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Waters of LIFE Advisor Training

Module 3B: Intro to Catchment Science II -SPR Model

May 2025

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How do pollutants actually reach a water body?

SOURCE

or pressure

PATHWAY

over land flow, through surface waterbodies, or groundwater.

RECEPTOR

Each part required for there to be an impact

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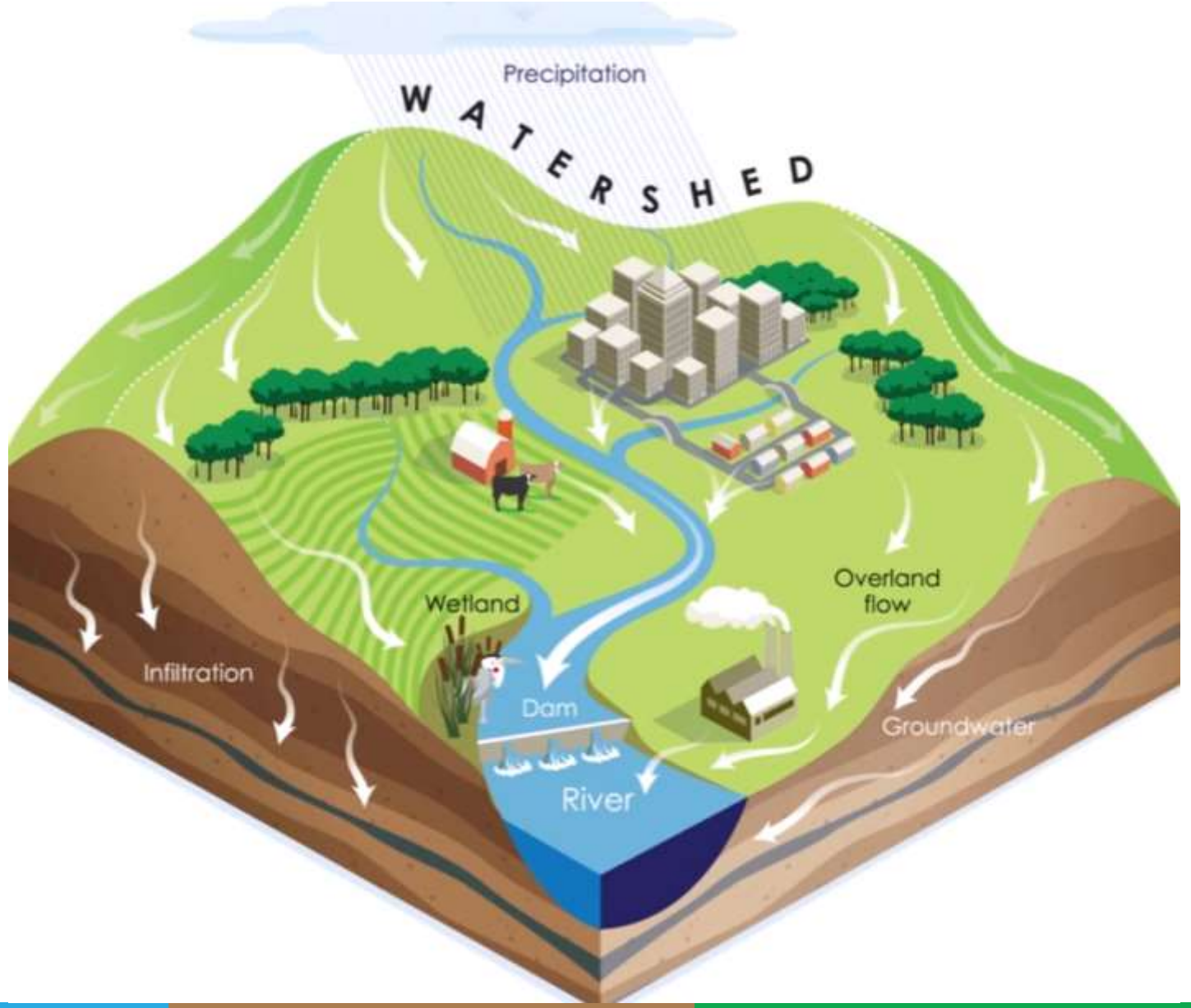
What is a catchment?

An area of land where all rainfall collects and drains to a single point.



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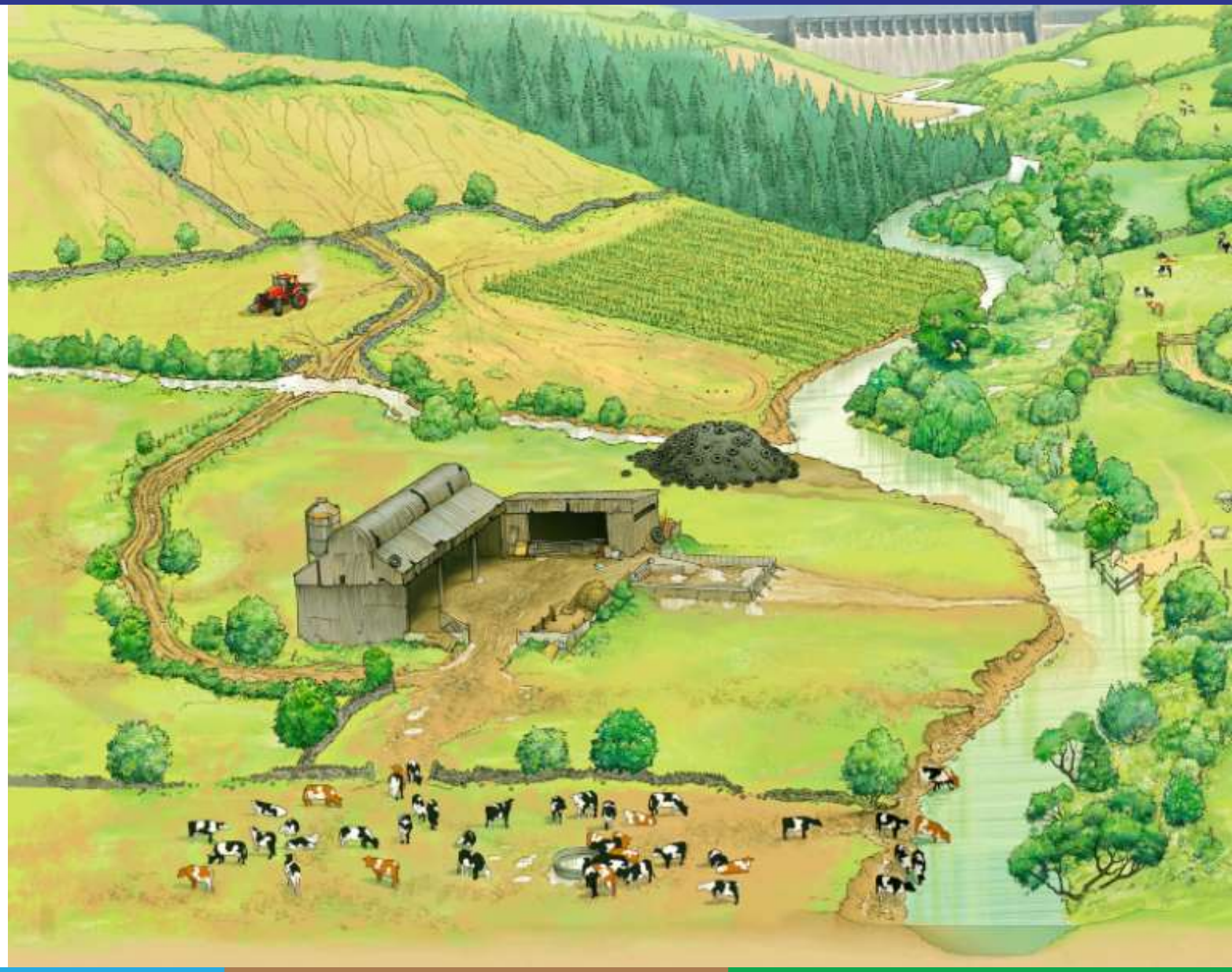

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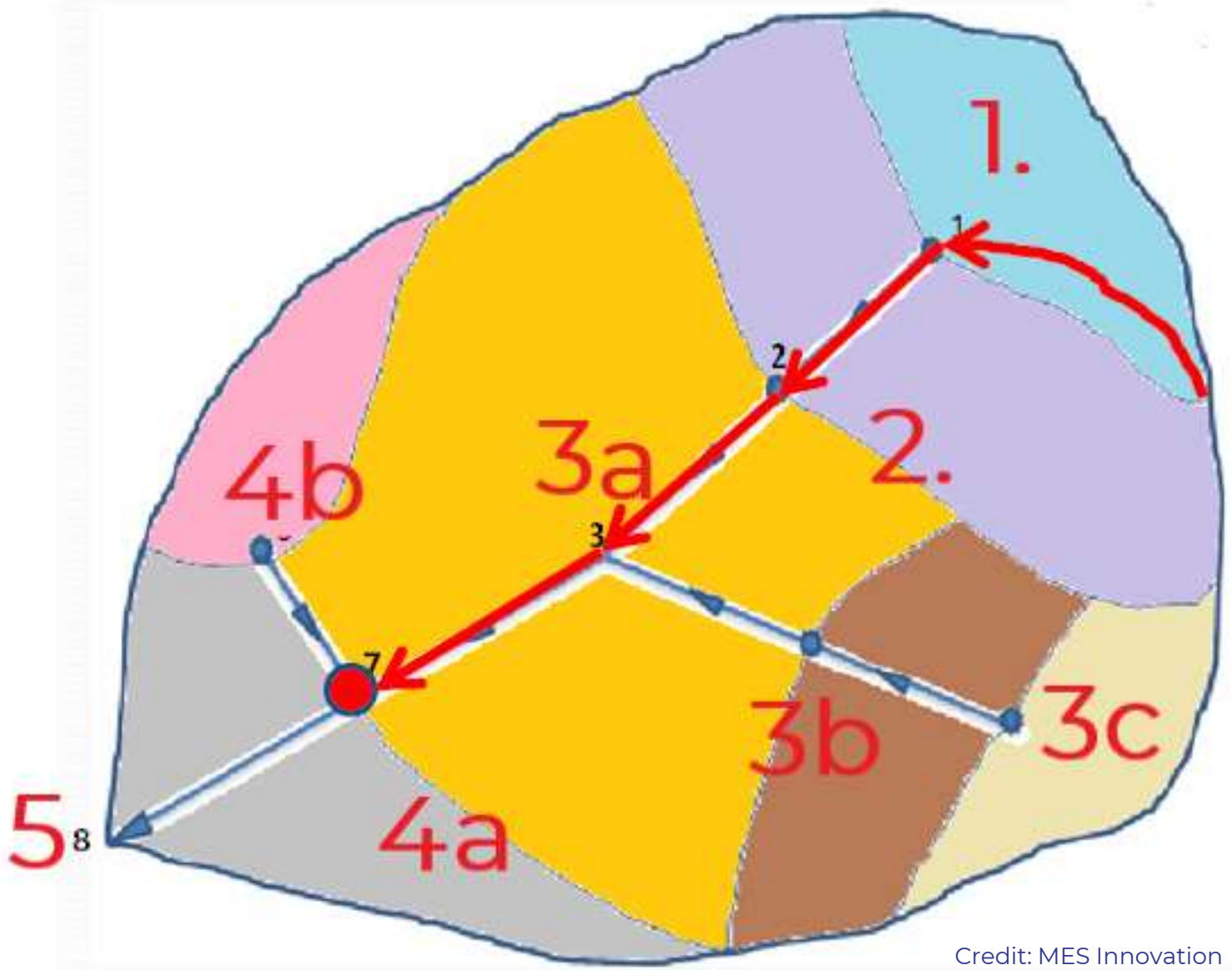

