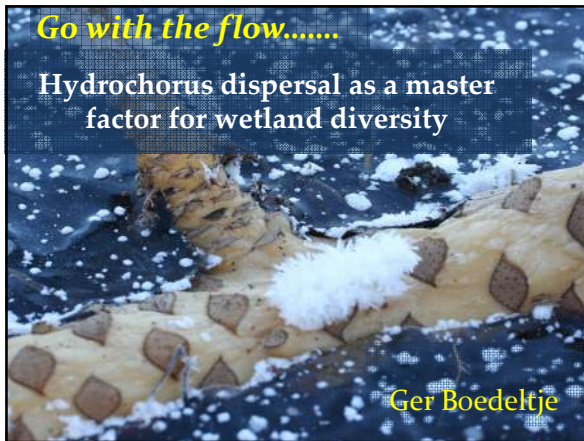


Go with the flow.....

Hydrochory dispersal as a master factor for wetland diversity



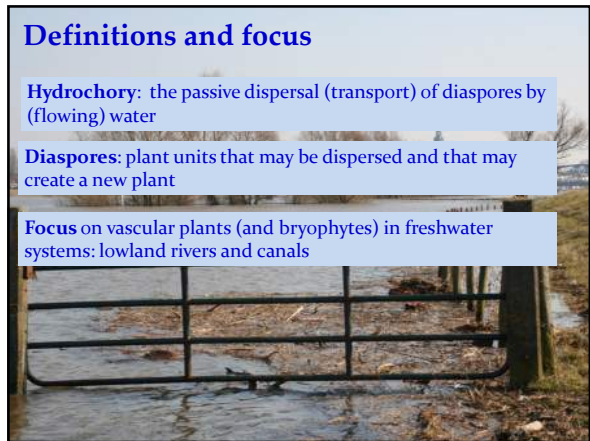
Ger Boedeltje

Definitions and focus

Hydrochory: the passive dispersal (transport) of diaspores by (flowing) water

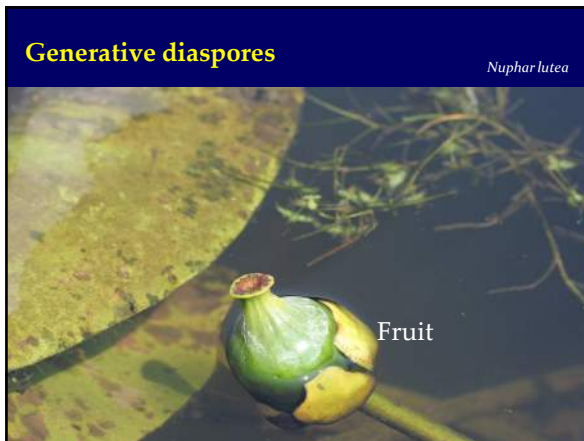
Diaspores: plant units that may be dispersed and that may create a new plant

Focus on vascular plants (and bryophytes) in freshwater systems: lowland rivers and canals



