

The influence of land use and geomorphology on water and sediment dynamics in the Canadian Prairies

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Canadian Prairies

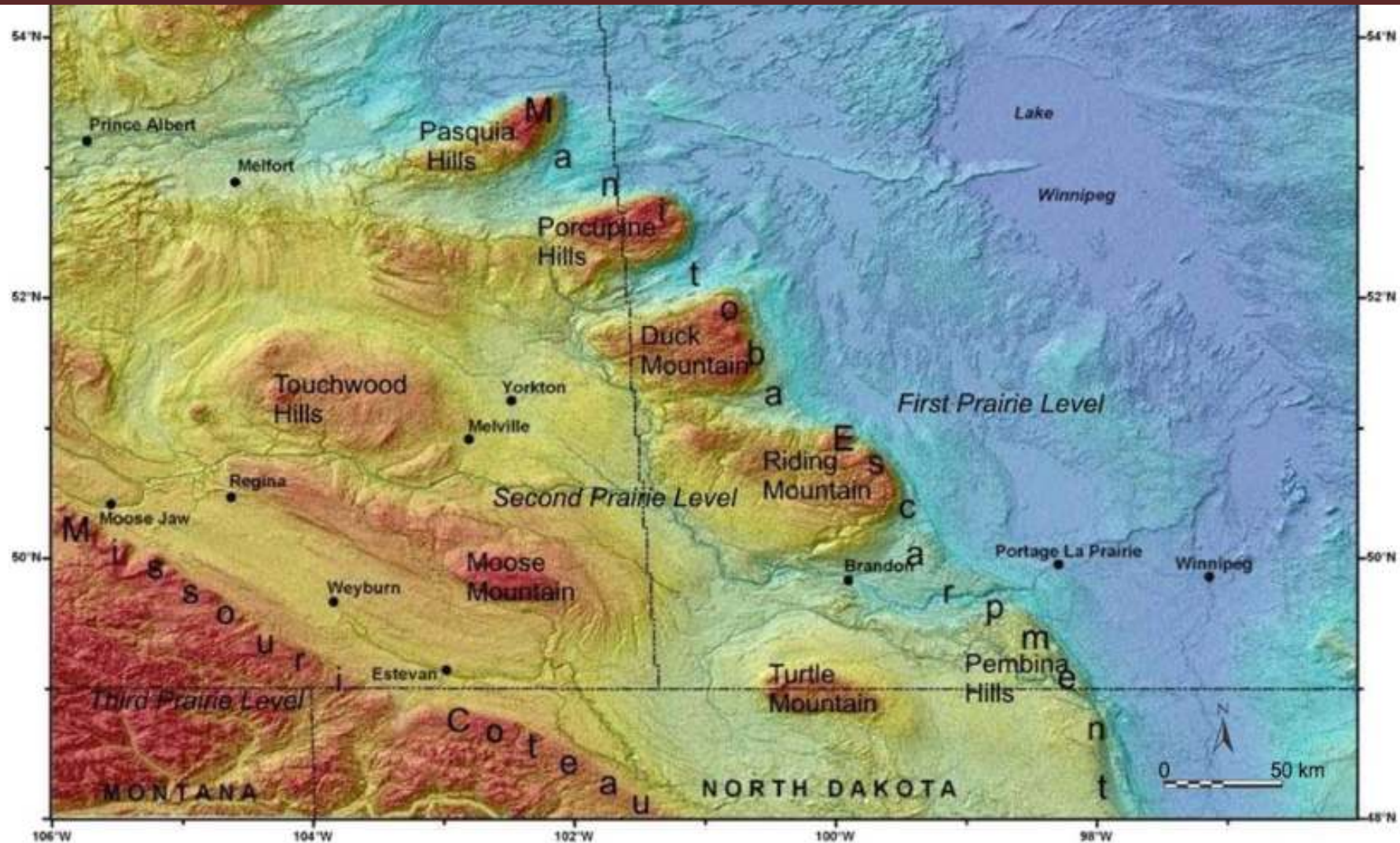
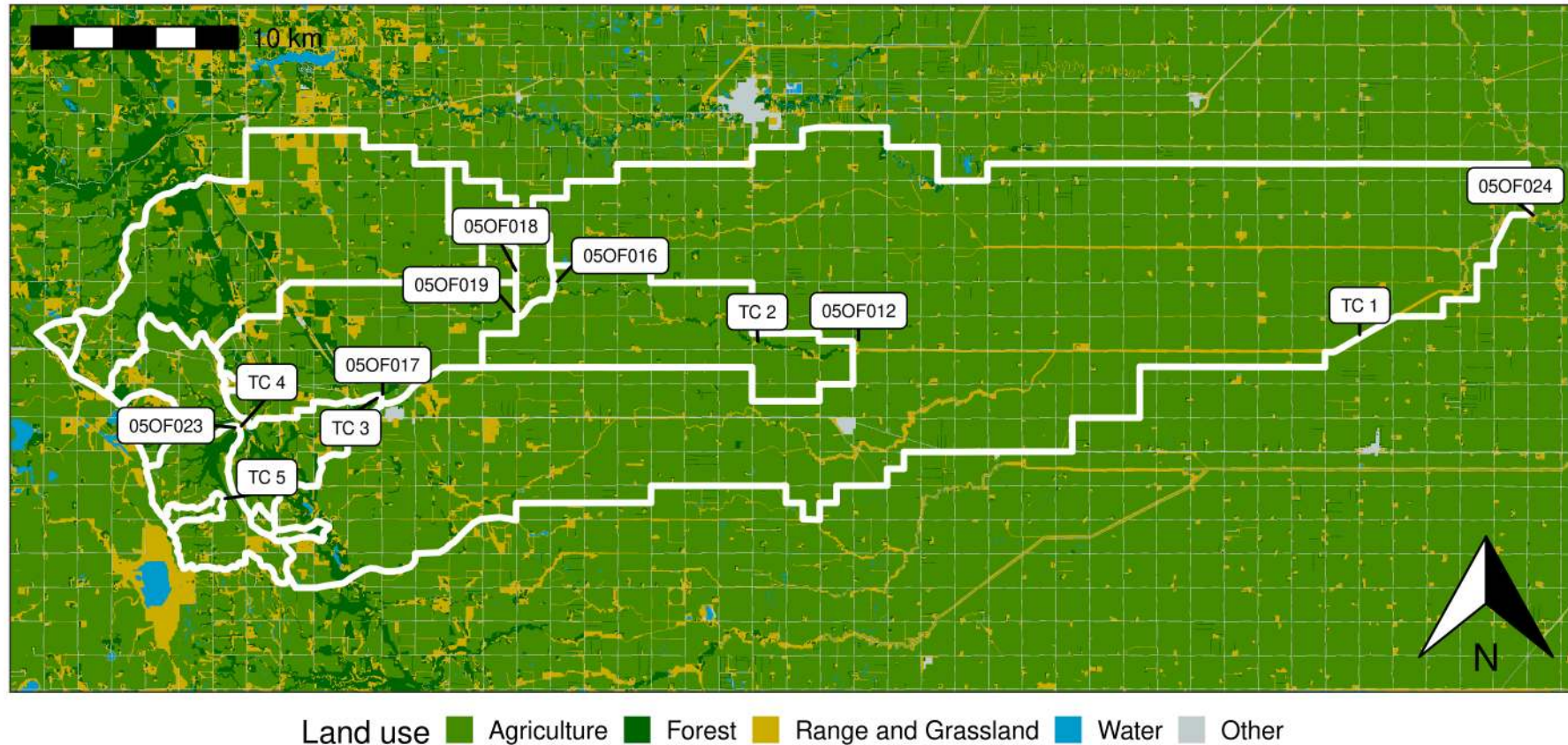


