

# GIS in Archaeology

## 08 - Making nicer Maps

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# Choosing a Base Map

- Think about what someone reading your map needs to see for context
- Think about how the base map interacts with the data on your map

# Base Maps - Hierarchy

- If your data is the most important part of the map, make sure it looks more important than the base map
- Avoid base maps that strongly emphasize features that aren't relevant on your map

# Base Maps - Colors

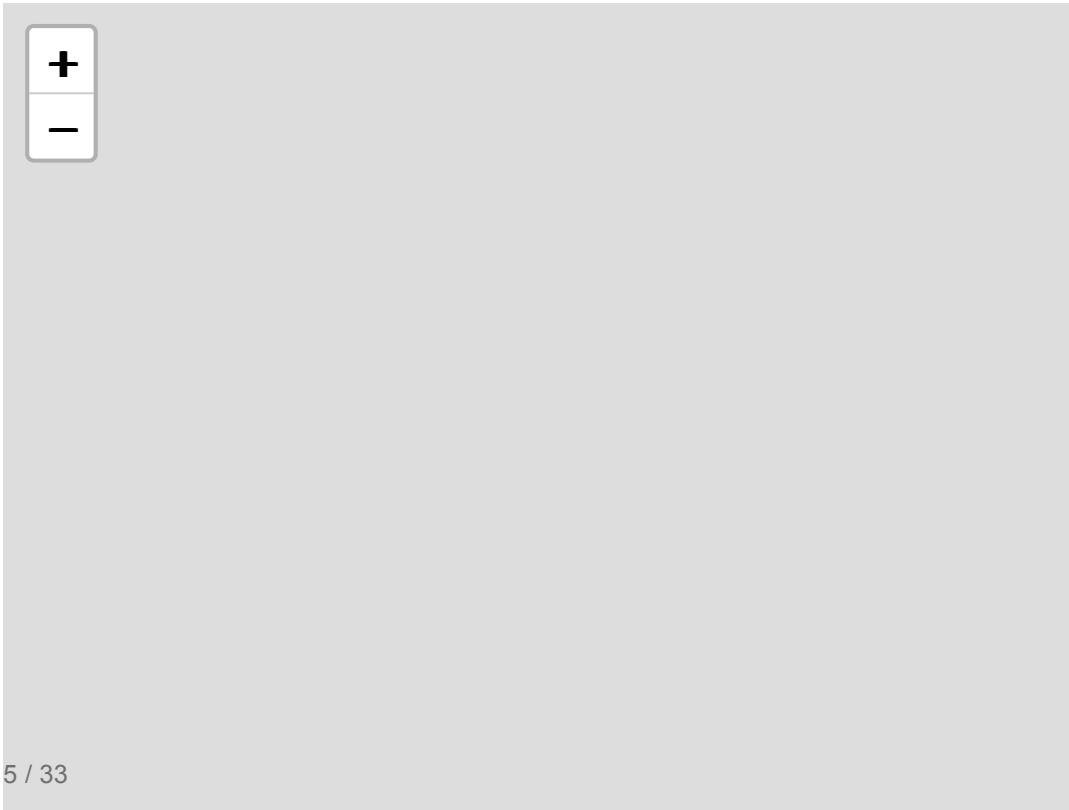
- Choose base maps with colors that complement the colors on your map
- The contrast between the color on your map and the color on the base map should be enough to make your layers clearly visible

# Options for Background Maps

Stamen

Work also for small scale

TonerBackground



TerrainBackground

# Options for Background Maps

Esri

More natural Variants, large scale

WorldTerrain

WorldPhysical

# Options for Background Maps

Esri

More neutral Variants, large scale

WorldShadedRelief

WorldGrayCanvas

# Options for Background Maps

CartoDB

Good for man made features

Positron

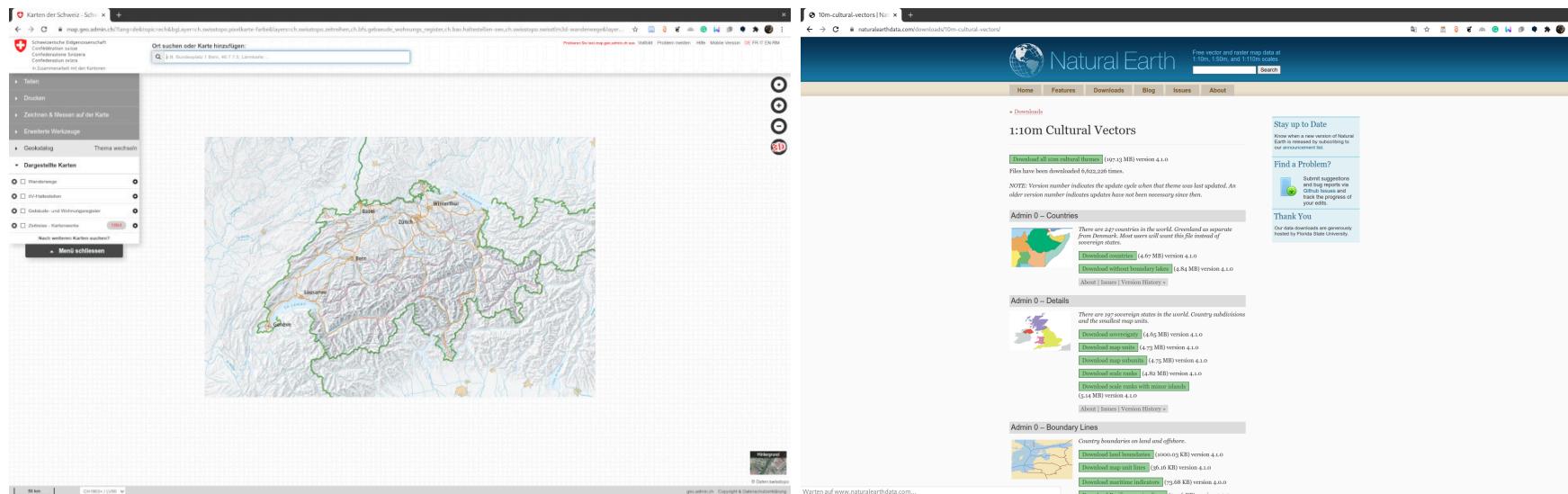
# Building a background map from scratch

If there is no Basemap according to our needs, we have to build on our own...

- Political borders (if necessary)
- Waterbodies
- Mountains

# Political borders (if necessary)

- depends on the area and scale you are working with
- good source for Switzerland: <https://map.geo.admin.ch>
- in general: <https://www.naturalearthdata.com>

