Stream restoration in the Netherlands – two examples differing in scale

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- Small-scale restoration: woody debris in the Jufferbeek
- Large-scale-project: restoration of the Geeserstroom
- Conclusions

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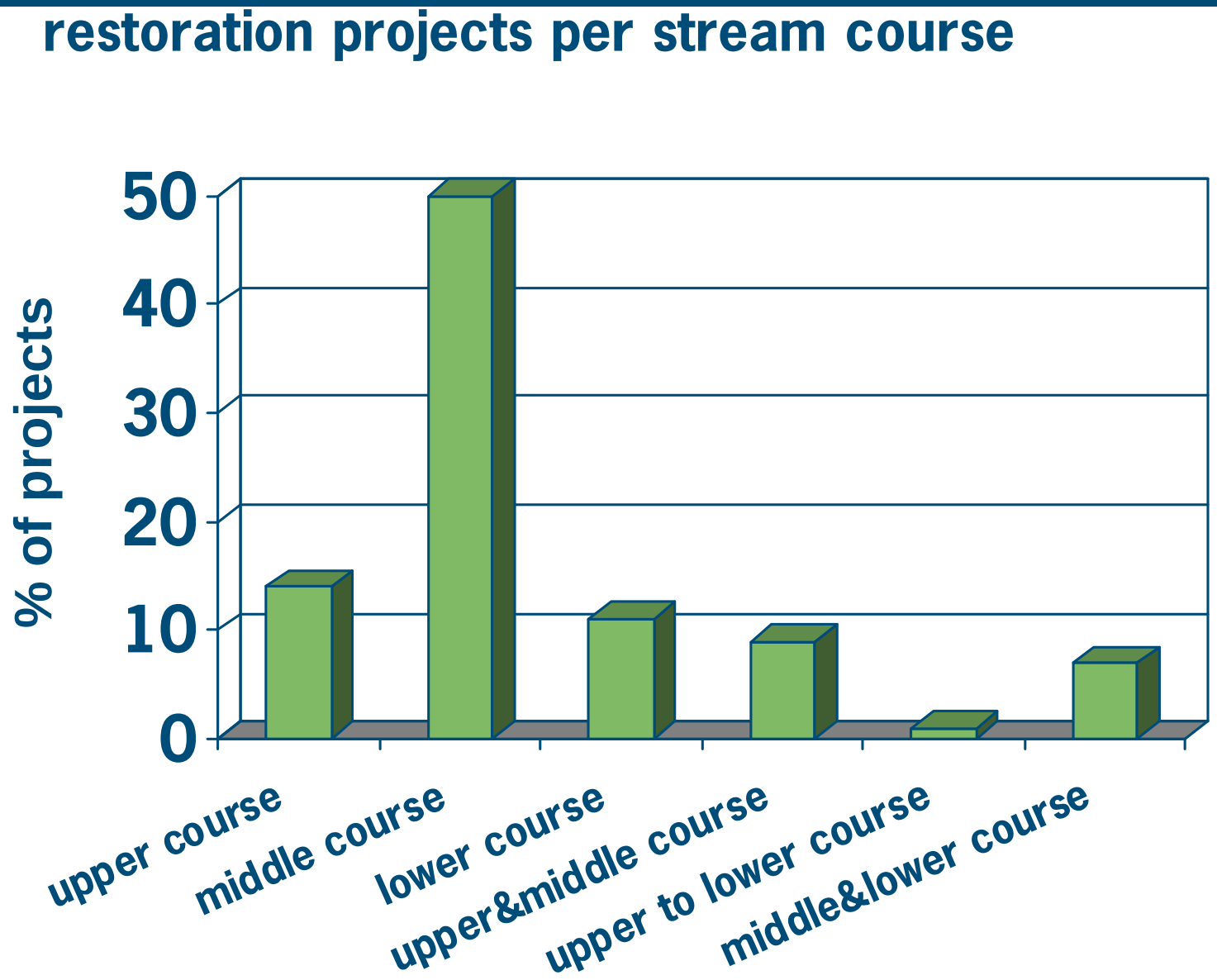
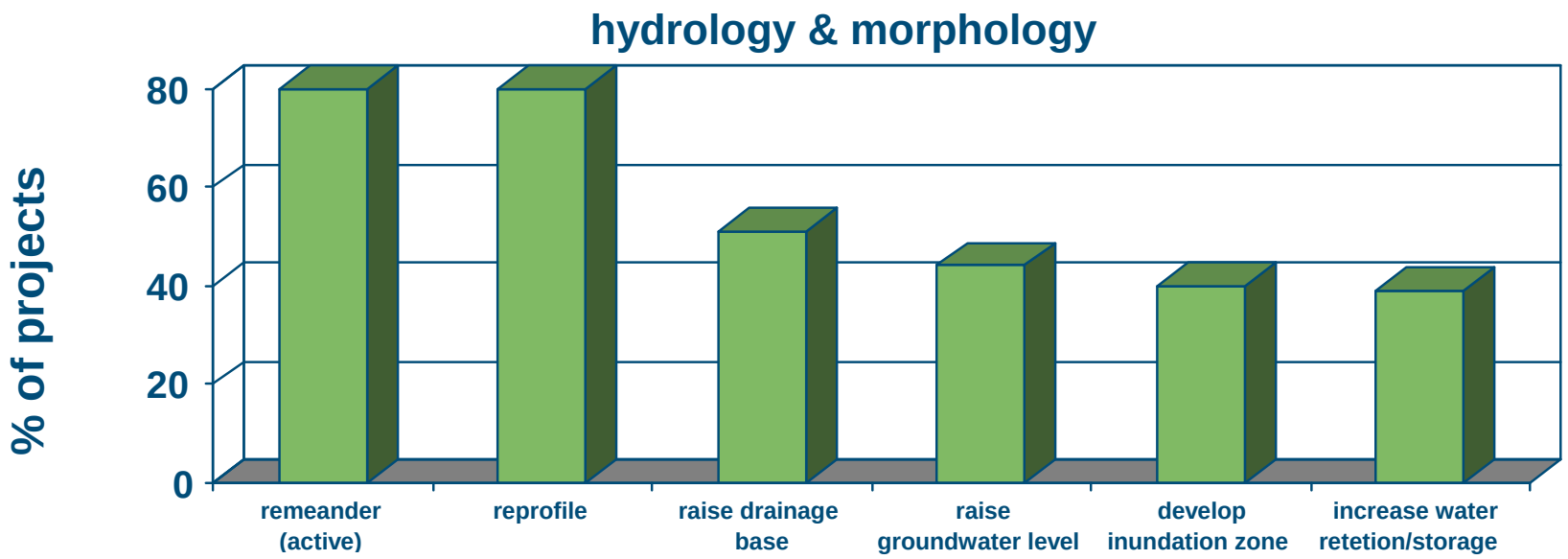
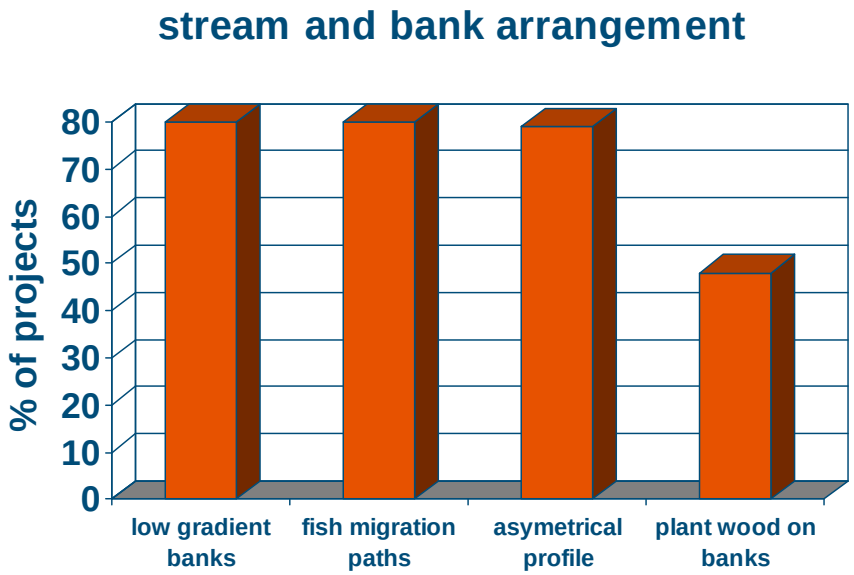
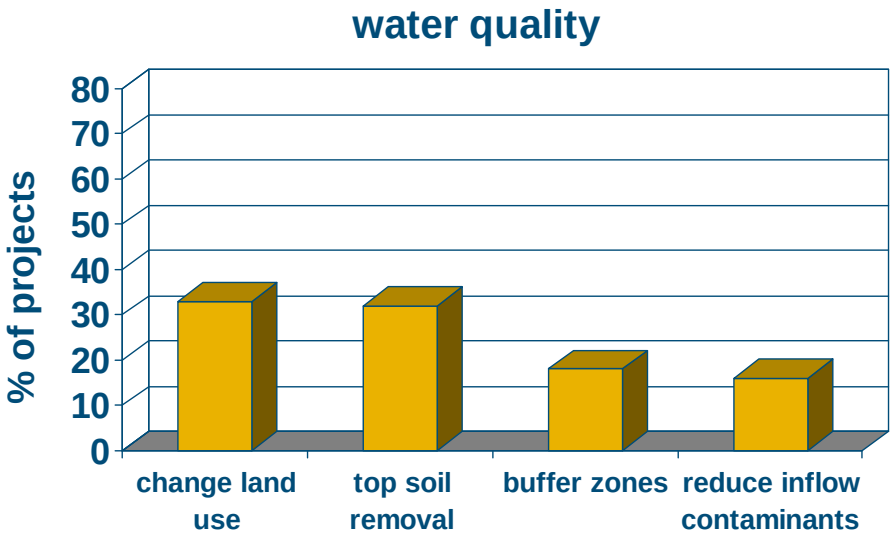
Stream restoration survey – where?



