MONITORING THE APPEARANCE OF THE CYANOBACTERIA PLANKTOTHRIX RUBESCENS IN RESERVOIRS IN MIDDLE EUROPE

NEW APPROACHES FOR AUTOMATICAL IDENTIFICATION

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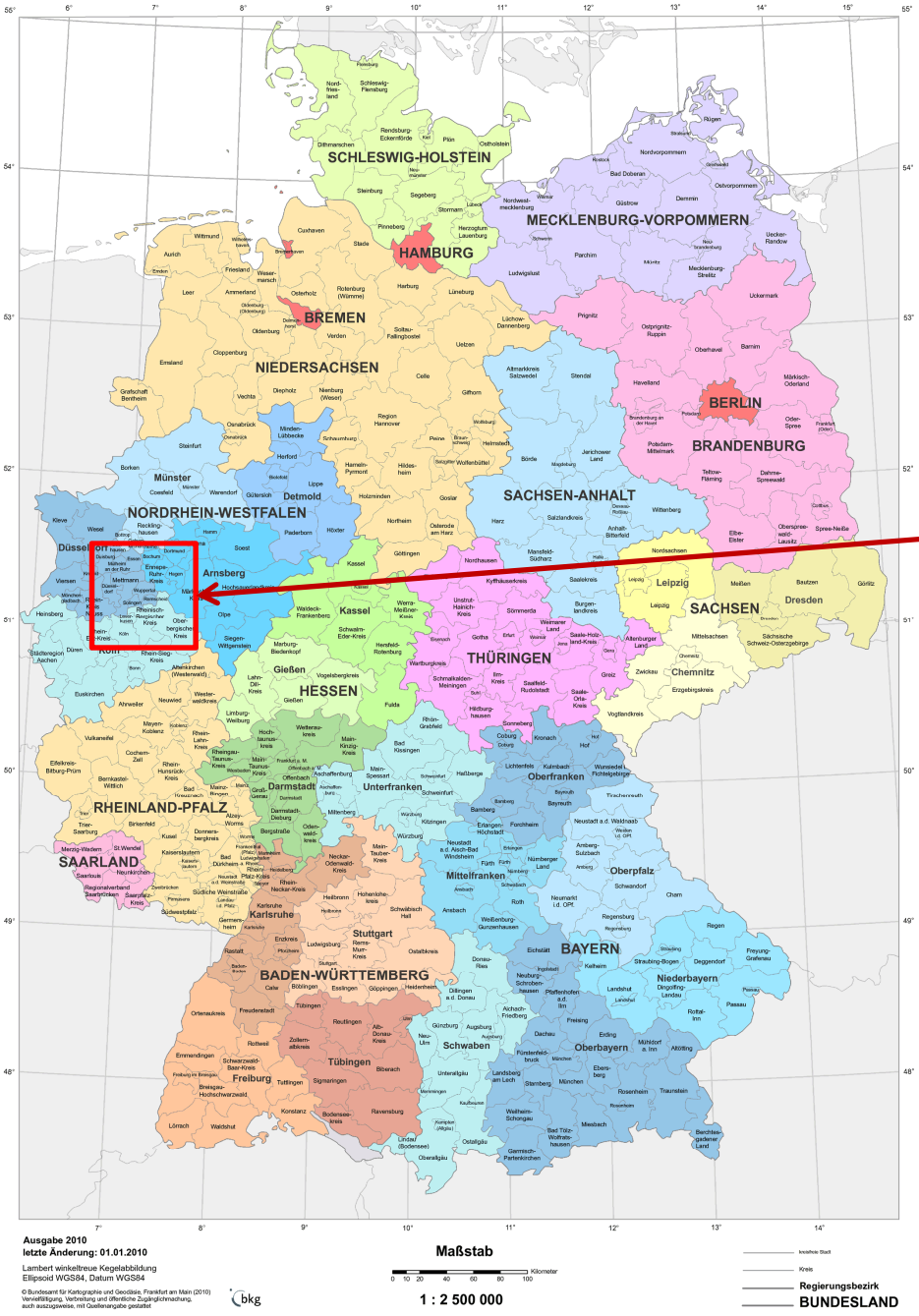
STADTWERKE SOLINGEN



North Rhine-Westphalia (part of it)

