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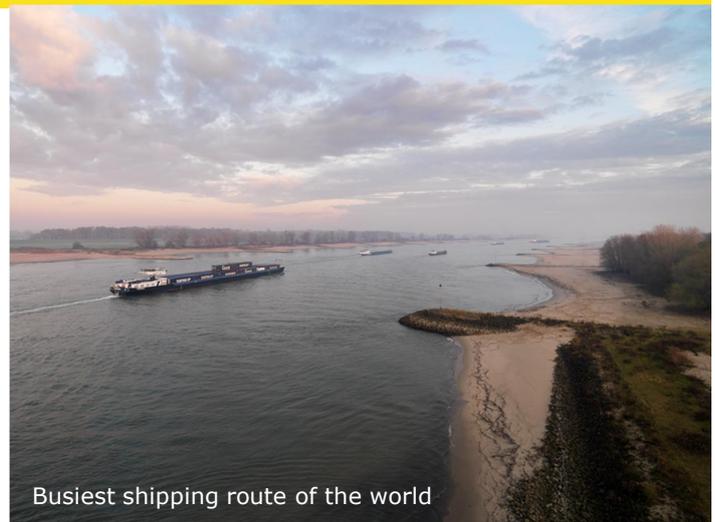
Large wood in navigable rivers

a pilot study to stimulate
biodiversity within safety
constraints

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The Rhine





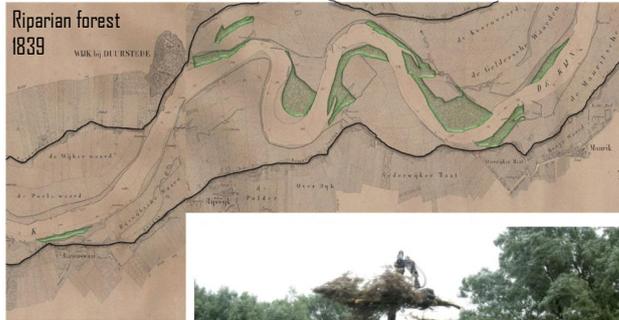
Nederrijn Lek



groynes and riprap
at expece of
habitat diversity



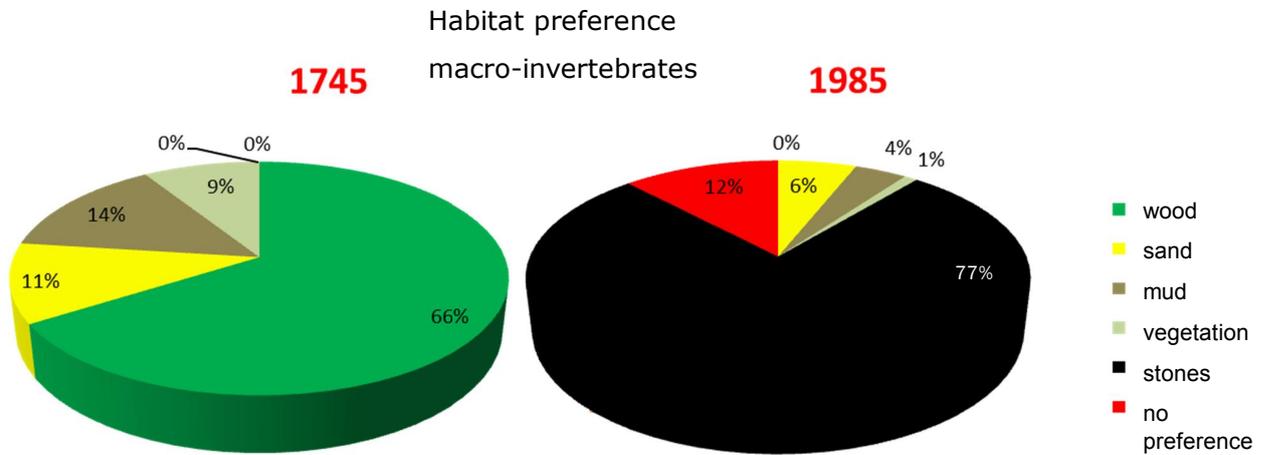
Flood protection first



Trees → hydraulic roughness >> flood level



Change in the macro-invertebrate community

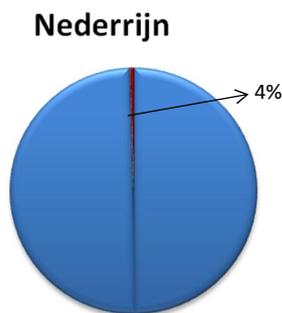


Wood dominated species → stone dominated species

Data from: A.G. Klink



Eurytope dominated fish community



Ketelmeer





Measures to improve ecological quality



fish



macro-invertebrates



macrophytes



Large wood

Photo wood: www.spsseg.org



- Side channels
- Connecting backwaters
- Floodplain lowering

=> Small steps forward

may improve the ecological benefits



Pilot large wood



Pilot area large wood

Questions

- Is it effective in an impounded river?
 - fish
 - macro-invertebrates
- Is it safe?
- How to sample?

2013/2014: 3 locations, 15 trees



Pilot site 1



Everdingen
6 trees
Dec. 2013



Pilot 1

Behind wave screens, safe for shipping



Steel bars, heavy chains



Monitoring: Fish sampling

Electro fishing

Fike fishing

- May-oktobre
- Night fishing in septembre
- Large wood and reference sites

Video monitoring failed (turbidity)



Macro-invertebrate sampling

- Start oktobre 2014
- Half yearly cycle
- Cutting 3 branches each tree
- Collecting all organisms





