Studium sukcese jako inspirace pro rozvoj nových technologií obnovy ekosystémů na výsypkách

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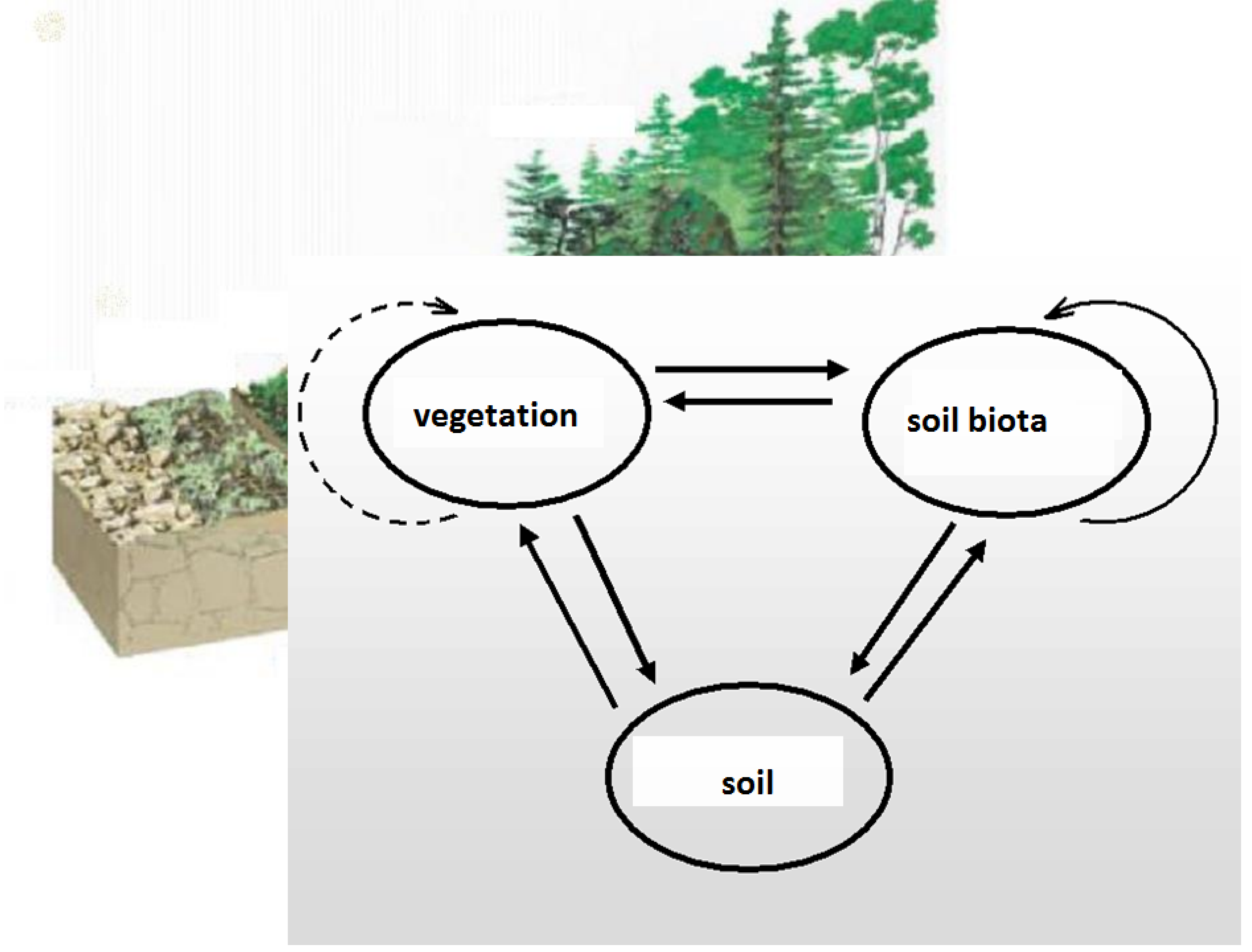
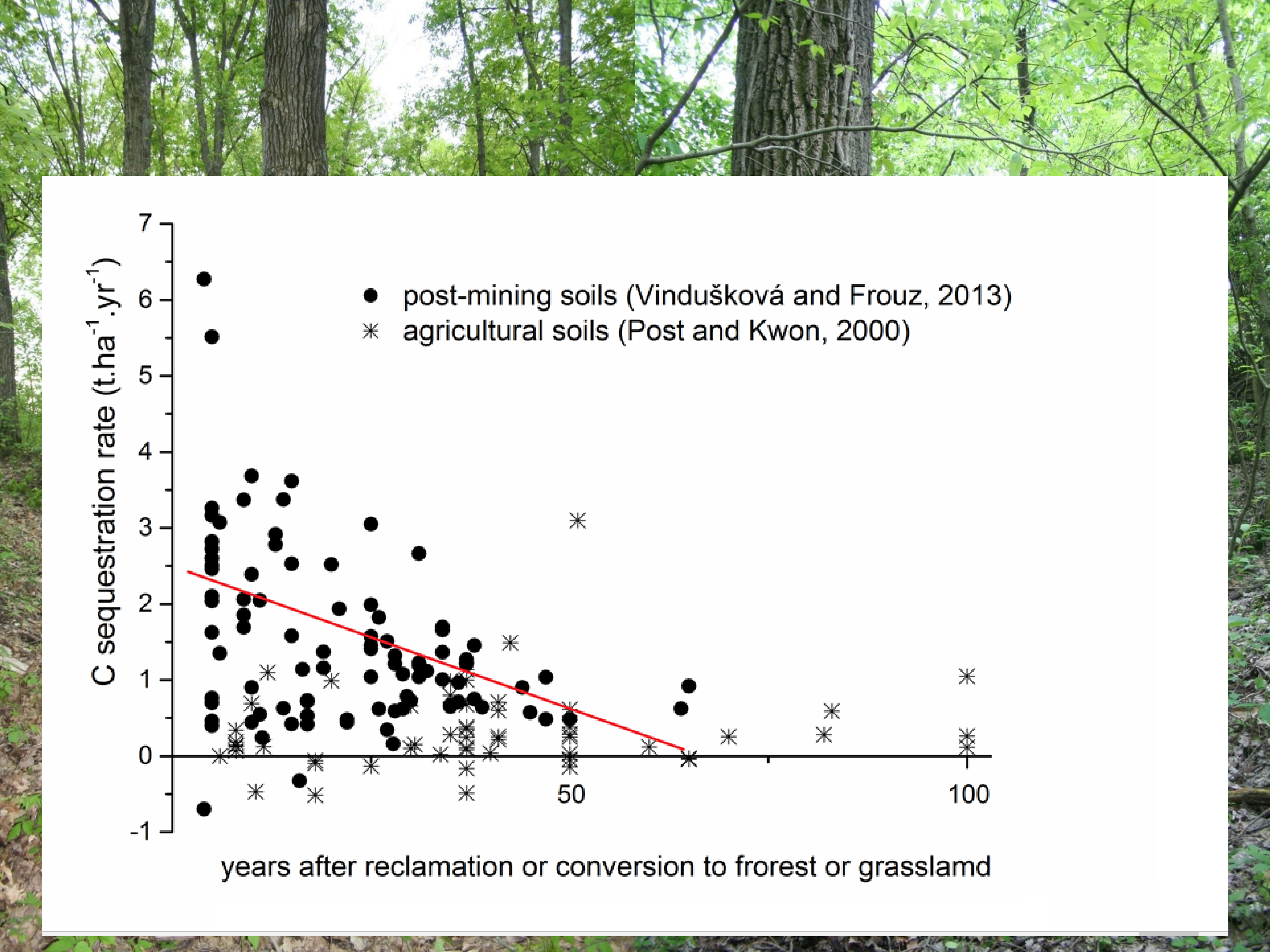
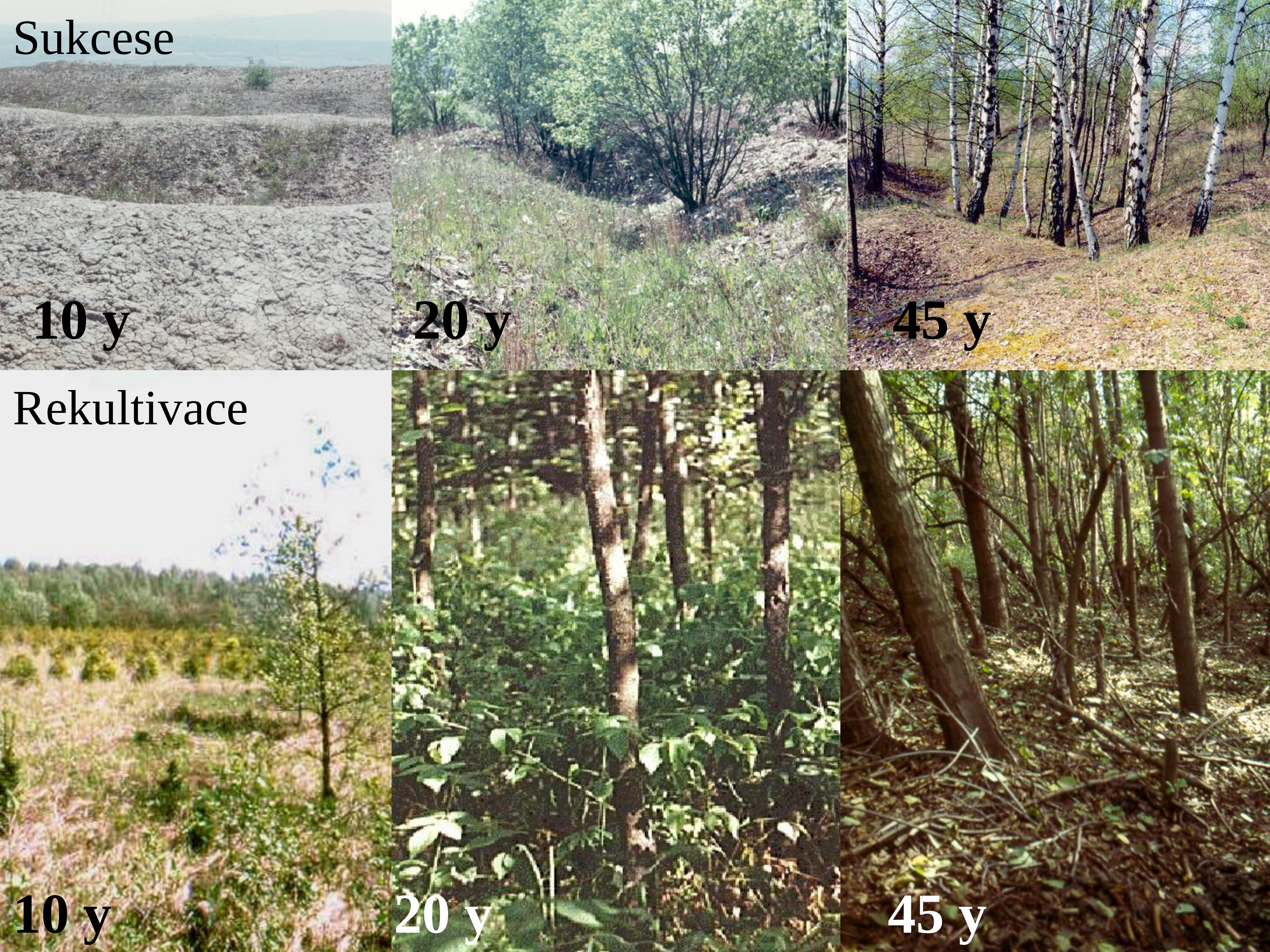
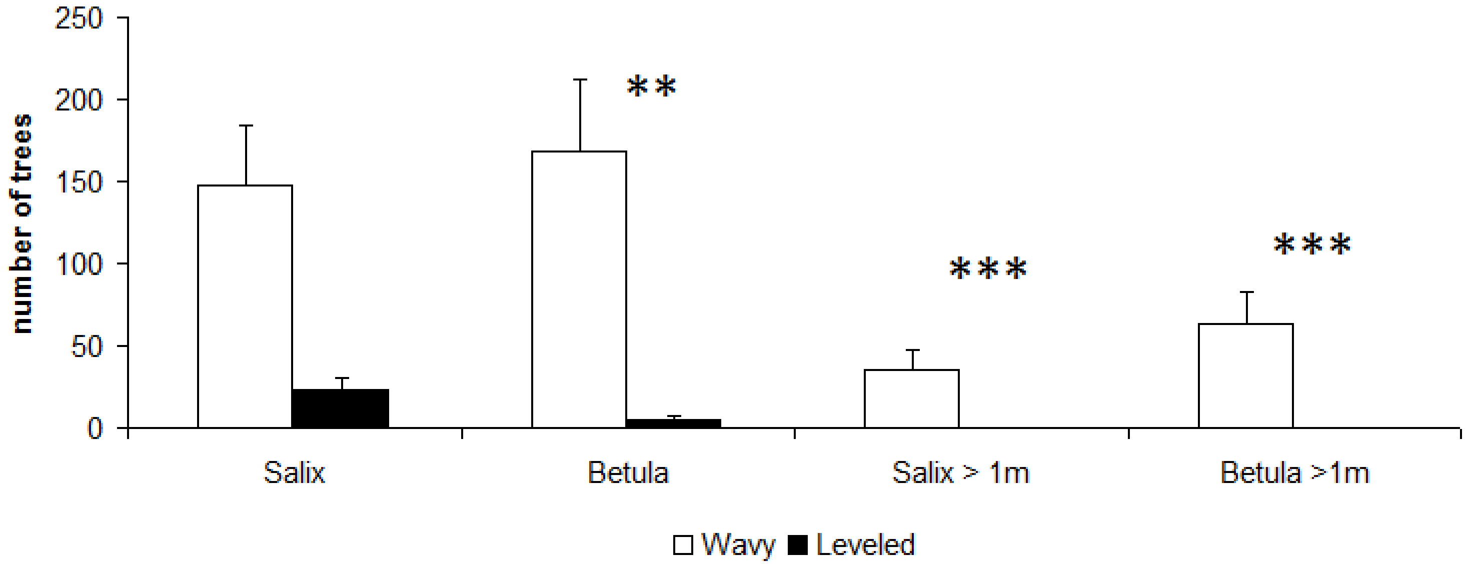
SOWA Research Infrastructure

