

# Restoration Site Analysis

(Before you go in the field)

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20-minute talk...

We going to be drawing lots of owls

How to draw an owl

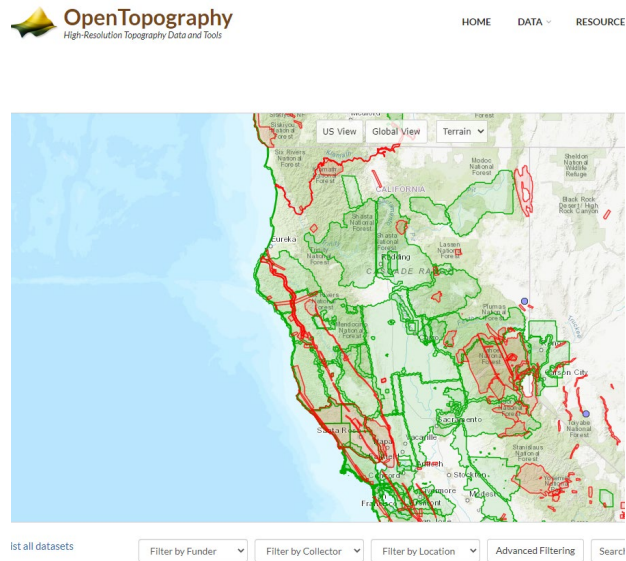


1. Draw some circles



2. Draw the rest of the owl

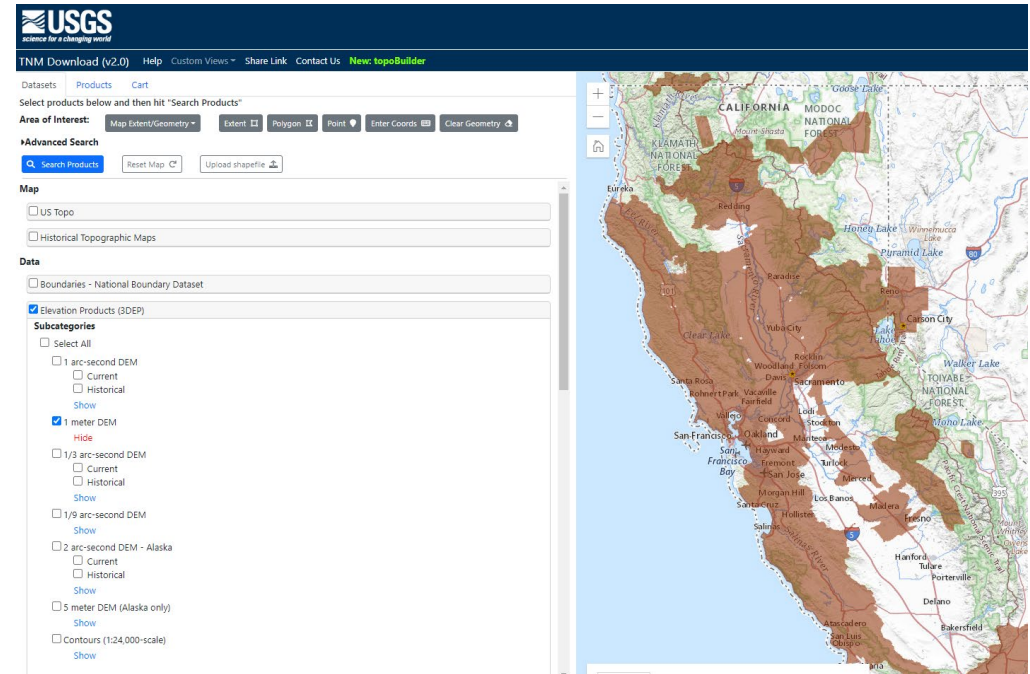
# Step 1: Does the site have LiDAR?



[opentopography.org](https://opentopography.org)



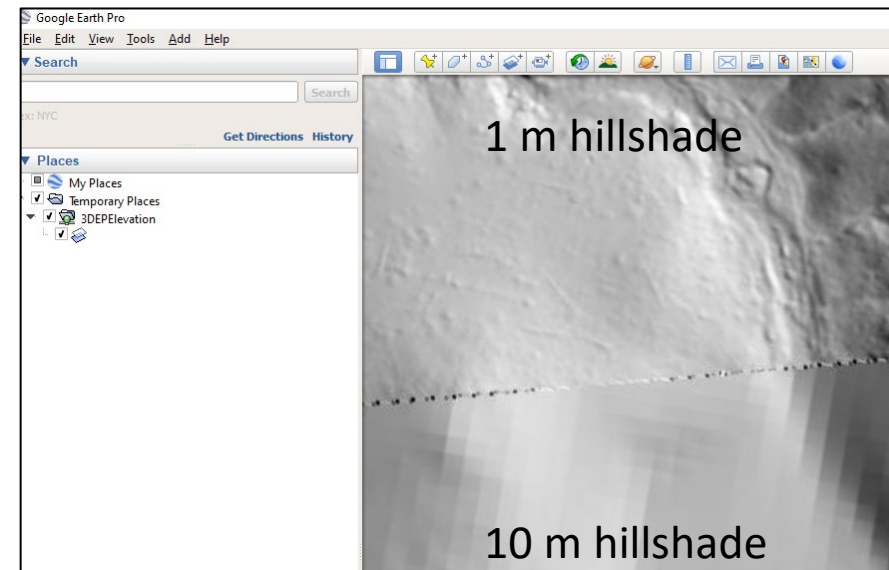
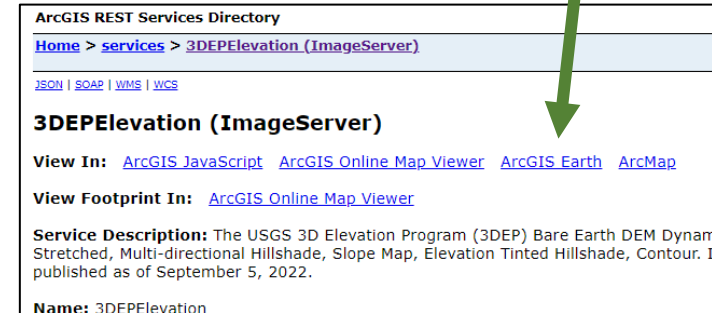
<https://coast.noaa.gov/dataviewer/#/>



<https://apps.nationalmap.gov/downloader/>

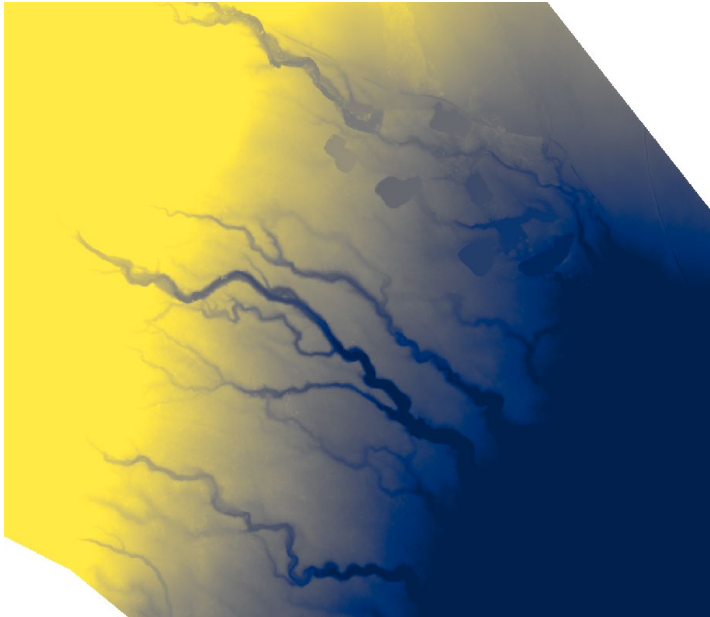
# And one of my favorite LiDAR tools:

- Google “3DEP wms server”
- Click the “3DEP Elevation (ImageServer)”
- Click “ArcGIS Earth” to download a kmz of the 3DEP to view in Google Earth.
- Not all the hillshade is 1m. The KML fills in the best resolution available, some of which is 3m or 10m.

