PUBLIC NOTICE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

APPLICATION FOR REAUTHORIZATION OF REGIONALGENERAL PERMIT 78 FOR THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE FISHERIES RESTORATION GRANT PROGRAM

Public Notice/Application No.: SPL-2003-01123-BAH
Project: FISHERIES RESTORATION GRANT PROGRAM REGIONAL GENERAL PERMIT
Comment Period: 24 February through 26 March 2014
Project Manager: Bruce Henderson; 805-585-2145; Bruce.A.Henderson@usace.army.mil

Applicant
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Fisheries Restoration Grant Program
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Location
The California Department of Fish and Wildlife's salmonid habitat restoration activities typically occur in watersheds that have been subjected to significant levels of logging, road building, urbanization, mining, grazing, and other activities that have reduced the quality and quantity of stream habitat available for native anadromous fish species. The CDFW, under its Fisheries Restoration Grant Program (FRGP), conducts salmonid habitat enhancement projects in streams and rivers in California, including San Luis Obispo, Santa Barbara, Ventura. Los Angeles, Orange and San Diego counties in Los Angeles District. Projects are identified on an annual basis and submitted to the Corps for pre-implementation approval.

Activity
To conduct various activities to restore anadromous fish habitat in non-tidal reaches of rivers and streams, improve watershed conditions impacting salmonid streams, and improve the reproduction, growth, migration, and survival of anadromous fish. Note that for this reauthorization of RGP 78, CDFW is requesting modification of the RGP to improve its implementation as well as to allow an activity not discussed prior to this public notice. For more information, see page 5 of this notice.

Interested parties are hereby notified that an application has been received for a Department of the Army permit for the activity described herein. We invite you to review this public notice and provide views on the proposed work. By providing substantive, site-specific comments to the Corps Regulatory Division, you provide information that support the Corps' decision-making process. All comments received during the comment period become part of the record and will be considered in the decision. This permit will be issued, issued with special conditions, or denied under Section 404 of the Clean Water Act. Comments should be mailed to:

U.S. Army Corps of Engineers
Ventura Regulatory Field Office
2151 Alessandro Drive, Suite 110
Ventura, CA 93001

Alternatively, comments can be sent electronically to: Bruce.A.Henderson@usace.army.mil

Evaluation Factors

The mission of the U.S. Army Corps of Engineers Regulatory Program is to protect the Nation's aquatic resources while allowing reasonable development through fair, flexible and balanced permit decisions. The Corps evaluates permit applications for essentially all construction activities that occur in the Nation's waters, including wetlands. The Regulatory Program in the Los Angeles District is executed to protect aquatic resources by developing and implementing short- and long-term initiatives to improve regulatory products, processes, program transparency, and customer feedback considering current staffing levels and historical funding trends.

Corps permits are necessary for any work, including construction and dredging, in the Nation's navigable water and their tributary waters. The Corps balances the reasonably foreseeable benefits and detriments of proposed projects, and makes permit decisions that recognize the essential values of the Nation's aquatic ecosystems to the general public, as well as the property rights of private citizens who want to use their land. The Corps strives to make its permit decisions in a timely manner that minimizes impacts to the regulated public.

The decision whether to issue a permit will be based on an evaluation of the probable impact including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit, which reasonably may be expected to accrue from the proposal, must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including the cumulative effects thereof. Factors that will be considered include conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food production and, in general, the needs and welfare of the people. In addition, if the proposal would discharge dredged or fill material, the evaluation of the activity will include application of the EPA Guidelines (40 CFR Part 230) as required by Section 404(b)(1) of the Clean Water Act.

The Corps of Engineers is soliciting comments from the public; Federal, state, and local agencies and officials; Indian tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

Preliminary Review of Selected Factors

EIS Determination – A preliminary determination has been made that an environmental impact statement is not required for the proposed work.

Water Quality – Pursuant to Section 401 of the Clean Water Act, the applicant is required to obtain water quality certification from the California State Water Resources Control Board (SWRCB) or the pertinent Regional Water Quality Control Board. Section 401 requires that any applicant for a Section 404 permit provide proof of water quality certification to the Corps of Engineers prior to permit issuance. For any proposed activity on Tribal land that is subject to Section 404 jurisdiction, the applicant would be required to obtain water quality certification from the U.S. Environmental Protection Agency. The California Department of Fish and Wildlife annually apply to the SWRCB for a conditional water quality certification for projects funded through its Fisheries Restoration Grant Program. The SWRCB issued a conditional water quality certification to the California Department of Fish and Wildlife for its 2012 Fisheries Restoration Grant Program by order dated June 15, 2012.

Coastal Zone Management – For projects in or affecting the coastal zone, the Federal Coastal Zone Management Act requires that prior to issuing the Corps authorization for the project, the applicant must obtain concurrence from the California Coastal Commission that the project is consistent with the State's Coastal Zone Management Plan. For the previously authorized RGP 78, the applicant certified that proposed activities conducted under RGP 78 complied with and would be conducted in a manner consistent with the approved State Coastal Zone Management Program. This proposed reauthorization of RGP 78 includes several modifications not considered before. The District Engineer hereby requests the California Coastal Commission's concurrence or non-concurrence for consistency with the CZMA for this revised regional general permit.

Essential Fish Habitat – Preliminary determinations indicate the proposed activity would not adversely affect essential Fish Habitat because the projects to date have all been quite small and often a moderate distance up in the watershed. Ground disturbance could facilitate sediment transport, but within a short distance, most of the sediment would resettle and become part of the background transport. Material reaching estuaries or the ocean from these projects would likely be immeasurable, and justifying a determination of no adverse effect on EFH. Therefore, formal consultation under Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) is not required at this time.

Cultural Resources – The latest version of the National Register of Historic Places will be consulted to determine if any of the identified proposed projects may affect a cultural resource listed or potentially eligible for listing on the National Register of Historic Places. If such a resource is determined to be potentially affected by a particular project, the Corps shall enter into consultation with the State Historic Preservation Office pursuant to Section 106 of the National Historic Preservation Act.

Endangered Species – Activities likely to be conducted under the regional general permit are anticipated to affect one or more federally listed endangered or threatened species, or their designated critical habitat. For the original establishment of RGP 78, the Corps initiated formal consultation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). In addition to the consultation with NMFS regarding steelhead (*Oncorhynchus mykiss*) and its critical habitat, consultation with the Service addressed potential effects on tidewater goby (*Eucyclogobius newberryi*), unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), California red-legged frog (*Rana draytonii*), arroyo toad (*Anaxyrus californicus*), California tiger salamander (*Ambystoma californiense*), least Bell's vireo (*Vireo bellii pusillus*), southwestern willow flycatcher (*Empidonax traillii extimus*), Gambel's watercress (*Rorippa gambellii*), marsh sandwort (*Arenaria paludicola*), and Chorro Creek bog thistle (*Cirsium fontinale* var. *obispoense*).

NMFS, in its biological opinion SWR/2007/06563, dated May 23, 2008, concluded activities conducted under RGP 78 would not jeopardize the continued existence of the South-Central California Steelhead Distinct Population Segment (DPS) or the Southern California Steelhead DPS, and are not likely to destroy or adversely modify designated critical habitat for these populations.

USFWS, in its biological opinion 1-8-08-F-17, dated December 9, 2008, concluded activities conducted under RGP 78 would not affect tiger salamander and Chorro Creek bog thistle, or designated critical habitat the vireo and arroyo toad. The USFWS also concluded, after reviewing the current status of the other species and their critical habitat, the environmental baseline for the action area (coastal southern California drainages potentially supporting steelhead), the effects of the proposed activities within the action area, and the cumulative effects of these activities, that issuance of the proposed RGP would not likely jeopardize the continued existence of tidewater goby, unarmored threespine stickleback, arroyo toad, California red-legged frog, least Bell's vireo or southwestern willow flycatcher, nor destroy or adversely modify critical habitat for the goby, frog or flycatcher.

During the consultation, USFWS also concluded that activities proposed under RGP 78 could jeopardize the continued existence of marsh sandwort and Gambel's watercress. When informed of this conclusion, the Corps coordinated with CDFW, which confirmed to the Service's satisfaction that CDFW would not conduct restoration activities under the Fisheries Restoration Grant Program through RGP 78 in any area potentially harboring the listed sandwort or watercress. With that avoidance measure incorporated into the project description, the USFWS did not further include these species in their biological opinion.

Consultation with USFWS and NMFS will be conducted to determine if additional measures to avoid and minimize adverse impacts on listed species or critical habitat is appropriate.

Public Hearing – Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. Requests for public hearing shall state with particularity the reasons for holding a public hearing.

Proposed Activity for Which a Permit is Required

Basic Project Purpose – The basic project purpose comprises the fundamental, essential, or irreducible purpose of the proposed project, and is used by the Corps to determine whether the applicant's project is water dependent (i.e., requires access or proximity to or siting within the special aquatic site to fulfill its basic purpose). Establishment of the basic project purpose is necessary only when the proposed activity would discharge dredged or fill material into a special aquatic site (e.g., sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and pool-and-riffle complexes). The basic project purpose for the proposed project is habitat restoration. Such actions are anticipated to often require in-channel work to address degraded conditions, and as such, are necessarily water dependent. These in-channel activities may affect wetlands and riffle-and-pool complexes, but are not anticipated to result in adverse conditions of long duration. Other activities will require substantial bank work in order to provide optimal habitat conditions within the stream corridor. These activities are water dependent.

Overall Project Purpose – The overall project purpose serves as the basis for the Corps' 404(b)(1) alternatives analysis and is determined by further defining the basic project purpose in a manner that more specifically describes the applicant's goals for the project, and which allows a reasonable range of alternatives to be analyzed. The overall project purpose for the regional general permit is to correct degraded conditions at specific locations on stream courses where habitat is suboptimal for passage, spawning or rearing of steelhead of various age classes.

Proposed Modifications to RGP 78 – The applicant requested modifications to RGP 78 to improve its implementation in Los Angeles District. Item 1 below is procedural. Items 2 through 4 are substantive and would require coordination or consultation with USFWS and NMFS. These modifications are:

1. Enable CDFW to proceed with a given project following a 60-day notification to the Corps. The CDFW provides a list annually for projects slated for construction in the year's schedule. Previously, a notice to proceed (NTP) would be required from the Corps before initiating the project. Delays in the process would adversely affect the project's schedule and potentially its funding. The Corps retains the opportunity to issue NTPs with special conditions as conditions warrant, such as a determination a given project may exceed take limits of biological opinions. This is consistent with general permits in that the permit is issued to be utilized within appropriate environmental constraints. The NTP or verification letter is an acknowledgement the project meets the terms and conditions of the RGP. If a proposed action does not comply with the RGP, the Corps would so inform the CDFW and consider the proposed project by other means, such as by appropriate Nationwide Permit or individual permit.

2. Include small dam removal (permanent, flashboard and seasonal) in the list of authorized activities. The CDFW proposes to adopt the guidelines developed for the National Oceanic

and Atmospheric Administration (NOAA) Restoration Center's biological opinion (BO) (No. 151422SWR2009AR00566), dated March 21, 2012 and issued for San Francisco District's RGP12 issued to implement FRGP projects in northern California. Small dams considered would be (a) less than 25 feet in height from the natural bed of the stream measured at the downstream toe of the dam, or from the lowest elevation of the outside limit of the barrier to the maximum possible water storage elevation, or (b) were designed to have an impounding capacity of less than 50 acre-feet. Additional constraints on proposed small dam removal projects include only those that will form a channel at natural grade and shape upstream of the dam, naturally or with excavation, to minimize negative effects on downstream habitat. The project dam must have a relatively small volume of sediment available for release, that when released by storm flows, will have minimal effects on downstream habitat, or are designed to remove sediment trapped by the dam down to the elevation of the target thalweg, including design channel and floodplain dimensions by estimating the natural thalweg using an adequate longitudinal profile (see CDFW Manual Part XII *Fish Passage Design and Implementation*) and designing a natural shaped channel that provides the same hydraulic conditions and habitat for listed fish that is provided by the natural channel and has the capacity to accommodate flows up to a 2-year flood. To implement these projects, additional limits on linear disturbance of the stream course, dewatering, and access would be imposed. Longitudinal and cross-section profiles of the stream would be required to characterize the channel morphology and characterize and quantify the stored sediment to determine the potential for channel degradation. Furthermore, a habitat typing survey must map and quantify all downstream spawning areas that may be affected by sediment released by removal of the water control structure.

Projects would be deemed ineligible for the program if (1) sediments stored behind dam have a reasonable potential to contain environmental contaminants [dioxins, chlorinated pesticides, polychlorinated biphenyls (PCB's), or mercury] beyond the freshwater probable effect levels (PELs) summarized in the NOAA Screening Quick Reference Table guidelines, or (2) the risk of significant loss or degradation of downstream spawning or rearing areas by sediment deposition is considered to be such that the project requires more detailed analysis. Sites downstream of historical contamination sources such as lumber or paper mills, industrial sites, or intensive agricultural production for several decades (i.e., since chlorinated pesticides were legal to purchase and use) would be considered to have a reasonable potential to contain contaminants of concern. In these cases, preliminary sediment sampling would be advisable.

3. Allow projects in hardened channels to exceed 500 linear feet for dewatering and disturbance. Per the biological opinion issued by the NMFS, individual projects that may affect southern steelhead cannot exceed 500 feet of contiguous stream reach. The CDFW is requesting relaxation of this limit in hardened channels that impede steelhead passage due to lack of stream structure utilized by the fish for resting during passage.

4. Establish consistent in-channel work periods between biological opinions from USFWS and NMFS. Within these agencies' respective biological opinions, USFWS identifies limiting ground disturbing activities in potential arroyo toad and California red-legged frog habitat to the period between July 1 and October 15, whereas NMFS states fish relocation and dewatering activities shall occur only between June 1 and November 30. The CDFW is

requesting making the work periods consistent by bracketing the period of annual work between June 1 and November 30, *and/or* when the stream is not actively flowing and no measurable rainfall is forecast within 72 hours. In the event rainfall is predicted within 72 hours, all activities would cease and protective measures to prevent erosion or siltation would be implemented and maintained.

Additional Project Information

With the exception of Item 2 above under Proposed Modifications, these restoration projects must be consistent with procedures found in the California Salmonid Stream Habitat Restoration Manual, Fourth Edition, dated July 2010. The most current version of the Manual may be found at **http://www.dfg.ca.gov/fish/Resources/HabitatManual.asp**.

The FRGP manages an annual grant cycle initiated in the spring of each year supporting a variety of projects from sediment reduction to watershed education throughout coastal California. Projects selected for funding have two years to be implemented, and most of the habitat restoration activities take place during the dry summer season. The majority of this funding is awarded for habitat restoration projects that improve overhead cover, spawning gravels, and pool habitat; reduce or eliminate erosion and sedimentation impacts; screen diversions; and remove barriers to fish passage. These habitat restoration activities conform to mandates of the California Legislature in the Fish and Game Code and Public Resources Code. Proposed activities are designed to restore salmon and steelhead habitat with the goal of increasing populations of wild anadromous fish in coastal streams and watersheds. Habitat restoration activities and practices include fish passage projects, bank stabilization treatments, upslope road decommissioning or repair, and replacement or modification of culverts that are barriers to fish passage.

Proposed structures would provide predator escape and resting cover, increase spawning habitat, improve upstream and downstream migration corridors, improve pool-to-riffle ratios, and add habitat complexity and diversity. Some structures would be designed to reduce sedimentation, protect unstable banks, stabilize existing landslides, provide shade, and create scour pools.

The proposed habitat restoration activities conform to State law and are consistent with the California Salmonid Stream Habitat Restoration Manual (Manual). The following information was provided by the applicant:

- In-stream habitat improvements, including cover structures (divide logs, digger logs, spider logs, and log/root wad/boulder combinations), boulder structures (boulder weirs, vortex boulder weirs, boulder clusters, and single- and opposing-boulder wing-deflectors), log structures (log weirs, upsurge weirs, single- and opposing-log wing-deflectors, and Hewitt ramps) and placement of imported spawning gravel may be utilized in certain locations. Techniques and practices are identified in part VII of the Manual. Techniques for placement of spawning gravel are identified on page VII-46 of the Manual.
- Unanchored large woody debris may be used to enhance pool formation and improve stream reaches, particularly on first- through third-order streams. Logs selected for placement would generally have a minimum diameter of 12 inches and a minimum length 1.5 times the mean stream channel type bankfull width at the deployment site. A root wad should have a

minimum root bole diameter of 5 feet and a minimum length of 15 feet, and should be at least half the channel type bankfull width. More information can be found on page VII-23 of the Manual.

- Fish screens may be used to prevent entrainment of juvenile salmonids in water diverted for agriculture, power generation, or domestic use, and are necessary on both gravity flow and pump diversion systems. Guidelines for functional designs of downstream migrant fish passage facilities at water withdrawal projects are found in Appendix S of the Manual. The appendix covers structure placement, approach velocity, sweeping velocity, screen openings, and screen construction.
- Fish passage at stream crossings includes activities that provide fish-friendly crossings where the crossing width is at least as wide as the active channel. Culvert passes are designed to withstand a 100-year storm flow and crossing bottoms are buried below the streambed. Examples include replacement of barrier stream crossings with bridges, bottomless arch culverts, embedded culverts, or fords. Guidelines for fish passage practices are covered in Part IX of the Manual. Baffled culverts (Washington baffles and steel ramp baffles,), fishways (step-and-pool, Denil fishway, Alaskan steeppass and back-flooding weirs), and fish ladders are described in Part XII of the Manual.

  Fish passage improvements may include removal of obstructions such as log jams, beaver dams, waterfalls and chutes, and landslides. Suitable large woody debris removed from fish passage barriers that are not used by the project for habitat enhancement would be left within the riparian zone so as to provide a source for future recruitment of wood into the stream system. Guidelines for fish passage improvements are covered in Part VII of the Manual.
- Upslope restoration activities reduce sediment delivery to anadromous streams, and may include road decommissioning, road upgrading, and stormproofing roads by replacing high risk culverts with bridges, installing culverts to withstand the 100-year flood flow, installing critical dips, installing armored crossings, and removing unstable sidecast and fill materials from steep slopes. Guidelines for upslope restoration practices are covered in Part X of the Manual.
- Watershed and stream bank stability activities serve to reduce sediment input from erosive areas within the watershed. Examples include slide stabilization, stream bank stabilization, boulder stream bank stabilization structures, log stream bank stabilization structures, tree revetment, native material revetment, mulching, revegetation, willow wall revetment, brush mattress installation, checkdams, brush checkdams, waterbars, and exclusionary fencing. Guidelines for watershed and stream bank stability are covered in Part VII of the Manual.

Proposed Special Conditions

The applicant proposed various measures implemented with the previous period of authorization since May 2009, including:

- full consistency with the Manual;
- implementing projects to coincide with the summer dry season (generally between July 1 and November 1 or first rainfall);
- locating staging and storage areas for equipment, materials, fuels, lubricants and solvents outside of a stream's high water channel and associated riparian habitats;
- minimization of number of access routes and staging areas;
- containment of trash and debris throughout the project duration;
- working outside of flowing water by avoidance, use of cofferdams and diversion of flows;

- fitment of fish screens meeting CDFW and NMFS criteria for all intakes;
- disposal of turbid water pumped from the work site such that it will not drain back to any steam channel;
- downstream capture of suspended sediments for actions where construction of cofferdams would be more intrusive than the actions to complete the project;
- minimization of spread or introduction of non-native aquatic or plant species;
- minimization of any disturbance of wildlife encountered at a project site;
- use of exclusion measures at work sites that may harbor sensitive aquatic organisms;
- avoidance of ground disturbances that may adversely affect cultural resources and full compliance with existing state and federal statutes if such resources are found; and
- implementation of specific measures to avoid and minimize impacts to endangered, threatened or rare species that could occur at a particular project site.

These measures would continue to apply to any reauthorized RGP 78.

For additional information please call Bruce Henderson of my staff at 805-585-2145 or via e-mail at Bruce.A.Henderson@usace.army.mil . This public notice is issued by the Chief, Regulatory Division.

Regulatory Program Goals:

- To provide strong protection of the nation's aquatic environment, including wetlands.
- To ensure the Corps provides the regulated public with fair and reasonable decisions.
- To enhance the efficiency of the Corps' administration of its regulatory program.