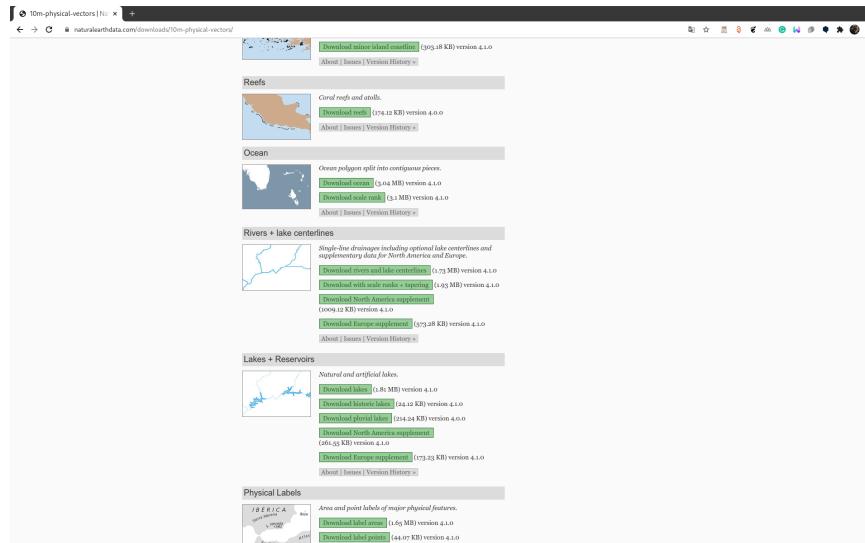


Source: <https://map.geo.admin.ch>; <https://www.naturalearthdata.com>

# Waterbodies

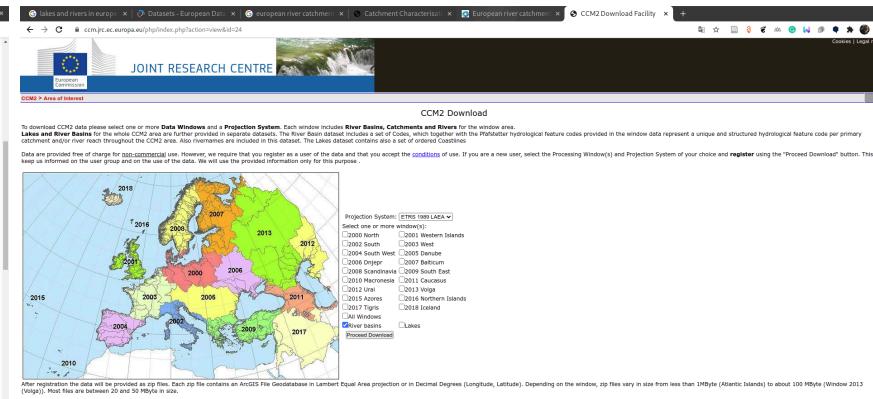
large scale:

- Natural Earth Data > Physical
  - Ocean
  - Rivers + lake centerlines
  - Lakes + Reservoirs
- World wide + Europe supplement



small scale:

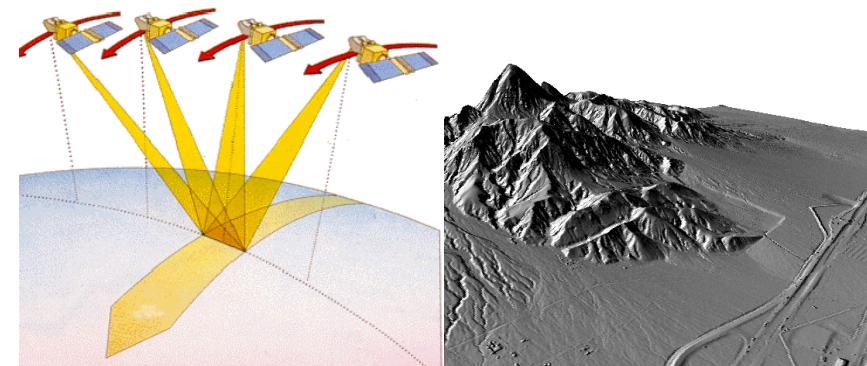
- depends on your region and scale
- **CCM River and Catchment Database, version 2.1 (CCM2) for Europe**



Source: <https://www.naturalearthdata.com>; <https://ccm.jrc.ec.europa.eu>

# Mountains -> DEM (Digital Elevation Model)

- DEM: a computer based representation of elevation data
- Mostly available as raster data, sometimes as TIN
- large scale: Mostly from remote (satellite) data
- small scale: areal photography or measurements, or even ground based surveys
- methods
  - Radar
  - LiDAR
  - Structure from motion
  - ...



Sources: <https://crisp.nus.edu.sg>; <https://desktop.arcgis.com>

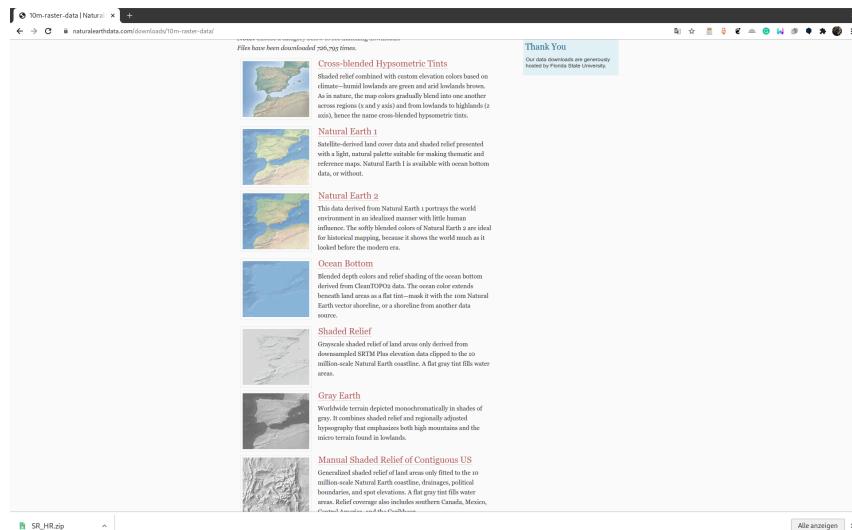
DEM can come in EPSG 4326 (WGS 84 lat/lng).

Then might be necessary to reproject the DEM to a projected (meter based) CRS. We cover this in the next session...

# Mountains

rendered:

- Natural Earth Data > Raster
  - Gray Earth
  - Shaded Relief



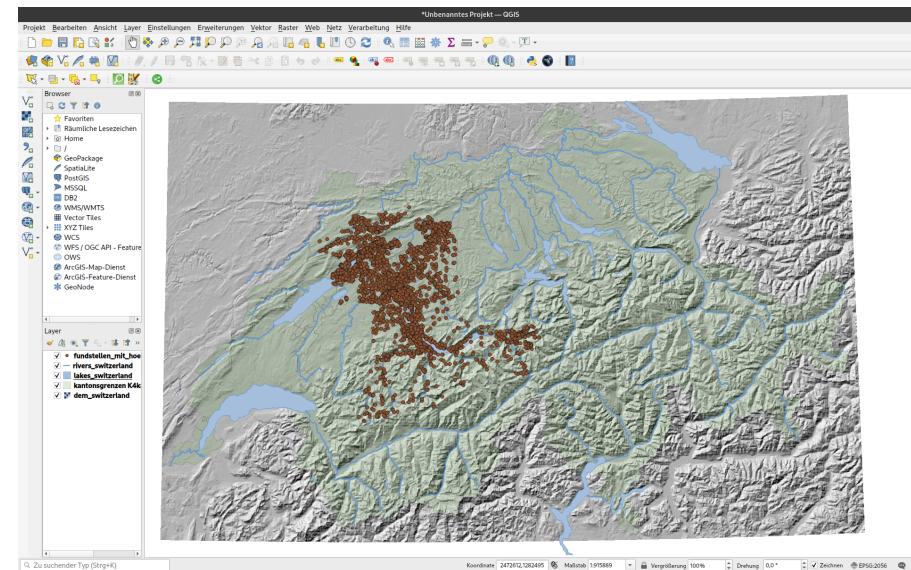
DEM:

- depends on your region and scale
- GMTED2010  
([https://topotools.cr.usgs.gov/gmted\\_viewer/viewer.html](https://topotools.cr.usgs.gov/gmted_viewer/viewer.html))  
7.5 arc second resolution (~ 225 m along the equator)
- SRTM (e.g.  
<https://dwtkns.com/srtm30m>) 3 arc second resolution (~ 90 meters along the equator)
- ASTER (e.g.  
<https://search.earthdata.nasa.gov/>) 3 arc second resolution (~ 30 meters along the equator)
- TanDEM-X (90 m after registration, 12 m only with project submission)
- LiDAR

