7.8 Road Deactivation Techniques

To reduce potential adverse effects on adjacent forest resources, there are a number of common techniques available for water management, road fill pullback, and revegetation. Refer to the Best Management Practices Handbook (BMP): Hillslope Restoration in British Columbia - Chapter 3 (PDF, 7.55 MB) for more details on each technique.

7.8.1 Water Management Techniques

Maintain surface drainage patterns consistent with natural drainage patterns by employing one or more of the following water management techniques:

Expand All | Collapse All

Cross-ditch across an intact road

The purpose of a cross-ditch is to intercept road surface and ditchline water and convey it across the road onto stable, non-erodible slopes below the road (Figure 7-1).

A cross-ditch is a ditch across a road excavated to a depth equal to, or greater than, the depth of the ditch at the road cut. Cross-ditches generally have a berm on the lower side, and a compacted ditchback.

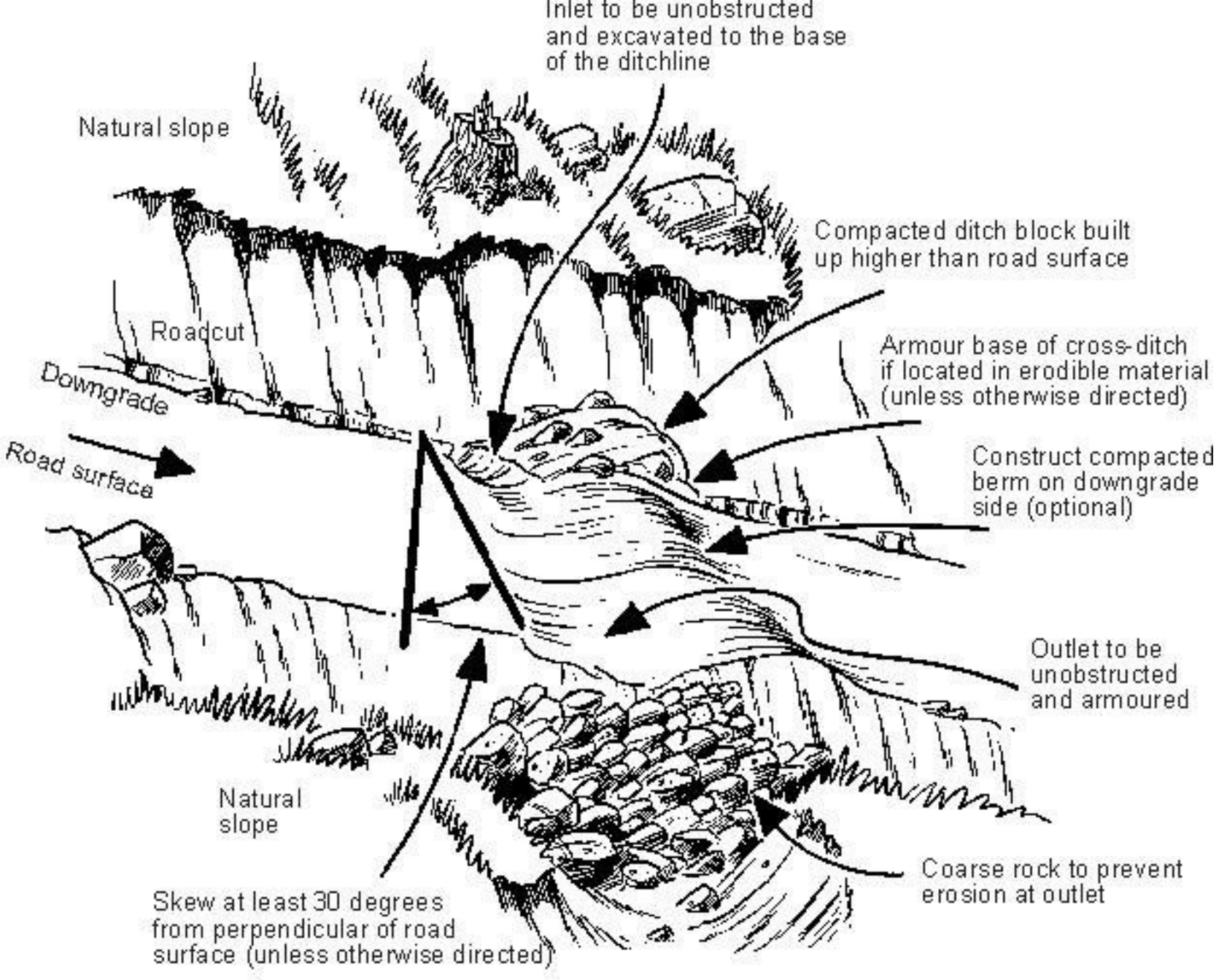
Install a well-compacted ditch block immediately downgrade of the cross-ditch inlet. Ensure that the ditch block is:

- higher than the road surface;
- large enough to divert all expected flows into the cross-ditch; and
- non-erodible and relatively impermeable.

Where ditchwater converges at low points in the road, construct the cross-ditch as a broad gentle swale so that no ditch block or berm is required. If constructed properly, cross-ditches are maintenance free.

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.1 (PDF, 7.55 MB) for further details.

Figure 7-1 Cross-ditch installation across an intact road



Note: Refer to Typical Road Deactivation Prescriptions Drawings in Appendix III

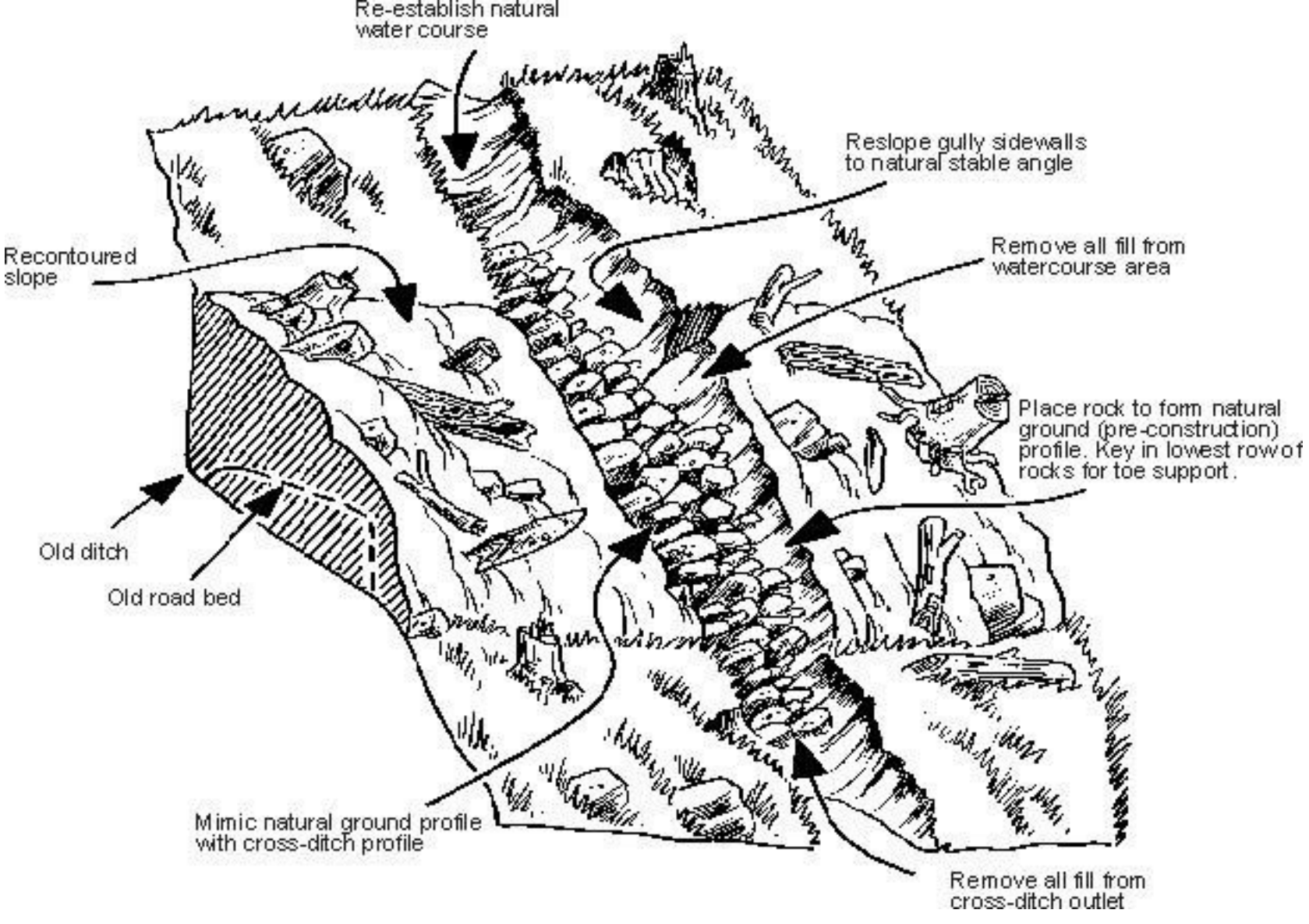
Cross-ditch in full pullback

The purpose of a cross-ditch located within segments of full road fill pullback is to restore the natural drainage paths to pre-construction (historic) locations along the hillslope (Figure 7-2). Since water flow along the surface is not possible in areas of road fill pullback, fewer cross-ditches are needed in pullback than for roads where pullback is not carried out.

