National Water Quality Monitoring Conference (NWQMC)
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Water Quality Data Assessment
Saale River Basin, Thuringia, Germany

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Background Saale River Project

Integrated Watershed Management in the Saale River Basin

Development of an integrated methodology for sustainable watershed management

Definition of ecological and economical measures

Quantification of water-, nutrient - and constituent fluxes and their economical effects

Development of measures for nutrient management and delineation of integrated flood prevention concepts

Socio-economic evaluation- and decision support

Support of local authorities and stakeholders during implementation of the EU Water Framework Directive through operational strategies and management options

Background EUWFD

Management Plans
for Sub-Watersheds (2009)

Environment goals → Status Quo → River Monitoring → Deficit Analysis → Management Programs → Achievement of **Environment Goals "good status" (2015)**

Milestones

Public Participation

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Introduction to the Saale River Basin

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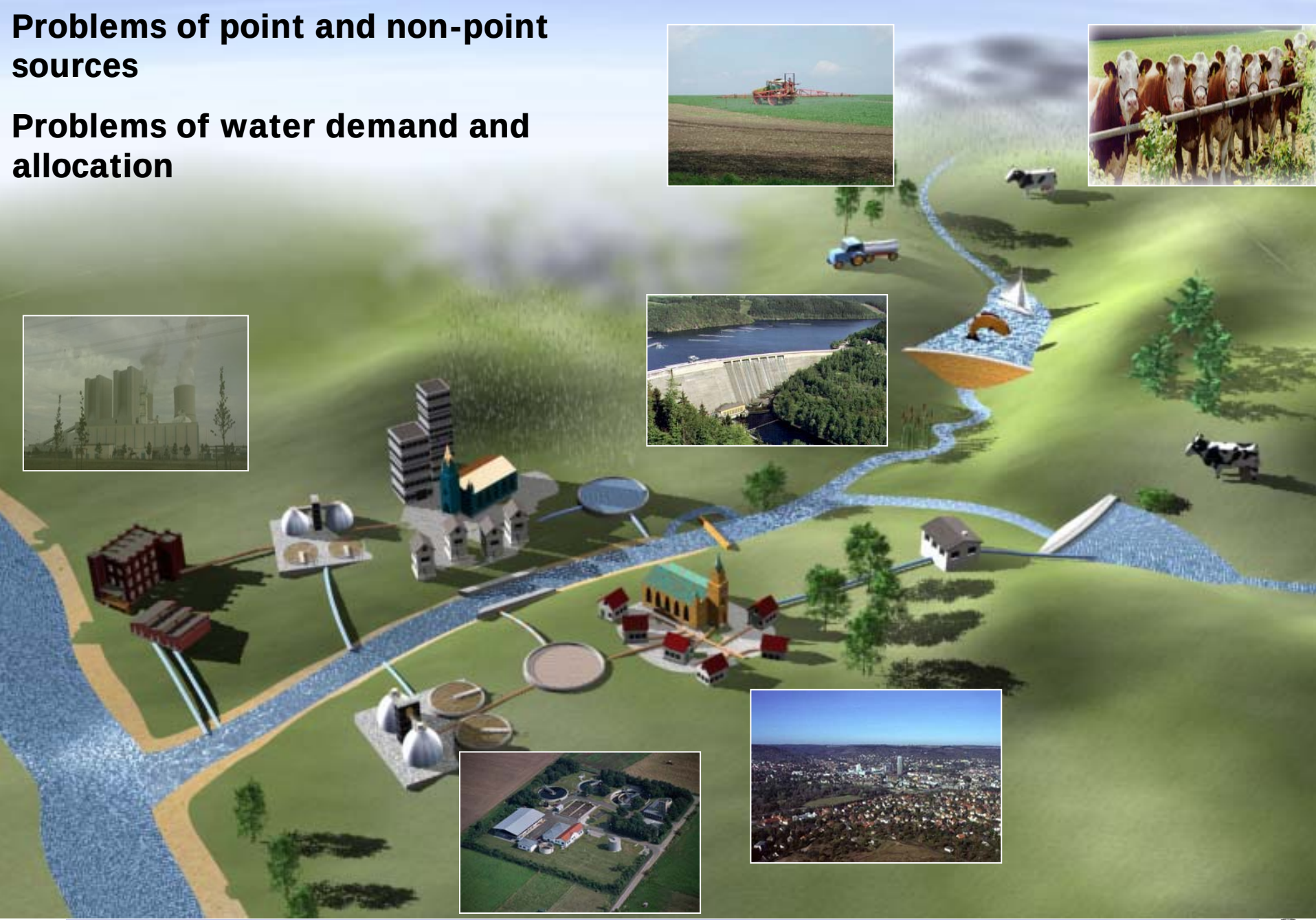
Problems of point and non-point sources

Problems of water demand and allocation



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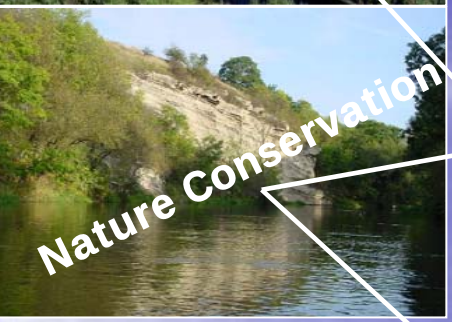
Competing stakeholders in the Saale River Basin



