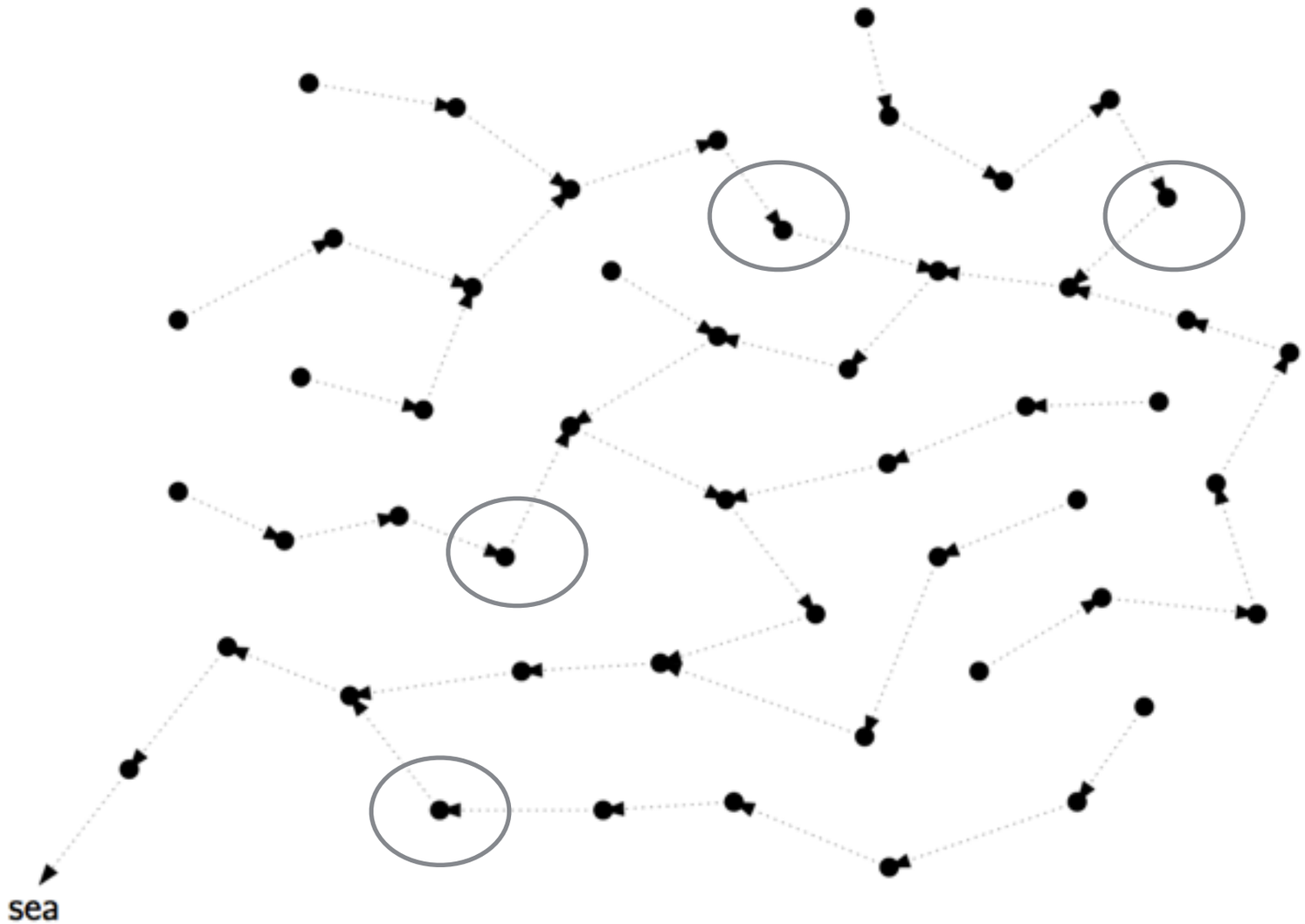
Below is a flow direction graph. It represents one river-tree.

1. Label each node with its flow accumulation (FA) value.

The basin (or watershed) of a point u is defined as the set of all the nodes that contribute to FA(u). Put differently, it's the part of the terrain that drains through u.

