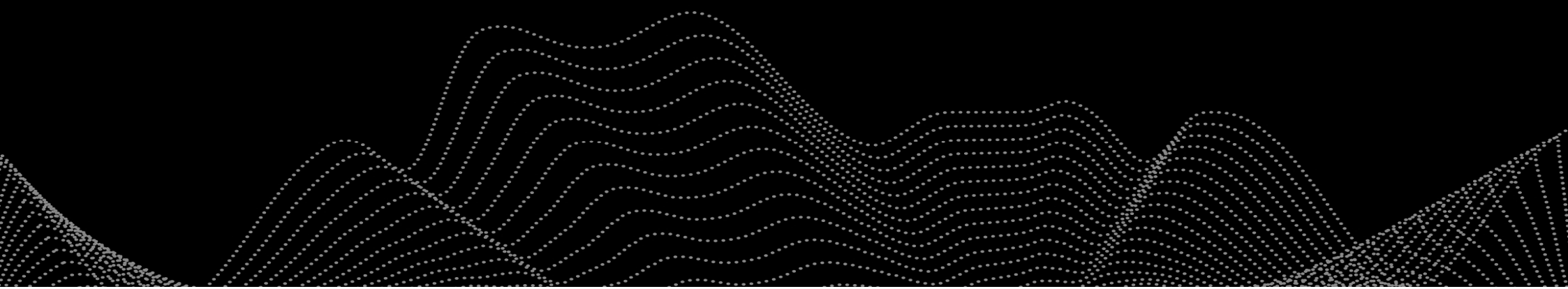




# Mitigation: erosion & sediment control effectiveness

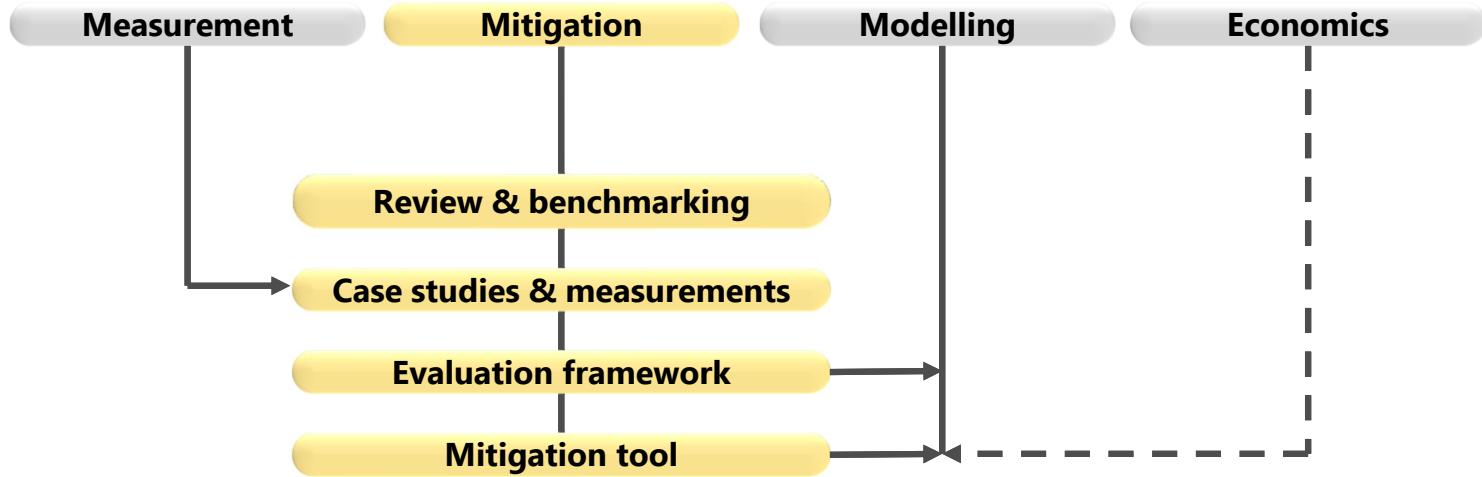
Chris Phillips and many others



# Outline



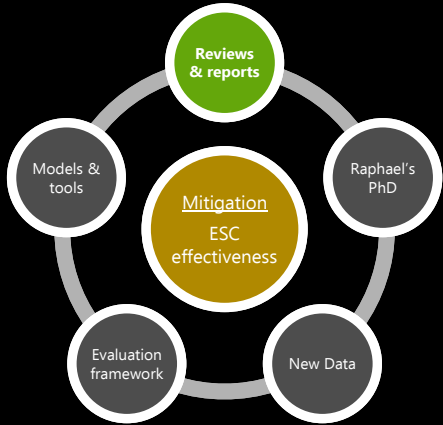
## Smarter targeting of erosion control



- ESC effectiveness is the extent to which the soil conservation treatment or ESC practice achieves the desired outcome.
- Consistent and repeatable methods are required to assess effectiveness and enable comparisons.
- ESC performance, while related to effectiveness, is the actual measure of sediment reduction, and is expressed as a percentage relative to a control.
- Common usage - effectiveness and performance often synonymous.



# Reviews & reports



RESEARCH ARTICLE Open Access

*New Zealand Journal of Forestry Science*

**Tree root research in New Zealand: a retrospective 'review' with emphasis on soil reinforcement for soil conservation and wind firmness**

Chris Phillips<sup>1,\*</sup>, Mark Bloomberg<sup>2</sup>, Michael Marden<sup>3</sup>, and Suzanne Lambie<sup>4</sup>

Ecological Engineering 173 (2021) 106436

Contents lists available at [ScienceDirect](#)

Ecological Engineering

journal homepage: [www.elsevier.com/locate/ecoleng](http://www.elsevier.com/locate/ecoleng)

Shallow landslides and vegetation at the catchment scale: A perspective

