

Use of ICP Water data for the Water Framework Directive

Resent paper testing different acidification indices
and their relevance for evaluation of the ecological
status of lakes for The Water Framework Directive

**Macroinvertebrate indicators of lake
acidification: analysis of monitoring
data from UK, Norway and Sweden**

By

Schartau et al. (2008)



Material tested

Number of macroinvertebrate samples available for analyses of clear and humic water, after temporal grouping for linking with chemistry

| Country | Clear | Humic | All |
|---------|-------|-------|-----|
| UK | 29 | 14 | 43 |
| Norway | 102 | 31 | 133 |
| Sweden | 96 | 292 | 388 |
| All | 227 | 337 | 564 |

Conclusions from the paper

- The paper confirm earlier knowledge of sensitive and tolerant species and their thresholds with regard to pH.
- Development of metrics using proportional abundance showed changes in species composition before extinction.
- Increase of DOC had a positive effect on sensitive species, as a higher number of species were found in humic lakes than in clear-water lakes at a given pH.
- The significant relationship between different invertebrate metrics and acidification showed a potential for further development of assessment systems for the ecological quality of lakes.
- To improve the predictive power, further harmonization and standardisation of sampling and taxa identification are needed

ICP Water database – relevance for the Water Framework Directive

- In the following, methods and indices for evaluating ecological status in running water will be given.
- Differences between acidification indices and indices for evaluation of other disturbances will be discussed.
- Examples of evaluation based on biological data from the ICP water database will be shown.

Water Framework Directive: Ecological status, methods

- Proposed method for evaluation of the ecological status of rivers is to use the British Monitoring Working Party (BMWP) score system.
- The BMWP is the sum of scores given for families of invertebrates recorded at a site. Families giving a high scores, > 7 , indicate low pollution, while families representing a low scores, < 5 , indicate pollution or low ecological status.
- The average score per taxa, the ASPT score, indicate the ecological status of the site.
- Finally an ecological quality ratio, the EQR, can be calculated. The EQR is the ASPT in relation to an original ASPT. The original ASPT is an expert judgement of the site in an undisturbed situation. EQR will normally be < 1

Ecologic status:

Differences
between
BMWP score
and
Acidification score

Families representing
high BMWP score
are usually acid
tolerant and vice
versa

| Family | Org.BMWP Score | Acidification score |
|-------------------|----------------|---------------------|
| Valvatidae | 3 | 1 |
| Lymnaeidae | 3 | 1 |
| Physidae | 3 | 1 |
| Spaeriidae | 3 | 0,25 |
| Glossiphonidae | 3 | 0,5 |
| Hirudidae | 3 | 0,5 |
| Aselliidae | 3 | 0,5 |
| Baetidae | 4 | 1 |
| Hydropsychidae | 5 | 0,5 |
| Ancylidae | 6 | 1 |
| Unionidae | 6 | 1 |
| Gammaridae | 6 | 1 |
| Caenidae | 7 | 1 |
| Nemuridae | 7 | 0 |
| Rhyacophilidae | 7 | 0 |
| Polycentropodidae | 7 | 0 |
| Limnephilidae | 7 | 0 |
| Phiolopotamidae | 8 | 0,5 |
| Siphonuridae | 10 | 0,5 |
| Heptagenidae | 10 | 0,5 |
| Leptophlebiae | 10 | 0 |
| Taeniopterygidae | 10 | 0 |
| Leuctridae | 10 | 0 |
| Capniidae | 10 | 0,5 |
| Perlodidae | 10 | 0,5 |
| Cloroperlidae | 10 | 0 |
| Phryganeidae | 10 | 0 |
| Molannidae | 10 | 0 |