Fig. 9.2 The First, Second, and Third Prairie Levels, Manitoba Escarpment, and Missouri Coteau (after Bamburak and Nicolas 2010)

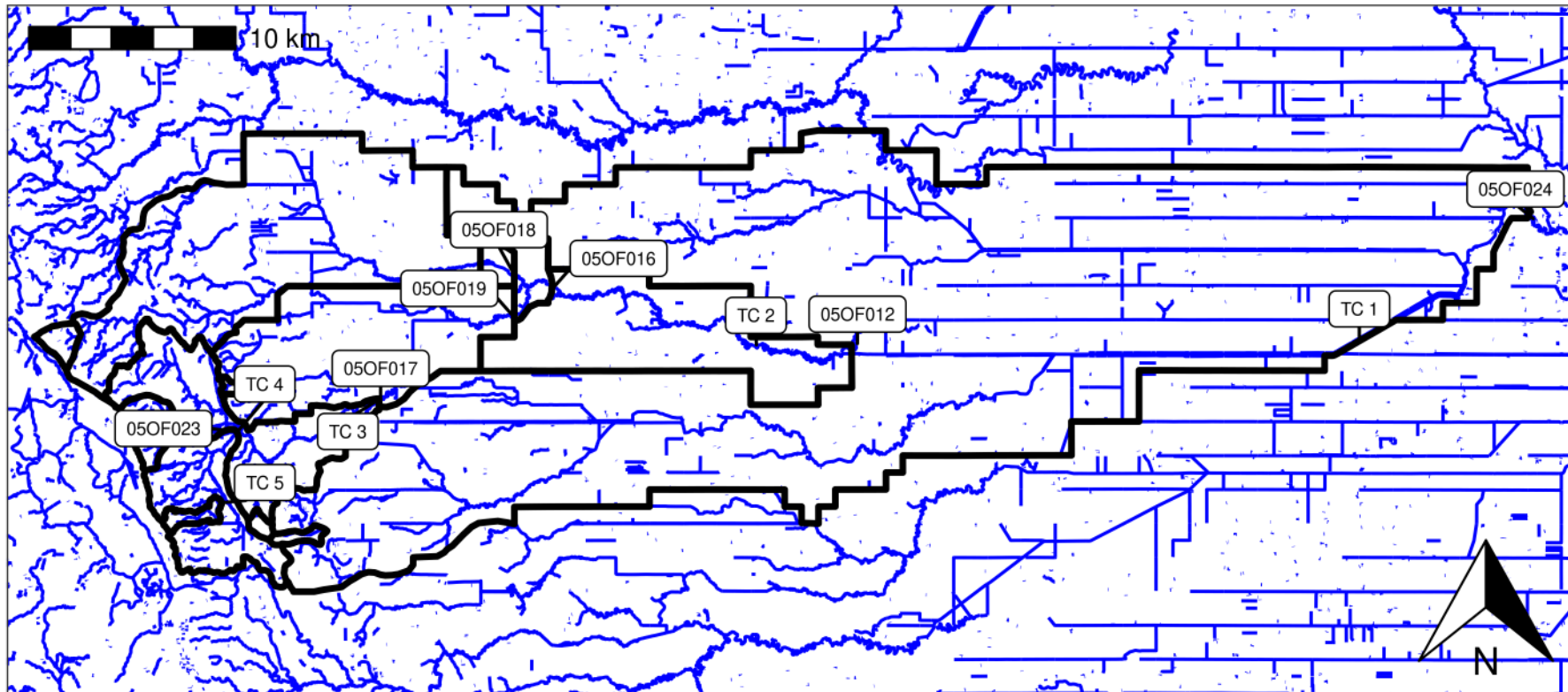
Tobacco Creek Model Watershed

- Nested watersheds: $\sim 2\text{km}^2$ to $\sim 1000\text{km}^2$
- Predominantly agricultural land use



