Species Act.
- Consistency of implementation across all field offices.

BLM California has a long history of working with the State and other partners to improve water quality. This document incorporates BMPs for the US Department of Interior, Bureau of Land Management (BLM) Field Offices in California and provides for the broad range of

activities that occur on BLM lands. Standardization will improve consistency, ensure that BLM resource professionals use best available science to develop site-specific BMPs, and, ultimately, continue to improve water quality on and downstream of BLM lands. The BLM California BMP Program is a key piece of the agency's non-point source pollution control program for achieving and documenting water resource protection, demonstrating commitment to land stewardship and protection of water quality.

Authority

I. Federal Authorities

The BLM must comply with Federal laws, Presidential and Secretarial executive orders, and Department of Interior directives, while implementing programs and operations. Federal laws and executive orders applicable to water-quality management include the following:

1. The Federal Land Policy and Management Act of 1976 (P.L. 94-579) (as amended) requires that public lands will be managed in a manner to protect water quality (Section 102(a)(8)). In addition, Section 202(a)(8) states that BLM land use plans shall provide for compliance with applicable pollution control laws.

2. Wild and Scenic Rivers Act of 1968 (16 U.S. C. 1271.1287; PL 90-452) requires that the BLM manage for no degradation and enhancement of water quality in designated rivers on public lands.

3. National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321, 4331.4335, 4341.4346, 4346a-b, 4347) (as amended). This law declares a national policy that encourages a "productive and enjoyable harmony between humans and their environment." All Federal agencies are required to use a systematic interdisciplinary approach to planning and decision-making. In addition, Federal agencies are to prepare detailed statements assessing the environmental impact of and alternatives to major Federal actions significantly affecting the environment.

4. Environmental Quality Improvement Act of 1970 (42 U.S.C. 4371.4374). This act establishes a national policy for the environment, which provides for the enhancement of environmental quality.

5. Federal Water Pollution Control Act of 1972, as amended (33 U.S.C. 1251, 1254, 1323, 1324, 1329, 1342, 1344). This series of laws establishes goals, policies, and procedures for maintaining and improving the Nation's waters. It addresses both point and nonpoint sources of pollution and establishes or requires programs for controlling both sources of pollution. Section 208 requires area-wide waste-treatment management plans and water-quality management plans for nonpoint sources of pollution. The act established specific roles for Federal, State, and local authorities in the regulation, enforcement, planning, control, and management of water pollution. Section 313 requires Federal agencies to comply with water-quality regulations of state and local governments. Section 319 addresses nonpoint source pollution and requires development of water-quality management plans. BMPs must be identified to control identified nonpoint sources and to reduce the level of pollution from such sources. Proper installation, operation, and maintenance of State approved BMPs may meet a

land manager's obligation for compliance with applicable water quality standards. If subsequent evaluation indicates that approved and properly installed BMPs are not achieving water quality standards, better ways to protect water quality will need to be developed.

6. The Coastal Zones Management Act of 1972 (16 USC sections 1451 et seq.) established a national framework for effective management, protection, development, and beneficial use of the coastal zone. Recognizing that the CZMA did not specifically mention water quality, in 1990 Congress amended CZMA section 306(d)(16) (16 USC section 1455[d][16]) and added section 6217 (16 USC section 1455b) to focus on NPS pollution problems and the protection of coastal waters.

7. Public Rangeland Improvement Act of 1978 (43 U.S.C. 1901-1908). This law provides for on-the-ground range rehabilitation, maintenance and the construction of range improvements including cooperative agreements with range users.

8. Executive Order 12088 of October 13, 1978. This order requires Federal agencies to comply with pollution control standards to be consistent with requirements that apply to a private person. Compliance will be in line with authorities and responsibilities of other Federal agencies, State, interstate, and local authorities as specified and granted in each of the various environmental laws.

II. Water-quality regulation of activities on BLM lands is the result of both Federal and State laws.

The BLM must comply with California laws and the implementation by California of several federal laws, while implementing programs and operations. California Laws and amendments to Federal Laws applicable to water-quality management include the following:

1. Congress, in amending the Federal Water Pollution Control Act (Clean Water Act) in 1972, waived sovereign immunity for Federal agencies, and included in the law a requirement that Federal agencies comply with all state and local laws pertaining to water quality to the same extent as nonfederal entities. Clean Water Act Section 208 provided authority and funding for states to develop water quality management plans and to designate water quality management agencies with primary responsibility for implementing those plans. Water quality management plans as well as Basin Plans were developed in California (40 CFR, Part 130, Section 130.6). In 1987, the Federal Water Quality Act was approved, adding Section 319 to provide funding for implementing nonpoint source management plans. Section 401 of the Clean Water Act gives the State Water Board the authority to review any proposed federally permitted or federally licensed activity that may impact water quality and to certify, condition, or deny the activity if it does not comply with State water quality standards.

1. In California, the Porter-Cologne Water Quality Control Act (1969, as amended) provides separate and broader substantive authority, including issuing state water discharge requirements. The Porter-Cologne Act; Water Code Division 7 and Related Sections (Statutes 2018) was amended to require that all Water Board waivers of waste discharge requirements include monitoring as a condition. California Water Code section 13269. Subdivision (a)(2) includes monitoring requirements (http://leginfo.legislature.ca.gov/faces/codes.xhtml).

2. Under the Coastal Zones Management Act of 1972 (16 USC sections 1451 et seq.) California prepared the California Coastal Management Program that was approved by the National Oceanic and Atmospheric Administration (NOAA). The bulk of California's coast is within

the jurisdiction of the California Coastal Commission pursuant to the Coastal Act of 1976 (Public Resources Code [PRC] sections 30000 et seq.).The State Coastal Conservancy is a third partner agency in the California Coastal Management Program. Coastal Zone Act Reauthorization Amendments (CZARA) section 6217 requires state coastal zone management agencies, in coordination with state water quality agencies, to develop and implement management measures to restore and protect coastal waters from adverse impacts of NPS pollution.

3. The State Legislature enacted the California Coastal Act (PRC section 30000 et seq.) to provide for the conservation and planned development of the State's coastline. The CCA defines the "coastal zone" as the area of the State which extends three miles seaward and generally about 1,000 yards inland. In environmentally sensitive habitat areas where there can be considerable impact on the coastline from inland development, the coastal zone extends to a maximum of 5 miles inland from mean high tide line. The CCC approves coastal development permits (CDPs), energy projects, and federal (federally approved, conducted, or funded) projects consistent with Coastal Act policies. The CCA mandates all coastal development affecting a wetland to obtain a permit from the California Coastal Commission.

4. A key policy of California's water quality program is the State's Antidegradation Policy. This policy, formally known as the Statement of Policy with Respect to Maintaining High Quality Waters in California (State Water Board Resolution No. 68-16), restricts degradation of surface and ground waters. This policy protects water bodies where existing quality is higher than necessary for the protection of beneficial uses. Under the Antidegradation Policy, any actions that can adversely affect water quality in all surface and ground waters must be consistent with maximum benefit to the people of the State, not unreasonably affect present and anticipated beneficial use of the water, and not result in water quality less than that prescribed in water quality plans and policies. Furthermore, any actions that can adversely affect surface waters are also subject to the Federal Antidegradation Policy (40 Code of Federal Regulations section 131.12) developed under the Clean Water Act.

5. The National Marine Fisheries Service, USFWS, and the California Department of Fish and Wildlife began listing distinct populations of fish, amphibians, and reptiles as threatened or endangered pursuant to the Federal or State Endangered Species Acts, a process that is continuing. BLM lands harbor parts of the remaining habitat and refuge for some of these populations, across all districts. These species all require clean water, and connectivity of habitat in some circumstances.

Project Planning and Implementation: BLM California BMP Process

Water quality goals and objectives are established in BLM resource management plans and are required to be analyzed during planning and used during implementation of projects. These goals are intended to meet or exceed applicable legal requirements including the Clean Water Act and California's Porter-Cologne Act and to assist in complying with Basin Plans. The project planning process is where BMPs are evaluated for applicability and developed for the project. These BMPs should then be put into contracts or given to crew implementing projects on the ground. A project may be initiated by BLM or may be proposed by an outside party that wants to occupy or use BLM lands for a specific purpose, such as for a commercial recreation development, large event, or a utility facility.

During project development, the BLM will select BMPs based upon site-specific conditions, technical feasibility, resource availability, and the water quality of those waterbodies potentially

impacted; to achieve water quality goals and objectives. When a project is initiated, the BLM develops the appropriate environmental analysis as required by the National Environmental Policy Act (NEPA) to inform the decision on the project or activity. For implementation actions, an interdisciplinary team will develop the appropriate BMPs to include with the proposed action and relevant alternatives which will be evaluated during NEPA. These site-specific BMPs are developed to account for many factors: the proposed activity, water quality objectives, soils, topography, geology, vegetation, climate, and other site-specific factors. The site-specific BMPs and other permit requirements are described and disclosed in the NEPA analysis document or project file.

The site-specific BMPs s need to be translated into contract provisions, right-of-way stipulations, special use authorization requirements, project plan specifications, and other similar documents. This will ensure that the operator or person responsible for applying the BMPs is required to do so. The BLM will monitor the application of BMPs after completion of the project to evaluate effectiveness. Effectiveness monitoring occurs after a designated period of wet weather has passed. Effectiveness monitoring will evaluate whether selected BMPs reduced erosion, reduced non-point source pollution, or protected beneficial uses. Specific monitoring requirements would be developed on a project-specific basis and depend on the potential level of impacts expected and the types and number of BMPs implemented, and the locations within lands managed by BLM California. Post-project implementation monitoring of selected BMPs will answer the question “Did we do what we said we were going to do?”.

The BMPs that relate to instream activities may also be included to satisfy other permitting requirements, such as US Army Corps of Engineers’ 404 permits, Regional Board 401 certifications, or Endangered Species Act consultations as contained in biological assessments. The BMPs in the following tables are not necessarily specific permit requirements, but rather demonstrate the process by which the BLM would control nonpoint source pollution from activities in streams, at watercourse crossings, in aquatic habitats, in riparian reserves, and in other areas vulnerable to erosion.

For other management activities, including minerals exploration and development, or linear transmission projects, the mechanism to achieve California Water Quality Standards would be guided by RMP management direction, regulations, or project-level design features. BMPs contained in this document may be used as project level design features. For example, management of locatable minerals is governed by regulations found in 43 CFR 3809. The BMPs for locatable minerals include language from 43 CFR 3809 that requires operators to prevent unnecessary and undue degradation from mining operations, as defined in 43 CFR 3809.5 and 43 CFR 3809.415.

Best Management Practices

The following lists of BMPs are not intended to be all-inclusive nor replace site-specific project planning, which may require the use of different or additional BMP practices to achieve the goals of clean water. The intent of each section and each appropriate BMP will need to be used in the development of site specific BMPs. This section describes the BMPs intended for use on BLM lands as part of the strategy for water quality management.

A variety of activities contribute to soil disturbance and potential erosion and are directly associated with aquatic habitats. Table 1 provides general provisions to protect water from contamination, leaks or fuels, fertilizer, solvents or detergents, other hazardous materials, dust suppressants, sanitary facilities, pack animals or temporary stock facilities, diversions, and water drafting. Specific guidance for spill prevention is covered (see Table 2). Restoration activities in aquatic ecosystems are covered (see Table 3). Culverts are considered part of road maintenance and repair and can also be used during timber operations. Culverts can block connectivity of habitat for sensitive or rare species, and care is required to prevent damage to riparian and aquatic habitats and water quality (see Table 4). At times barriers to passage may need to be maintained or established to protect aquatic species from invasive species. Risks to water quality from other activities may be managed by using the appropriate Best Management Practices listed in the Tables 5-12.

These BMPS are focused on the operations and many differing activities in or near wetlands, streams, lakes, springs, seeps, or riparian reserves. BMPS to prevent erosion on steep slopes or during routine road activities are also included. Specific BMPs for operations in or near aquatic ecosystems are covered under sections that identify activities. In the tables below the objectives are to be achieved through project specific BMPs which can either use directly or be derived from the BMPs described below if intent is met. Applicability of the BMPs will examined at the project level.

Operations in or near Aquatic Ecosystems

Objectives: Minimize sediment and other pollutants delivery into aquatic ecosystems and all watercourses from culvert work, stream crossings, projects along lakes and streams, water drafting for dust abatement or fire, roads during road construction or reconstruction, routine maintenance, and other permitted activities. Prevent water pollution from entering watercourses and protect water quality in streams, and other aquatic habitats to protect beneficial uses and to comply with Basin Plans.

Explanation: This first section about Aquatic Ecosystems is intended to contain BMPs associated with all activities that may affect watercourses. Best management practices that are specific to an activity are in separate tables. Aquatic ecosystems include rivers and streams, lakes and ponds, seeps, springs, meadows, wetlands, and even shallow groundwater. Water in these habitats and their associated riparian reserves are valuable to aquatic and semi aquatic species, recreation users, local communities, ranchers, and farmers.

Riparian communities are found immediately around any water resource. Riparian communities are areas of critical importance, as they are at the intersection of terrestrial and aquatic ecosystems and provide a wide range of ecosystem services. Riparian vegetation provides bank stability and shade to maintain cool water temperatures in perennial streams during summer months (Beschta et al. 1987). Riparian reserves also provide terrestrial insects for fish, amphibian, and birds food. Riparian corridors are important for terrestrial and aquatic wildlife (especially birds), help to mitigate flooding and recharge aquifers, provide stormwater filtering, and help to regulate temperature in streams. They also serve an important role in nutrient cycling in the broader context, as they are extremely productive environments with a high density and

diversity of plants and animals. In addition, in arid environments, they tend to be areas with high concentrations of rare species and cultural resources.

There are two types of management zones administered in riparian communities: Riparian Reserves and Aquatic Management Zones (AMZs) (Appendix A). Aquatic Management Zones (AMZs) and Riparian Reserves are designed to protect water quality (see p.48 for Definitions). Riparian Reserves can act as a filter to prevent sediment from entering waterbodies. The widths of the Riparian Reserves vary depending on the aquatic resource they surround (i.e., small wetland on flat round versus large lake), varying from 100 feet to 300 feet slope distance from the stream channel on both sides. Typically, Riparian Reserves are intended to maintain and restore riparian functions, maintain water quality, and stream dynamics, and contribute toward the conservation of invertebrates, fish, amphibian, reptile, mammal, or bird species and conservation of BLM sensitive species. Throughout freshwater systems, stream temperature has effects on aquatic species. Throughout the western US, temperature is of concern for native fish, amphibian, and invertebrate species. Riparian trees and large woody debris providing shade within the stream are key regulators of stream temperature. Riparian Reserve management activities that restore the natural fire regime, reduce high fuel levels, or promote native riparian species may disturb the ground, but can be done following BMPs to reduce potential impacts to waterbodies.

References to 100-year floods in the BMPs are based on the need to protect impoundments, roads and stream crossings from extreme rain, atmospheric rivers, or rain on snow events. Fires can also exacerbate risk to stream crossings and roads. Estimates of one-hundred-year recurrence interval peak discharges methods to determine proper sizing of culverts are outlined in Cafferata et al. 2017) . Evaluating stream crossings in post-fire environments to evaluate which are at risk is important to protect water quality. Methodologies for designing rock-armored crossings, including how to size rock riprap to withstand overtopping 100-year flood flows can be found in Cafferata et al (2017). Since most BLM Field Offices do not have a hydrologist, nor are stream gauges present on many streams or rivers, using a program like Streamstats (https://streamstats.usgs.gov/ss/) can be used to generate estimates of flows including 100-year peak flows. While this method can be tailored to the watershed above a stream crossing or settling basin, or proposed artificial impoundment, it is an estimate based on data through 2006. Engineers should evaluate the designs for culverts or other stream crossings and incorporate BMPs to reduce potential impacts to water quality.

The Aquatic Management Zones (AMZs) are designated as an area adjacent to ephemeral, intermittent, and perennial channels and around water bodies, wetlands, springs, seeps, meadows, and other Waters of the State. Hand treatment and protection of soils are important. Exceptions for restoration activities (Table 3) can be made on a case-by-case basis. Factors considered in AMZ development include stream class, channel aspect and stability, and slope. AMZs are designed as a filter for the maintenance and improvement of water quality.

Table 1. Best Management Practices for Operations in or near Aquatic Ecosystems.