# Lets put it together

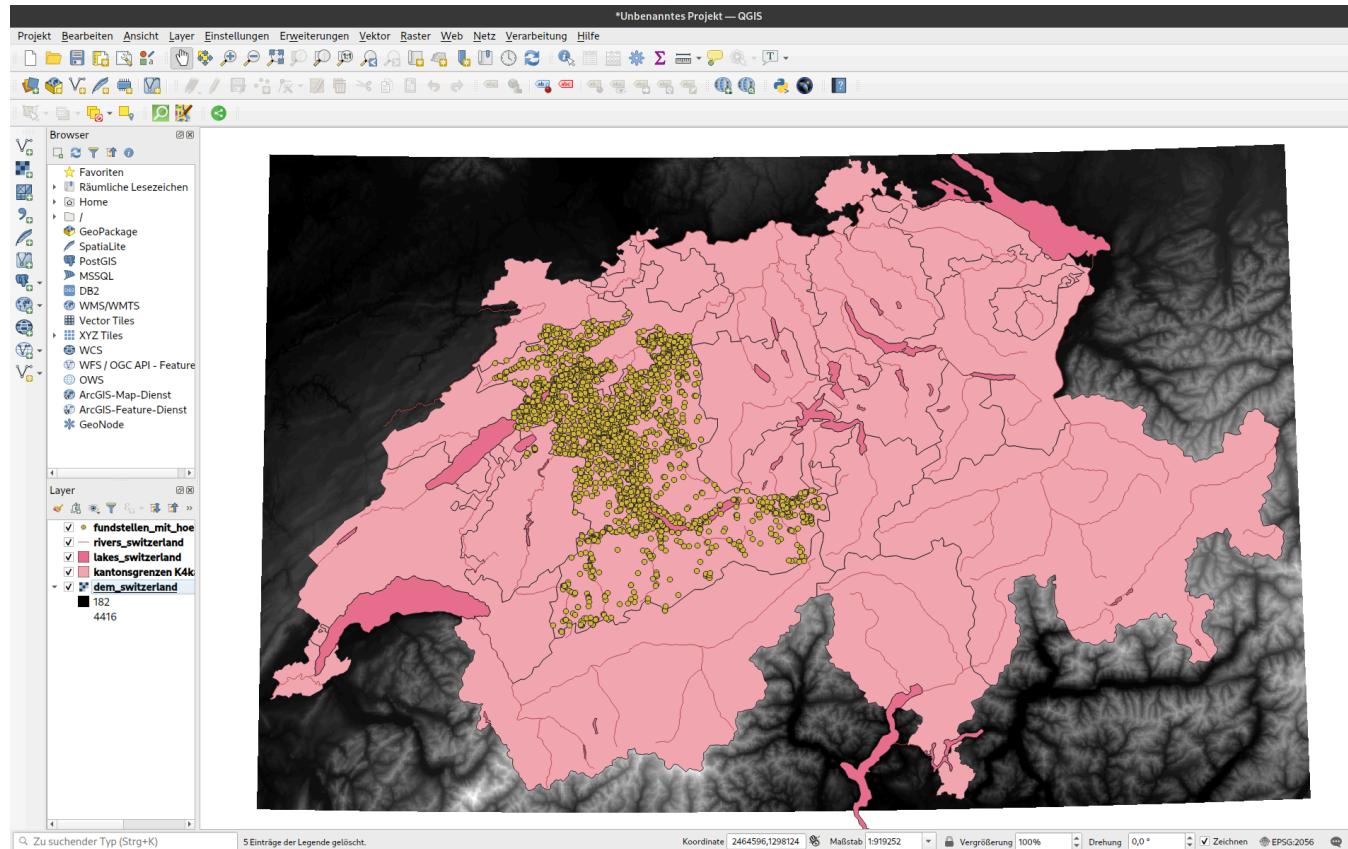
- Download the Bernese Archaeological sites
- Download the Kantonal Borders of Switzerland
- Download the Waterbodies
  - Rivers
  - Lakes
- Download the DEM for the Kanton of Bern (GMTED2010, 7.5 arc seconds)
- Start QGIS and add all layers

All not best possible resolution, but they will serve their purpose



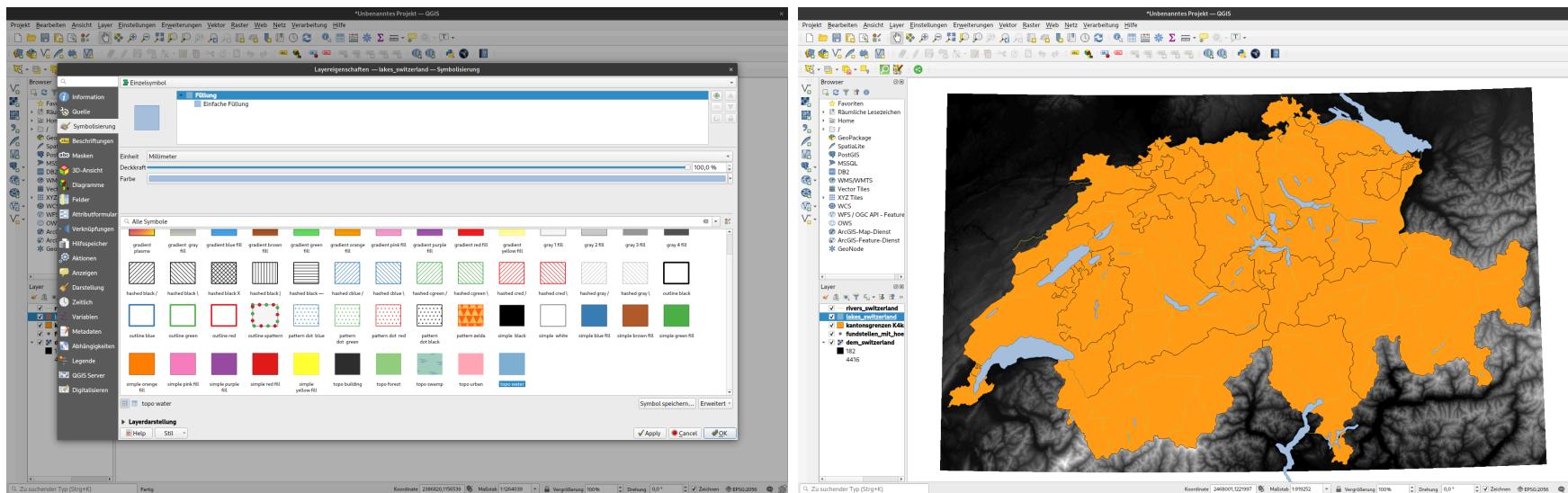
# Your Map will probably look like this -

after you arranged the layers in a meaningful order...