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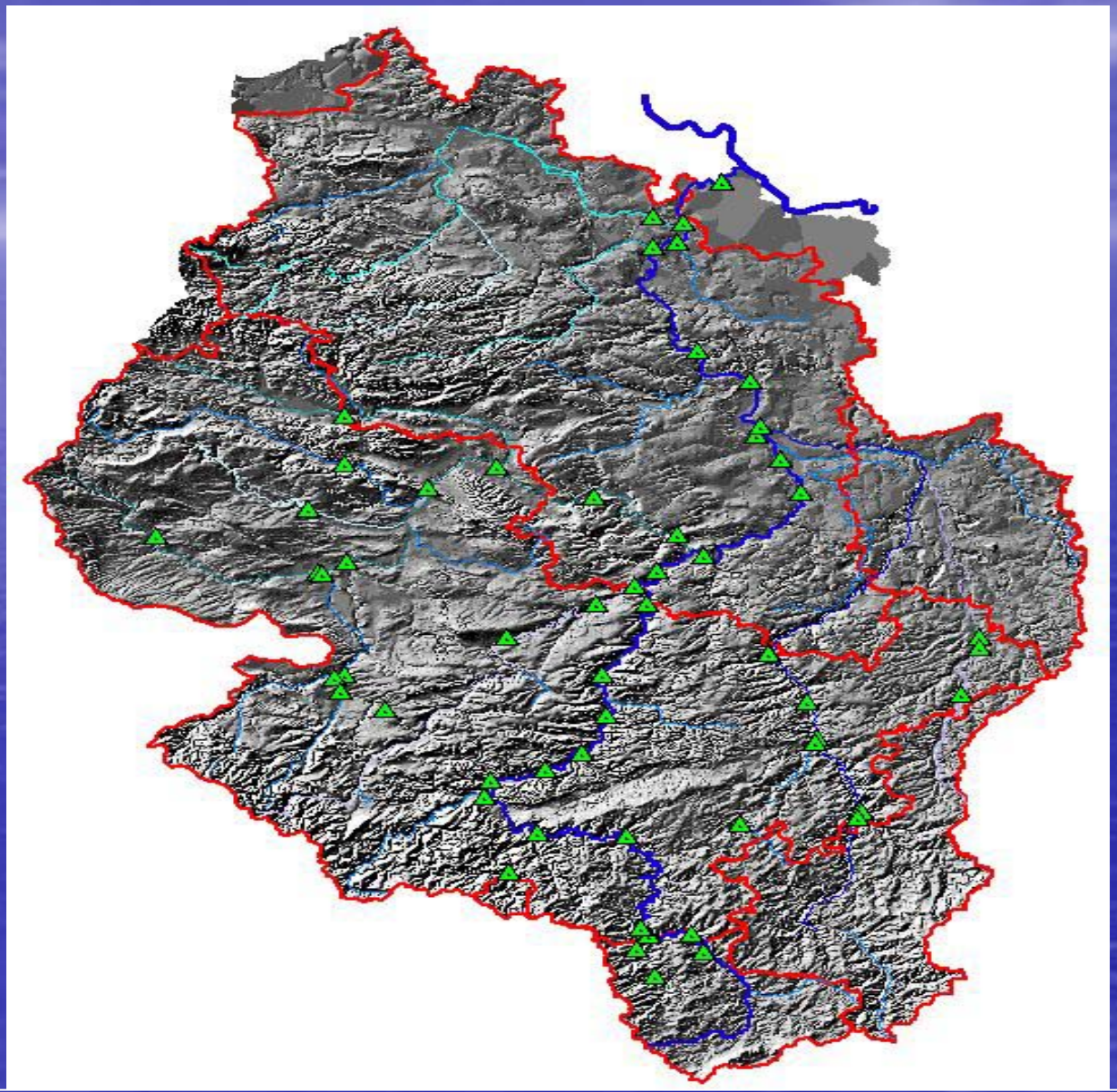
Key Water-Quality Monitoring Sites

