

Waikōau-Arapawanui & Te Ngarue Catchments

Erosion, sediment and changing flood risk

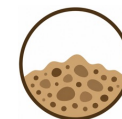
THE BIG PICTURE

Cyclone Gabrielle triggered erosion and movement of massive amounts of sediment through the catchments.

- ~55% of the sediment came from the hillslopes, ~45% from river erosion
- Rivers widened, cut deeper (incised) and were built up (aggraded)
- ~33% of sediment moved to Tangitū (the moana)
- ~67% remains stored in the catchments and can move again in future storms

Sediment is:

loose material like
soil, sand, mud, rocks
that is moved by wind or water.
Silt is a type of sediment.



KEY MESSAGES



Large volumes of
sediment eroded
from hillslopes.



Rivers widened, cut
deeper or built up
in many places.



Sediment is stored in
river channels,
floodplains and
valley floors.



Riverbeds have risen
or fallen by up to
1-2m in places.



This can reduce river
channel capacity
and increase
future flood risk.



The system is still
adjusting – future
floods can move
sediment again.

HOW THE RISK WAS ASSESSED

REPEAT LIDAR

Compared land levels before and after Cyclone Gabrielle to map where erosion occurred and where sediment built up.



SEDIMENT BUDGETS

Estimated how much material was eroded, how much moved downstream and how much remains stored in the catchments.



GEOMORPHIC ANALYSIS

Identified the key processes that eroded, moved and deposited sediment: landslides, tributary erosion, bank erosion, river widening, incision, aggradation and floodplain sedimentation.



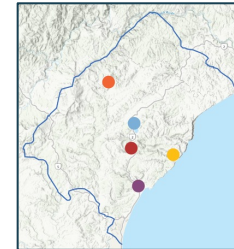
FLOOD MODELLING

HEC-RAS 2D modelling tested flood behaviour before and after Gabrielle, and under future bed-level scenarios (+0.5m and +1m) to see how further sediment build-up could affect flooding.



MODELLING KEY AREAS

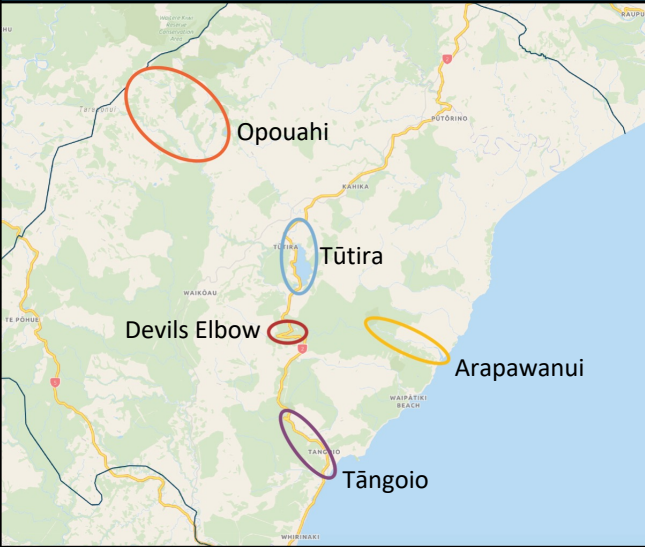
Focused the modelling on five priority areas.



WHAT THIS MEANS FOR OUR CATCHMENTS

Together, this information shows changes across the catchments and rivers following Cyclone Gabrielle, where sediment is now stored, and helps us consider how future sediment movement and flooding may affect our wāhi taonga and communities.

FIVE PRIORITY AREAS – KEY FINDINGS FROM THE MODELLING

	OPOUAHİ	TŪTIRA
	• Few large landslides, but some strong tributary erosion and bank erosion. • Riverbed rose and fell in different places by ~0.5 – 1m. • If riverbeds rise another 1m, typical floods could break out onto the floodplain.	• Many landslides on western slope and significant sediment build-up above the lake. • Streams widened, cut deeper, or built-up by up to 1.5m. • If riverbeds rise another 1m, widespread flooding and breakout channels become likely during typical floods.
DEVIL'S ELBOW	ARAPAWANUI	TĀNGOIO
• Extremely high landslide rates and major incision of Tarere Stream and Arapawanui River. • Channels widened and in places lowered or built up. • A wider channel can carry typical floods well; if riverbeds rise another 1m it may cause limited additional hazard in many places.	• Many slope collapses and large sediment deposition across the valley floor. • River channel became much wider (up to ~40m) and floodplain rose by ~1m. • If riverbeds rise another 1m, typical floods could overflow into side channels and expand flood hazards.	• Many shallow landslides in upper catchments, deep incisions near Te Pā-o-Toi caused more slope failures. • Valley floor and channels gained ~1 – 2m of sediment in places; channels widened. • Typical floods may be carried better now, but if riverbeds rise another 1m it would cause extensive high-hazard flooding across the lower floodplain.

