Riparian management led by the landscape

Inspiration from Sweden

Stefan Ploum

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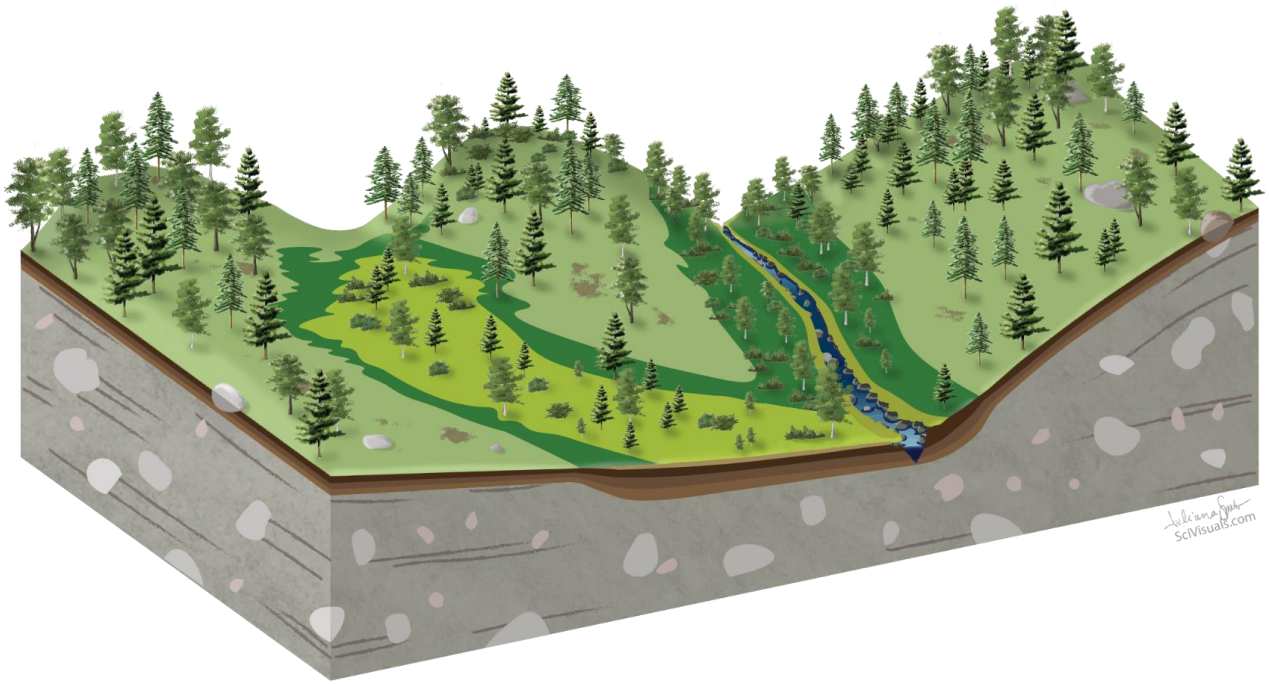
Riparian management led by the landscape

PhD thesis:
"Groundwater connections between the boreal landscape and its headwater streams:
the role of discrete riparian inflow points (DRIPs)"



