



**Landscape management and nitrogen retention in the watersheds :
quantitative impact at the coastal zone**

Nitrogen and global change - Edinburgh, April 11-14 2011

1 – What are we able to model?

Principles and validations

2 – What progress since 1985 in terms of wastewater treatment?

Reference year OSPAR, maximum diffuse inputs to the sea

3 – Complete the endeavor of the urban waste waters treatment

Implementation of the European Water Framework Directive (1992)

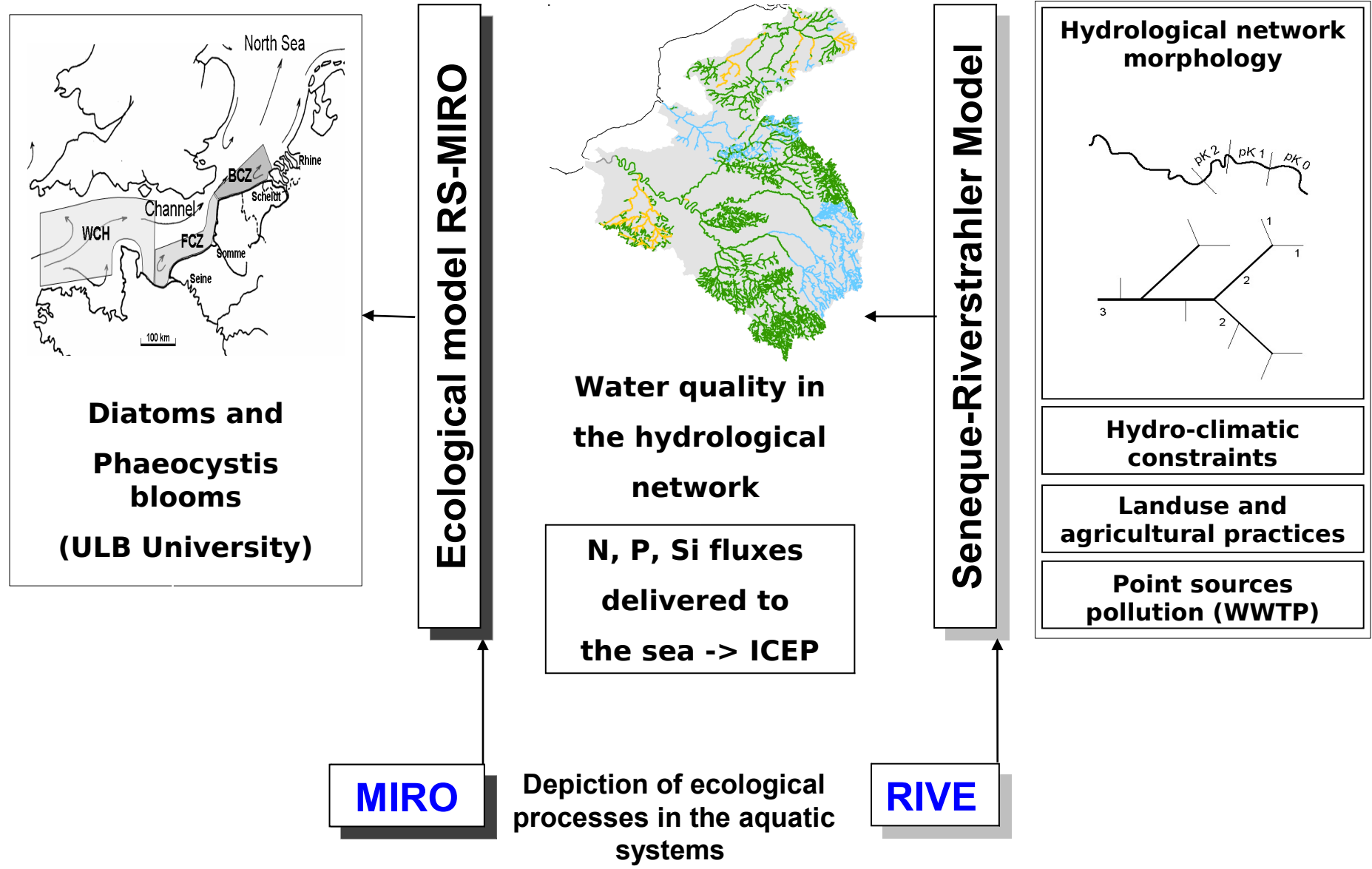
4 – Implementation of the goals of the « Grenelle de l'Environnement »

An other agriculture on well catchments

5 – Imagine a radical change in agricultural practices

An other agriculture on the whole of the three watersheds

1 – What are we able to simulate?

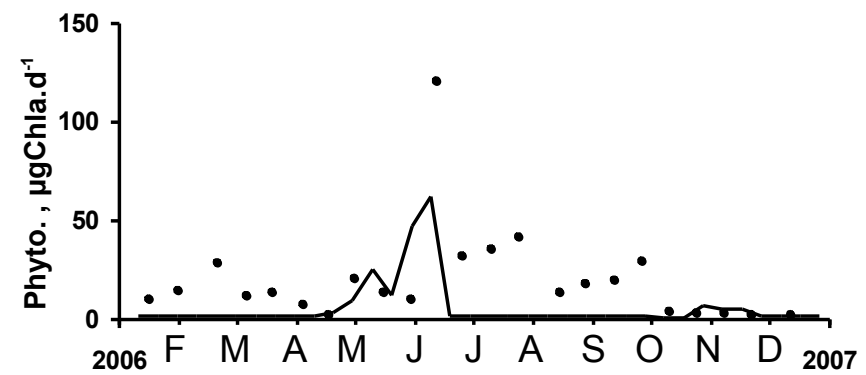
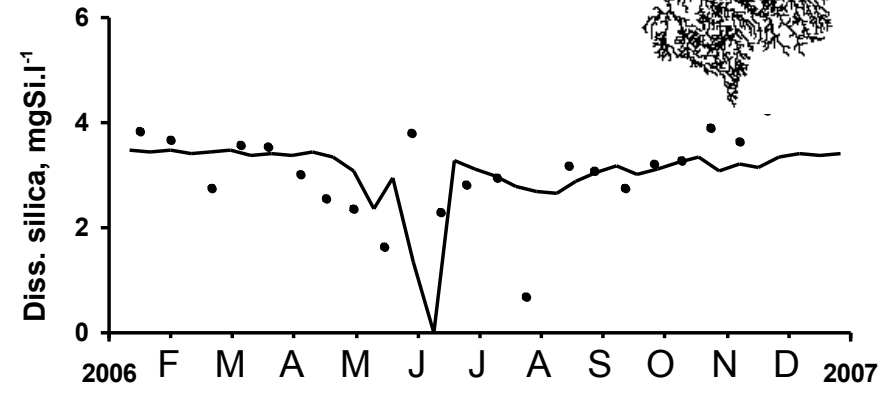
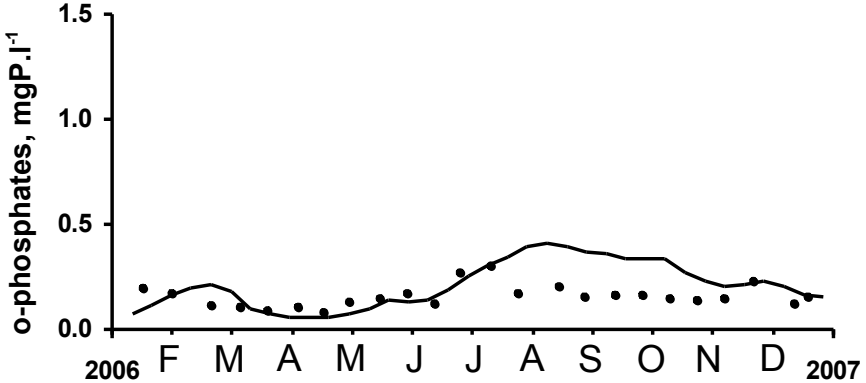
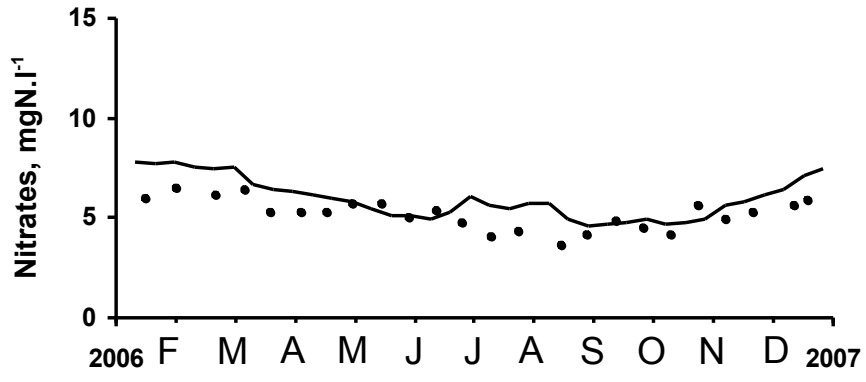
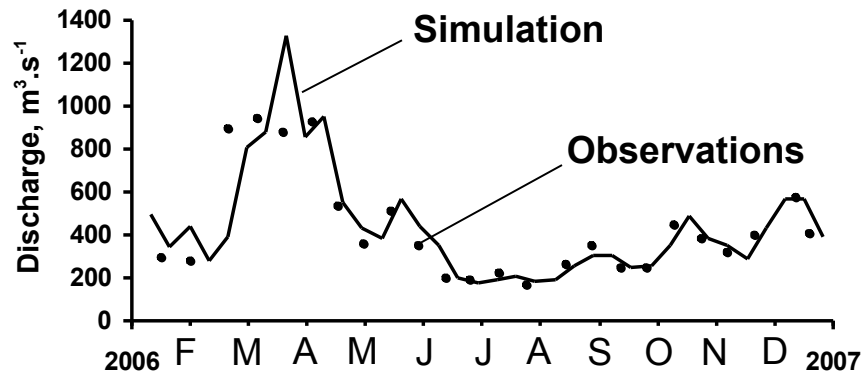
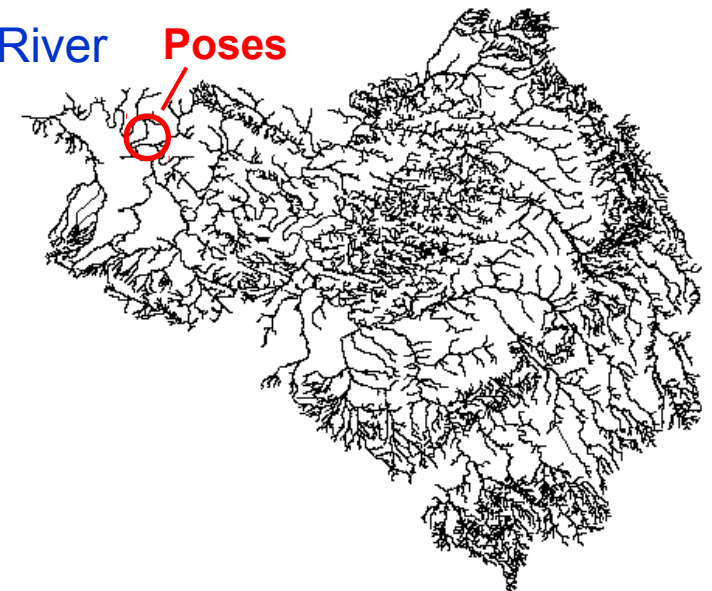


Lancelot et al., 2005; Lancelot et al., 2007

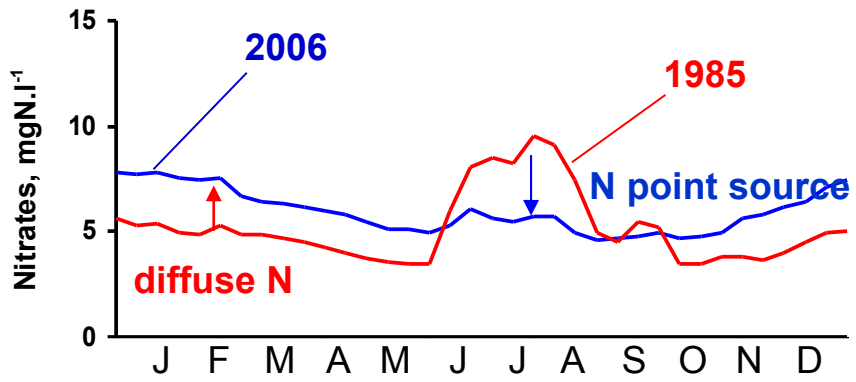
Billen et al., 1994; Garnier et al. 2000

1 – What are we able to simulate?