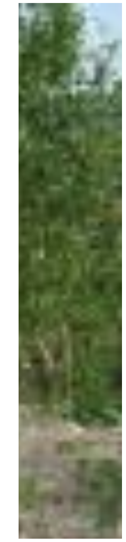

vegetation
soil biota
soil

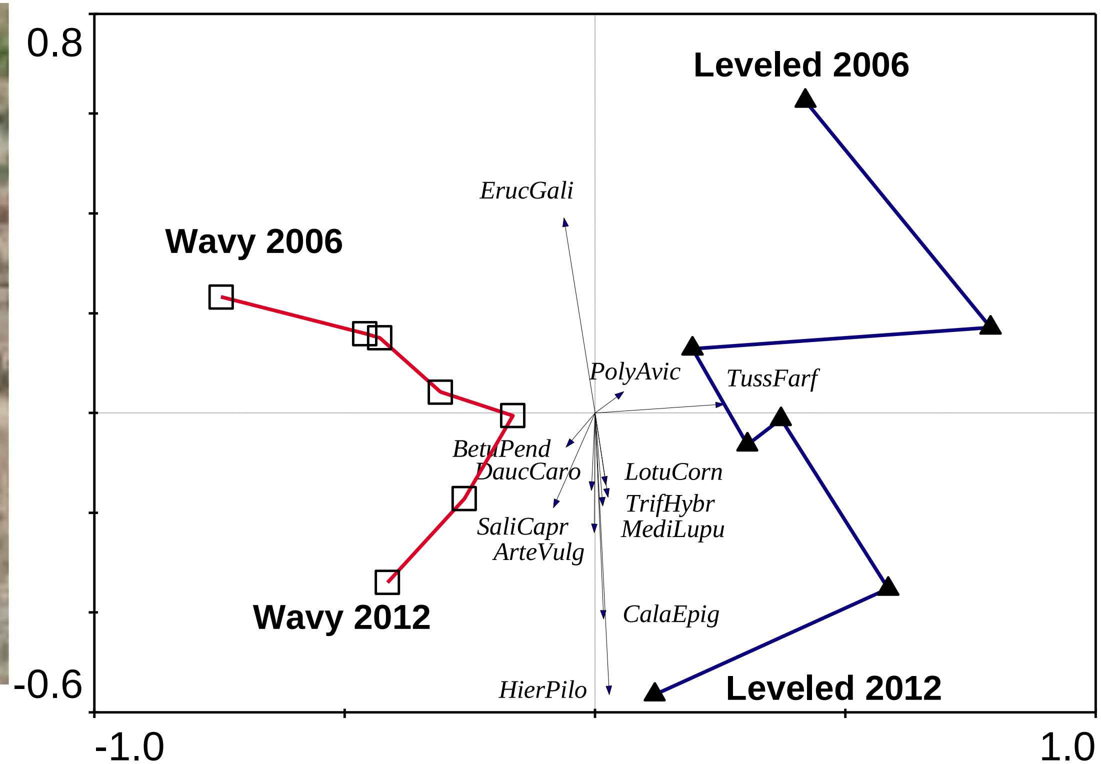



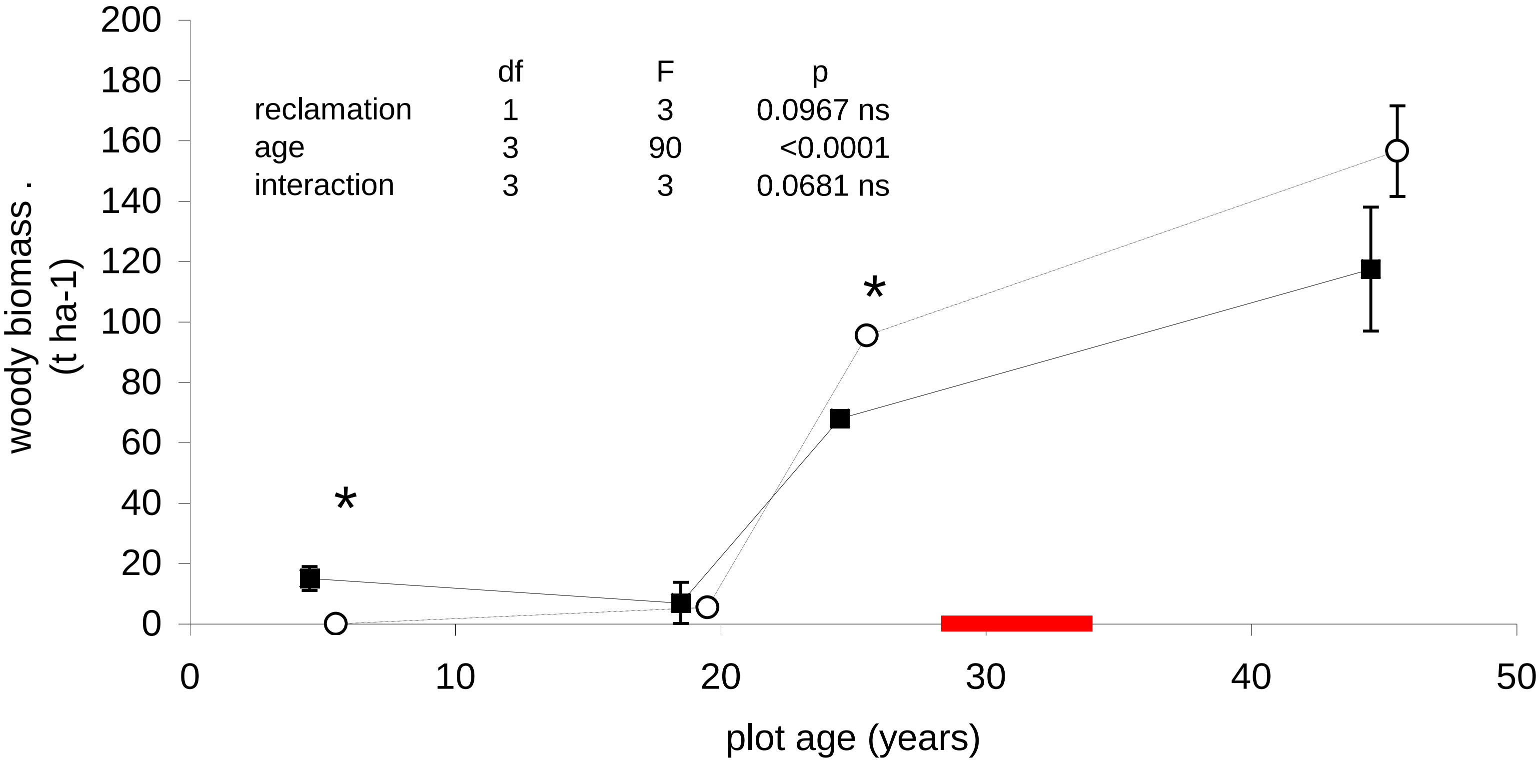
C sequestration rate (t.ha-1.yr-1)
7
6
5
4
3
2
1
0
-1
post-mining soils (Vindušková and Frouz, 2013)
agricultural soils (Post and Kwon, 2000)
50
100
years after reclamation or conversion to frorest or grasslamd

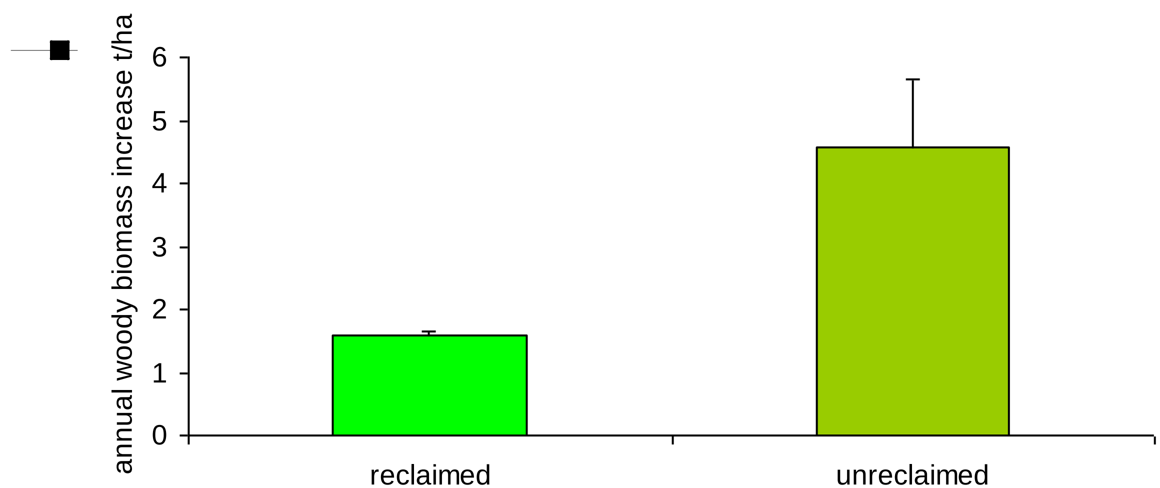

Sukcese
10 y
20 y
45 y
Rekultivace
10 y
20 y
45 y


number of trees
250
200
150
100
50
0
**
***
***
Salix
Betula
Salix > 1m
Betula >1m
Wavy
Leveled

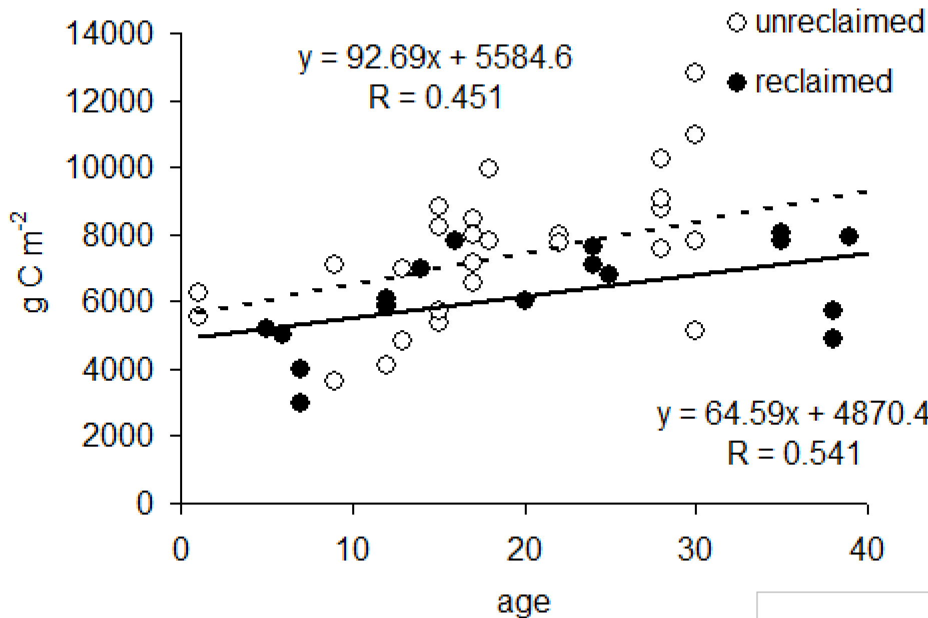



0.8
-0.6
-1.0
1.0
Leveled 2006
Wavy 2006
Wavy 2012
Leveled 2012
ErucGali
PolyAvic
TussFarf
BetuPend
DaucCaro
LotuCorn
TrifHybr
MediLupu
SaliCapr
ArteVulg
CalaEpig
HierPilo

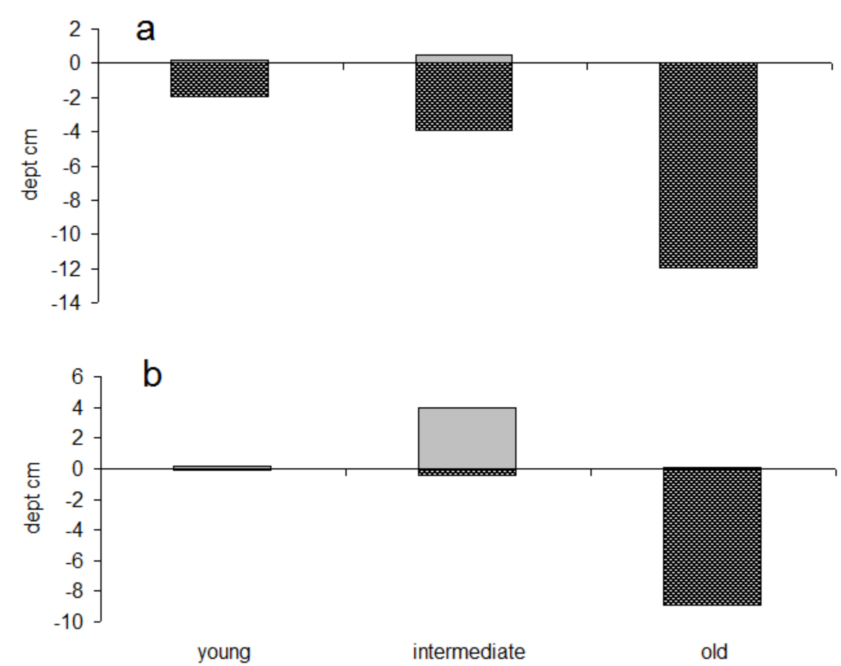




Frouz et al., 2015,
Ecological Engineering, 84: 233-239.