Pilot site 2



Fishway Amerongen
Jan. 2014
3 trees



Pilot 2

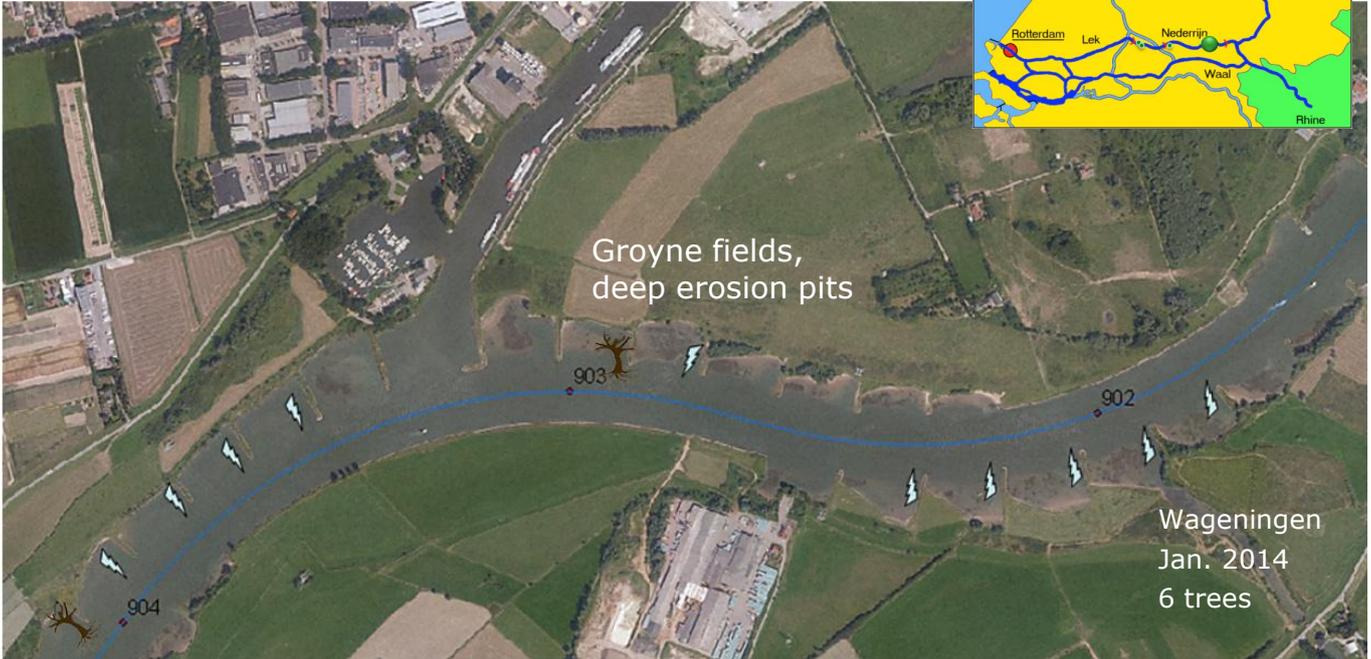
Monitoring macro-invertebrates

- Spring 2014 - one-time only
- Tree lifted from the water and washed
- Branches cut and wrapped
- All organisms are collected



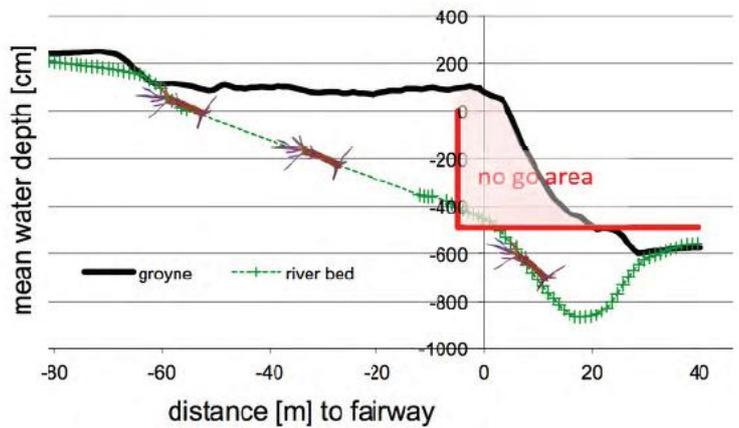


Pilot site 3



Pilot 3

Erosion pits



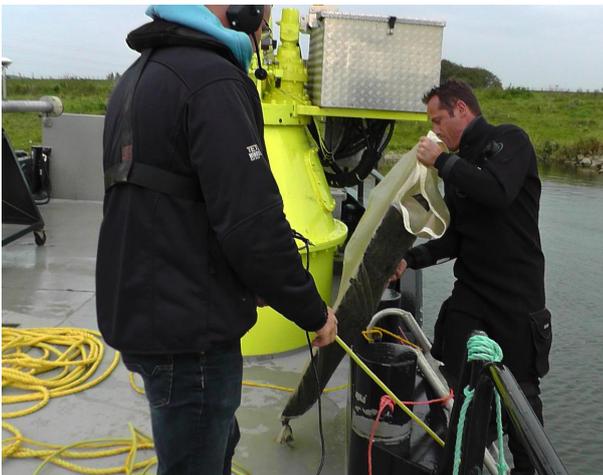
Why here?

- Flowing water erosion pits?
