Degraded fen systems in Poland:

in search of sustainable management options

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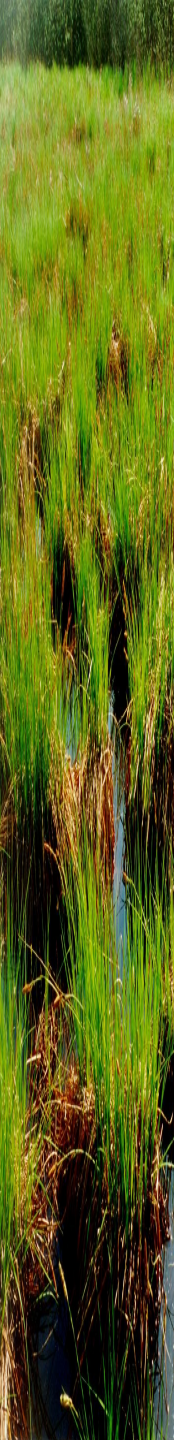
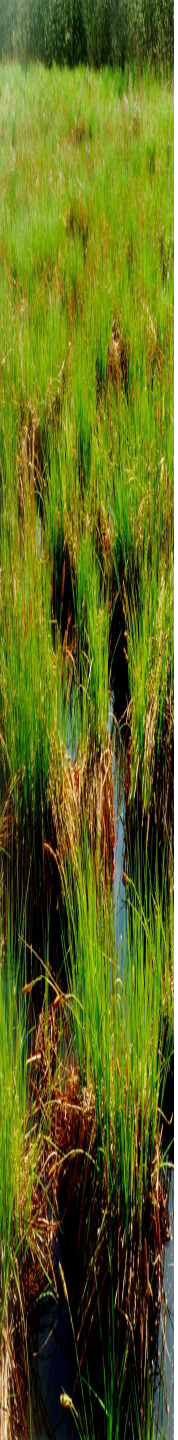


