



1st Symposium on Harmful Cyanobacteria in Cyprus

Phytoplankton community long – term changes in Polemidia reservoir

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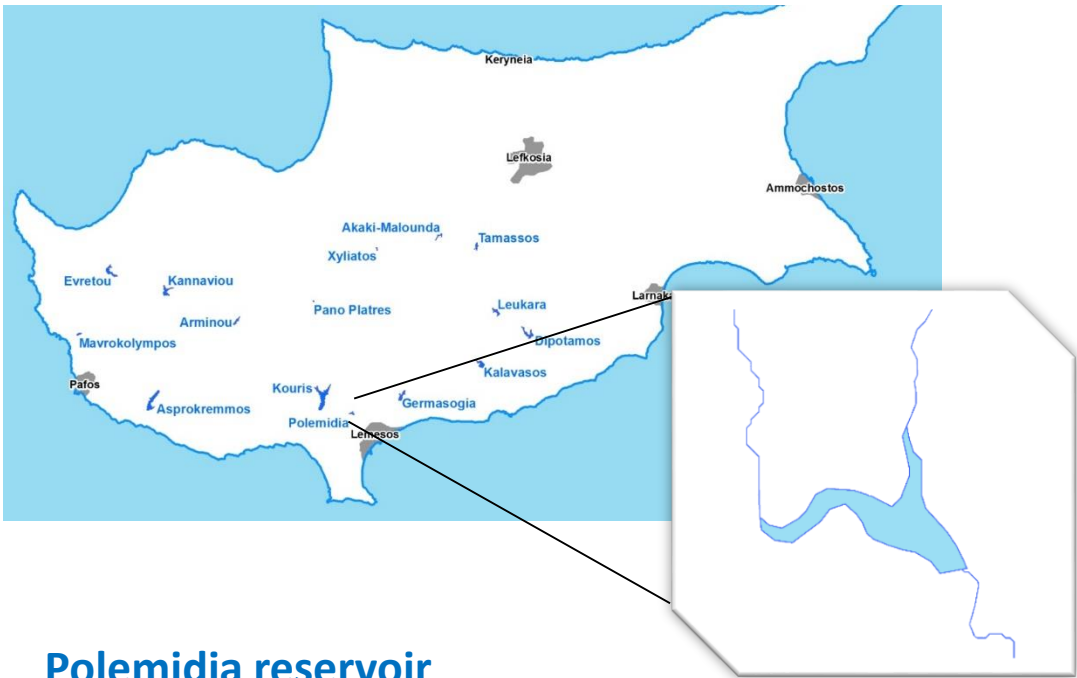
WDD:

Phytoplankton monitoring in Cyprus impounded rivers (reservoirs), as the **only Biological Quality Element** under the implementation of the WFD 2000/60/EC

In Polemidia reservoir:

- phytoplankton was examined for 8 years (2008-2016)
- 23 samplings on several periods of the year
- special focus on the warm period (June and September)





Polemidia reservoir

- ✓ built in 1965
- ✓ water capacity: 3,4 million m³
- ✓ relatively shallow (max. water depth: 26 m)
- ✓ without oxygenation equipment
- ✓ area sensitive to urban waste water discharges
- ✓ storage of recycled water
- ✓ use for irrigation
- ✓ **highly eutrophic with prolonged cyanobacterial blooms**



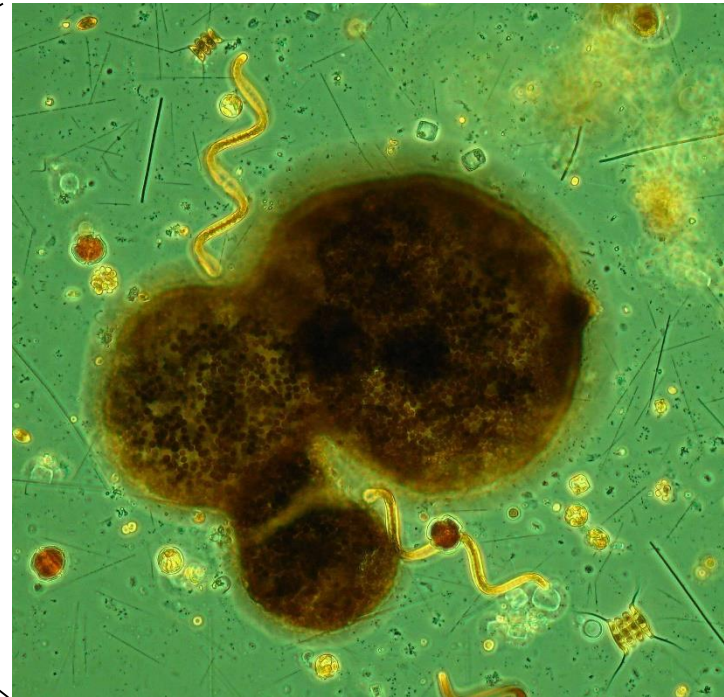
Sampling procedure:

- Sampling of the euphotic zone, at the deepest lake point (euphotic zone = $2.5 * \text{Secchi depth}$)
- Integrated water sample of the euphotic zone
- Live phytoplankton samples, using plankton net



Phytoplankton analysis:

- Live and preserved (with lugol) samples are analyzed in Hydrobiology Lab
- Utermöhl inverted microscope method
- Species identification & enumeration, abundance and biomass determination, WFD indices estimation, ecological potential evaluation



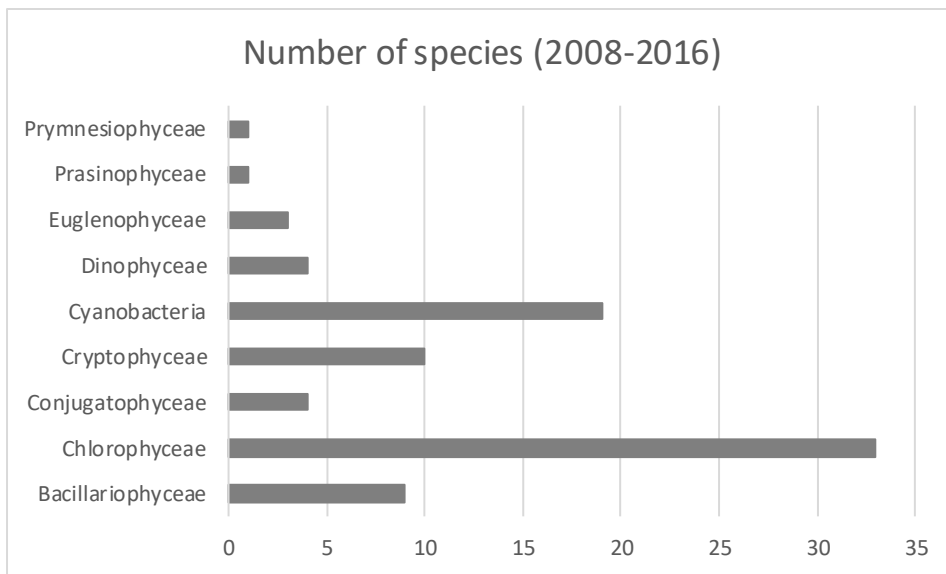
2008-2016:

23 samples

7 phytoplankton groups

total 84 species

avg 16 species / sample



ABUNDANCE

High levels (6000 - 47000 ind./mL), with continuous fluctuations through time

2008-2016

- ✓ Cyanobacteria
- ✓ Diatoms
- ✓ Chlorophyceae
- ✓ Cryptophyceae
- ✓ Dinophyceae



BIOMASS

Extremely high values, with continuous fluctuations

2008-2011: avg 177 mm³/L

- Cyanobacteria



DOMINANT: *Microcystis* spp.
(avg 90,5%)

