

Road Maintenance and Deactivation managing water and risk in steep terrain

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- **Introduction**
- **BC and Chile**
- **Context**
- **Principles**
- **Techniques**
- **Cost & Benefits**
- **Conclusion**

1890's Coastal British Columbia



1980's Coastal British Columbia



BC Story



Road related landslides due to poor water management



Road Deactivation in BC



Chile



Chilean road construction





Forces of Nature

Water and gravity

Culvert inlets before & after



Road failure and slide due to blocked culvert



Landslide due to road failure



Surface erosion



Slope failure from re-concentrated drainage



Gravity and sidecast



Gravity and Sidecast



Road Deactivation

Forest road deactivation is an activity required to protect the financial investment in forest roads and the environmental values near roads.

Typical deactivation objectives are to:

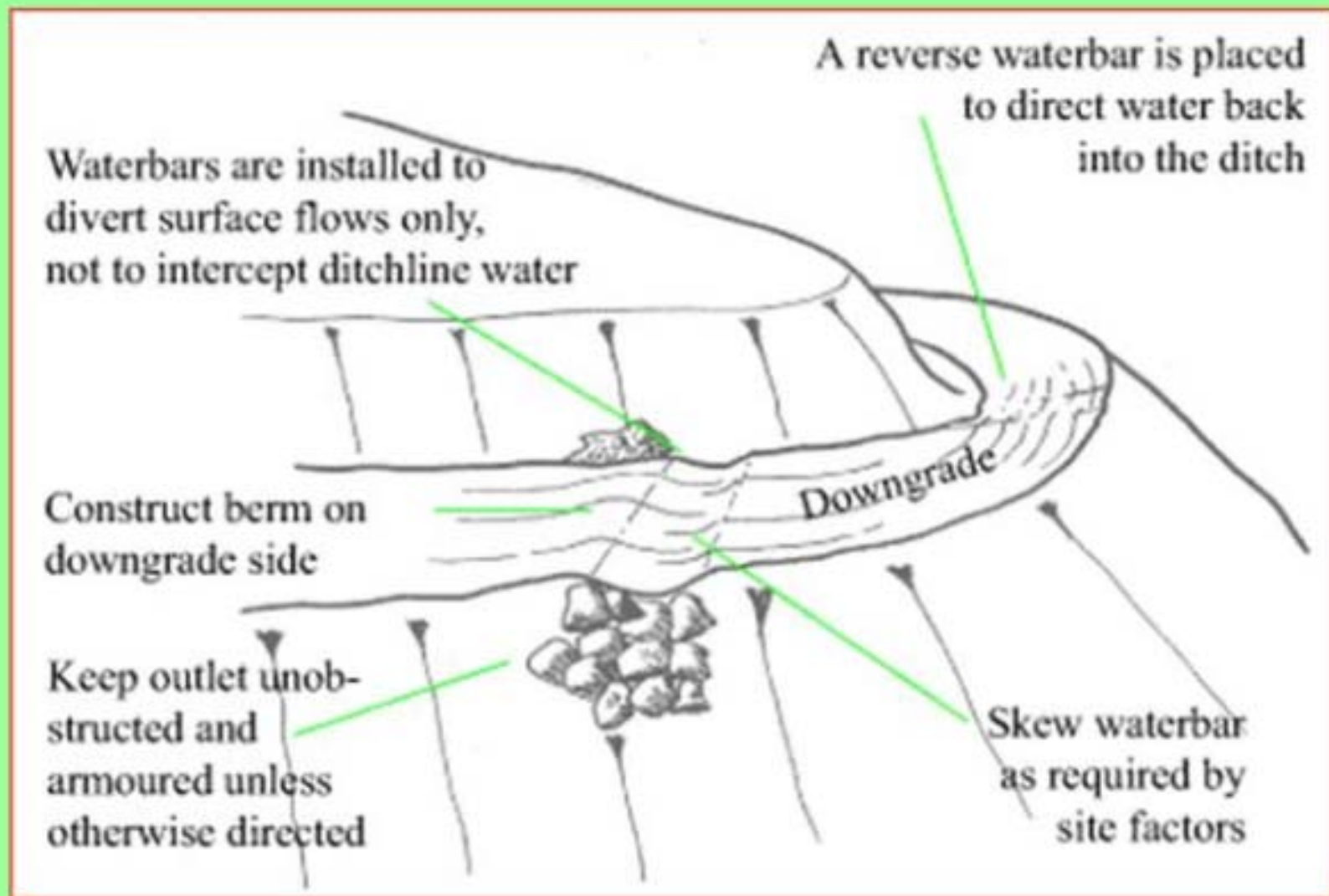
- maintain or re-establish natural hill slope drainage patterns;
- minimize the potential for road-related landslides and erosion;
- construct or alter slope angles to be stable;
- enhance productive growing sites, where practical;
- minimize maintenance for inactive roads;
- maintain access management objectives where applicable;
- improve visual aesthetics