2. Show on the figure the basins of the marked nodes.



Watersheds and watershed hierarchy

A watershed is an area of land where water drains to a common outlet. Because the whole watershed drains to the same point, it represents more or less a homogenous unit of landscape that can be studied on its own. Projects in the geo-sciences start by identifying the watershed they want to study.

Wait a minute: what scale? Clearly if we pick the “mouth” of a river, the entire river drains to it, so the whole river tree constitutes a watershed. What if we did not want to study the whole basin of the Amazon, but only a smaller portion of it? We need to be able to split watersheds into sub-watersheds and so on.

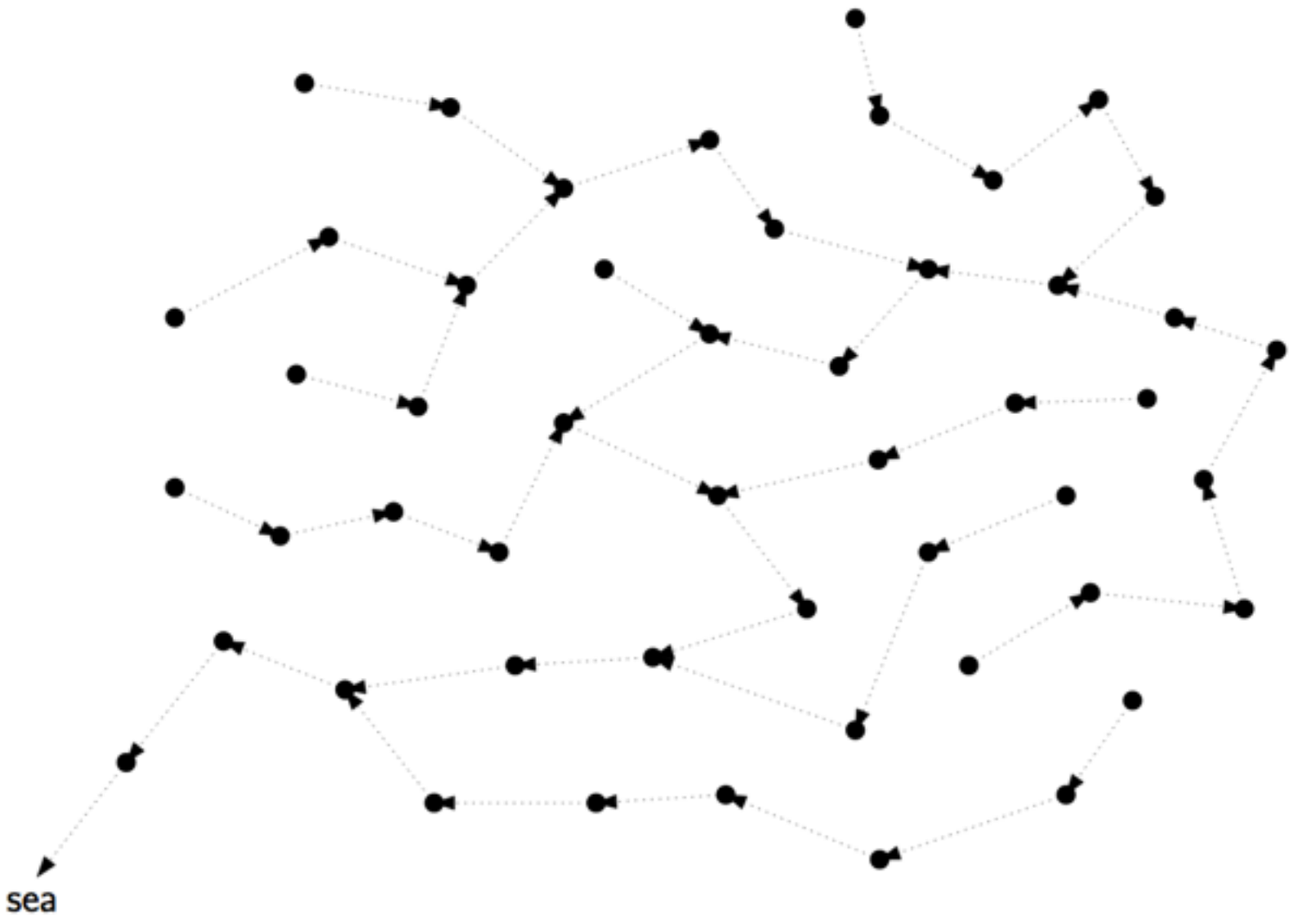
FD and FD give us an elegant way to model a watershed hierarchy. Idea is credited to Pfafstetter.