Stefan Ploum, 32

2016-2021: PhD at SLU Umeå, Zweden

Consultant at Aequator Groen & Ruimte

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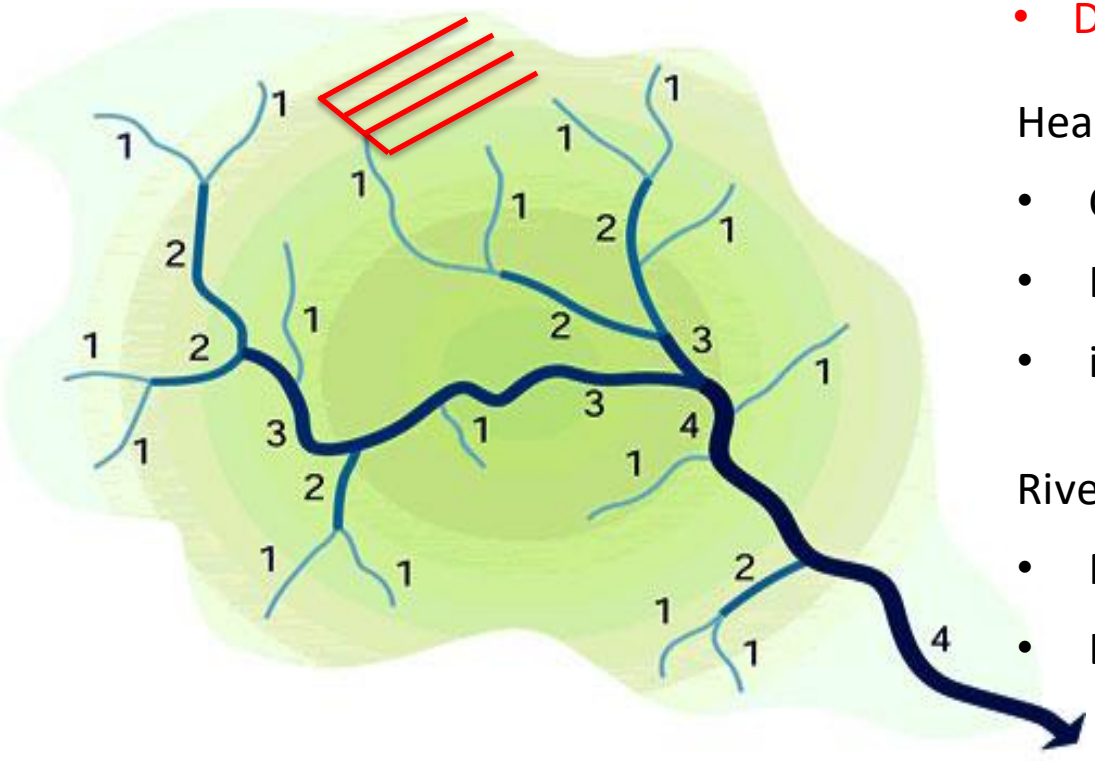
Perspective on the stream network

Strahler stream order



0 order:

- Interaction landscape-GW-stream
- Ditched and drained → lost buffer capacity

Headwaters (1st order):

- Capillaries of the landscape (haarvaten)
- Hard to find on maps, but everywhere
- interaction GW-stream

Rivers (4th order):

- Net sum of headwaters
- Less interaction with direct surroundings, more internal processes

Landuse and waterways

Forestry, clearcuts
Timber floating: straightened rivers
Ditching: draining soils for timber production (spruce & pine)
Heavy metals, soil compaction

Agriculture, urban development
Straight waterways: discharge water (dry feet)
Ditching: improve field conditions for agriculture
High nutrient loads

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We removed the water buffer we need most

