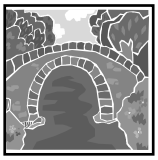
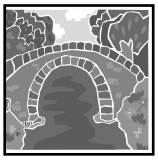
CHAPTER 6
WORKING IN AND AROUND STREAM CHANNELS





6.1 General Principles for Working In or Near Stream Channels

DESCRIPTION

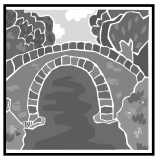
***Note*- The maintenance practices covered in this chapter *do not* include channel maintenance or flood control activities. For information on flood control or channel maintenance BMPs, please refer to Flood Control Facility Maintenance Manual developed by the Bay Area Stormwater Management Agencies Association (BASMAA, June 2000). This document can be found at http://www.mcstoppp.org/FloodControlBMPs.htm.**

This chapter *does* provide aquatic protection guidelines when performing road maintenance activities in or near stream channels, ponds, estuaries and wetlands. Activities include culvert cleaning, repair and replacement, streambank stabilization, woody debris management, dewatering and low water crossings. While some of these activities might be considered *projects*, versus *routine maintenance*, we felt it was critical to expand the scope of this chapter to cover these important subjects which are critical to salmon fisheries protection and restoration (e.g. culvert replacement for fish passage). Adopting best management practices when conducting routine maintenance or implementing projects in or near the streams, is the first line of defense for protecting salmon fisheries and other aquatic life. These BMPs can also make it easier to get environmental permits for your project.

In this chapter we refer to channels as *natural watercourses* that provide aquatic habitat for salmonids, or are connected to streams that do so. Culverts and crossings on natural stream channels are covered in *6.2 - Culvert Cleaning, Repair and Replacement.* For the purpose of this manual, cross drains and roadside ditches are considered separately from natural channels. Although ditches often function similarly to channels, and under certain conditions may be considered Waters of the U.S. (defined in Chapter 2, page 2-3), they are part of a man-made road system and are covered in *Chapter 5.5- Roadside Ditches.* Cross drain culverts are covered in *Chapter 5.6 - Drainage Systems.*

ENVIRONMENTAL CONCERNS

- ✓ Discharge of sediment or debris to streams or watercourses.
- ✓ Harm to instream aquatic habitat or aquatic species.
- ✓ Harm to riparian areas and riparian species.
- ✓ Alteration of natural channel function or shape or destabilization of stream banks.
- ✓ Water pollution from equipment operation.
- ✓ Alteration of stream hydraulics and diversion of stream energies that may cause downstream erosion or structural damage.
- ✓ Dewatering of stream or stream segments.
- ✓ Loss of instream habitat due to wood removal.



BMP OBJECTIVES

- ✓ Protect water quality by reducing erosion and sedimentation.
- ✓ Avoid negative impacts to aquatic and riparian habitat and species.
- ✓ Maintain or restore fish passage.

BEST MANAGEMENT PRACTICES

1) Schedule channel-related road maintenance work during the dry season, avoiding periods which may be more harmful to fish or other aquatic species of concern, such as California red-legged frogs, Santa Cruz long-toed salamanders, and San Francisco garter snakes. Consult local Fish and Game or U.S. Fish and Wildlife biologists to ensure compliance with seasonal constraints. For further details per species see Seasonal Planning BMP.

Measures to Minimize Disturbance From Instream Construction[1]

2) Construction should generally occur during the lowest flow period of the year.

3) Construction should occur during the dry period if the channel is seasonally dry.

4) Prevent any construction debris from falling into the stream channel. Any material that does fall into a stream during construction should be immediately removed in a manner that has minimal impact to the streambed and water quality.

5) Where feasible, the construction should occur from the bank, or on a temporary pad underlain with filter fabric.

6) Temporary fill must be removed in its entirety prior to close of work-window.

7) Areas for fuel storage, refueling, and servicing of construction equipment must be located in an upland location.

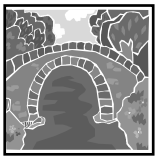
8) Prior to use, clean all equipment to remove external oil, grease, dirt, or mud.

9) Wash sites must be located in upland locations so that dirty wash water does not flow into stream channel or wetlands.

10) All construction equipment must be in good working condition, showing no signs of fuel or oil leaks.

11) Petroleum products, fresh cement, or deleterious materials must not enter the stream channel.

[1] CALIFORNIA SALMONID STREAM HABITAT RESTORATION MANUAL; Chapter IX Fish Passage Evaluation. April 2003 Guidance to Minimize Impacts Suring Stream Crossing Construction.



12) Operators must have spill clean-up supplies on site and be knowledgeable in their proper use and deployment.

13) In the event of a spill, operators must immediately cease work, start clean-up, and notify the appropriate authorities.

Measures to Minimize Degradation of Water Quality[2]

14) Isolate the construction area from flowing water until project materials are installed and erosion protection is in place.

15) Erosion control measures shall be in place at all times during construction. Do not start construction until all temporary control devices (straw bales, silt fences, etc.) are in place downslope or downstream of project site.

16) Maintain a supply of erosion control materials onsite, to facilitate a quick response to unanticipated storm events or emergencies.

17) Use erosion controls to protect and stabilize stockpiles and exposed soils to prevent movement of materials. Use devices such as plastic sheeting held down with rocks or sandbags over stockpiles, silt fences, or berms of hay bales to minimize movement of exposed or stockpiled soils.

18) Stockpile excavated material in areas where it cannot enter the stream channel.

19) Prior to start of construction, determine if such sites are available at or near the project location. If unavailable, determine location where material will be deposited. If feasible, conserve topsoil for reuse at project location or use in other areas.

20) Minimize temporary stockpiling of excavated material.

21) When needed, utilize instream grade control structures to control channel scour, sediment routing, and headwall cutting.

22) Immediately after project completion and before close of seasonal work window, stabilize all exposed soil with mulch, seeding, and/or placement of erosion control blankets.

Measures to Minimize Loss or Disturbance of Riparian Vegetation[3]

23) Prior to construction, determine locations and equipment access points that minimize riparian disturbance. Avoid affecting less stable areas.

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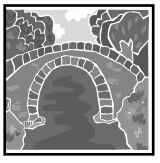
[2] CALIFORNIA SALMONID STREAM HABITAT RESTORATION MANUAL; Chapter IX Fish Passage Evaluation. April 2003 Guidance to Minimize Impacts Suring Stream Crossing Construction.
[3] CALIFORNIA SALMONID STREAM HABITAT RESTORATION MANUAL; Chapter IX Fish Passage Evaluation. April 2003 Guidance to Minimize Impacts Suring Stream Crossing Construction.



