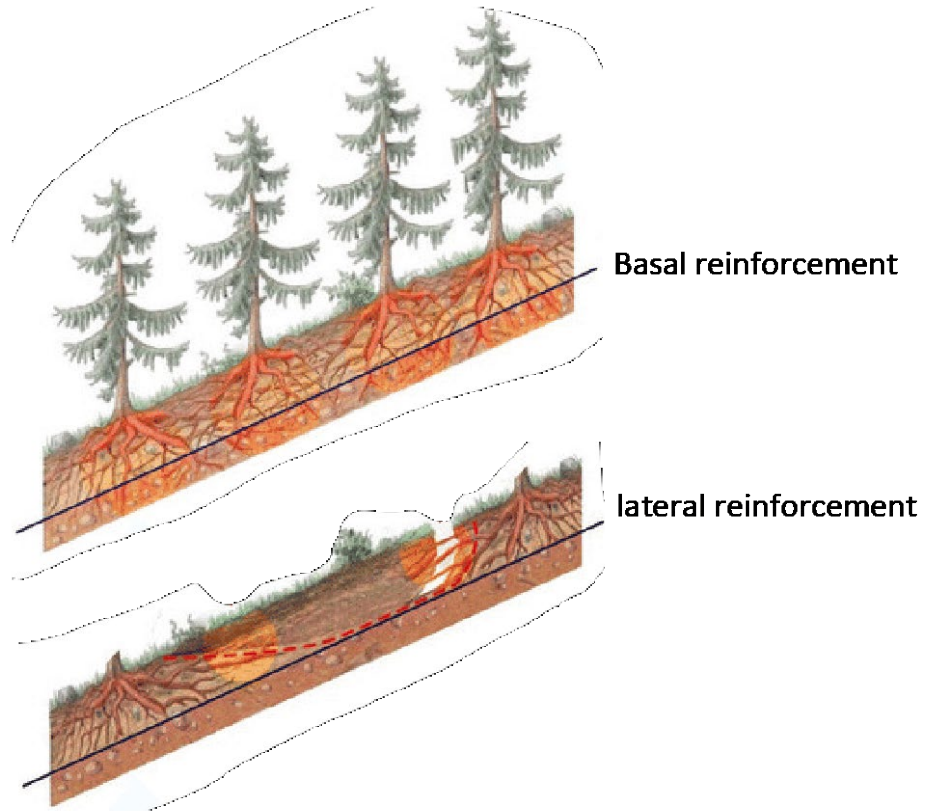


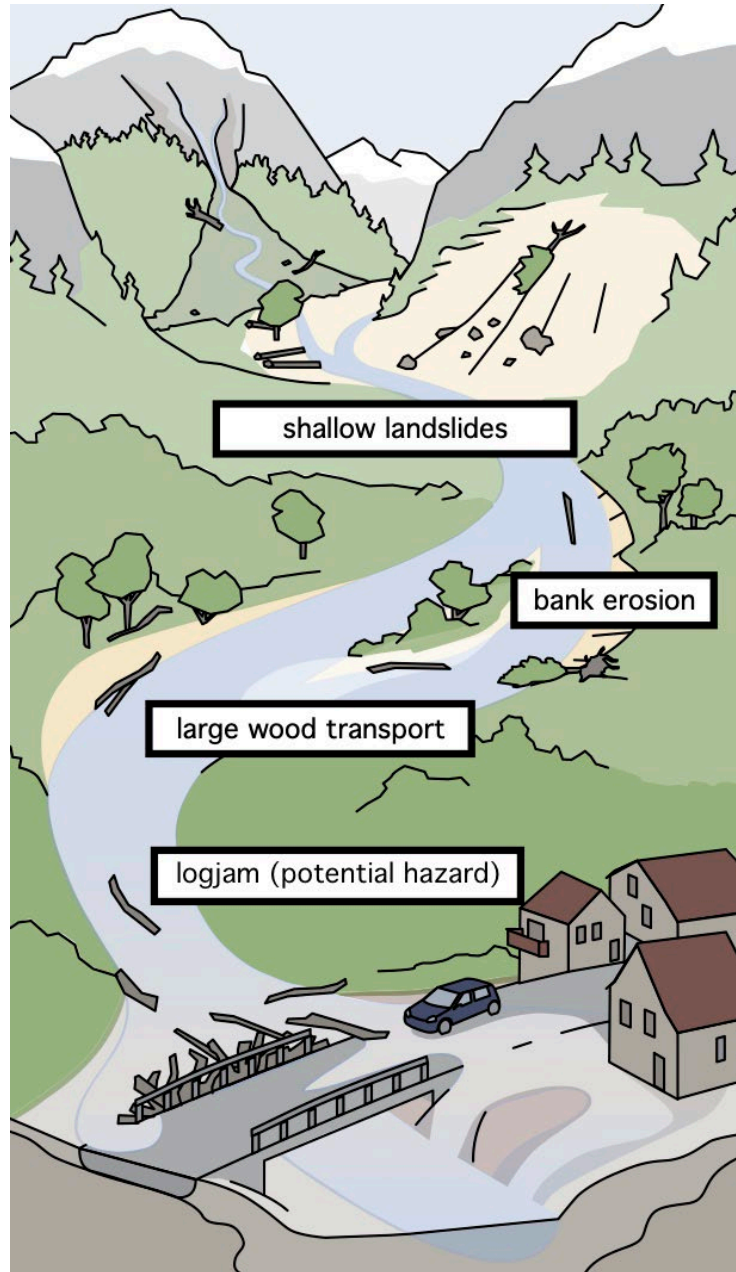
# Quantifying and managing bank erosion and instream wood