Stream restoration survey – measures

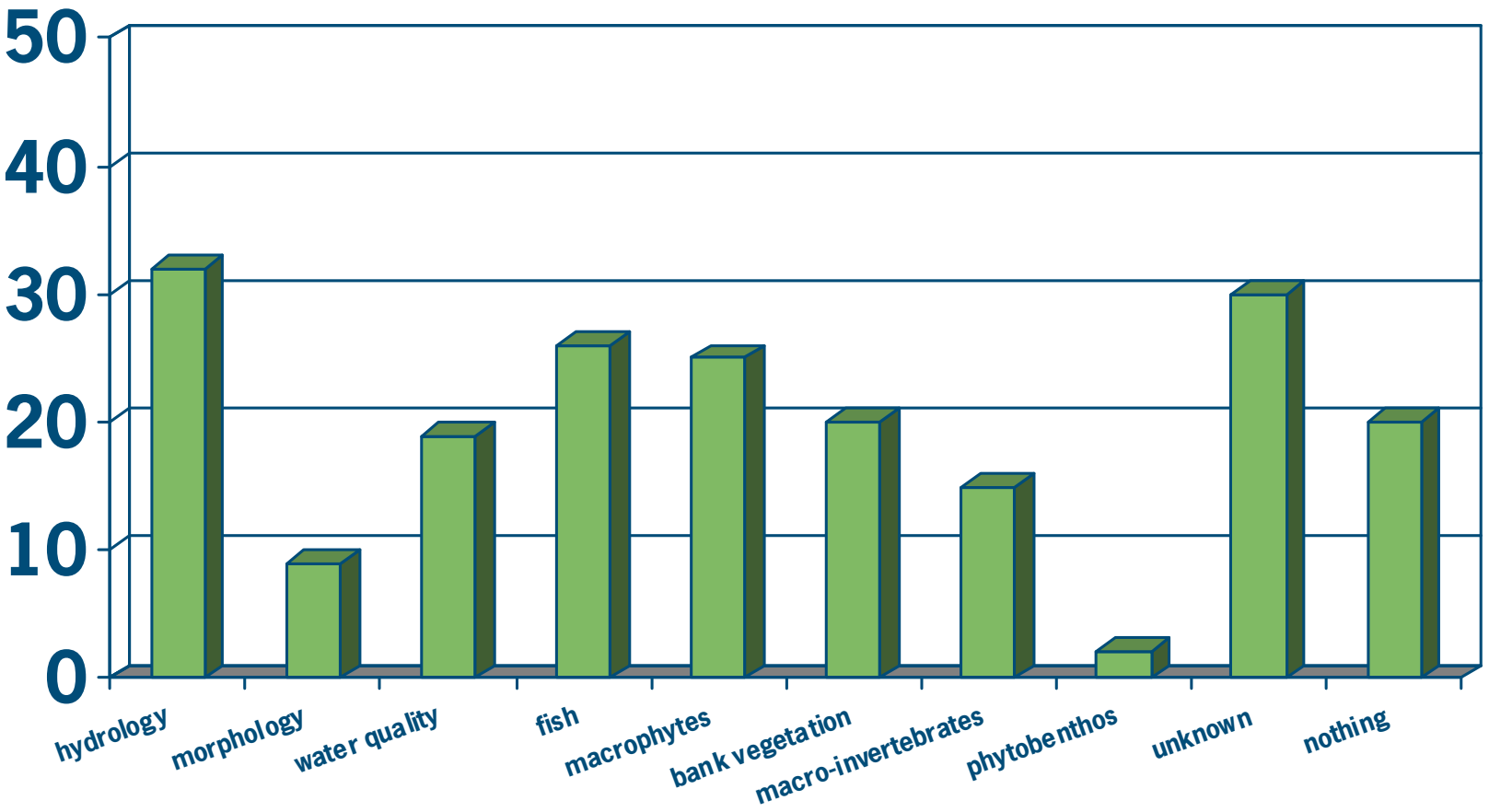






Stream restoration inquiry – monitoring

monitoring both before and after restoration



Wood experiment in the Jufferbeek

- Free-flowing discharge
  - Removal of leaves and branches
  - 1-5% coverage of organic matter (naturally 25% wood, 25% leaves)
- Effects
  - Habitat disappearance for stream-dwelling organisms
  - Homogeneity of habitats
  - Increased discharge
  - Bed-incisions and drought
- Wood addition could be a cheap restoration measure for a small part of a stream course

