

Restoration of semi-natural litter meadows in the Enns valley

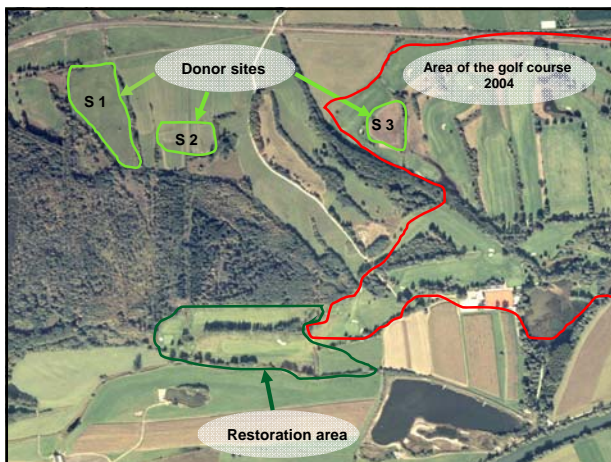
Wilhelm Graiss, Albin Blaschka, Petra Haslgrübler, Bernhard Krautzer
Agricultural Research and Education Centre Raumberg-Gumpenstein



Background

- Extension of the Golf course Weißenbach (Enns valley, Styria - Austria) from 9-hole to 18-hole was approved by regional government in 1996, 2 alleys were constructed (ca. 5 ha)
- In parallel the extension area was evaluated as NATURA 2000 site and established in 2004 – two legislative decisions in conflict!
- Solution: renaturation of the respective 2 alleys and alternative extension of golf course in the south

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Position of restoration site in Austria



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Aims

- Create an area with high nature value, potential nesting site for the Corn crane (*Crex crex*)
- Which kind of vegetation type is suitable for Corn crane?
 - Open grassland with low height
- Seed material for restoration was collected on near NATURA 2000 areas - Distance between donor and receptor sites less than 1 km

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Material and methods

- Altitude: 640 m a.s.l.
 - Longitude: 47° 56' 13" N, Latitude: 14° 19' 88" E
- Mean annual temperature: 6.7 °C
- Annual precipitation: 969 mm
- Harvesting date: 01 September 2006
- Harvesting machinery: plot combine thresher
- Restoration area: 5 ha
- Date of seeding: 15 November 2006

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Quality aspects of threshed material

- Yield of threshed seed material: ~20 g/m²
- Chaff : Seeds = 40 : 60
- Grasses : Forbs = 10 : 90
- Thousand seed weight (TSW): 0.94g
- Germination capacity in Greenhouse experiment on organic growing media: 27 - 30%
 - Monocotyledons: 7 - 8% (1/4 of germinated seeds)
 - Dicotyledons: 20 - 23% (3/4 of germinated seeds)

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Restoration activities

- Site preparation: mulching, ploughing, levelling with caterpillar, removing drainages
- Sowing with Seeding rate of 3.5 g/m² of threshed material, ~2 g/m² pure seeds
- Management: 1 cut per year and removal of biomass
- Monitoring of vegetation development

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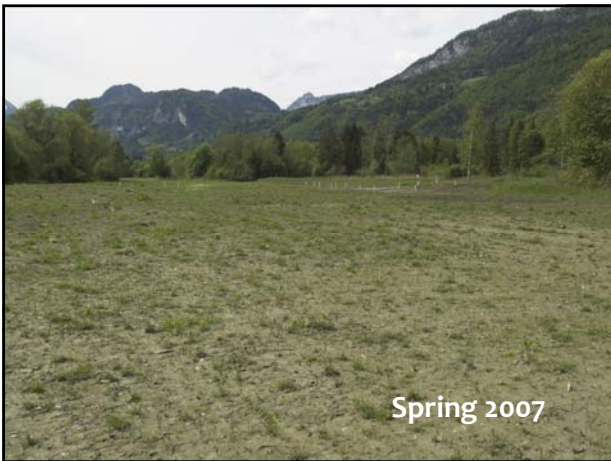





Ploughing November 2006



Sowing November 2006



Spring 2007



Before cleaning cut, June 2007



After cleaning cut, July 2007




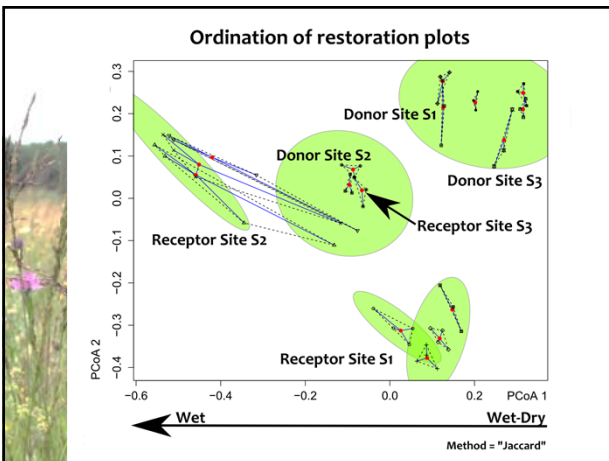
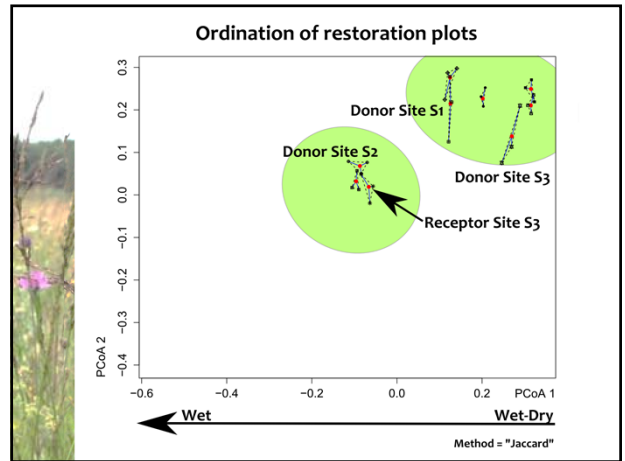
July 2009



Analysis of vegetation development

- Principal coordinate Analysis (PCoA)
- Statistic programme R, Version 3.0
- Vegan package, Version 2.0-7
- Analysis based on beta diversity: change over time
- k-means clustering: 5 clusters based on the Calinski-Harabasz criterion
- Botanical assessment by projective cover in % according to Schechtner 1958
- Relevees on each site with 3 replicates


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Open questions

- Seed bank in the soil
- Site condition varies on small scale
- Composition of threshing material not exactly known – representative seed sample difficult to get
- Seed quality – difference in germination capacity between field and lab of the threshed material

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Conclusions

- High amount of frost germinators (*Iris sibirica*, *Molinia caerulea*) established by sowing before winter
- Slight amount of threshed material 3 g/m² is sufficient for restoration success
- Cleaning cut for weed control important
- Restoration success depends from soil and water conditions – inhomogeneous site conditions
- After five years transfer rate between 30-50 %
- Nowadays the area is converted to a suitable habitat for *Crex crex*, confirmed by ornithologists

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Thank you for your attention!