24) Retain as much understory brush and as many trees as feasible, emphasizing shade producing and bank stabilizing vegetation.

25) Minimize soil compaction by using equipment with a greater reach or that exerts less pressure per square inch on the ground, resulting in less overall area disturbed or less compaction of disturbed areas.

26) If riparian vegetation is to be removed with chainsaws, consider using saws currently available that operate with vegetable-based bar oil.

27) Decompact disturbed soils at project completion as the heavy equipment exits the construction area.

28) Revegetate disturbed and decompacted areas, with native species specific to the project location that comprise a diverse community of woody and herbaceous species.

Measures to Minimize Impacts to Aquatic Habitat and Species During Dewatering of Project Site - See Dewatering Chapter 6.5

BMP TOOLBOX

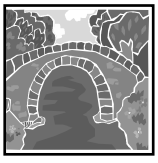
Road Surface BMPs
- ✓ Rolling Dip

Streambank Protection - Biotechnical BMPs
- ✓ Brush Mattress
- ✓ Large Woody Debris Revetment
- ✓ Willow Wall Revetment
- ✓ Wattles/Fascines
- ✓ Live Stakes
- ✓ Fabric Reinforced Earth Fill with Brush Layering

Streambank Protection - Hardscape BMPs
- ✓ Boulder/Riprap
- ✓ Vegetated Concrete Cribwall
- ✓ Streambed Gravel

Water Management BMPs
- ✓ Aqua Barrier
- ✓ Cofferdam
- ✓ Dewatering
- ✓ Diversion Berm
- ✓ Sandbag
- ✓ Slope Drain – Temporary
- ✓ Slope Drain – Overside
- ✓ Stream Bypass

Sediment Control BMPs
- ✓ Silt Fence
- ✓ Turbidity Curtain
- ✓ Brush Packing



✓

Culvert BMPs

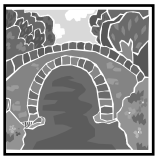
- ✓ Energy Dissipater

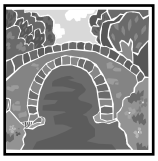
Planning and Prevention BMPs

- ✓ Seasonal Planning

PERMITS

6.1 GENERAL PRINCIPLES- WORKING IN AND AROUND STREAM CHANNELS	
Activity or Condition	**Required permit or limitation**
• Replacing riprap • Removing or altering large woody debris (non-emergency debris maintenance) ***or*** • Otherwise altering a channel	• CWA 404 - COE • CWA 401 – RWQCB • DFG 1601 • NOAA Fisheries consultation
In a Coastal Zone, work is exempt from a coastal development permit unless: • subject to review under Section 1601 of the Fish and Game Code • excavation or disposal of fill is outside of the roadway prism	Coastal Zone Development Permit (County or City planning department)
BMPs that may involve "take"; these include dewatering, coffer dams, diversion berms, and stream bypass structures.	• (NOAA Fisheries or USFWS) ESA Section 10 Incidental Take Permit • (DFG) CESA Section 2081 Incidental Take Permit





6.2 CULVERT CLEANING, REPAIR AND REPLACEMENT AT STREAM CROSSINGS

DESCRIPTION

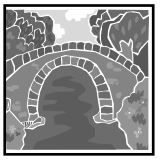
Water Quality- Culverts, bridges, and other stream crossing structures must be periodically maintained or replaced to preserve their function of passing stream flows and wood, to prevent flooding, to prevent damage to the structure, and to avoid sediment inputs to the stream channel by eroding or "blown-out" culverts. Using best management practices when maintaining these structures will serve as a first line of defense to protect and improve water quality. Best Management Practices in *Section 6.1- General Principles for Working In or Near Stream Channels* should be adhered to during routine culvert maintenance or project implementation.

Stream Crossings on Salmon Streams- Many culverts we deal with now were installed long ago on salmoind bearing streams before standards were developed for fish passage. Many of these culverts now present problems for salmon that need to swim upstream to spawn or find colder water in the upper tributaries during hot summer months. Fish passage barriers also cause problems when juvenile salmon leave the river to migrate out to sea in the spring. The FishNet counties, with the support of the Department of Fish and Game and the Coastal Conservancy, have completed fish passage assessments for county structures on salmon bearing streams. These studies have helped Public Works Departments develop priority lists for replacing and renovating culverts or other crossings to provide fish passage. [4]

Fish Passage Projects- The best management practices presented in this chapter will assist county staff in preparing projects for fish passage in consultation with permitting agencies. Appendix C includes two essential references for fish passage projects: Guidelines for Salmonid Passage at Stream Crossings, NOAA Fisheries 2001 and Culvert Criteria for Fish Passage; CDFG Salmonid Stream Habitat Restoration Manual; CH IX 2002.

Cross Drains and Culverts on Non-Fish Bearing Streams- Standards for culverts on fish bearing streams are subject to different rules from culverts and cross-drains on non-fish bearing streams. California Department of Fish and Game and NOAA Salmonid Passage Guidelines in Appendix C apply only to culverts on streams with salmonid habitat. Other drainage design guidelines (Caltans, ASHTO, etc.) apply to culverts and cross-drains on non-salmon bearing streams. Best Management Practices for these structures are covered in the Roads Chapter; Section 5.6- Drainage Systems.

[4] Taylor and Assoc. (June 2003). Marin County Stream Crossing Inventory and Fish Passage Evaluation-.
Taylor and Assoc. (March 31, 2003). Sonoma and Mendocino Counties Russian River Stream Crossing Inventory and Fish Passage Evaluation.
Taylor and Assoc. (January 2004) County of Santa Cruz Stream Crossing Inventory and Fish Passage Evaluation.
Taylor and Assoc. (April 2004) San Mateo County Stream Crossing Inventory and Fish Passage Evaluation.



ENVIRONMENTAL CONCERNS

- ✓ Discharge of sediment or debris to streams or watercourses.
- ✓ Impeding or altering fish or amphibian passage.
- ✓ Altered flows (e.g. by dewatering), changes in channel shape, (e.g. widening by removal of sandbars and vegetation), changes in channel carrying capacity or ability to pass debris, increased potential for flooding, or damage to road or other structures.
- ✓ Harm to aquatic or riparian vegetation, or aquatic or riparian species; for example removing sediment from a culvert in a watercourse that has fish may directly harm salmonids or their habitat.