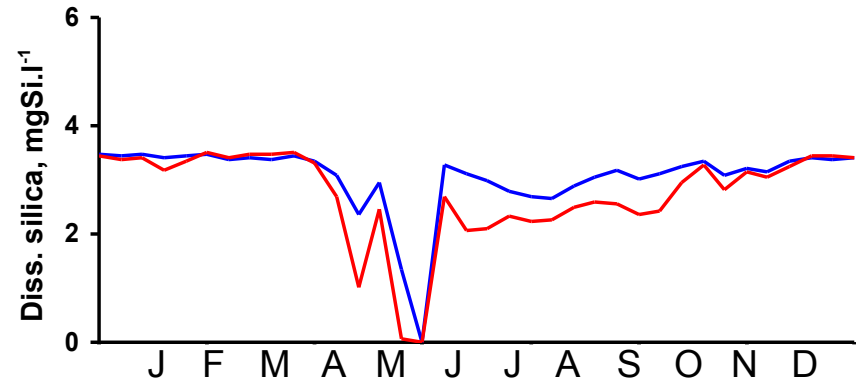
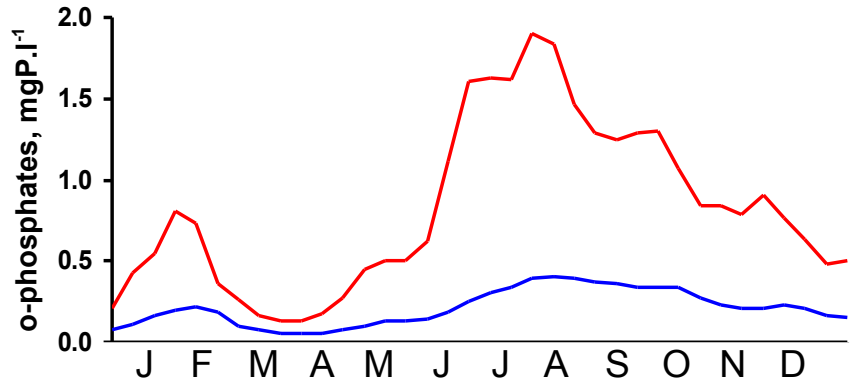
The Seine River **Poses**



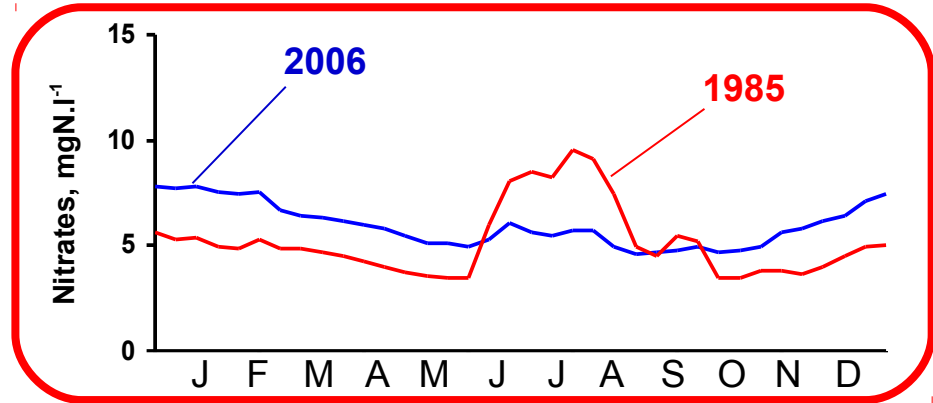
2 - What progress since 1985 in terms of wastewater treatment?



**Comparaison 1985 – 2006
at the Seine outlet**

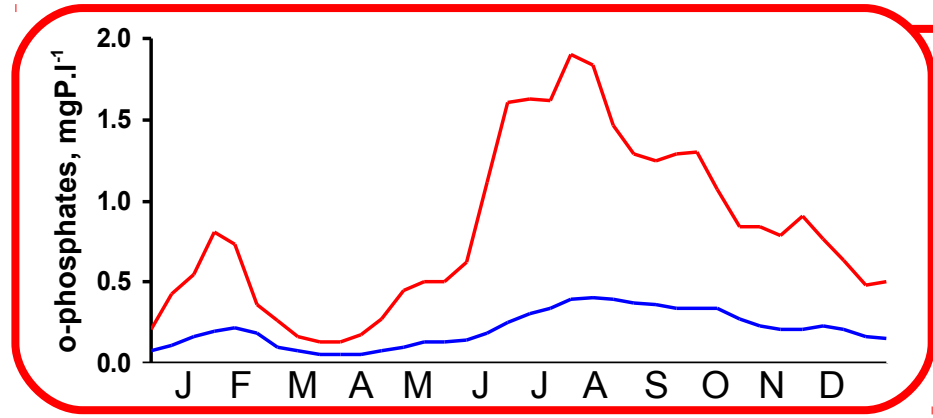


2 - What progress since 1985 in terms of wastewater treatment?

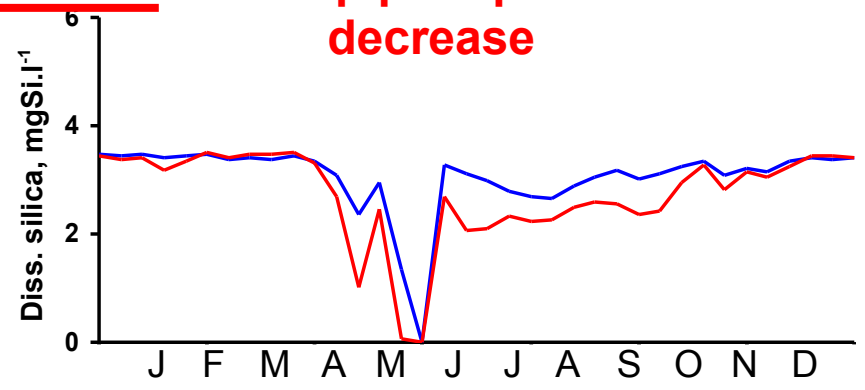


Increase of winter nitrate level
Decrease in N WWTP input

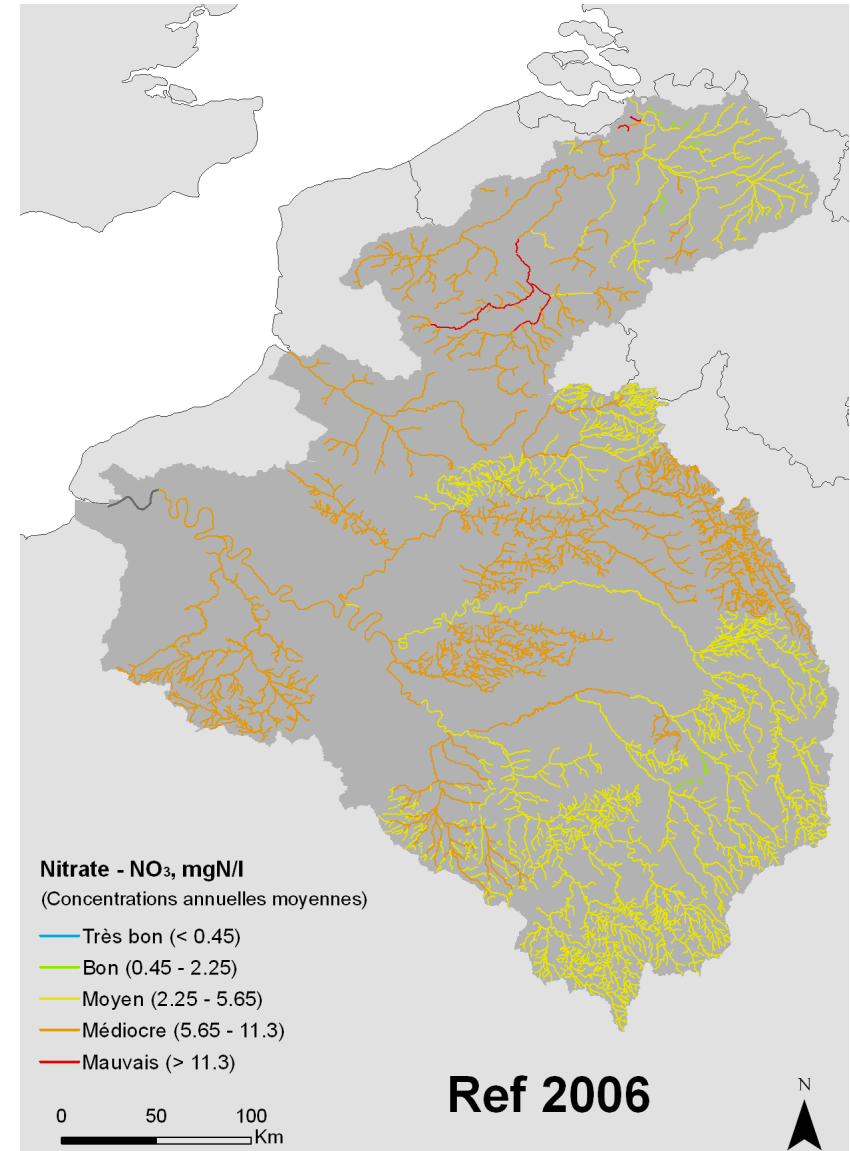
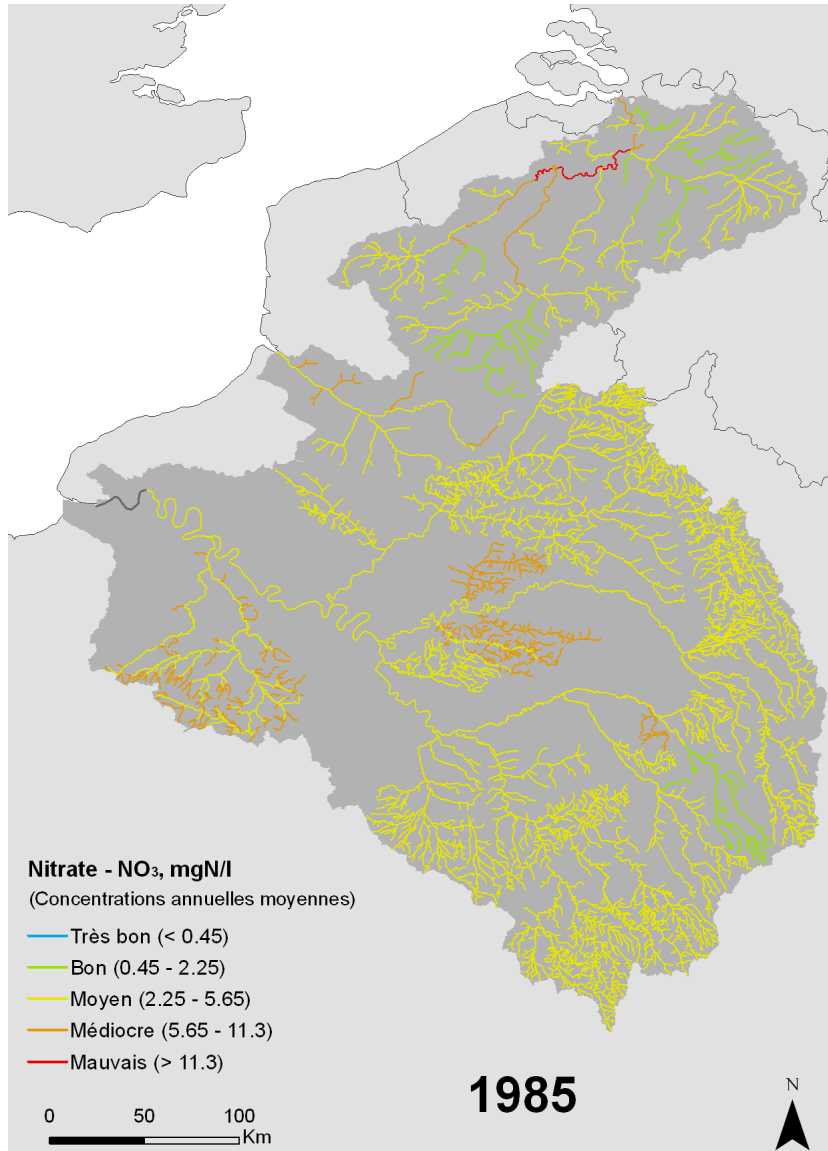
Comparison 1985 – 2006
at the Seine outlet