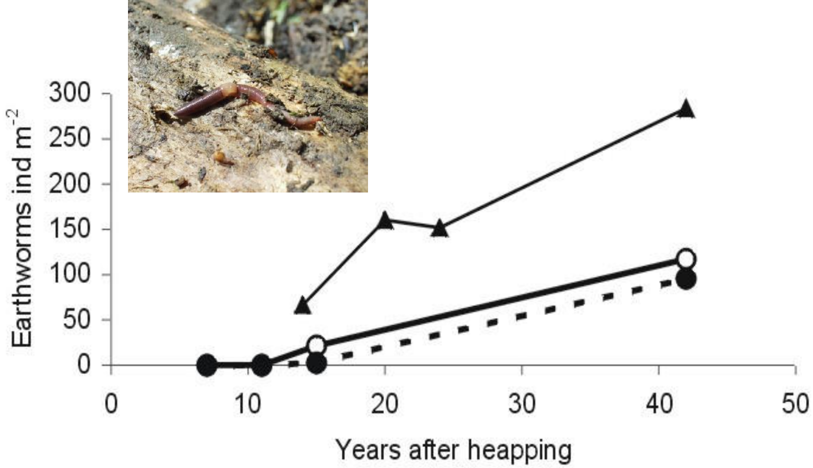
unreclaimed
reclaimed
y = 92.69x + 5584.6
R = 0.451
y = 64.59x + 4870.4
R = 0.541
g C m-2
age
14000
12000
10000
8000
6000
4000
2000
0
0
10
20
30
40

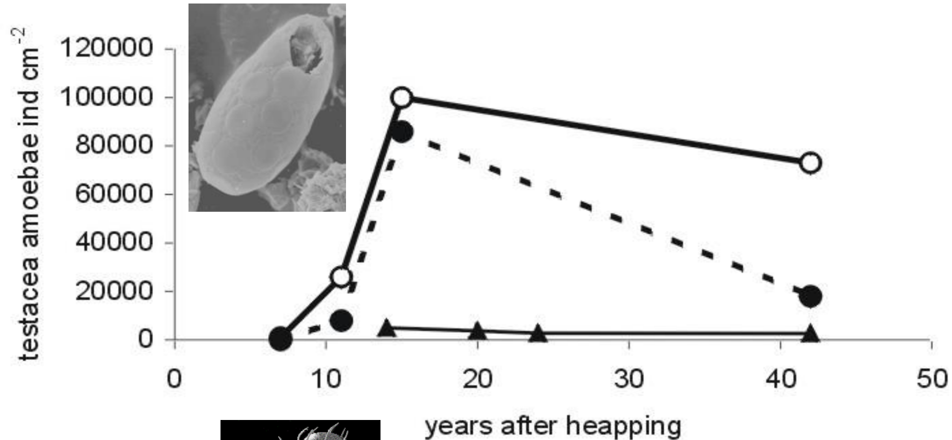


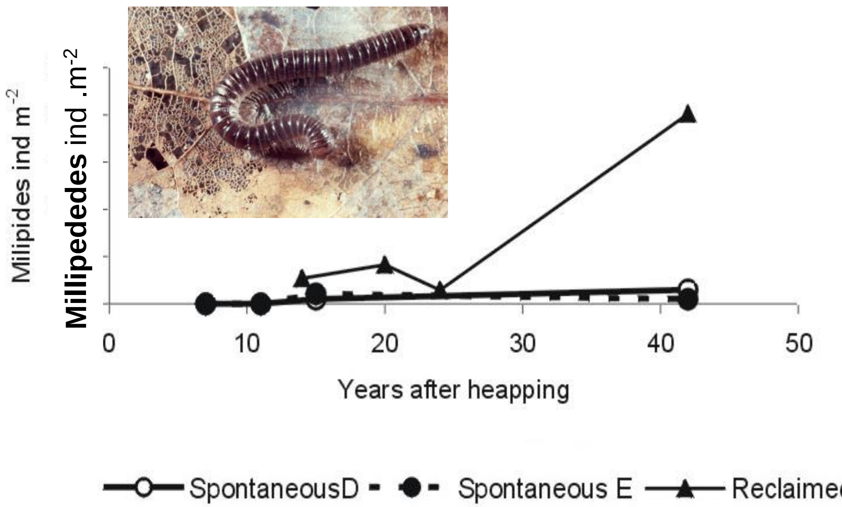
a
b
dept cm
dept cm
2
0
-2
-4
-6
-8
-10
-12
-14
6
4
2
0
-2
-4
-6
-8
-10
young
intermediate
old

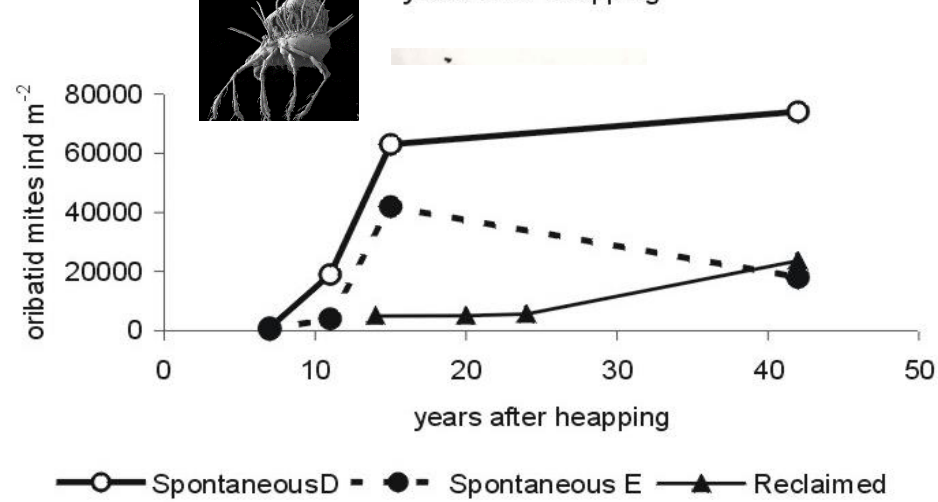
Rekultivace

Sukcese

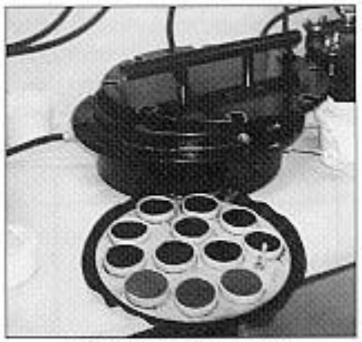






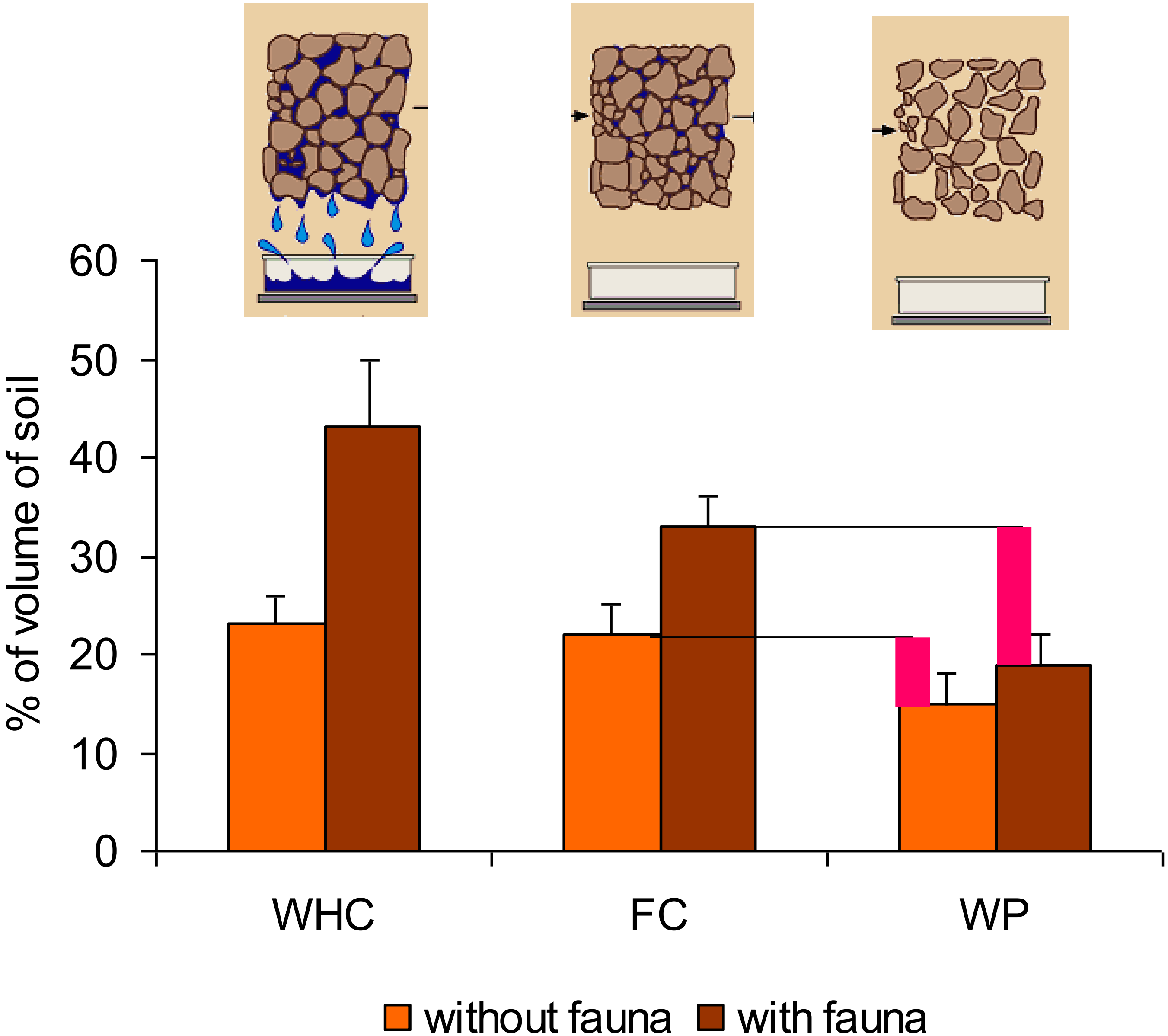


Frouz J. et al., 2001. Ecological Engineering, 17: 275-284,
Frouz J, et al., 2008. European J Soil Biology 44(1): 109-121