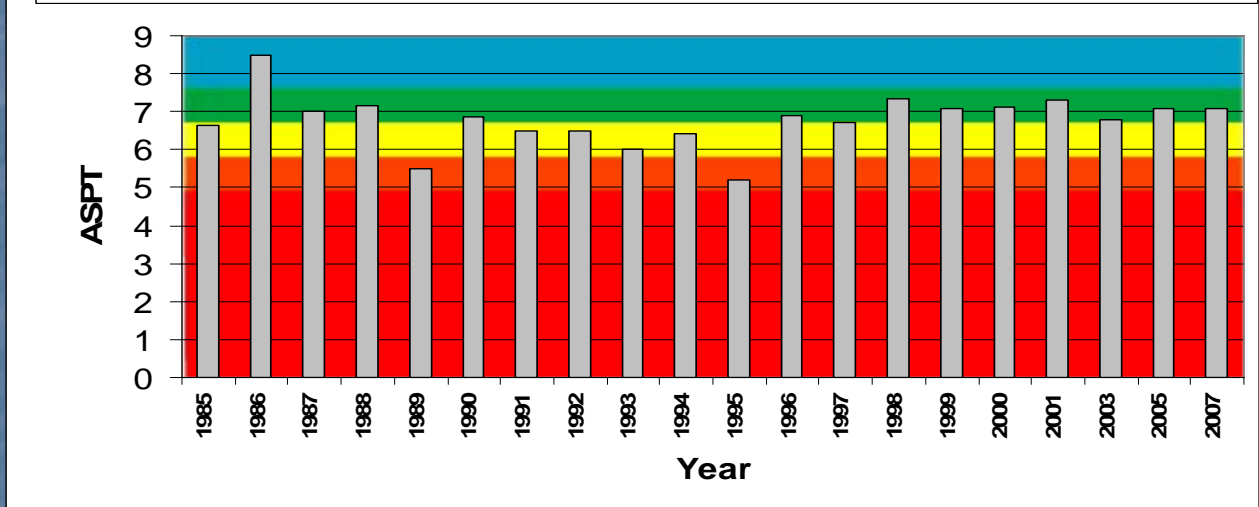
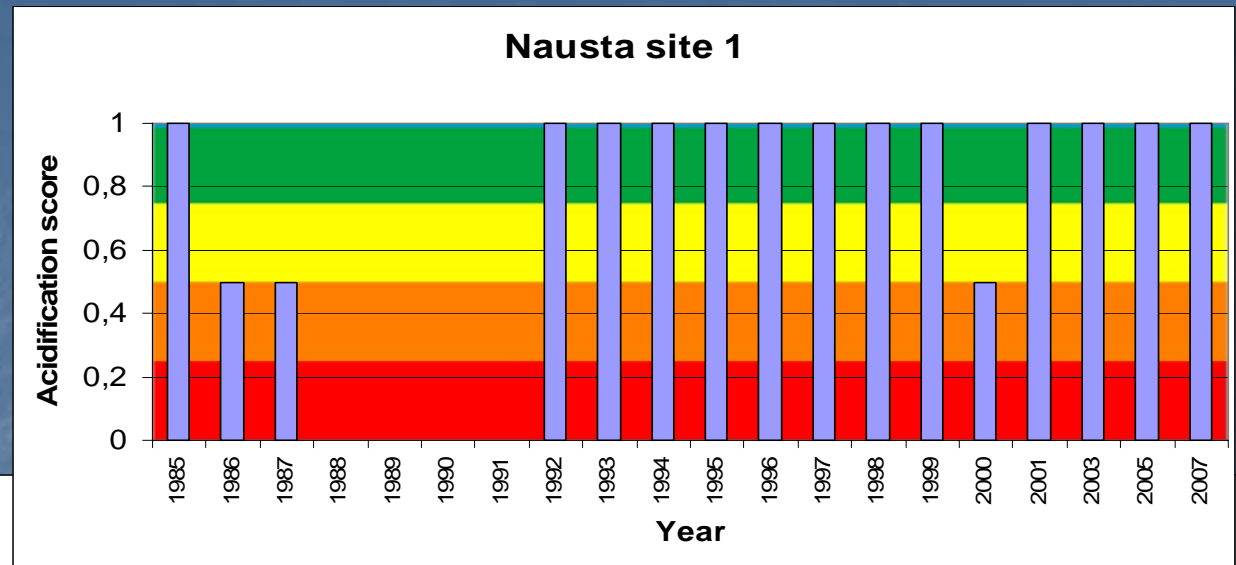
What is good ecological status

- Used method is to summarize the scores of the families recorded in a sample and calculate the mean value = the ASPT score
- Good ecological status was originally set to ASPT = 7 or higher. The BMWP has later been revised for habitat specific scores. The ASPT score for good ecological quality for different habitats vary and need further evaluations.
- The BMWP/ASPT take not acidification into consideration

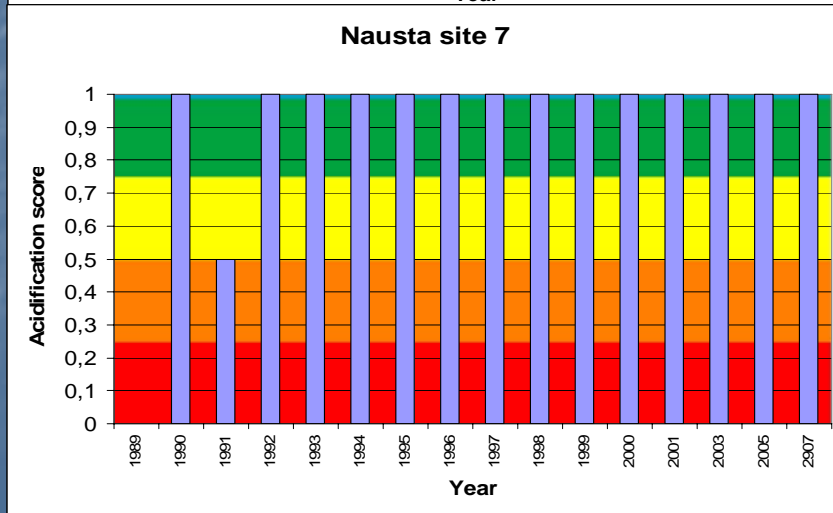
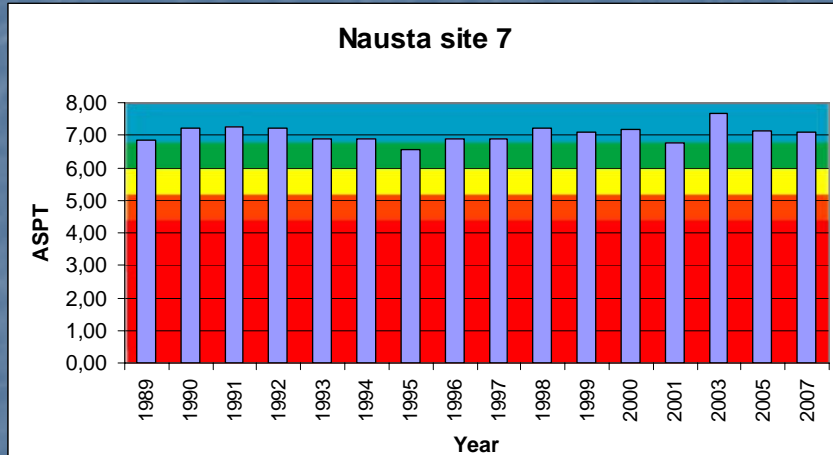
In the following examples the original BMWP is used and ASPT for good ecological quality is set to 7

ASPT score and the Acidification score for the period 1985 to 2007 at Nausta site 1.