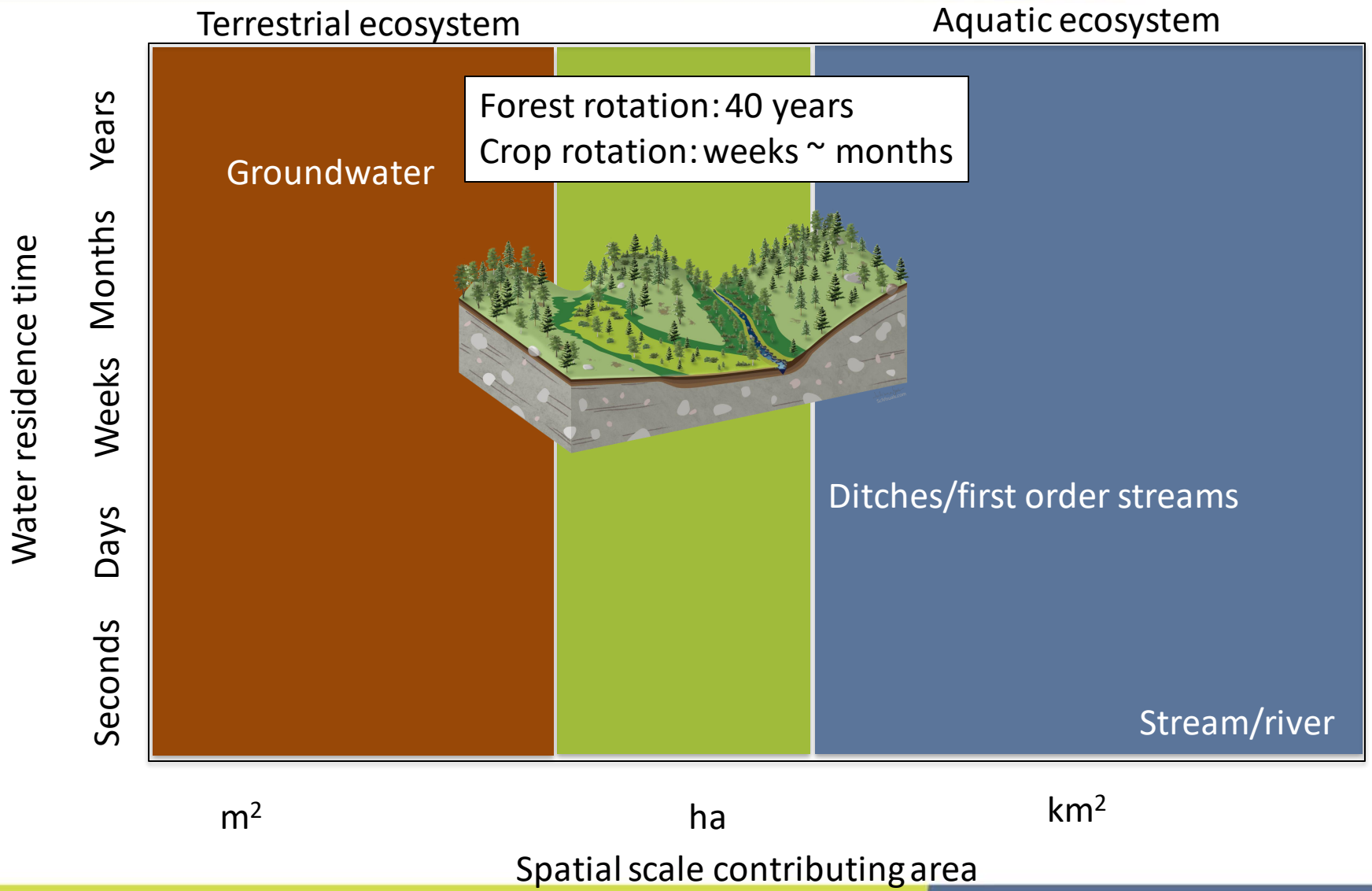

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Illustration: J. Spahr

The role of riparian wetlands and forest

Hydrology:
- Buffering floods
- Sponge effect
- Residence time

Water quality:
- Shade/cooling
- Nutrient buffer
- Sediment/erosion

Biodiversity:
- Soil wetness
- Leaves and deadwood
- Refuge

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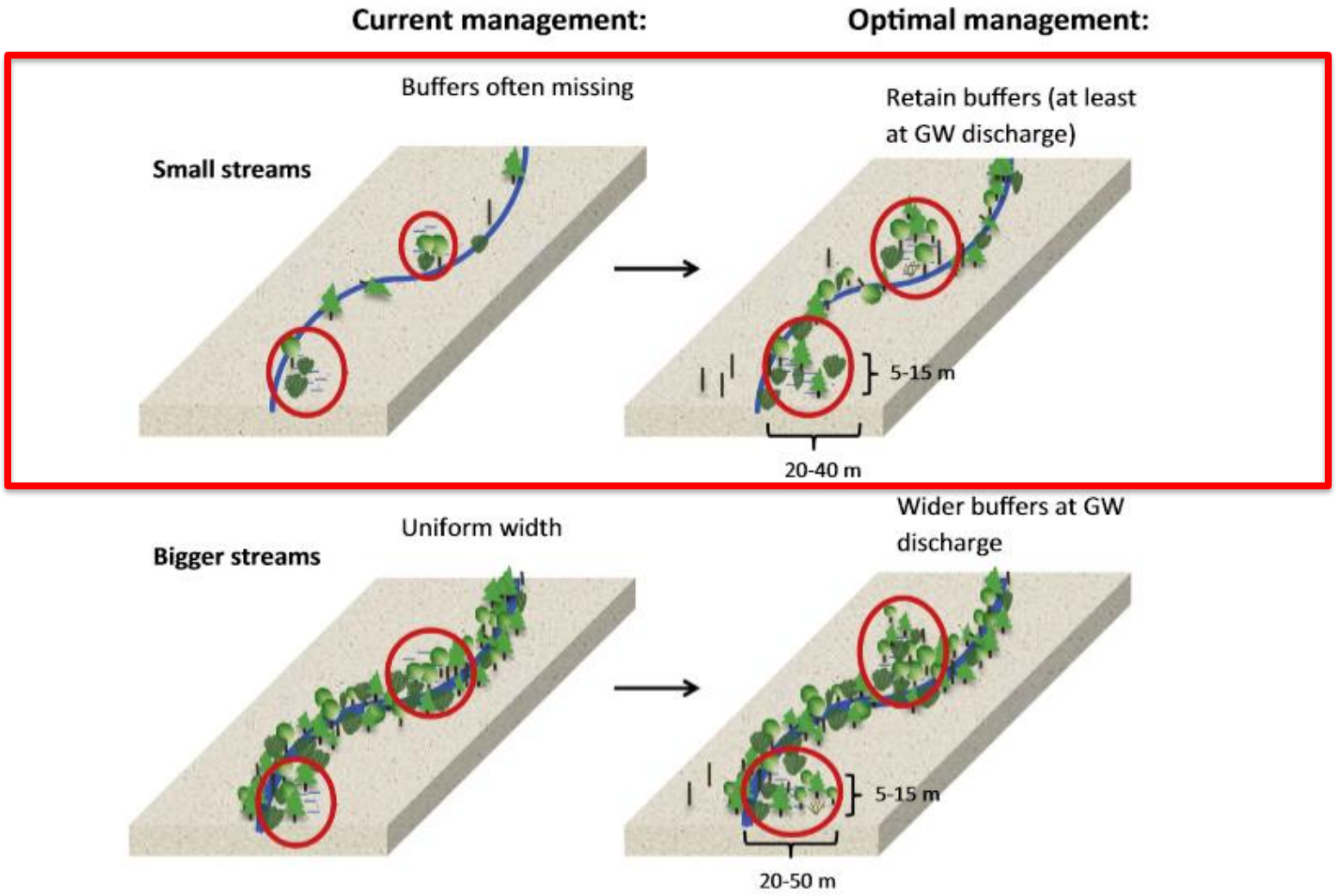
Trade off between landuse & riparian ecosystem



