



Wetland dynamics in a short-term dataset: riparian vegetation development along restored lowland streams

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CWE symposium 'Understanding wetland dynamics: the value of long-term datasets'

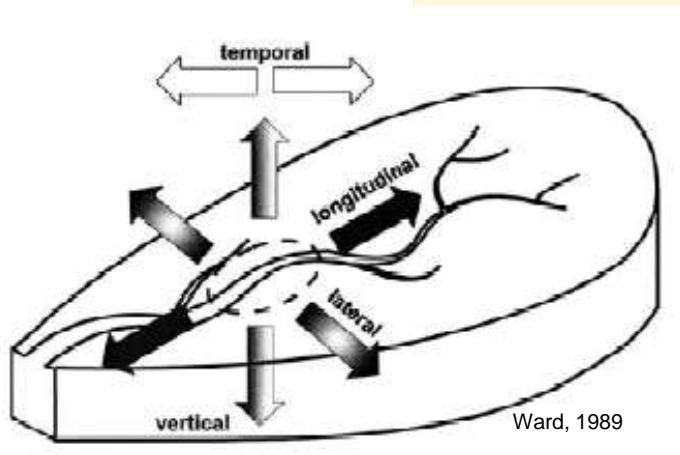
NIOO Wageningen, 11-01-2013



Universiteit Utrecht

Lowland streams

- Flat lowland areas of European plain
- Fed by rainwater
- Gentle slope of terrain



- Dynamic and diverse ecosystems
- Variable flow velocity and water table
- Environmental gradients
- Habitat heterogeneity, high biodiversity

Channelization: loss of habitat heterogeneity and biodiversity



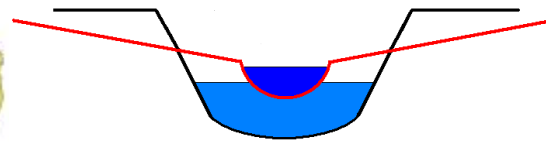
Stream restoration

Meandering, floodplains:
Marginal improvement



Project Beekdalbreed Hermeanderen:
Improve stream functioning

Agency NL
STOWA Water Mosaic
Six water boards
Utrecht University
Wageningen UR
Alterra



Vegetation development

Main research question:

How does hydrology in the riparian gradient affect vegetation development along restored streams?

Hypotheses:

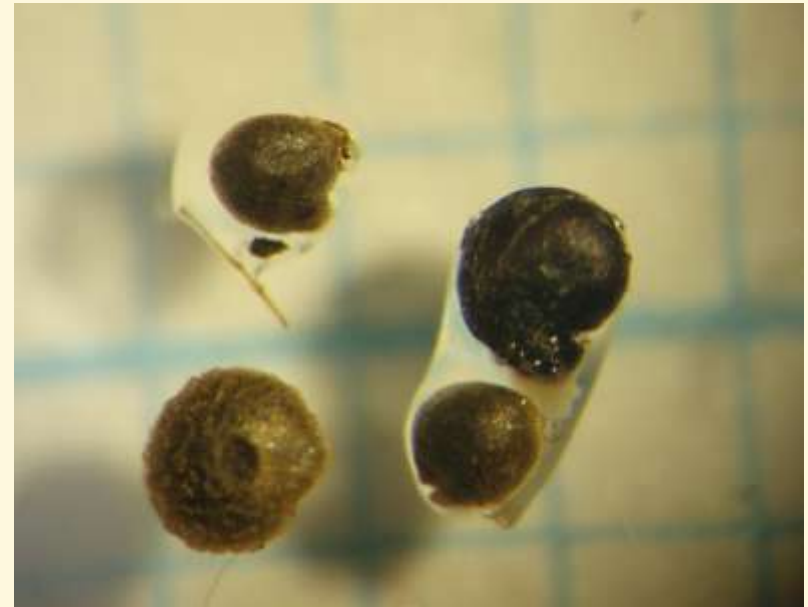
- Stream hydrology acts as an environmental filter for the establishment of riparian plant species
- Species-specific preferences for hydrological conditions lead to a zonation of species, which promotes biodiversity development