- No hinder for shipping
- No effect on flood levels



Monitoring: macro-invertebrates

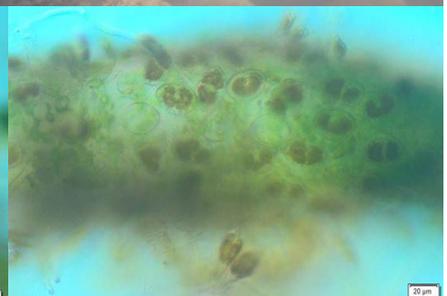
- Removable slice of bark and roots



Filamentous algae

Results: macro-invertebrates

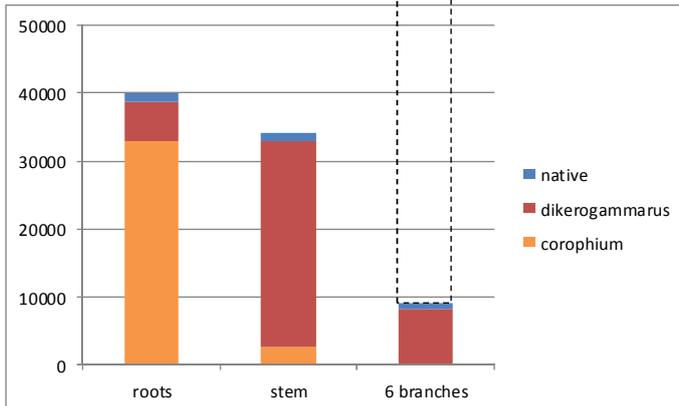
1. Filamentous algae
2. Diatoms
 - Chains (*Diatoma sp.*)
 - Clusters on stalks (*Gomphonema sp.*)
 - Solitary (*Cocconeis sp.*)
3. Lots of macro-invertebrates