U.S. ARMY CORPS OF ENGINEERS – LOS ANGELES DISTRICT
VENTURA REGULATORY FIELD OFFICE
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Attachment B

Figures are from the California Salmonid Stream Restoration Manual (http://www.dfg.ca.gov/fish/Resources/HabitatManual.asp)

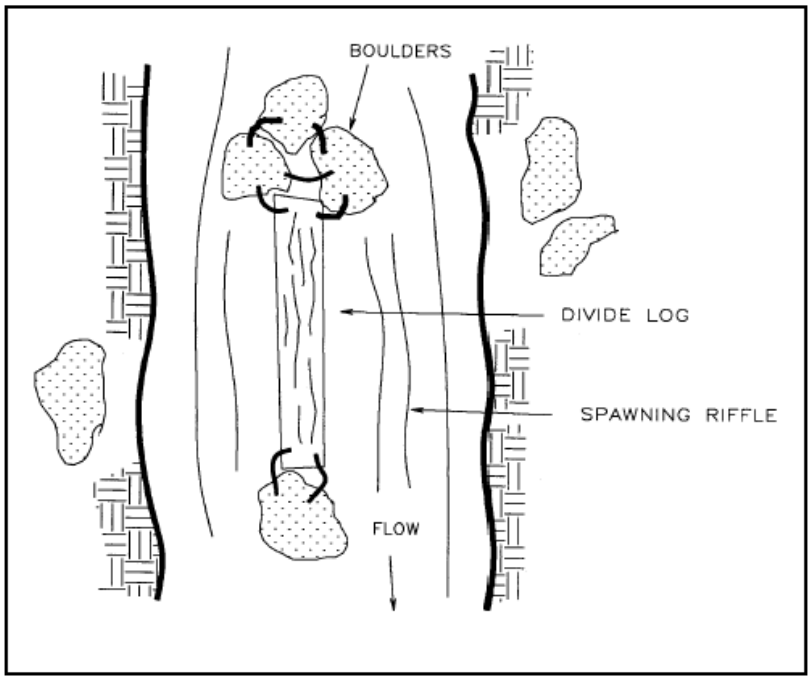


Figure VII-17. Divide log.

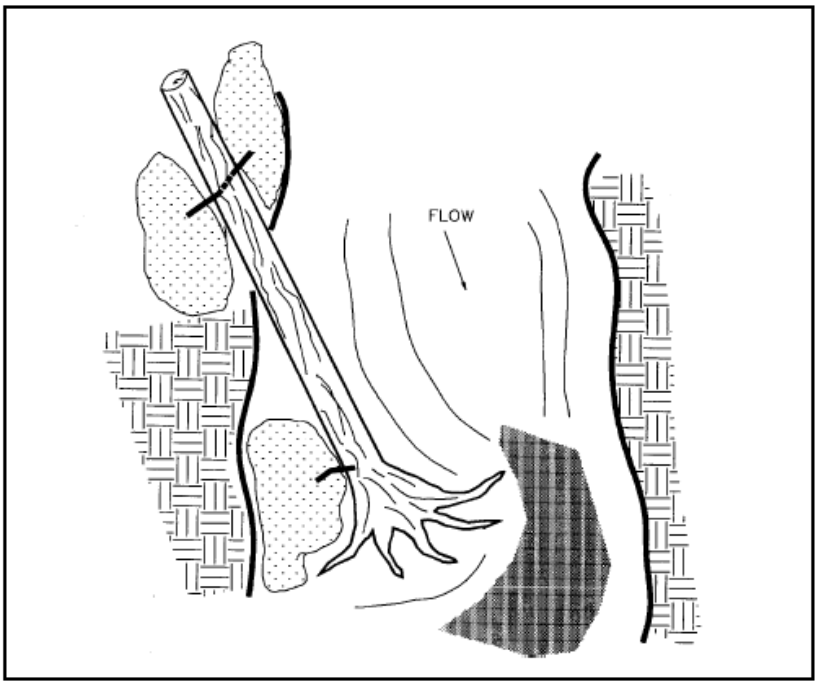


Figure VII-18. Digger log.

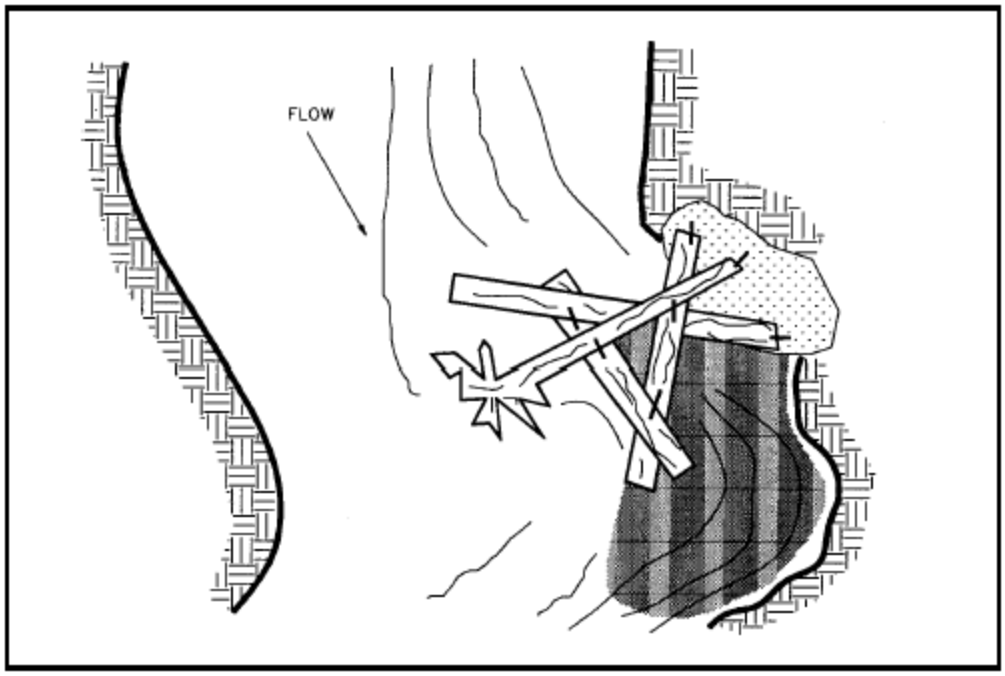


Figure VII-19. Spider logs.

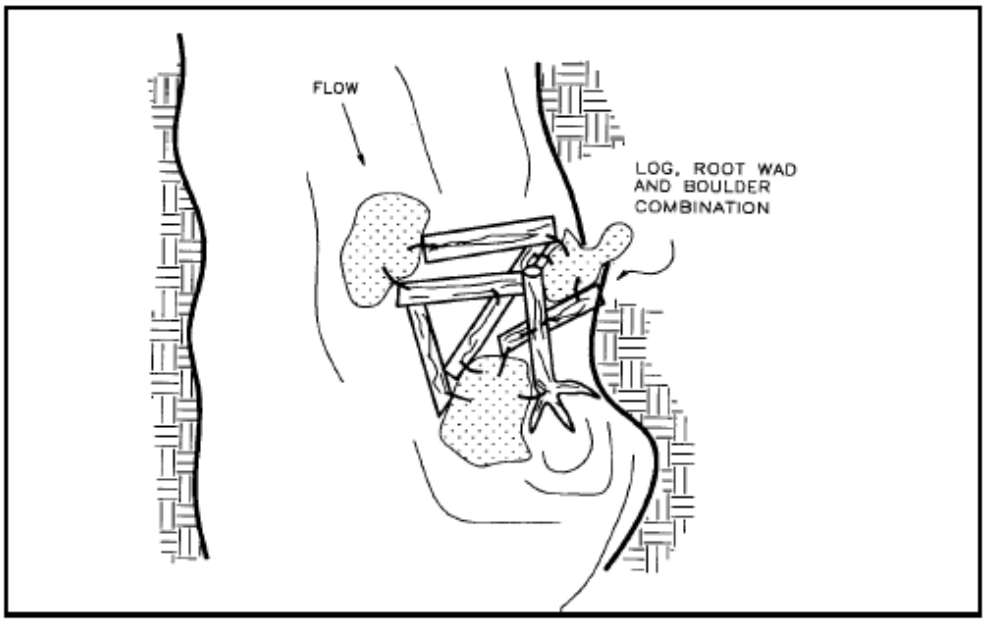


Figure VII-20. Log, root wad, and boulder combination.

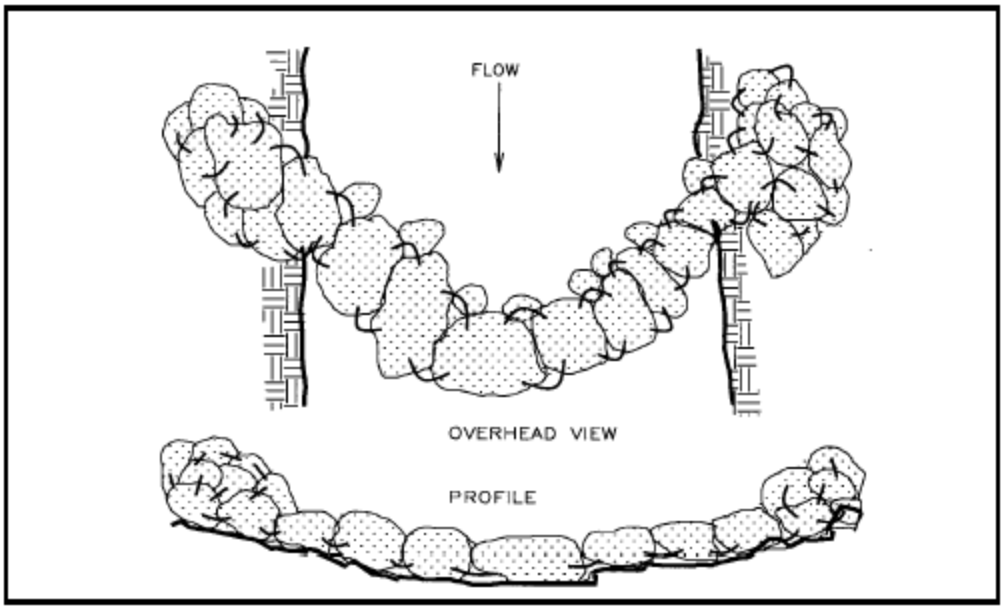


Figure VII-21. Downstream-V boulder weir.

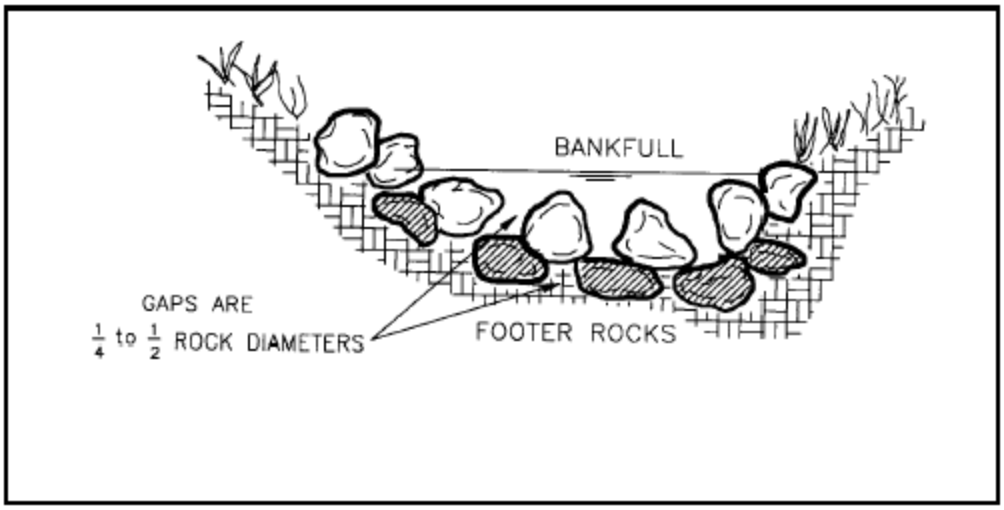


Figure VII-22. Vortex boulder weir, cross section view (Rosgen, 1993).

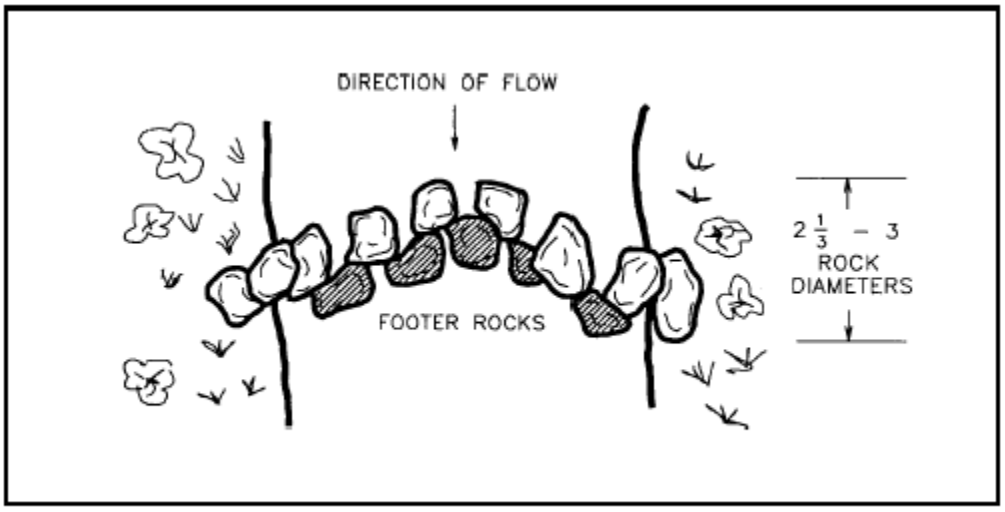


Figure VII-23. Vortex boulder weir, plan view (Rosgen, 1993).

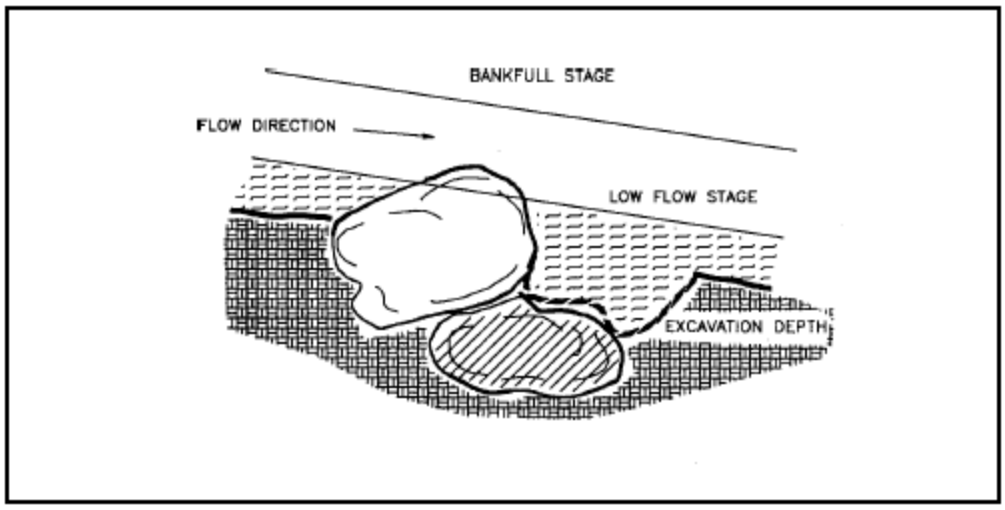


Figure VII-24. Vortex boulder weir, profile view (Rosgen, 1993).

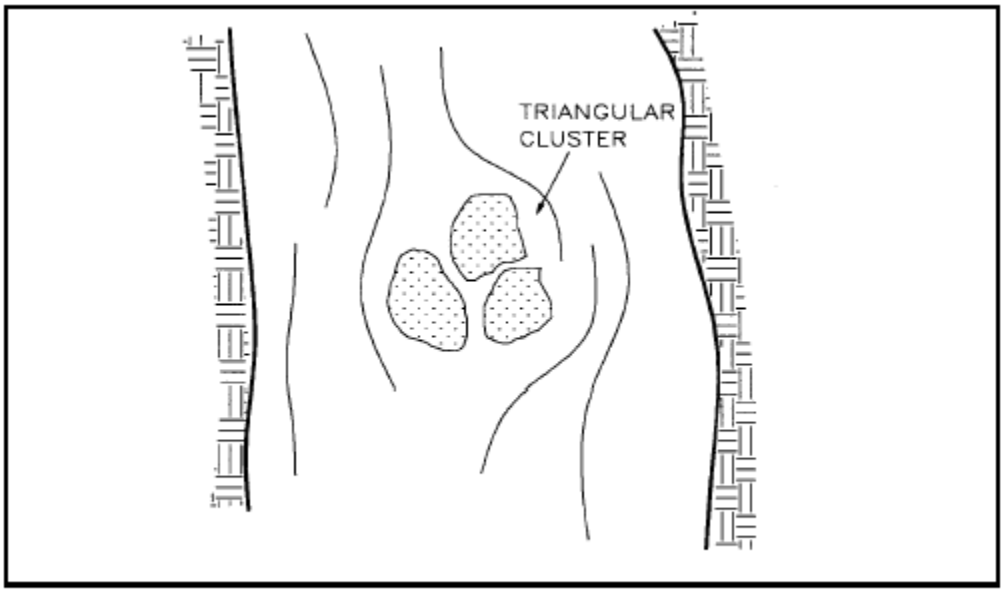


Figure VII-25. Boulder cluster.

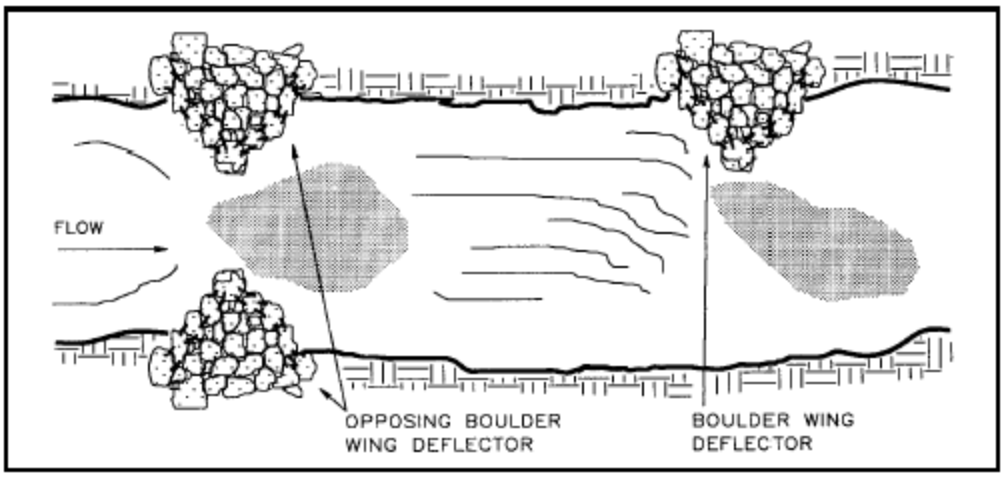


Figure VII-26. Single and opposing boulder wing-deflectors.

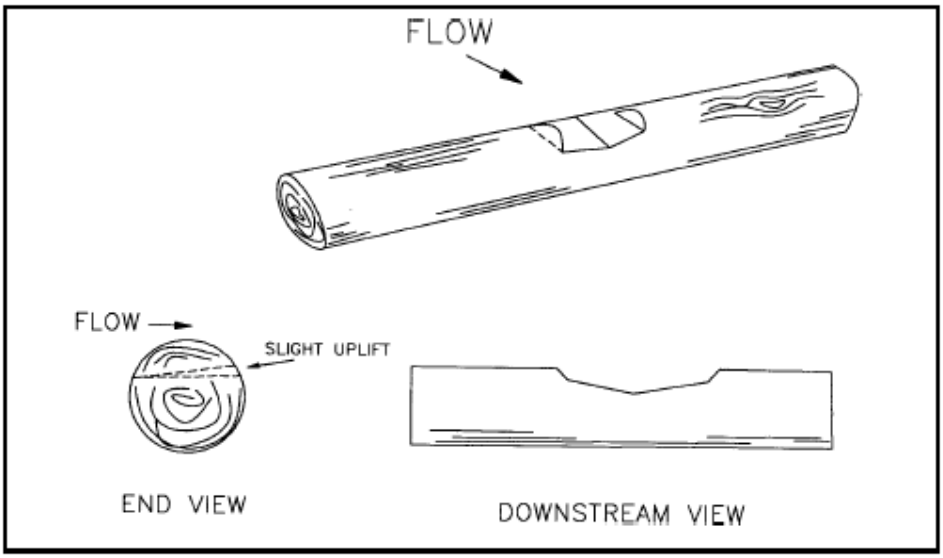


Figure VII-27. Straight log weir with low-flow notch.