# Styling Lakes topo water

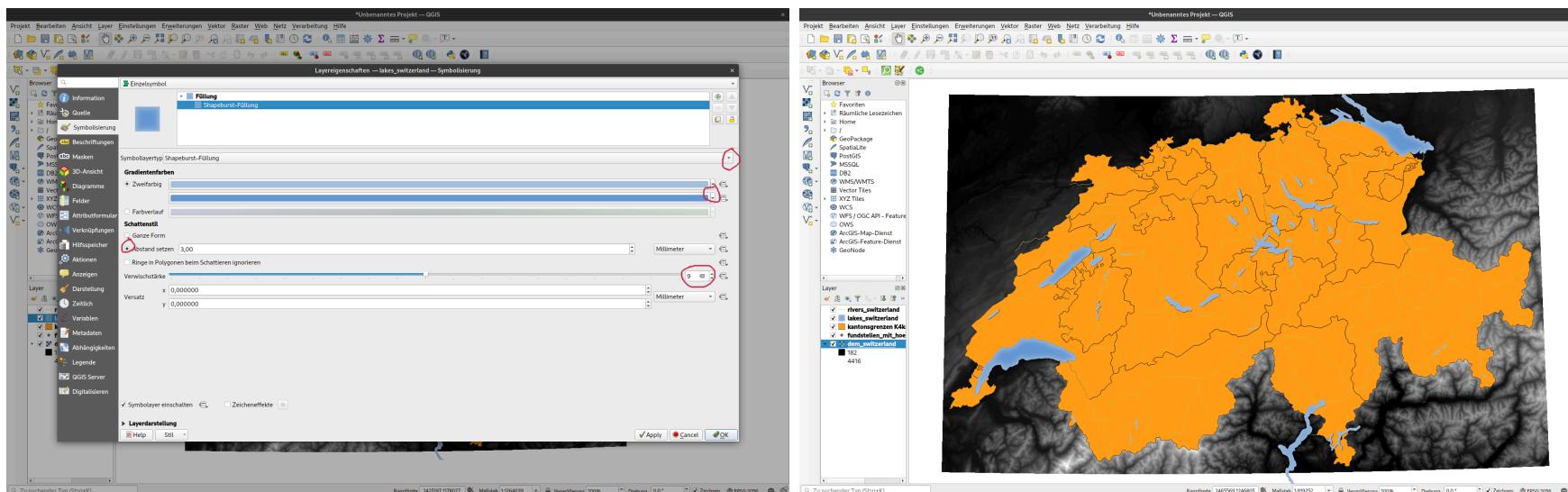
- Right Click on the layer
- Properties > Symbology
- Most simple: Select topo water from the suggested styles



Source: Lakes symbology topo water + result.

# Styling Lakes shapeburst

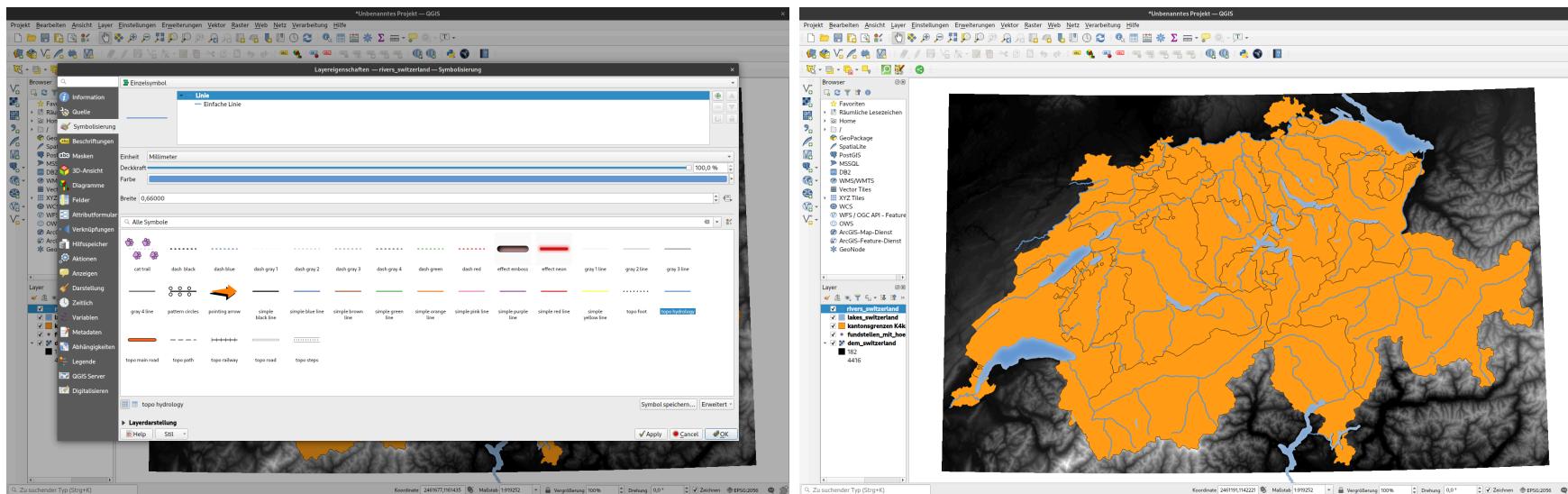
- More elaborated: Select shapeburst from layer type
- select a different (darker) shade of blue as second color
- set a distance (eg. 3 mm)
- add a blur (eg. 50%)
- Maybe already too fancy for scientific maps!?



Source: Lakes symbology topo water + result.

# Styling Rivers topo hydrology

- Right Click on the layer
- Properties > Symbology
- Most simple: Select topo hydrology from the suggested styles

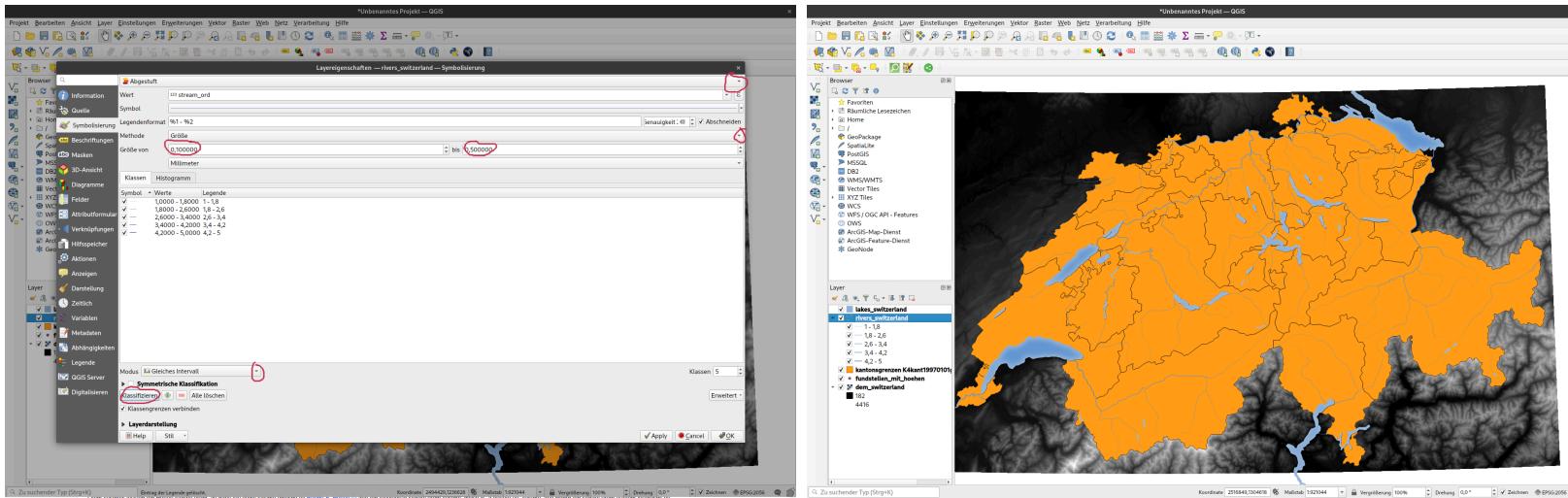
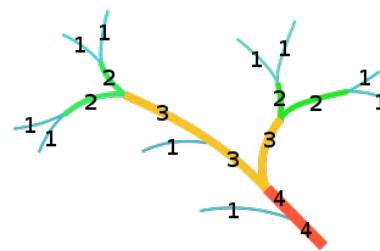


Source: Rivers symbology topo hydrology + result.