Chris Phillips<sup>a,\*</sup>, Tristram Hales<sup>b</sup>, Hugh Smith<sup>c</sup>, Les Basher<sup>d</sup>

*sustainability*

Opinion

**Harmonizing Erosion Control and Flood Prevention with Restoration of Biodiversity through Ecological Engineering Used for Co-Benefits Nature-Based Solutions**

Freddy Rey

*water*

Article

**A New Framework to Model Hydraulic Bank Erosion Considering the Effects of Roots**

Eric Gasser<sup>1,2,\*</sup>, Paolo Perona<sup>3</sup>, Luuk Dorren<sup>1,2</sup>, Chris Phillips<sup>4</sup>, Johannes Hübl<sup>2</sup> and Massimiliano Schwarz<sup>1</sup>

**Bio-physical performance of erosion and sediment control/mitigation techniques – an international comparison to common practices in New Zealand**

Prepared for: MBE as part of STEC

November 2020

**Biophysical performance of erosion and sediment control techniques in New Zealand: a review**

Prepared for: MBE as part of STEC

June 2020

Phillips CJ, Basher L, Spiekermann R (2020). Biophysical performance of erosion and sediment control techniques in New Zealand: a review LC3761.

Schwarz M, Poesen J, Rey F, Holbling D, Phillips C (2020). Bio-physical performance of erosion and sediment control/mitigation techniques – an international comparison to common practices in New Zealand LC3891.