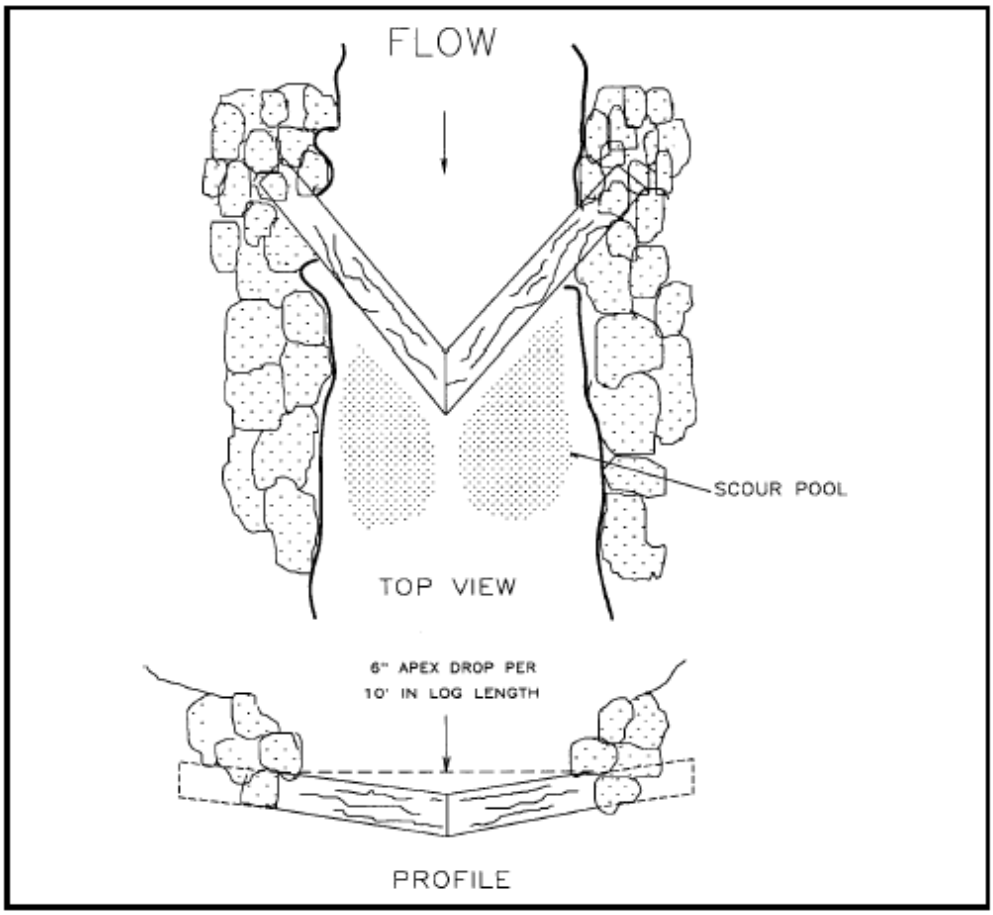


Figure VII-28. Downstream-V log weir.

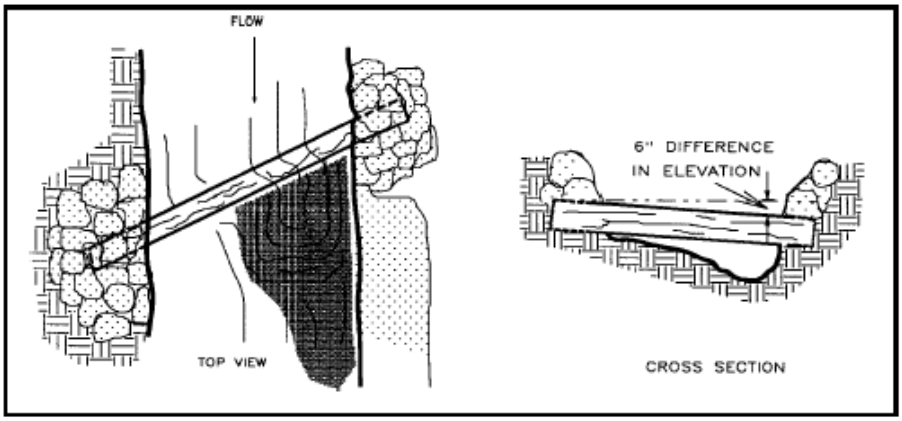


Figure VII-29. Diagonal log weir.

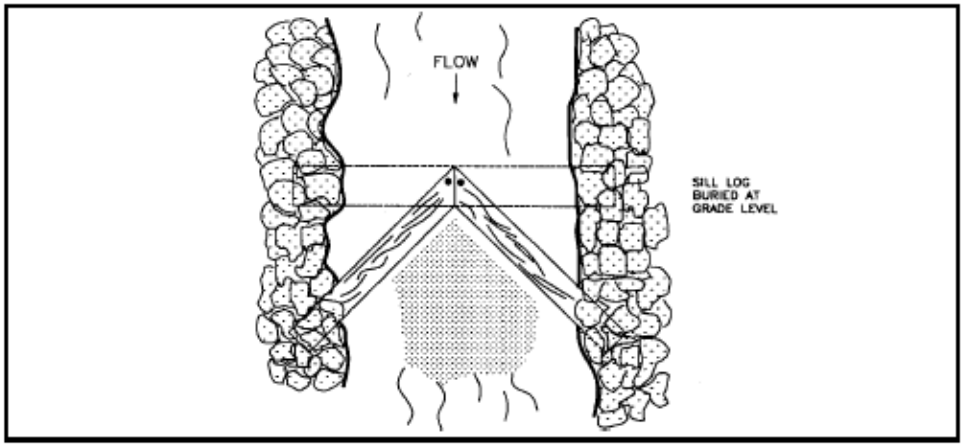


Figure VII-30. Upstream-V log weir.

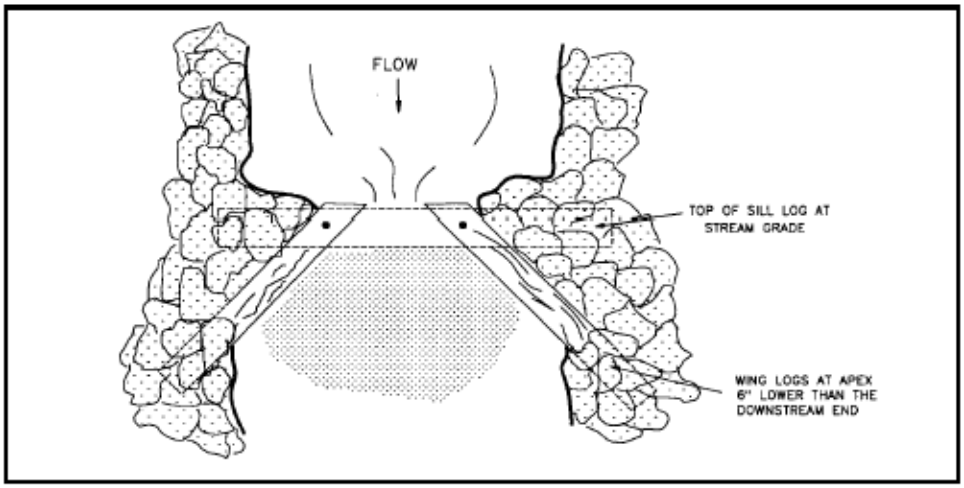


Figure VII-31. Upstream-V log weir with a low-flow notch.

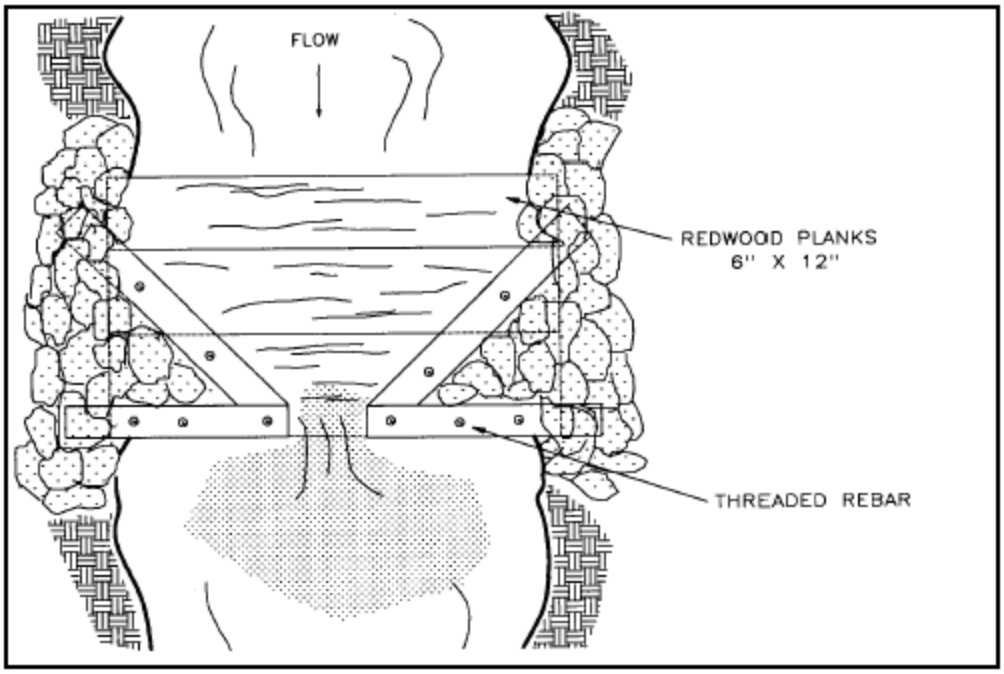


Figure VII-33. Log constrictors over planks.

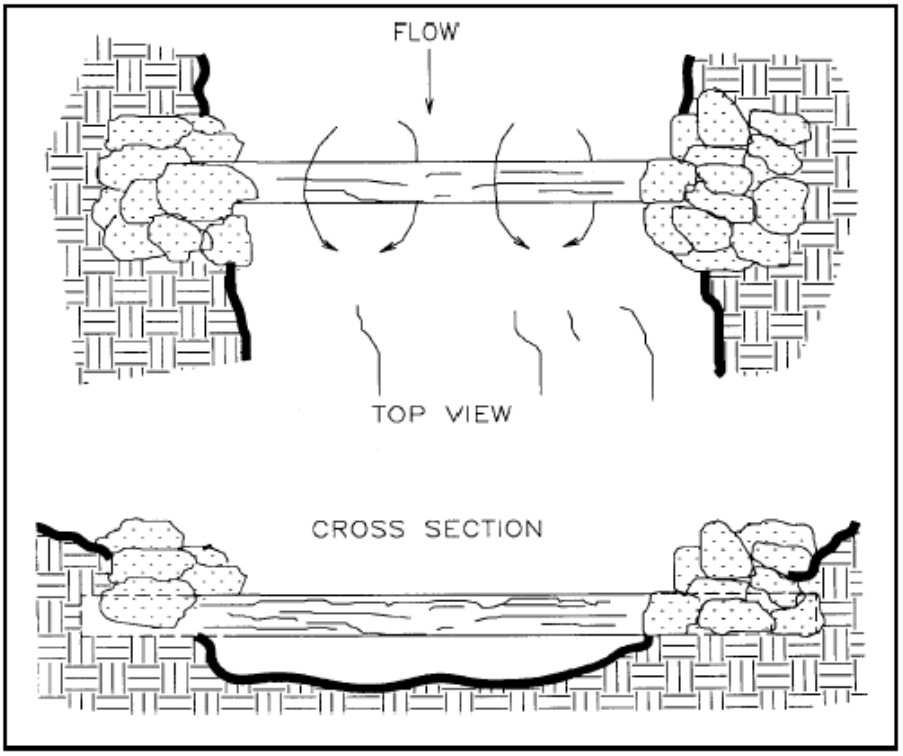


Figure VII-34. Upsurge weir.

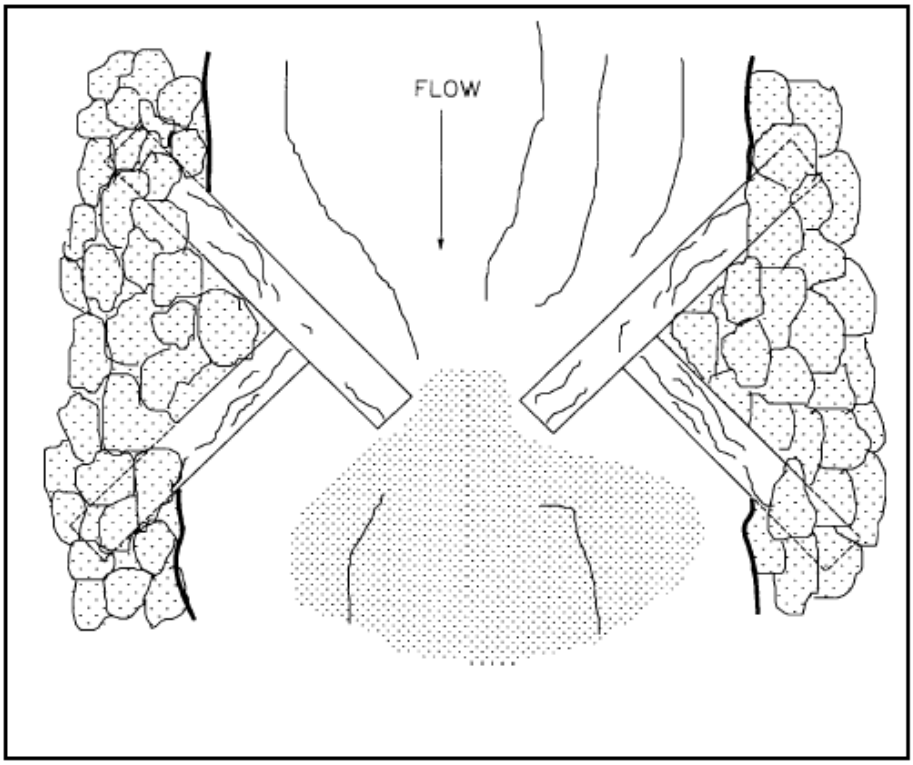


Figure VII-35. Opposing log wing-deflector.

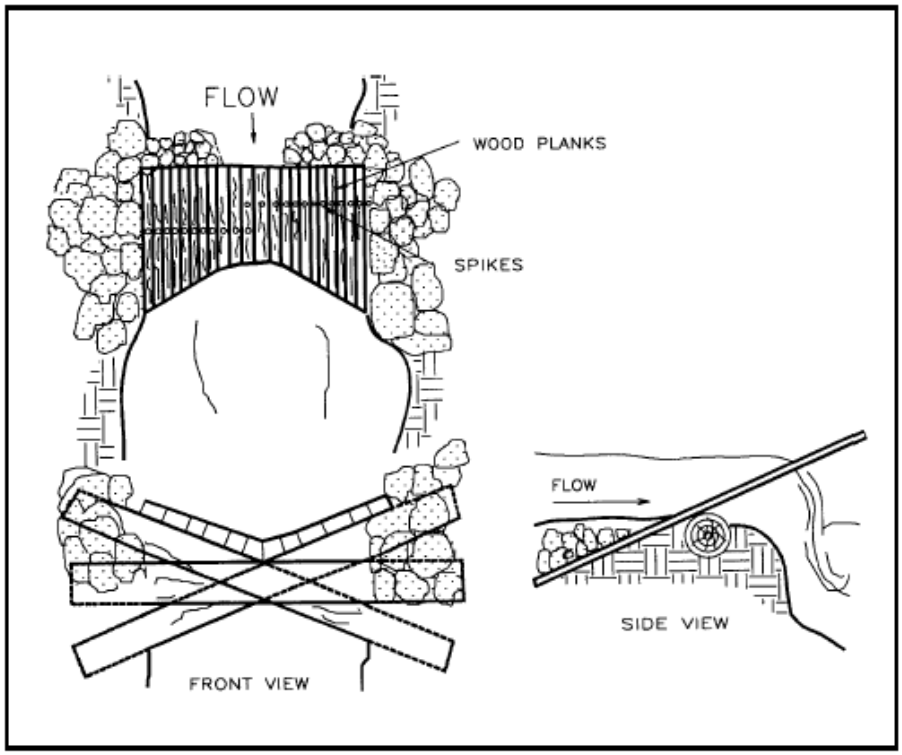


Figure VII-36. Hewitt ramp.

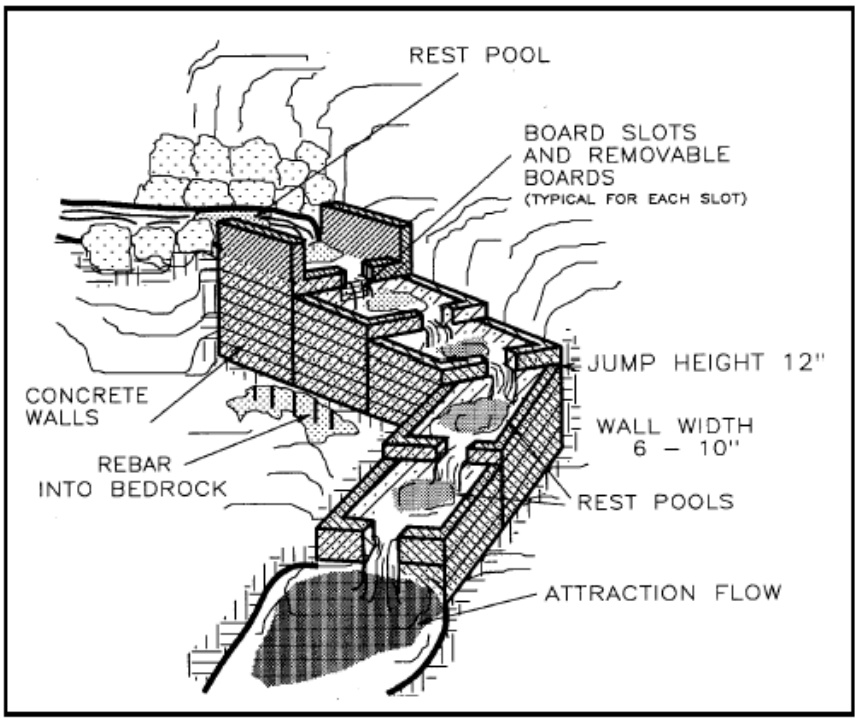
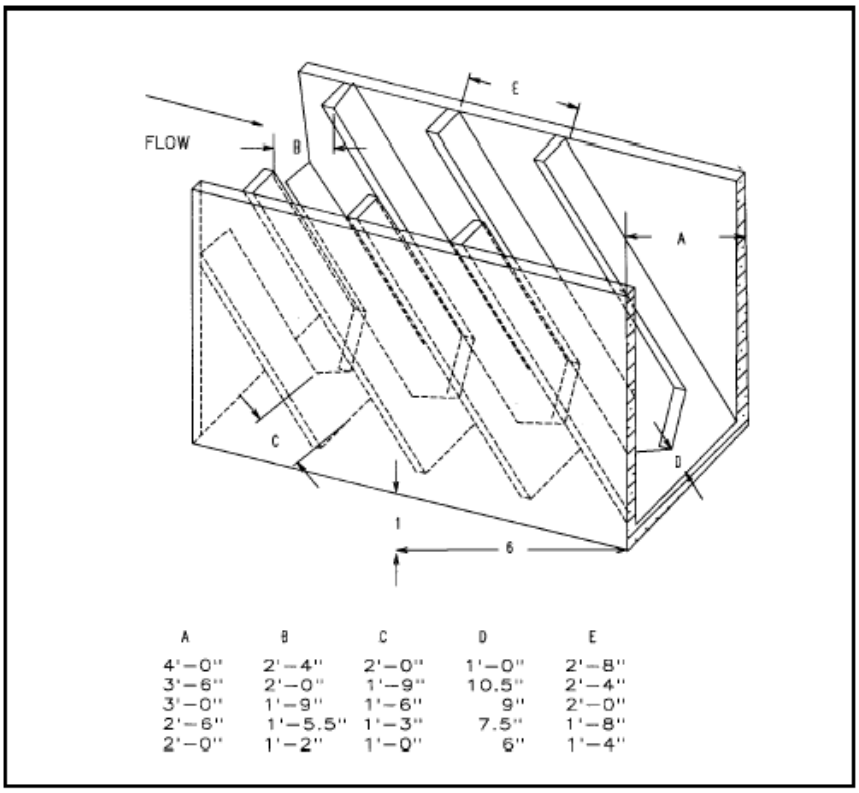


Figure VII-39. Step-and-pool fishway.



A	B	C	D	E
4'–0"	2'–4"	2'–0"	1'–0"	2'–8"
3'–6"	2'–0"	1'–9"	10.5"	2'–4"
3'–0"	1'–9"	1'–6"	9"	2'–0"
2'–6"	1'–5.5"	1'–3"	7.5"	1'–8"
2'–0"	1'–2"	1'–0"	6"	1'–4"

Figure VII-40. Denil fishway.

