Determinants of sustainable production in permanent wet grasslands dominated by *Phalaris arundinacea*

Case study of the Třeboň Basin Biosphere Reserve, Czech Republic

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Outline

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2. Seasonal course of aboveground biomass
3. Comparison of production with other biotopes
4. Variation in production of natural communities
5. Management: effect of cutting frequency & fertilization
6. Conclusions

Introduction

Site: „Wet Meadows“ near Třeboň

49°05’N , 14°46’E

Altitude: 428 m

Mean ann. temp. 7.4 °C

Ann. precipitation 620 mm

Willow carr (*Salix* spp.)

Unmown sedge-grass marsh (*Carex* spp.)

Mown wet meadow: (*Phalaris* arundinacea)

Environment

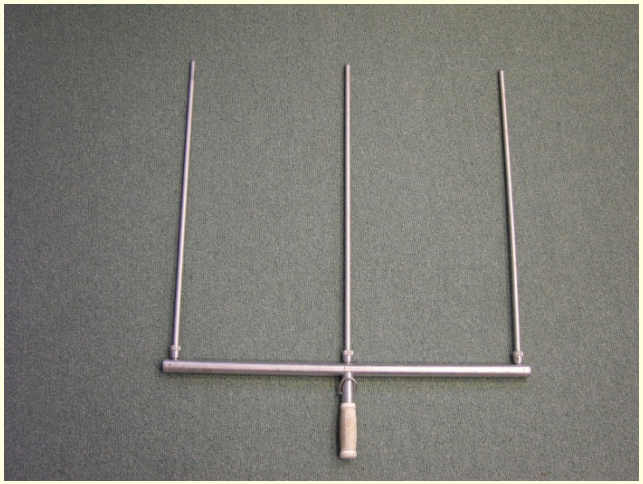
- Marginal wetland
- Organic soil

Characteristic of *Phalaris arundinacea*

- Perennial stoloniferous grass
- Robust growth, maximum height over 2 m

Methods

- Harvest method
- In most studies plots 0.5 x 0.5 m^2
- In fertilization study plots 1 m^2
- 3 to 5 replicates per sampling date depending on design
- Material sorted into live and dead parts, separately for *P. arundinacea* and other plant species