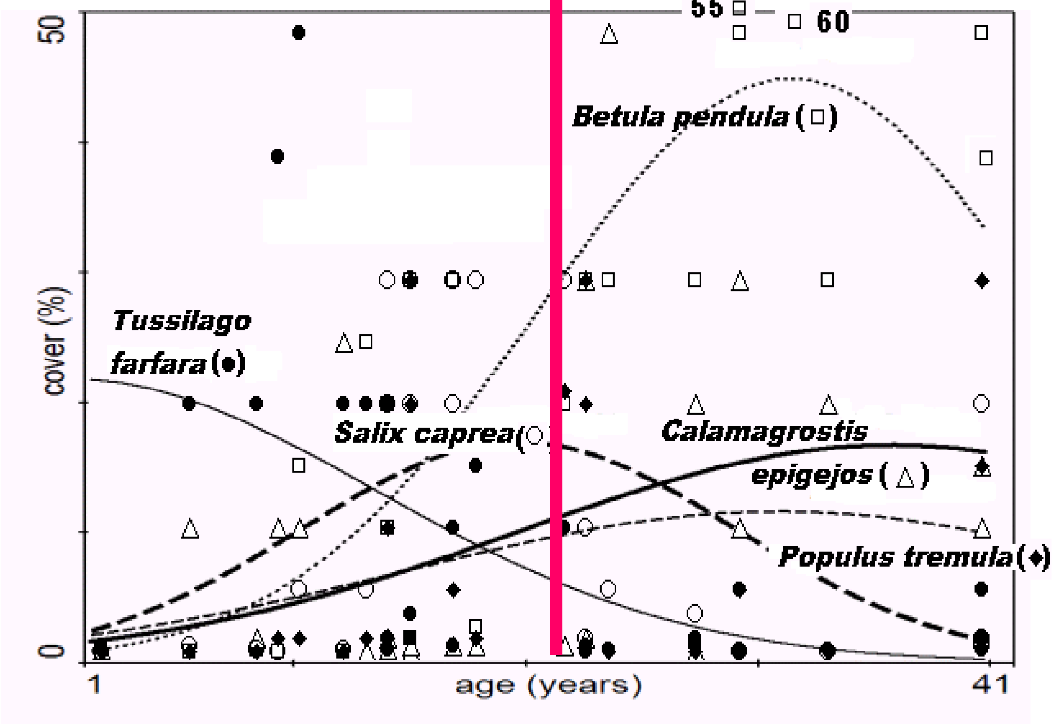
15 Bar laboratory apparatus

1/3 (.333) Bar laboratory apparatus

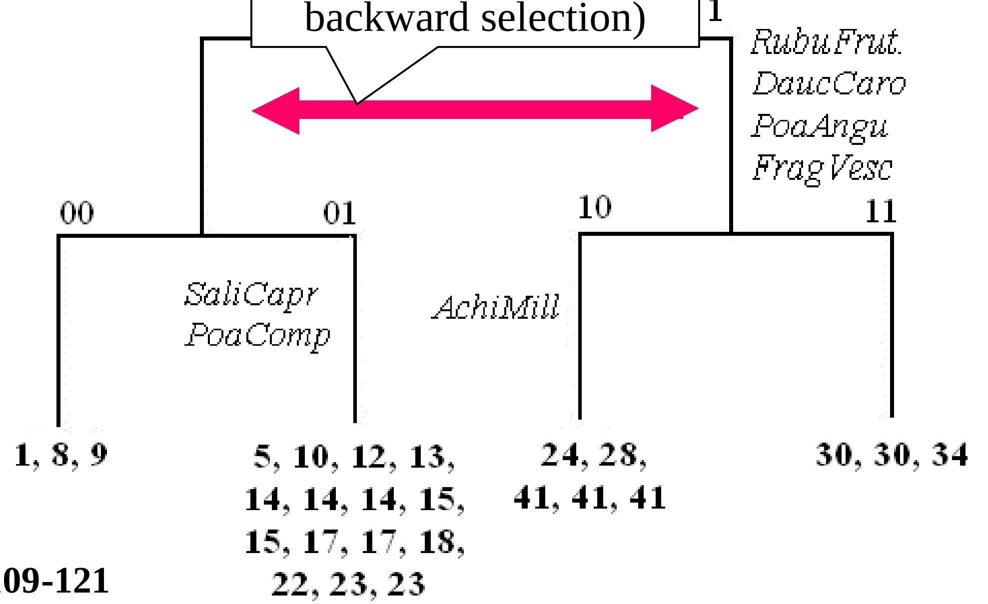


Frouz J, et al., 2006. Appl. Soil Ecol 33(3): 308-320

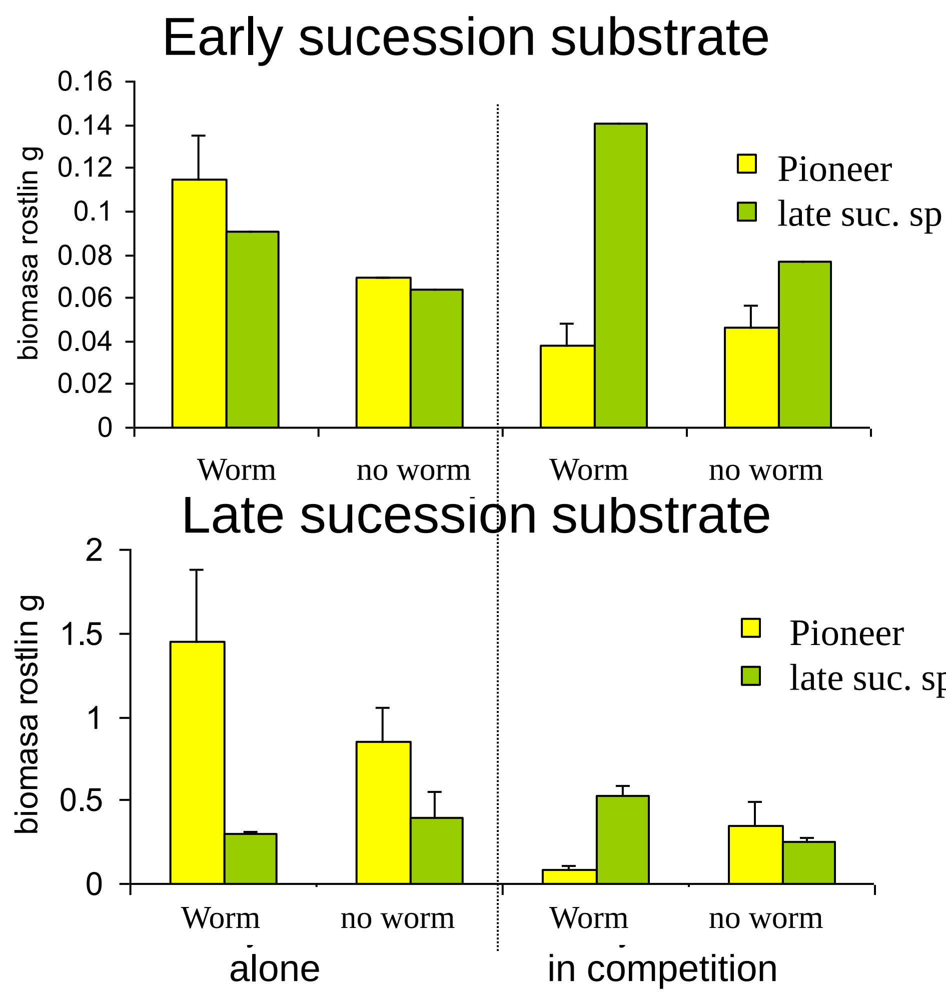
Plant community changes



presence **humus layer** is strongest predictor of these groups (discriminant analysis, backward selection)



Frouz J, et al., 2008. European J Soil Biology 44(1): 109-121



Mudrak et al., under review

Mudrak et al., 2016. Journal of vegetation science 27 (1), 156-164

Fig. 1 Schematic diagram of sampling design. Samples were collected in *Salix caprea* monocenosis (SalM), *Calamagrostis epigejos* monocenosis (CalM) and in the contact zone of the two species (Mix).