Sharp phosphate decrease



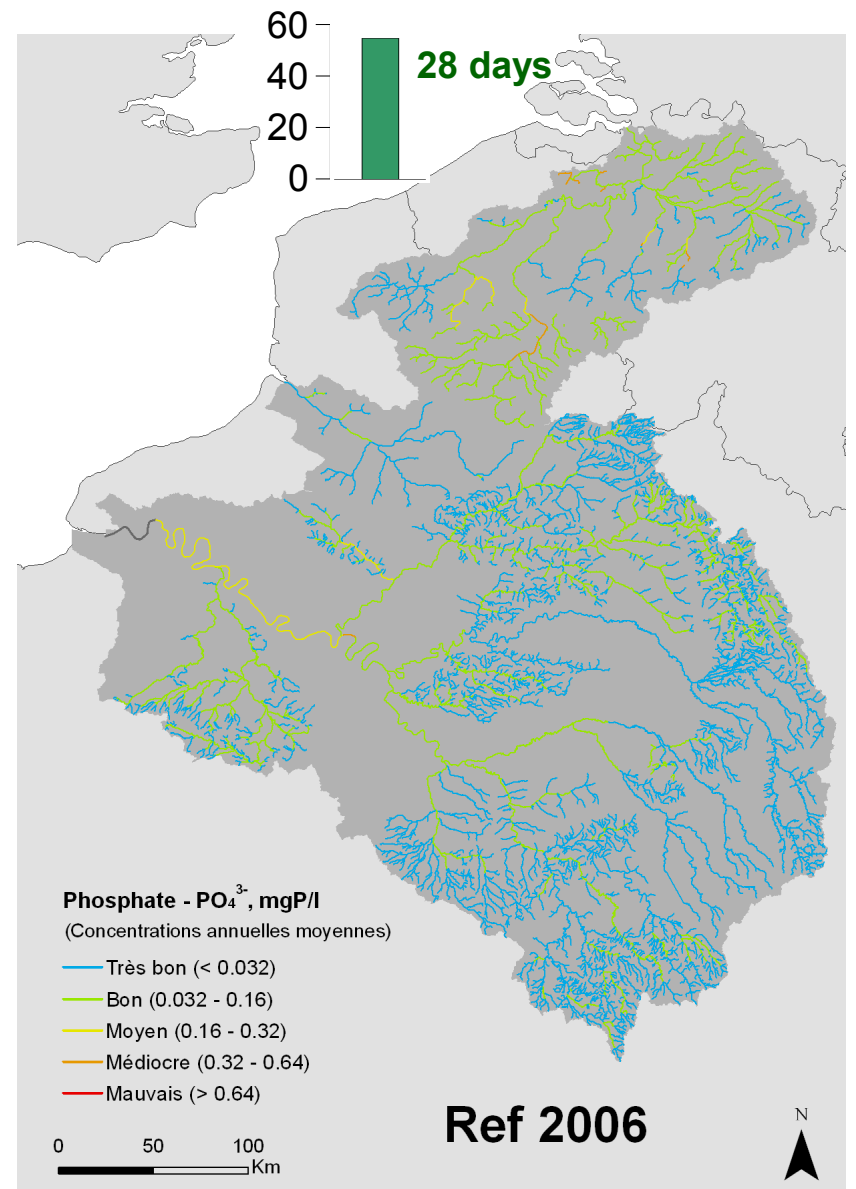
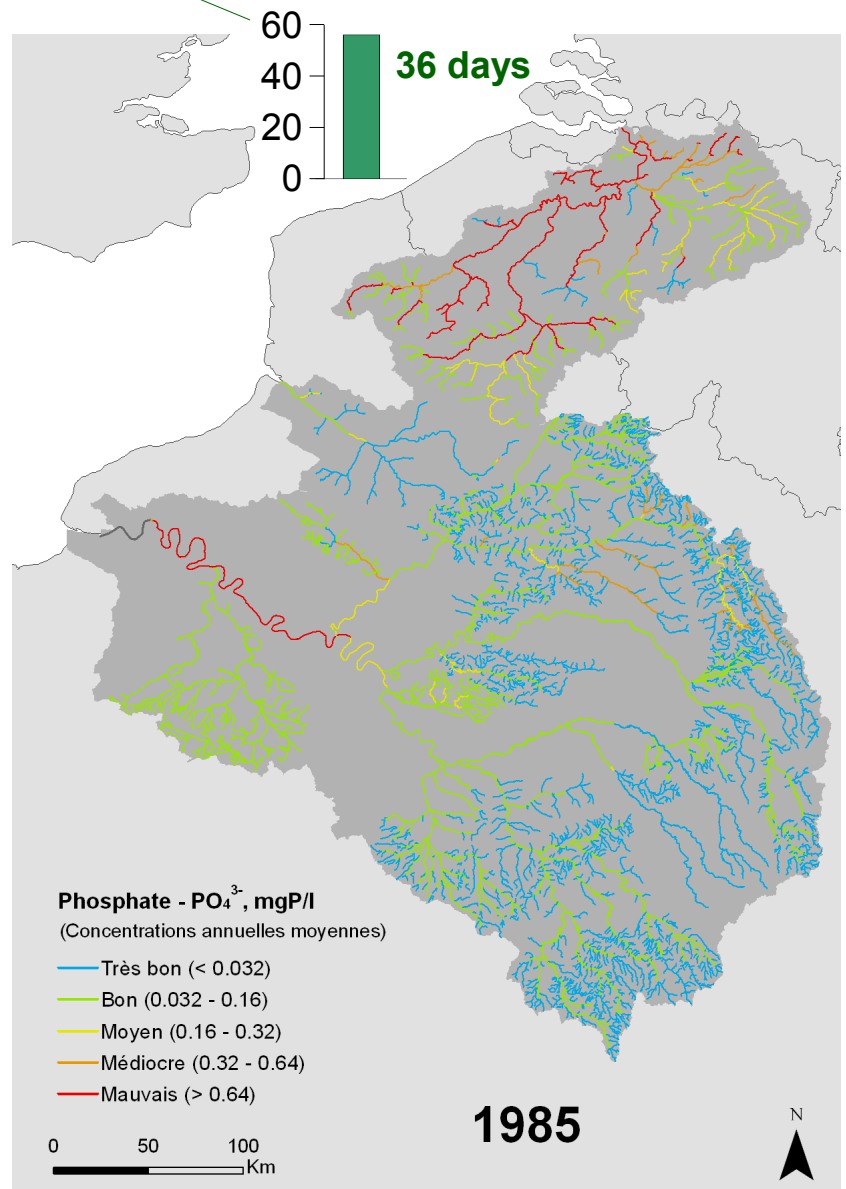
Changes 1985 - 2006 in terms of **nitrate** in the hydrological network



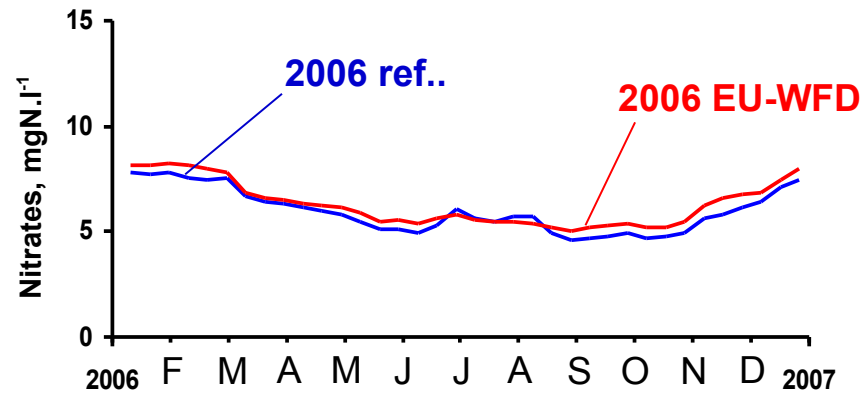
2 - What are the effects, since 1985, of the effort of WWTP treatment?

Changes 1985 - 2006 in terms of phosphates in the hydrological network

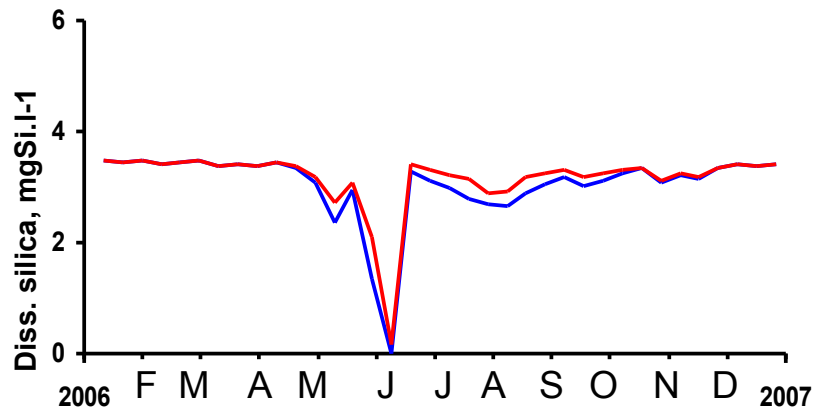
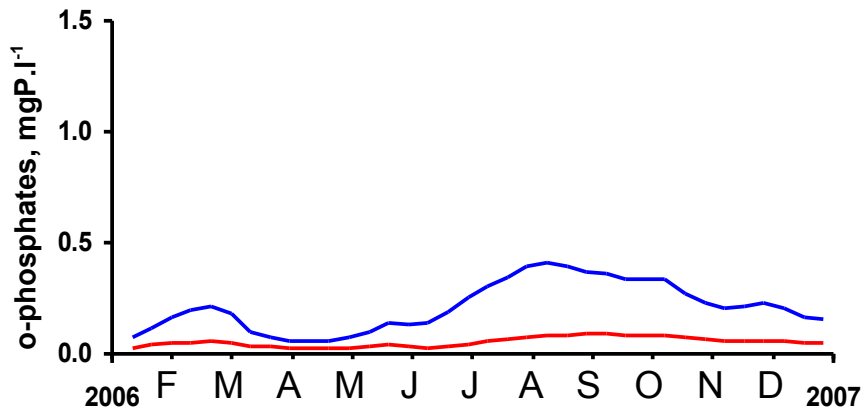
Phaeocystis, 10^6c.l^{-1}

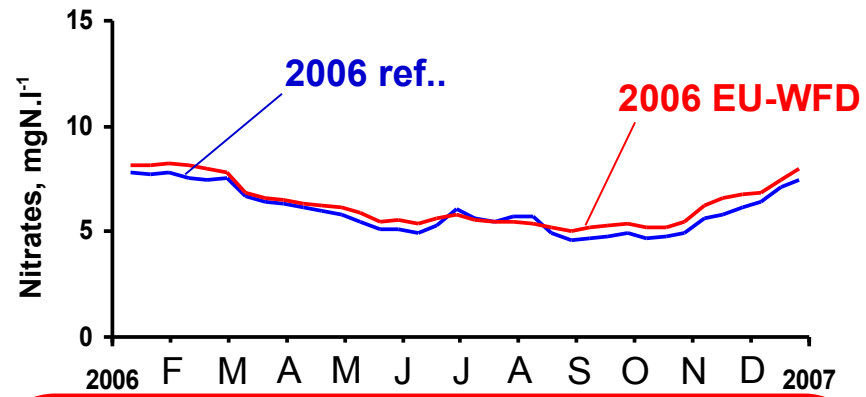


3 – Complete the treatment of the urban waste waters

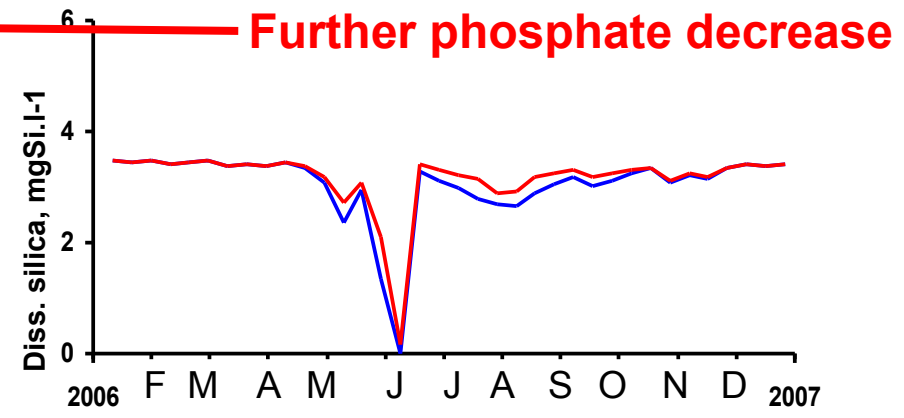
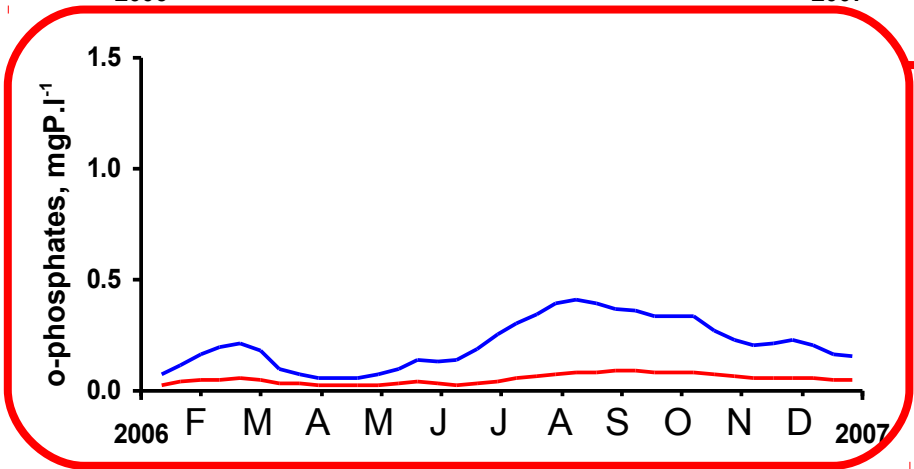