A cross-ditch in pullback is a ditch across the old roadbed connecting a natural hillslope drainage path (streams, gully channels, and swales with flow). Excavate cross-ditches in pullback down to natural (undisturbed) non-erodible material.

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.2 (PDF, 7.55 MB) for further details.

Figure 7-2 Cross-ditch installations across full road pullback



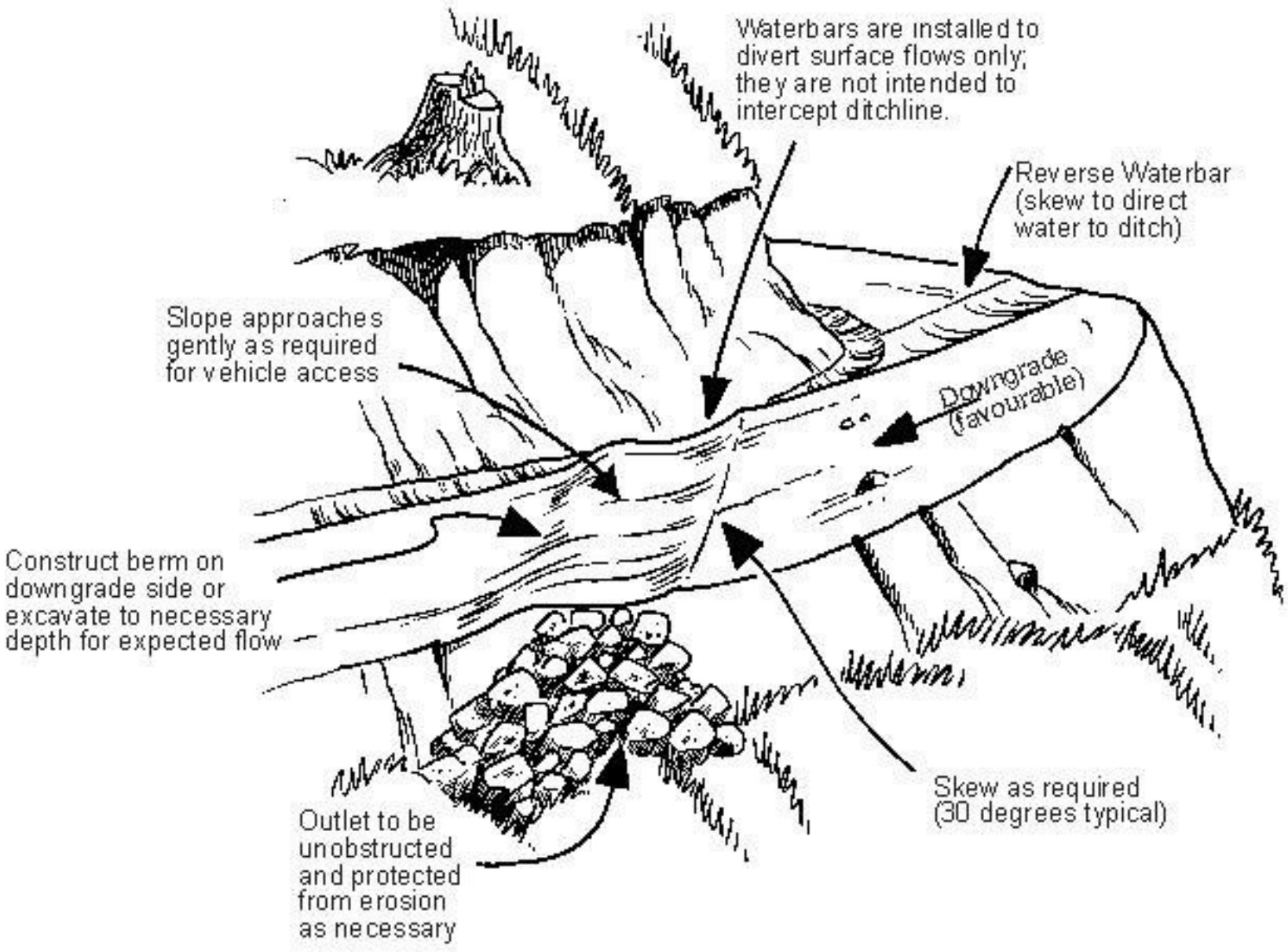
Waterbars

The purpose of a waterbar is to intercept surface water on the road and convey it across the road onto stable slopes below the road. Also, use waterbars to reduce the flow energy along the grade. Reverse waterbars direct flow off the road into the drainage ditch (Figure 7-3).

A waterbar is a shallow ditch across a road, skid trail, or backspar trail to prevent excessive flow down the road surface (or trail). Waterbars are not intended to intercept ditchlines; thus, the base of the waterbar is above the base of the ditch and a ditchblock is not required.

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.3 (PDF, 7.55 MB) for further details.