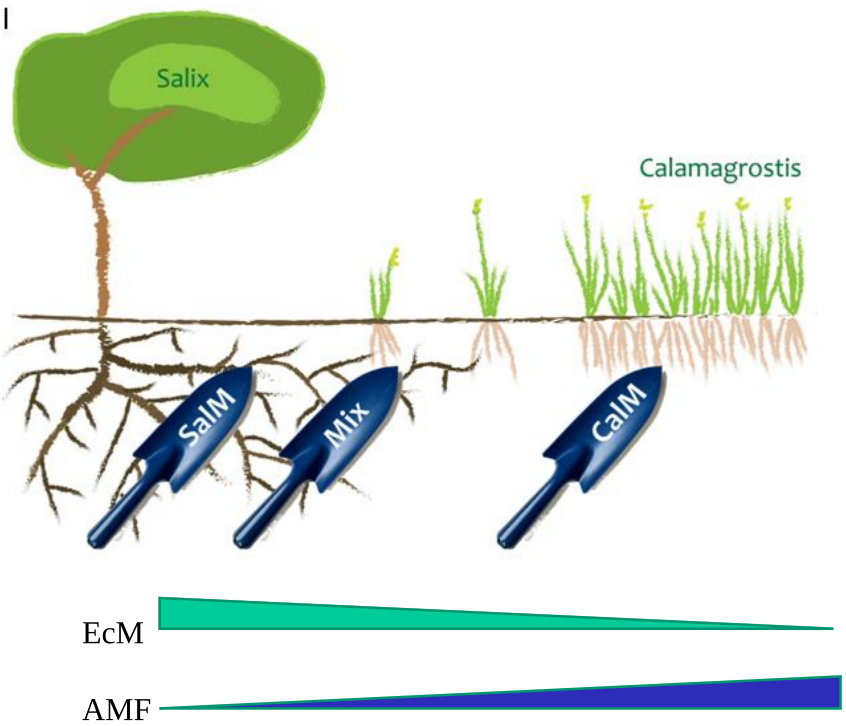
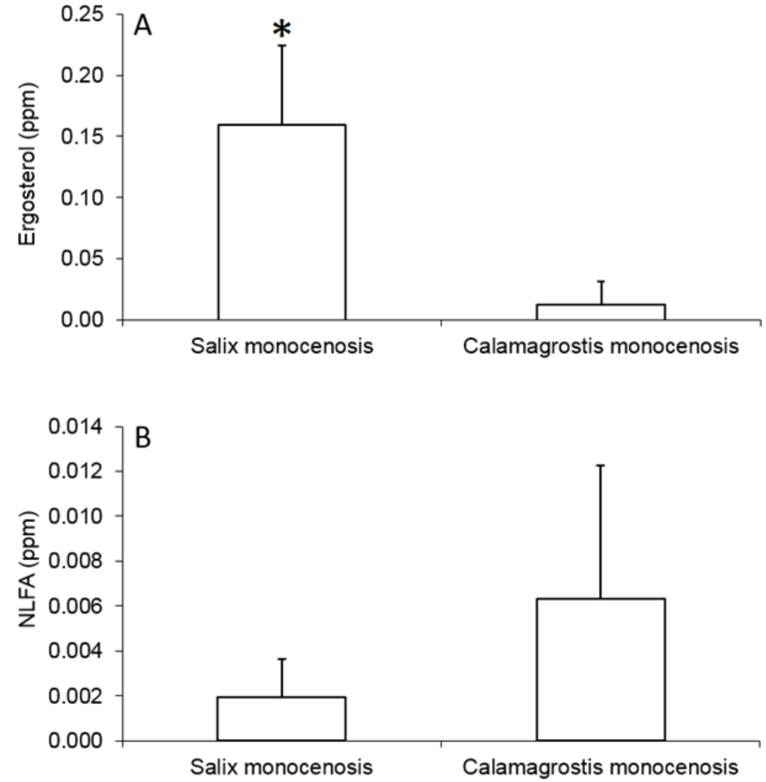
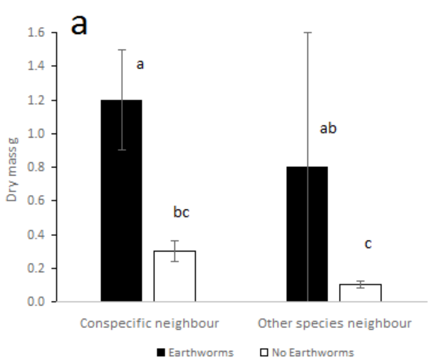


Fig. 2 Concentration of egrosterol (A) in sand bags was significantly higher in *S. caprea* monocenosis than in *C. epigejos* monocenosis ($p<0.0001$). We observed a trend in concentration of NLFA (B) of slightly higher values in *C. epigejos* monocenosis than in *S. caprea* monocenosis ($p=0.0746$).