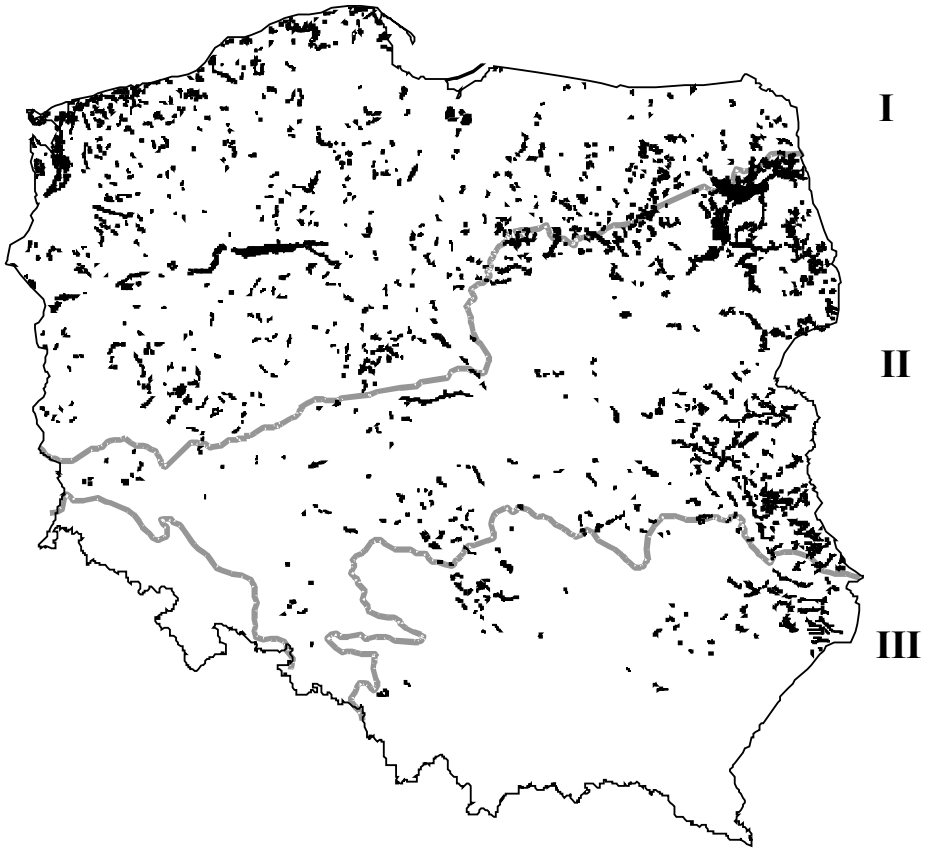
Fens

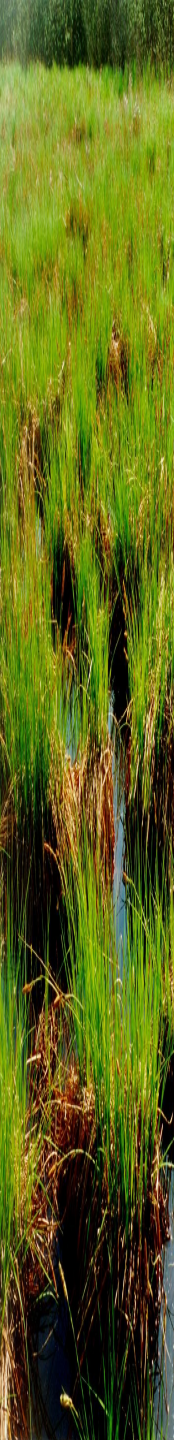
- Fens are groundwater-fed mires (i.e. peat-forming ecosystems)
- Degraded fens are (usually) not **fen ecosystems** any more, though they are located on **fen peat soils**



Original extent of fens

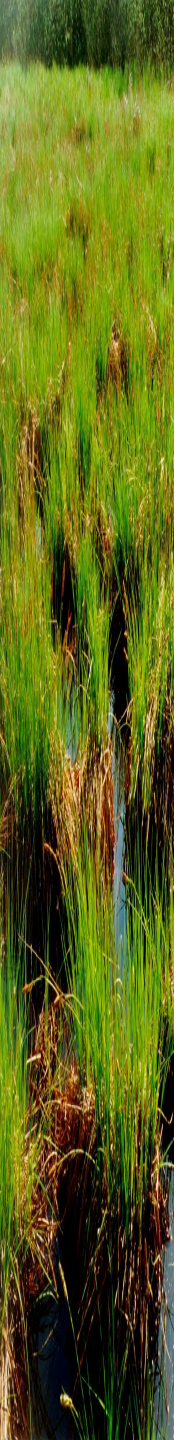
- 11,588 km2 (areas with at least 30-cm deep layers of sedge-, sedge-moss-, reed- or alder-peat)
- 3.8 % of the total area of Poland
- 92.35% of the area of all peatlands
- 26.7% of all sites with hydrogenous soils, i.e. originally wetlands.
- uneven distribution, correlated with the geomorphologic origin of landscape,
- many different hydrological and ecological types





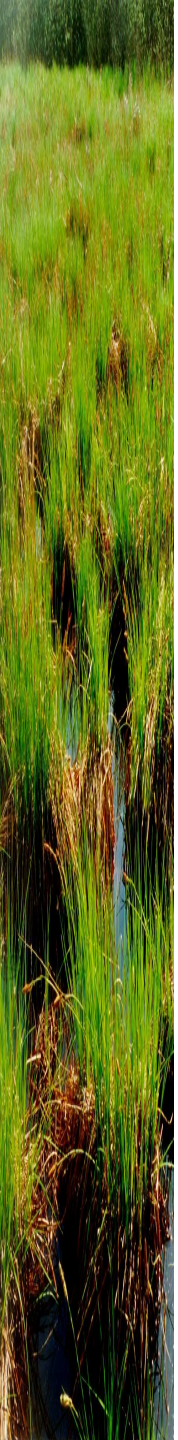
Agricultural reclamation

- Middle Ages: extensive agricultural activities led to the development of floristically rich seminatural plant communities
- 18th century: the first systematic fen reclamation in larger river valleys
- People's Republic of Poland (1945-1989):
  - reclaiming wetlands for agriculture was a part of the State's economical policy
  - drainage of c. 85% of fens,
  - only few fen areas transformed into arable fields (unlikely in other European countries)

