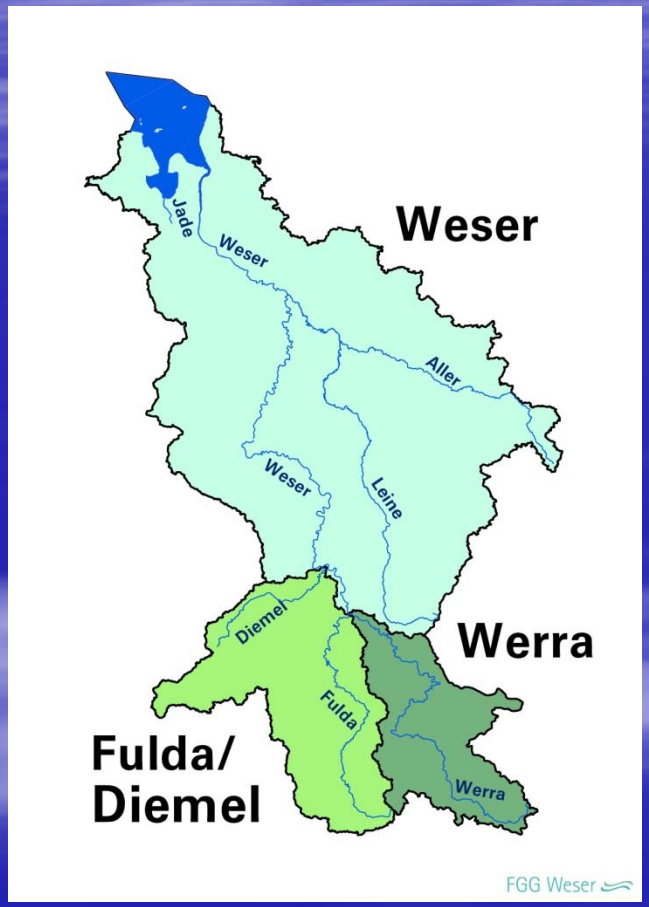
Water-Quality Data-Assessment of Long-Term Time Trends Weser River Basin, Germany – A Case Study



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Simon Henneberg, Weser River Basin Commission, Hildesheim, Germany

in Collaboration with Houshang Behrawan, Friedrich Schiller-University of Jena, Germany

National Water Quality Monitoring Council
7th National Monitoring Conference
Monitoring from the Summit to the Sea
Denver, Colorado USA, April 28, 2010

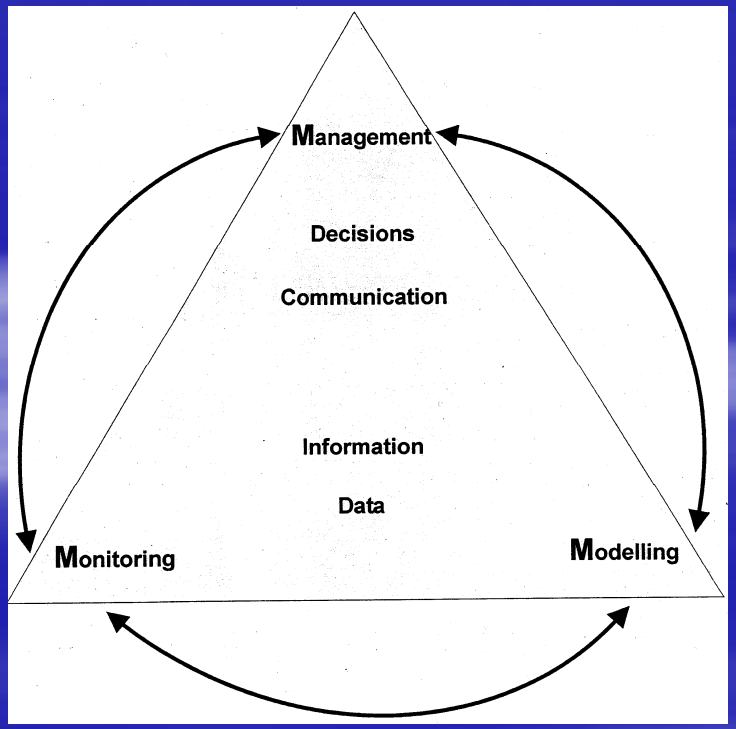
[1] *Support by the Alexander von Humboldt Foundation, Bonn, Germany, is hereby acknowledged.*

Outline of this Presentation:

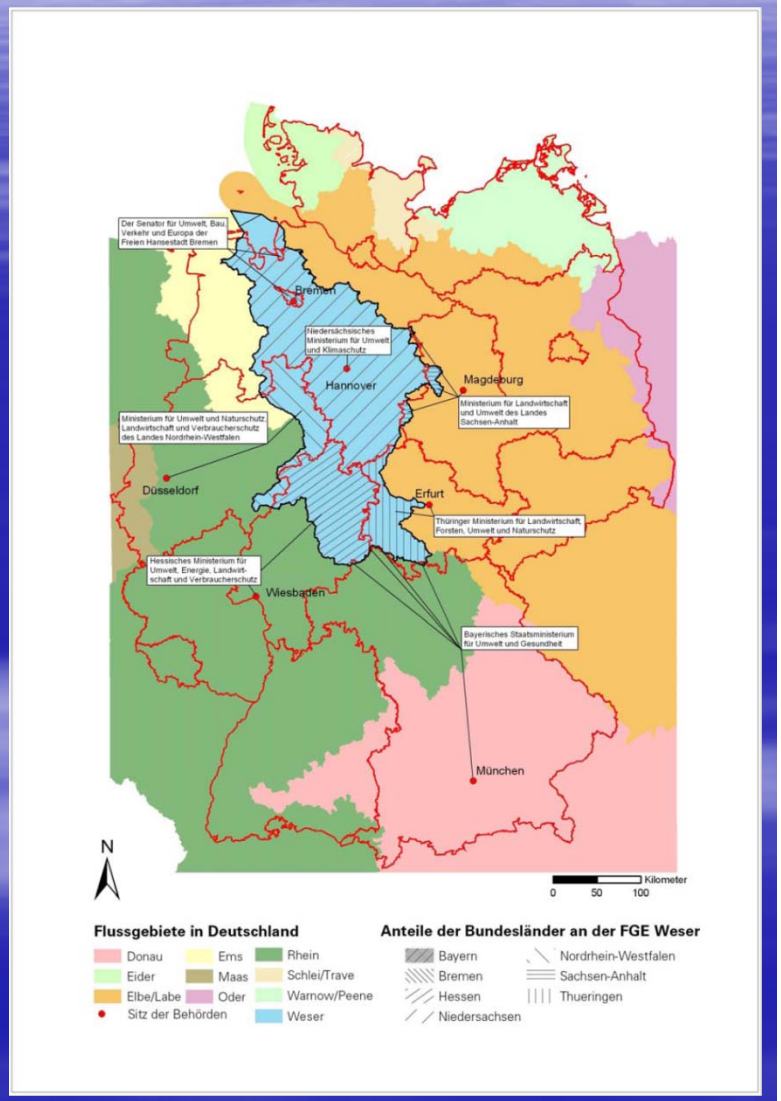
- Monitoring Data – the Critical Basis for Assessment
  - *Long-term (30-year) records for four sites in the basin*
  - *Data accessible through the internet (www.FGG-Weser.de)*
  - *Streamflows and a range of water-quality variables*
- EU's Water Framework Directive – Highlights
  - *Executed in 2000 with sequential deliverable milestones*
  - *Integration of monitoring plan with river-basin management plan*
  - *Identify resource-management issues needing further consideration*
- Relationship of monitoring data with economic activities
  - *Time trends for specific water-quality variables*
  - *Changes in economic development and beneficial impacts*
  - *Possible consideration of other kinds of adverse WQ impacts*

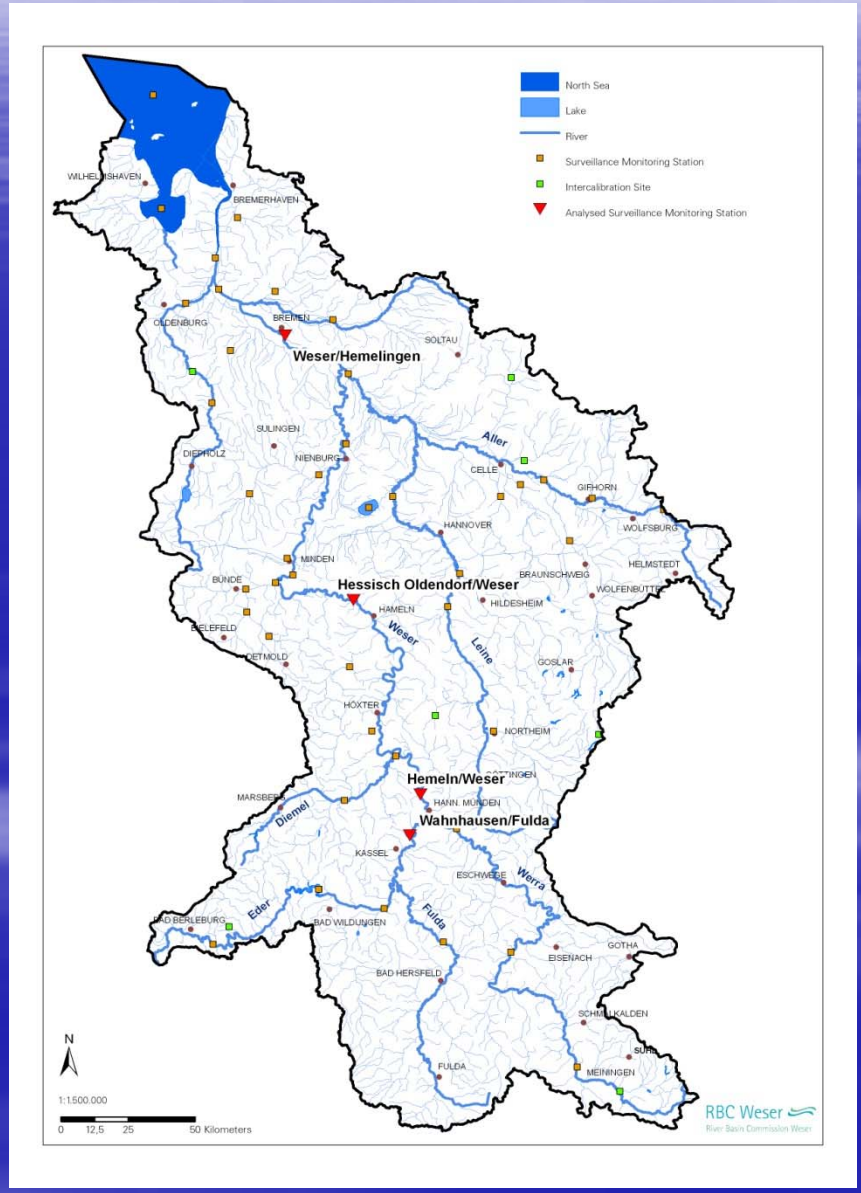
Integrated Watershed Approaches – The 3M Concept