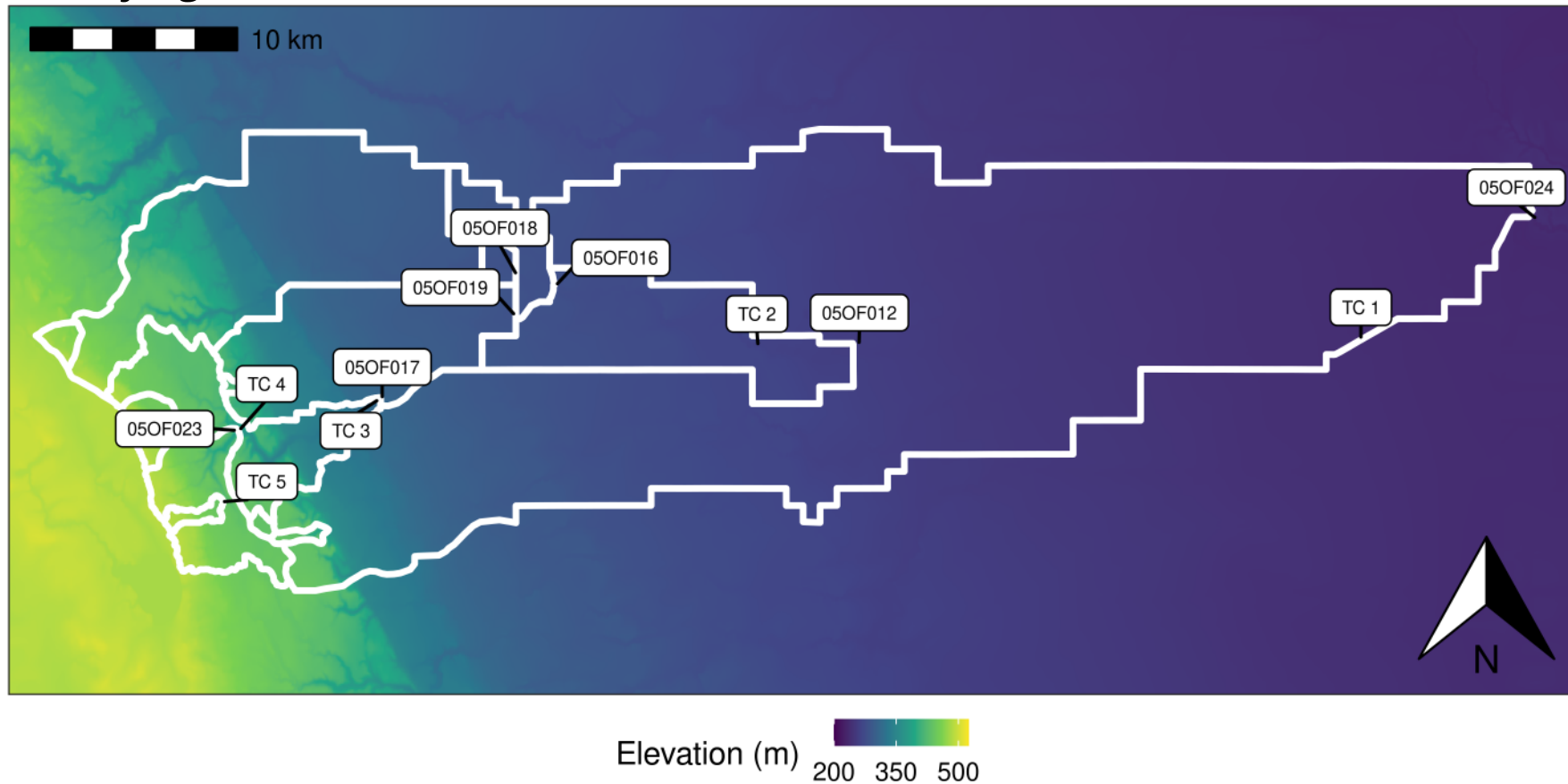
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- Highly modified drainage network
- Predominantly agricultural land use



Tobacco Creek Model Watershed

- Nested watersheds: $\sim 2\text{km}^2$ to $\sim 1000\text{km}^2$
- Predominantly agricultural land use
- Highly modified drainage network
- Three distinct physiographic regions



Above the MB Escarpment

- Undulating hills
 - Glacial till
 - Headwater storage dams
 - Low-order streams



MB Escarpment

- Incised streams
 - Rapid change in elevation
 - Steep valley walls
 - Low-strength shales
 - Beaver dams



Lowlands

Glacial Lake Agassiz

- Low relief
 - Meandering rivers and streams
 - Provincial drains
 - Municipal drains
 - Lots of in-field surface drains