Generative diaspores

Nuphar lutea



Fruit

Generative diaspores



Myosotis scorpioides



Seed

Vegetative diaspores



Whole plant

Glyceria maxima

Vegetative diaspores



Fragments

Callitriche platycarpa

Vegetative diaspores



Fragment

Callitriche platycarpa

Vegetative diaspores



Rhizome

Nuphar lutea

Vegetative diaspores



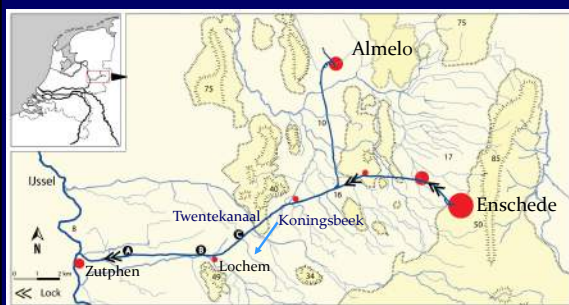
Fragments

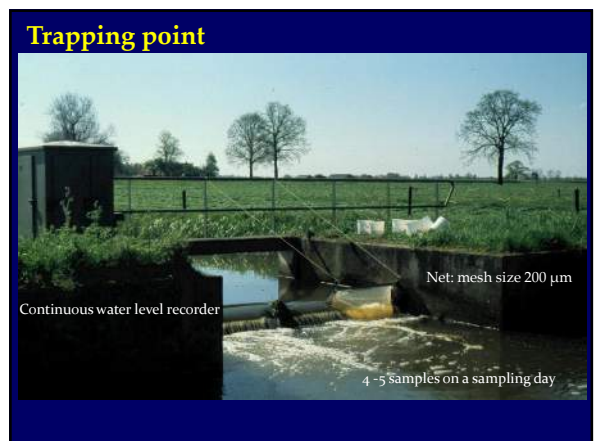
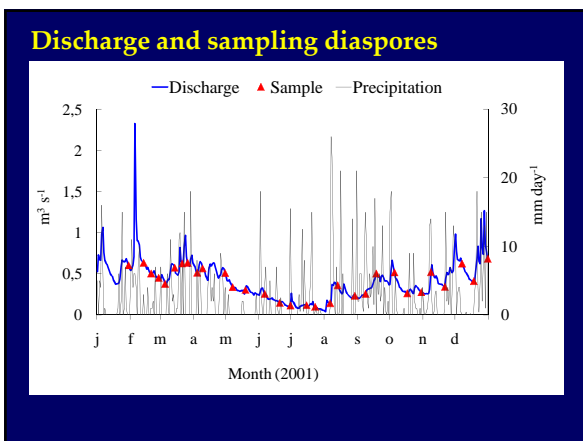
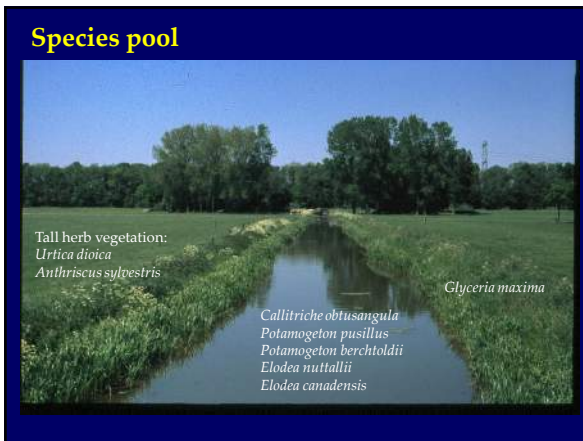
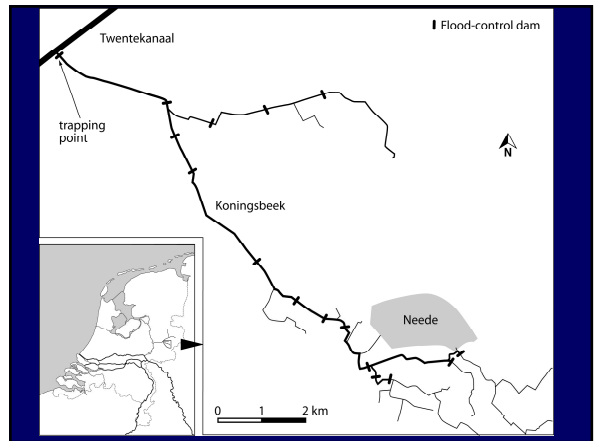
Eurlhynchium speciosum

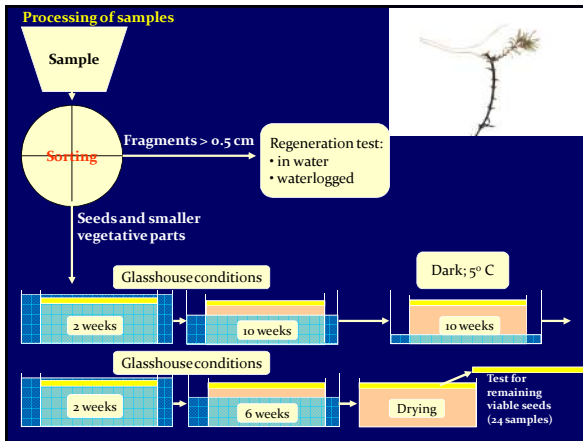
Aim of this presentation

- to show the **diversity and abundance** of diaspores dispersed in a lowland stream and a navigation canal
- to highlight **key factors** for hydrochorous dispersal
- to show **temporal patterns** in hydrochorous plant dispersal
- to discuss the **significance of the results** for wetland restoration