- ***M***onitoring Data
- WQ Load "***M***odel"
- Watershed ***M***anagement

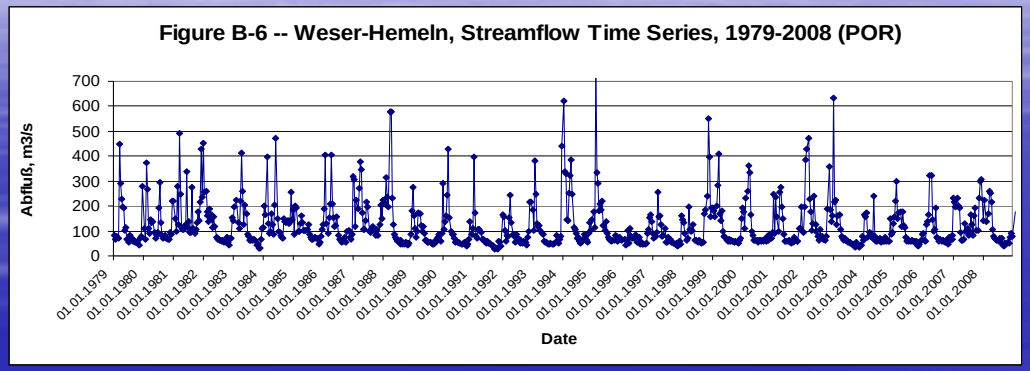


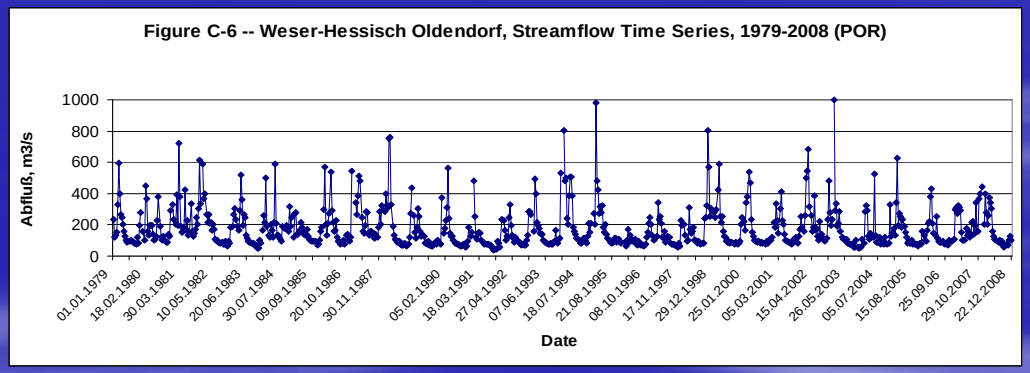
Weser River Basin (49,000 km²)

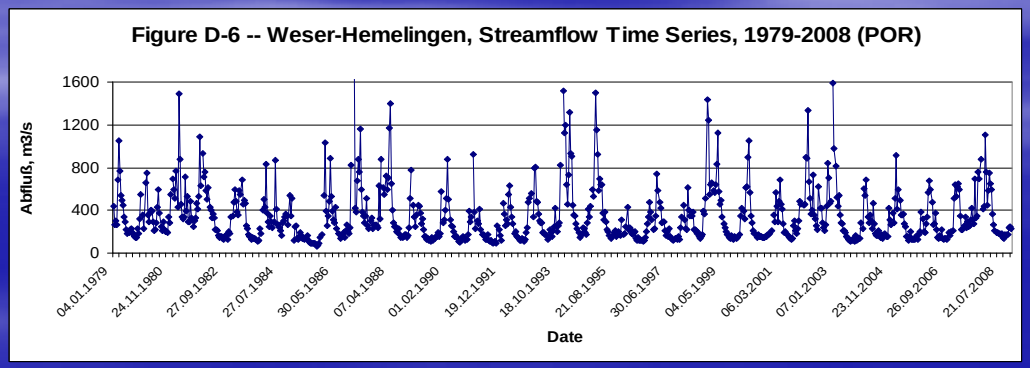




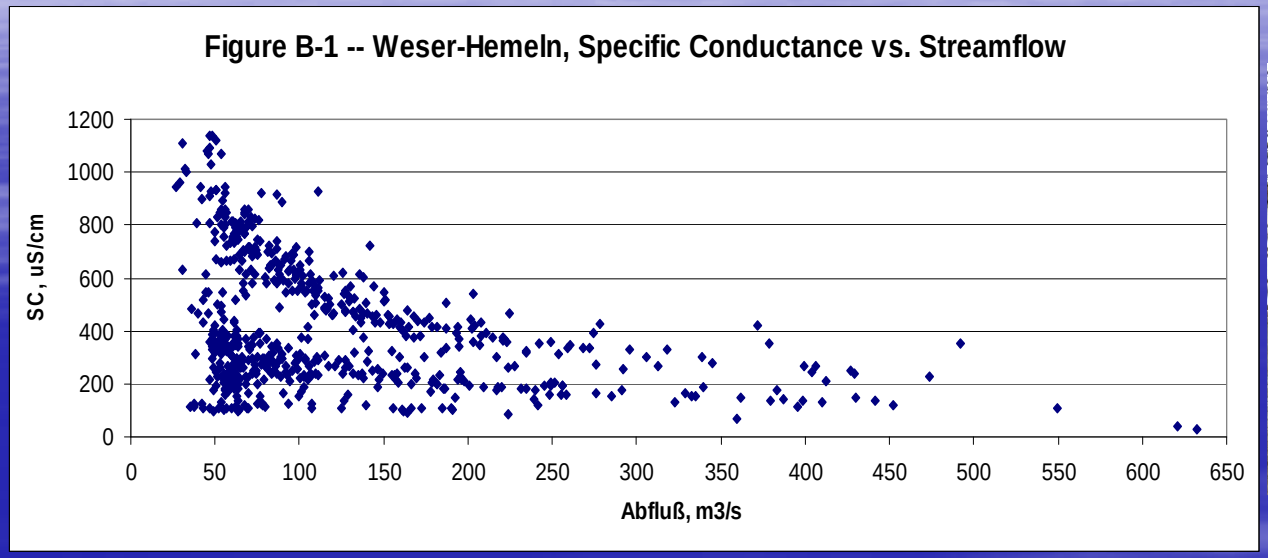
Weser River Time-Series Data, Streamflows