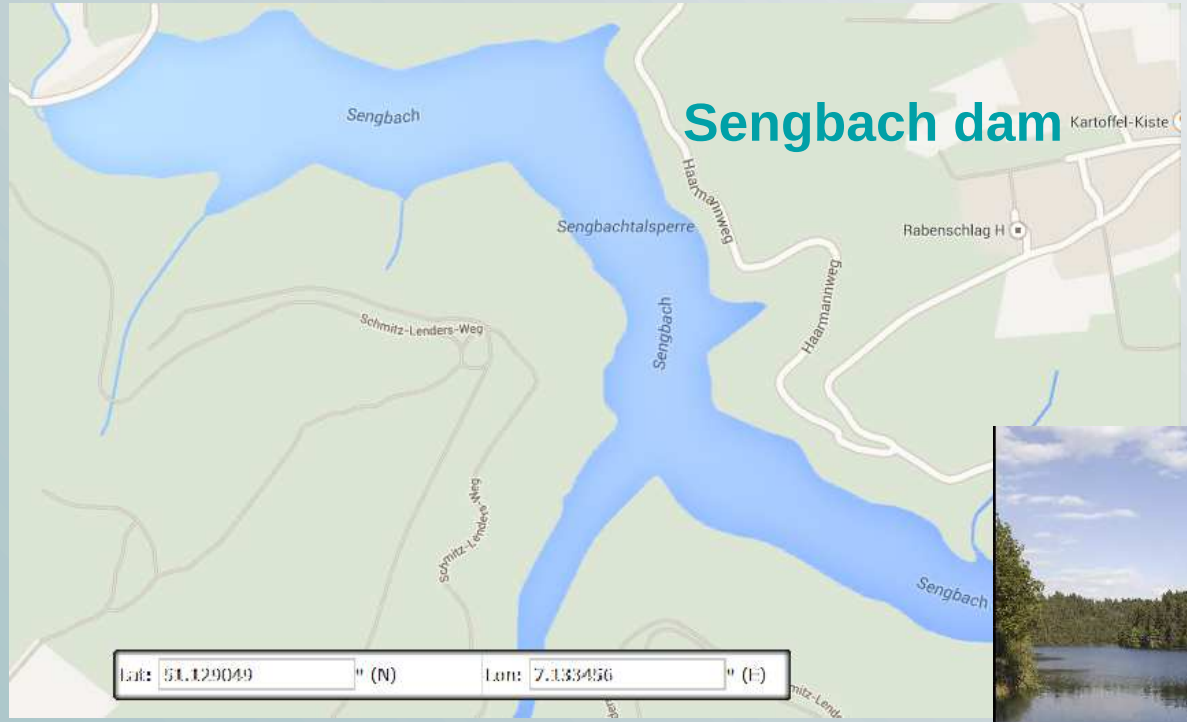
North Rhine-Westphalia

16,6 Mio. inhabitants (2013)