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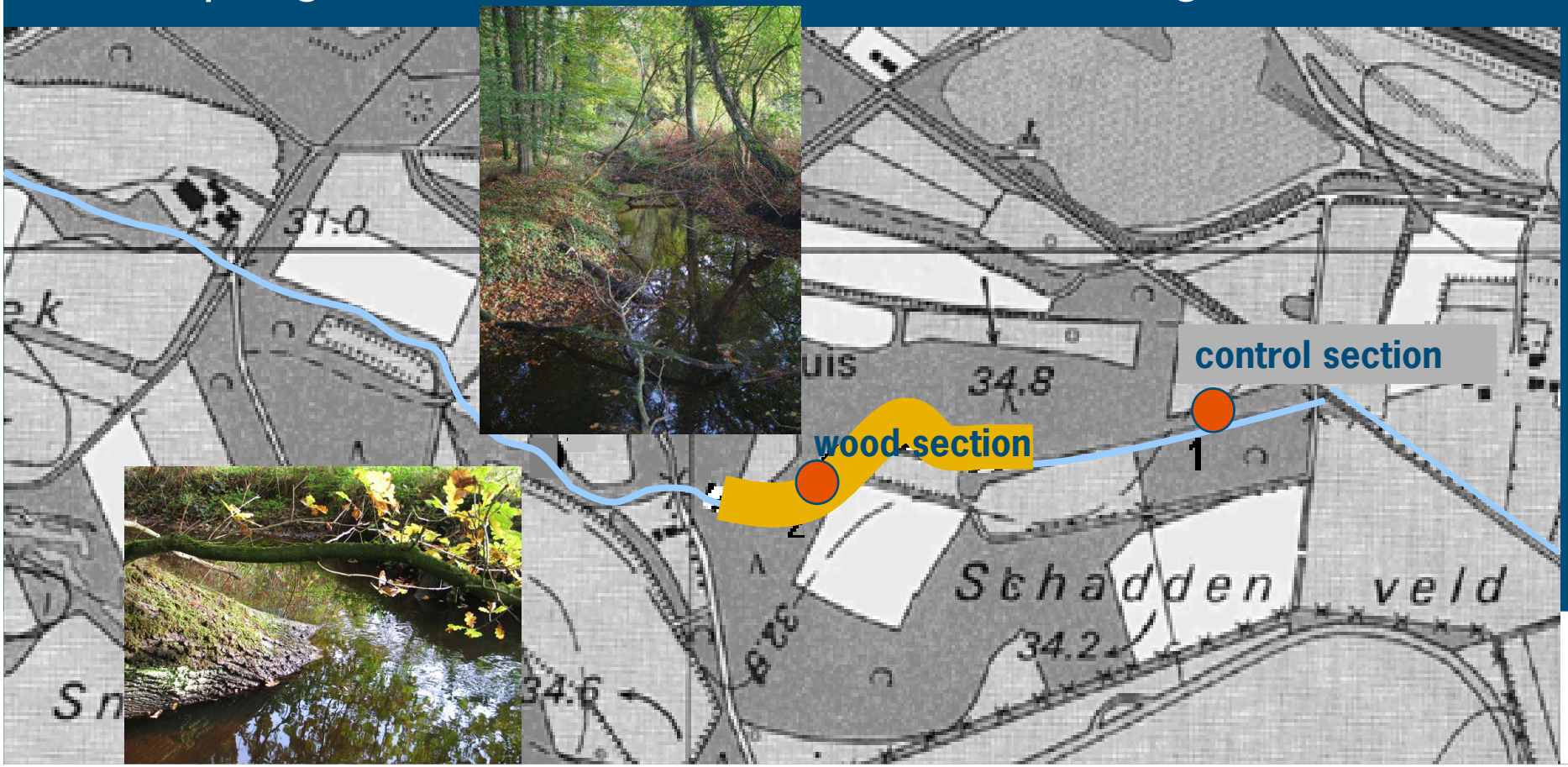
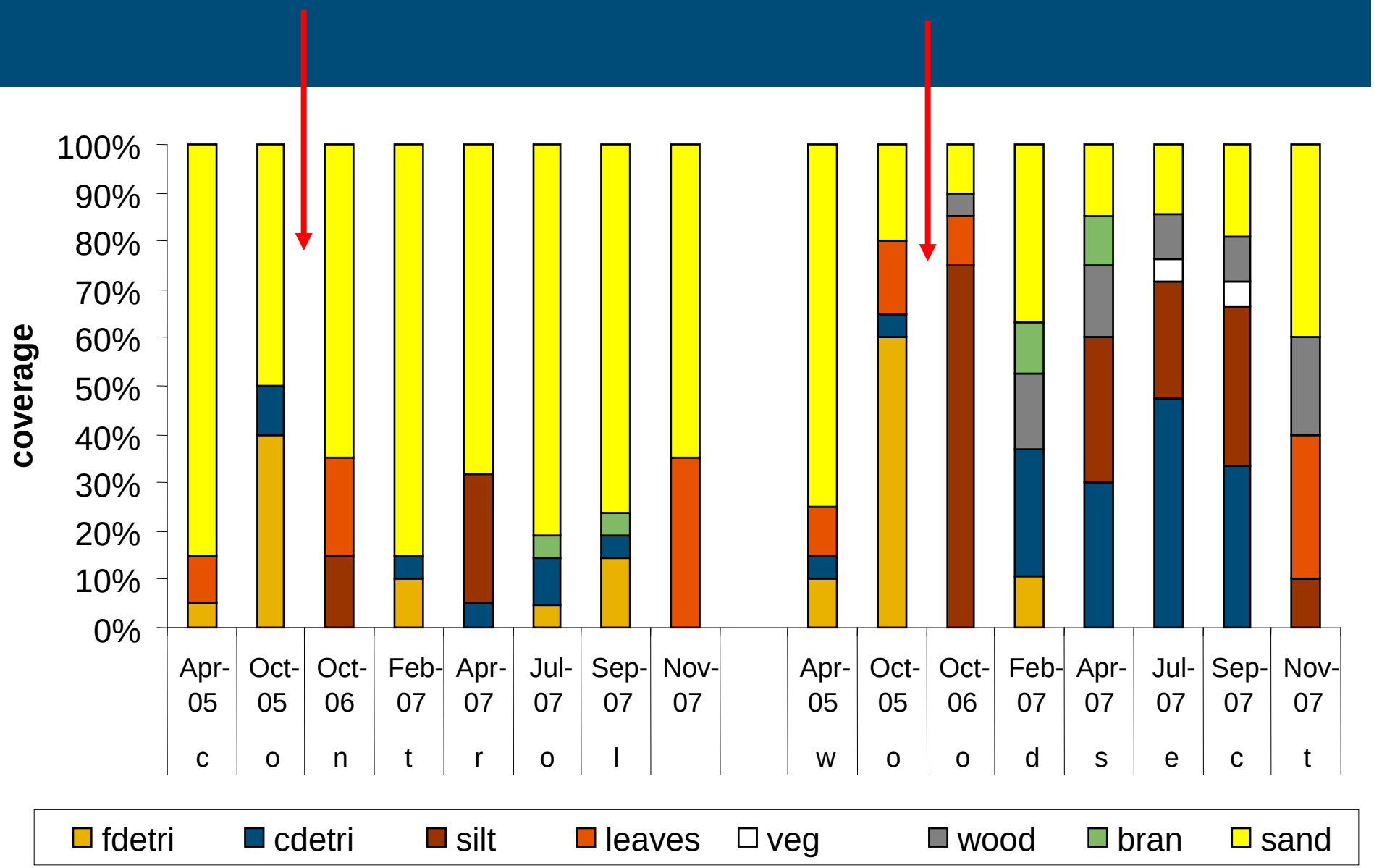
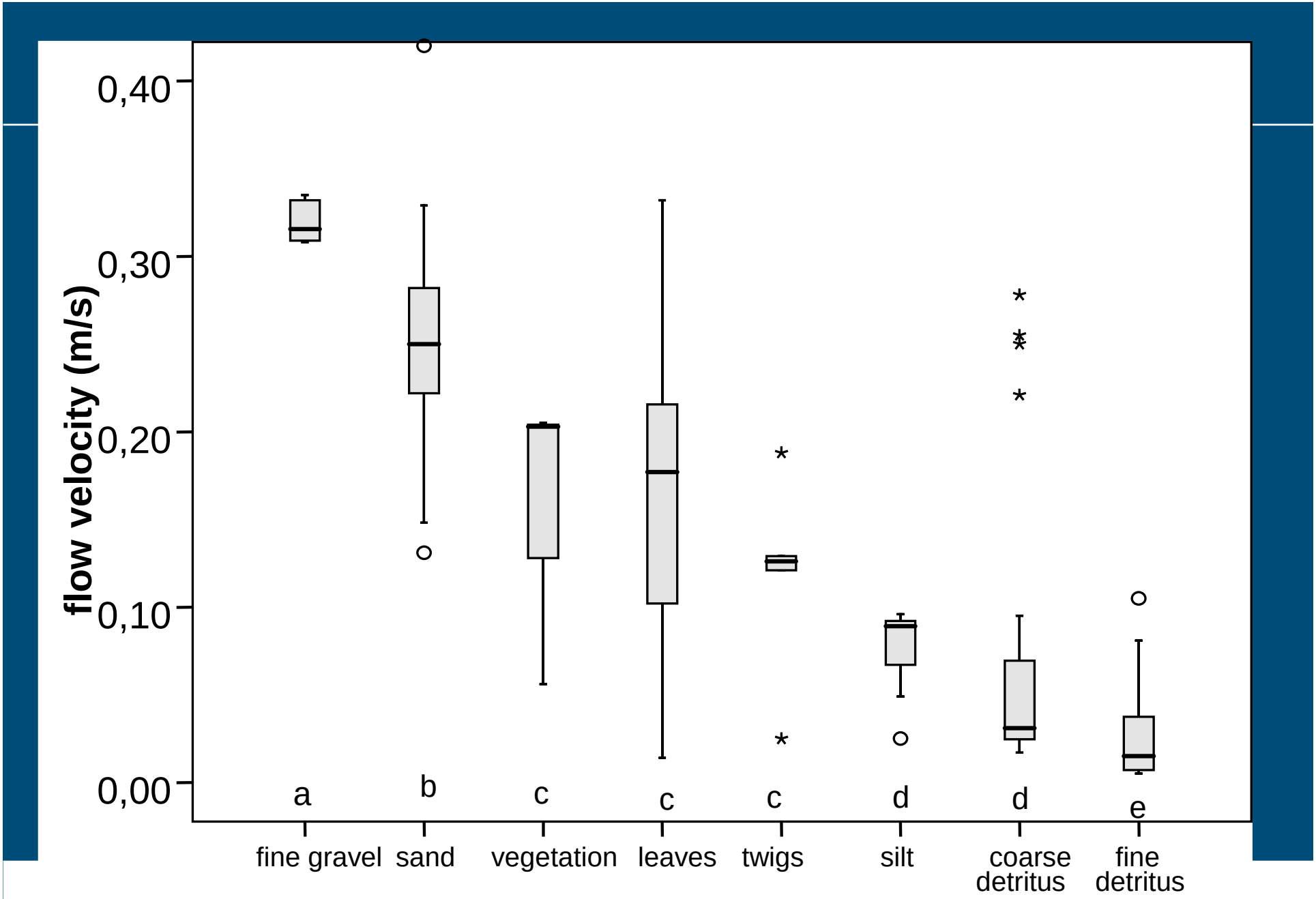
Wood experiment in the Jufferbeek

