

After the storms

A case study in risk reduction

Gully erosion which carried logging slash downstream (Photo courtesy Bay of Plenty Regional Council)

Margaret Horner – science communicator, Scion, reports on a study undertaken by the Bay of Plenty Regional Council aimed at reducing the damage from woody debris during heavy rainfall events.

Extrême storms hitting the eastern Bay of Plenty show the costly damage that can flow from forested land. Heavy rainfall events have carried large volumes of woody material from plantation forests, wreaking havoc to waterways and properties downstream.

The Bay of Plenty Regional Council used two affected forests as case studies to consider ways of reducing future damage from woody debris. A working group comprising council staff, representatives from the forest industry and Scion developed recommendations for forest management practices. Following is a summary of their findings.

The risk

Exotic forests in the Bay of Plenty region cover approximately 270,000ha. Around 9% of this area has slopes greater than 25 degrees, which is classified as high risk erodible land. These forests are frequently subjected to high intensity rain storms originating from downgraded tropical cyclones. About 90% of the exotic forest estate was planted on soil types vulnerable to erosion.

In many cases, forests in the eastern Bay of Plenty have replaced farmland that was no longer considered economic. Where land was converted from farming to plantation forestry, the trees have controlled erosion problems which occurred while being farmed. The downside is that steep forested land presents erosion risks of its own. Woody debris can cause much more damage and generate more negative publicity than soil washing off hillsides.

The storms

Forests in the Whakatane River and the Ohiwa, Nukuhou, Waimana and Opotiki catchments were affected by three storms during the latter part of 2010 and January 2011. Rainfall of over 50 mm per hour was measured during these storms, with 250 mm recorded during certain 24 hour periods. This intensity of rainfall exceeds a 100 year storm event.

The high intensity rainfall, combined with saturated catchments, triggered subsequent erosion problems. Four different types of erosion occurred as a result of the storms:

Theme

- Sheet and soil slip erosion
- Gully headway erosion
- Debris avalanche
- Stream bank erosion.

The damage

Forest debris dislodged by erosion caused downstream damage. Waste wood and forest slash backed up against bridges, culverts, farm fences and native bush. Debris washed downstream was deposited in stream channels or scattered on floodplains.

Forestry companies have been assisting with the clean-up on farms affected by accumulated debris. However, much of the debris poses ongoing risk because it gets trapped in inaccessible areas and can be remobilised in another flood.

In addition to physical damage, the natural loss of soil from the slopes has also affected many aquatic ecosystems. Stream channels were scoured by woody debris and streamside vegetation was ripped out. The resulting loss of habitat could take a long time to recover.

The worst damage occurred in areas where harvesting had been carried out within the last two years. These sites suffered the greatest erosion which led to the accumulation of woody debris in streams. Recently replanted sites (less than five years old) were also affected, but to a lesser degree. Established forest

and indigenous bush (greater than five years old) were least affected, but some erosion still occurred, due to the extreme nature of the storms.

Pastoral catchments bounding these forests were affected with similar erosion types and severity. The big difference was that only soil and water were carried downstream. On forested land, the debris flows caused greater visible damage.

Managing the risk

Woody slash is normally used to help rehabilitate harvested sites. It provides organic material and can reduce erosion caused by normal rainfall on bare soils. However, the risks associated with high-intensity rainfall present new challenges for many forest managers. A collaborative approach is therefore needed to come up with ideas for reducing the problems.

Steep slopes have been one of the main factors leading to the movement of woody debris. The slope angle which started this process was greater than 26 degrees. The Bay of Plenty Regional Council has identified and mapped these high areas as an important first step in managing the risk.

A concave slope in excess of 26 degrees has been identified as a key failure point. Failure at the base of these slopes occurs due to concentrated storm water energy. The resulting gully head ward erosion moves up the slope. Any timber pushed or left in these areas

*Woody debris becomes lodged in mid-catchment.
(Photo courtesy Bay of Plenty Regional Council)*





Logging debris washed down from steep slopes into flowing waterways. (Photo courtesy Bay of Plenty Regional Council)



Significant erosion which carried logging slash down-stream. (Photo courtesy Bay of Plenty Regional Council)

will move down the slope as the soil erodes.

The Council has created a map showing the soils which are vulnerable to erosion during heavy rain. A table naming the soils, their erosion risk types and general forest location has also been created as a guide to assist forest managers.

The working party developed the following recommendations for managing at-risk sites. While these recommendations relate to soil types unique to the Bay of Plenty, some of the lessons could be usefully applied in other steep forested areas.

- **Remove slash** - Physically remove large material from the site. This includes logs longer than 4 m with an S.E.D of 30 cm, large slovens and intact tree heads. Do not push slash from skid sites into areas with a high likelihood of underlying failure on very steep slopes. The slash should be placed on a stable excavated bench which should not be overloaded by ensuring that it is visible. Where slash removal is not practical through mechanical methods, burning should be carried out.
- **Poison standing trees** – Trees which have little chance of being recovered during harvesting should not be felled to waste if they are to remain on highly erodible slopes. They should be poisoned standing and left to break down slowly. This will allow suitable regrowth to establish between the poisoned stems as the canopy dies off.

- **Intercept woody debris below vulnerable sites** – Slash racks constructed from railway irons and wire rope are another mitigation option. These require heavy machine access so the slash racks can be easily cleared when build-up of debris occurs. The slash racks should be located on alluvial fans where the problem is likely to occur. They should not be placed across gullies or in streams. Standing managed trees on alluvial fans can also be used to contain woody debris.

The full report is available in hardcopy from the Bay of Plenty Regional Council, or on www.boprc.govt.nz

“Report on exotic forest debris management related to storm events in the Bay of Plenty”

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