BMP Number	Best Management Practices for Operations in or near Aquatic Ecosystems
AQ 01	For BLM-permitted activities, no hazardous materials storage with 0.25 mile of centerline of

BMP Number	Best Management Practices for Operations in or near Aquatic Ecosystems
	designated Wild and Scenic Rivers, within Riparian Reserves, within AMZ and near permanent water sources.
AQ 02	For short term projects (up to 2 weeks), small amounts of fuel (up to 20 gallons) for staging activities associated with restoration activities may be stored outside the riparian reserve. If fuel over 20 gallons is left at staging area, ensure proper signage is present and provide secondary containment to prevent accidental movement of fuel over the surface to a stream or water body. Fuel and service equipment used for instream, AMZ, or riparian work (including chainsaws and other hand power tools) only in designated areas more than 300 feet from stream or another aquatic habitat. On a case-by-case basis, fueling outside of the AMZ but inside the Riparian Reserve could occur (i.e., when a road is present so that during the dry season that location might be the safest place to refuel). A Spill kit must be present when fueling within 300 ft of a stream.
AQ 03	Fuels, chemicals, or fertilizer shall not be stored on the active floodplain or riparian reserves of any waterbody. All hazardous materials and petroleum products will be stored in durable containers located at least 500 feet from streams, springs, and wetlands. Spill kits will be present. Secondary containment would be required to prevent fuel or other materials from moving down slopes into streams.
AQ 04	Conduct equipment maintenance outside riparian reserves, wetlands, or stream to avoid contamination of water. Locate equipment washing sites in areas with no potential for runoff into wetlands, Riparian Reserve, floodplains, and Waters of the State. Do not use solvents or detergents to clean equipment on site.
AQ 05	Use non-oil-based dust suppressants such as water, within riparian reserves to prevent contamination of surface and groundwater water quality.
AQ 06	Locate contractor or permitted activities outside riparian reserves to protect water quality. Require self-contained sanitary facilities. Locate all new high recreational use sites outside riparian reserves to protect water quality and provide self-contained sanitary facilities.
AQ 07	Plan, locate, design, construct, operate, inspect, and maintain sanitary facilities to minimize water contamination. Sanitation facilities should not be placed within the 100- year floodplain or riparian reserve of a watercourse.
AQ 08	Require self-contained sanitary facilities when long-term camping (greater than 14 days) is involved with permit or contract implementation.
AQ 09	Provide self-contained sanitary facilities when there is high recreational use (campgrounds or dispersed camp areas, temporary camp for an OHV recreational activity, temporary camp due to horse roundup) inside riparian reserves.
AQ 10	Locate pack animal and riding facilities outside riparian reserves to protect water quality.

BMP Number	Best Management Practices for Operations in or near Aquatic Ecosystems
AQ 11	Water Sources: when locating proposed water developments for livestock or other uses, evaluate feasibility of use; and techniques for protecting original water source. Springs used for water source should retain enough water for riparian vegetation and water for rare plant species. Water sources designed for permanent installation, such as piped diversions to off-site trough, are preferred over temporary, short-term-use developments especially when wildlife friendly fences are built to protect the original source.
AQ 12	Basins shall not be constructed at culvert inlets for the purpose of developing a waterhole for drafting, as these can exacerbate plugging of the culvert.
AQ 13	Water sources: excavation of lakeshore, streambed, or bank materials for approaches for permanent water intakes are subject to State or federal restrictions on streambed alteration and ground-disturbing activities that can contribute sediment to a watercourse or aquatic habitat. Therefore, without the appropriate permits, these excavations should not occur. In addition, the following restrictions may apply: Permitted excavations should not occur during wet season. The wet season will vary dependent on location risk and timing of storms. Generally, from October 15-May 15 is when storms can come and runoff from snow occurs, but this can vary dependent on location. Monsoonal rains in the desert may bring heavy rains in summer. Prior to excavation, federally listed threatened and endangered species, BLM sensitive species (including State-listed), management indicator species, and aquatic organisms of interest shall be considered and appropriate mitigations shall be implemented based on federal, state or local permitting agency requirements. Other restrictions such as spawning season may be applicable.
AQ 14	Water sources: avoid use of road fills for permanent water impoundment dams unless specifically designed for that purpose. Impoundments over 9.2-acre-feet or 10 feet in depth will require a dam safety assessment by a registered engineer. Upgrade existing road fill impoundments to pass 100-year flood events. Apply for all required permits to protect water quality.
AQ 15	Water sources: access approaches for water developments are located as close to perpendicular as possible to prevent spring or stream bank damage. The intake within the source water shall be placed parallel to the flow of water and screened, with opening size consistent with the protection of aquatic species of interest. Access approaches are stabilized with appropriate materials, depending on expected life and use frequency of the developed water source. Use a drafting pad for water source placed above the bank full elevation of the channel with little or no excavation and/or fill placement to create drafting pad. Protections to reduce erosion from rain or snowmelt should spread flows off pad and not directly into watercourse. Site should be rehabilitated when pad is no longer needed to minimize erosion.
AQ 16	When diverting water from streams for water sources, in stream flows shall be maintained that ensure continuous surface flow in downstream reaches and keep habitat in downstream reaches in good condition. The channel must not be dewatered to the point of isolating pools and dewatering riffles or to hinder any life stage of fish. Sensitive plants habitat must be maintained.
AQ 17	Water sources, if gravity-fed storage tanks or troughs are employed, shall utilize the following: Water storage tanks shall be fitted with properly sized pipes designed to bring minimal flows to the tank. Outflow pipes shall be sized to fully contain the tank overflow and cleanly return to the downstream areas of the spring or streams. It should be designed to withstand trampling.

BMP Number	Best Management Practices for Operations in or near Aquatic Ecosystems
	Water storage tank return pipes at the water outfall area shall be armored to prevent erosion of watercourse banks or wetlands.
AQ 18	Water sources: File Initial Statement of Water Diversion and Use with State Water Resource Control Board as required. Claim riparian use and record point of diversion (POD) location, water source name, place of use location, purpose of use, diversion works description, quantity of water diverted per month in gallons using on-line reporting.
AQ 19	Drafting Operations: for dust control or water tanker: if an existing off-site storage or more permanent water source such as a reservoir or manmade pond is not available, then the following locations shall be considered for drafting water: Use sites where approaches are hydrologically disconnected from streams. Flowing side channels rather than the main thread of the channel can be used for drafting if access is easier. Areas with existing deeper pools if access is close by.
AQ 20	Temporary dams created to divert flows (e.g., around a culvert or bridge being replaced) shall be removed when operations are complete or before winter weather, whichever comes first. Flow should be put into a large temporary pipe and sent down stream as this is often necessary even for small streams. Downstream temporary dams should be placed to catch sediment coming from site Removal of all temporary dams shall be done so that accumulated sediment is not discharged into the stream flow.
AQ 21	Drafting Operations: limit water withdrawals from fish or amphibian bearing streams to 20 percent of the flow. Limit water withdrawals within or upstream from ESA-listed or other rare species habitat to 10 percent of stream flow or less at the point of withdrawal. The channel must not be dewatered to the point of isolating pools and dewatering riffles for life stages of fish or amphibians. For all other streams, ponds or shallow lakes withdraw no more than 40 percent.
AQ 22	Drafting Operations: Trucks directly drafting from the channel shall utilize the following practices: No more than one truck at the same location or stream reach and time shall occur. No truck will enter the area below the high-water elevation and will stay on an existing road when feasible. Road approaches and drafting pads shall be treated to prevent sediment production and delivery to a watercourse or waterhole. This will include armoring as necessary from the end of the approach nearest a stream for a minimum of 50 feet, or to the nearest drainage structure (for example, waterbars or rolling dip) or point where road drainage does not drain toward the stream. Intakes for trucks, shall be placed parallel to the flow of water.
AQ 23	Drafting Operations: When drafting from the channel utilize the following practices: Do not place pump intakes on the substrate or edges of the stream channel. When placing intakes instream, place on hard surfaces (e.g., shovel and rocks) to minimize turbidity. Where overflow runoff from water trucks or storage tanks may enter the stream, effective erosion control devices shall be installed (for example, gravel berms or waterbars).

BMP Number	Best Management Practices for Operations in or near Aquatic Ecosystems
	Areas subject to high flood events shall be armored to prevent erosion and sediment delivery to water courses. At the end of drafting operations, intake screens shall be removed, and drafting pipes plugged, capped, or otherwise blocked or removed from the active channel to terminate water drafting during the off season. Use a temporary liner to create intake site. After completion of use, remove liner and restore channel to natural condition. Screen intakes with opening size consistent with the protection of aquatic species
AQ 24	Drafting Operations: Trucks directly drafting from the channel shall utilize the following practices: All water-drafting vehicles shall be checked daily and shall be repaired as necessary to prevent leaks of petroleum products and aquatic invasive species from entering AMZs. Water-drafting vehicles shall contain petroleum-absorbent pads, which are placed under vehicles or portable pumps before drafting. Water-drafting vehicles shall contain petroleum spill kits. Dispose of absorbent pads according to the Hazardous Response Plan.
AQ 25	Minimize the frequency and number of passes for heavy equipment through low water crossings. Restrict heavy equipment watercourse crossings to designated locations only. Time operations near streams or riparian reserves to driest time of year to reduce soil compaction and erosion from banks and sedimentation in streams.
AQ 26	Revegetate disturbed areas to prevent soil erosion and stream sedimentation in the fall prior to the wet season or when vegetation has the greatest chance of successful transplant or germination. Otherwise treat disturbed areas by covering with straw or other methods to protect soil.
AQ 27	When invasive species cannot be effectively eliminated by hand pulling, selective herbicide use within riparian reserves must follow all guidelines in Herbicide PEIS. Restrict herbicide use to only those that are designed for use within 100 feet of Waters of the State and have been shown to have no effects on aquatic species.

The Objective of Table 2 is to prevent water pollution from entering streams and protect water quality in streams with fish and rare aquatic species, and other beneficial uses.

Explanation: During road and restoration activities, timber projects, construction and maintenance of OHV trail routes, special uses, wild horse, or burro gathers, fuels work, and vegetation management disturbances to soil, there is the potential for mechanized equipment to leak fluids into water bodies or riparian reserve, undermining water quality. These best management practices are important for minimizing this risk. Large, mechanized equipment used for road work, hazard tree removal, or even restoration work must be checked for leaking fluids to minimize risk to streams or shallow groundwater. Shallow groundwater moves into springs, seeps, meadows, and streams and the many uses of this water makes it important to protect.

Table 2. Best management practices for spill prevention and abatement

BMP Number	Best Management Practices for Spill Prevention and Abatement
SP 01	Have absorbent containment materials present at work sites and places where fueling or use of other hazardous materials may take place. Take immediate action to stop and contain leaks or spills of chemicals and other petroleum products. Notify the California Department of Fish and Wildlife Office of Spill Prevention and Response, through the office's Hazardous Materials specialist, and the State Water Board of any spill that enters the Waters of the State.
SP 02	Spill Prevention, Control, and Countermeasure Plan (SPCCP): All operators shall develop a modified SPCCP prior to initiating project work if there is a potential risk of chemical or petroleum spills near waterbodies. The SPCCP will include the appropriate containers and design of the material transfer locations.
SP 03	Spill Containment Kit (SCK): All operators shall have a SCK as described in the SPCCP on-site during any operation with potential for run-off to adjacent waterbodies. The SCK will be appropriate in size and type for the oil or hazardous material carried by the operator.
SP 04	Operators shall be responsible for the clean-up, removal, and proper disposal of contaminated materials from the site.
SP 05	Prevent spills of hazardous materials by requiring: Spill Prevention, Control, and Countermeasure Plan (SPCCP) when applicable (1,320 gallons cumulative capacity for storage of oil and/or hazardous material, potential impact to Waters of the U.S., or causing unnecessary or undue degradation, as required by federal law), and secondary containment of all hazardous materials in 55-gallon drum capacity and greater. Material to absorb a spill of fuel or other hazardous liquids if working near riparian reserves or streams is required.
SP 06	Inspect and clean heavy equipment as necessary prior to moving on to the project site, to remove oil and grease, noxious weeds, and excessive soil. Inspect hydraulic fluid and fuel lines on heavy-mechanized equipment for proper working condition daily before entering riparian reserves or streams or other waterbodies. Equipment refueling will follow (Table 1) to prevent toxic materials from entering waterways. Refuel small equipment (e.g., chainsaws and water pumps) at least 300 feet from waterbodies (In certain situations, fueling within 300 feet of a stream or riparian reserve would be acceptable (i.e., when a road or other feature makes fueling at that location the safest and most logical place to refuel or as far as possible from the waterbody where local site conditions do not allow a setback) to prevent direct delivery of contaminants into a waterbody. Refuel small equipment from no more than 5-gallon containers. Use absorbent material or a containment system to prevent spills when re-fueling small equipment within the stream margins or near the edge of waterbodies. If large amounts of fuel or other hazardous liquids are stored use secondary containment requirements for fuel storage areas such as a catchment basin or soil berms.
SP 07	In the event of a spill or release, take all reasonable and safe actions to contain the material. Specific actions are dependent on the nature of the material spilled. Notify the State's Water Board or other environmental regulator when fuel is spilled with the potential to impact surface or ground water.

BMP Number	Best Management Practices for Spill Prevention and Abatement
SP 08	Use spill containment booms or as required. Have access to booms and other absorbent containment materials. Immediately remove waste or spilled hazardous materials (including but not limited to diesel, oil, hydraulic fluid) and contaminated soils and dispose of it/them in accordance with the applicable regulatory standard. Notify the California Department of Fish and Wildlife Office of Spill Prevention and Response of any spill over the material reportable quantities, and any spill not totally cleaned up after 24 hours. Store equipment containing reportable quantities of toxic fluids outside of Riparian Reserve

The Objective of Table 3 is to minimize erosion, soil compaction, and sediment delivery from restoration activities.

Explanation: Restoration actions for meadows, streams, rivers, fens, seeps, and springs can provide enormous benefits in term of preserving meadows, reducing erosion, returning habitat structure and function, and restoring species habitat for a wide range of species dependent on these habitats throughout California from the dry desert to the wet coastal areas. During construction activities, the potential for erosion and subsequent sedimentation of streams, lakes or wetlands can occur. In addition, care must be taken to avoid spills (see Table 2Table 2. Best management practices for spill prevention and abatement). Many meadow or stream restorations can conserve seed bearing soils and natural vegetation for planting after construction is finished to reduce erosion. The risks to water quality from restoration activities can be managed by using the appropriate techniques from Table 1 adapted as needed to protect water quality.

Table 3. Best management practices for restoration activities

BMP Number	Best Management Practices for Restoration Activities
RST 01	Confine work in the stream channels to the in-water work period. The instream work period is defined as the period when low base flows occur. June 15 through September 30 could be considered a base flow period where no summer or monsoonal rains occur. Construct new stream crossings when streams are dry or when stream flow is at its lowest. These times may vary if sensitive aquatic species are present or in differing parts of the state. This may be extended if no precipitation is forecast over the following three days and mulch and erosion control materials are stockpiled onsite to be deployed in the event of rainfall occurring.
RST 02	In meadows and other aquatic habitat (e.g., meadow streams), do not drive heavy equipment in flowing channels and floodplains when wet. Do not drive heavy equipment in the AMZ in wet conditions when such use could result in soil compaction and displacement. Prohibit heavy equipment from entering flowing water, unless at a preapproved crossing. Avoid and minimize heavy equipment passage at crossings where water is flowing.