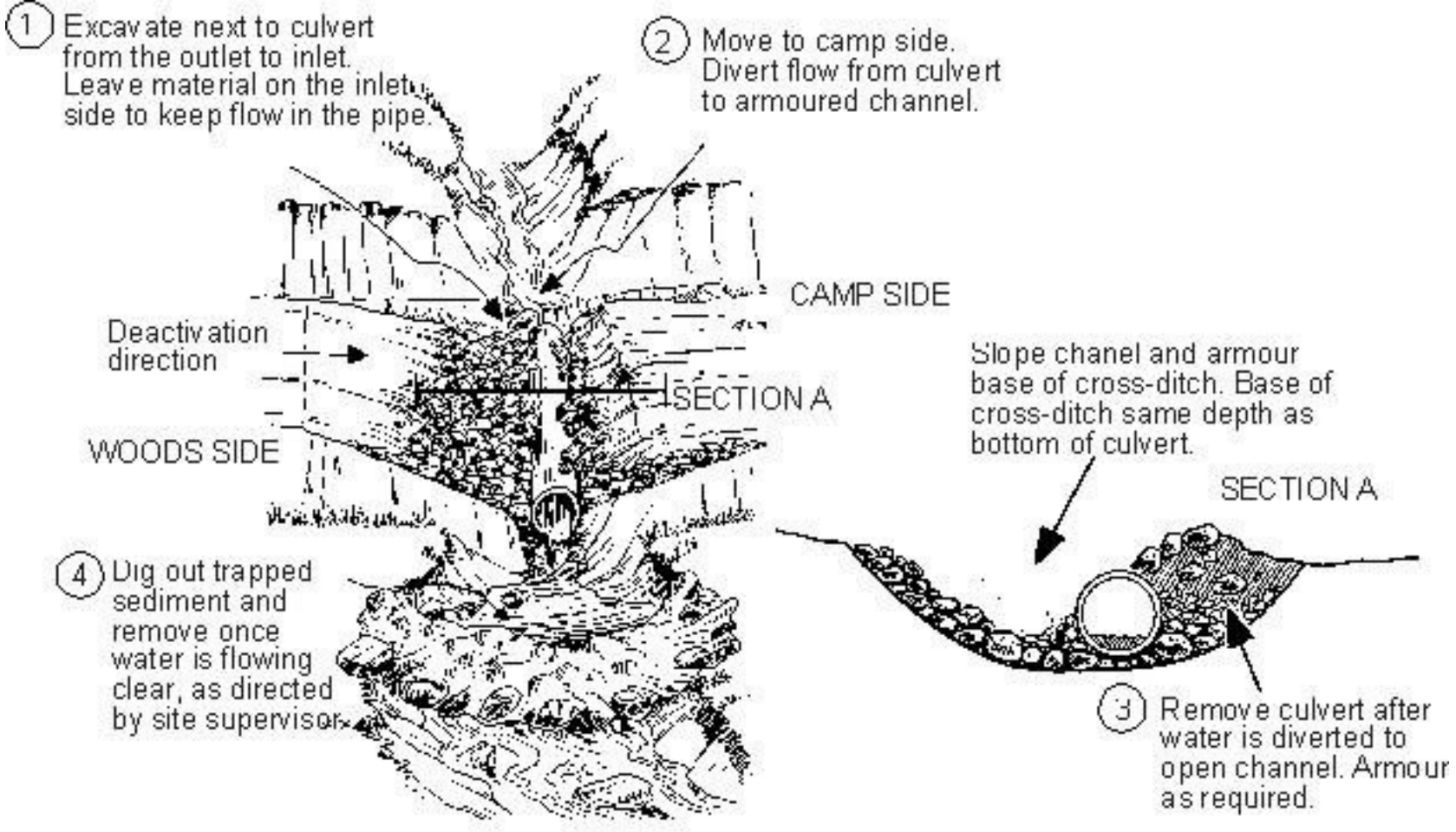
Figure 7-3 Waterbar installation



Stream culvert removal

Remove stream culverts (metal or plastic pipes or log culvert stringers) and reconstruct the channel, to remove the existing culvert while creating the least amount of sedimentation possible and leaving a cross-ditch. Re-establish the natural width and gradient of the stream, and armour the streambanks (sides of the cross-ditch) and the base of the channel. The size, depth, and shape of the re- established stream crossing depend on the hillslope and creek/gully contours and expected flows. (Figure 7-4) and (Figure 7-5) show techniques that can be used to remove a pipe or log culvert where running water is present in the channel and the stream is hydraulically connected to fish habitat or community water supplies.

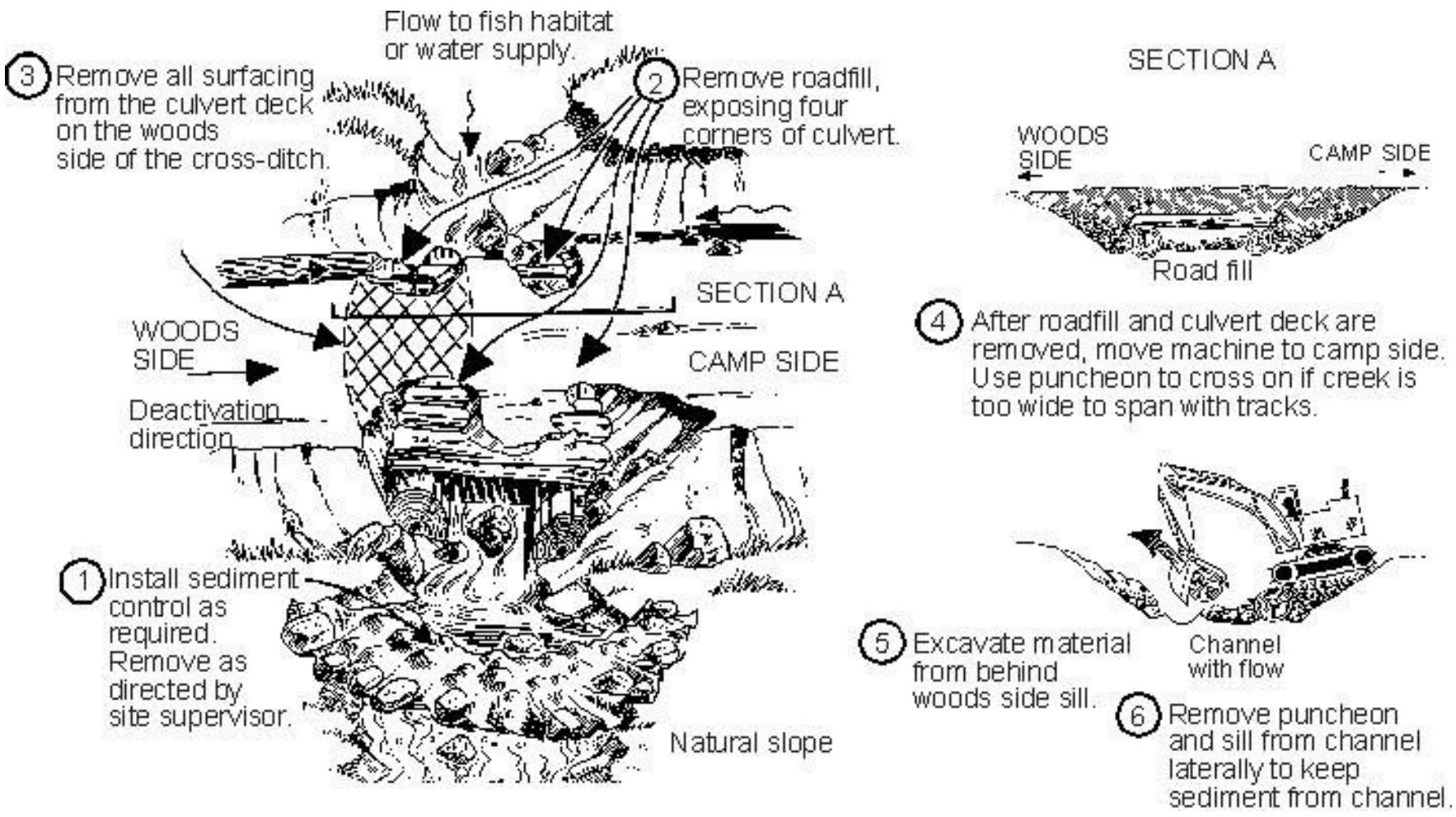
Figure 7-4 Metal or plastic pipe stream culvert removal (non-fish stream)



At challenging sites, explore the range of practical options with fisheries agencies, to ensure that the potential for sedimentation is reduced to acceptable levels.

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.4 (PDF, 7.55 MB) and Chapter 3.5.5 (PDF, 7.55 MB) for further details.

Figure 7-5 Log stream culvert removal (non-fish stream)