Thuringia:
37 Stations with regular sampling (2 weeks) of 60 variables

Saxony-Anhalt:
16 Stations with regular sampling (2 weeks) of 60 variables



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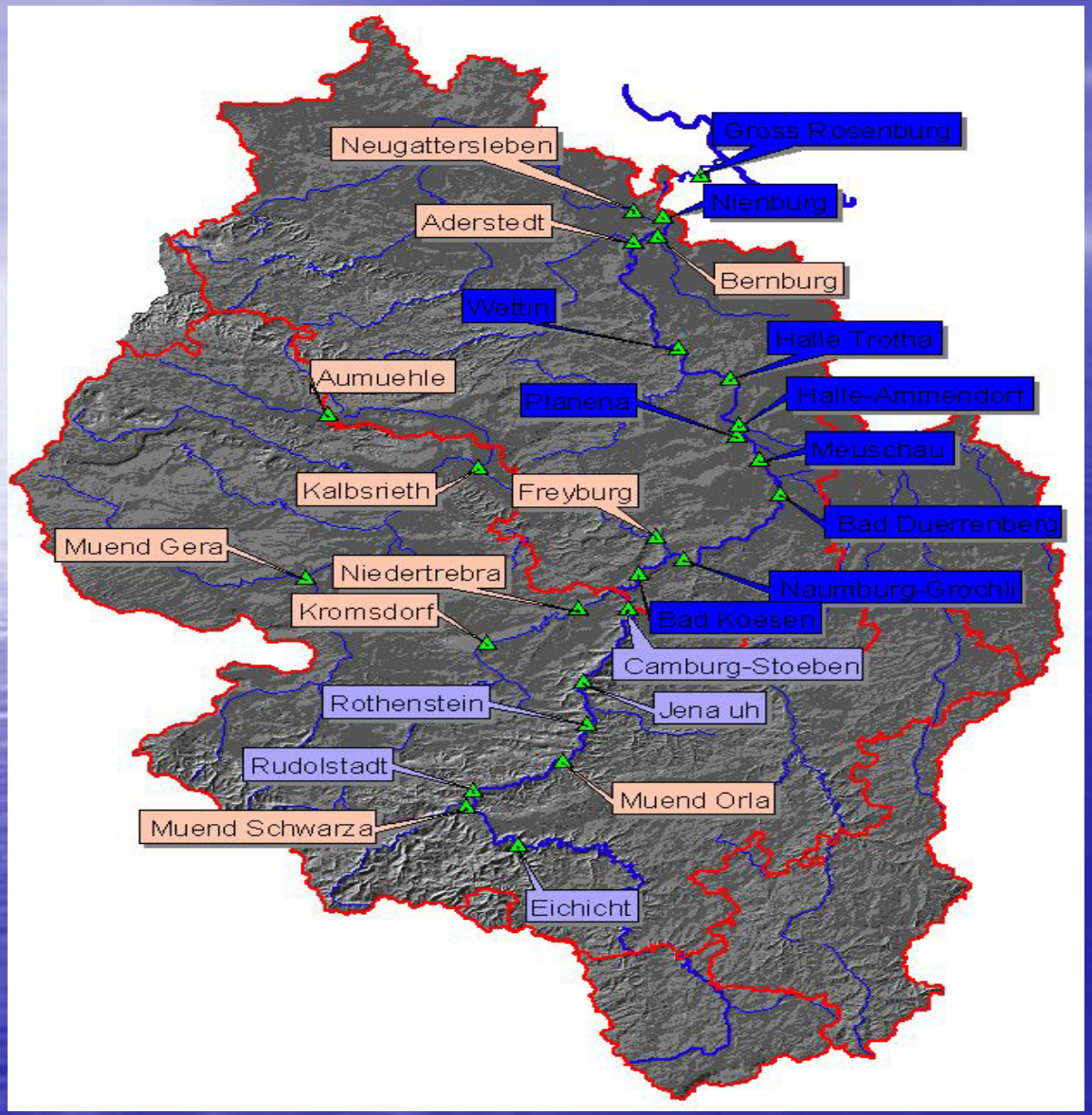
Key stations used for this investigation



Thuringia
5 mainstem Saale River sites
6 tributary sites
(Source Thuringian Environmental Agency)

Saxony-Anhalt
10 mainstem Saale River sites
4 tributary sites
(Source: LAWA)

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Period Record Statistics (Specific Conductance, NO3, Zn)

Thuringia

Statistical Summary 1997-2003 Tributary	Station	Q m³/s	SC µS/cm	NO3 mg/l	Zn µg/l
Saale	Eichicht	16,4	421,6	27,4	17,1
Schwarza	Confluence	25,5	373,1	13,8	15,3
Saale	Rudolstadt	25,1	439,9	22,9	15,2
Orla	Confluence	1,3	959,0	40,3	18,0
Saale	Rothenstein	28,7	520,0	24,0	20,7
Saale	Jena	33,0	598,2	26,5	14,8
Ilm	Kromsdorf	4,9	978,9	25,8	34,3
Gera	Confluence	4,8	1212,9	23,6	39,0
Helme	Kalbsrieth	18,4	1325,4	17,0	17,0
Helme	Aumühle	1,5	930,6	19,8	15,1

Saxony-Anhalt

Statistical Summary Tributary	Station	Period	Q m³/s	SC µS/cm	NO3 mg/L	Zn µg/L
Saale	Bad Kösen	2000-2003	35,0	747	27,6	10,0
Unstrut	Freyburg	2000-2002	31,2	2045	23,4	11,6
Saale	Naumburg	1997-1999	67,1	1483	28,0	17,3
Saale	Bad Dürrenberg	1997-1999	69,9	1540	20,4	27,8
Saale	Meuschau	1997-1999	70,8	1585	28,0	27,1
Saale	Planena	2000-2002	81,7	1476	24,1	24,0
Weisser Elster	Ammendorf	2000-2002	25,0	1083	26,0	37,9
Saale	Trotha	2000-2003	97,3	1364	24,2	22,6
Saale	Wettin	2000-2003	101	1482	24,1	38,9
Wipper	Aderstedt	2000-2002	2,94	1066	23,7	53,6
Fuhne	Bernburg	1997-1999	0,88	2116	23,8	31,4
Saale	Nienburg	1997-1999	108	2501	29,9	110
Bode	Neugattersleben	1998-1999	14,3	5041	15,2	10,5
Saale	Gross Rosenburg	2000-2002	115	2511	20,5	80,8