Credit: MES Innovation

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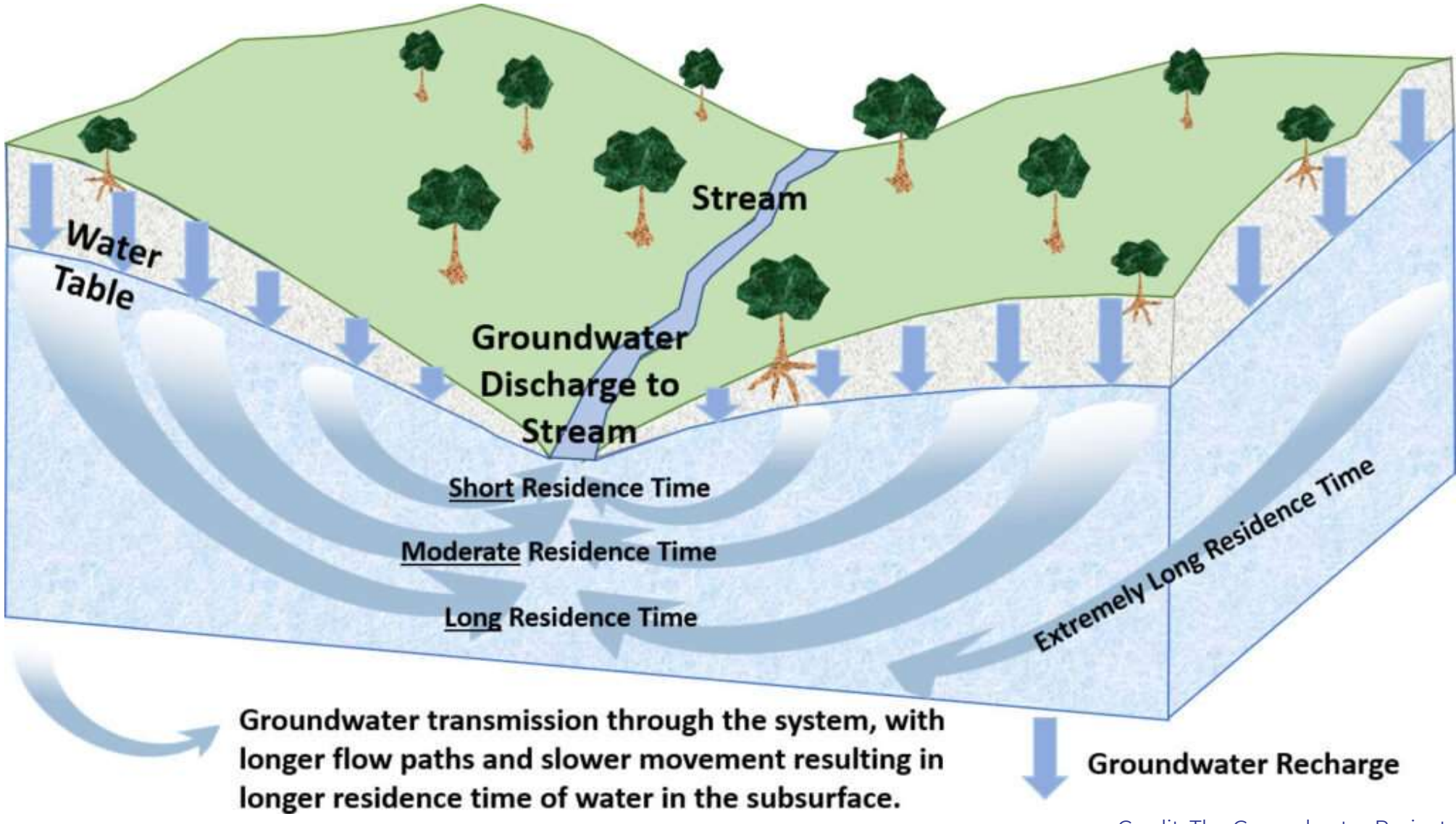
You have to picture catchments in 3 dimensions

Pathways:

1) Surface water
2) Ground water



Credit: The Groundwater Project

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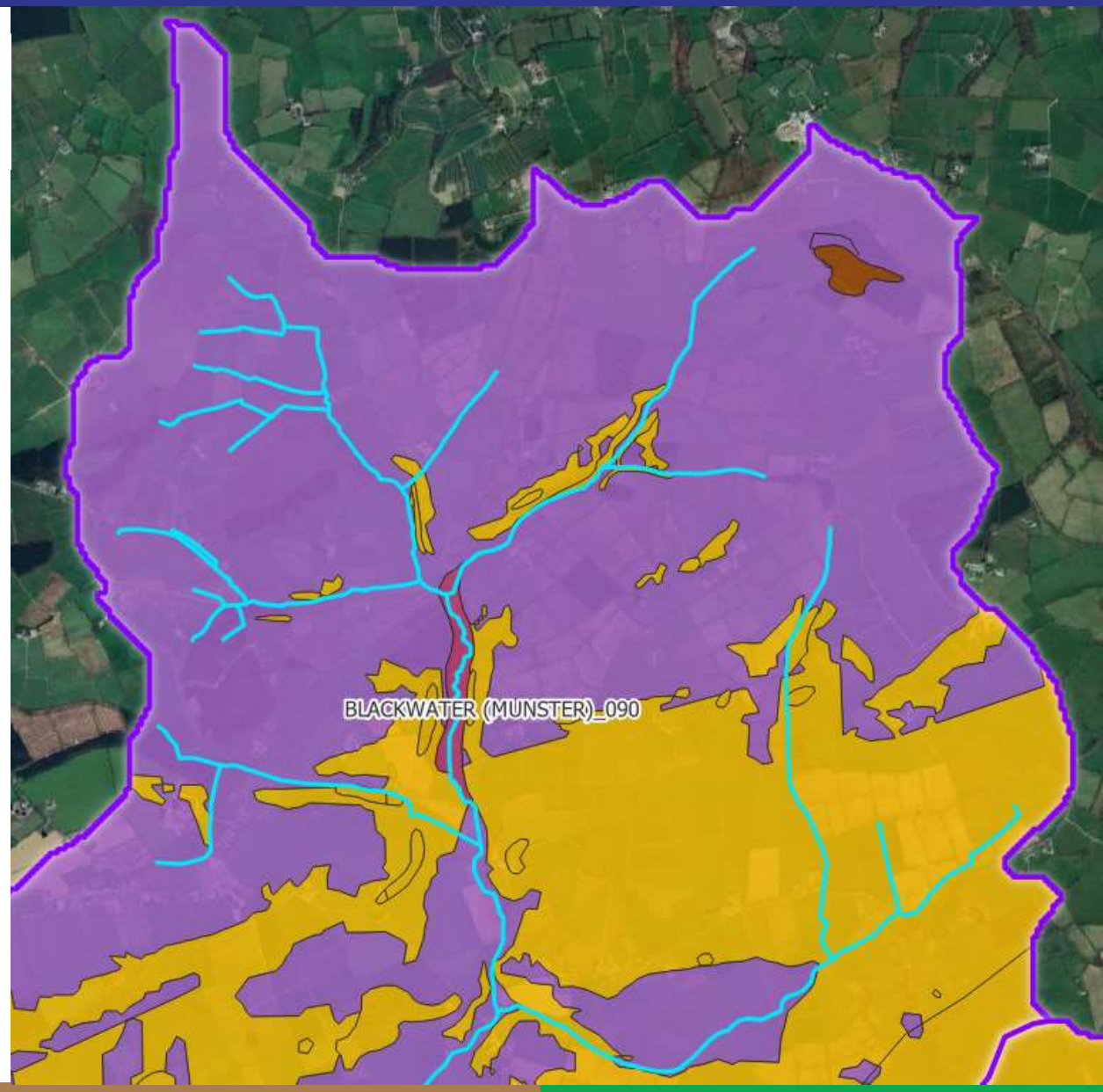
Flow pathway determination

1. Underlying soil types

How porous is the soil?