# Styling Rivers size based

More advanced: Sometimes you have informations about the size of rivers. Quite often it is in the form of **Strahler number**. We can use this information to specify the river width.

- Select 'Graduated' as style option
- Select 'Size' as method
- Select 'stream\_ord' as value
- Select sizes and Classify (Best with 'Equal Interval')

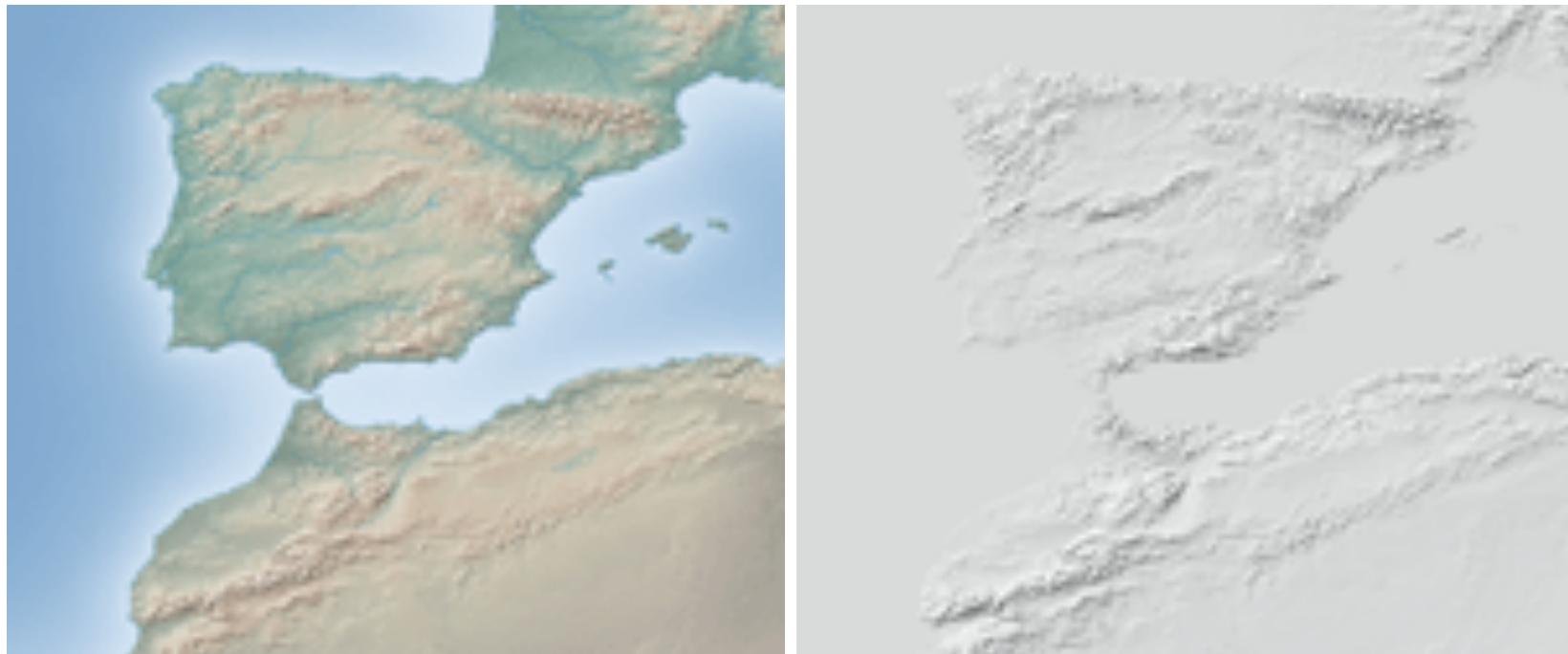


Source: Rivers symbology graduated + result.

# Visualisation of Topography

We need a DEM (Digital Elevation Model)

- Either: Hillshade combined with color ramp visualisation of elevation (more colorful)
- Or: Hillshade combined with polygon (more 'scientific')

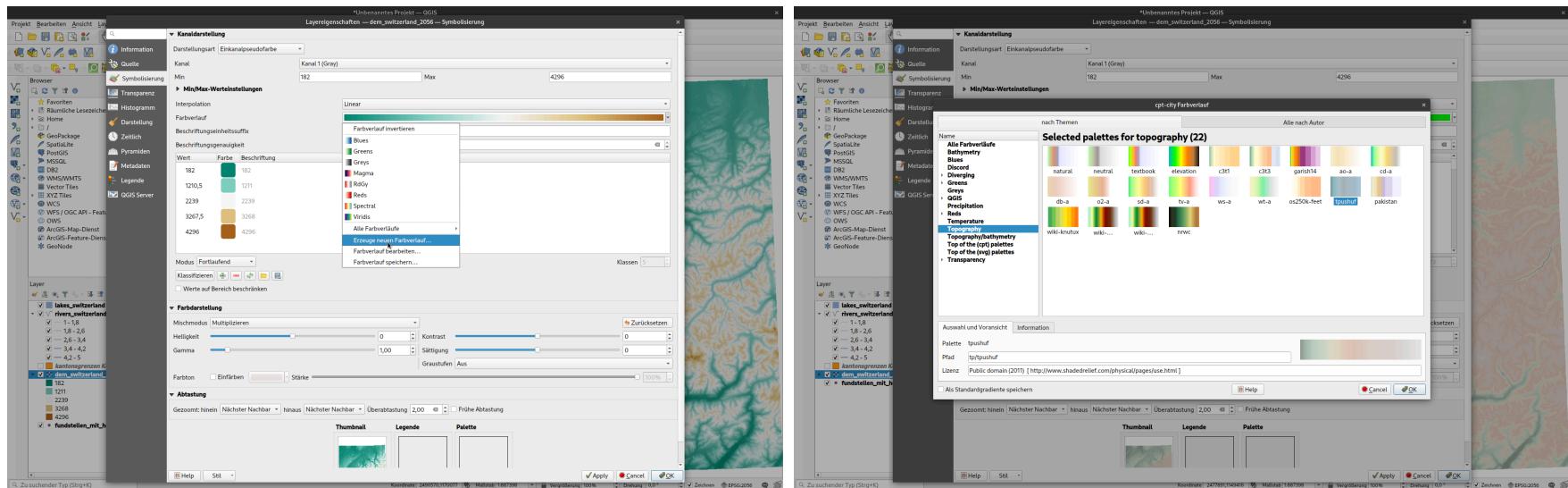


Source: <http://https://www.naturalearthdata.com/>

# Topographic color ramp

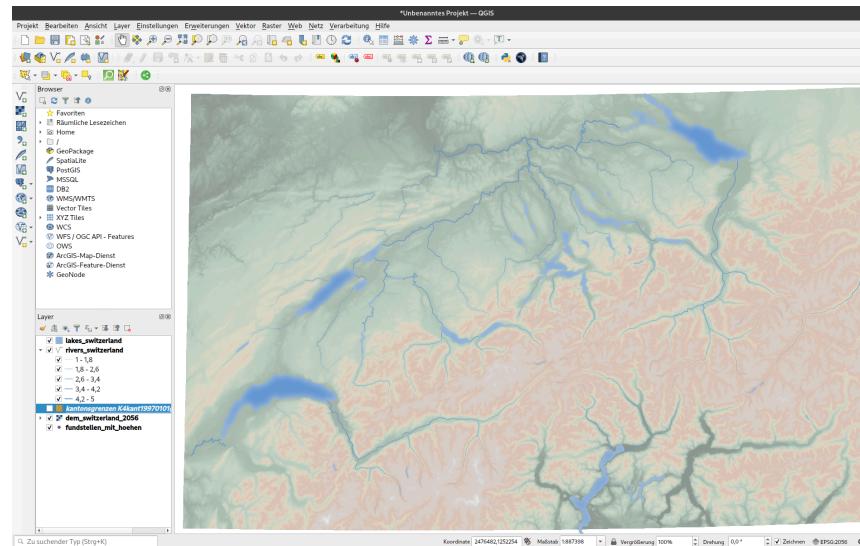
For this, we make our polygon layer invisible

