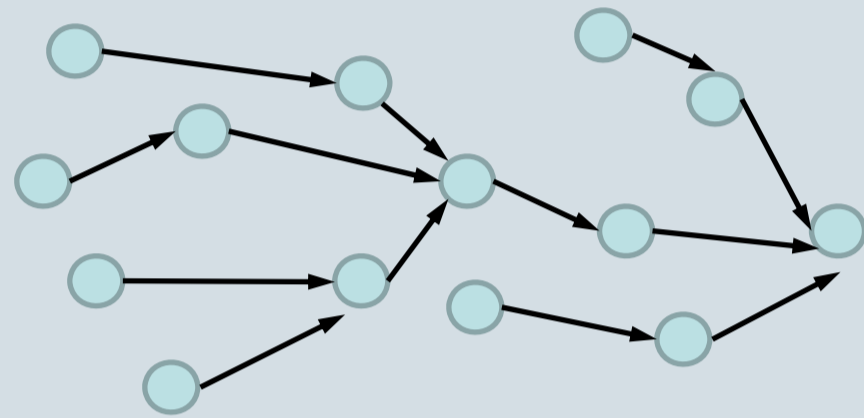


TerraSTREAM: Flow Modeling

Flow Modeling

Two of the most important concepts in terrain flow modeling are flow routing and flow accumulation

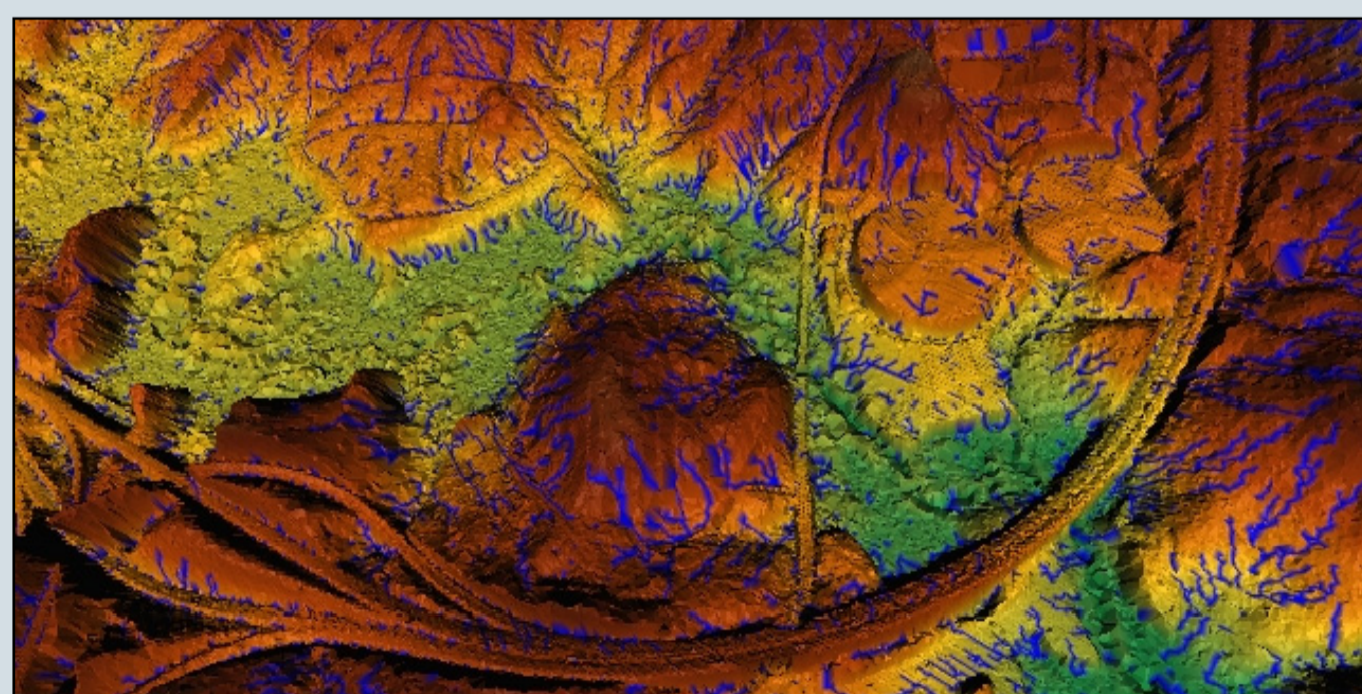
- **Flow routing** is the assignment of flow directions to every point of a terrain and models how water flows through it. Flow routing is performed by selecting one or more down slope neighbors at each point.



