UNIVERSITÄT BERN

GIS in Archaeology

08 - Making nicer Maps

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You can download a pdf of this presentation.

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

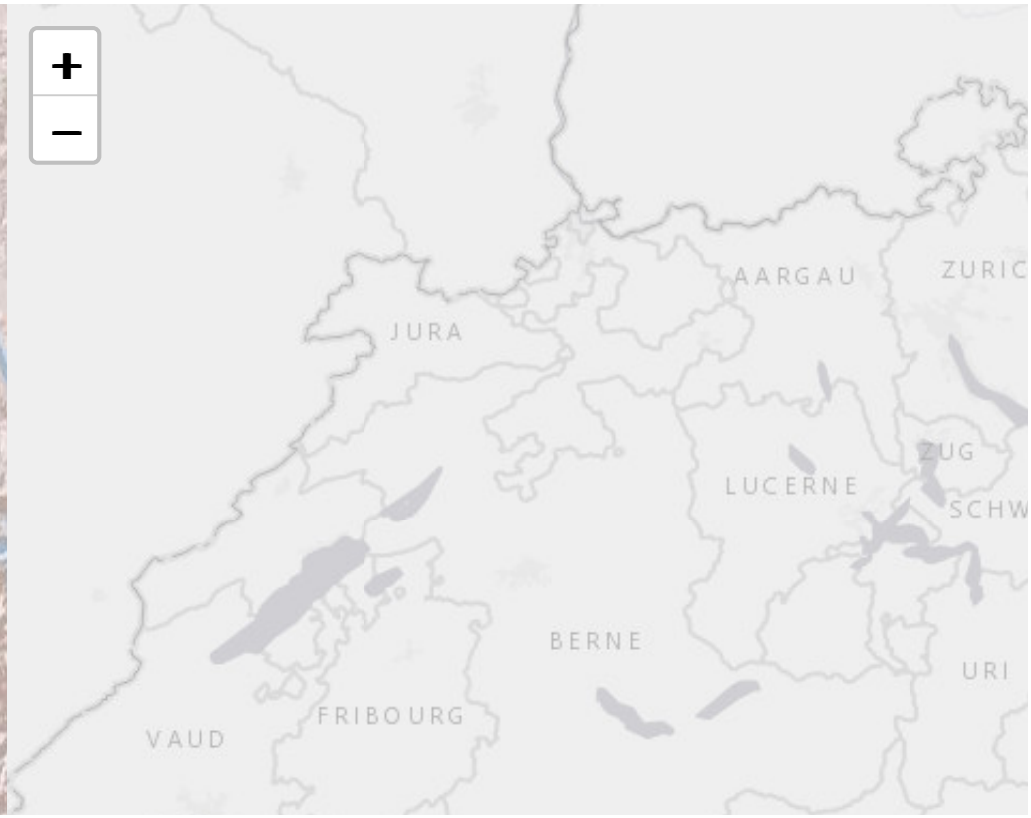
Options for Background Maps

Esri

More neutral Variants, large scale

WorldShadedRelief

WorldGrayCanvas



Options for Background Maps

CartoDB

Good for man made features

Positron

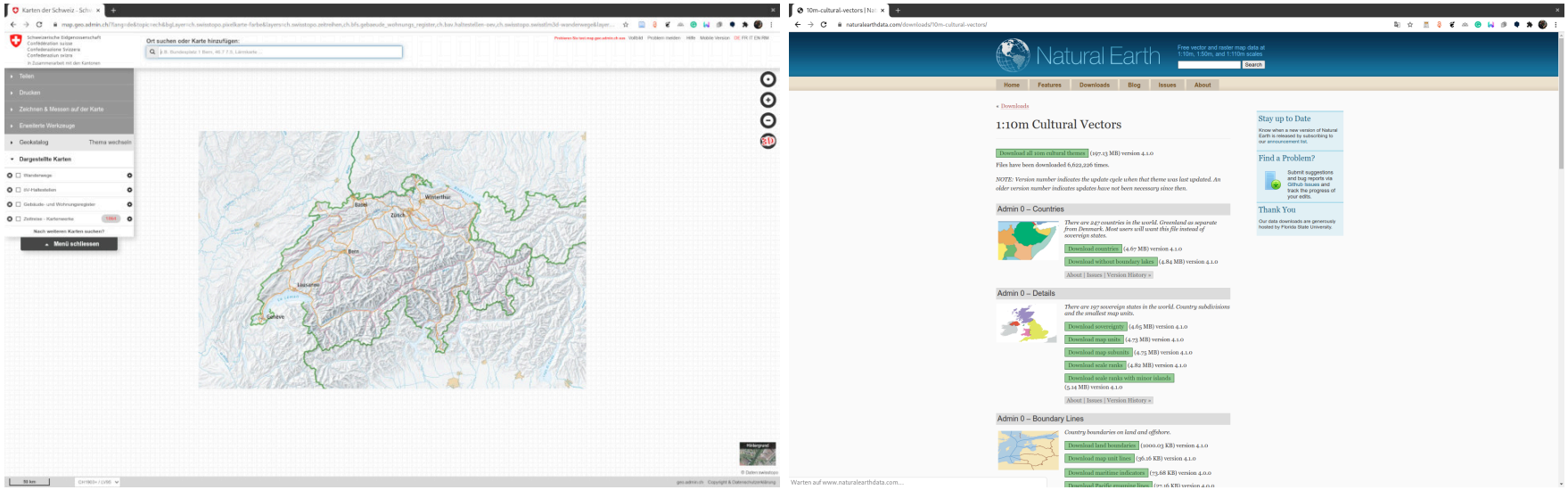
Building a background map from scratch

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

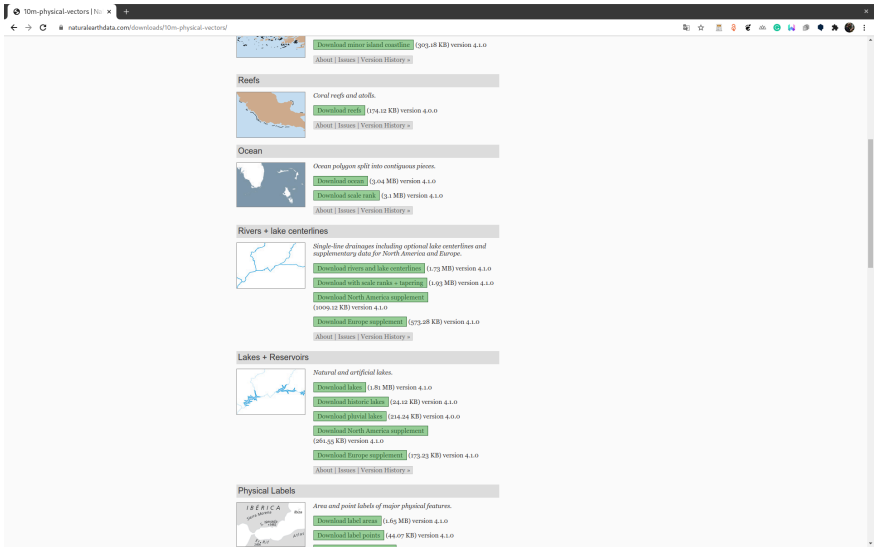
Waterbodies

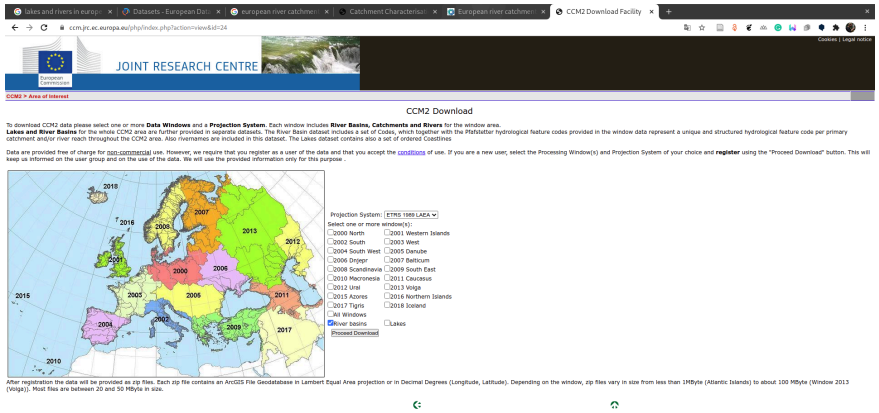
large scale:

