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Dimensioning of riparian buffer zones in agricultural catchments at national level

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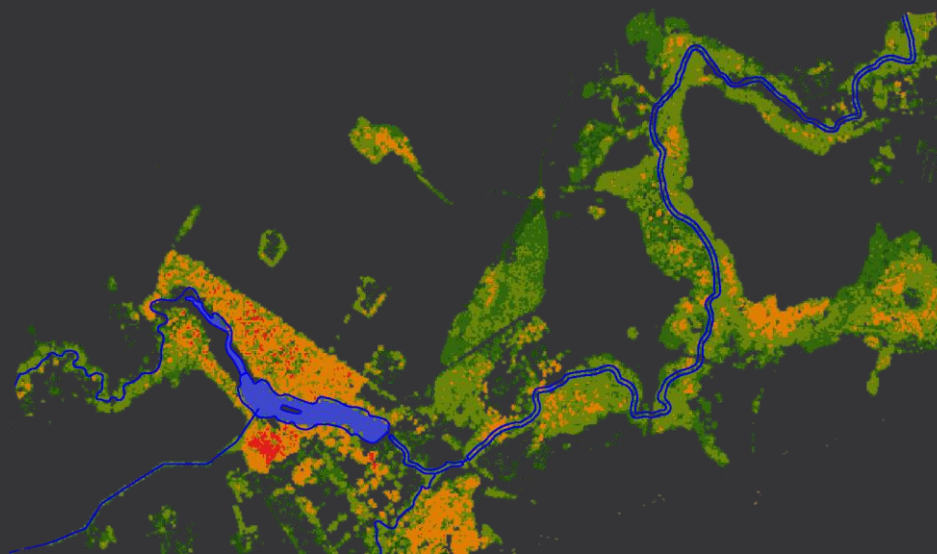
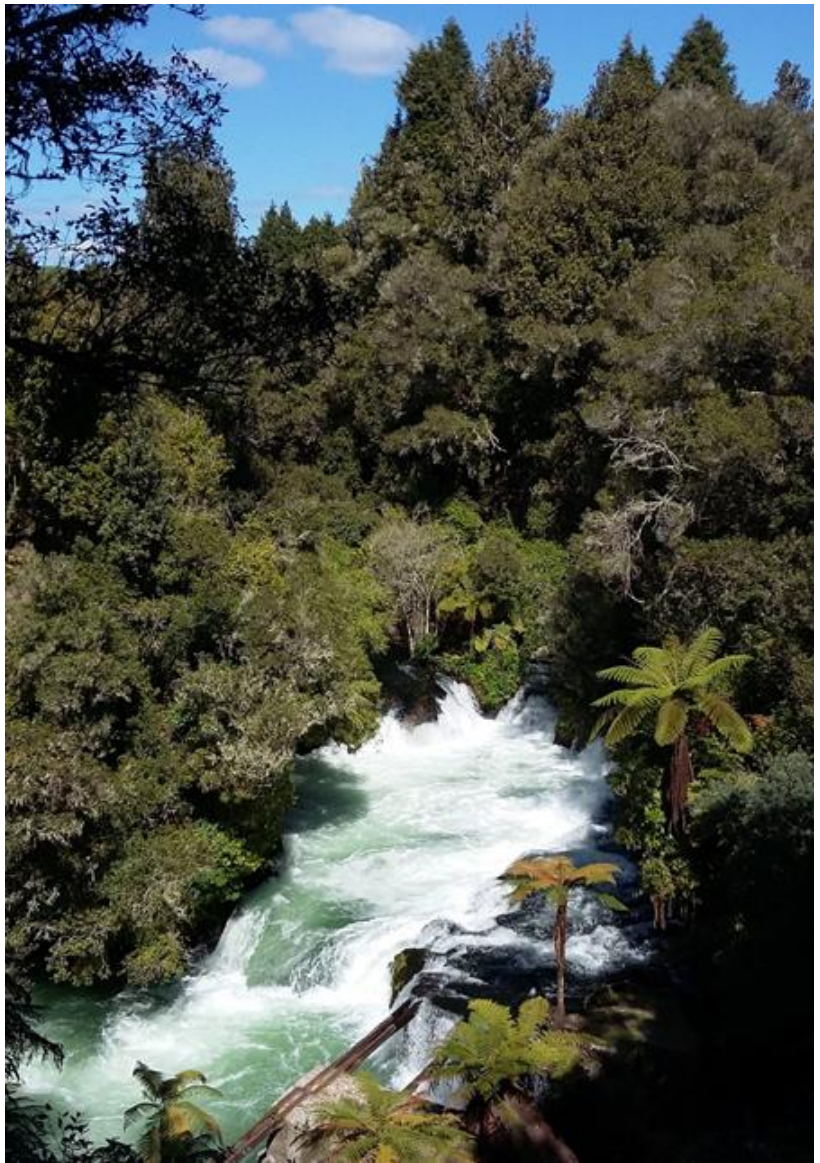
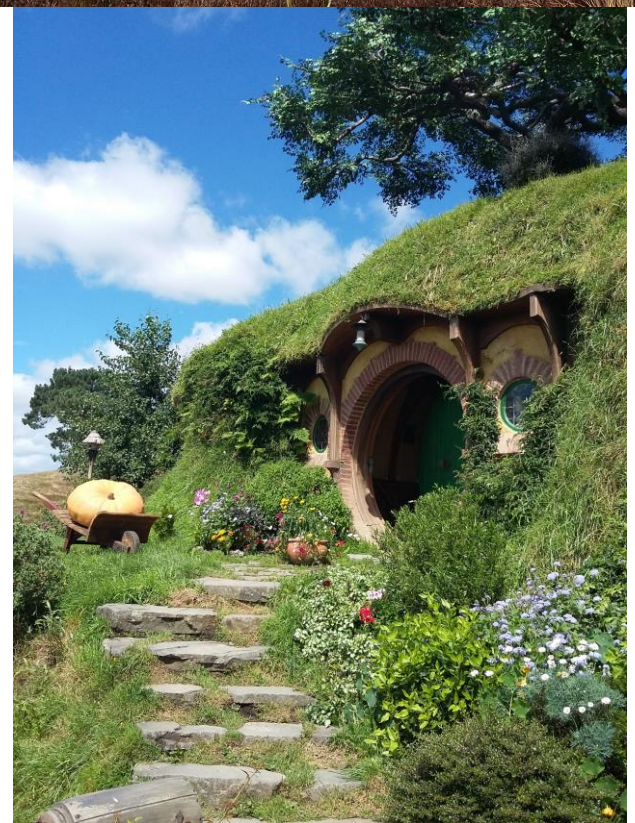