1) Waipara Neke: Sediment on the Move

Waikōau – Arapawanui Catchment

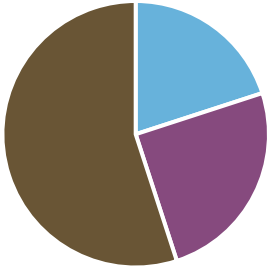


Te Ngarue Catchment



Sediment eroded	Sediment stored in the catchment	Sediment into the moana		Sediment eroded	Sediment stored in the catchment	Sediment into the moana
12.9M m ³	8.9M m ³	4.0M m ³	 8m (carries ~12m ³)	4.4M m ³	2.7M m ³	1.7M m ³
1,100,000 dump trucks	740,000 dump trucks	330,000 dump trucks		370,000 dump trucks	230,000 dump trucks	140,000 dump trucks
8,600 km trucks in a line	5,900 km trucks in a line	2,700 km trucks in a line		2,900 km trucks in a line	1,800 km trucks in a line	1,100 km trucks in a line
			 (Cape Reinga to Wellington is ~1,000 km drive)			
16 x	11 x	5 x	 Size of the head of Te Rae-o-Tāngoio	5.5 x	3.4 x	2.1 x

2) How did the sediment move?



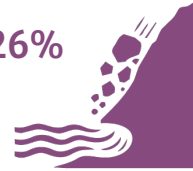
Most sediment came from hillslope erosion; River widening was the next major source.



HILLSLOPE EROSION

Heavy rain can cause soil and loose rock to slip off steep hillsides, most of the landslides were shallow.

26%



RIVER WIDENING

When rivers cut into their banks, the hillsides can collapse and add huge amounts of sediment to the river.

19 – 21%



RIVER PROCESSES

Fast flowing water wears away the riverbed and banks, and moves sediment downstream. As rivers slow down on lower slopes they drop the sediment, building up the riverbed and flats.

3) Sediment stored vs sediment moved to Tangitū



~ 67%
STILL STORED IN
THE CATCHMENTS

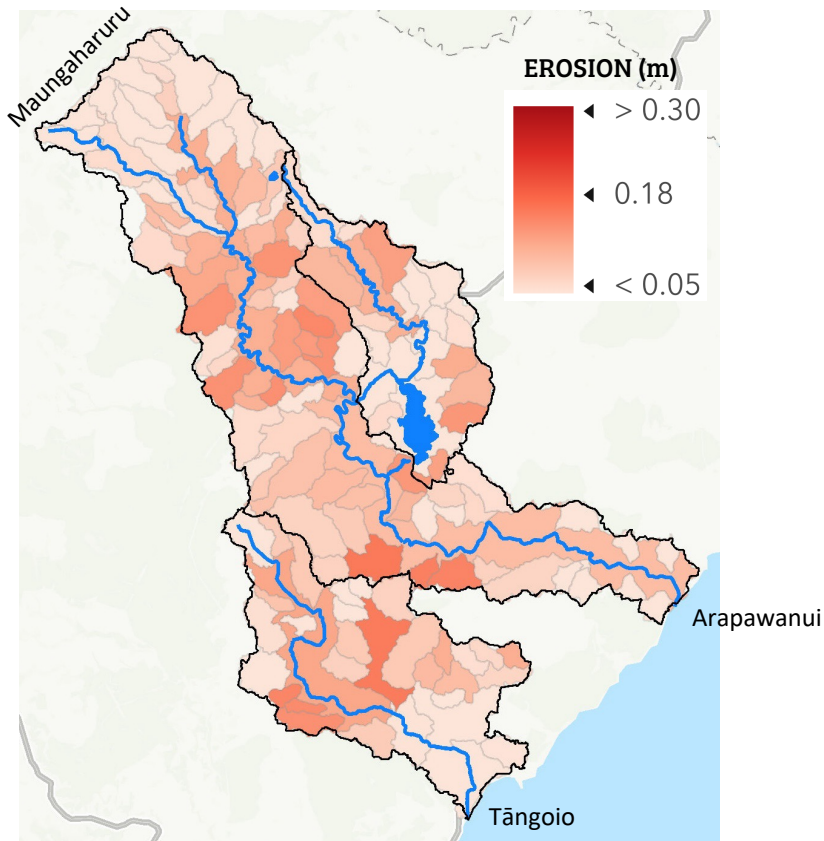


~ 33%
MOVED TO
TANGITŪ
(THE MOANA)

