

# **The importance of soil seed banks for the conservation of nearly extinct species: insights from *Coleanthus subtilis* (Poaceae)**

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# Introduction

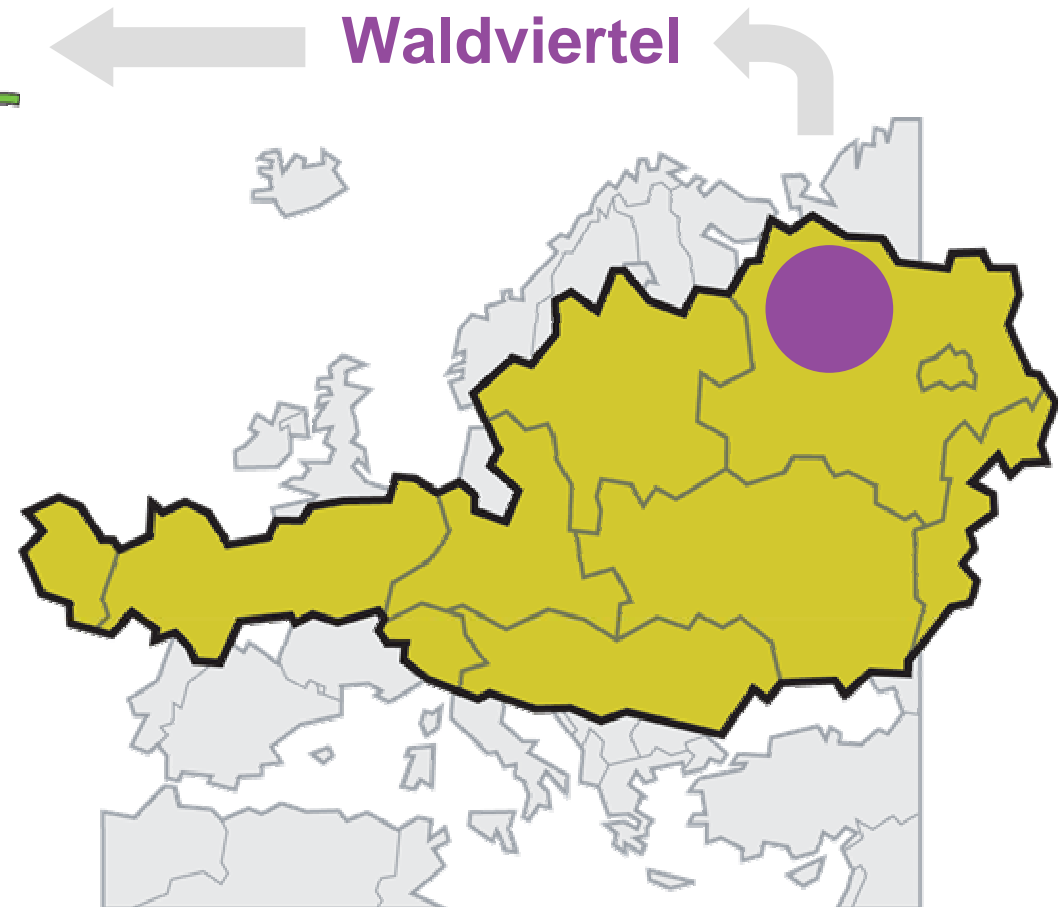
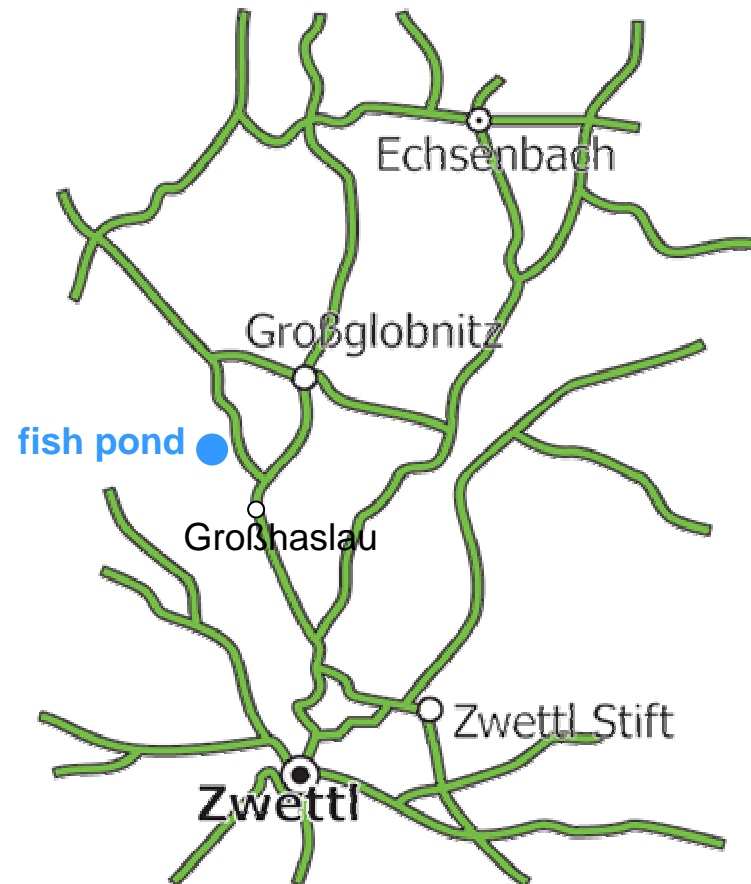
*Coleanthus subtilis*, a Poaceae was for many years assumed to be **extinct** in Austria

After its rediscovery its **population biology and ecology** was investigated:

- **life cycle**
- **germination**
- **dormancy**
- **presence in soil seed bank**
- **dynamics**

The results obtained are necessary for an in-situ and ex-situ species conservation concept.