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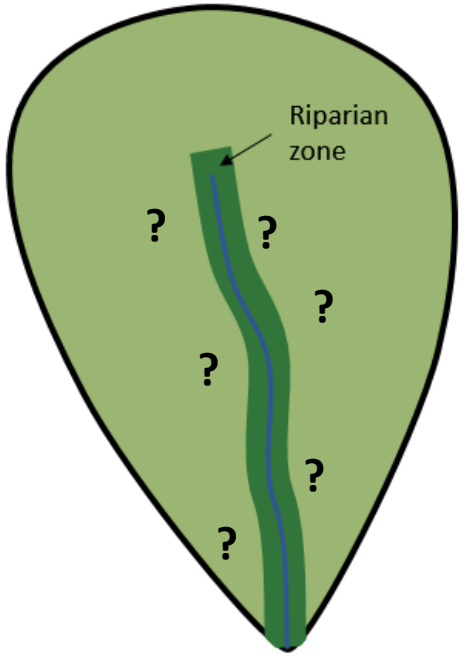
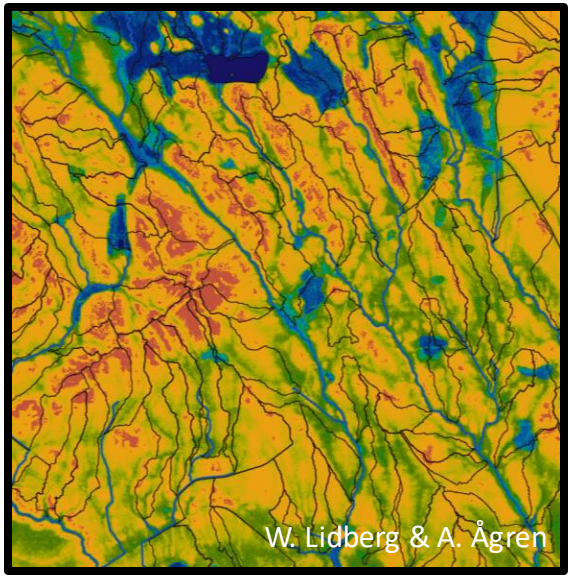
Kuglerová et al. (2014)

Trade off between landuse & riparian ecosystem



Where do we protect the riparian zone?