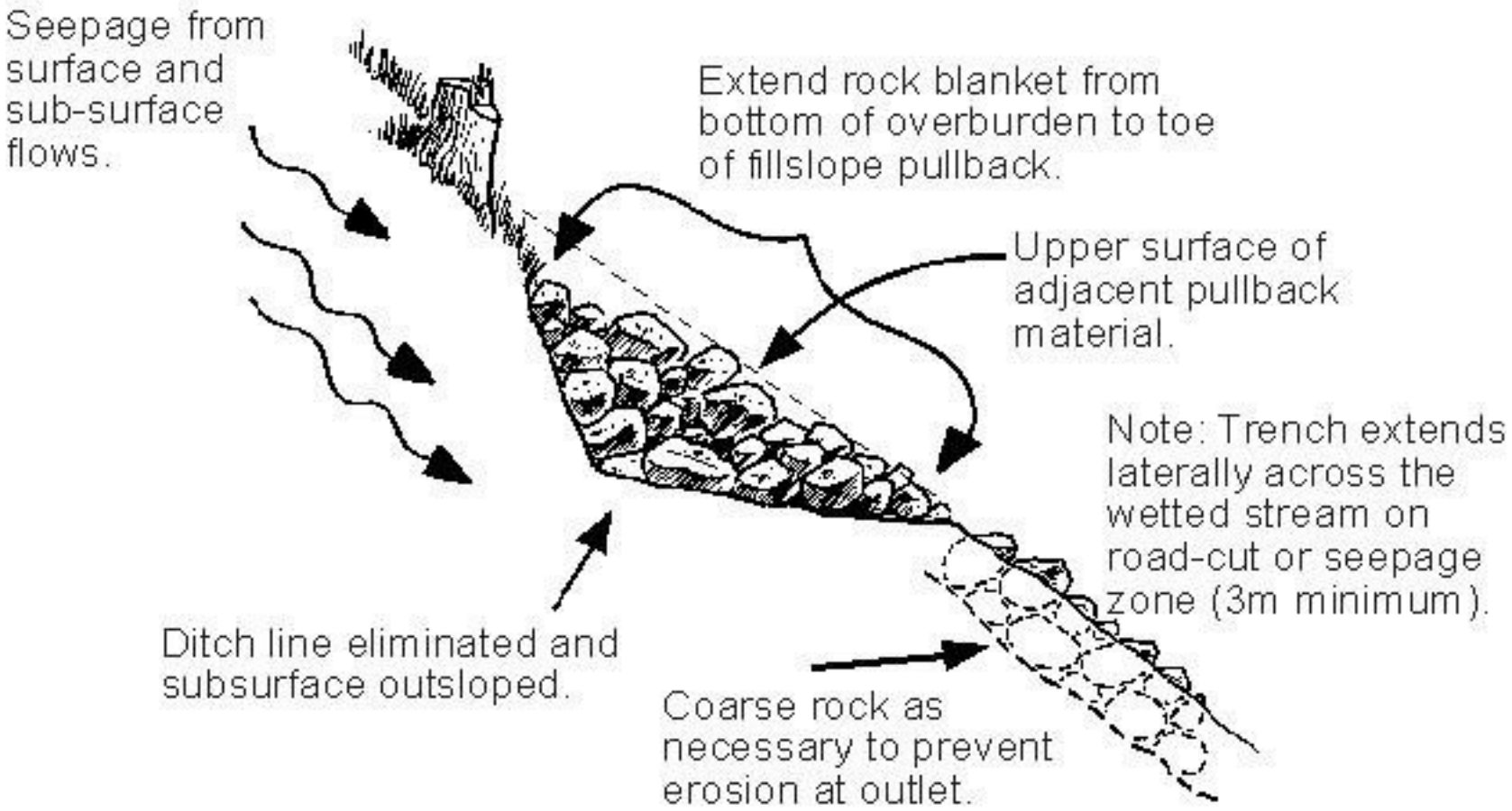
Trench drains

Consider prescribing trench drains in areas of full (heavy) pullback; they are particularly useful where it is necessary to use all the space on the road bench for placement of road fill pullback.

A trench drain is a cross-ditch in road fill pullback that is filled with coarse rock to carry water from seepage areas on the road and/or small surface flows. The purpose of a trench drain is to allow both surface and seepage flow to pass across road fill pullback (Figure 7-6).

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.6 (PDF, 7.55 MB) for details.

Figure 7-6 Trench drain



Blanket drains

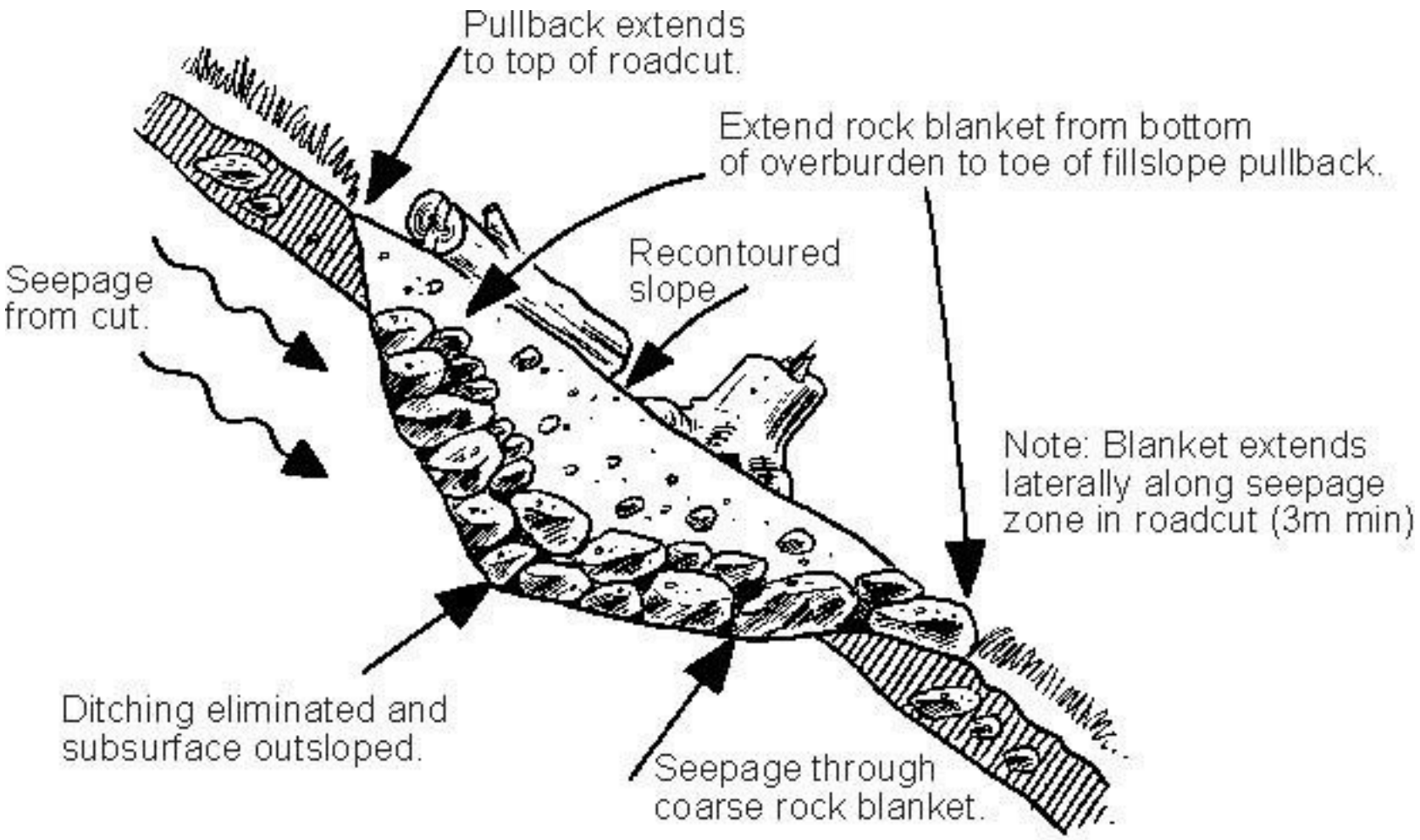
The purpose of a blanket drain is to disperse point seepage or subsurface flow under the road fill pullback. Blanket drains disperse flow rather than concentrate the flow at one hillslope locations, and are not intended to convey surface flows or replace open cross-ditches in areas of substantial flow.

A blanket drain consists of a layer of cobbles or shot rock placed against the seepage zone in the road cut. The blanket extends down the cutslope and across the decompacted road surface to the ground surface. Road fill is placed on top of the road cut to the bottom of the blanket. The blanket of shot rock does not extend to the top of the road cut, but only to the top of the seepage zone.

A blanket drain has a wider “footprint” in plan than a trench drain: it commonly extends a greater lateral distance along the road, providing increased flow capacity (Figure 7-7).

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.7 (PDF, 7.55 MB) for further details.

Figure 7-7 Blanket drain



French drains

The purpose of a French drain is to divert flow along the base of a cut slope and discharge it into a stable location, such as a creek or gully. Use French drains where road fill pullback or bank sloughing may block the ditch and cause water management problems. These drains also provide some degree of water management if the road cannot be decompacted to below ditchline depth. The rock-filled French drain extends down the ditchline until it intersects, and is hydraulically connected with, a cross-ditch or gully.