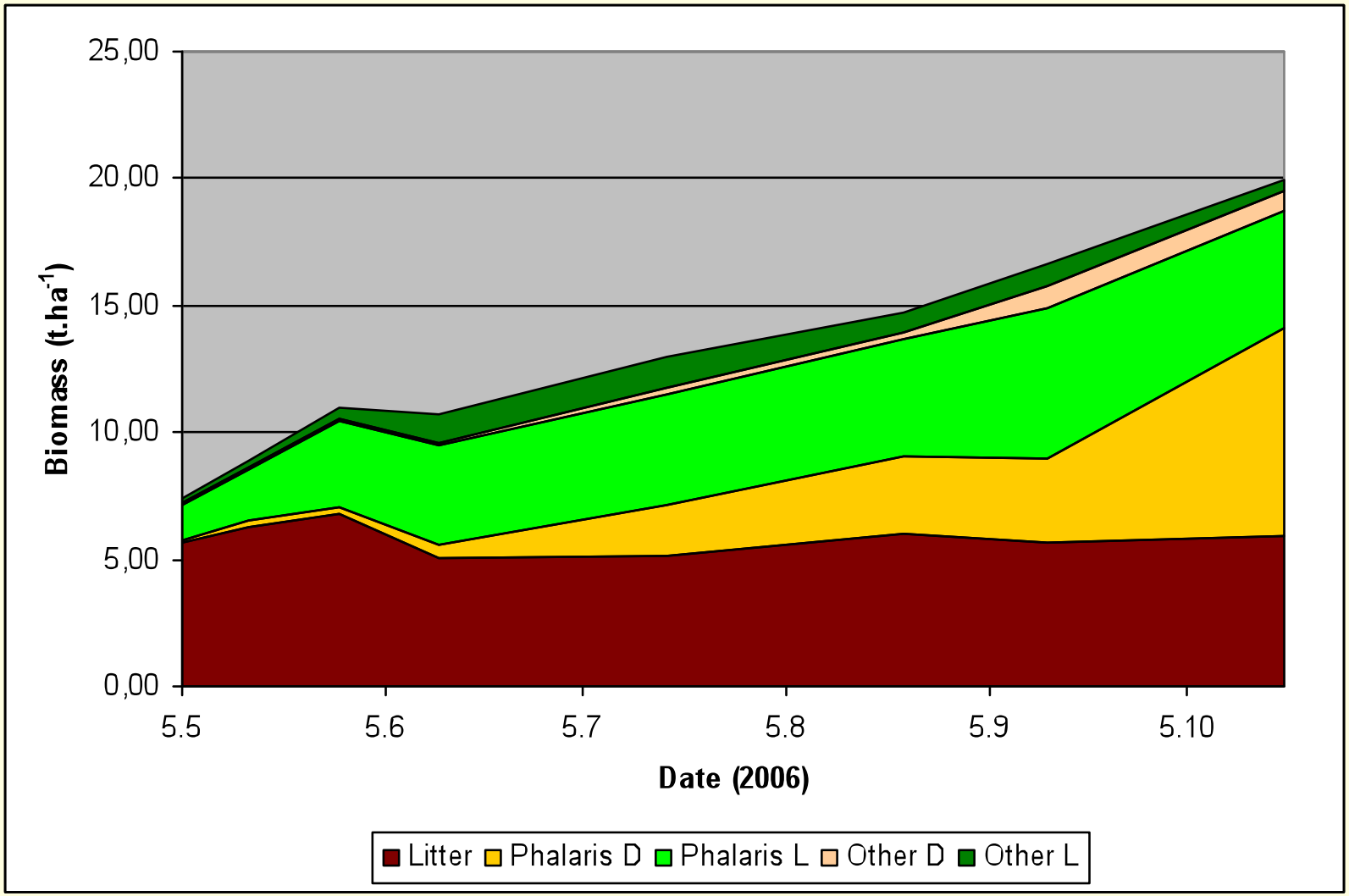


2. Seasonal course

Phenology

2. Seasonal course

Aboveground biomass