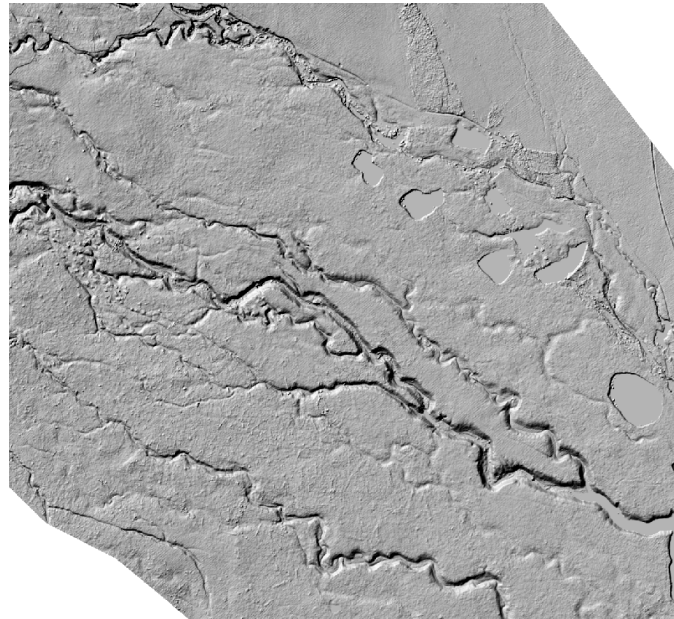


# Ok so you've got LiDAR. Now what?

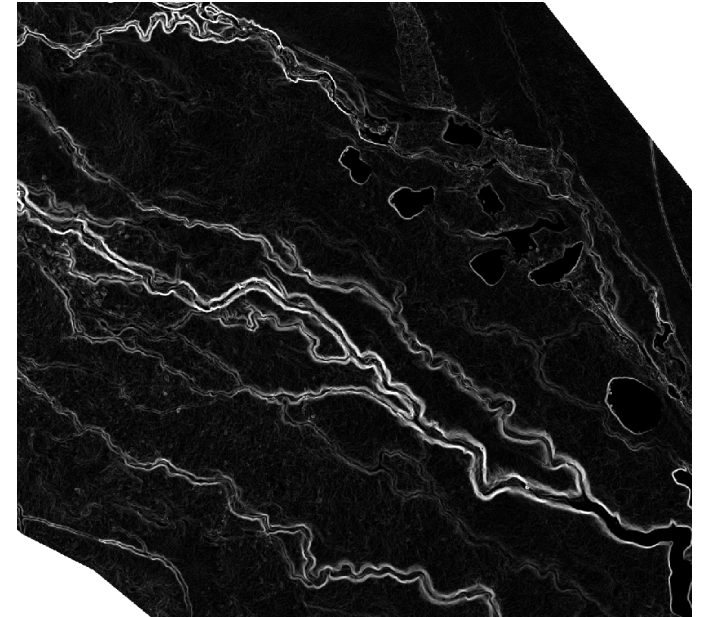
## Very simple steps



Dynamic Range Adjustment



Hillshade with 5x vertical exaggeration

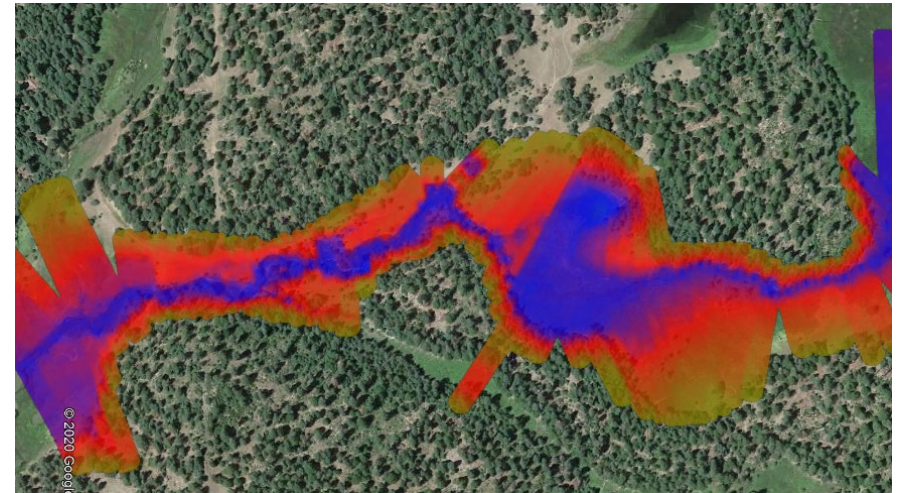
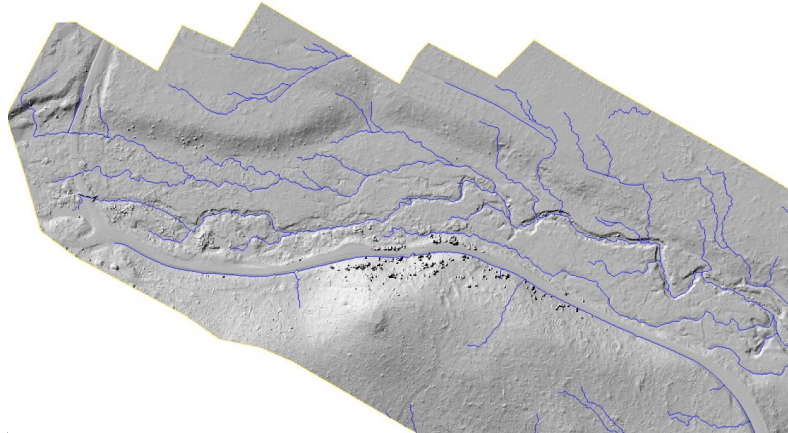


Slope Raster

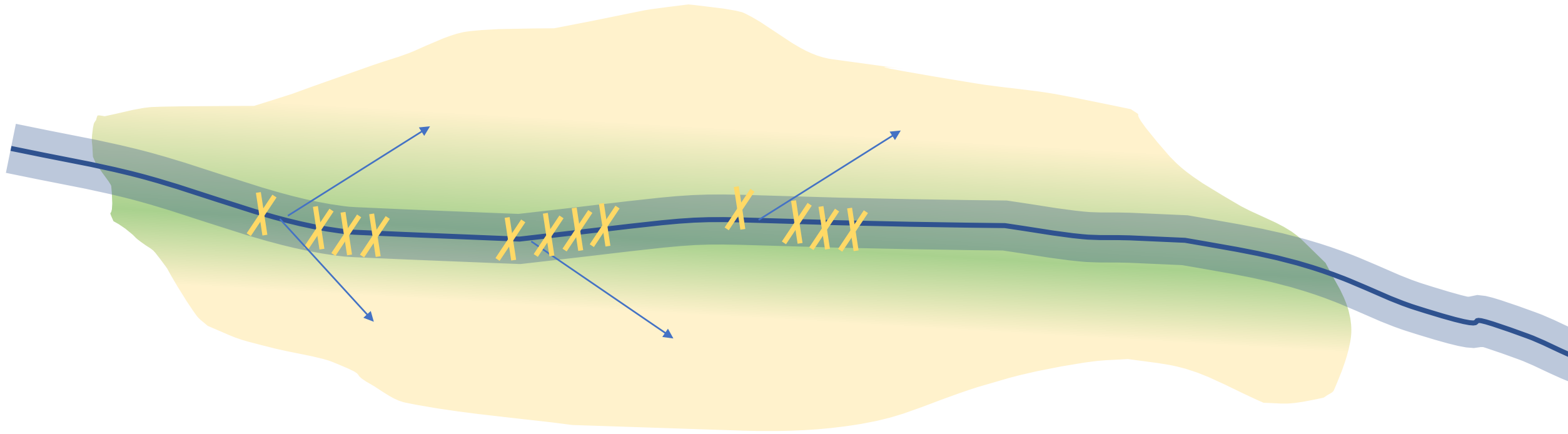
(PnP zone of Yellow Creek  
with color range 1318 – 1322 m)

# Possible next steps

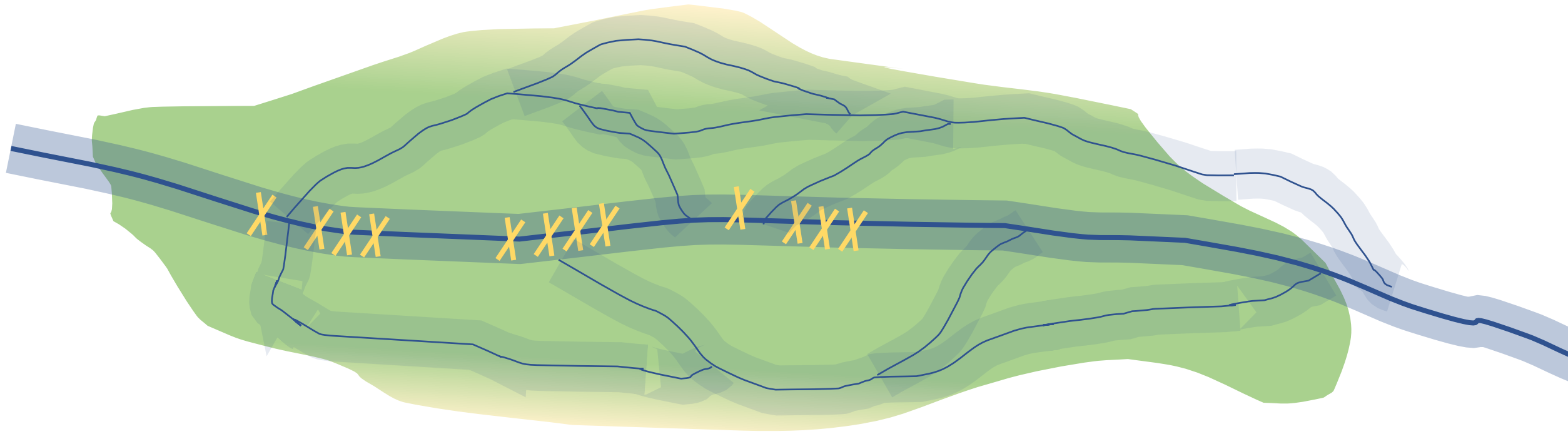
- Generate basic flow routing
  - ArcMap
  - Saga-GIS
  - QGIS
  - TauDEM (My preferred)
  - Etc.
- Generate detrended elevation models and stream cross sections
  - Saga-GIS
  - {ProcessSpace} R package
  - Etc.
- Get to know your system!
  - Potential Constraints
  - **And opportunities!**