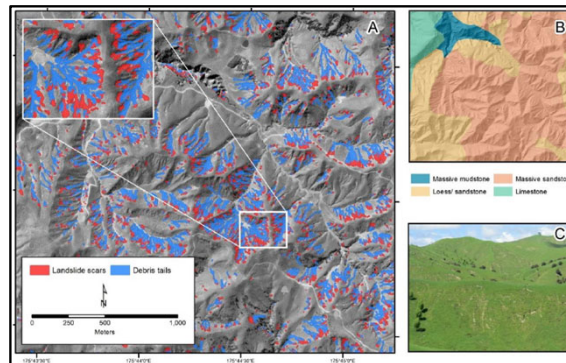
# Raphael's PhD



## Quantifying the performance of silvopastoralism for landslide erosion and sediment control in New Zealand's hill country



- Good linkage between RA1.1 and 1.2
- New tree influence model
- New connectivity model
- Used high resolution information (LiDAR) and demonstrated its value
- Demonstrated value of targeting
- Benefit v cost
- 3+ papers, 9 conference presentations
- OL&W silvopastoral think-piece



Geomorphology 440 (2023) 106670  
Contents lists available at ScienceDirect  
Geomorphology  
ELSEVIER journal homepage: www.journals.elsevier.com/geomorphology

Comparing physical and statistical landslide susceptibility models at the scale of individual trees  
Raphael I. Spiekermann<sup>a,b,\*</sup>, Feiko van Zadelhoff<sup>c,d,1</sup>, Jan Schindler<sup>a</sup>, Hugh Smith<sup>a</sup>, Chris Phillips<sup>a</sup>, Massimiliano Schwarz<sup>e</sup>

Ecological Engineering 100 (2022) 106676  
Contents lists available at ScienceDirect  
Ecological Engineering  
ELSEVIER journal homepage: www.elsevier.com/locate/ecoleng

Development of a morphometric connectivity model to mitigate sediment derived from storm-driven shallow landslides  
Raphael I. Spiekermann<sup>a,b,\*</sup>, Hugh G. Smith<sup>a</sup>, Sam McColl<sup>b</sup>, Lucy Burkitt<sup>b</sup>, Ian C. Fuller<sup>b</sup>

Geomorphology 396 (2022) 107993  
Contents lists available at ScienceDirect  
Geomorphology  
ELSEVIER journal homepage: www.elsevier.com/locate/geomorph

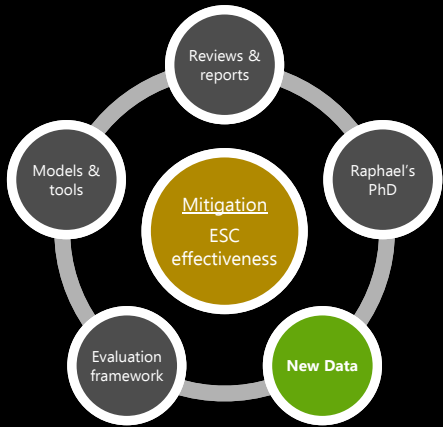
Quantifying effectiveness of trees for landslide erosion control  
Raphael I. Spiekermann<sup>a,b,\*</sup>, Hugh G. Smith<sup>a</sup>, Sam McColl<sup>b</sup>, Lucy Burkitt<sup>b</sup>, Ian C. Fuller<sup>b</sup>

Journal of Environmental Management 286 (2021) 112194  
Contents lists available at ScienceDirect  
Journal of Environmental Management  
ELSEVIER journal homepage: http://www.elsevier.com/locate/jenvman

Quantifying the influence of individual trees on slope stability at landscape scale  
Raphael I. Spiekermann<sup>a,b,\*</sup>, Sam McColl<sup>b</sup>, Ian Fuller<sup>b</sup>, John Dymond<sup>a</sup>, Lucy Burkitt<sup>b</sup>, Hugh G. Smith<sup>a</sup>

\* Massey University - Landcare Research, Palmerston North, New Zealand  
<sup>a</sup> Massey University - Landcare Research, Palmerston North, New Zealand  
<sup>b</sup> School of Agriculture and Environment, Massey University, Palmerston North, New Zealand

# New data



forests



2023

Article

## Analysis of Poplar's (*Populus nigra* ita.) Root Systems for Quantifying Bio-Engineering Measures in New Zealand Pastoral Hill Country