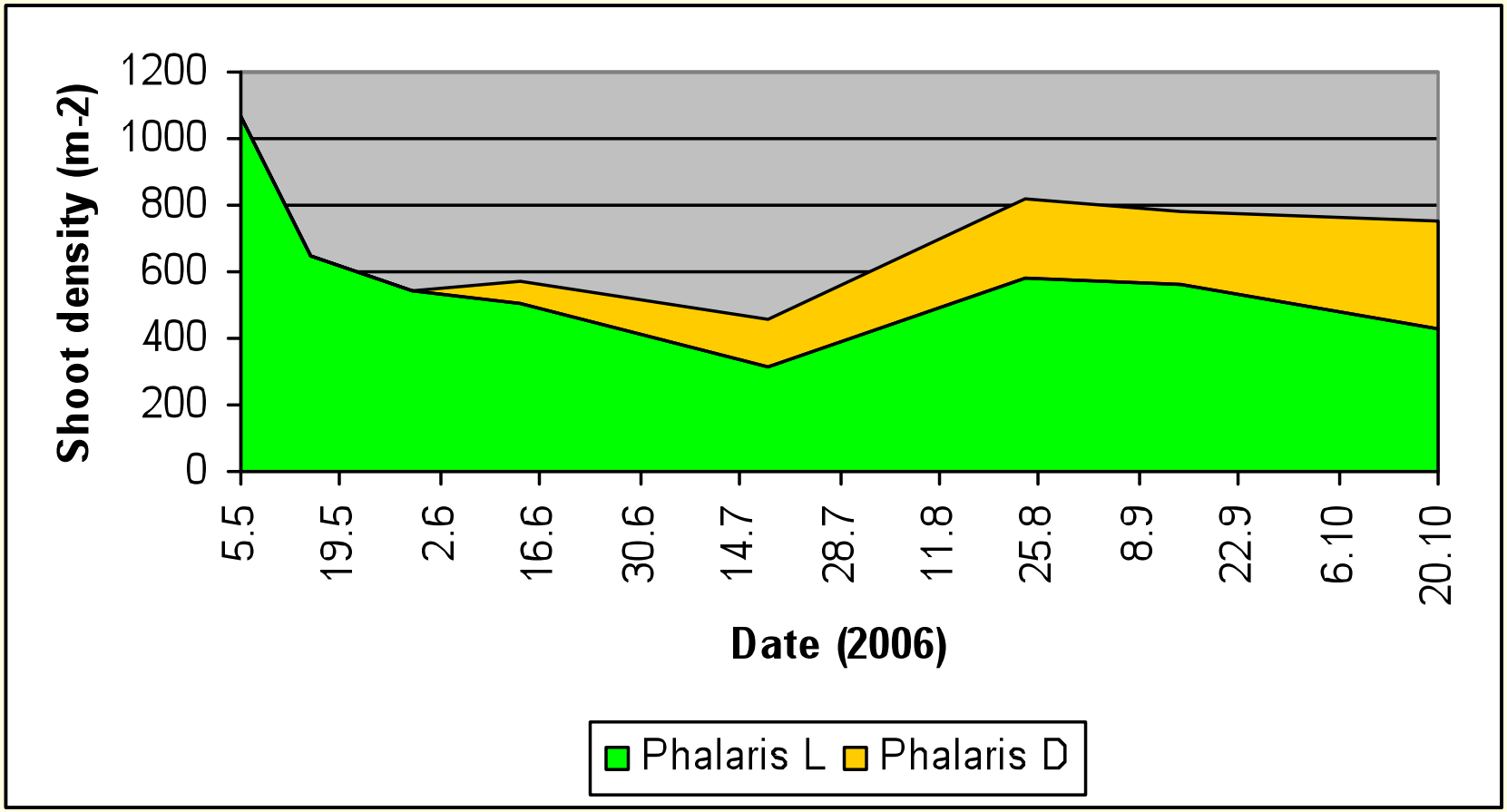


Stand dominated by *P. arundinacea*, Wet meadows near Třeboň, Czech Republic

2. Seasonal course