Trees can reinforce soils and prevent bank erosion and shallow landslides, but...



More trees, less trees? Which ones and where?

At catchment scale:



### Processes:

- Shallow landslides
- Bank erosion
- LW recruitment/transport
- Logjams

### ecorisQ numerical tools:

- Identification of forests with protective effect
- Identification of main large wood reservoirs

### Objectives:

Facilitate...

- Forest management
- LW related risk management

→ costs/benefits (including ecological!)

→ preservation/prevention measures

# Prevention?



Germany, July 2021

# Numerical models

## **FINT: Find individual trees**

- Individual trees height/diameter
- Wood volume
- Root reinforcement

## **SlideforMAP:**

- Probability of shallow landslides
- Landslides runoff

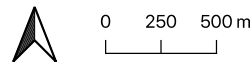
## **BankforMAP:**

- Probability of bank erosion
- LW volume reservoirs and transport

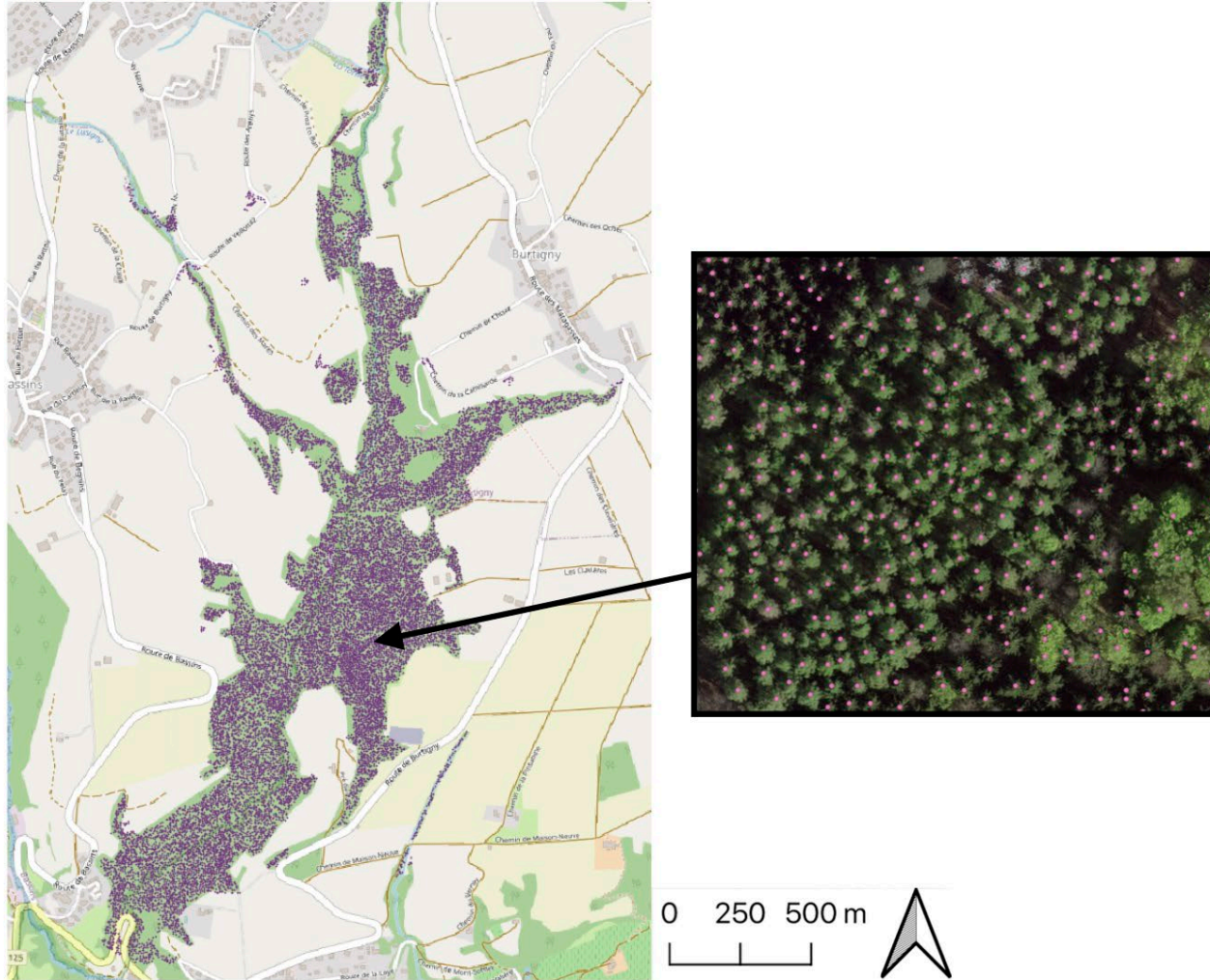
# Study site: La Serine



Location: Switzerland  
Catchment area: 29 km<sup>2</sup>



# FINT (Find Individual Trees) results



DEM/DTM →

- Root reinforcement
- “Available” volume of wood

Then add some data about the catchment area, precipitation and discharge values, soil characteristics...

# SlideforMAP: probability of failure (shallow landslide) for a return period = 100 yrs

Without trees



Probabilité de glissement (pr = 100 ans)