Intro

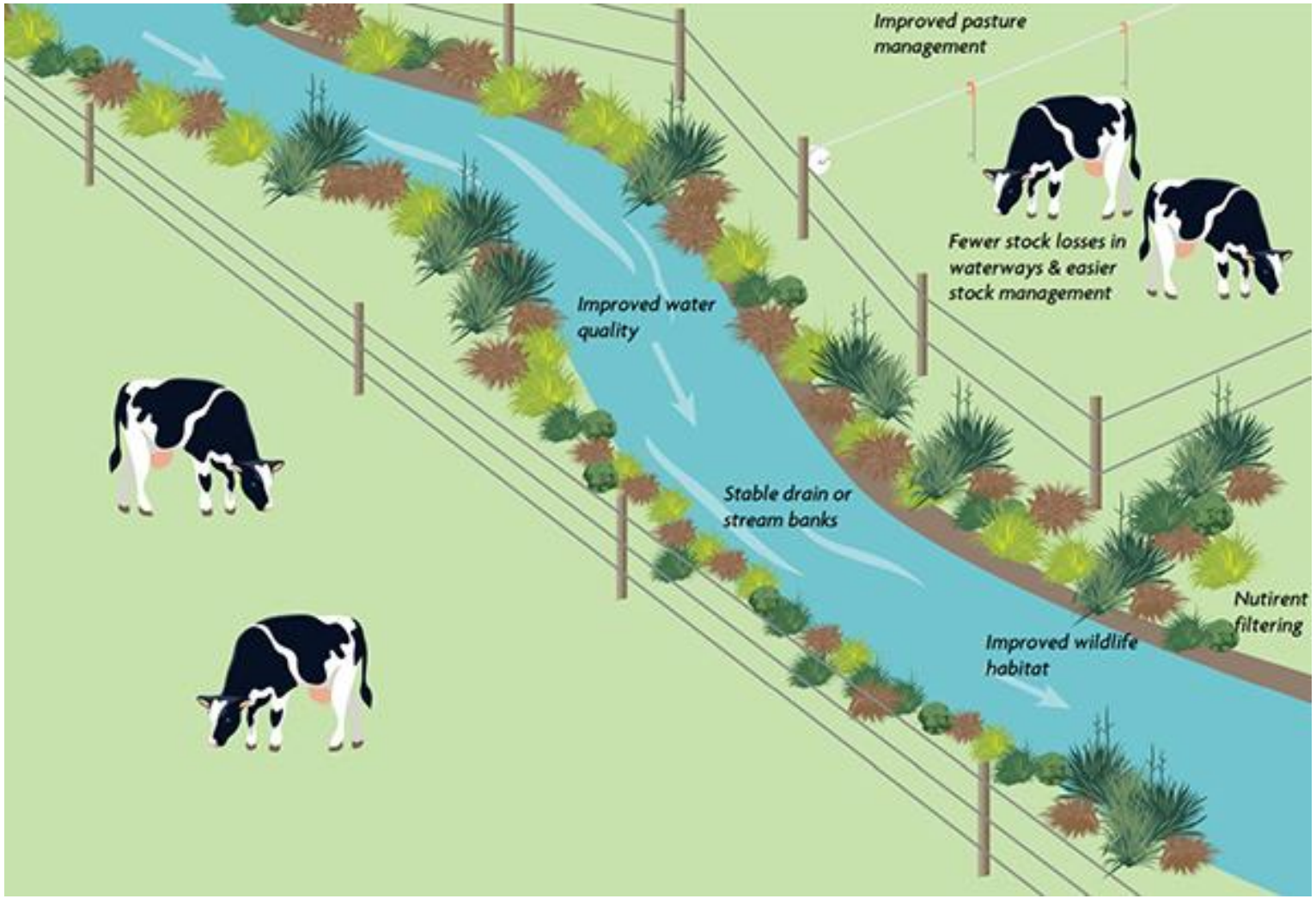
The New Zealand experience





The New Zealand experience

Measures to reduce the agricultural pollution



- Fencing
- Buffer strips from native vegetation
- Wetlands

The main functions of riparian buffer zones

(Mander et al. 2005; Polyakov et al. 2005)

MULTIFUNCTIONALITY

1) Nutrient removal from surface flow;

2) Preventing erosion;

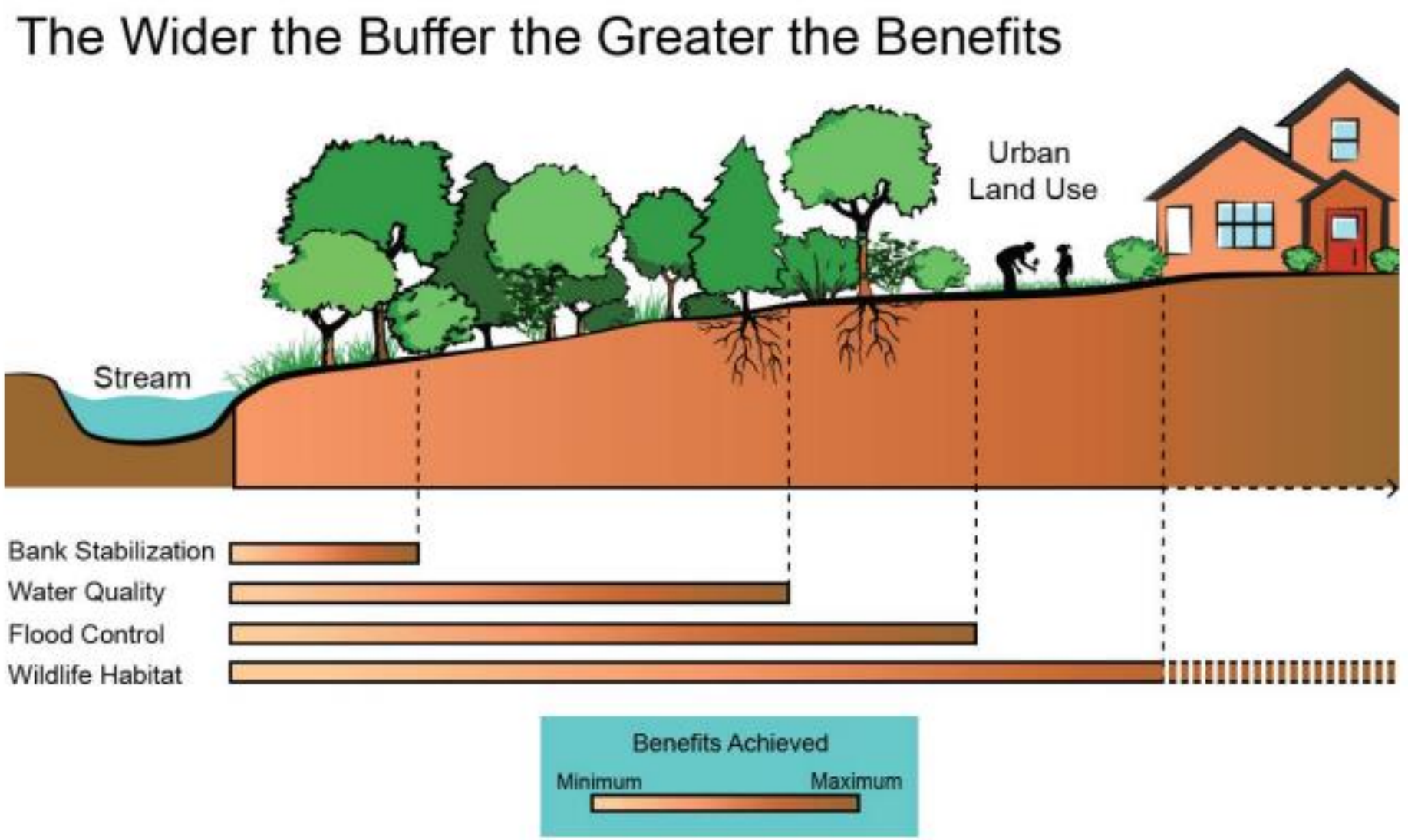
3) Carbon sequestration;

4) Limit the growth of higher plants in the waterbodies by shading;

5) Improve microclimate;

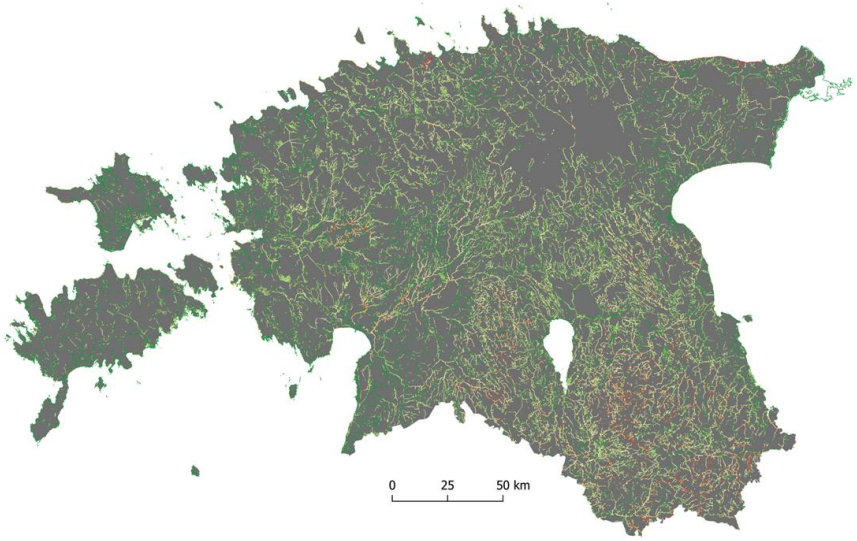
6) Provide habitat, increase landscape connectivity