Shoot density

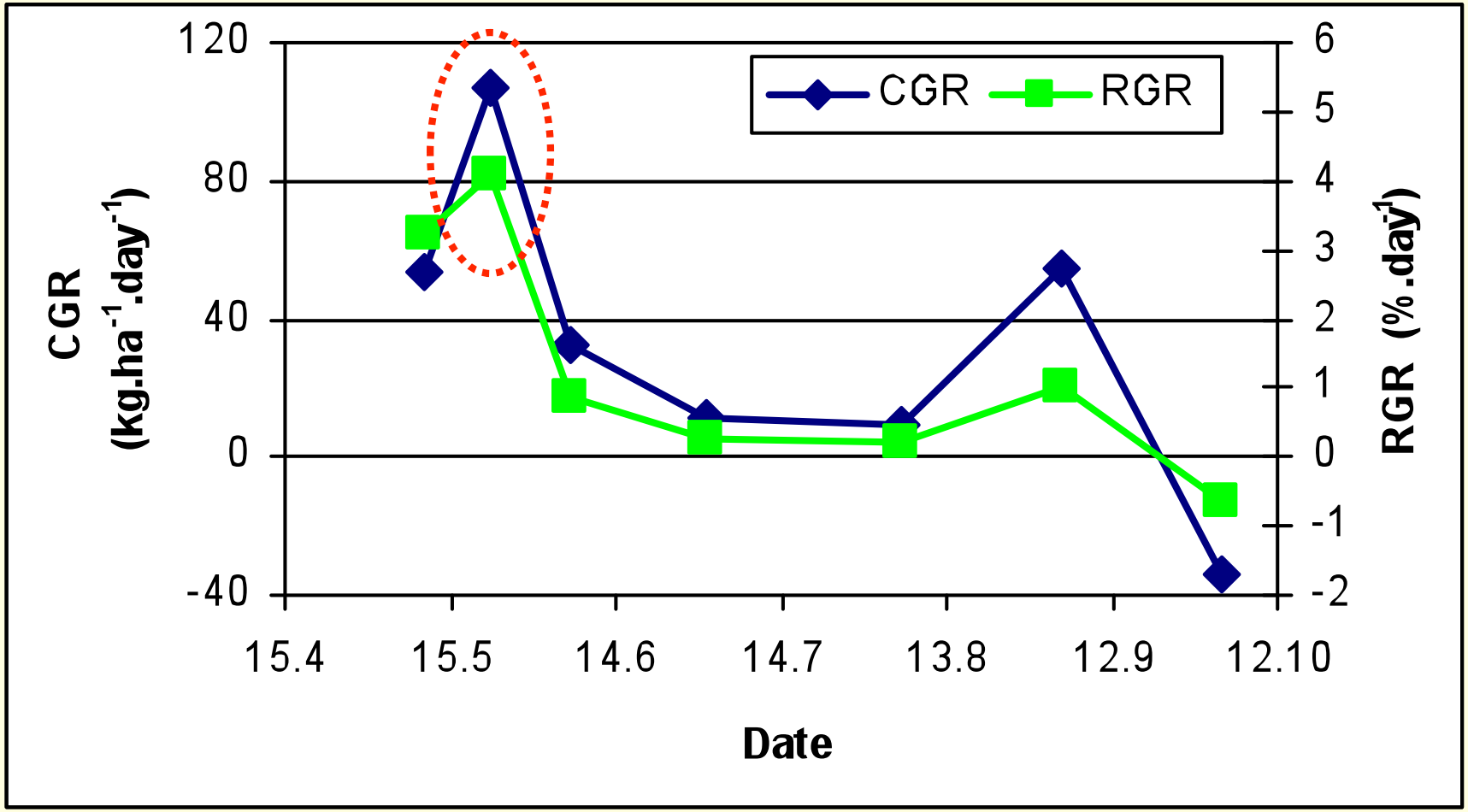
Maximum biomass achieved at a density of 557 shoots per m^2