Study area



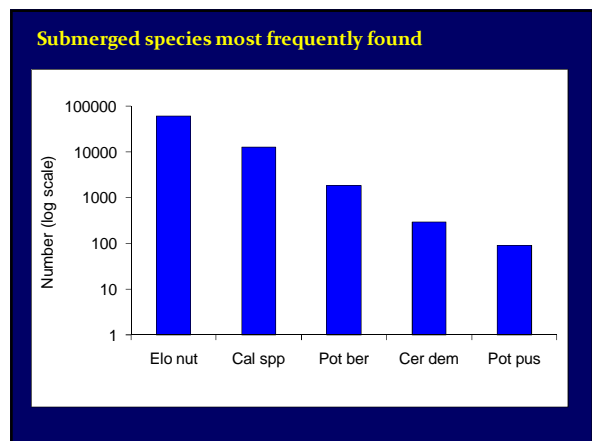
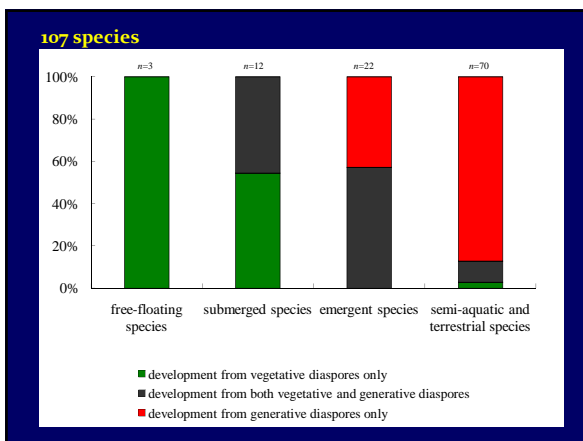
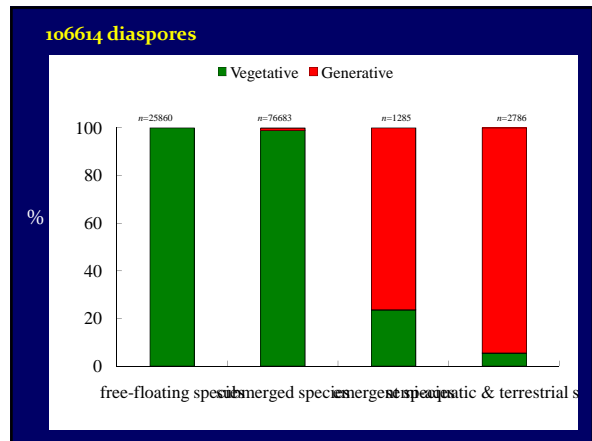




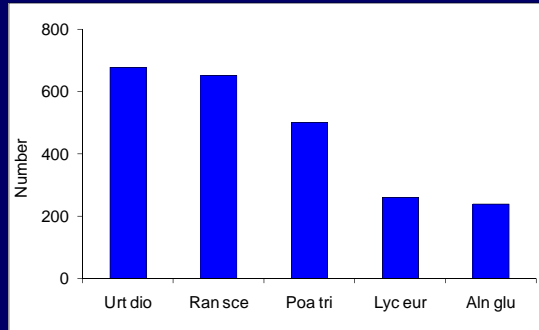
Results

From 126 samples:

- 106614 individuals of vascular plants developed
- 95.8% from vegetative diaspores, 4.2% from seeds
- 107 species
- 79% of the species found in the stream was trapped
- 40% of the species found on the banks was trapped



Bank species most frequently found



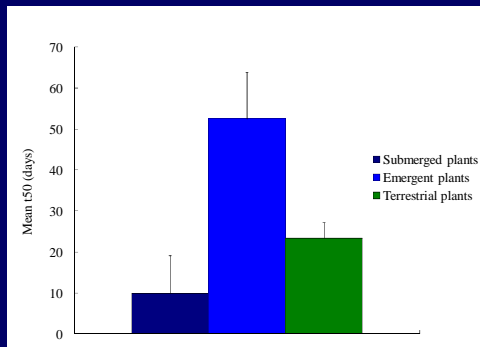
Key factors for hydrochorous dispersal

(Stepwise multiple regression analysis)

	frequency and abundance in vegetation	buoyancy of seeds	seed production	distance
• submerged plants	_____	_____	_____	_____
• emergent plants	_____	_____	_____	_____
• terrestrial plants	_____	_____	_____	_____