- 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

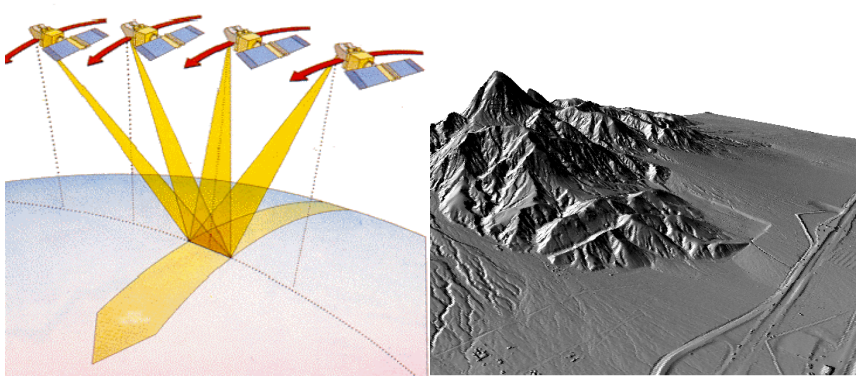




Source: https://www.naturalearthdata.com; https://joint-research-centre.ec.europa.eu

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

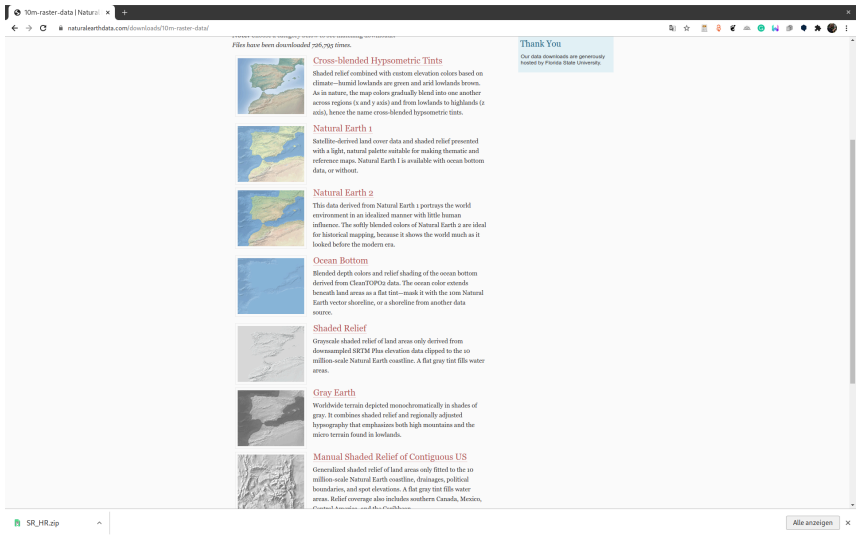
DEM can come in EPSG 4326 (WGS 84 lat/lng).

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



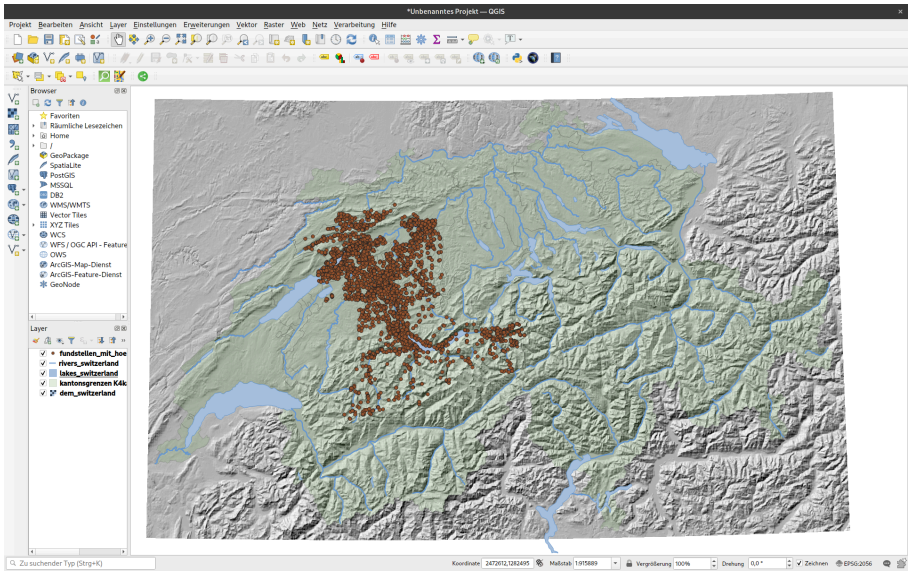
DEM:

- depends on your region and scale
- GMTED2010 (https://topotools.cr.usgs.gov/gmted_viewer/viewe 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