Alien and native species

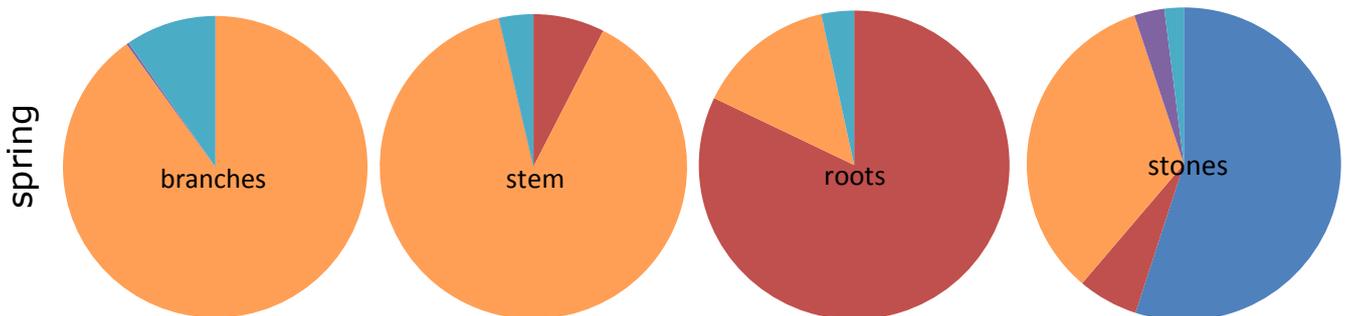
- mainly alien species
 - Corophium (*Chelicorophium curvispinum* and *Chelicorophium robustum*)
 - Killer shrimp (*Dikerogammarus villosus*)
- ± 100.000 on entire tree



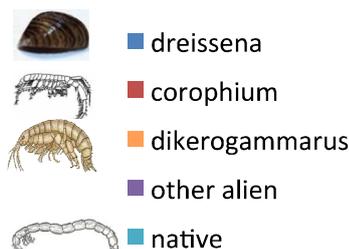
Rijkswaterstaat
Large wood in navigable rivers



Macro-invertebrate community

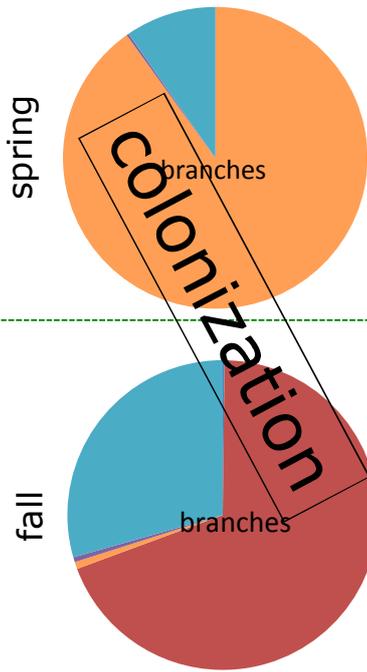


Relatively more native species on branches
Many stones dominated by Dreissena sp.