# Study area





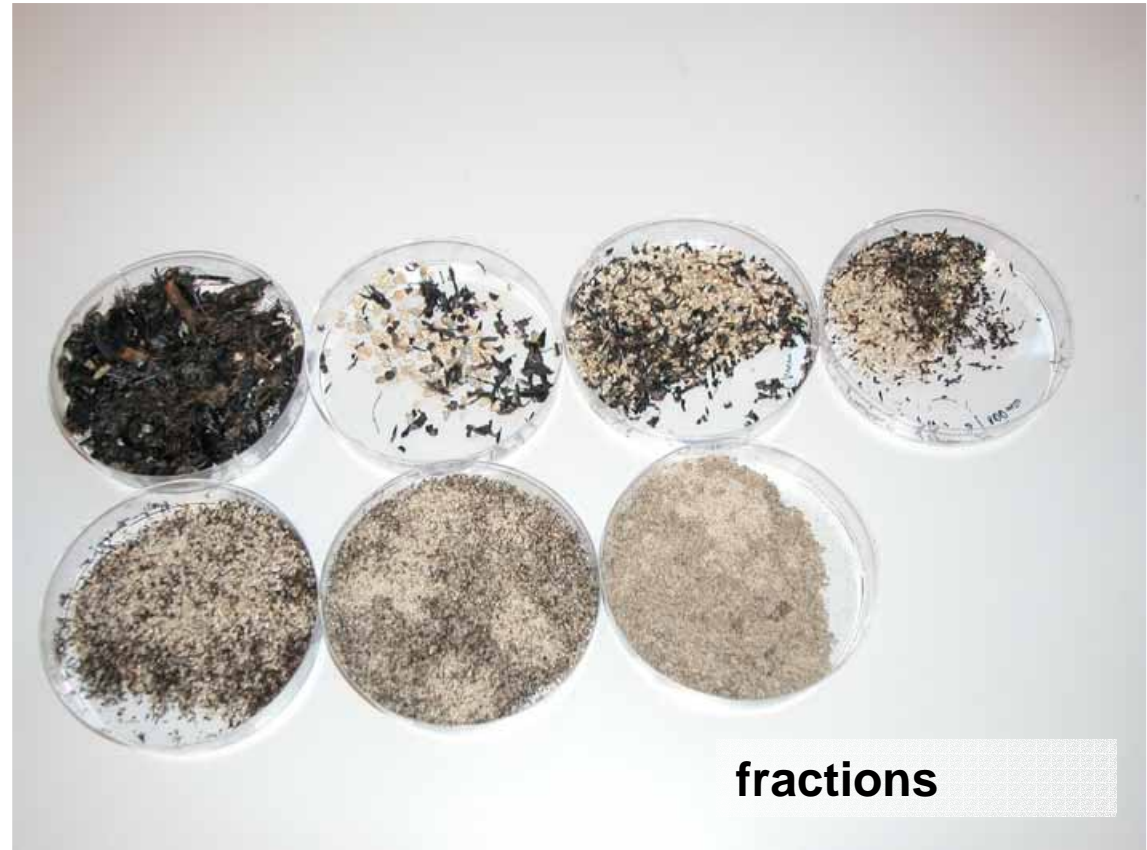


# Methods

The bulked soil samples were analysed by two methods (Bernhardt & Hurka 1989)

1. **Separating the organic fraction** by washing and floating and then recovery by sieving, followed by counting the seeds under a microscope
2. **Spread out of soil samples** in the greenhouse for germination and then counting and identification of seedlings

Seperating the organic fraction by washing and floating ...