BMP Number	Best Management Practices for Restoration Activities
RST 03	In well-armored channels that are resistant to damage (e.g., bedrock, small boulder, and cobble-dominated), consider conducting the majority of heavy- equipment work from within the channel, during low streamflow, to minimize damage to sensitive riparian reserves.
RST 04	Design access routes for individual work sites to reduce exposure of bare soil and to minimize compaction and soil disturbance to wet meadows and floodplains.
RST 05	Limit the number and length of equipment access points through Riparian Reserves. Locate equipment storage areas outside of riparian reserves, including machinery used in stream channels for more than one day, following Table 2.
RST 06	Limit the amount of stream bank excavation to the minimum necessary to ensure stability of enhancement structures. Provide isolation from flowing water during excavation. Excavated material should be removed and placed where it cannot reenter the stream during precipitation or flood events. If materials will remain on site, they should have permanent stabilization measures applied (such as regrading to match surrounding and revegetation).
RST 07	Rehabilitate headcuts and gullies. Use large wood in preference to rock weirs if available. Enter these areas during the driest time to minimize soil compaction and diversion of flows.
	Use waterbars, barricades, seeding, and mulching to stabilize bare soil areas along project access routes prior to the wet season. Since access routes can become compacted to the point that vegetative recovery is difficult consider loosening the topsoil layer on slopes less than 1 percent prior to seeding or mulching.
RST 08	Prior to the wet season, stabilize disturbed areas where soil will support seed growth, with the potential for sediment delivery to wetlands and streams. Apply native seed and certified weed-free mulch or erosion control matting in steep or highly erodible areas, or within riparian reserves. Adjust techniques if amphibians present due to entanglement in matting.
RST 09	Implement measures to control turbidity. Measures may include installation of turbidity control structures (e.g., isolation, diversion, and silt curtains) immediately downstream of instream restoration work areas. Remove these structures following completion of turbidity-generating activities. Ensure that sediment trapped does not discharge into watercourse and dispose of in location where sediment will not move after precipitation into the waterbody .
RST 10	When replacing culverts, consider using larger culverts and embedding (see definition p.48) the culvert to 30 percent bedload. Use bridges on high-gradient stream channels.
RST 11	When mowing of meadow edges or pockets of dry areas of meadows is required to reduce encroachment by upland species, enter during the driest time of year.
RST 12	Use low-PSI equipment for work in meadow environments For meadow restoration enter with heavy equipment during the driest period.

The objective of Table 4 is to minimize water, aquatic, and riparian resource disturbances and related sediment production when constructing, reconstructing, or maintaining temporary and permanent water crossings. Designing and constructing crossings to pass the 100-yr flood and debris flow will minimize damage to roads from atmospheric rivers and other sources of flash floods that can cause undersized culverts to fail and roads to wash out. Sizing culverts correctly when replacing them allows them to pass debris flows after fires without clogging and risking the road washing out.

Explanation: Stream crossings present the highest risk to water quality associated with roads. Management activities often occur in areas that require surface waters to be crossed. Depending on the activity type and duration, crossings may be needed permanently or temporarily. Permanent crossings are designed to meet applicable standards while also protecting water, aquatic, and riparian resources. The risk from construction, reconstruction or maintenance of stream crossings can be managed by using the appropriate techniques from the following list (and Table 1, Table 2). The intent and the standards specified for the following BMPs need to be met, exactly how they will be implemented can be adapted as needed to local site conditions.

Examples of crossings include culverts, bridges, arched pipes, low water crossings, fords, vented fords, and permeable fills. Crossing materials and construction will vary, based on the type of access required and volume of use expected. Optimally, crossings should be designed and installed to provide passage for the flow of water plus anticipated sediment and debris, provide for desired aquatic organism passage, and minimize disturbance to the surface and shallow groundwater resources. Sizing of culvert is based on a weighed balance between providing for larger storm events, and cost feasibility, while still meeting other resource objectives.

Permits are generally required for instream work associated with perennial or intermittent stream crossing construction and maintenance projects. There are specific requirements for such projects under the Clean Water Act and implementing regulations. State and local entities may also provide guidance and regulations. Additional guidance on stream crossing can be found in Cafferata et al 2017.

Table 4. Best management practices for Stream Crossings

BMP Number	Best Management Practices for Stream Crossings for roads
SC 1	Conduct all nonemergency in-water work during the instream work window to avoid effects on listed or rare aquatic species. In water work should be done when flows are at their lowest. If water is flowing at the time of removal, divert and/or isolate flows from the active work area. Avoid sediment and turbidity entering streams during in-water work to the extent practicable. Remove stream crossing culverts and entire in-channel fill material during the instream work period and/or when the there is no water flowing through the channel. The instream work period is defined as the period when low base flows occur. June 15 through September 30 could be considered a base flow period where no summer or monsoonal rains occur. It is preferable to time the work when ephemeral or desert streams are dry These times may vary if sensitive aquatic species are present or in differing parts of the state. This may be extended if no precipitation is forecast over the following three days and mulch and erosion control materials are stockpiled onsite to be deployed in the event of rainfall occurring.
SC 2	Design the stream crossings to pass the 100-year flood flow plus associated sediment and debris; armor to withstand designed flows and to provide desired passage of fish and other aquatic organisms.

BMP Number	Best Management Practices for Stream Crossings for roads
SC 3	When it is necessary to divert or dewater stream flow during crossing installation ensure that: All crossings whether structures are being placed or removed shall be protected from siltation, all stages of life for fish or amphibians must be protected. Suitable measures are used to divert or partition channelized flow around the site or to dewater the site as needed. Aquatic organisms are removed from the construction area before dewatering and prevent organisms from returning to the site during construction. Clean flows are returned to channel or water body downstream of the activity. Direct pass-through flow or overflow from in-channel and any connected off-channel water developments go back into the stream downstream of the site. Flows are restored to their natural stream course as soon as possible after construction or prior to seasonal closures. Downstream collection basins, retention facilities, or filtering systems are installed as needed to capture and retain turbid water. Collected sediment is removed as needed to maintain their design capacity during the life of the project.
SC 4	Reduce hydrologic connection between road surface drainage or ditchline and stream crossings. Locate and design crossings to minimize disturbance to the waterbody. All crossings should be minimized and should not have multiple crossings within 1/4 mile of another. Use structures appropriate to the site conditions and traffic levels: Favor bridges, bottomless arches, or buried pipe-arches for those streams with identifiable floodplains and elevated road prisms, instead of pipe culverts. Place bridge and arch footings below the scour depth for the 100-year flood flow plus the appropriate factor of safety as determined by road engineers. Favor armored fords for those streams where vehicle traffic is either seasonal or temporary. For perennial streams, use vented fords, so that the crossing can pass low flows.
SC 5	Minimize fill volumes at permanent stream crossings by restricting width and height of fill to amounts needed for safe travel and adequate cover for culverts. For deep fills (generally greater than 15 feet deep), incorporate additional design criteria (e.g., rock blankets, buttressing, bioengineering techniques) to reduce the susceptibility of fill failures. A rolling dip, or simple diversion prevention dip) will eliminate stream diversion potential. For very small stream crossings and for cross drains, a waterbar may suffice.
SC 6	Prevent culvert plugging and failure in areas of active debris movement with measures such as beveled culvert inlets, flared inlets, wingwalls, over-sized culverts, trash racks, or slotted risers. Larger culverts or arched culverts will pass debris better and accommodate bed movement. Trash racks can be high maintenance; it is more effective to size the crossing for 100-year floods and debris from watershed.
SC 7	To reduce the risk of loss of the road crossing structure and fill causing excessive sedimentation, use bridges or low-water fords when crossing debris-flow susceptible streams. Avoid using culverts when crossing debris-flow susceptible streams when practicable.
SC 8	Locate stream-crossing culverts on well defined, unobstructed, and straight reaches of stream. Locate these crossings as close to perpendicular to the streamflow as stream allows. When structure cannot be aligned perpendicular, provide inlet and outlet structures that protect fill, and minimize bank erosion. Choose crossings that have well-defined stream channels with erosion-resistant bed and banks.

BMP Number	Best Management Practices for Stream Crossings for roads
SC 9	Install culverts at the natural stream grade, unless a lessor gradient is required for fish, amphibian, or reptile passage. Stream crossings with ESA-listed fish must meet ARBO II (USDOC NMFS and USDI FWS 2013 or other ESA documentation) fish passage design criteria. unless barriers to passage are required to protect from invasive species. Aquatic Organism Passage Projects include culvert and bridge replacements or removals. Head cut and grade stabilization may need to be done to ensure fish amphibian, reptile, and other species passage. Improperly designed/installed culverts could impede movements of federal or state listed amphibian or reptile species. http://www.conservewildlifenj.org/downloads/cwnj_281.pdf
SC 10	Design stream crossings to prevent diversion of water from streams into downgrade road ditches or down road surfaces if the crossing is blocked by debris or overtopped during storm events. This protection could include hardening crossings, armoring fills, dipping grades, diversion prevention dips, oversizing culverts, hardening inlets, and outlets, and lowering the fill height. Place instream grade control structures above or below the crossing structure, if necessary, to prevent stream head cutting, culvert undermining and downstream sedimentation. Sizing the structure to fit the watershed 100-year floods tends to prevent these issues.
SC 11	Utilize stream diversion and isolation techniques when installing stream crossings. Evaluate the physical characteristics of the site, volume of water flowing through the project area and the risk of erosion and sedimentation when selecting the proper techniques.
SC 12	Limit activities and access points of mechanized equipment to streambank areas or temporary platforms when installing or removing structures. Keep equipment activity in the stream channel to an absolute minimum.
SC 13	Minimize streambank and riparian area excavation during construction of crossings: Install temporary culverts and washed rock with sufficient size to avoid erosion on top of a low-water ford to reduce vehicle contact with water during active haul. Remove culverts promptly after use or before high flows unless culvert built to the 100-year flood capacity. Stabilize adjacent areas disturbed during construction using surface cover (mulch), retaining structures, and or other stabilization methods. Stabilization of the approaches usually require 50 or more feet of rock materials to prevent tracking of sediment into the watercourse. See Weaver 2015 (p.213 Guidelines for erosion and sediment control application) or similar guidance. Keep excavated materials out of channels, floodplains, wetlands, and lakes. Excavated material should be removed and placed where it cannot reenter waterbodies during precipitation or flood events. Banks of the stream, water body, or in riparian reserves are not appropriate. Install silt fences or other sediment- and debris-retention barriers between the water body and construction material stockpiles and wastes. Use only clean, suitable materials that are free of toxins and invasive species for fill. Size competent rock fills to avoid or minimize erosion. Fill must be free of organic materials and preference should be to use locally sources fill.
SC 14	Install stream crossing structures before heavy equipment moves beyond the crossing area.
SC 15	Use no-fill structures (e.g., portable mats, temporary bridges, or improved hardened crossings) for temporary stream crossings. Harden low-water ford approaches with durable materials that can withstand erosive forces. These low water fords are not appropriate in high energy systems nor where moderate traffic occurs. For small first and second order streams this may be appropriate. When not practicable,

BMP Number	Best Management Practices for Stream Crossings for roads
	design temporary stream crossings with the least amount of fill and construct with coarse material to facilitate removal upon completion. Provide cross drainage on approaches. Limit temporary ford crossings to the instream work period (see SC 01 for definition.
SC 16	Restrict access to temporary unimproved low-water stream crossings. Improve crossings where traffic indicates frequent use. Use bridges where traffic is heavy to protect the streams.
SC 17	When installing temporary culverts, use washed rock of a size to withstand erosion as a backfill material. Rock must be large enough to withstand normal flows. Use geotextile fabric as necessary where washed rock will spread with traffic and cannot be practicably retrieved. Remove culverts promptly after use and prior to the wet season or when storms are expected.
SC 18	Temporary fill crossings must be removed after use and prior to the wet season. Removal shall be done so that accumulated sediment is not discharged into the stream flow. Follow practices under the Closure/Decommissioning section for removing stream crossing drainage structures and reestablishing the natural drainage.
SC 19	When removing temporary crossings, restore the waterbody profile and substrate.
SC 20	When removing silt fences and other non-biodegradable sediment controls care must be taken not to release sediment into water courses. Banks of the stream, water body, or in riparian reserves are not appropriate. Place sediment where it cannot wash back into waterbody after rain.

Road Construction and Reconstruction

Objective: Minimize erosion and sediment delivery from roads during road construction or reconstruction, new temporary road construction or reconstruction of historic roads, and other related activities.

Explanation: During road construction and reconstruction activities, vegetation and ground cover are removed, often exposing both the surface and subsurface soil to erosion. Temporary and long-term erosion-control measures are necessary to reduce erosion and maintain overall slope stability. These erosion-control measures may include vegetative and structural techniques to ensure the area's long-term stability. Runoff from staging areas can create rills or gullies, and carry sediment, nutrients, and other pollutants to nearby surface waters.

Culverts can block connectivity of habitat for sensitive or rare species. In these cases, ensuring that the culverts are large enough to carry the bedload and 100-year floods reduces the risk that the culvert will erode the downstream and create a barrier (see Table 4). Care is required to minimize damage to riparian and aquatic habitats and water quality (see Table 4). Construction and reconstruction of a water crossing usually requires heavy equipment to be in and near streams, lakes, and other aquatic habitats to install or remove culverts, fords and bridges and their associated fills, abutments, piles, and cribbing. In addition, heavy equipment has potential for contamination of surface water from vehicle fluids (see Table 2).

Disturbance near a waterbody can increase the potential for accelerated erosion and sedimentation from destabilization of streambanks or shorelines, vegetation, and ground cover removal, and soil

exposure or compaction. The risk from road construction and reconstruction can be managed by using the appropriate techniques from the following list (as well as Table 1, Table 2 , Table 4, Table 7a and Table 7b). The intent and the standards of the BMPs must be met and during implementation can be adapted as needed to local site conditions. Road building becomes more difficult and expensive as slopes become steeper. Roads built on steep slopes are also more likely to have erosion and stability problems (Weaver et al. 2015).

An Erosion Control Plan should be prepared for construction of new roads or when a section needs to be reconstructed, or with disturbance in locations with high sensitivity, or large-scale disturbances that have a probability to affect water resources that could be controlled by measures described in an erosion control plan. Site specific BMPs and design criteria developed for steep or sensitive sites will be included in these Erosion Control Plans. Locations of sites where potential ground-disturbing actions associated with the project (e.g., stream diversion; exposed cut slopes; stripped and stockpiled topsoil; water source development or use), will be marked on maps. Equipment access routes, storage or fuels and stockpiled materials, and service areas should be included. Methods for stabilization for stream crossings during storms should be included. The selection of erosion and sedimentation control measures shall be based on assessments of site conditions and how storm events may contribute to erosion.

Storm Proofing roads under construction or roads in general prior to precipitation can protect Waters of the State and the species that depend upon them. Storm-proofing road systems can have an immediate benefit to the streams and aquatic habitat as well as protect the road surface and reduce annual road maintenance costs. If storm-proofing treatments are implemented correctly, future storm runoff can cleanse the streams of accumulated coarse and fine sediment rather than deposit fine sediments in areas where it impairs aquatic habitat. Road Stormproofing, road closures and wet season haul routes are covered under sections in Table 6.

Table 5. Best management practices for road construction and reconstruction activities.

BMP Number	Best Management Practices for Road Construction and Reconstruction
R 01	Implement an approved Best Management Practices checklist, operating or erosion control plan that covers all disturbed areas, including borrow areas and stockpiles used during road management activities. Follow operations for wet weather (below) . The need for an Erosion Control Plan will be set by the scope and complexity of the project and its potential to cause erosion and deposition in streams.
R 02	Maintain erosion-control measures to function effectively throughout the project area during road construction and reconstruction, and in accordance with the approved Best Management Practices and erosion control plan.