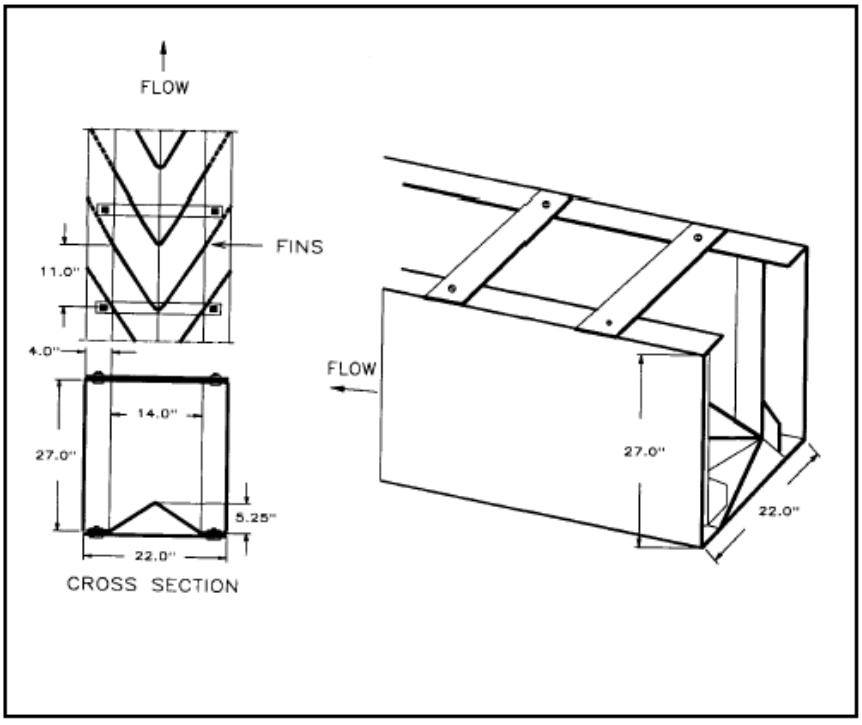


Figure VII-41. Alaskan steep-pass.

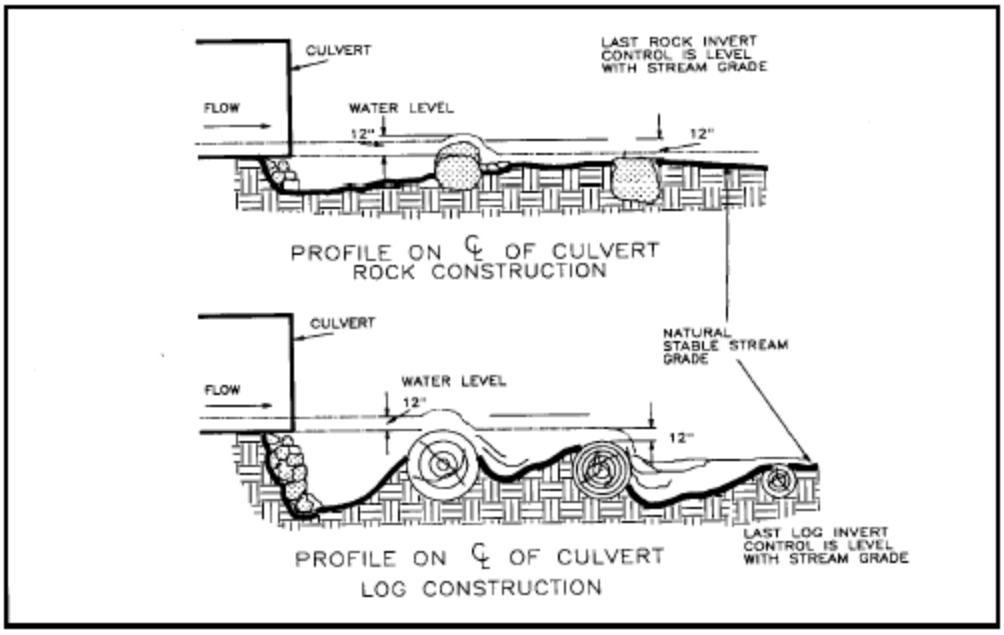


Figure VII-42. Back-flooding weirs.

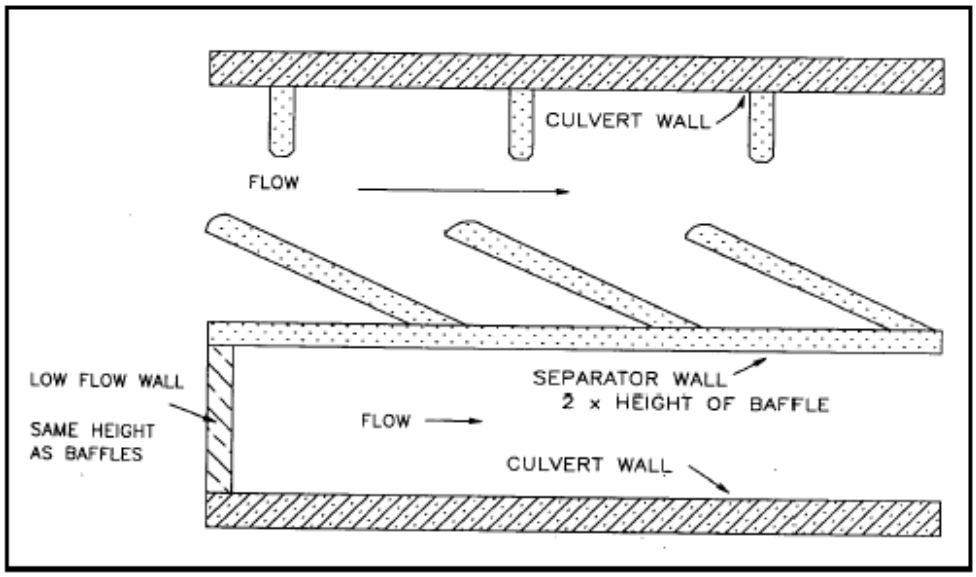


Figure VII-43. Washington baffles with a separator wall. (*Stream Enhancement Guide*, British Columbia Ministry of Environment, 1980, p. 42).

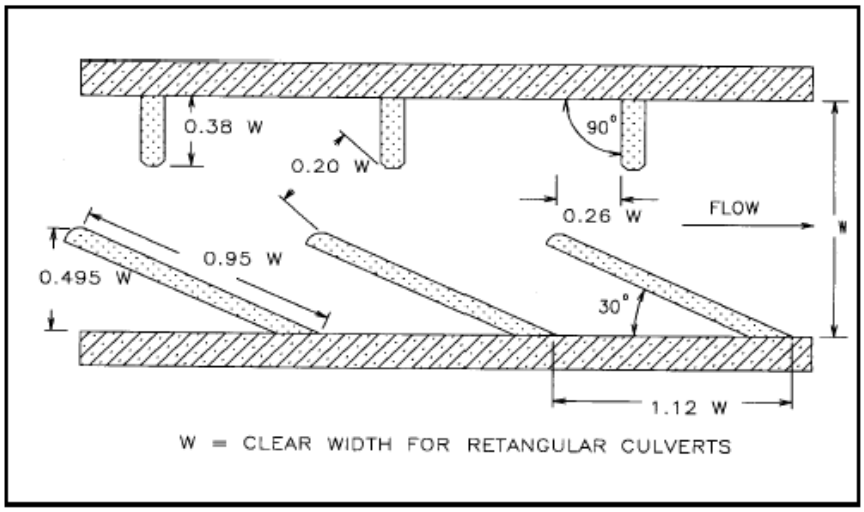


Figure VII-44. Washington baffles. (*Stream Enhancement Guide*, British Columbia Ministry of Environment, 1980, p.42).

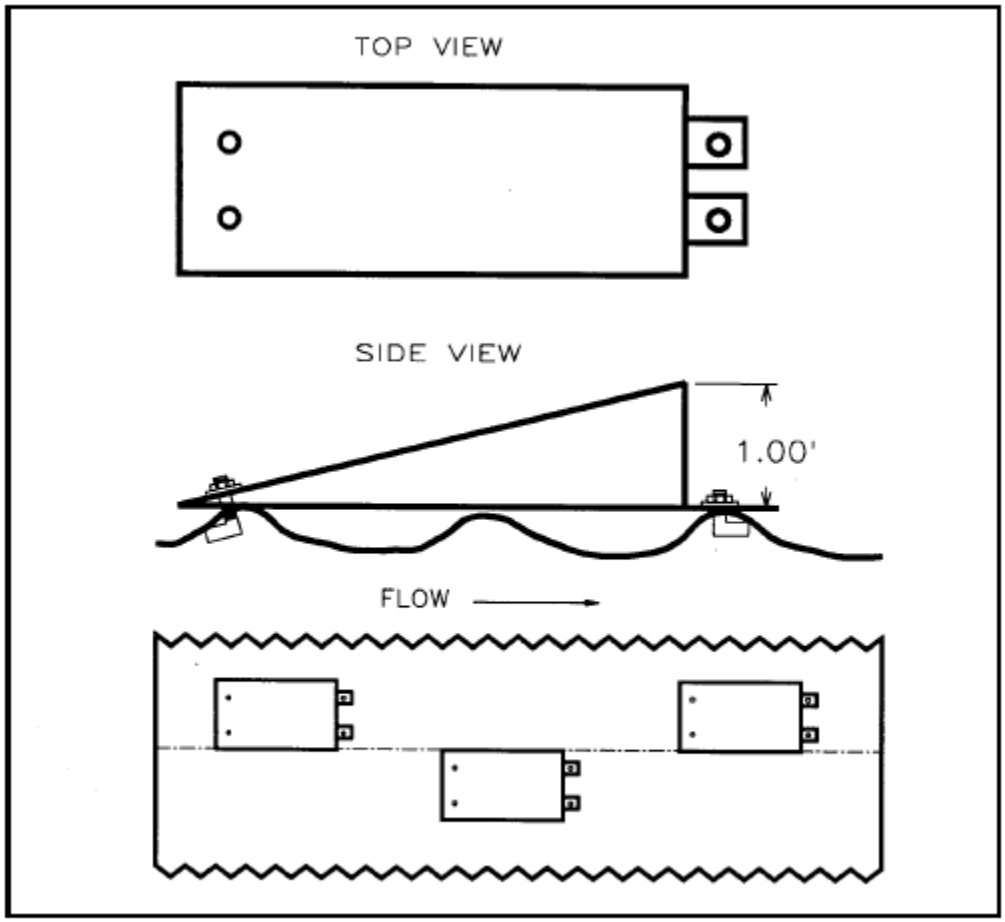


Figure VII-47. Corrugated metal pipe steel ramp baffles.

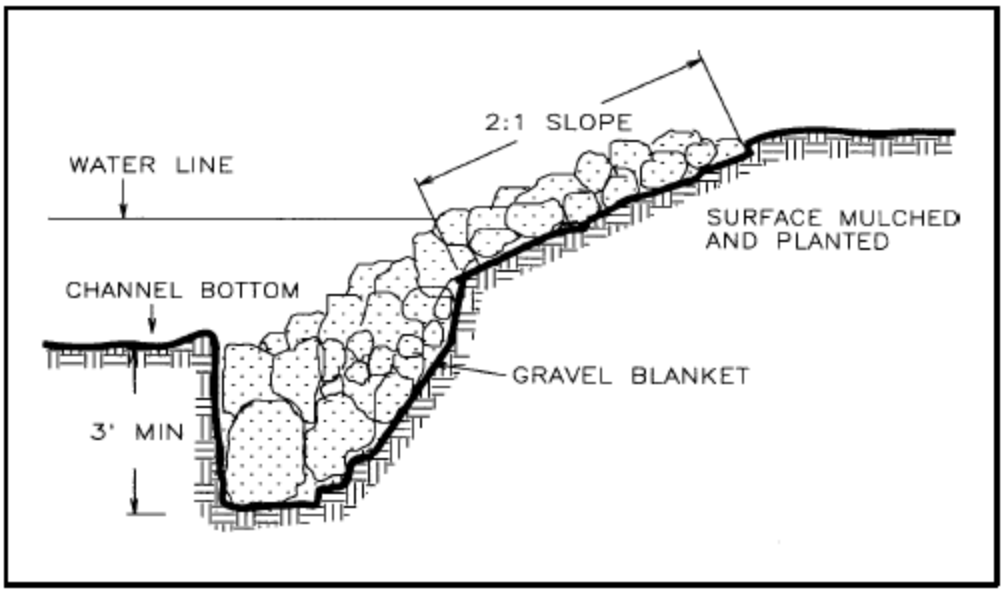


Figure VII-48. Riprap.

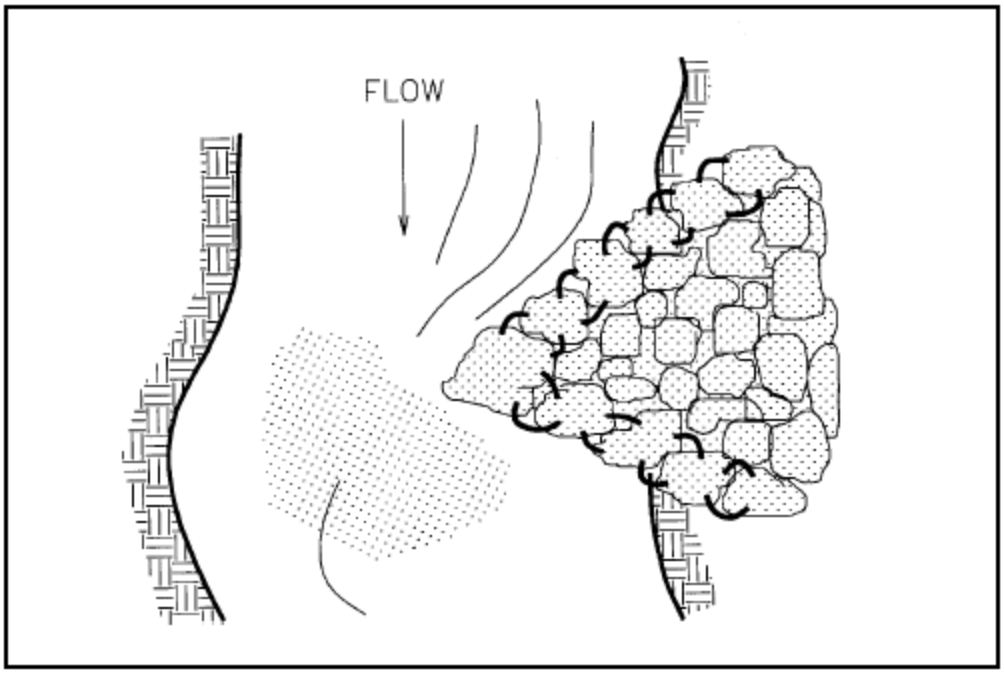


Figure VII-49. Boulder wing-deflector.

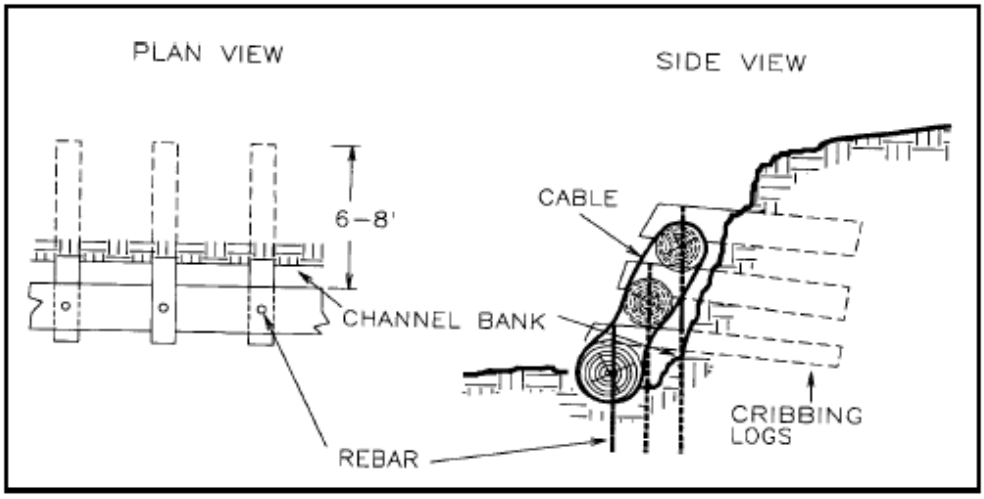
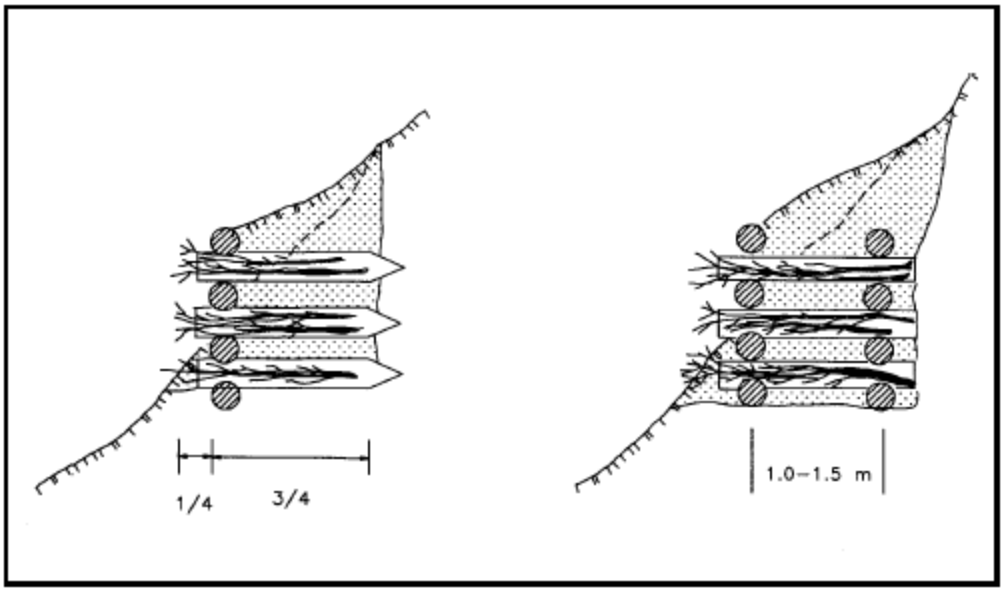


Figure VII-50. Log cribbing.



FigureVII-51. Live Vegetated Crib Wall (Schiechtl and Stern, 1996)

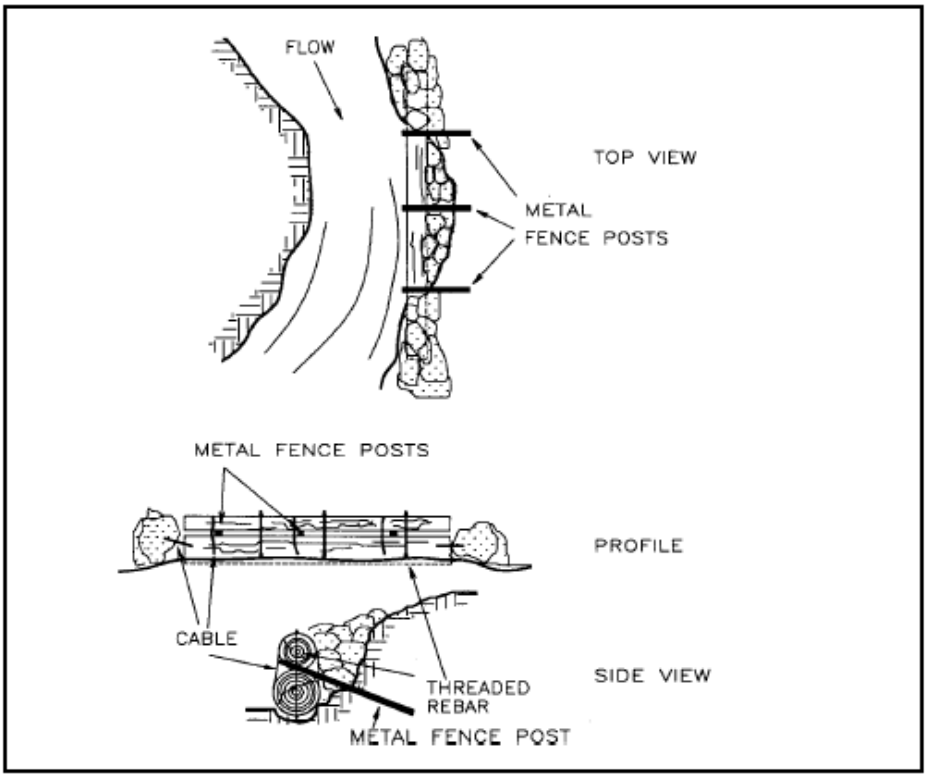


Figure VII-52. Log bank armor.