Pfafstetter watershed hierarchy:

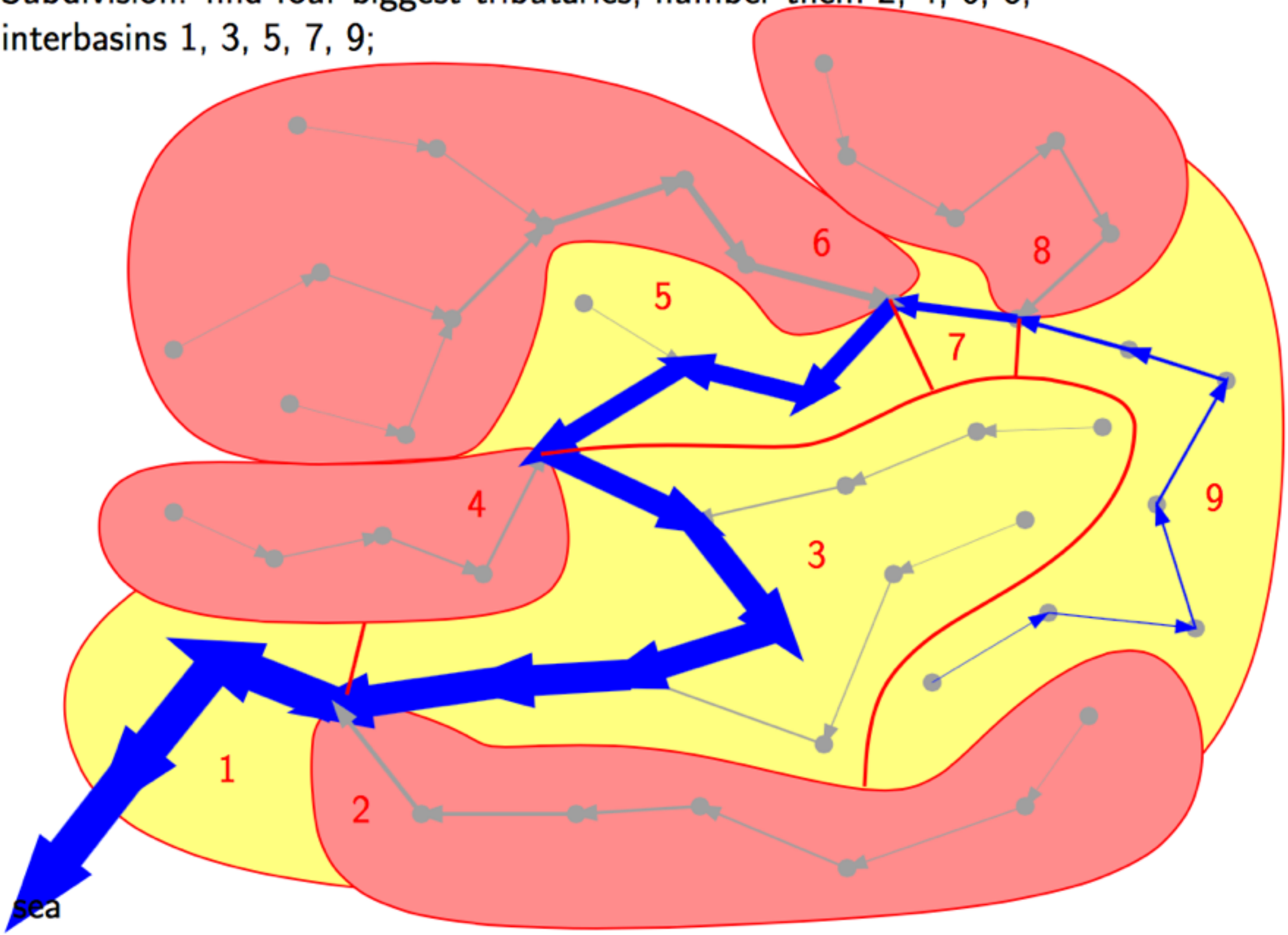
- Find the backbone of the river.
- Find the largest 4 tributaries of the main river, and draw their basins; number these 2,4,6,8.
- Find the inter-basins between these four tributaries and number these 1,3,5,7,9.