Stand dominated by *P. arundinacea*, Wet Meadows near Třeboň

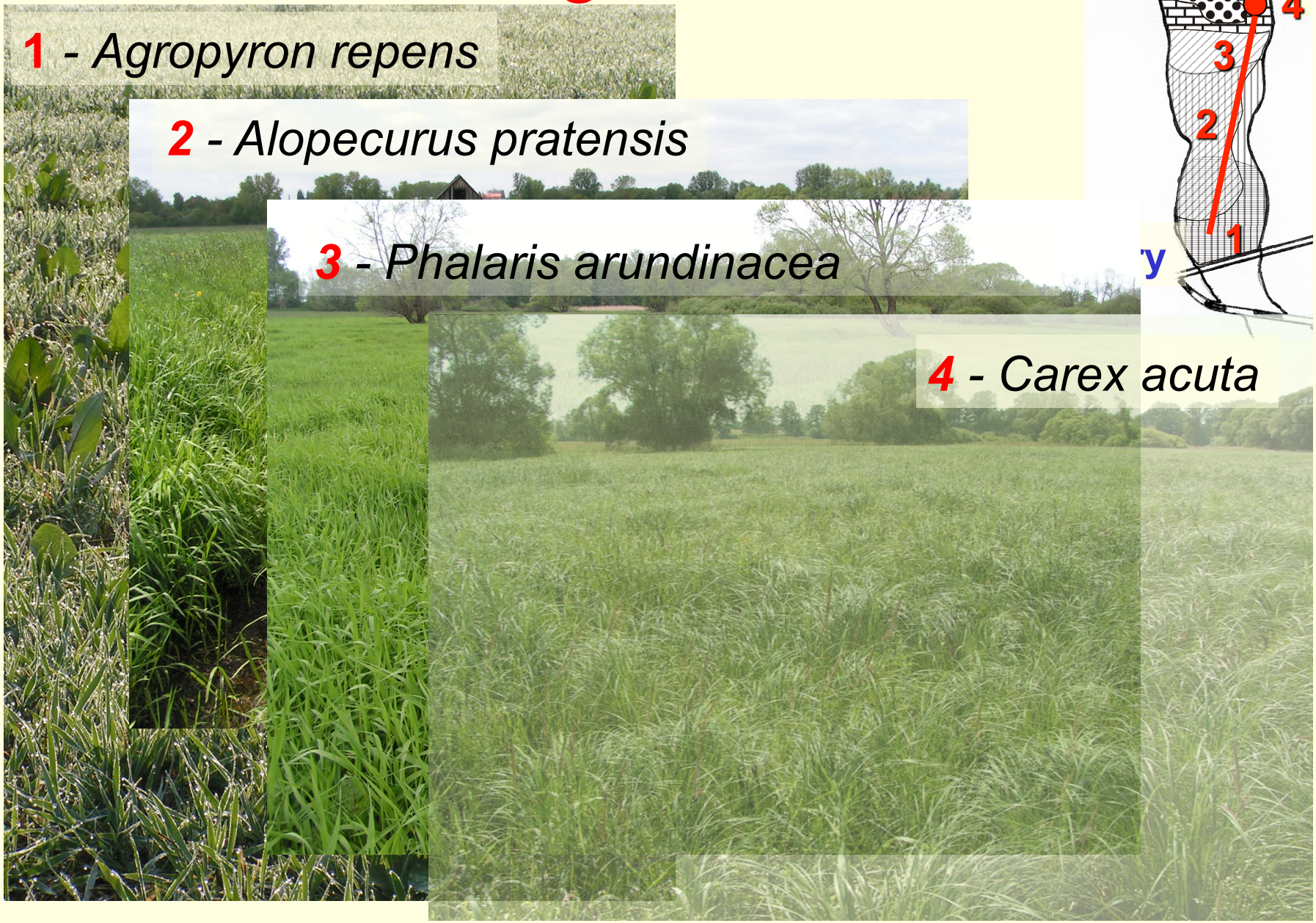
2. Seasonal course

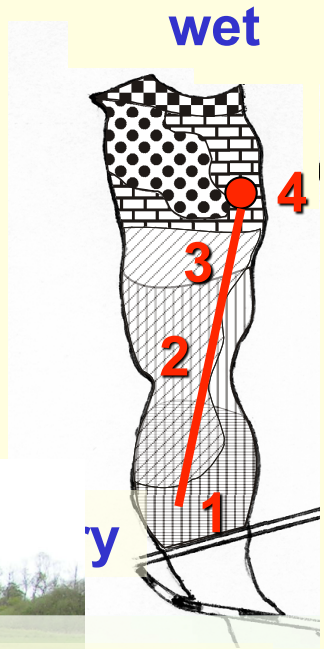
Growth rates: live *P. arundinacea*



3. Comparison between biotopes