2. Topography

Natural slopes in the landscape as well as features such intercepting streams and ditches



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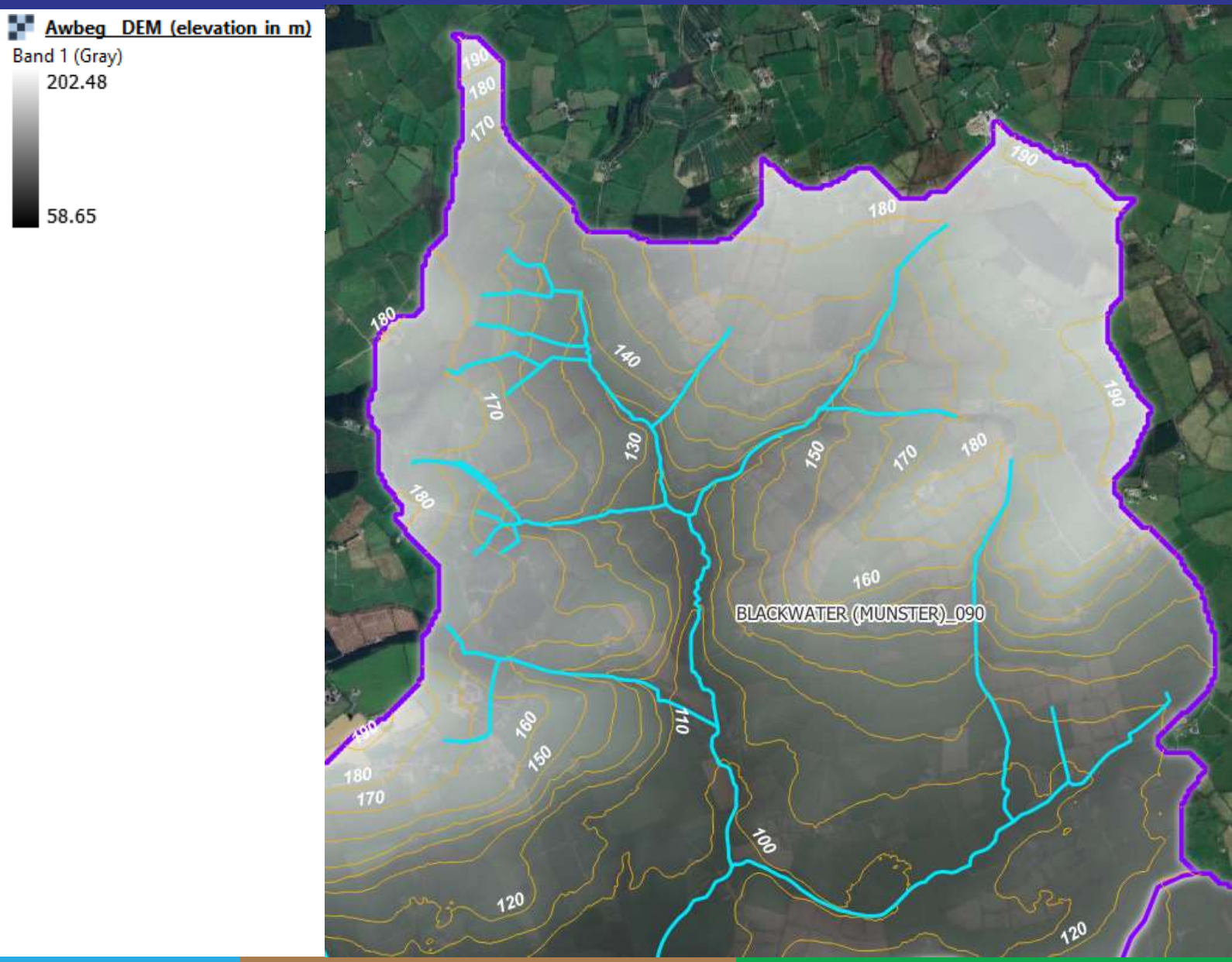

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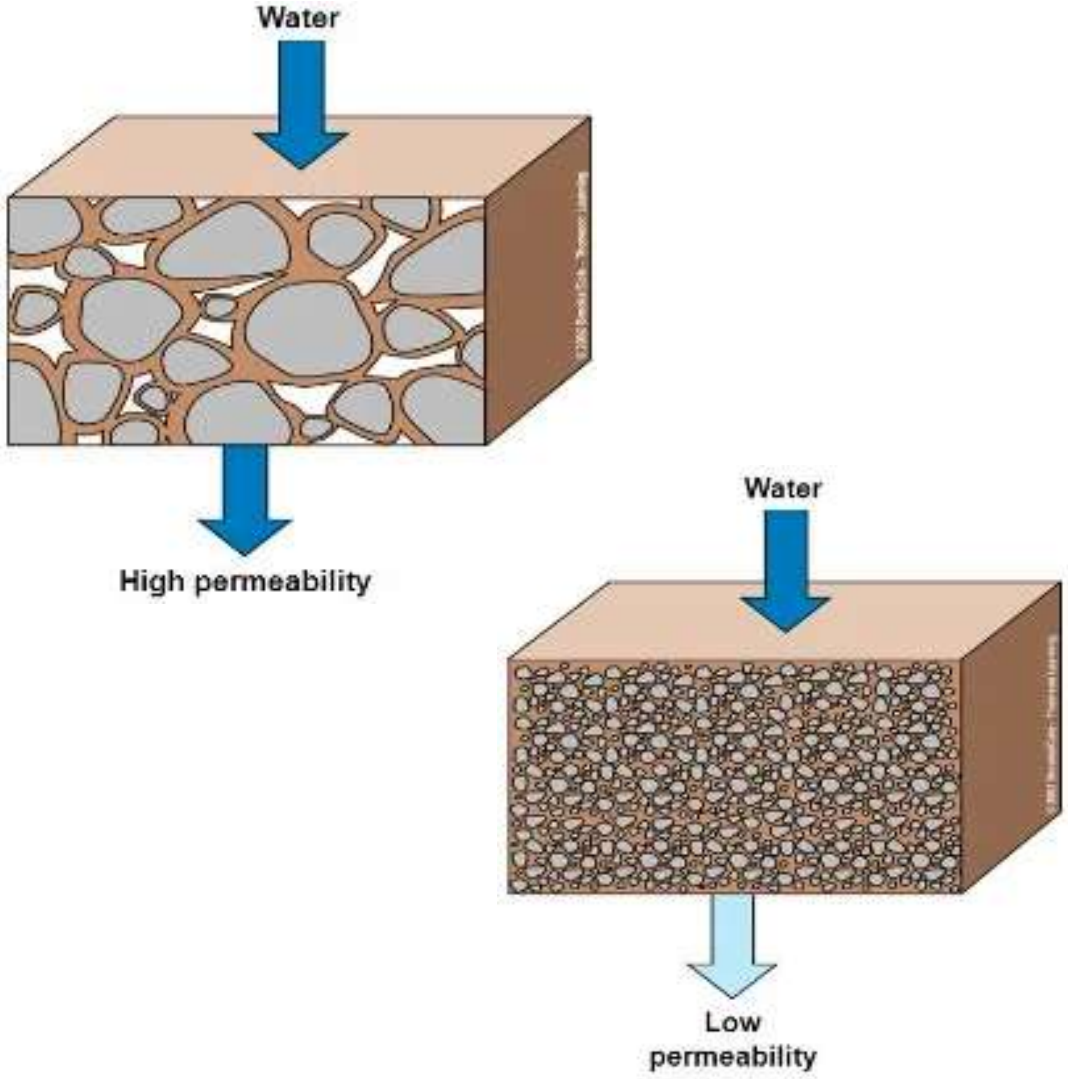
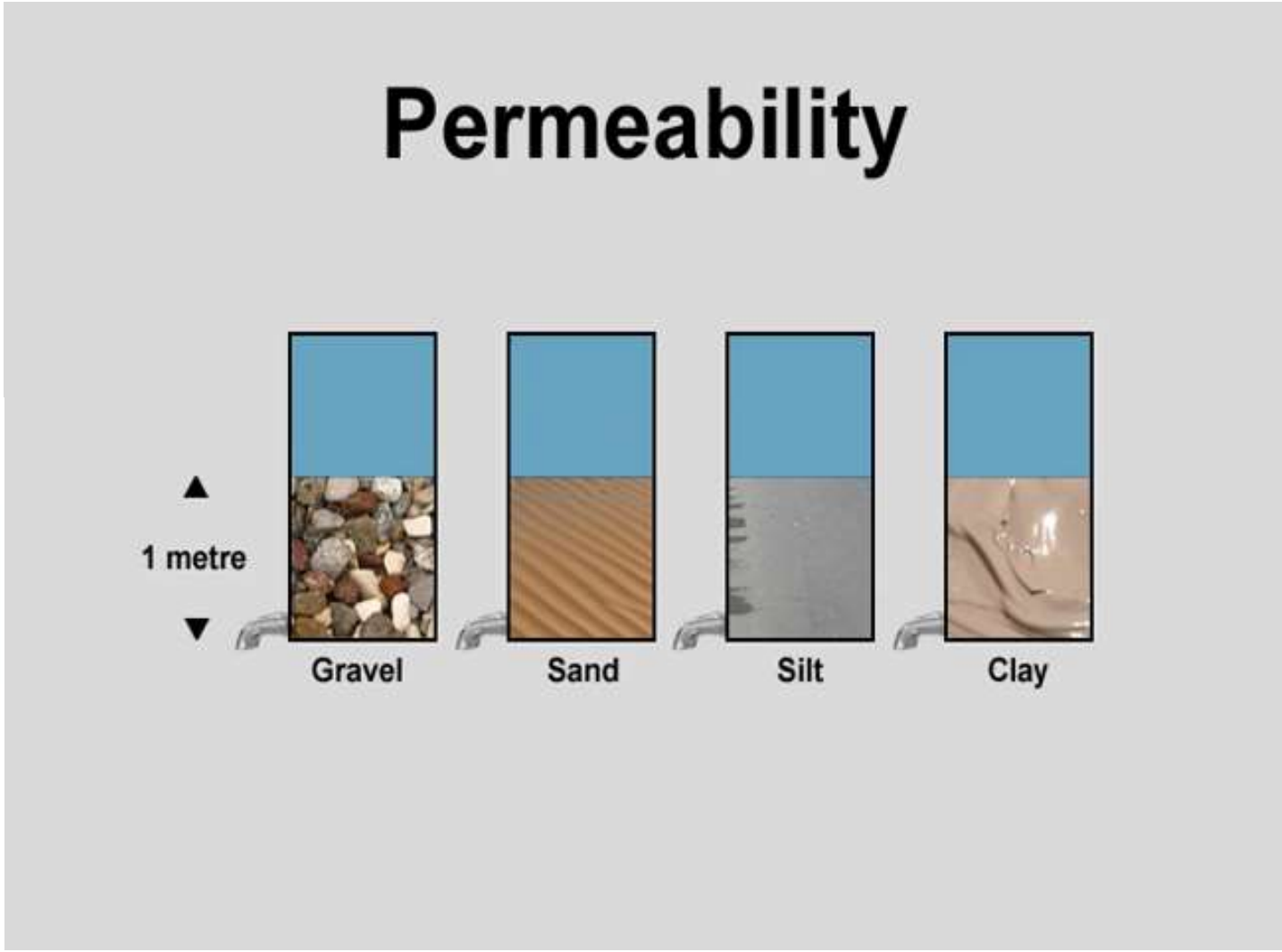
The bigger the grain size, the faster water can flow through subsoil