- **Flow accumulation** quantifies how much water flows through each point of the terrain if poured uniformly onto it. Water is routed along the flow paths computed by flow routing.

Topological Simplification

Since flow models route water downstream, many small sinks impedes water flow along hydrological features.



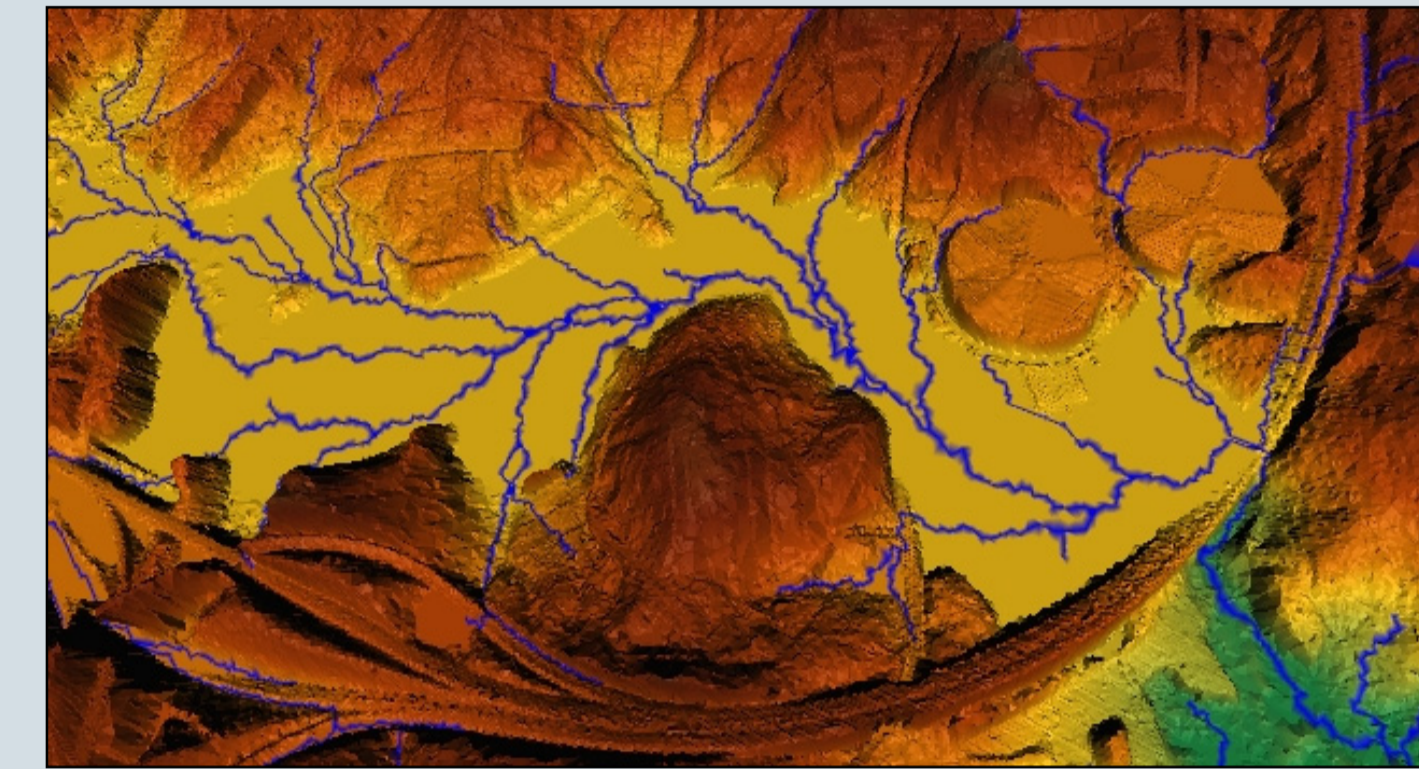