BMP OBJECTIVES

- ✓ Restore or improve fish passage for all life stages of salmonids, providing fish access to valuable upstream habitat.
- ✓ Improve channel's ability to convey debris flows, including sediment, gravel, cobbles and woody debris, without removing sandbars and vegetation (which often leads to channel widening).
- ✓ Upgrade size of new and replacement culverts to 100-year storm capacity on salmonid streams as permitted.
- ✓ Restore or improve stream flow conveyance function of culverts.
- ✓ Properly identify potential blockages based on fish passage assessment criteria approved by DFG.
- ✓ Reduce potential for erosion at stream crossings.
- ✓ Protect streambank root habitat and riparian vegetation

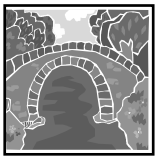
BEST MANAGEMENT PRACTICES

CULVERT CLEANING

1) Inspect culverts and other crossings annually before the rainy season (prior to October 15th), and after the first major rainfall event (2 year event), when feasible. Inspect suspected problematic culverts as necessary after that, depending on intensity and frequency of rain events.

2) Schedule work to take into account the life cycles of salmon and steelhead and any other pertinent threatened or endangered species such as California red-legged frogs, Santa Cruz long-toed salamanders, and San Francisco garter snakes. Consult with agency biologists to identify seasonal work restrictions or limitations on procedures to protect threatened or endangered species in your area.

3) Perform all work in dry conditions, and do not work in flowing waters. If a stream is flowing, use Cofferdam or Dewatering BMPs as needed.



4) Identify riparian areas and potential fish habitat before cleaning culverts. Consult with appropriate staff or agency biologists if you have questions about the extent of riparian areas or presence of fish at the crossing.

5) Exercise caution when using equipment in riparian areas and potential fish habitat. Inspect equipment for leaks, damage and buildup of oils and grease prior to performing work. Monitor frequently for leaks and equipment failure, and avoid causing damage to vegetation, sandbars, and surrounding environment. If leaks are detected during operation, equipment should be immediately removed from the area, and the spill properly cleaned. (For important details on using equipment in the field, see *Chapter 5.2- Paved Roads*).

6) Stream crossing maintenance should *not* include sediment or vegetation removal to increase channel capacity for flood flow, unless permitted as a specific activity. Minimize stream channel disturbance by avoiding removal of sediment and vegetation within the county right of way where possible.

7) Report to supervisors the locations of culverts that appear damaged, may impede fish passage, or may cause erosion, noted during routine cleaning. This is a critical first step to protecting fish-bearing streams. NOAA Fisheries and DFG have established fish passage criteria for culverts. Typical problems to watch for during inspection of culverts and other crossings are: [5]

- Excessive velocities in a culvert (culvert set at too steep a slope for juvenile fish to swim through at high flows);
- Lack of water depth in a culvert;
- Perched culvert outlet (i.e. outlet is physically above the stream bed);
- Lack of depth in an outlet pool preventing fish from jumping up into culvert;
- Obstructions within a culvert; and
- Physical damage to fish from deteriorating and jagged corrugated metal.

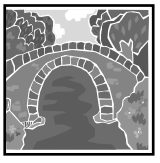
8) Dispose of all sediment and debris from culvert cleaning according to *Chapter 7.3- Spoils Handling and Disposal*. Never dispose of material along the banks or in the floodplain where it could be delivered back to the channel during the next rainstorm.

CULVERT REPAIR AND REPLACEMENT

1) Schedule culvert repair or replacement during the dry season (between April 15th and October 15th). Do not perform culvert repair or replacement in wet conditions or during the rainy season unless permitted. Rain and flooding greatly increase the risk of pollutant runoff.

2) Schedule work to take into account the life cycles of salmon and steelhead and any other pertinent threatened or endangered species such as California red-legged frogs, Santa Cruz long-toed salamanders, and San Francisco garter snakes. Consult with agency biologists to identify seasonal work restrictions or limitations on procedures to protect

[5] CALIFORNIA SALMONID STREAM HABITAT RESTORATION MANUAL; Chapter IX Fish Passage Evaluation. April 2003 Guidance to Minimize Impacts Suring Stream Crossing Construction.



threatened or endangered species in your area. These limitations will be part of the permits you will need to complete this work.

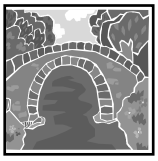
3) Before replacing or altering culverts or bridges on fish-bearing streams, consult appropriate engineering and design staff familiar with NOAA Fisheries and DFG criteria found in Appendix C- *Guidelines for Salmonid Passage at Stream Crossings*, NOAA, 2001. The proposed design and mitigations will be part of the NOAA Fisheries and DFG permit applications. Fish passage can be computed by Roads Engineers by using Fish Xing Software for culvert design and assessment, at **http://www.fs.fed.us.fishxing/** See Appendix A Culvert BMPs for additional information as well.

4) Options for anadromous fish-bearing stream crossings, in order of preference are: (Sources include: Bates et al. 1999; Robison et al. 2000; NOAA, 2001.)

a) No crossing – realign road to avoid crossing the stream.
b) Bridge spanning the stream to allow for long-term dynamic channel stability; making sure there is no encroachment into the channel or 100-year flood plain. When installing or replacing a stream crossing, bridges are strongly preferred for fish-bearing streams.
c) Streambed simulation strategies: Bottomless arch, embedded culvert, or ford.
d) Culvert set below stream-grade (countersunk or embedded).
e) Non-embedded culvert set at a low gradient (less than 0.5%) to allow for fish passage.
f) Baffled culvert, or structure designed with a fishway – for steeper slopes (greater than 0.5%). Baffles are not generally recommended because they require continual clearing of debris and maintenance to function properly, and require a longer, more difficult permit process.
g) Culvert set at grade with baffles installed to allow low-flow passage and reduced velocities during higher migration flows.
h) Culvert perched with outlet pool weirs and baffles throughout culvert. Entry jumps should never exceed 1 foot for adults or 0.5 feet for juveniles.

5) Design criteria for anadromous fish-bearing stream crossings' proper sizing and alignment are: (Bates et al. 1999; Robison et al. 2000)

- Pass a 100-year storm flow at less than 100 percent of the culvert's height, to allow passage of large wood and channel substrate during high flows.
- Culvert width sized at least equal to active channel width, or ordinary high water flow (OHW), which is approximately at line of annual vegetation growth. Reduce or eliminate constriction of flows at the inlet associated with fish migration.
- Avoid projecting culvert inlets.
- Align culvert with upstream channel direction – avoid sharp bends in channel at approach to inlet.
- If there are channel constraints at the crossing, the culvert is likely undersized or placed in an inappropriate location.
- Avoid installing trash racks at culvert inlets.
- Use channel alterations judiciously and avoid channel confinement in fish-bearing streams.



6) Implement appropriate Water Management and Culvert BMPs while replacing or retrofitting culverts, and Streambank Protection BMPs and Erosion and Sediment Control BMPs to control sediment discharge during work. See list at end of section and Appendix A for detailed BMPs.