Sans végétation

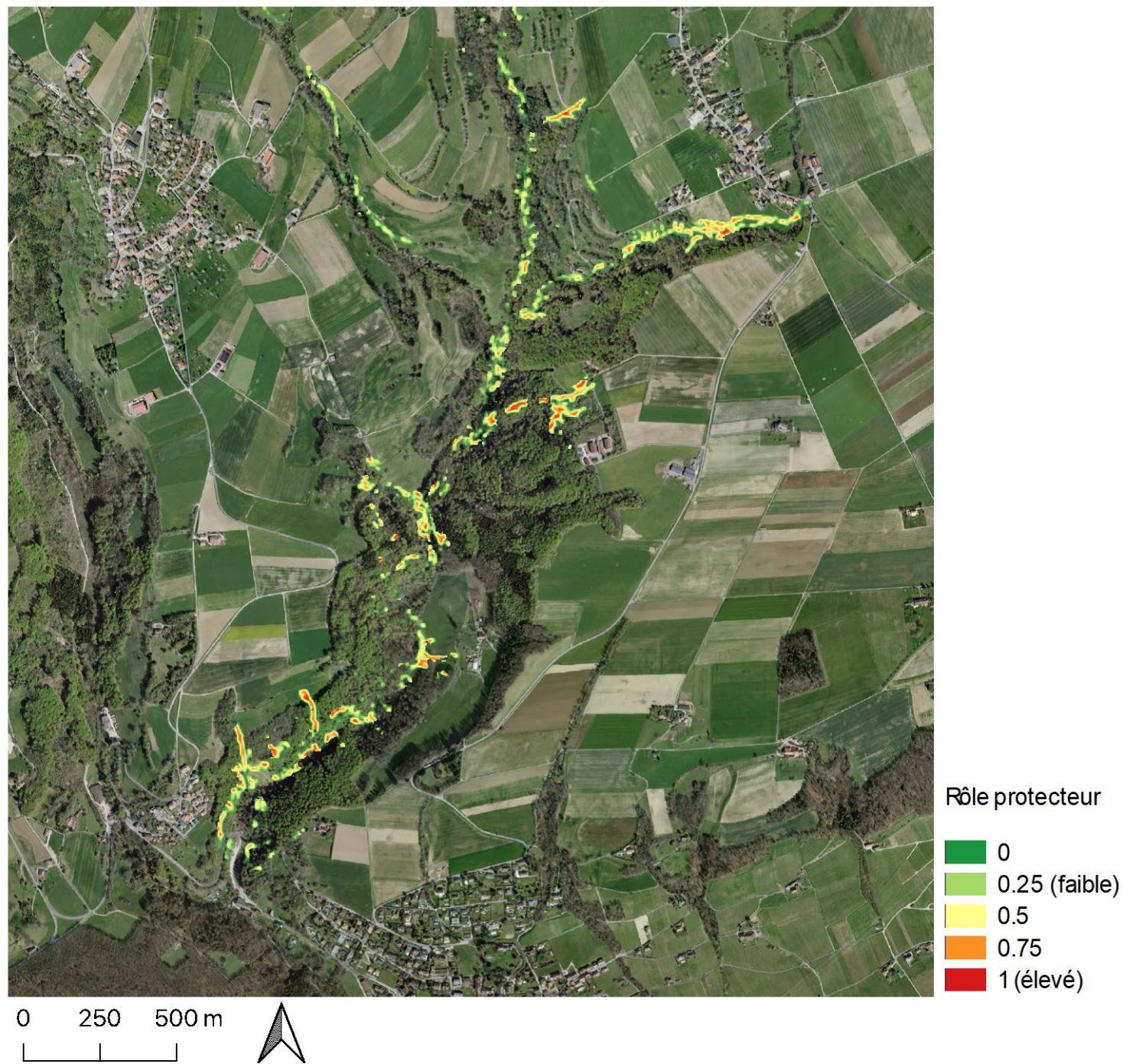


With trees



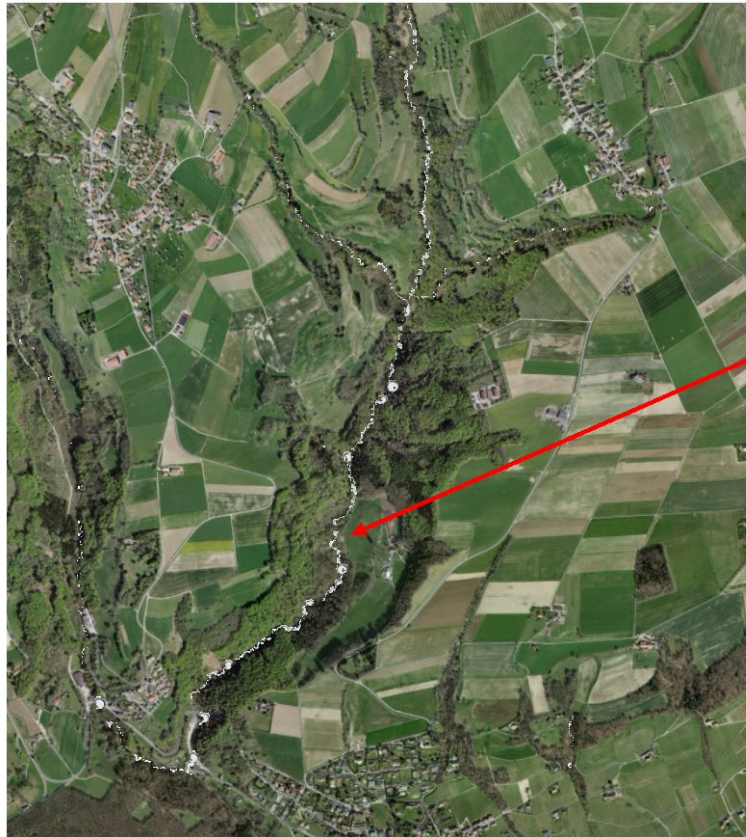
==

Protection forest against shallow landslides

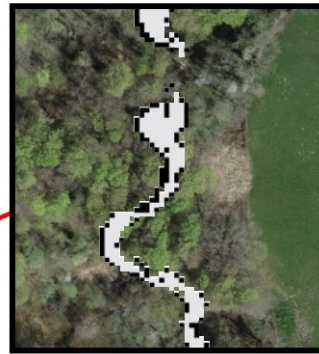


# BankforMAP

Probability of bank erosion



0 250 500 m



without trees – with trees



Protection forest against bank erosion



0 250 500 m



Délimitation des zones de forêt protectrice

## BankforMAP:

- LW volume mobilized by landslides and bank erosion
- main LW reservoirs
- Recruited LW volume
- Transported/deposited LW volume

→ Which decision?

