Measurements and AKWA-M® Water Balance Modelling in Wetlands with limited Surface Water Supply

Water Balance Perspectives under Climate Change

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Naturschutzgroßprojekte in Germany:

Since 1979: 56 areas,

26 revitalisations finished.

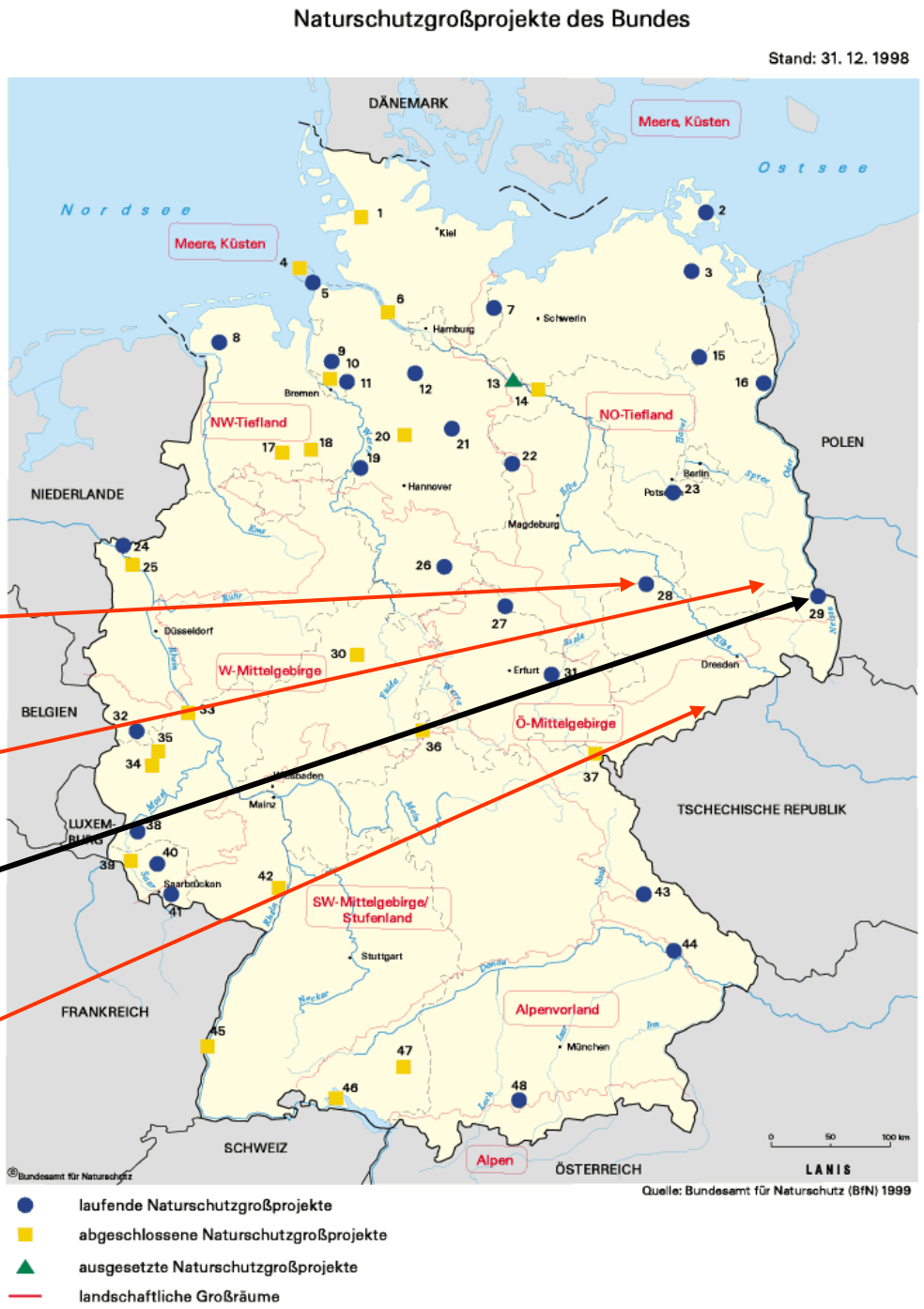
In Saxony: 4 areas.