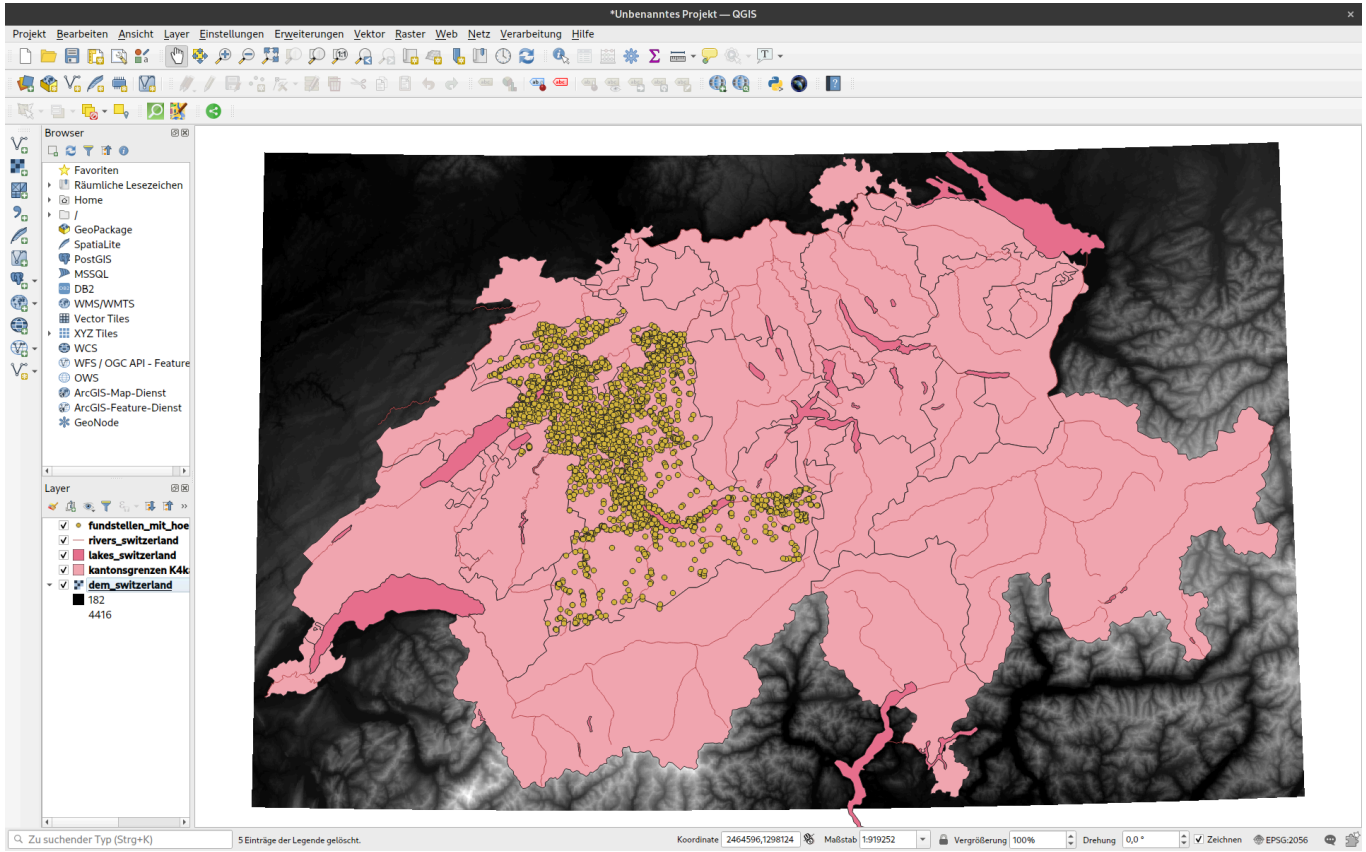
- Download the Bernese Archaeological sites
- Download the Kantonal Borders of Switzerland
- Download the Waterbodies
  - Rivers
  - Lakes
- Download the DEM for the Kanton of Bern (GMTED2010, 7.5 arc seconds)
- Start QGIS and add all layers

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



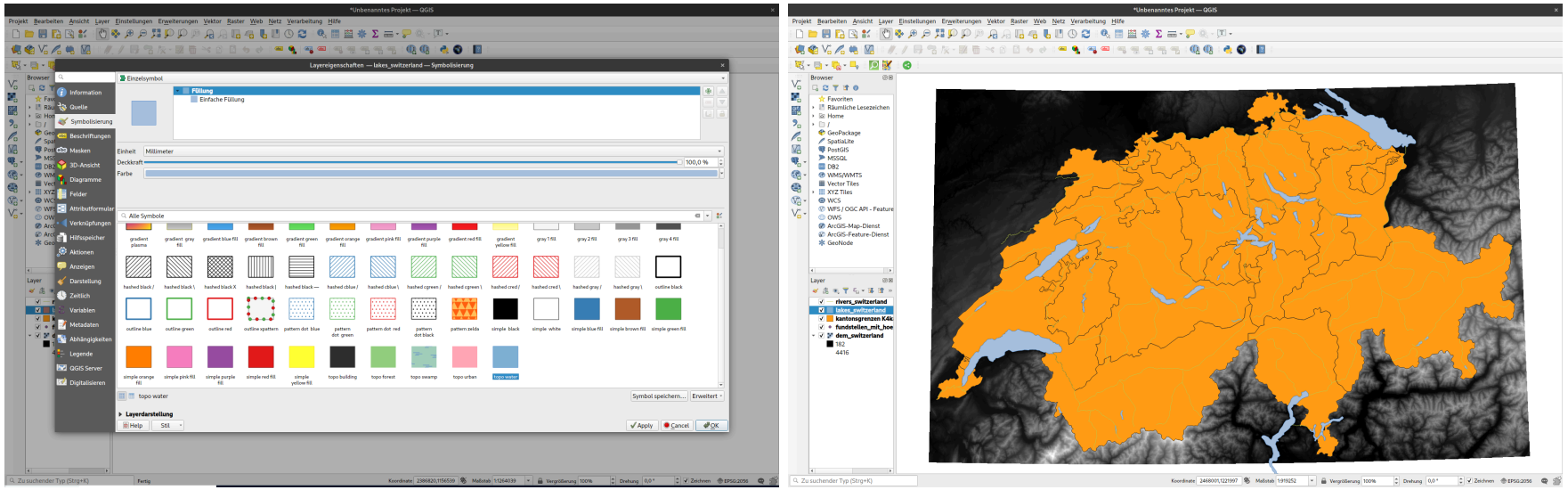
Your Map will probably look like this -

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



Styling Lakes topo water

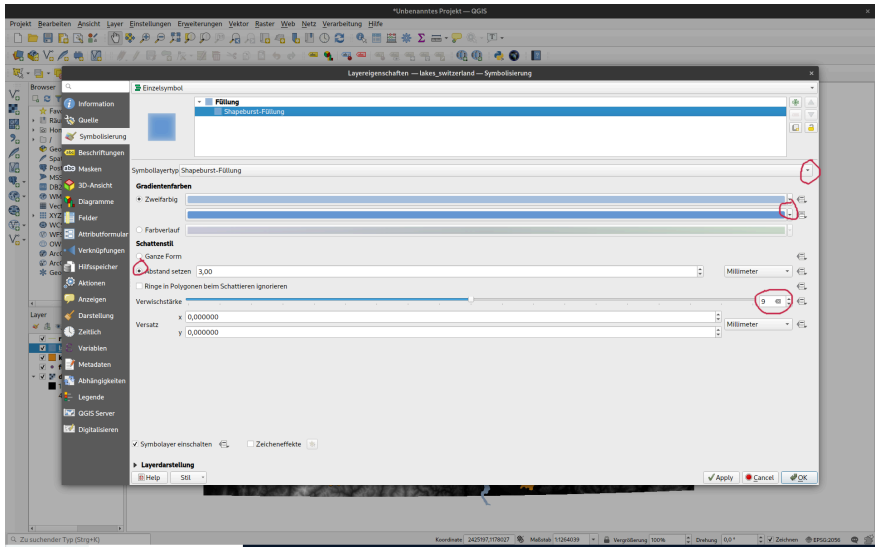
- Right Click on the layer
- Properties > Symbology
- Most simple: Select topo water from the suggested styles

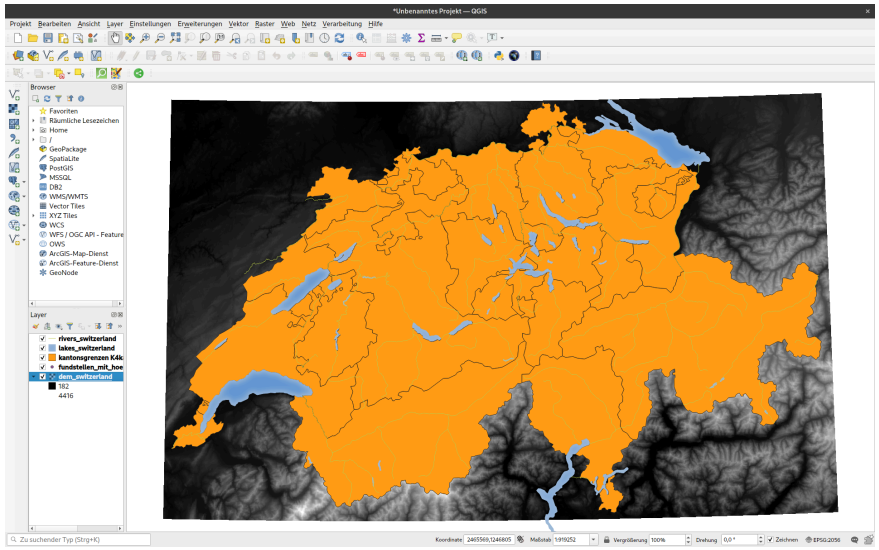


Source: Lakes symbology topo water + result.