Methods

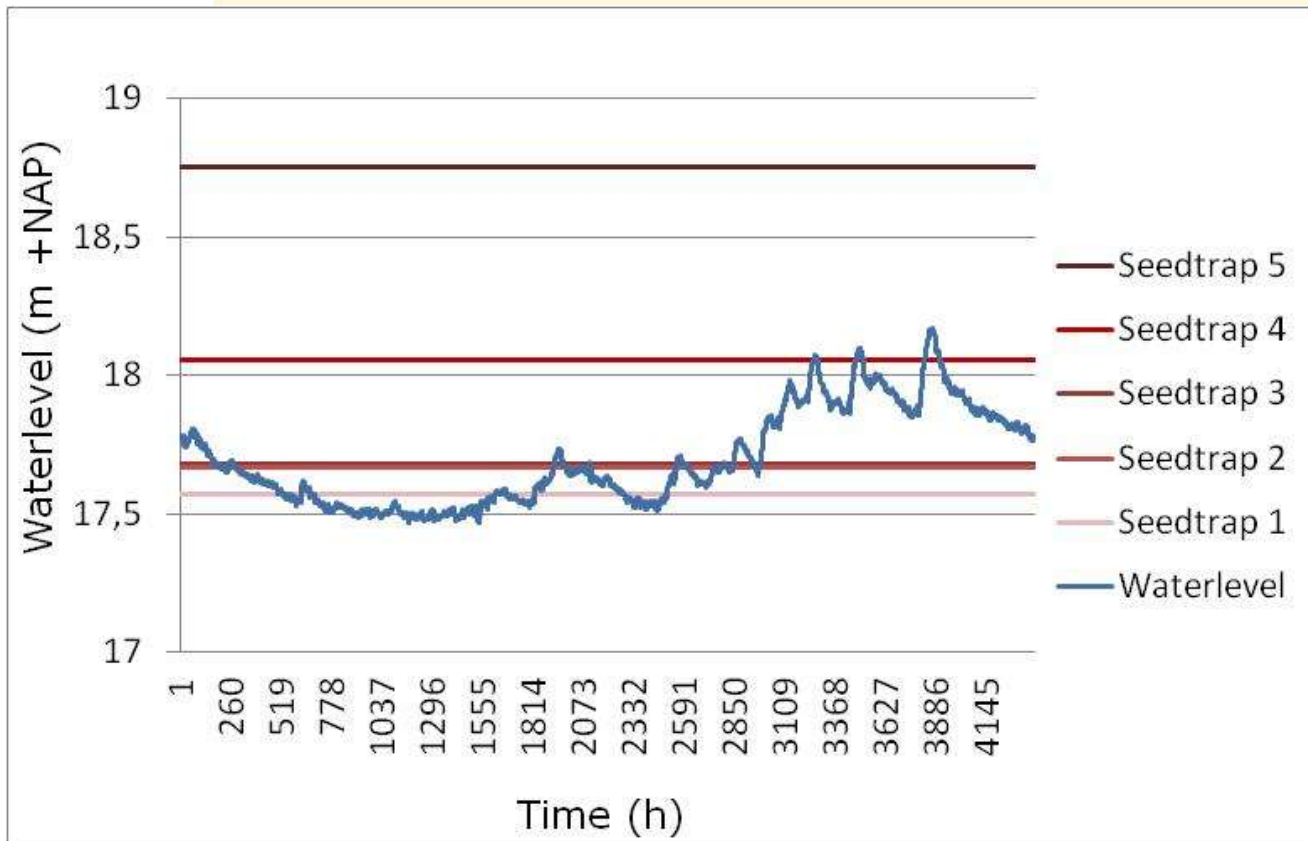
One year of vegetation development after restoration

- Field research: Hagmolenbeek, Overijssel. Restoration June 2010.
- Seed traps: artificial grass mats 25x25 cm
- Seed identification in laboratory
- Vegetation surveys 25x50 cm: August 2011



Results

Water level

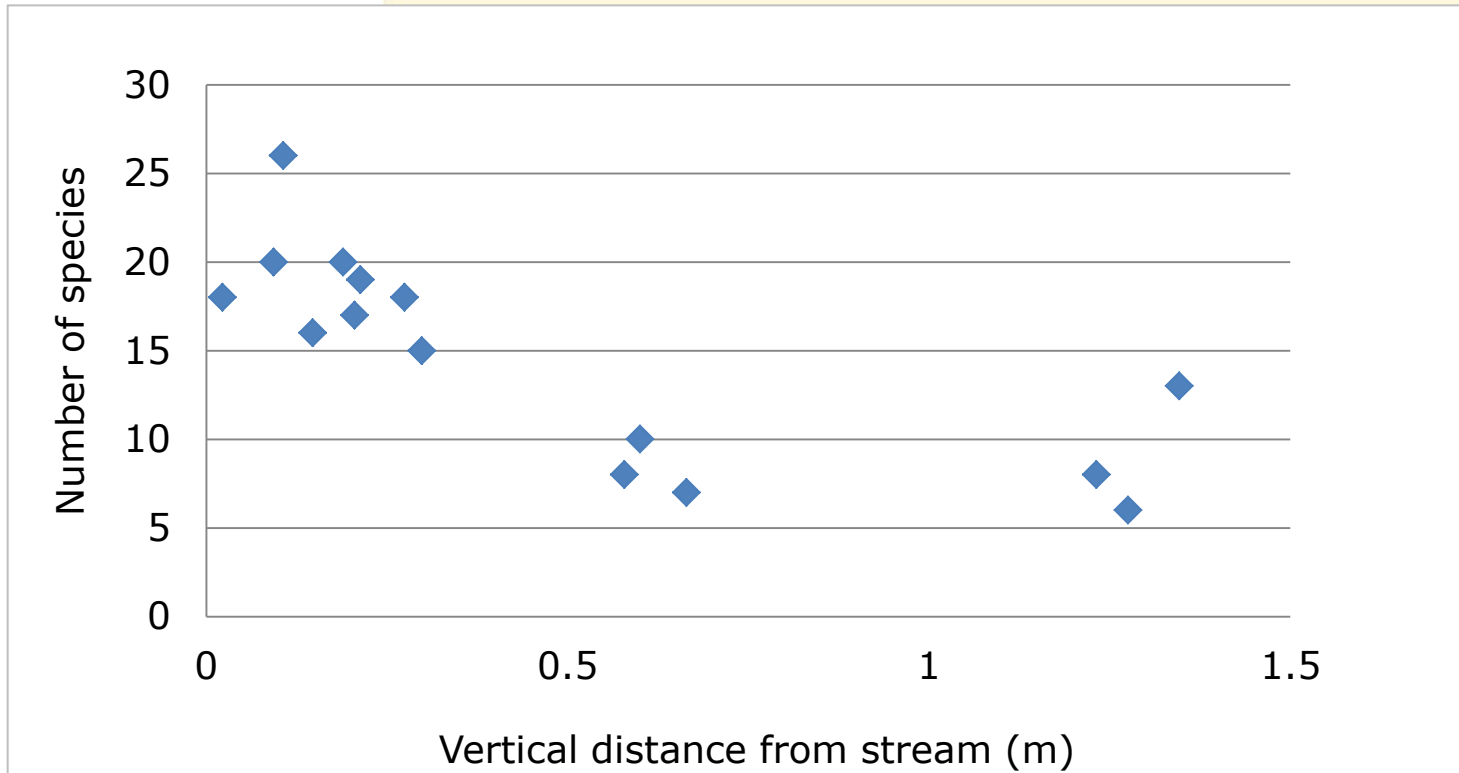
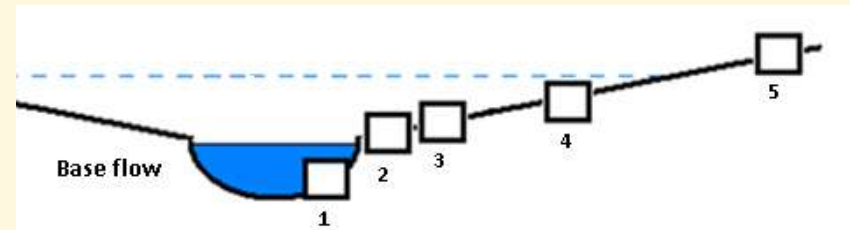