R 03	When new roads or reconfigurations of old roads are necessary, locate roads and landings to reduce total transportation system mileage. Relocate roads and landings outside of AMZs and Riparian Reserves wherever possible. Renovate or improve existing roads or landings when it would cause less adverse environmental impact. Where roads traverse land in another ownership, investigate options for using those roads before constructing new roads. Locate temporary (see definitions p. 48) and permanent roads and landings on stable locations, e.g., ridge tops, stable benches, or flats, and gentle-to-moderate side slopes to minimize erosion impacts. Minimize road construction on steep slopes (> 50 percent).
R 04	Confine new roads to the construction limits of the permanent roadway to reduce the amount of area disturbed and do not design for deposition in wetlands, Riparian Reserve, floodplains, and Waters of the State.
R 05	Avoid road or landing locations in Riparian Reserves. If no other feasible options exist, prevent and minimize discharges of sediment to surface waters (see Table 1, Table 2, Table 4 for additional BMPs). Do not put landings in AMZs.
R 06	Avoid locating landings in areas that contribute to runoff and erosion. Use methods to minimize erosion. Hydrologic connectivity between landings and waterbodies should be kept to an absolute minimum or completely reduced. Install temporary drainage, erosion, and sediment control structures to route runoff from the road to a stabilized area (i.e., vegetated area, sediment basin or riprap lined ditch), and away from watercourses. In unstable areas, stabilize slopes with straw wattles or rock. When on steep or unstable slopes (follow methods Table 7a and Table 7b) in order to avoid erosion from road surfaces. Storm proof (see section below in Table 5) or close roads under construction or reconstruction prior to the onset of the wet season.
R 07	Design (prior to building) temporary roads to either avoid or access sensitive areas at specific locations. Decommission temporary roads upon completion of use. Storm proof before the wet season if project is not completed. Subsoil (i.e., rip) temporary roads where needed to lessen detrimental soil conditions, minimize surface runoff, improve soil structure, and water movement through the roadbed. See also Table 6 Road Closure and Decommissioning.
R 08	Design roads to the minimum width needed for the intended use as referenced in BLM Manual 9113 – 1 – Roads Design Handbook (USDI BLM 2011). Where in-sloped roads are proposed, design inboard ditches to reduce hydrologic connectivity and maintenance requirements.
R 09	Design road cut and fill slopes with stable angles, to reduce erosion and prevent slope failure. Locate and designate waste areas before operations begin.
R 10	Design and construct sub-surface drainage (e.g., trench drains using geo-textile fabrics and drainpipes) in landslide-prone areas and saturated soils. Minimize or eliminate new road construction in these areas.
R 11	To protect Waters of the State from sedimentation and other pollutants from roadways: Locate roads and landings away from wetlands, Riparian Reserve, floodplains, and other Waters of the State. Minimize roads within AMZ, use only for stream crossings. See Stream Crossings below. Locate temporary and permanent road construction or improvement to minimize the number of stream crossings. Do not fill wetlands, do not design roads through meadows. If a wetland or meadow must be crossed use a bridge design that does not block floodplain flows. If a road must go through a Riparian Preserve, use bridges or spans, and elevate road over drainages to minimize disruption of floodplain flows in Riparian Preserves. Stay out of AMZ to protect water quality.

R 12	Excavated material should be removed and placed where it cannot reenter the stream or water bodies during precipitation or flood events. Do not place such materials on slopes with a high risk of mass failure, in areas subject to overland flow or seasonally saturated areas, or within 100 feet (outside of AMZ) of perennial streams or wetlands, Riparian Reserve, floodplains, and unstable areas to minimize risk of sediment delivery to Waters of the State. Apply surface erosion control prior to the wet season. Deposit and stabilize excess and unsuitable materials only in designated site where there are no potential for sediment to discharge to a watercourse. Provide adequate surface drainage and erosion protection at disposal sites. Construct road fills to prevent fill failure using inorganic material, compaction, buttressing, sub-surface drainage, rock facing, or other effective means.
R 13	Use controlled blasting techniques to minimize loss of material on steep slopes or into wetlands, Riparian Reserve, floodplains, and Waters of the State. Restrict blasting after intense storms when soils are saturated.
R 14	Schedule operations when rain, runoff, wet soils, snowmelt, or frost melt are less likely. Follow seasonal restrictions, as outlined in an approved Best Management Practices checklist, operating or erosion control plan. Stabilize project area during normal operating season when the National Weather Service predicts a 30 percent or greater chance of precipitation, such as localized thunderstorm or approaching frontal system. Complete all necessary stabilization measures prior to predicted precipitation that could result in surface runoff. Close roads during wet weather conditions when ground conditions could result in excessive rutting (greater than 2 inches), soil compaction (except on the road prism or other surface to be compacted), or runoff of sediments directly to streams
R 15	Use temporary sediment control measures (e.g., check dams, silt fencing, bark bags, filter strips, and mulch) to slow runoff and contain sediment from road construction areas. Remove any accumulated sediment and the control measures when work or haul is complete. When long-term structural sediment control measures are incorporated into the approved Best Management Practices checklist, operating or erosion control plan, remove any accumulated sediment to retain capacity of the control measure.
R 16	Do not permit sidecasting within or close to streams or wetlands. Prevent stockpiled excavated materials from entering water ways or within 100 feet (outside of AMZ) of perennial or intermittent streams.
R 17	Fully suspend logs, pipes, posts, and other transported materials when crossing waterbodies, or streams and their riparian reserve.
R 18	Construct new stream crossings when streams are dry or when stream flow is at its lowest. Install sediment controls to reduce sedimentation. See Table 4.
R 19	On slopes greater than 40 percent, the organic layer of the soil shall be removed prior to fill placement, according to project specifications. Soil can then be reused where needed to establish vegetation.

R 20	Stabilize all disturbed areas with mulch, erosion fabric, vegetation, rock, large organic materials, engineered structures, or other stabilization measures according to the approved Best Management Practices checklist, operating or Erosion Control Plan, and project specifications and drawings for permanent controls (e.g., crib walls, gabions, or riprap placement).
R 21	Waste organic material, such as uprooted stumps, cull logs, accumulations of limbs and branches, and unmerchantable trees, shall not be buried in logging road or landing fills. Dispose of waste organic material according to project specifications, in locations designated for waste disposal. Assure compliance with the project approved Best Management Practices checklist, operating or erosion control plan.
R 22	Monitor contractor's plans and operations to assure contractor does not open more ground than can be substantially completed before expected wet seasons shutdowns unless erosion-control measures are implemented.
R 23	Scatter construction-generated slash on other disturbed areas to help control erosion. Windrow slash at the outlet of water bars on outsloped roads Do not use slash in -inboard ditches Windrow slash at the base of fill slopes to reduce sedimentation. Ensure that windrows are placed along the contour and that there is ground contact between slash and disturbed slope.
R 24	Dewater live streams where crossed by construction of new roads with appropriate diversion devices use Table 4. Accommodate drainage with adequate temporary crossings (Table 4) during construction. Disconnect road runoff to the stream channel by outsloping the road approach. If outsloping is not possible, use runoff control, erosion control and sediment containment measures. These may include using additional cross drain culverts, ditch lining, and catchment basins. Prevent or reduce ditch flow conveyance to the stream through cross drain placement above the stream crossing (see section below on Surface Drainage).
Surface Drainage including Cross drains Road Activities	
R 25	Effectively drain the road surface by using crowning, insloping or outsloping, grade reversals (rolling dips), and waterbars or a combination of these methods. Avoid concentrated discharge onto fill slopes unless the fill slopes are stable, and erosion proofed.
R 26	Outslope temporary and permanent low volume roads to provide surface drainage on road gradients up to 6 percent unless there is a traffic hazard from the road shape.
R 27	Consider using broad-based drainage dips or leadoff ditches in lieu of cross drains for low volume roads. Locate these overland drainage measures where they will not drain into wetlands, floodplains, and Waters of the State.
R 28	Avoid use of outside road berms unless designed to protect road fills from runoff. If road berms are used, breach to accommodate drainage where fill slopes are stable. Use armoring or slash placed at outside berm breeches to prevent erosion
R 29	Construct variable road grades and alignments (e.g., roll the grade and grade breaks) which limit water concentration, velocity, flow distance, and associated stream power.
R 30	Install underdrain structures when roads cross or expose springs, seeps, or wet areas rather than allowing intercepted water to flow down gradient in ditch lines.

R 31	Design roads crossing low-lying areas so that water does not pond on the upslope side of the road. Provide cross drains at short intervals to ensure free drainage.
R 32	Divert road and landings used for vehicle storage runoff water away from headwalls, slide areas, high landslide hazard locations, or steep erodible fill slopes.
R 33	Limit the construction of temporary in-channel water drafting sites for dust abatement.
R 34	Locate cross drains or relief culverts, to prevent or minimize runoff and sediment conveyance to Waters of the State. Implement sediment reduction techniques such as brush filters, sediment fences, and check dams to prevent or minimize sediment conveyance. Locate cross drains to route ditch flow onto vegetated and undisturbed slopes. If on unstable slopes use rocks and other means to reduce erosion and stabilize water flow off road.
R 35	Space cross drain culverts at intervals sufficient to prevent water volume concentration and accelerated ditch erosion. At a minimum, space cross drains at intervals referred to in the BLM Road Design Handbook 9113-1 (USDI BLM 2011), Illustration 11 –'Spacing for Drainage Lateral.' Increase cross drain frequency through erodible soils, or steeper grades. Use guidelines in Table 7b to stabilize soils below drainage structures in steeper areas.
R 36	Choose cross drain culvert diameter and type according to predicted ditch flow, debris and bedload passage expected from the ditch. Minimum diameter is 18". When species needs for passage are present, sizes should be larger (e.g., for desert tortoise or other wildlife, the minimum size is 36").
R 37	Locate surface runoff drainage measures (e.g., cross drain culverts, rolling dips, and water bars) where water flow will be released on convex slopes or other stable and non-erodible areas that will absorb road drainage and prevent sediment flows from reaching wetlands, floodplains, and Waters of the State. Where possible locate surface runoff drainage structures above road segments with steeper downhill grade. Locate cross drains at least 50 feet from the nearest stream crossing and allow for a sufficient non-compacted soil and vegetative filter.
R 38	Armor surface drainage structures (e.g., broad-based dips, and leadoff ditches) to maintain functionality in areas of erodible and low-strength soils.
R 39	Discharge cross drain culverts at ground level on non-erodible material. Install downspout structures or energy dissipaters at cross drain outlets or drivable dips where alternatives to discharging water onto loose material, erodible soils, fills, or steep slopes are not available.
R 40	Cut protruding 'shotgun' culverts at the fill surface or existing ground. Install downspout or energy dissipaters to prevent erosion.
R 41	Skew cross drain culverts 45–60 degrees from the ditch line and provide pipe gradient slightly greater than ditch gradient to reduce erosion at cross drain inlet.
R 42	Provide for unobstructed flow at culvert inlets and within ditch lines during and upon completion of road construction prior to the wet season.

Road Maintenance and Operations

Objective: To ensure water quality protection by providing adequate and appropriate maintenance and by controlling road use and operations, and to minimize or reduce the hydrologic connectivity of the road system.

Explanation: Appropriate maintenance and control of road use and operations can protect water quality, aquatic and riparian resources, and capital investments. Maintenance needs and operational controls are informed by periodic inventory and assessment that determine road condition and the potential impacts the road has on water quality.

Properly designed and maintained road surfaces and drainage systems can reduce adverse effects to water resources by facilitating natural hydrologic function. Roads and drainage systems normally deteriorate because of traffic, weather, and effects of maintenance. In addition, roads occasionally become saturated by new groundwater springs and seeps after a wildfire or unusually wet periods. Many such conditions can be corrected by timely maintenance. However, while routine maintenance may be needed to ensure the road performs as designed, it can also be a source of soil disturbance and therefore, sediment production. In particular, the grading of inside ditches and road surfaces can significantly increase sediment production rates. Less aggressive maintenance may be desired to minimize disturbance of stable sites.

Operational objectives and activities are also defined by the travel management objectives and depend upon the amount of maintenance a road is expected to receive. Road operations also include permit, contract, and agreement administration, control of seasonal use, sustaining roads in closed status and revising maintenance levels and seasonal closures, as needed. Road closures and restrictions are necessary because many BLM roads are designed for dry season use or very localized use. Most local roads are not surfaced, while others have some surfacing or spot stabilization. Roads without stabilized surfaces or adequate base can be damaged by use during wet periods or by loads heavier than the road was designed to convey.

Detrimental soil compaction generally results from use of heavy equipment during road activities. In the process of compaction, pore spaces between soil particles become compressed. Higher soil moisture makes soils more prone to compaction because water is squeezed out of pore spaces and spaces between soil particles compress during compaction. The soil then becomes denser; less water and air can infiltrate down though the soil profile in the reduced pore space. Compaction also limits root penetration and thus may curb plant access to soil nutrients and induce slower plant growth. The compacted surfaces of roads also contribute to soil erosion by forcing water to run overland rather than naturally infiltrate at the point of raindrop impact. In turn, erosion will often lead to sedimentation, as displaced sediment is transported and deposited into nearby streams. Recontouring slopes to a more natural shape and replacing unstable road fill can help keep the soil on the slopes and protect roads and water quality.

Optimally, a specialist works to determine if approved maintenance tasks are completed with minimal resource impacts. Adjustments to future maintenance plans and methods are considered when previous methods do not provide the needed protection to water quality.

Storm Proofing roads prior to precipitation can protect Waters of the State and the species that depend upon them. Storm-proofing road systems can have an immediate benefit to the streams and aquatic habitat as well as protect the road surface and reduce annual road maintenance costs. If storm-proofing treatments are implemented correctly, future storm runoff can cleanse the streams of accumulated coarse and fine sediment rather than deposit fine sediments in areas where it impairs aquatic habitat.

Risk from road maintenance activities can be managed by using the appropriate techniques from the following table as well as those in Table 1, Table 2, Table 7a, Table 7b, and Table 4. The intent and the standards specified for these BMPs need to be met, exactly how they will be implemented can be adapted as needed to local site conditions.

Table 6. Best Management Practices for Road Maintenance

BMP Number	Best Management Practices for Road Maintenance
RM 1	Maintain road surfaces to dissipate intercepted water in a uniform manner along the road and prior to the wet season, provide effective road surface drainage maintenance. Where feasible and consistent with protecting public safety, utilize outsloping and rolling the grade (rolling dips) as the primary drainage technique. Remove accumulated sediment and blockages at cross-drain inlets and outlets. Grade natural surface and aggregate roads where the surface is uneven from surface erosion or vehicle rutting. Restore crowning with drains, outsloping with rolling dips or insloping with drains for the road type for effective runoff. Remove or provide outlets through berms on the road shoulder.
RM 2	Clean ditches and drainage structure inlets only as often as needed to keep them functioning. Prevent unnecessary or excessive vegetation disturbance and removal on features such as swales, ditches, shoulders, and cut and fill slopes. Clear ditch lines in sections where there is lowered capacity or obstruction by dry gravel, sediment wedges, small failures, or fluvial sediment deposition. Retain ground cover in ditch lines, except where sediment deposition or obstructions require maintenance.
RM 3	Ensure roads are dry. Conduct maintenance operations during the least critical periods for water and aquatic resources (e.g., when streams are dry; during low-water conditions; in compliance with spawning and breeding season restrictions).
RM 4	Maintain water flow conveyance, sediment filtering and ditch line integrity by limiting ditch line disturbance and groundcover destruction when using heavy equipment to clean in -board ditches within 200 feet of road stream crossings. Remove spoil piles to designated disposal site away from water course.
RM 5	When grading roads or cleaning drainage structure inlets and ditches, avoid undercutting of cut-slopes. Retain low-growing vegetation on cut-and-fill slopes.
RM 6	Adjust surface drainage structures to minimize hydrologic connectivity by discharging road runoff to areas of high infiltration and high surface roughness, armoring drainage facility outlet as energy dissipater and to prevent gully initiation.