The width of a buffer zone depends on the function



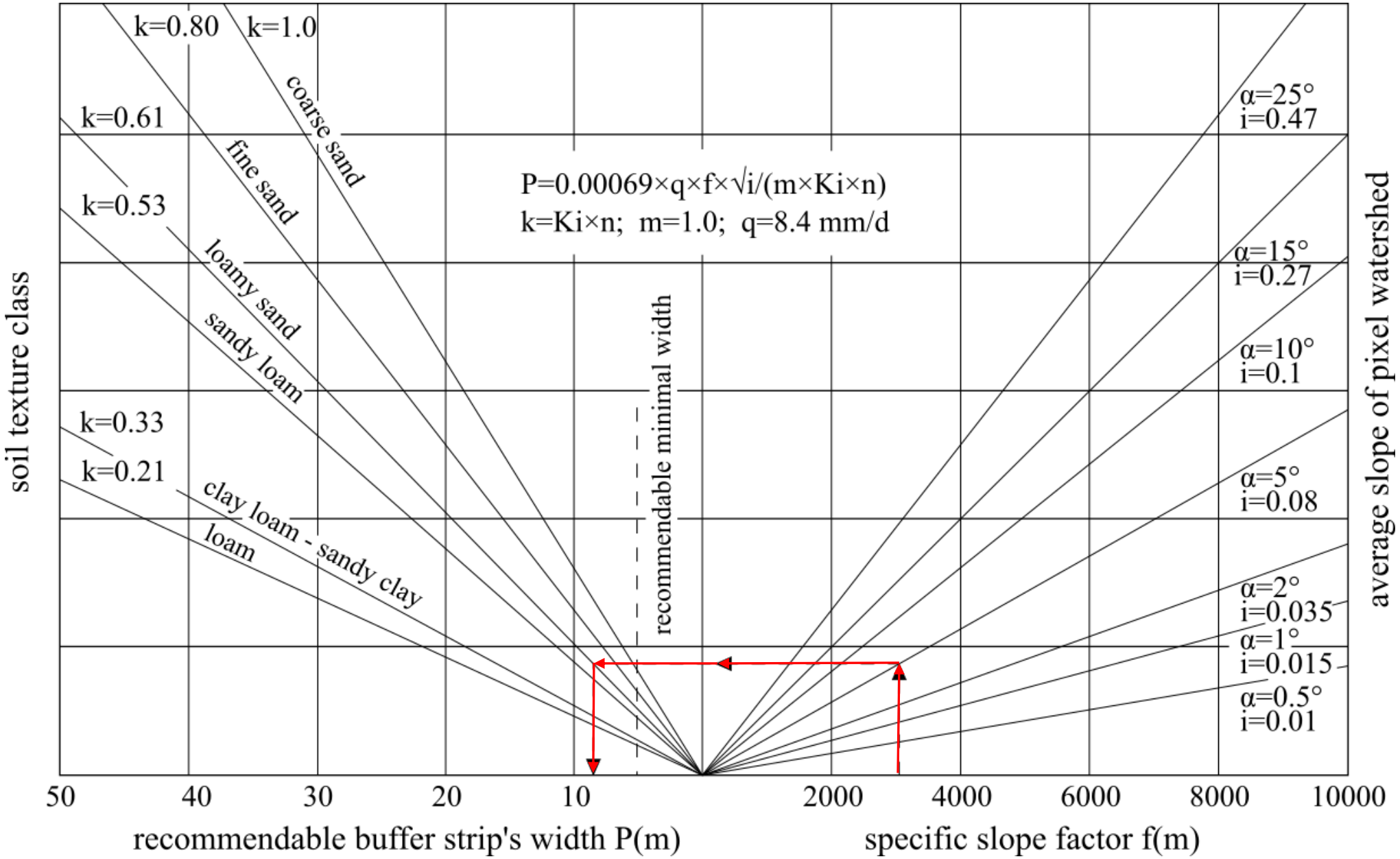
Source: Tennessee Urban Riparian Buffer Handbook

Identifying the optimal riparian buffer zone widths at high resolution for the whole Estonia



Nomograph for determination of the recommendable buffer zone width

(Mander and Kuusemets, 1998)