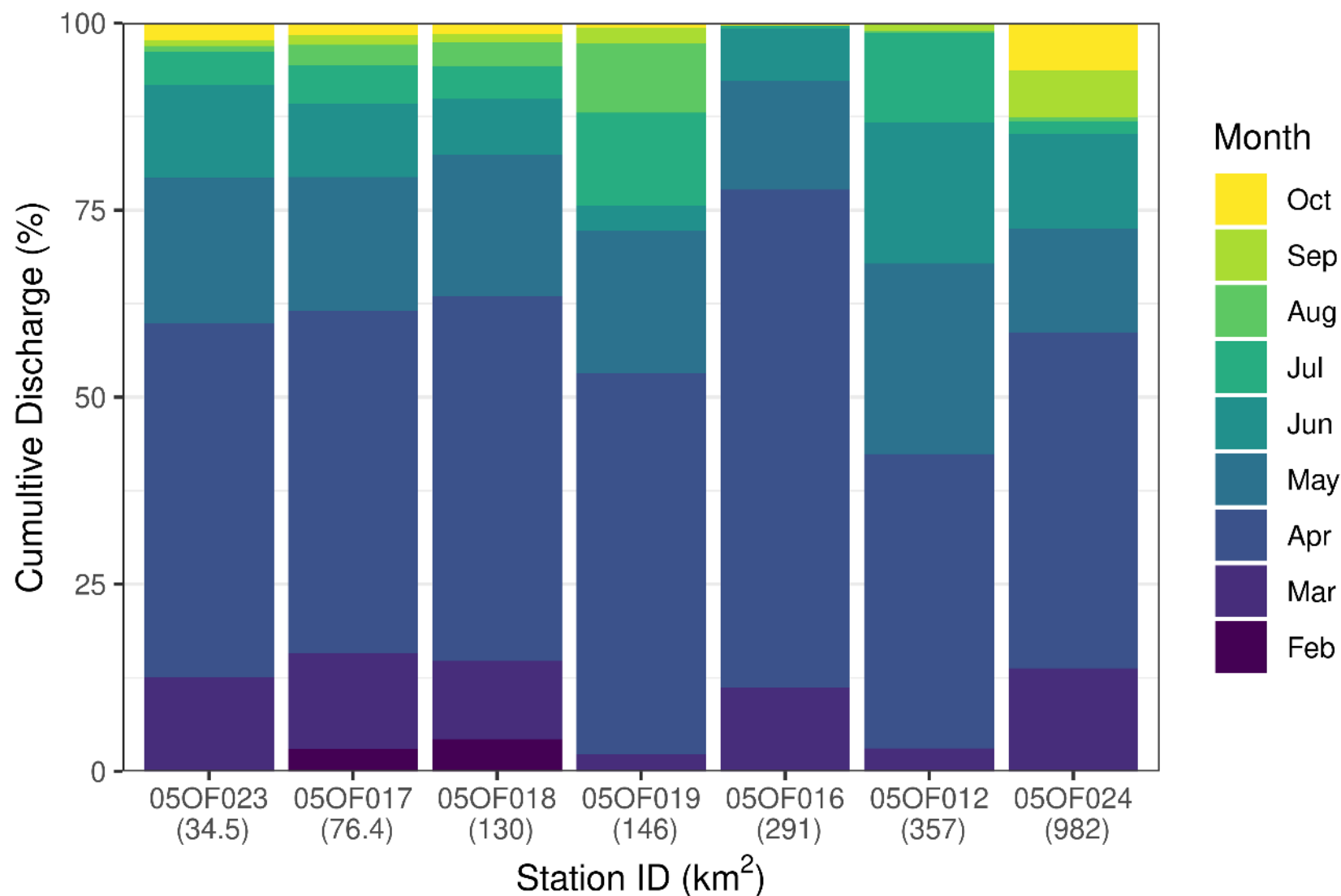
Complicates the normally simple concept of drainage area