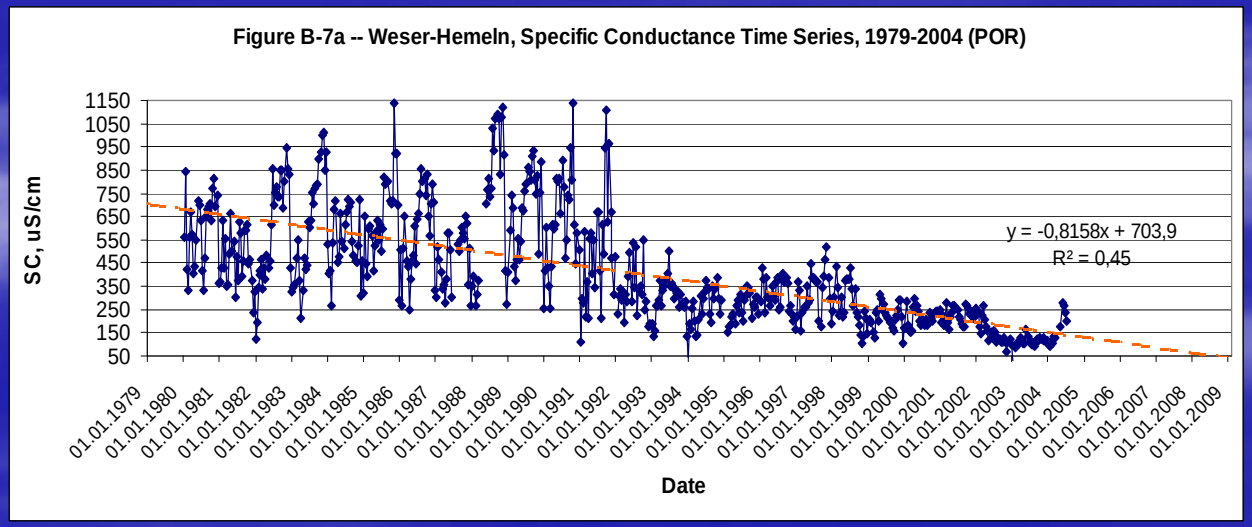




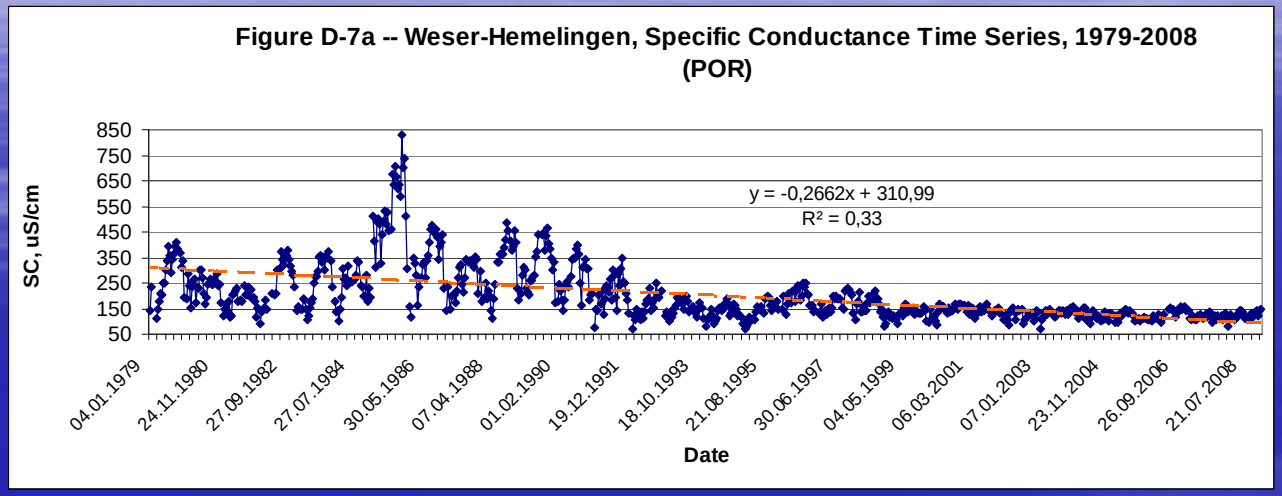


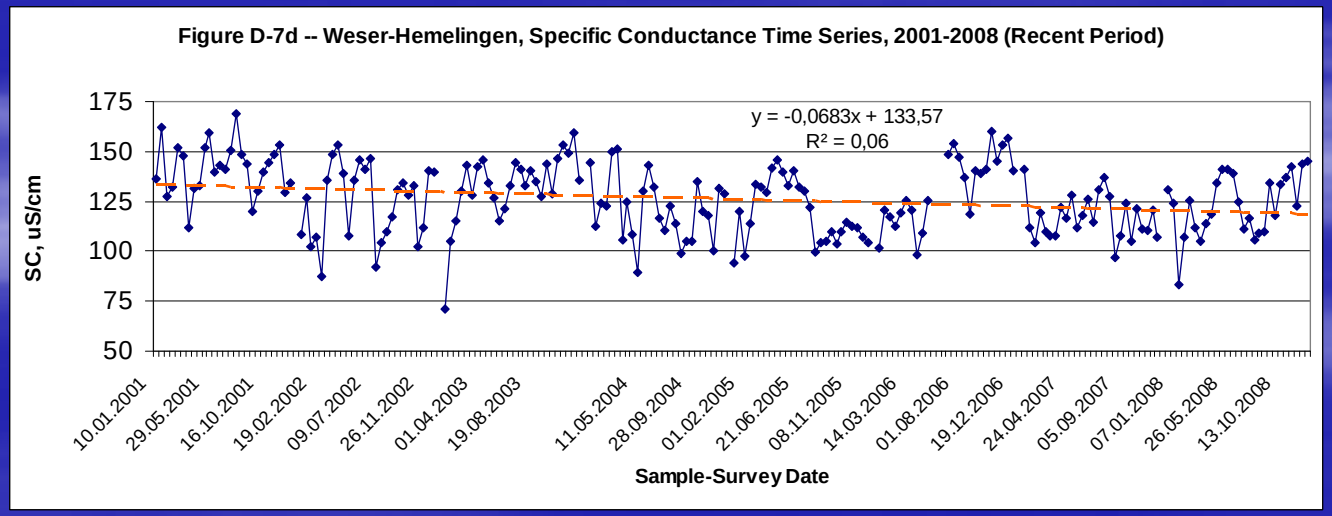
Weser River Basin, Conductivity Characterization



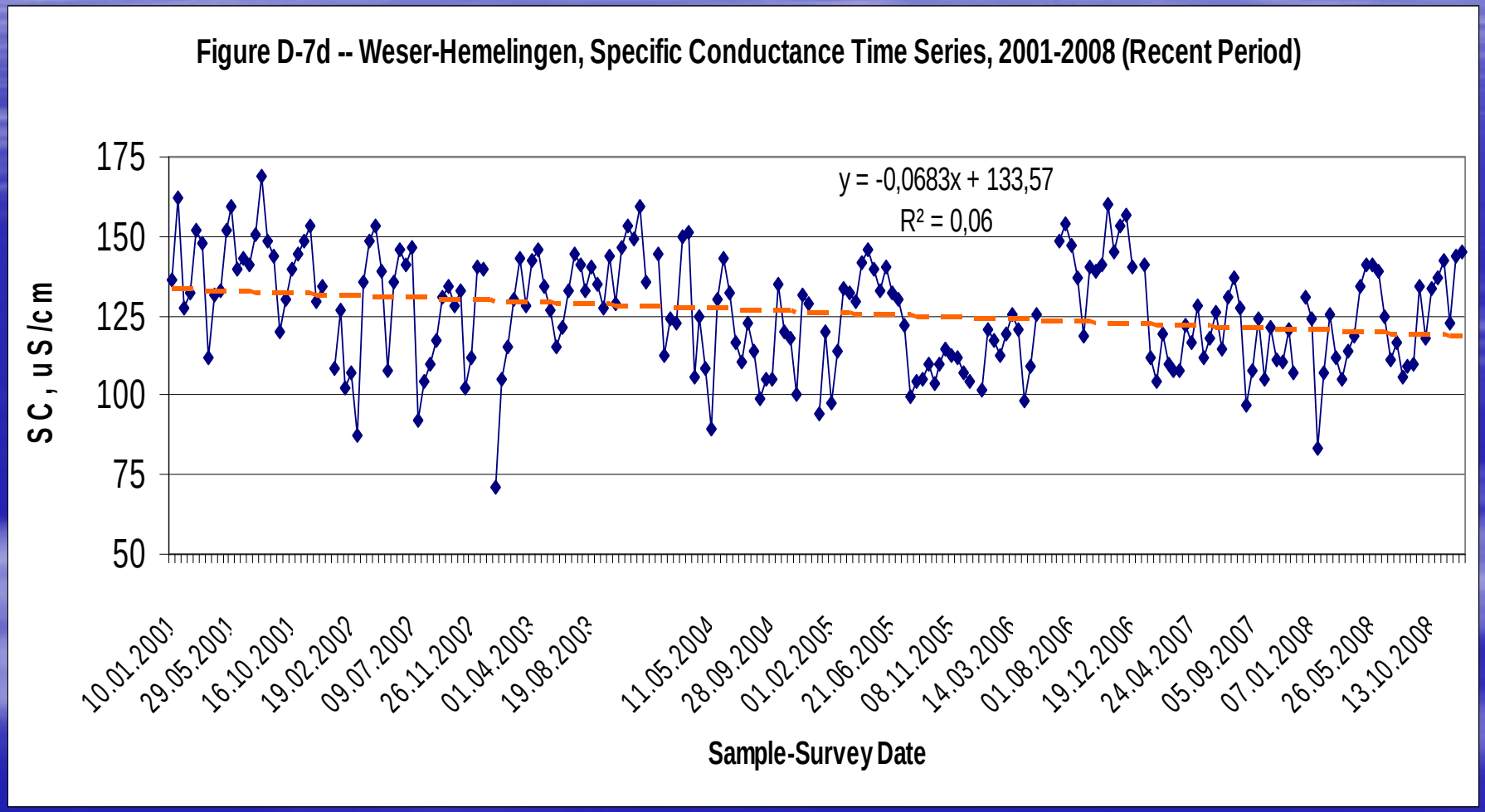


Weser River Conductivities -- A Closer Look





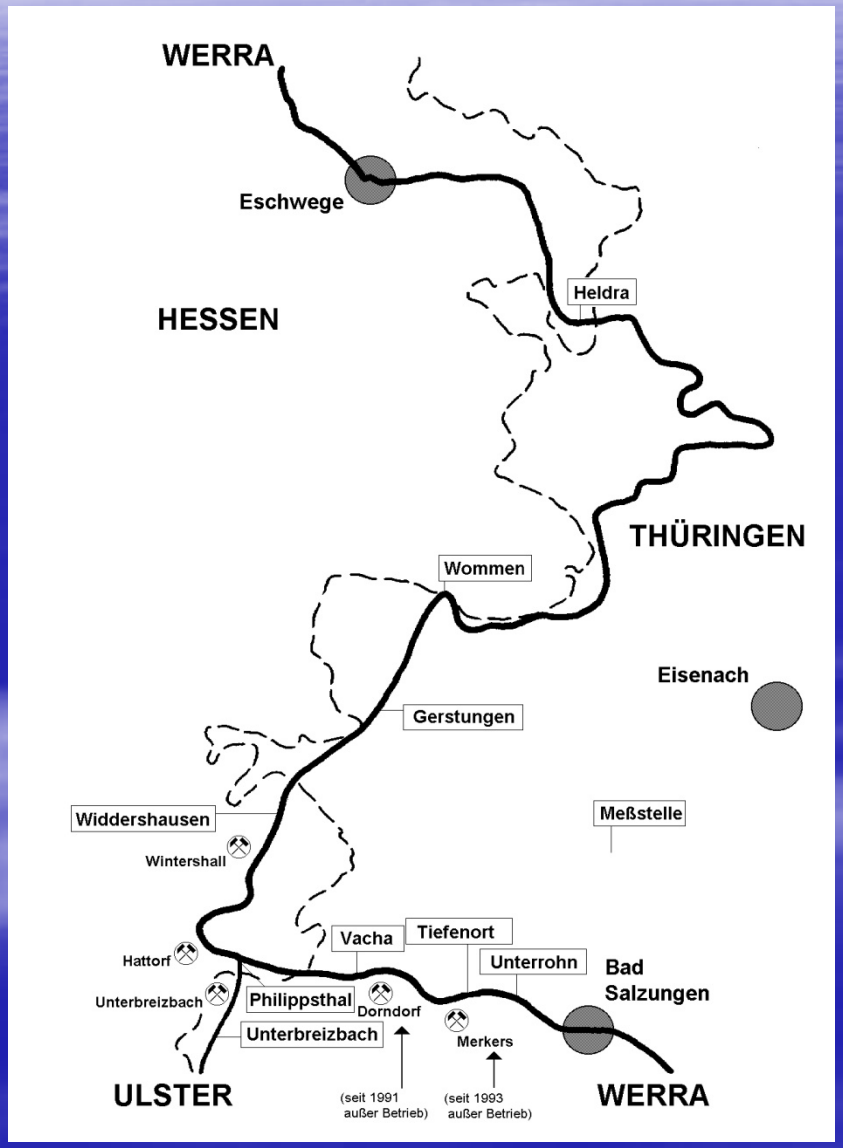
Weser River – Hemelingen, Recent SC Time Series



