

Impact of multiple disturbances on microbiological quality of urban and peri-urban lakes

Presentation of the thesis project

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Urban and Peri-Urban Lakes

Enghien Lake



Grand Marais Lake



Châtillon Lake

(Catherine *et al.*, 2008)

Scientific context



Local scale
Anthropogenic pressures
(urban/industrial pollutions)

Global scale
Climatic events changes
(rains, heatwaves)

(Poff *et al.*, 2002; Peters *et al.*, 2008)

Lake (aquatic ecosystem)

Ecosystem Services
(economical/recreational/educational)

(Bolund & Hunhammar, 1999)

Scientific context



Local scale
Anthropogenic pressures
(urban/industrial pollutions)

Global scale
Climatic events changes
(rains, heatwaves)

Lake (aquatic ecosystem)

(Williamson *et al.*, 2008; Johnson *et al.*, 2010)

Ecological status
(Ecosystem functioning)

Sanitary status

Ecosystem Services
(economical/recreational/educational)

Lakes (aquatic ecosystem)

Ecological status

Bacterial communities
(diversity/density)

Sanitary status

Indicators of faecal pollution
(*E. coli*/intestinal enterococci)

Environmental pathogens
(nontuberculous mycobacteria NTM)

Scientific context



Escherichia coli



Enterococcus faecalis



Mycobacterium chelonae

Urban Lakes (aquatic ecosystem)

Ecological status

Bacterial communities
(diversity/density)

Sanitary status

Indicators of faecal pollution
(*E. coli*/intestinal enterococci)

Environmental pathogens
(NonTuberculous Mycobacteria NTM)

Identify factors controlling bacterial and pathogen populations density and diversity



Modelize relative impact of global changes on microbial compartment

Identify sensitive areas and factors modifying the ecological and sanitary status by modeling



Optimise management practices



PULSE Project

- 4 laboratories
- abiotic and biotic parameters monitored

↓
metals
light
T°
conductivity
TSS
PAH
etc.

↘
diatoms
zooplankton
viruses
bacterial community
pathogen populations
etc.

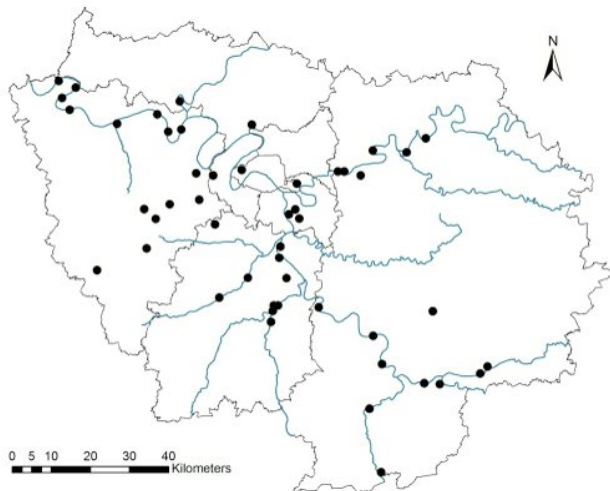


PULSE Project

- 4 laboratories
- abiotic and biotic parameters monitored
- two approaches :

larger scale

(impact of land use)



smaller temporal and spatial scale

(seasonal changes)