Main LW reservoirs in case of bank erosion



0 250 500 m

Principales zones d'apport en bois flottant du à l'érosion des berges  
Concentration du volume de bois  
élevée  
faible

Main LW reservoirs in case of landslides

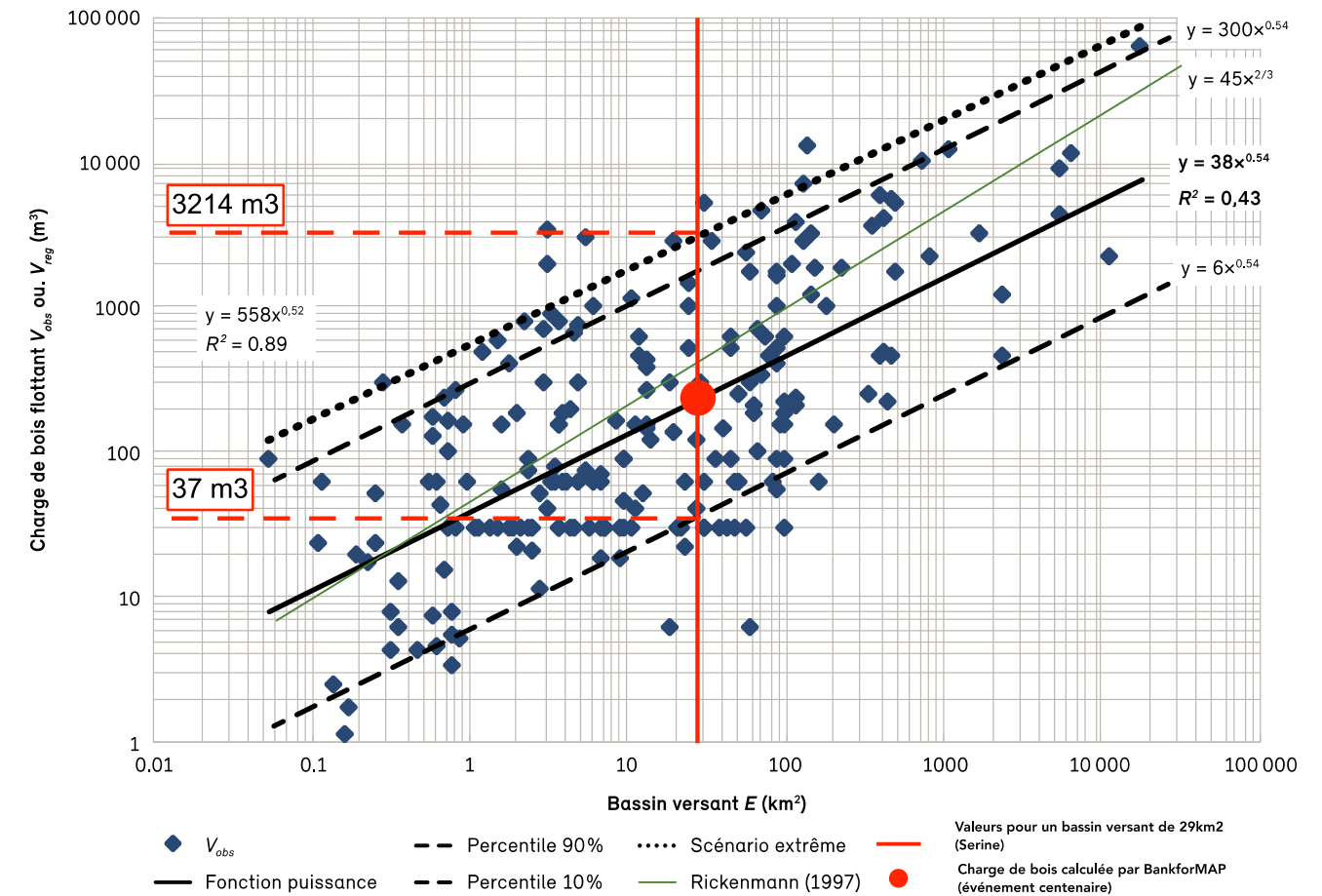


0 250 500 m

Principales zones d'apport en bois flottant du aux glissements superficiels de terrain  
Concentration du volume de bois  
élevée  
faible