# Lateral Connectivity: Switches Get Stitches

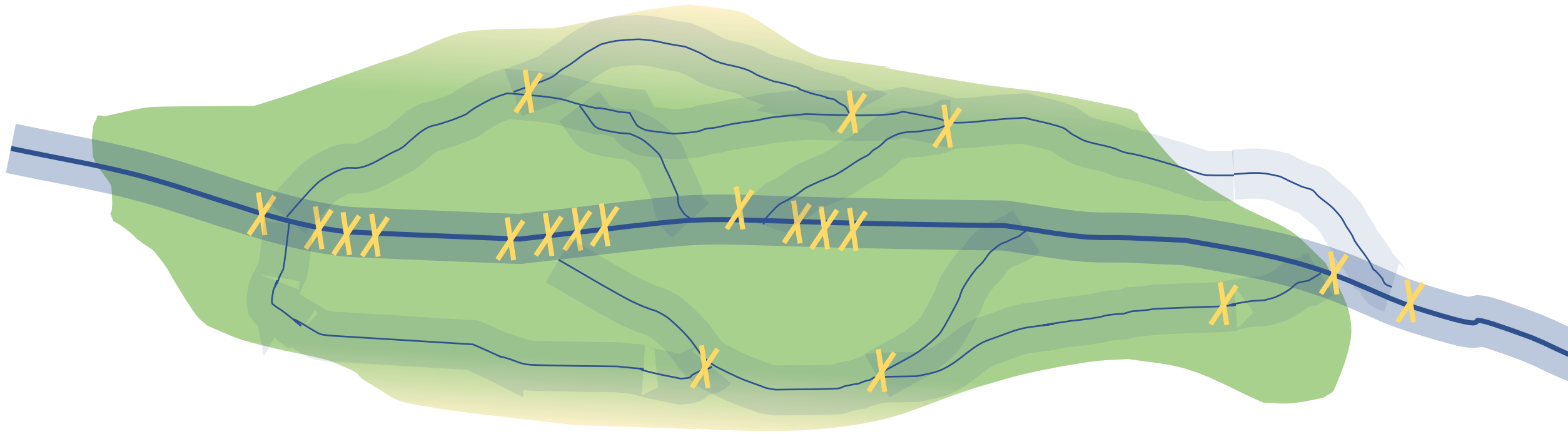


# Lateral Connectivity: Switches Get Stitches

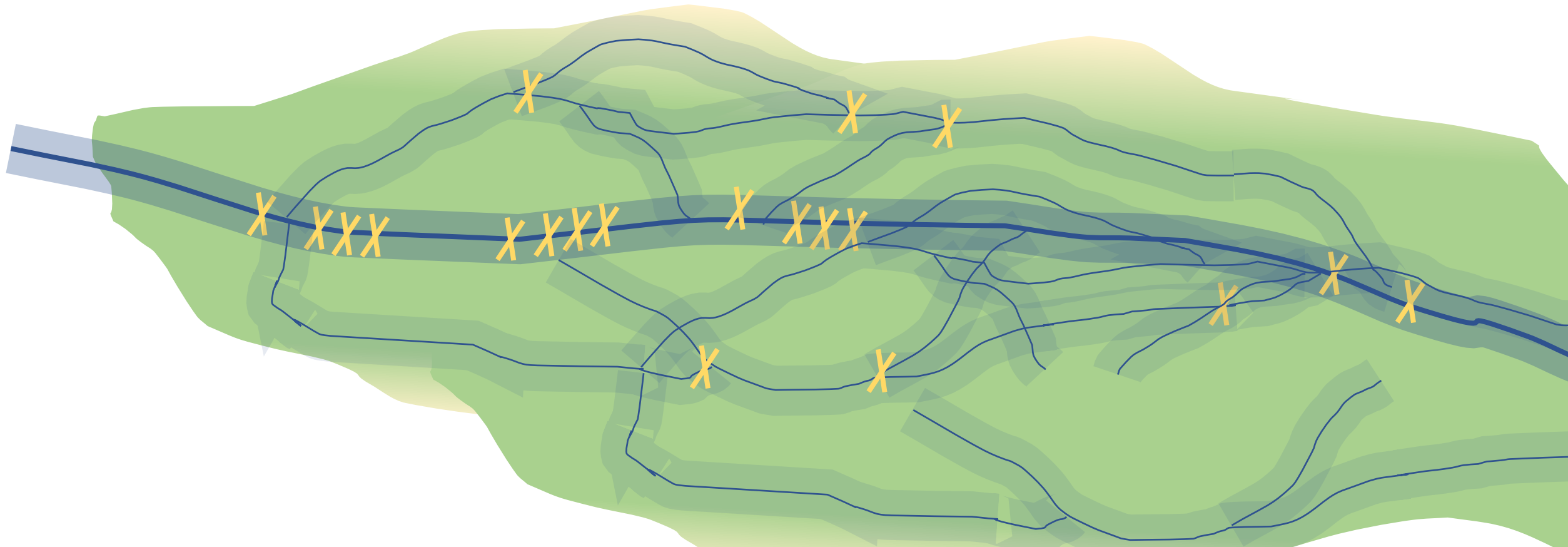




# Lateral Connectivity: Switches Get Stitches

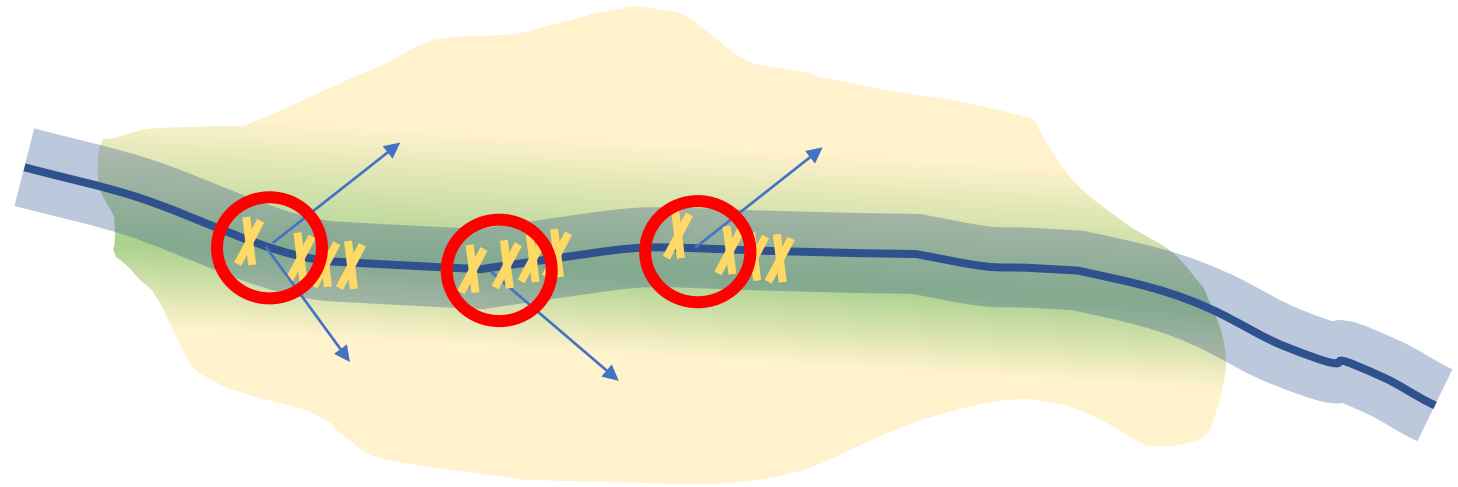


# Lateral Connectivity: Switches Get Stitches

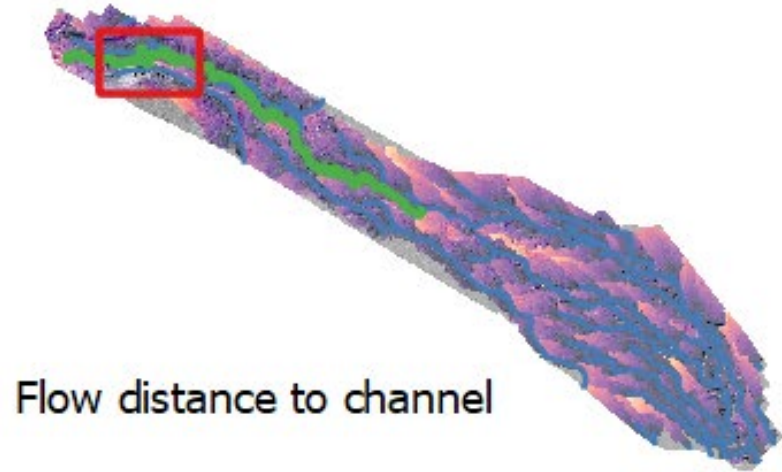


# How to find the switches?

1. Define your Process Space (i.e. the area that you expect to be able to promote process).
2. Identify locations where your Process Space overlaps with areas of high potential to spread/escape existing confinements.