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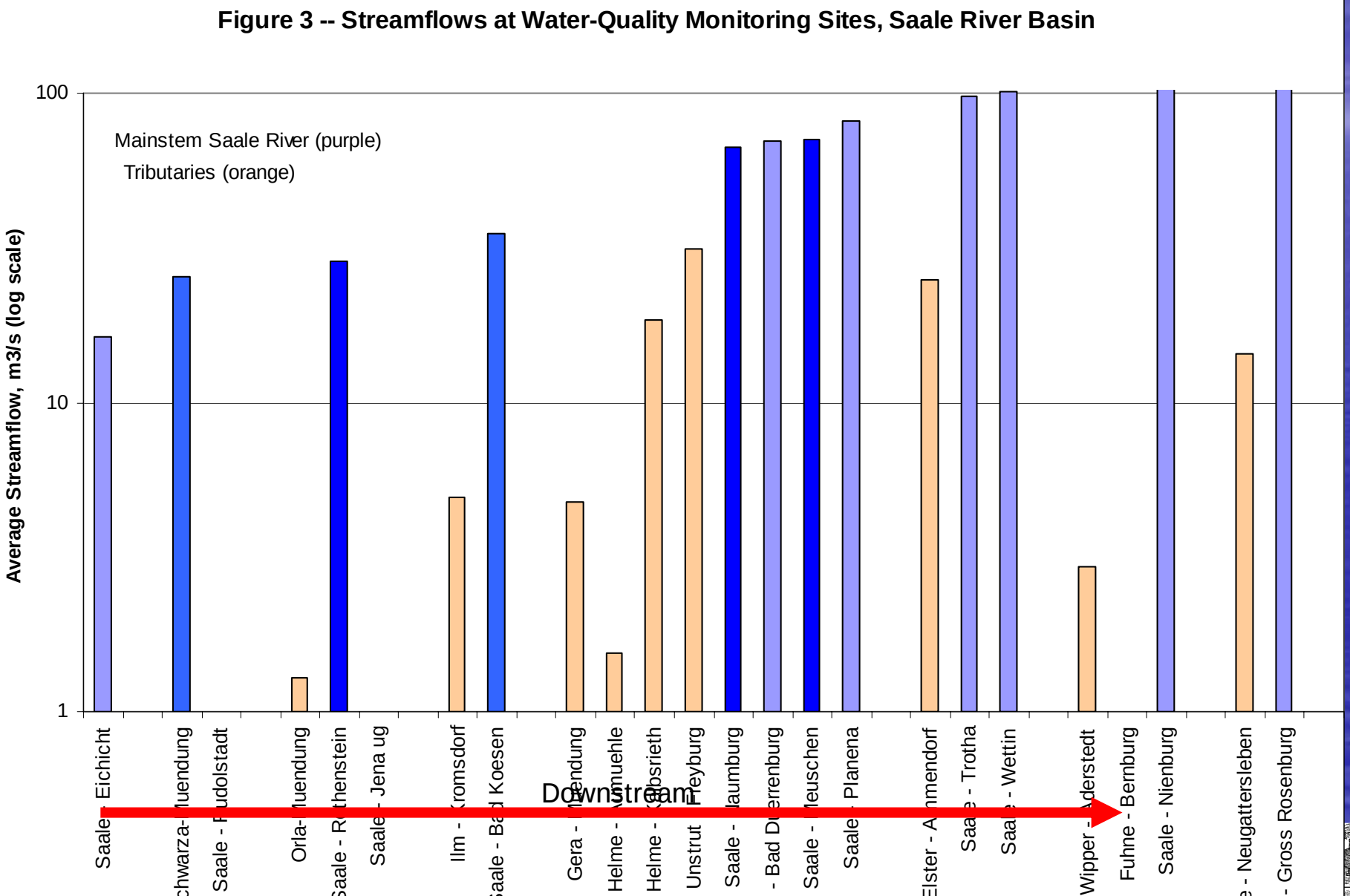
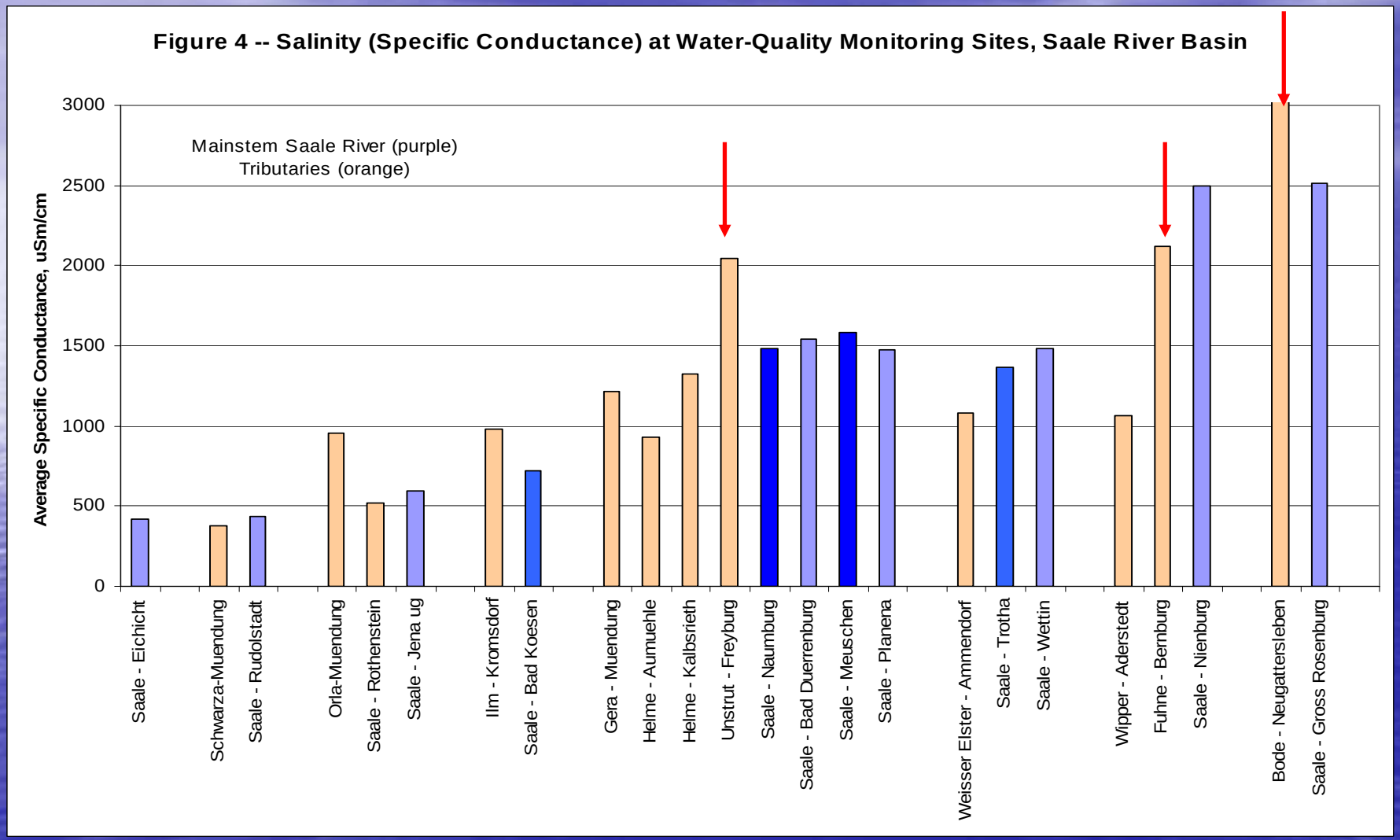
Average Flows and Runoff Variability