* **Larger scale** : impact of land use

- 48 lakes monitored

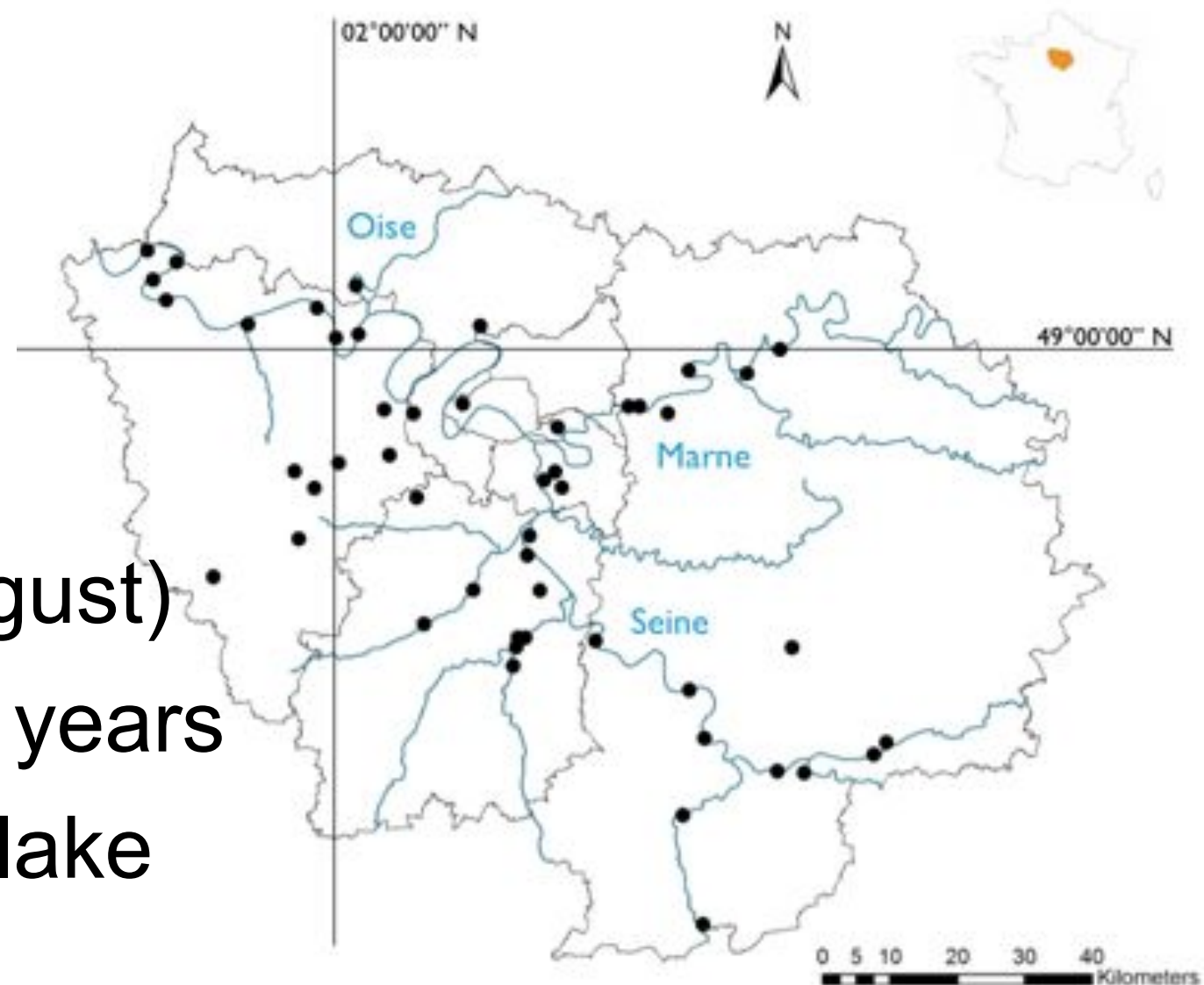


Ile-de-France region



contrasted watersheds : size, land use, water management, etc.

- once a year (July-August)
- for three consecutive years
- 1 pooled sample per lake