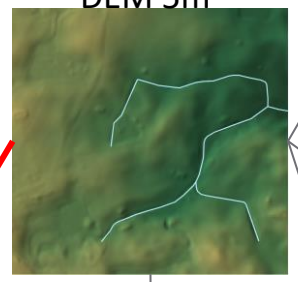


Inputs for the nomograph

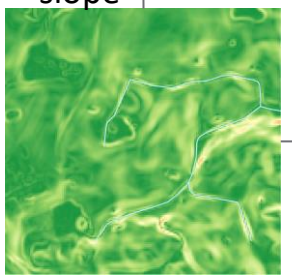
5M RESOLUTION
DIGITAL ELEVATION MODEL

SOIL MAP

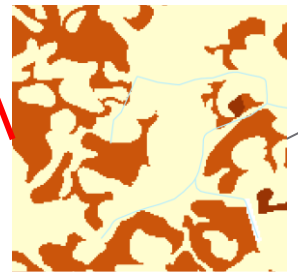
DEM 5m



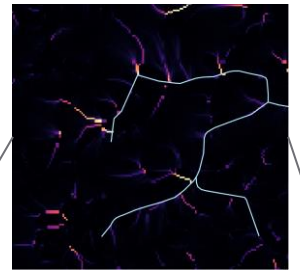
slope



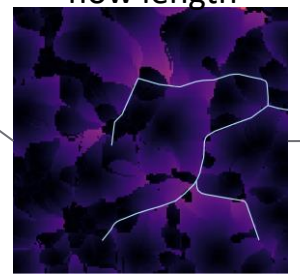
soil texture



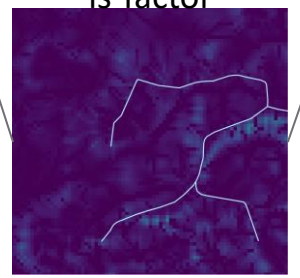
flow accumulation



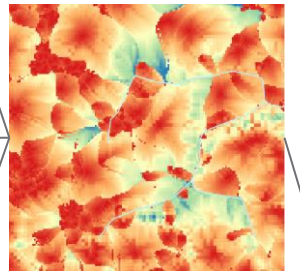
flow length



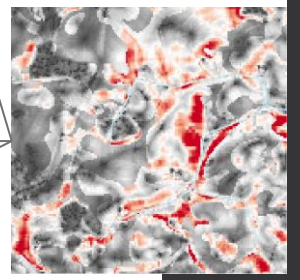
ls-factor

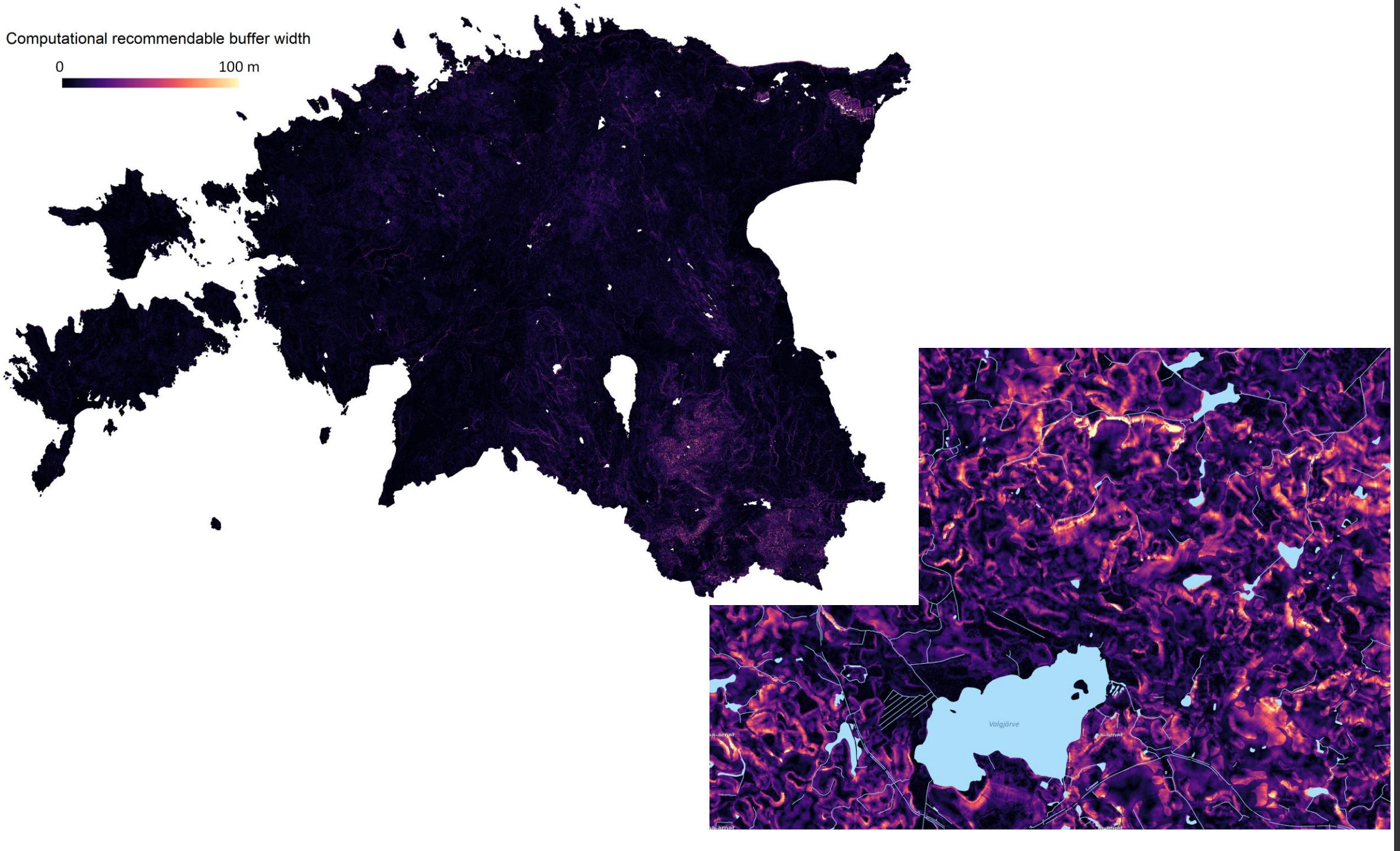


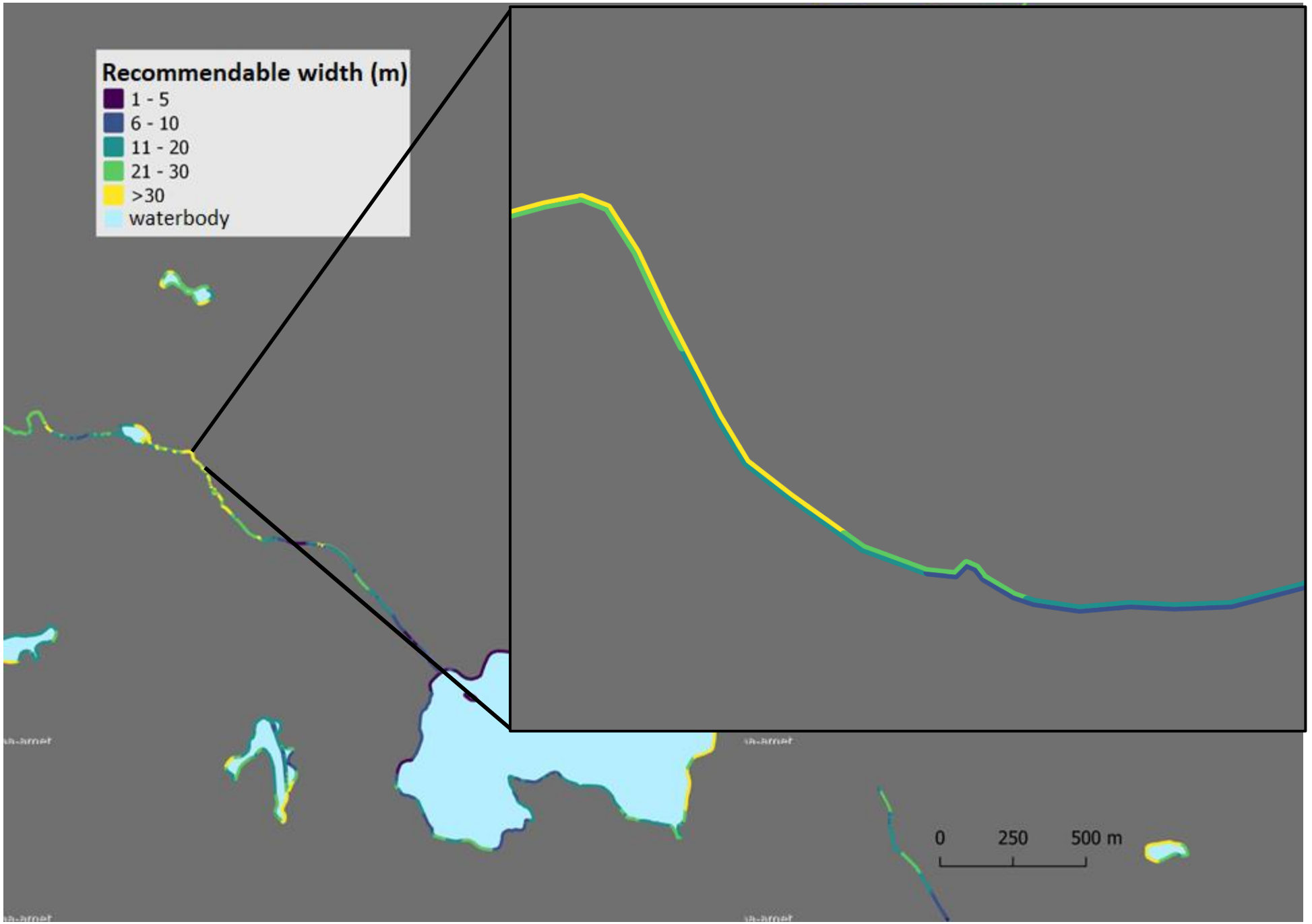