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!?

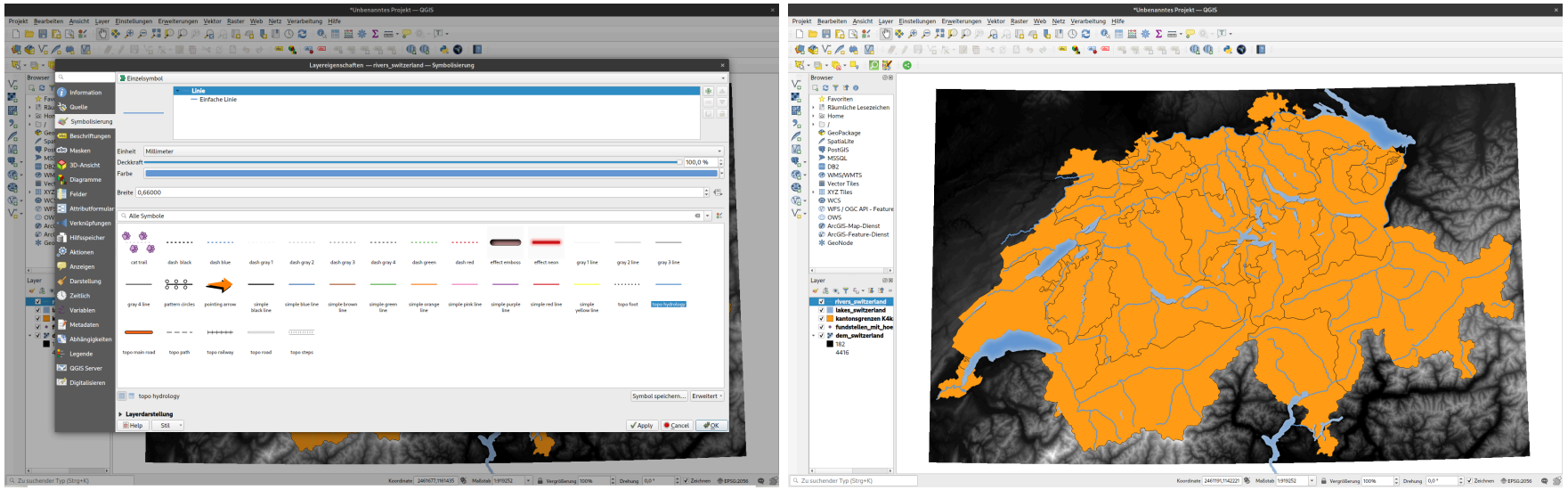




Source: Lakes symbology topo water + result.

Styling Rivers topo hydrology

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

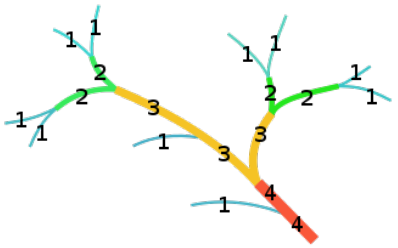


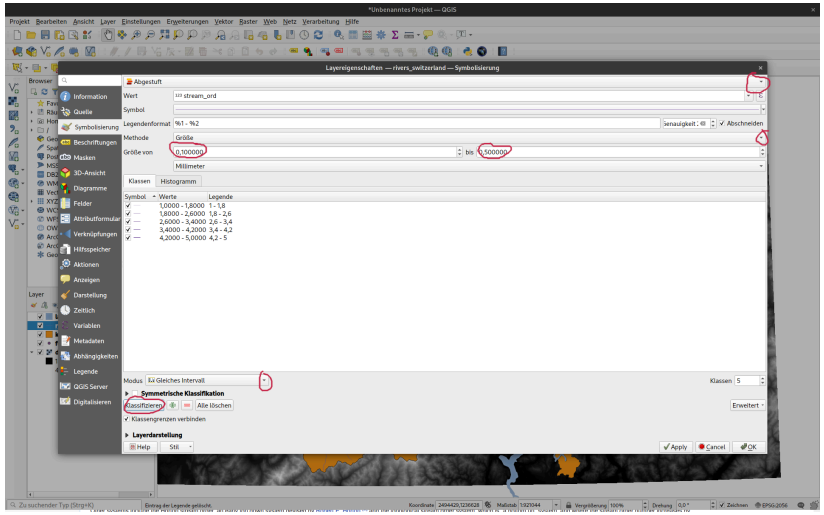
Source: Rivers symbology topo hydrology + result.

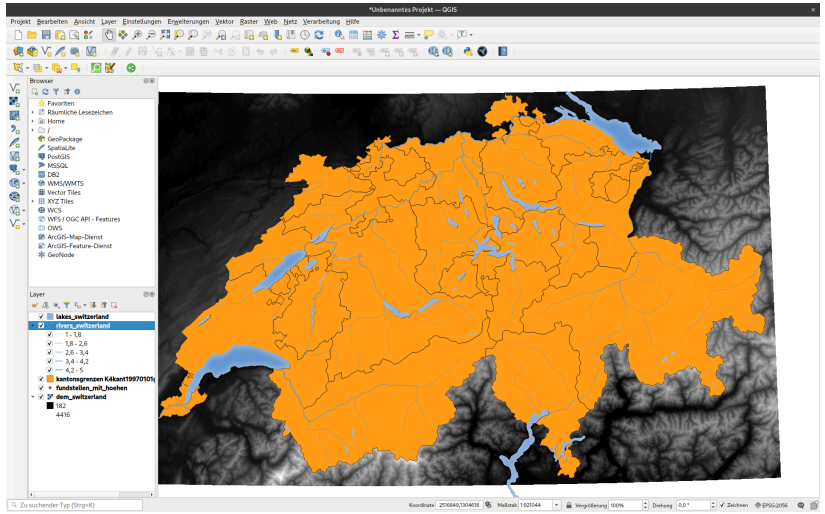
Styling Rivers size based

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')