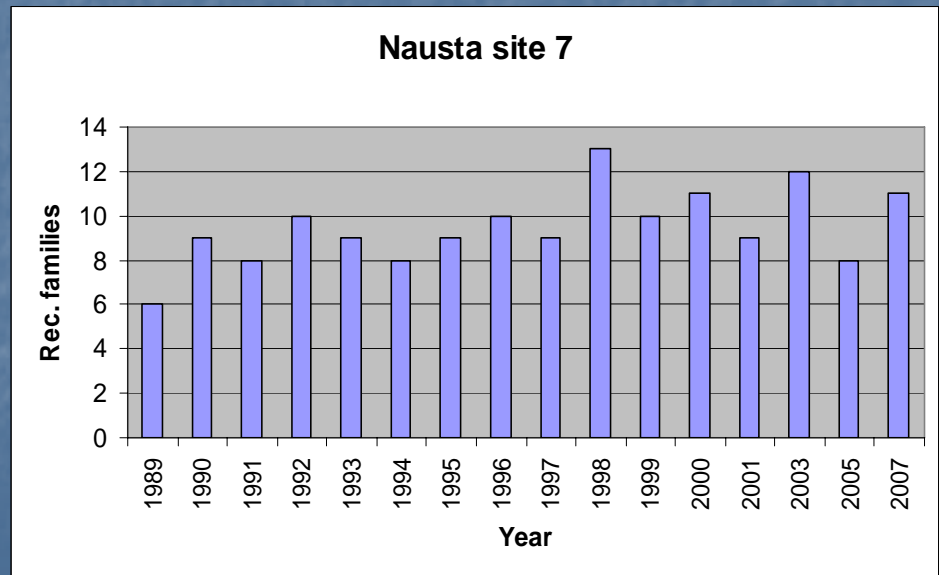
The acidification index varies between bad and high/good, while ASPT mainly is in the range moderate to good



ASPT score, Acidification score and Number of scoring families at site 7 In Nausta



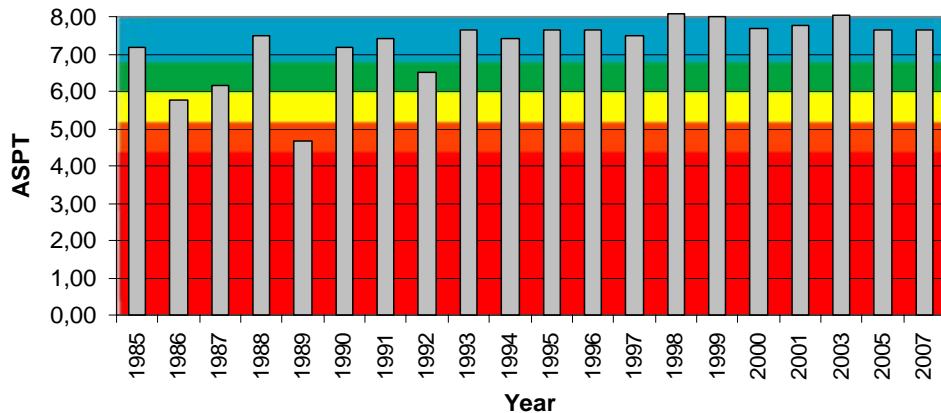
ASPT indicate good to high conditions during the whole period. Acidification indicated bad conditions at the start, but become low and indicated a good/high ecological quality during most of the period. The number of families increased slightly during the years.



ASPT score, Acidification score and Number of scoring families at site 17 In Nausta

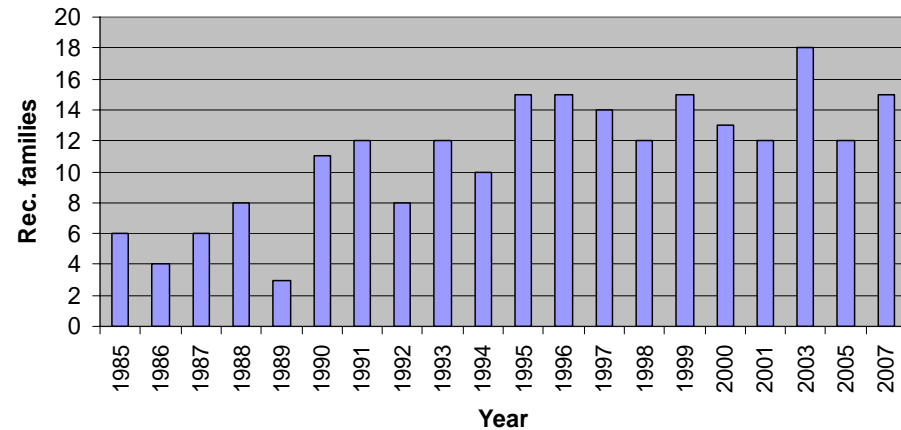
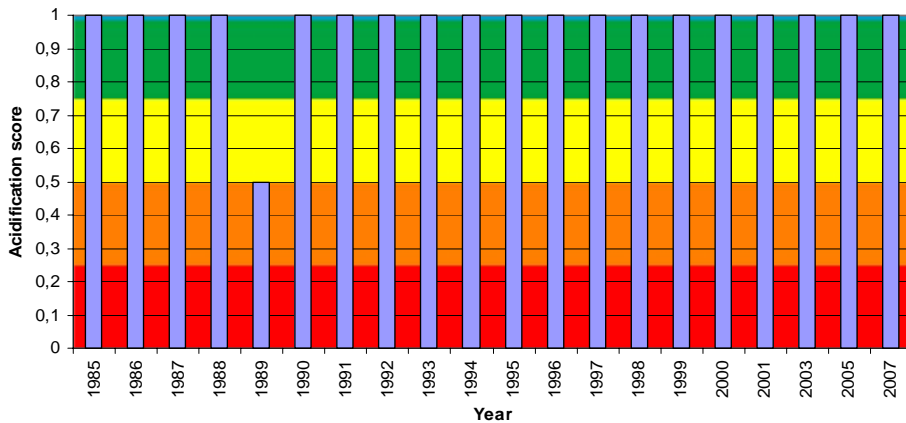