- Select Properties > Symbology from the DEM layer
- Select Pseudocolor
- Select 'Create new color ramp'
- Select 'catalog: cpt-city' from the following dialog
- There, under Topography, select a color ramp of your choice
- "Classify", "Apply" and "OK"



# Topographic color ramp Result

Not bad, but a bit flat...

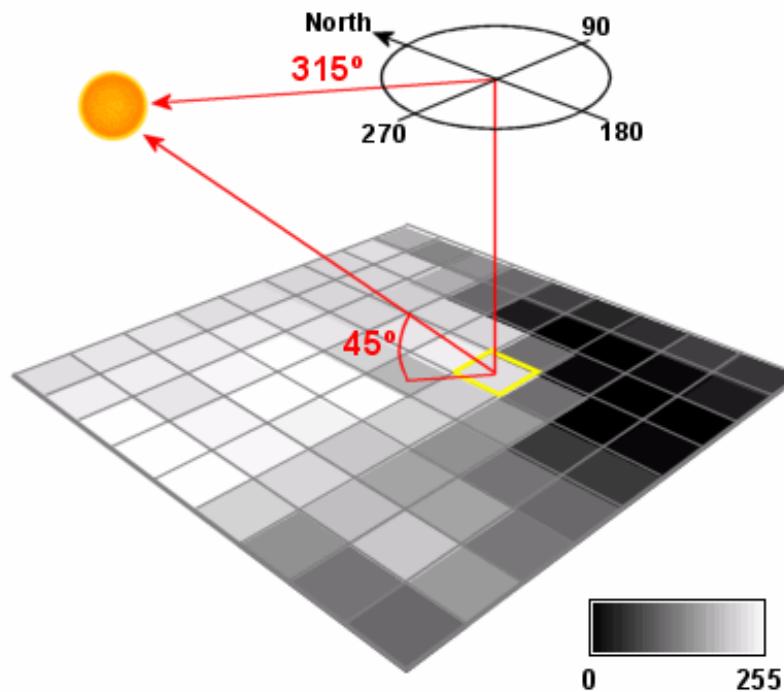


We need to add hill shading!

# Hillshading

Hillshading is a technique used to create a realistic view of terrain by creating a three-dimensional surface from a two-dimensional display of it. Hillshading creates a hypothetical illumination of a surface by setting a position for a light source and calculating an illumination value for each cell based on the cell's relative orientation to the light, or based on the slope and aspect of the cell. -

<http://www.geography.hunter.cuny.edu>

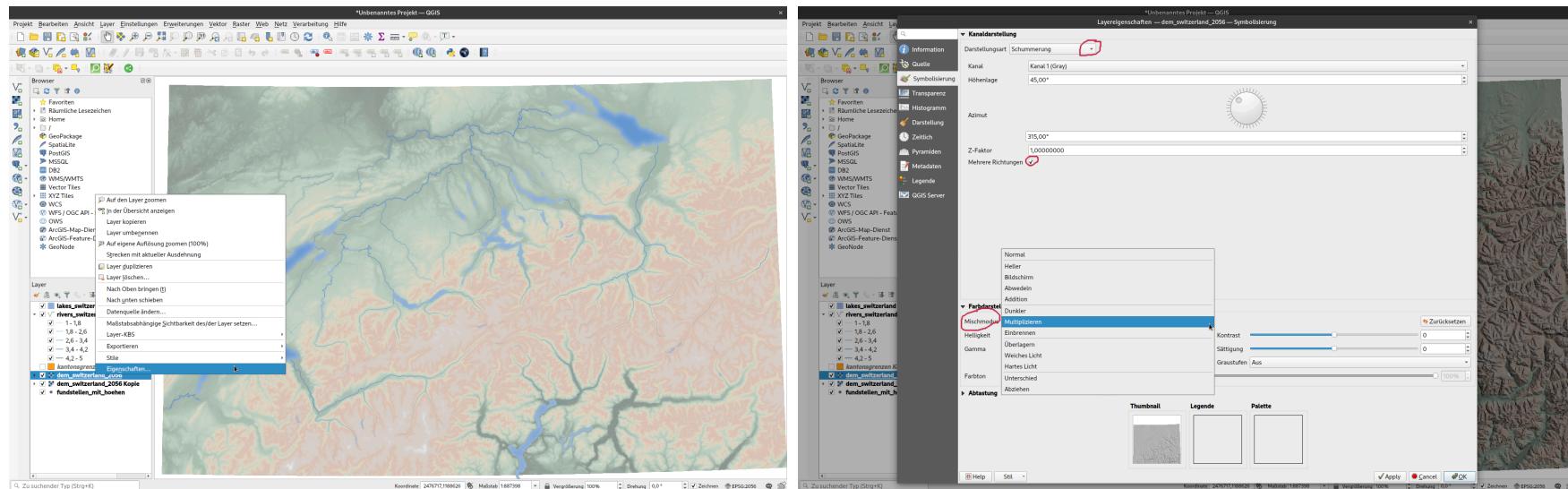


Source: <http://www.geography.hunter.cuny.edu>

# Hill Shading

We need the DEM Raster layer twice: once for the color, once for the hillshading

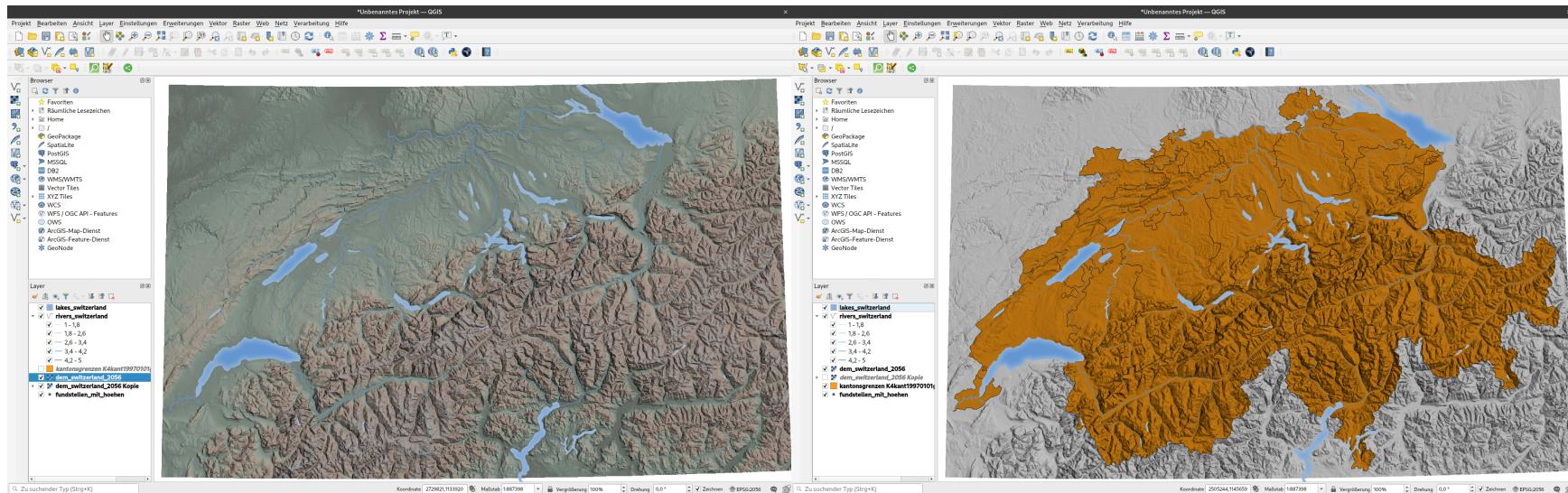
- Right click on the layer and duplicate
- Right click on the upper copy and select Properties > Symbology
- Select 'Hill Shading' as Visualisation
- You can change angle of sunlight
- Select 'Multi-Directional' and 'Multiply' as Blending Mode