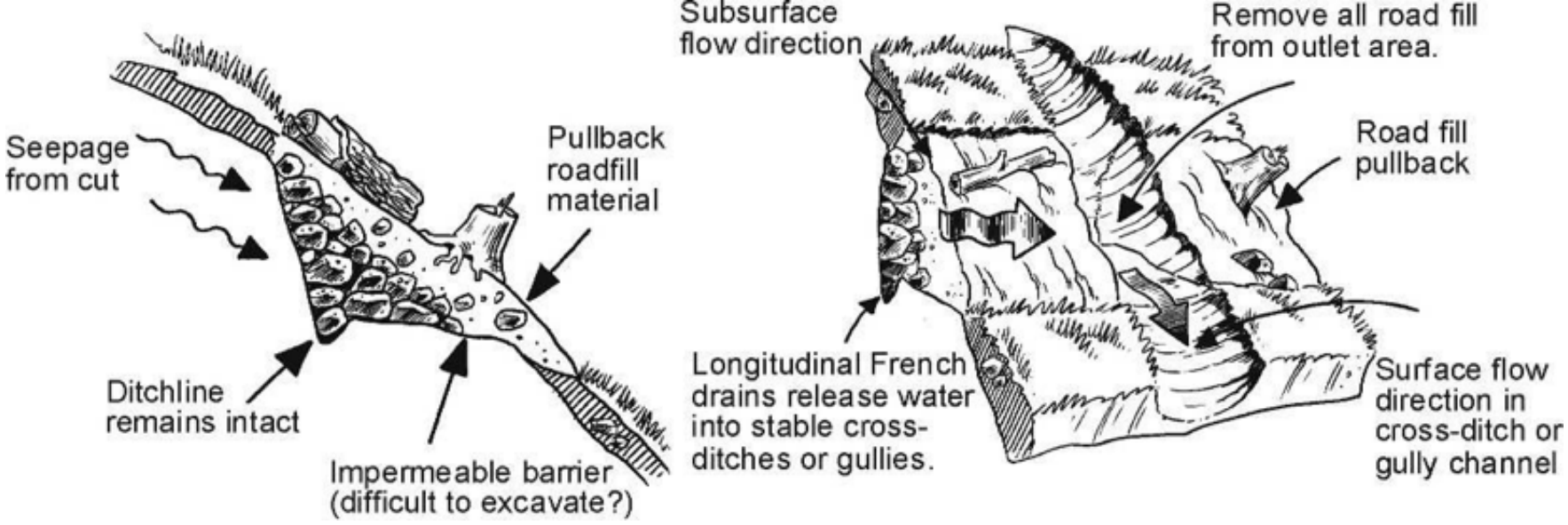
Consider using a French drain where a cross-ditch is impractical, specifically:

- where the seepage zone is extensive in length;
- the retrieved road fill will be impermeable when placed against the road cut; and
- the stability of the road fill material may be compromised if it becomes saturated.

Normally, use French drains in conjunction with road fill pullback (Figure 7-8).

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.8 (PDF, 7.55 MB) for further details.

Figure 7-8 French drain



Fords and armoured swales

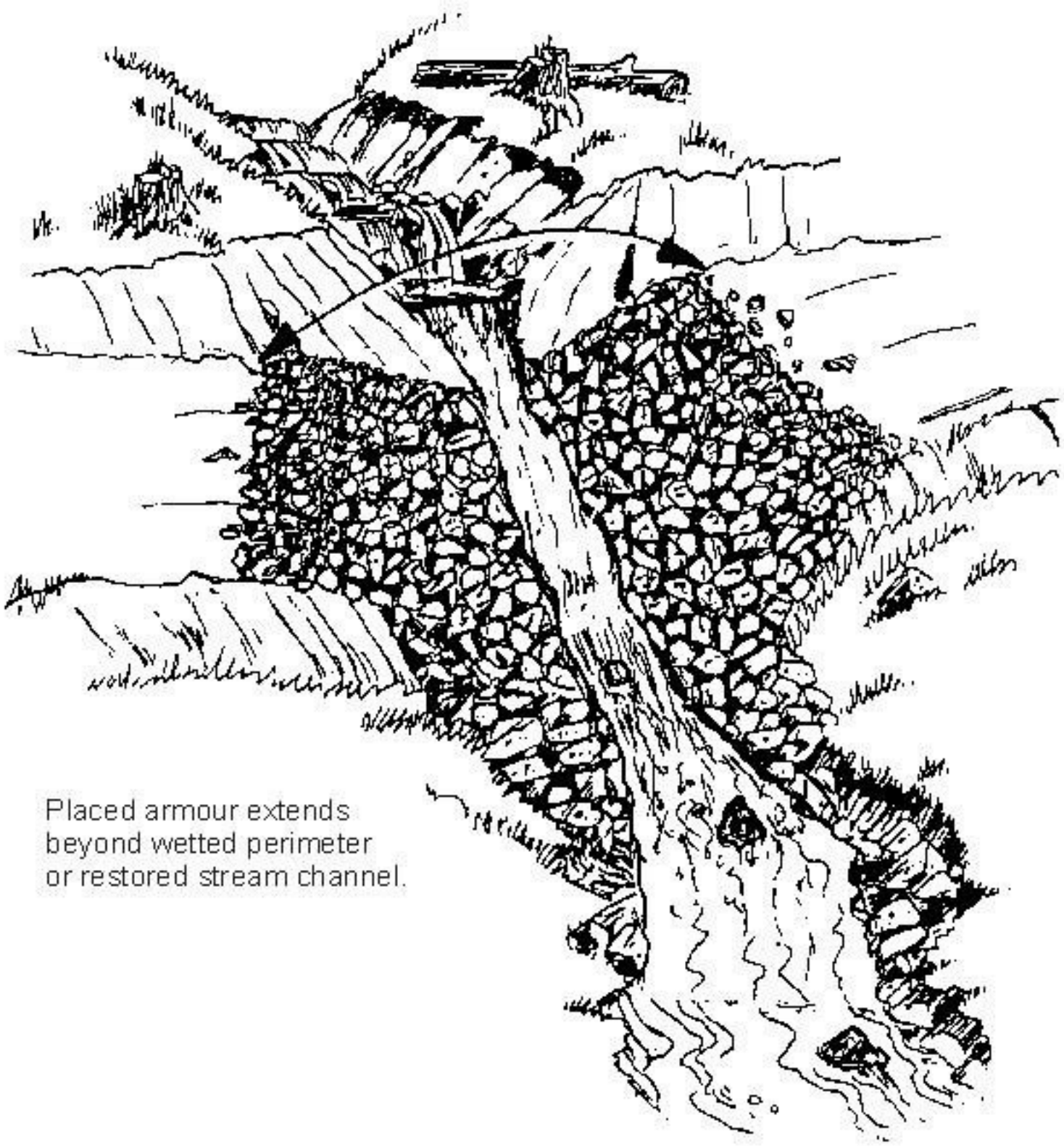
Fords and armoured swales provide erosion-resistant and storm-proof wet crossings for motor vehicles. A ford is used to cross a stream, whereas an armoured swale is constructed where a cross-ditch would normally be used.

Fords

A ford is a dip in a road, constructed to cross a perennial or ephemeral stream, normally designed and built as a permanent feature (Figure 7-9). Fords are a suitable road deactivation option where vehicle access is to be maintained. Fords are restricted to non-fish streams unless otherwise approved by the fisheries agencies. For deactivation, consider protecting the running surface of the ford using rock armour where the natural stream bottom will not support the intended vehicle loads.

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.9 (PDF, 7.55 MB) for further details.