Water consumption 130 l/day

= 2,2 Mio. m^3/day total

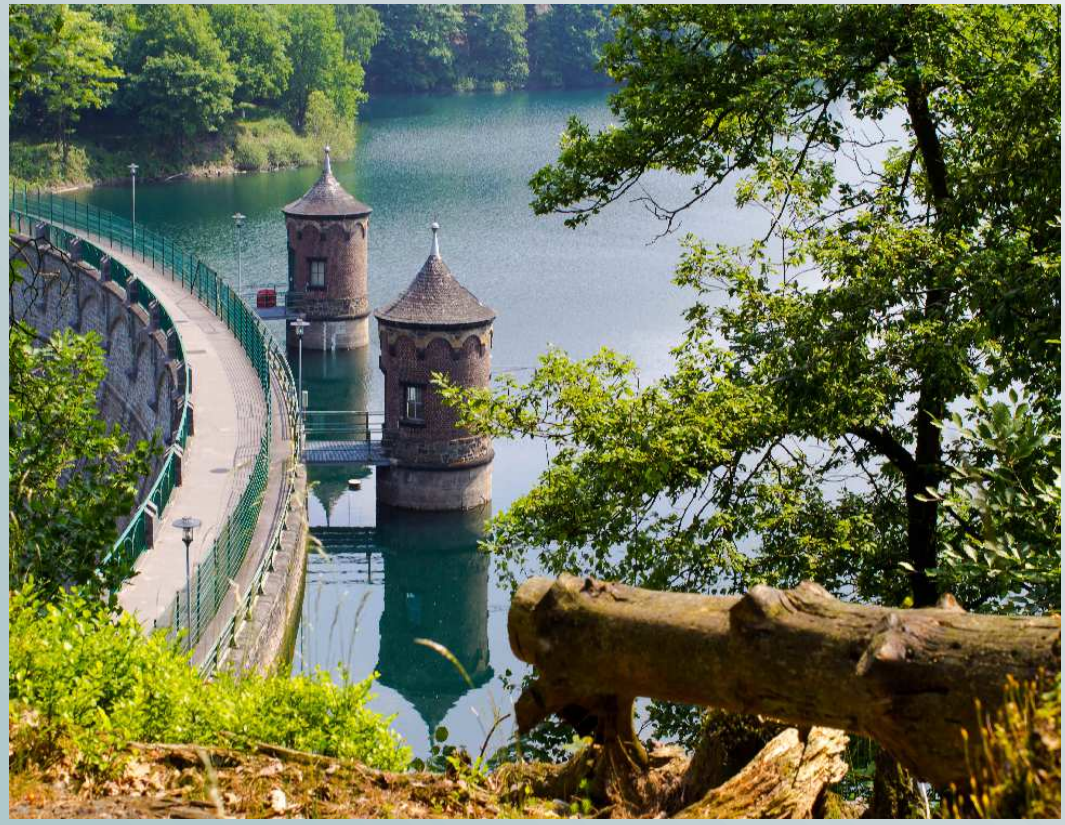
The area of interest in 2013



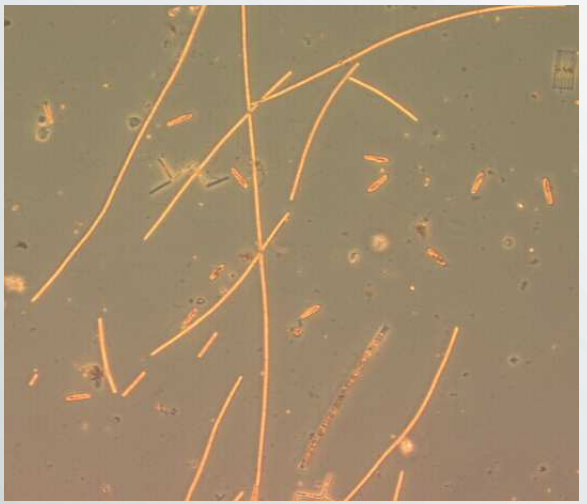
Sengbach dam

20 ha
2,8 Mio. m³
Maximum depth 36 m

Extraction for drinking water processing

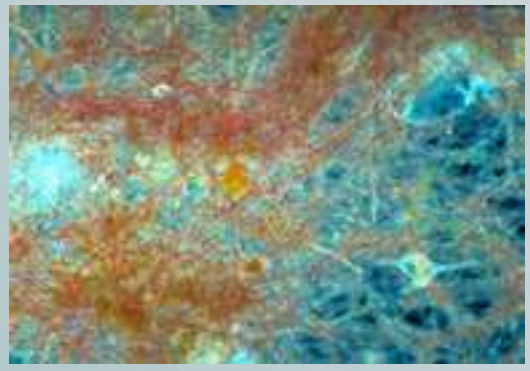


massive dam with waterworks Glüder



Planktothrix rubescens

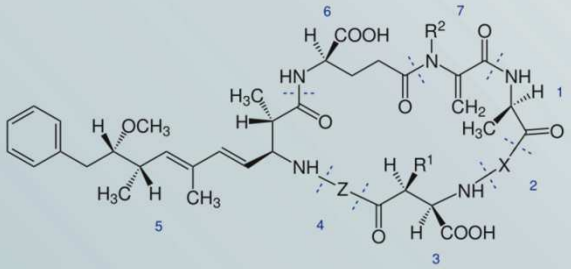
The threat of the Planktothrix

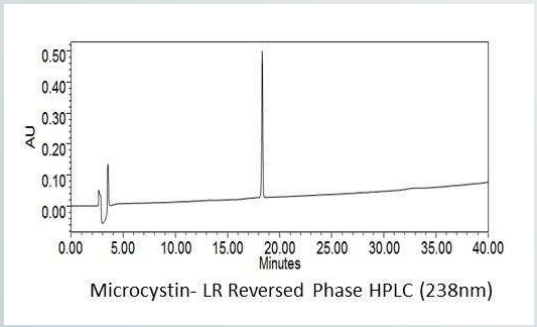


→ Cyanotoxin →

Reduce water quality
Raise health risks
Additional counteractions
Raise costs
Close of extraction