# Hill Shading Result

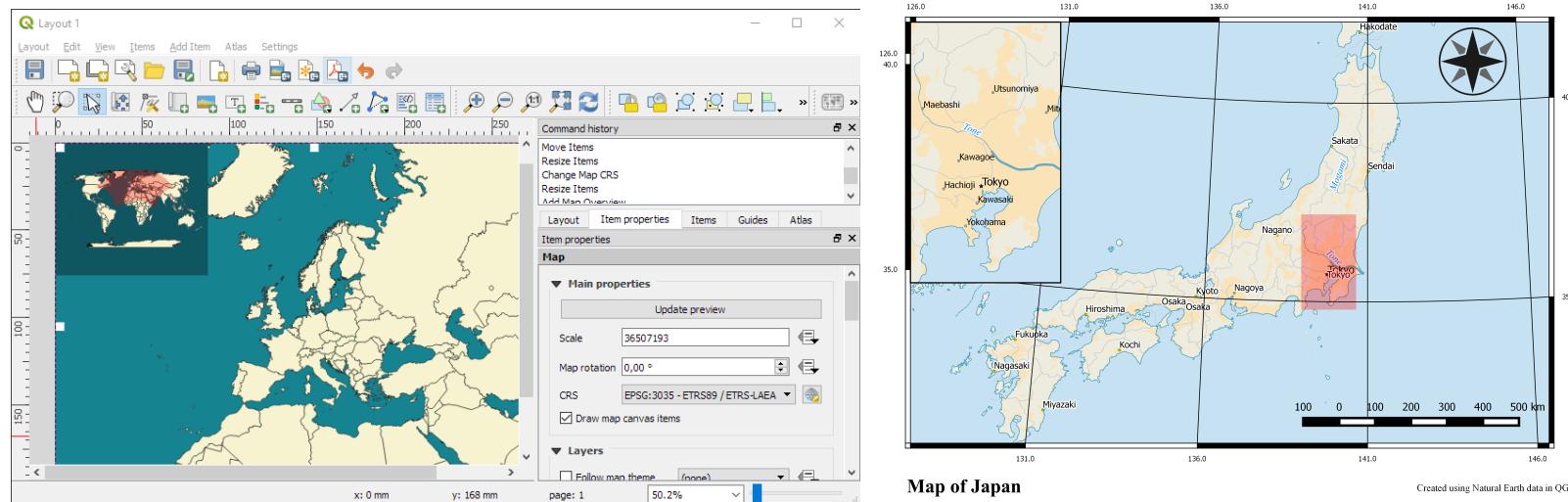
That looks rather nice!

It also looks nice if we put the vectors below the hillshade and make the colored DEM invisible.



# Overview Map

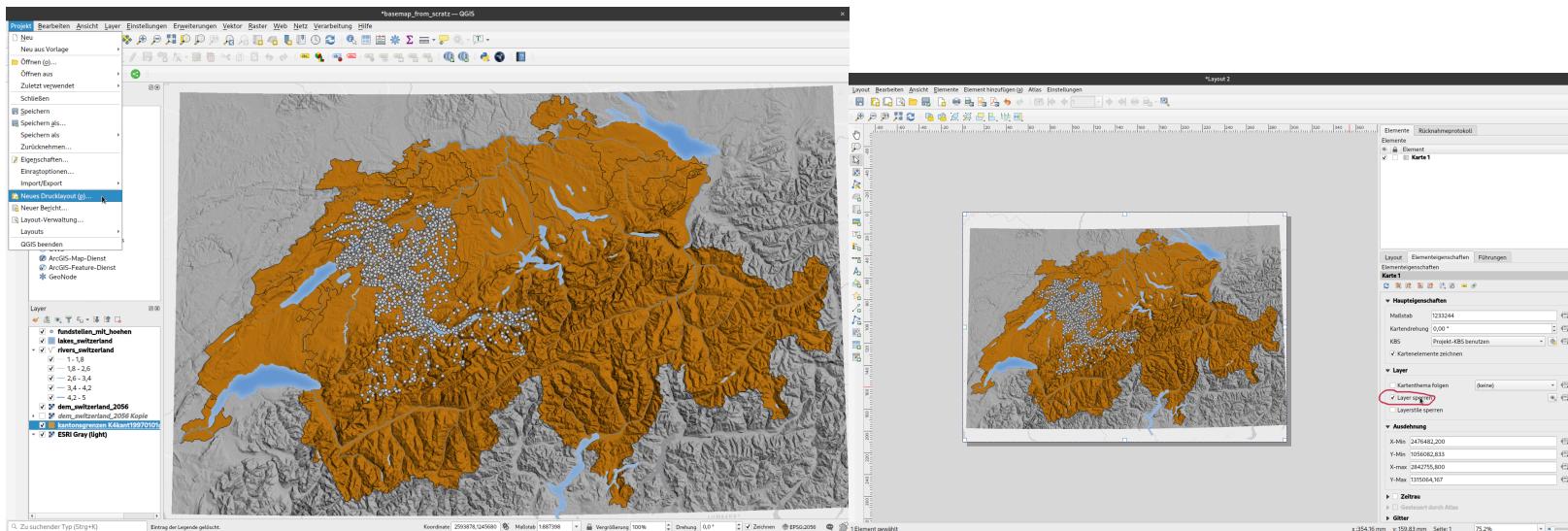
- more than one map in the map layout
- often necessary to indicate the general location of the mapped area
- can also be 'multi staged'
- can also be a detailed map...