Figure 7-9 Example of a ford installed on a non-fish bearing stream

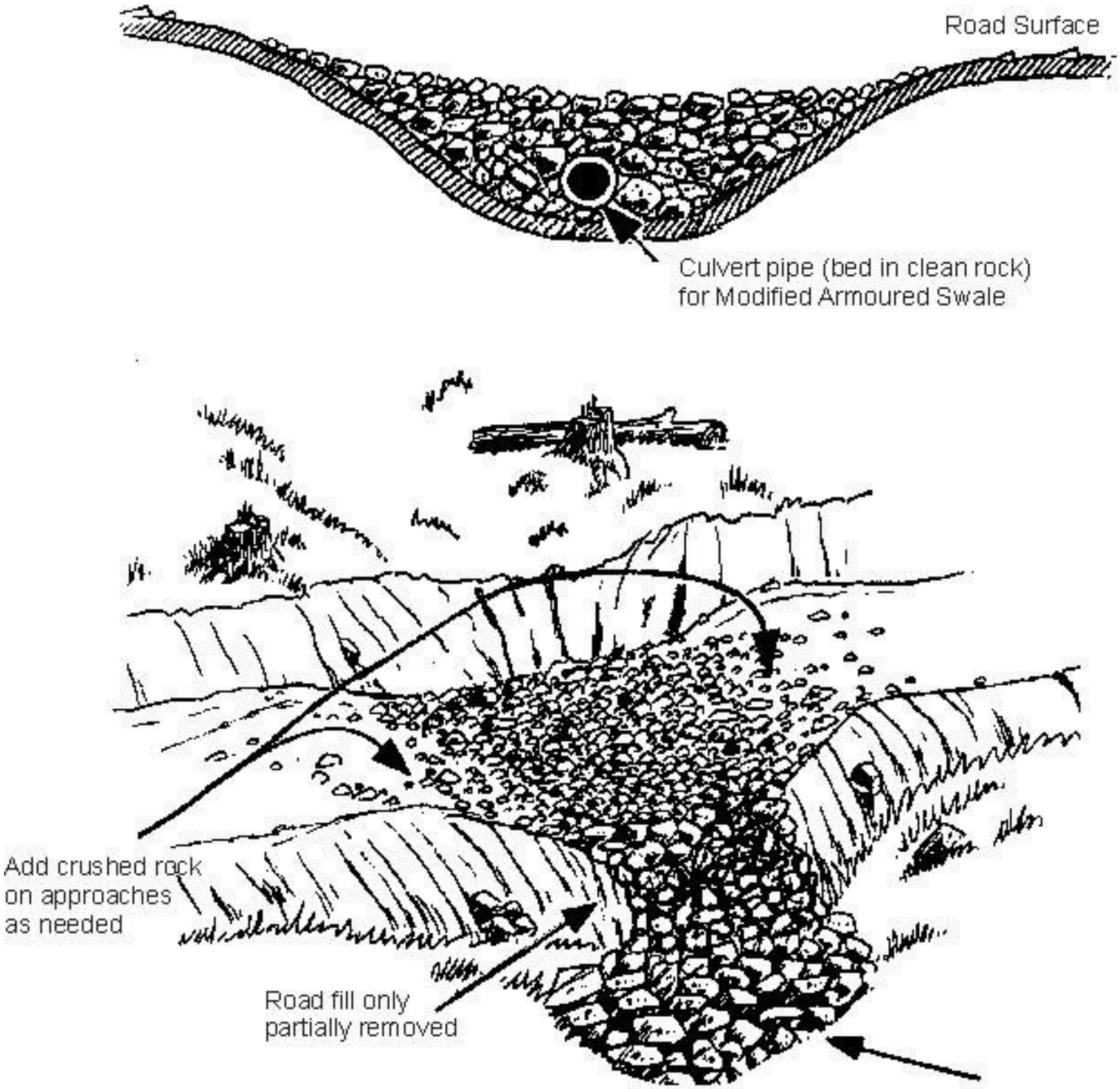


Armoured Swales

An armoured swale is a dip in the road grade, installed to convey road surface runoff, ditchwater, or cutbank seepage across a road during works such as road deactivation, where it is critical to minimize sedimentation while short-term vehicle access is required (Figure 7-10).

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.9 (PDF, 7.55 MB) for further details.

Figure 7-10 Example of an armoured swale



Insloping / outsloping road surface

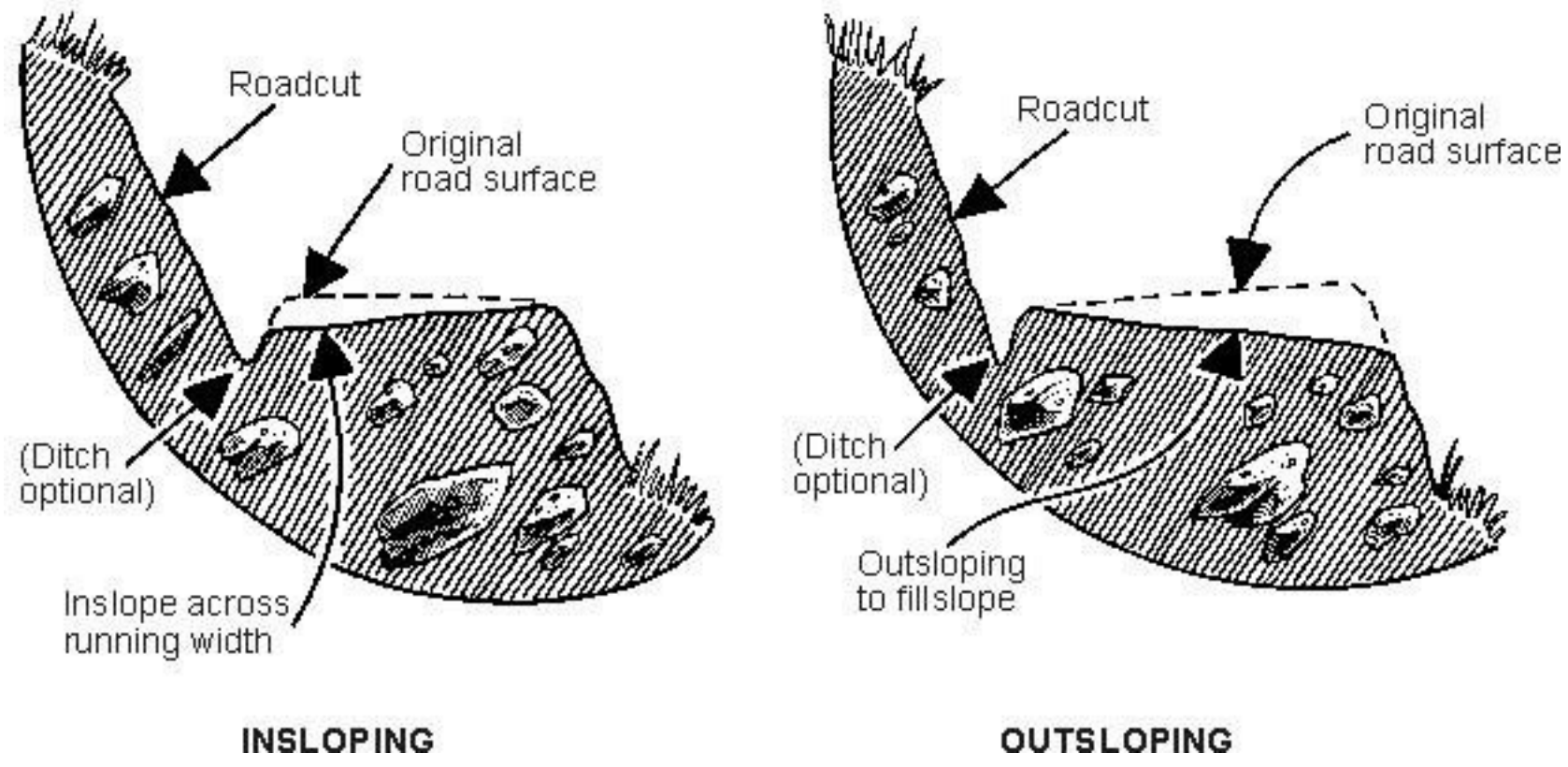
The purpose of insloping or outsloping the road surface is to control water without using ditches or cross-ditches (Figure 7-11).

Insloping is the sloping (reshaping) of the road surface to direct road surface water toward the road cut and away from unstable or erodible road fill materials. Outsloping is the sloping (reshaping) of the road surface to direct water across the road and onto the road fill in a dispersed fashion.

This technique is more effective on roads where there is no vehicle traffic. However, where deactivated roads receive vehicle traffic, the insloping or outsloping will disappear with road use.

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.10 (PDF, 7.55 MB) for further details.