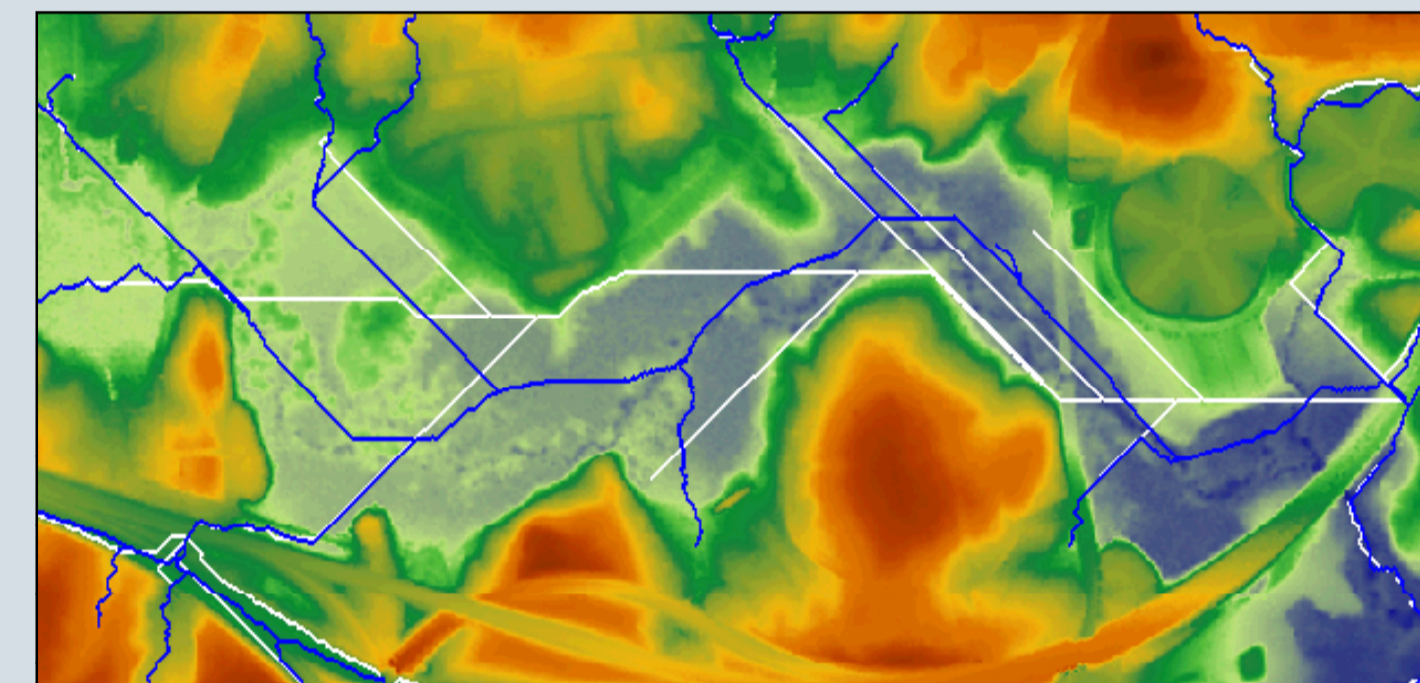
The figure above shows cells with high flow accumulation values in blue, these “rivers” are quite short and uninteresting. Furthermore, this terrain has a large sink defined by the highway bridge crossing the valley.

The topological simplification algorithm in TerraSTREAM allows us to condition the terrain for use in flow modeling.