Differences in mean buoyancy

T₅₀: time after which 50% of the seeds had sunk



Intermezzo



Intermezzo

Buoyancy (t₅₀): 38 days

Buoyancy (t₅₀): >112 days

Lythrum salicaria

Lycopus europaeus

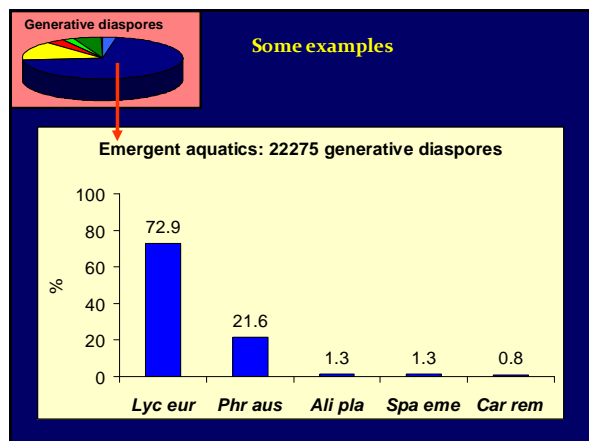
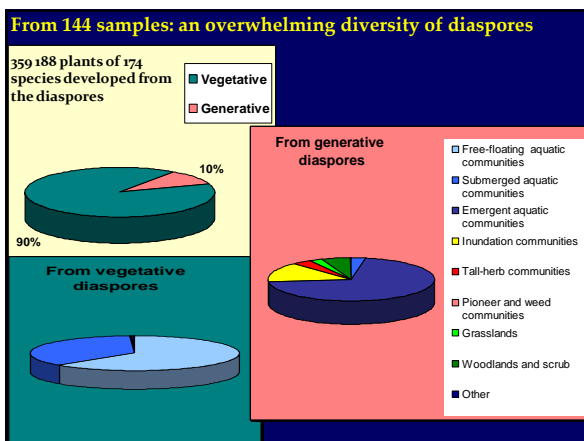
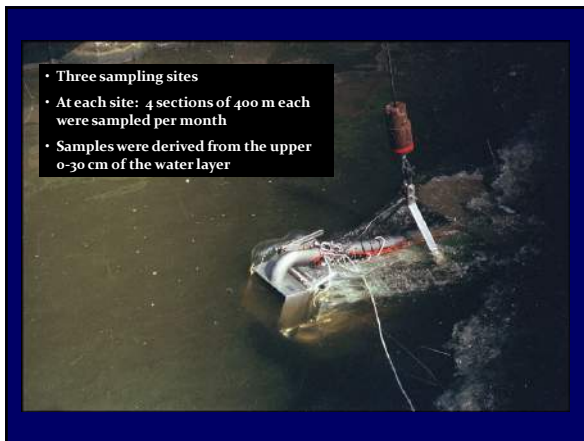
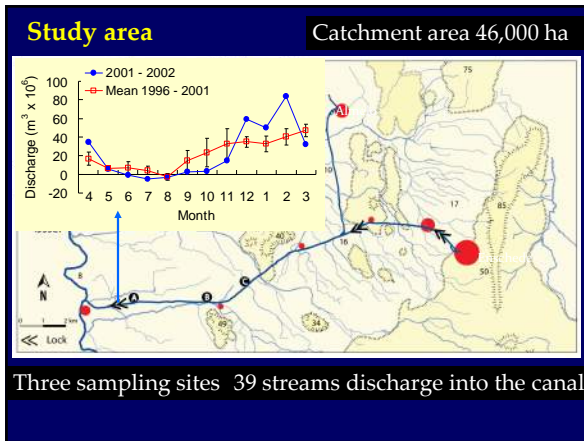