BMP Number	Best Management Practices for Road Maintenance
RM 7	Minimize diversion potential by installing diversion prevention dips that can accommodate overtopping runoff. Install such that water is directed back into the channel if overtopping occurs or to a retention swale if topping is likely to occur. Armor diversion prevention dips when the expected volume of fill loss is significant. Place diversion prevention dips downslope of crossing, rather than directly over the crossing fill, and in a location that minimizes fill loss in the event of overtopping.
RM 8	Remove and dispose of slide material when it is obstructing road surface and ditch line drainage. Place material on stable ground outside of wetlands, Riparian Reserve, floodplains, and Waters of the State. Seed with native seed and use weed-free mulch.
RM 9	Maintain road surface drainage by removing berms, unless specifically designated otherwise.
RM 10	Do not side cast loose ditch or surface material where it can enter wetlands, Riparian Reserve, floodplains, and Waters of the State.
RM 11	Inspect and maintain culvert inlets and outlets, drainage structures and ditches before and during the wet season to diminish the likelihood of plugged culverts, the possibility of washouts, and that fish or wildlife passage is being maintained.
RM 12	Seed and mulch cleaned ditch lines and bare soils that drain directly to wetlands, floodplains, and Waters of the State, with native species and weed-free mulch.
RM 13	Accompany grading of hydrologically connected road surfaces and inside ditches with erosion and sediment control installation as needed to prevent sediment transport to a water body.
RM 14	Encourage field personnel of all disciplines to observe road deterioration or damage commensurate with travel to field activities, and report to engineering or roads crew.
RM 15	Regularly inspect roads during all operations. Identify diversion potential on roads and prioritize for treatment.
RM 16	Keep unimproved dirt roads closed to public use, but open for administrative use, in hydrologically functional condition; and prioritize for treatment when rutting, poor drainage, or hydrologic connectivity issues develop.
RM 17	Evaluate road management objectives when an inspection indicates road design is not meeting current transportation and/or resource needs. Road management objectives are supported by RMPs or travel management plans.
RM 18	When roads are used for commercial use (e.g., timber sales, mineral sales, energy development, etc.), enforce pre-project maintenance, maintenance during project use, and post-project maintenance. Require commercial operators to leave roads storm proofed and with all drainage structures functioning and clear, slopes stabilized, no rutting, and no hydrologic connectivity when project is complete.
RM 19	During roadside brushing, remove vegetation by cutting rather than uprooting

BMP Number	Best Management Practices for Road Maintenance
RM 20	Apply native seed and certified weed-free mulch to cut and fill slopes, ditch lines, and waste disposal sites with the potential for sediment delivery to wetlands, Riparian Reserve, floodplains, and Waters of the State. Apply seed upon completion of construction and as early as possible to increase germination and growth. Temporary erosion control materials should be maintained in place until seeding has taken and the soil is stabilized by the root growth. Reseed if necessary, to accomplish erosion control. Select seed species that are fast-growing, have adequate provide ample ground cover and soil-binding properties. Apply mulch that will stay in place and at site-specific rates to prevent erosion.
RM 21	Place sediment-trapping materials or structures such as straw bales, wildlife friendly netting, or sediment basins at the base of newly constructed fill or side slopes where sediment could be transported to Waters of the State. Keep materials away from culvert inlets or outlets. https://documents.coastal.ca.gov/assets/water-quality/permits/Wildlife-Friendly_Netting_in_Erosion_&_Sediment_Control-Factsheet_r5_Sept_2016.pdf
RM 22	Use biotechnical stabilization and soil bioengineering techniques to control bank erosion (e.g., commercially produced matting and blankets, live plants or cuttings, dead plant material, rock, and other inert structures).
RM 23	Apply water or approved road surface stabilizers/dust control additives to reduce surfacing material loss and buildup of fine sediment that can enter wetlands, floodplains, and Waters of the State. Prevent entry of road surface stabilizers/dust control additives into Waters of the State during application. For dust abatement, limit applications of lignin sulfonate to a maximum rate of 0.5 gal/yd2 of road surface, assuming a 50:50 (lignin sulfonate to water) solution.
RM 24	Limit road and landing construction, reconstruction, or renovation activities to the dry season. Keep erosion control measures concurrent with ground disturbance to allow immediate storm proofing.
RM 25	Limit disturbance to vegetation and modification of streambanks when locating road approaches to instream water source developments. Surface these approaches with durable material. Employ erosion and runoff control measures.
RM 26	Do not locate placement of road fill in the proximity of a public water supply intake (404(f) exemption criteria xi) in Waters of the State.
RM 27	Decommission and restore temporary roads to natural conditions upon completion of use.
RM 28	Monitor access and evaluate fire or disease damaged trees that may fall on road surface throughout wet season when roads are dry but before public access can be allowed.
Road Stormproofing	
RM 29	Stormproof open roads receiving infrequent maintenance to reduce road erosion and reduce the risk of washouts by concentrated water flows. Stormproof temporary roads if retained over wet season. Specific methods on Stormproofing such as removing hazard trees, improving and monitoring drainage structures, monitoring and minimizing erosion from cut banks, stabilizing soils, shaping roads to allow drainage, and other methods help in keeping the road structures in working order prior to heavy rains or snow. When the National Weather Service predicts a 30 percent or greater chance of precipitation, such as localized thunderstorm or approaching frontal system storm proofing should be postponed.

BMP Number	Best Management Practices for Road Maintenance
RM 30	Increase Road Surface Drainage when storm proofing by implementing a variety of surface drainage techniques including construction of rolling dips and /or waterbars, and berm removal. Ditches, fill slopes and cut banks can be storm proofed by frequently draining them with rolling dips or waterbars and/or ditch relief culverts. Ensure that these features do not discharge to streams or onto active (or potentially active) landslide areas. Monitor outflow from rolling dips, waterbars, and ditch relief culverts during the rainy season to ensure functioning properly. Watch for gully development along the outside edge of the road throughout the rainy season. If gullies do develop then dewater them to best extent possible.
RM 31	Stormproof Cut banks and Fill slopes. Monitor cut banks for slumping, rock falls, or other landsliding. Excavated soil should be placed in locations where it will not enter a stream. Excavated soils should be placed where it will not cause further slope failures or landslides. Unstable soils may be too saturated to excavate during the rainy season so treatments may have to wait until dryer time of year or when soils are dry. .
RM 32	Repair damaged culvert inlets and downspouts to maintain drainage design capacity. To the extent possible, ensure drainage features are fully capable of preventing pollutant discharges to surface waters before the start of the local wet season (such as October 15 to May 1) or before the start of runoff-inducing precipitation events.
RM 33	Ensure that culvert inlet, outlet, and bottom are open and in sound condition. Ensure that culverted stream crossings have no diversion potential (endure dips and other protections are functional. Ensure that culverted stream crossing inlets have low plug potential
RM 34	Blade and shape roads to conserve existing aggregate surface material retain or restore the original cross section, remove berms and other irregularities that impede effective runoff or cause erosion, and ensure that surface runoff is directed into vegetated, stable areas.
RM 35	When suspending storm proofing operations and cover or otherwise temporarily stabilize all exposed soil using methods such as weighted straw wattles to prevent for sediment-laden runoff to enter a wetland, floodplain, or Waters of the State. Resume operations when conditions allow soils to dry to be met.
Road Closure and Decommissioning	
RM 36	Effectively maintain closed roads to eliminate all motorized vehicle use. Maintain physical closure devices, if present, to be safe and effective. Prevent use of vehicular traffic by utilizing methods such as gates, guard rails, earth/log barricades, to reduce or eliminate erosion and sedimentation hat would result from traffic on roads. For roads where physical closure methods are not feasible, install signing to inform of road closure and eliminate road on official maps.

BMP Number	Best Management Practices for Road Maintenance
RM 37	Place excavated material from removed stream crossings on stable ground outside of wetlands, Riparian Reserve, floodplains, and Waters of the State. In some cases, the material could be used for recontouring old road cuts or be spread across roadbed and treated to prevent erosion.
RM 38	Reestablish stream crossings to the natural stream gradient. Excavate sideslopes back to the natural bank profile. Reestablish natural channel width and floodplain.
RM 40	Following culvert removal and prior to the wet season, apply erosion control and sediment trapping measures (e.g., seeding, mulching, straw bales, jute netting, and native vegetative cuttings) where sediment can be delivered into wetlands, Riparian Reserve, floodplains, and Waters of the State.
RM 41	Pull back unstable road fill and end-haul or contour to the natural slopes
RM 42	Implement tillage measures, including ripping or subsoiling to an effective depth for compacted areas including the roadbed, landings, construction areas, and spoils sites.
RM 43	Inspect closed roads to ensure that vegetation stabilization measures are operating as planned, drainage structures are operational, and noxious weeds are not providing erosion control. Conduct vegetation treatments and drainage structure maintenance as needed.
RM 44	Convert, as appropriate, existing drainage structures such as ditches and cross drain culverts to a long-term maintenance free drainage configuration.
RM 45	Suspend ground-disturbing activity in areas where a potential occurs for movement of sediment from the road to wetlands, floodplains, and Waters of the State, if NWS forecasted rain is greater than 30 percent. Temporarily stabilize exposed soils during work suspension. Upon completion of ground-disturbing activities, immediately stabilize slopes and soils. Measures could include but not limited to erosion control blankets and mats, soil binders, wattles, seed and straw, soil tackifiers, or placement of slash.
Wet Season and Haul Road Use	
RM 46	On active haul roads, during the wet season, use durable rock surfacing and sufficient rock depth to resist rutting or development of sediment on road surfaces that drain directly to wetlands, floodplains, and Waters of the State.(see Weaver 2015 for more information)
RM 47	Implement structural road treatments prior to wet season hauling or other wet season road use. Such as: increasing the frequency of cross drains; installing sediment barriers or catch basins; applying gravel lifts or asphalt road surfacing at stream crossing approaches; and armoring ditch lines.
RM 48	Remove snow on surfaced roads in a manner that will protect the road and adjacent resources. Minimize disturbance to soils. Retain a minimum layer (4”) of compacted snow on the road surface. Provide drainage through the snowbank at periodic intervals to allow snowmelt to drain off the road surface.
RM 49	Avoid removing snow from unsurfaced roads where runoff drains to Waters of the State.
RM 50	Maintain road surface to protect road surfaces from rutting and erosion under active haul where runoff drains to wetlands, Riparian Reserve, floodplains, and Waters of the State.
RM 51	To reduce sediment tracking from natural surface roads during active haul, provide a gravel approach before entrance onto hard surfaced roads.

Potential Erosion Hazards for Road or Trails

Vulnerability to soil erosion varies across the state. The variability in vulnerability shows that road drainage design and frequency of drainage structures requires the evaluation of site-specific conditions (Weaver et al. 2015). While soil scientists or geologists can evaluate soil erodibility (based on slope and type of soil that dominates an area), BLM does not always have this expertise even at the District level.

The ratings in the Web Soil Survey indicate the hazard of soil loss from unsurfaced roads and trails. The ratings are based on soil erosion factor K, slope, and content of rock fragments. The erosion hazard is described as "slight," "moderate," or "severe." A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, and that simple erosion-control measures are needed; and "severe" indicates that significant erosion is expected, and that costly erosion-control measures are needed. The data from the website are aggregated data. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Water bar spacing for unsurfaced or natural surfaced road is based on road gradient and soil erosion vulnerability. The Web Soil Survey provides a reasonable basis for the erosion hazard rating to use in the Table 7a. Available online at https://websoilsurvey.nrcs.usda.gov/ , the soil survey can be used to evaluate where the risk is low (slight), moderate or severe. Definitions for extreme include decomposed granitic soil, sandy soils, adjacent earthflows, and deep-seated landslide features. Due to the difficulty of maintaining roads in steep areas with these features, a roads engineer may be needed to evaluate the road. For unpaved rural roads, Table 7a gives water bar spacing based on erosion hazard rating and road gradient (from Weaver et al. 2015). Soil surveys and erosion hazards should be examined before any road maintenance should start.

The ratings listed in Table 7b indicates the soil cover needed to prevent erosion coming off slopes above and below roads, trails, or roads under construction. The hazard of soil loss from denuded slopes is highest in areas where slope is steep, or soil is highly erodible. The ratings are based on soil erodibility, slope, and content of rock fragments. A rating of "slight" indicates that some erosion-control measures are needed on the slopes above and below the road; "moderate" indicates that the areas above and below will need more ground cover; and "severe" and “very severe” indicates that significant erosion is expected and that these areas will need significantly more ground cover. For larger or more complex issues like stream crossings or road construction, analysis should be done by a civil engineer and a geologist. Often soil ground cover is living cover in moist areas. In the desert and arid areas, vertical mulch or rocks are often needed to protect soils. Ground cover can vary tremendously dependent on location.

Table 7a. Water bar spacing (feet) by gradient and erosion class

Estimated Erosion Hazard	Road Gradient (%)		
	<10%	11-25%	>25%
Extreme	100	75	50
High	150	100	75
Moderate	200	150	100
Low	300	200	150

† The erosion classes include the following rock types:

Extreme: Decomposed **g**ranitic soil, sandy soils, adjacent earthflows, and deep-seated landslide features
High: Sandstone, andesite porphyry, glacial or alluvial deposits, soft matrix conglomerate, volcanic ash, and pyroclastics
Moderate: Basalt, andesite, quartzite, hard matrix conglomerate, and rhyolite
Low: Metasediments, metavolcanics, and hard shale

Table 7b. Soil ground cover needed to protect soils

NRCS Erosion Hazard Rating*	Minimum Percent Effective Ground Cover – Year 1	Minimum Percent Effective Ground Cover – Year 2
Very Severe	60%	75%
Severe	45%	60%
Moderate	30%	40%
Slight	20%	30%

* Rating obtained from Natural Resources Conservation Services http://websoilsurvey.nrcs.usda.gov/

Vegetation (including timber) Management Activities

Objective: Minimize erosion and sediment delivery from haul roads, skid roads, end lining, and other vegetation management and timber activities.

Explanation: During timber and hazard tree removal operations heavy trucks are often needed to haul timber off site, and small access roads, landings and skid trails are either opened or constructed. In the process vegetation and ground cover are removed, often exposing both the surface and subsurface soil to erosion.

Detrimental soil compaction in forests and woodlands generally results from use of heavy equipment during road and landing construction and from forestry activities such as ground-based yarding. In the process of compaction, pore spaces between soil particles become compressed. Higher soil moisture makes soils more prone to compaction because water is squeezed out of pore spaces and spaces between soil particles compress during compaction. The soil then becomes denser; less water and air can infiltrate down though the soil profile in the reduced pore space. Compaction also limits root penetration and thus may curb plant access to soil nutrients and induce slower plant growth. The compacted surfaces of roads also contribute to soil erosion by forcing water to run overland rather

than naturally infiltrate at the point of raindrop impact. In turn, erosion will often lead to sedimentation, as displaced sediment is transported and deposited into nearby streams.

Temporary and long-term erosion-control measures are necessary to reduce erosion and maintain overall slope stability. These erosion-control measures may include vegetative and structural techniques to ensure the area's long-term stability. Activities such as culvert replacements may require instream work and some disturbance of the banks. The risk from vegetation and timber activities can be managed by using the appropriate techniques from the following list (and Table 1, Table 2, Table 4, Table 7a and Table 7b).

Table 8. Best Management Practices for vegetation (and timber) management activities

BMP Number	Best Management Practices for Vegetation (and Timber) Management Activities
TM 01	Design skid trail and cable yarding corridor stream crossings or other stream crossings to limit the number of such crossings, using narrow widths, and using the most perpendicular orientation to the stream feasible. Space corridors and skid trails as far apart as is practicable for example: Set yarding corridors at 12–15-foot maximum widths, and In Riparian reserves use preexisting skid trails and roads to minimize soil disturbance in these areas. Use existing or previous stream crossings to minimize disturbance to the AMZ. No new skid trails, logging roads or landings shall be planned for construction within 150 feet of streams with salmonids or listed species present or downstream of the site, within 150 feet of perennial Waters of the State on slopes greater than 30%, or within other Waters of the State with few exceptions. If the Waters of the State are dry at the time of the work limit the construction in the AMZ and in Riparian Reserves. If the crossing will not negatively influence the beneficial uses of the Waters of the State and if the State permit allow for the crossings.
TM 02	Consider the location and planned use of logging roads and landings and whether such logging roads and landings will be abandoned or deactivated and blocked to restrict public use.
TM 03	Trees felled for skid trails and yarding corridors in the Riparian Reserve would be directed toward the stream and left on site unless silvicultural prescriptions in the riparian reserve permit removal. If removal is the intent, then fell tree away from the streams. Keep logs suspended, to minimize damage to soils within the Riparian Reserve.
TM 04	In cable yarding, fully suspend logs over flowing streams, non-flowing streams with highly erodible bed and banks or steep slopes, and Waters of the State.
TM 05	Limit designated skid trails to ≤ 15 percent of the harvest unit area to reduce displacement or compaction to acceptable limits.
TM 06	Limit width of skid roads to single width of what is operationally necessary for the approved equipment. Where multiple machines are used, provide a minimum-sized pullout for passing.
TM 07	Ensure leading end of logs is suspended when ground based skidding.