slope length factor

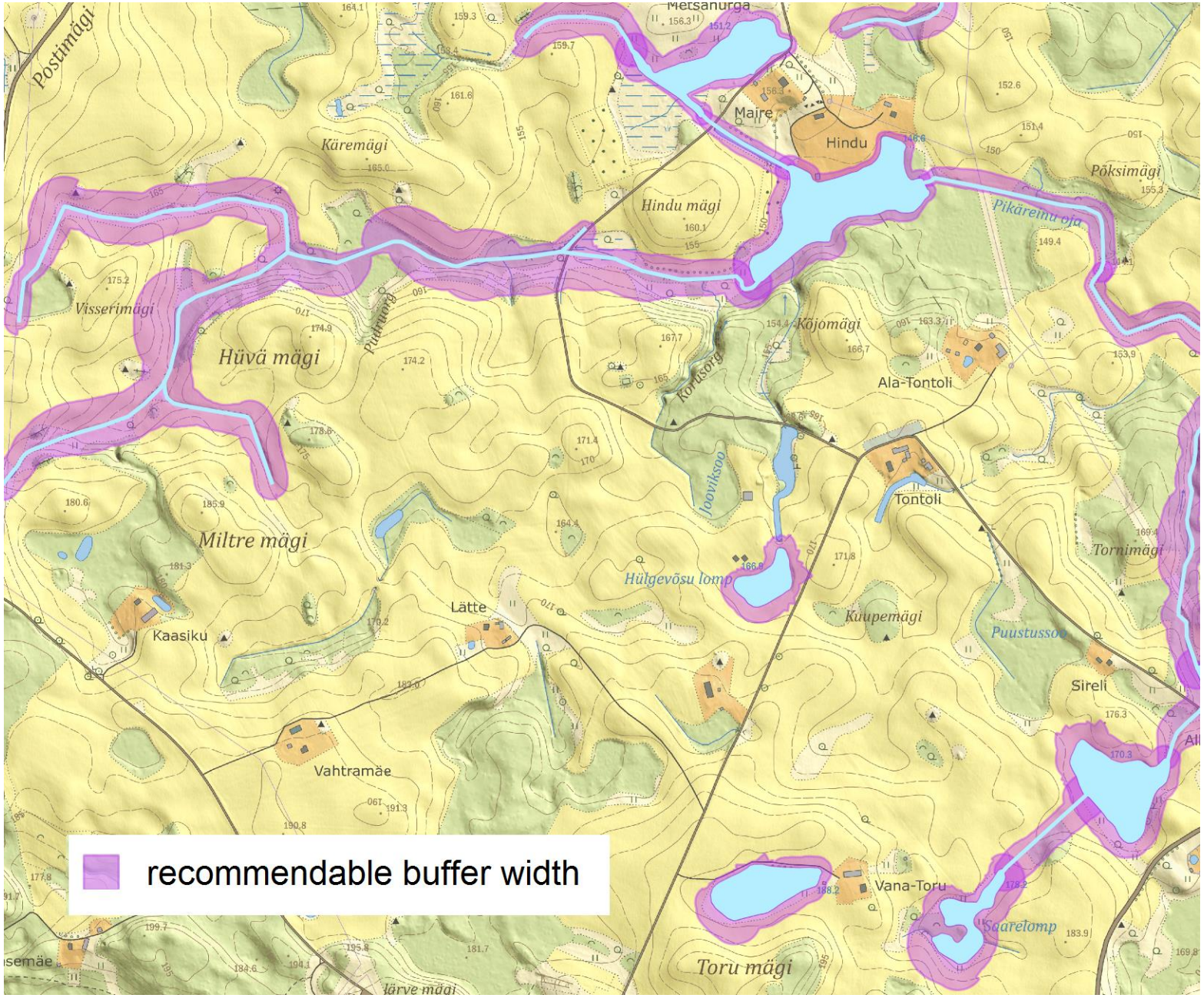


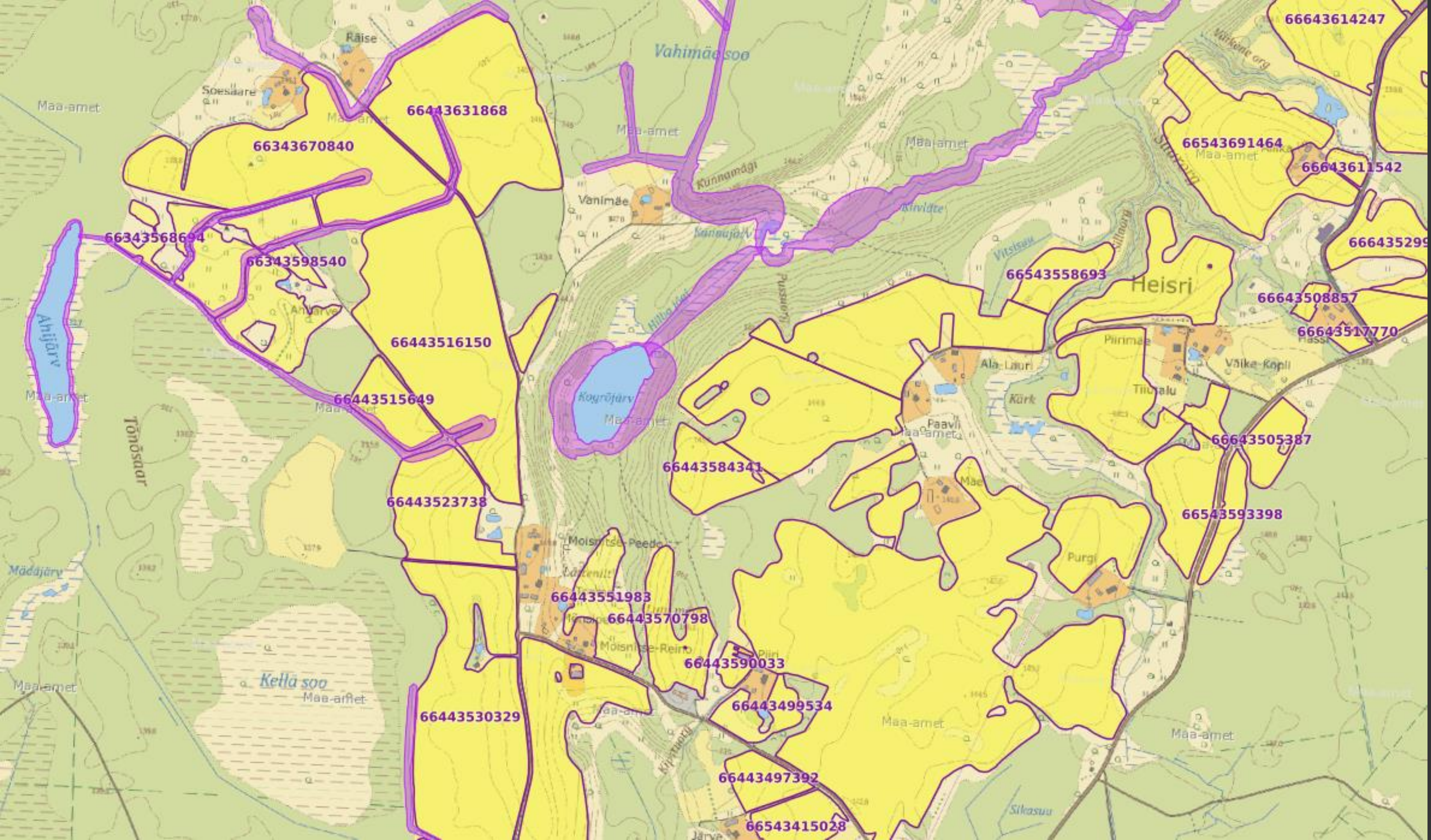
recommendable buffer width (m)




Computational recommendable buffer width
0
100 m
Valgjärve


Recommendable width (m)
1 - 5
6 - 10
11 - 20
21 - 30
>30
waterbody
0
250
500 m


Postimägi
Käremägi
Maire
Hindu
Hindu mägi
Põksimägi
Pikäreinu oja
Visserimägi
Hüvä mägi
Kõjomägi
Ala-Tontoli
Tontoli
Joaviksoo
Miltre mägi
Tornimägi
Hülgevõsu lomp
Kuupemägi
Puustussoo
Lätte
Kaasiku
Sireli
Vahtramäe
Vana-Toru
Saarelomp
Toru mägi
recommendable buffer width