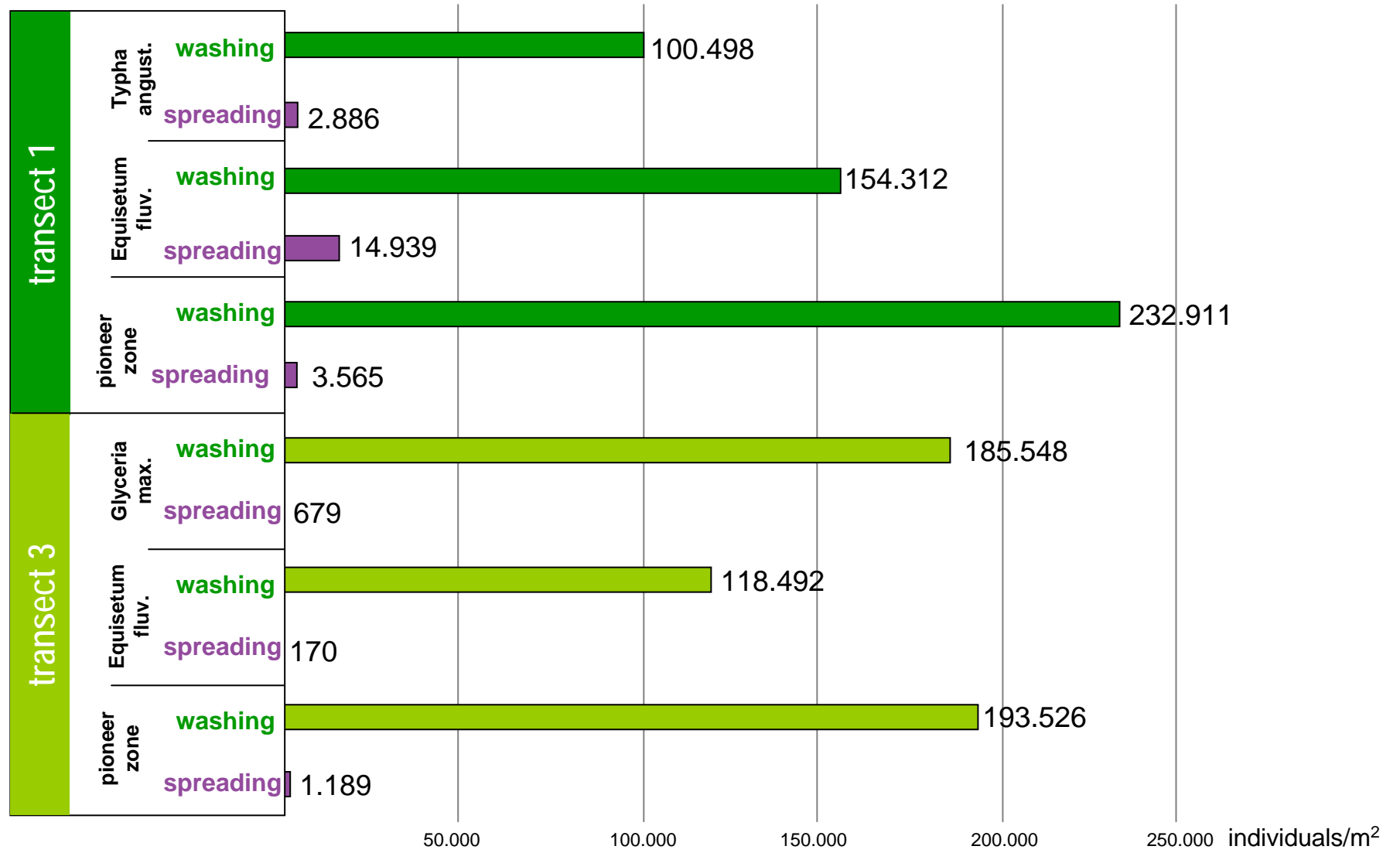




**... spread out of soil samples in the greenhouse ...**

# Results – Soil seed bank

## *Coleanthus subtilis*



## Comparison of *Coleanthus subtilis* abundances in soil seed bank and vegetation cover

Vegetation record	1	2	3	4	5	6	7	8	9
Soil seed bank (total number m <sup>2</sup> )	194725	186227	103384	236476	118662	169251	12053	32934	13921
Vegetation cover in %	85	85	45	90	45	70	25	10	25
Soil type	mud with organic matter						mineral sand		

***Coleanthus subtilis* is represented in the soil seed bank with a high number of seeds**

**The above-ground appearance of *Coleanthus subtilis* is correlated with the number of seeds in soil seed bank**

**The number of seeds in soil seed bank is correlated with the soil type:**

- mud conserves viability of seeds for longer time and in deeper soil layers (anaerobic conditions)
- sandy substrates contain fewer seeds only in the upper soil layers (0-5 cm)

# Results – Life cycle

The length of life cycle is the result of the duration of the terrestrial period

A long terrestrial phase results in bigger plant size and higher reproduction of seeds

# Results – Greenhouse experiments

Development of *Coleanthus subtilis*  
from seedling to ripening stage (20 plots)

Condition	Number of days (70% of individuals)	Size of individuals
always wet	58	5 – 9 cm
Desiccation *	28	1.5 – 3 cm
Basin irrigation *	35	2 – 5 cm

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\* Starting after formation of primary leaves

# Summary

The number of seeds in soil varies between 12000 to 237000 per m<sup>2</sup>

The seeds are able to survive in deeper muddy soil layers for decades

The dynamics of water level are necessary to recover *Coleanthus subtilis* in vegetation cover

The duration and time (autumn or spring) of terrestrial periods are responsible for the length of life cycle and quality of seed reproduction

Long terrestrial periods increase the size of soil seed bank

# Consequences for conservation management

## Conservation of traditional fish pond management

**Substitution of genetic diversity of populations and gene flow  
(investigations just started)**

- Dispersal of diaspores
- Pollination
- Seeding at suitable ponds (regional)



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