- Jufferbeek: upper course in the east of the Netherlands
- 2 locations: upstream (control) and section with wood addition (300 m)
- Spring 2006: wood was added to a coverage 25%

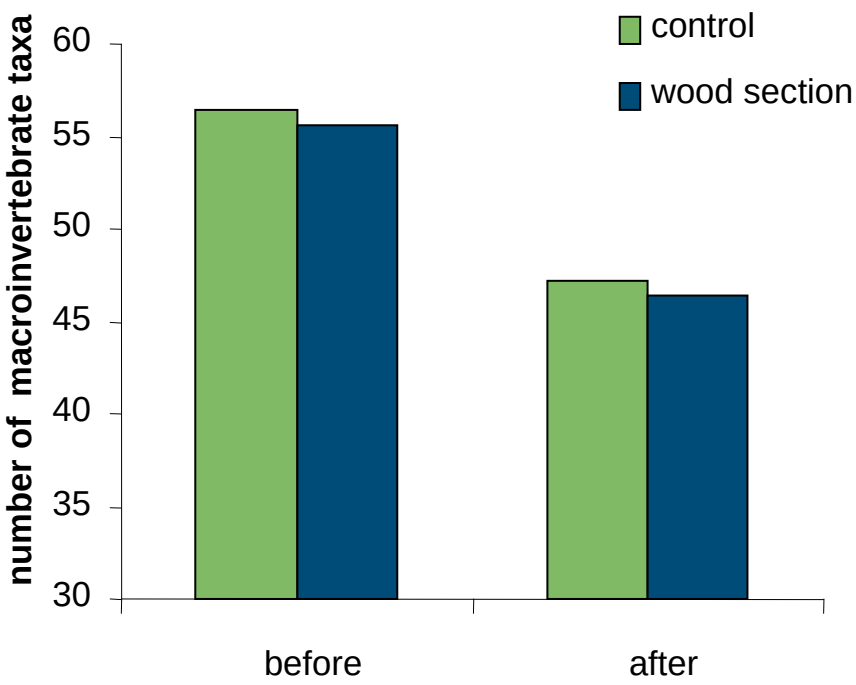


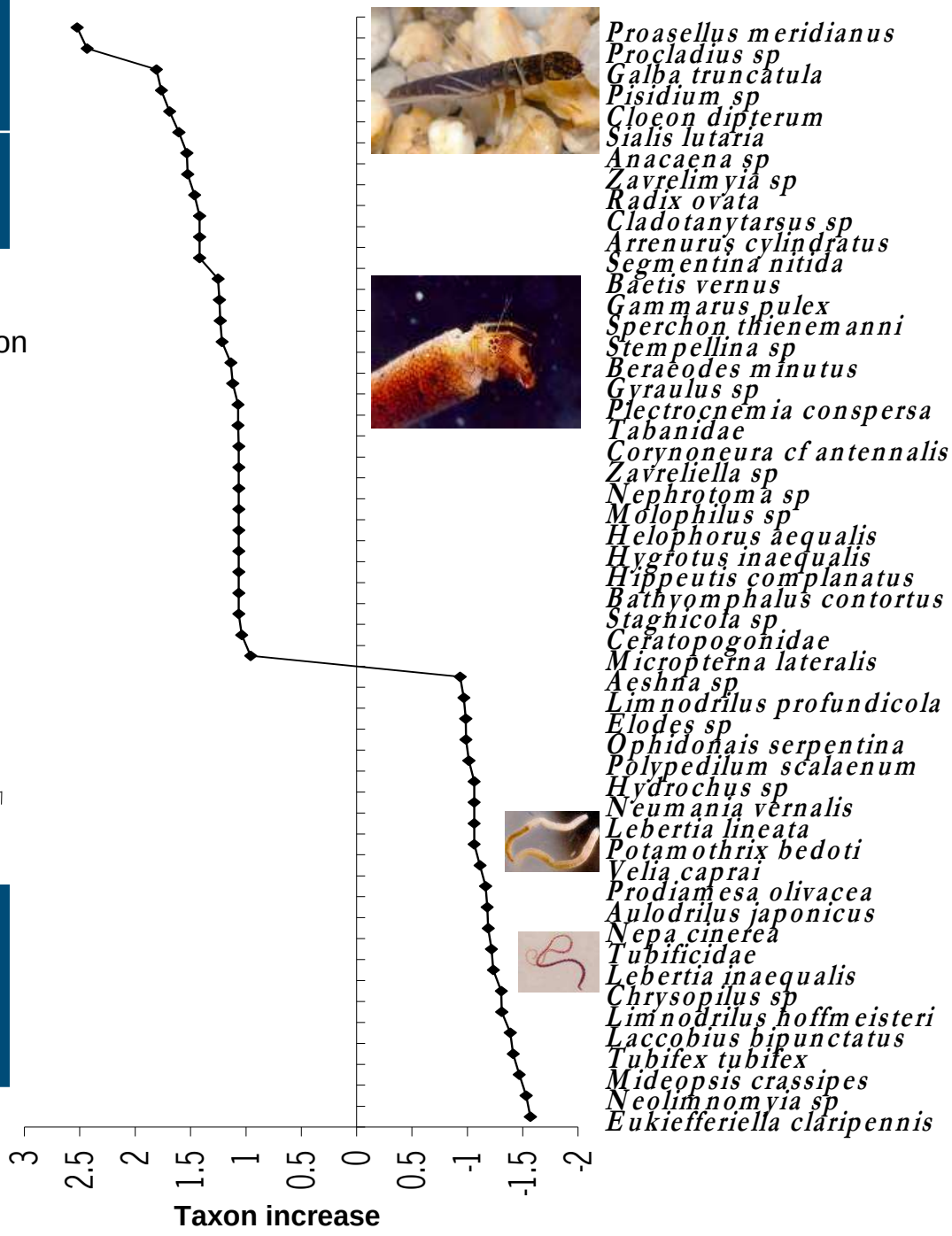
Wood experiment in the Jufferbeek




flow velocity (m/s)
0,40
0,30
0,20
0,10
0,00
a
b
c
c
c
d
d
e
fine gravel
sand
vegetation
leaves
twigs
silt
coarse detritus
fine detritus

Wood experiment





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Large-scale restoration: Geeserstroom