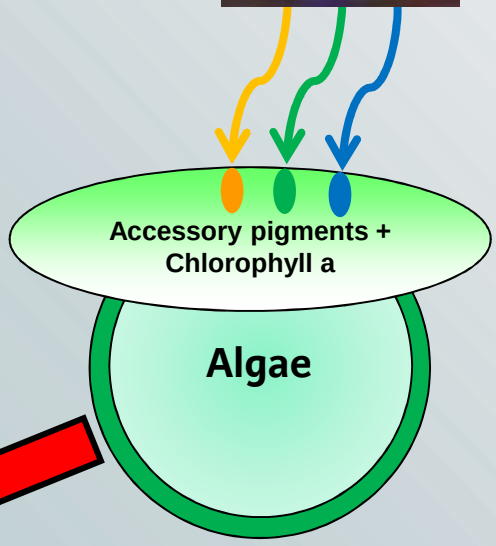
Planktothrix rubescens

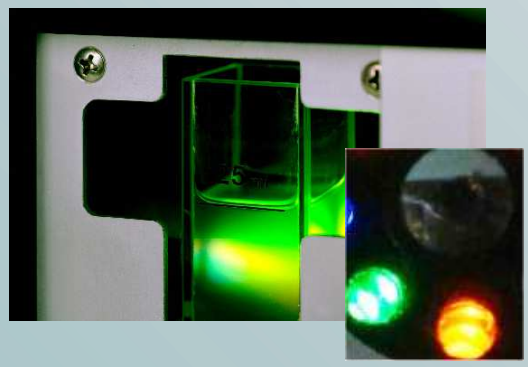




How it works: fluorometric measurement of algal and cyanobacterial microplankton

Excitation of pigments with light of different wavelengths

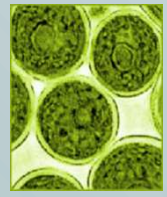




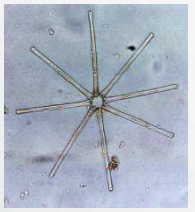
Determination of chlorophyll fluorescence

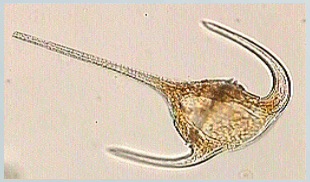
What are the Algae classes?

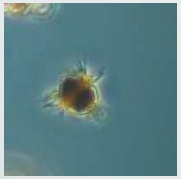
Algae classes contain different accessory pigments



Spectral Group	Green	Blue	Brown	Red	Mixed
Peripheral Antenna	Chlorophyll a/b-Xanthophyll	Phycobilisomes (Phycocyanin)	Chlorophyll a/c-Xanthophyll	Phycobilisomes (Phycoerythrin)	Chlorophyll a/c-Phycobiliprotein
Division	Chlorophyta	Cyanophyta Glaucophyta	Heterokonto-phyta Haptophyta Dinophyta	Rhodophyta	Cryptophyta