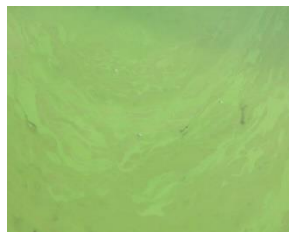
2008



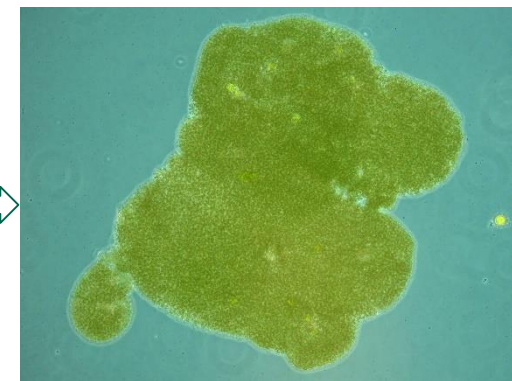
2009



2010

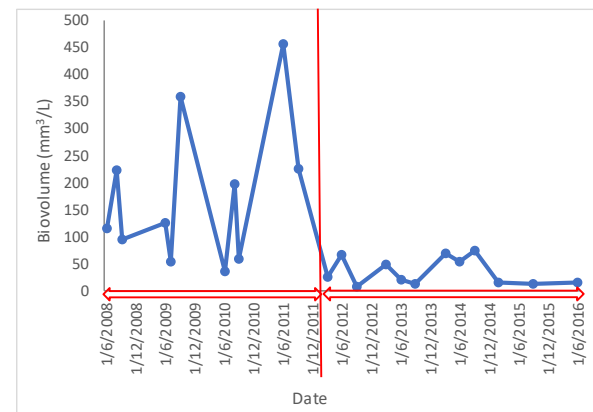


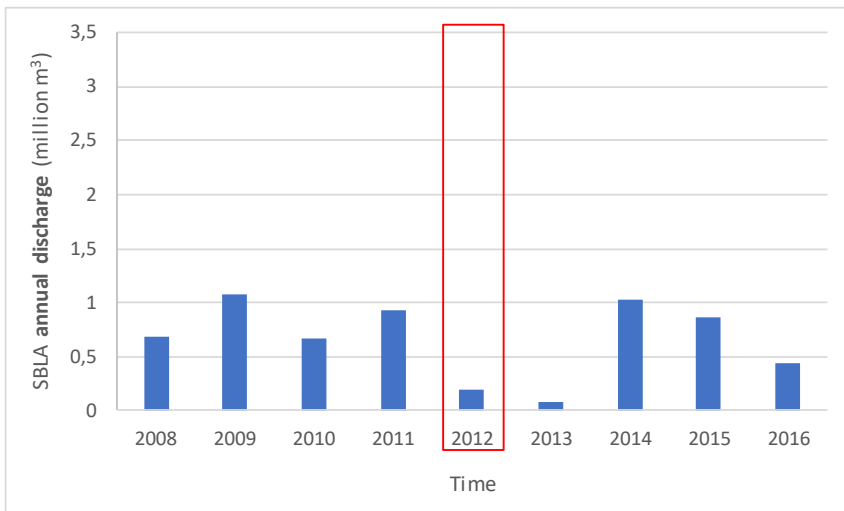
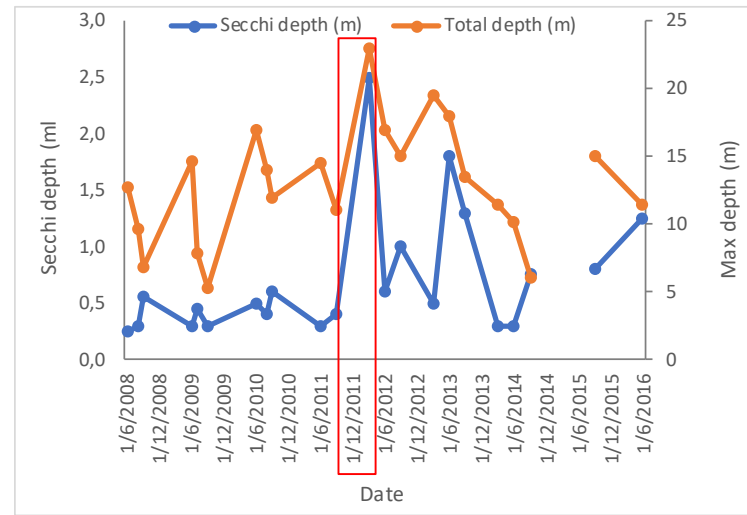
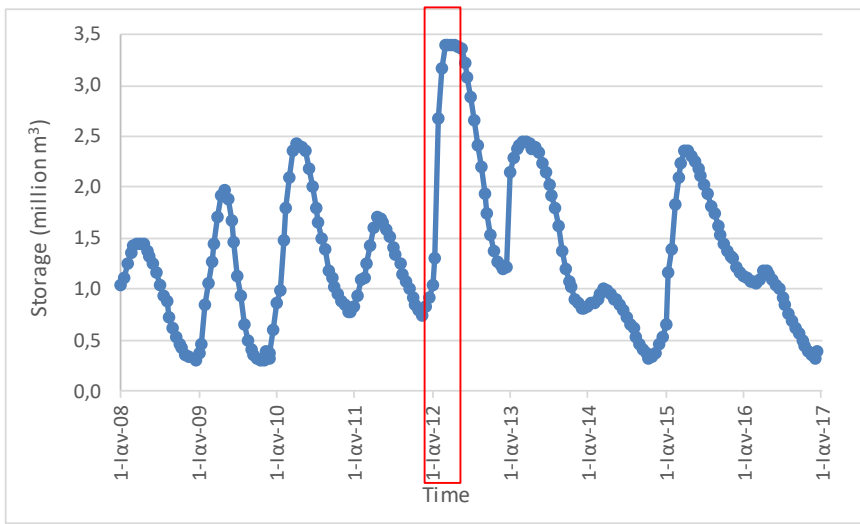
2011