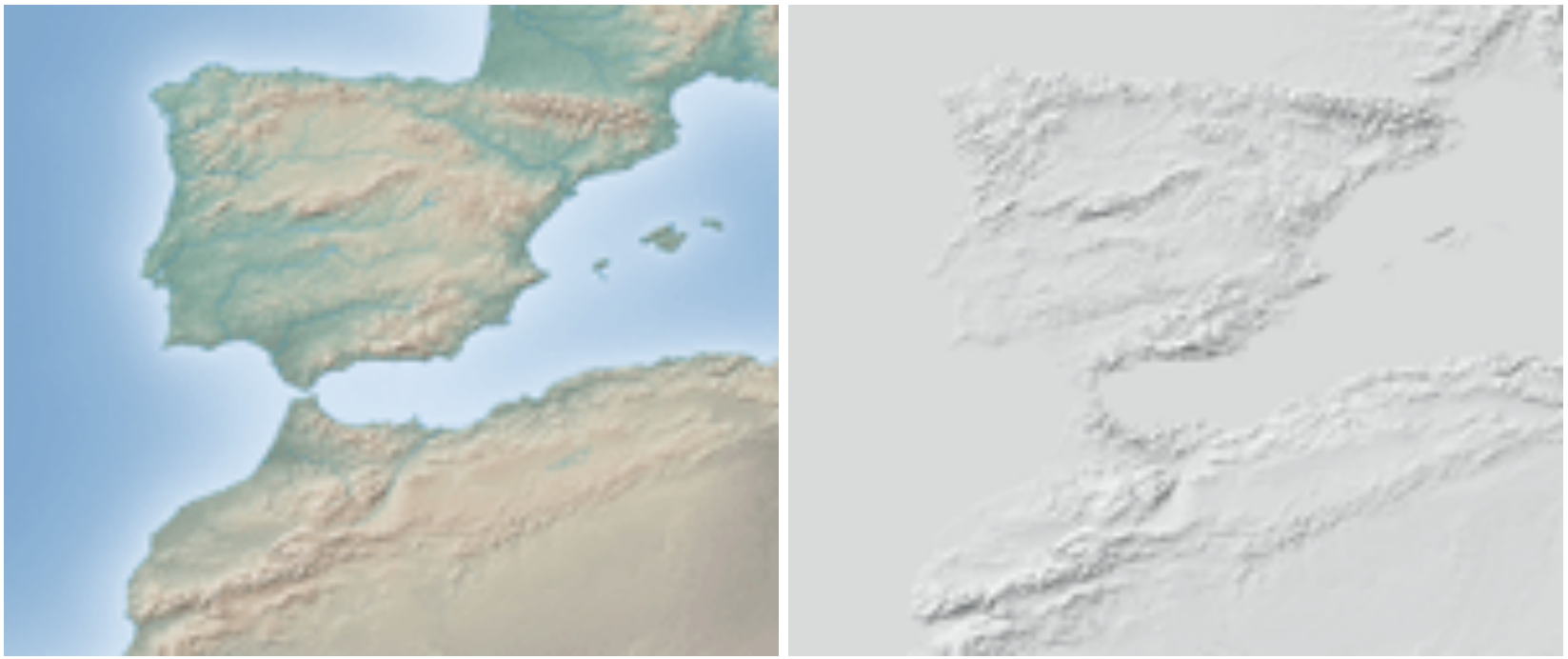


Source: Rivers symbology graduated + result.

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')

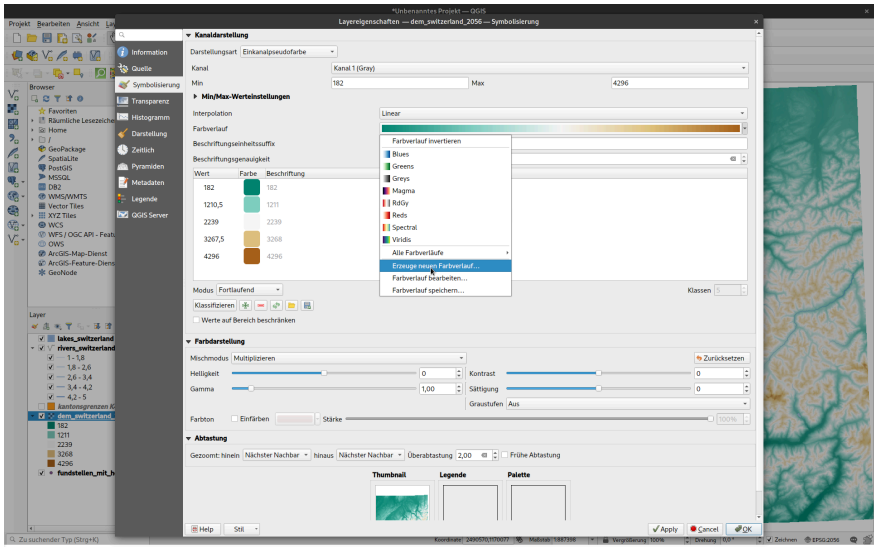


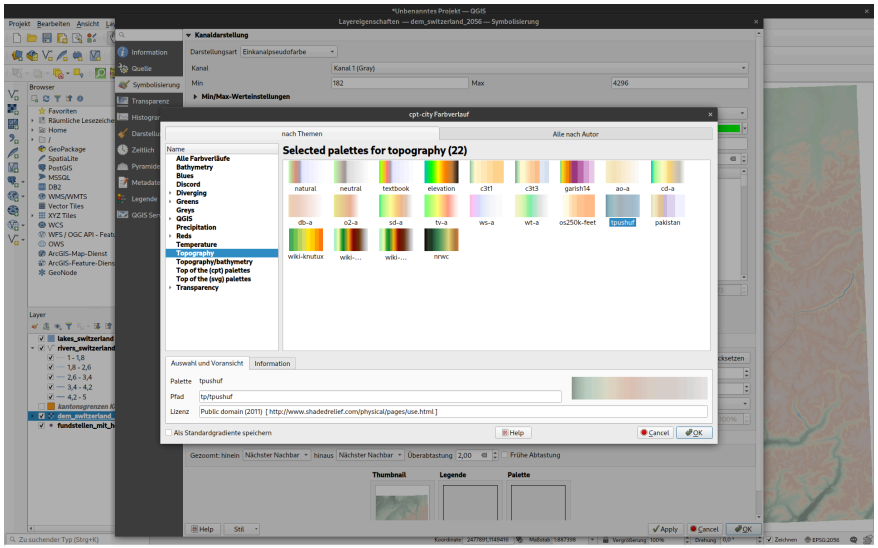
Source: http://https://www.naturalearthdata.com/

Topographic color ramp

For this, we make our polygon layer invisible

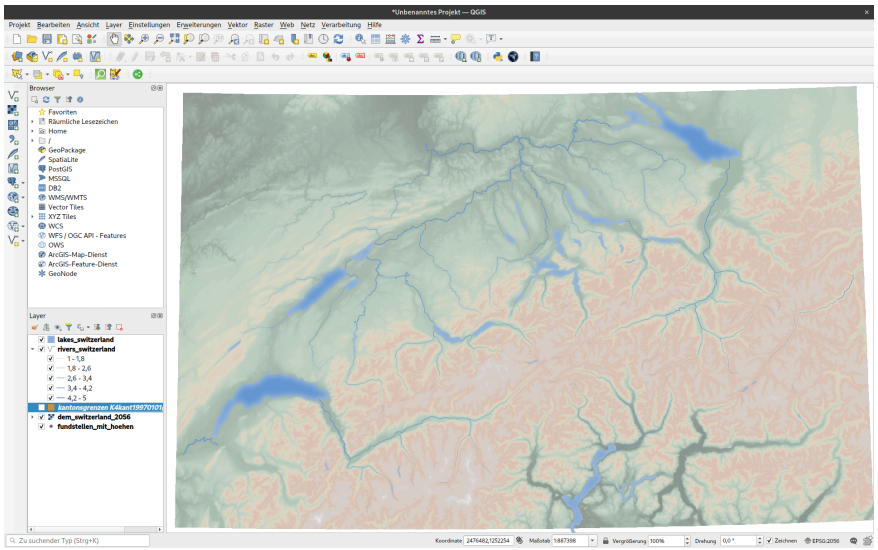
- Select Properties > Symbology from the DEM layer
- Select Pseudocolor
- Select 'Create new color ramp'
- Select 'catalog: cpt-city' from the following dialog
- There, under Topography, select a color ramp of your choice
- "Classify", "Apply" and "OK"