April-October 2011

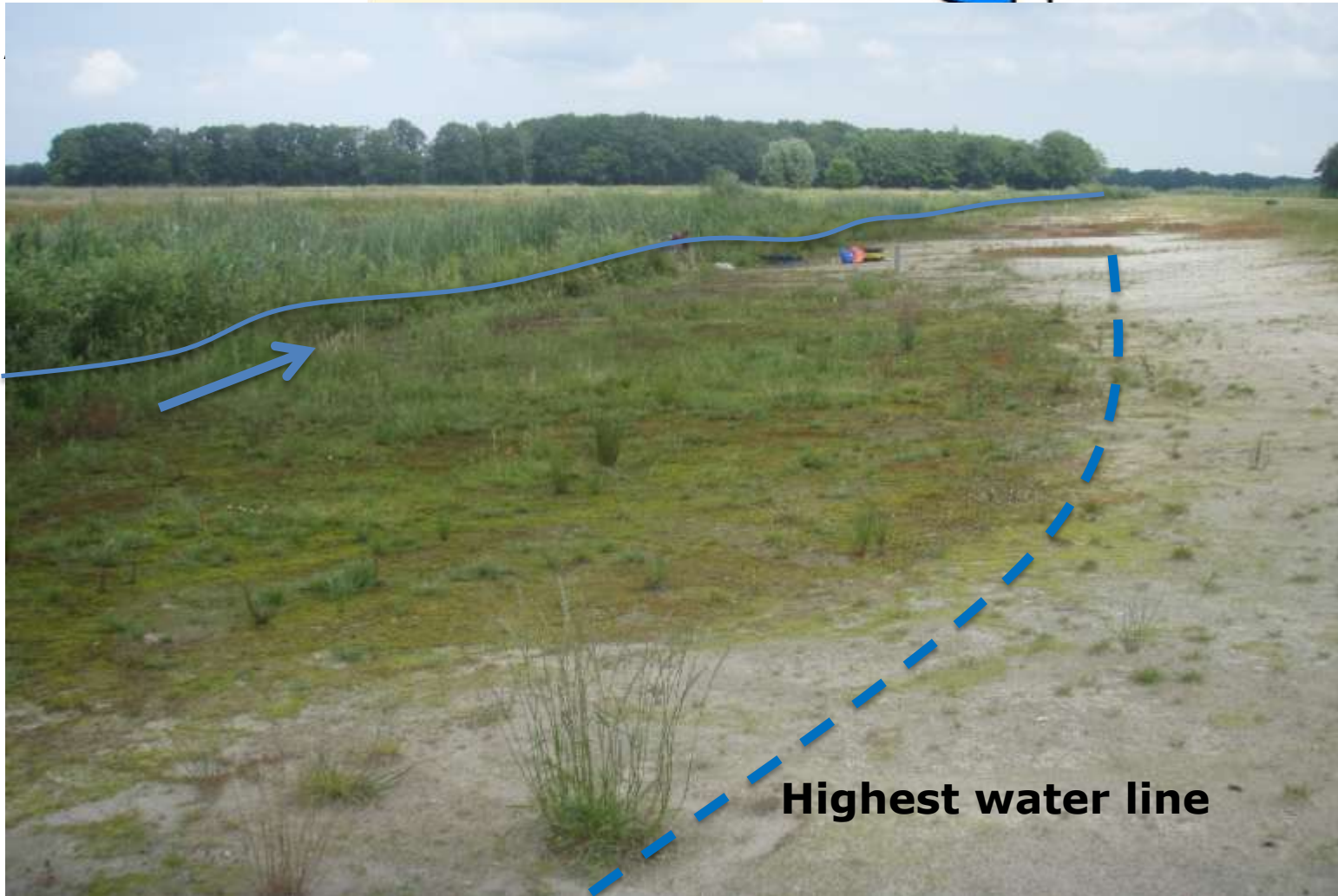
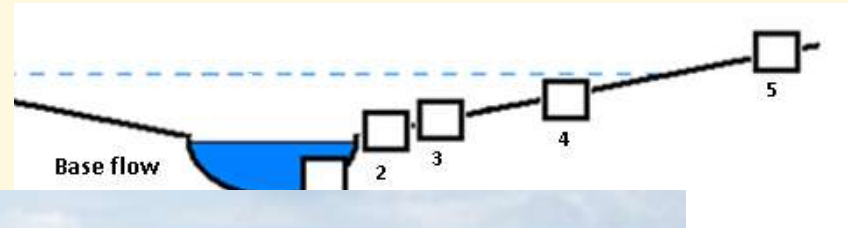