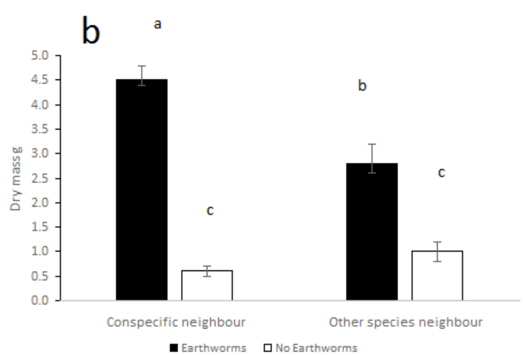


Knoblochova et al., 2017. Mycorrhiza, DOI 10.1007/s00572-017-0792-x

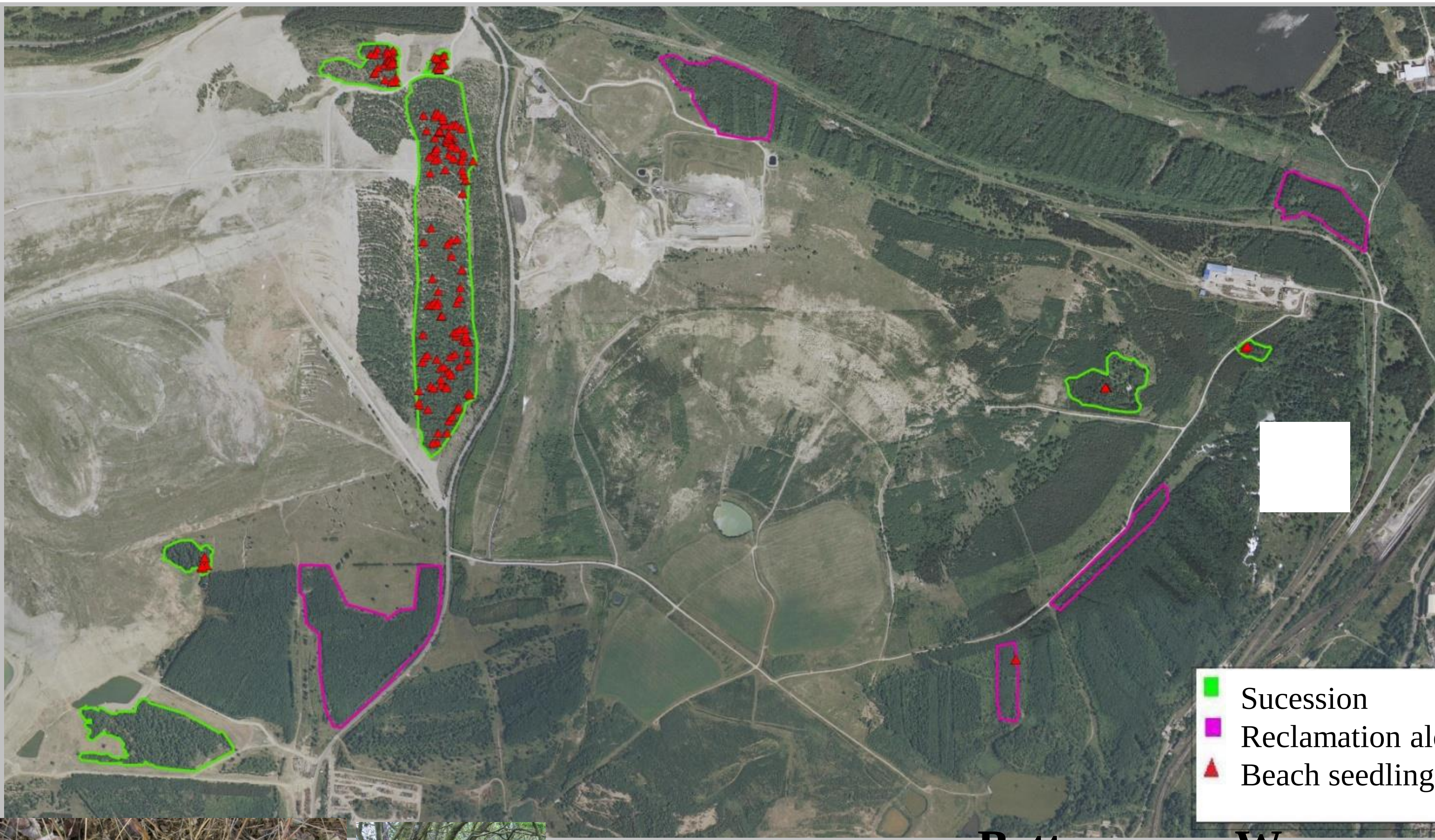
Tripleurospermum
AMF



Betula
EcM

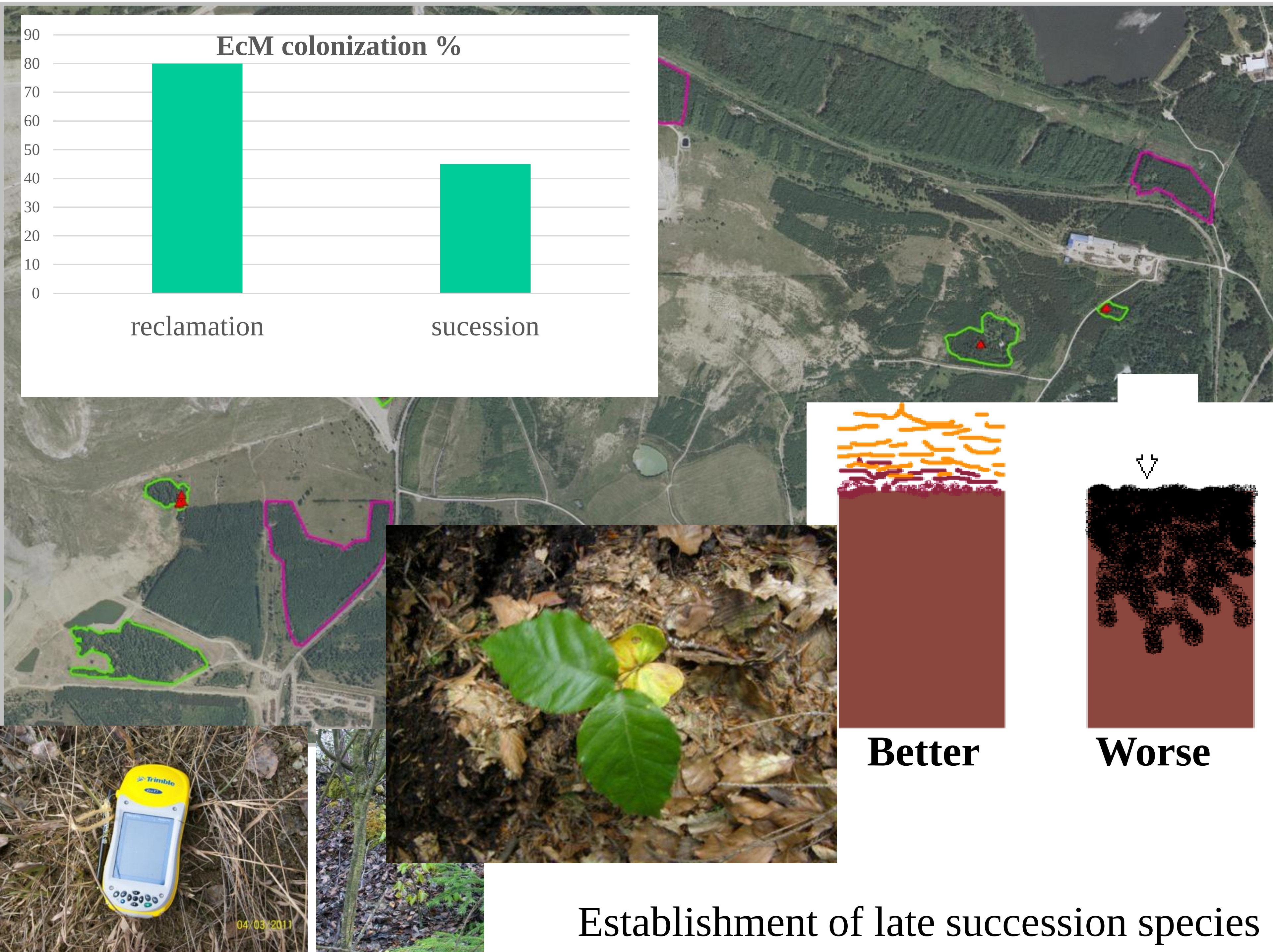


Frouz et al., in prep



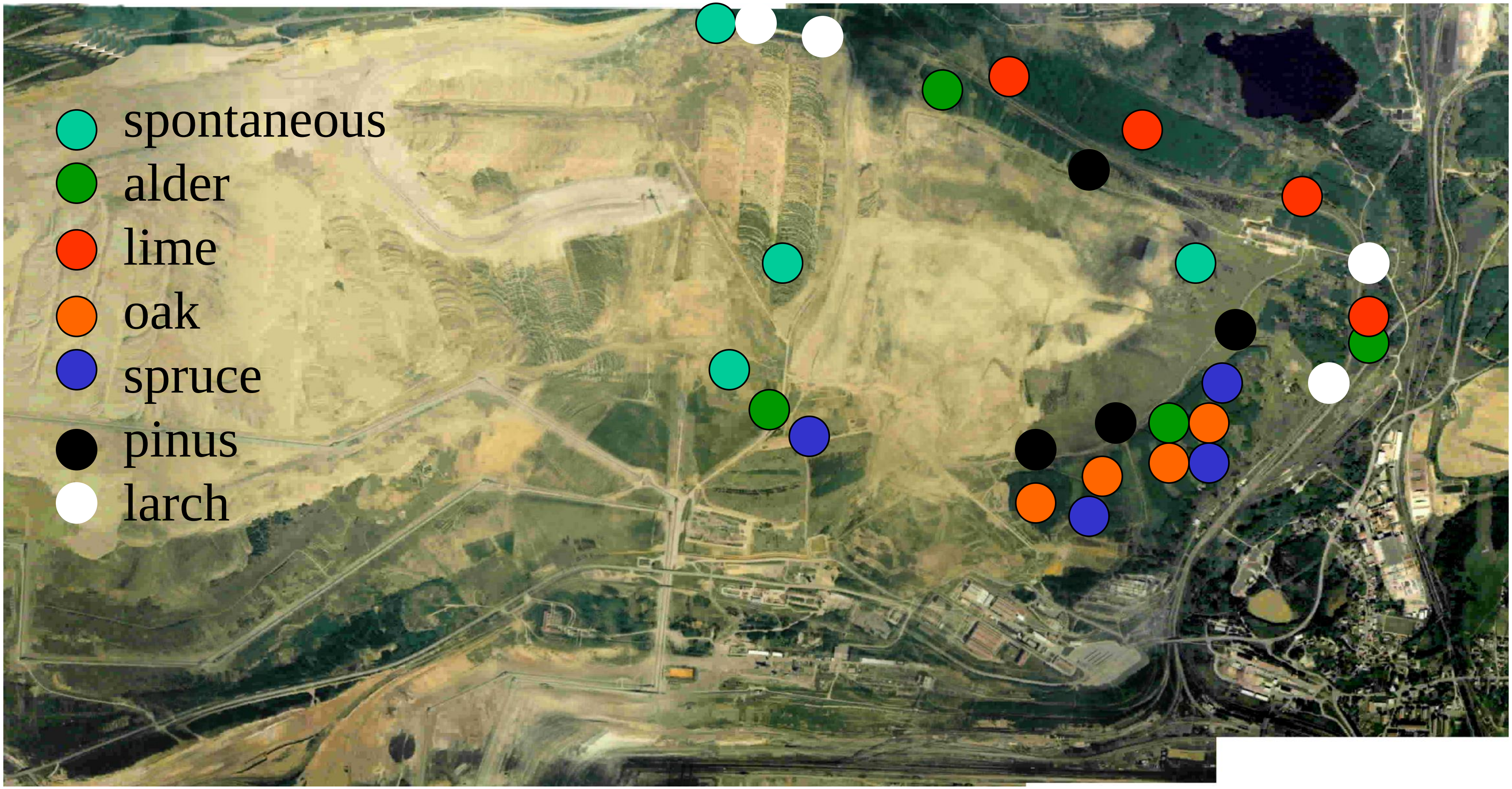
Better **Worse**