# TauDEM + {ProcessSpace} + QGIS

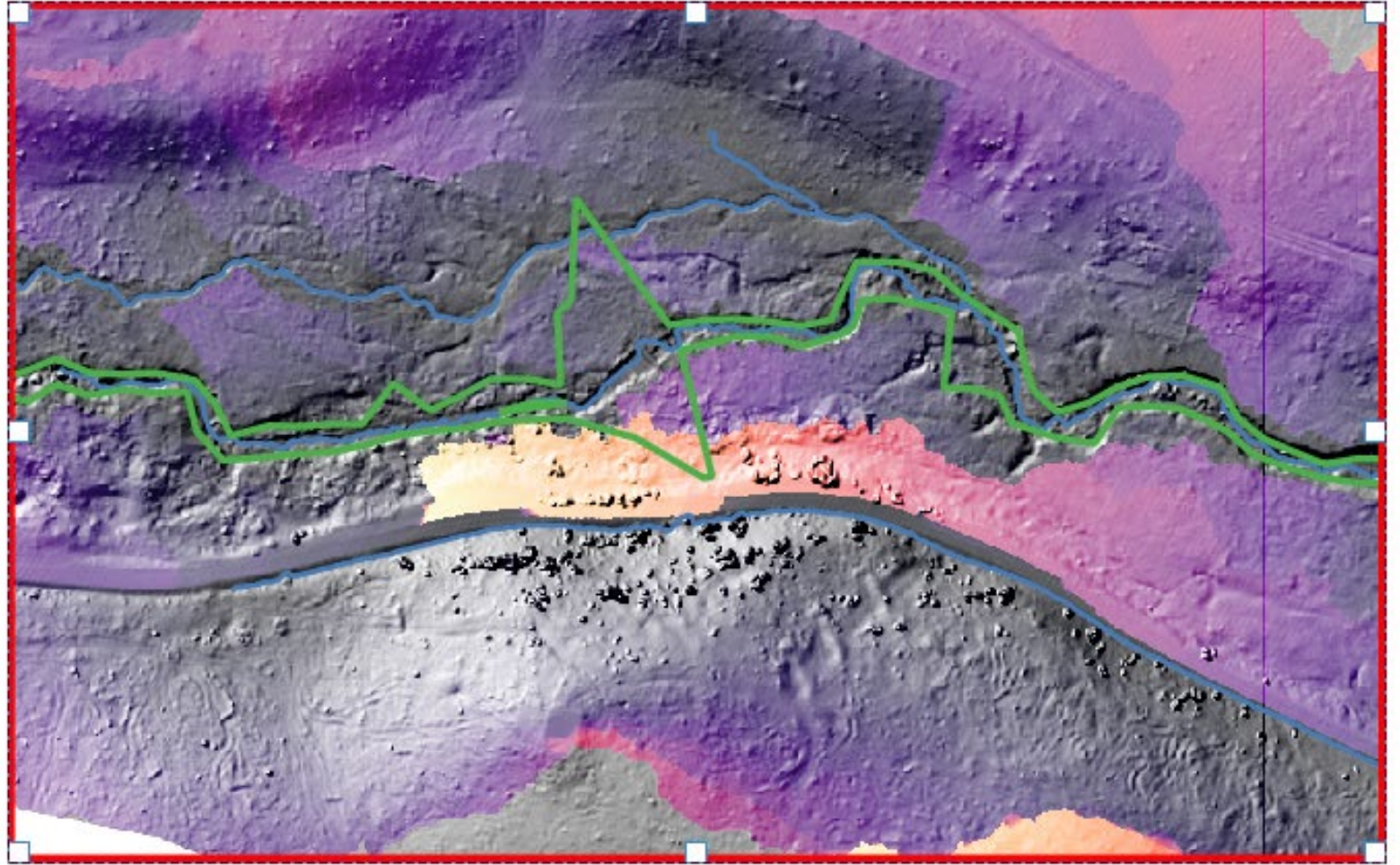


Flow distance to channel

450 (m)

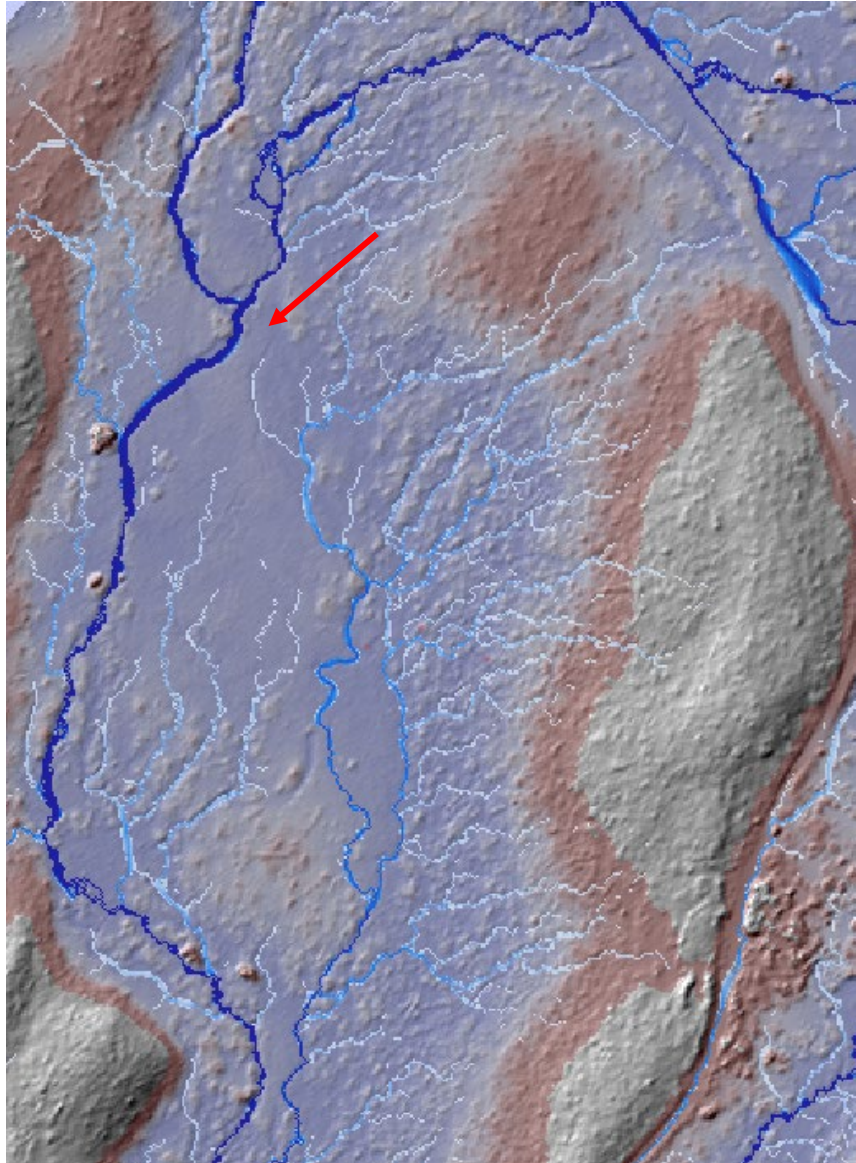
0 (m)

2 Foot Process Space



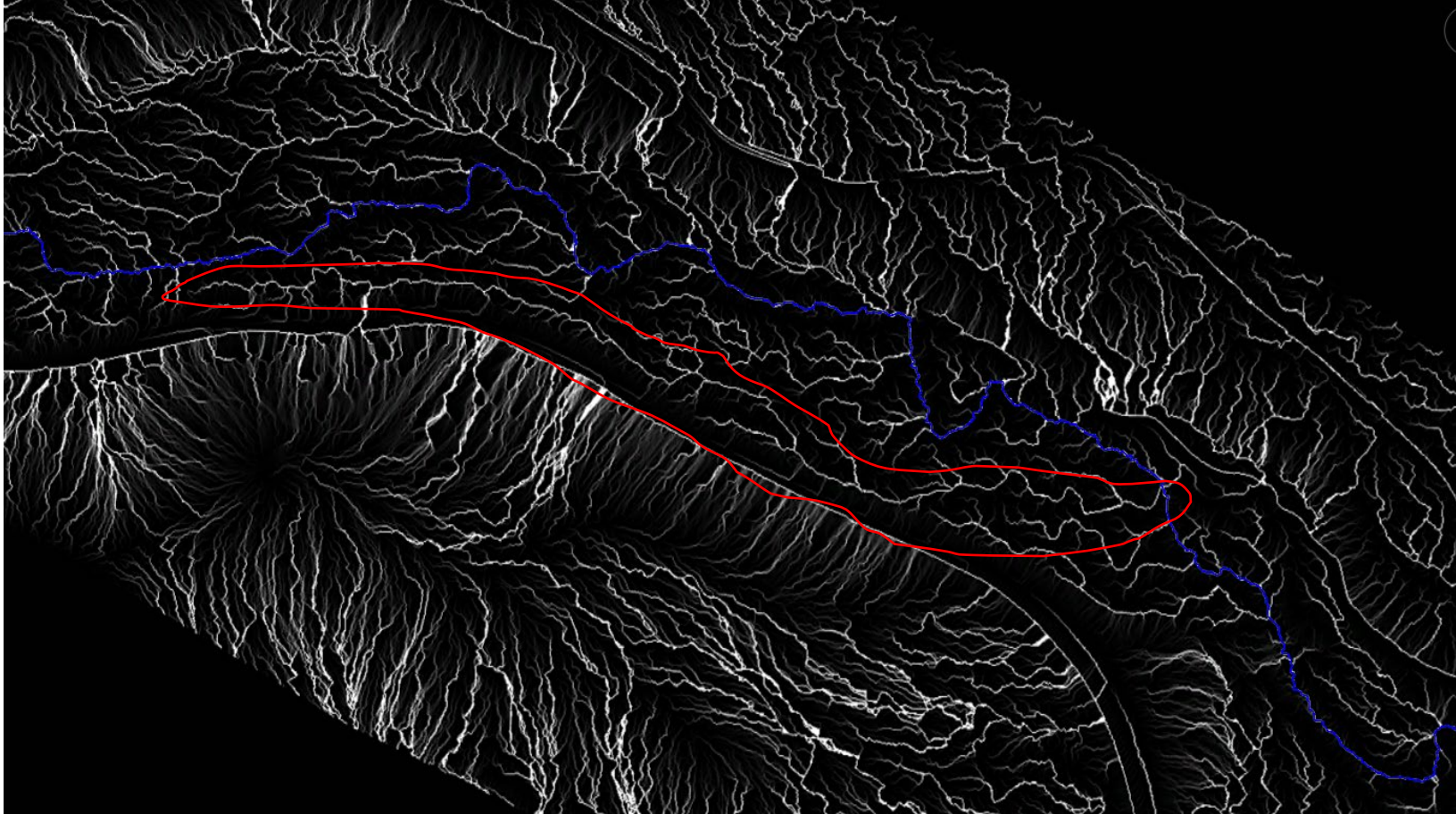
Activating this switch can turn on >400 m of currently dry channel

# Low-Threshold Flow Accumulation



- Flow accumulations can show potential reconnection or switch points
- To make a LTFA:
  - Use your favorite software to make a flow accumulation raster.
  - Then set the symbology to mask values below a low threshold (50? 150? 10000?)