Material & Methods

Sampling design

Ecological status

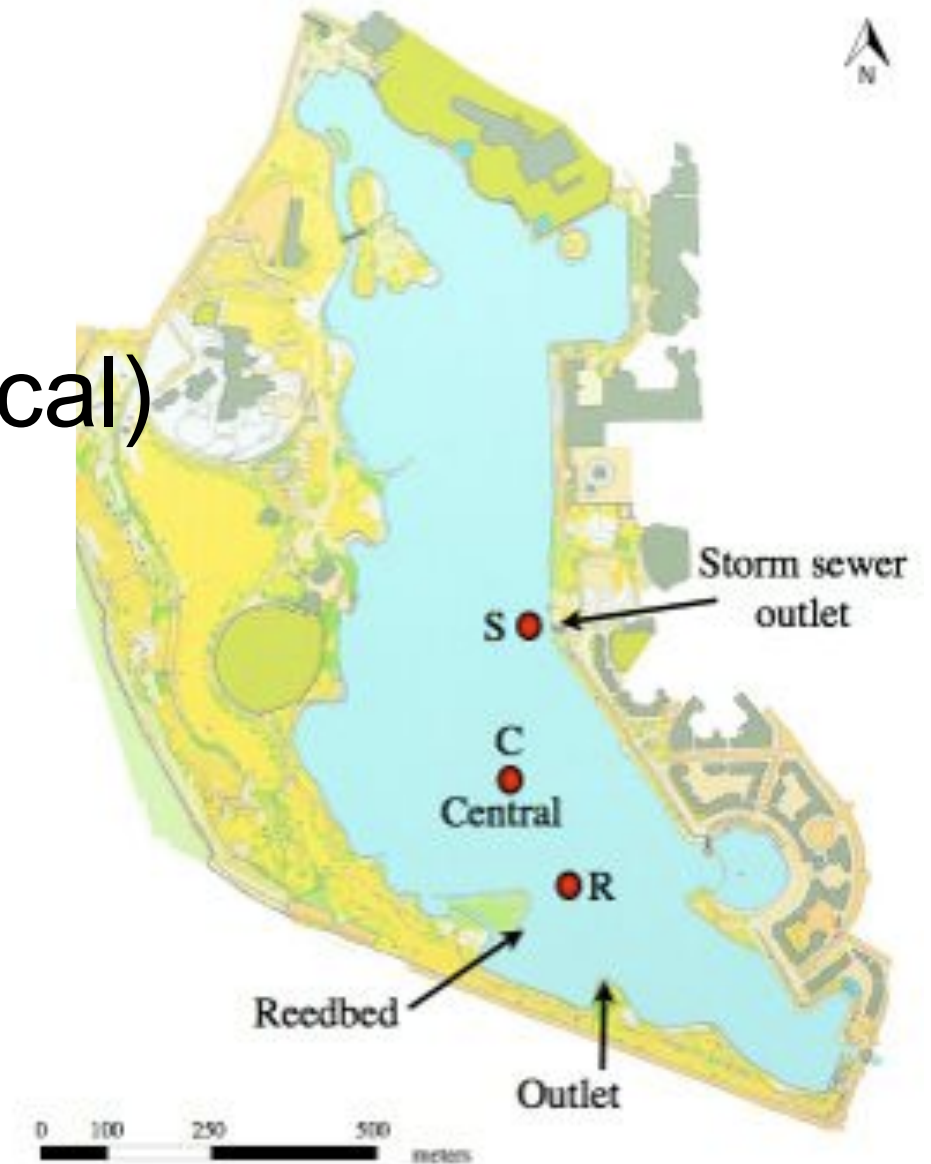
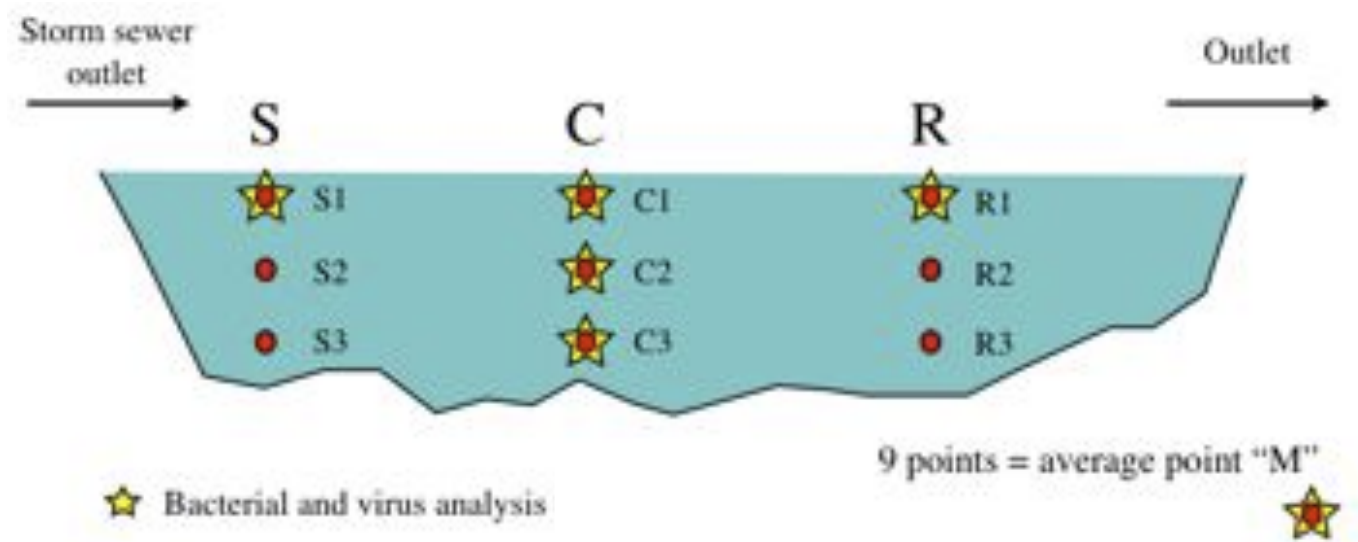
Sanitary status