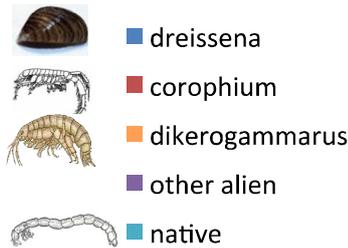
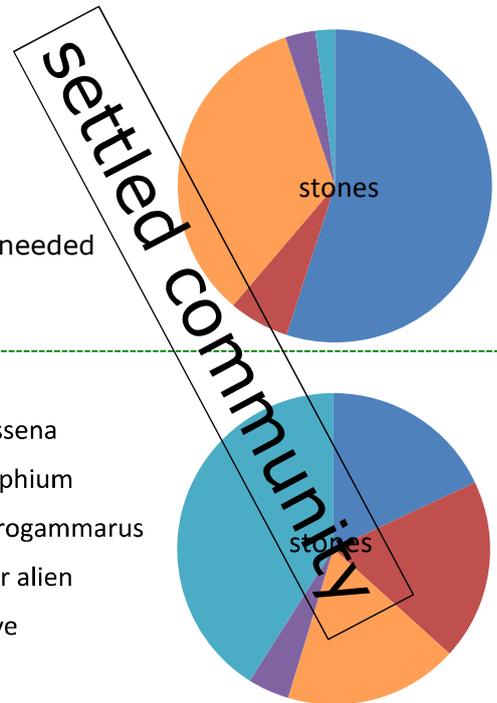


Macro-invertebrate community



In fall: more native species

At least 3 years monitoring is needed



Target species found on wood

Ephemeroptera (May flies)	Trichoptera (caddisflies)	Simuliidae (black flies)
		Simulium erythrocephalum Simulium no
Chironomidae (midges)		
Brillia bifida Brillia longifurca Cardiocladius fuscus	 Eukiefferiella minor Orthocladius (O) obumbratus	Polypedilum cultellatum Polypedilum pedestre Potthastia gaedii Tanytarsus gr. brundini
Diamesa gr, insignipes		

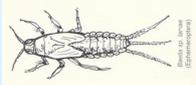
species found only on wood

New in the Netherlands



Target species found on wood

Not found since 1934

Ephemeroptera (May flies)	Trichoptera (caddisflies)	Simuliidae (black flies)
Caenis macrura 	Hydropsyche bulgaromanorum Ecnomus tenellus Lype phaeopa Orthotrichia spec. Psychomyia pusilla Tinodes waeneri 	Simulium erythrocephalum Simulium no
Chironomidae (midges)		
Brilia bifida Brilia longifurca Cardiocladius fuscus Chironomus acutiventris Chironomus nudiventris Cricotopus annulator Cricotopus curtus Cricotopus triannulatus agg Cryptochironomus rostratus Cryptotendipes gr, usmaensis Diamesa gr, insignipes 	Eukiefferiella minor Harnischia spec. Lipiniella arenicola Lipiniella moderata Orthocladius (E) thienemanni agg. Orthocladius (O) obumbratus Parachironomus frequens Paralauterborniella nigrohalteralis Paratrichocladius rufiventris Paratanytarsus dissimilis agg Paranaïs frici	Polypedilum scalaenum Polypedilum cultellatum Polypedilum pedestre Potthastia gaedii Rheopelopia spec. Rheotanytarsus spec. Stictochironomus pictulus Tvetenia discoloripes agg. Tanytarsus gr. brundini Unio tumidus

