

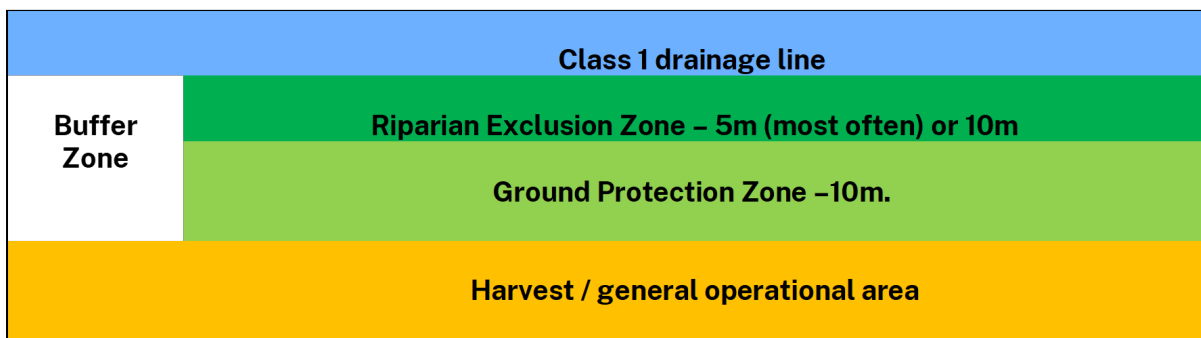


Stream buffers on NSW state forests

This note summarises research to investigate the effectiveness of riparian buffers on Class 1 streams in state forests. This work was carried out by researchers at Jacobs Group Australia Pty Ltd under the Coastal IFOA Monitoring Program.

What are stream buffers?

The Coastal IFOA requires Forestry Corporation of NSW (FCNSW) to establish riparian buffer zones on streams within state forests. Class 1 drainage lines, also known as ephemeral streams, are headwater flow paths found at the top of a catchment. Riparian buffers and exclusion zones are important for protecting water quality and habitat around these drainage lines. The exclusion zone conditions require a riparian buffer zone comprising both a 'riparian exclusion zone' and a 'ground protection zone', to be maintained around Class 1 drainage lines.



Depiction of a Class 1 stream buffer zone. Within the riparian exclusion zone, all forestry operations are excluded. Tree harvesting and earthworks may occur in a ground protection zone only if they minimise ground disturbance.

What did the research find?

The research investigated two questions:

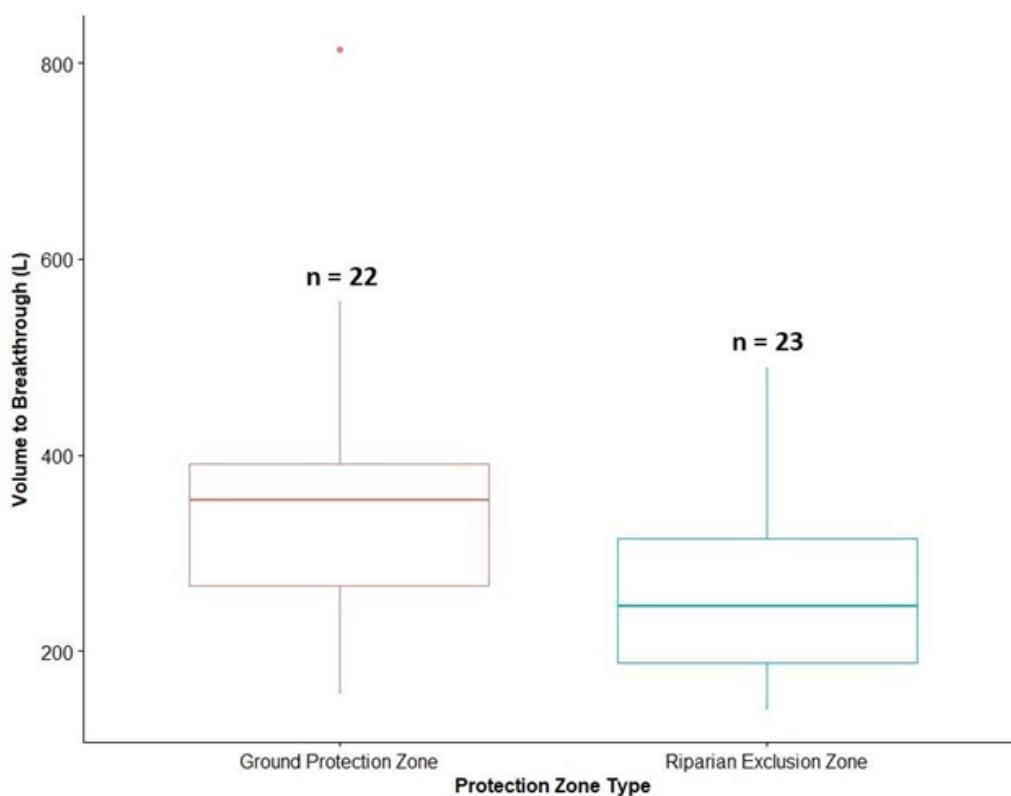
1. Are the exclusion zone conditions (including both the riparian exclusion zone and ground protection zone) effective in minimising potential impacts on waterway condition? and
2. Do ground protection zones perform as well as riparian exclusion zones, specifically those that have been accessed by machinery, in minimising the impact on waterway condition?