Regional variations in salinity (conductance)



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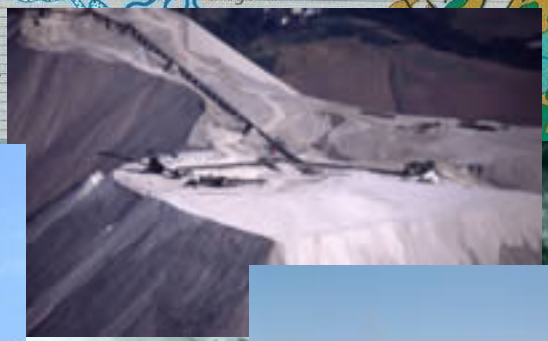
Sources (Natural, Mining, Health Spas)



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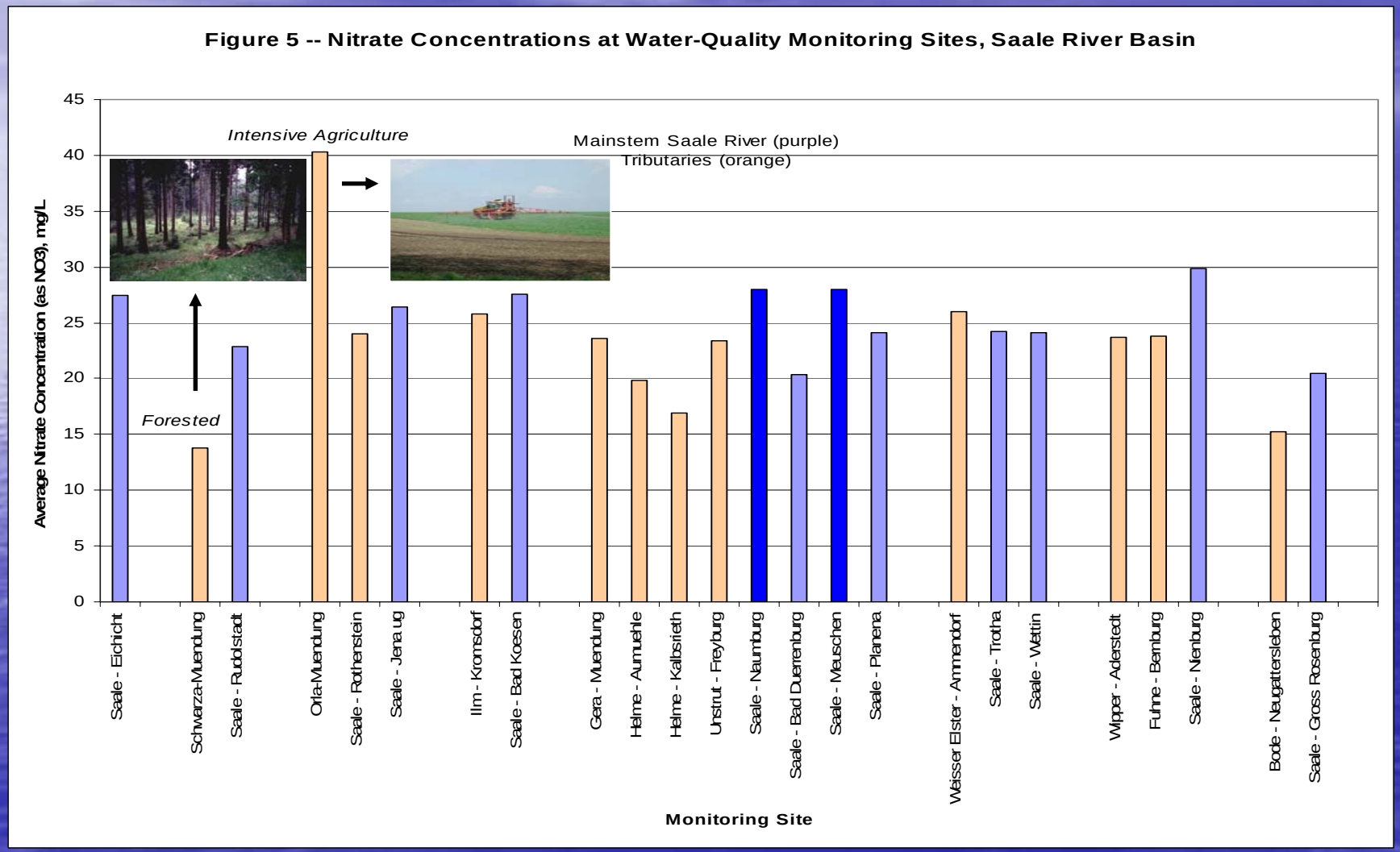
Using Nitrate as an Indicator for Nutrients