7) When restoring the surrounding site after culvert replacement or retrofitting, stabilize the work area and prevent erosion by using appropriate Streambank Protection BMPs and Erosion Control BMPs.

8) Use of biotechnical BMPs and native vegetation is preferable over hardscape techniques when appropriate for the site conditions and engineering constraints. For biotechnical BMPs that require the establishment of vegetative cover, plan and implement ongoing vegetation maintenance and irrigation as needed.

9) When using hardscape BMPs for streambank stabilization, work to incorporate planting of trees, shrubs or erosion control grasses into designs.

10) In pools downstream of culverts, bridges, and other structures, always leave vegetation to provide cooling shade, shelter and cover for aquatic animals. (See *Chapter 8-Vegetation Management*.)

11) Using Water and Sediment Management BMPs, capture runoff from bridge structures with long or wide spans.

12) After completion of construction, monitor the performance of long-term BMPs periodically, particularly after significant storm events. Perform immediate repairs or upgrades as necessary.

13) Perform maintenance only in the vicinity of the crossing (i.e. within the road right-of-way).

BMP TOOLBOX

Valuable References

- ✓ For the latest guidelines on fish passage criteria and inventory methodologies, go to www.dfg.ca.gov or http://swr.nmfs.noaa.gov

- ✓ See Appendix C for :

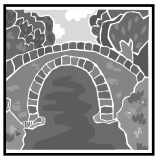
Department of Fish and Game. (Flosi et al 2001). "Fish Passage Criteria and Guidelines" (Chapter X). California Salmonid Stream Habitat Restoration Manual
NOAA Fisheries (2001). Guidelines for Salmonid Passage on Stream Crossings.

Planning and Prevention BMPs

- ✓ Seasonal Planning

Road Drainage BMPs

- ✓ Ditch Relief Culverts
- ✓ Rolling Dip



Culvert BMPs

- ✓ Culvert Hydraulics Diagram
- ✓ Culvert Plugging Diagram
- ✓ Back-Flooding Weirs
- ✓ Baffles for Fish Passage Improvement
- ✓ Energy Dissipator
- ✓ Culvert Inlet Sediment Trap
- ✓ Culvert Sizing

Streambank Protection - Preferred Biotechnical BMPs

- ✓ Brush Mattress
- ✓ Large Woody Debris Revetment
- ✓ Live Stakes
- ✓ Fabric Reinforced Earth Fill with Brush Layering
- ✓ Wattles/Fascines

Streambank Protection - Hardscape BMPs

- ✓ Boulder/Riprap
- ✓ Streambed Gravel
- ✓ Vegetated Concrete Cribwall

Water Management BMPs

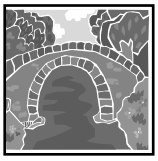
- ✓ Aqua Barrier
- ✓ Cofferdam
- ✓ Dewatering
- ✓ Diversion Berm
- ✓ Sandbag
- ✓ Stream Bypass

Erosion / Sediment Control BMPs

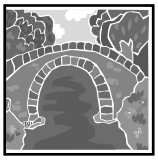
- ✓ Silt Fence
- ✓ Turbidity Curtain
- ✓ Containment of Concrete Pours

PERMITS

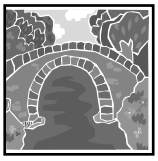
Before replacing or altering culverts or bridges, consult agency biologists and obtain appropriate permits from DFG, RWQCB, COE, and NOAA Fisheries. In stream channels with anadramous fish habitat, state and federal permits require culverts be designed for fish passage of all life stages of salmon. DFG's Fish Passage Criteria and Guidelines (Chapter X, DFG Stream Restoration Manual) address the passage needs of all aquatic animals, not just anadramous fish. NOAA Fisheries': Guidelines for Salmonid Passage on Stream Crossings, address the needs of migrating salmonid fish. (See *Appendix C* for complete technical papers).



6.2 CULVERT CLEANING, REPAIR AND REPLACEMENT	
Activity or Condition	**Required permit or limitation**
Culvert replacement.	(DFG) Fish & Game Code Section 1602 Streambed Alteration Agreement with CEQA compliance. Maintenance requires an annual or multi-year agreement. CESA 2081 incidental take permit from DFG if state-listed *endangered* species are in the stream and if an ESA Section 10 incidental take permit has not already been obtained. RWQCB CWA 401 permit Under CWA 404, consultation with NOAA Fisheries and/or US Fish and Wildlife Service, (through the ACOE) is triggered under ESA Section 7, for federally-funded and permitted activities. Take authority is required if take of listed salmonid species might occur.
Placement of any fill in streams (e.g. rock in pools below culverts), or any material into wetlands.	U.S. Army COE 404 CWA
Sediment reduction projects at stream crossings with potential to affect fish passage	Under CWA 404: • NOAA Fisheries consultation, triggered under ESA Section 7 for federally-funded and permitted activities ***and either*** • (COE) General-Nationwide Permit (#14) – "Linear Sediment Reduction Projects at Water Crossings" ***or*** • (COE) General-Regional Permit (#1) – "Fish Passage / Sediment Reduction Projects at Water Crossings"



6.2 CULVERT CLEANING, REPAIR AND REPLACEMENT	
Activity or Condition	**Required permit or limitation**
Activities in the Coastal Zone are exempt from permit unless: • subject to review under Section 1601 of the Fish and Game Code, ***or*** • excavation or disposal of fill is outside of the roadway prism.	Coastal development permit from County or City Planning Departments.



6.3 WOODY DEBRIS

DESCRIPTION

A healthy salmon stream is chock full of large wood - big logs and rootwads - that dig into the banks and help form the channel's complexity, making pools and providing food and shelter. Wood is a key link in the ecosystem of salmon. Restorationists and public agencies have taken on the task of placing large woody debris structures into creeks to benefit salmon. While restoration certainly helps***, our goal in this section is to provide guidelines on how to keep wood in the creek in the first place.***

Large Woody Debris (LWD), is defined as stumps, rootwads and logs having an average diameter greater than six inches and a length greater than 10 feet. When we refer to woody debris management it is best to think about modification, rather than removal, whenever feasible. Removal of wood from creeks has such a negative impact on salmon, that as a general practice, it should not be done unless there is a very real threat to county property or public safety. Best Management Practices outlined below will help guide crews in avoiding or minimizing this impact.

One of the very best ways to allow wood to stay in the creek is to maintain culverts and bridges that pass the 100-year flood flows. This ensures that large debris flows will also pass, creating more natural channel conditions overall. (See *6.2 Culvert Cleaning, Repair and Replacement*.)