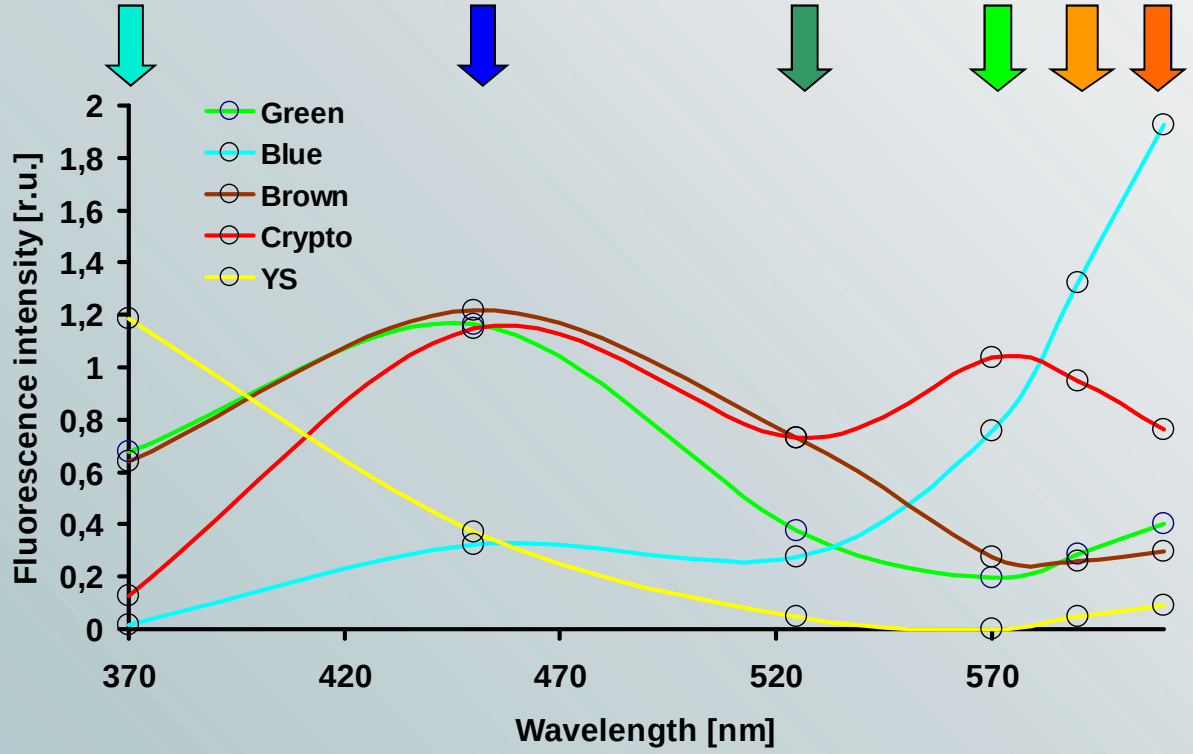


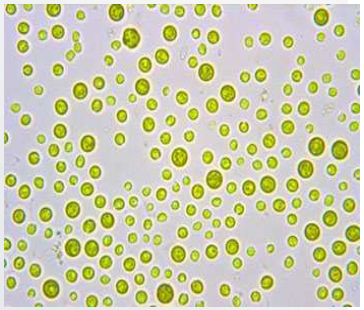


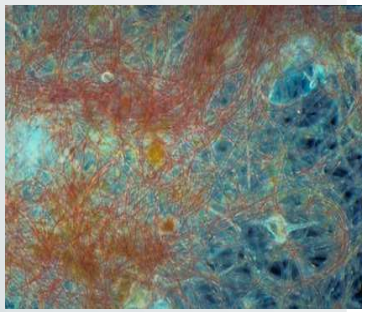


…which affect the chlorophyll fluorescence emission in characteristic pattern

Who is Who: Norm spectra

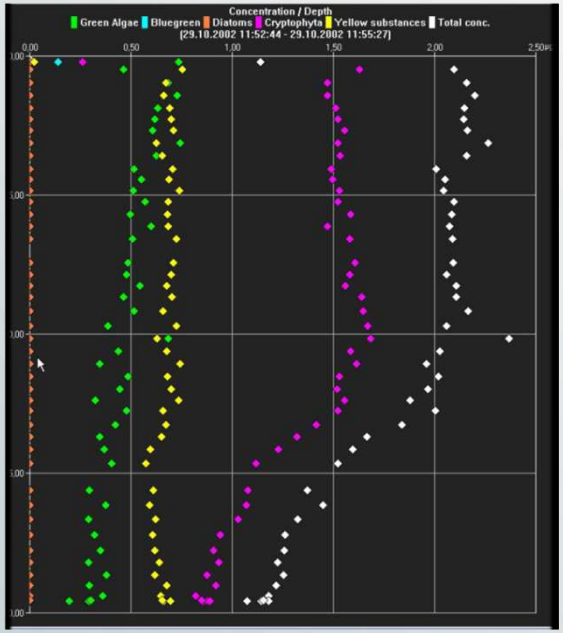






(fingerprints) of algae classes including *Planktothrix* from a cell library

What can multispectral fluorometry accomplish?