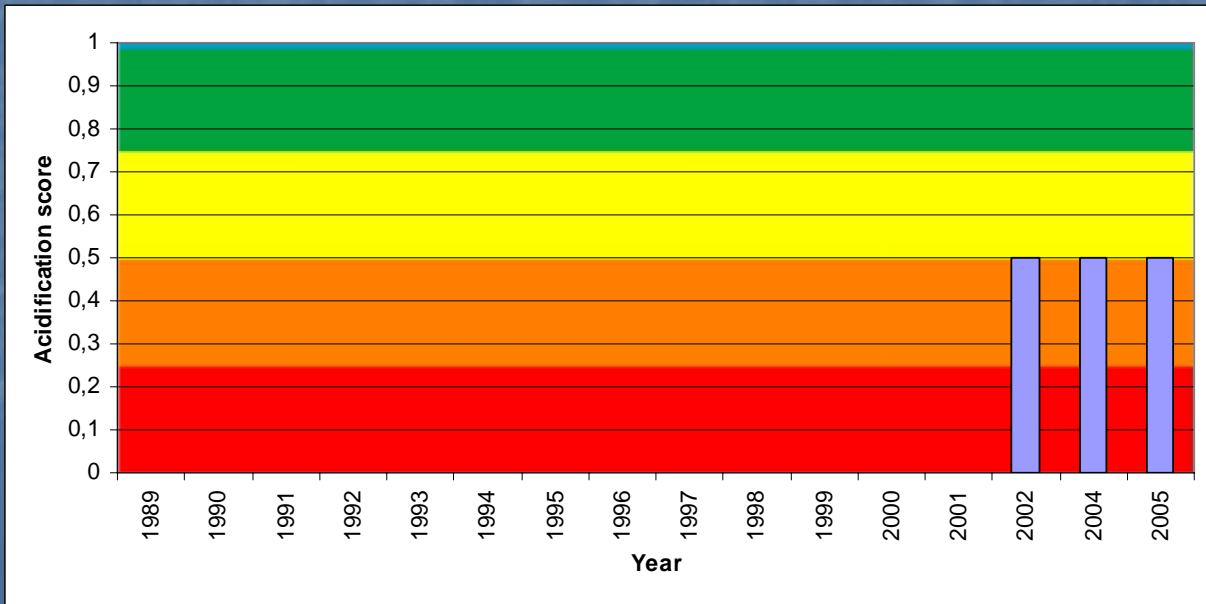
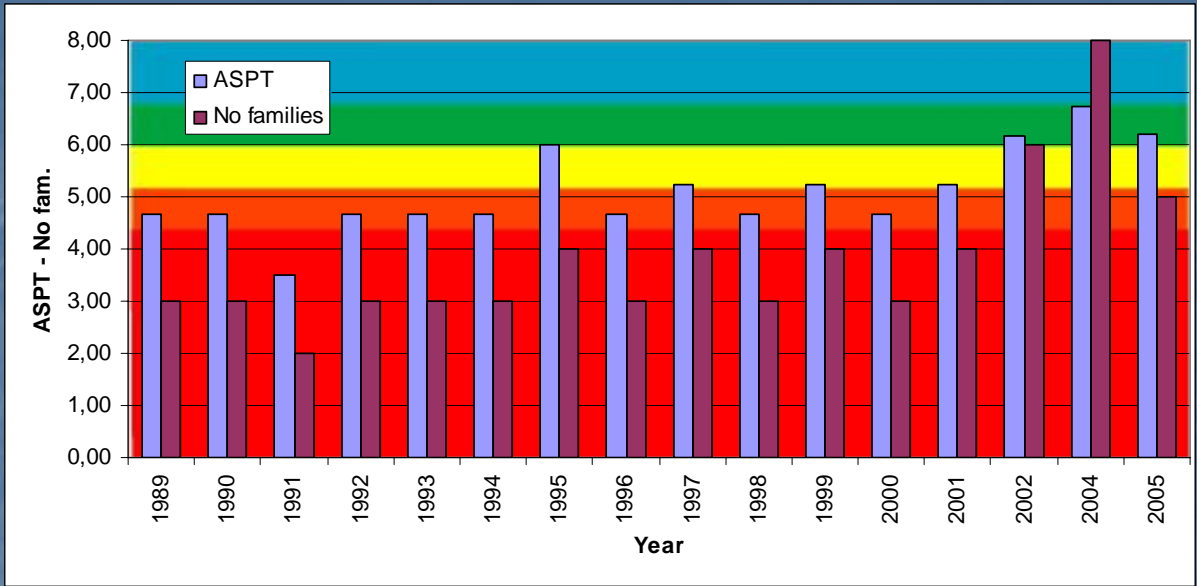
Nausta site 17



ASPT indicate good to high conditions during most of the period. Acidification was low and indicated a good/high quality during the period, except year 1989. The number of families increased significantly from 1985 to 1996.