Fia. 16 : Charge de bois flottant en fonction de la superficie du bassin versant  $E$

Relationship between catchment area size and wood volume under different scenarios



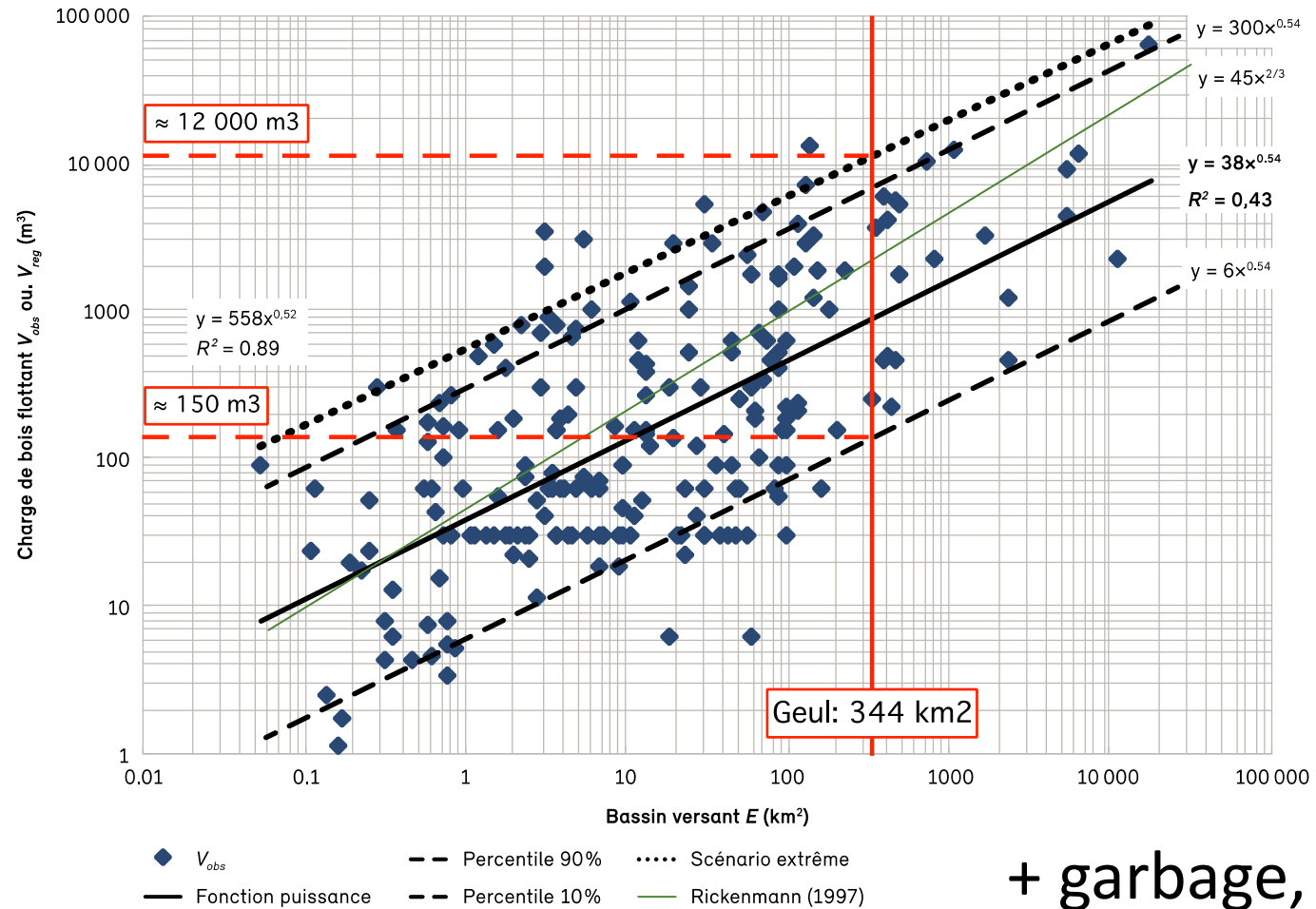
Calculated LW volume recruited by bank erosion + calculated LW volume recruited by shallow landslide = 250  $m^3$



→ Logjam probability → risk management

# And in the Geul?

Relationship between catchment area size and wood volume under different scenarios



+ garbage, cars, furniture...