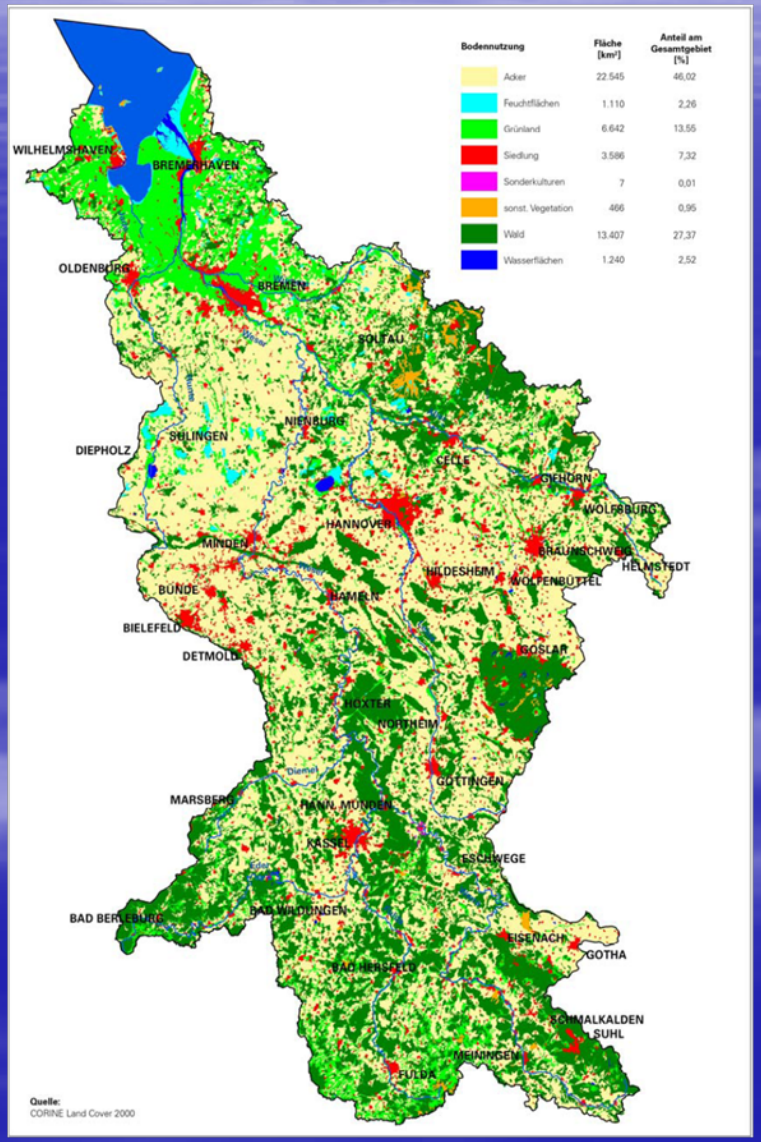
Salt Loadings to the Weser River System

- Salt mines closed, primarily Werra River tributary
- Other remedial activities (river-basin mgmt. plan)
- Monitoring data confirm beneficial effects of remedial actions

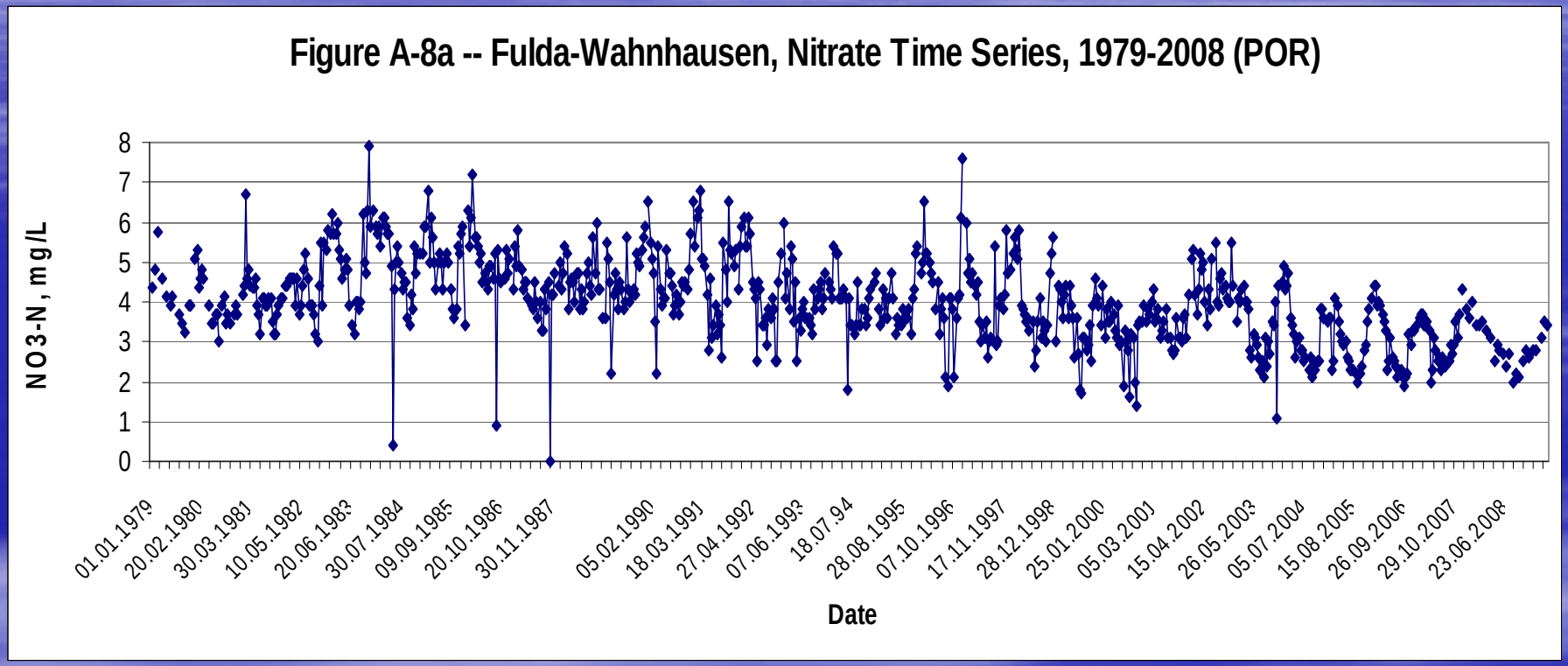
Werra River Ulpper Tributary to the Weser River – Impacts