Figure 7-11 Insloping and outsloping the road surface

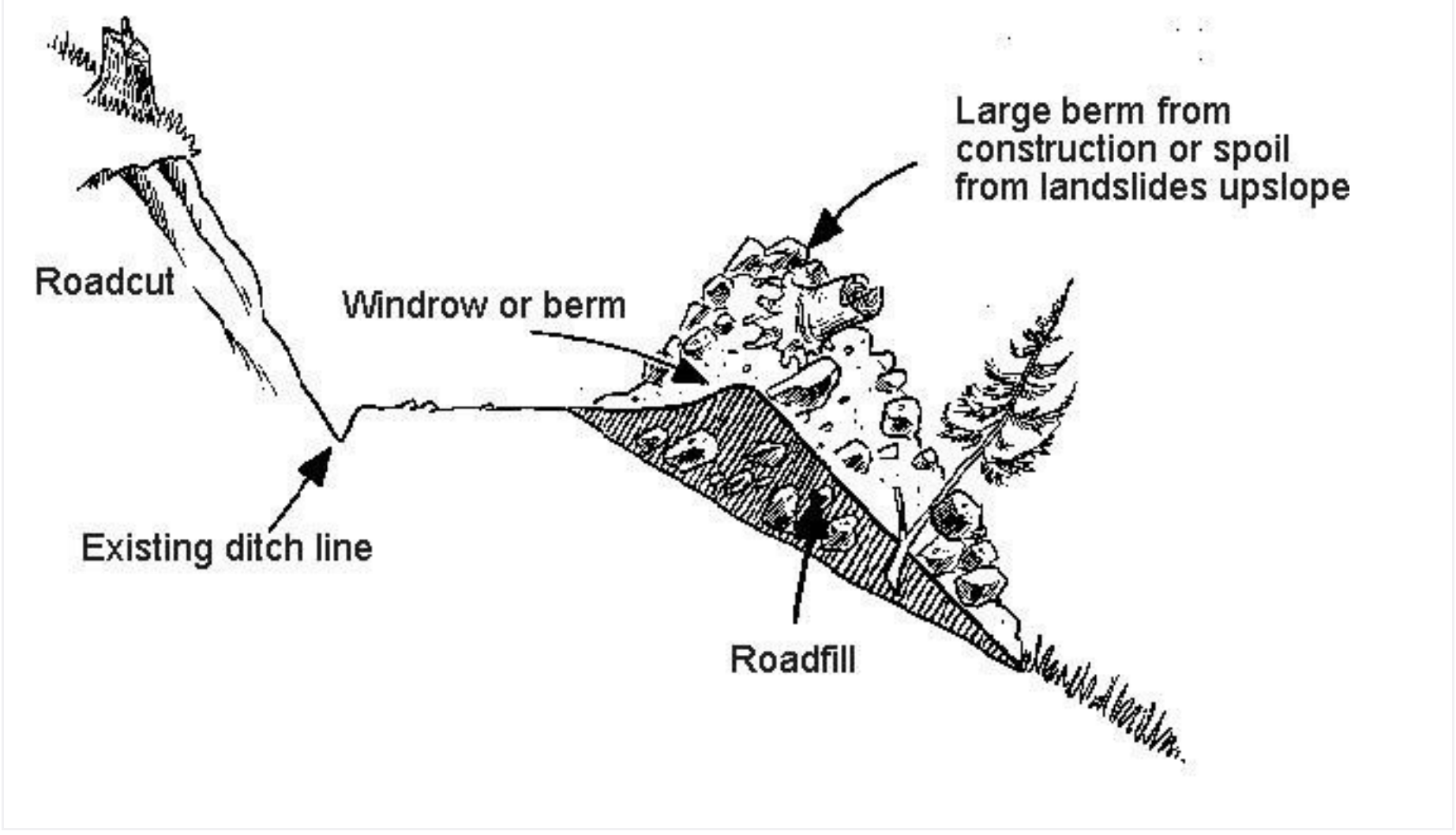


Windrow or roadside spoil pile pullback

The purpose of windrow or roadside spoil pile pullback is to restore natural hillslope drainage paths where road maintenance activities have left a continuous soil berm on the edge of the road. Pull back larger berms to reduce the weight on the outside edge of the road, or to meet silviculture objectives (Figure 7-12).

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.11 (PDF, 7.55 MB) for further details.

Figure 7-12 Grader windrow and spoil pile berm (site conditions before fill pullback)



7.8.2 Road Fill Pullback Techniques

Where there is potential for unstable road cut or fill slopes to develop during periods of inattention, consider using road fill pullback. This removes marginally stable sidecast fill that has a high risk of failure, and effectively adds a weighting berm to the toe of the road cut.

Expand All | Collapse All

Full road fill pullback

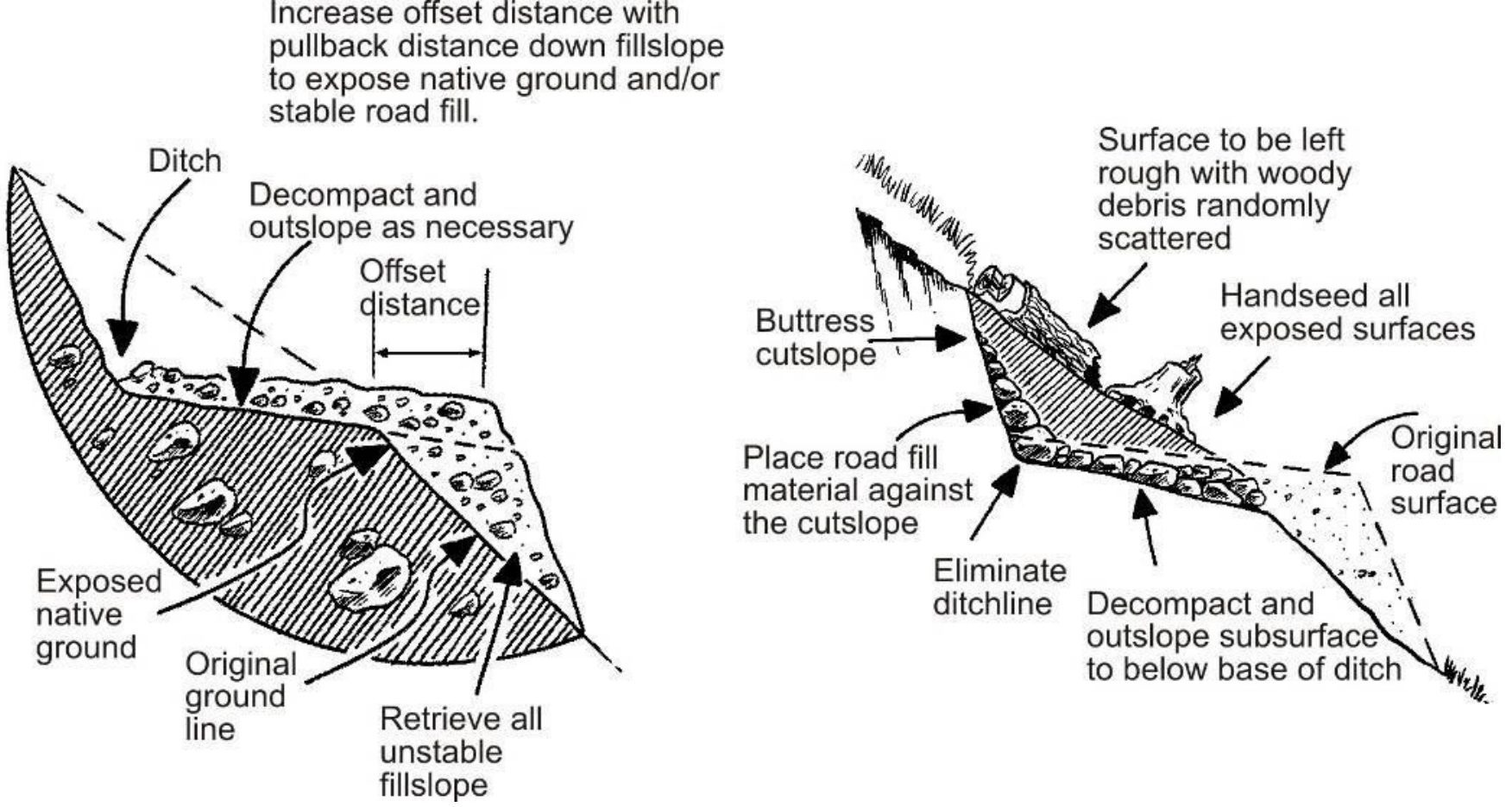
The purpose of full road fill pullback is to retrieve all potentially unstable sidecast material and place it tight against the road cut, thereby reducing the landslide hazard to the greatest extent possible. Usually no access – or only limited access for foot or all-terrain vehicle traffic – is possible after full road fill pullback (Figure 7-13).

Full road pullback is the deconstruction (also known as “re-contouring” or “de- building”) of the road subgrade to restore the original hillslope profile and contours.

Decompaction may also be necessary. This involves breaking up road fill materials to a depth equal to, or greater than, the depth of the ditch, and removing this material to outslope the surface before pullback material is placed overtop.

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.14 (PDF, 7.55 MB) for further details.