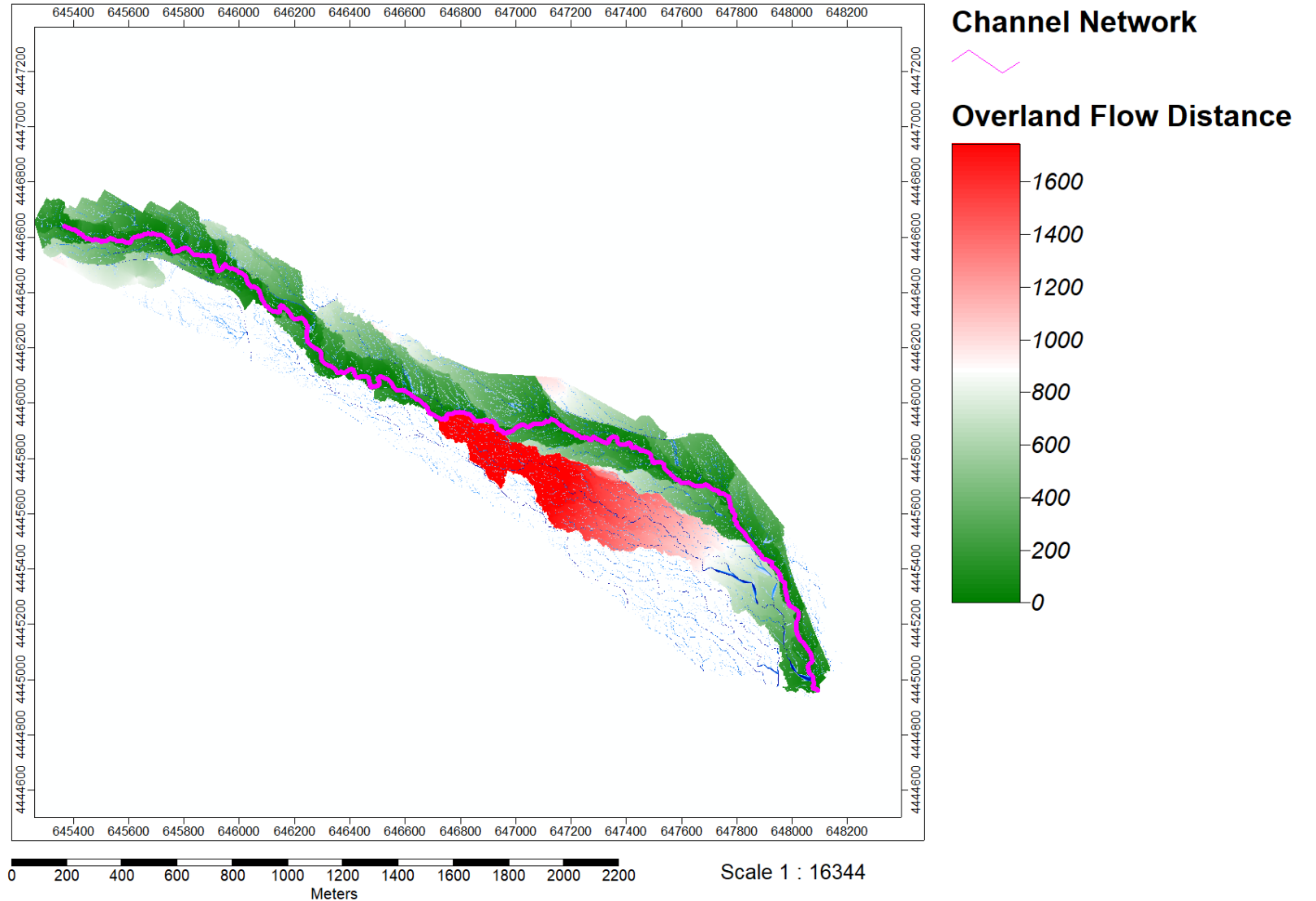
# Flow Accumulation + Google Earth



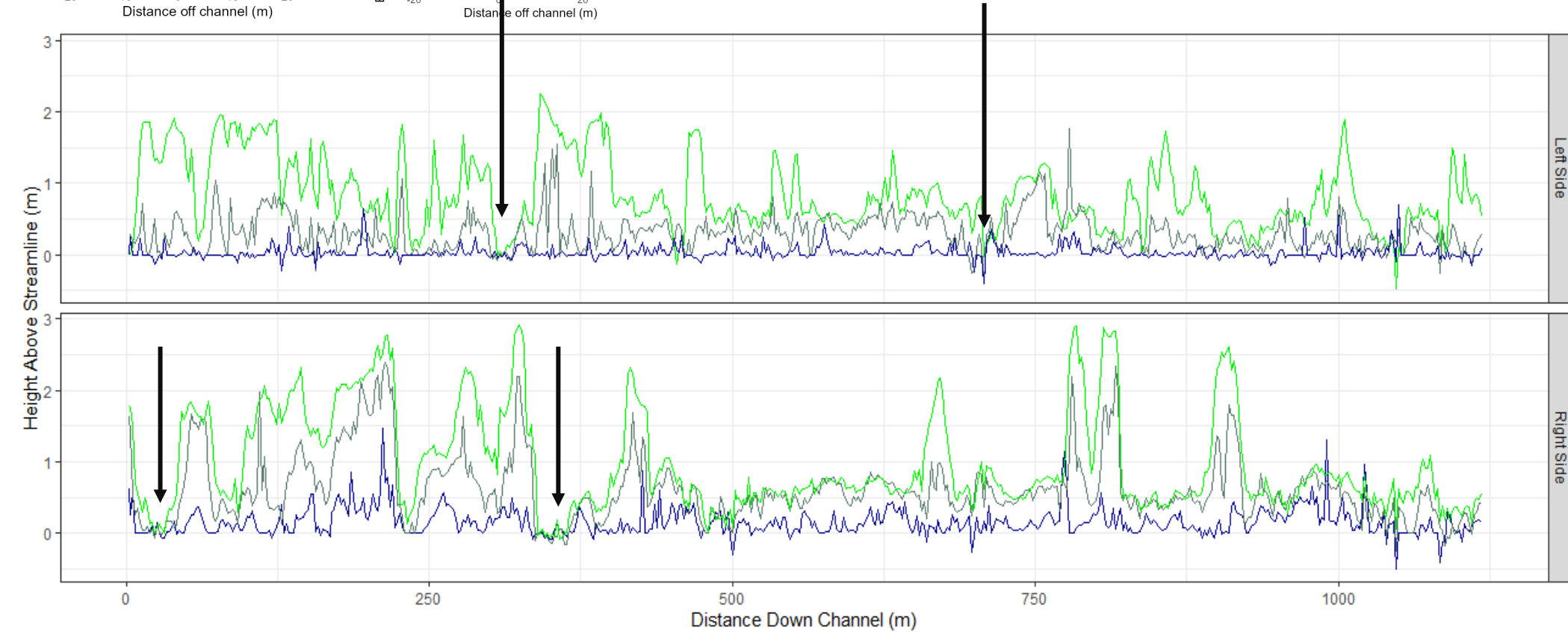
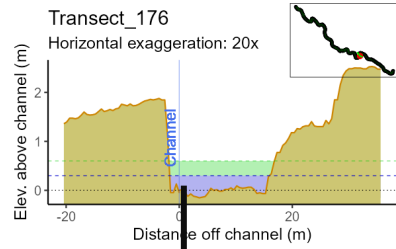
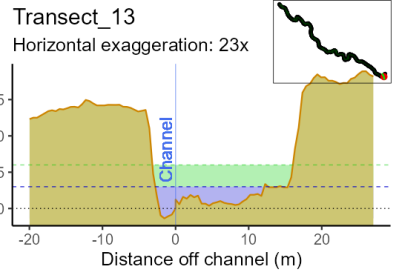
No control over visualization but very straight-forward way to visualize how water might be moving on the landscape.