Moisture gradient





Aboveground production

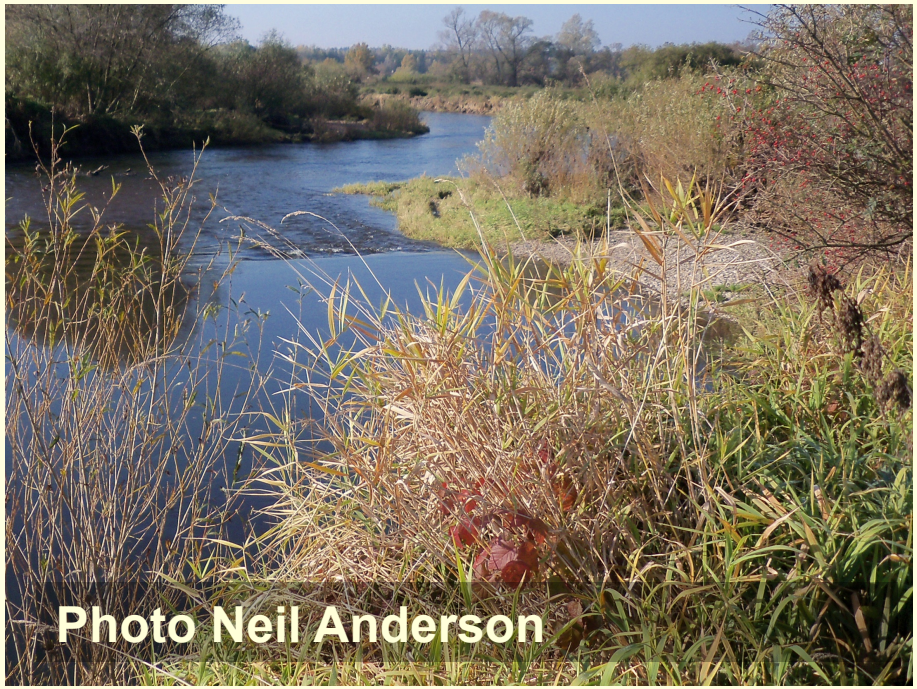
Annual aboveground biomass production (t. ha^{-1}) of four stands along a moisture gradient (Wet Meadows near Třeboň)

Biotope dominant	1st cut	2nd cut	Total