Discharge

Annual

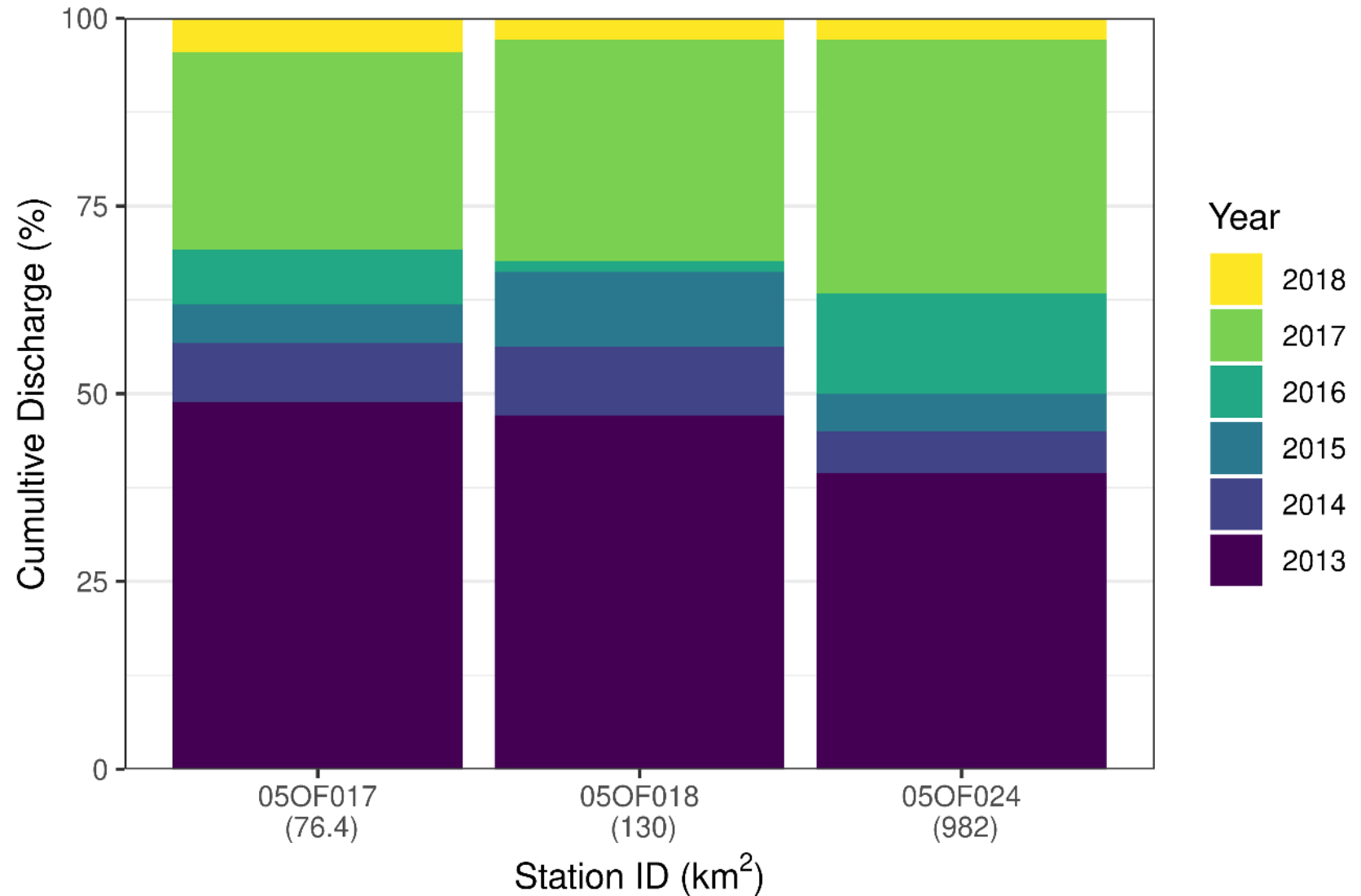
- Spring snowmelt dominated hydrology



Discharge

Inter-Annual

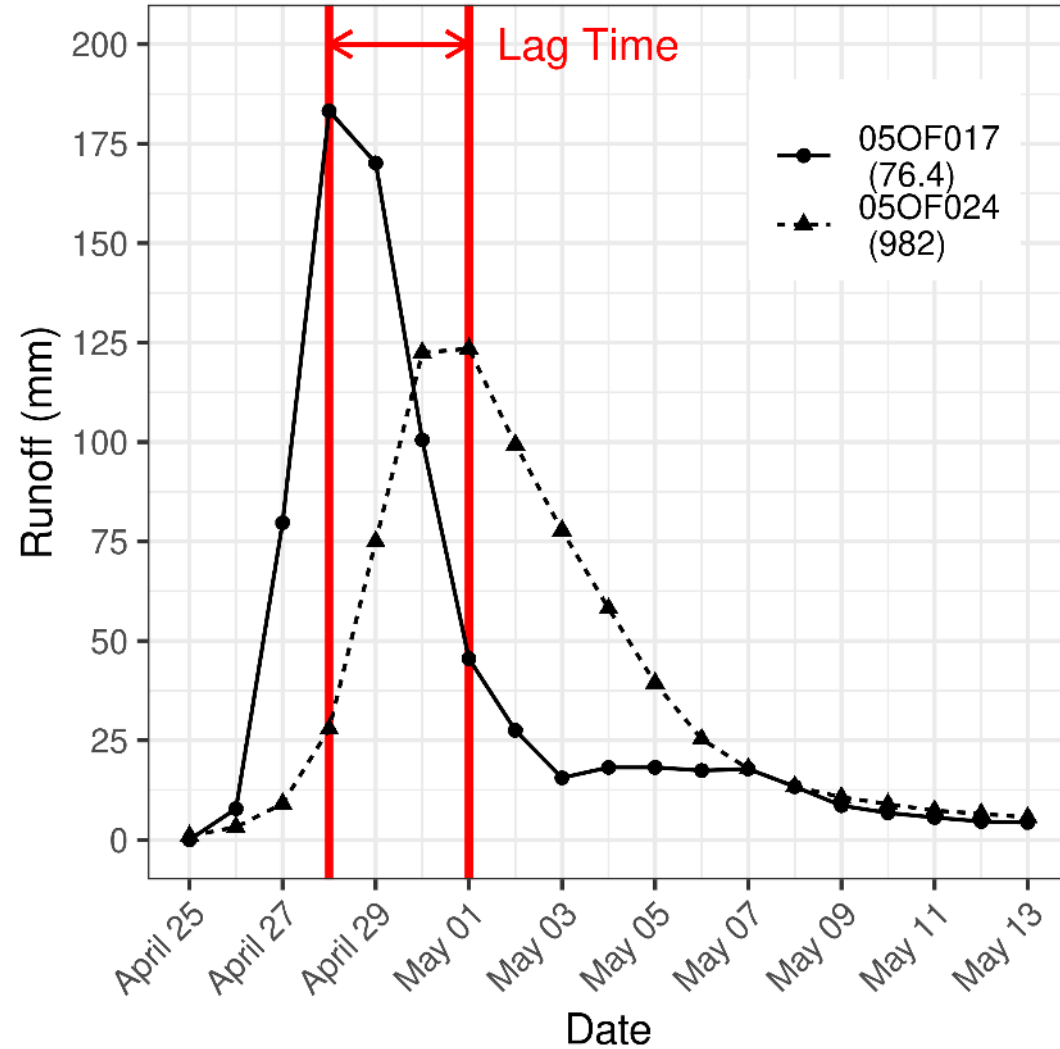
- 2/6 years account for more than >75% of water