Effects of the EU-WFD implementation at the Seine outlet



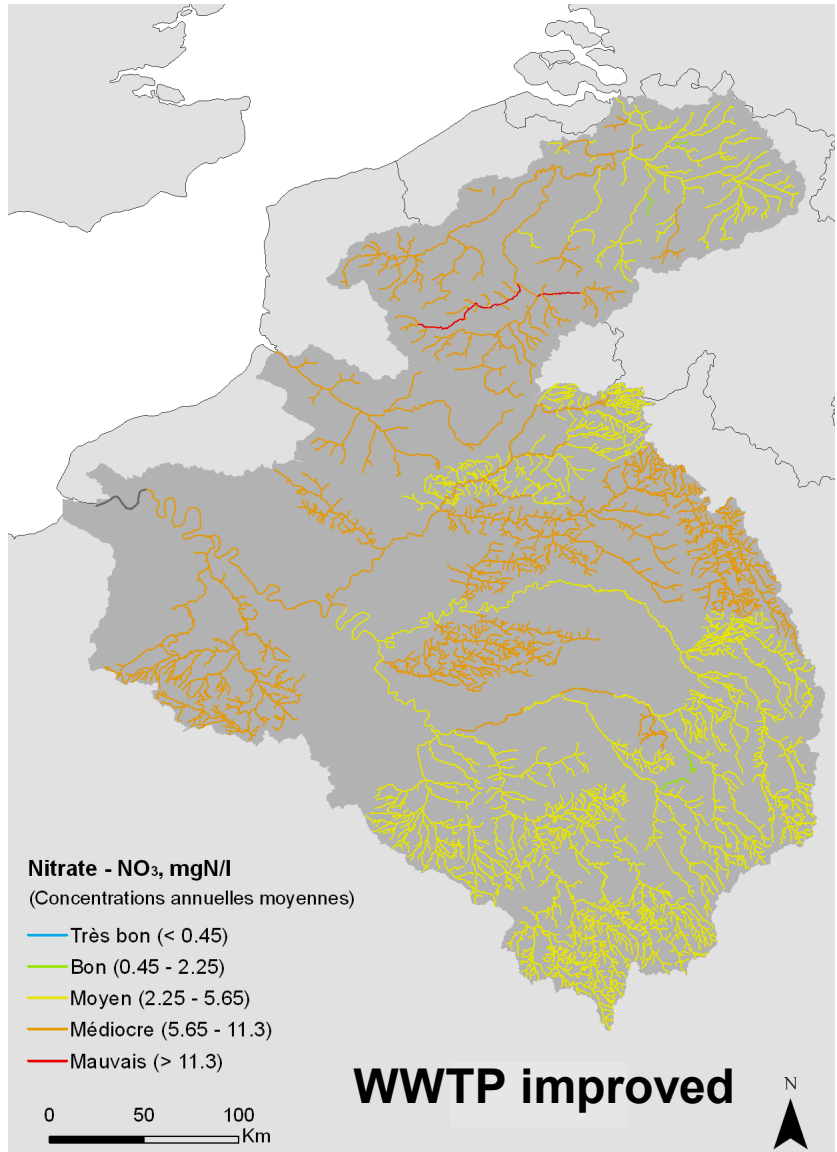
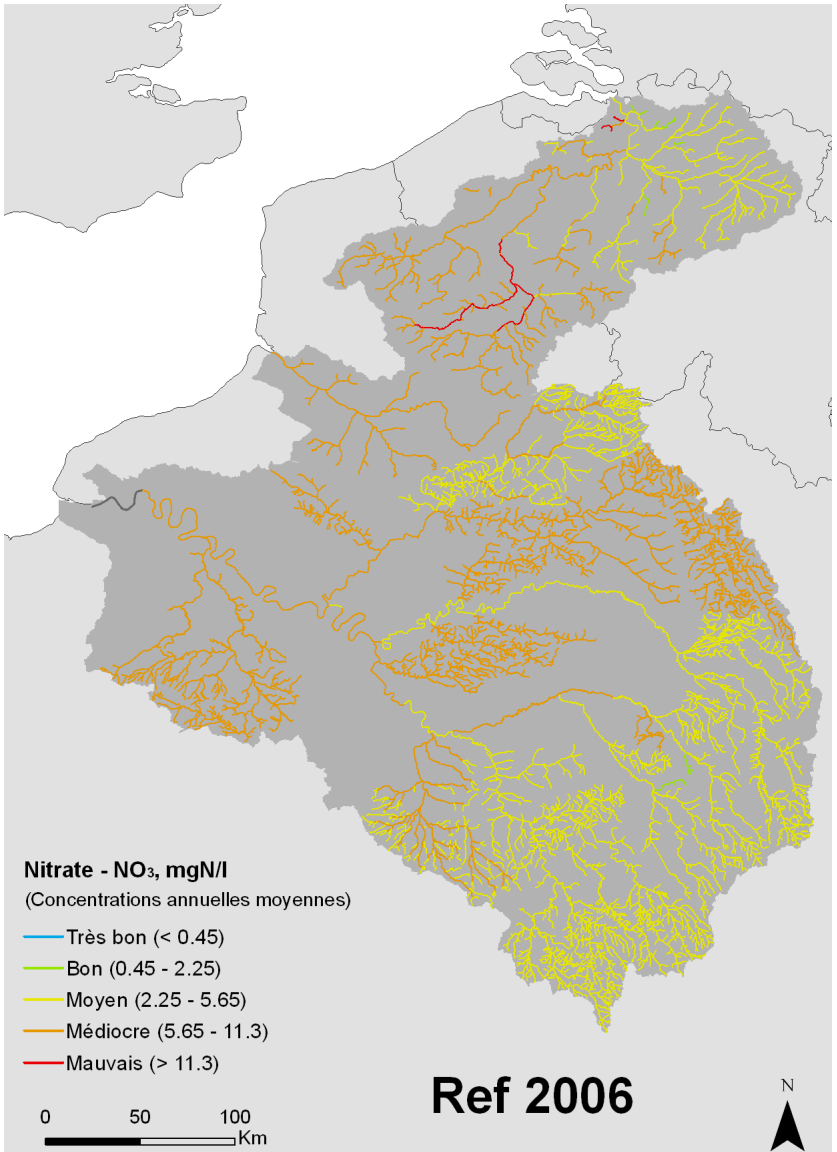


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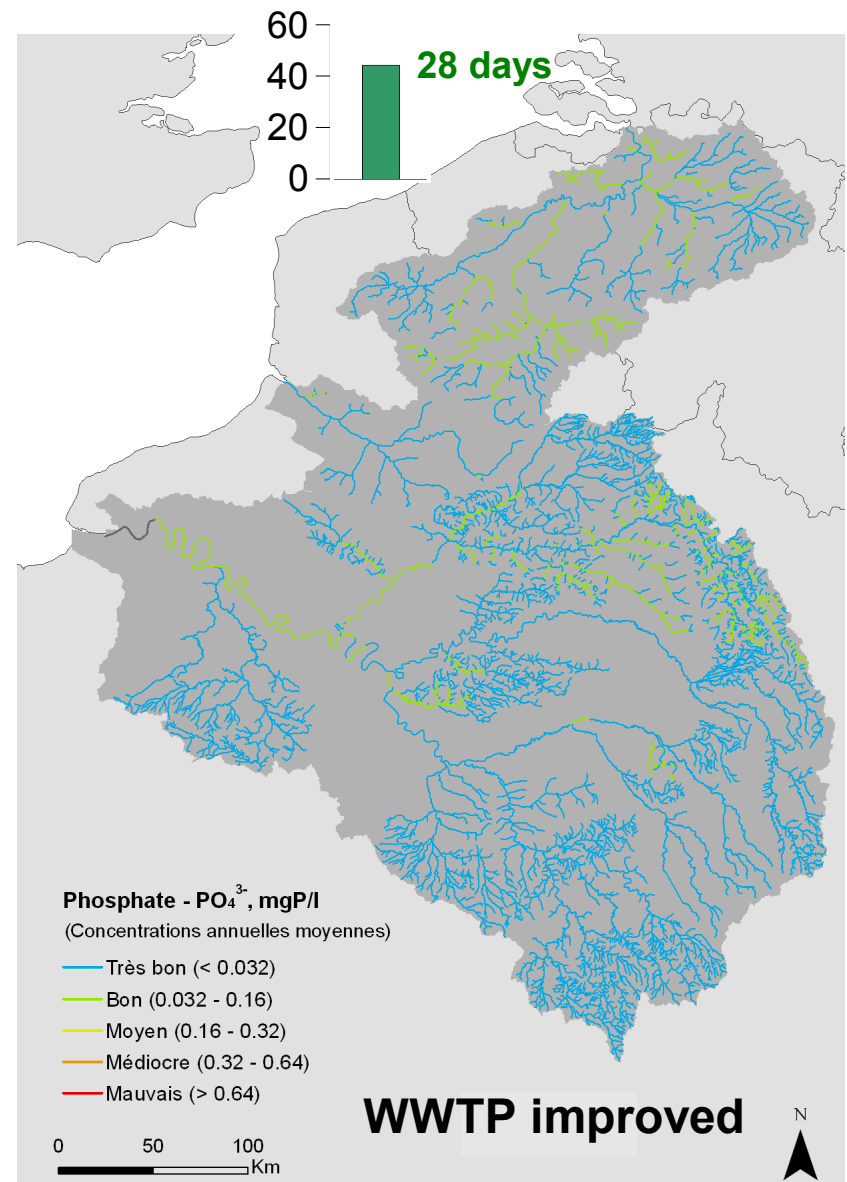
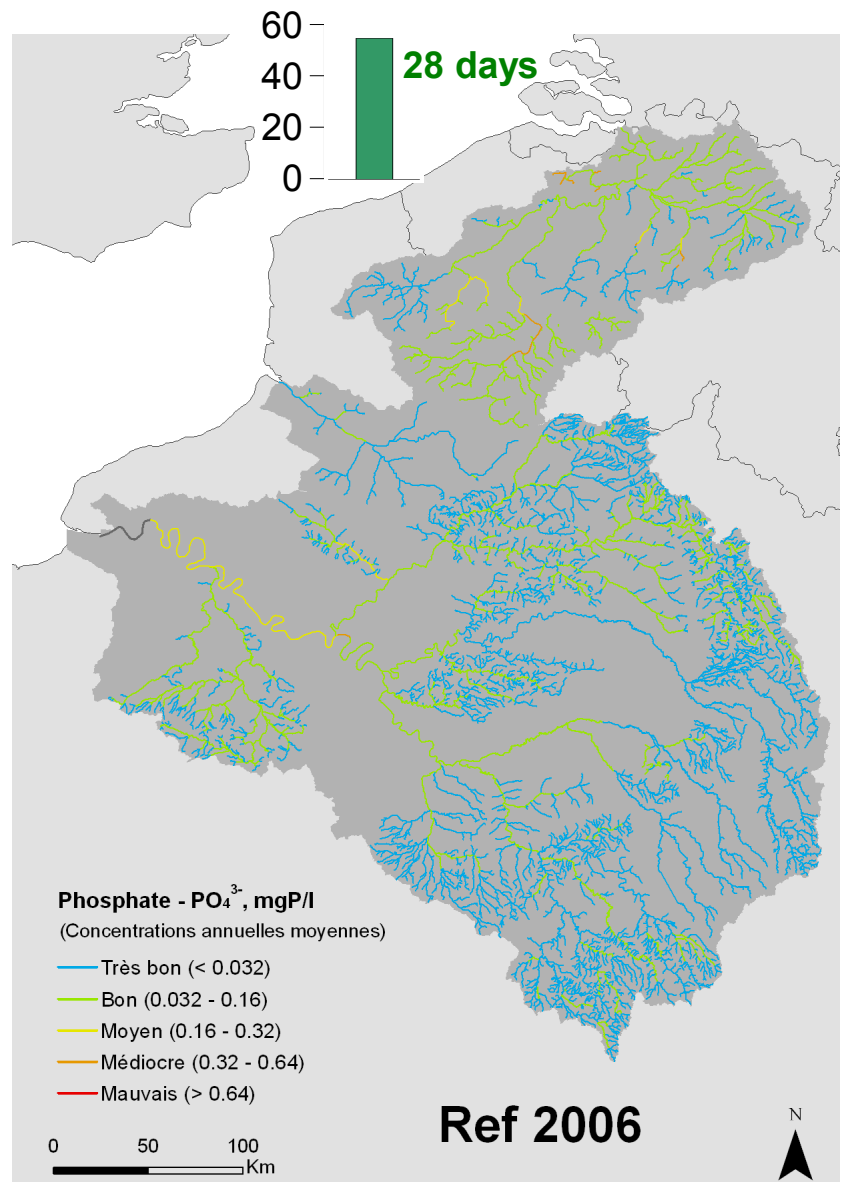
3 – Complete the treatment of the urban waste waters

Effects of the EU-WFD implementation
in terms of **nitrate** in the hydrological network