* **Larger scale** : impact of land use

* **Finner scale** : impact of temporal and spatial variability

Créteil Lake

- monthly monitoring
- 2 transects (horizontal/vertical)



Bacterial communities

- diversity : characterization of microbial communities

dHPLC (Denaturing High-Performance Liquid Chromatography)

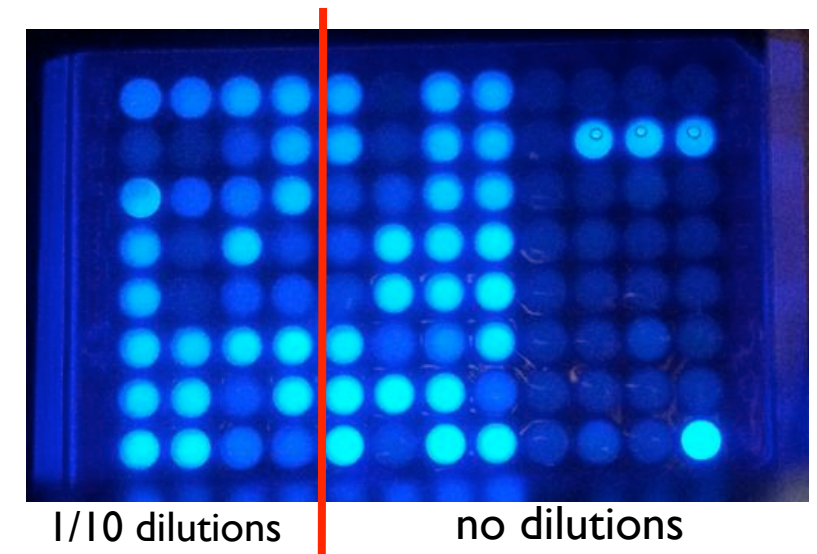
sequencing (one the three 48 lakes campaigns - Créteil Lake)

- density : cytometry (other laboratory, ESE, Orsay France)

* Indicators of faecal pollution :

- density : Most Probable Number

E. coli (NF EN ISO 9308-3)
intestinal enterococci (NF EN ISO 7899-1)



* Environmental pathogens : NonTuberculous Mycobacteria (NTM)

- density : quantitative PCR highly specific
- structure : dHPLC

Only results on indicators of faecal pollution level
(6 Créteil Lake campaign + 1st 48 lakes campaign)

Only results on indicators of faecal pollution level
(6 Créteil Lake campaign + 1st 48 lakes campaign)

[E. coli + intestinal enterococci] ↗ ↗
when



Lakes connected to the
Seine river



after rain events

Achieved


- First 48 lakes campaign achieved (preparation of the next one)
- 6 campaigns on Créteil lake
- Development of protocols for DNA extraction
- Harvest data for GIS
- Creation of sampling systems for others projects



February 2012,
Créteil Lake



Assemblage of
metal screen



Thank you for your attention