Nausta site 17

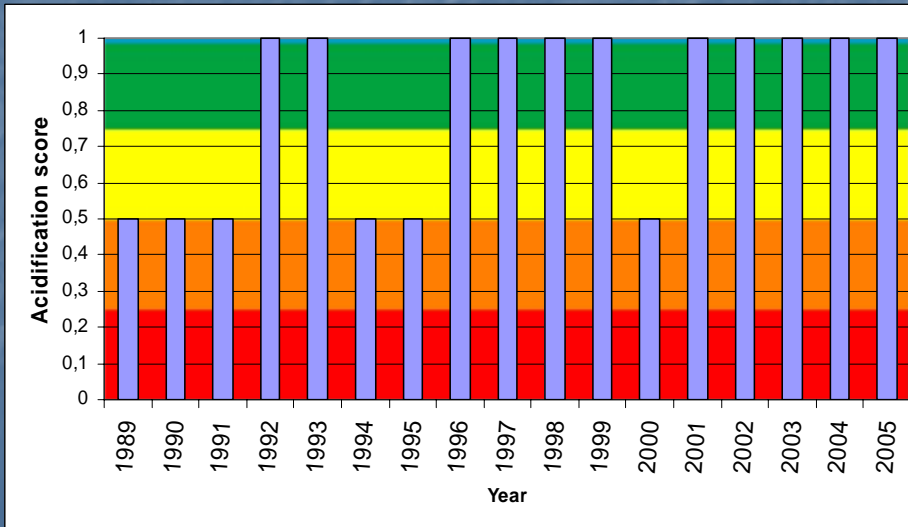
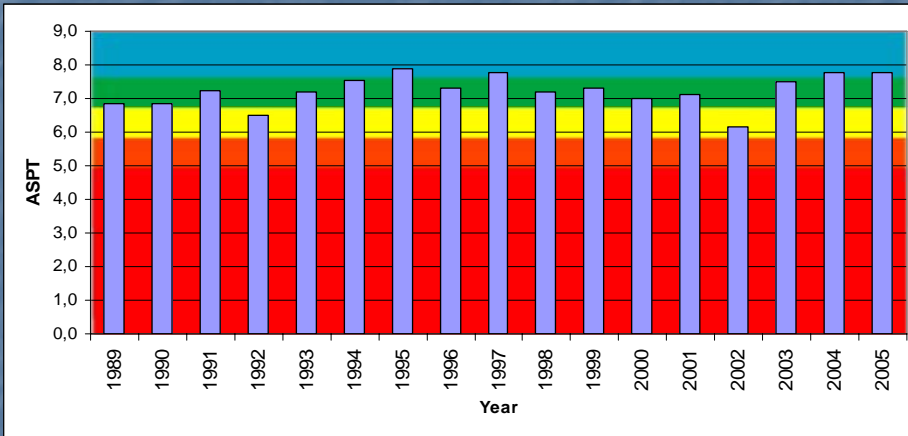




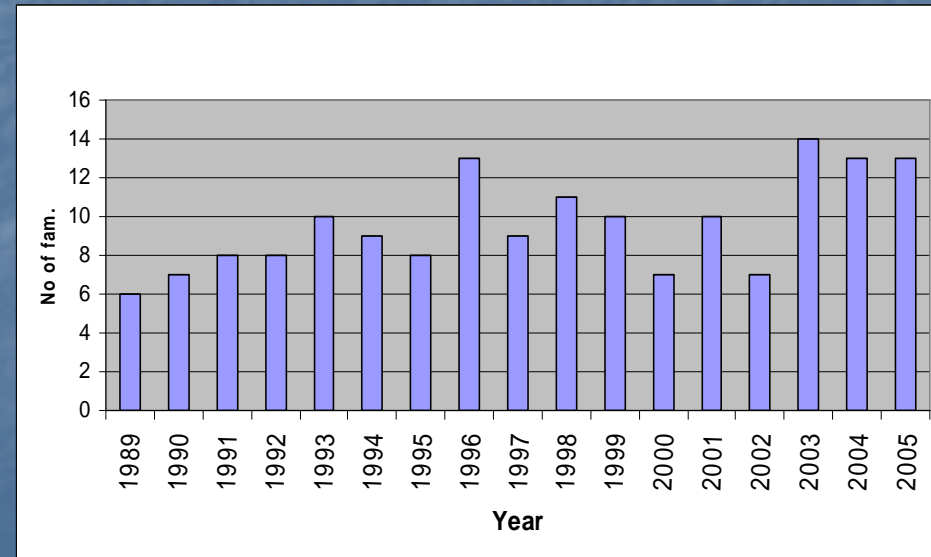
ASPT score, Acidification score and Number of scoring families at site 1 In Gaula

ASPT varied between poor to high quality. Acidification has been high almost the whole period. Since 2002 the ecological status has improved to a poor/moderate status.