2012-2016: avg 36 mm³/L

- Cyanobacteria
- Chlorophyceae
- Cryptophyceae
- Dinophyceae
- Diatoms





2012:

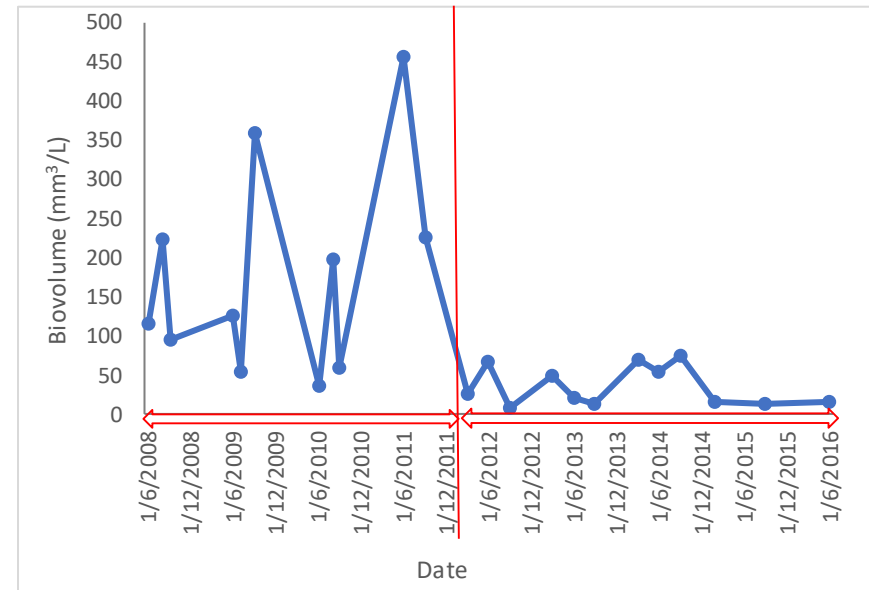
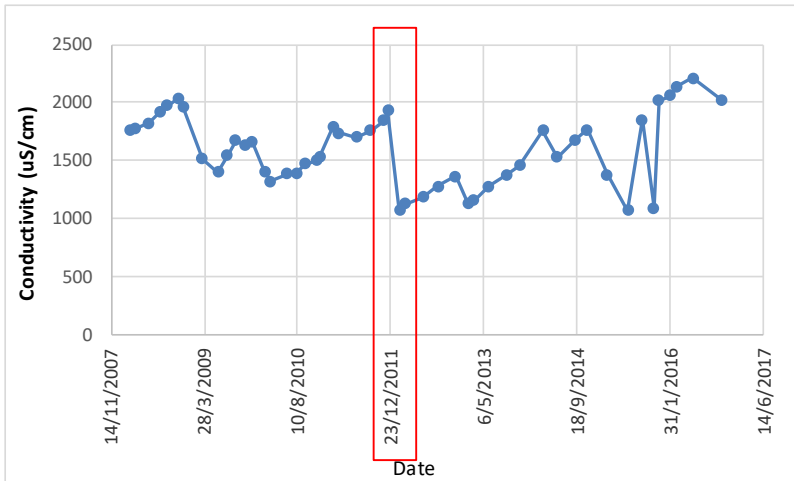
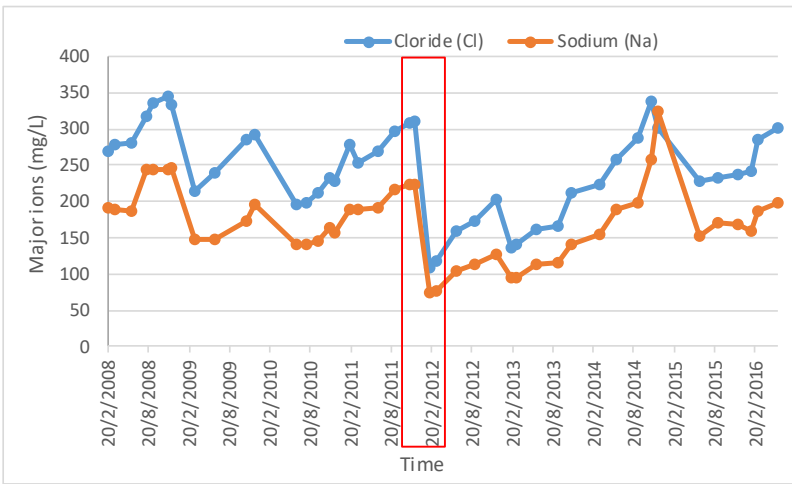
- above average rainfall
- full storage
- sharp increase of total depth
- increased Secchi depth
- decreased treated sewage effluent