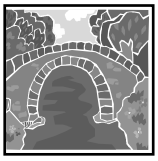
Note*:* The maintenance practices covered in this section *do not* include traditional channel maintenance or flood control activities. For information on flood control or channel maintenance BMPs, please refer to local county guidelines, or to Flood Control Facility Maintenance Manual developed by the Bay Area Stormwater Management Agencies Association (BASMAA, June 2000). This document can be found at http://www.mcstoppp.org/FloodControlBMPs.htm.

ENVIRONMENTAL CONCERNS

- ✓ Loss of instream habitat due to wood removal.
- ✓ Harm to instream aquatic habitat or aquatic species.
- ✓ Harm to riparian areas and riparian species.
- ✓ Alteration of natural channel function or shape or destabilization of stream banks.
- ✓ Water pollution from equipment operation.
- ✓ Alteration of stream hydraulics and diversion of stream energies that may cause downstream erosion or structural damage.

BMP OBJECTIVES

- ✓ Preserve and protect important woody debris in creeks to the extent possible.
- ✓ Prevent potential water pollution from equipment operations.



BEST MANAGEMENT PRACTICES

1) Only remove (as opposed to modify) logs and debris from streams as a "last resort" when accumulation of debris poses a threat to road stability and bridges, culverts or other instream structures.

2) Have both a biologist and an engineer conduct a full review of the situation. The biologist should be familiar with the life histories and habitat needs of federally listed plants and animals in the area and be able to identify any of the life stages of these species. If in doubt as to the best way to handle large woody debris in a stream, consult with DFG personnel.

3) If log jams immediately threaten, or are damaging the integrity of roads, bridges, other public facilities during high flows, consider opportunities to ***modify*** the debris jam to halt damage and direct flow toward a more desirable path.

4) Take precautions to ensure that modifications of logs or debris jams will not cause damage downstream to culverts and other structures.

5) Limit modifications and/or removal to materials that extend higher than approximately two feet above the streambed (i.e. above knee height) to preserve some instream habitat features, *unless* the log or debris jam is immediately upstream and threatening a culvert or bridge, or if permit conditions require otherwise.

6) When modifying log jams, leave trees, logs and/or stumps in the longest lengths and diameters practicable for removal and hauling. If logs must be cut from fallen trees, leave as much as possible of the main trunk (12 feet plus is desirable) attached to the rootball and only cut branches obstructing flow. Log jams create suitable habitat for California red-legged frogs and San Francisco garter snakes and so where applicable this should be considered before removing or modifying any logjams.

7) Whenever feasible, incorporate LWD removed from water bodies into streambank repairs or cribbing at a nearby location, and/or transport any removed LWD to an approved storage site and make available for later use (e.g. in stream restoration activities).

BMP TOOLBOX

Streambank Protection Biotechnical BMPs

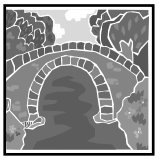
- ✓ Large Woody Debris Revetment

Planning and Prevention BMPs

- ✓ Seasonal Planning

PERMITS

6.3 WOODY DEBRIS	
Activity or Condition	**Required permit or limitation**
Removing or modifying large woody debris	Consult with DFG biologists



6.4 STREAM BANK STABILIZATION

DESCRIPTION

Every one of our counties has heritage roads that wind along the edge of some of our most important salmon streams. Our crews, as part of their work to maintain these roads, need to implement streambank stabilization projects in order to repair road-related slipouts, washouts, and slides. When the stream is so nearby it is especially critical to consider bio-engineered alternatives, in order to create streambank habitat that salmon need to survive. Bio-engineering also allows a more natural channel and prevents scour of downstream areas. While these activities might be considered *projects*, versus *routine maintenance*, we felt it was critical to expand the scope of this chapter to cover this important subject which is critical to stream and salmon fisheries protection.

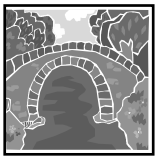
Activities may include:

- removal of slide debris from the bank, channel, or roadway,
- construction of terraces with willow walls or other bioengineered solutions,
- construction of crib walls or retaining structures,
- use of rip rap or other hardscape materials,
- backfilling or reshaping the bank,
- re-establishing damaged roadway features,
- repairing and cleaning drainage systems, and
- applying erosion controls,
- replanting and monitoring of revegetation.

Bank stabilization may be an emergency response to mitigate ongoing or imminent damage, or a planned project. Refer to *Chapter 10.2- Emergency Slide and Washout Repair* for bank stabilization activities under Emergency Conditions.

ENVIRONMENTAL CONCERNS

- ✓ Discharge of sediment or debris to streams or watercourses.
- ✓ Harm to or loss of streamside aquatic habitat.
- ✓ Harm to or loss of riparian areas.
- ✓ Water pollution from equipment operations.
- ✓ Hardening of streambank channel and alteration in channel hydraulics that may increase water velocities and downstream erosional forces, and lead to loss of riparian habitat.



BMP OBJECTIVES

- ✓ Protect water quality by reducing erosion/sedimentation.
- ✓ Prevent potential water pollution from equipment operations.
- ✓ Encourage revegetation to stabilize slopes and protect aquatic and riparian habitat.

BEST MANAGEMENT PRACTICES

1) Schedule work to take into account the life cycles of salmon and steelhead and any other pertinent threatened or endangered species such as California red-legged frogs, Santa Cruz long-toed salamanders, and San Francisco garter snakes. Consult with agency biologists to identify seasonal work restrictions or limitations on procedures to protect threatened or endangered species in your area. These limitations will be part of the permits you will need to complete this work.

2) In order to create a natural streambank environment, use biotechnical repairs, versus riprap or other hardscape repairs, if site conditions allow.

3) Inspect equipment for leaks, damage and buildup of oils and grease prior to performing work; and perform maintenance at designated repair facilities. If equipment must be refueled in the field, perform fueling in identified staging areas well away from stream or riparian areas and maintain an absorbent spill kit.

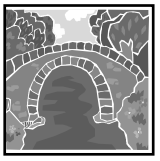
4) Implement appropriate Erosion Control and Water and Sediment Management BMPs as referenced in the BMP Toolbox section below during bank stabilization projects.

5) Set up the work and staging area to minimize the area of soil that will be disturbed and the tracking of soil out of the work area by vehicles and equipment. Avoid staging projects in areas where runoff will be concentrated or may run into a watercourse.

6) When installation of riprap or other hardscape repairs is required to protect structures:
   - o Consult with qualified engineering or planning staff about the appropriate size of hardscape protection needed, the appropriate placement techniques, and the potential usage of biotechnical protection in conjunction with the hardscape protection;
   - o Attempt to limit hardscape protection to below the ordinary high water mark;
   - o Incorporate plantings, designed to allow tree growth, into hardscape designs; and
   - o Key into the bank as appropriate.