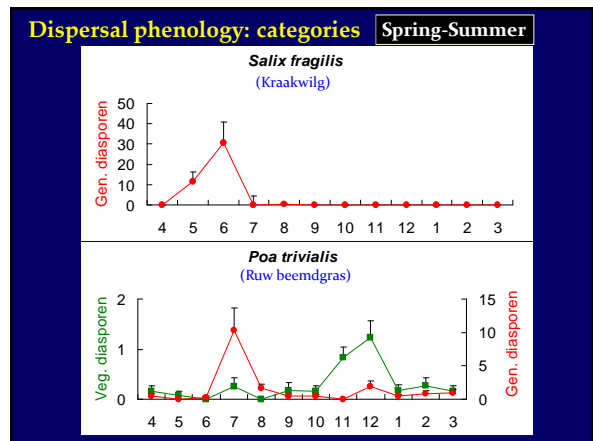
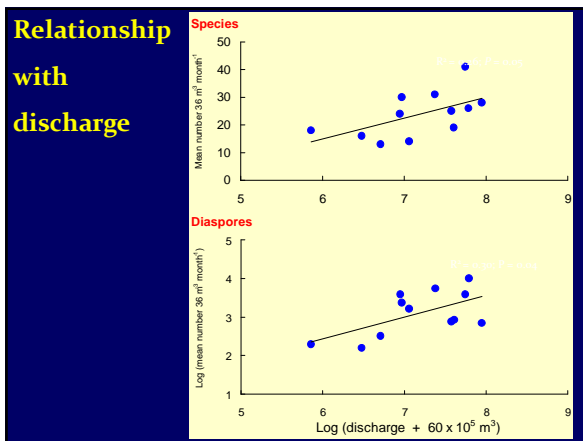
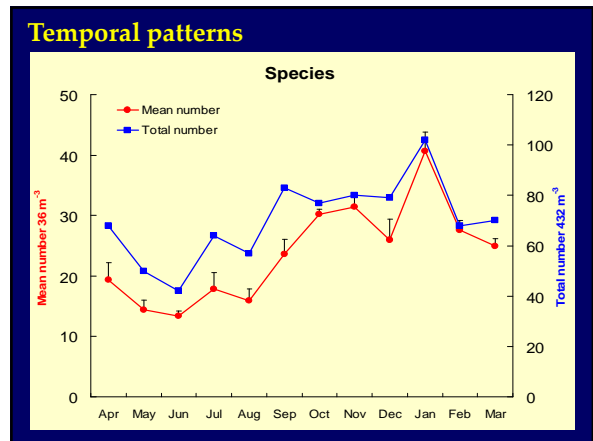
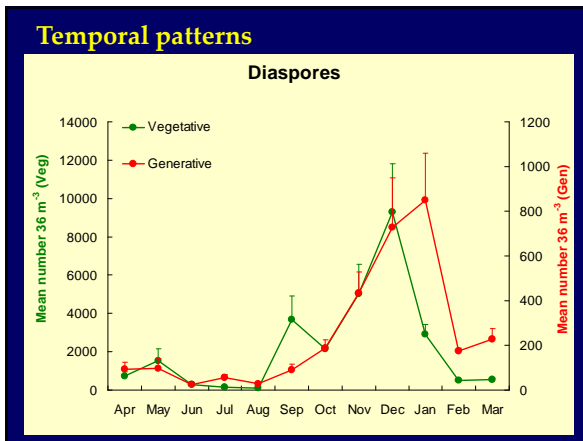
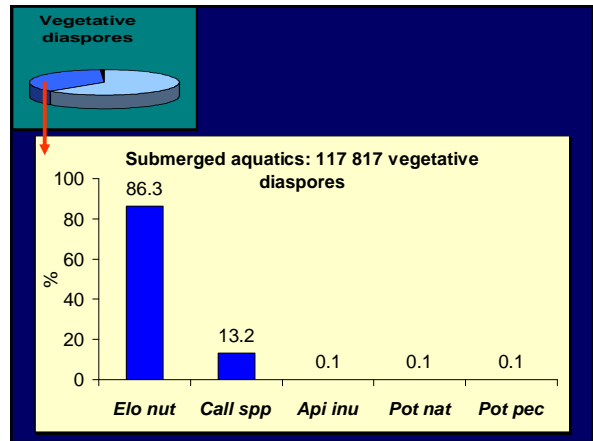
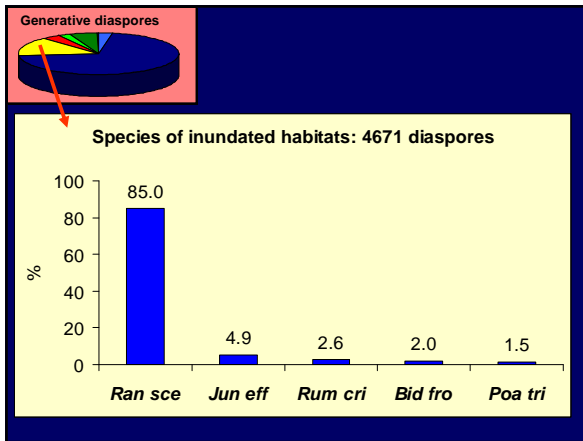
II Temporal patterns