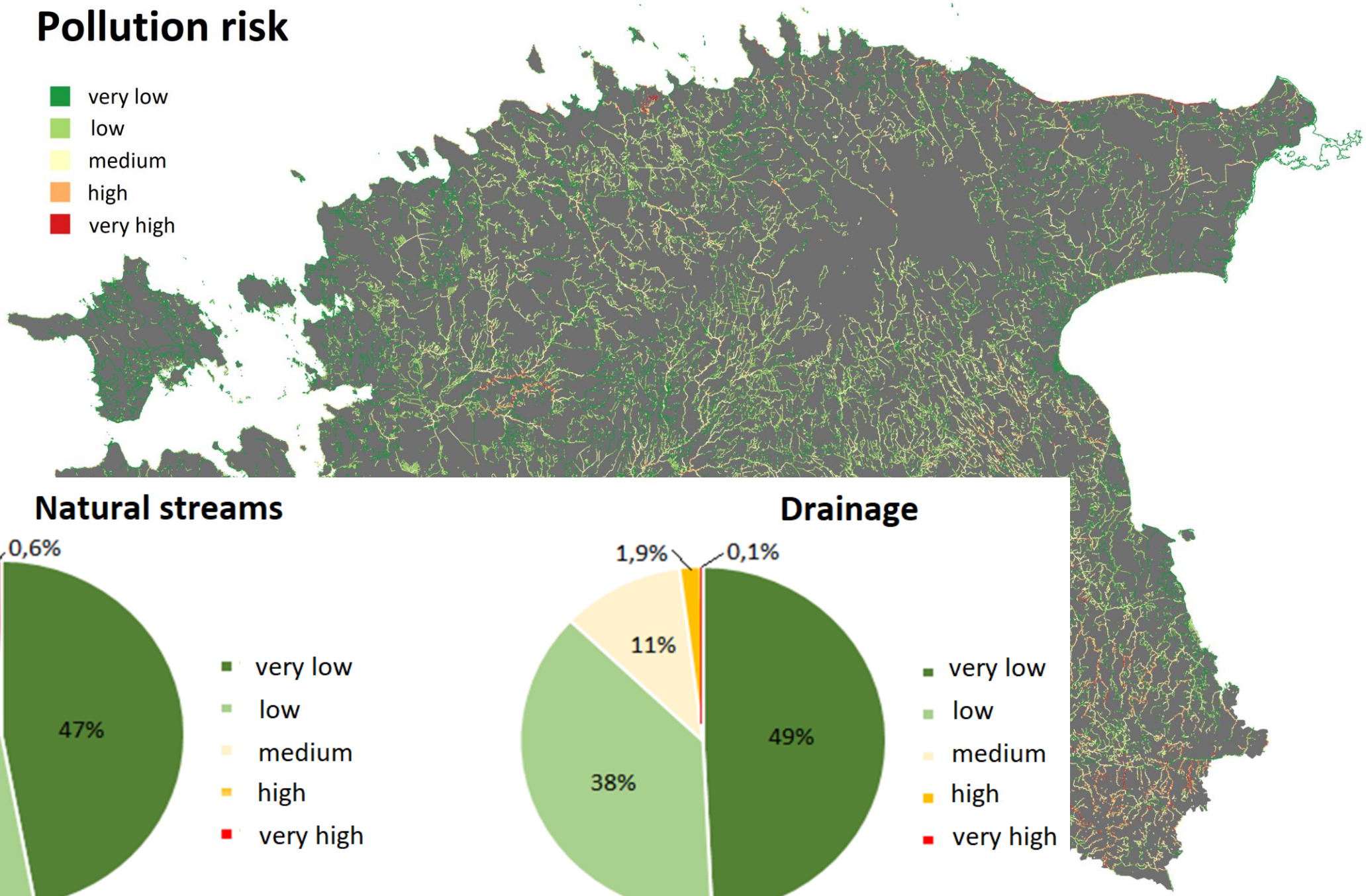
Räise
Soesaare
Maa-amet
66443631868
66343670840
Vahimäe soo
Vanimäe
Kunnamägi
66343568694
66343598540
Ahijärv
66443516150
66443515649
Kogrõjärv
Tõnõsaar
66443584341
66443523738
Moisnitse-Peedo
66443551983
66443570798
Moisnitse-Reino
66443590033
Piiri
66443499534
Kella soo
Mädajärv
66443530329
66443497392
66543415028
Järve
Heisri
66543558693
66543691464
66643611542
66643614247
666435299
66643508857
66643517770
Piirimäe
Väike-Kopli
Ala-Lauri
Paavli
Kürk
Tiitsalu
66643505387
66543593398
Purgi
Sikasuu

Pollution risk

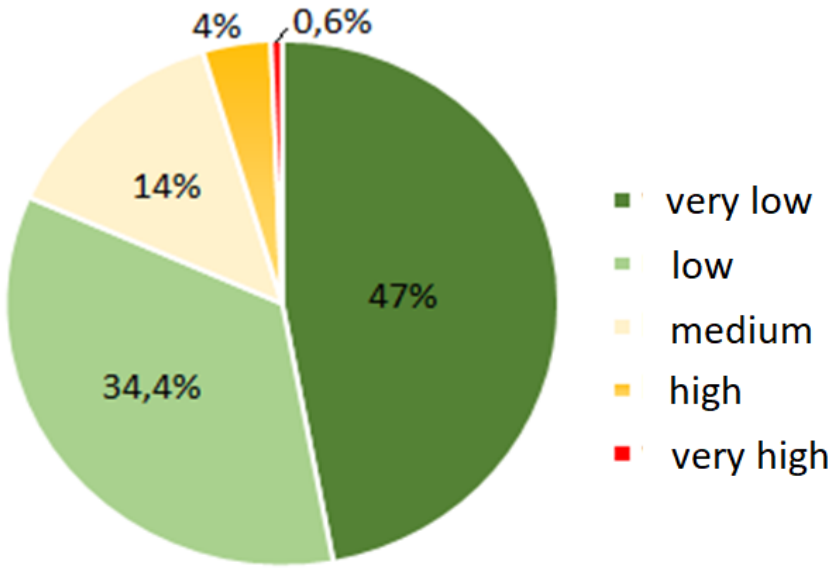
- Based on nomograph calculations, we created pollution risk classes

Pollution risk class number	Pollution risk	Recommendable buffer width
1	Very low	1 - 5 m
2	Low	6 - 10 m
3	Medium	11 - 20 m
4	High	21 - 40 m
5	Very high	41 - 100 m