Results

Number of seed species



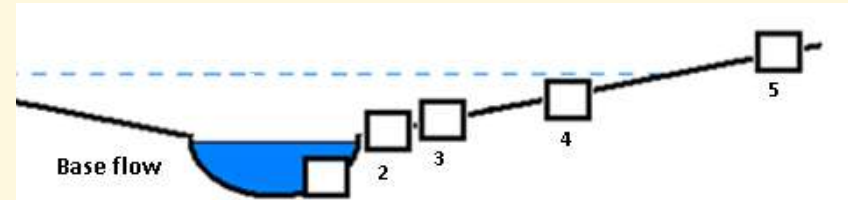
Results



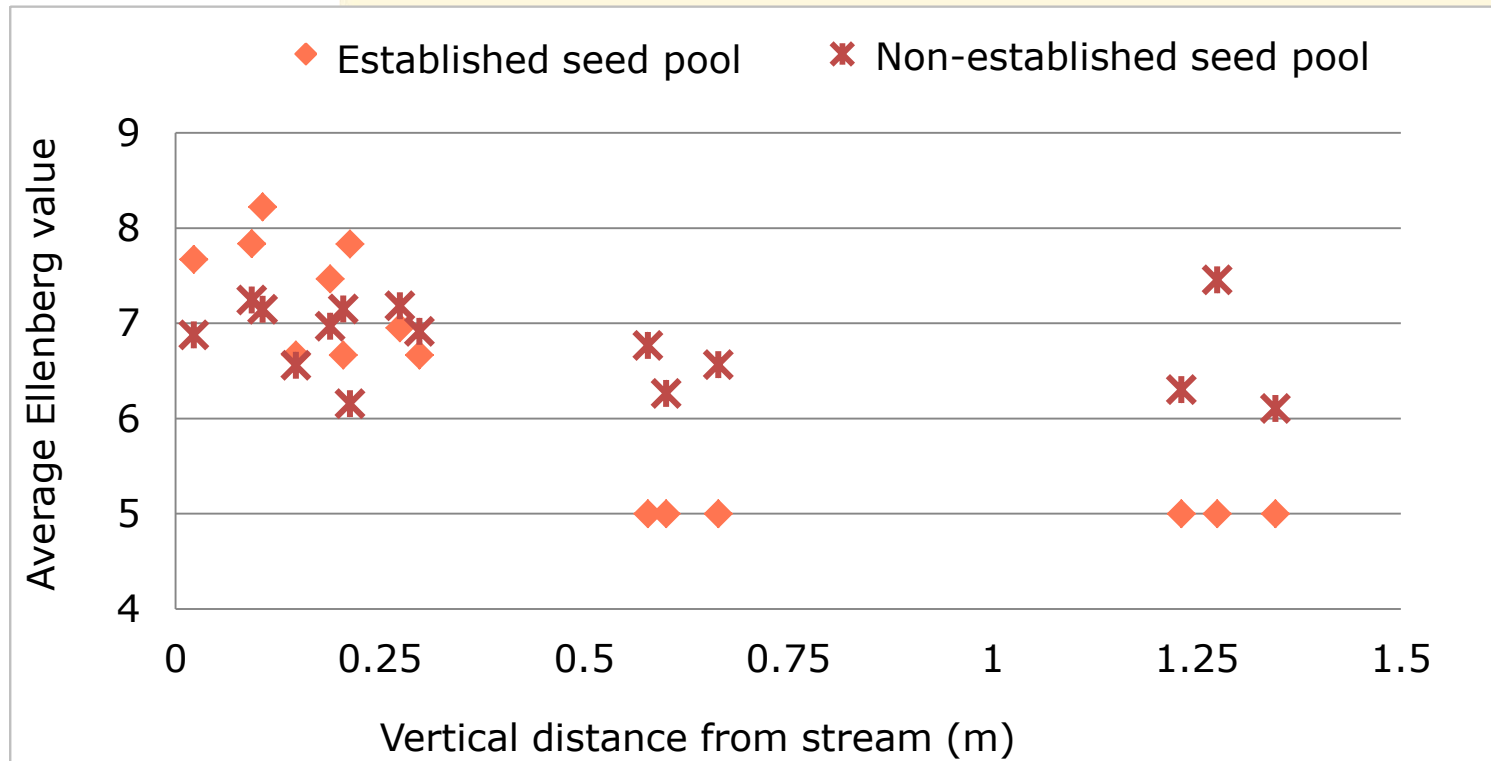
Highest water line



Results

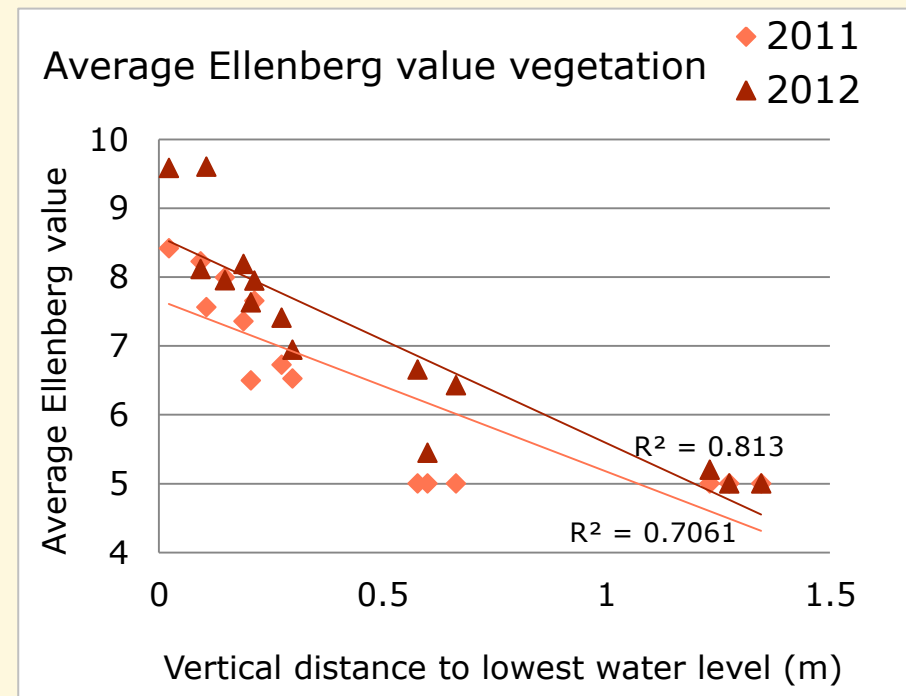
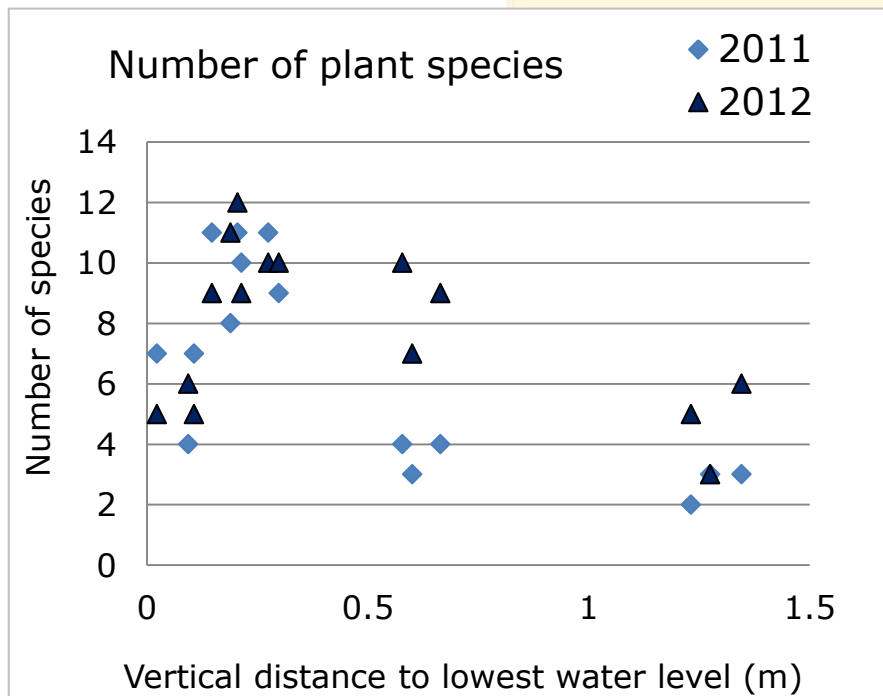


Ellenberg value for moisture of established seed pool



Results

Vegetation two years after restoration



Germination experiment

Methods

- Field research at two locations



Hagmolenbeek (HM)



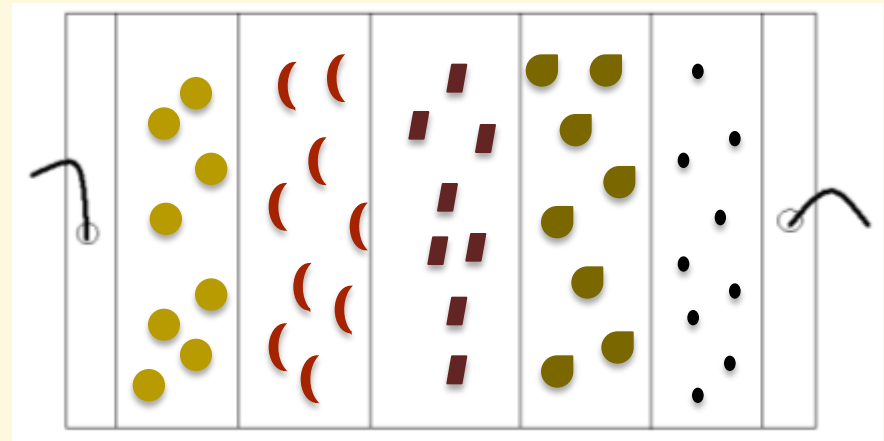
Hooge Raam (HR)



Germination experiment

Methods

- Field research at two locations
- Seeds of nine wetland species in litter bags