In black: species found only on wood
in red: species on wood and on stones

New in the Netherlands

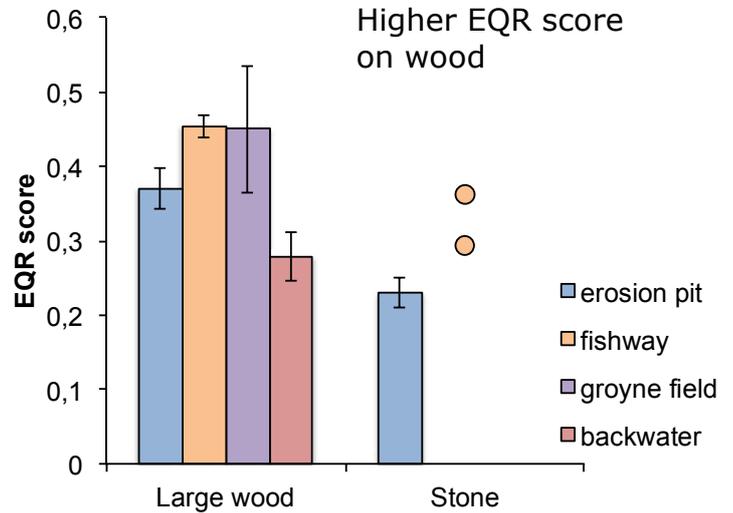
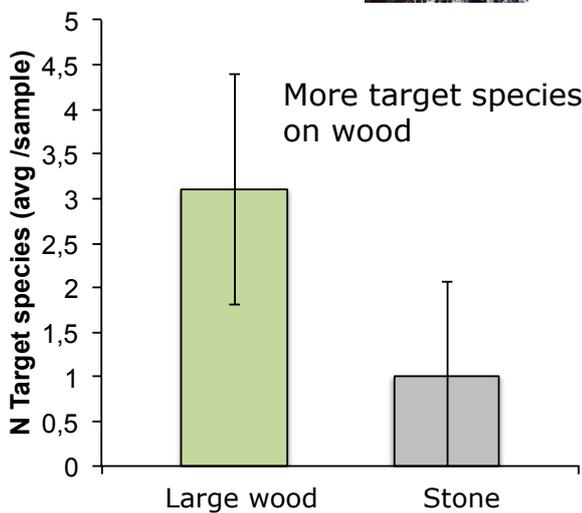


Target species (WFD)



Mayflies

Stoneflies





Conclusions macro-invertebrates



- Many target species on wood
- EQR wood > stones

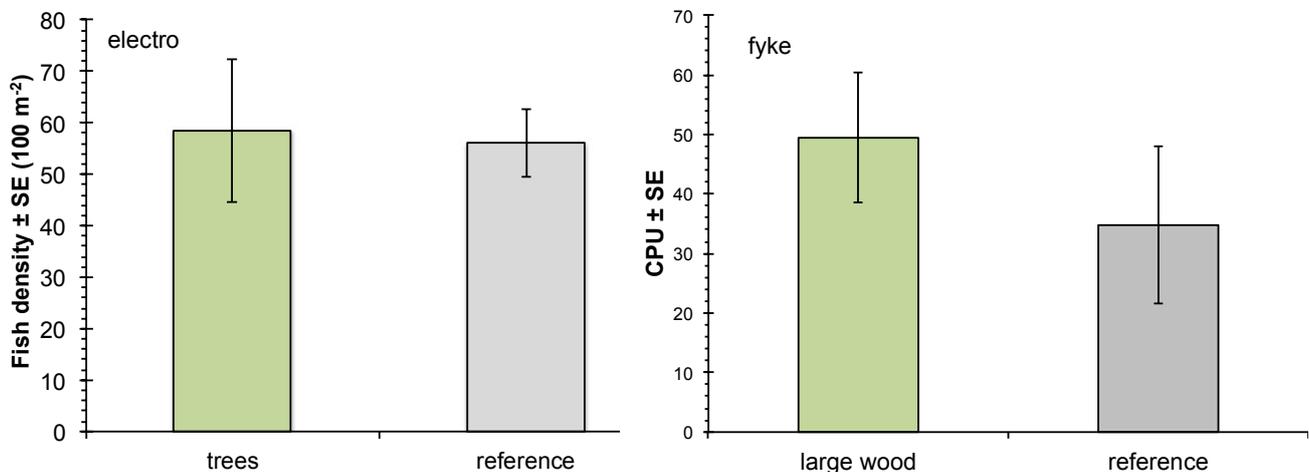


- Invasive alien species dominate
- Will Dreissena colonise the wood?