Presseler Heidewald- und Moorgebiet

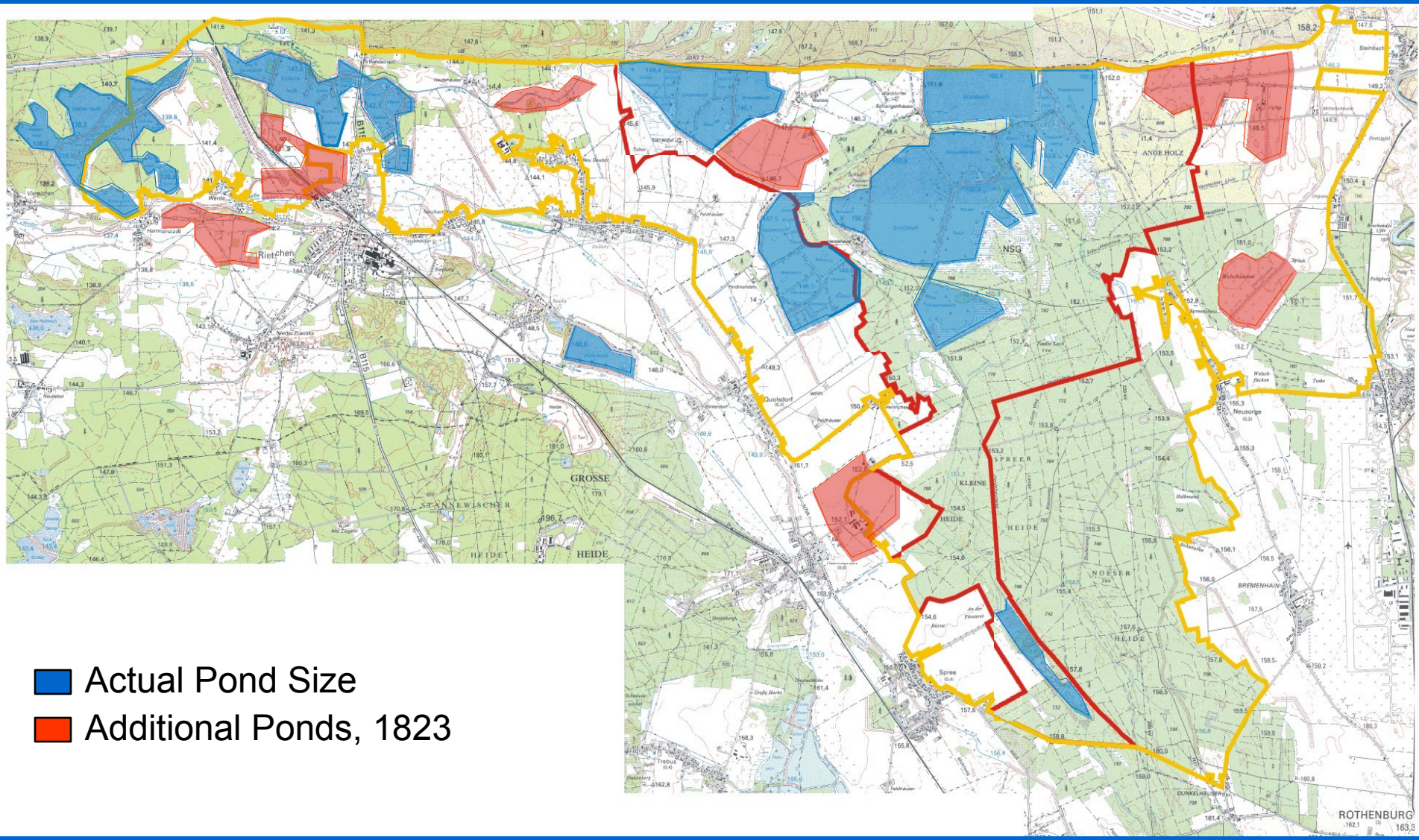
Lake-Land Lausitz

Pond-Land Niederspree

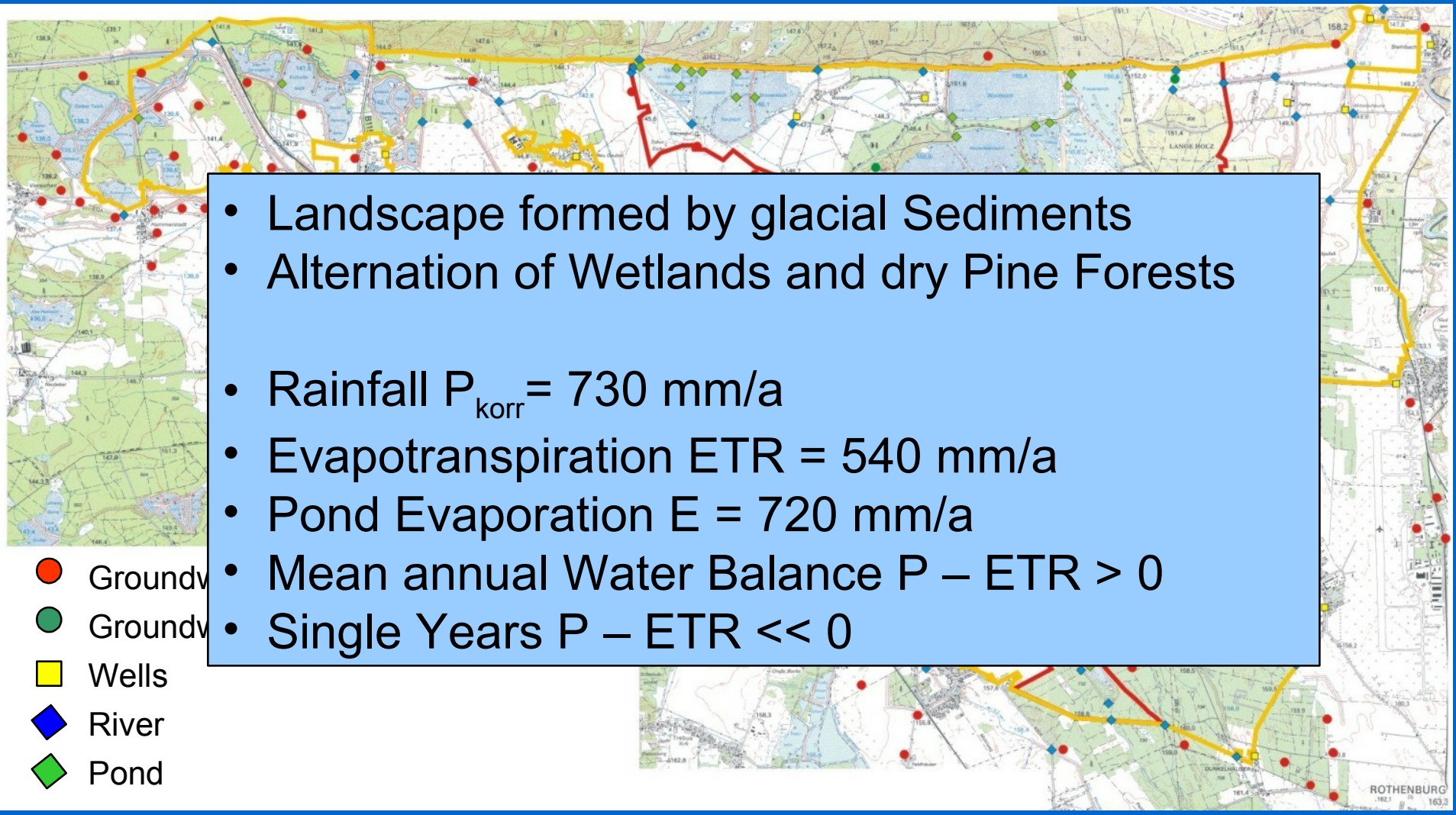
Ore Mountain Hill-Meadows