Germination experiment

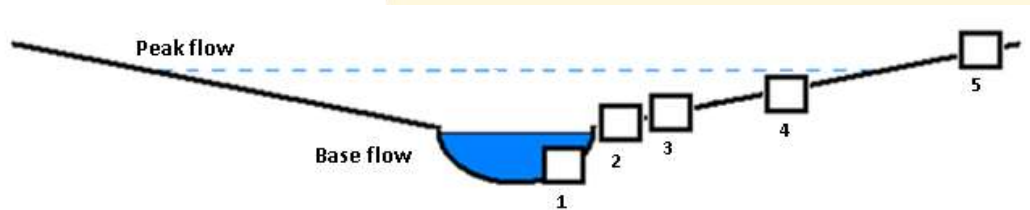
Used species

Family	Genus	Species	Ellenberg Moisture
Ranunculaceae	<i>Ranunculus</i>	<i>Ranunculus lingua</i>	10
Apiaceae	<i>Berula</i>	<i>Berula erecta</i>	10
Poaceae	<i>Glyceria</i>	<i>Glyceria maxima</i>	10
Boraginaceae	<i>Myosotis</i>	<i>Myosotis scorpioides</i>	9
Ranunculaceae	<i>Ranunculus</i>	<i>Ranunculus flammula</i>	9
Poaceae	<i>Phalaris</i>	<i>Phalaris arundinacea</i>	8
Lamiaceae	<i>Lycopus</i>	<i>Lycopus europaeus</i>	8
Ranunculaceae	<i>Ranunculus</i>	<i>Ranunculus repens</i>	7
Poaceae	<i>Anthoxanthum</i>	<i>Anthoxanthum odoratum</i>	6