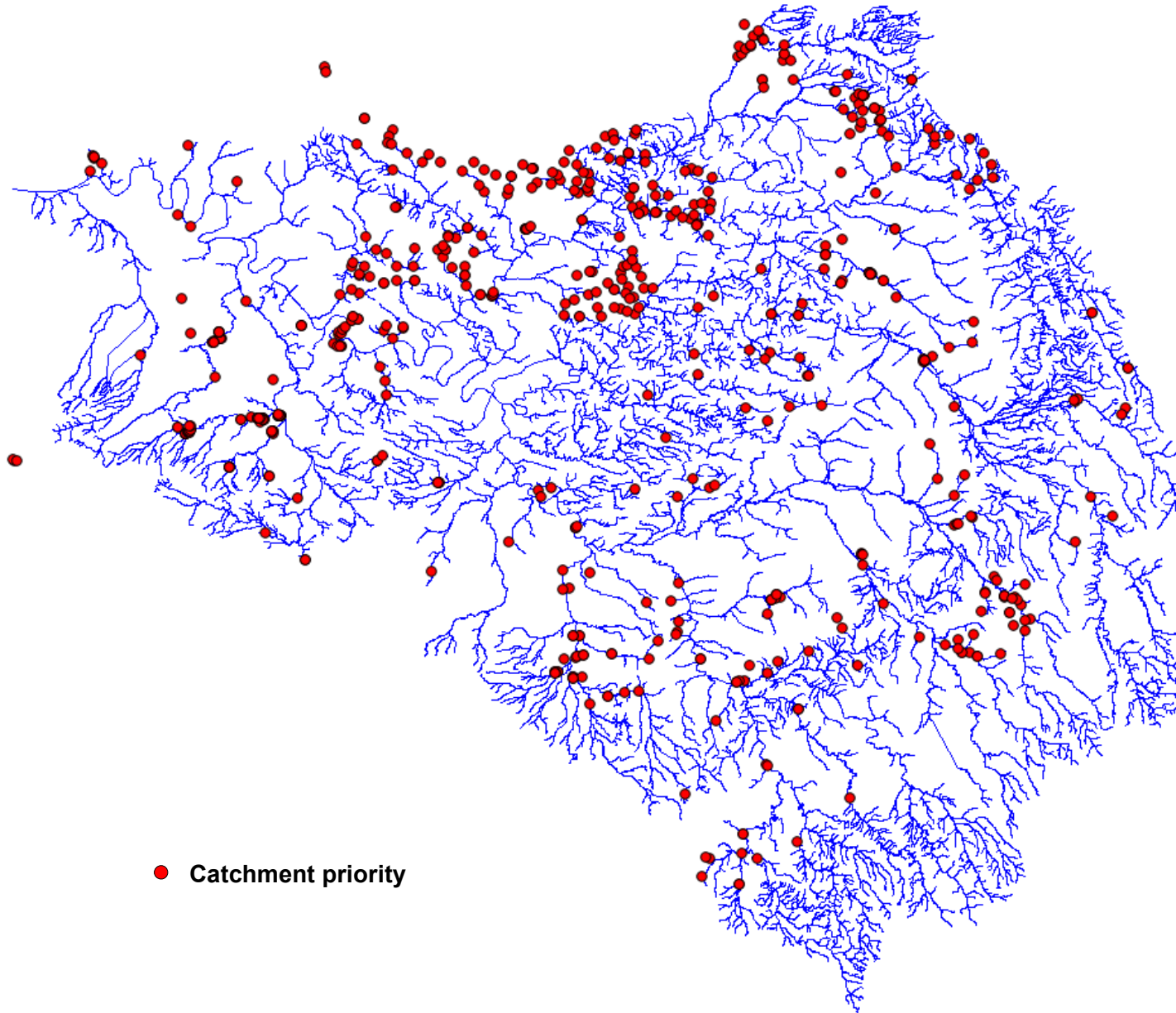


3 – Complete the treatment of the urban waste waters

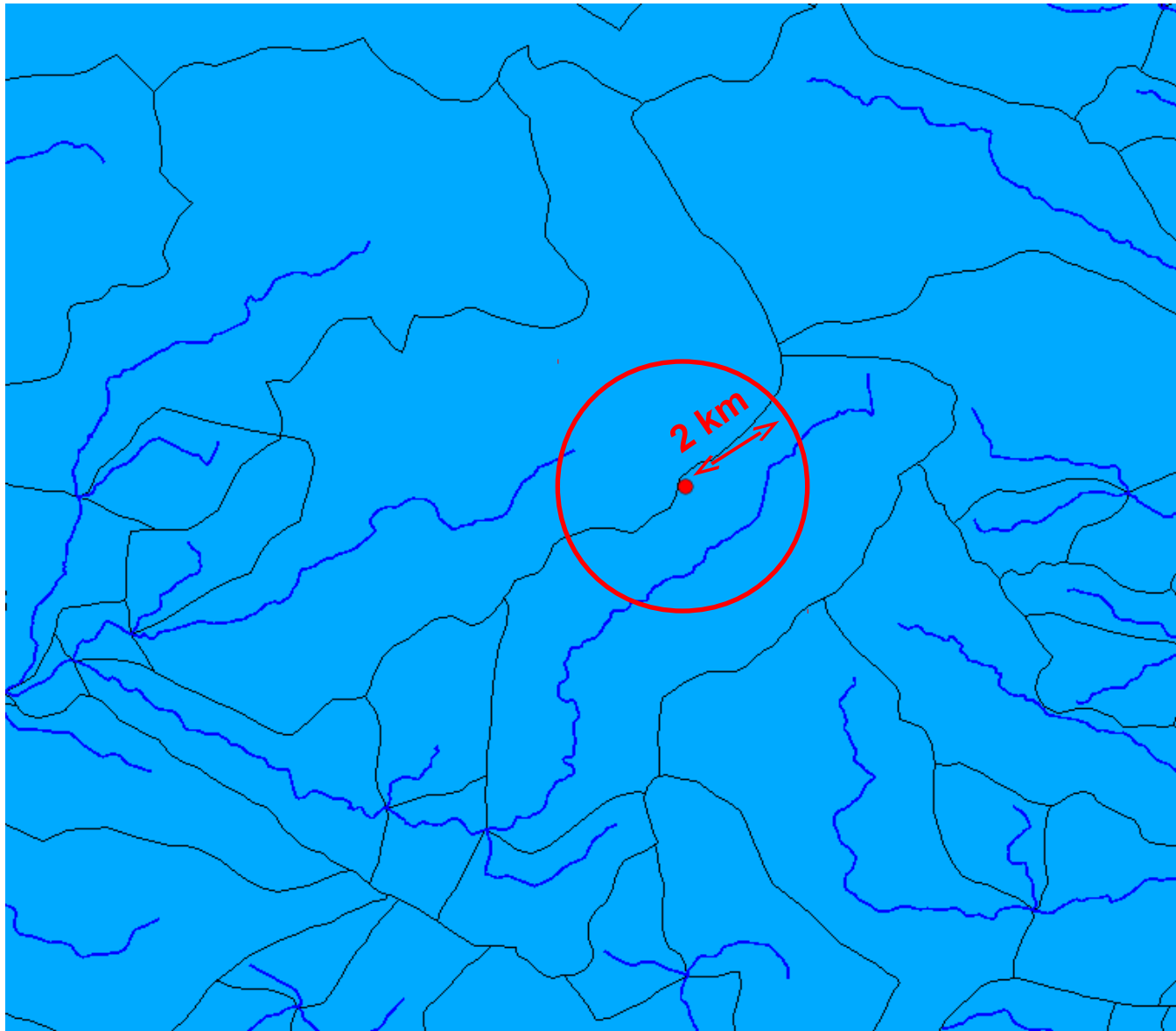
Effects of the EU-WFD implementation
in terms of **phosphate** in the hydrological network



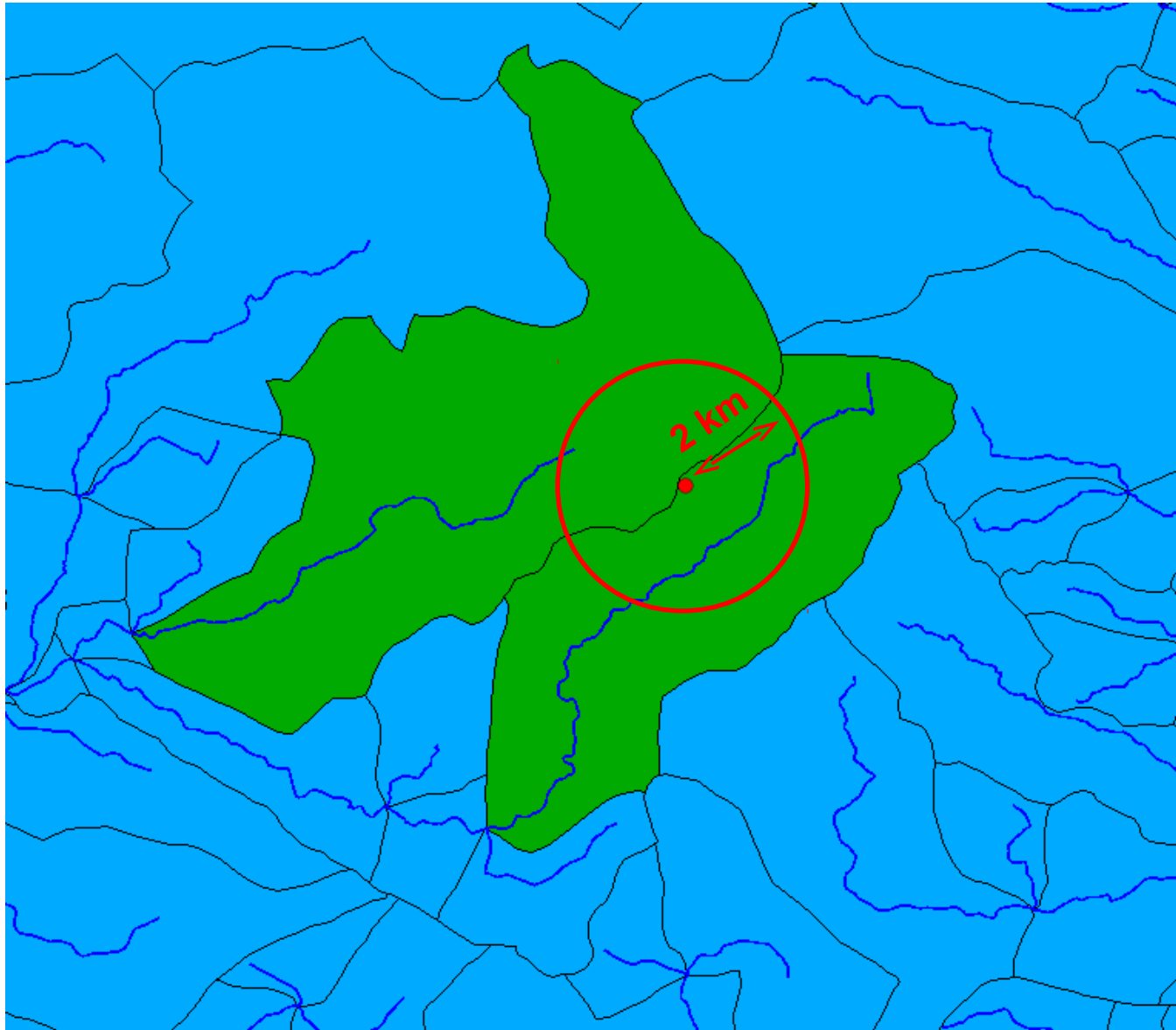
Well catchements areas: fragmentary information



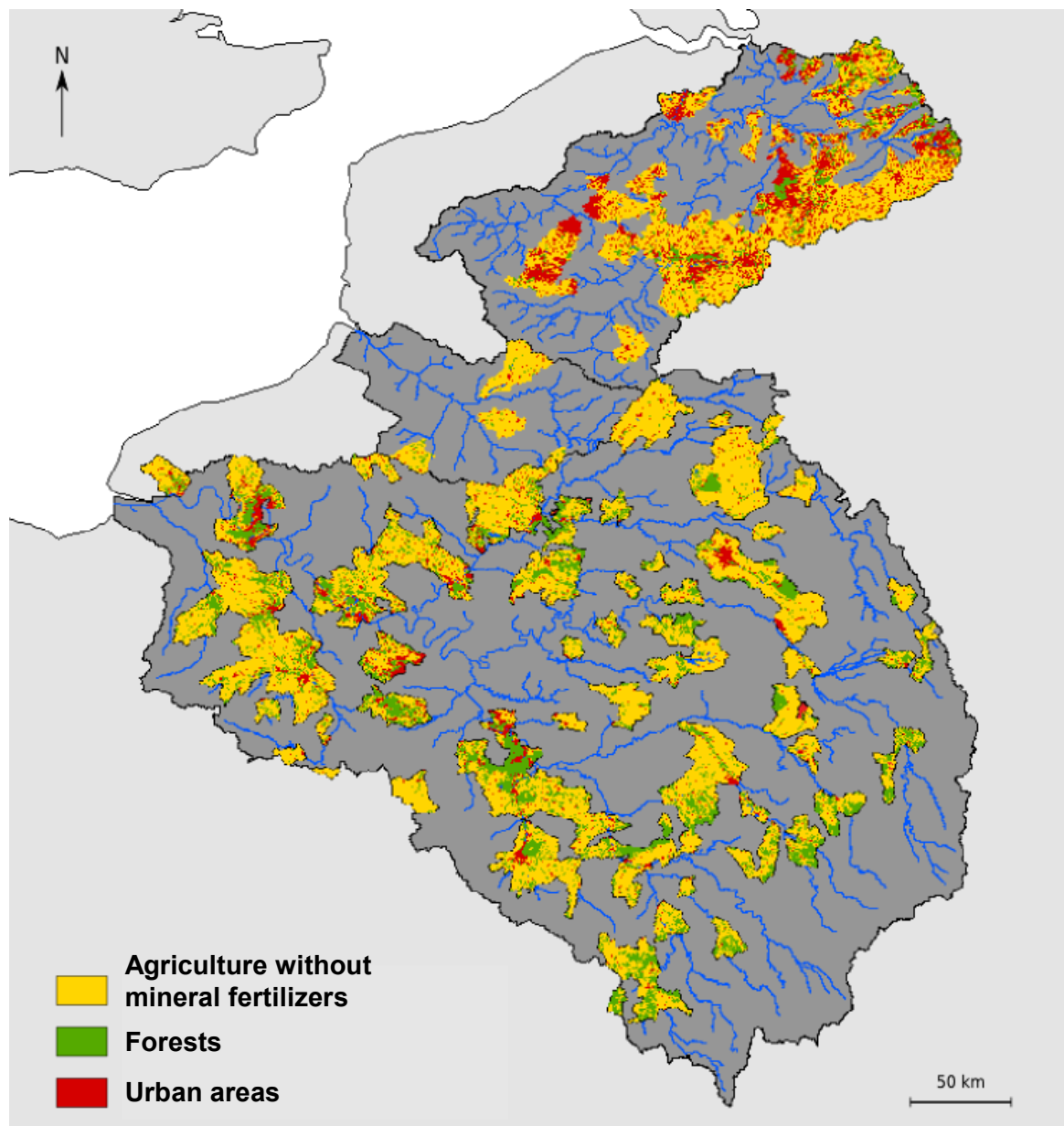
Which well cathments areas (WCA) can we select?