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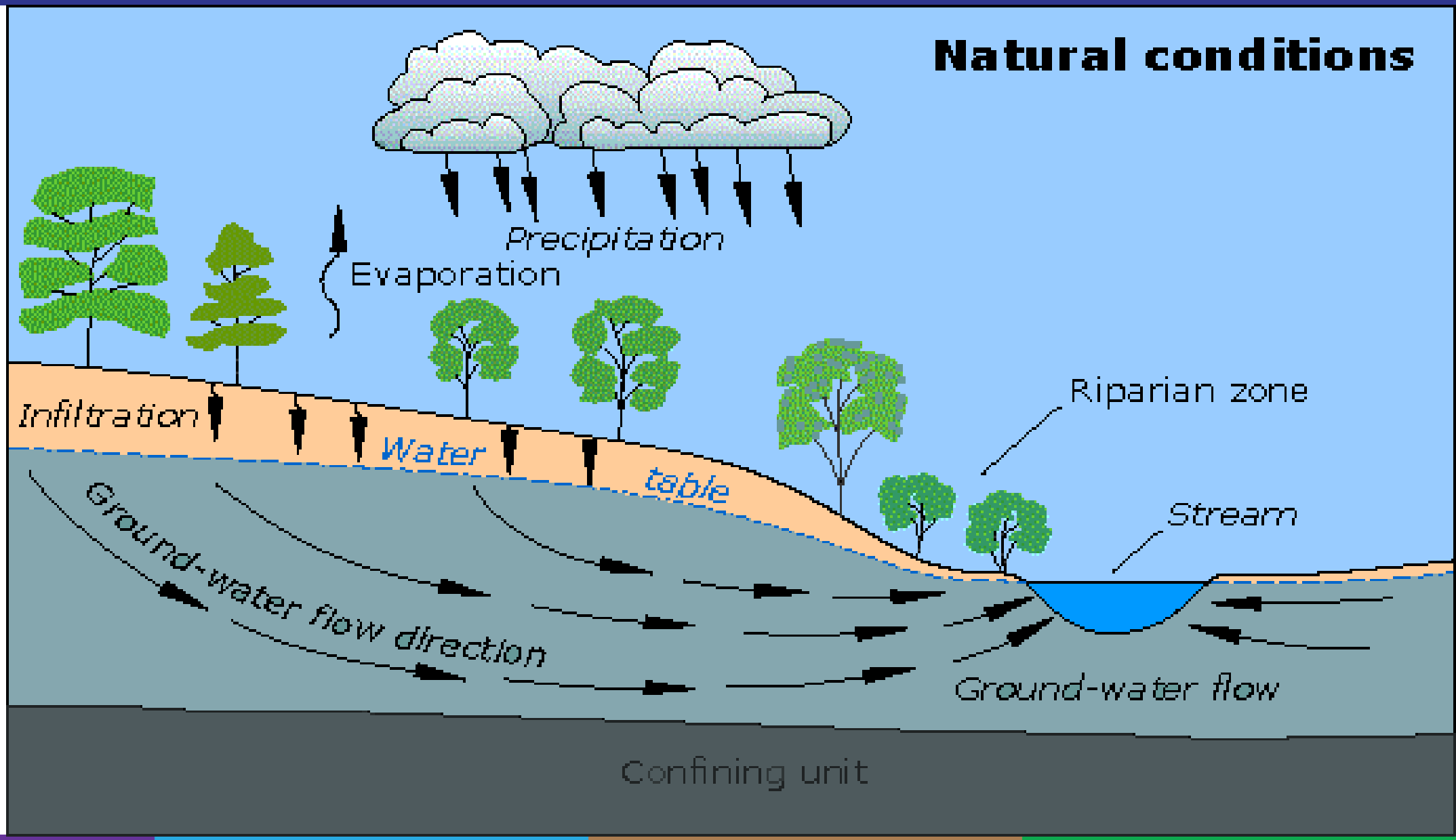
Aquifer

Interface

Will have varying levels of speed and direction



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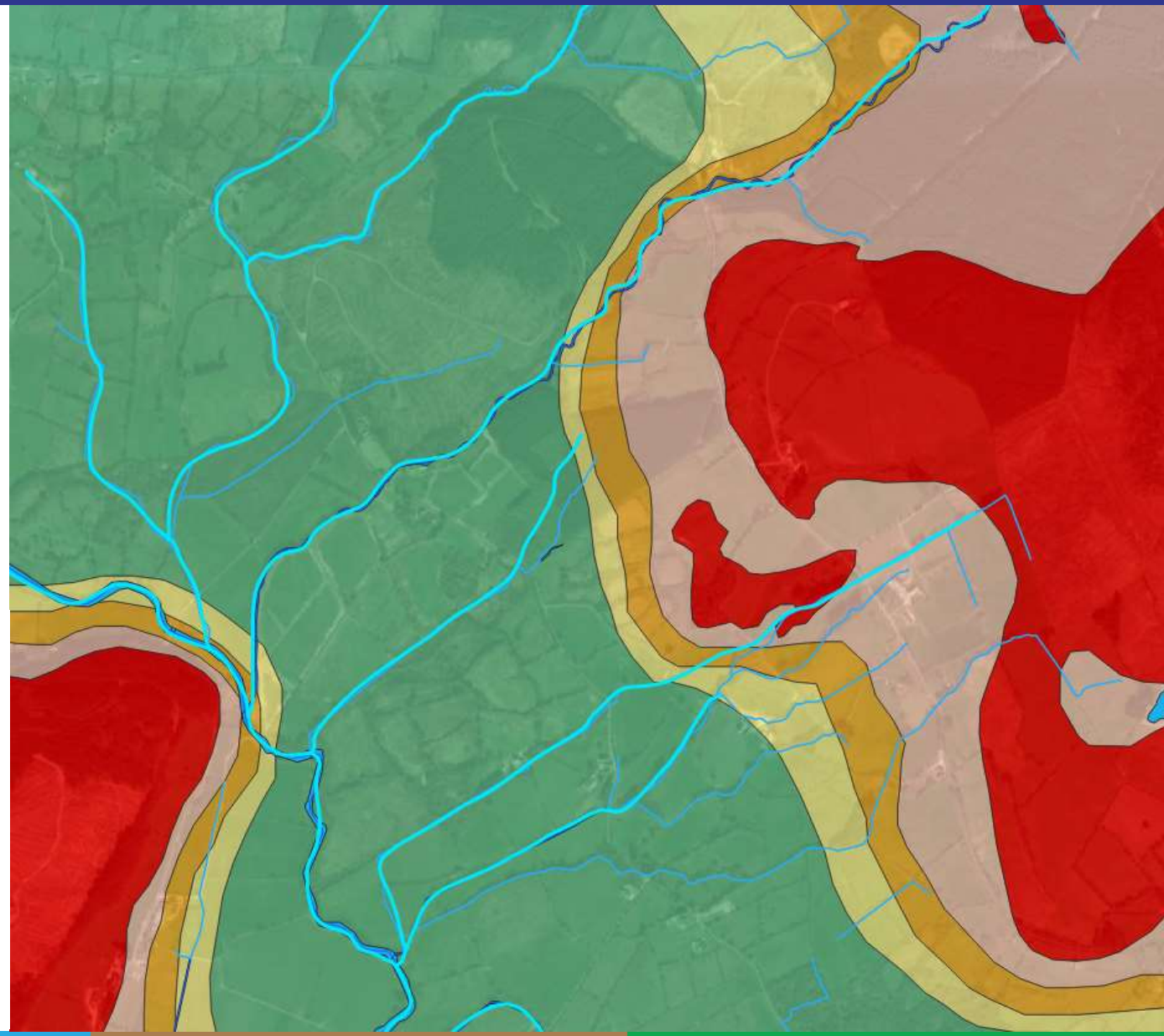
Groundwater vulnerability

Can water and contaminants move in subsurface materials (soil and subsoil) and get down to groundwater easily?



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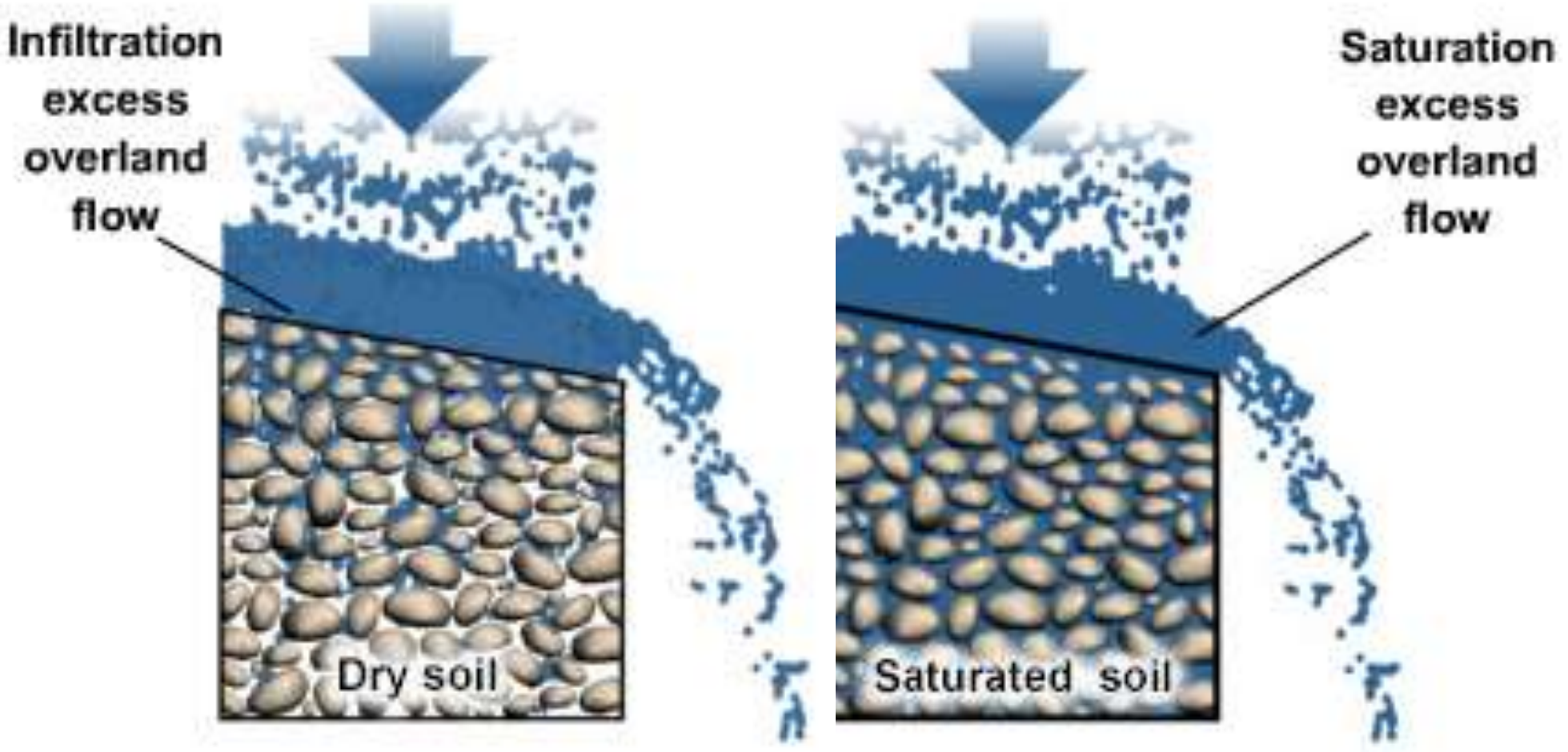
Path of least resistance