Agropyron repens	6.30	6.65	12.95
Alopecurus pratensis	6.56	5.64	12.20
Phalaris arundinacea	9.43	5.16	14.59
Carex acuta	n.d.	n.d.	278

Biotopes of *P. arundinacea*

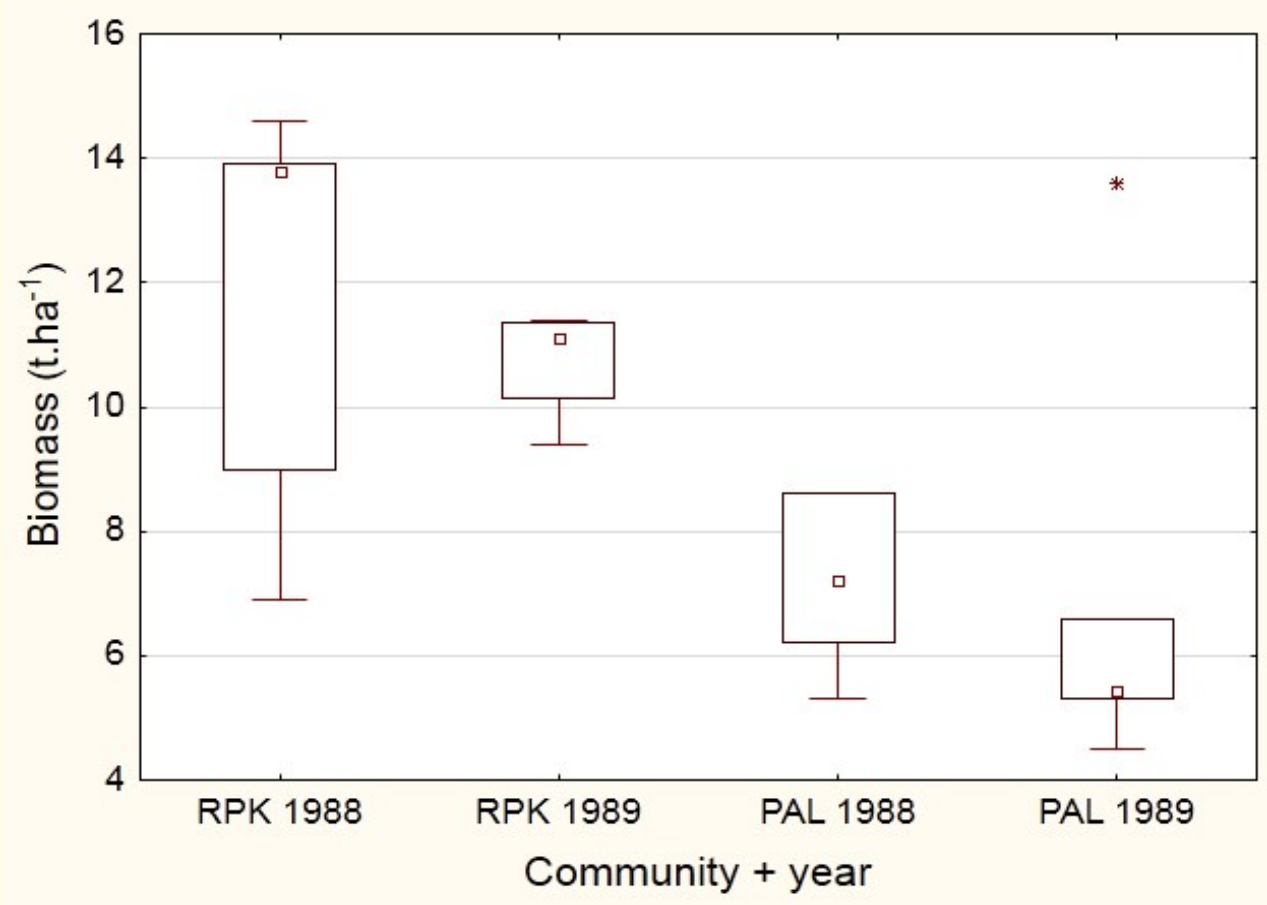
Common dominant of eutrophic wetland biotopes:

- well flushed sites along waterourses:
  - ass. *Rorippo-Phalaridetum arundinaceae* Kopecký 1961
- rarely flushed sites on organic soils
  - ass. *Phalaridetum arundinaceae* Libbert 1931



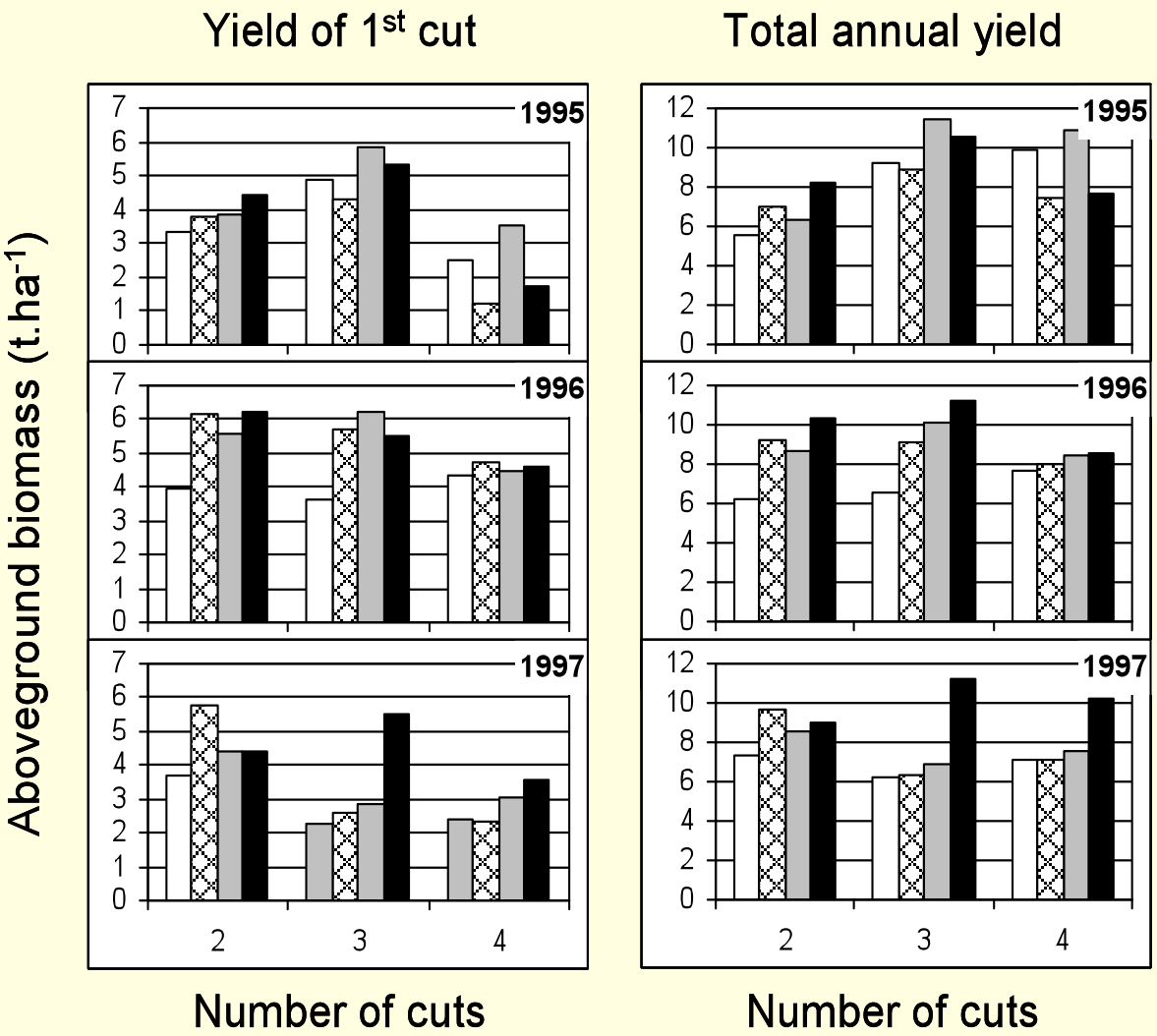
4. Natural communities

Variation in aboveground production



RPK - *Rorippo-Phalaridetum arundinaceae* Kopecký 1961, found on well flushed sites along river banks,
PAL - *Phalaridetum arundinaceae* Libert 1931, found on rarely flushed sites on organic soils.

Cutting frequency & fertilization



Trt	N	P	K
	kg.ha^{-1}.yr^{-1}		
Control	0	0	0
PK	0	6	25
NPK	17	6	25
2NPK	33	6	25

Plant species diversity

No. cuts	Fert.	No of species	Simpson index	P.a. %	Gr. %	C&J %	Dic. %
1[c)]	0	8	2.04	66	2	21	11
2	**0**	**14**	**4.37**	**28**	**9**	**36**	**24**
2	PK	7	1.06	97	0	0	3
2	NPK	13	2.44	60	14	11	15
2	2NPK	5	1.08	96	0	0	4
3	**0**	**12**	**5.18**	**30**	**15**	**37**	**18**
3	PK	12	1.34	86	3	5	6
3	NPK	12	2.36	60	15	20	5
3	2NPK	4	1.34	85	15	0	0
4	**0**	**17**	**3.60**	**19**	**44**	**2**	**35**
4	PK	13	3.52	40	0	0	54
4	NPK	14	4.33	27	23	0	50
4	2NPK	11	1.18	92	0	0	8

Conclusions

1. <u>Seasonal course:</u>

   Aboveground growth of *P.arundinacea* starts early in spring. The live aboveground biomass attains its maximum in June in unidisturbed P.a. stands. Mowing or flooding act as disturbances after which the stands can rapidly regenerate thanks to intense vegetative propagation.

2. <u>Comparison of production among biotopes:</u>

   P. arundinacea dominated meadows can produce equal or omewhat higher amounts of aboveground biomass per year as other alluvial grassland communities situated higher above the average water table.

Conclusions (cont.)

3. Variation in production in natural communities:

Riparian communities of the association *Rorippo-Phalaridetum arundinaceae* Kopecký 1959 tend to be more productive than the land-forming communities of the association *Phalaridetum arundinaceae* Libbert 1931.

4. Mowing & fertilization:

Highest annual amounts of aboveground biomass production was found in P.a. +dominated meadows mown 3x per year and fertilized with the basal NPK dose. Two cuts per year with the basal PK dose preserve satisfactorily the plant species variety.


Thank you for your attention!