Topographic color ramp Result

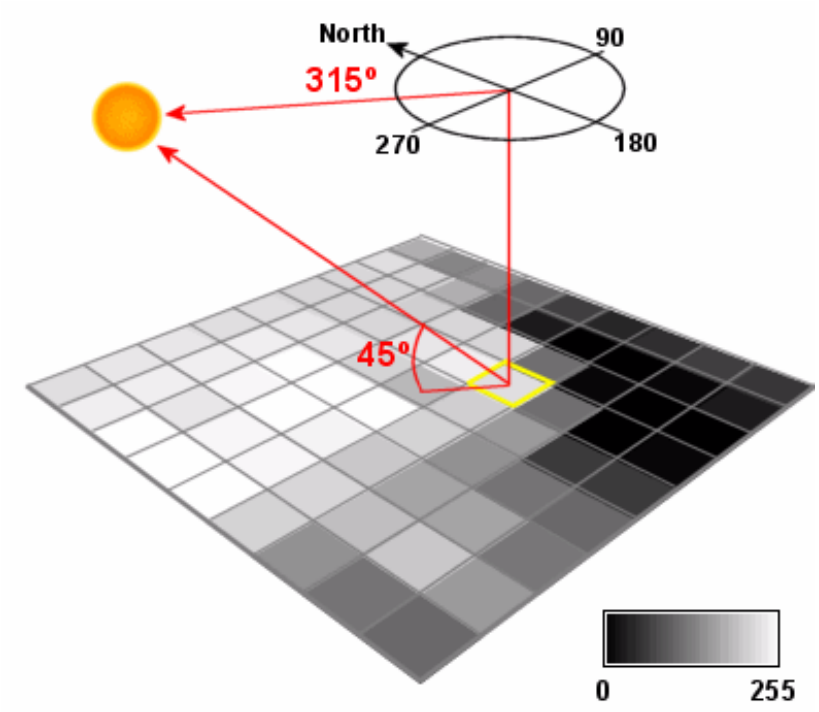
Not bad, but a bit flat...

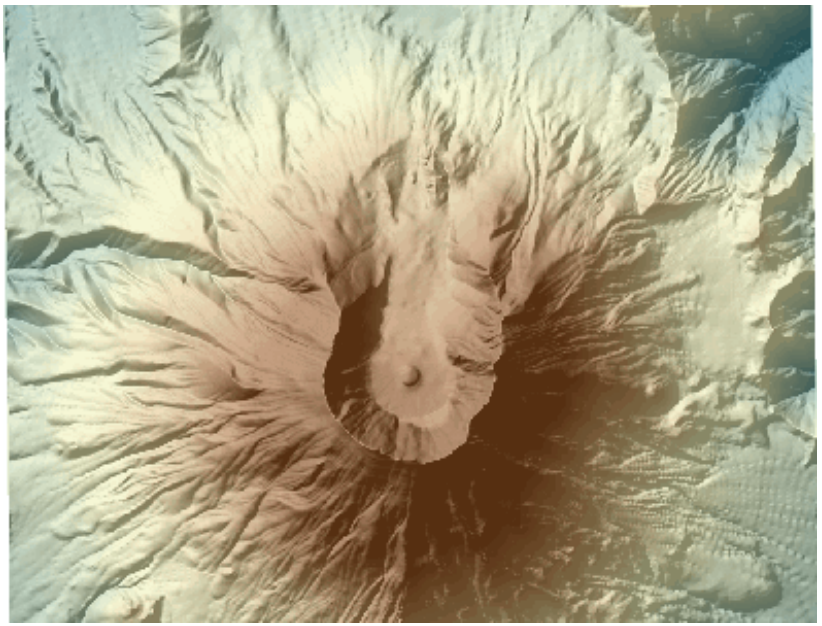


We need to add hill shading!

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



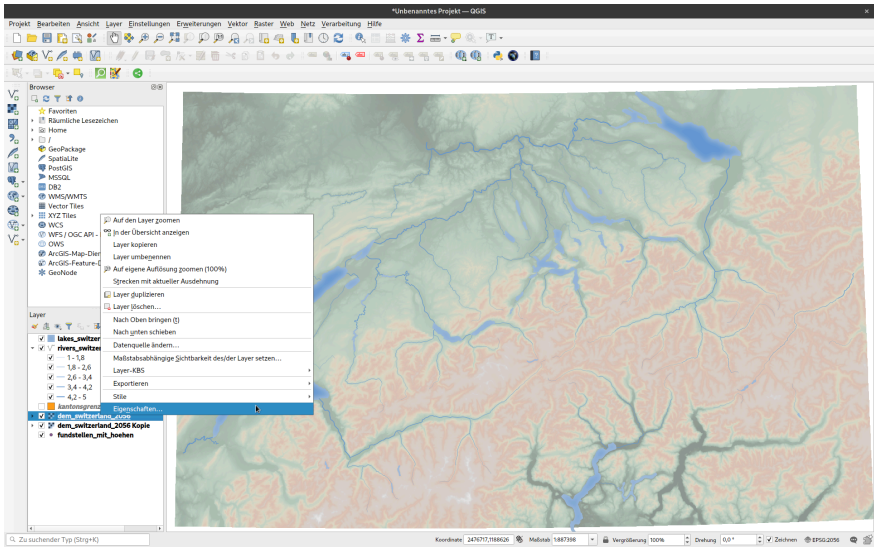


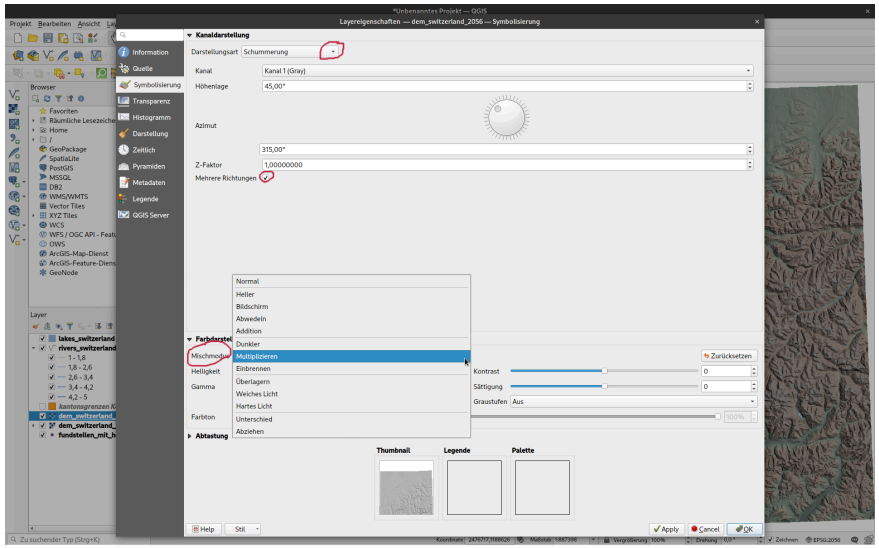
Source: http://www.geography.hunter.cuny.edu

Hill Shading

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

- Right click on the layer and dublicate
- 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