Once water cannot infiltrate soils, it will follow path of least resistance at the surface level

- Downhill following topography

Types of surface runoff



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- Downhill following topography

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Overland Flow Pathways

Credit: Waters of LIFE

Credit: CWD Group

OVERLAND FLOW PATHWAYS

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SURFACE PATHWAYS: OVERLAND FLOW

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Credit: Aveland trees

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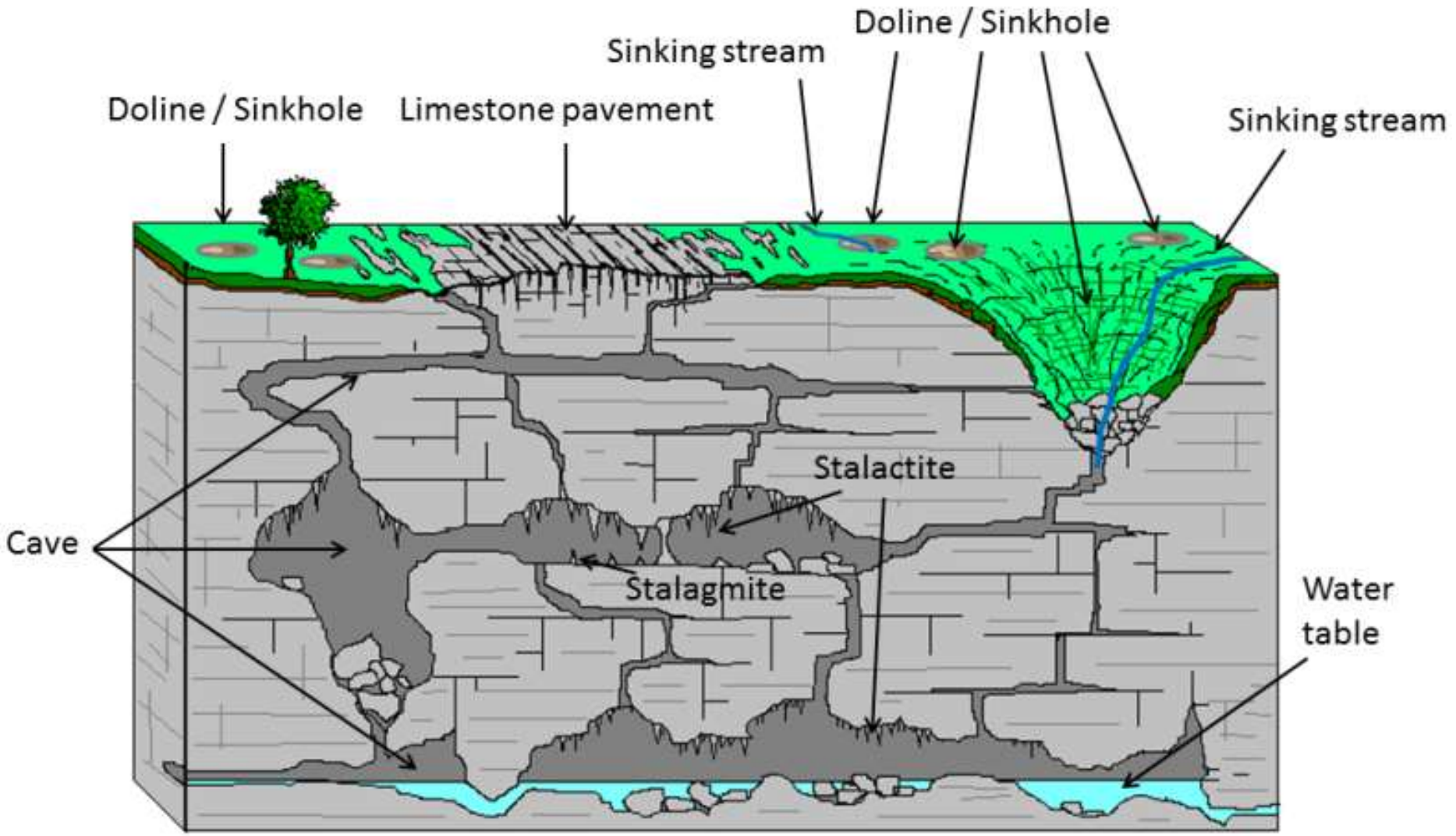

Credit: GSI

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Credit: GSI

Are called sink holes, dolines, sluggers etc.

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Pollution Impact Potential

Show the highest risk areas in the landscape for losses of N and P to water.

Derived from stocking rate and information on soil type and underlying hydrogeology

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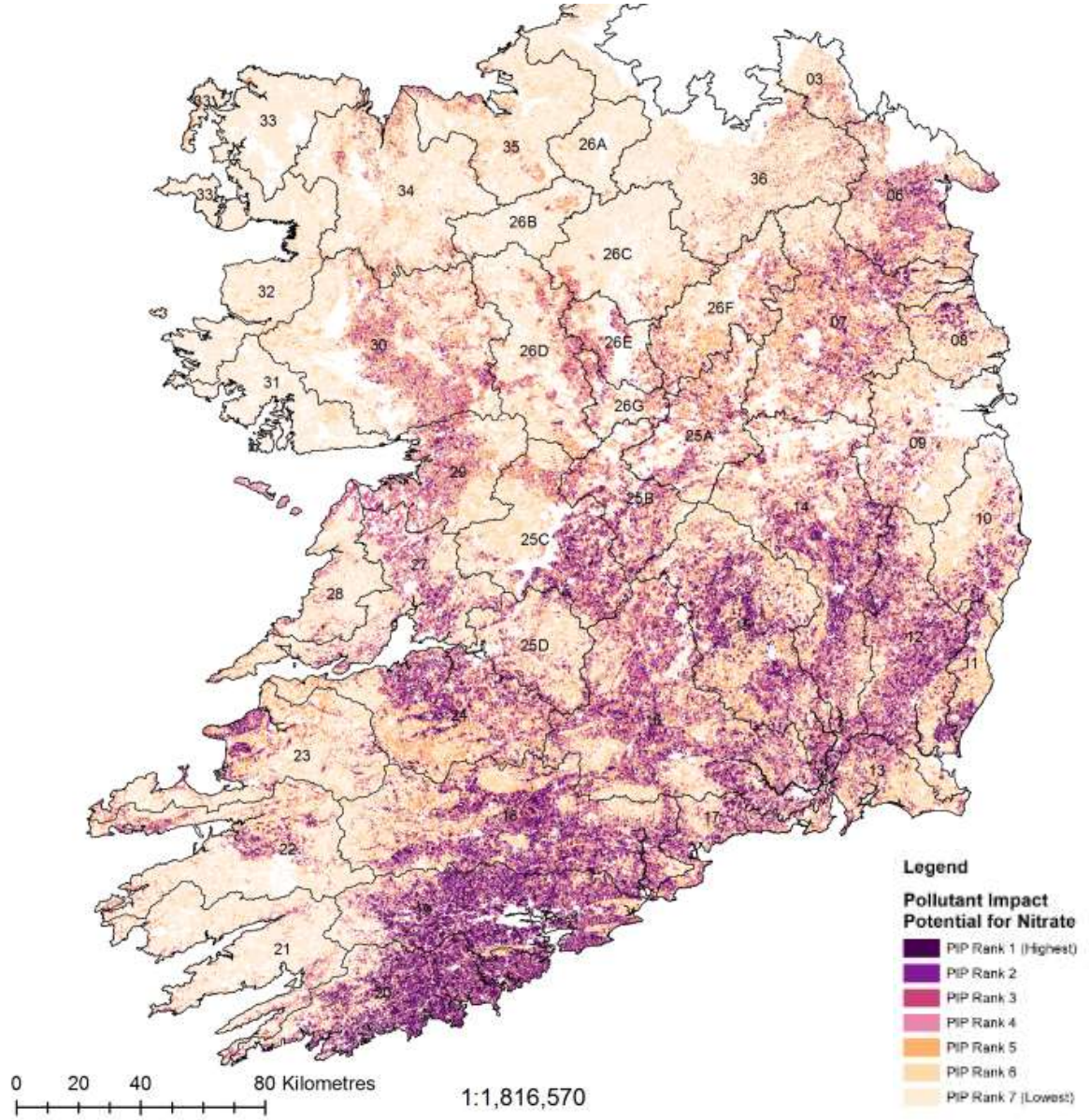
Pollution Impact Potential
Nitrate

Show the highest risk areas in the landscape for losses of N and P to water.