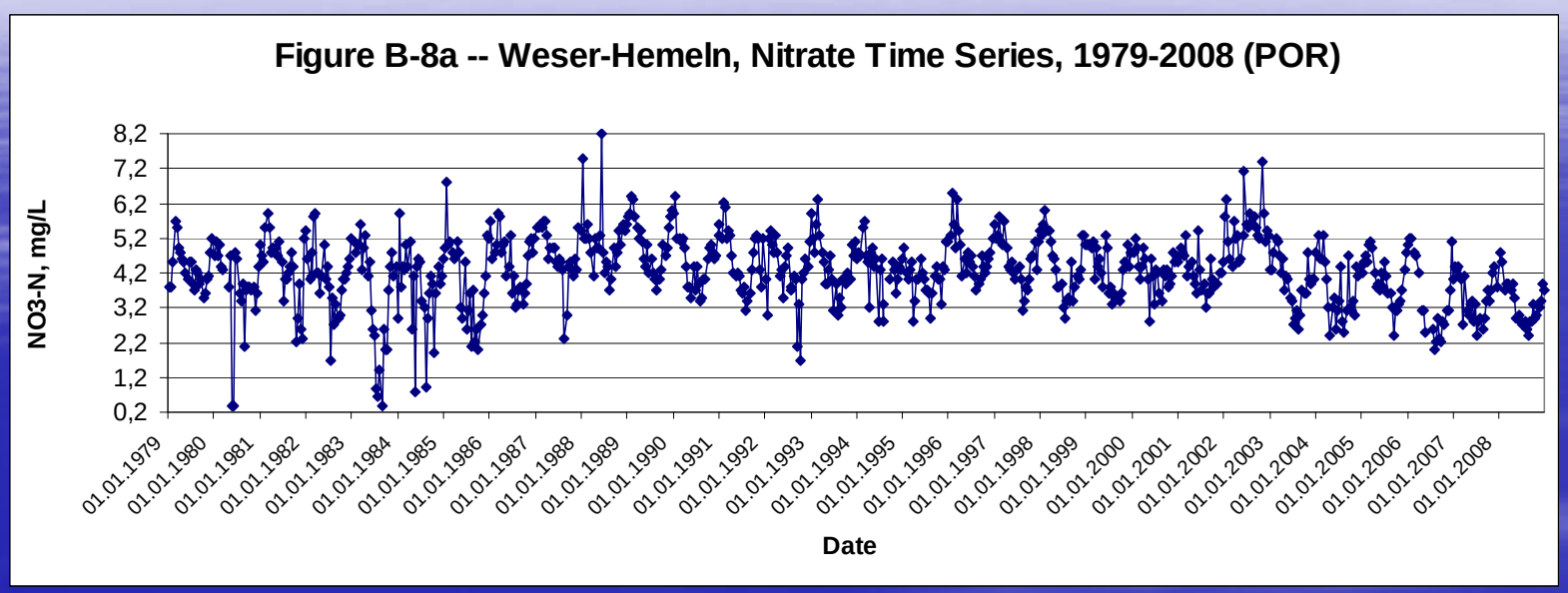
Weser River Basin – Land Uses

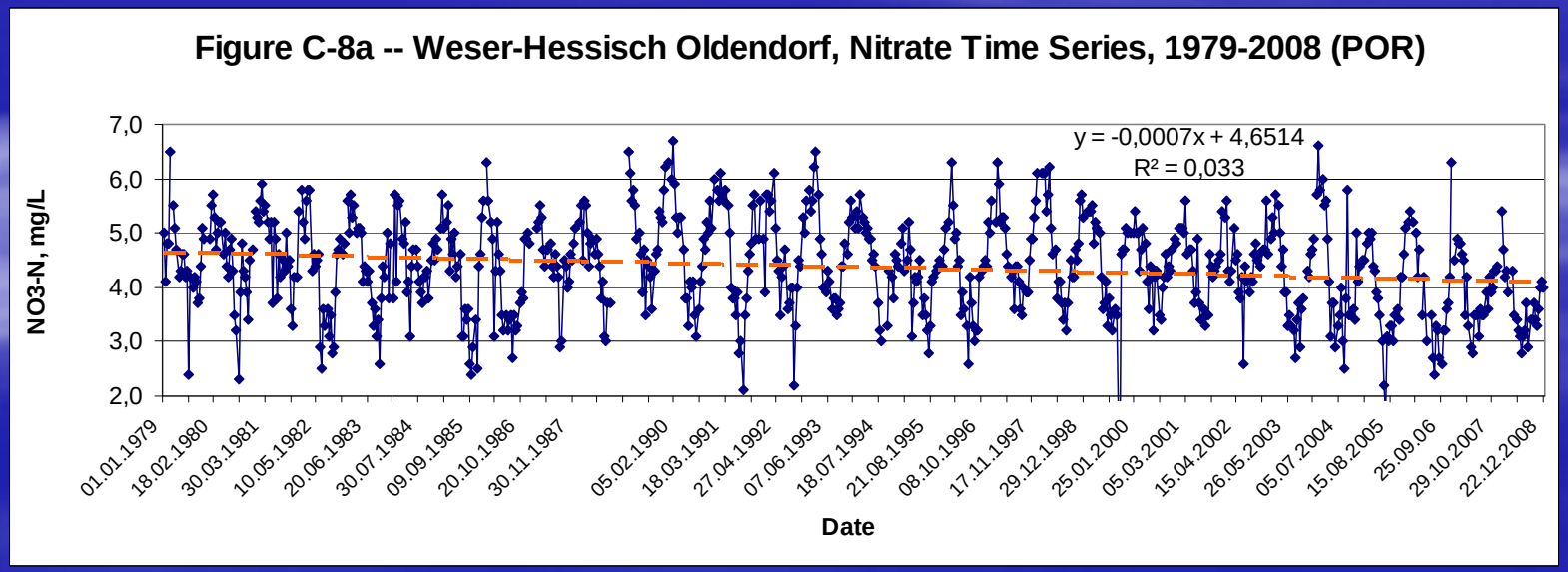


Weser River Basin, Nutrients Conditions Upstream

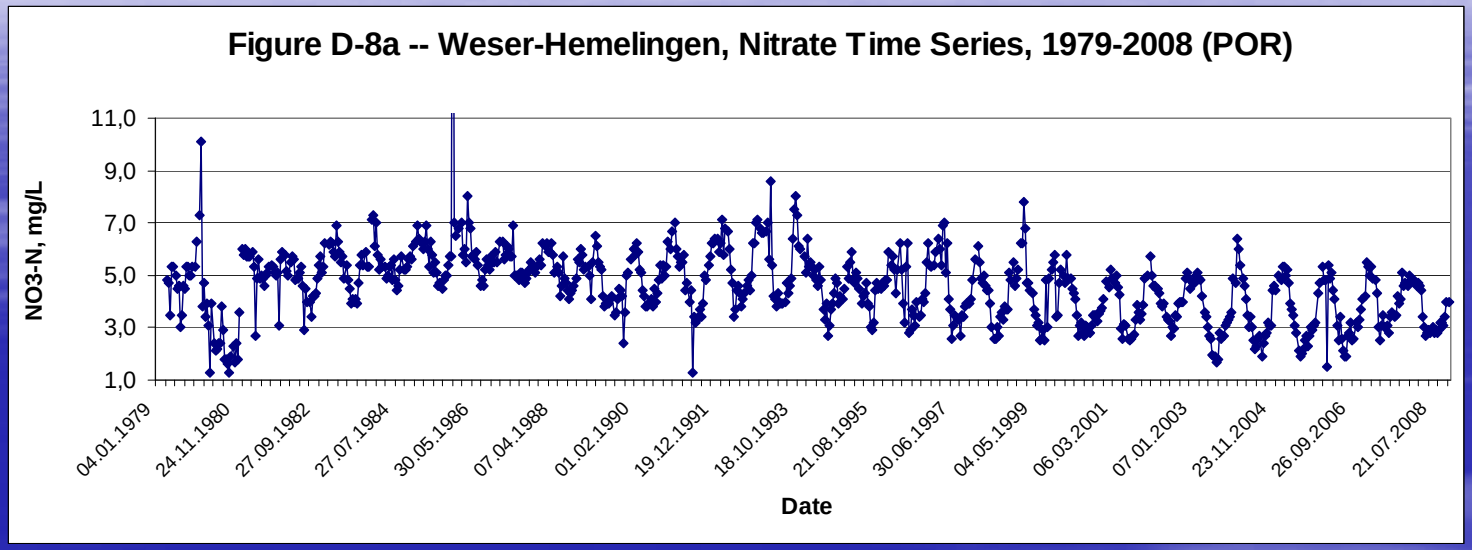


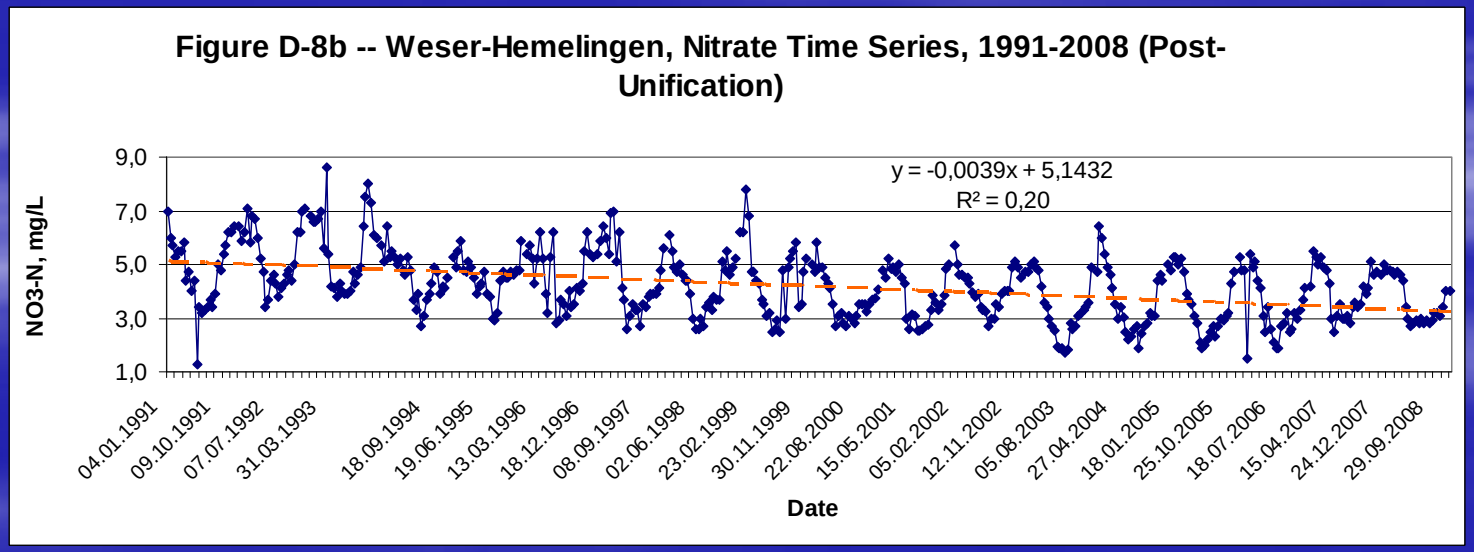
Weser River – Downstream Nitrate-Concentration Patterns