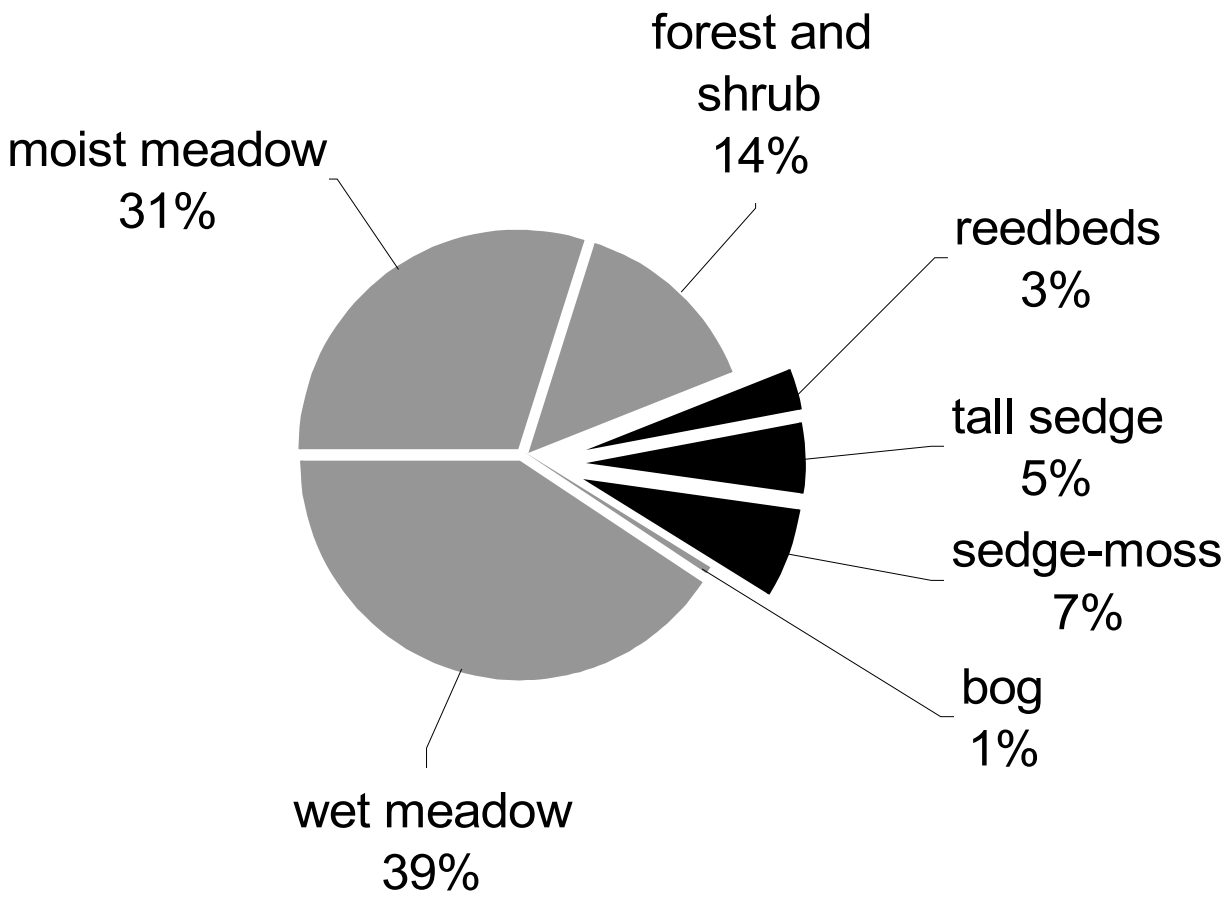


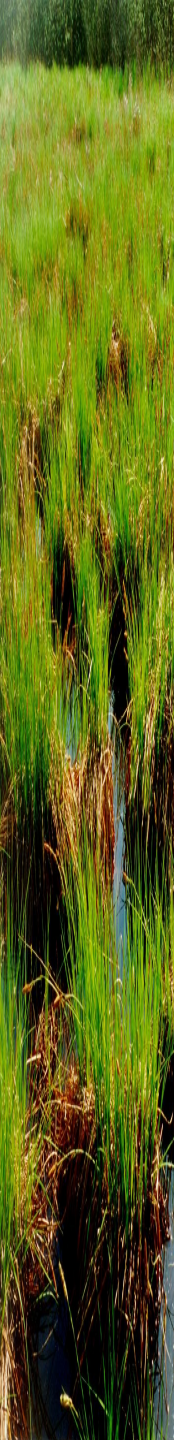
Main changes in the habitats

- Ongoing drainage by systems of drainage ditches (no outflow control),
- Water deficit due to overdrainage (lack of capillary rise),
- Soil impoverishment by decades of mowing management (need to intensive fertilisation),
- Overgowing with shrubs due to abandonment,



Present vegetation cover





Current landuse

- **Permanent grasslands (intensive and extensive)**
- **Peat extraction – gardening soil (also illegal)**
- **Fishpond creation** (also as an excuse for peat digging)
- **Conservation (protection)**
- **No management (abandoned land)**
- (infrastructure development)
- (aforestation)
- (willow plantation)
- (reed harvesting)