Routing on Flat Areas

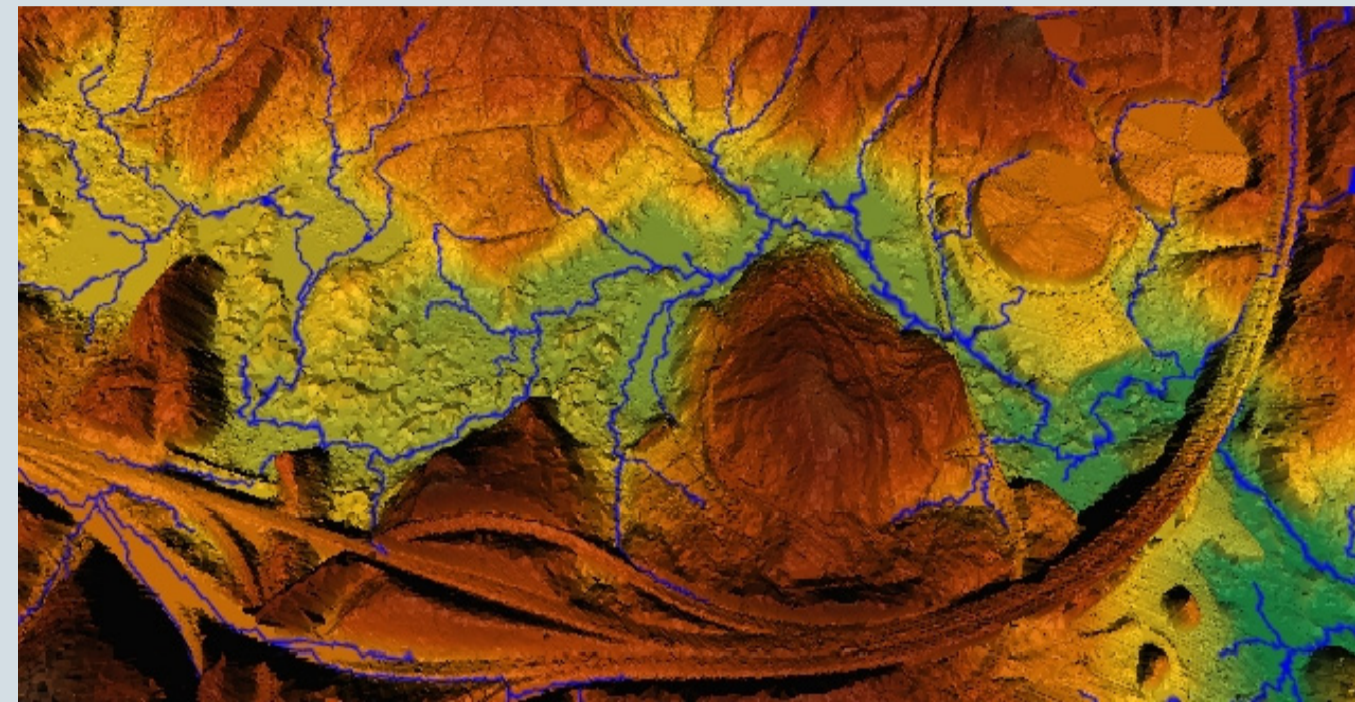
We support flow routing on flat areas using two different models.

- A traditional model that routes the flow at each point in the direction of the closest spill point (shown in white in the figure below).