Weser River – Hemelingen, Nitrate Time Series

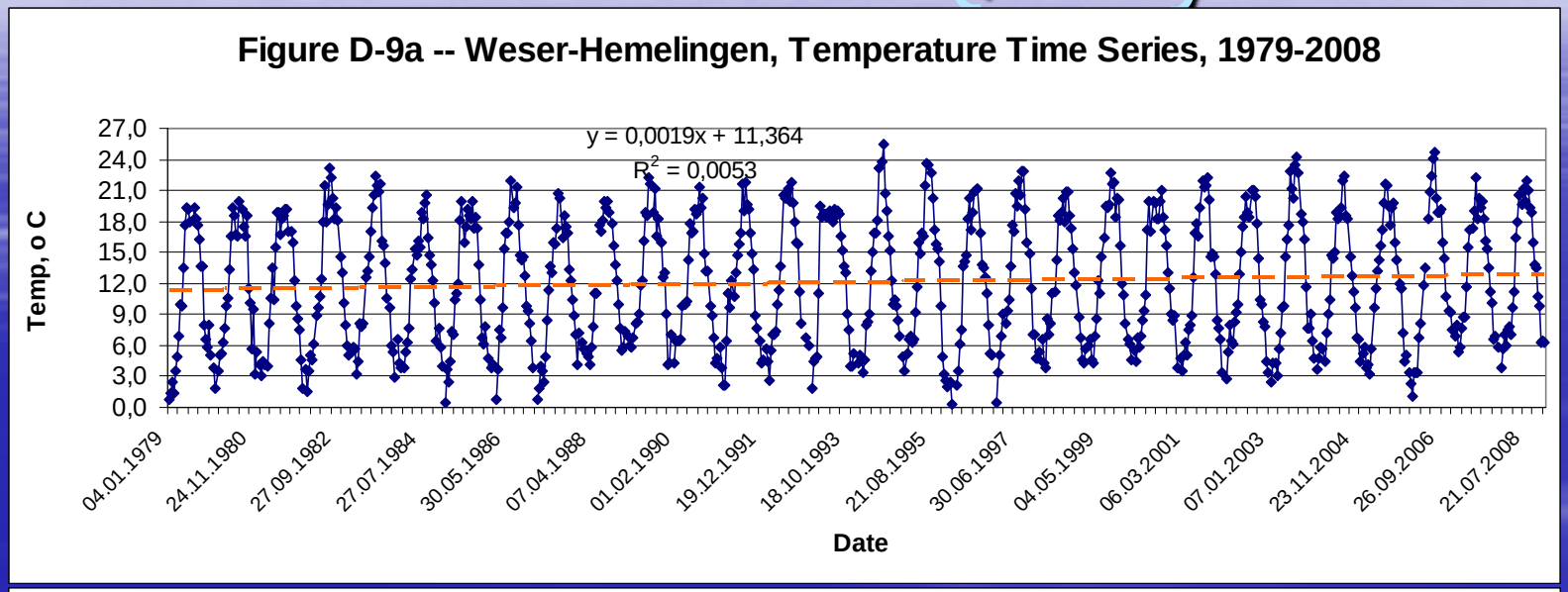


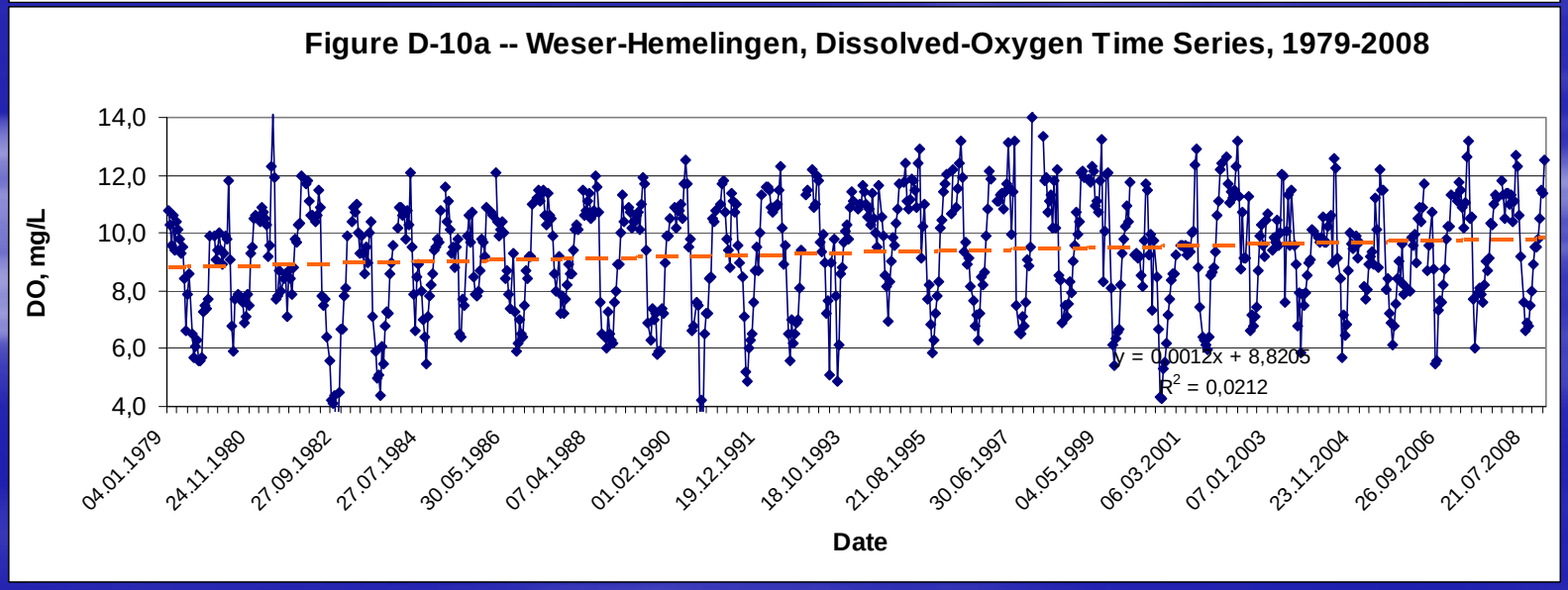


Changes in the Weser River Basin Affecting Nutrient Loads

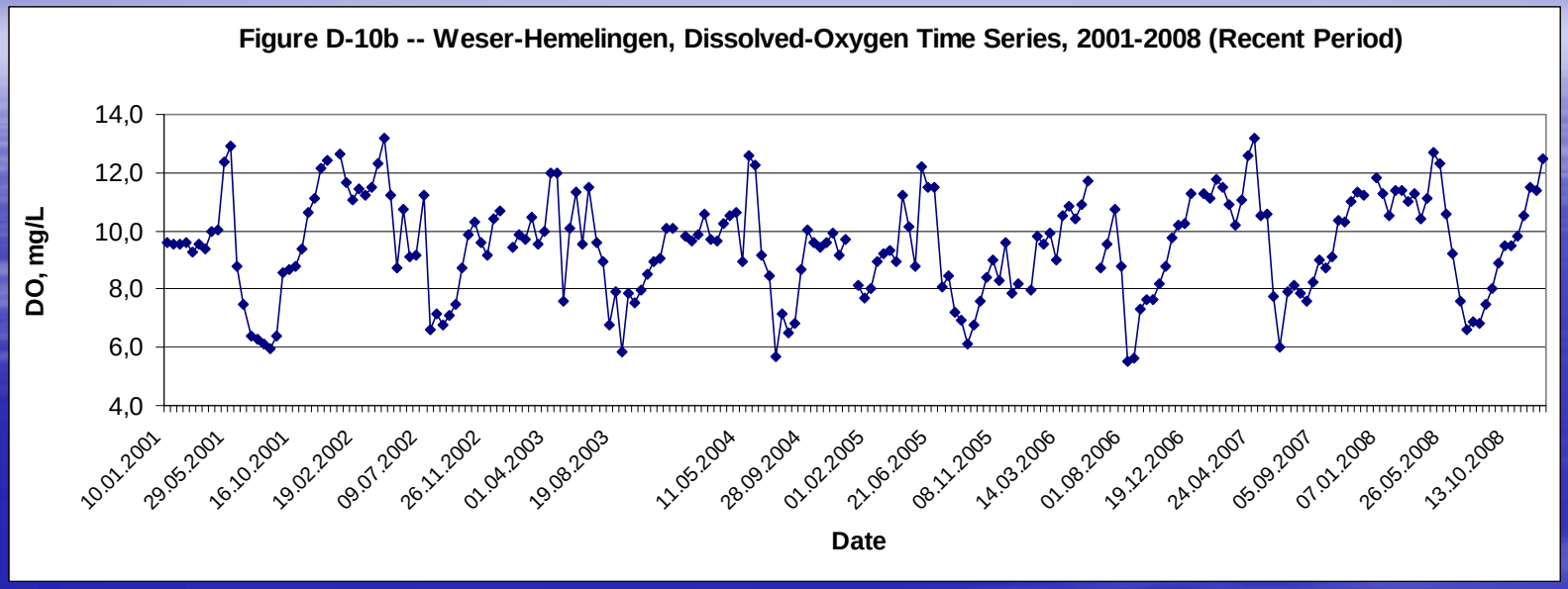
- WWTP upgrades have been implemented
- Phosphorus not considered here (future topic?)
- Application of fertilizers on agricultural lands
- AGRUM model, used to assess beneficial impacts
- Net effect, average upstream-to-downstream NO3-N concentrations (1991-2008):
  - Fulda River-Wahnhausen, 3.7 mg/L
  - Weser-Hemeln, 4.2 mg/L
  - Weser-Hessisch Oldendorf, 4.3 mg/L
  - Weser-Hemelingen, 4.2 mg/L
  - These represent about a 10-percent reduction from POR values