BMP Number	Best Management Practices for Vegetation (and Timber) Management Activities
TM 08	Restrict non-road, in unit, ground-based equipment used for harvesting operations to periods of low soil moisture; generally, from May 15 to Oct 15. Low soil moisture varies by texture and is based on site specific considerations. Vehicles, tractors, and other equipment that operate off paved roads, under moist or wet conditions must not create ruts exceeding two inches in depth and 25 feet in length. No ruts exceeding three inches in depth are allowed. Where project skid trails remain wet in isolated depressions that are less than 50 feet in length (i.e., no more than two such instances within 1000 feet), woody debris, weed-free straw, or landing mats may be brought in to fill and/or span these depressions for operability.
TM 09	Incorporate existing cable yarding corridors, skid trails and landings as a priority over creating new trails where feasible, into a designated trail network for ground-based harvesting equipment, consider proper spacing, skid trail direction and location relative to terrain and stream channel features.
TM 10	Limit non-specialized skidders or tracked equipment to slopes less than 35 percent, except when using previously constructed trails or accessing isolated ground-based harvest areas requiring short trails over steeper pitches. Also, limit the use of this equipment when surface displacement creates trenches, depressions, excessive removal of organic horizons, or when disturbance would channel water and sediment as overland flow.
TM 11	Limit the use of specialized ground-based mechanized equipment (those machines specifically designed to operate on slopes greater than 35 percent) to slopes less than 50 percent, except when using previously constructed trails or accessing isolated ground-based harvesting areas requiring short trails over steeper pitches. Also, limit the use of this equipment when surface displacement creates trenches, depressions, excessive removal of organic horizons, or when disturbance would channel water and sediment as overland flow.
TM 12	Designate skid trails and other surface disturbances in locations that channel water from the trail surface away from waterbodies, floodplains, and wetlands, or unstable areas adjacent to them.
TM 13	Directionally fall trees to lead for skidding and skyline yarding to minimize ground disturbance when moving logs to skid trails and skyline corridors.
TM 14	Apply erosion control measures to skid trails, cable yarding corridors, and other disturbed areas with potential for erosion and subsequent sediment delivery to waterbodies, floodplains, or wetlands. These practices may include seeding, mulching, water barring, tillage, and woody debris placement. Use guidelines from the road closure and decommissioning section. Waterbar spacing guidelines are found in Table 7a, and percent groundcover that should be maintained is in Table 7b. Hydrologically disconnect the roads and trails from Waters of the State.
TM 15	Subsoiling should occur in proximity to roads, watercourses, and in highly compactable soils. Subsoil (i.e., rip) skid trails, landings, or temporary roads where needed to lessen detrimental soil conditions, minimize surface runoff, improve soil structure, and water movement through the roadbed. See also road closure and decommissioning section.
TM 16	Block skid trails to prevent public motorized vehicle and other unauthorized use at the end of seasonal use.

BMP Number	Best Management Practices for Vegetation (and Timber) Management Activities
TM 17	Allow harvesting operations (cutting and transporting logs) when ground is frozen or adequate snow cover exists to prevent soil compaction and displacement and any visible disturbance of soils.
TM 18	Maintain the minimum percent of effective ground cover needed to control surface erosion, as shown in Table 7b following forest management operations. Ground cover may be provided by vegetation, slash, duff, medium to large gravels, cobbles, or biological crusts.
TM 19	Consider the use of helicopter or aerial logging systems to prevent water quality impacts from road construction or ground-based timber yarding, where other BMPs would be more costly or have limited effectiveness.
TM 20	Limit skid trails in riparian reserves to protect soils and limit soil disturbance to 20 percent of the area. Use mulching, water barring, tillage, and woody debris placement to repair the damage in this area.
TM 21	By selective harvest maintain and restore the species composition and structural diversity of plant communities in riparian reserves and Waters of the State. Leave sufficient trees to maintain 40 to 60 percent shade within 100 feet of Waters of the State. These trees provide summer cooling and nutrient filtering.
TM 22	Trees left in riparian reserves limit surface erosion and bank erosion. Felled trees left in stream can add to distributions of coarse woody debris sufficient to sustain physical complexity.

Fire and Fuels Management Activities

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that may result from wildland fire or fuels management activities.

Explanation: To minimize erosion and sediment delivery from bulldozer lines, loss of groundcover, fire line construction, plugging of culvert and drainage structures on roads and trails, mastication, and hazard tree removal best management practices are available. Common wildland fire management operations include using prescribed fire, managing wildfire using a wide range of strategies from monitoring to aggressive control and suppression, and rehabilitating fire and suppression damage. Firefighter and public safety are always the first priority in wildland fire activities. Implementation of BMPs to protect soil, water quality, and riparian resources, though important, must not compromise public or firefighter safety in wildland fire situations.

Prescribed fire is often a useful tool to reduce fuels and improve watershed condition by consuming vegetation, dead woody debris, humus, and duff. A prescribed fire may burn at a range of intensities, leaving a mosaic of burn severities within the fire perimeter. Activities associated with fuel reductions can affect watersheds. Actions to control and contain the prescribed fire, such as fire line construction can also adversely affect watershed condition by creating a ground disturbance.

During fuels and wildland fire management, heavy vehicles are often needed to create fire lines, prepare roads for fire crew access, clearing and grubbing safety zones, repair roads damaged during fires, remove hazard trees, and to change the nature of shrubby vegetation fuels. Small access roads and landings are either opened or constructed.

During wildland fire management, retrieving water and applying it to the fire, performing back-fire operations, and applying aerial or ground-based fire retardant occur during wildfire suppression. Certain fire-retardant formulations are toxic to aquatic fauna, including fish.

Vegetation and ground cover may be removed by wildfire depending on soil burn severity. In high and moderate burn severity removal of vegetation exposes both the surface and subsurface soil to erosion. In the absence of invasive species such as cheat grass, riparian reserves and uplands may be able to recover naturally, if soils are not disturbed by fire lines. BMPs for rehabilitating fire lines, fire camps, staging areas, and burned areas are necessary to ensure protection of soil, water quality, and riparian resources. Temporary and long-term erosion-control measures are necessary to reduce erosion and maintain overall slope stability where fuels and fire activities have disturbed soils. These erosion-control measures may include vegetative and structural techniques to ensure the area's long-term stability.

Trail and road drainage facilities may become inadequate after wildfires due to increased surface runoff, loss of vegetative cover, and stream bulking. New springs and seeps occasionally saturate trails after the occurrence of a wildfire. Timely maintenance and application of BMPs can correct these conditions to minimize erosion off trails (see recreation below) or roads. Many of these BMPs can be included as minimal impact suppression techniques (MIST). These techniques can be used for wildfire suppression and related activities in wilderness or other sensitive areas such as streams with sensitive aquatic species present.

The BMPs designated by FM are for fuels management, F for wildland fire and FS for Suppression repair, and FE Emergency Stabilization. Many of the BMPs were taken from interagency policies found at https://www.nifc.gov/policies/pol_ref_redbook.html. The Post Fire Emergency Stabilization and Rehabilitation Plan is written after fires on BLM lands to request funding to work on roads, uplands, stream crossings and other locations. After a year or two additional funds under Burned Area Rehabilitation may be obtained after a plan is written. Other links may be more up to date, but these are both publicly available
https://www.nps.gov/archeology/npsGuide/fire/docs/18%20Interagency%20BAER%20Handbook.pdf
https://www.fws.gov/fire/postwildfire/Files/Interagency%20BAR%20Guidebook.pdf

Table 9. Best management practices for fire and fuels management

BMP Number	Best Management Practices for Fire and Fuels Management
Fuels Management	
FM 01	Keep broadcast burns and jackpot burns out of Riparian Reserve, unless prescribed for restoration purposes (e.g., sudden oak death sanitation, improve species composition, invasive weed control, and invigorate deciduous trees, reduce fuel loading).

BMP Number	Best Management Practices for Fire and Fuels Management
FM 02	When operating in meadows use mowing or hand cutting of vegetation to maintain a fire perimeter. When burning in meadows the burn plan should have objectives to limit burn intensity or residence to limit soil heating.
FM 03	Reduce fuel loads by whole tree yarding, and piling material, as necessary, prior to under burning in dry forest types where fuel loads are elevated.
FM 04	To protect soils, do not directly light fires within the AMZ. Hand thin theses areas to reduce fuels and pile and burn outside the AMZ. Do not burn piles within AMZ.
FM 05	Avoid direct ignition of large woody material that is touching the high-water mark of a waterbody or that may be affected by high flows, even if this large wood is outside the AMZ.
FM 06	Store and dispose of ignition devices/ materials (e.g., flares and plastic spheres) outside Riparian Reserve. Maintain and refuel equipment (e.g., drip torches and chainsaws) a minimum of 300 feet from waterbodies, floodplains, and wetlands (unless a road is nearby, and the equipment can be safely maintained and refueled without spilling) .Portable pumps can be refueled on-site within a spill containment system.
FM 07	Avoid creating piles greater than 16 feet in height or diameter. Pile smaller diameter materials and leave larger > 12" pieces within the unit.
FM 08	Prevent use of mechanized heavy machinery fuel reduction equipment within the Riparian Reserve unless prescribed for restoration. Low ground pressure equipment (13-PSI or less) can be used within AMZs and Riparian reserves. Limit mechanized heavy machinery fuel reduction equipment to slopes less than 35 percent. Restrict non-track mechanized equipment (e.g., feller bunchers and horizontal bar masticators) to slopes less than 35 percent.
FM 09	Use temporary stream crossings if necessary, to access the opposite side with any equipment or vehicles (including OHVs). Follow Temporary Stream Crossing practices under Roads section.
FM 10	Construct fire line to the minimum size and standard necessary to contain the prescribed fire and meet overall project objectives. Limit fire lines inside Riparian Reserve. Where hand constructed fire lines are necessary, angle the approach, where feasible, rather than have it perpendicular to the Riparian Reserves. Locate and construct fireline in a manner that minimizes erosion and runoff from directly entering waterbodies by considering site slope and soil conditions, and using and maintaining suitable water and erosion control measures. Consider alternatives to ground-disturbing fireline construction such as using wet lines, rock outcrops, or other suitable features for firelines. Locate fire lines to minimize soil disturbance near temporary and intermittent streams, areas directing water into waterbodies, wetlands, headwalls, or areas of instability.
Wildfire Management including Fire Suppression Repair	
F 11	Fall snags in the Riparian Reserve towards the stream channel when felling is necessary for safety or fire suppression activities.

BMP Number	Best Management Practices for Fire and Fuels Management
F 12	Water drafting sites for engines and tankers would be reviewed by the resource advisor and/or agency representative.
F 13	Within Riparian Reserves, consultation with wildlife biologist familiar with the species present in these habitats can guide where lines can go and not harm natural resources. Pre fire season planning is important to establish places for protection from ground disturbance during wildland fires unless the wildfire is deemed a threat to human safety or private property.
F 14	Avoid delivery of chemical retardant foam or additives to within 300 feet of waterbodies, and wetlands. When retardant is discharged into a waterbody, complete reporting of discharge as required by 2018-2023. California Master Cooperative Wildland Fire Management and Stafford Act Response Agreement (CFMA and as amended), or federal operating plan guidance.
F 15	Use water or other less toxic wildland fire chemical suppressants for direct attack or less toxic approved fire retardants in areas occupied by threatened, endangered, proposed, candidate or sensitive species (TEPCS) or their designated critical habitats. Apply aerial retardant adjacent to Riparian Reserves by making parallel passes.
F 16	Water drafting for aerial water bucket refills can be found in lakes and other open water bodies (see Table 1 for BMPs). Consultation with wildlife biologist familiar with the species present in these habitats can guide which are the most suitable, and which may have the required depths. Pre-fire season planning is important in arid areas and fire prone areas to establish places for water drafts during wildland fires.
F 17	Locate and maintain portable self-contained sanitation facilities at incident bases, camps (including spike/remote camps), helibases, staging areas, constructed helispots, and other centers for incident activities in accordance with State and local regulations.
F 18	Avoid locating incident bases, camps, helibases, staging areas, constructed helispots, and other centers for incident activities in Riparian Reserves. Locate Incident Command Post, air resource bases, staging areas, and other fire management support areas outside of riparian reserves and wetlands, and at a suitable distance from waterbodies to minimize the potential for adverse effects to water quality. Protect surface and subsurface water resources from nutrients, bacteria, and chemicals associated with solid waste and sewage disposal. Collect and properly dispose of trash and other solid waste. Use applicable practices of BMP Road-10 (Equipment Refueling and Servicing) when servicing, refueling, and cleaning vehicles and equipment. Install suitable measures to minimize and control concentrated water flow and sediment from support areas.
FS 19	To intercept water, trap sediment, place residual logs or branches on severely burned areas near trails and near stream crossings, where there is potential for sediment delivery into waterbodies, floodplains, and wetlands.
FS 20	Stabilize fireline in areas that pose a risk to water quality. Use erosion control techniques such as tilling, water barring, or debris placement on fire lines when there is potential for soil erosion and delivery to waterbodies, floodplains, and wetlands. Space the waterbars on trails, and as directed in CFMA or local operating plan guidance.

BMP Number	Best Management Practices for Fire and Fuels Management
FS 21	Block dozer lines and roads or landing intersections with an approved barricade or scattered slash to preclude public motorized vehicle use Stabilize firebreaks in a manner that minimizes exposed soil to the extent practicable.
Emergency Stabilization	
FE 22	Evaluate post-fire threats due to flooding, debris flows, and hazard trees, as well as impacts to vegetation and wildlife to prepare emergency stabilization and rehabilitation plan.
FE 23	Stabilize disturbed areas including safety zones, fireline, and base camps that have increased erosion potential or drainage patterns altered by fire suppression activities. Install suitable drainage features to promote dispersed runoff from sites. Mitigate soil compaction to improve infiltration and revegetation conditions. Use suitable species and establishment techniques to stabilize the site in compliance with local direction and requirements for vegetation ecology and prevention and control of invasive species
FE 24	In many cases there is enough perennial plants remaining on-site that, if protected from further disturbances would allow for natural site recovery. Riparian willows and graminoids recover quickly if allowed to grow over several years. Protection of willows and other riparian vegetation would be secured by temporary fencing of riparian areas, or deferment of grazing for at least two growing seasons. This treatment would allow those areas to recover from wildfires by preventing grazing of new and recovering vegetation.
FE 25	Seeding or planting native vegetation for short-term cover development and long-term recovery. Focus on sites highly susceptible to accelerated erosion, or where perennial plant species cannot reasonably be expected to provide soil and watershed protection, or areas with high densities of invasive annual species e.g., cheatgrass Bromus tectorum, or invasive annual grasses and noxious weeds may readily invade and become established. Temporarily close trails during post fire recovery where recovery is needed close to Waters of the State. When preparing seedbed ensure soil preparations are done prior to rainy season and that no erosion of soils will occur.
FE 26	Implement emergency fire stabilization or rehabilitation treatments to accomplish erosion control as quickly as possible and before the wet season if fire timing allows. Soil and water conservation practices may include, but are not restricted to: Mulching with straw, wood chips, or other suitable material. To avoid introducing noxious weeds when mulching, use certified weed-free straw mulch or rice straw. Placing straw wattles on the contour at adequate spacing between each row to capture eroded material without overflowing. Embed to the surface of the soil in slight trench to prevent under cutting. Depending on slope place more wattles especially in severe burn or moderate burn areas on steep road banks or above culverts. Placing and anchoring log erosion barriers similarly to straw wattles. Spreading available cut vegetation or slash on bare soils to intercept water, trap sediment, preventing precipitation from forming rills and carrying ash and fine sediment to streams and other water bodies.

BMP Number	Best Management Practices for Fire and Fuels Management
FE 27	Soil and water conservation practices for roads and trails include: Placing or clearing channel sediment retention or stabilization structures. Placing and maintaining trash racks for debris above road drainage structures. Preventing culvert and drainage structure plugging Replacing undersized or damaged culverts to increase peak flow capacity of stream crossing culverts to accommodate the 100-year design flood. Installing drainage structures, such as waterbars or drainage dips, on fire lines, fire roads, and other cleared areas according to guidelines in Table 7-b (Waterbar spacing by gradient and erosion class). Reducing road system hydrologic conductivity though proper grading, culvert spacing, and installing drivable dips. Repairing damaged road drainage facilities, such as flattened or ripped culvert ends, or burned-out plastic pipes, or cleaning ditch lines of materials that impede natural flow. Correcting stream diversions.

Recreation management

Objective: To avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that may result from recreation activities. To avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that may result from building new facilities or large staging areas.

Explanation: Construction of new facilities, and locations where large-scale disturbances have a probability of affecting water quality, require an Erosion Control Plan. The selection of erosion and sedimentation control measures shall be based on assessments of site conditions and how storm events may contribute to erosion. Developed recreation sites provide amenities for user comfort and can be in motorized or nonmotorized settings. Oftentimes these areas concentrate high volumes of use into relatively small areas and may be located on or near waterbodies, thereby increasing the potential for water quality degradation. Potential pollutants generated by use at developed recreation sites include, but are not limited to, human and animal waste; solid wastes (trash); petroleum products; and other hazardous substances. In addition, continuous or recurring use at one site can cause excessive soil compaction; damage to vegetation, wetlands, and riparian reserves; and erosion and sediment transport from the site.