# The SAGA-GIS version:

SAGA-GIS is another free software that can calculate the necessary rasters



# Longitudinal profiles to explore



5 m from thalweg  
3 m from thalweg  
1 m from thalweg

5 m from thalweg  
3 m from thalweg  
1 m from thalweg

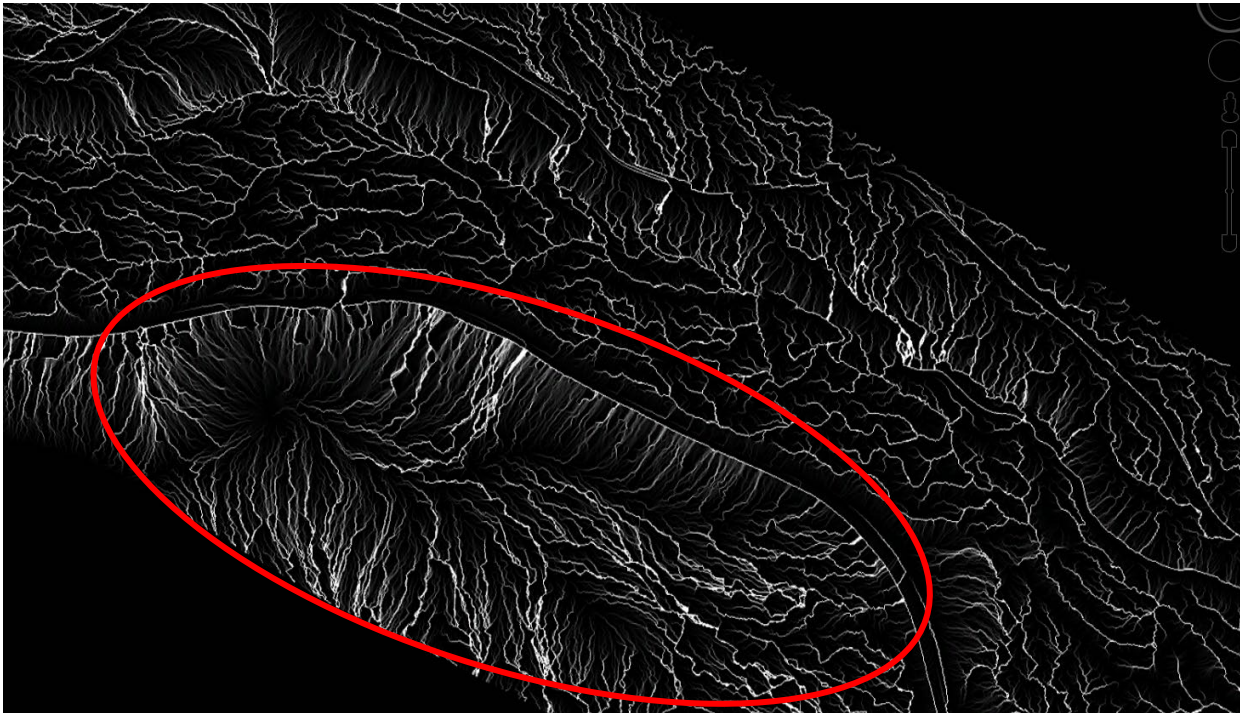




# Longitudinal Connectivity

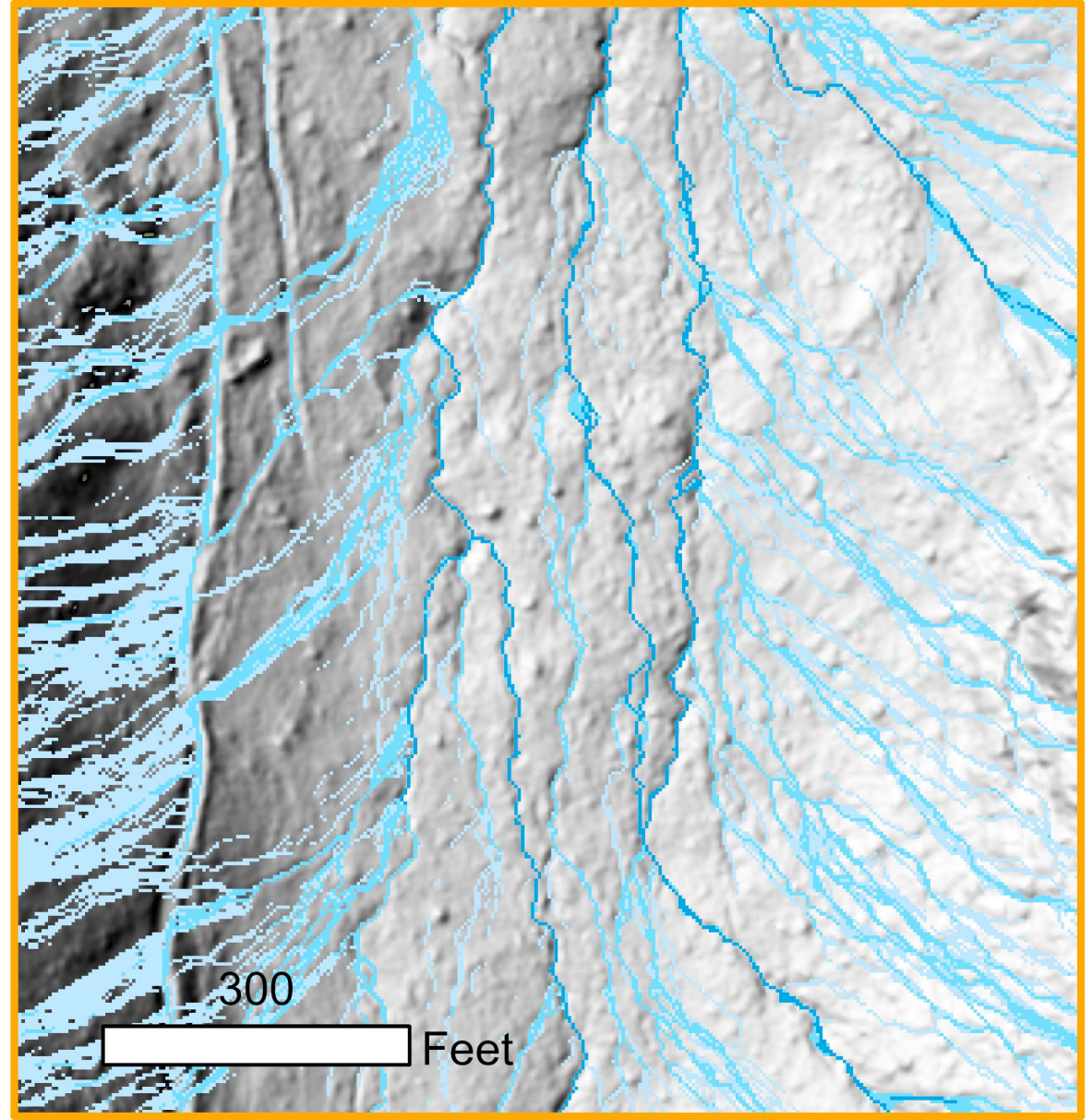
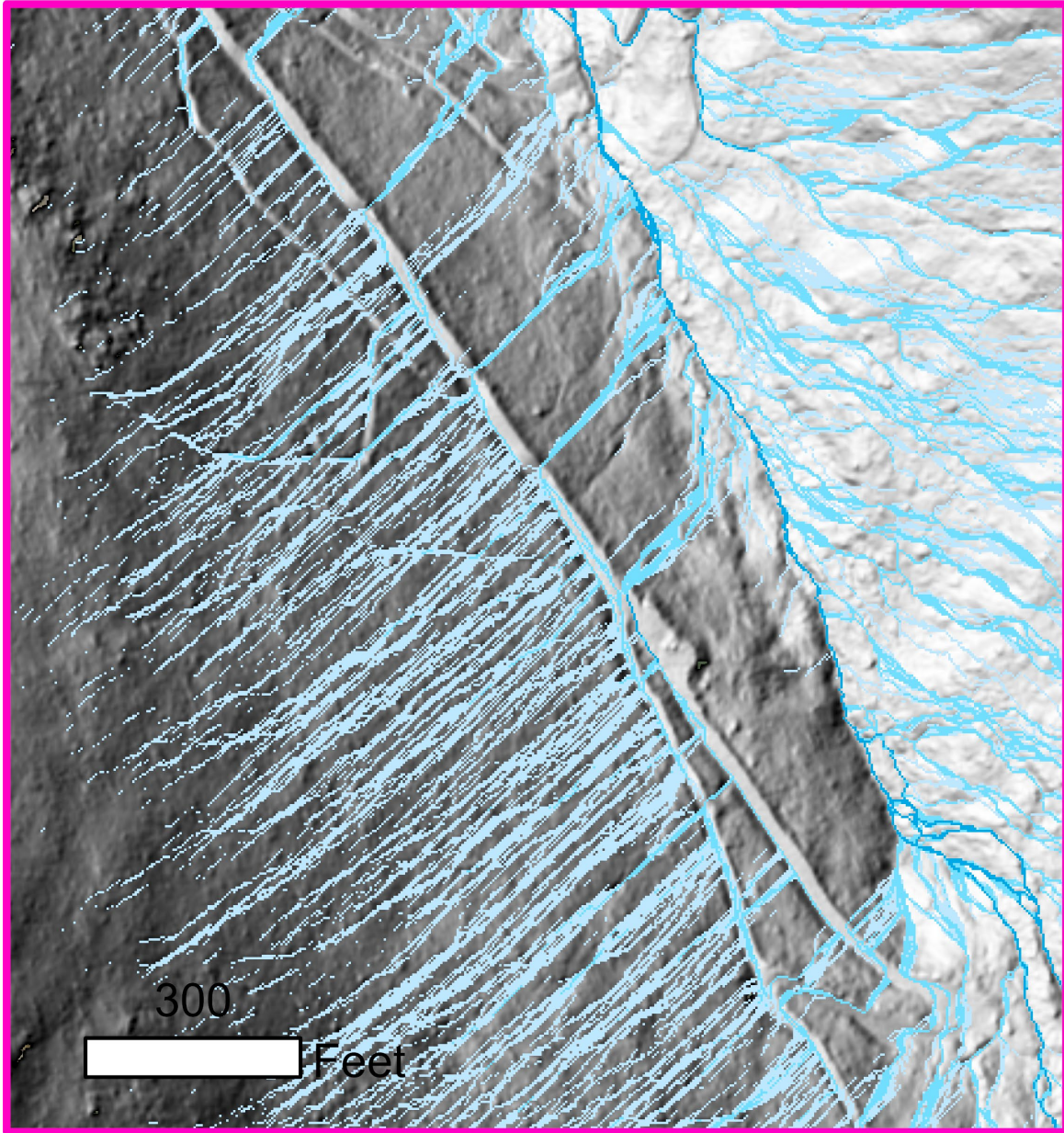
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# Roads!