Germination experiment

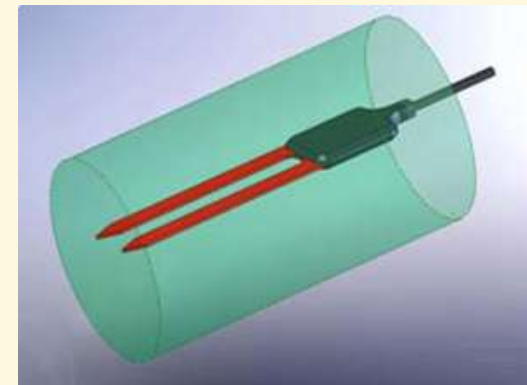
Experimental set-up



Groundwater level

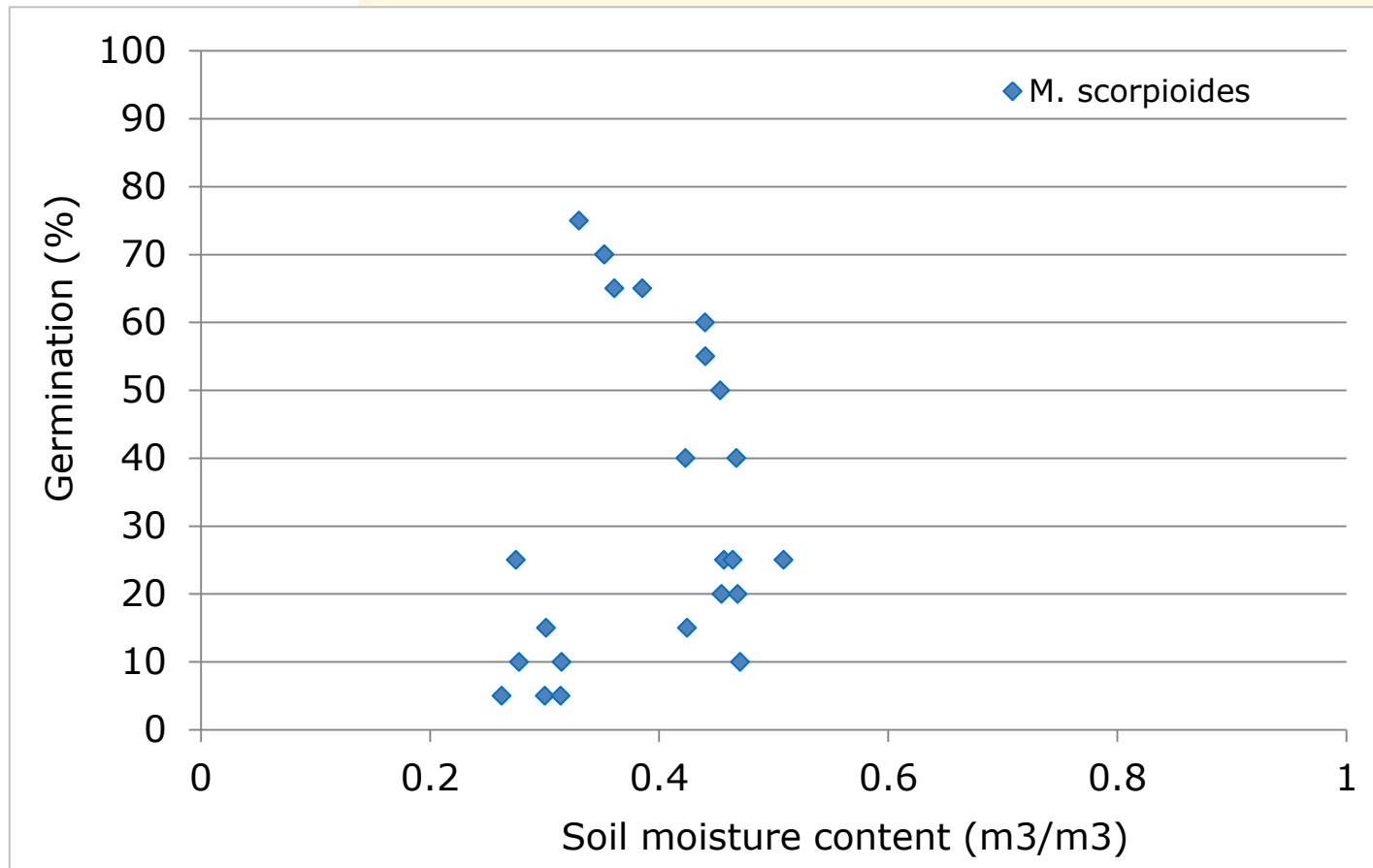


Soil moisture content



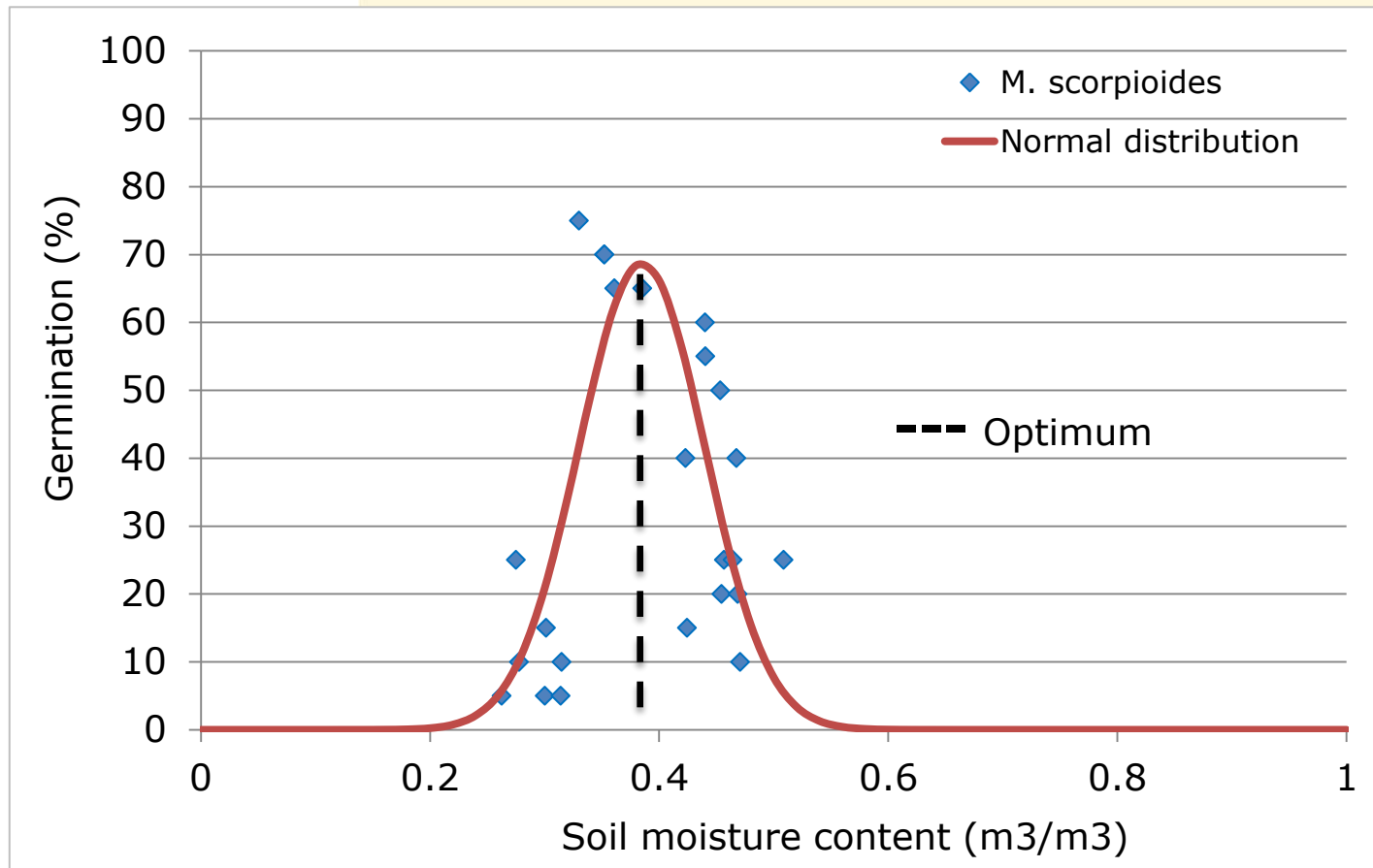
Germination experiment

Results of 1 species: *Myosotis scorpioides* at Hagmolenbeek



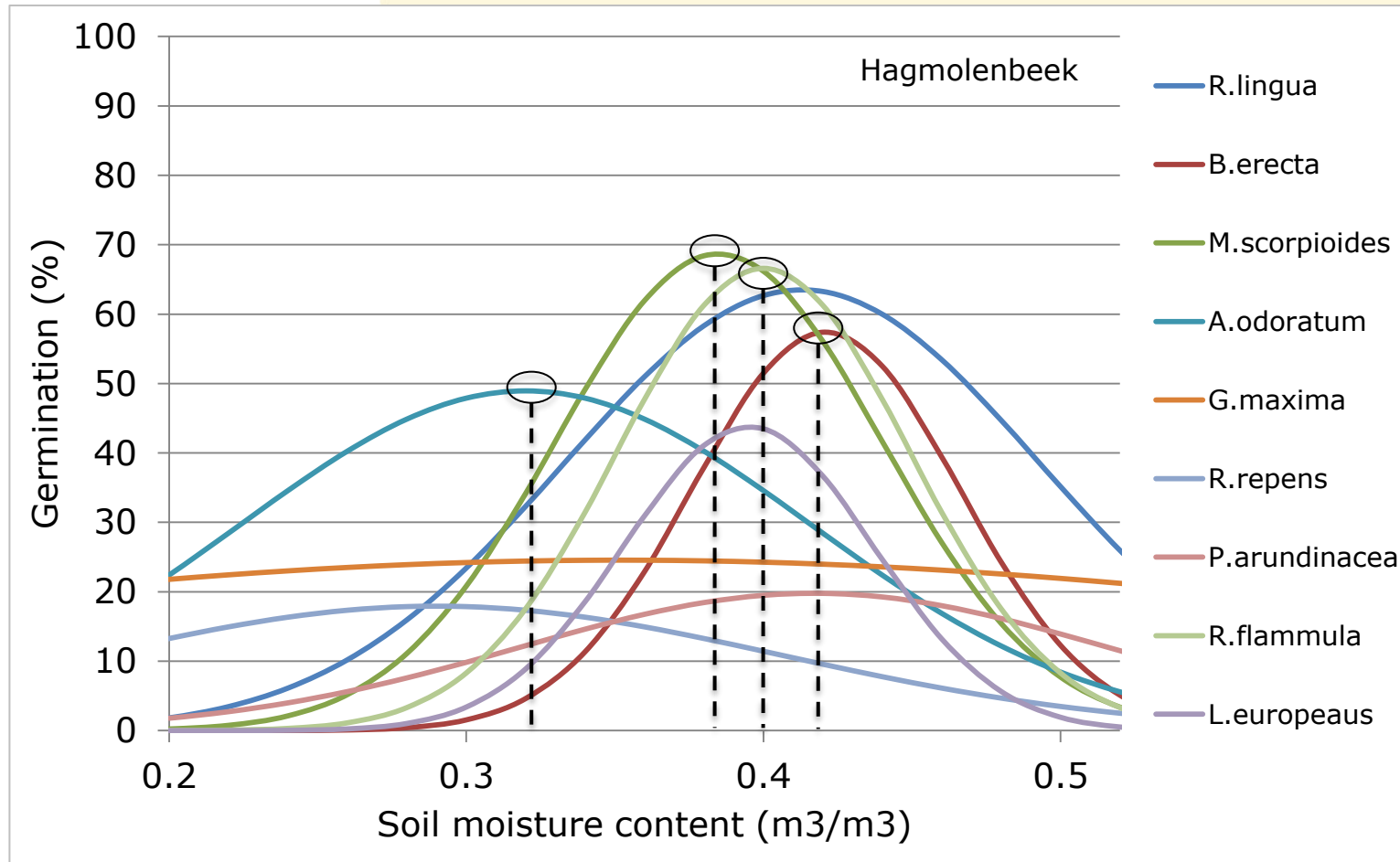
Germination experiment

Results of 1 species: *Myosotis scorpioides* at Hagmolenbeek



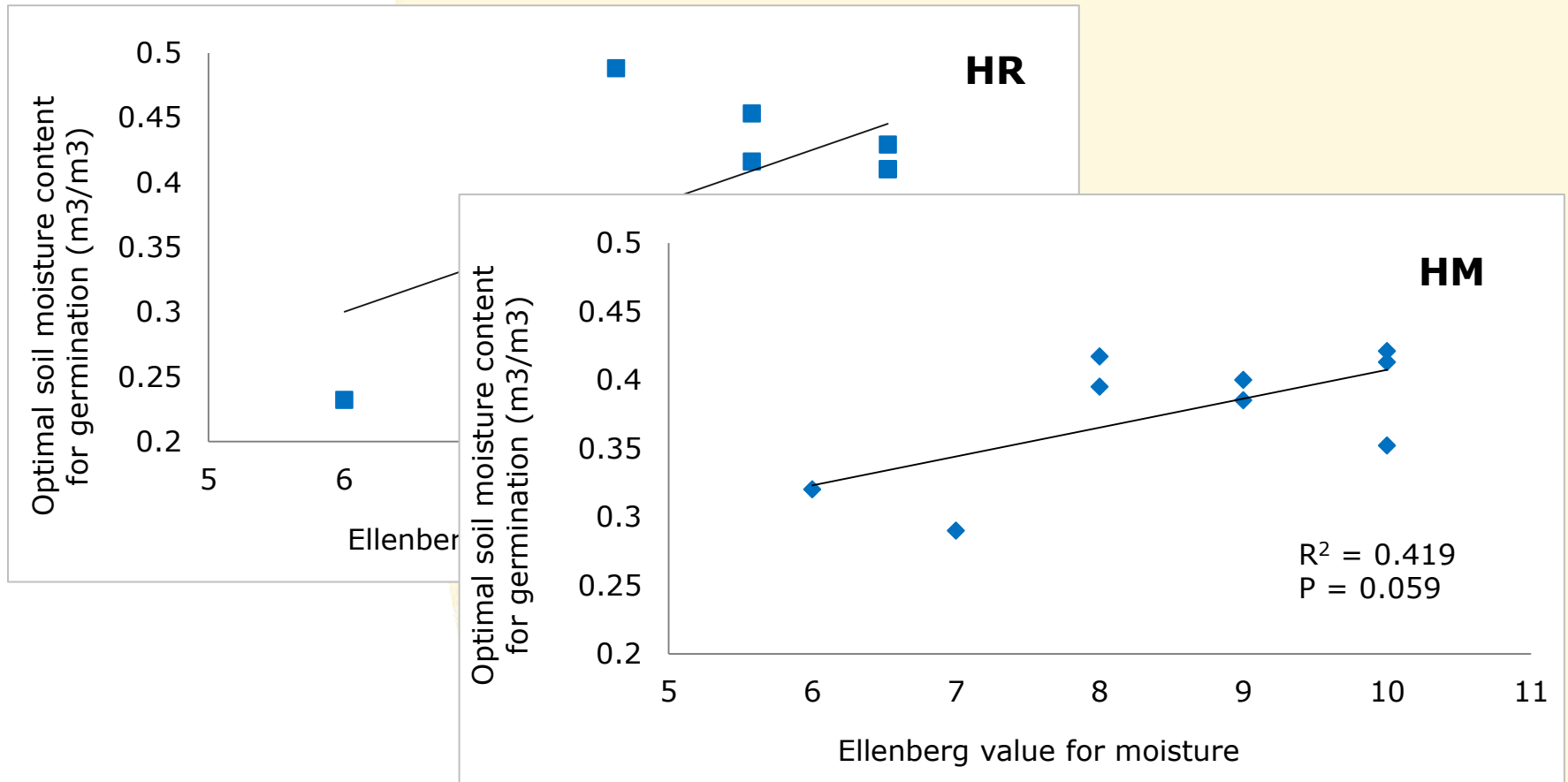
Germination experiment

Results of all species



Germination experiment

Relation germination preference and Ellenberg values for moisture



Results summary

- Large numbers of seeds and species at flooded areas
- Ellenberg for moisture difference between established and non-established seed species
- Changes in vegetation from 2011 to 2012: more species, more gradual distribution of species
- Clear differences among wetland species for germination along a hydrological gradient
- Germination preferences showed a positive relation with the optima as an adult plant



Discussion

- Dispersal of seeds by stream water most important at this stage, later stages dispersal by wind will increase
- Germination may have a broader range than the subsequent processes (seedling survival, establishment, competition) that co-determine the adult distribution, probably large impact of flooding



- Changes in vegetation influenced by high dynamics of an early successional stage



Conclusions

- Flooding with stream water brings many seeds to riparian zones, this may accelerate colonization after restoration
- Large variation in germination patterns among wetland species: a first step towards a vegetation pattern
- Restoration should involve a wide hydrological gradient to provide optimal conditions for several species and increase biodiversity
- Wetlands are dynamic, even on a short term! Continuous monitoring necessary for good understanding



Acknowledgements

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Thank you! Questions?



Agentschap NL
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Landbouw en Innovatie

stowa

watemozaïek



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