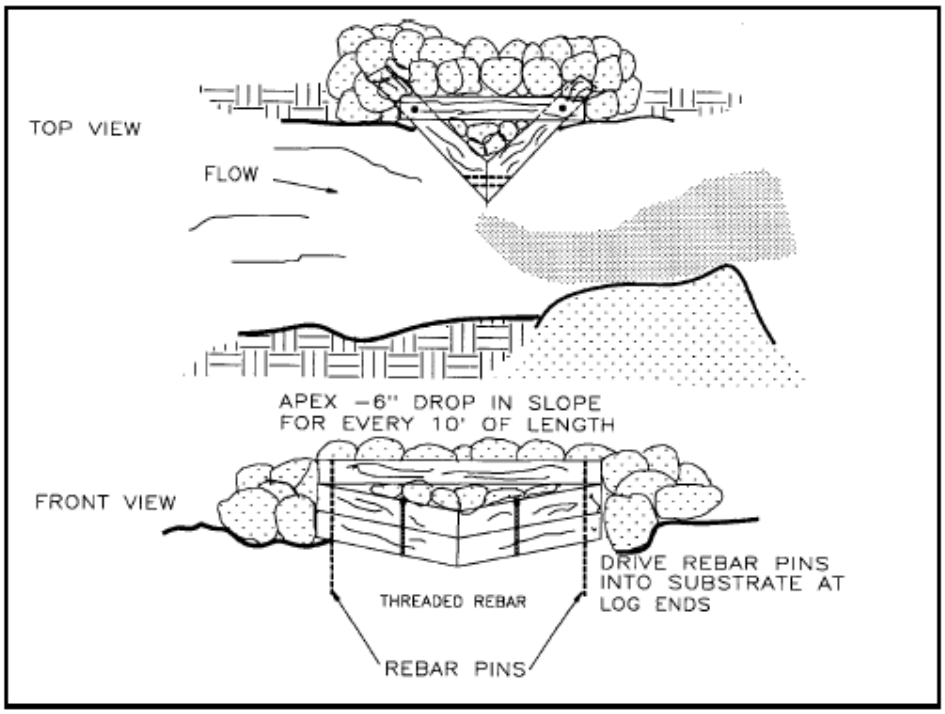


Figure VII-53. Log wing-deflector.

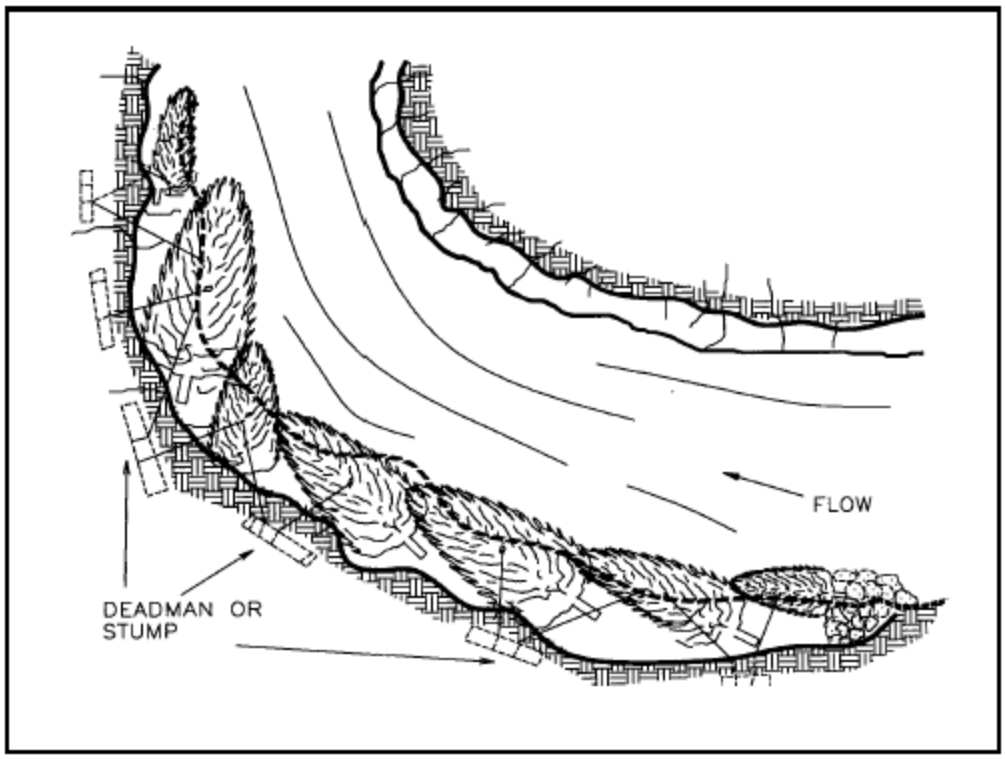


Figure VII-54. Tree revetment.

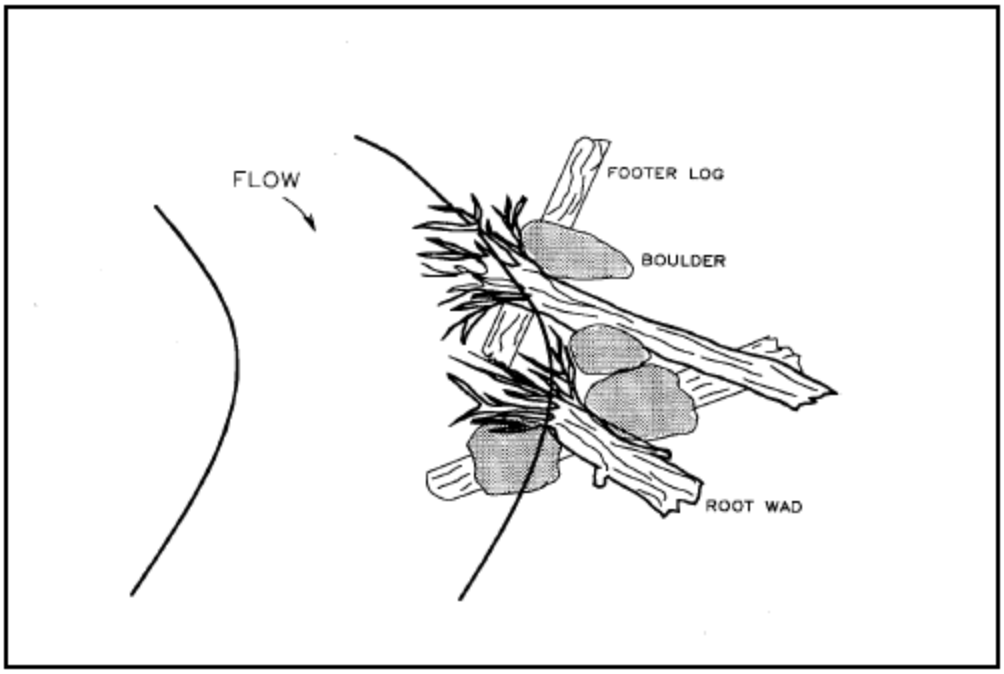


Figure VII-55. Plan view of native material revetment (Rosgen, 1993)

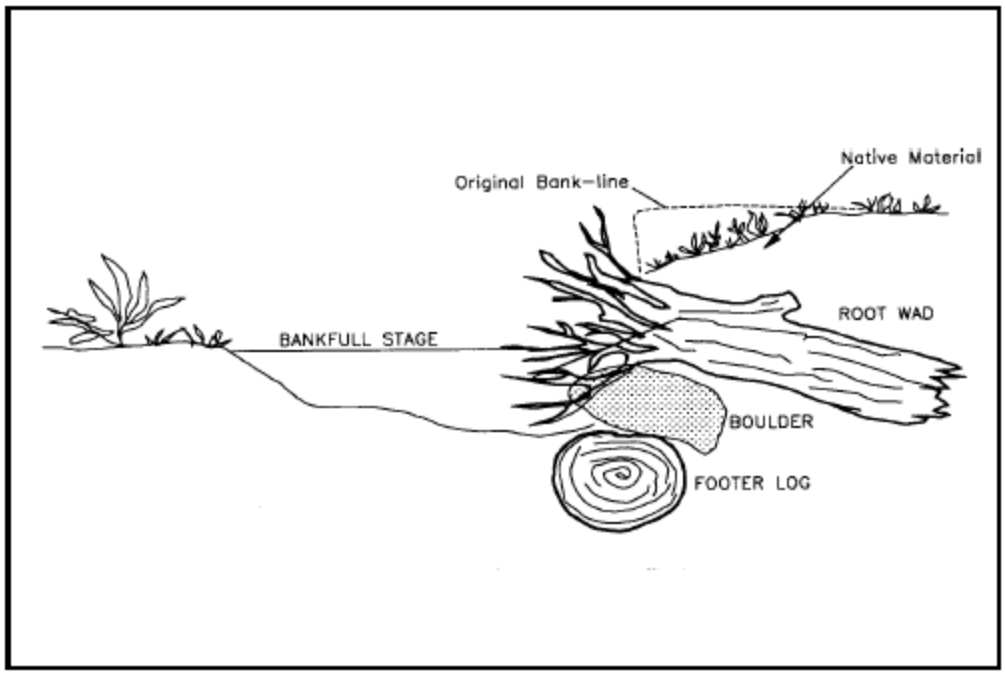


Figure VII-56. Native material revetment (Rosgen, 1993).

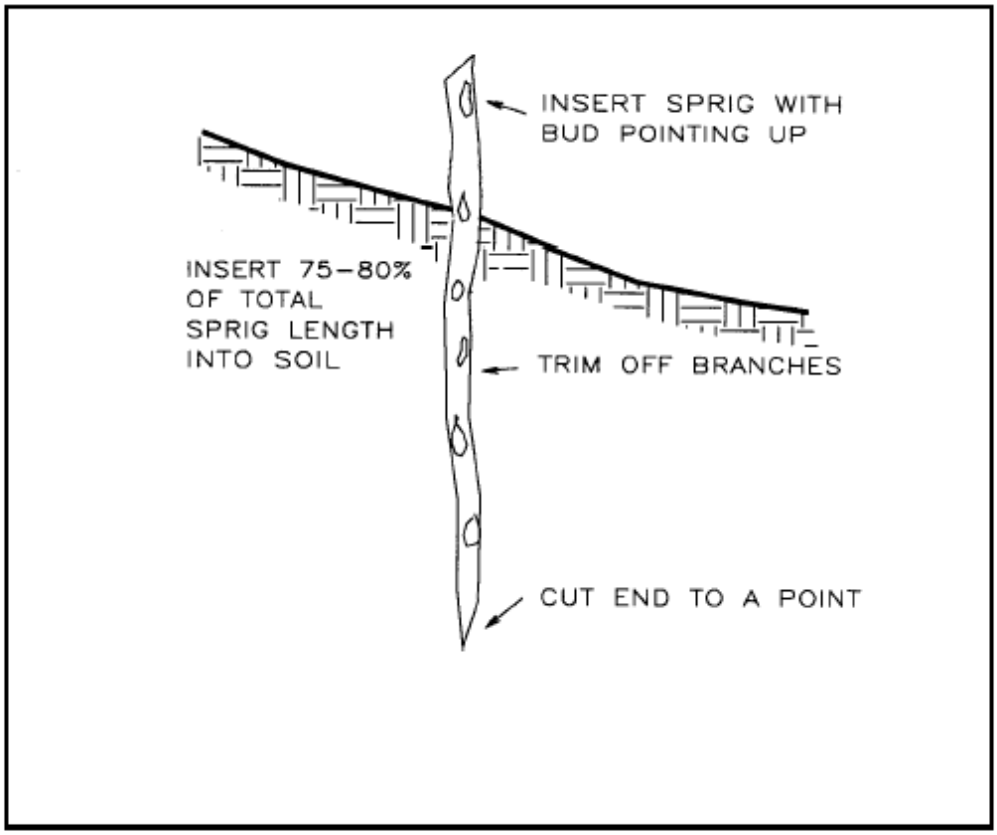


Figure VII-57. Willow sprigging. (Prunuske, 1987).

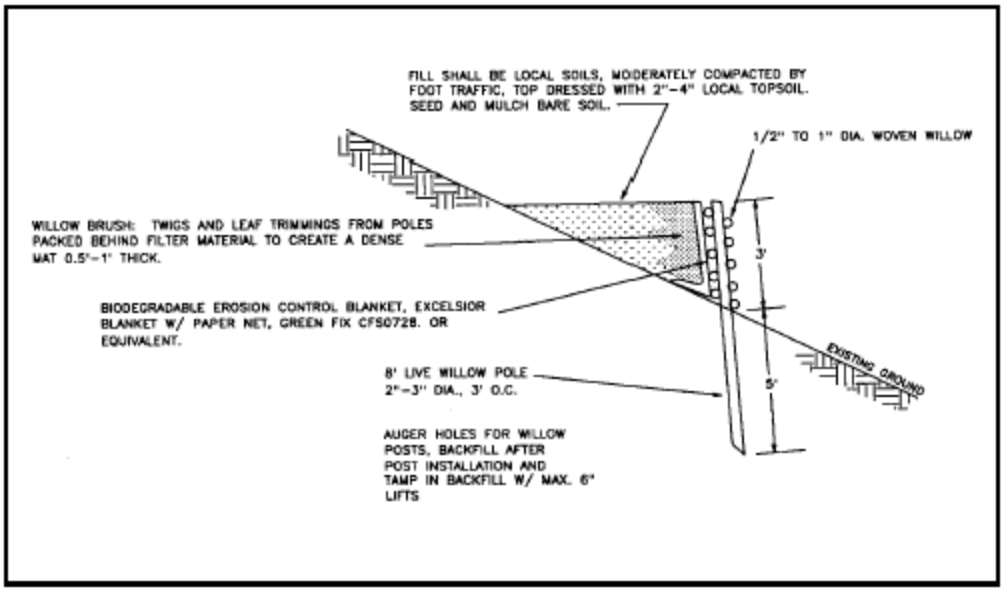


Figure VII-58. Willow Wall Revetment (L. Prunuske, 1997)

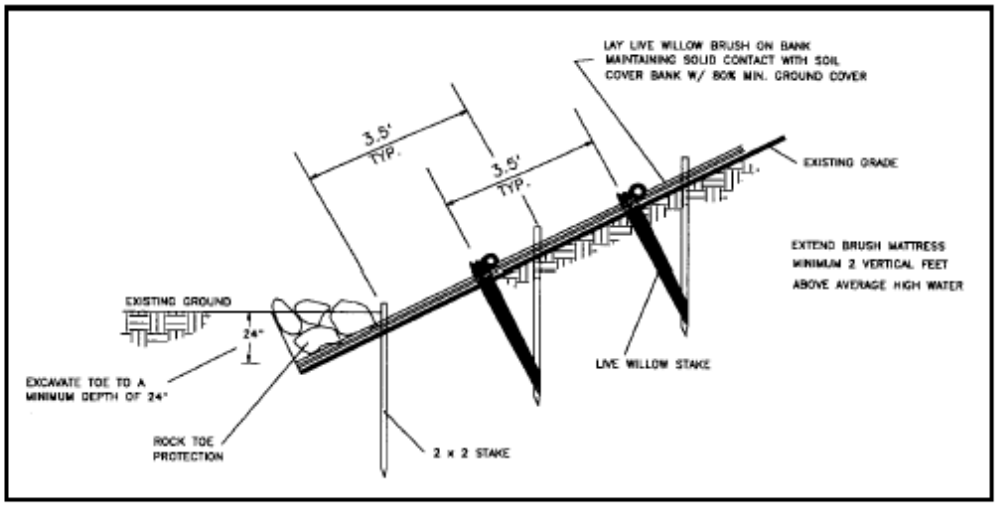


Figure VII-60. Brusch Mattress Cross Section (L. Prunuske, 1997)

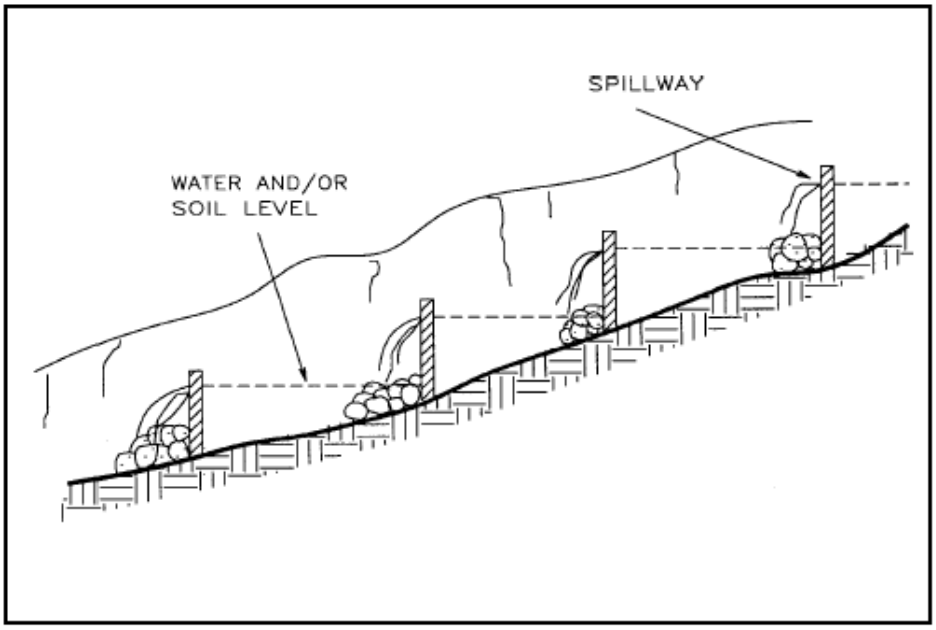


Figure VII-67. Checkdam placement. (Prunuske, 1987).