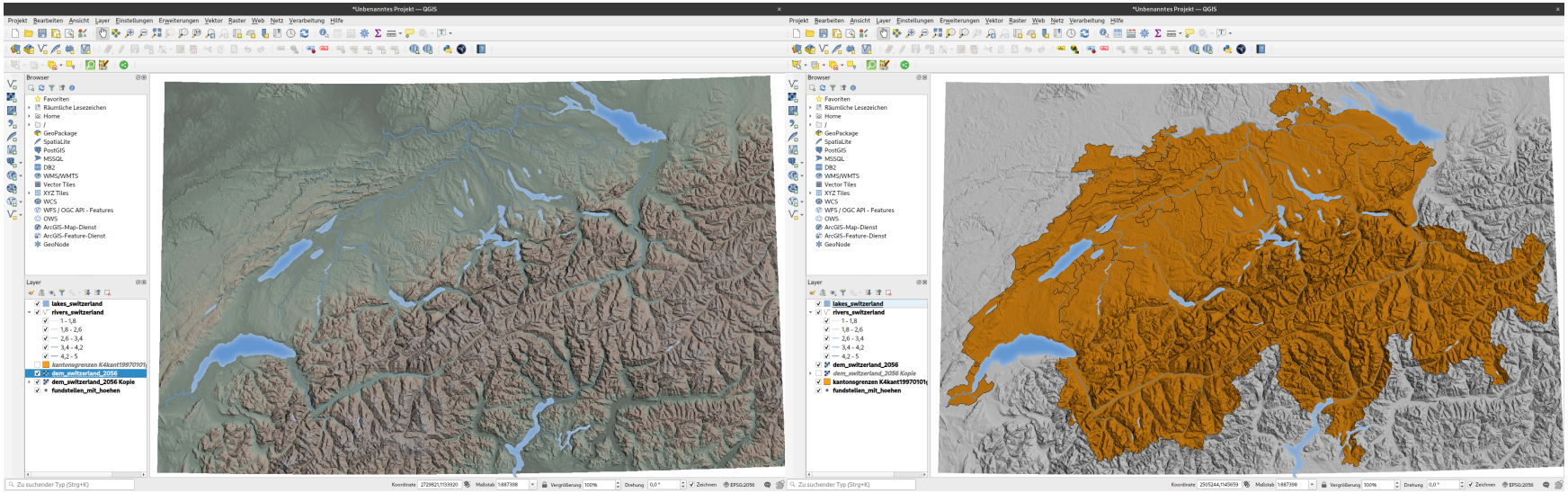




Hill Shading Result

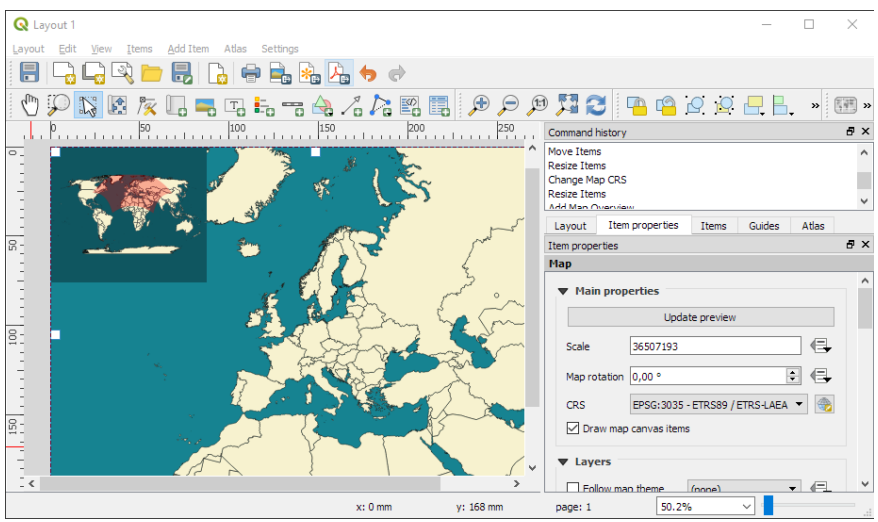
That looks rather nice!

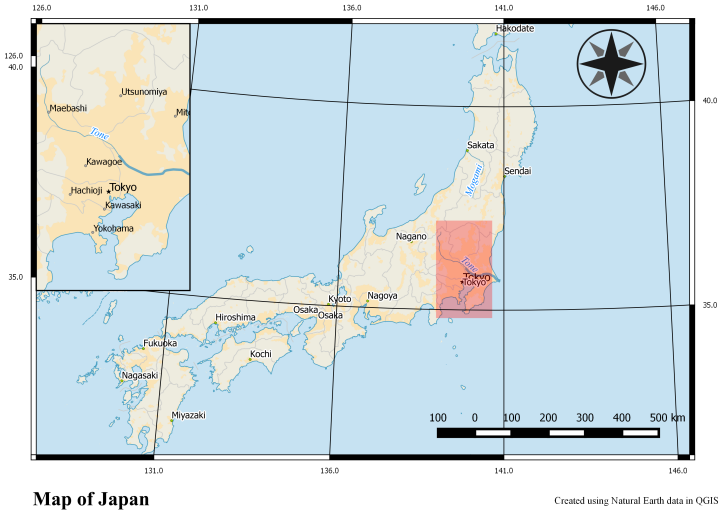
It also looks nice if we put the vectors below the hillshade and make the colored DEM invisible.



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...

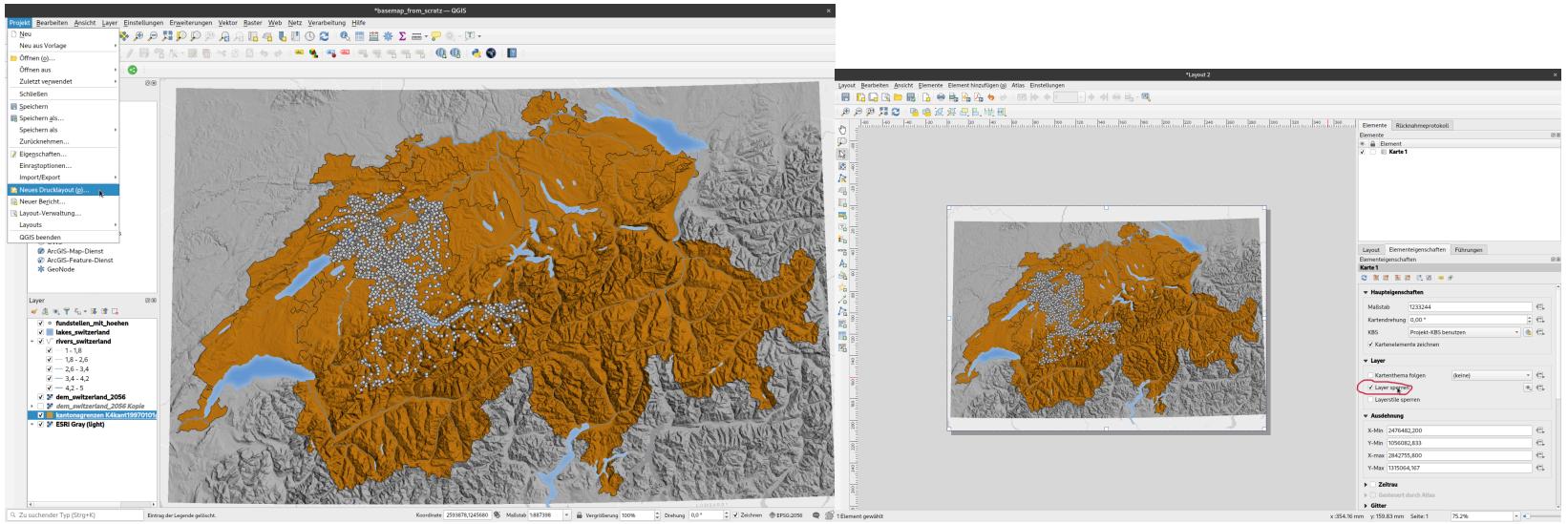




Examples of Overview and Detail map layout. Source: http://http://www.qgistutorials.com