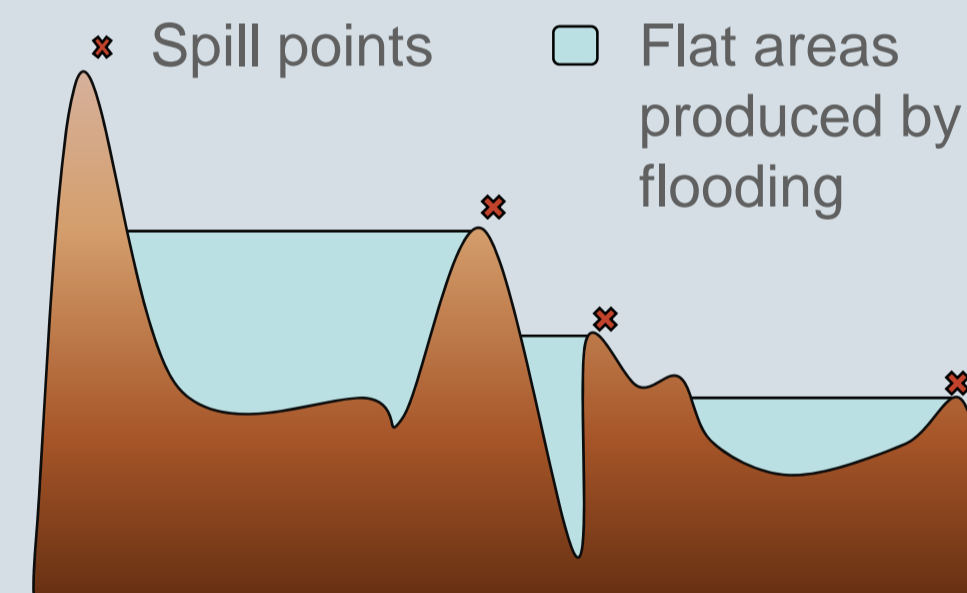


- A more sophisticated model that makes the flow converge more naturally along the middle of the flat area (shown in blue on the figure).

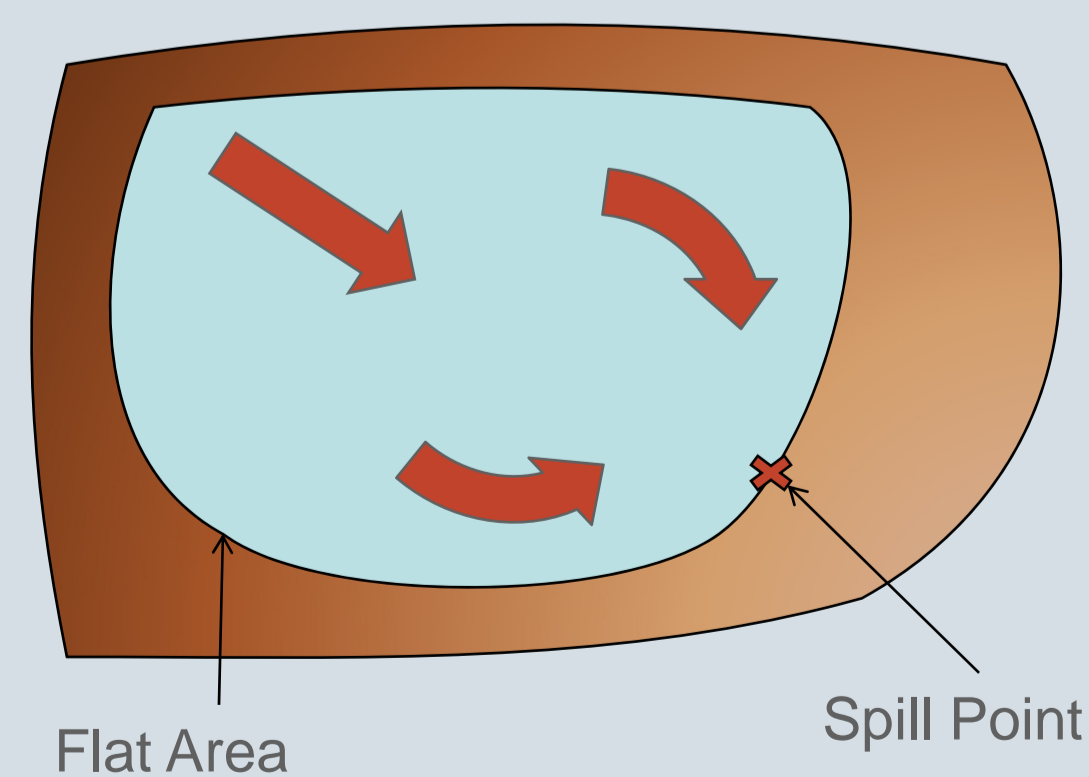
By flooding insignificant sinks using the simplification algorithm we get the following result



However, by flooding sinks we create flat areas and traditional flow routing models breaks down on such areas since they assume that at least one downslope neighbor exists for each terrain point.



Flat area routing is the process of routing flow on a completely flat area, flow is routed from points with adjacent upslope neighbors to *spill points* with adjacent downslope neighbors.



Flow Accumulation on the Neuse River Basin

This figure shows the Neuse river basin in North Carolina. We have performed flow routing on a digital model of the Neuse and colored all cells with a flow accumulation above a certain threshold (~20000) blue.