Contrast Agriculture vs. Forested



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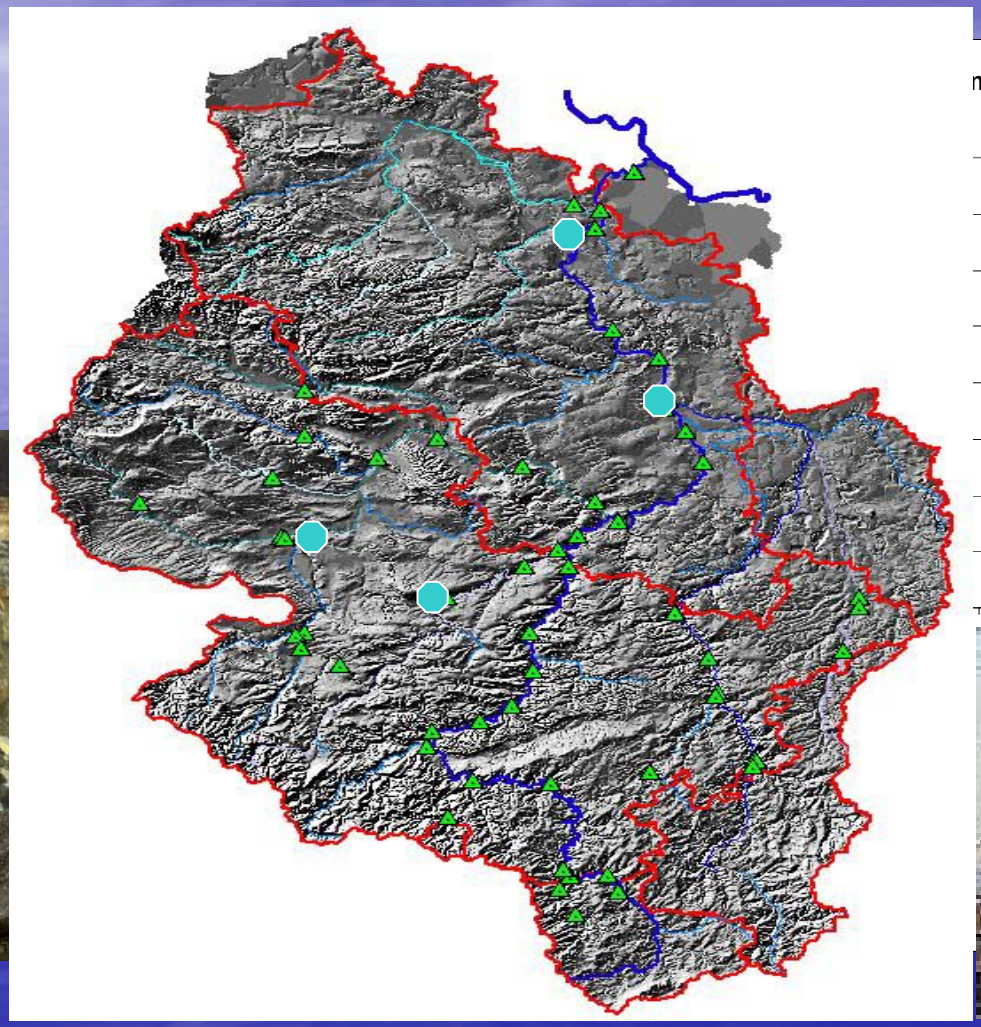
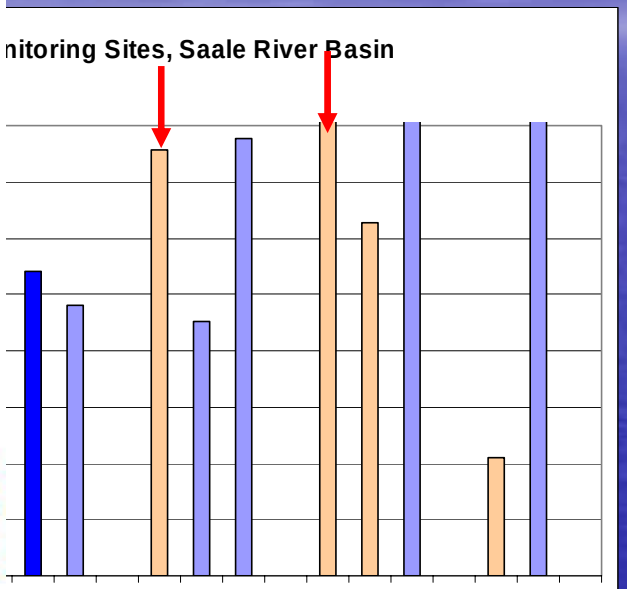
Zinc as an indicator for trace metals

Mining / Mineralisation Industry





Management considerations

1.) Remediation of mine tailings (salinity and zinc)