Before

- Deeply incised, canalized, short length, limited slope
- Eutrophication from agriculture and sewer overflow
- No fish migration possible (weirs)

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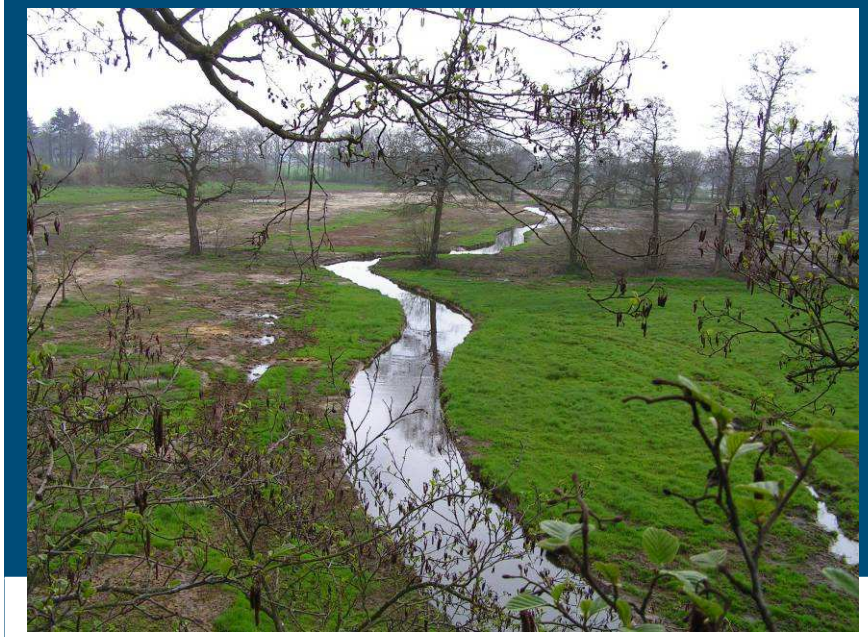
Large-scale restoration: Geeserstroom

Restoration measures

- New, meandering stream bed (2005)
- Close-off + diversion agricultural waters
- Only 1 weir with fish ladder



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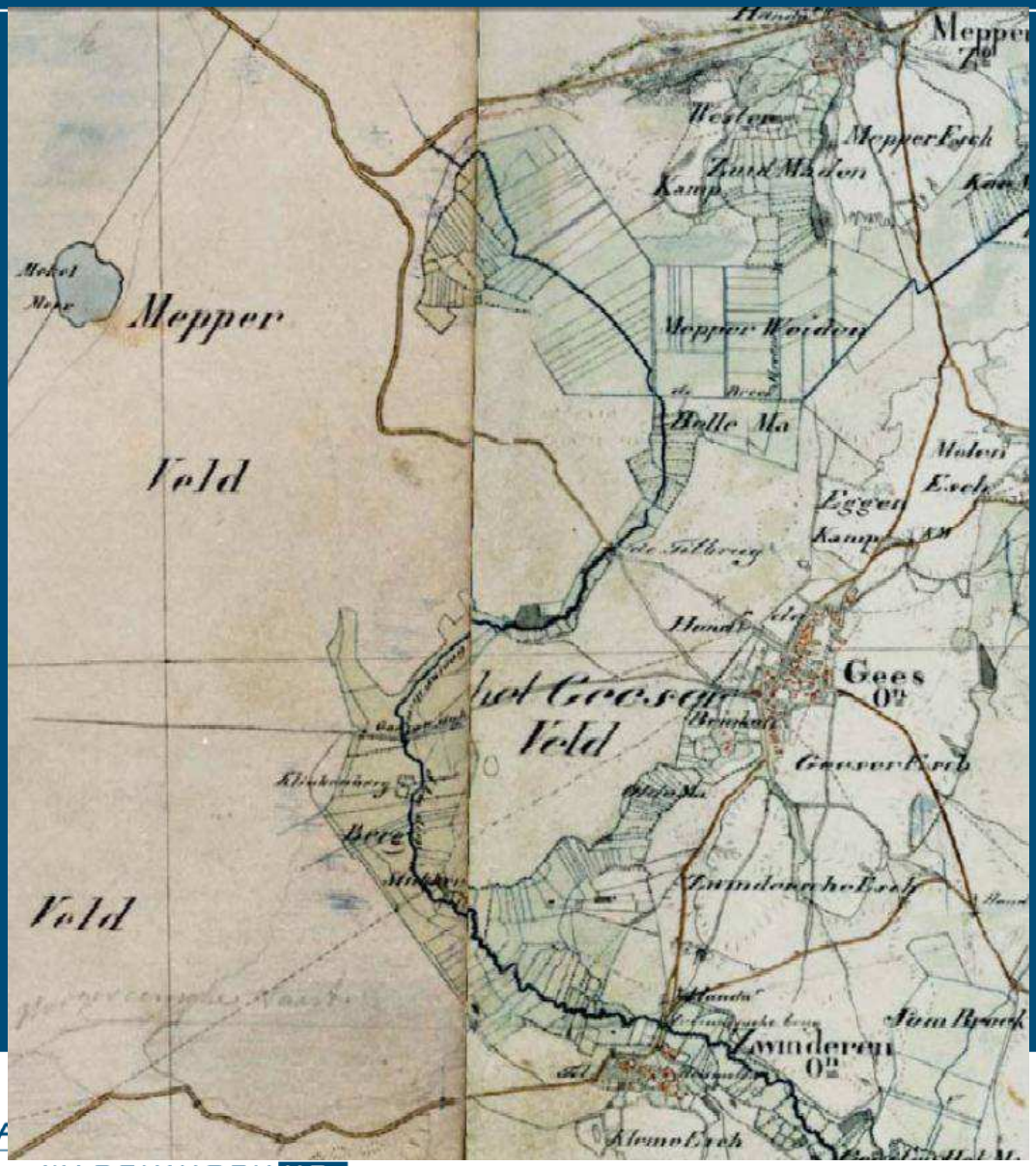
Large-scale restoration: Geeserstroom