This road above Yellow Creek appears to:

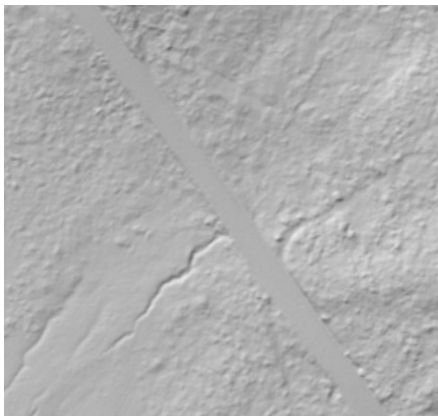
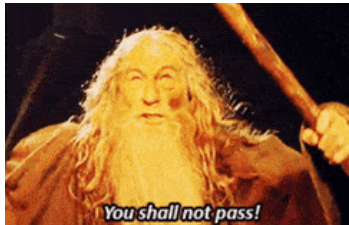
1. Concentrate flows into the project area
2. Potentially disrupt ground water flows
3. Disrupt hillslope sediment pulses
4. Be an untouchable infrastructure constraint.



# And where roads finally allow water to pass....



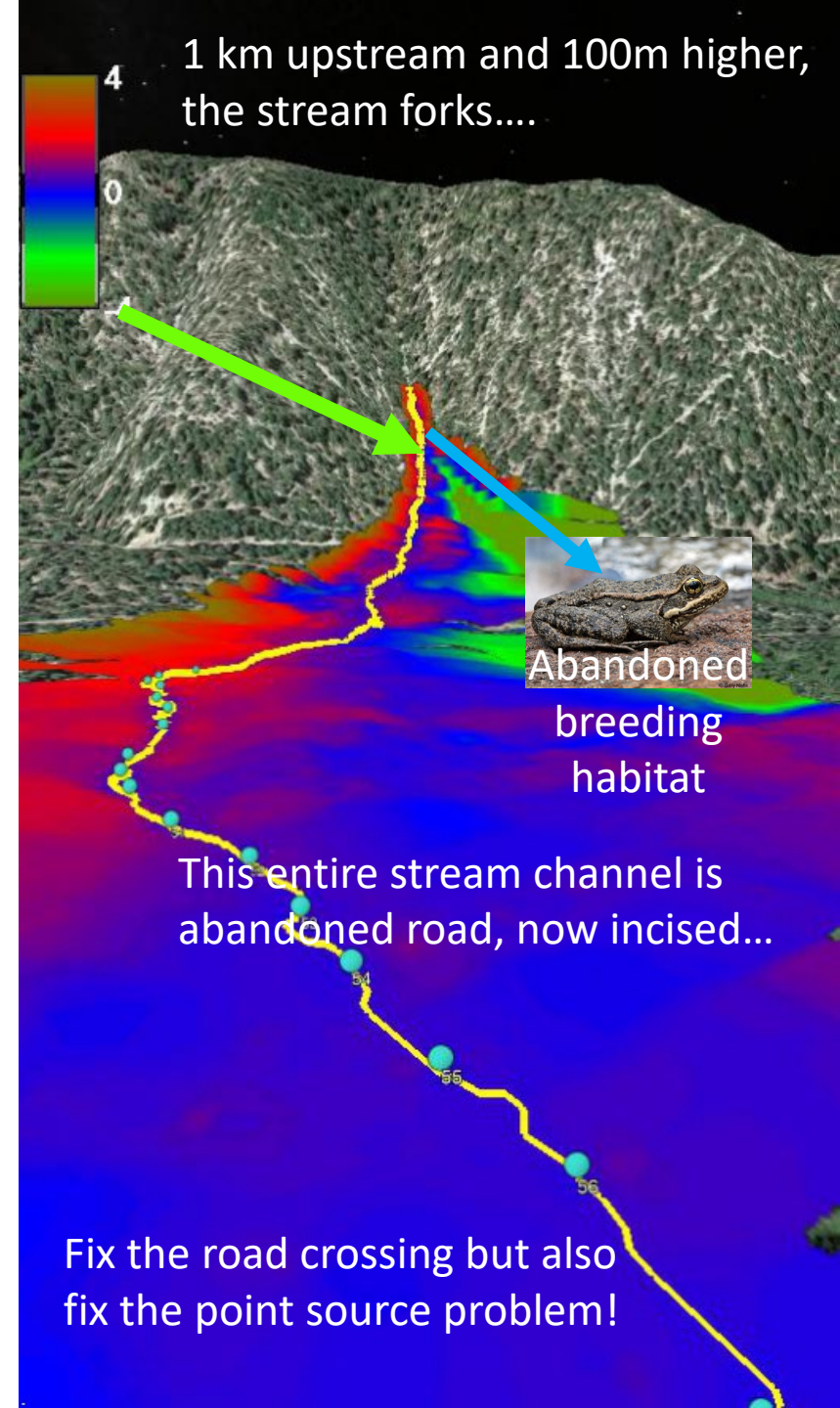
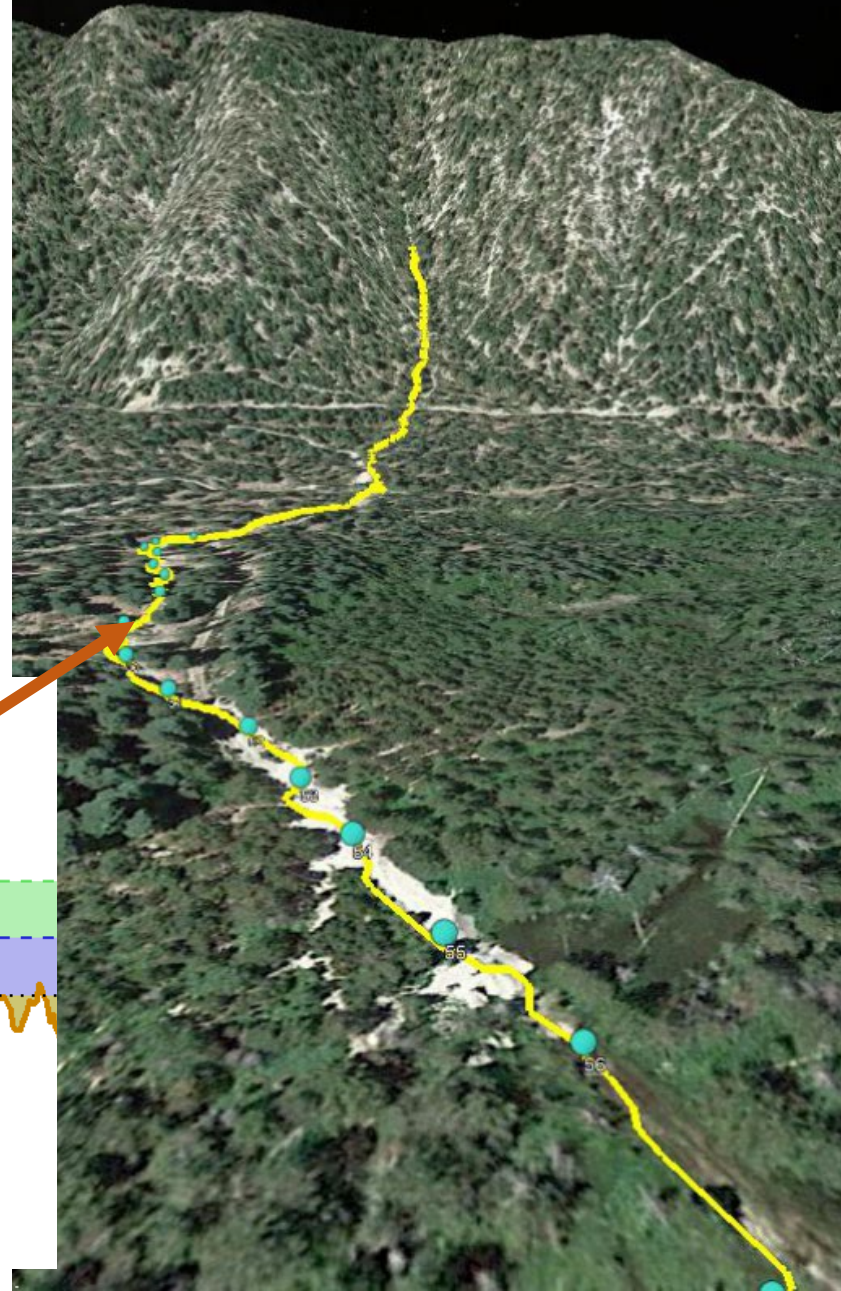
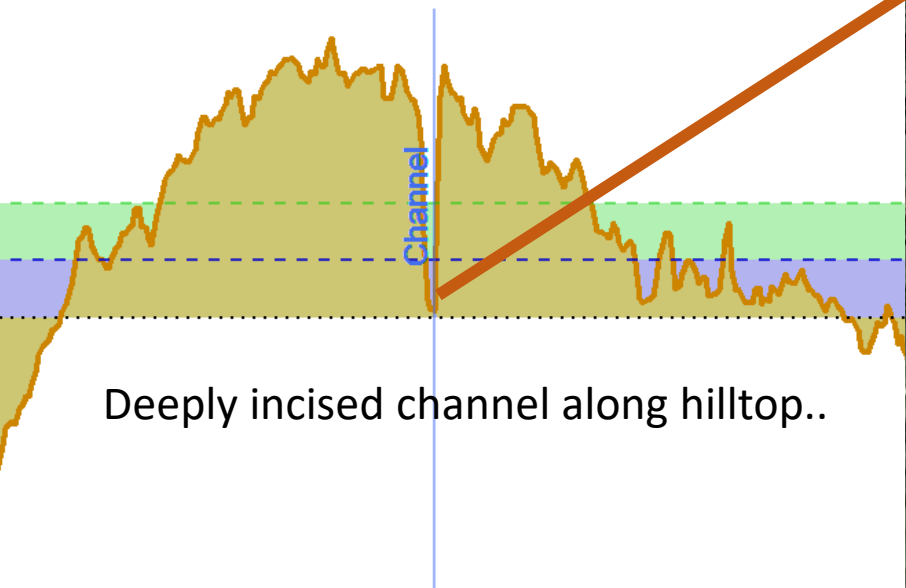
- **Upstream:** A wet spongy groundwater fen system.
- **Downstream:** A single threaded incised channel.
- **Cause:** The road:
  - Daylights all the groundwater
  - Triples the watershed area (due to road capture)
  - Concentrates flows into a single flowpath