Establishment of late succession species



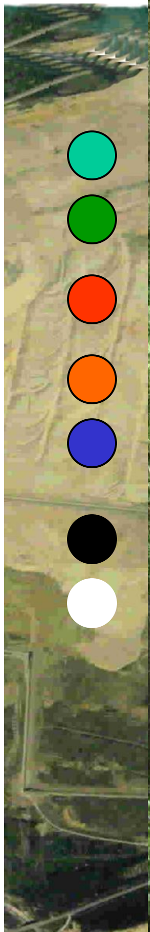
Establishment of late succession species

Carbon accumulation under variuos tree species



Frouz et al., 2009. Biogeochemistry 94(2): 111-121

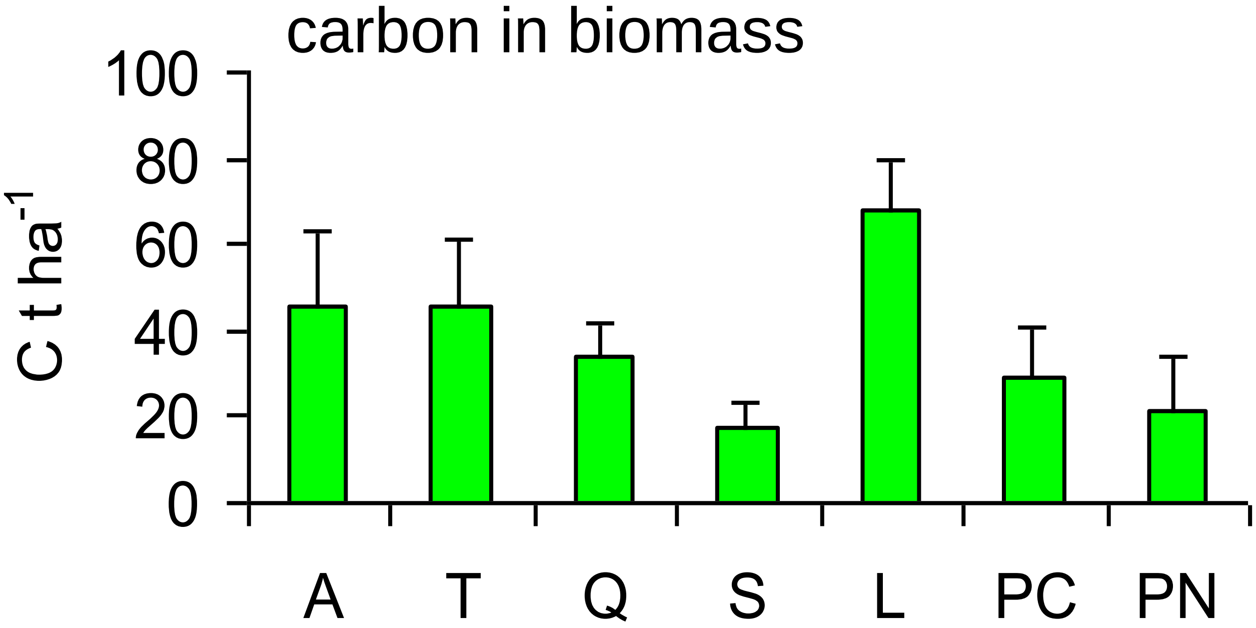
Carbon accumulation under variuos tree species