Derived from stocking rate and information on soil type and underlying hydrogeology



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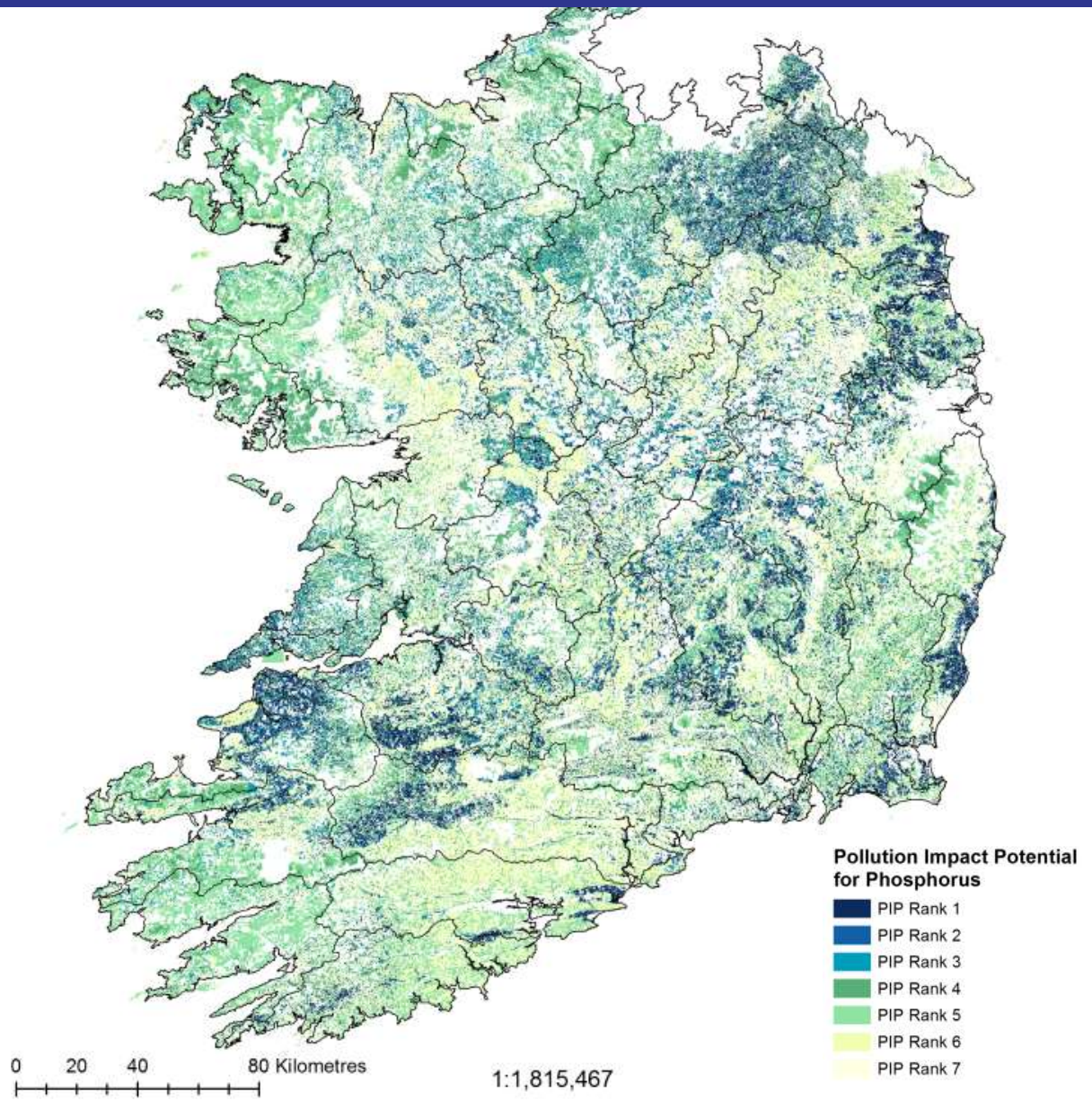
Pollution Impact Potential
Phosphorous

Show the highest risk areas in the landscape for losses of N and P to water.

Derived from stocking rate and information on soil type and underlying hydrogeology



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PIP Map Ranking

Most susceptible to loss

Least susceptible to loss

Nitrogen:

- PIP Rank 1
- PIP Rank 2
- PIP Rank 3
- PIP Rank 4
- PIP Rank 5
- PIP Rank 6
- PIP Rank 7

Phosphorous:

- PIP Rank 1
- PIP Rank 2
- PIP Rank 3
- PIP Rank 4
- PIP Rank 5
- PIP Rank 6
- PIP Rank 7

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Soil and Geology

Nutrients are absorbed and used in soil, less risk if contained.

Deeper soils are also less risky.

NITRATE	PHOSPHATE
More soluble in water	Sticks more readily to soil particles
Moves quickly through free draining soil	Cannot filter through poorly draining soil – stays in surface water

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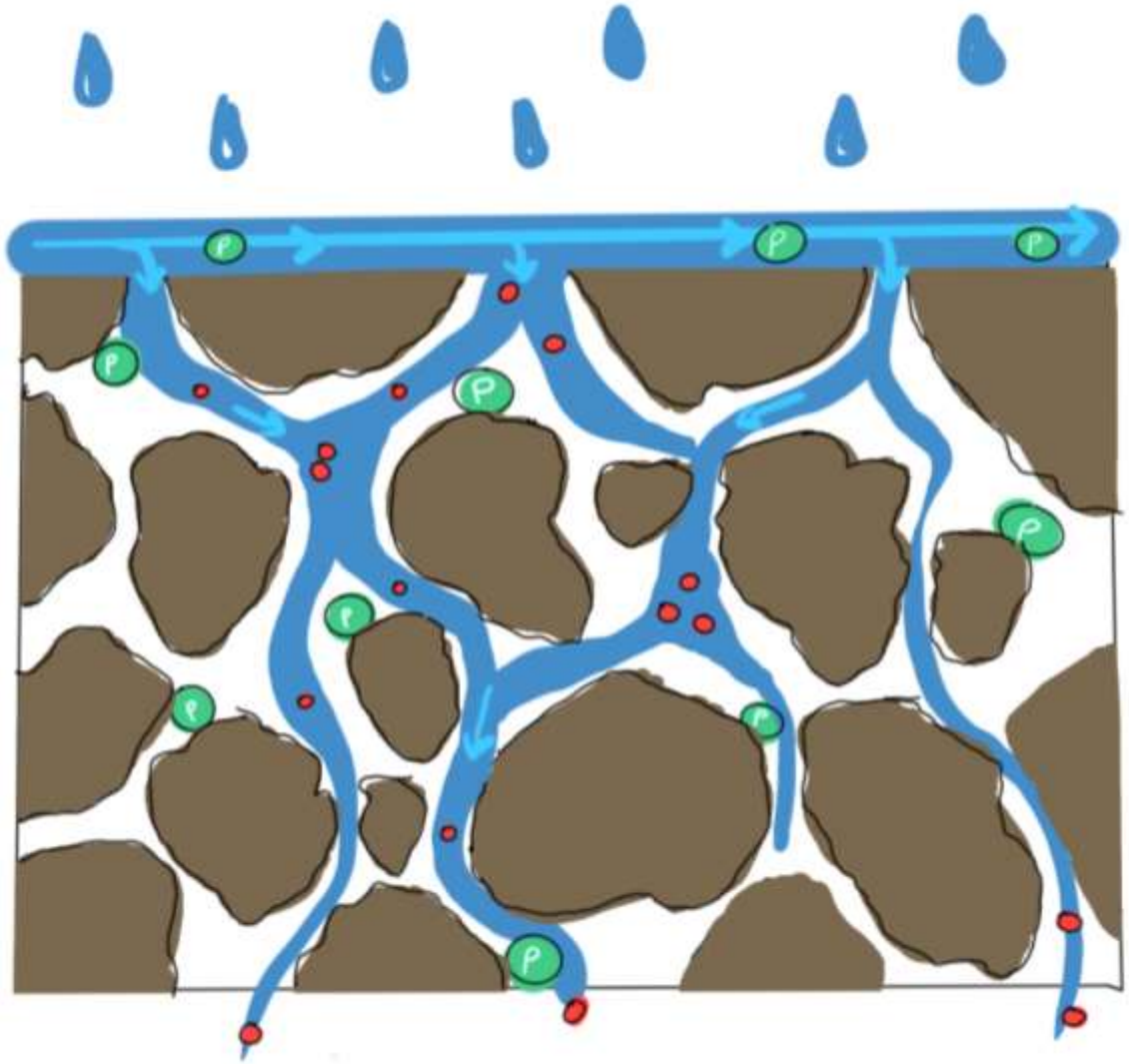
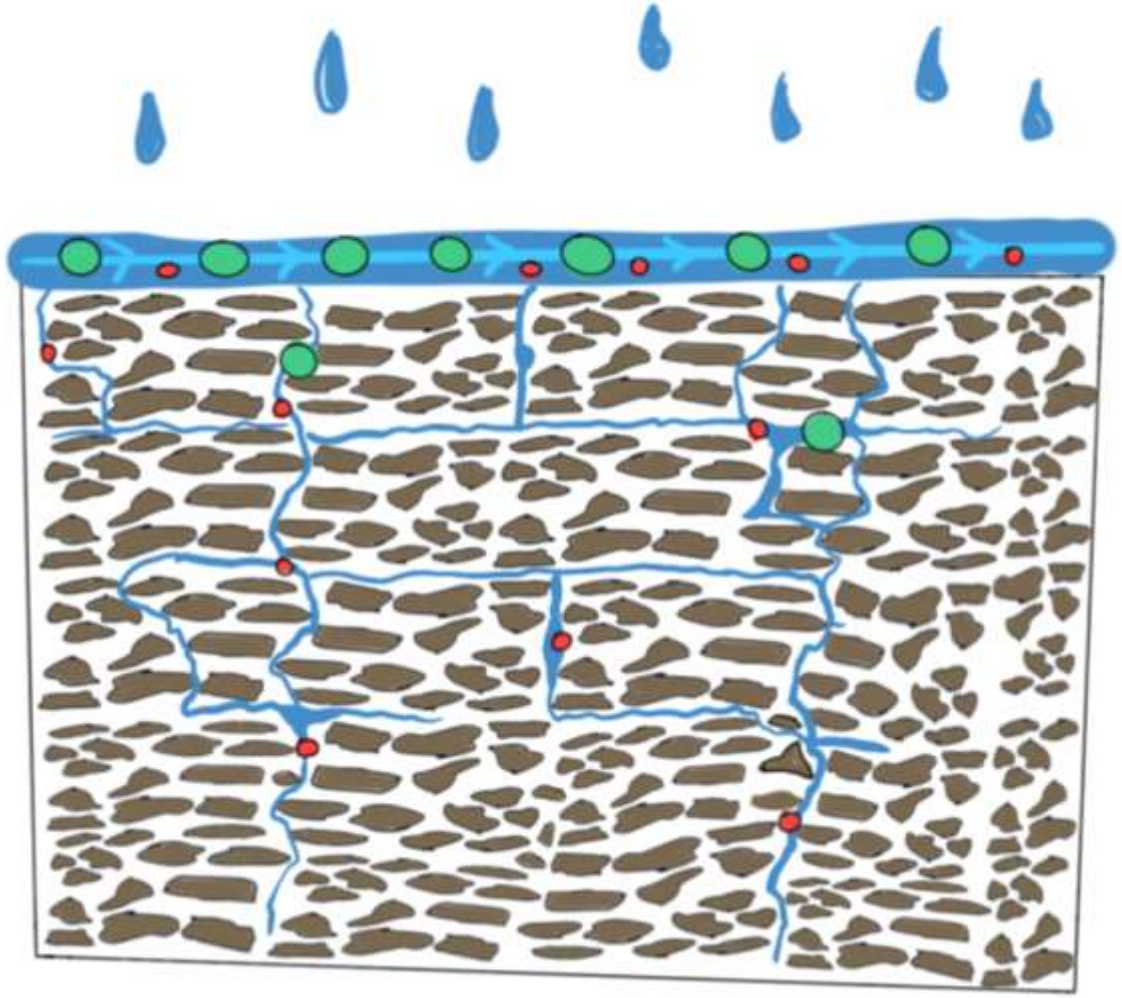
Freely Draining Soil