Historical situation

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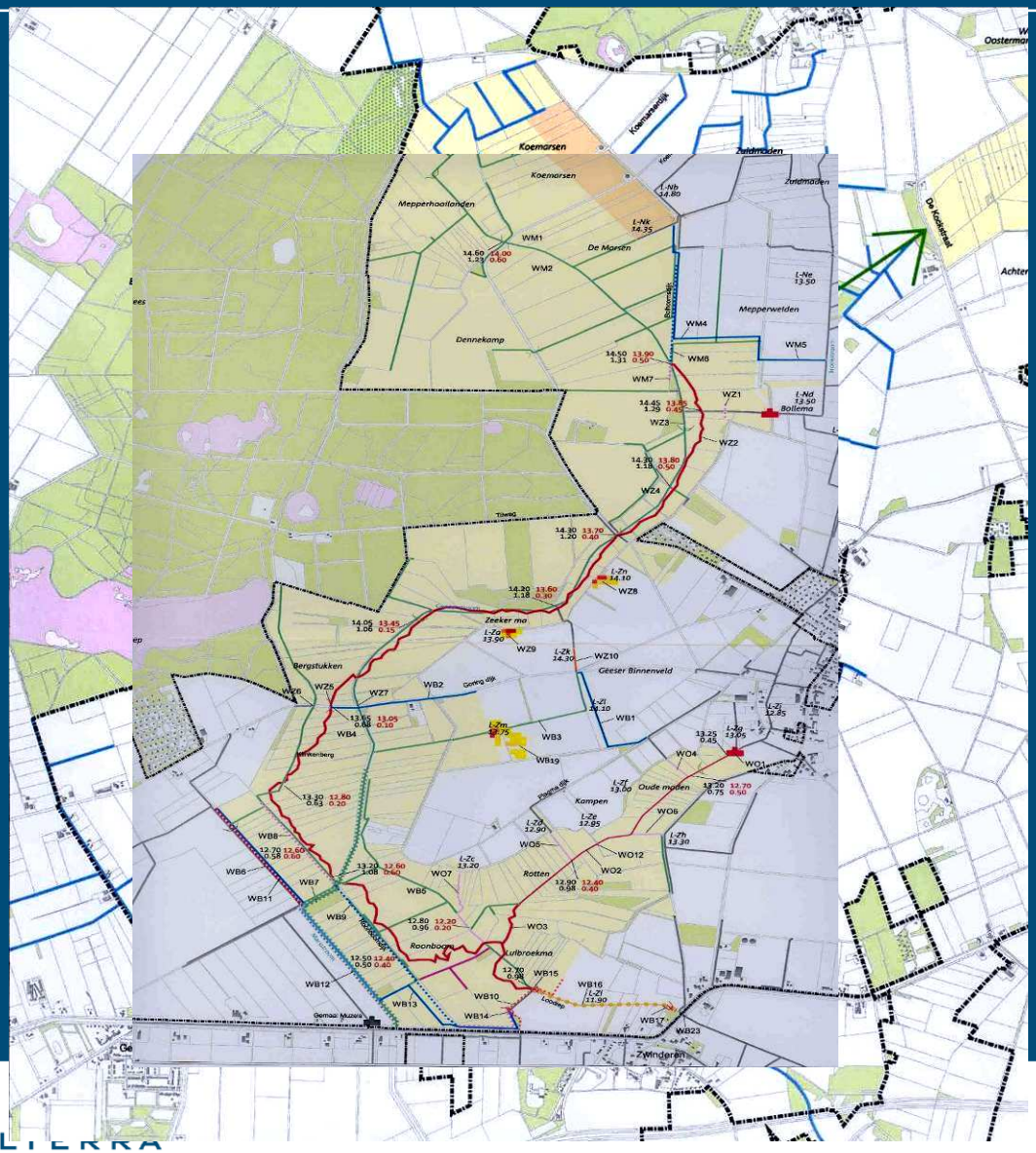
Large-scale restoration: Geeserstroom