In regard to **Question 1**, Jacobs Group modelled the worst-case scenario where overland flow from snig tracks discharged directly into the buffers. In this instance, exclusion zones were most effective in situations where closer crossbank spacings (e.g. 10m apart) occur, in low to moderate rainfall and rainfall event intensities up to 1 in 10-year.

They will be less effective where wider track crossbank spacings occur (e.g. greater than 30m apart) and in higher rainfall regions. The results were similar across the Coastal IFOA region, and not influenced by forest type or other environmental factors.

For **Question 2**, researchers found the comparison of ground protection zones and riparian exclusion zones was limited due to the small sample size. This prevented definitive conclusions. However, the research suggests that both buffer zones did not differ significantly in the ability to prevent overland flow.

Overland water flow patterns remained consistent across different forest types. However, Coastal Floodplain Wetlands showed higher water infiltration rate to any of the other sites. While slope showed a weak but significant negative relationship with flow volumes, other environmental factors displayed no strong correlations.



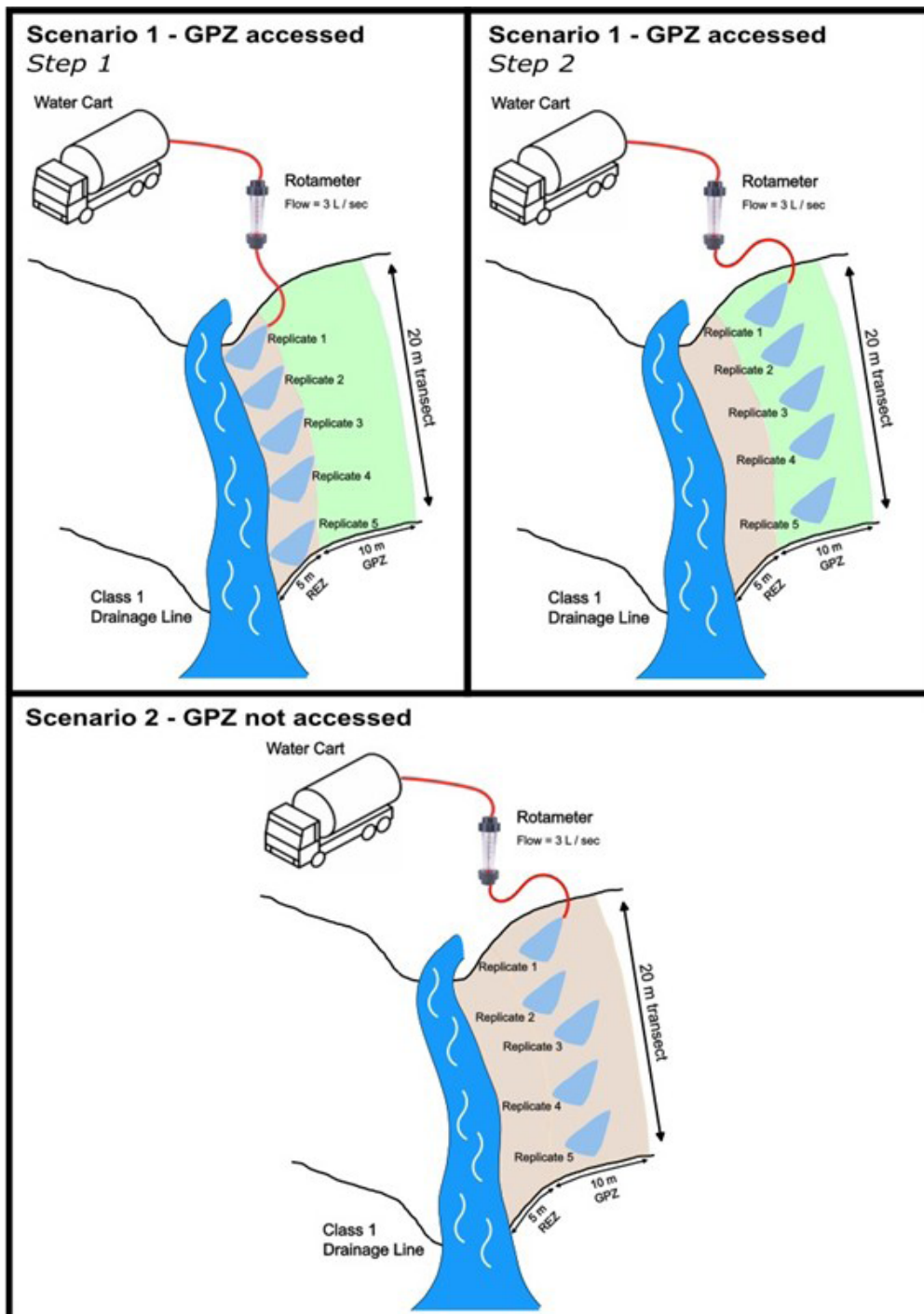
Box plots display the volume-to-breakthrough measurements in ground protection zones and riparian exclusion zones in the Coastal IFOA region. (Horizontal lines represent the 25th percentile, mean, and 75th percentile, while vertical lines show the range of values).