Examples of Overview and Detail map layout. Source: <http://www.qgistutorials.com>

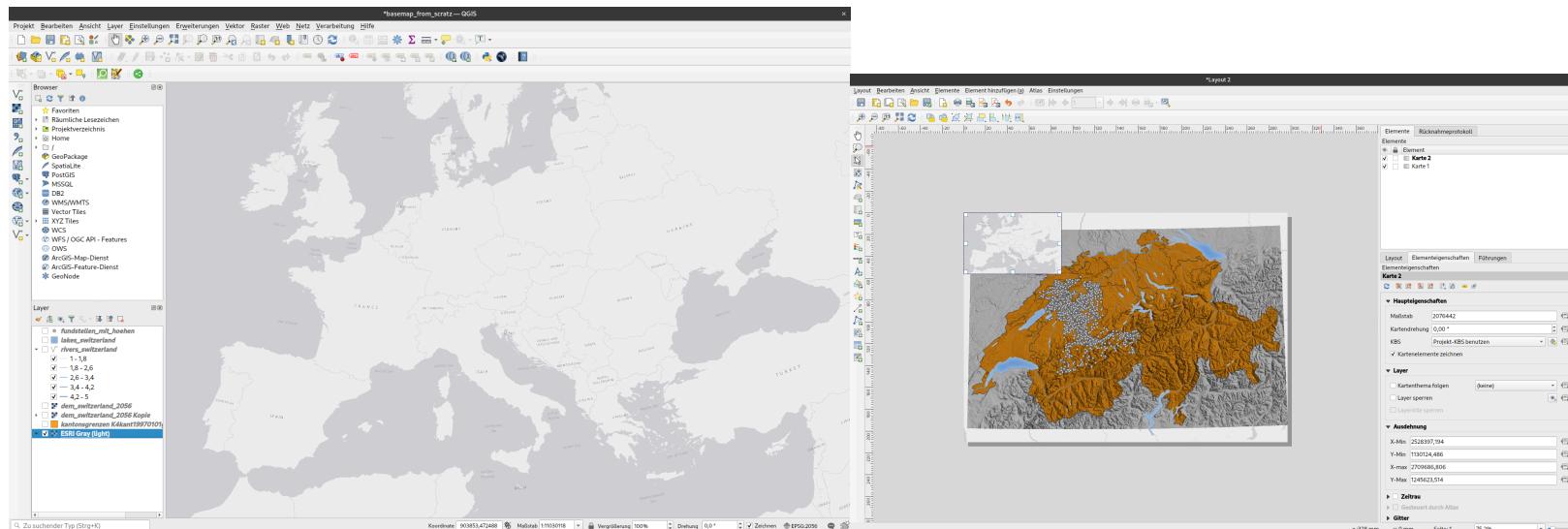
# Create an Overview Map in QGIS (1)

- Add another Worldwide Basemap layer to your map, eg. ESRI Gray light
- Start the Print Composer
- Add the current map
- Select 'Lock Layer'



# Create an Overview Map in QGIS (2)

- Go back to the main window
- Zoom to a europe wide extend
- remove all layers except the background layer
- Go back to the Print Composer Window
- Add another map eg. to the left upper corner

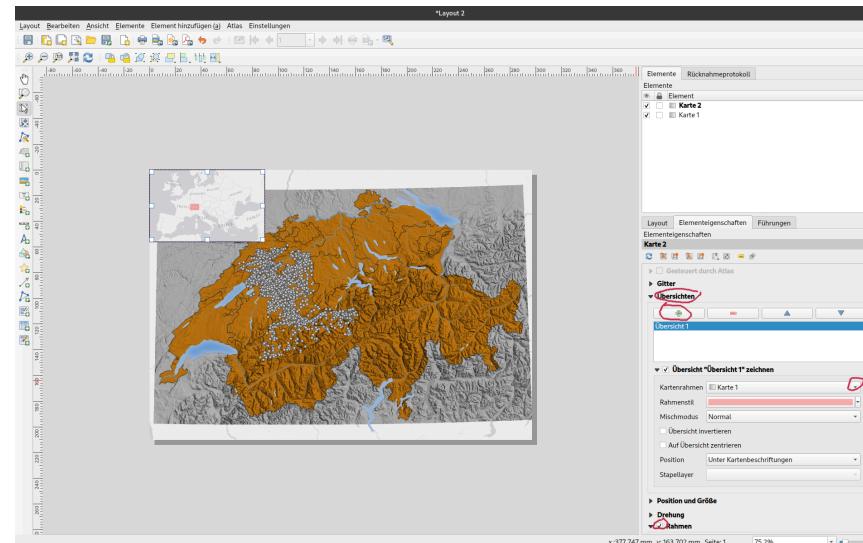


# Create an Overview Map in QGIS (3)

- Select the small map
- In the Elements Tab, select Overview
- click on the + item
- Select map 1 as map frame

You might also like to frame the minimap

- Find 'Frame' in the element properties and check the box

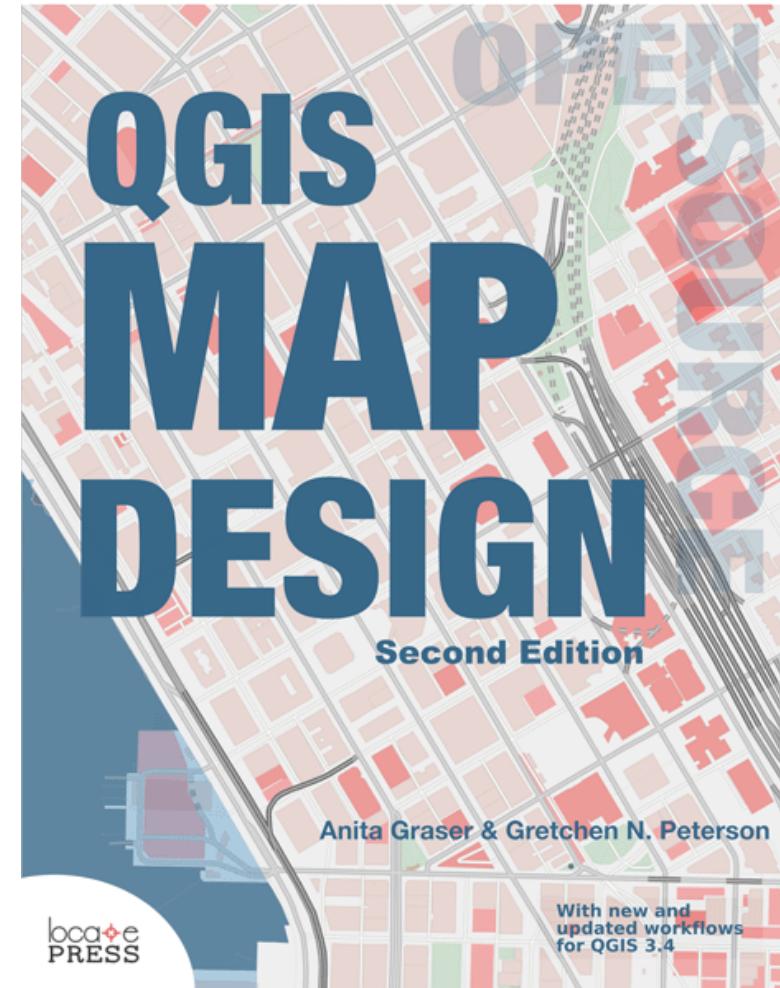


# What We've Covered

- Different Basemaps
- Getting Vector and Raster Data
- Styling Water Bodies
- Getting and Styling DEMs
- Hillshading
- Making an Overview Maps

# More Map Design with QGIS

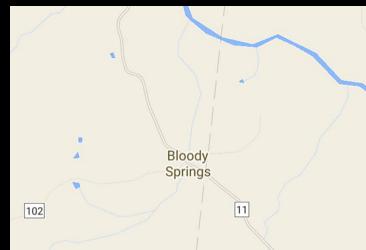
Gretchen Peterson and Anita Graser QGIS Map Design, 2nd Edition (Locate Press, 2018), pp. 200 ISBN: 978-0989421751.



# Homework

**No Homework!**

# Any questions?



Source: <https://www.instagram.com/sadtopographies>

You might find the course material (including the presentations) at

<https://github.com/BernCoDALab/gia>

You can see the rendered presentations at

<https://berncodalab.github.io/gia>

You can contact me at

[martin.hinz@unibe.ch](mailto:martin.hinz@unibe.ch)