Cirsio-Polygonetum on moderatelly drained fen

Anthoxantum odoratum – typical dominant on intensively drained fens

Severely drained fen dominated by Cardaminopsis arenosa

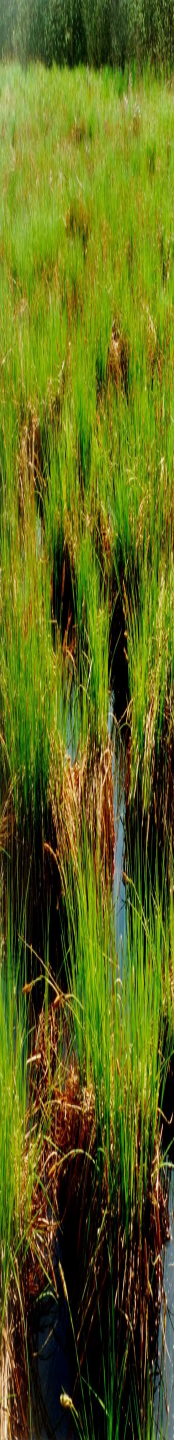
Forests on drained fens

- Increasing evapotranspiration
- Very high mineralisation of peat
- High N release,
- Low biodiversity

Seed bank - no fen species left

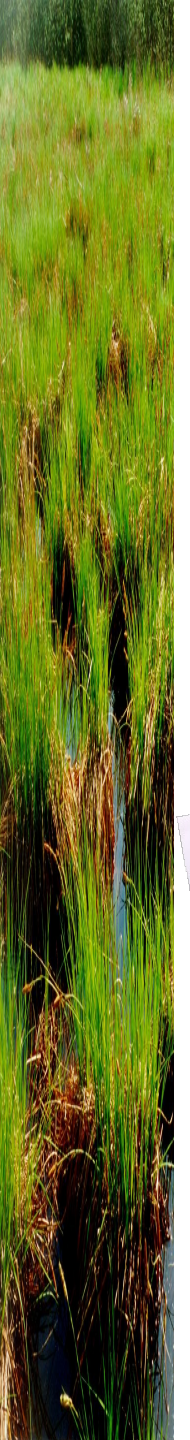
	Top (5-10cm)	20 cm	40 cm
Seed density per m^2	2957	693	10,5
Ave. # species	25,7	11,6	0,9
Seed bank dominated			
Cardaminopsis arenosa	22%	5%	10%
Sagina procumbens	22%	20%	
Juncus articulatus	11%	45%	31%
Plantago pauciflora (major)	9%		10%
Capsella bursa-pastoris	5%		
Urtica dioica			20%
Mentha x verticiliata			10%
Total	~70%	70%	81%

Klimkowska, unpubl.



