Effectiveness of riparian margins for trapping sediment in steepland plantations

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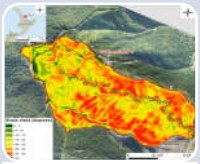
Acknowledgement: FGLT is thanked for funding this project

Outline

CONTEXT | METHODS | RESULTS | WHAT NEXT

Minimising and mitigating steepland harvest impacts

LANDCARE RESEARCH MANAAKI WHENUA

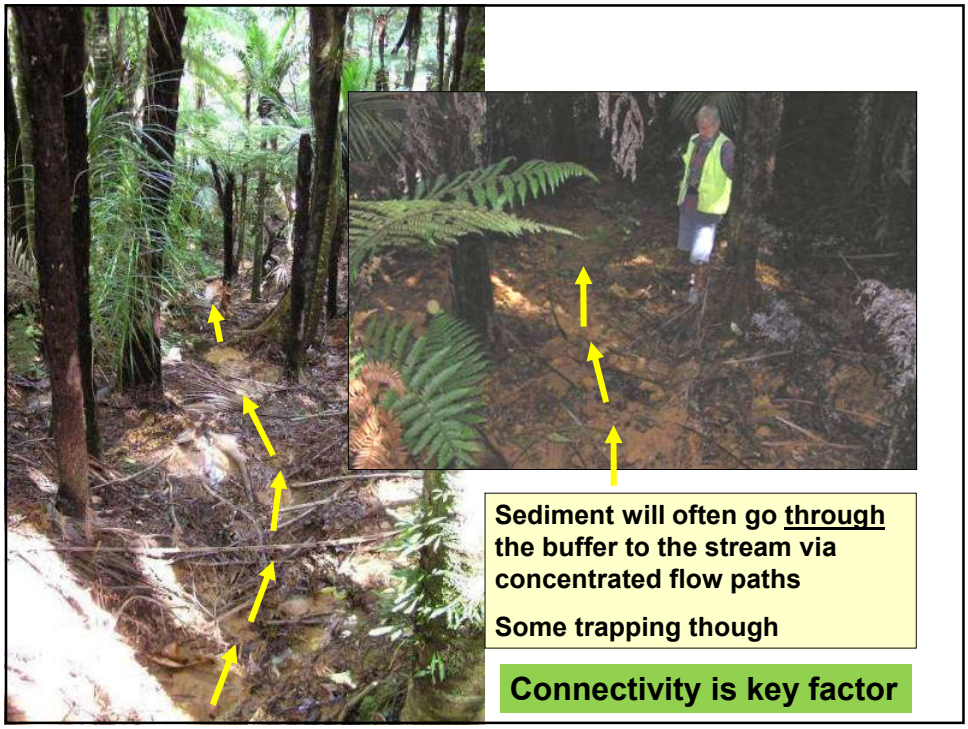
Growing confidence in forestry's future Research Programme