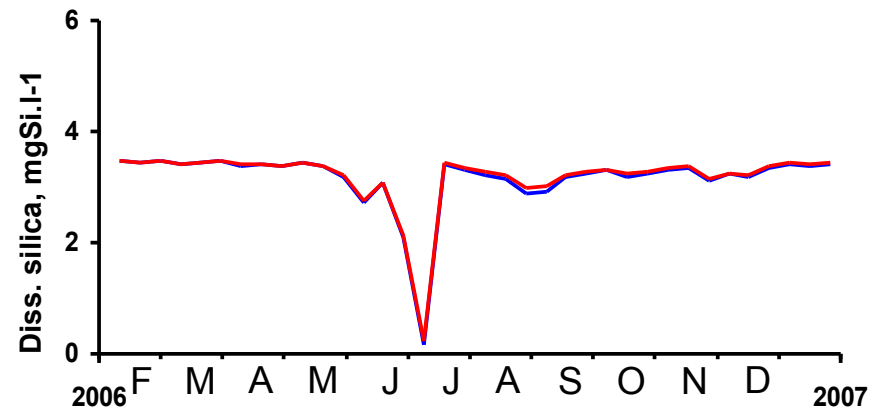
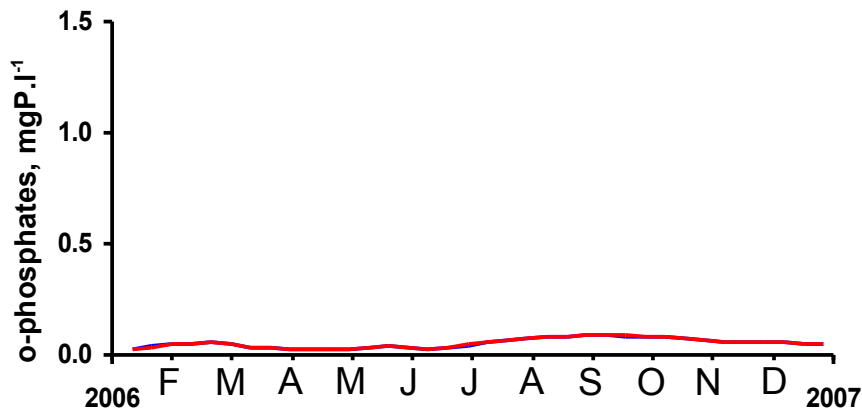
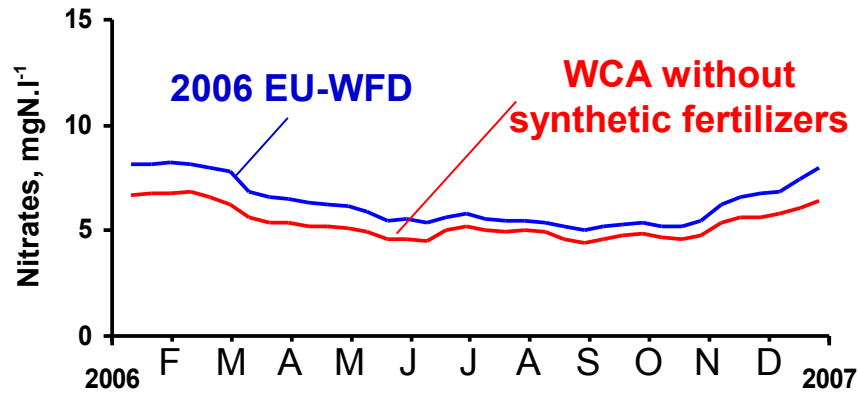
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Well catchments areas: $\approx 30\%$ of the watershed area

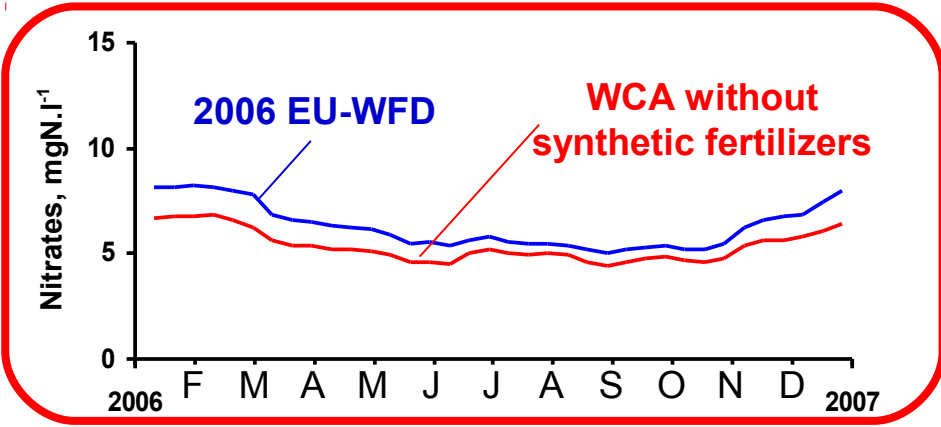


Effects of the « Grenelle » implementation at the Seine outlet

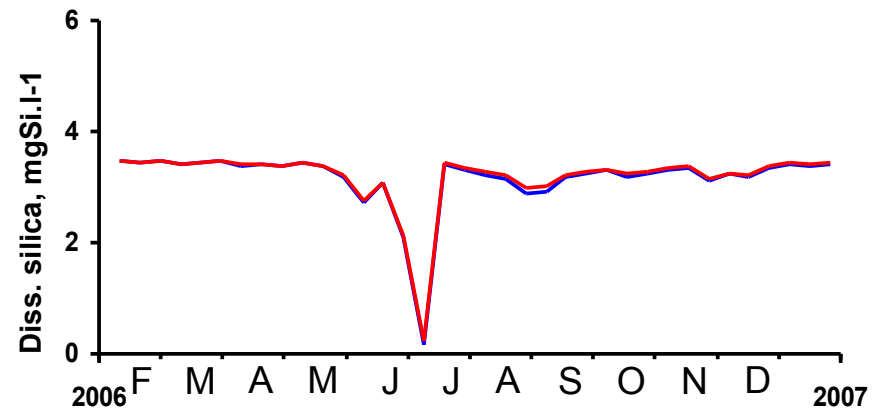
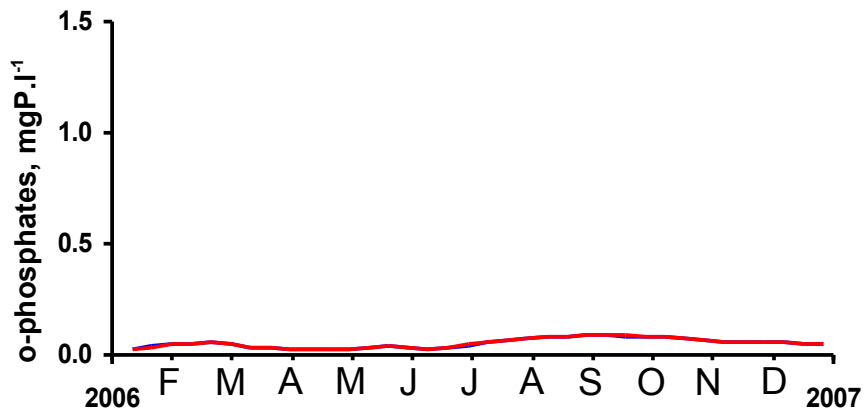


4 – Implementation of the goals of the « Grenelle de l'Environnement »

Effects of the « Grenelle » implementation at the Seine outlet

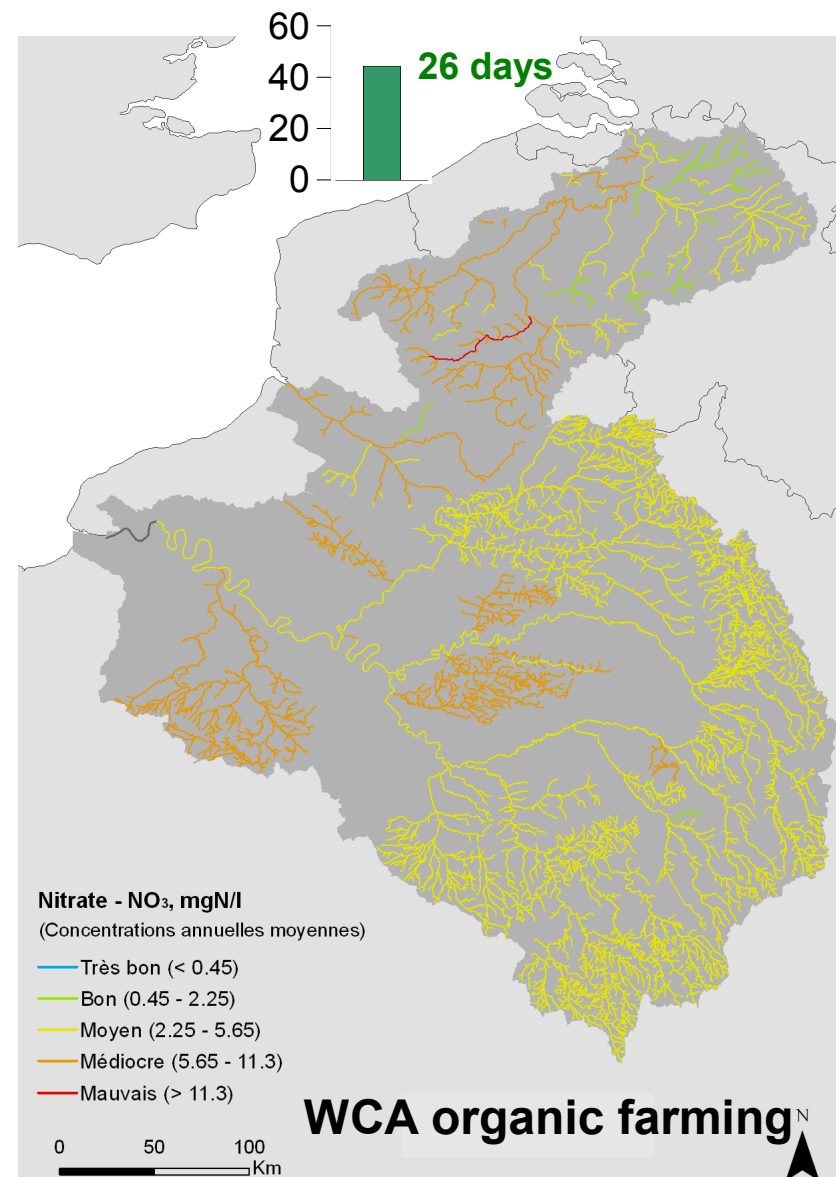
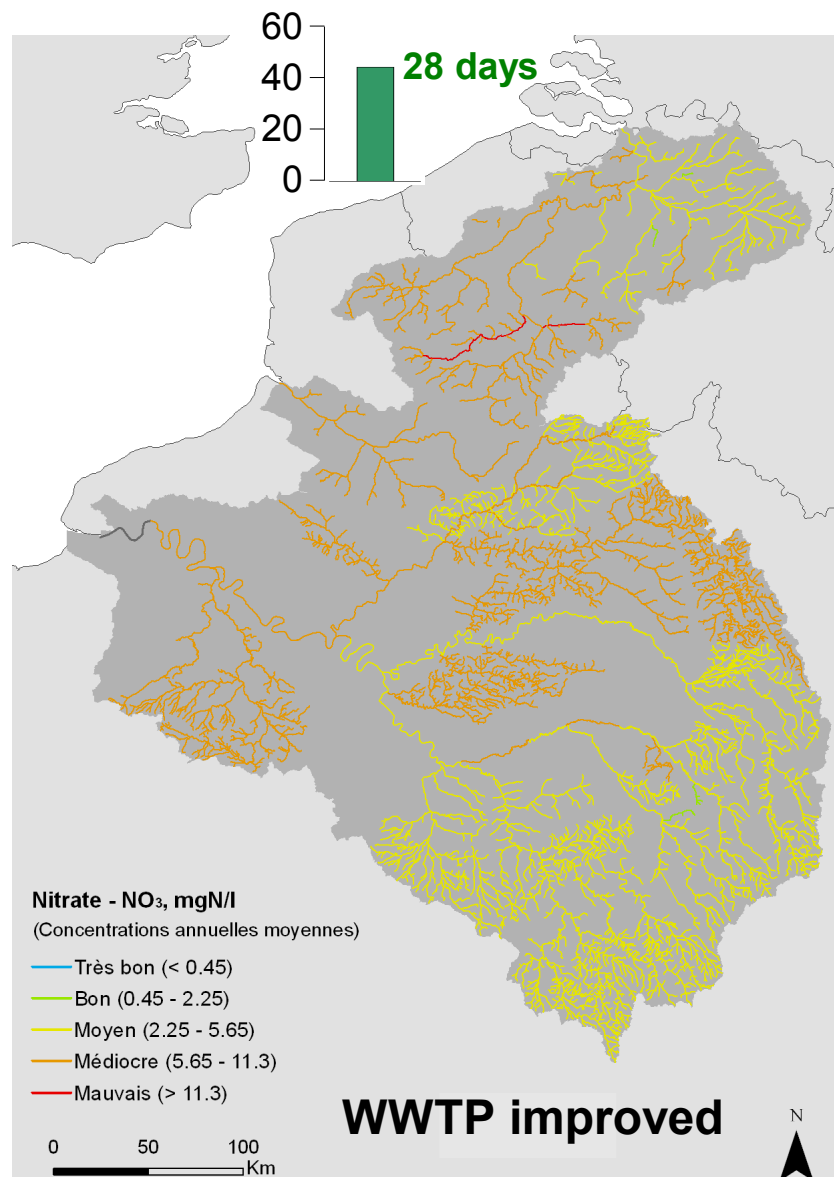