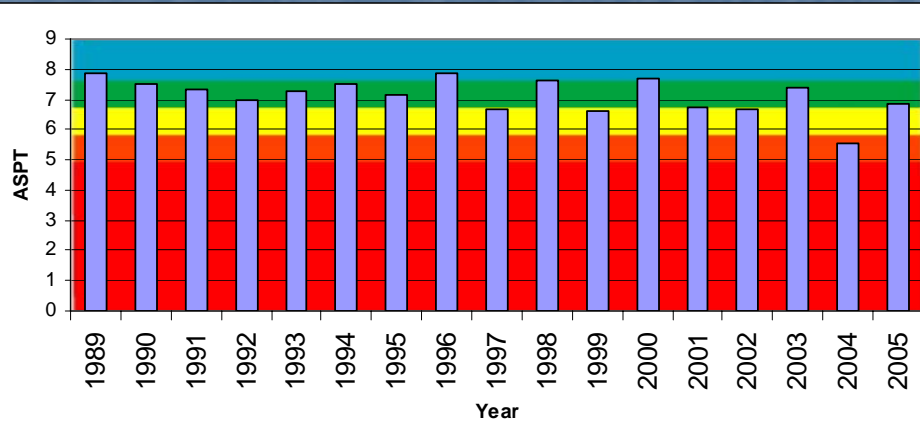
ASPT score, Acidification score and Number of scoring families at site 5 in Gaular



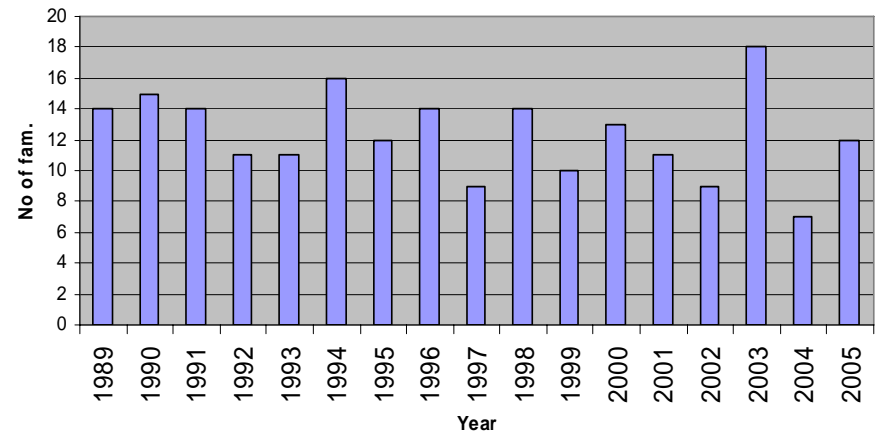
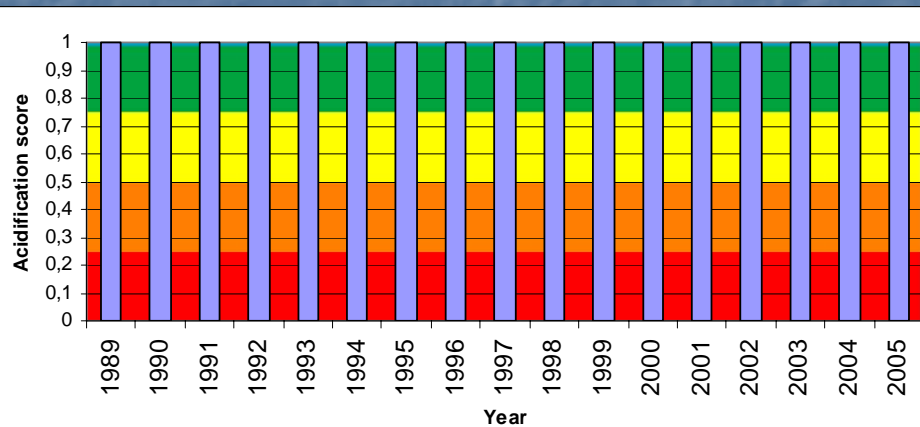
ASPT indicate mostly good to high conditions during the whole period. Acidification varied between poor and good situation until 2001. Later the situation has been good/high. The number of families have varied, but a modest increased over the years is observed.



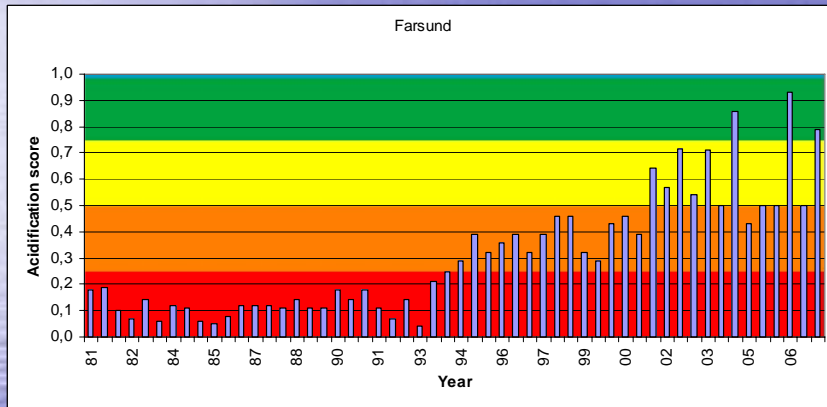
ASPT score, Acidification score and Number of scoring families at site 17 in Gaular