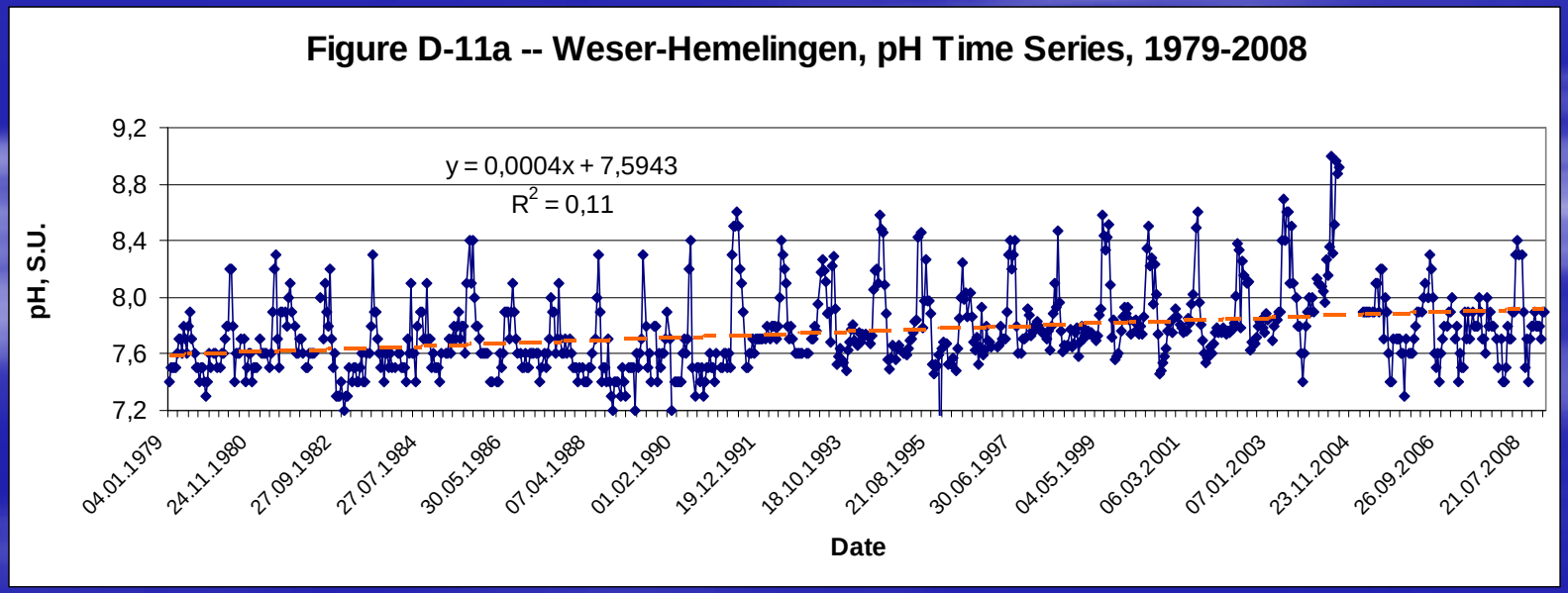
Other Selected Water-Quality Variables



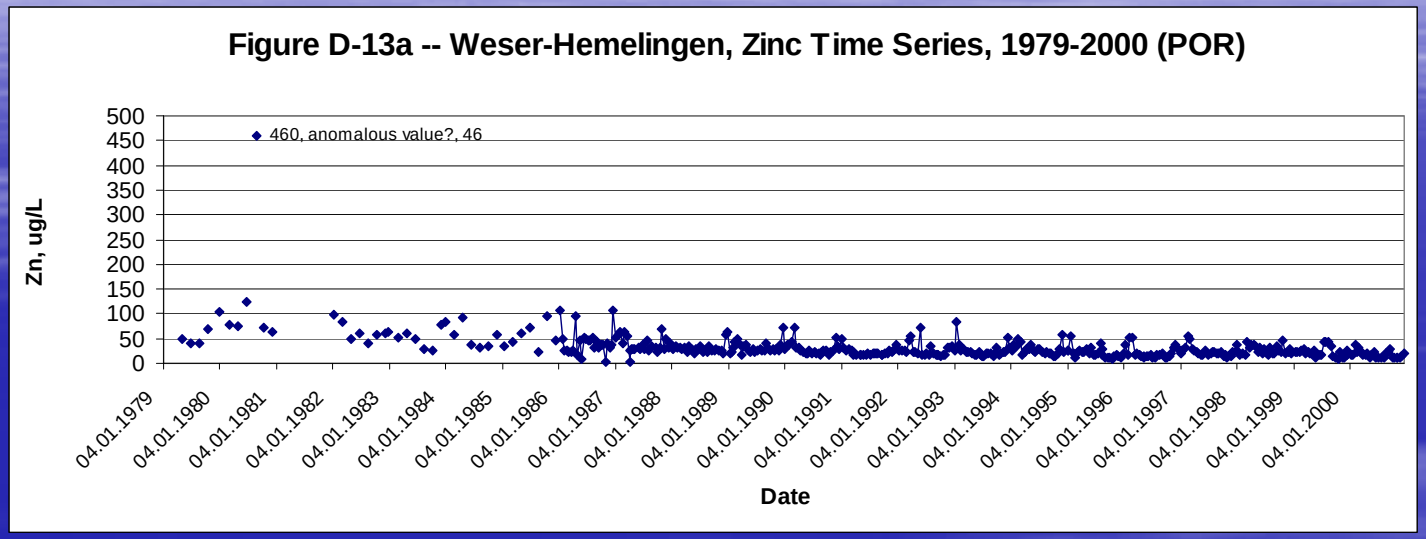


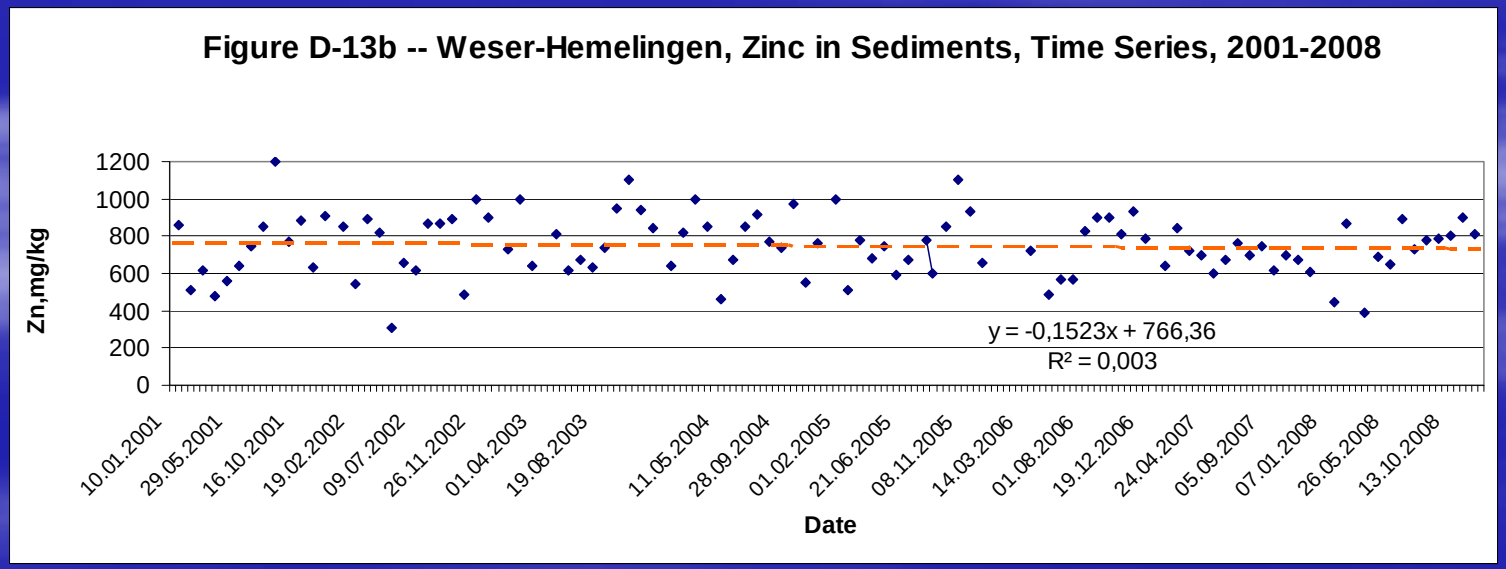
Other water-quality variables -- continued





Trace Metals – Weser River Basin





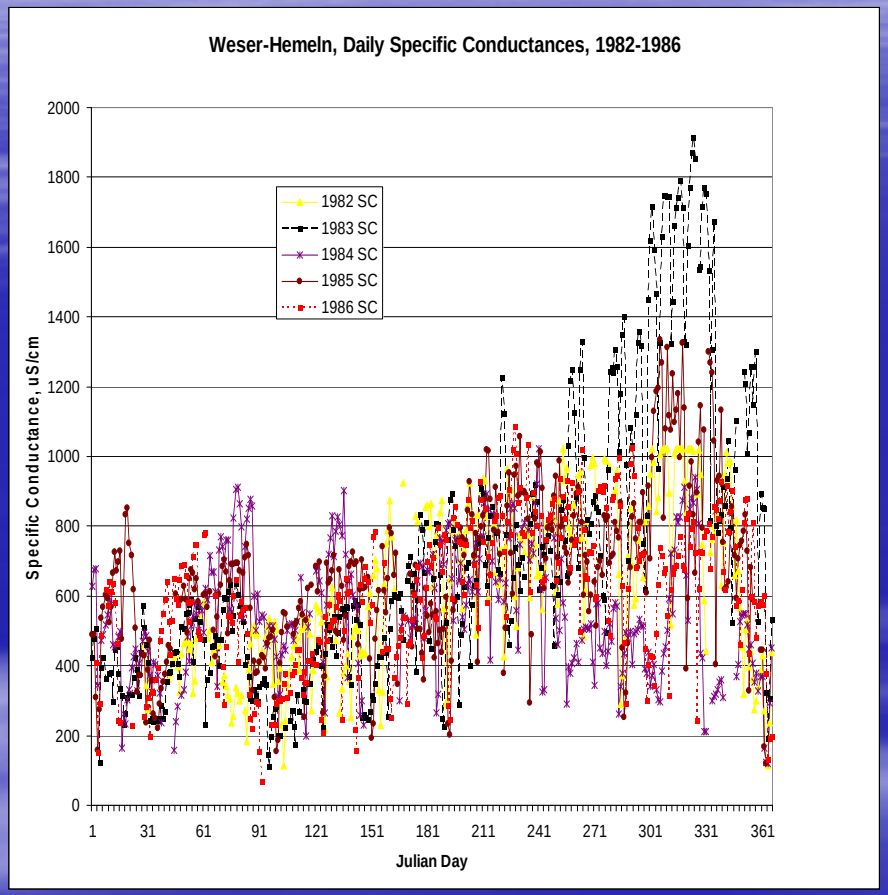
Anthropogenic Impacts

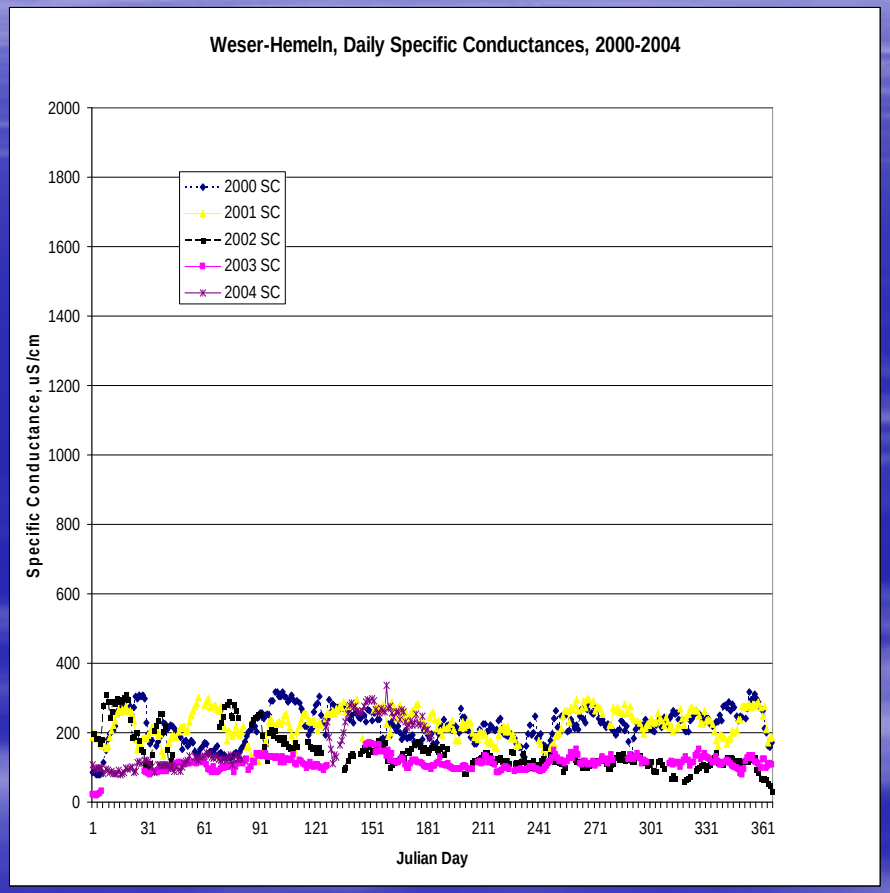
Summary and Conclusions

- Consistency in data collection over the long-term has been beneficial; use of indicators preferred
- Need for monitoring other variables of concern (PCPs, priority pollutants, sediment transport, etc.)
- Integration of data with model applications and basinwide water-resources management planning
- Further milestones regarding the EU‘s WFD
  - 2012, implementation of management measures
  - 2015, attain „good-status“ targets for SWs and GWs
  - 2015, initial update of river-basin management plans
- Transforming basic data into useful information