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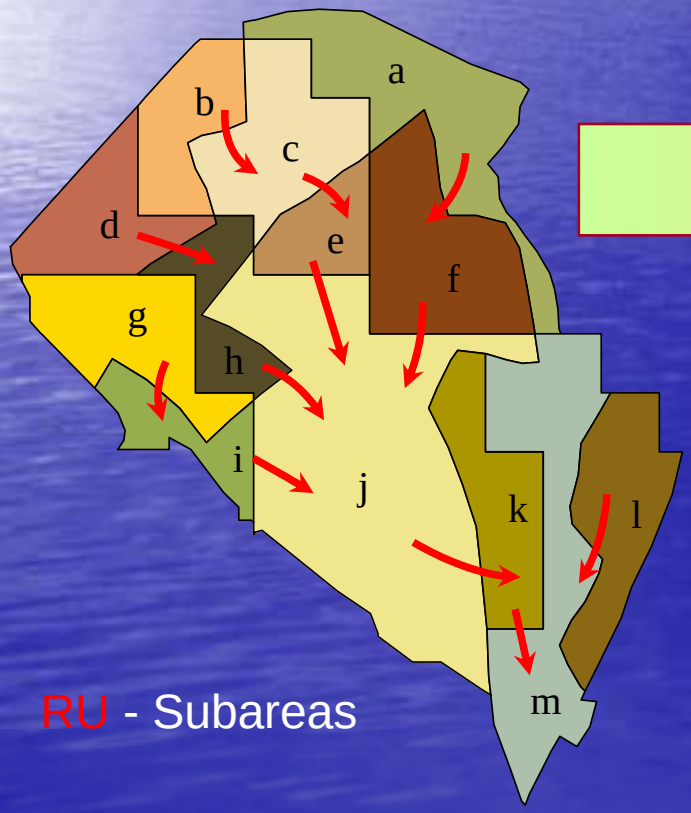
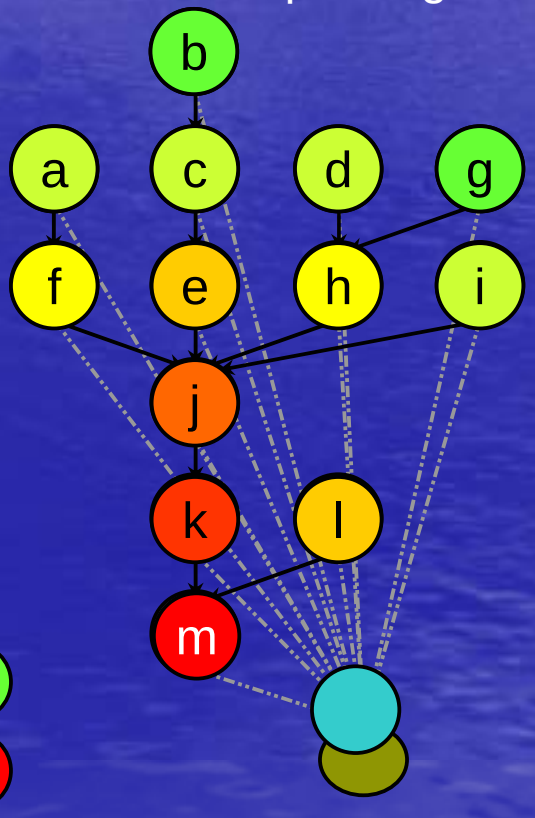
2.) Reduction of fertilizers and livestock in hotspot areas

1. Delineation of Nutrient Response Units
2. Implementation of RU into a neural Network
3. Targeting of an tolerable **N-Input** to the rivers
4. Calculation of areal specific fertilizer reduction to achieve the input target.