7) Minimize erosion and impacts to bank toe during stabilization by:[6]
   - o Leaving as much vegetation as possible
   - o Using downstream energy dissipation features such as pools or grade control structures, and other protection BMPs such as coir logs, riparian enhancement

[6] Santa Clara Valley Water District. (December 2001). SFRWQCB Tentative Order Appendix C, Stream Maintenance Program, Implementation of Best Management Practices,



planting, strategic placement of rock, and flow deflectors. Hardscape often causes increased flow velocity at bank protection sites, thereby increasing erosion downstream. (For more information on appropriate Erosion Control, Water and Sediment Management BMPs. (see *BMP Toolbox* below, and *Chapter 7- Sediment Controls*)

8) When excavating slide material, minimize the size of the disturbed area by removing only the amount of slide debris needed to prevent future slope failure and delivery of material to the stream. Dispose of slide debris and other spoils according to procedures discussed in *Chapter 7- Sediment Controls , Section 7.2- Spoils Handling and Disposal*.

9) For biotechnical BMPs that require the establishment of vegetative cover, plan and implement ongoing vegetation monitoring, maintenance and irrigation as needed.

10) After completing construction, monitor the performance of long-term BMPs periodically, particularly after significant storm events. Perform immediate repairs or upgrades as necessary.

BMP TOOLBOX

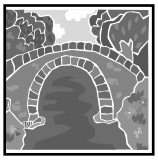
Planning and Prevention BMPs
- ✓ Seasonal Planning

Road Drainage BMPs
- ✓ Rolling Dip

Streambank Protection - Preferred Biotechnical BMPs
- ✓ Brush mattress
- ✓ Harvesting and Handling of Woody Cuttings
- ✓ Large Woody Debris Revetment
- ✓ Wattles/ Fascines
- ✓ Live Stakes
- ✓ Fabric Reinforced Earth Fill with Brush Layering

Streambank Protection - Hardscape BMPs
- ✓ Boulder/Riprap
- ✓ Streambed Gravel

Water Management BMPs
- ✓ Aqua Barrier
- ✓ Cofferdam
- ✓ Dewatering
- ✓ Diversion Berm
- ✓ Sandbag
- ✓ Slope Drain – Temporary
- ✓ Slope Drain – Overside
- ✓ Stream Bypass



Sediment Management BMPs

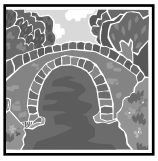
- ✓ Silt Fence
- ✓ Brush Packing
- ✓ Turbidity Curtain

Culvert BMPs

- ✓ Energy Dissipator

PERMITS

6.4 STREAM BANK STABILIZATION	
Activity or Condition	**Required permit or limitation**
Any non-emergency bank stabilization work	Complete ***before*** work starts: • U.S. Army Corps of Engineers 404 Permit • Regional Water Quality Control Board 401 Water Quality Certification • California Department of Fish and Game Streambed Alteration Agreement 1602. • NOAA Fisheries consultation
Emergency work	See *Chapter 10.2- Emergency Slide and Washout Repair*, for documentation protocol and permit requirements.



6.5 DEWATERING

DESCRIPTION

Dewatering is the removal of water from the work area. The purpose is to prevent water from interfering with the work (e.g., excavation, bank stabilization, etc.), and to prevent the discharge of contaminants such as suspended sediment and concrete. Dewatering may include damming, creating a stream bypass, pumping or draining. The dewatering of anadromous fish streams must be conducted in consultation with the Department of Fish and Game and National Marine Fisheries Service. A fisheries biologist with state and federal "take" permits will be required to be on-site to relocate any salmonids that become stranded during the dewatering process. An individual project permit may include incidental take requirements specific to the dewatering process.

ENVIRONMENTAL CONCERNS

- ✓ Discharge of sediment or debris to streams or watercourses.
- ✓ Harm to instream aquatic habitat or aquatic species such as fish and amphibians
- ✓ Temporal disruption of fish passage.

BMP OBJECTIVES

- ✓ Protect water quality by reducing erosion and sedimentation.
- ✓ Avoid negative impacts to aquatic and riparian habitat and species.
- ✓ Maintain or restore fish passage.

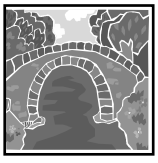
BEST MANAGEMENT PRACTICES

1) Consult with agency biologists and obtain necessary permits before beginning project (see *Permits* below). Schedule work to take into account the life cycles of salmon and steelhead and any other pertinent threatened or endangered species such as California red-legged frogs, Santa Cruz long-toed salamanders, and San Francisco garter snakes. Consult with agency biologists to identify seasonal work restrictions or limitations on procedures to protect threatened or endangered species in your area. These limitations will be part of the permits you will need to complete this work.

2) If anadromous salmonids are present a fisheries biologist needs to be on site to begin netting fish and moving them downstream as dewatering proceeds.

3) Intakes and outlets should be designed to minimize turbidity and the potential to wash contaminants into the stream.

4) If a work site is to be temporarily dewatered by pumping, intakes should be completely screened with wire mesh not larger than 5 millimeters to prevent amphibians from entering the pump system.



5) A filtration/settling system must be included to reduce downstream turbidity (i.e. filter fabric, turbidity curtain). The selection of an appropriate system is based on the rate of discharge. If feasible, water that is pumped into a pipe should discharge onto the top of bank into a densely vegetated area. This may require extra hose length.

6) Note pre-construction grade prior to placement and return channel bottom, cofferdam areas and discharge sites to preconstruction grades.

7) Once the project work is complete, release water slowly back into the work area to prevent erosion and increased turbidity.

Dewatering BMPs from Fisheries Grants Program Regional General Permit[7]

8) Work must be performed in isolation from the flowing stream. If there is any flow when the work is done, the operator shall construct cofferdams upstream and downstream of the excavation site and divert all flow from upstream of the upstream dam to downstream of the downstream dam. The coffer dams may be constructed with clean river gravel or sand bags, and may be sealed with sheet plastic. Sand bags and any sheet plastic shall be removed from the stream upon project completion. Clean river gravel may be left in the stream, but the coffer dams must be breached to return the stream flow to its natural channel.