Values / resources

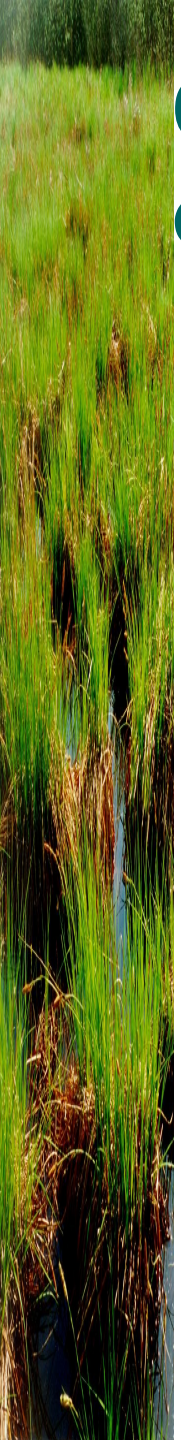
- **Biodiversity:** reclaimed fens lost most of their biodiversity but still contain certain vature values:
  - Remnant stands of rare fen plant species (e.g. on fen margins, in turf pits, ditches, etc.)
  - Fragmented wet meadow communities,
  - Nesting and foraging areas of birds.
- **Hay for cattle:** various quality
- **Soil carbon**
- **Water retention potential (high if water is rised in the ditches)**
- **Space (most valued around big cities)**



What should be the functions of the severely drained fen areas?

Option 1: keep as it is – allow succession

- Opportunities:
  - No direct costs
  - ‘nature will find its way’
- Constraints:
  - Increasing evapotranspiration
  - Increasing mineralisation of peat
  - Low biodiversity for long time

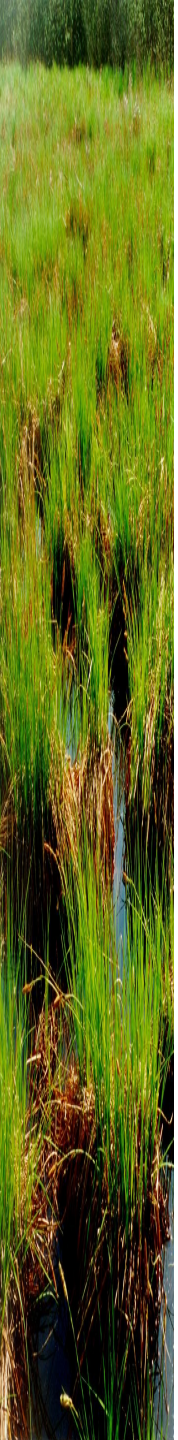


Option 2: restoration of original fen vegetation

	Batalionowa	Calowanie	Wizna	Sumiackie	Malynka	Rudnia
A1. local hydrological regime	+	±	-	±	-	-
A2. degree of soil degradation	+	±	±	±	+	-
Is fen habitat restoration feasible?	*y*	±	*n*	±	*n*	*n*
B1. source populations of fen species	+	+	±	±	-	-
B2. character of vegetation	+	-	-	-	-	-
Are there chances of self-establishment of fen plants?	*y*	*y*	±	±	*n*	*n*
C1. prospects for financial support of management	+	+	+	+	+	+
C2. interference with present land-use	+	+	±	-	+	±
C3. nature conservation status	+	+	-	-	-	-
NGO involvement	+	+	+	+	+	+
Socio-economical situation favourable for fen restoration?	+	+	*n*	*n*	±	*n*
D1. opportunity to preserve rare species	+	+	±	-	-	-
D2. impact of restoration on present natural values	+	+	+	±	+	+
Is fen restoration an aid to nature conservation?	*y*	*y*	±	*n*	*n*	*n*

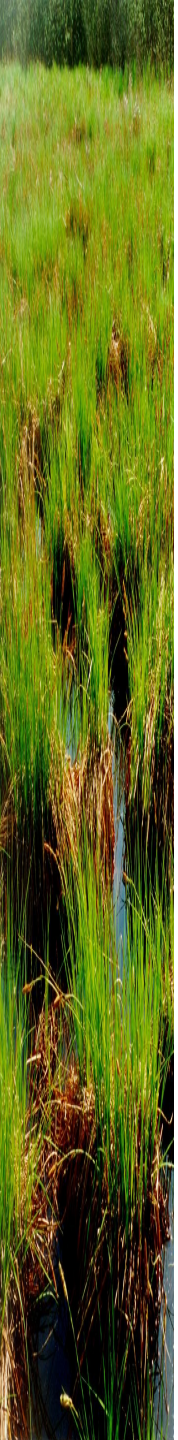
Option 3: restoration of eutrophic mires