Find and show basins 1 through 9 on the graph on the other side. Every point in the terrain should be either in a basin or in an inter-basin. If it’s not, you did something wrong.

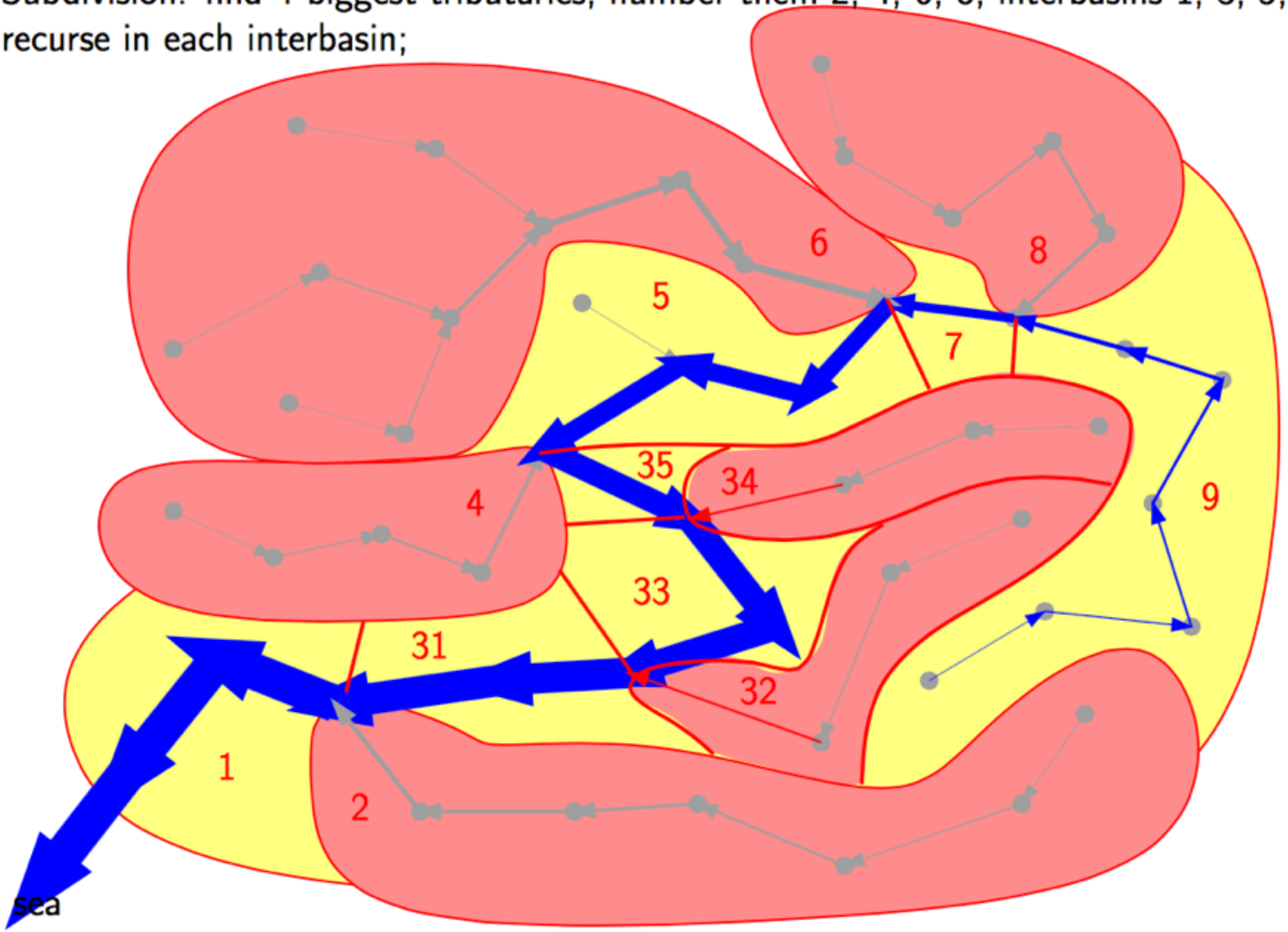
- Pick watershed 3 and recurse. Show its sub-watersheds 31,32,33…