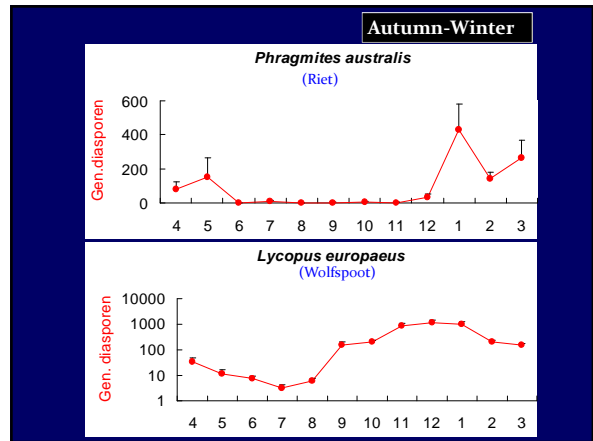
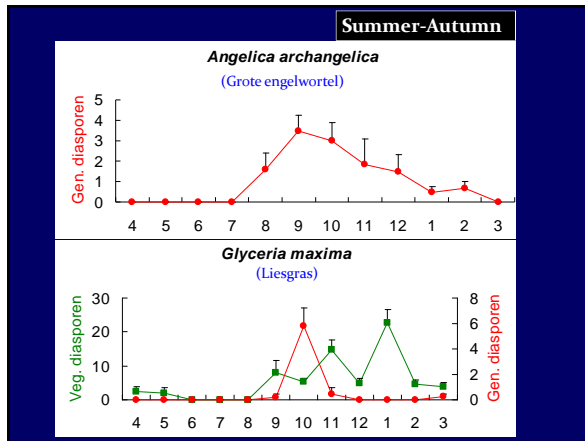
Research questions

When, over a 1-year period, are which plant diaspores dispersed by water?

Which life-history traits determine the length of a species' dispersal period?







Key factors for the length of the dispersal period

- Buoyancy of diaspores
- Length of seed release period

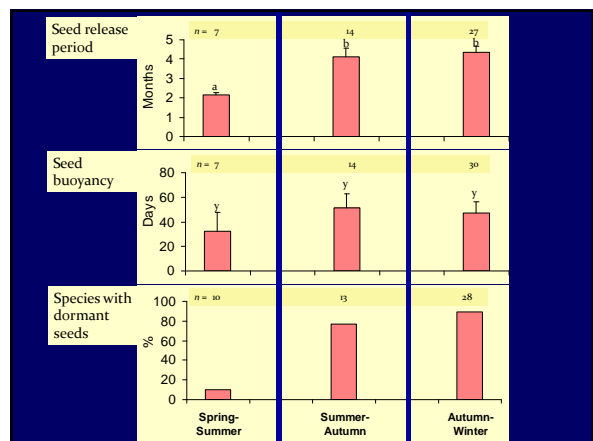
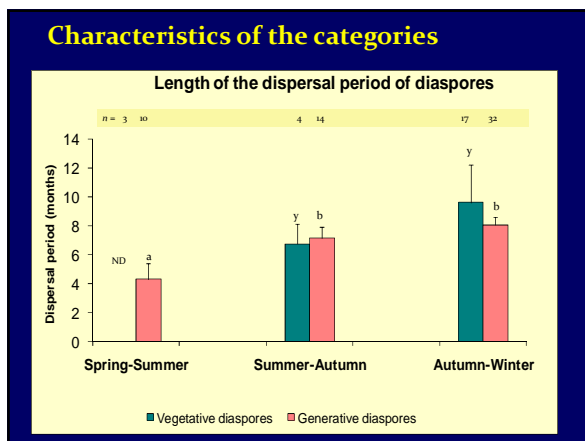
Intermezzo