- Opportunities:
  - Relatively feasible in short time
  - Restoration of processes (peat formation, nutrient retention)
  - May evolve into species-rich communities after long time
- Constraints:
  - High costs
  - Difficult management
  - Low biodiversity for long time



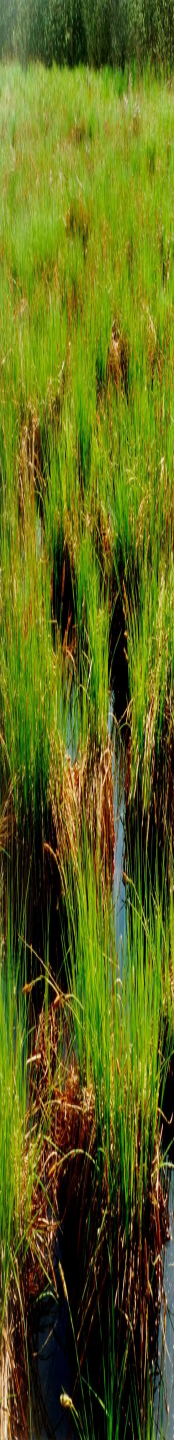
Option 4: Grasslands…

- Opportunities:
  - Recent increase of profitability related to EU accession (increase of cattle price, direct subsidies, AE subsidies)
- Constraints:
  - Impoverishment of soils (NPK depletion), need for high fertilisation
  - Overgowing with shrubs (willow), high costs of re-opening the landscape
  - Inadequate water regime: decreased water holding capacity of the soils, drying out in summer
  - Fast decomposition of peat (moorsh) soils



Option 5: Peat extraction / fishpond creation…

- Opportunities:
  - high demand for low-quality peat to improve garden soil,
  - increase of local biodiversity (?)
  - could be combined with recreation (angling)
- Constraints:
  - possible changes in the groundwater flow (esp. if peat digging connected to outflow ditches)
  - eutrophication of groundwater (if fishponds)

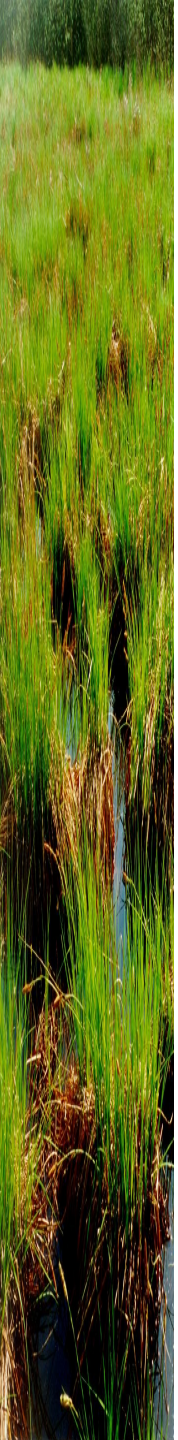


Combining functions as chance for biodiversity?