Decrease of nitrate



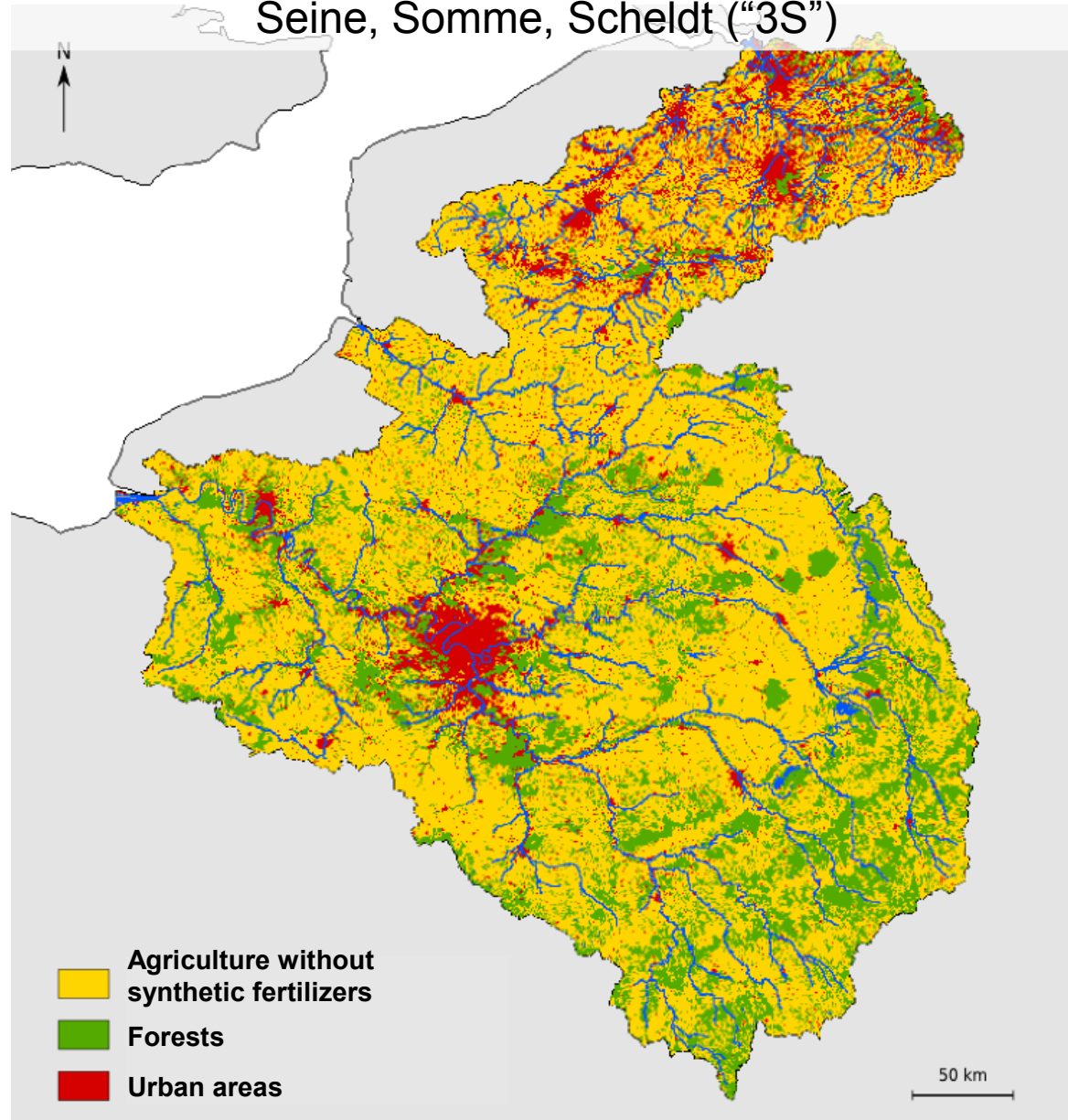
4 – Implementation of the goals of the « Grenelle de l'Environnement »

Effects of the implementation of agriculture without synthetic fertilizers on well catchments areas in terms of **nitrate** in the hydrological network

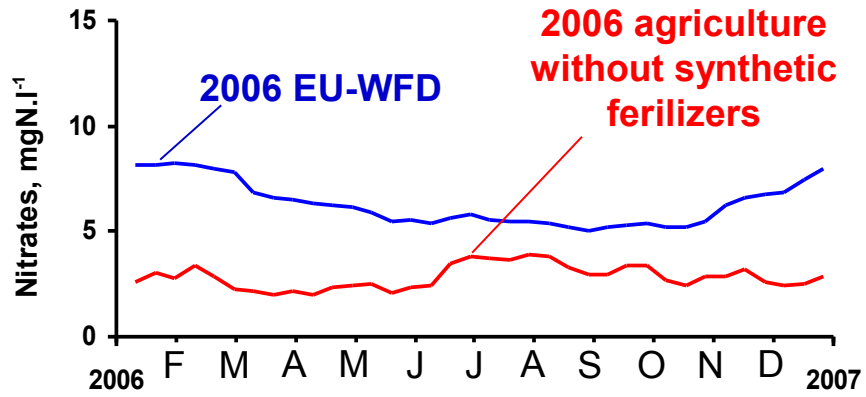


5 – Imagine a radical change in agricultural practices !

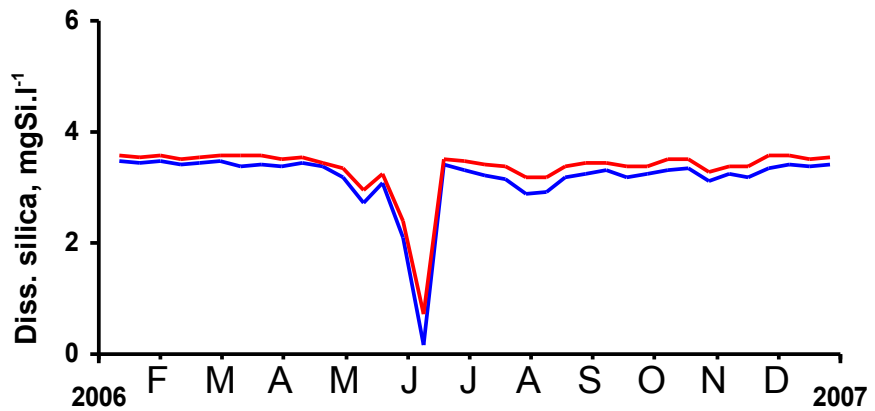
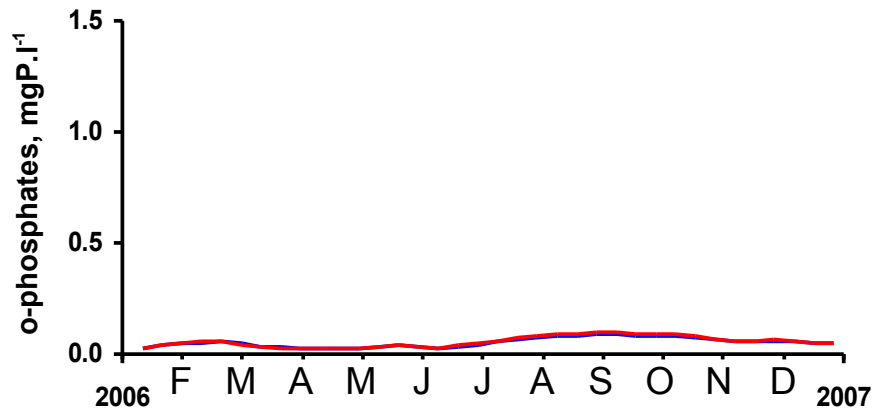
Agriculture without synthetic fertilizers on the whole three watersheds:
Seine, Somme, Scheldt (“3S”)



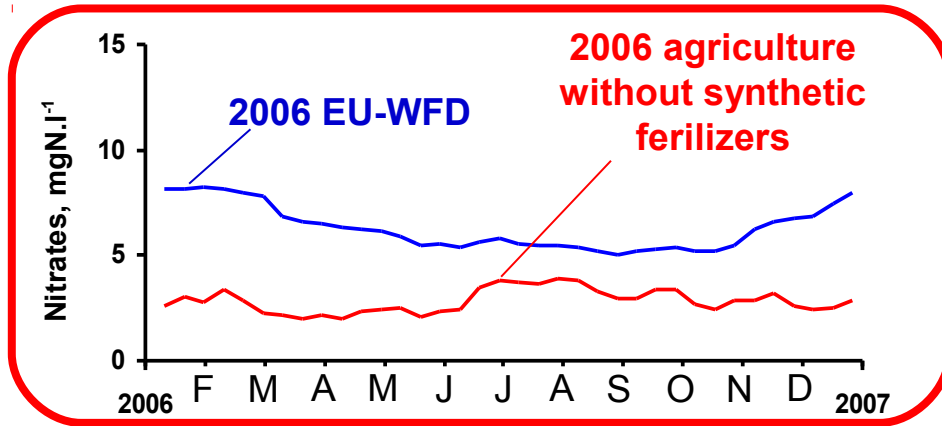
5 – Imagine a radical change in agricultural practices !



Effect of the implementation of agriculture without synthetic fertilizers on the whole three basins at the Seine outlet

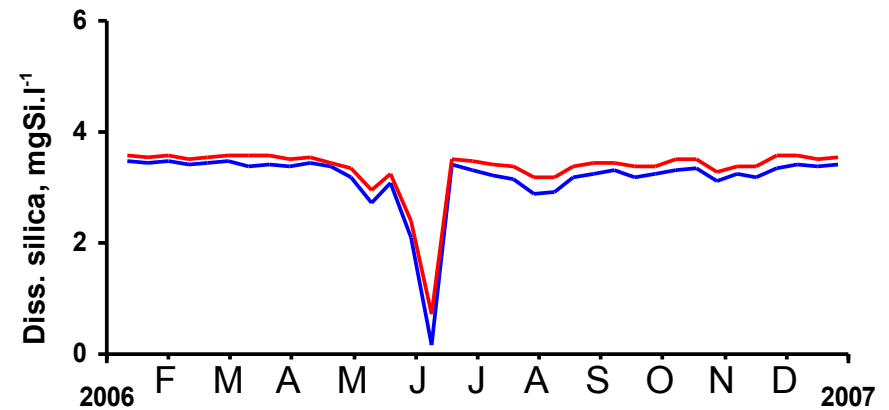
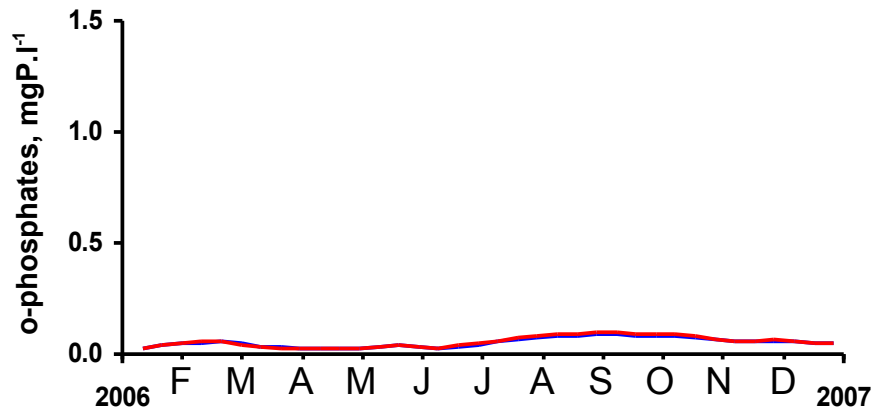