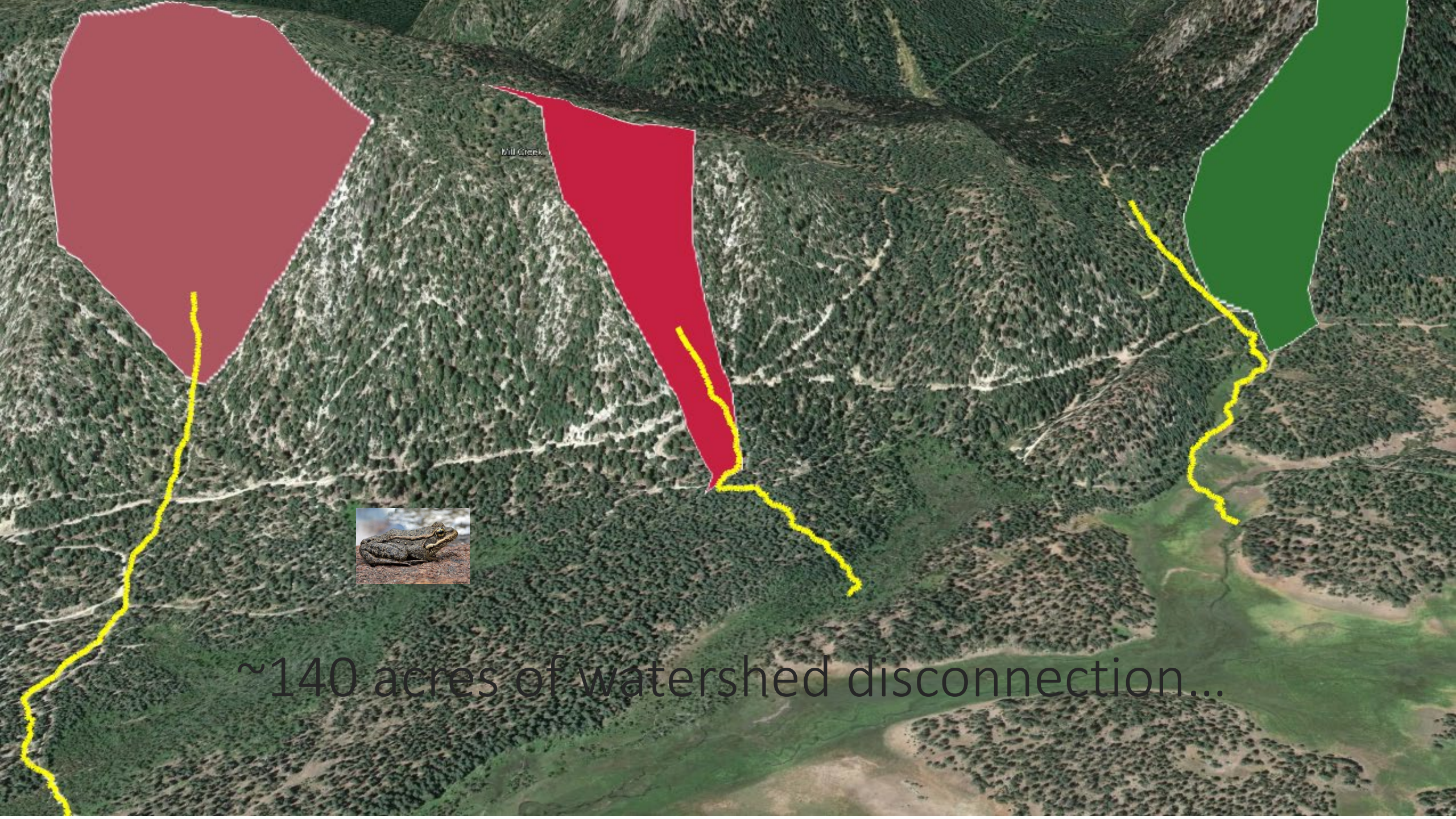


# Not just hillslope discharge disruption

- Road crosses meadow surface:
  - pooling
  - flow concentration
  - channelization downstream
- Remove road from meadow.
  - Done?

# All roads lead to incision...





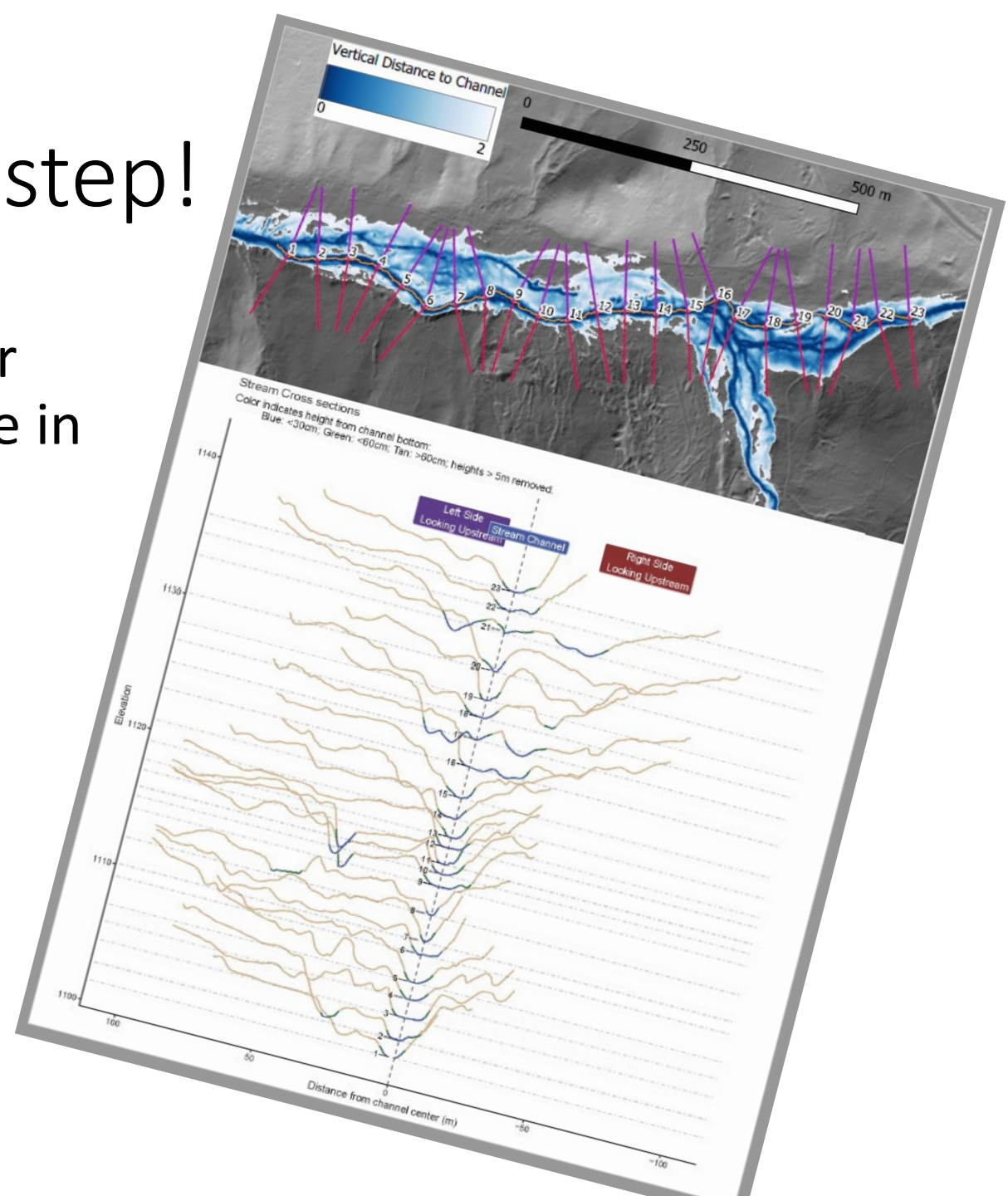
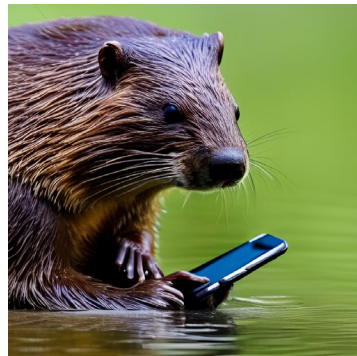
Mill Creek



~140 acres of watershed disconnection...

# The final, most important step!

- Save what you found to GeoPDFs or some other format that you can use in the field.
- And get in the field!





# Questions?

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Google