Dispersed recreation use takes many forms, both motorized and nonmotorized, across a range of settings. Many dispersed uses and user-created undeveloped sites are located adjacent to or provide easy access to lakes and rivers and lack the design and amenities offered at developed sites to mitigate effects of use. As a result, the impacts of dispersed recreation use on soils, water quality, and riparian resources can be greater than impacts at developed sites. Nonpoint source pollution from

dispersed recreation use includes human and animal wastes, petroleum products, other hazardous substances, streambank disturbance, stream channel alteration, and sediment eroded from the site.

Almost all BLM trails serve nonmotorized users, including hikers, bicyclists, and equestrians, alone or in some combination with motorized uses. Trail construction, maintenance, and use by motorized vehicles and human or stock traffic can adversely affect water quality by increased sediment delivery and contamination from vehicle fluids and human and animal wastes to nearby waterbodies. Compaction of the trail surface limits water infiltration, which can lead to concentrated runoff on the trail surfaces. Concentrated runoff on trails lacking adequate drainage causes erosion of the trail surface and can transport sediment and other pollutants directly into waterbodies if not filtered or caught in sediment basins. Heavy tread, foot, or hoof traffic can loosen some trail surface materials, making them more susceptible to erosion.

Motor vehicles are an enjoyable, legitimate, and appropriate way for people to use BLM lands—in the right places and with proper management. Unrestricted cross-country travel by motor vehicles increases soil erosion and adversely affects water quality. The first vehicle driving across a piece of ground may harm the land, especially in sensitive areas. After many more vehicles have crossed the same path, however, the result may be a user-created route with lasting impacts to soil, water quality, and riparian resources. The proliferation of user-created routes and trails is a major challenge on many public lands in California. User-created routes, in general, are not located, designed, or maintained to avoid, minimize, or mitigate adverse effects to soil, water quality, or riparian resources. Motorized use is designated by allowed vehicle class and, if appropriate, by time of year, with the objective of minimizing damage to soil and watershed resources.

The risk from recreation activities can be managed by using the appropriate techniques from the following list (also see Table 1, Table 2, Table 4, Table 7a and Table 7b). The intent of these BMPs must be achieved, however implementation may vary with local site conditions. Maintaining erosion and sediment control measures to function effectively to prevent discharges of pollutants to surface waters throughout the project area during trail construction and reconstruction, and maintenance will help maintain clean water.

Table 10. Best management practices for recreation management

BMP Number	Best Management Practices for Recreation Management
REC 01	Motorized use of unpaved roads, staging areas, watercourse crossings will not be conducted on rain or water saturated soils conditions because of the likelihood of producing significant sediment discharge.
REC 02	Implement erosion control measures at high use recreation sites to stabilize exposed soils where water flows or sediment, may reach waterbodies.
REC 03	Restrict development of recreation facilities that are not water-dependent (e.g., boat ramps and docks) in the Riparian Reserve.
REC 04	Use self-contained sanitary facilities at all developed recreational facilities unless a sewage system and drain field is approved through the NEPA process.

BMP Number	Best Management Practices for Recreation Management
REC 05	When conducting recreation site maintenance, do not cut portions of logs or coarse woody debris that fall across the active stream channel unless such wood would cause potential flooding hazards with downstream road crossings. Keep adequate lengths of material on the banks to anchor it in place. If not possible to make the log stable, it may be removed.
REC 06	Construct boat ramps and approaches with hardened surfaces. Minimize riprap to a 4- foot width to protect concrete ramps. For constructed boat ramps on rivers and perennial streams write plan to avoid sedimentation in the river from construction and use. Docks must not be wider than 6', and not include any treated wood.
REC 07	Locate new OHV trails on stable locations (e.g., ridge tops, benches, and gentle-to- moderate side slopes). Minimize trail construction on steep slopes where runoff could channel to a waterbody. Close trails appropriately when rerouting trails. Ensure closed trails are blocked from OHV access.
REC 08	Design, construct, and maintain trail width, grades, curves, and switchbacks suitable to the terrain and designated use. Use and maintain surfacing materials suitable to the site and use, to withstand traffic and to minimize runoff and erosion.
REC 09	Suspend construction or maintenance of trails at the time of year when erosion and runoff into waterbodies would occur.
REC 10	Locate staging areas outside Riparian Reserves. Design or upgrade staging areas to prevent sediment/pollutant delivery to wetlands, floodplains, and waterbodies, (e.g., rocking or hardening and drainage through grading or shaping).
REC 11	Designate class of vehicle suitable for the trail location, width, trail surfaces, and waterbody crossings, to prevent erosion and potential sediment delivery.
REC 12	Designate season of use if the trail bed is prone to erosion, rutting, gullying, or compaction, due to high soil moisture, standing water or snowmelt.
REC 13	Design and space trail drainage structures to remove storm runoff from the trail surface before it concentrates enough to initiate rillling. Design trails to dissipate intercepted water by rolling dips. Where trails intersect road ditches, provide erosion resistant crossings. Divert water from the trail to keep from reaching wetlands, floodplains, and waterbodies.
REC 14	Design trails to be no wider than necessary to provide the recreation experience. Incorporate design elements that discourage off-route use (for example, taking shortcuts, cutting new lines). Avoid public motorized vehicle use in ponds and wetlands and navigating up or down wetted streams and side-channels. Use suitable barriers where feasible.
REC15	Use existing road crossings of streams and floodplains on low-volume roads and partially decommissioned roads that tie with the trail system, where safety permits.

BMP Number	Best Management Practices for Recreation Management
REC 16	Design improved stream crossings (culverts and bridges) for the 100-year flood event. Stream crossings with ESA- listed fish must meet ARBO II (NMFS 2013 and USFWS 2013) fish passage design criteria. Design stream crossings for other ESA and State listed and sensitive aquatic species. See Roads and Landings section for stream crossing BMPs.
REC 17	Use existing road crossings of streams and floodplains on low-volume roads and partially decommissioned roads that tie with the trail system, where safety permits.
REC 18	Minimize low-water stream crossings for constructed or existing trails. Cross streams on stable substrate (e.g., bedrock, cobble) in areas of low streambanks. Block alternate stream-crossing routes where OHV wheel slippage (acceleration / braking) would tear down banks or deliver sediment. Avoid long, steep OHV trail segments on approaches to watercourse crossings.
REC 19	Orient stream crossings perpendicular to the channel in straight and resilient stream reaches. Where trails cannot be effectively drained by rolling dips or using reverse grades, provide additional drainage structures. Where needed to prevent connectivity to a water body, incorporate sediment basins at OHV rolling dip outlets instead of lead off ditches. Sediment basins can be used to retrieve eroded material to maintain trail surface and mitigate trail incision. Clean sediment basins regularly. Sediment basins need to be cleaned before reaching a capacity at which sediment is no longer collected and is at risk of delivering to a waterbody. Dispose of materials by using to fill gullies or repair trail tread. Where sediment basins cannot be installed, provide energy dissipaters at OHV rolling dip outlets. Extend drainage outlets beyond the toe of fill or side-cast. Place stable materials below the outlets of cut-off water breaks to dissipate energy. Space cross drains more closely on approaches to stream crossings to reduce storm water volume and potential erosional energy. Install surface armoring on trail sections that are steep and or erodible. Favor native materials.
REC 20	If OHV use is permitted in desert dry washes, protect dry wash woodland vegetation, and ensure that excessive bank erosion and is not occurring in areas where listed or sensitive species are present or downstream.
REC 21	In OHV bridge structures, avoid chemically treated materials at water level contact points where leachate or solids may enter waterbodies.
REC 22	Use a temporary flow diversion bypass to minimize downstream turbidity, when constructing in perennial stream crossings (See Roads and Landings section for Stream Crossing BMPs).
REC 23	If trail width is too wide for the designated use (such as old roads converted to trails), consider tilling one side of the trail, covering with brush, and seeding or planting with native vegetation.
REC 24	Monitor trail condition to identify surface maintenance and drainage needs to prevent or minimize sediment delivery to waterbodies. Repair rills and gullies to keep sediment from reaching wetlands, floodplains, and waterbodies.

BMP Number	Best Management Practices for Recreation Management
REC 25	Hydrologically disconnect trails from waterbodies to the extent practicable. Construct and repair water bars, drain dips, and leadoff ditches. These features may need rock reinforcement to promote longevity. Self-maintaining drain dips or leadoff features are the preferred design.
REC 26	Harden trail approaches to stream crossings using materials such as geotextile fabric and rock aggregate. Harden fords with gravel or cobble of sufficient size and depth to prevent movement by traffic. Construct watercourse crossings to sustain bankfull dimensions of width, depth, and slope, and to maintain streambed and bank resiliency. Cross wet areas with naturally high-water tables with permeable fills, perched culverts, and/or culvert arrays to maintain hydrologic function. If possible, reroute trail away from seeps or wetlands. Bridge wetlands if trail reroute not possible and damage to wetland is occurring due to trails.
REC 27	Rehabilitate unauthorized and decommissioned trails, where needed, to protect sensitive areas and water quality.
REC 28	When constructing or maintaining trails within Riparian Reserve, do not cut any portion of logs or coarse woody debris that extend into the active stream channel unless they pose a flooding hazard. Use alternative passage options, such as earthen ramps, small notch steps, or slight trail realignments, to facilitate maintenance of intact logs. Cut and stabilize if necessary, for safe passage and safety.
REC 29	Position fill or waste material in a location that would avoid direct or indirect sediment discharge to streams or wetlands.
REC 30	Plant restored stream banks with native vegetation, and mulch. Use water-tolerant species where appropriate. Restrict access to and allow nearby vegetation to grow into closed trails.
REC 31	Prioritize upgrading and preparing roads for the wet season that access parking areas such as OHV parking areas and wet season use areas.
REC 32	Staging Areas: Consider the number and type of vehicles to determine parking or staging area size, type of surface and drainage. Take advantage of existing openings, sites away from waterbodies, and areas that are apt to be more easily restored. Prevent erosion to adjacent water; aquatic, and riparian resources. Avoid sensitive areas such as riparian reserves, wetlands, meadows, bogs, fens, inner gorges, overly steep slopes, and unstable landforms. Provide signage to designate parking, staging, and refueling areas, and to minimize impacts to sensitive areas. Use permeable pavements where possible and integrate vegetative islands to trap and filter runoff. Infiltrate as much of the runoff as possible using permeable surfaces and infiltration ditches or basins in areas where groundwater contamination risk is low. Pave parking areas that experience heavy use and those that are used during wet periods. Install curbs and gutters to direct and capture surface flow from these paved surfaces.

BMP Number	Best Management Practices for Recreation Management
REC 33	For staging areas, designate specific locations for fueling and have a berm or other protection to prevent water-quality impacts Install and maintain oil and grease separators in larger parking lots with high use and where drainage discharges directly to streams. Plan for necessary clean out and disposal of material collected in these vaults. Connect drainage system to existing stormwater conveyance systems where available and desirable.
REC 34	For staging areas, rehabilitate temporary parking or staging areas immediately following use. Effectively prevent access to the area once site restoration activities have been completed.
REC 35	. Site camps for permitted group overnight camping greater than 150 feet from surface water.

Rangeland and Wild Horses and Burros Best Management Practices

Objective: The purpose of this set of Best Management Practices (BMPs) is to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that may result from rangeland management.

Explanation: Rangeland use includes grazing by cattle, sheep, goats, horses, and saddle stock used to manage the range and recreational stock. Throughout California rangelands rely on water sources for stock watering. In eastern California arid and semi-arid non-forested ecosystems are used for rangelands, and water supplies are rarer. Grazing is a means of managing vegetation to meet needs for commercial livestock operations, fuels management, invasive species management, wildlife habitat improvement, and reduction of competing vegetation in plantations. Rangelands should have properly functioning riparian reserves, wetlands streams and floodplains. Soils, vegetation, structure, and diversity are all important to maintain in proper functioning condition to support clean water. For water bodies, the primary objective is to maintain the existing quality and beneficial uses of water, protect them where they are threatened (and livestock grazing activities are a contributing factor), and restore them where they are currently degraded (and livestock grazing activities are a contributing factor).

The best management practices are tiered to these range standards:

1. Soils exhibit characteristics of infiltration, fertility, permeability rates, and other functional biological and physical characteristics that are appropriate to soil type, climate, desired plant community, and landform.
2. Precipitation is able to enter the soil surface at appropriate rates; the soil is adequately protected against accelerated erosion; and the soil fertility is maintained at appropriate levels.
3. There is minimal evidence of accelerated erosion (based on ecological site type) in the form of rills, gullies, pedestaling of plants or rocks, flow patterns, physical soil crusts/surface sealing, or compaction layers below the soil surface.
4. Riparian vegetation and soils interact to capture and pass sediment, sustain infiltration, maintain the water table, stabilize the channel, sustain high water quality, and promote biodiversity appropriate to soils, climate, and landform.

5. Naturally occurring vegetation cover will protect banks and dissipate energy during high flows.
6. A diversity of plant species with various developmental stages and rooting depths is present
7. Root masses are sufficient to stabilize streambanks and shorelines.
8. Adequate organic matter (litter and standing dead plant material) is present to protect the site and to replenish soil nutrients through decomposition.
9. Point bars are becoming vegetated over time.
10. There is adequate streambank stability, morphology, pool frequency, stream width/depth ratio, and minimal substrate sediments and bare ground.

BLM engages in planning for management of grazing allotments, and administering rangeland permits, including managing overall livestock numbers, distribution, and season of use. The BLM range program strives to reduce pollution and take action to remedy any pollution resulting from its actions that violate applicable California water quality standards (including the requirements identified in Regional Basin Plans), or Tribal water quality standards, or other applicable water quality requirements (e.g., requirements adopted by California Water Resource Control Board or Regional Water Quality Control Board, or the Environmental Protection Agency (EPA) pursuant to Section 303(d) of the Clean Water Act or the Coastal Zone Reauthorization Act). Where action related to grazing management is required, such action will be taken as soon as practicable, but not later than the start of the next grazing year (in accordance with 43 CFR 4180.1). Rangeland Improvement BMPs provide guidance for prevention of resource damage, construction and maintenance of structural and nonstructural improvements and improvement of deteriorated rangeland soil and water resources. BLM also manages wild horses and has horse gathers and work to improve and protect springs and other water sources for these herds.

The risk from activities associated with livestock grazing and wild horse herds can be managed by using the appropriate techniques from the following list (and Table 1, Table 2, Table 4, Table 7a and Table 7b) meet the intent of the BMP. Maintaining erosion and sediment control measures to function effectively to prevent discharges of pollutants to surface waters throughout the allotment area helps maintain clean water. Most allotment management plans allow for protections of water quality and riparian areas.

Table 11. Best management practices for livestock grazing, and Wild Horses and Burro management

BMP Number	Best Management Practices for Livestock Grazing and Wildhorse management
G 01	Fence water developments near springs and seeps when feasible, unless other methods are effective. Pipe overflow away from the developed source where feasible and in cooperation with permitees.
G 02	Protect and maintain the physical, biological, and chemical integrity of perennial, intermittent streams and Waters of the State using fencing, seasonal rotations, and other methods. When water quality is threatened by bank trampling or other disturbances fence areas to keep large animals out of the riparian corridor (Riparian Reserve).