VS

Poorly Draining Soil





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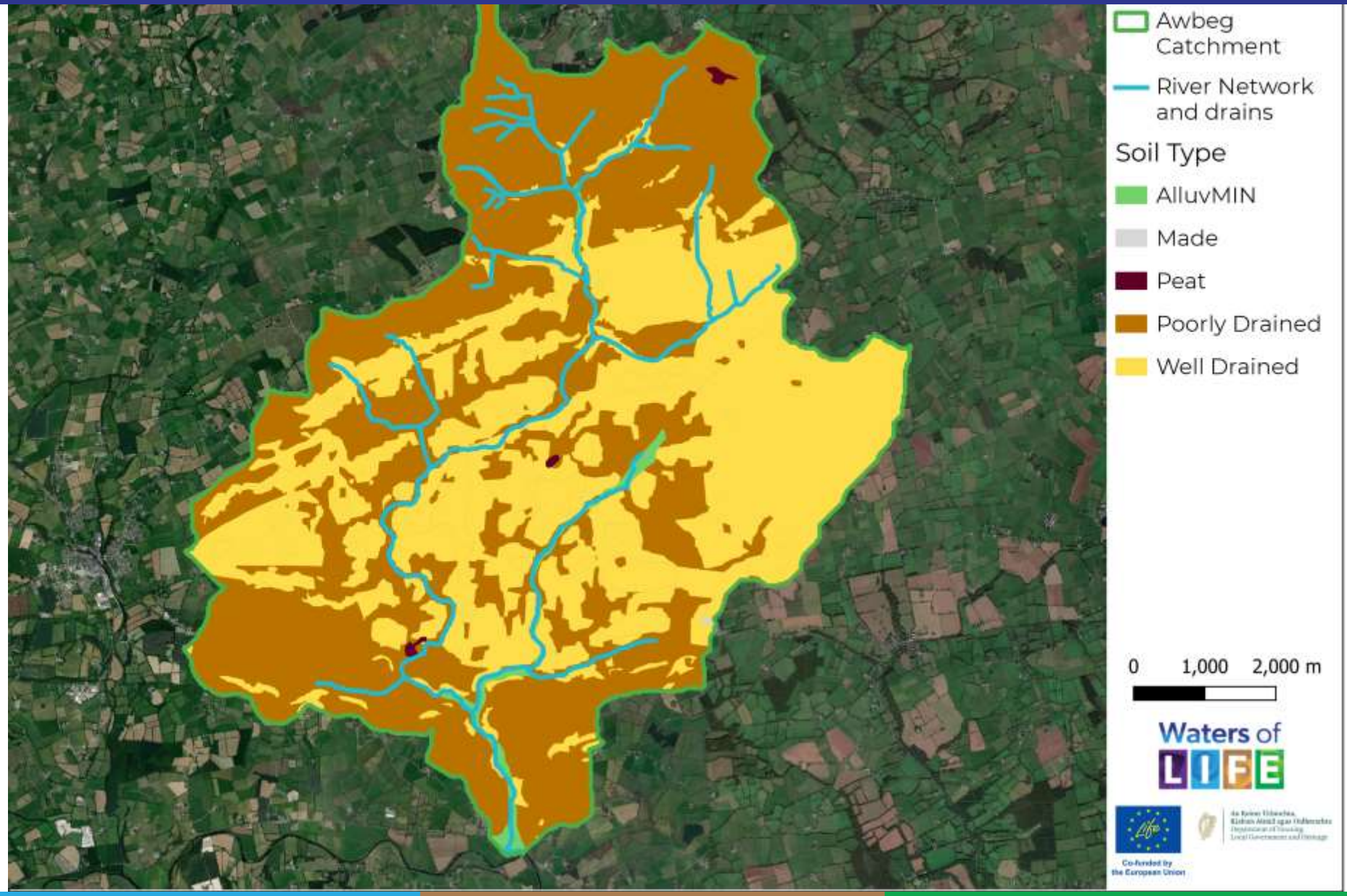
Awbeg (Kilbrin) Sub-Catchment Soil Type



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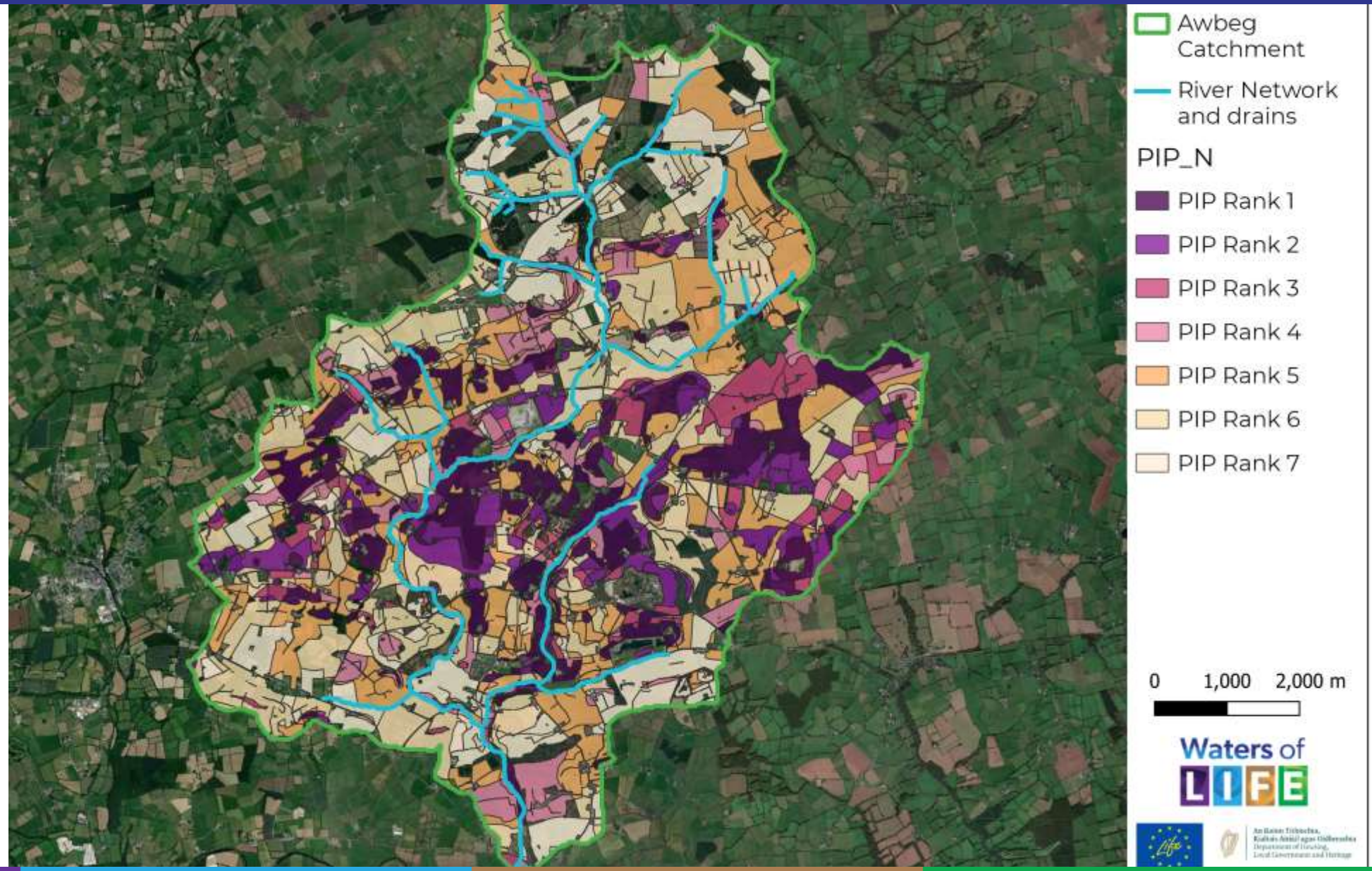
Awbeg (Kilbrin) Sub-Catchment PIP_N



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Awbeg (Kilbrin) Sub-Catchment PIP_P