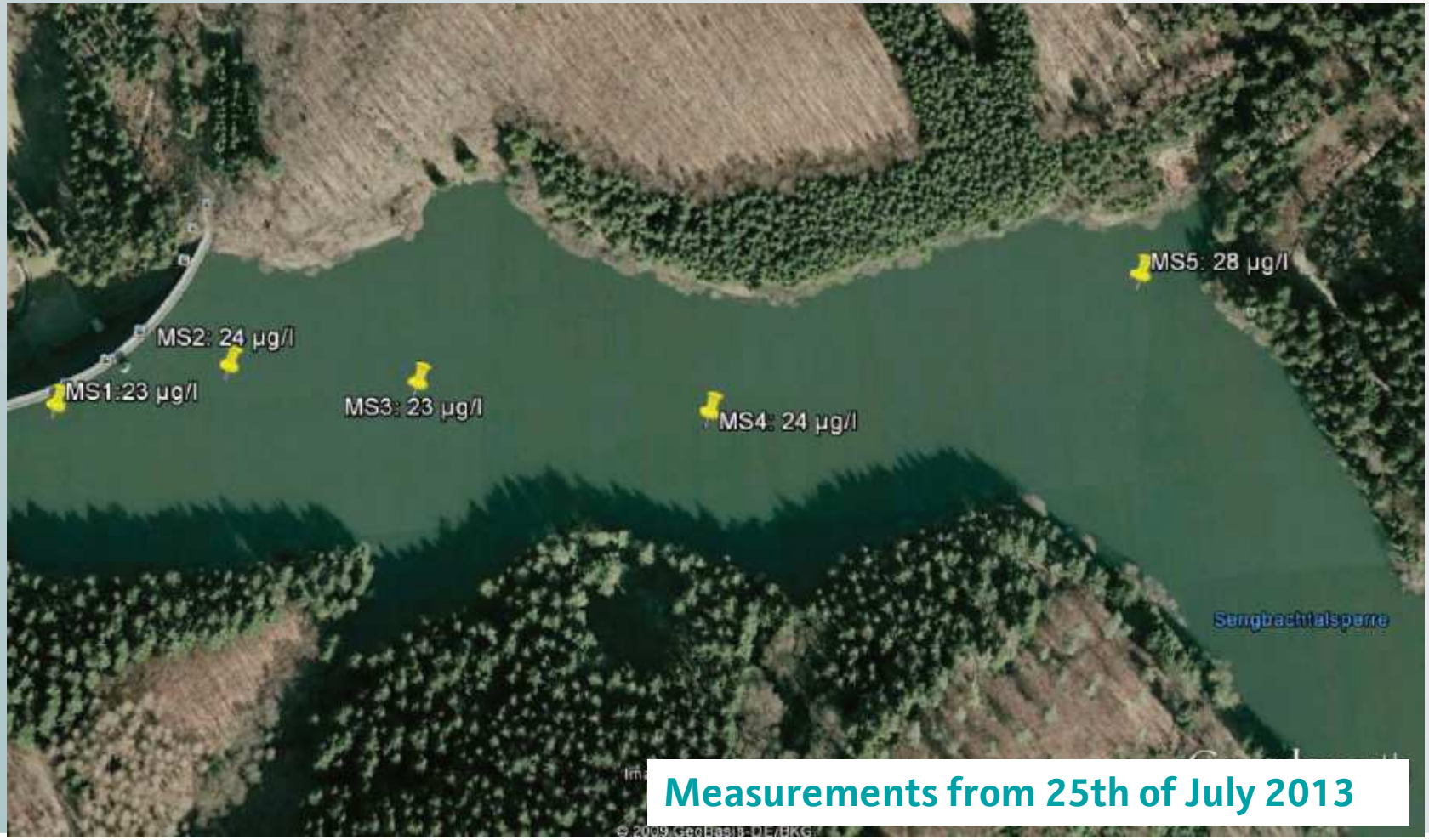


- Differentiation of algal classes in a complex mixture
- Determination of cyanobacteria i.e. *Planktothrix*
- Determination of chlorophyll content
- Correction for fluorescent interfering substances