Pilot 1

Results: Fish Abundance

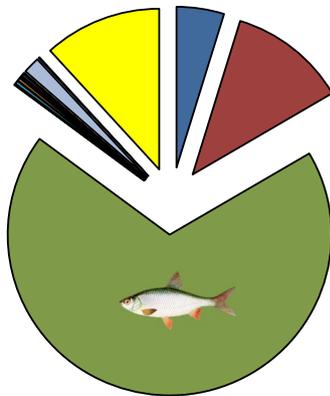


No significant difference in abundance



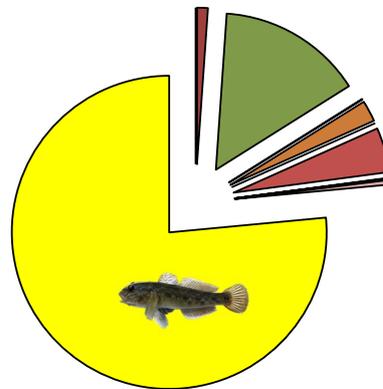
Fish species composition

Large wood



- bleak
- perch
- roach
- common bream
- common/white bream
- Kessler's goby
- white bream
- eel
- rudd
- nase
- pikeperch
- ide
- round goby

Reference



- perch
- roach
- common bream
- Kessler's goby
- eel
- monkey goby
- asp
- nase
- ide
- round goby

Mean relative abundance per species - electro fishing

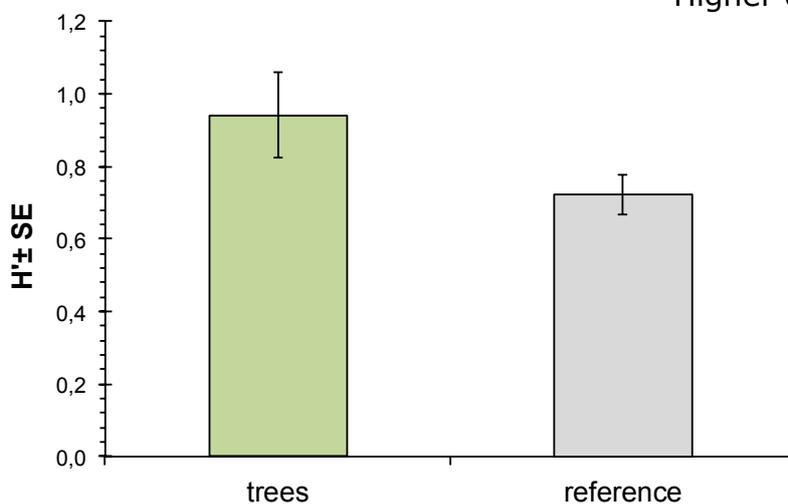
Roach dominated - Goby dominated



Fish species diversity

Shannon-Wiener index:

- Higher diversity on large wood

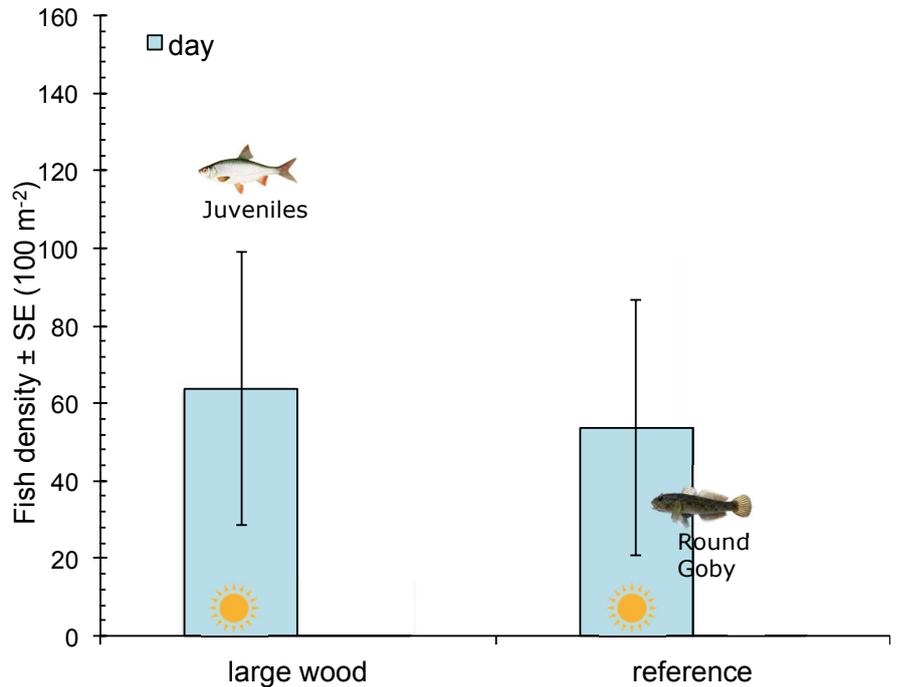




Day - night

Day: large wood provide shelter for juveniles

Electro fishing Sept. 2014



Rijkswaterstaat
Large wood in navigable rivers

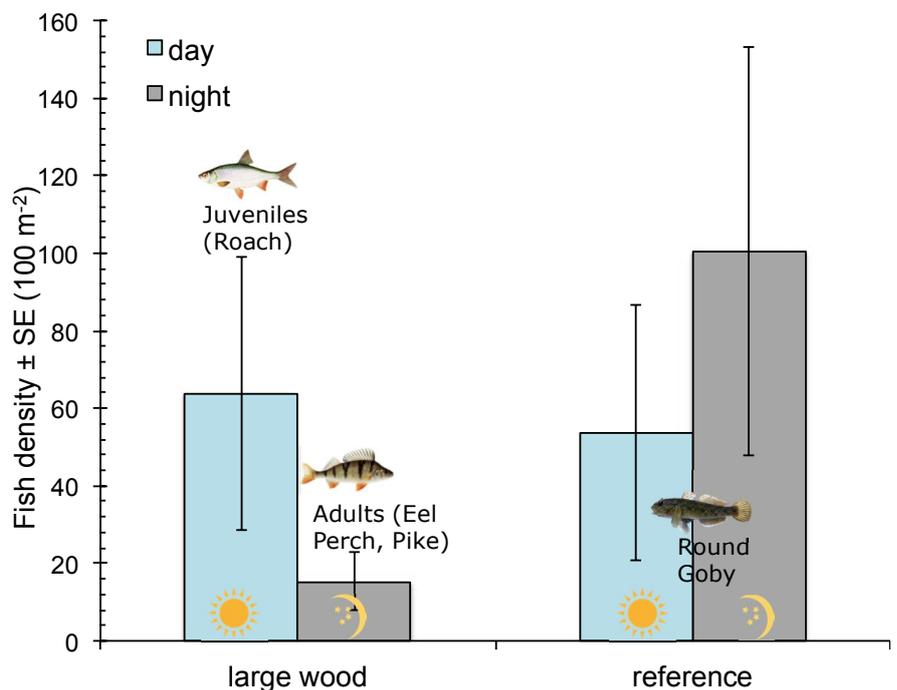


Day - night

Day: large wood provide shelter for juveniles

Night: piscivores fouraging near large wood

Electro fishing Sept. 2014



Rijkswaterstaat
Large wood in navigable rivers



Conclusions fish



Quick results: after 1 year

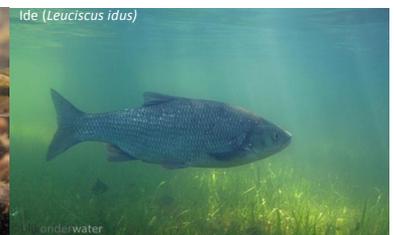
- Native species outnumber alien species
- Diversity large wood > groyne fields
- Functions:
 - nursery → spawning not clear
 - fouraging
 - shelter



Will rheophilic fish profit ?
(WFD target)



Nose carp (*Chondrostoma nosus*)



Ide (*Leuciscus idus*)



Conclusions pilot project

- Preliminary ecological results appear positive for fish and macro-invertebrates
- Use trees with branches, stem and roots
- Long term monitoring (>3 years) will have to demonstrate sustainability
- All applied fixing methods are functioning (no big flood)
- Not expensive compared to other measures
 - Highest costs: Transport costs
 - Macro-invertebrate research



New practices in the future

- Side channels river Waal and IJssel



New practices in 2015

- River training constructions





New monitoring methods

- Non destructive handyvac



Rijkswaterstaat
Large wood in navigable rivers



Thank you for your attention!

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