agriculture
conservation
→ EXTENSIVE MOWING, SLIGHT REWETTING

agriculture
conservation
energy production
→ SHRUB REMOVAL

peat extraction
restoration
→ SHALLOW PEAT EXTRACTION – WETLAND RE-CREATION



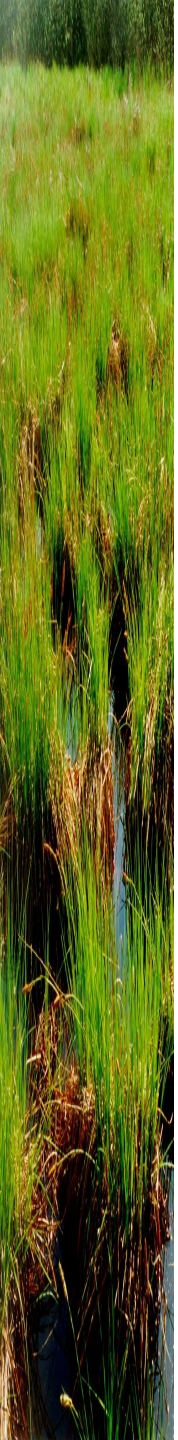
agriculture

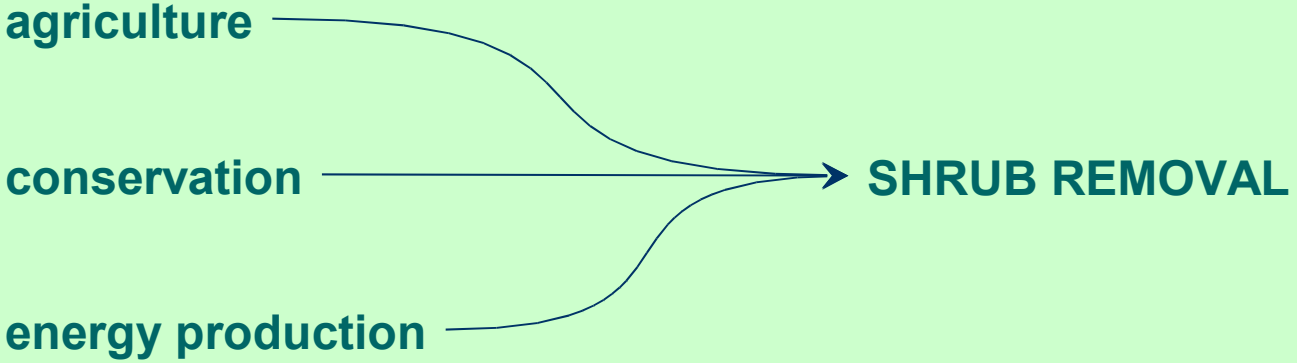
conservation

→ **EXTENSIVE MOWING, SLIGHT REWETTING**

Necessary measures:

- Increasing wetness by (re)establishing locks on the ditches
  - Find compromise between production and conservation (wet meadow conditions),
  - New AE schemes targeted on re-wetting
- Well-targeted AE packages compensating for the prohibition of fertilisation and delayed mowing





- Need for shrub removal to restore open landscapes
- Costs of shrub removal EUR 1000-2000 / ha
  - Not really feasible for AE programmes
- Fast-growing market for bio-fuels:
  - Local heating instalations
  - Industry/business

  (meeting Kyoto targets of CO_2 emmissions)!

peat extraction

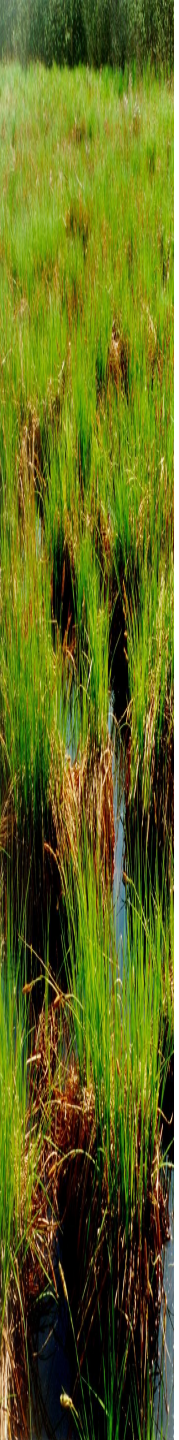
restoration

→ SHALLOW PEAT EXTRACTION – WETLAND RE-CREATION

Topsoil removal – the most effective method of fen/fen meadow restoration:

- Decrease of nutrient availability
- Increase of wetness
- Removal of ‘unwanted’ seedbank

- **Main constraint: high costs of soil transport**
- **Solution: selling the topsoil**
  - Forestry (tree nurseries)
  - Gardening companies
  - Private gardens



Conclusions

- Traditional landuse is not economically feasible in highly degraded fens
- Nature restoration is very costly and usually can be implemented on small scale only
- Multifunctional landuse is the chance for:
  - for restoring natural processes
  - preserving biodiversity on much larger scale,
  - decreasing land degradation elsewhere

But be quick: there are other possible functions that compete for (former) fen resources…