BMP Number	Best Management Practices for Livestock Grazing and Wildhorse management
G 03	Locate new permanent livestock handling or management facilities (corrals, pens, or holding pastures) outside Riparian Reserves or 200 feet from waterbodies and on level ground where drainage would not enter surface waters. Make changes to existing facilities within Riparian Reserves to meet water quality standards and regulations. Encourage cattle to obtain water away from riparian area.
G 04	Adjust forage utilization levels, improved livestock distribution, and management through fencing, vegetation treatments, water source developments, or changes in season of use or livestock numbers to recover degraded waterbodies.
G 05	Apply specific livestock grazing strategies for riparian wetland areas, including timing, intensity, or exclusion for maintenance of proper functioning condition. Use one or more of the following features: Include the waterbodies, floodplains, and wetlands within a separate pasture. Fence or herd livestock out of waterbodies, floodplains, and wetlands for as long as necessary to allow vegetation to recover. Control the timing and intensity of grazing to keep livestock off stream banks when they are most vulnerable to damage and to coincide with the physiological needs of target plant species. Add more rest to the grazing cycle to increase plant vigor, allow stream banks to re-vegetate, or encourage more desirable plant species composition. Limit grazing intensity to a level that will maintain desired species composition and vigor. Permanently exclude livestock from those waterbodies, floodplains, and wetlands areas that are at high risk and have poor recovery potential, and when there is no practical way to protect them while grazing adjacent uplands.
G 06	Locate salting areas outside Riparian Reserves, and further than 400 feet from permanent or intermittent streams and Waters of the State.
G 07	Use practices of BMPs from (Table 1, Table 2, Table 3, Table 4, Table 7a and Table 7b) when designing range improvement activities that involve Waters of the State and when developing water sources for livestock watering or temporary access or gather areas.
G 08	Design and locate parking and staging or wild horse or burro gather areas of appropriate size and configuration to accommodate expected vehicles and horses /burros and prevent damage to adjacent water; aquatic, and riparian resources. When gathering wild horses and burros avoid sensitive areas such as riparian reserves, wetlands, meadows, bogs, fens, inner gorges, overly steep slopes, and unstable landforms to the extent practicable. For staging areas for wild horse and burro gathers, designate specific locations for fueling so that water-quality impacts are minimized.
G 09	In the Sonoran and Mojave deserts, fence off wetlands to livestock and wild burros to protect rare plants and habitat. Provide off-site water while protecting riparian values. In arid and semi-arid areas, fence riparian reserves and provide off-site water for livestock and wild horses, as funding allows.

Minerals Development Best Management Practices

Objective: Managing mineral and energy resources on BLM lands is to encourage and facilitate the orderly exploration, development, and production of these resources in an environmentally sound manner integrated with the management of other BLM resources. These BMPs are to be used during all mineral's management activities on BLM lands. Additional site-specific design criteria and BMPs may need to be developed to protect water quality.

The risk from activities associated with minerals can be managed by using the appropriate techniques from the following list (and Table 1, Table 2. Table 4, Table 6, Table 7a and Table 7b).

Table 12. Best management practices for minerals

BMP Number	Best Management Practices for Minerals Development
M 01	Require suitable characterization of ore, waste rock, and tailings using accepted protocols to identify materials that have the potential to release acidity or other contaminants when exposed during mining. Stipulate suitable requirements, including water treatment as needed, to avoid or minimize the development and release of acidic or other contaminants in surface or groundwater.
M 02	Require suitable characterization of mine site hydrology commensurate with the potential for impacts to surface water and groundwater resources, to include physical and chemical characteristics of surface and groundwater systems, as needed, for the range of expected seasonal variation in precipitation and potential stormflow events likely to occur at the site for the duration of the minerals activities.
M 03	Evaluate the consumptive use of water in the mining operation and its effect on water (including groundwater) dependent ecosystems.
M 04	Evaluate the potential for direct and indirect impacts to morphology, stability, and function of waterbodies, riparian reserves, and wetland habitats.
M 05	Identify suitable interim and post-project surface water and groundwater monitoring where needed to confirm predictions of impacts, detect adverse changes at the earliest practicable time, and develop appropriate changes in operations or recommend closure where needed.
M 06	Locate stockpile sites on stable ground where the material would not move into waterbodies, floodplains, and wetlands.
M 07	Locate, design, and construct salable mineral sites to control runoff and prevent or minimize sediment delivery to streams. Prevent overburden, solid wastes, drainage water, or petroleum products from entering wetlands, Riparian Reserves, flood plains, and Waters of the State.
M 08	Locate, design, and maintain settling ponds to contain sediment discharges. Monitor to ensure that contamination of ground water or surface waters does not occur.

BMP Number	Best Management Practices for Minerals Development
M 09	When a quarry or rock pit is depleted or vacated, stabilize cut banks, headwalls, and other surfaces to prevent surface erosion and landslides. Close roads, excavations, and crusher pads in accordance with Roads and Landings section. Remove all potential pollutants to prevent their entry into wetlands, Riparian Reserves, floodplains, and Waters of the State.
M 10	Use erosion-reduction practices, such as seeding, mulching, silt fences, and woody debris placement, to limit erosion and transport of sediment to streams from quarries. Provide drainage from stockpiles and mineral sites, dispersed over stable vegetated areas rather than directly into stream channels. Grade all material sites, where practicable to conform with the surrounding topography prior to closure. Utilized topsoil as a medium to for successful revegetation. Reseed and plant shrubs, grasses, forb, and trees, where needed.

Definitions

Amendment. ES and BAR Handbook, the mineral's Gold Book and other that folks are aware of ? updated.

Apron. A reinforcement mechanism that protects soil from erosional and gravitational displacement.

Armoring. Protective coverings or structures used to dissipate the erosive energy of water. Aprons and riprap are types of armoring.

Aquatic Management Zone (AMZ). An administratively designated zone adjacent to ephemeral, intermittent, and perennial channels; and around standing bodies of water, wetlands, springs, seeps and other wet or marshland areas. A protective buffer along a stream or other water body is the most commonly prescribed and important water quality protection practice. Buffer widths vary depending on stream size, topography, and underlying geological conditions (Appendix A). AMZs are designed and delineated for the application of special management controls aimed at the maintenance and/or improvement of water quality and habitat for many species including those that use burrows. AMZ delineation can have synergistic benefits with other resources such as maintenance and improvement of riparian area-dependent resources, visual and aesthetic quality, wildlife habitat, and recreation opportunities.

Beneficial Use. A use of the Waters of the State to be protected against quality degradation, including but not necessarily limited to domestic, municipal, agricultural, industrial supply, power generation, recreation, esthetic enjoyment, navigation, conservation and enhancement of fish, wildlife, and aquatic resources.

Best Management Practice (BMP). A practice, or a combination of practices, that is determined by the State (or designated area-wide planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing, or reducing the amount of pollution generated by nonpoint sources to a level compatible with water-quality goals.

BMP Evaluation Program (BMPEP). The field evaluation process developed in cooperation with State Water Board to evaluate the implementation and effectiveness of BMPs.

Cross Drain. A ditch relief culvert or other structure designed to capture and divert surface runoff and divert it across road before the runoff concentrates to erosive volumes and velocities.

Crowning. Forming a convex road surface, which allows runoff to drain from the running surface to either side of the road prism.

Decommissioning. Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1), (FSM 7703). User created trails are not legal and thus are not decommissioned.

Diversion potential A stream crossing has diversion potential if, when stream crossing capacity is exceeded (i.e., the culvert plugs), the stream would back up behind the fill and flow down the road rather than flow directly over the road fill and back into the natural.

Embedding. Embedding (e.g., sinking, countersinking), a culvert to 30 percent bedload is a means to prevent erosion of stream bed or banks. Thirty percent of the bedload can move through the culvert simulating a stream. Ideally a bed stability-mobility analysis would be done by a geologist or fluvial geomorphologist to prevent instability in the ability of a culvert to handle the sediment in the stream. Scour could result, creating barriers to passage for many aquatic and semi-aquatic species.

Erosion Control Plan. An Erosion Control Plan is prepared for construction of new roads or facilities, or with disturbance in locations with high sensitivity, or large-scale disturbances that have a probability to affect water resources that could be controlled by measures described in an erosion control plan. Site specific BMPs and design criteria developed for steep or sensitive sites will be included in these Erosion Control Plans. Locations of sites where potential ground-disturbing actions associated with the project (e.g., stream diversion; exposed cut slopes; stripped and stockpiled topsoil; water source development or use), will be marked on maps. Equipment access routes, storage or fuels and stockpiled materials, and service areas should be included. Methods for stabilization for stream crossings during storms should be included. The selection of erosion and sedimentation control measures shall be based on assessments of site conditions and how storm events may contribute to erosion.

Erosion Hazard Rating (EHR). A relative rating of the potential for soil erosion on a given site. Commonly used to estimate the erosion response expected from a given land management activity. Ratings are the result of a composite analysis of the following factors: soil, topography, climate, soil cover.

Floodplain. The areas adjoining inland streams and standing bodies of water and coastal waters, including debris cones and flood-prone areas of offshore islands, including at a minimum, that area subject to a 1 percent chance of flooding in any given year.

Grade Reversals. Grade reversals are short sections of trail that change from climbing to descending, then return to climbing. The reversal shortens the water flow path and enhances the rider experience.

Ground Cover. Material on the soil surface that impedes raindrop impact and overland flow of water. Material may include duff and organic matter such as needles, sticks, and limbs, in addition to exposed roots, stumps, surface gravels, and living vegetation.

Hazardous Materials. Hazardous and toxic materials that are brought to a site because of project implementation include special paints, sealants, fuels, chemicals, or solvents. Other hazardous materials like fuel, and chemicals can enter water due to the nature of the activities such stream crossings.

Hydrologic Disconnection. means the removal of direct routes of drainage or overland flow of road runoff to a watercourse or lake.

Inner Gorge. A geomorphic feature that consists of the area of channel side slope situated immediately adjacent to the stream channel, and below the first break in the slope above the stream channel. Debris sliding and avalanching are the dominant mass wasting processes associated with the inner gorge.

Leadoff Ditches. Ditches are channels alongside a trail used to convey water to another drainage structure. They range in depth from 6 to 18 inches. A ditch that drains to the adjacent land is known as a leadoff ditch.

Nonpoint Source. Diffuse sources of water pollution that originate at indefinable sources, such as from silvicultural and recreational activities. Practically, nonpoint sources do not discharge at a specific, single location such a conveyance pipe.

Outsloping. Shaping a road prism without an inside drainage ditch to direct runoff to the outside shoulder, as opposed to insloping which directs runoff to an inside ditch. Emphasis is on maintaining flow at an angle across the road to avoid buildup of an erosive flow of water.

Point Source. Water pollution originating from a discrete identifiable source, or conveyance.

Riparian Reserves. A protective vegetative zone along a stream or other water body is an important water quality and habitat protection practice. Riparian Reserves widths vary depending on stream size, topography, and underlying geological conditions (Appendix A). These reserves provide corridors for larger mammal and birds, and habitat for amphibians, reptiles, birds, and small mammals. They provide a filter for sediment from upland activities; and are wider a than an AMZ. Treatment as long as ground disturbance.is limited is allowed in the area outside the AMZ.

Rolling the Grade. Refers to rolling dips or rolling grade dips or grade dips. A rolling dip has two design goals. The first is to get the water off an existing trail and the second is to build it long enough that the rider does not know it is there. (https://www.fs.fed.us/t-d/atv_trails_site/build/keeping-water-off-the-trail/rolling-dips.html.)

Source Water Watershed. Source water protection practices are actions taken to prevent contamination of surface and groundwater sources of drinking water. The source water protection area generally includes the watershed area upstream of a water supplier's intake. It is delineated by the boundaries of drainage basins that supply streams, lakes, and reservoirs that serve as source water. This is referred to as the source water watershed.

Standard Specifications. Standards and design requirements, from the current version of California Stormwater Quality Association BMP standard specifications. These specifications and illustrations can be used to develop approved Best Management Practices checklist, operating or Erosion Control Plan which help minimize erosion during BLM construction activities.

Storm Proofing. Roads are storm-proofed when runoff and sediment delivery to streams is strictly minimized. This is accomplished by dispersing road surface drainage, protecting stream crossings from failure or diversion, and preventing failure of unstable cutbanks or fillslopes from delivering sediment to a stream.

Temporary roads. A temporary road is a road that is designed and built along a temporary alignment, solely for use during construction. Temporary roads focus the ground disturbance of equipment and vehicles along a certain path, so that erosion and sediment movement can be planned and mitigated for in accordance with all applicable permits. Structures, such as water bars, road sloping, rolling dips and level spreaders are generally limited to low traffic volumes. Temporary constructed roads cannot encroach into jurisdictional wetlands without the appropriate permits. These roads are closed, and the land rehabilitated when the project is completed.

Unstable Areas. Lands with slope gradients at, or steeper than the mechanical strength of the underlying soil and rock materials. Land areas exhibiting one, or more of the following characteristics:

1. Active landslides.
2. Inner gorges.
3. Portions of shear zones and dormant landslides having slope gradients that are typically steeper than 60 to 65 percent.
4. Unconsolidated deposits with slope gradients at, or steeper than the stable angle of repose.

Vertical mulch. Vertical mulch along roads involves placing dead branches upright in the soil to simulate the appearance of dead shrubs. Vertical mulch leads to increased plant cover, soil moisture, soil stability, and lowers compaction in desert areas.

Water drafting. A short duration, small-pump operation that withdraws water from streams or lakes to fill conventional tanks or trailers. Water is normally used for dust abatement or for wildfire management. Short term drafting is also used to temporarily de-water or divert water around construction site.

Waters of the State. Any surface water or groundwater, including all wetlands, all classification of streams, lakes, ponds, and impoundments.

Wetlands. Those areas that are inundated by surface or groundwater with a frequency sufficient to support a prevalence of vegetation, or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, springs, seeps, wet meadows, river overflows, mud flats, and natural ponds.

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Appendix A - How to define a riparian reserve or Aquatic management zone (AMZ)

Waterbody Type	Riparian Reserve Width	Aquatic Management Zone width
Perennial and intermittent fish or amphibian bearing streams	300 ft on each side of aquatic zone for preventing erosion. Actively manage outer 200 ft. to minimize soil disturbance, reduce fuels, restore native vegetation, and thin trees. Prescribed fire with ignitions should be done in a manner to preserve soils and patchy ground cover.	100 ft on each side of stream primarily hand treatment if required, no fire ignition for prescribed fire, and no disturbance of soils if fire line required. If crossing is required, minimize watercourse crossings. No pile burning.
Perennial or intermittent nonfish-or amphibian bearing streams	150 ft. on each side of stream Actively manage outer 50 ft. to minimize soil disturbance, reduce fuels, restore native vegetation, and thin trees. Prescribed fire with ignitions should be done in a manner to preserve soils and patchy ground cover.	100 ft on each side of stream primarily hand treatment if required, no fire ignition for prescribed fire, and no disturbance of soils if fire line required. If crossing is required, minimize watercourse crossings. No pile burning,
All watercourses (minimum distances)	100 ft. on each side of watercourse. Actively manage outer 50 ft. to minimize soil disturbance, reduce fuels, restore native vegetation, and thin trees. Prescribed fire with ignitions should be done in a manner to preserve soils and patchy ground cover. If slope is over 30 percent no heavy machinery or wheeled vehicles should be permitted.	50 ft on each side primarily hand treatment if required, no fire ignition for prescribed fire, and no disturbance of soils if fire line required. If crossing is required, minimize watercourse crossings where possible. No pile burning. Prescribed fire ignition only for restoration purposes and no soil disturbance for fire line.
Wetlands seeps, springs, or other wet areas	100 feet on each side or all around. Avoid active management while wet. Minimize soil disturbance, reduce fuels, restore native vegetation, and thin invading trees or other upland vegetation. Prescribed fire with ignitions should be done in a manner to preserve soils and patchy ground cover.	75 ft on each side or all-around take care to minimize soil compaction and erosion, and primarily hand treatment. Prescribed fire ignition only for restoration purposes and no soil disturbance for fire line.
Lakes and natural ponds	300 feet around the lake or pond Actively manage outer	100 ft. around the lake or pond primarily hand treatment if

	200 ft. with care. Minimize soil disturbance, reduce fuels, restore native vegetation, and thin invading trees or other upland vegetation. Prescribed fire with ignitions should be done in a manner to preserve soils and patchy ground cover.	required, prescribed fire ignition only for restoration purposes and no soil disturbance for fire line.
Constructed ponds and reservoirs	150 feet slope distance from the edge of the wetland. Actively manage outer 50 ft. with care to minimize soil disturbance. Prescribed fire with ignitions should be done in a manner to preserve soils	50 ft. primarily hand treatment if required for shrubs, mowing for grass, prescribed fire ignition preserves soil and manages vegetation for reservoir. No soil disturbance for fire line.

Source: Aquatic Conservation Strategy, Attachment A to the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within Range of the Northern Spotted Owl, pp. C-30-31. PACFISH (INFISH contains similar provisions) .