1 Change of Pond Size since 1823



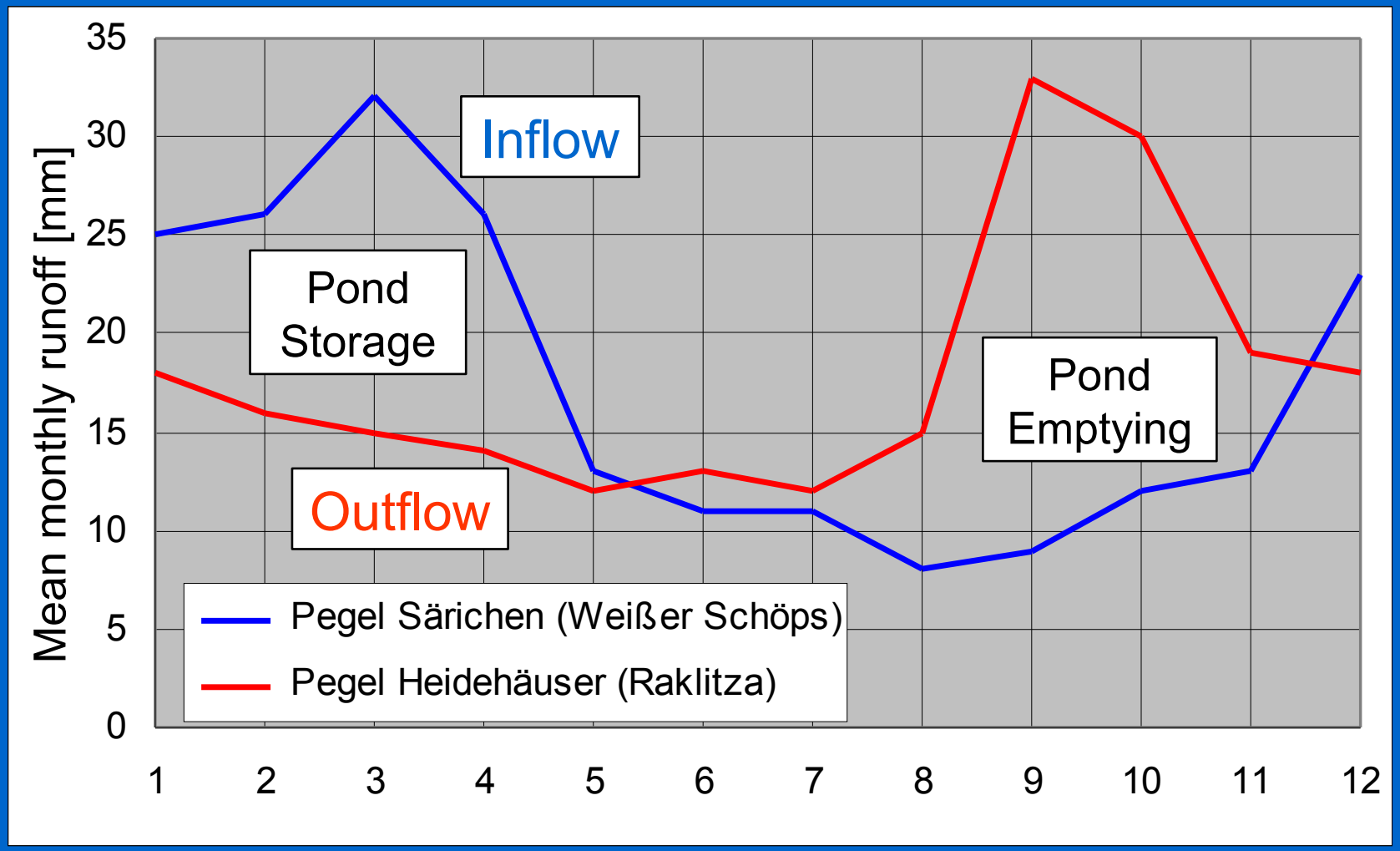
2 Hydrological Monitoring



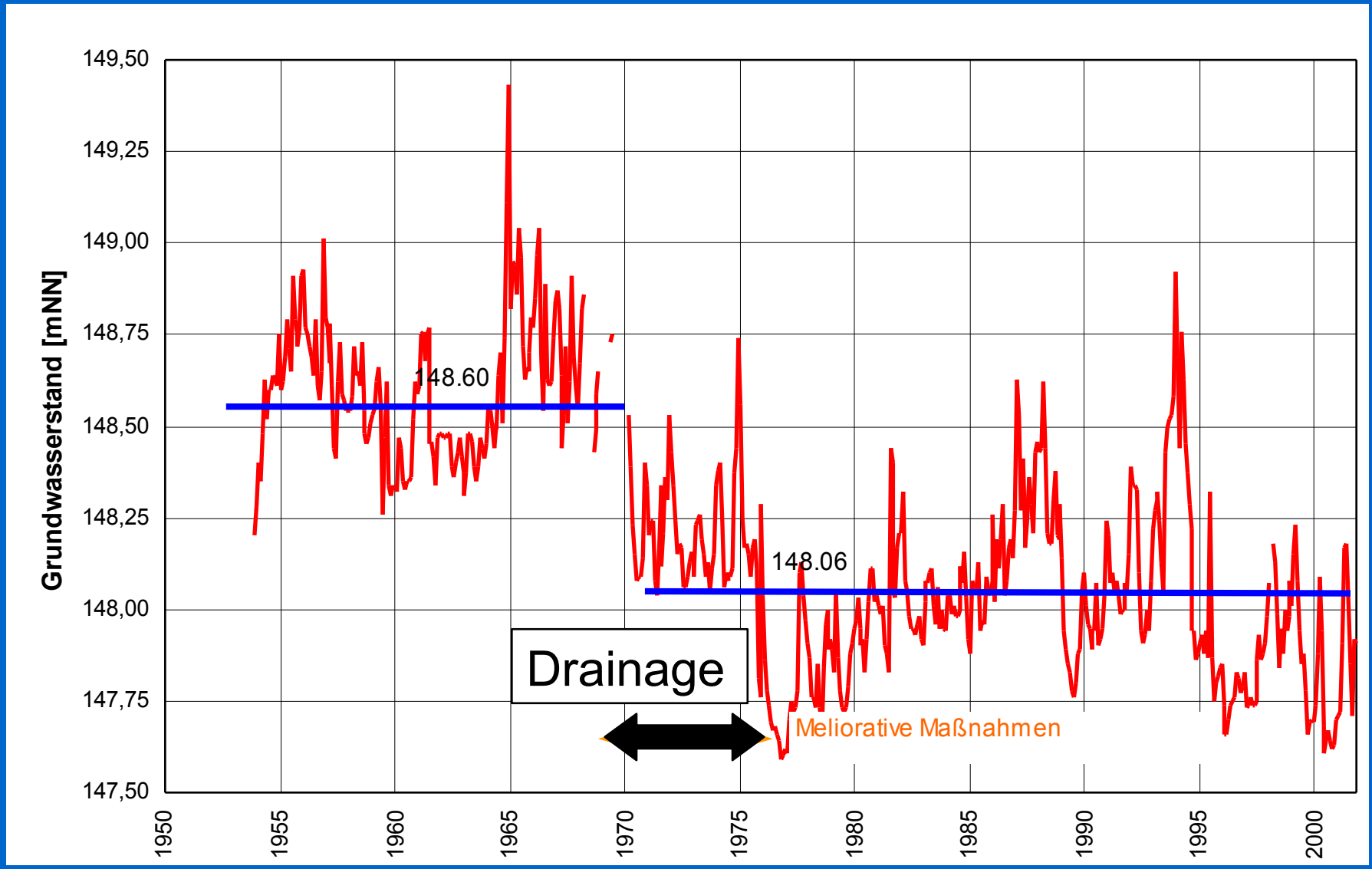
- Landscape formed by glacial Sediments
- Alternation of Wetlands and dry Pine Forests

- Rainfall P_{korr}= 730 mm/a
- Evapotranspiration ETR = 540 mm/a
- Pond Evaporation E = 720 mm/a
- Mean annual Water Balance P – ETR > 0
- Single Years P – ETR << 0