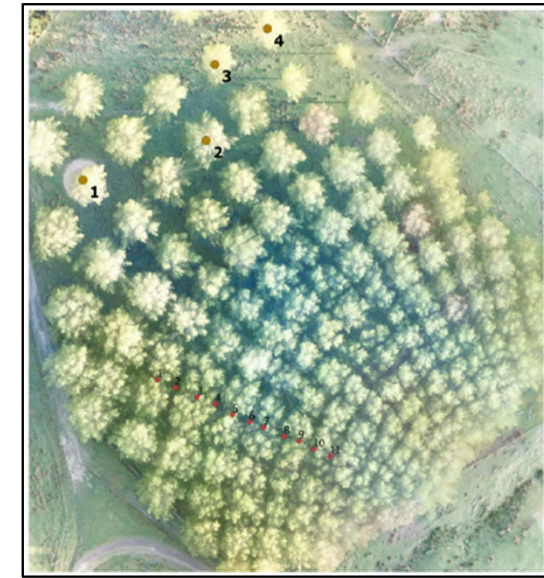
Ha My Ngo <sup>1,2</sup>, Feiko Bernard van Zadelhoff <sup>2,3</sup>, Ivo Gasparini <sup>2</sup>, Julien Plaschy <sup>2</sup>, Gianluca Flepp <sup>2</sup>, Luuk Dorren <sup>2</sup>, Chris Phillips <sup>4</sup>, Filippo Giadrossich <sup>1</sup> and Massimiliano Schwarz <sup>2</sup>

Chapter

2023

## Drivers and New Opportunities for Woody Vegetation Use in Erosion Management in Pastoral Hill Country in New Zealand

Ian McIvor, Thomas Mackay-Smith and Raphael Spiekermann



# New data

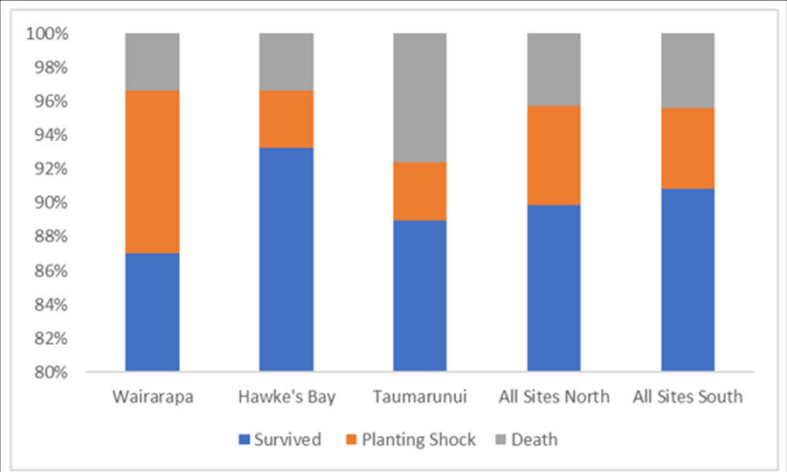
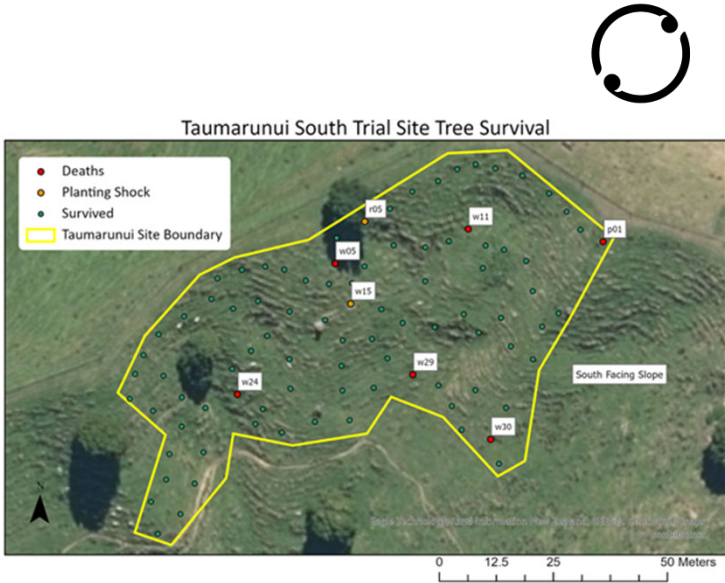