sea

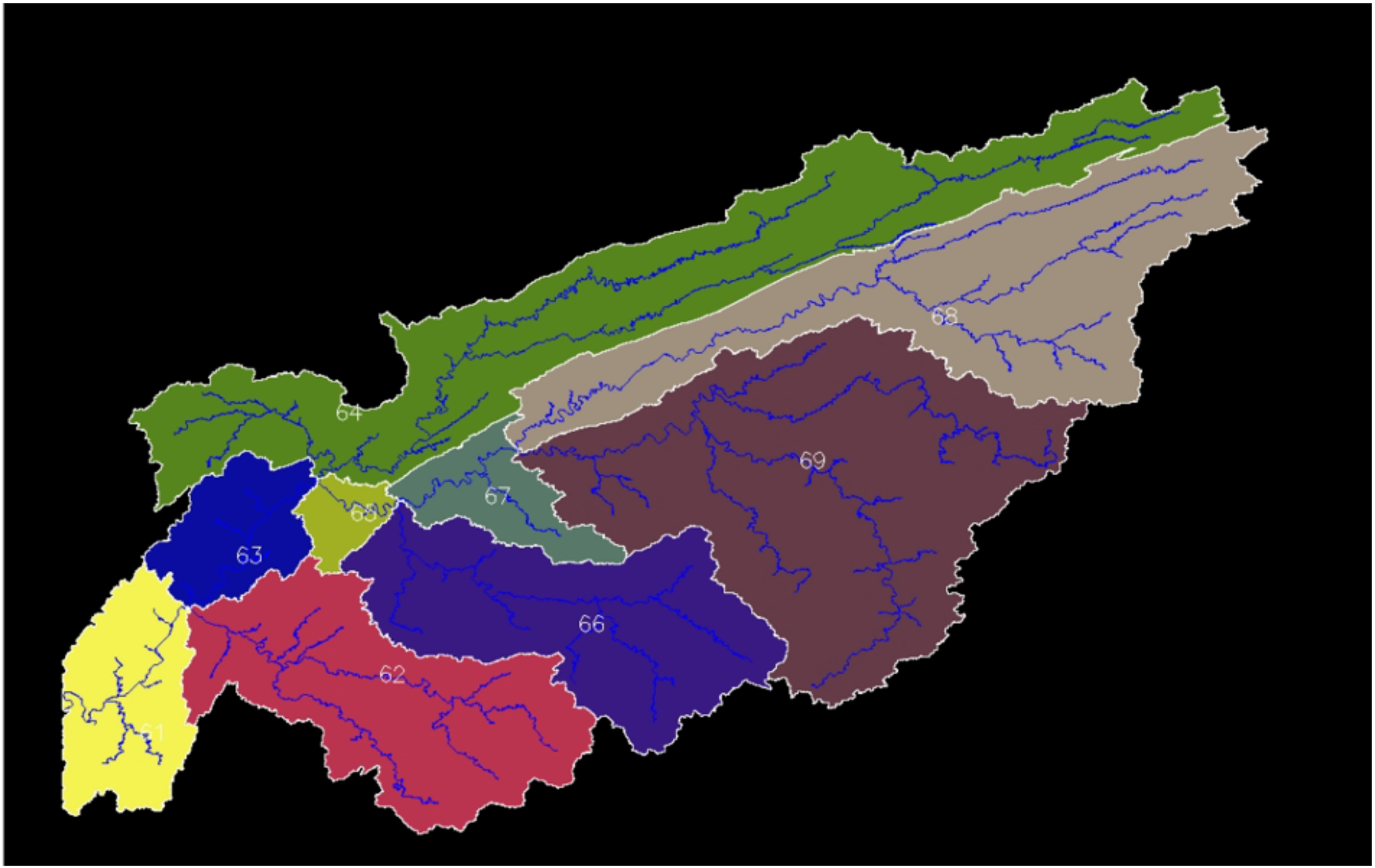
Subdivision: find four biggest tributaries, number them 2, 4, 6, 8;
interbasins 1, 3, 5, 7, 9;