RU - Subareas

HydroNet
sematic neural Net

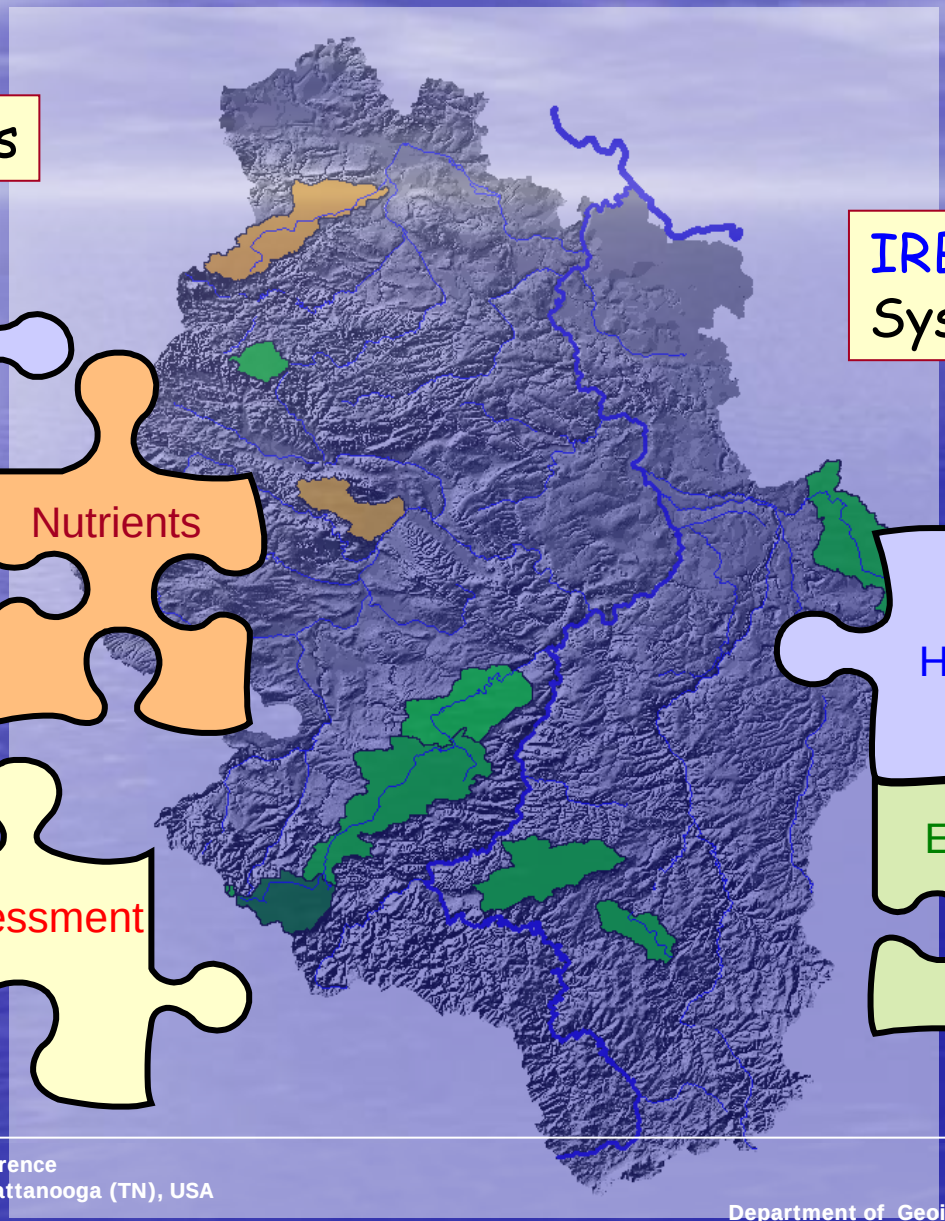


small Change

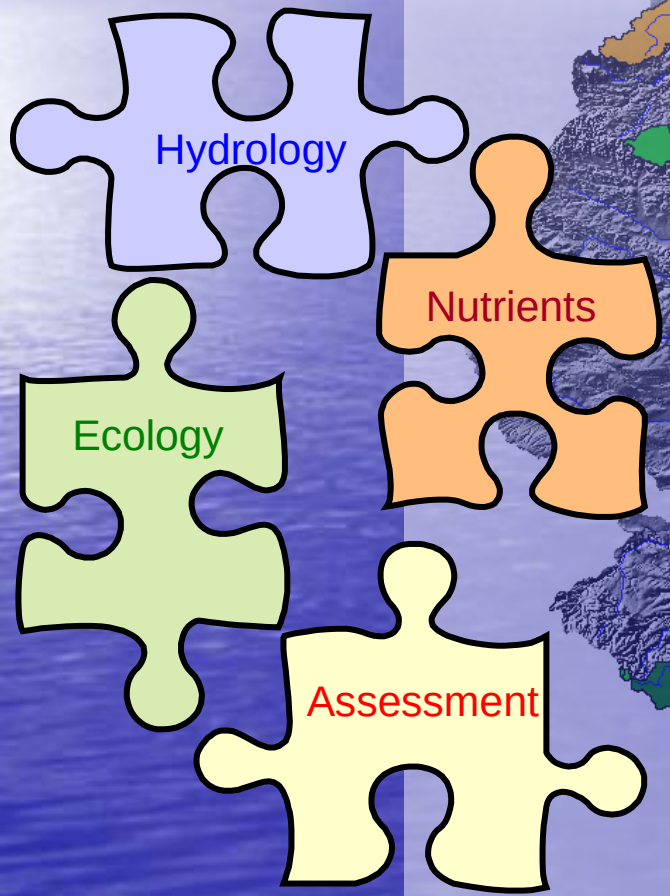
high Change

Future Outlook

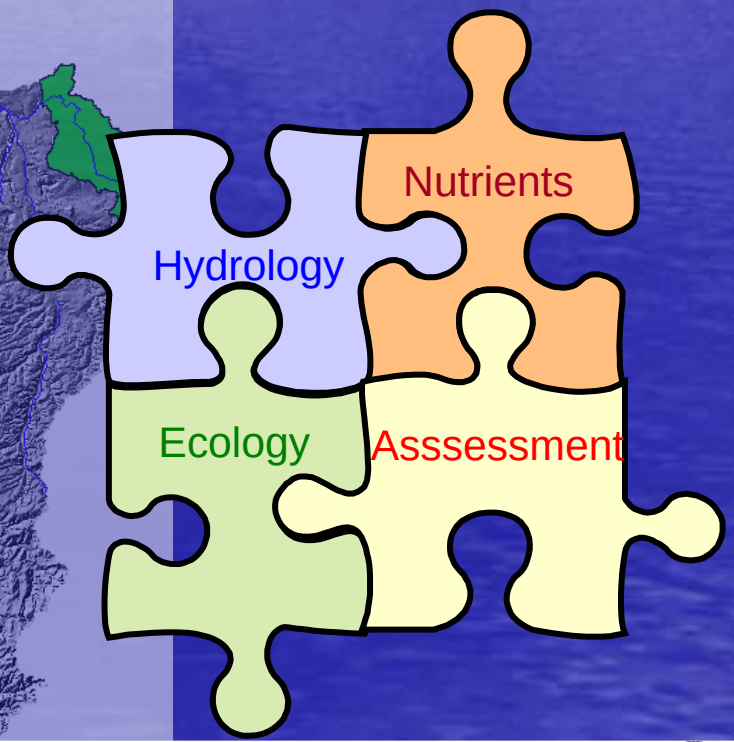
Management Unit Saale River Basin



Process models



IRBDSS as integrated System



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European Water Framework Directive: Goals

There are a number of objectives in respect of which the quality of water is protected.
The key ones at European level are:

general protection of the aquatic ecology,

specific protection of unique and valuable habitats,

protection of drinking water resources,

and protection of bathing water (recreational use).

All these objectives must be integrated for each river basin.

The central requirement of the WFD is that the environment be protected to a high level in its entirety.

Therefore at first the sampling methods, constituents, intervalls and data has to be homogenised between state authorities and in a second step between International water authorities

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Stakeholder involvement

- Problem survey
- Target definition
- Formulation of alternative activities
- Assessment of results
- Implementation of management measures

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Thank you for your attention