What method was applied?

Researchers collected field data across 30 sites in 11 different state forests in both north and south Coastal IFOA regions. Researchers:

- Applied volume-to-breakthrough (vbt) experiments to replicate water flow through both the riparian exclusion zone and ground protection zone. The team pumped water from a cart and released it in buffer zones to simulate overland flow, allowing them to measure vbt5, which indicates the volume of water needed to create a 5m flow plume.
- Collected data on soil density and topography including slope to examine their effects on overland water flow.
- Modelled the overland flow plume distances under various storm intensities and tracked spacing scenarios to evaluate connectivity risks of increased sediment.

The project research was informed by multiple field visits and collaboration between FCNSW, the Environment Protection Authority and Dr. Peter Hairsine the program's independent expert. Professor Jacky Croke from the Queensland University of Technology peer reviewed this research.



Undisturbed sections of the buffer zone are shaded brown, while disturbed sections (accessed ground protection zones) are shaded green. Scenario 1: The ground protection zone is accessed by forest harvest machinery, and the experiment is conducted sequentially in both the riparian exclusion zone and ground protection zone sections. Scenario 2: The ground protection zone is not accessed by machinery, and the transect is placed anywhere within the 15m zone near the Class 1 drainage line.

Next steps

Jacobs Group advised several actions to improve exclusion zones, including adopting a risk-based approach to ensure crossbank spacings are appropriate to manage relevant and local risks.

After reviewing the report, the NSW Forest Monitoring Steering Committee also agreed to develop a method to assess the risk of runoff generated on snig tracks in compartments potentially impacting instream water quality and habitat. The method should consider a range of factors including cross bank spacings, infiltration measures in the harvest area and riparian zone and rainfall intensity.

More information

This research assessed the effectiveness of Class 1 drainage stream buffers within forestry operations in NSW coastal State forests, under the waterway and wetland health monitoring strategy.

Jacobs Group performed this work as part of the NSW Forest Monitoring and Improvement Program, and relates to the Coastal IFOA Monitoring Program.

This work builds on a portfolio of research for waterway health on state forests including a [scientific literature review on the extent of forestry impacts](#) to waterway health and water quality in Coastal IFOA state forests and [post-fire debris flows](#) in southern Coastal IFOA catchments.

The reports detailing the proposed methodology can be found on the [Commission's website](#).

The logo for Jacobs, featuring the word "Jacobs" in a bold, black, sans-serif font.