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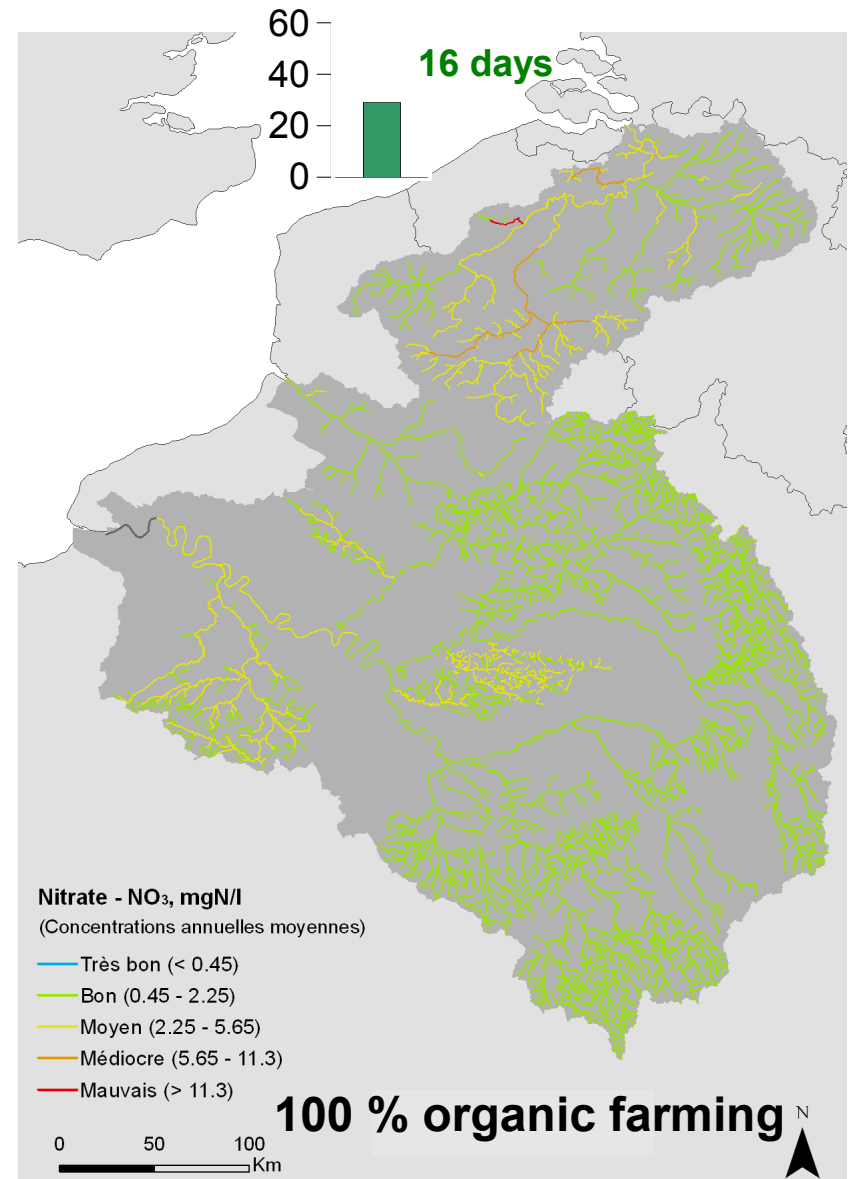
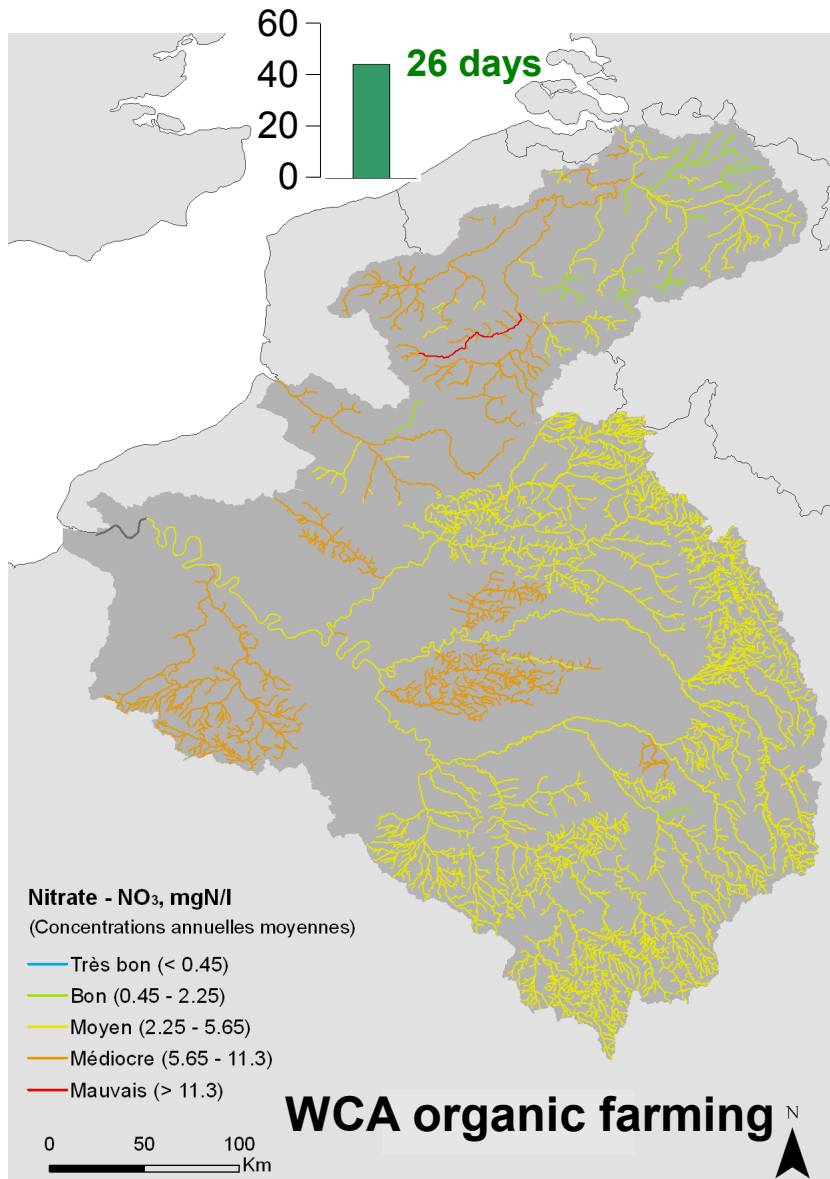
Sharp nitrate decrease

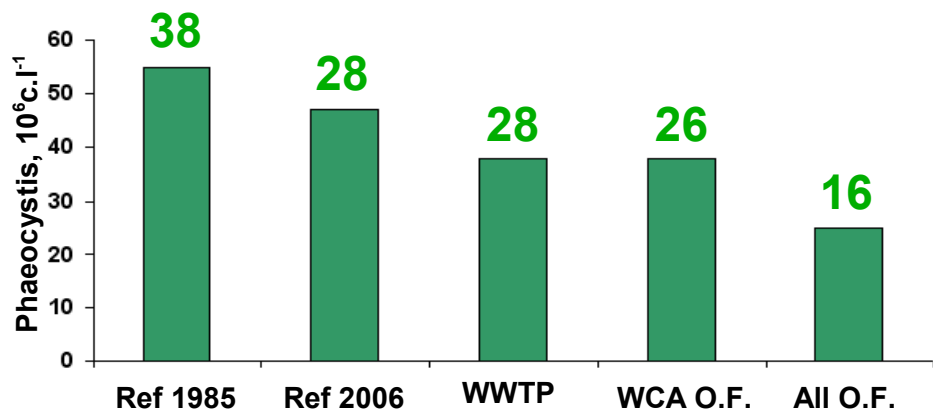
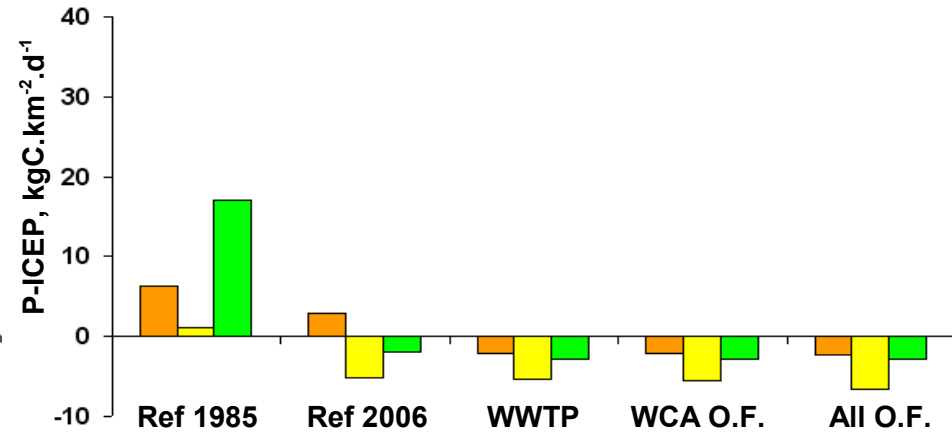
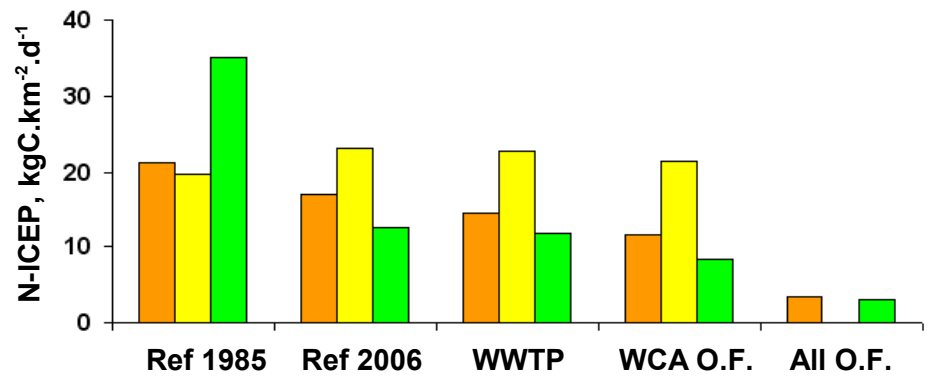
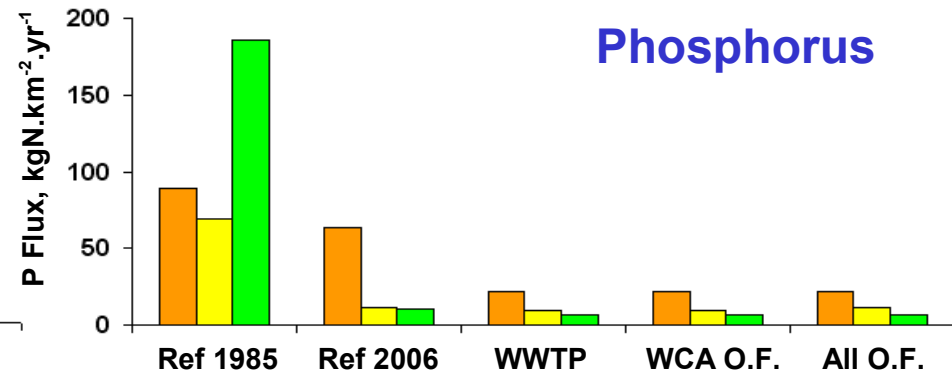
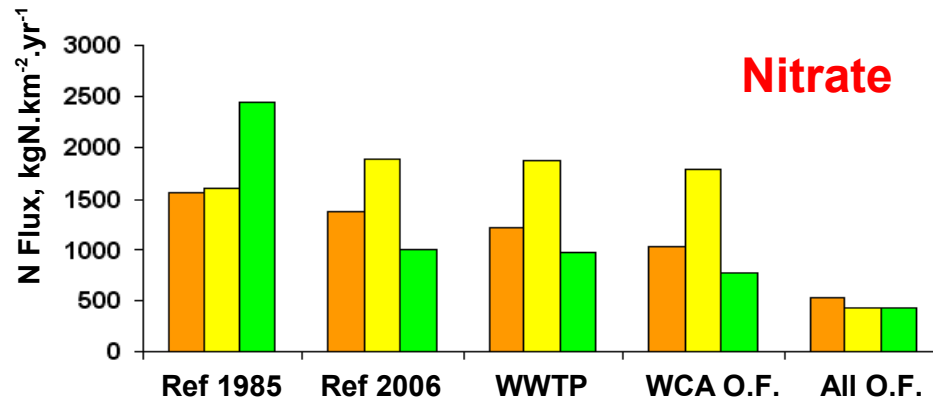
Effect of the implementation of agriculture without synthetic fertilizers on the whole three basins at the Seine outlet



5 – Imagine a radical change in agricultural practices !

Effects of the implementation of agriculture without synthetic fertilizers on the whole three basins in terms of **nitrate** in the hydrological network





Phaeocystis	→ nb days of bloom decreases
Nitrate	→ (hard) effort still needed
Phosphorus	→ problem (almost) solved

Thanks for attention !

Some questions ?