Online measurement at the intake of the waterworks

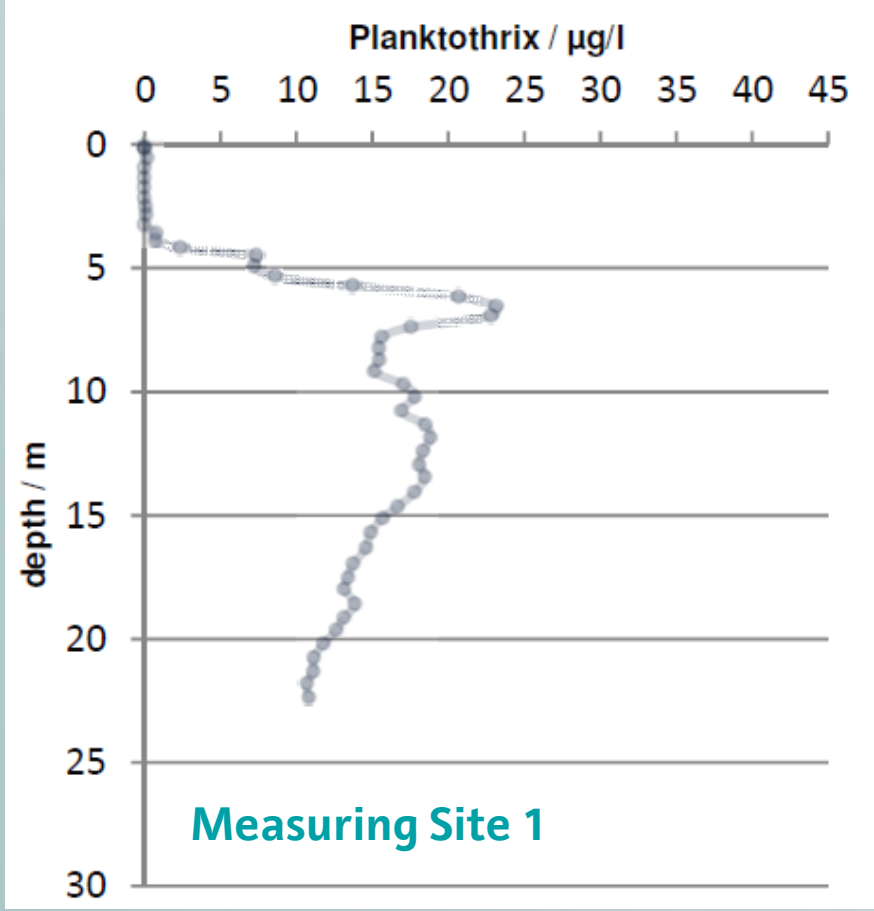
profile measurements in the dam

Distribution of *Planktothrix rubescens*



Measurements from 25th of July 2013

Depth profiles of *Plankthothrix rubescens*



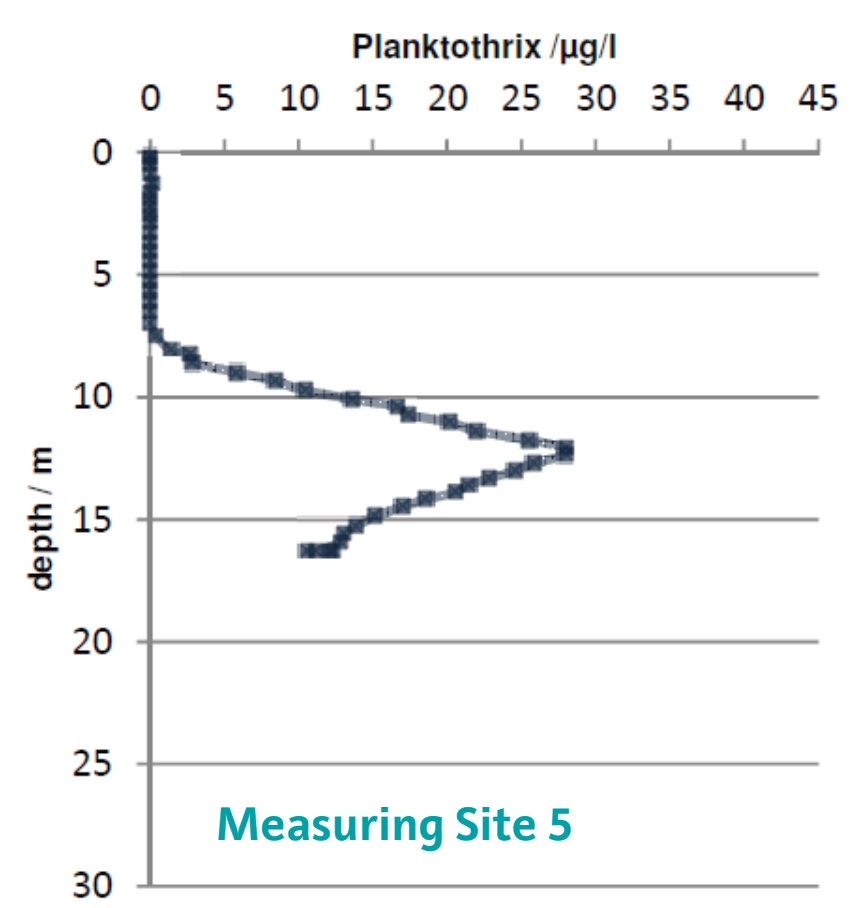
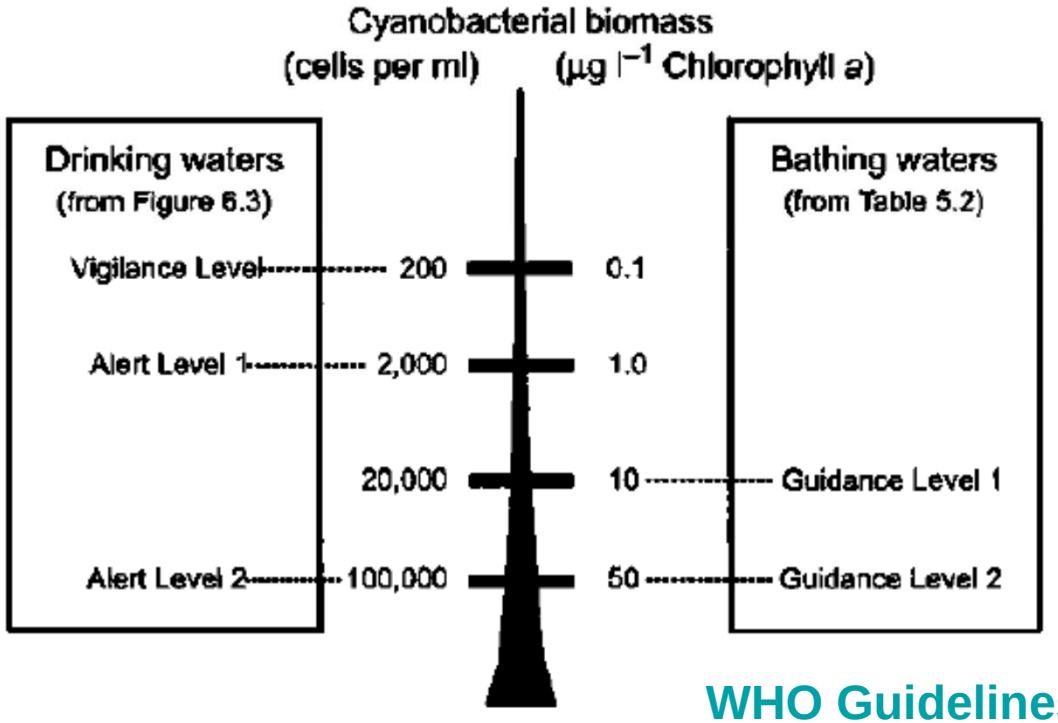
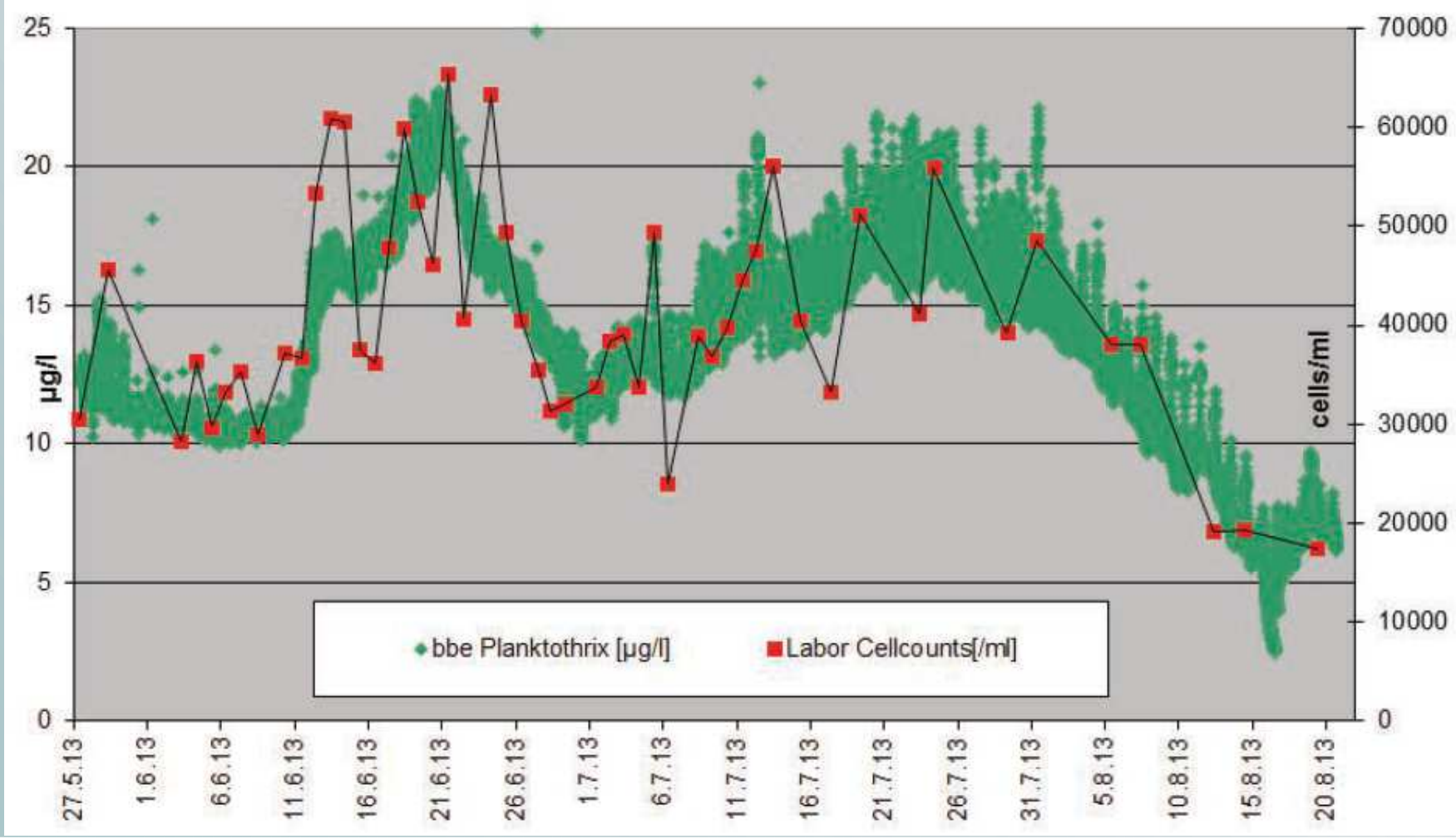


Figure 6.5 Summary of managerial action levels for drinking waters (see Alert Levels Framework decision tree in Figure 6.3) and for bathing waters (see Guidance Levels in Table 5.2). Note that for bathing waters, the special Guidance Level 3 (scum formation) can be achieved during calm weather conditions at open water biomass levels similar to Guidance Level 1



WHO Guidelines 1999

Compare the cell counts



Conclusion

Fluorometric depth profiling and flow through online analysis are a sensitive and rapid tool for the detection of upcoming Plankthotrix

非常感谢您的参加！