Water Management Principles

Most road deactivation activities can be achieved by following some simple principles:

1. Do not combine several watercourses into one ditch or channel.
2. Minimize disturbance to subsurface water flows.
3. Do not create slope instability by oversteepening cut and fill slopes.
4. Avoid disturbing sensitive soil and maintain water quality.
5. Do not introduce debris or soil into watercourses.
6. Design drainage structures adequately and install them correctly.
7. Keep water flows wide and shallow to reduce erosive energy.
8. Do not cut corners and always expect the worst.

Waterbars



Cross ditches

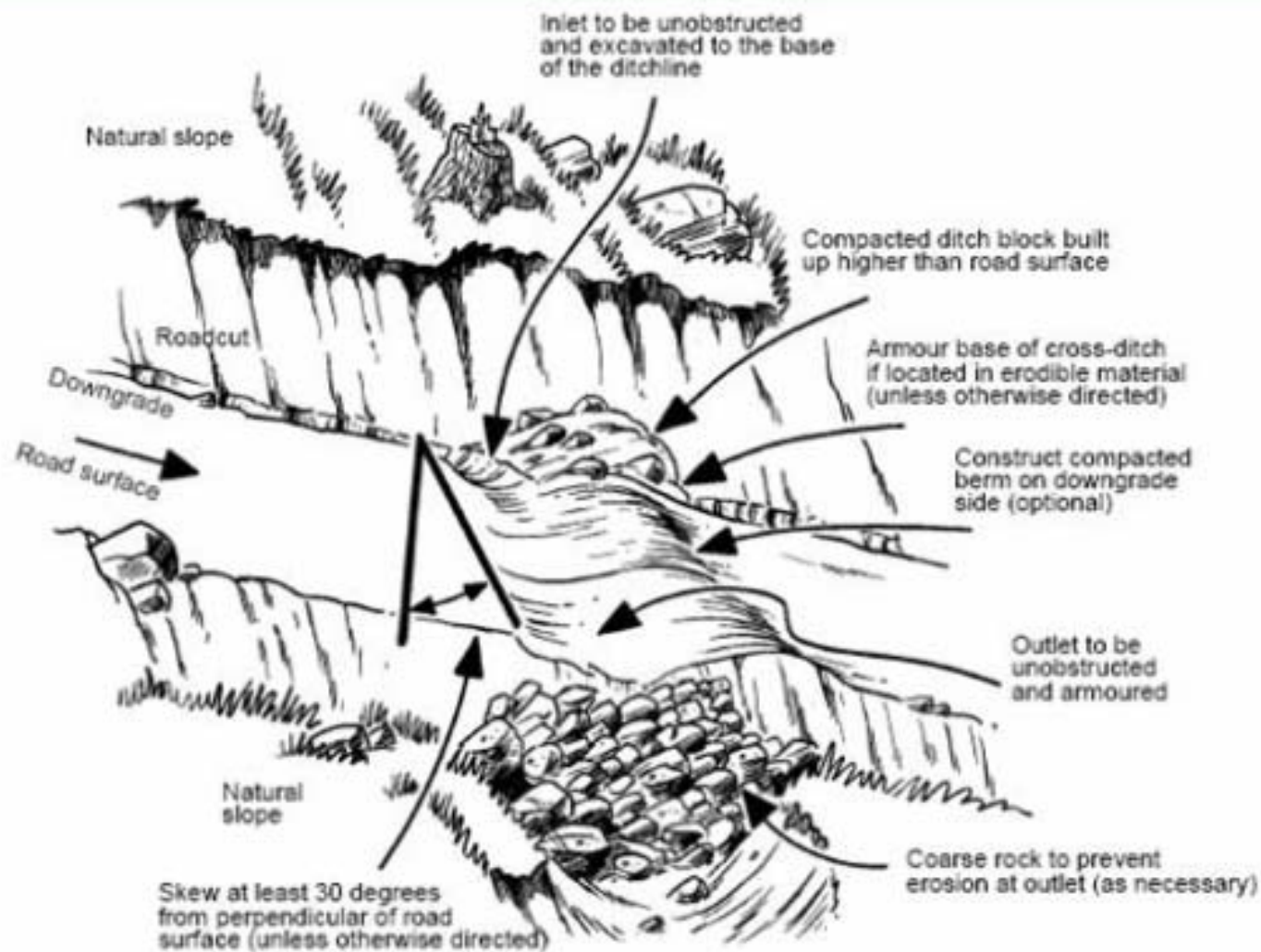
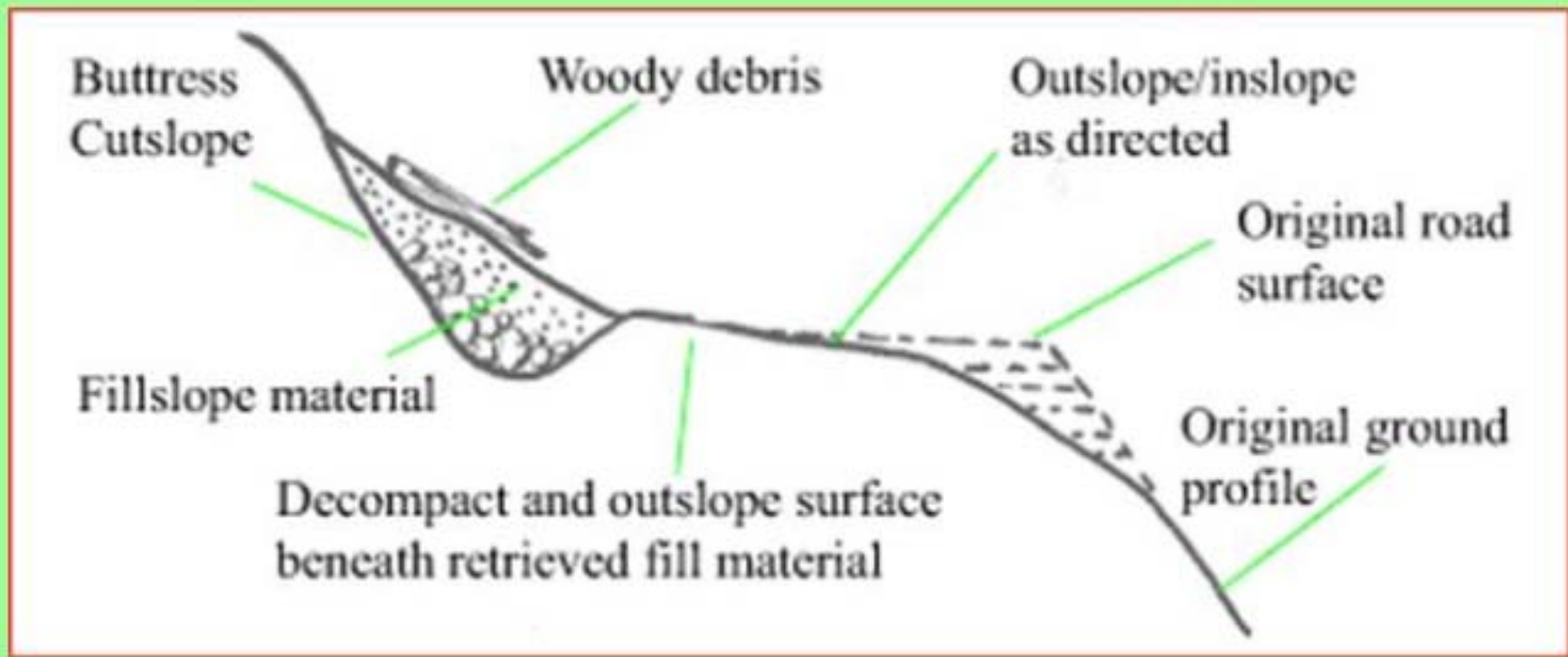
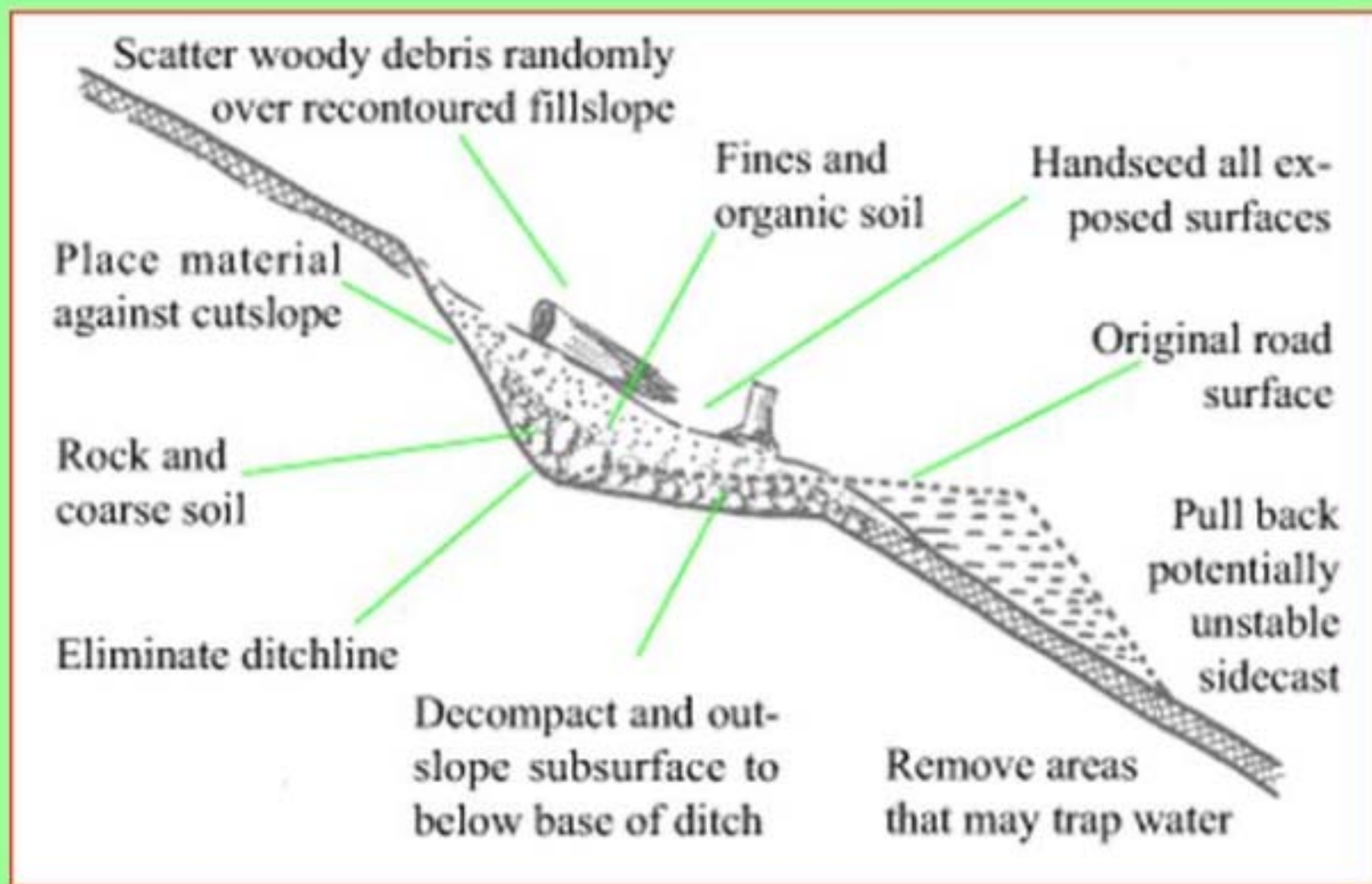


Figure 22. Cross-ditch installation across an intact road.

Partial pullback of sidecast



Full pullback of sidecast



Costs and benefits

- **The prevention of road failure is key to its long term use;**
- **When short term rotations are involved the need to access the block for reforestation, silviculture, thinning and harvest does mean access to the block on a rotational basis;**
- **Saving money during road construction by using a lot of organic material will result in the necessity to place a larger emphasis its maintenance;**
- **The deactivation of roads for a period of time will ensure its long term use;**
- **Bringing a road back up to functionality after deactivation is a fraction of re-building a road that has failed in the interim;**

Summary

- **Past history of road building techniques and the subsequent consequences of design is a great tool to have at our disposal;**
- **We have witnessed many examples both in Canada and Chile of these consequences and the awareness level is starting to be realized at the corporate level due to cost saving by prevention;**
- **Over the last few years we have been active in transferring these experiences in Chile by designing and presenting workshops on this matter;**
- **The usage of certified deactivation procedures will ensure the long term investment of your roads and the renewal of your of your certification;**
- **When environmentally sensitive lands are being restored, permanent deactivation procedures will allow you to return the land to it's original condition**