Seed release period: 3 months

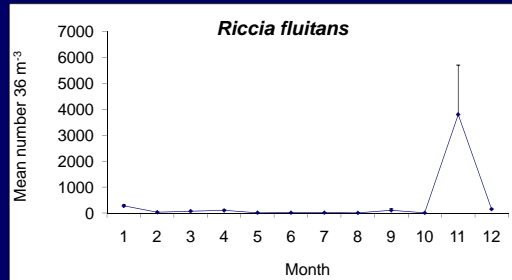
Sparganium emersum

Seed release period: 7 months

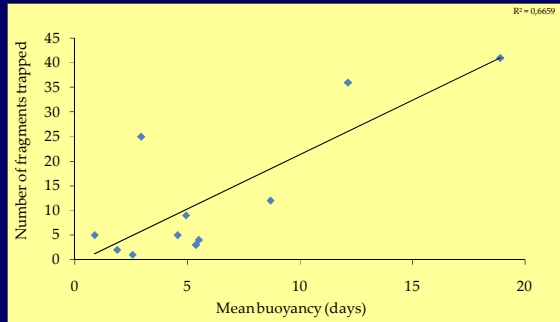
Phragmites australis



Temporal patterns in bryophytes as well



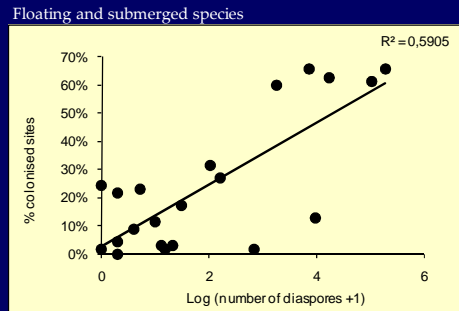
Buoyancy of fragments is important for bryophytes as well



III Colonization of newly created shallow banks

	Number of diaspores		Banks colonized	%
	Vegetative	Generative		
Sterrenkroos (spec.) Callitriche	15460	791		62.9
Smalle waterpest (Elo nut)	101632	0		61.4
Grof hoornblad (Cer dem)	1779	0		60
Gewoon kraansblad (Chara sp.)	0	*		41.4
Schedelfonteinkruid (Pot pec)	101	0		31.4
Drijvend fonteinkruid (Pot nat)	157	0		27.1
Gekruisd fonteinkruid (Pot rzi)	0	0		24.3
Glaand fonteinkruid (Pot her)	4	0		22.9
Aarvederkruid (Myr spi)	28	0		17.1
Tonger fonteinkruid (Pot pas)	9	0		11.4
Haarfonteinkruid (Pot)	3	0		8.6
Gele plomp (Nap hat)	1	0		4.3
Watergentiaan (Nym pel)	1	12		2.9
Slijve wateranonke (Ran cir)	20	0		2.9
Fijne wateranonke (Ran aqu)	7	7		1.4
Doorgroeid fonteinkruid (Pot per)	0	0		1.4
Klein fonteinkruid (Pot ber)	60	0		0
Ondergedoken moerasscherm (Api in)	174	0		0
Waterviolier (Hot pal)	48	0		0
Zittende zannichella (Zan pal)	0	35		0

Relation between the number of banks colonized and number of diaspores trapped



Conclusions:

1) Flowing water is a key vector for the transport of diaspores of plant species in rivers and canals



Conclusions:

2) Many aquatic species enhance their dispersal capacity by using both vegetative and generative diaspores

3) This capacity may be further enhanced by dispersing each type of diaspores in different periods of a year



4) Dispersal of hydrochorous plants is determined by their frequency and abundance in the vegetation, their diaspore production and the buoyancy and release period of their seeds



5) Flow pulses at appropriate times of year are crucial for plant dispersal in river systems. The **flood pulse concept** is therefore a useful tool in the **restoration of riverine wetlands**



Therefore: go with the flow.....



The role of dispersal, propagule banks and abiotic conditions in the establishment of aquatic vegetation (2005)

Radboud Universiteit Nijmegen



Ger Boedeltje

RuG Rijksuniversiteit Groningen
Community and Conservation Ecology Group

Journal of Ecology 91 (2003): 855-866

Journal of Ecology 92 (2004): 786-796

Global Ecology and Biogeography 15 (2008): 50-58

www.bureaudaslook.nl

Epiloog



Intermezzo**De invloed van de waterstand op de kieming**

100 cm diep: welke soorten kunnen kiemen?

1 cm diep: welke soorten kunnen kiemen?

Matig vochtige grond

Waterplanten**Moerasplanten****Oeverplanten**

Drijvend fonteinkruid	Gele lis	Haagwinde
Tenger fonteinkruid	Riet	Witbol
Gele plomp	Rode waterereprijs	Krulzuring
Aarvederkruid	Grote lisdodde	Ridderzuring