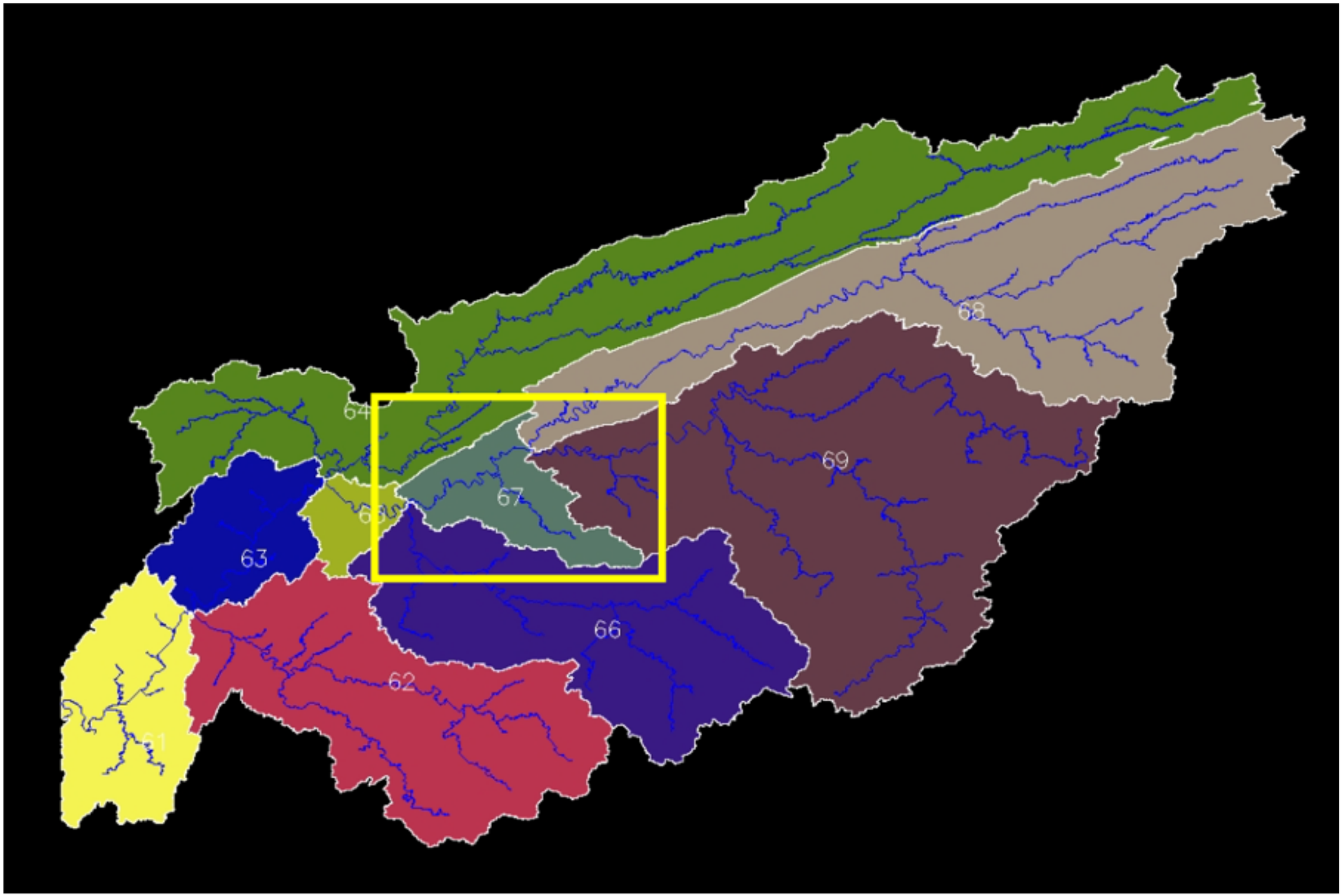
Subdivision: find 4 biggest tributaries, number them 2, 4, 6, 8; interbasins 1, 3, 5, 7, 9; recurse in each interbasin;



Partitioning watershed 6 into sub-watersheds 61, 62,…69



Partitioning sub-watershed 67



Partitioning sub-watershed 67