Figure 7-13 Example of full road fill pullback



Partial road fill pullback

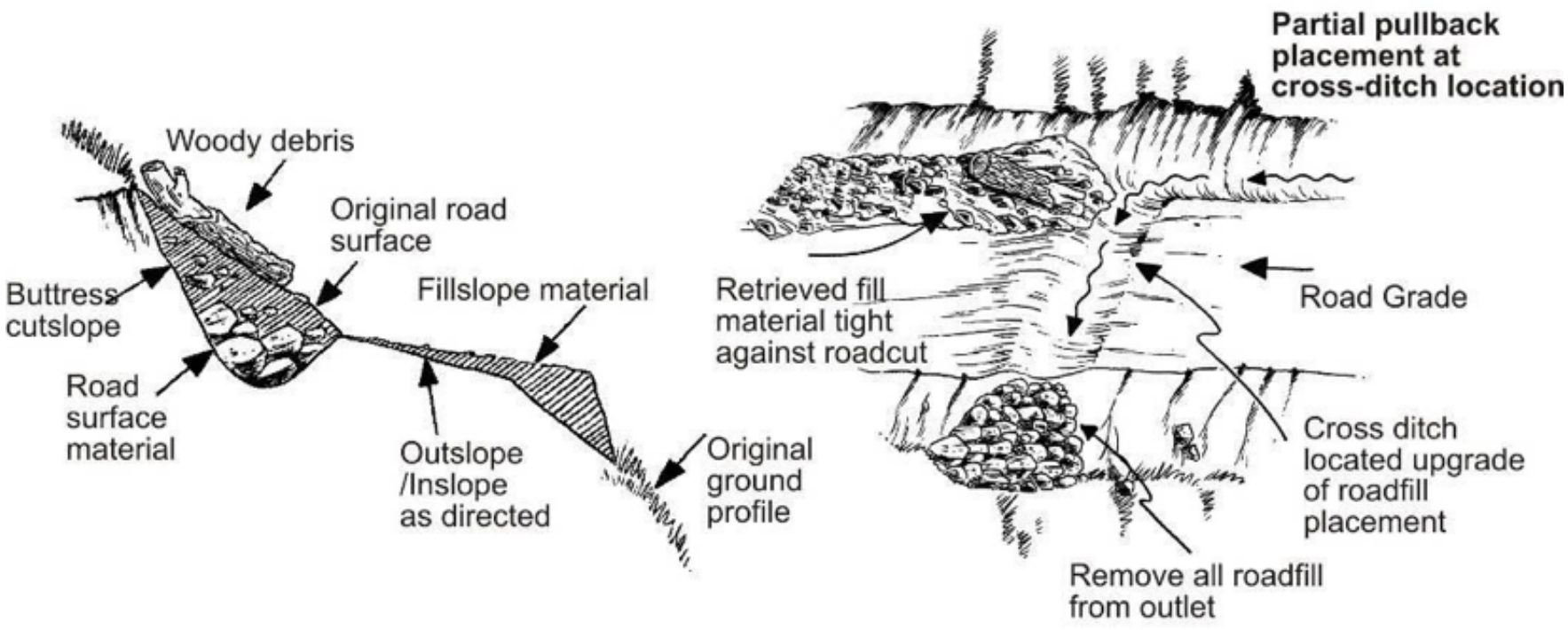
Partial road pullback may be appropriate to maintain motor vehicle access if the road is open to traffic or if road access is needed in the future. Full road fill pullback may be required at some future date to provide long-term stability of the road prism.

Partial road pullback (Figure 7-14) retrieves the currently or imminently unstable portions of the road fill and leaves those portions with no evidence of immediate instability intact. Retrieved road fill is placed tightly to the road cut with organic soil and woody debris on top to promote revegetation.

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.13 (PDF, 7.55 MB) for further details.

Endhaul the pullback material when the unstable volumes of road fill exceed the available room in the ditchline. This is the process of removing excess road fill and placing it in an approved waste area. Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.6.1 (PDF, 7.55 MB) for further details.

Figure 7-14 Partial road fill pullback



Gully restoration

Gully restoration is carried out during full road fill pullback to decrease the landslide hazard along the road approaches on the side walls of the gully.

Gully restoration involves pulling back all the fill material out of a gully channel. The size, depth, and shape of the pullback should mimic the natural ground profiles and contours of the gully system above and below the road. Armouring the gully channel and endhauling are often used together. Consider using similar techniques for entrenched creeks. Refer to the Gully Assessment Procedure Guidebook (PDF, 1.83 MB) for detailed technical information on the deactivation of road crossings of gully systems.

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.6.1 (PDF, 7.55 MB) for further details.

7.8.3 Revegetation Techniques

To control surface soil erosion and sediment transport, seed or plant, in the first growing season after deactivation, all exposed soils that will support vegetation.

Establish vegetation by the end of the second growing season. Consider prolonging this time period or varying the process for revegetation if it seems apparent that the change will adequately manage and conserve the forest resources. Consider natural revegetation as an appropriate option if it can be suitably established within two growing periods. Revegetation is considered to be successful when there is uniform coverage on the ground. Spotty or clumpy patches of vegetation are not considered adequate.

Consider the following in assessing the adequacy of revegetation efforts:

- the mixture of the grass seed used;

- the time and rate at which the seed was applied;
- the appropriateness of the fertilizer and mulch used; and
- the number of attempts made to establish the vegetation.

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.8 (PDF, 7.55 MB) for further details.

Expand All | Collapse All

Grass and legume seeding

Seeding is the most common and usually the most cost-effective means of treating deactivated roads to prevent erosion.

For further details, refer to Chapter 5: Soil Erosion & Sediment Control and BMP: Hillslope Restoration in British Columbia - Chapter 3.8.1 (PDF, 7.55 MB).

Scarification

To grow trees for soil erosion control purposes in areas that are not part of the net area to be reforested (but where trees can be reasonably expected to grow), it may be necessary to supplement grass seeding by scarifying the road surface, re-using local topsoils, or employing other similar measures.

Note: Scarification is for reforestation purposes, whereas decompaction during fill pullback activities is for deactivation/water control purposes.

Scarification (also known as “silvicultural fluffing”) is designed to enhance revegetation. It involves breaking up the road surface to a minimum depth equal to about twice the length of the teeth on an excavator bucket (about 400mm, or 16-20 inches).

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.5.12 (PDF, 7.55 MB) for further details.

Woody species establishment

In addition to grass seeding of all deactivated roads where necessary, consider the localized re-use of topsoil to grow trees for soil erosion control purposes.

Consider planting pioneering species such as alder, willow, and, in some cases, lodgepole pine and Douglas-fir on areas of full road fill pullback or on areas that have been scarified. These species are important early colonizers of disturbed sites, and prepare the site for later succession forest species such as spruce, cedar, and hemlock. Before any planting activities on a permanently deactivated road are undertaken, consult with the professional forester responsible for silviculture activities in the area to ensure that such planting is consistent with silviculture prescriptions prepared for the area.

Use topsoil and tree planting to achieve revegetation (outside the net area to be reforested) on a permanently deactivated road simply for controlling soil erosion. There is no requirement to reforest all permanently deactivated roads, even where such reforesting is feasible. The choice to reforest rests with the person required to deactivate the road.

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 3.8.2 (PDF, 7.55 MB) for further details.

Soil bioengineering

Consider using soil bioengineering systems if the objective is to:

- drain excess moisture that may be creating slope instability (e.g., live pole drains, live silt fences, live bank protection, live gully breaks, and live staking);
- reduce slope angles relative to the growth of vegetation and prevent raveling of fill slopes (e.g., wattle fences, modified brush layers, brush layers in a cut); or
- control erosion along watercourses (e.g., live gravel bar staking, and live shade).

Soil bioengineering is a term that describes the use of living plant materials to build drains, slope breaks, low slope support walls and other similar living systems for water management and soil erosion control on steep slopes. It may also be an effective technique for riparian restoration.

Refer to BMP: Hillslope Restoration in British Columbia - Chapter 6 (PDF, 7.55 MB) for further details.

Control of noxious weeds

During deactivation assessment, consider the presence of knapweed and other noxious weeds that are found along many old logging roads. Consult with a forester, agrologist, or biologist to minimize the likelihood of spreading these problem weeds through machine travel or seed disturbance, if scheduling deactivation work outside the seed maturity time is not possible.