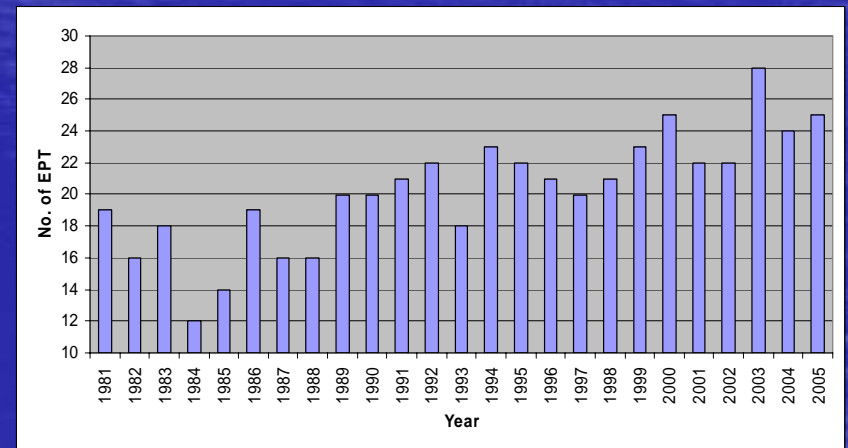
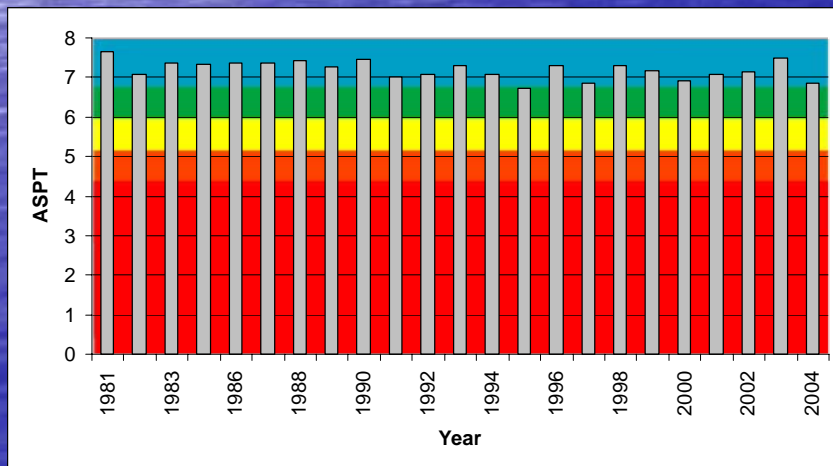
ASPT indicated high/good conditions at the start, but ended as moderate/good in 2004-2006. Acidification showed high/good conditions during the whole period. The number of families decreased somewhat during the years.



Ecological status of Farsund watershed

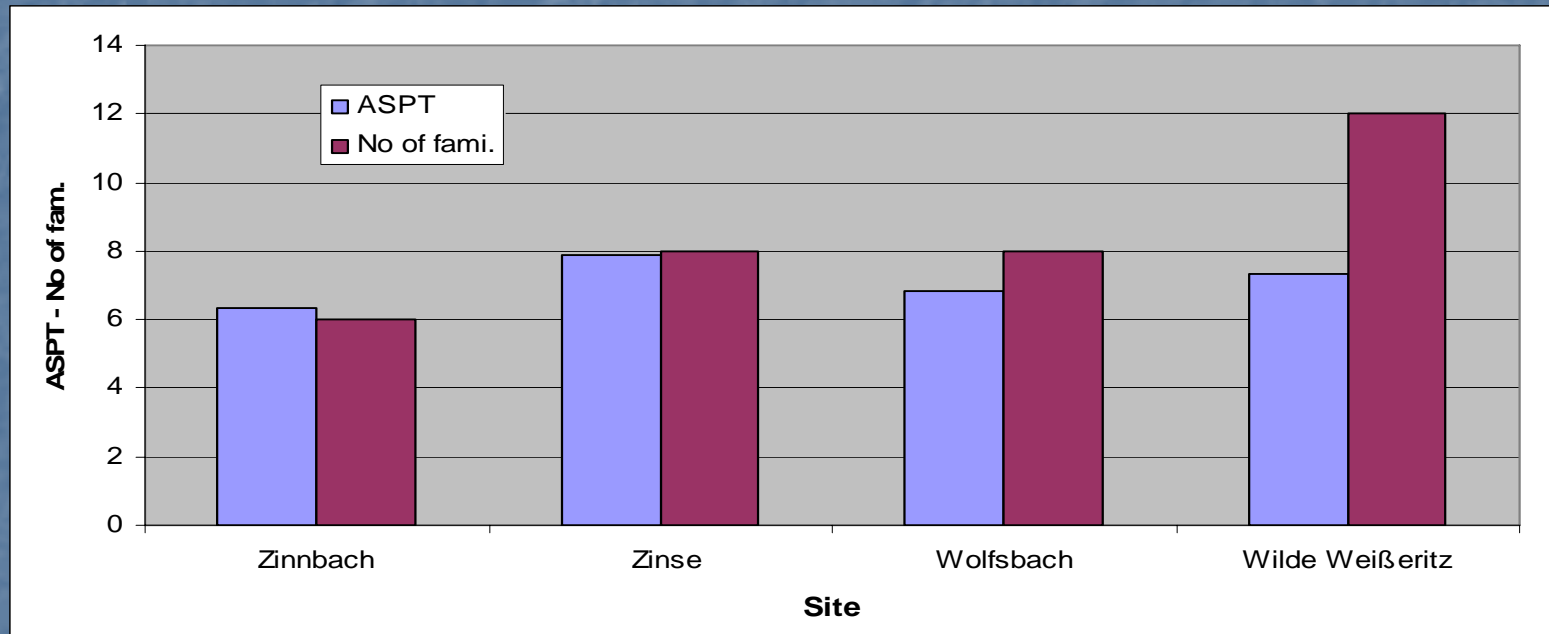


ASPT indicate good to high conditions during the whole period. Acidification showed bad conditions until 1995. Later the status changed to poor and then to moderate in the last part of the period. The number of families have increased significantly over the years.