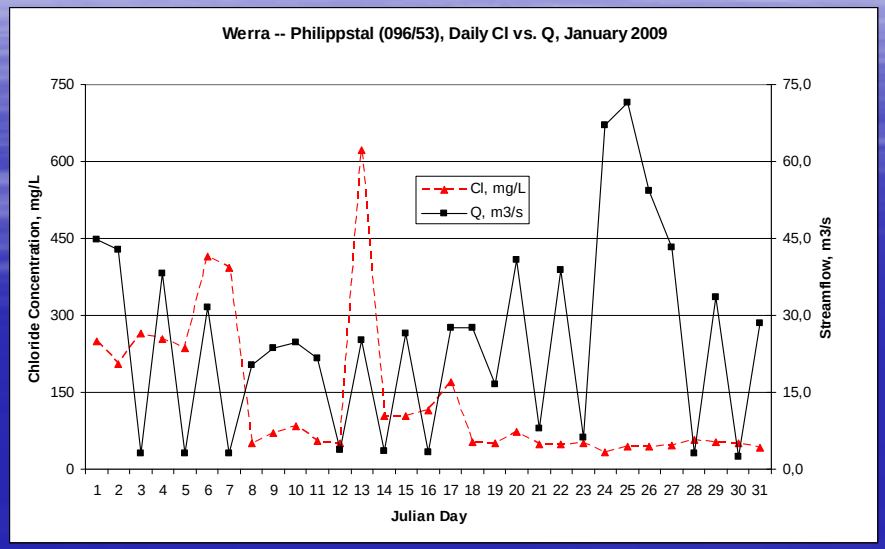
Questions and Discussion

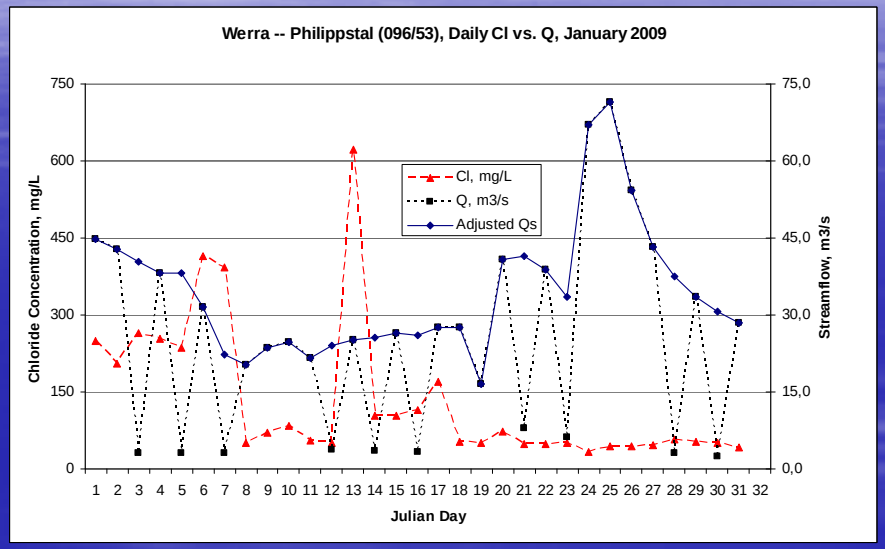
Weser-Hemeln, Daily SC Data, 1983-2004

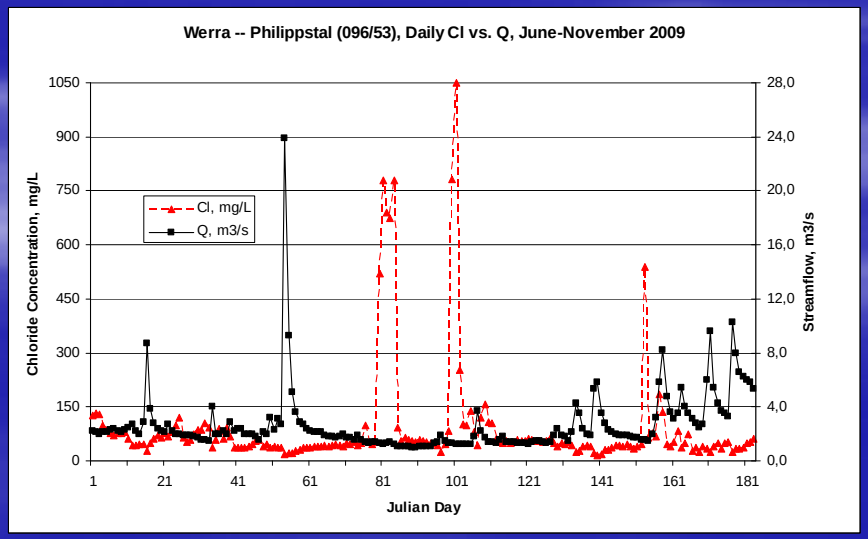




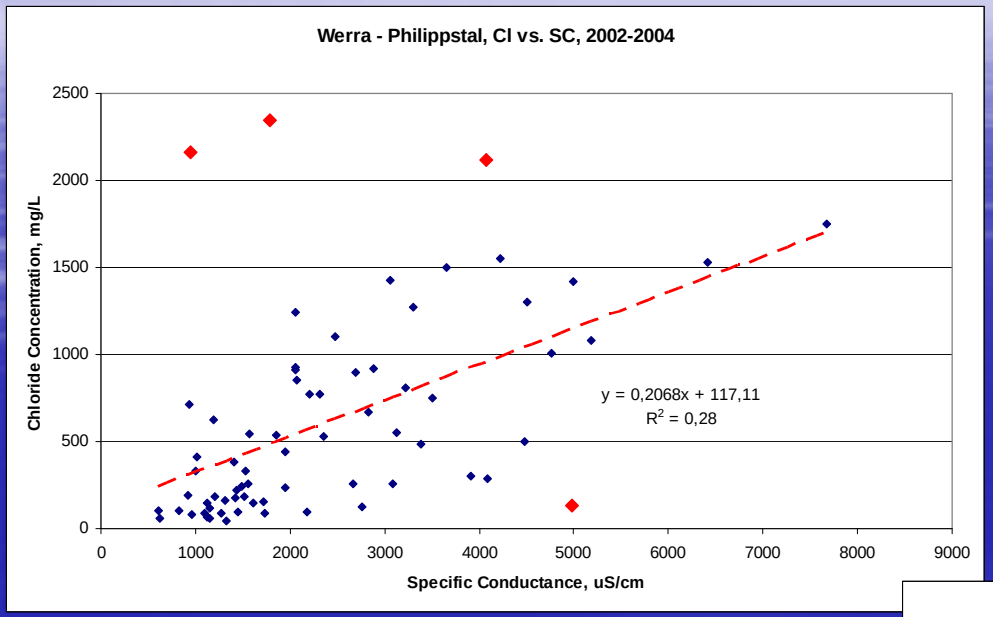
The Werra River Tributary – Chloride Source

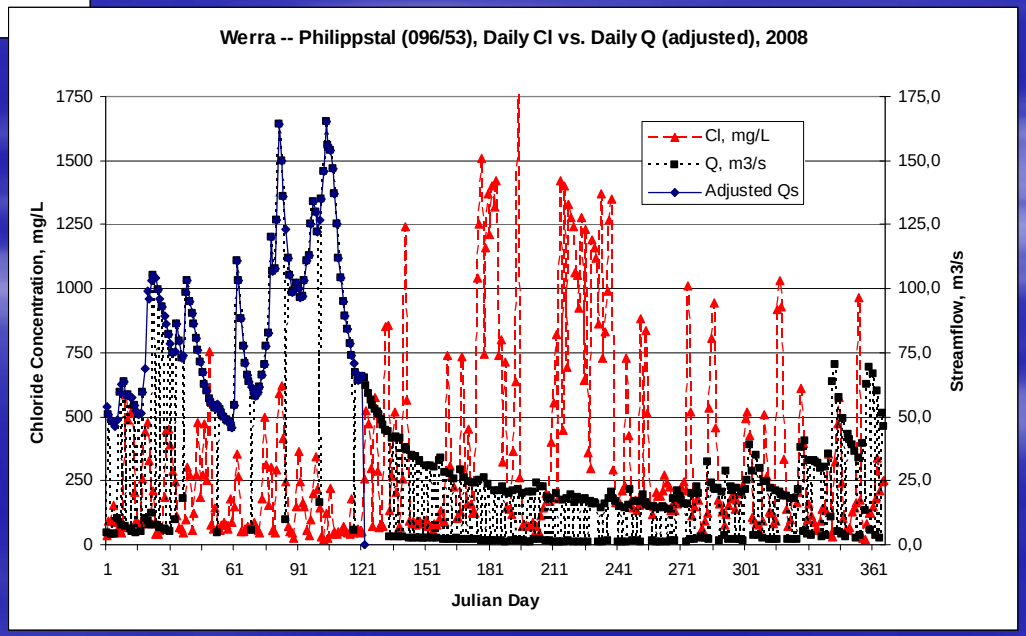






Werra River Subbasin – Assessing Historical Impacts





EG-Wasserrahmenrichtlinie

Bewirtschaftungsplan 2009
für die Flussgebietseinheit Weser

Maßnahmenprogramm 2009
für die Flussgebietseinheit Weser

FGG Weser
Flussgebietsgemeinschaft Weser