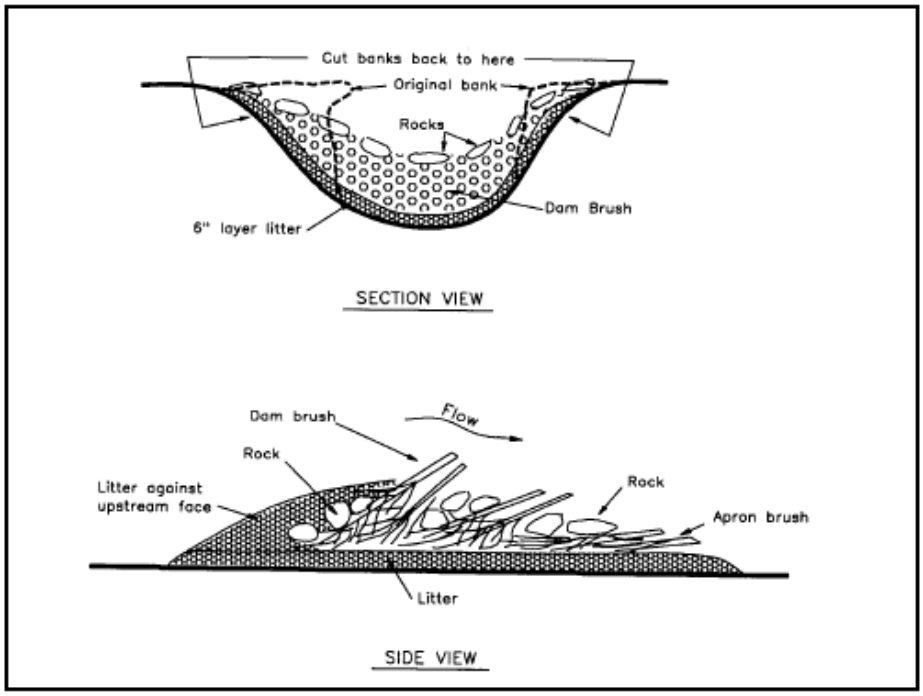


Figure VII-69. Brush and Rock Checkdam (Kraebel and Pillsbury, 1934)

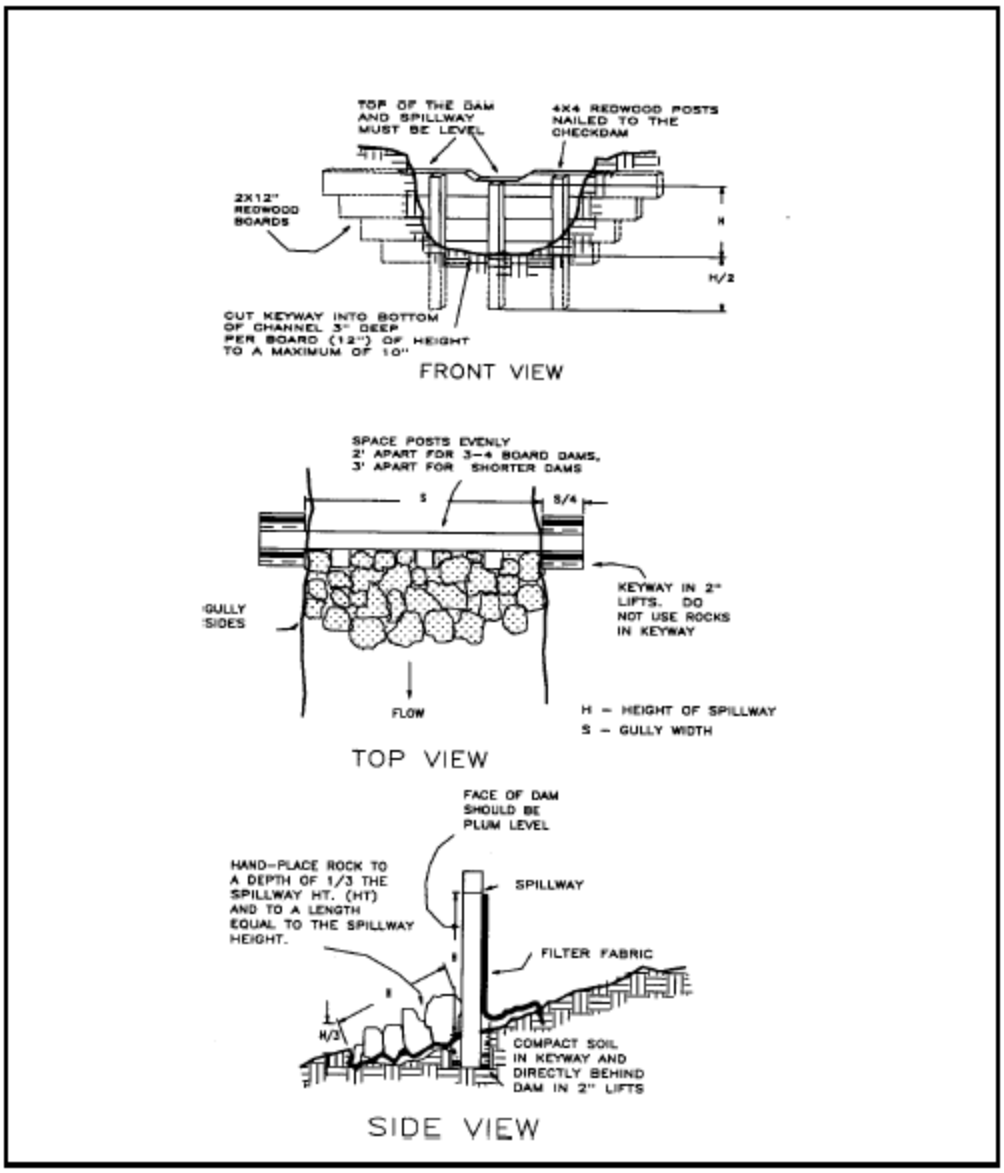


Figure VII-68. Redwood board checkdam. (Prunuske, 1987)

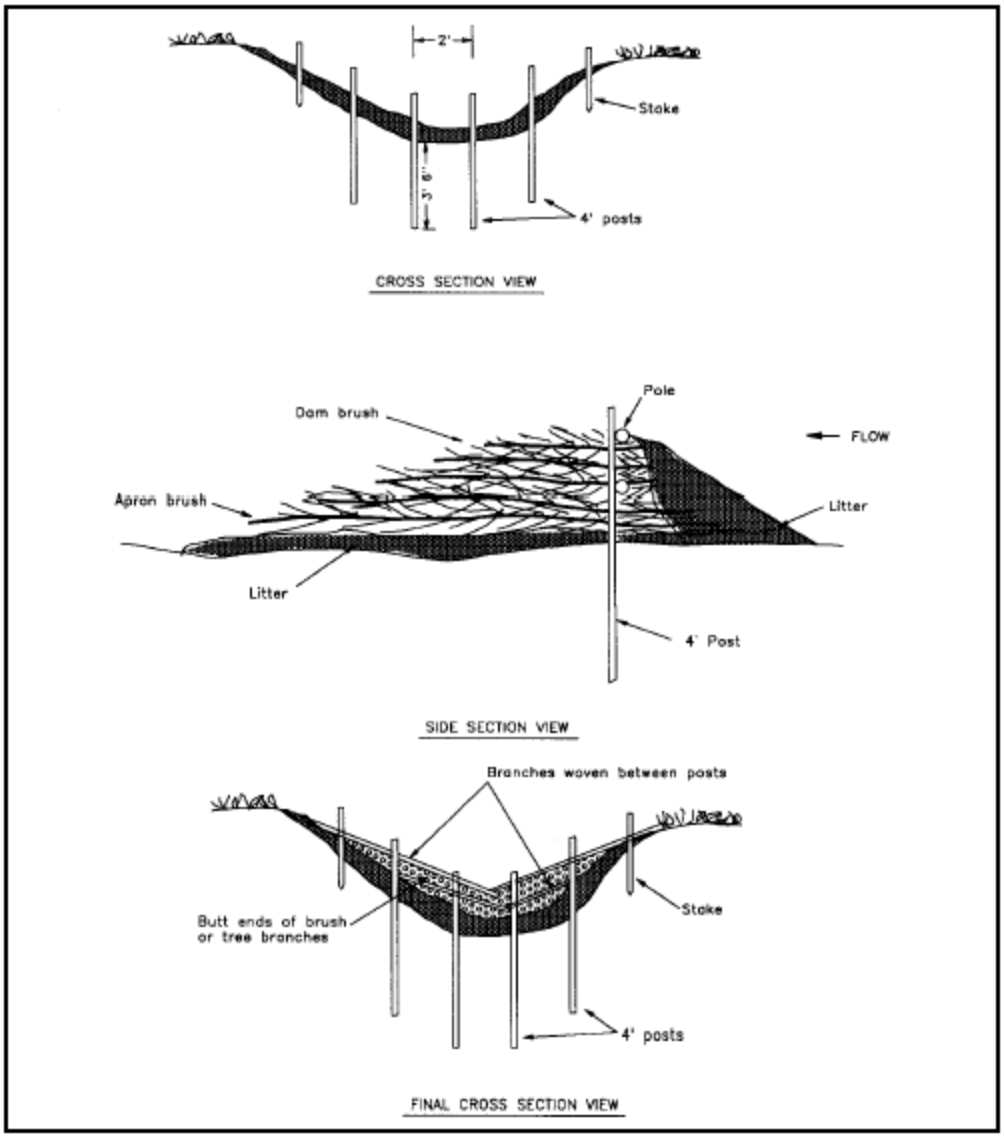


Figure VII-70. Post Checkdam (Kraebel and Pillsbury, 1934)

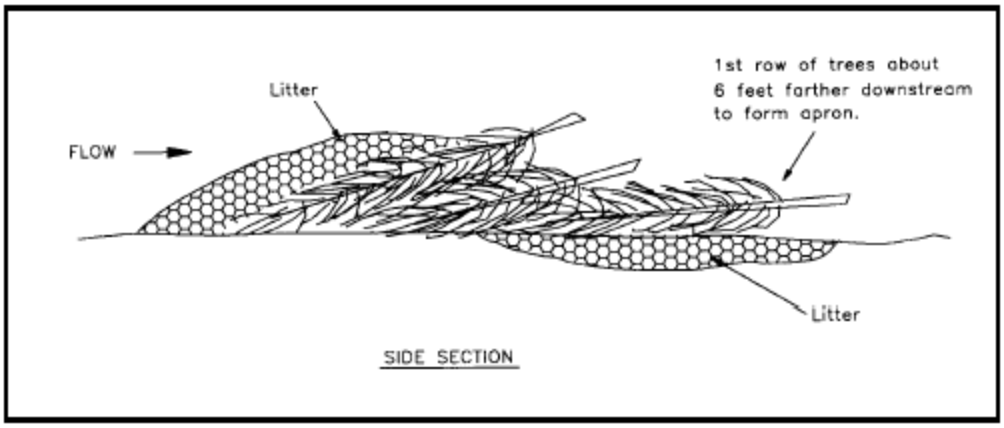


Figure VII-71. Tree Checkdam (Kraebel and Pillsbury, 1934)

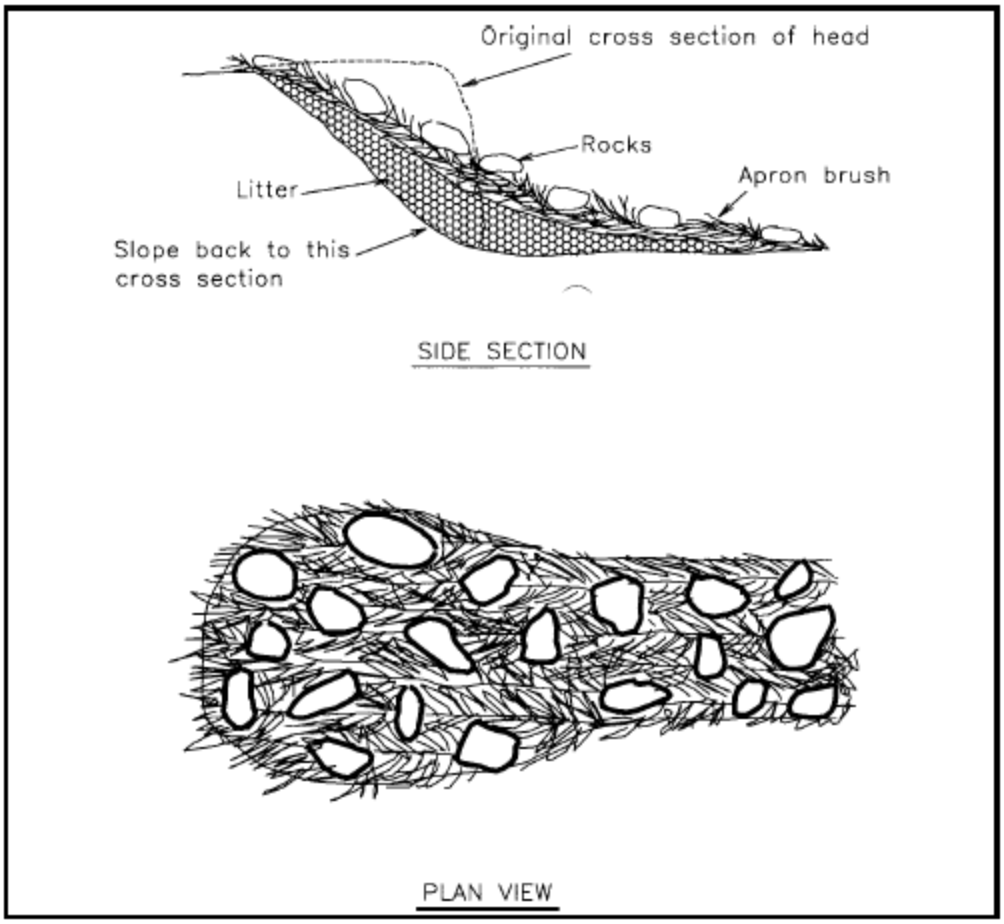


Figure VII-72. Brush and Rock Mattress (Kraebel and Pillsbury, 1934)

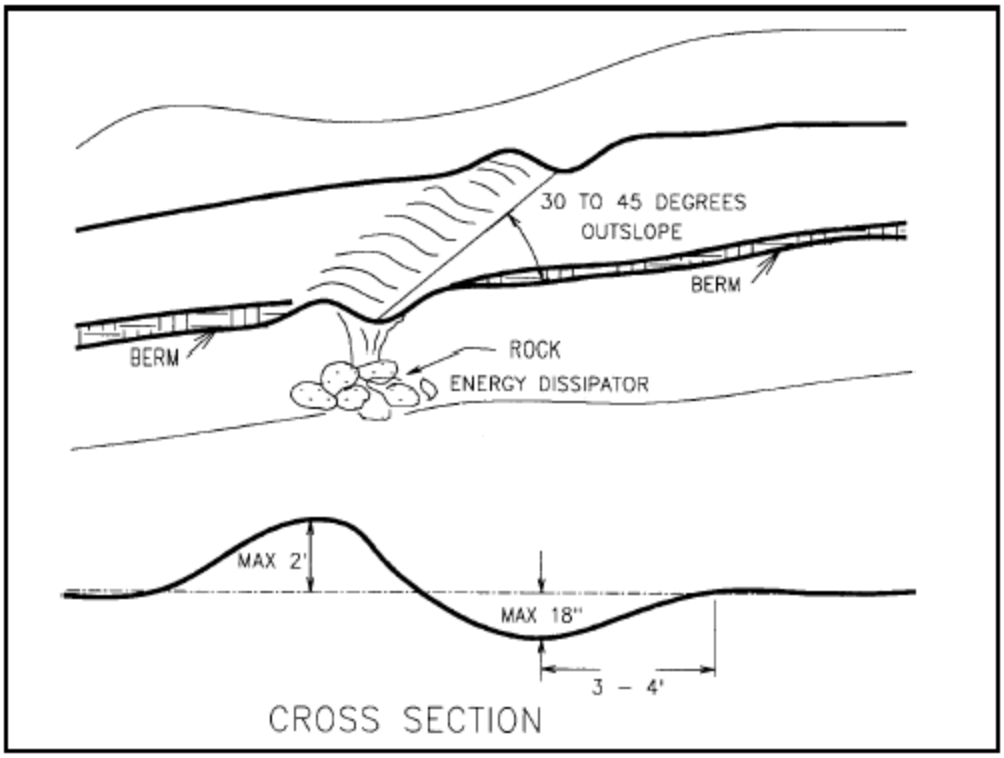


Figure VII-73. Waterbar.

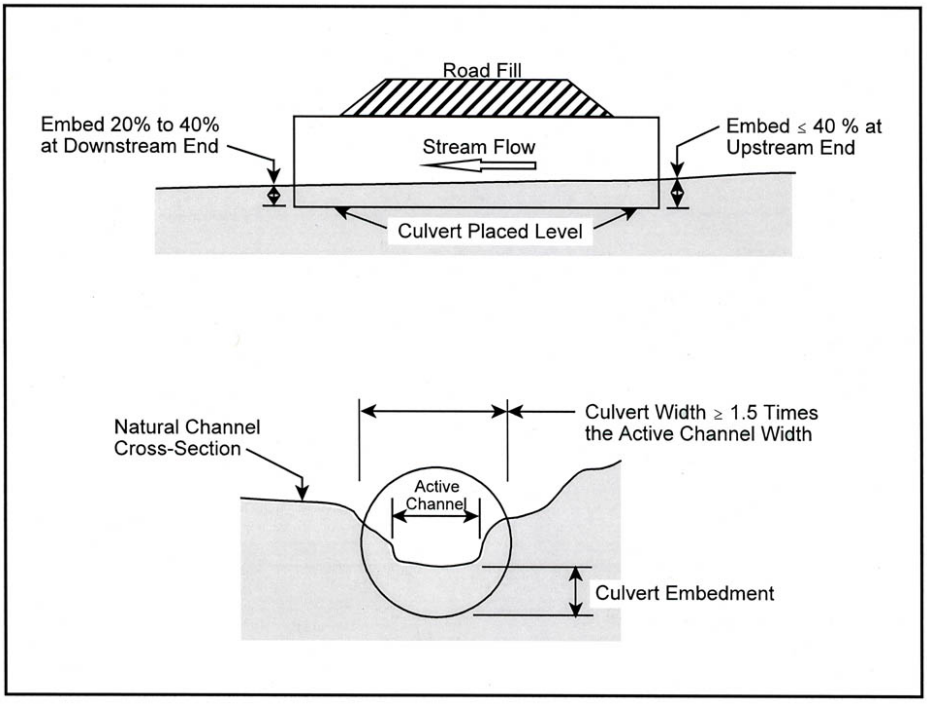


Figure IX-A-1. Active channel design option.

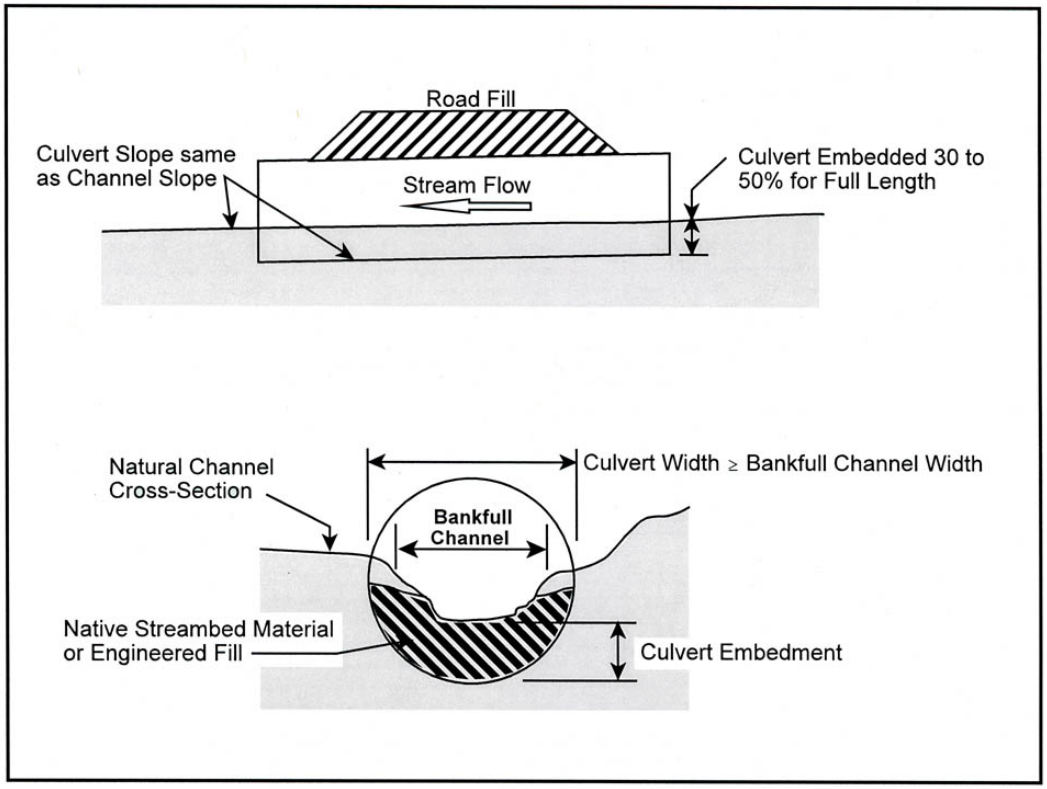


Figure IX-A- 2 Stream simulation design option.

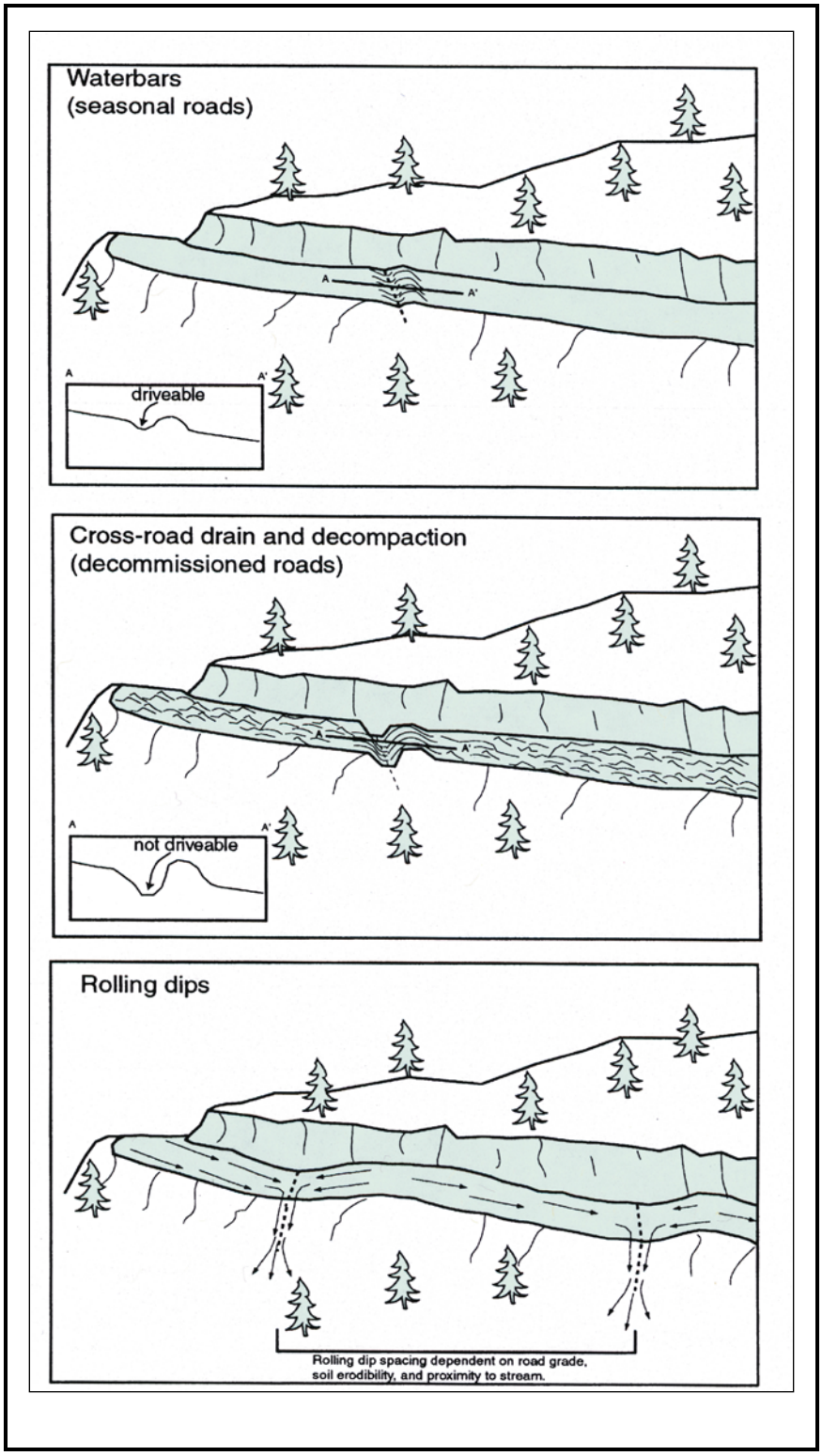


Figure X- 10. Techniques for dispersing road runoff.