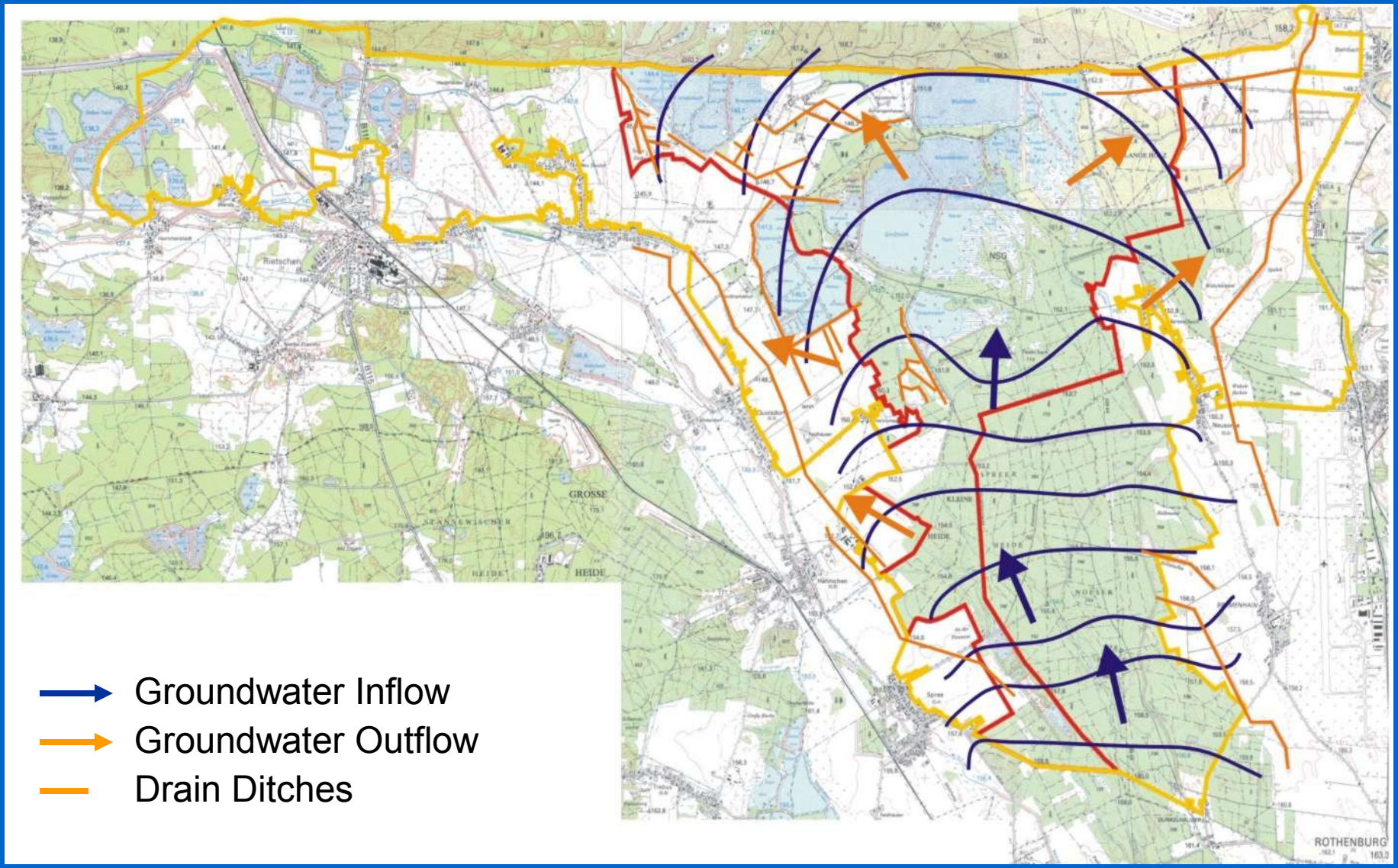
3 Pond Water Storage changes Discharge



4 The Effect of the former socialist Agriculture – Dewatered Landscapes



5 Groundwater Dynamic modified by Drainage



7 Climate-Change Impact on Water Ressources and Project Design *(KLEMEŠ 2000)*

„The general message from the current climate-change research is that the climate can get ‚worse'. If it should get ‚better', we need not worry.

This can be translated readly into impacts on water ressources, with no need for models, computers, scenarios, sensitivity analyses, algorithms and esoteric jargon.

It boils down to the possibility of the following:

1. Less water available,
2. Greater extremes,
3. Less advantageous seasonal distribution of precipitation and / or runoff."

Water Balance Model AKWA-M®

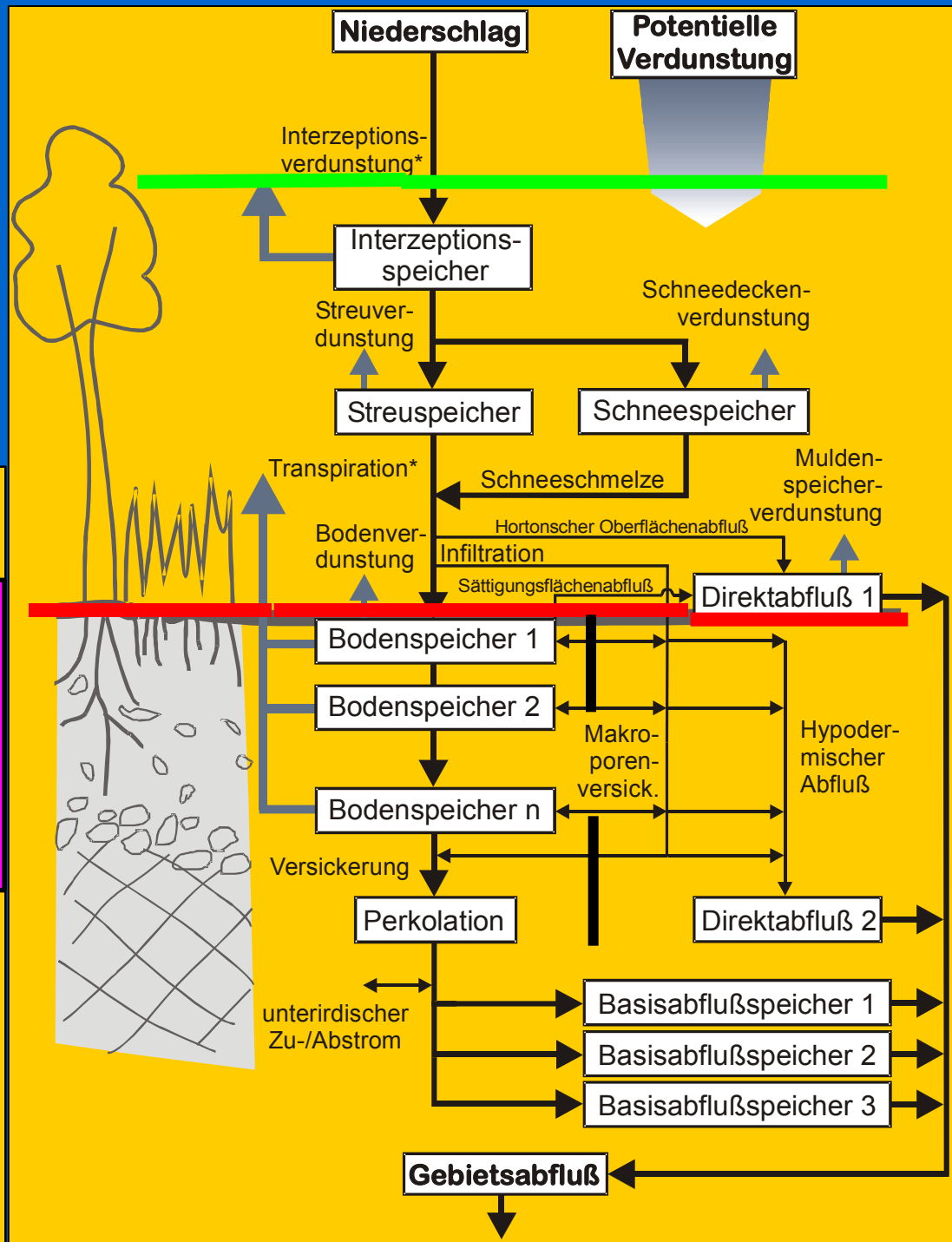
Data:

- Climate/Weather (mon, d, h, min)
- Discharge
- Groundwater Level
- Soil Moisture a.s.o.