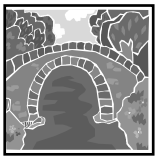
9) For minor actions, where the disturbance to construct cofferdams to isolate the work site would be greater than to complete the action (for example, placement of a single boulder cluster), measures will be put in place immediately downstream of the work site to capture suspended sediment. This may include installation of silt catchment fences across the stream, or placement of a filter berm of clean river gravel. Silt fences and other non-native materials will be removed from the stream following completion of the activity. Remove sediment behind the silt fence before removing the fence. Gravel berms may be left in place after breaching, provided they do not impede the stream flow.

10) If it is necessary to divert flow around the work site, either by pump or by gravity flow, the suction end of the intake pipe shall be fitted with fish screens meeting DFG and NMFS criteria to prevent entrainment or impingement of small fish. Any turbid water pumped from the work site itself to maintain it in a dewatered state shall be disposed of in an upland location where it will not drain directly into any stream channel.

11) Measures shall be taken to minimize harm and mortality to listed salmonids resulting from fish relocation and dewatering activities:

a) Fish relocation and dewatering activities shall only occur between June 15 and November 1 of each year.
b) DFG shall minimize the amount of wetted stream channel that is dewatered at each individual project site to the fullest extent possible.
c) All electrofishing shall be performed by a qualified fisheries biologist and conducted according to the National Marine Fisheries Service *Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act*, June 2000.

[7] Mitigation Measures, Monitoring and Reporting Program for the 2005 Fisheries Restoration Grant Program Negative Declaration; Appendix B. California Department of Fish and Game.



Measures to Minimize Impacts to Aquatic Habitat and Species During Dewatering of Project Site[8]

12) Prior to dewatering, determine the best means to bypass flow through the work area to minimize disturbance to the channel and avoid direct mortality of fish and other aquatic vertebrates.

13) Coordinate project site dewatering with a fisheries biologist qualified to perform fish and amphibian relocation activities.

14) Minimize the length of the dewatered stream channel and duration of dewatering.

15) Bypass stream flow around work area, but maintain stream flow to channel below construction site.

16) The work area must often be periodically pumped dry of seepage. Place pumps in flat areas, well away from the stream channel. Secure pumps by tying off to a tree or stake in place to prevent movement by vibration. Refuel in area well away from stream channel and place fuel absorbent mats under pump while refueling. Pump intakes should be covered with 1/8" mesh to prevent entrainment of fish or amphibians that failed to be removed. Check intake periodically for impingement of fish or amphibians.

17) Discharge wastewater from construction area to an upland location where it will not drain sediment-laden water back to stream channel.

Measures to Minimize Injury and Mortality of Fish and Amphibian Species During Dewatering[9]

Prior to dewatering a construction site, fish and amphibian species should be captured and relocated to avoid direct mortality and minimize take. This is especially important if listed species are present within the project site. The following measures are consistent with those defined as *reasonable and prudent* by NOAA for projects concerning several northern California Evolutionary Significant Units for coho salmon, chinook salmon, and steelhead trout.

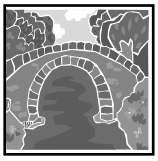
18) Fish relocation activities must be performed only by qualified fisheries biologists, with a current DFG collectors permit, and experience with fish capture and handling. Check with your local DFG biologist for assistance.

19) In regions of California with high summer air temperatures, perform relocation activities during morning periods.

20) Periodically measure air and water temperatures. Cease activities when water temperatures exceed temperatures allowed by DFG and NOAA.

[8] CALIFORNIA SALMONID STREAM HABITAT RESTORATION MANUAL FISH PASSAGE EVALUATION Chapter IX, Guidance to Minimize Impacts During Stream Crossing Construction.

[9] same



21) Exclude fish from re-entering work area by blocking the stream channel above and below the work area with fine-meshed net or screens. Mesh should be no greater than 1/8 inch. It is vital to completely secure bottom edge of net or screen to channel bed to prevent fish from re-entering work area. Exclusion screening should be placed in areas of low water velocity to minimize impingement of fish. Screens should be checked periodically and cleaned of debris to permit free flow of water.

22) Prior to capturing fish, determine the most appropriate release location(s). Consider the following when selecting release site(s):

a. Similar water temperature as capture location

b. Ample habitat for captured fish

c. Low likelihood of fish re-entering work site or becoming impinged on exclusion net or screen.

23) Determine the most efficient means for capturing fish. Complex stream habitat generally requires the use of electrofishing equipment, whereas in outlet pools, fish may be concentrated by pumping-down pool and then seining or dipnetting fish.

24) Electrofishing should only be conducted by properly trained personnel following DFG and NOAA guidelines.

25) Minimize handling of salmonids. However, when handling is necessary, always wet hands or nets prior to touching fish.

26) Temporarily hold fish in cool, shaded, aerated water in a container with a lid.

27) Provide aeration with a battery-powered external bubbler. Protect fish from jostling and noise and do not remove fish from this container until time of release.

28) Place a thermometer in holding containers and, if necessary, periodically conduct partial water changes to maintain a stable water temperature. If water temperature reaches or exceeds those allowed by DFG and NOAA, fish should be released and rescue operations ceased.

29) Avoid overcrowding in containers. Have at least two containers and segregate young-of-year (YOY) fish from larger age-classes to avoid predation. Place larger amphibians, such as Pacific giant salamanders, in container with larger fish.

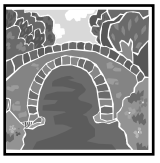
30) If fish are abundant, periodically cease capture, and release fish at predetermined locations.

31) Visually identify species and estimate year-classes of fish at time of release.

32) Count and record the number of fish captured. Avoid anesthetizing or measuring fish.

33) Submit reports of fish relocation activities to DFG and NOAA in a timely fashion.

34) If feasible, plan on performing initial fish relocation efforts several days prior to the start of construction. This provides the fisheries biologist an opportunity to return to the work



area and perform additional electrofishing passes immediately prior to construction. In many instances, additional fish will be captured that eluded the previous days efforts.

35) If mortality during relocation exceeds 5 percent, stop efforts and immediately contact the appropriate agencies.

BMP TOOLBOX

Water Management BMPs
- ✓ Cofferdam
- ✓ Aqua Barrier
- ✓ Dewatering
- ✓ Stream Bypass

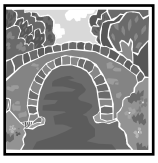
Planning and Prevention BMPs
- ✓ Seasonal Planning

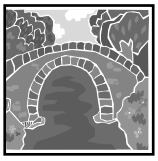
Sediment Management BMPs
- ✓ Silt Fence
- ✓ Turbidity Curtain

Culvert BMPs
- ✓ Energy dissipator

PERMITS

6.5 DEWATERING	
Activity or Condition	**Required permit or limitation**
Installation of dewatering system in concurrence with a stream bank and/or channel activity	• U.S. Army Corps of Engineers 404 Permit • Regional Water Quality Control Board 401 Water Quality Certification • Consult DFG biologists and obtain Streambed Alteration Agreement DFG1602 and 2081 incidental Take Permit with CESA/CEQA compliance if anadromous salmonids are present. • NOAA Fisheries Consultation





6.7 LOW WATER CROSSING INSTALLATION AND MAINTENANCE

DESCRIPTION

Temporary stream crossings are used to allow vehicles to cross a drainage or stream without entering the water. Placing temporary stream crossings, typically during the summer or dry season, can protect sensitive areas subject to vehicle traffic by minimizing impacts to the stream bottom, and reducing erosion. Regrading and slope stabilization are necessary during installation and removal of the crossing and occasionally as maintenance activities when the crossings are impacted by excessive vehicle traffic or flooding.