Soil moisture maps

Red – dry

Green - moist

Blue - wet

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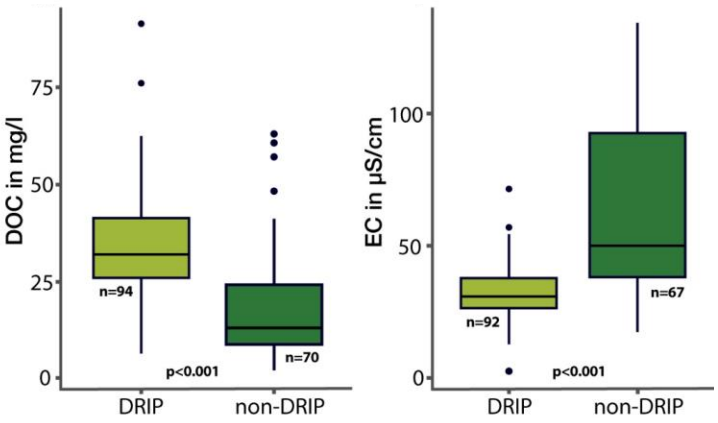
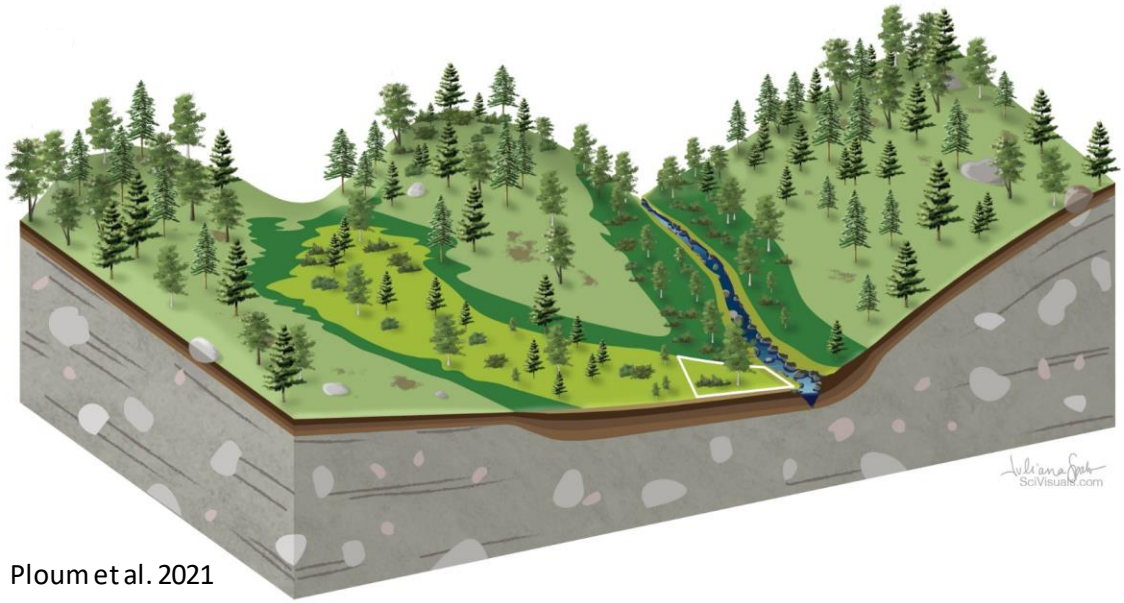
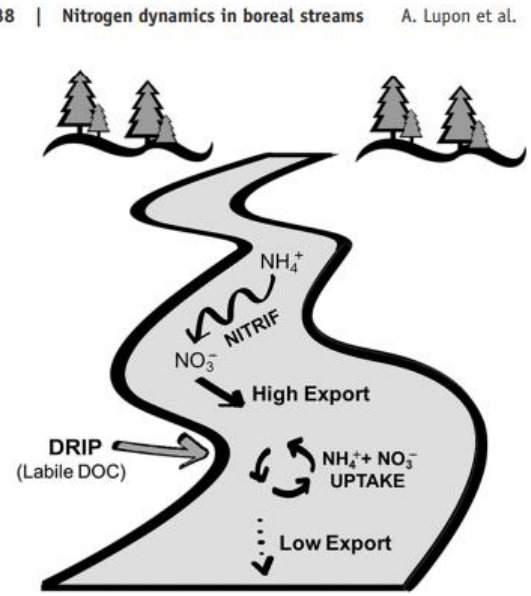
Hydrologically adapted bufferzones