Input and Control

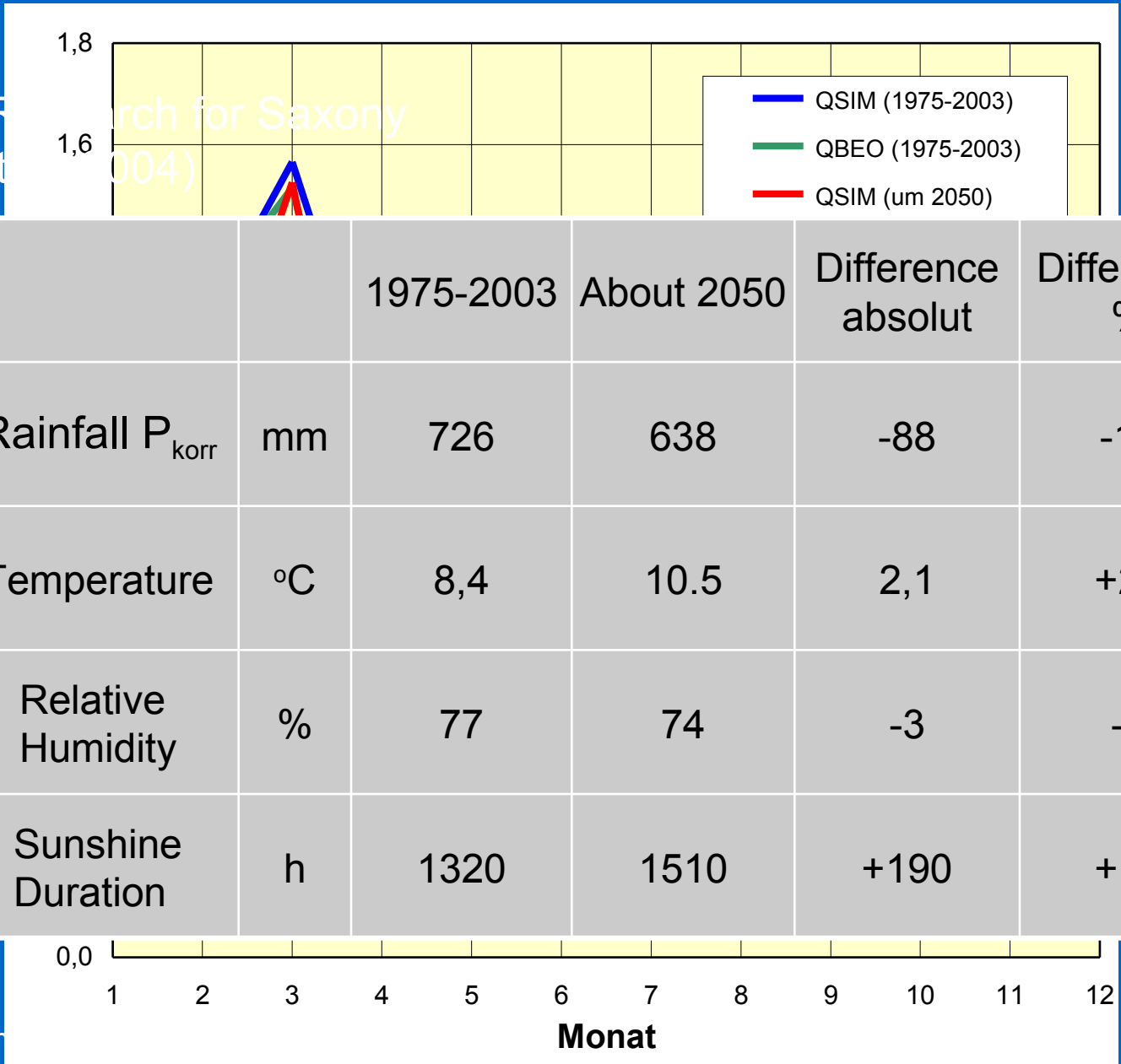
- DGM or Laser-Scan
- CIR-Landuse
- Vegetation
- Soil, Geology