Pollution risk

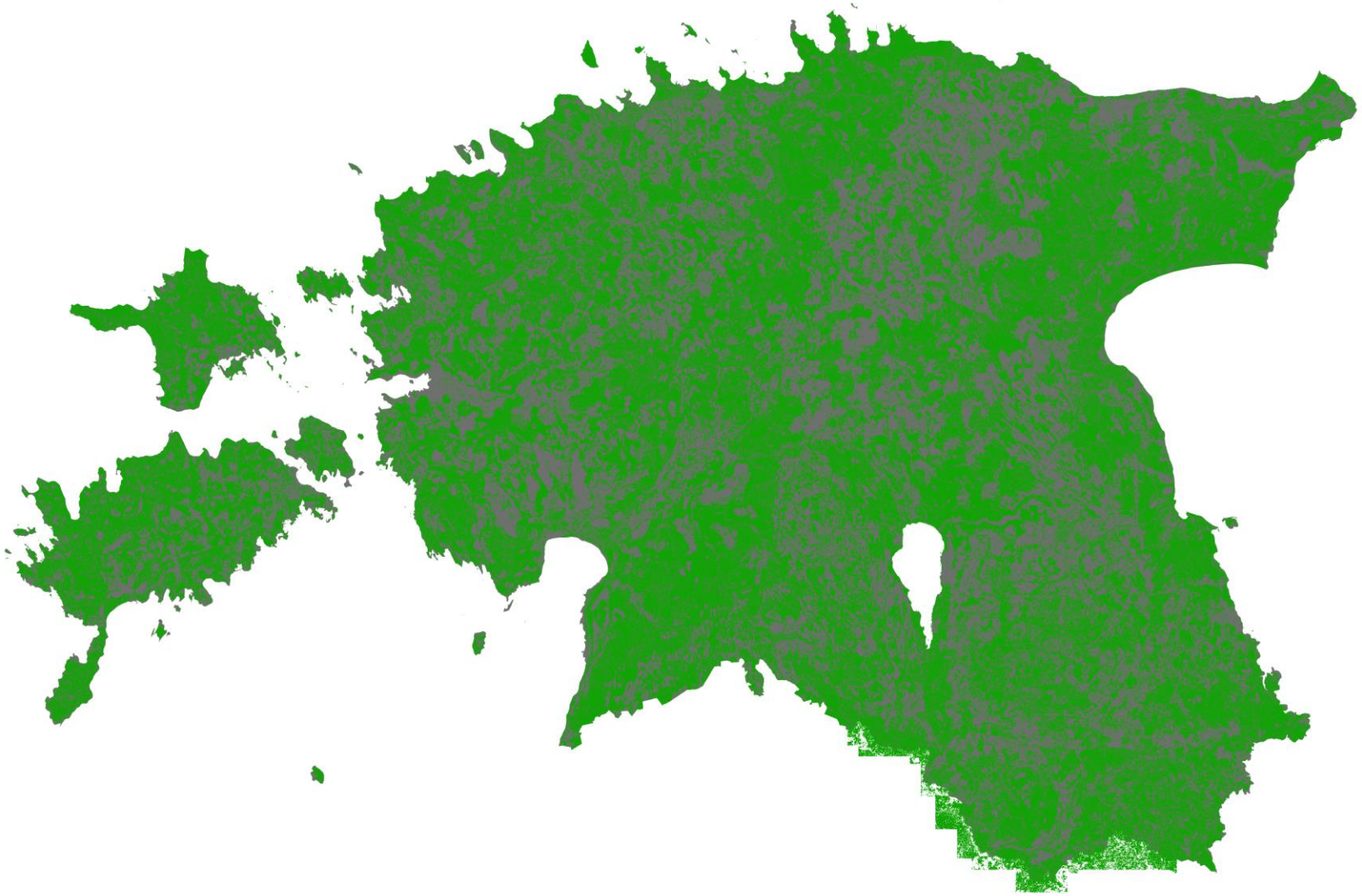


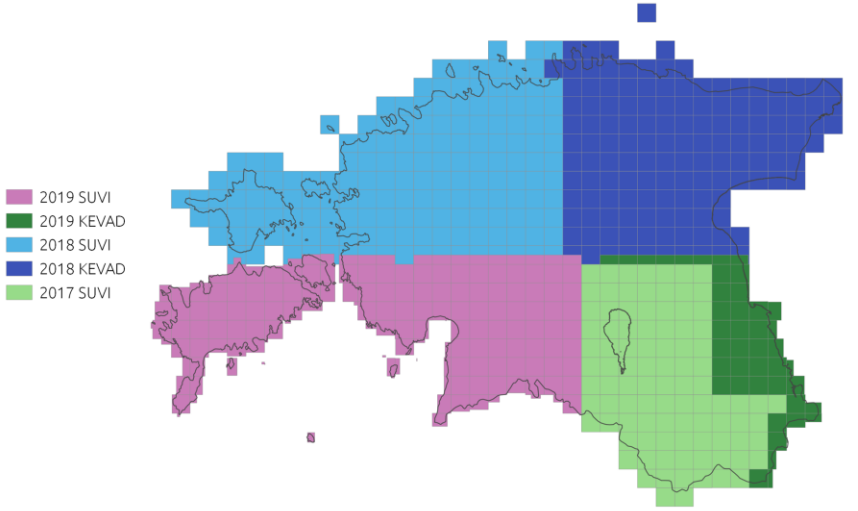
Natural streams

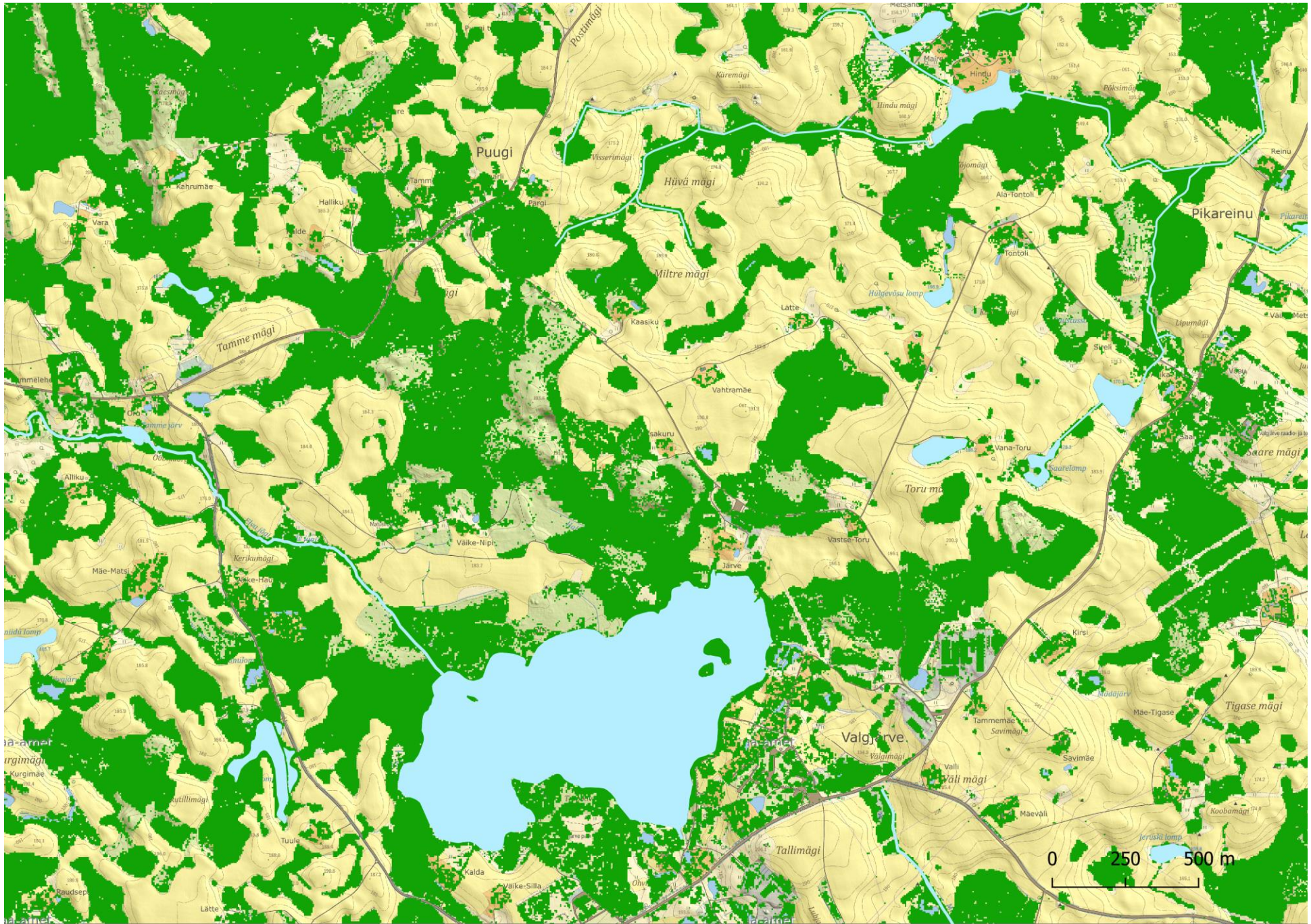


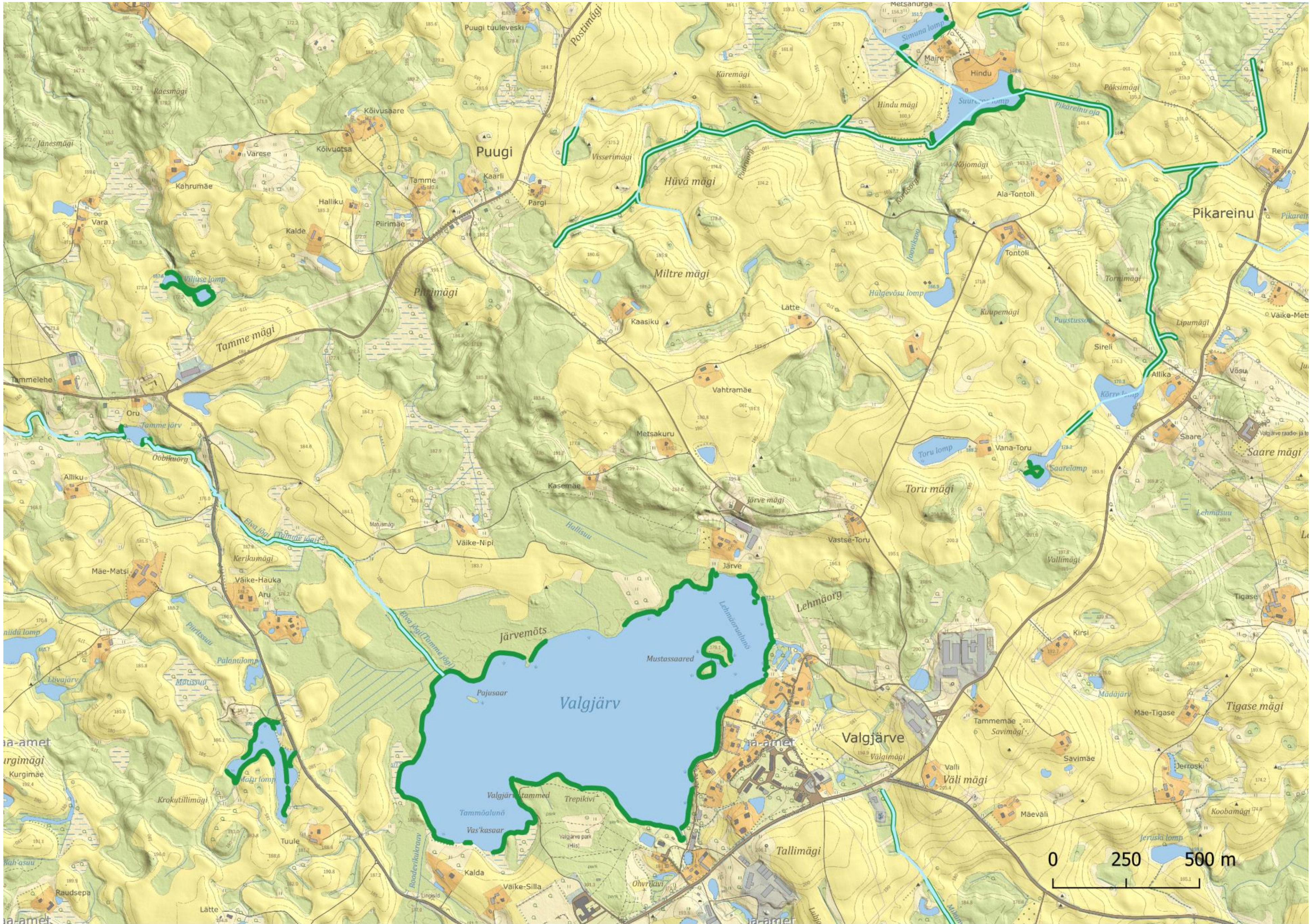
Drainage

Vegetation cover






Puugi
Kahrumäe
Halliku
Vara
Tamme mägi
Hüvä mägi
Miltre mägi
Visserimägi
Käremägi
Hindu
Hindu mägi
Pikareinu
Reinu
Ala-Tontoli
Tontoli
Lipumägi
Kaasiku
Lätte
Vahtramäe
Vana-Toru
Saare mägi
Vastse-Toru
Järve
Väike-Niph
Mäe-Matsi
Kerikumägi
Alliku
Kirsi
Mäe-Tigase
Tigase mägi
Tammemäe
Savimägi
Savimäe
Valgjärve
Valgimägi
Väli mägi
Mäeväli
Koobamägi
Tallimägi
Kalda
Väike-Silla
Tuule
Lätte
0
250
500 m



Puugi
Pikareinu
Valgjärve
Valgjärv
Puugi tuuleveski
Postimägi
Metsanurga
Simuna lomp
Majre
Hindu
Pikareinu oja
Põksimägi
Käremägi
Hindu mägi
Kõivusaare
Varese
Kõivuotsa
Kahrumäe
Tamme
Kaarli
Pargi
Halliku
Piirimäe
Kalde
Vara
Räesmägi
Jänesmägi
Visserimägi
Hüvä mägi
Kõjomägi
Ala-Tontoli
Tontoli
Reinu
Miltre mägi
Tamme mägi
Tammelehe
Oru
Tamme järv
Kaasiku
Lätte
Hülgevõsu lomp
Kuupemägi
Sireli
Lipumägi
Tornimägi