- More cost-effective (Tiwari et al. 2016)
- Protect ecosystem functions
  - Spatiotemporal variability in water chemistry
  - Carbon sequestration
  - Water storage
  - Thermal refuge areas
  - Decrease N export (Lupon et al. 2020)

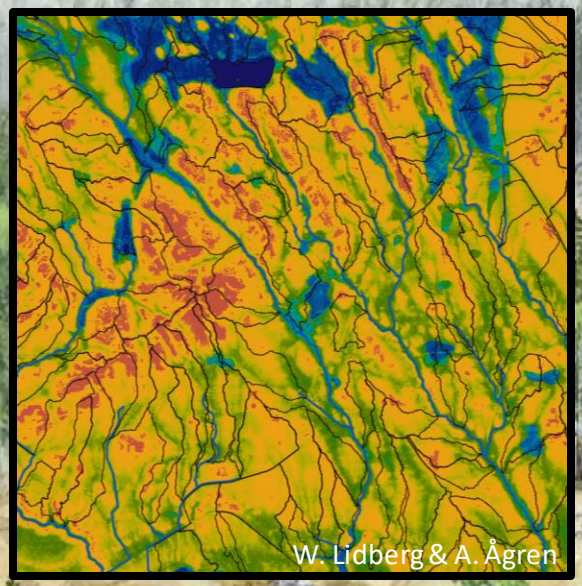


Ploum et al. 2021



Hydrology adapted bufferzones

Soil moisture maps



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How can these principles be applied in the Dutch landscape?

Paludification (verlanden) of ditches:

- brings back the sponge effect in the landscape
- Helophyte filter

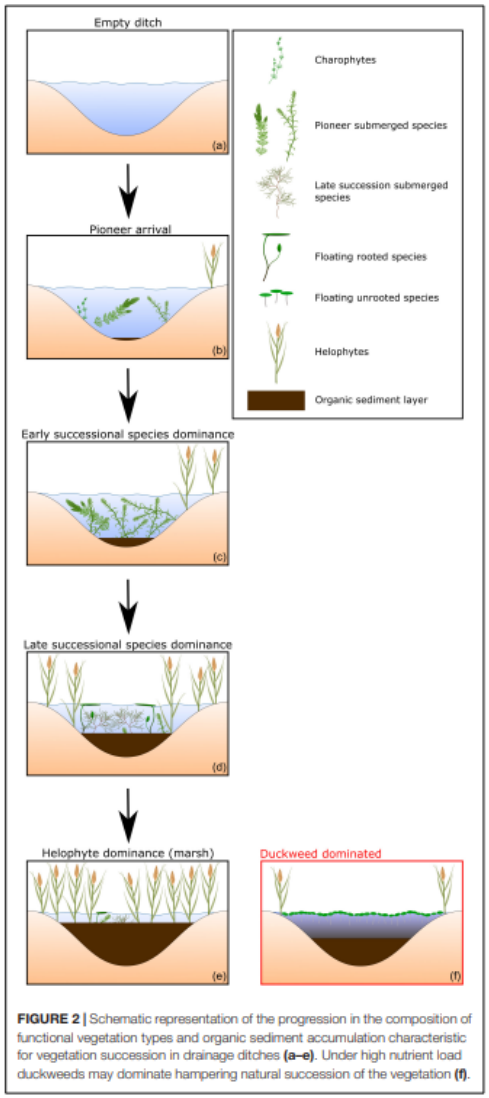

FIGURE 2 | Schematic representation of the progression in the composition of functional vegetation types and organic sediment accumulation characteristic for vegetation succession in drainage ditches **(a–e)**. Under high nutrient load duckweeds may dominate hampering natural succession of the vegetation **(f)**.

Helophyte ditch Aeres Dronten (Wolter van der Kooij)

Paludified ditch in Sweden

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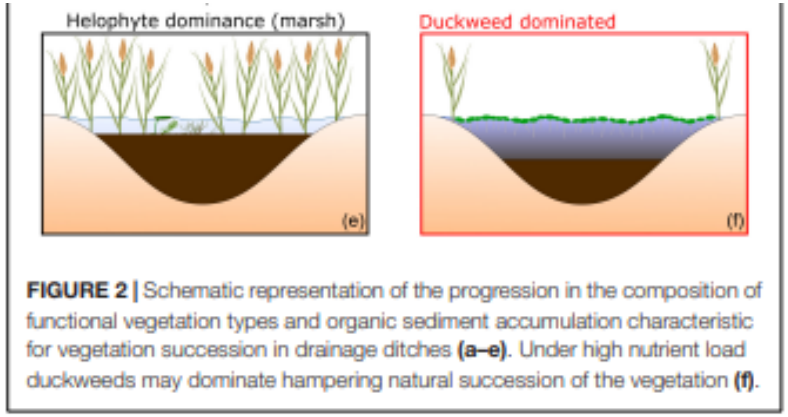
Teurlincx et al. 2018

How can these principles be applied in the Dutch landscape?