Area



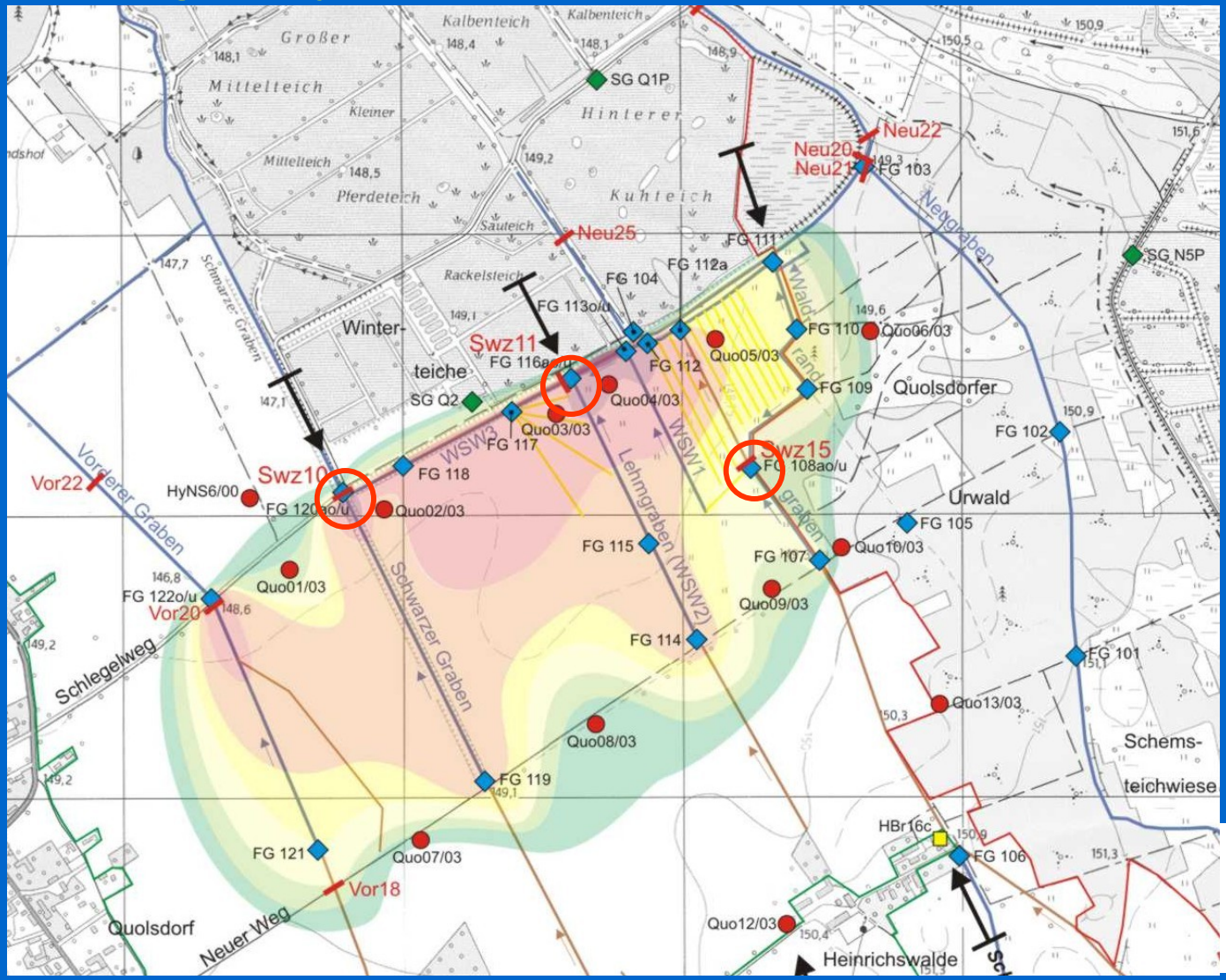
9 Climate Change and Runoff (AKMA-M®)

Climate R rch for Saxony
(ENKE et 004)