Fig 13: Percentage of survival, planting shock losses and death across the three trial sites and all north- and south-facing trees combined

Davison E 2023. Environmental factors influencing survival of poplar material planted for erosion control on hill country farms in New Zealand Unpublished thesis, Massey University, Manawatū, New Zealand 98 p.



Catena 213 (2022) 106215

Contents lists available at ScienceDirect

**Catena**

journal homepage: [www.elsevier.com/locate/catena](http://www.elsevier.com/locate/catena)

Check for updates

The impact of a kānuka silvopastoral system on surface runoff and sediment and nutrient losses in New Zealand hill country

Thomas H. Mackay-Smith<sup>1,\*</sup>, Lucy L. Burkitt, Ignacio F. López, Janet I. Reid

**land** MDPI

Review

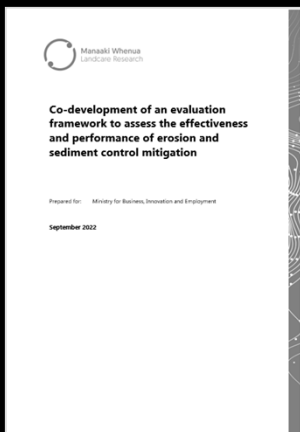
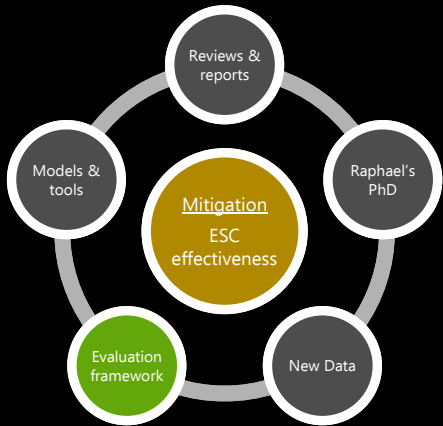
**A Framework for Reviewing Silvopastoralism: A New Zealand Hill Country Case Study**

Thomas H. Mackay-Smith<sup>1,\*</sup>, Lucy Burkitt<sup>1</sup>, Janet Reid<sup>1</sup>, Ignacio E. López<sup>1</sup> and Chris Phillips<sup>2</sup>