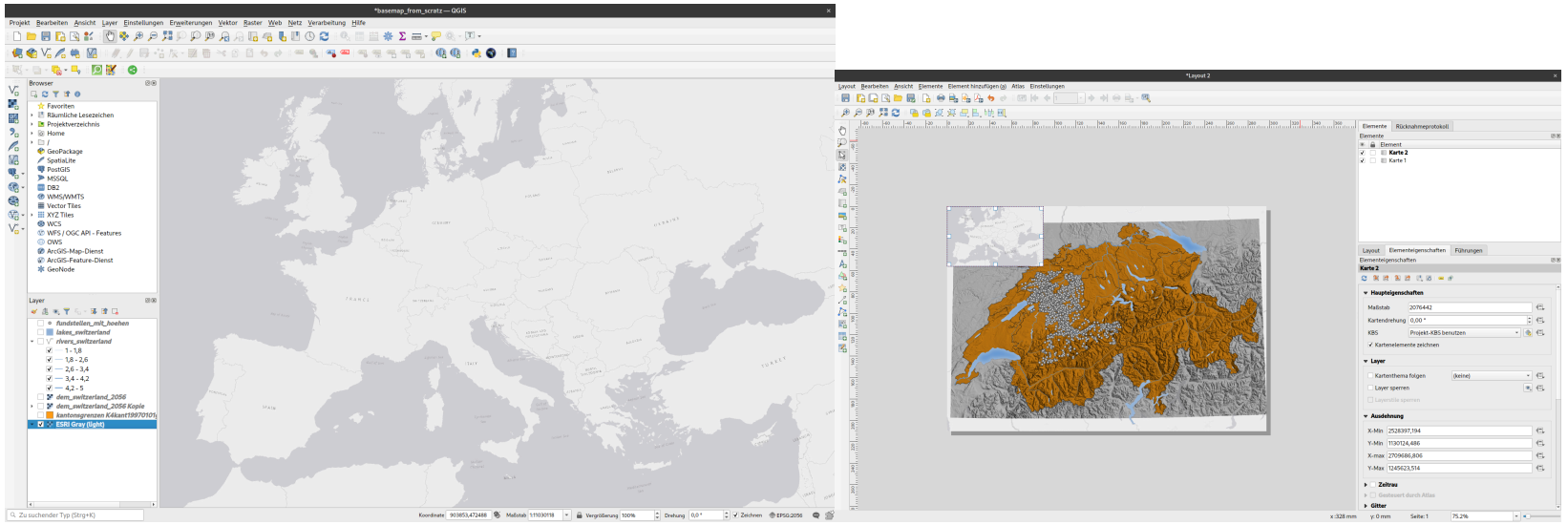
Create an Overview Map in QGIS (1)

- 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

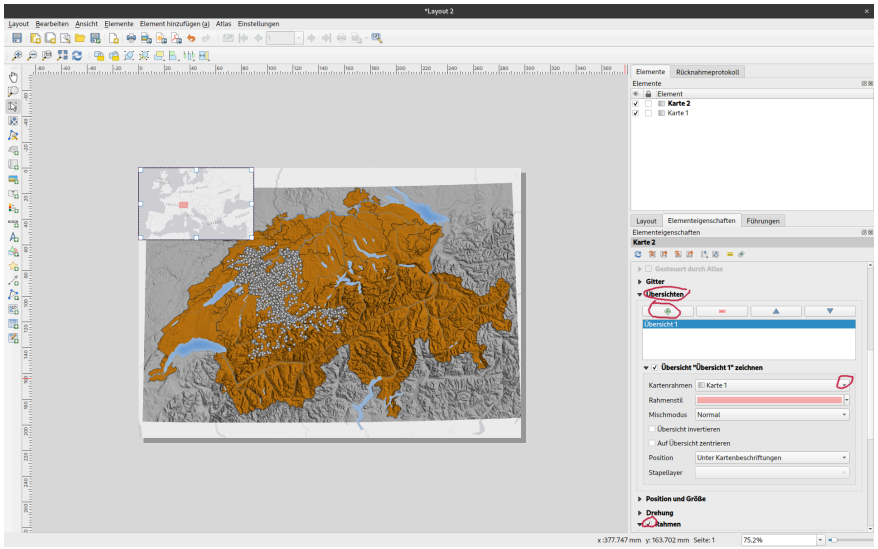


Create an Overview Map in QGIS (3)

- 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

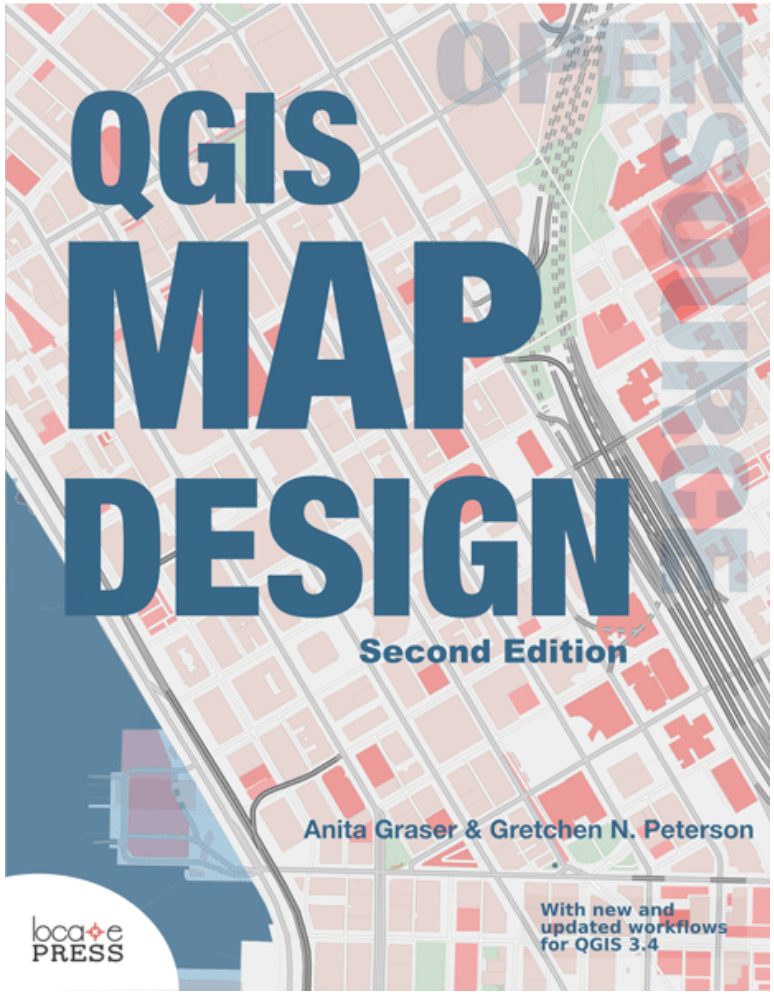


What We've Covered

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

More Map Design with QGIS

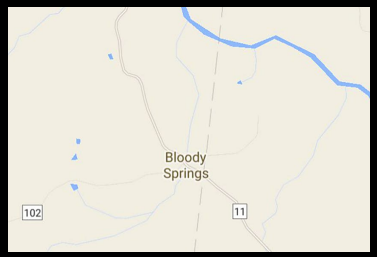
Gretchen Peterson and Anita Graser QGIS Map Design, 2nd Edition (Locate Press, 2018), pp. 200 ISBN: 978-0989421751.



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

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