supported by forestgrowers commodity levy

FOREST OWNERS ASSOCIATION


Lotsa bare areas to generate sediment
Steep topography


1
Sediment trap full
“Huge” native buffer > 40 m
Very steep topography into stream



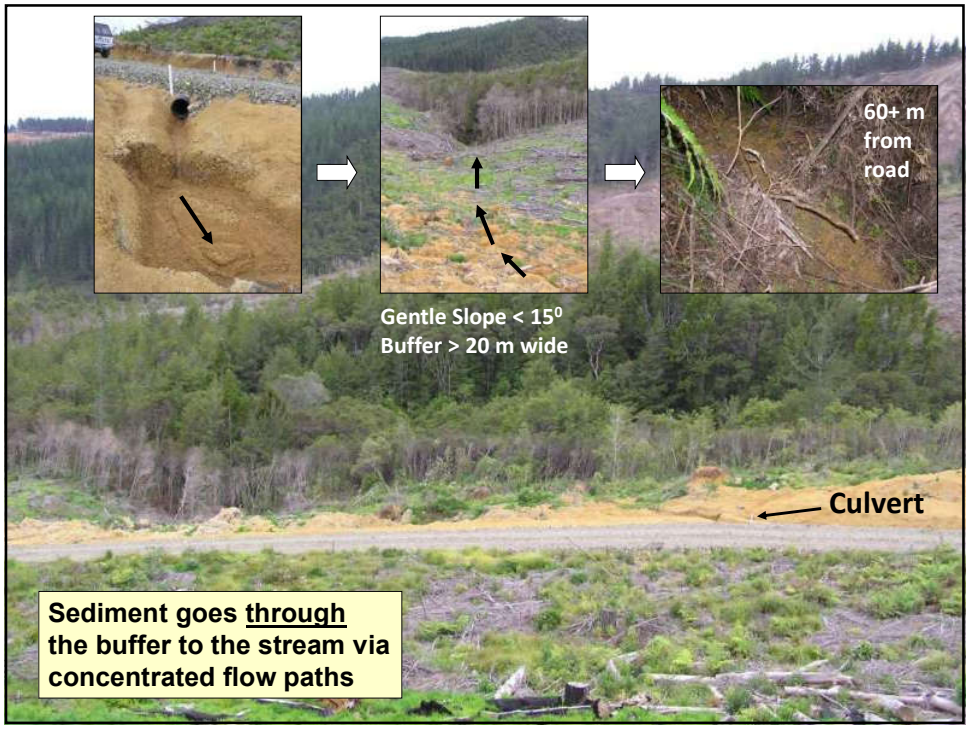
Sediment will often go <u>through</u> the buffer to the stream via concentrated flow paths

Some trapping though

Connectivity is key factor

Change in slope is a key factor

Micro-topography also important for sediment trapping



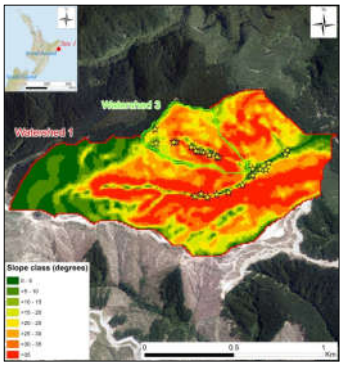
What we did

- Site selection
- Gather background data
- Desk-top GIS analysis
- Field survey
- Photographic evidence
- Report
- Presentation

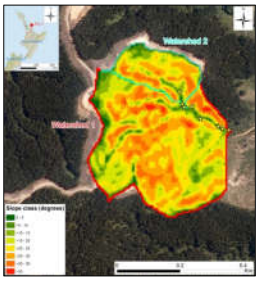
Hypothesis: slope steepness and form are primary drivers of connectivity of sediment sources to streams and thus the presence of riparian buffers for removing or filtering sediment within plantation forests are secondary.

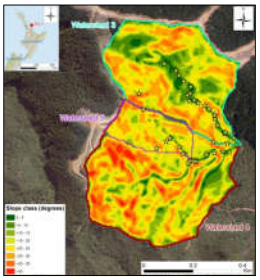
What we found - slope class

Paroa Forest

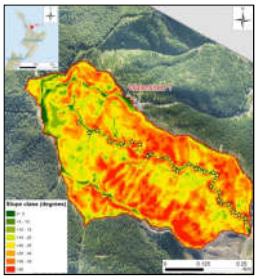


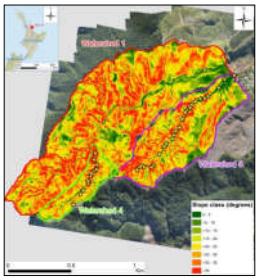
Whangapoua Forest





Tairua Forest



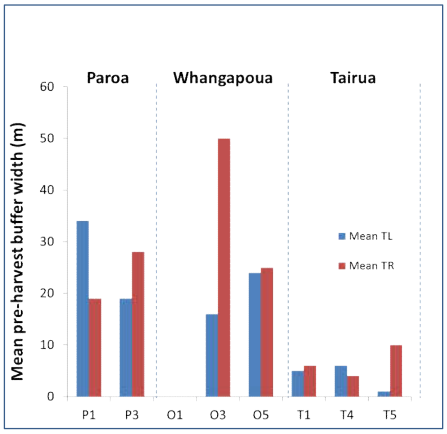


Slope continued….