SHIFT

SHIFT:

DILUTION of ions
HYDRODYNAMIC & LIGHT changes
CONDUCTIVITY DECREASE
→ change of dominant species
BIOMASS DECREASE to lower levels
IMPORTANT TRANSITION in
phytoplankton community



Cyanobacteria

2012 2013 2015

Anabaenopsis elenkinii



2014

Arthrospira platensis



2012 2014 2015 2016

Microcystis spp.



2015 2016

Limnothrix spp.



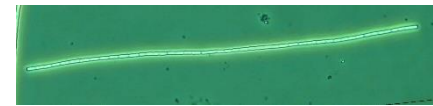
2012 2013 2014 2015

Planktothrix spp.



2012

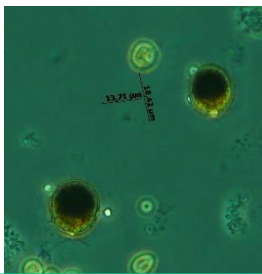
Pseudanabaena spp.



Chlorophyceae

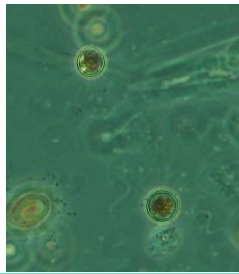
2012 2013

Chlamydomonas spp.



2015

Golenkinia radiata



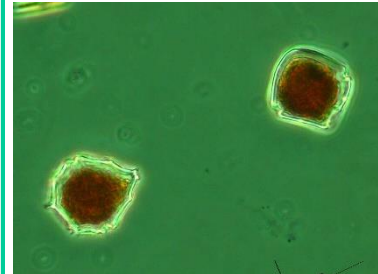
2013 2015 2016

Nitzschia spp.



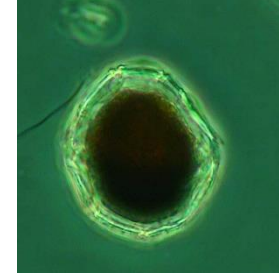
2013

Peridinium spp. (2 sps)



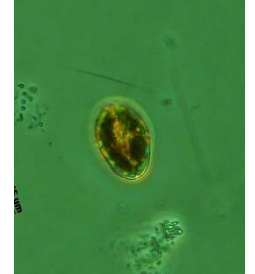
2013 2014

Peridinium cinctum



2013 2015

Cryptomonas spp. (2 sps)



- Despite phytoplankton community shift in 2012, **EQR remained low** and ecological potential **moderate and below**.

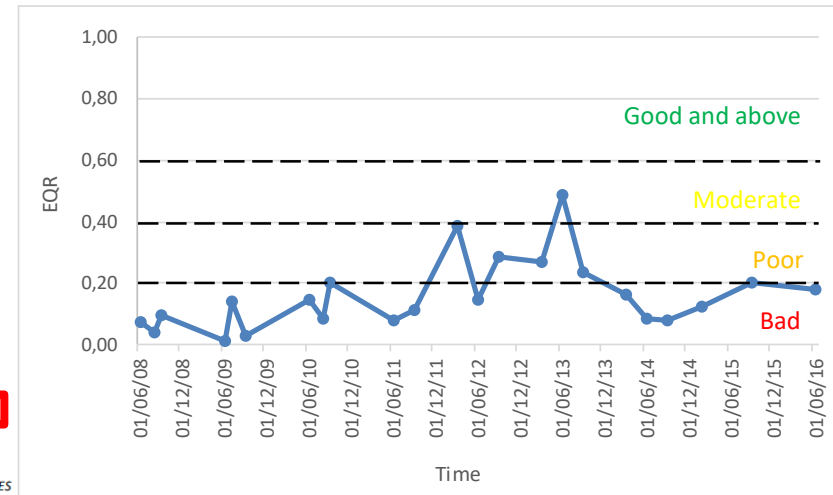
2nd River Basin Management Plan (2009 – 2013)