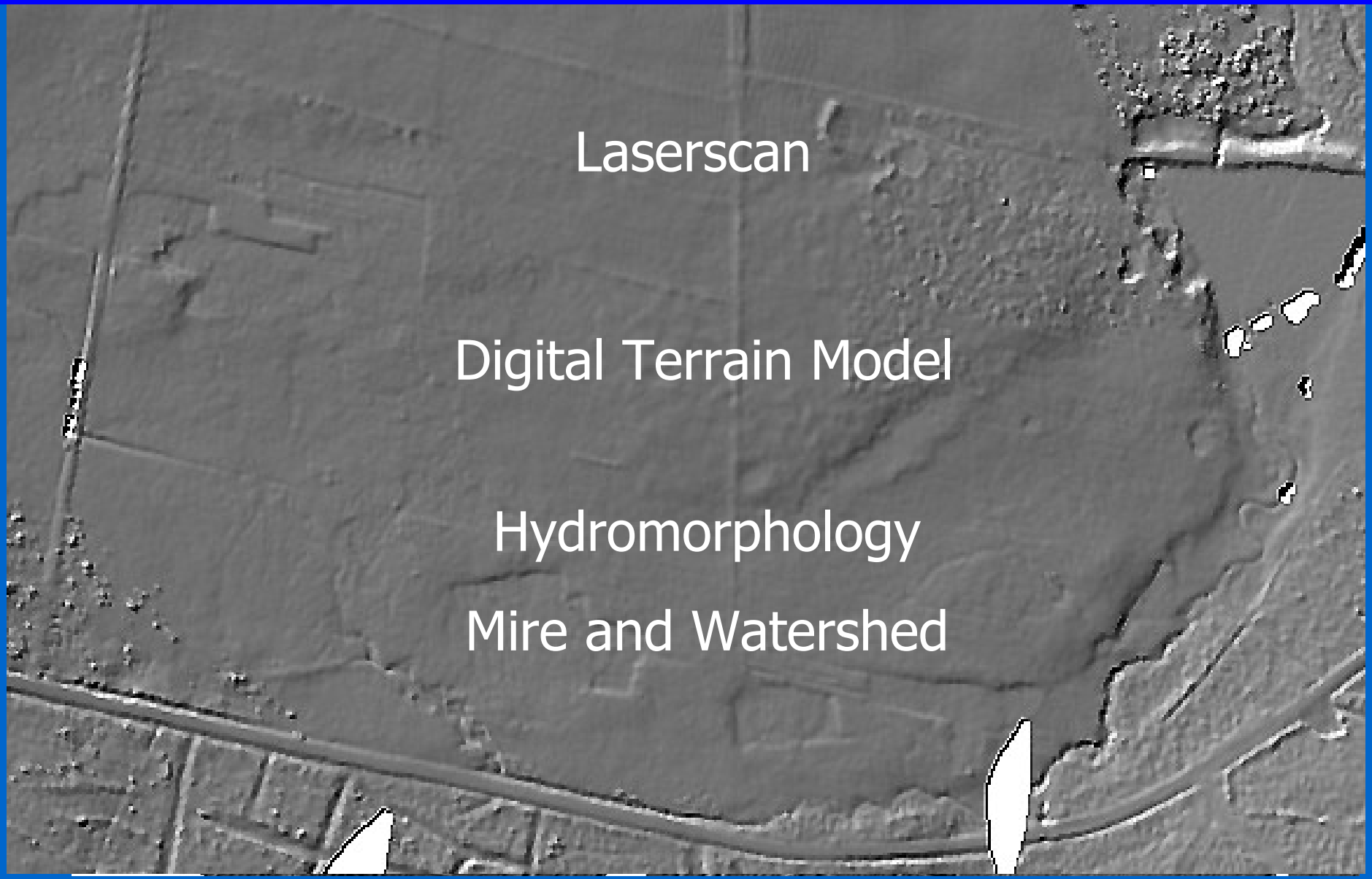


		1975-2003	About 2050	Difference absolut	Difference %
Rainfall P_{korr}	mm	726	638	-88	-12
Temperature	°C	8,4	10.5	2,1	+25
Relative Humidity	%	77	74	-3	-4
Sunshine Duration	h	1320	1510	+190	+14

10 Planning of Groundwater Level Rise by means of geohydraulic Models



11 Planning of Groundwater Level Rise by means of geohydraulic Models – Terrain Surface



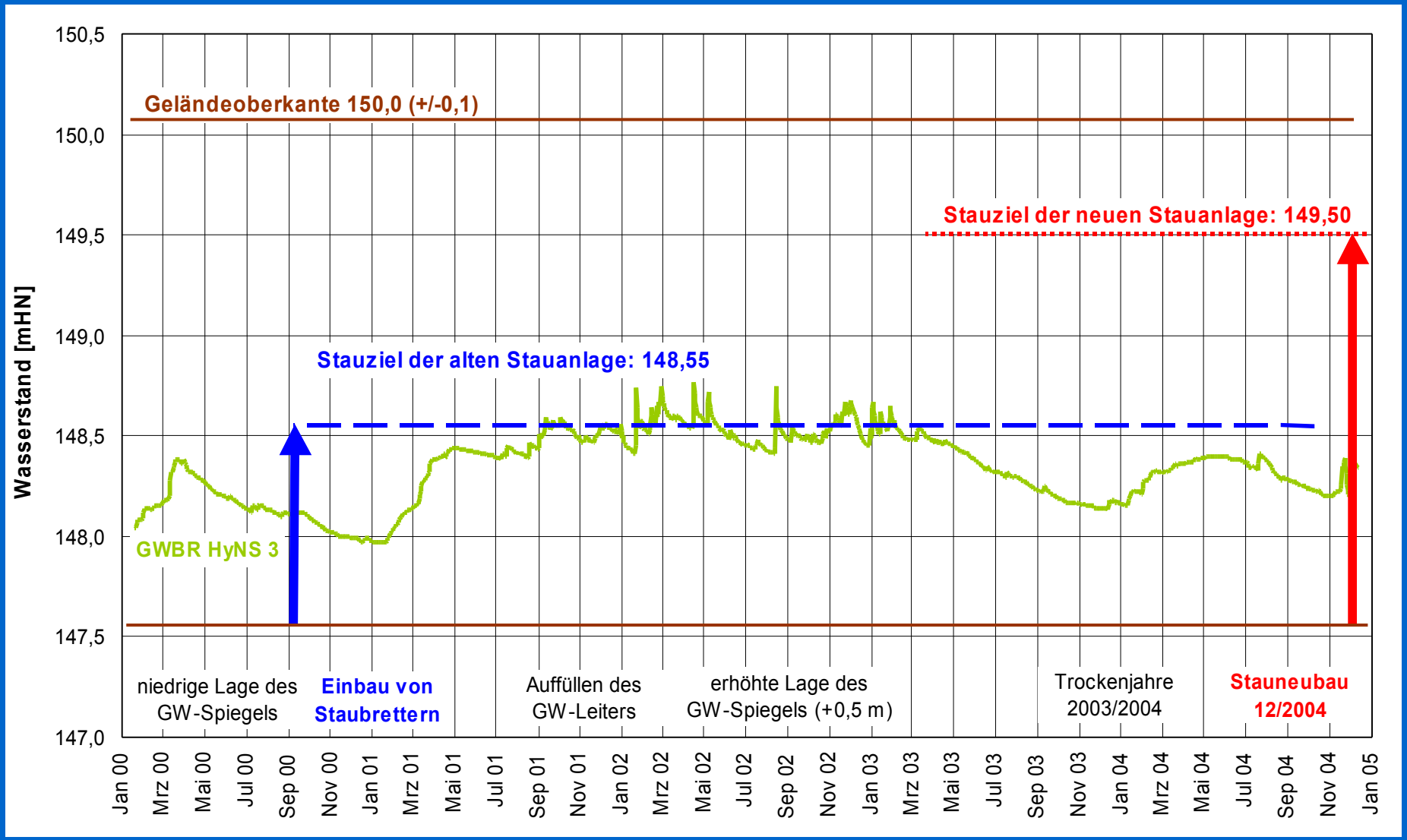
12 Planning of Groundwater Level Rise by means of geohydraulic Models

August 2000 Grabenräumung

September 2000

Stauneubau
December 2004

13 Exemple: Groundwater Level Rise



14 Conclusions

A possible climate change is not the main problem for wetlands in glacial formed landscapes. It is the dominant influence of many drainage systems.

To prevent negative impacts on wetlands:

Restore the original geohydraulic characteristics (water level and/or inflow quantity) by design of measures based on carfull monitoring and water balance data, hydrogeological knowledge and geohydraulic science.