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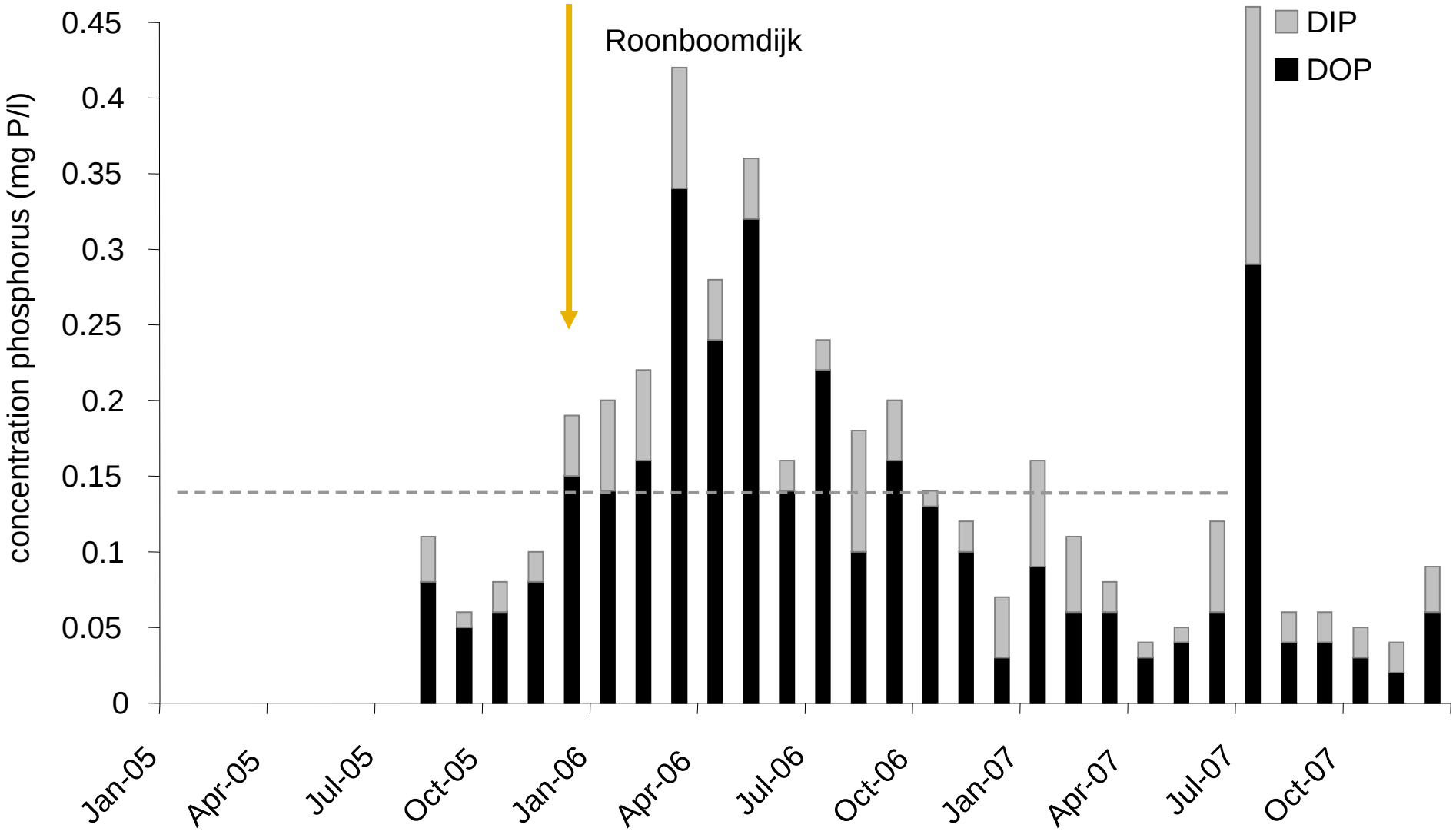
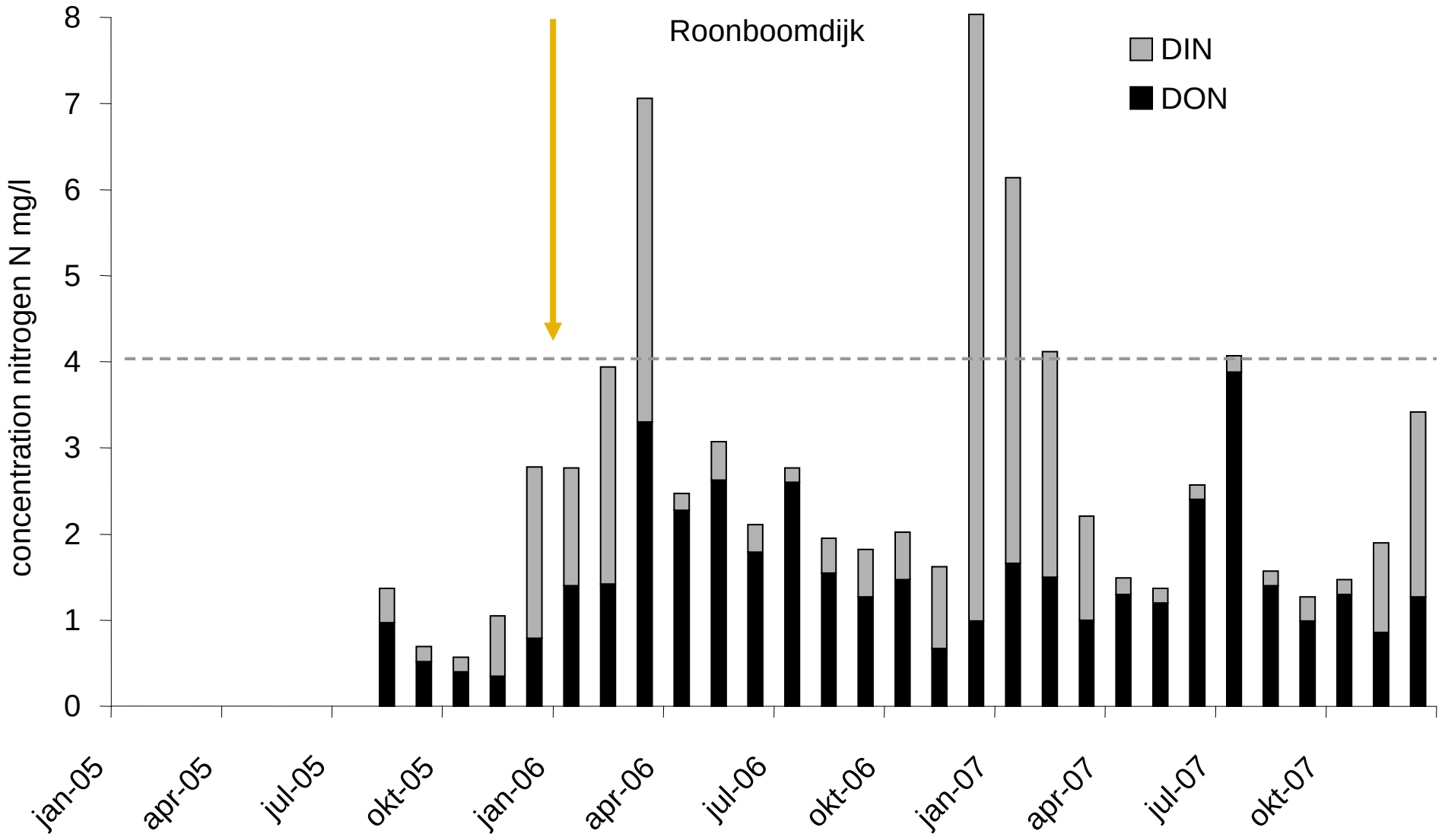
Large-scale restoration: Geeserstroom

	before restoration	after restoration
distance to fish ladder (km)	6.0	8.9
slope (%)	10	21
average width (m)	7	9
max width (m)	12	85
average water depth (cm)	70	27
max water depth (cm)	115	110

Large-scale restoration: Geeserstroom



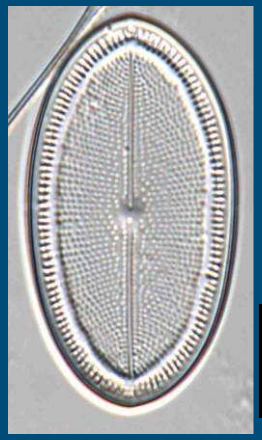
Large-scale restoration: Geeserstroom



Large-scale restoration: Geeserstroom

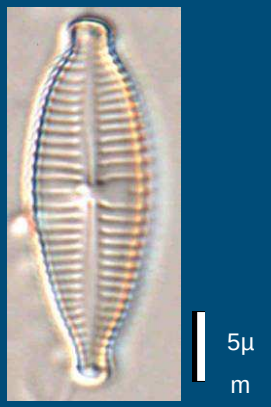
Diatoms

- 3 common, (hyper) eutrophic taxa dominant (pioneer species)