ASPT and number of scoring families in some German sites in fall 2000.

ASPT remained rather unchanged along an acid gradient



Zinse

Zinnbach

Wolfsbach

Wilde

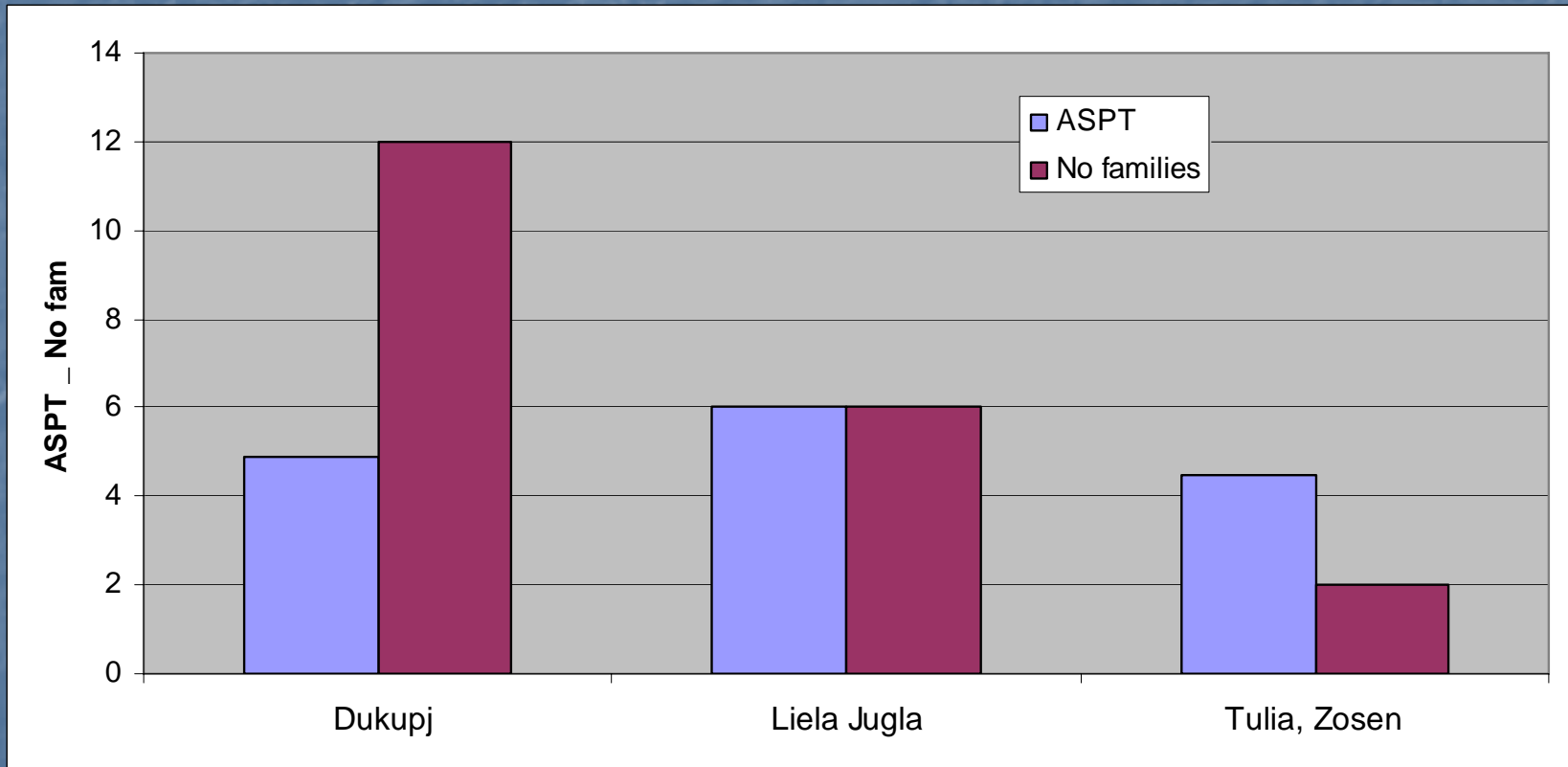
Weißeritz

High acid damage

Low acid damage

ASPT and number of scoring families in some Latvian sites in fall 2000.

High pH and no acidification resulted in low ASPT score as well as high variation in number of families.



All sites have high pH and no acidification damage

Conclusion

- The biological data in the ICP Water database are well suited for evaluation of ecological status for the Water Framework Directive (WFD).
- The database is probably one of the best harmonised and quality controlled bases for use in the WFD.
- The ICP Water data consists of long time series some of them are unique.
- Evaluation of both organic pollution (BMWP/ASPT) and acidification is needed for evaluation of the damage of an ecosystem. BMWP/ASPT do not include acidification. The acidification index do not include other damages.
- For the WFD the goal is that both indices should indicate good ecological status.

The River Basin Districts should use the information from ICP Water when it is overlap between watersheds and “sites”

Anyway ICP Water data will always be important correctives for the WFD.