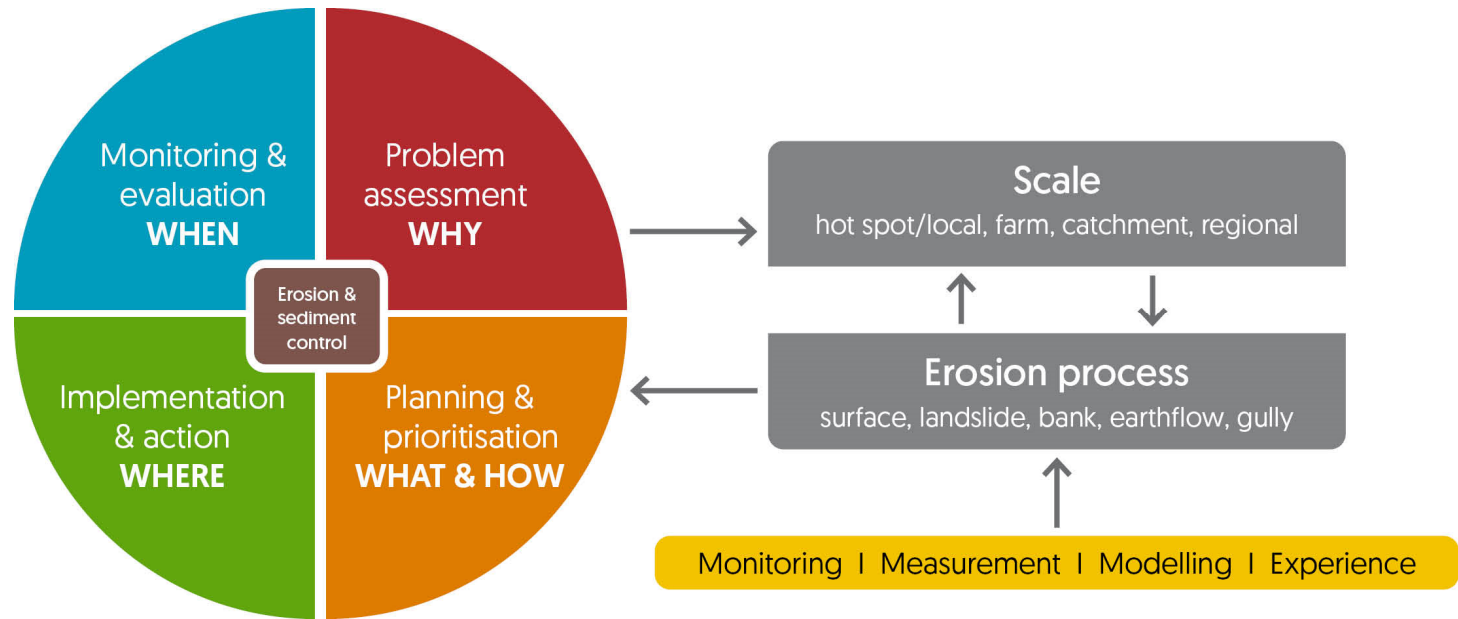




# Evaluation framework

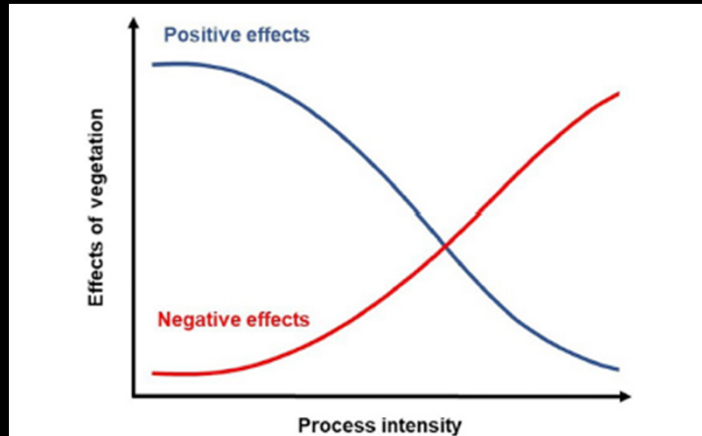
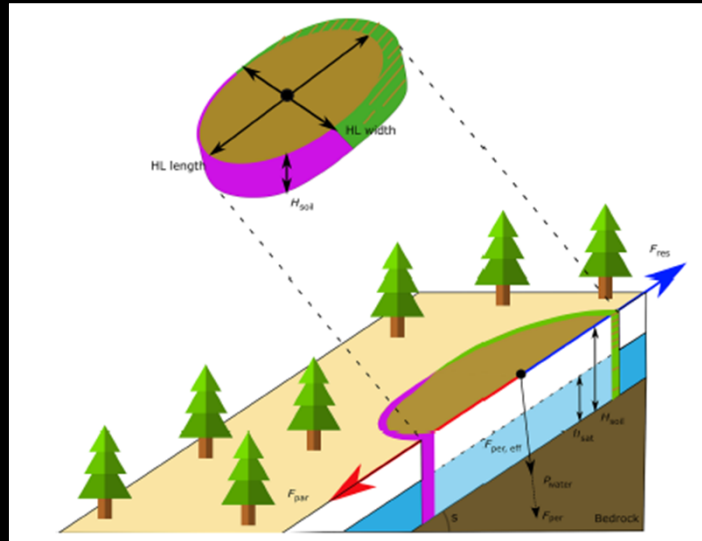
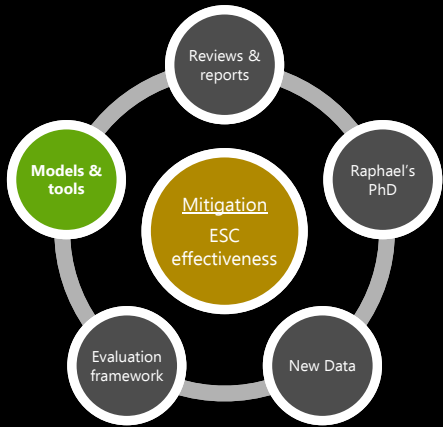