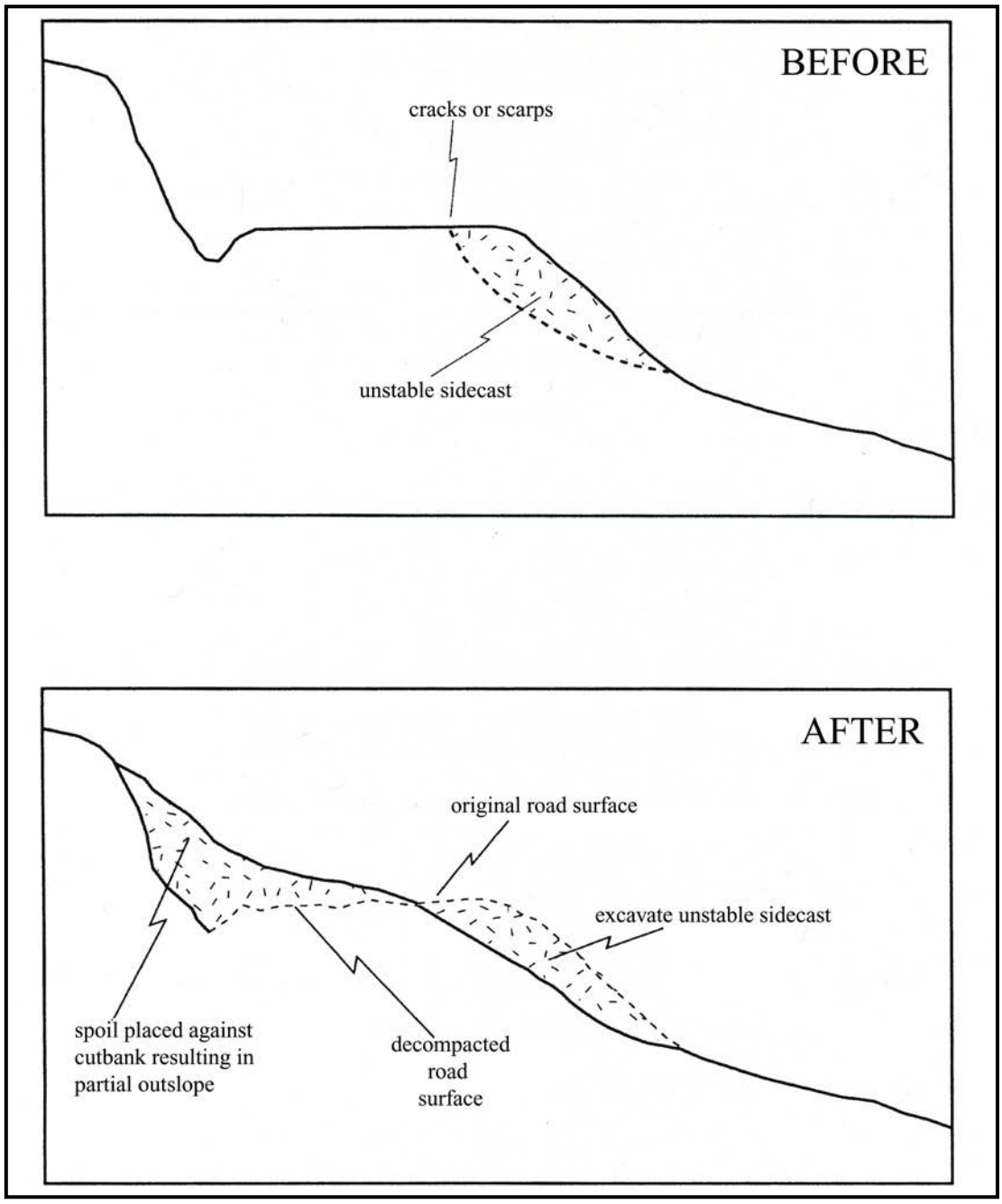


Figure X- 11. Partial outsloping for road decommissioning.

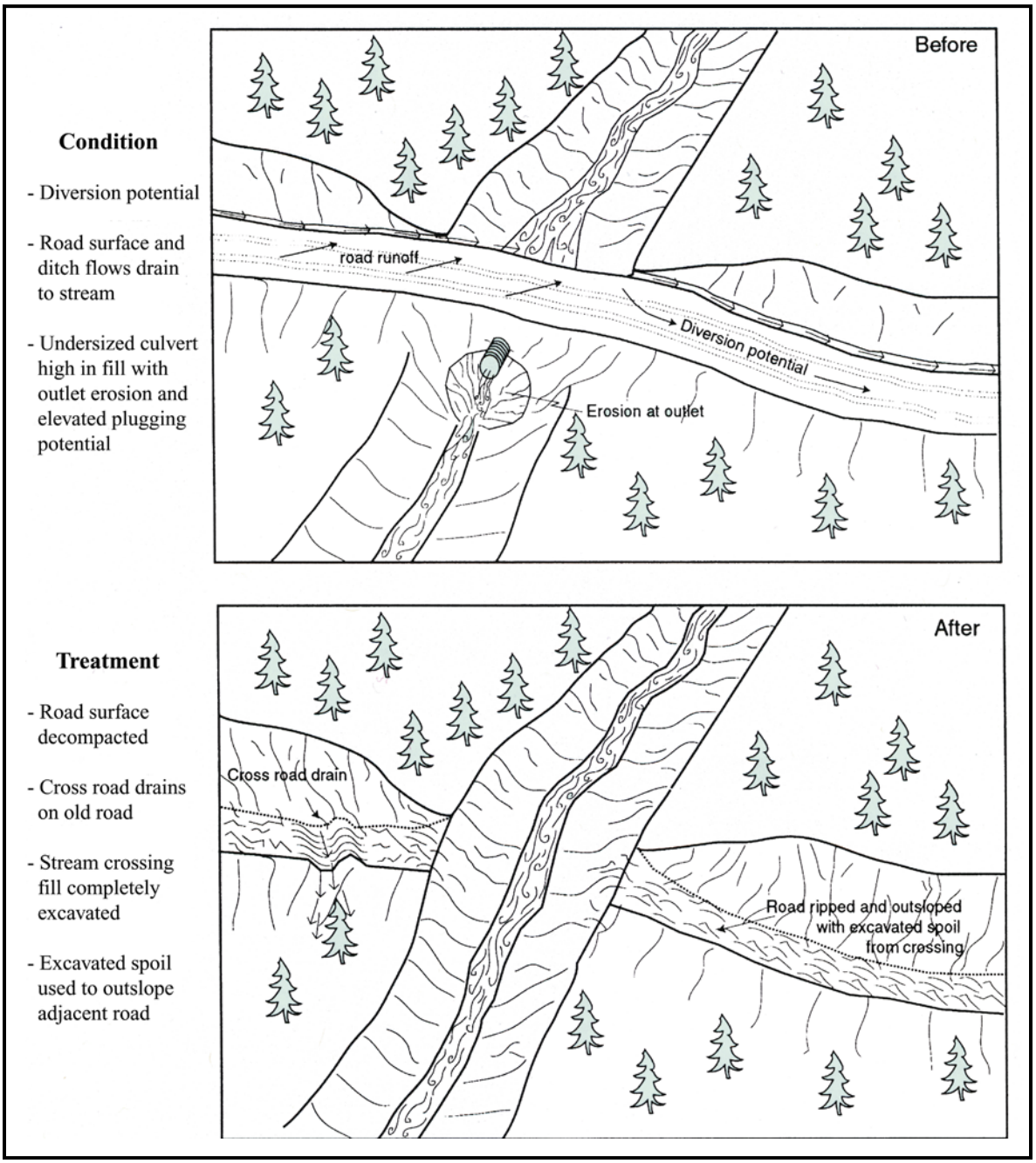


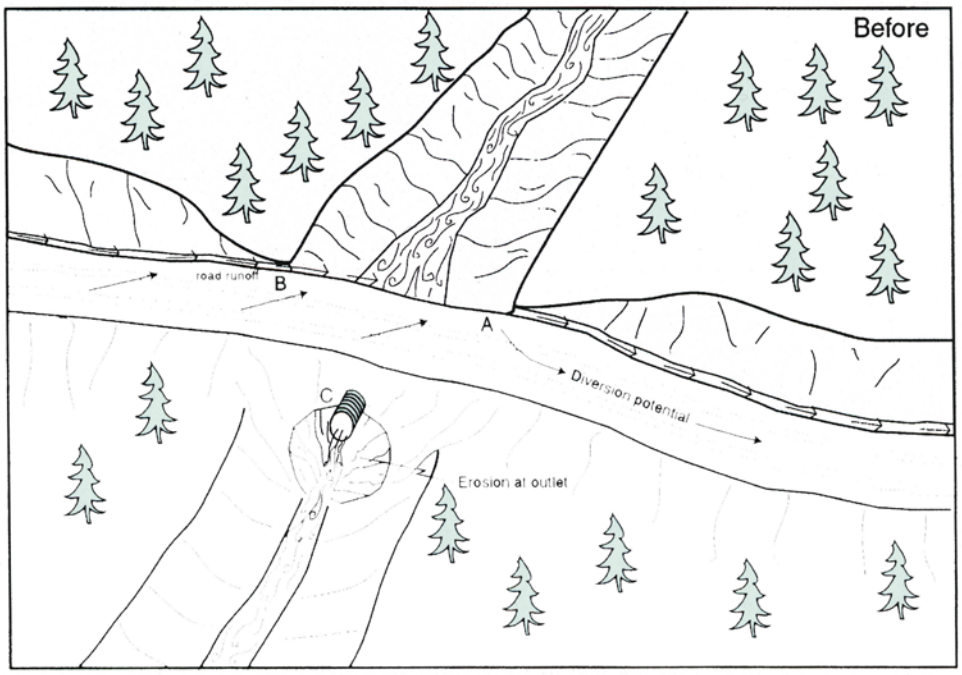
Figure X- 12. Typical stream crossing excavation on a decommissioned road.

Common Problems

A - Diversion potential

B - Road surface and ditch flows drain to stream

C - Undersized culvert high in fill with outlet erosion



General Standards

A - Road surface and ditch "disconnected" from stream

B - No diversion potential

C - 100 year culvert set at base of till

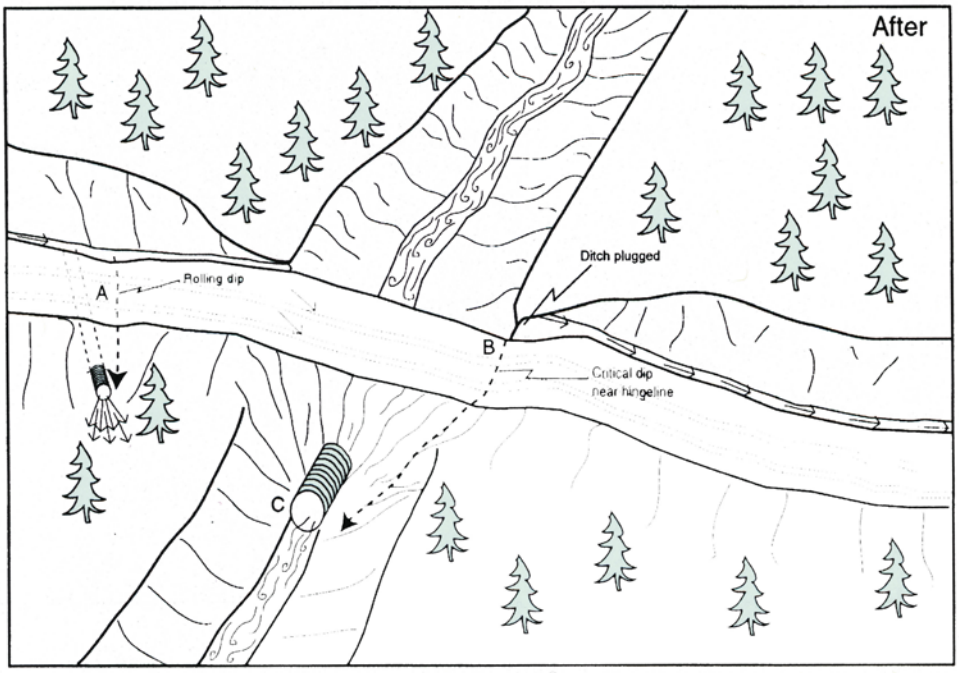


Figure X- 13. Typical upgraded stream crossing.

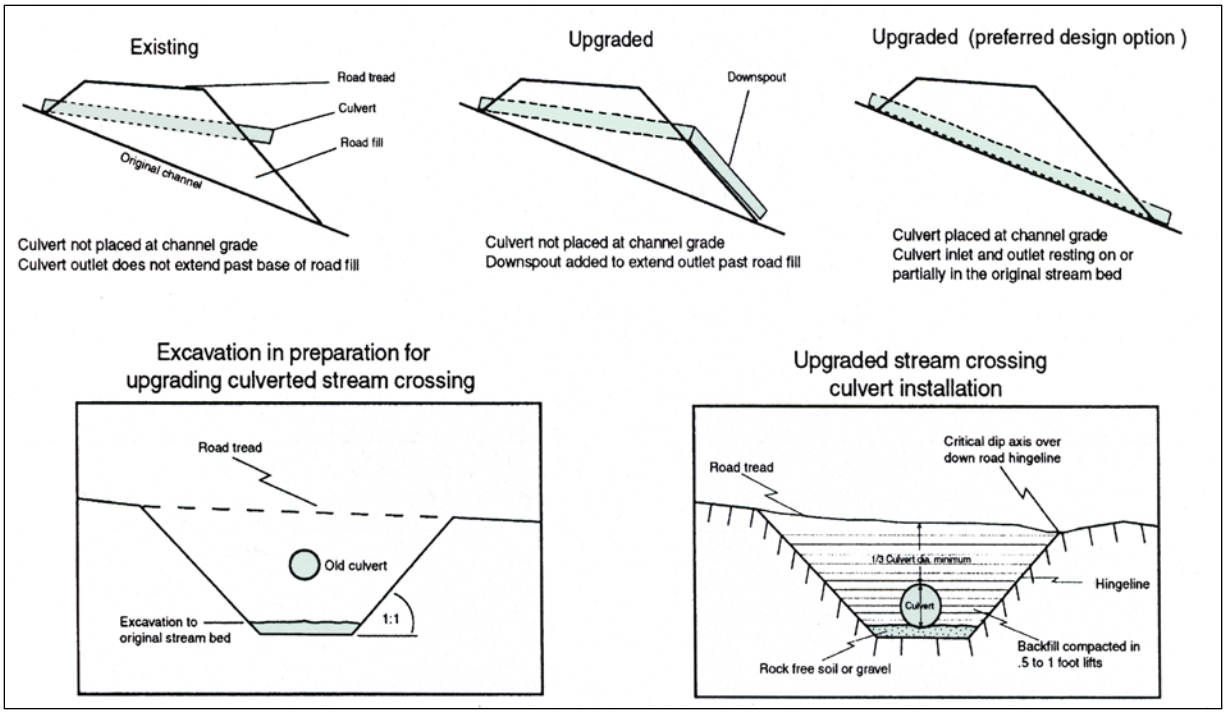


Figure X- 14. Typical culvert installation on non fish-bearing streams.

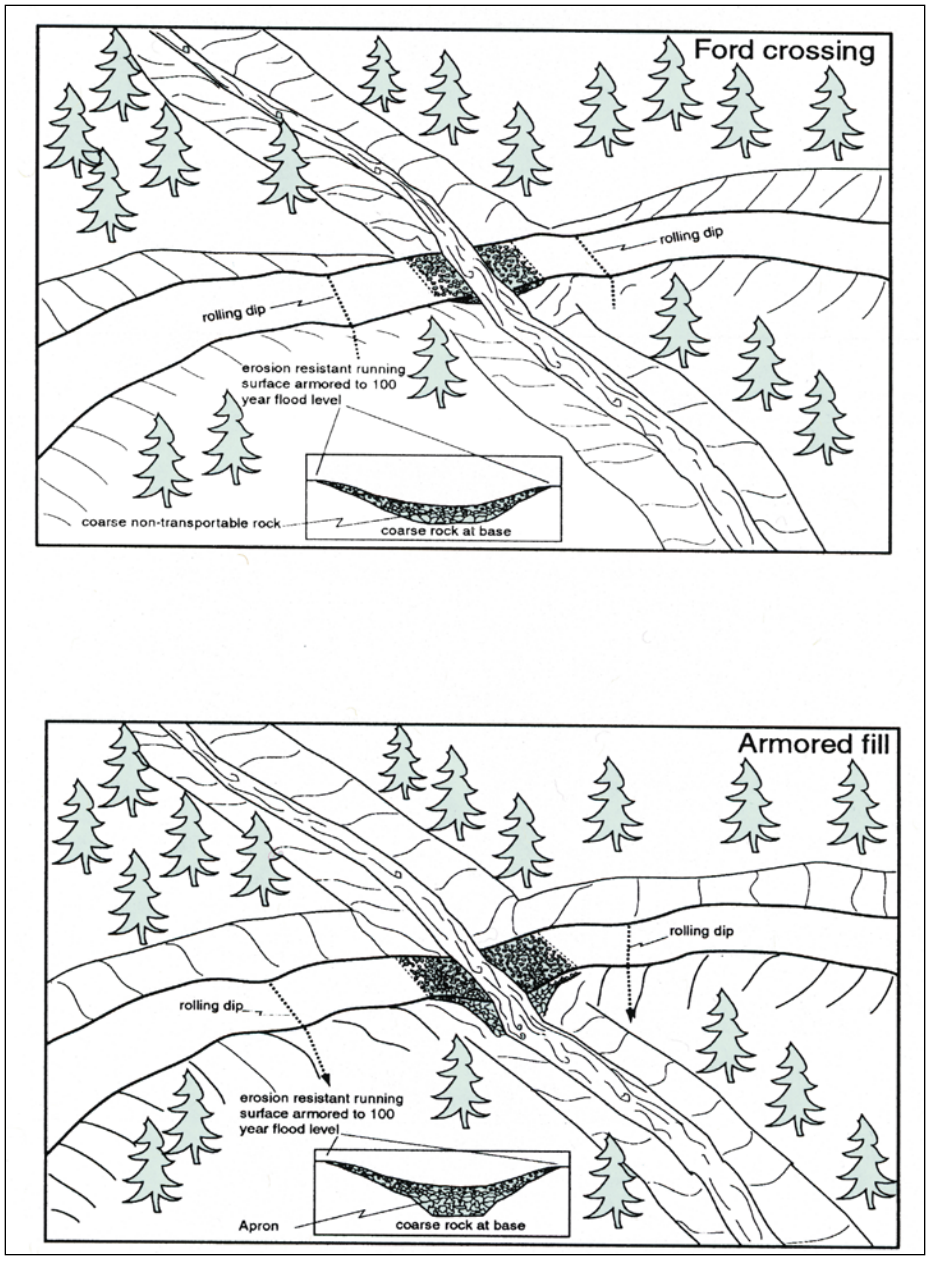


Figure X-15. Typical armored fill stream crossing.