Agroforestry:

- Co-locate trees/shrub vegetation and helophyte ditches/wetlands
- Trees provide shading and buffer nutrient loads to streams
- Minimize effect on current landuse with non-uniform buffers



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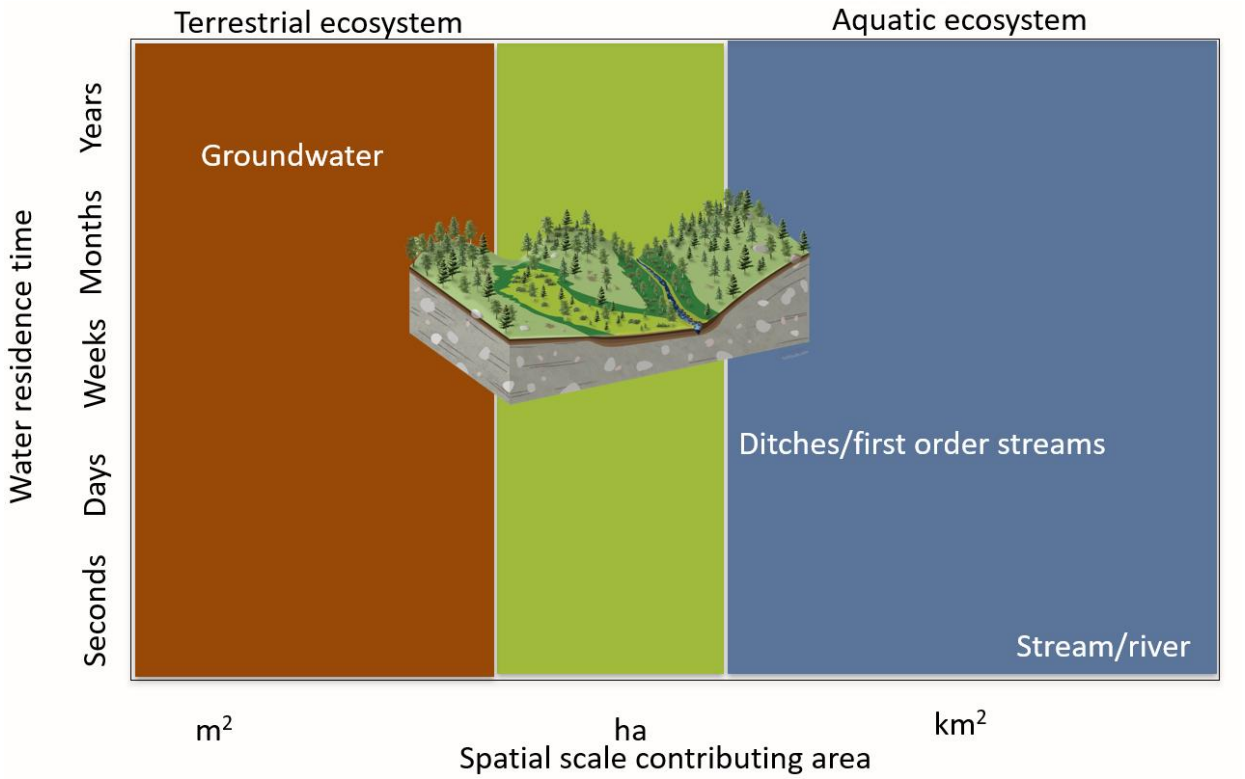
Take home & food for thought



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- Can we reverse ditch cleaning policy? You need a permit to clean small ditches
- Integrate waterway policy and agroforestry agenda:
  Require minimal fraction of shading by wood or brush cover along ditches and small streams
- If ditches should be filled, let them paludify (verlanden)

Further reading on Swedish riparian zone and ditches:
Lenka Kuglerová, Eliza Maher Hasselquist

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