Cocconeis placentula

Achnanthidium minutissimum

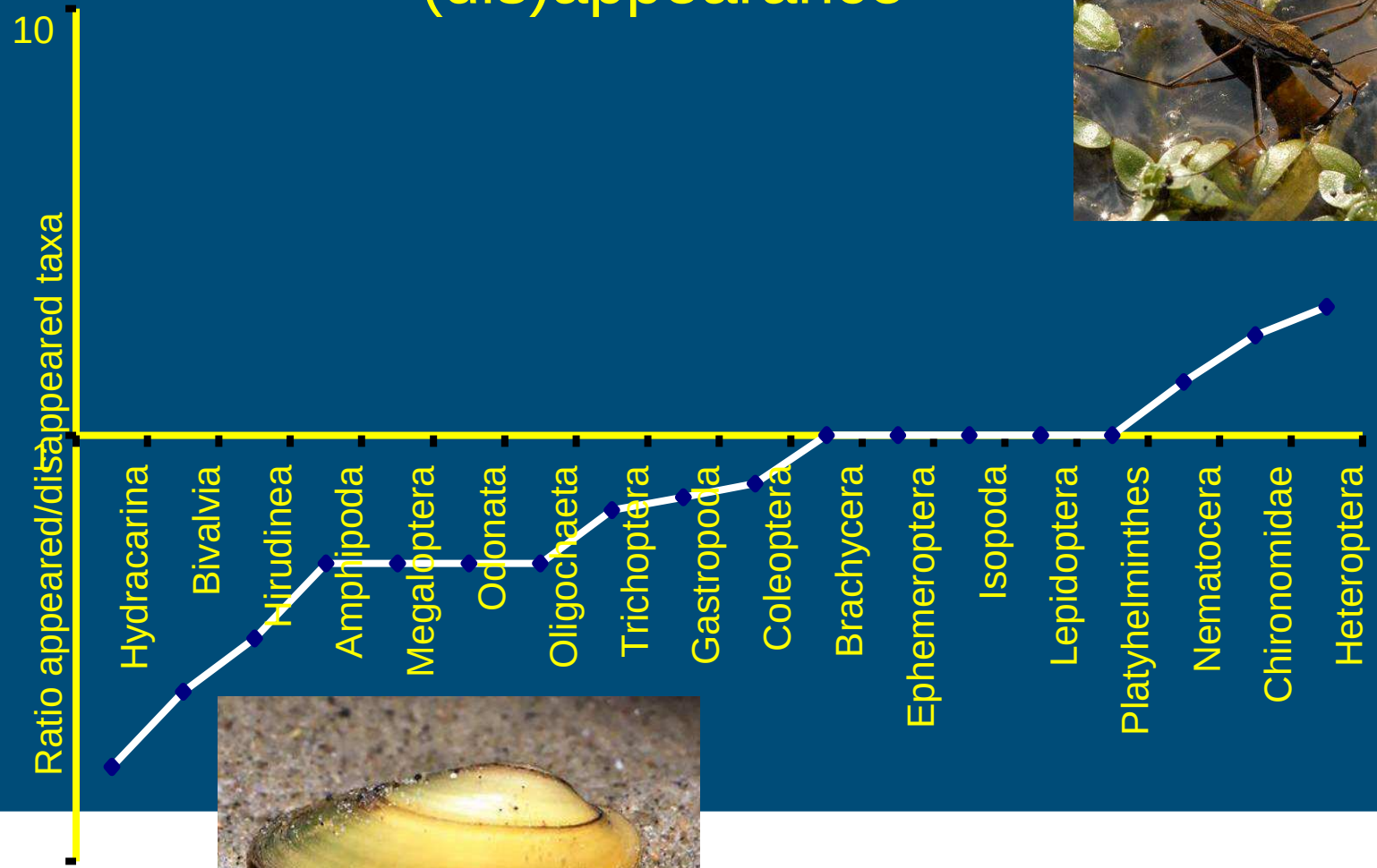


Gomphonema parvulum

Large-scale restoration: Geeserstroom

macroinvertebrates

(dis)appearance



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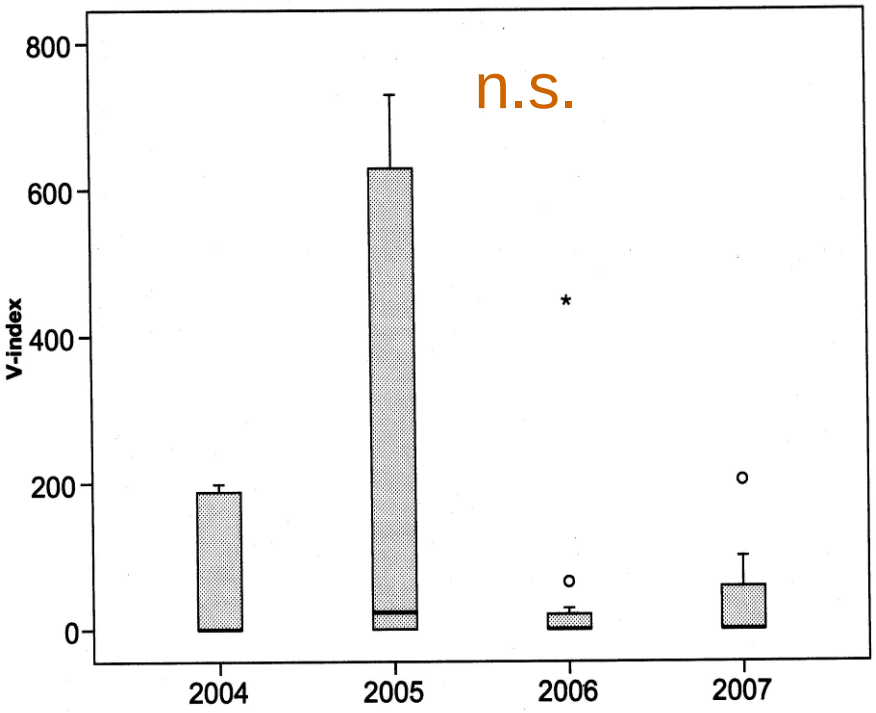
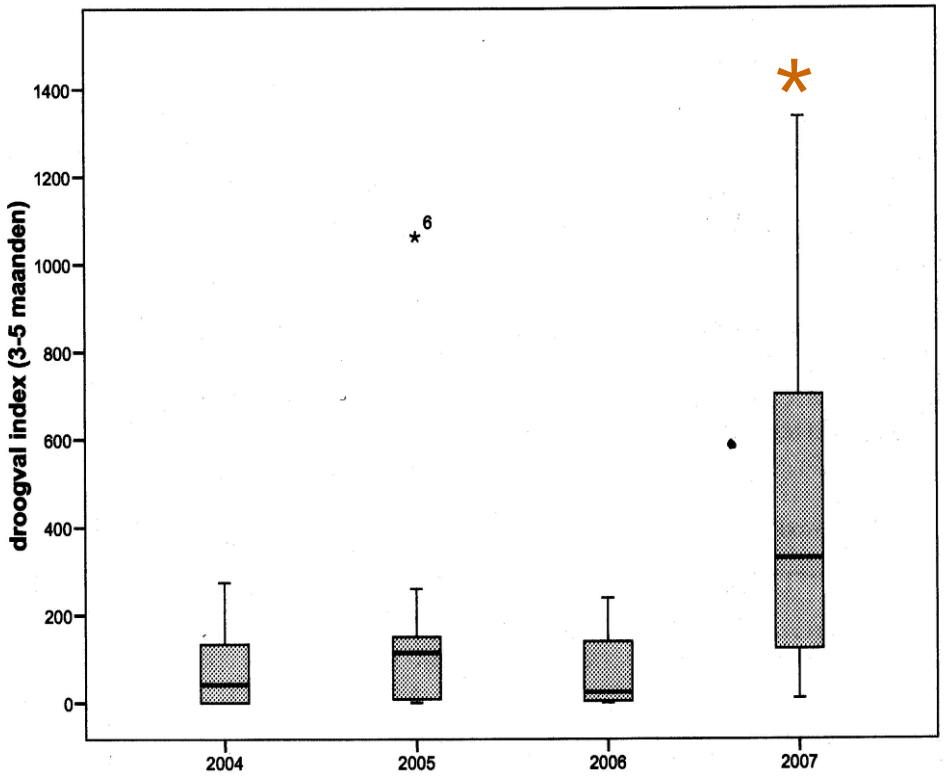
Large-scale restoration: Geeserstroom macroinvertebrates

Index for rheophilic species



Index for drought tolerant species



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Conclusions

- Dispersion plays an important role in (re)colonisation; flying species reach restored stream more easily than non-flying species
- (Re)colonisation and vegetation development take time: long-term monitoring necessary
- Exceeding nutrient norms may hamper development of ecology

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Conclusions

- Many projects in the Netherlands only focus on a small section of a stream, no restoration of entire catchments (+ problems from upstream sections)
- Most effort put into hydrological and morphological changes, little into nutrients
- Many projects are not monitored (especially not for biological targets). A before-after-control-impact monitoring would be best.
- Need for scientific research to gain do's and don'ts in lowland stream restoration