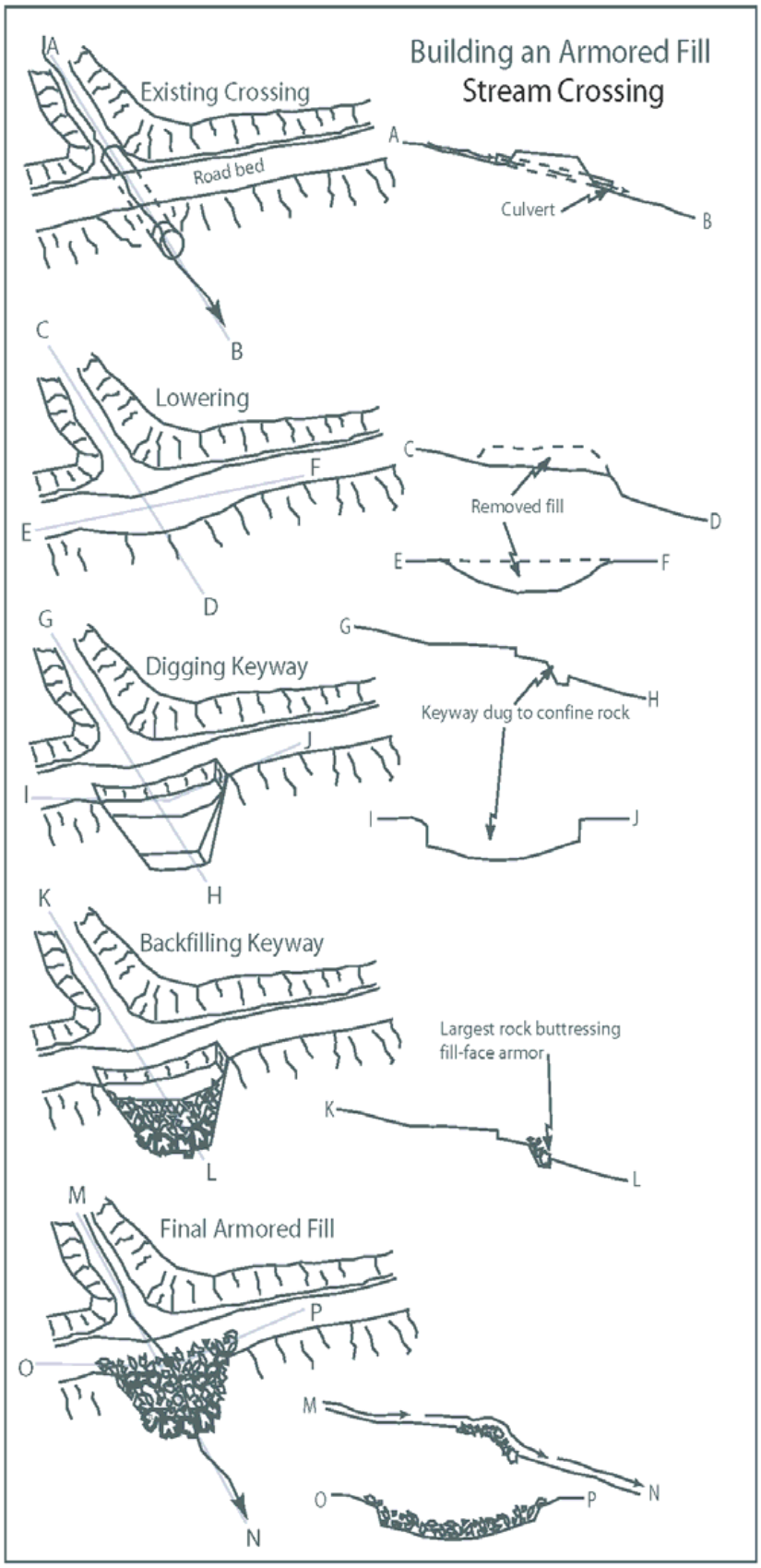


Figure X-16. Design elements of a typical armored fill crossing.

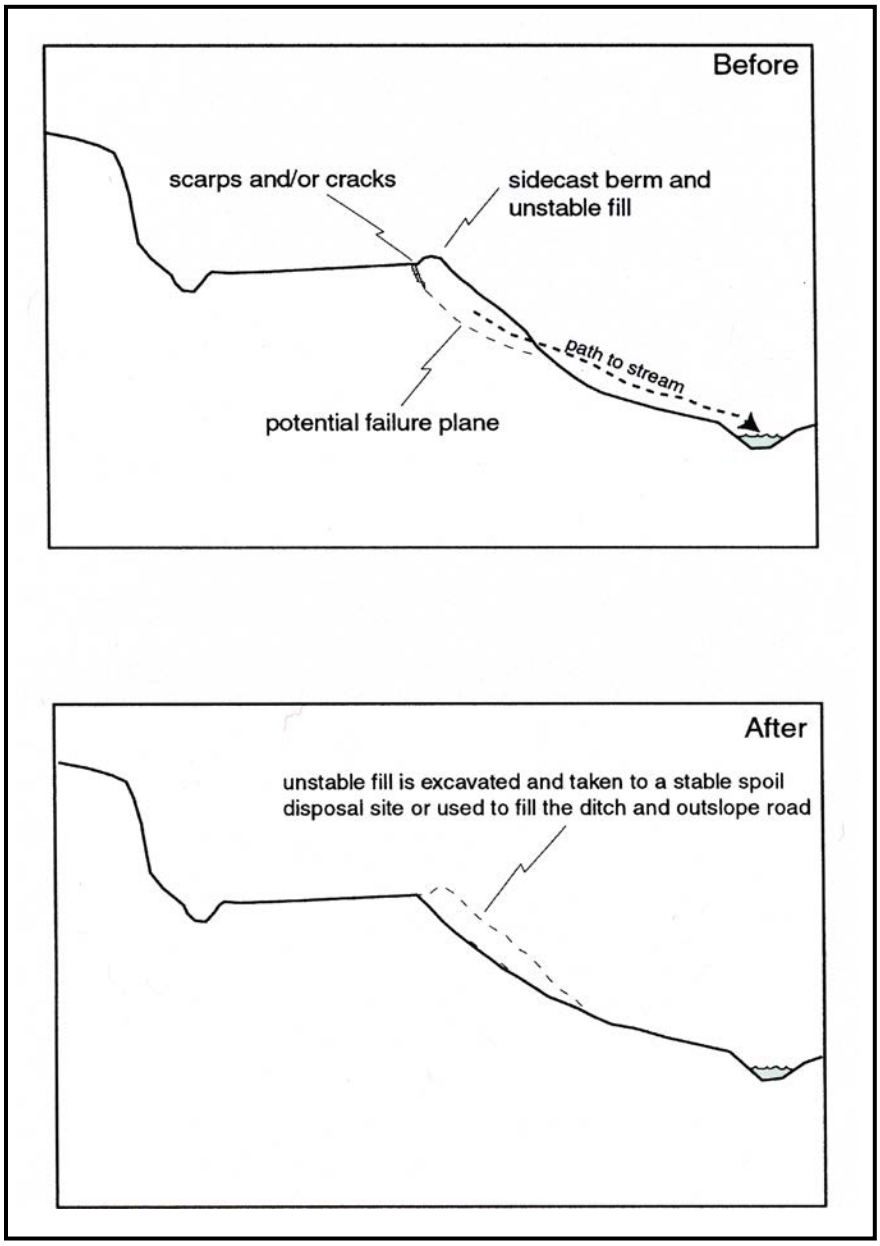


Figure X- 17. Removal of unstable sidecast materials.

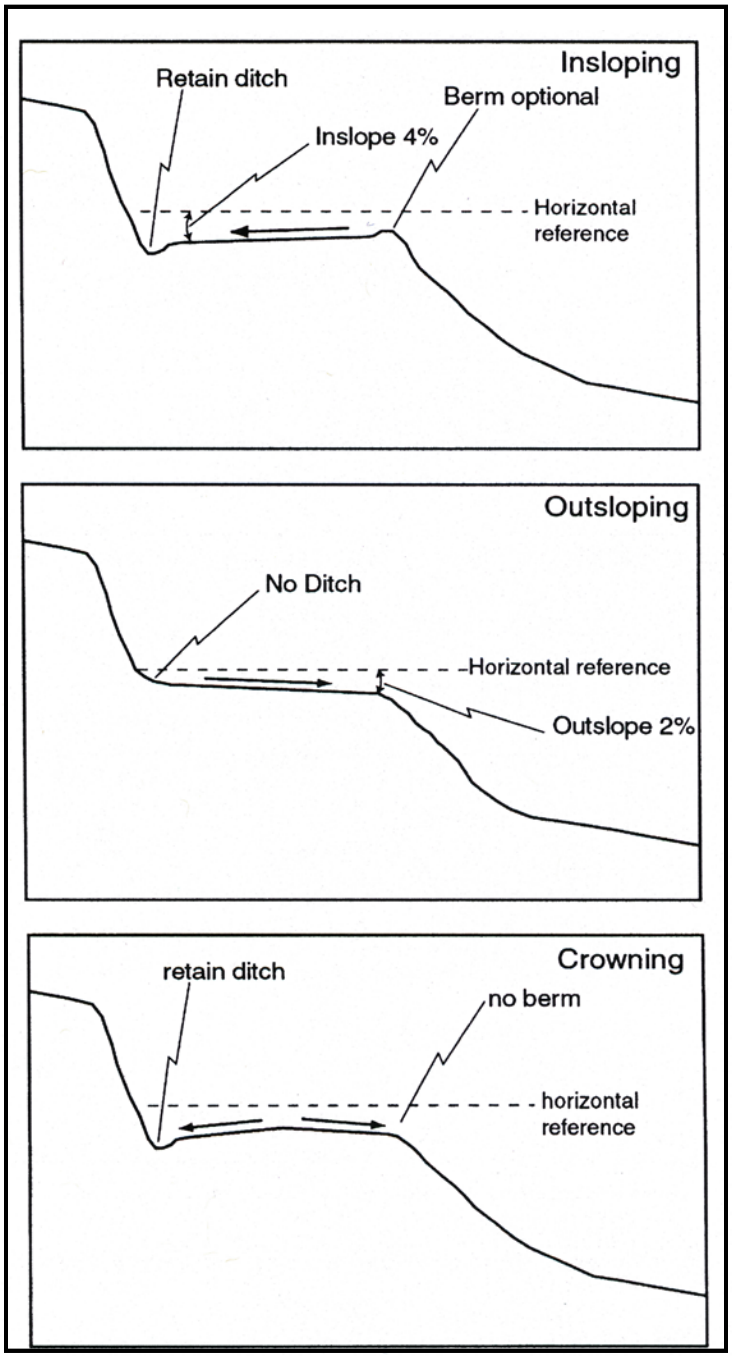


Figure X- 18. Utilizing road shape to reduce surface runoff rates.

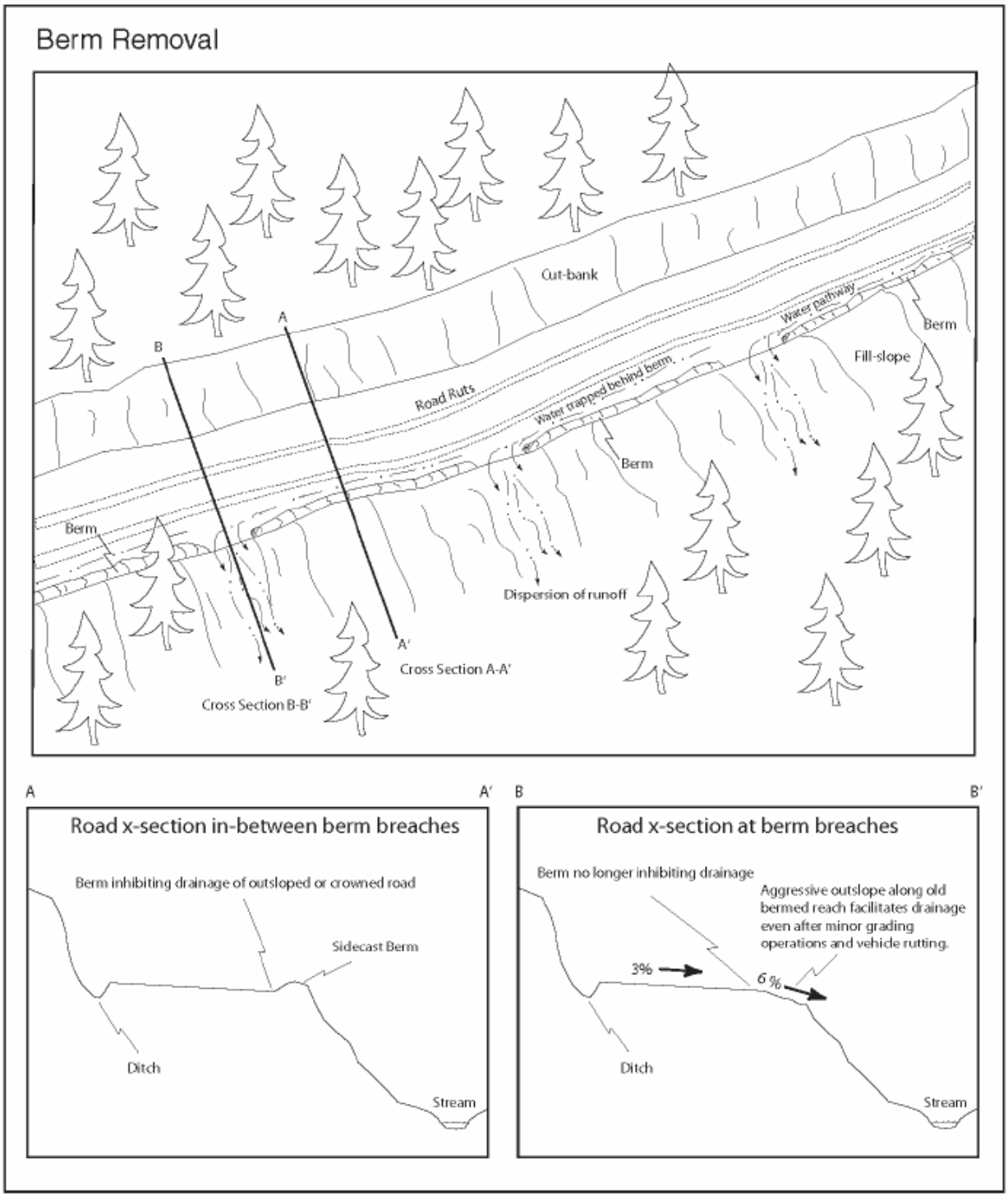


Figure X-19. Berm removal for improved drainage on outsloped and crowned roads.

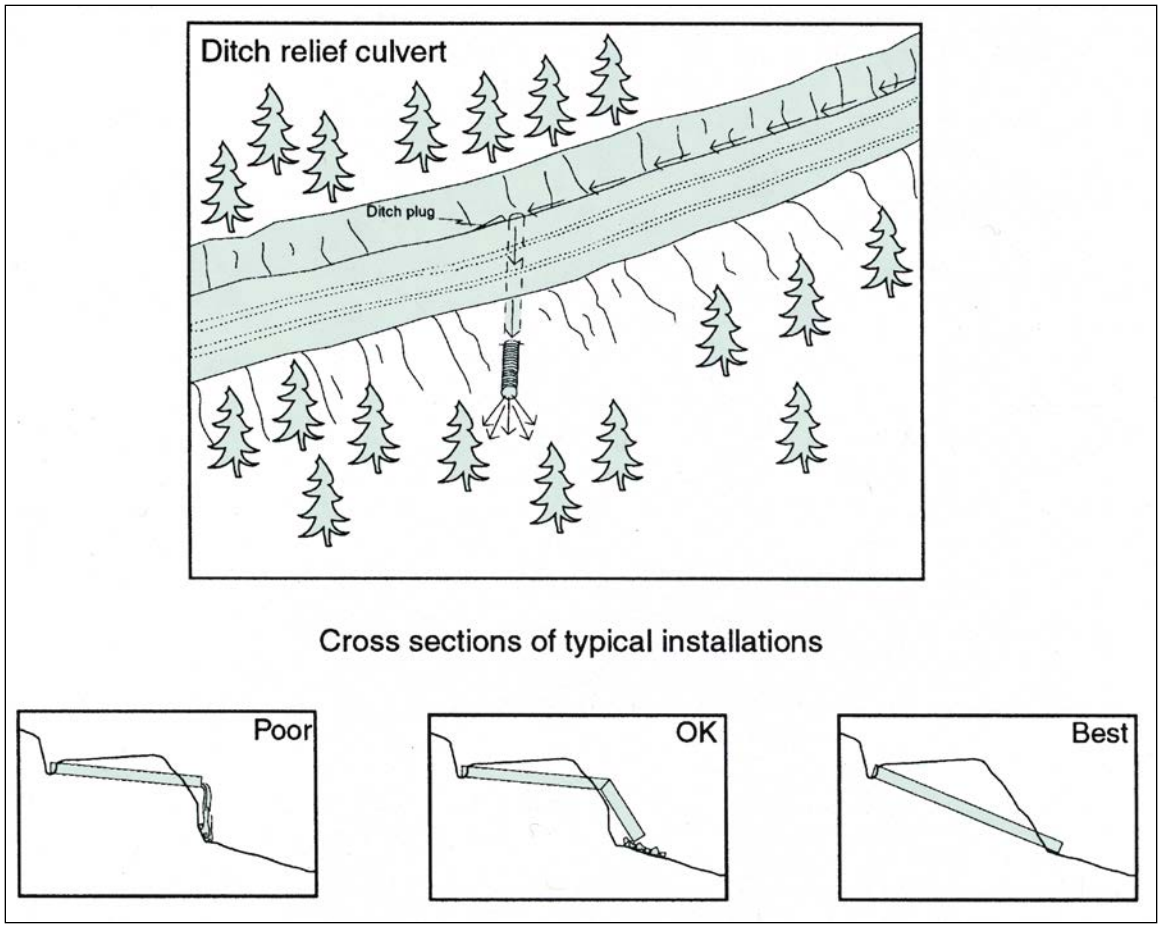


Figure X- 20. Typical ditch relief culvert installation.

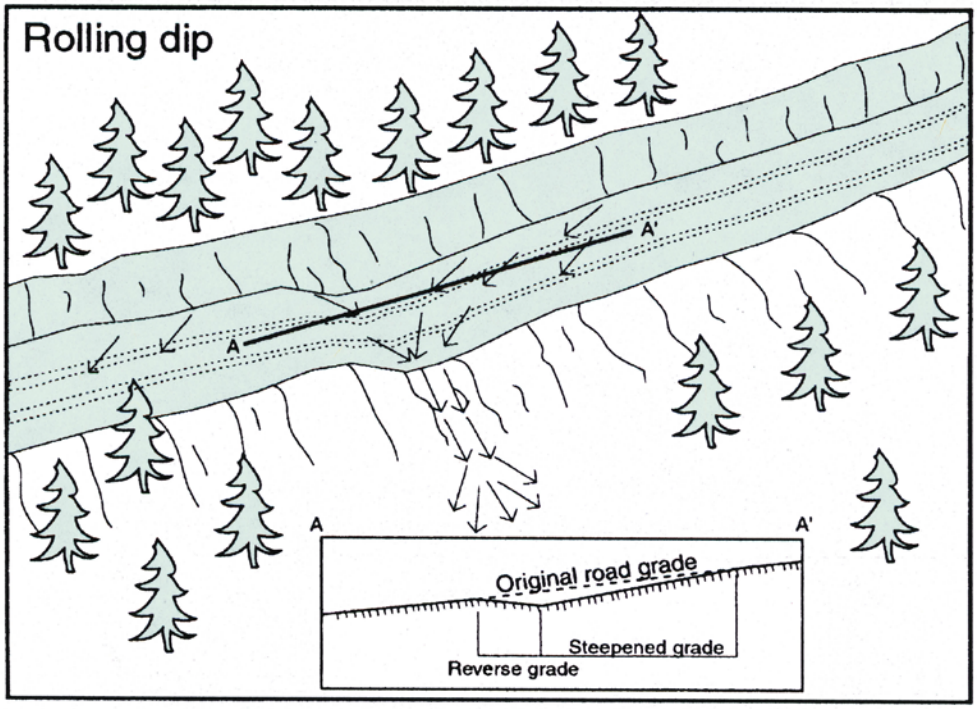


Figure X-21. Use of rolling dips to reduce ditch erosion and surface runoff.