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# Groundwater body delineation in Swiss river basins

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## STARTING POINT and OBJECTIVE

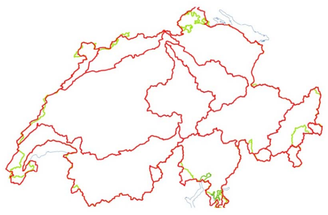
Being member of the European Environmental Agency EUA, Switzerland regularly delivers data for groundwater quality and quantity derived from the National Groundwater Monitoring NAQUA. As the basic tool for the reporting of monitoring results, an assessment for the delineation of groundwater bodies (GWB) has been conducted. This is regardless of the fact, that Switzerland is not part of the EU and therefore not subjected to implementing the EU-WFD.

## HYDROGEOLOGICAL SITUATION

Switzerland is characterised by a high geographical and hydrogeological diversity. By providing more than 80% of the total supply, groundwater represents the most important drinking water resource of the country. Highly productive aquifers are associated to porous unconsolidated rocks along the large river valleys (pumping wells) while springs in fissured and karstified rocks make important contribution to drinking water supply over wide areas.

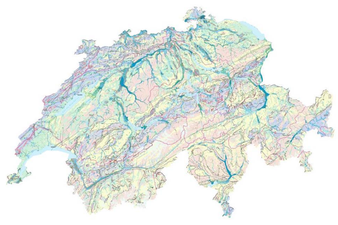
## PRINCIPLES and BASIC INFORMATION

- River-basin and groundwater-type related
- Nationwide and GIS-based approach
- Systematic and uniform assessment
- Criteria estimated from existing data



River basin districts

Aquifer types



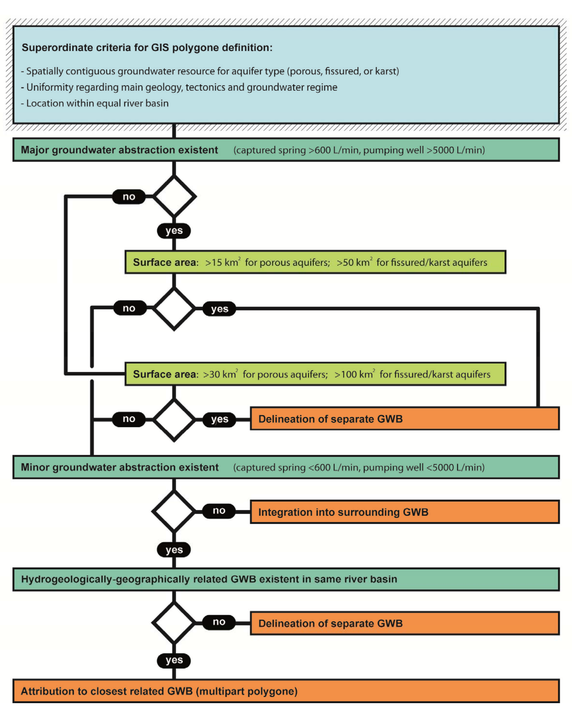
Groundwater resources

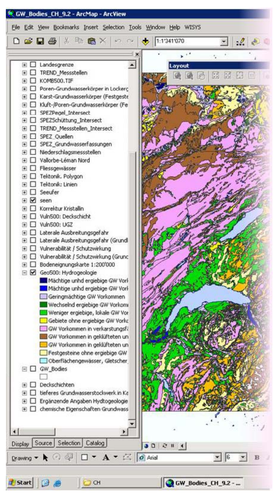
Groundwater abstraction

Beside attribution to a single river basin, GWB are primarily distinguished by the main aquifer type to which each of them belongs. Another principle is that GWB delineation in Switzerland should be nationwide, i.e. any land surface is assigned to a GWB. This required a systematic assessment that is however adapted to the specification of the aquifer type. The basic information is formed by the Swiss groundwater resources map, a data set that provides GIS-available aquifer characteristics on a national scale. It also includes important groundwater abstraction points (springs and pumping wells), another criterion taken into account for the dimensioning of the GWB. Finally, GWB delineation principles involve some supplemental information available, such as tectonic units or the prevailing groundwater regime, but is determined to minimise the consideration of regional or local expert knowledge.