Runoff

Lag Time

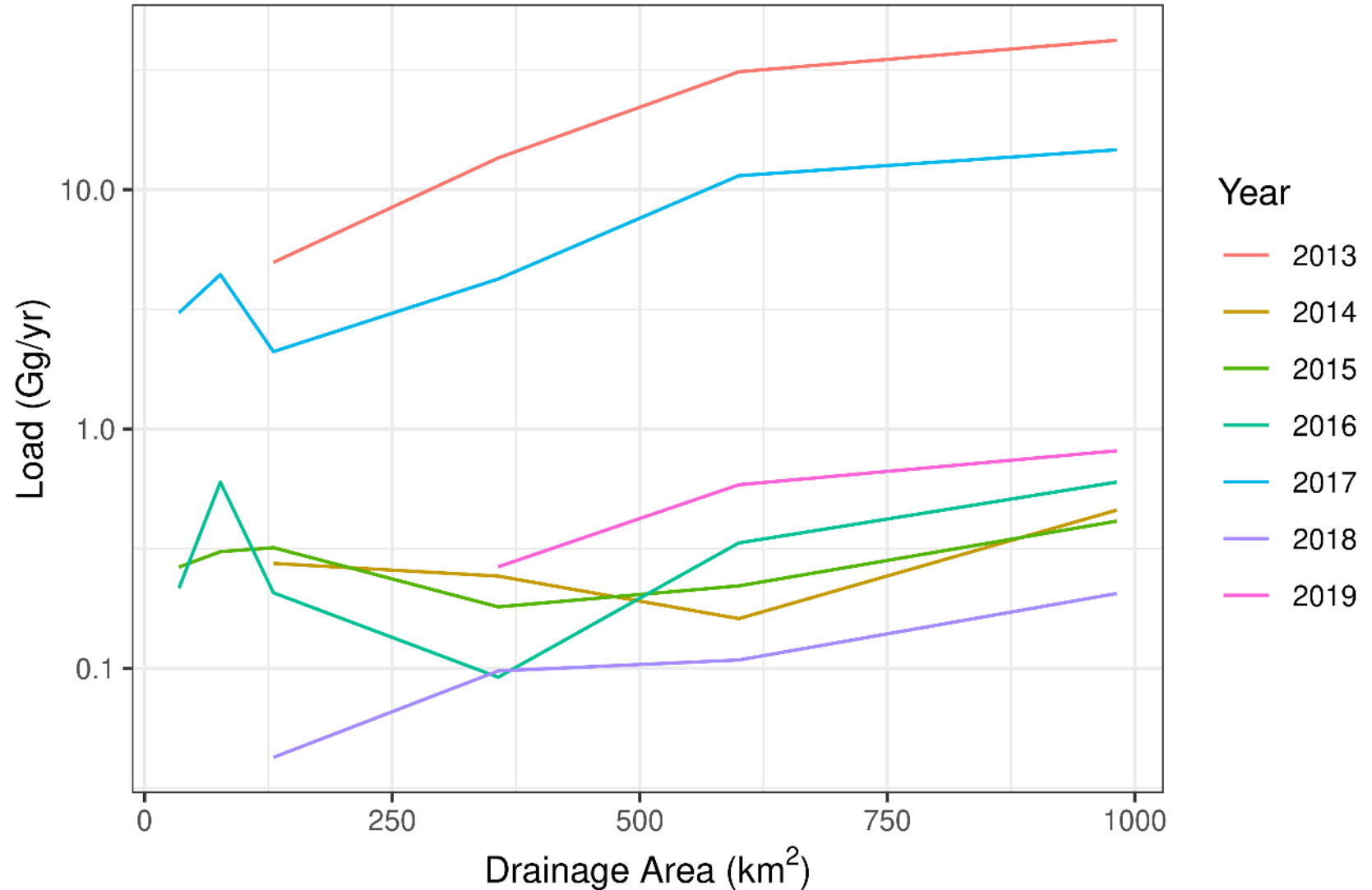
- Gaining streams above and within MB escarpment
- Losing streams below MB escarpment