Võsu
Allika
Vahtramäe
Metsakuru
Saare
Saare mägi
Toru lomp
Vana-Toru
Toru mägi
Järve mägi
Kasemäe
Alliku
Väike-Nipi
Vastse-Toru
Järve
Lehmäorg
Kerikumägi
Mäe-Matsi
Väike-Hauka
Aru
Järvemõts
Mustassaared
Pajusaar
Vallimägi
Lehmäsuu
Tigase
Kirsi
Tammemäe
Savimägi
Valli
Väli mägi
Savimäe
Mäe-Tigase
Tigase mägi
Koobamägi
Tallimägi
Trepikivi
Tammõalunõ
Vas'kasaar
Kalda
Väike-Silla
Raudsepa
Tuule
Kurgimäe
Liivajärv
0
250
500 m

The presence of higher vegetation near the streams

Pollution risk class number	Pollution risk	Natural streams	Drainage
1	Very low	55.9%	56.9%
2	Low	60.6%	43.5%
3	Medium	66.2%	42.7%
4	High	72.0%	43.4%
5	Very high	78.4%	54.0%

Example in Southwest Estonia where pollution risk due to slope and soil type is high and there is no higher vegetation close to the stream

https://puhverribad.web.app/

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Thank you!
Questions?

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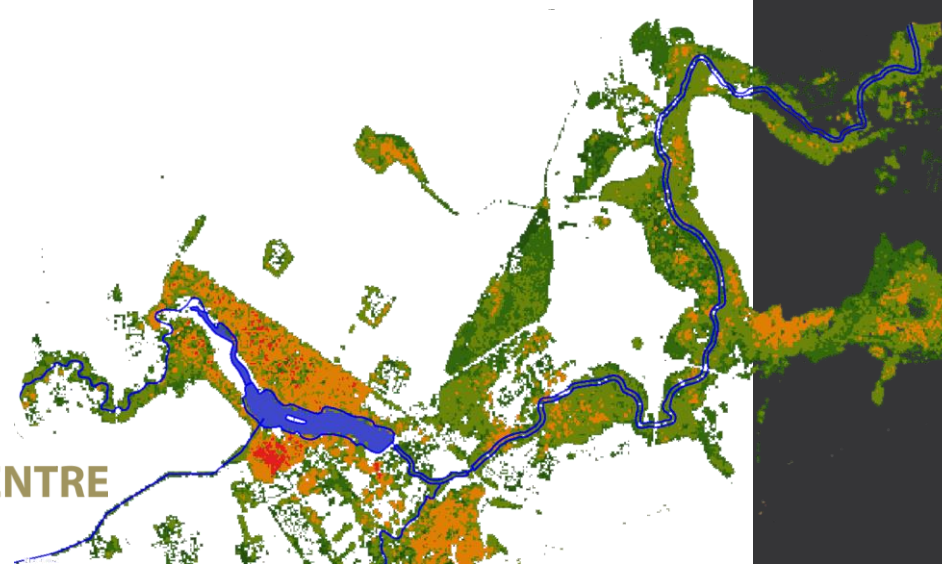

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