# What's next?

- Interface for practitioners
- Application/validation with different types of river catchments
- Roots reinforcement against bank erosion depending on tree species

# Bonus: BankforNET

- Decision making tool for forest management
- The module implemented in BankforMAP
- On the field easy-to-use tool (also on a smart phone)
- For river sections/specific tree
  - Flow height
  - Wood transport
  - Bank erosion

## BankforNET: inputs



# BankforNET

## Inputs

### Channel Parameters

Channel Width: 9.5 m

Channel Slope: 0.04 m/m

Inner Bank Slope: 3.5 deg

Outer Bank Slope: 3.3 deg

Bend Radius: 30 m

Manning Coefficient: 0.04 m<sup>1/3</sup>/s

Inner Bank Height: 1.2 m

Outer Bank Height: 1.2 m

D<sub>50</sub>: 50 mm

### Catchment

☒ Catchment Area & Return Period  
☐ Discharge & Duration  
☐ Catchment Area & Discharge

Catchment Area: 29 km<sup>2</sup>

Return Period: 10 yrs

Discharge: m<sup>3</sup>/s

Duration: min

Erosion Coefficient: 8.899e-7 m/Pa<sup>0.6</sup>/s

### Critical Shear Stress

Inner D<sub>50</sub>: 98 mm

Outer D<sub>50</sub>: 98 mm

Model: User Defined

Inner User Defined  $\tau_c$ : 18,246.8

Outer User Defined  $\tau_c$ : 20,271.2

### Vegetation

#### Inner Bank Tree

DBH: 0.2 m

Height: 4 m

Distance: 7.8 m

Tree Species: Alnus incana

#### Outer Bank Tree

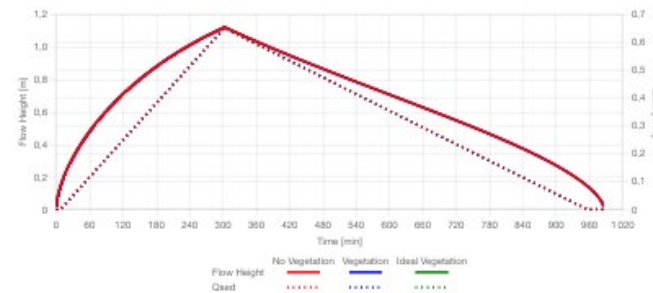
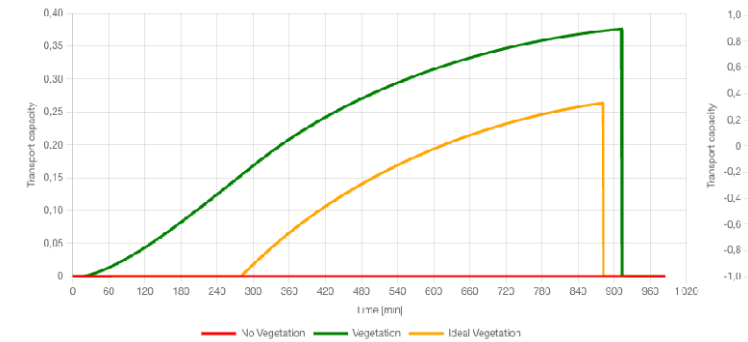
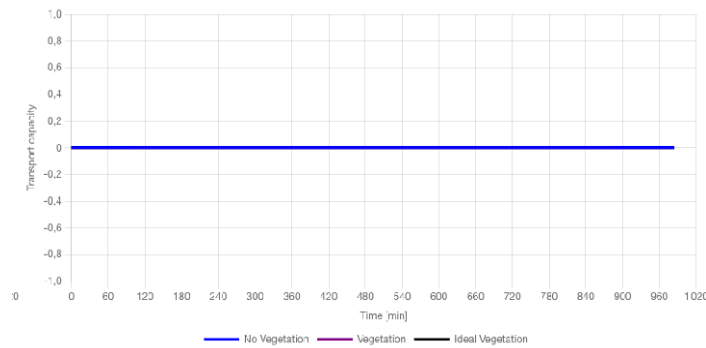
DBH: 0.45 m

Height: 15 m

Distance: 7 m

Tree Species: Alnus incana

## outputs



	No Vegetation	Vegetation	Ideal Vegetation
Total Erosion Inner Bank (m)	2.52	2.52	2.52
Total Erosion Outer Bank (m)	4.22	4.2	4.2

Thank you for you attention!