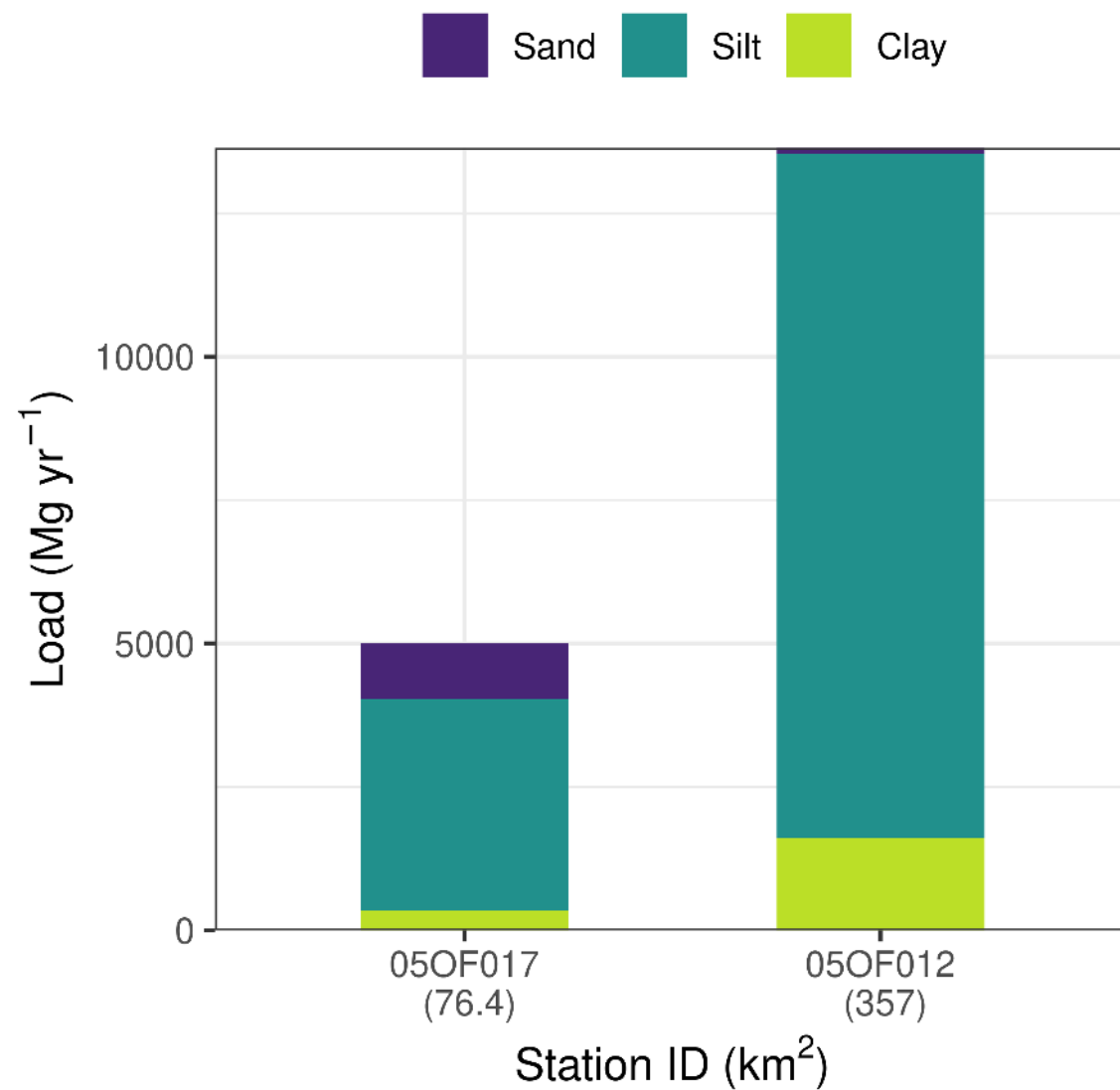
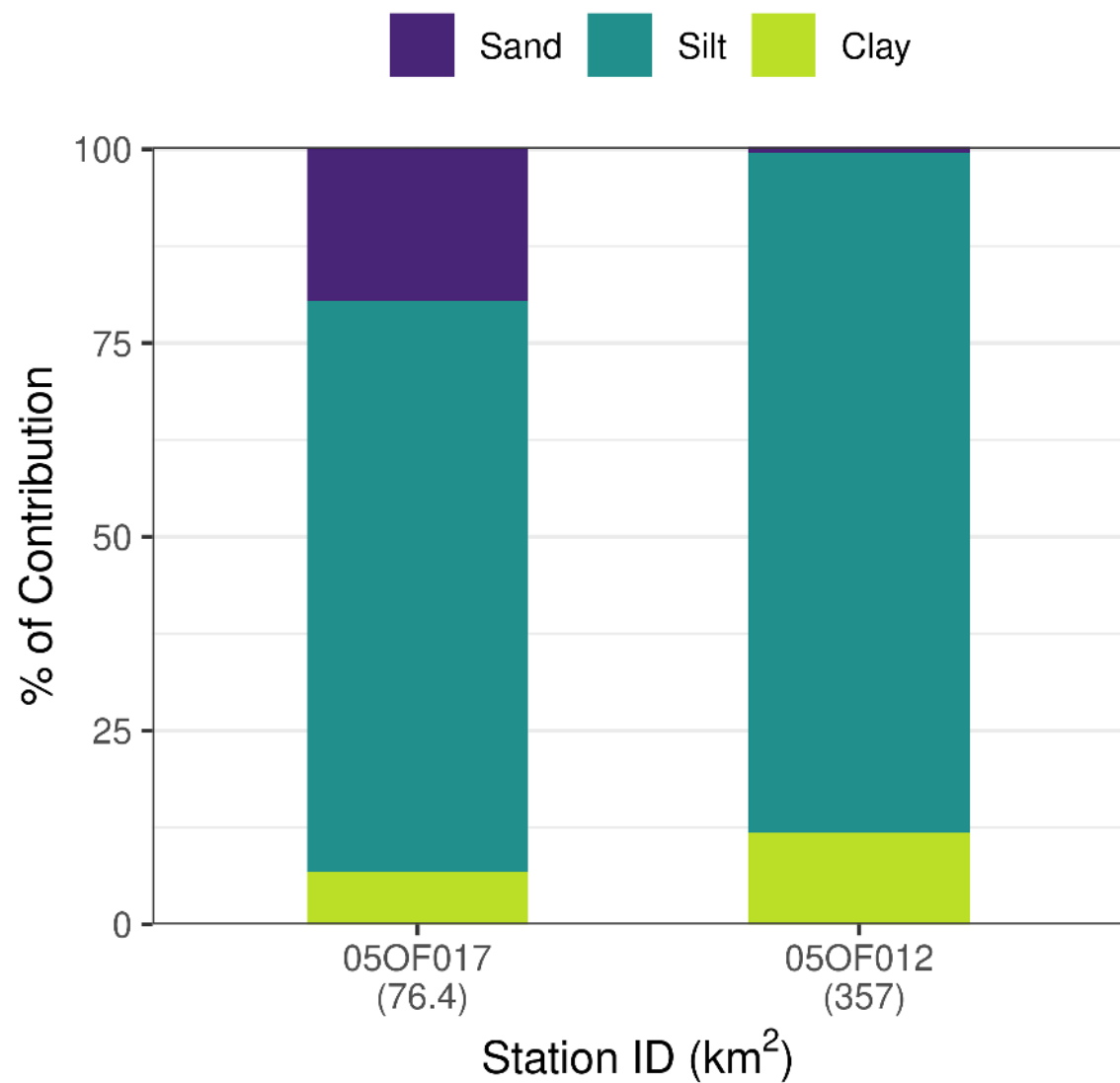
Sediment Load