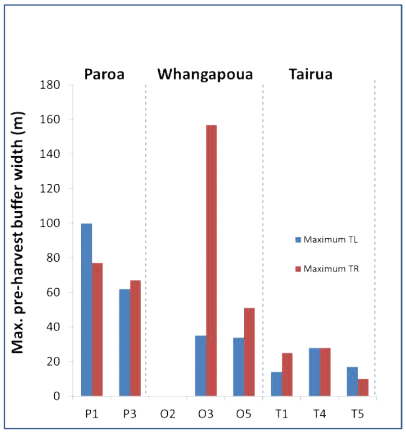
Paroa Forest	Whangapoua Forest	Tairua Forest
		
		
V. steep - deeply dissected Shallow to skeletal soils Bedrock controls slope & stream profile Established buffers No storm	Moderate to steep Deep soils Bedrock controls slight Established buffers Moderate storm 2016	Moderate to steep Deep soils Bedrock controls moderate Minimal buffers Very large storm 2017

Riparian buffer widths

Mean

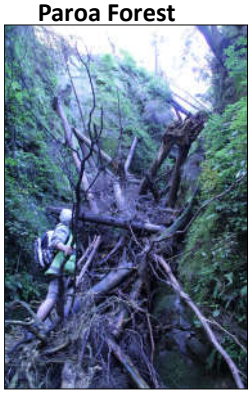


Maximum



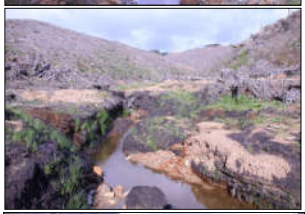
Stream environments

Paroa Forest



Whangapoua Forest

Tairua Forest



Key processes – channel scour






Roots exposed in banks, channel excavated, forest soils eroded, buried soils exposed – flood flows and debris flows

Riparian failure









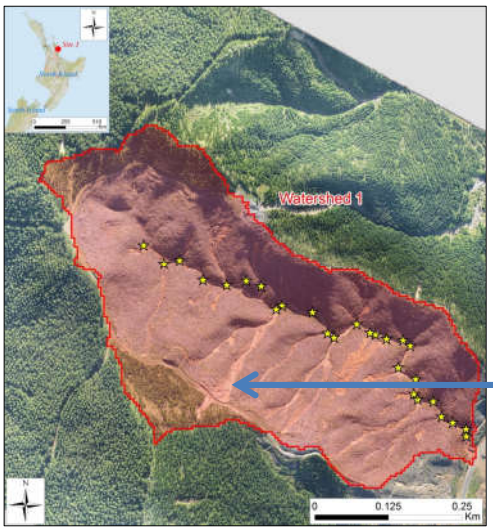

Undercutting and lateral sub-surface flow cause failures

Hillslope landslides

Landslides & debris flows

"Reamed out" channels down to bedrock, super-elevation around bends, transport of big boulders are all indicative of debris flows

Connectivity and storms



Effectiveness of riparian buffers for mitigating sediment increases as the slope decreases but large storms resulting in landslides, debris flows, and floods override this.

Sediment trapped

Large landslide

"Dry" not fluid

Vegetation and change in slope stopped sediment from entering stream

Mike Marden for scale

Sediment partly or not trapped


Landslide debris mostly goes through the buffer into the stream or is caught on terrace or lower gradient slope




Conclusions

- Supports previous work (but not much on this topic)
- Confirms steeplands most vulnerable in years following harvesting
- More water in the landscape after harvesting leads to landscape response
- Channel scour, riparian failure, hillslope landslides & debris flows were the key erosion processes observed
- A flat slope near stream +/- vegetation is a key determinant in sediment trapping efficiency
- Most landslides from outside buffer went through buffer
- Can't yet dispel the myth


What next

- Need to do a more in-depth study
- Requires support of forest owners
- The wider picture
- Risk management
- What can and can't be managed?
- What will the public accept?

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