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PIP-P Flow Pathways

Credit: Waters of LIFE

Credit: CWD Group

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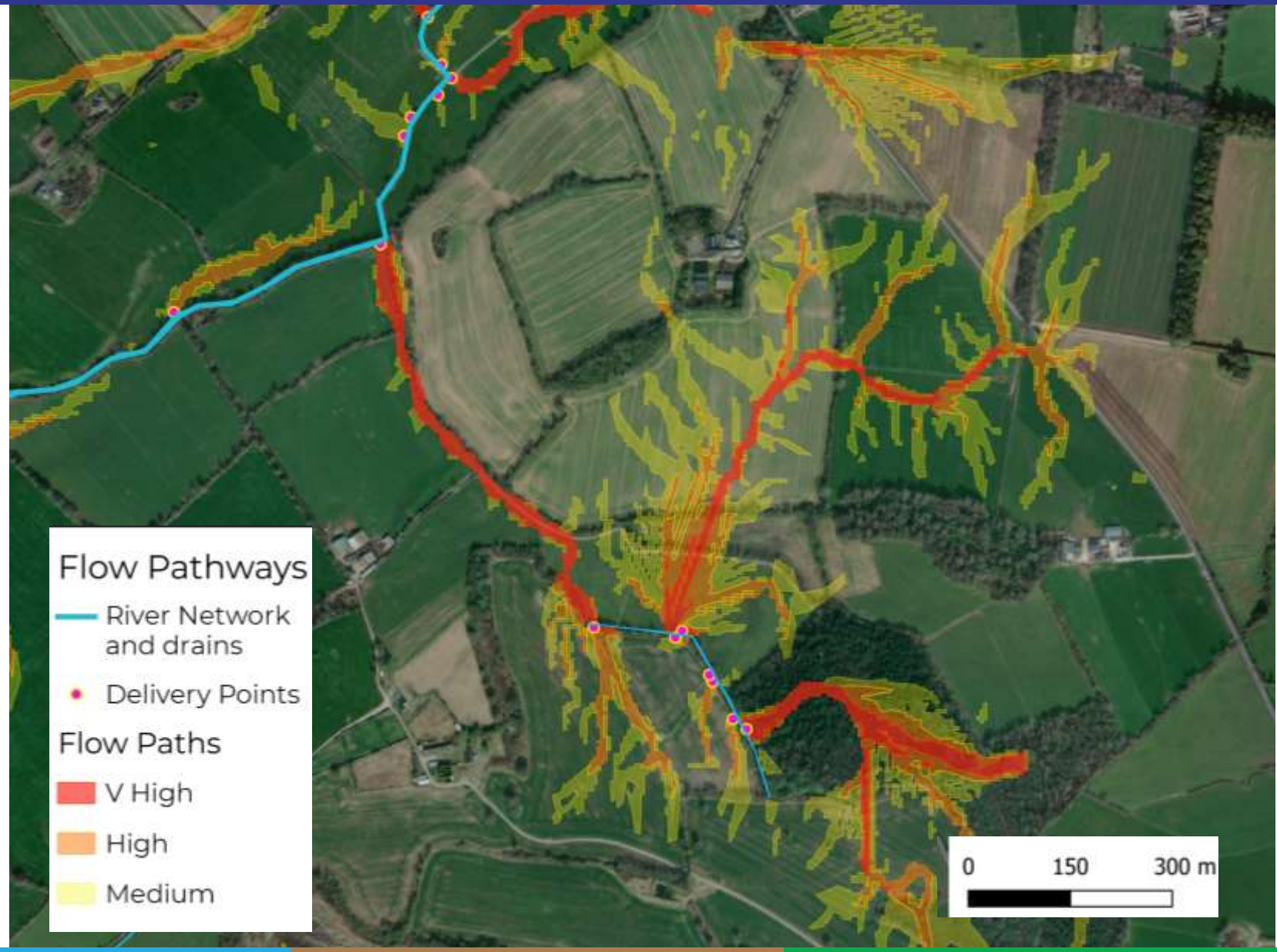
PIP-P Flow Pathways

A model based off elevation maps

Only generated for poorly drained soils



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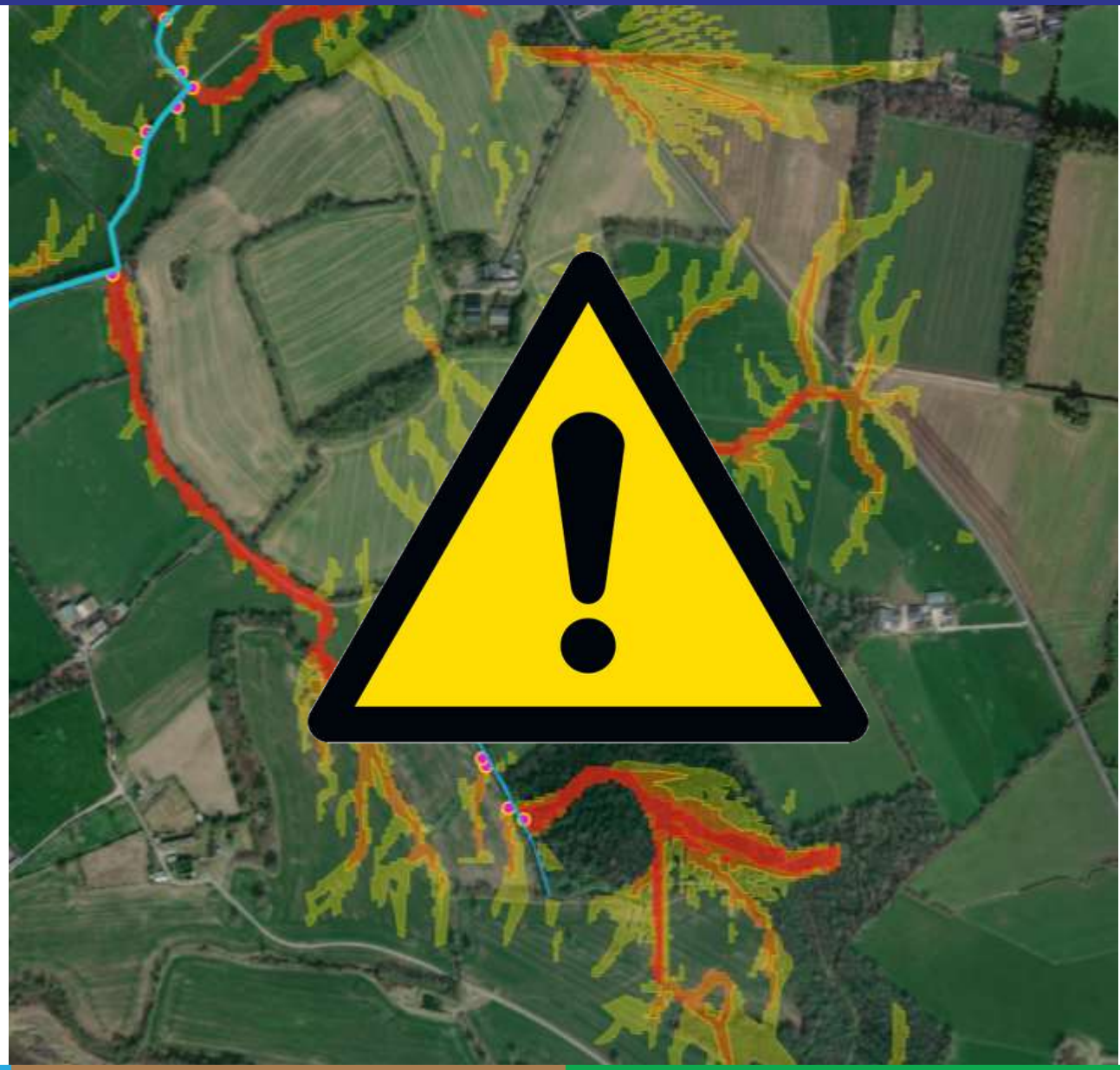
PIP Maps: A caveat.

- PIP maps are a model.
- Models are always wrong
- It's just a matter of how wrong!
- Use at a farm level, not field level, only as a introductory guide
- E.g.
  - Stocking rate is averaged across farm
  - Flow pathways do not consider hedges, ditches etc.



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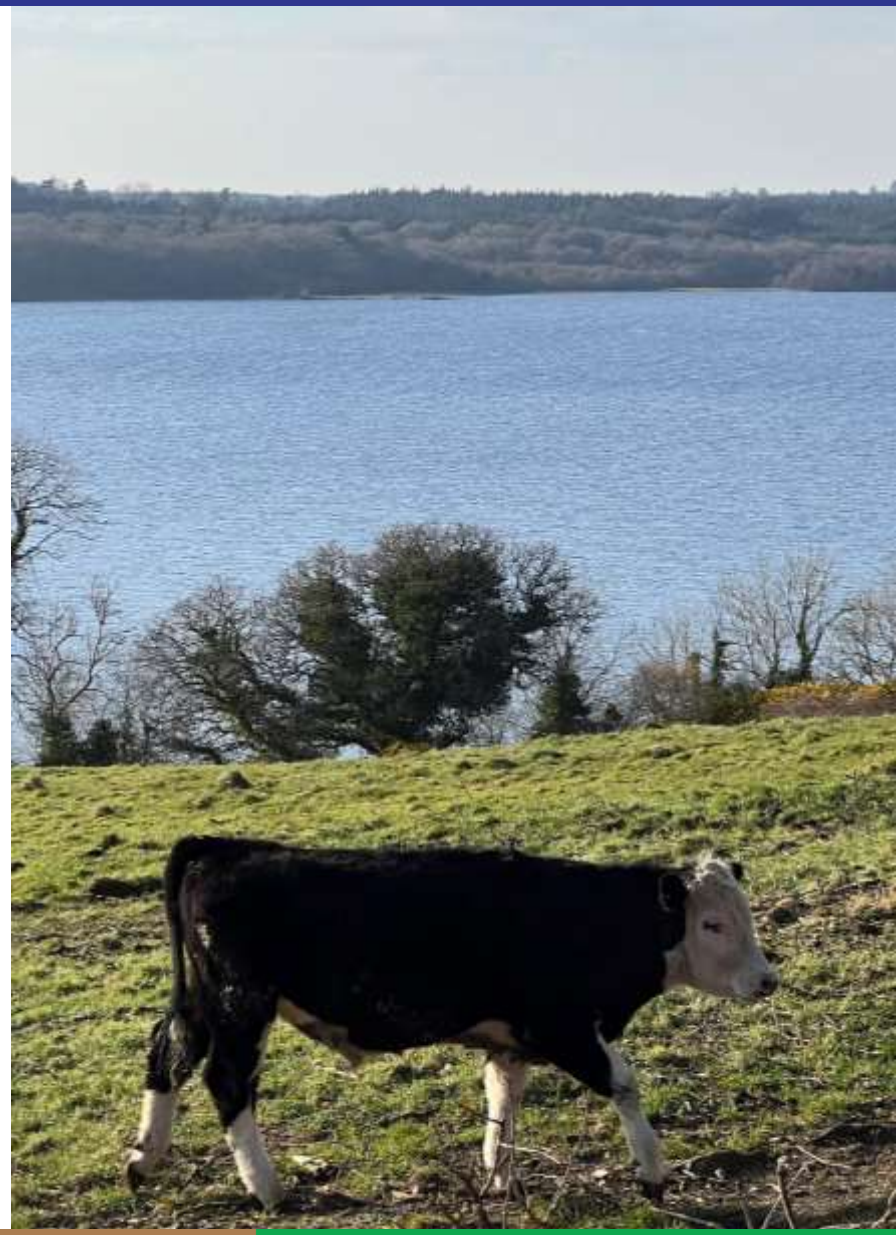
Remember:.

- All three of source-pathway-receptor are needed for impact
- Catchments drain to a point, are three dimensional with surface and groundwater pathways.
- Various factors determine which pathway water will take
- PiP Maps help to determine if a particular farm is susceptible to P or N losses and where they might drain to