Inter-Annual

- 2/6 years account for more than >80% of sediment moved

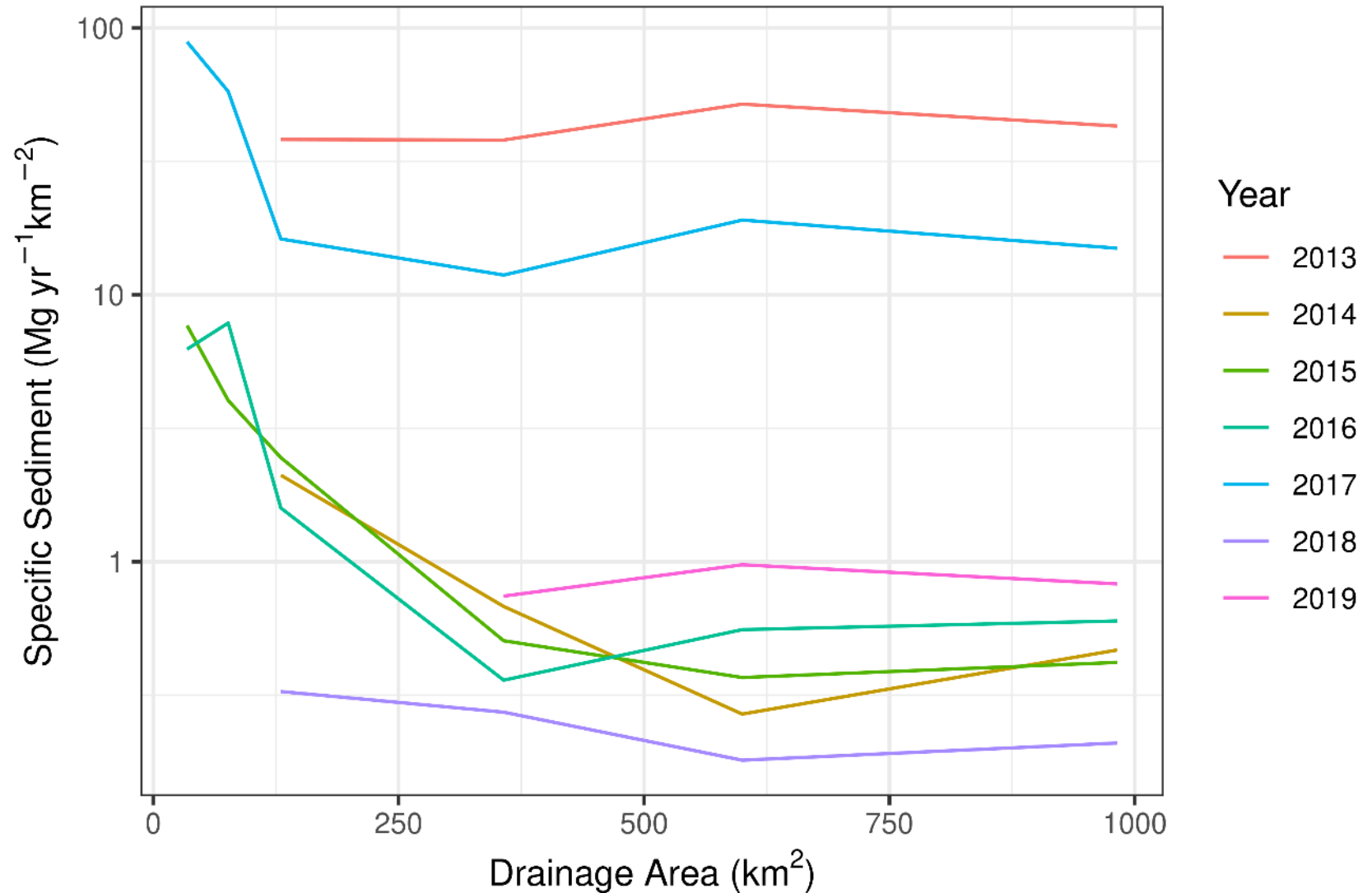


Grain-size



Specific Suspended Sediment Load

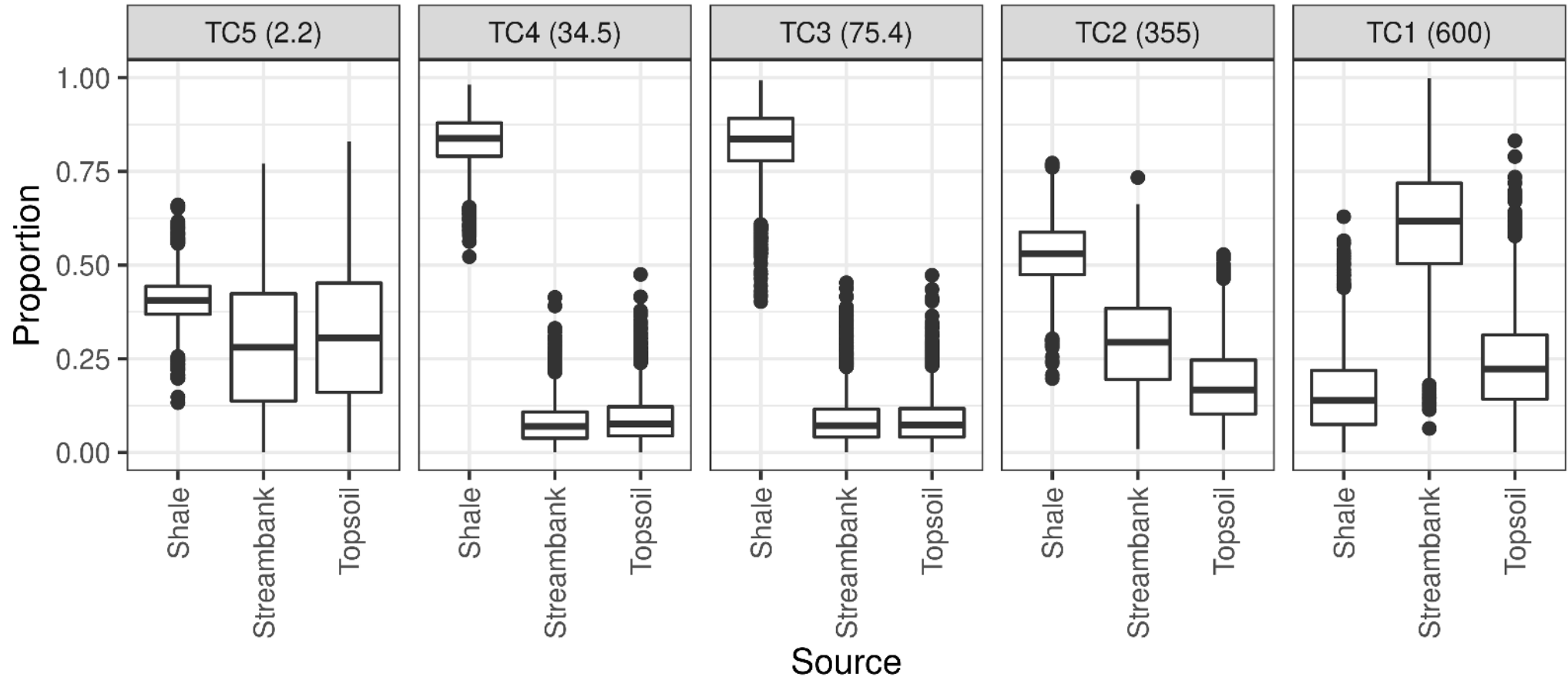
Decreases with
increasing drainage
area



Sources of Sediment

Shift in sources of sediment

- Colour fingerprints



Thank You

Changes in

- Physiographic regions, drainage, scale of observation

Impact

- Water yield, sediment yield, sources of sediment

Thank you!



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Slides: <https://github.com/alex-koiter/presentations> (PDF)

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