The installation of low water crossings on salmon streams is a highly regulated type of project, subject to Federal and State ESA and Clean Water Act provisions. During the permit process, you will be working with agency biologists, hydrologists, fish passage experts etc., to develop protections for the stream channel and fish, from installation and maintenance to removal. The FishNet 4C Program recognizes that permanent structures, allowing for fish passage and channel forming flows, are much more desirable than low water crossings. We encourage our counties to seek solutions to low water crossings, prioritizing important salmon streams first.

See California Salmonid Stream Habitat Restoration Manual (CDFG Chapter X, 4th Edition Armored Fill)

ENVIRONMENTAL CONCERNS

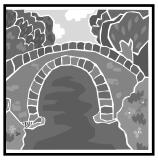
- ✓ Discharge of sediment to streams or watercourses, particularly washing of fine materials from crossing into stream.
- ✓ Harm to aquatic habitat.
- ✓ Harm to riparian areas.
- ✓ Water pollution from equipment operations and vehicle traffic.
- ✓ Impeding fish passage.
- ✓ Alteration of channel hydraulics and subsequent downstream effects.

BMP OBJECTIVES

- ✓ Minimize disturbance to the stream or waterway.
- ✓ Protect water quality by reducing erosion/sedimentation.
- ✓ Prevent potential water pollution from equipment operations.
- ✓ Eliminate fish barriers.

BEST MANAGEMENT PRACTICES

1) Consult with appropriate agencies to obtain permits for installation and removal of crossings *(*see *Permits* below*)*. During both installation and removal of crossings, keep equipment out of flowing waters.



2) Schedule work to take into account the life cycles of salmon and steelhead and any other pertinent threatened or endangered species such as California red-legged frogs, Santa Cruz long-toed salamanders, and San Francisco garter snakes. Low water crossings on salmonid streams are only permitted by NOAA Fisheries between June 8th and October 15th.

3) Consult with county road engineers on the appropriate number and size of culverts incorporated into a crossing. Consult with county and agency fish passage engineers (NOAA, DFG) on meeting fish passage criteria through these culverts. (See *Chapter 6.2 Culvert Cleaning, Repair and Replacement* and *Appendix A- Culvert Sizing BMP and Appendix C- Guidelines for Salmonid Passage at Stream Crossings, NOAA, 2001).*

4) If dewatering is necessary during construction, consult a qualified fisheries biologist, apply for appropriate permits, and implement appropriate fish removal and dewatering BMPs. (See *Chapter 6.5 Dewatering.)*

5) Best Management Practices (BMPs) for sediment and turbidity control should be implemented and in place prior to, during, and after construction in order to ensure that no silt or sediment enters surface waters. Appropriate erosion and sediment control measures should be implemented immediately after removal is complete.

6) All project related construction work should incorporate appropriate BMPs, including stabilizing and seeding disturbed upland slopes and stockpiles situated landward and above ordinary high water, to control and minimize bank erosion, sediment input and turbidity during the winter and spring months.

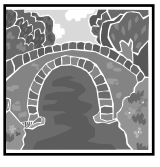
7) When a temporary culvert is installed, if needed, place appropriate geotextile or cellular confinement (honeycomb) fabric in the gravel bed at the downstream outlet to reduce erosion from the water flowing through the culvert. Do not use plastic netting.

8) Fill material placed in the stream to create the base for the crossings should be clean river gravel. Material placed above water level may be a road base allowing for compaction and a suitable driving surface. Clean river gravel may be left in the river to wash out during high winter flows. Road base or material containing a high level of fines above water level should be removed from the channel below the level of 'ordinary high water'. This material may be stored above the level of 'ordinary high water' to be used in subsequent years.

9) Upstream and downstream turbidity should be measured at each crossing before, during and after installation and removal. Monitor the downstream area for sediment or fine material washing off the crossing.

10) Do not treat the crossing with oil or other material that may pollute the stream, or use chemically treated materials (e.g. creosote-treated wood) to construct the crossing unless the material or treatment is certified safe for use in aquatic habitat.

11) Following the removal of the crossing the constructed roadbeds should be largely removed to reestablish the approximate contour, elevation, and condition of the affected bar area that existed prior to the seasonal roadbed construction. All excavated material should be hauled and stockpiled landward and above ordinary high water. The effected bars should be fine-graded to remove any pits and depressions that could otherwise



entrap salmonid fish species and to ensure positive drainage to the low-flow channel. Where roadbeds are constructed in flowing water, the dredged or fill material should be removed only to an elevation of two feet above the water level to minimize turbidity and sedimentation. If gravel is used, skim it off as low as possible without entering the flowing water. Trenches may be dug in the gravels to allow winter flows to break through the gravel.

BMP TOOLBOX

Culvert BMPs
- ✓ Culvert Hydraulics Diagram
- ✓ Energy Dissipator
- ✓ Culvert Inlet Sediment Trap

Water Management BMPs
- ✓ Aqua Barrier
- ✓ Cofferdam
- ✓ Dewatering
- ✓ Diversion Berm
- ✓ Stream Bypass

Sediment Managementl BMPs
- ✓ Silt Fence
- ✓ Turbidity Curtain

Erosion Control BMPs
- ✓ Blankets/Geotextile Fabrics
- ✓ Coir Logs/ Straw Rolls
- ✓ Planting
- ✓ Hydroseeding

PERMITS

6.6 Low Water Crossing Installation And Maintenance	
Activity or Condition	**Required permit or limitation**
Installation or removal of temporary stream crossings, including dewatering.	• U.S. Army Corps of Engineers 404 Permit • Regional Water Quality Control Board 401 Water Quality Certification • California Department of Fish and Game Streambed Alteration Agreement DFG1602 and 2081 incidental Take Permit with CESA/CEQA compliance. • NOAA Fisheries Service Consultation • Consult with county engineering or planning on appropriate size and design of structure.