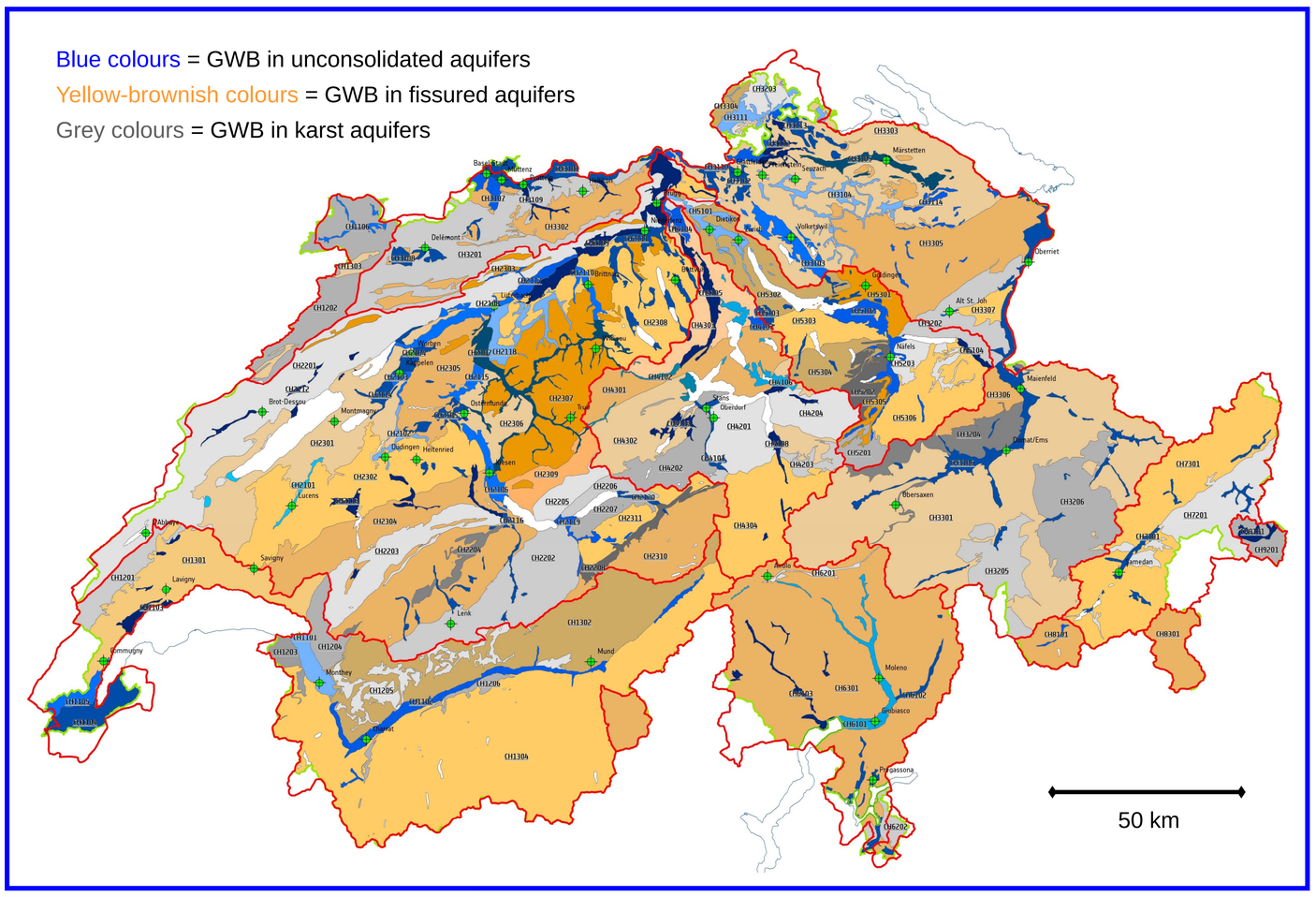
## APPROACH and ASSESSMENT

The definition of key criteria and their integration into a decision flow chart permits to systematically determine the number and dimension of GWB on a uniform basis. Polygon contours follow river-basin and aquifer-type boundaries obtained from the groundwater resources GIS. A further separation is made following criteria for the linkage of polygon surface area and the existence of important groundwater abstraction points. Accordingly, three different solutions are possible, i.e. delineation of a separate GWB, integration into the surrounding GWB, or attribution to the closest related GWB (multipart polygon). Such conjunction of groundwater usage and spatial hydrogeological information accounts for aquifer-specific groundwater management and is in agreement with the objectives of GWB delineation.



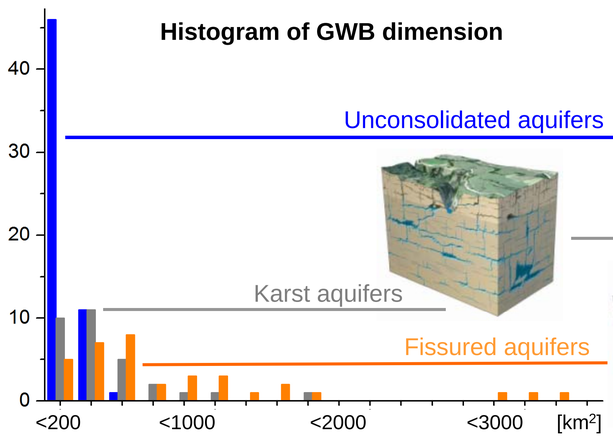



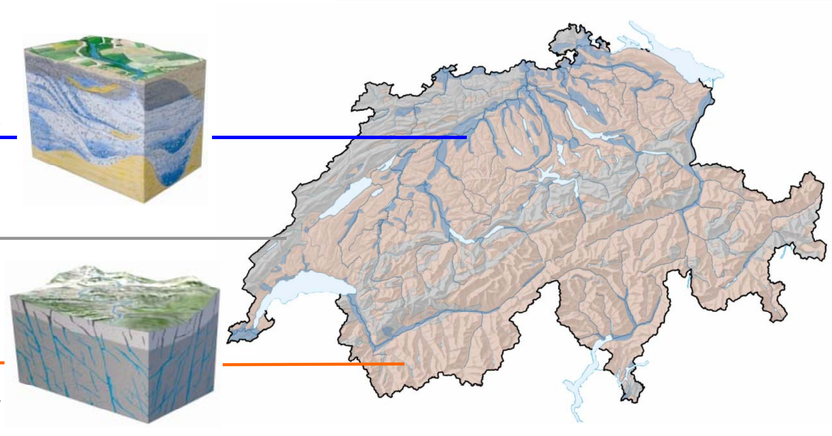
Blue colours = GWB in unconsolidated aquifers
Yellow-brownish colours = GWB in fissured aquifers
Grey colours = GWB in karst aquifers




## RESULTS

Implementation of the approach resulted in the delineation of 124 GWB covering the whole country. Differing surface area criteria for the aquifer types provided a high number of spatially detailed GWB in unconsolidated aquifers, while GWB in fissured and karst aquifer have larger dimensions.



Total number of GWB: **124**

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|---|---|
| Unconsolidated aquifers: | **58** GWB |
| Fissured aquifers: | **35** GWB |
| Karst aquifers: | **31** GWB |

The GWB map displays the typical distribution of hydrogeological units met in Switzerland. It serves as a basic tool for groundwater monitoring reporting, as well as it might be used for an integrated basin management outlying the EU-WFD. Ongoing work focuses on representativeness issues regarding the existing monitoring network as well as GWB grouping for specific purposes.

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