## Erosion & Sediment Control Evaluation Framework



Phillips C, Spiekermann R, Hyslop J 2022. Co-development of an evaluation framework to assess the effectiveness and performance of erosion and sediment control mitigation. Landcare Research Contract Report, LC2440. 43 p.

# Models & tools



**Fig. 16.** Conceptual schematic representation on when the beneficial effects of vegetation can become detrimental with increasing process intensity. At the point of intersection, positive silvicultural measures are needed and with increasing process intensity, more drastic forest management measures are recommended.



Comparing physical and statistical landslide susceptibility models at the scale of individual trees

Raphael I. Spiekermann<sup>a,b,\*</sup>, Feiko van Zadelhoff<sup>c,d,1</sup>, Jan Schindler<sup>a</sup>, Hugh Smith<sup>a</sup>, Chris Phillips<sup>a</sup>, Massimiliano Schwarz<sup>c</sup>

Nat. Hazards Earth Syst. Sci., 22, 2611–2635, 2022  
<https://doi.org/10.5194/nhess-22-2611-2022>  
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Natural Hazards and Earth System Sciences  
 Open Access  
**EGU**

**Introducing SlideforMAP: a probabilistic finite slope approach for modelling shallow-landslide probability in forested situations**

Feiko Bernard van Zadelhoff<sup>1</sup>, Adel Albaba<sup>1</sup>, Denis Cohen<sup>2</sup>, Chris Phillips<sup>3</sup>, Bettina Schaeffli<sup>4</sup>, Luuk Dorren<sup>1,5</sup>, and Massimiliano Schwarz<sup>1,5</sup>

Article  
**A New Framework to Model Hydraulic Bank Erosion Considering the Effects of Roots**

Eric Gasser<sup>1,2,\*</sup>, Paolo Perona<sup>3</sup>, Luuk Dorren<sup>1,2</sup>, Chris Phillips<sup>4</sup>, Johannes Hübl<sup>2</sup> and Massimiliano Schwarz<sup>1</sup>

A review of modeling the effects of vegetation on large wood recruitment processes in mountain catchments

Eric Gasser<sup>a,b,\*</sup>, Massimiliano Schwarz<sup>a</sup>, Andrew Simon<sup>c</sup>, Paolo Perona<sup>d</sup>, Chris Phillips<sup>c</sup>, Johannes Hübl<sup>b</sup>, Luuk Dorren<sup>a,b</sup>



# Outline



## Key messages

- Effectiveness and performance are 2 different things
- Vegetation can make a difference; not a universal panacea
- Root data and other vegetation data is hard and expensive to get and often limited in terms of species & age
- Need data to support/develop theory and models
- Need data to calibrate and test models
- Need to bring different science together to be able to produce tools for practitioners
- Tools need to be simple, easy to use and realistic





A big thankyou to our:

- international collaborators
- students
- stakeholders