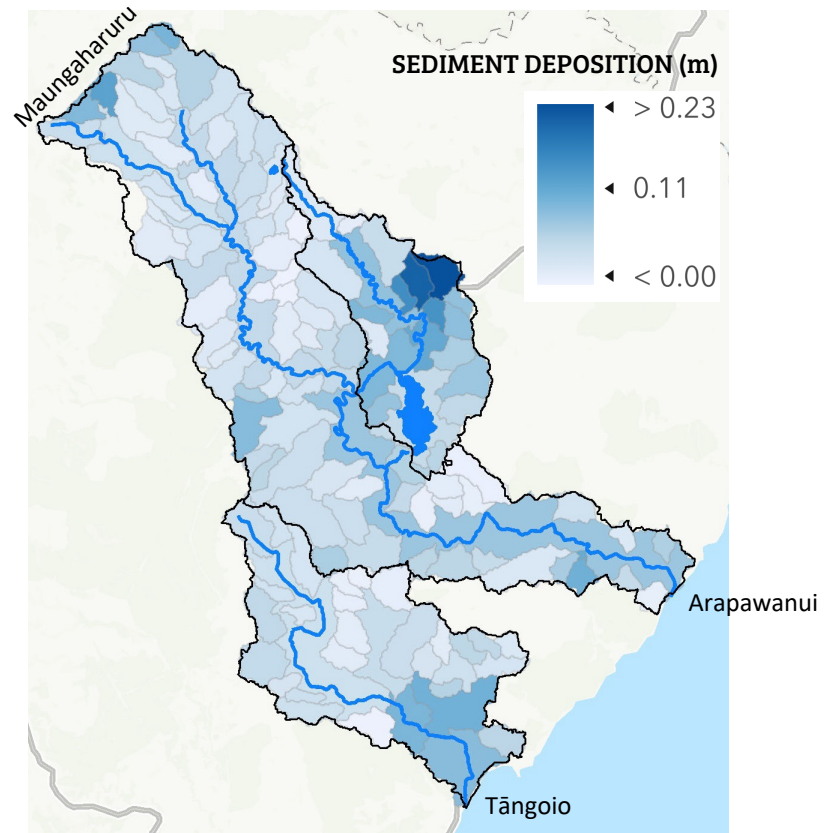


This tells us the risk is ongoing as future floods can move this sediment again, changing riverbeds, banks and flood pathways.

4) Where did Erosion & Sediment deposition occur?



- This map shows where sediment eroded, averaged at the sub-catchment level.
- The deeper the red the more erosion.
- It shows overall average erosion was generally concentrated in headwater areas and trunk streams.



- This map shows where sediment was deposited, averaged at the sub-catchment level.
- The deeper the blue the more deposition.
- It shows areas where stored sediment could be a concern, as future floods can move this sediment again, changing riverbeds, banks and flood pathways.

FROM INFORMATION TO ACTION

- Sediment moves from steep slopes, through rivers and floodplains, to Tangitū.
- No one group can respond alone. Whānau, hapū, landowners, catchment groups, councils, agencies and advisors all have a role.
- The goal is to hold soil in place and target the right action in the right place.



USE INFORMATION TO TARGET ACTION

On the maps, red/pink areas show where erosion was concentrated. Blue areas show where sediment is built up. These areas need different actions for different reasons.



START HIGH (PINK AREAS)

Focus on steep slopes, headwaters, gullies, trunk streams – where sediment is coming from.



STABILISE THE SOIL

Use the right plant in the right place – erosion control planting, long-term cover, native planting.



LOOK AFTER THE MAHI

Protect new plants from pests, stock, weeds and dry conditions.



MANAGE HIGH-RISK LAND

Where land is highly erosion-prone, consider long-term tree cover and, where appropriate, retiring the most erosion-prone areas from productive use.



SLOW SEDIMENT (BLUE AREAS)

Where sediment has built up or may move again. Sediment traps, debris dams and structures may help in some places, but need proper advice, permissions and maintenance.



PROTECT THE AWA

Fence waterways, plant riverbanks, protect unstable banks and crossings.



MONITOR CHANGE

Watch riverbed levels, channel widening, bank erosion, sediment build-up and changing flood pathways.



PLAN FOR SHIFTING FLOOD RISK

Riverbeds may rise or fall. Flood pathways can shift.



TARGET INVESTMENT

Focus effort where it helps hold soil in place - reduce sediment at source, manage stored sediment and reduce flood risk.

ABOUT THIS INFORMATION

Information for Whānau (2026) was developed for Te Rerenga Kārearea – Regional Hazardscape Tools Project by Kelly May and Hayley Lawrence, Maungaharuru-Tangitū Charitable Trust. It is informed by research undertaken by the Waterways Centre, University of Canterbury.

Disclaimer

This handout summarises research by the Waterways Centre, University of Canterbury. It is for information purposes only and should not be relied on for engineering, design, insurance, legal or regulatory decisions.

Page 7 draws on the Hawke's Bay Regional Council (2026), *Promoting Land and Water Health discussion document*.

For more information, please see Te Rerenga Kārearea StoryMap, accessible by scanning the QR code below, or navigating to:

www.tangoio.maori.nz/kaupapa/our-treasured-environment/rauemi