Βαθμός αβεβαιότητας: 1 = Χαμηλή, 2 = Μέτρια, 3 = Υψηλή, 4 = Πολύ υψηλή

Κωδικός ΥΣ	Όνομα	ΟΙΚΟΛΟΓΙΚΟ ΔΥΝΑΜΙΚΟ	Βαθμός αβεβαιότητας	Χημική κατάσταση	Βαθμός αβεβαιότητας	Συνολική κατάσταση
CY_1-2-c_RP_HM_IR	Αρμίνου	ΚΑΛΗ	1	ΚΑΛΗ	1	ΚΑΛΗ
CY_1-3-d_Rih_HM_IR	Ασπρόκρεμμος	ΚΑΛΗ	1	ΚΑΛΗ	3	ΚΑΛΗ
CY_1-4-c_RI_HM_IR	Κανναβιού	ΚΑΛΗ	1	ΚΑΛΗ	3	ΚΑΛΗ
CY_1-6-b_Rih_HM_IR	Μαυροκόλυμπος	ΚΑΛΗ	1	ΚΑΛΗ	2	ΚΑΛΗ
CY_2-2-e_RI_HM_IR	Ευρέτου	ΚΑΛΗ	1	ΚΑΛΗ	2	ΚΑΛΗ
CY_3-5-b_RI_HM_IR	Ευλιάτος	ΚΑΛΗ	1	ΚΑΛΗ	2	ΚΑΛΗ
CY_3-7-i_RI_HM_IR	Ακακίου-Μαλούντα	ΜΕΤΡΙΑ	1	ΚΑΛΗ	1	ΜΕΤΡΙΑ
CY_6-1-b_Rih_HM_IR	Ταμασού	ΚΑΛΗ	1	ΚΑΛΗ	1	ΚΑΛΗ
CY_8-7-b_RI_HM_IR	Λεύκαρα	ΚΑΛΗ	1	ΚΑΛΗ	3	ΚΑΛΗ
CY_8-7-e_RI_HM_IR	Διπόταμος	ΚΑΛΗ	1	ΚΑΛΗ	3	ΚΑΛΗ
CY_8-9-d_RI_HM_IR	Καλαβασός	ΚΑΛΗ	1	ΚΑΛΗ	1	ΚΑΛΗ
CY_9-2-g_RI_HM_IR	Γερμασόγεια	ΜΕΤΡΙΑ	1	ΚΑΤΩΤΕΡΗ ΤΗΣ ΚΑΛΗΣ	1	ΜΕΤΡΙΑ
CY_9-4-d_RI_HM_IR	Πολεμίδια	ΚΑΚΗ	2	ΚΑΤΩΤΕΡΗ ΤΗΣ ΚΑΛΗΣ	1	ΚΑΚΗ
CY_9-6-j_RP_HM_IR	Πάνω Πλάτρεις	ΚΑΛΗ	4	ΚΑΛΗ	3	ΚΑΛΗ
CY_9-6-s_RP_HM_IR	Κούρης	ΚΑΛΗ	1	ΚΑΛΗ	3	ΚΑΛΗ

ΠΗΓΗ: (REVIEW AND UPDATE OF ARTICLE 5 OF DIRECTIVE 2000/60/EC (WATER RESERVOIRS) & CLASSIFICATION OF WATER STATUS (RIVERS, NATURAL LAKES AND WATER RESERVOIRS), THAT WILL ESTABLISH BASELINE INFORMATION AND DATA FOR THE 2ND CYPRUS RIVER BASIN MANAGEMENT PLAN, April 2014 (Table 5.1.5-1))

Based on phytoplankton results (2008 – 2016)



- Correct future management requires further monitoring and longer time-series.





**Thank you for your
attention**



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