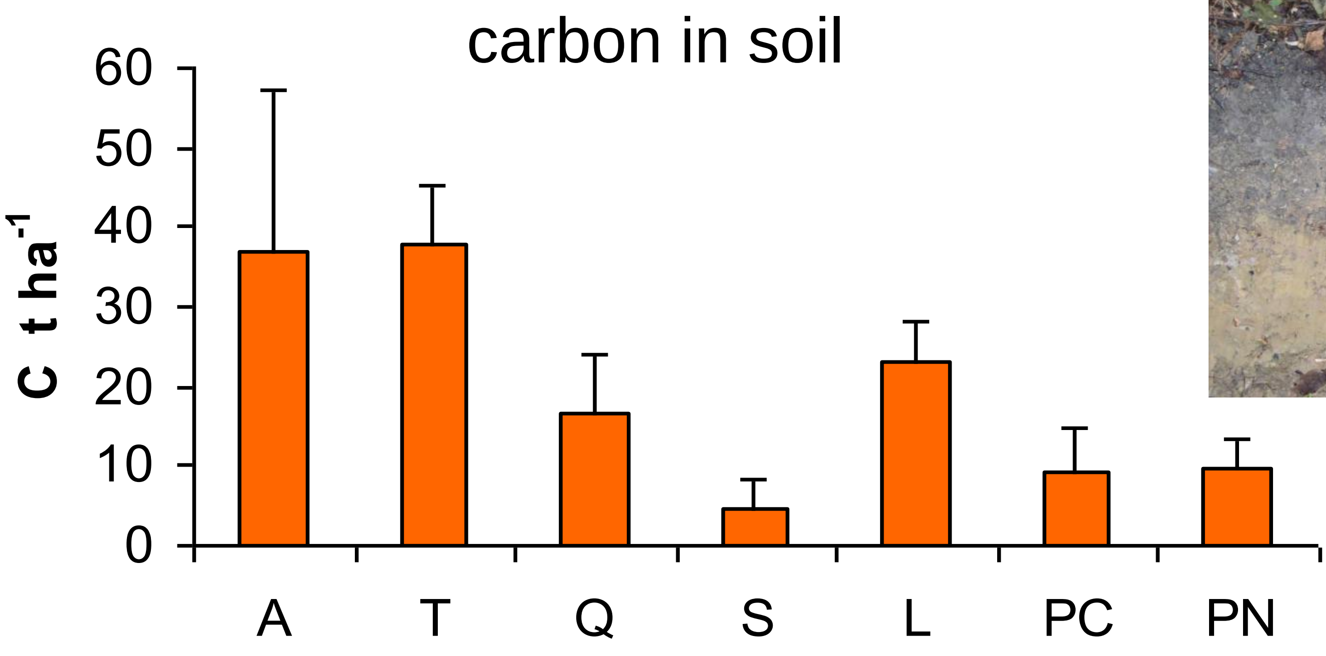


Frouz et

Carbon accumulation under variuos tree species

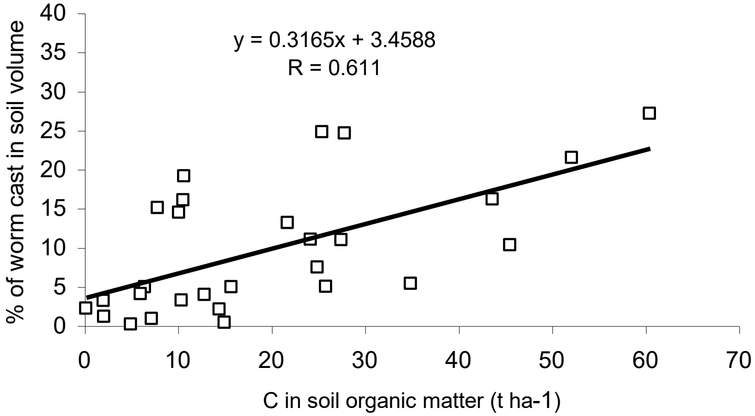
Frouz et

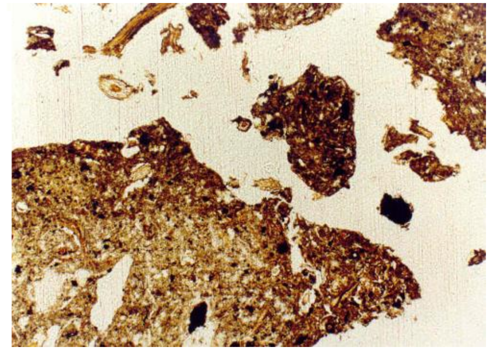


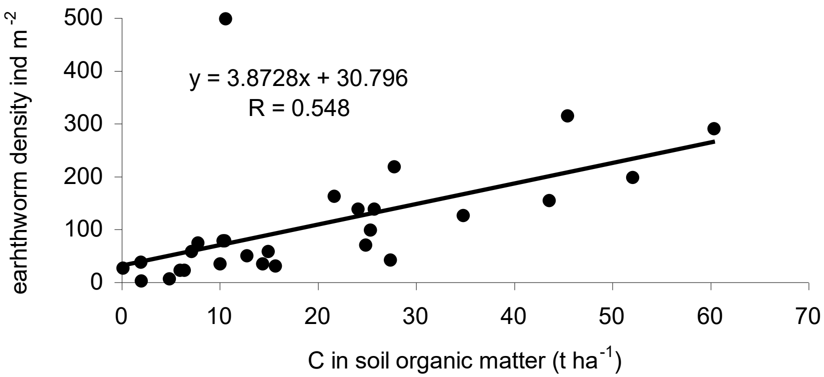


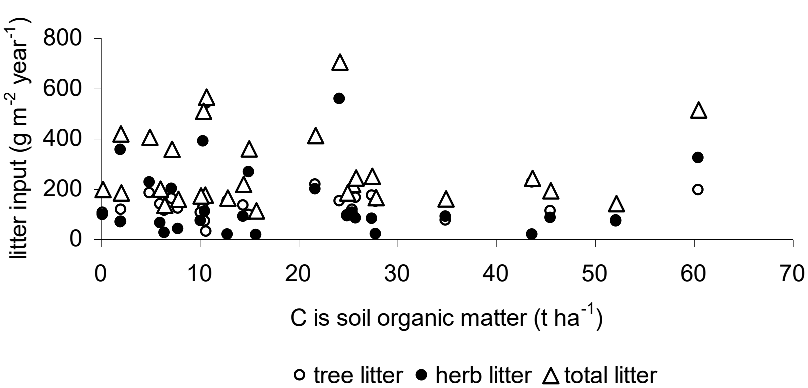
22-32
Old plots

Frouz et al., 2009. Biogeochemistry 94(2): 111-121

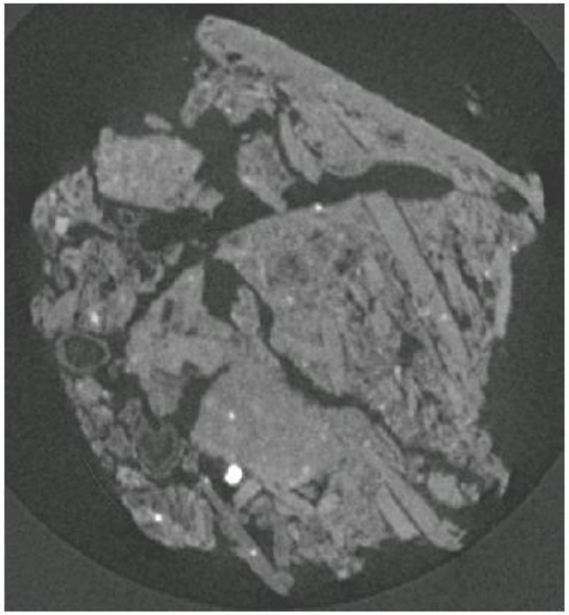




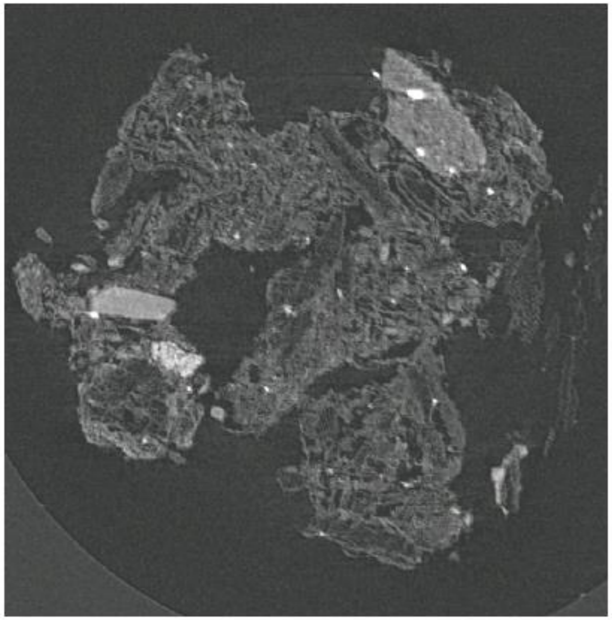




Frouz et al., 2009. Biogeochemistry 94(2): 111-121



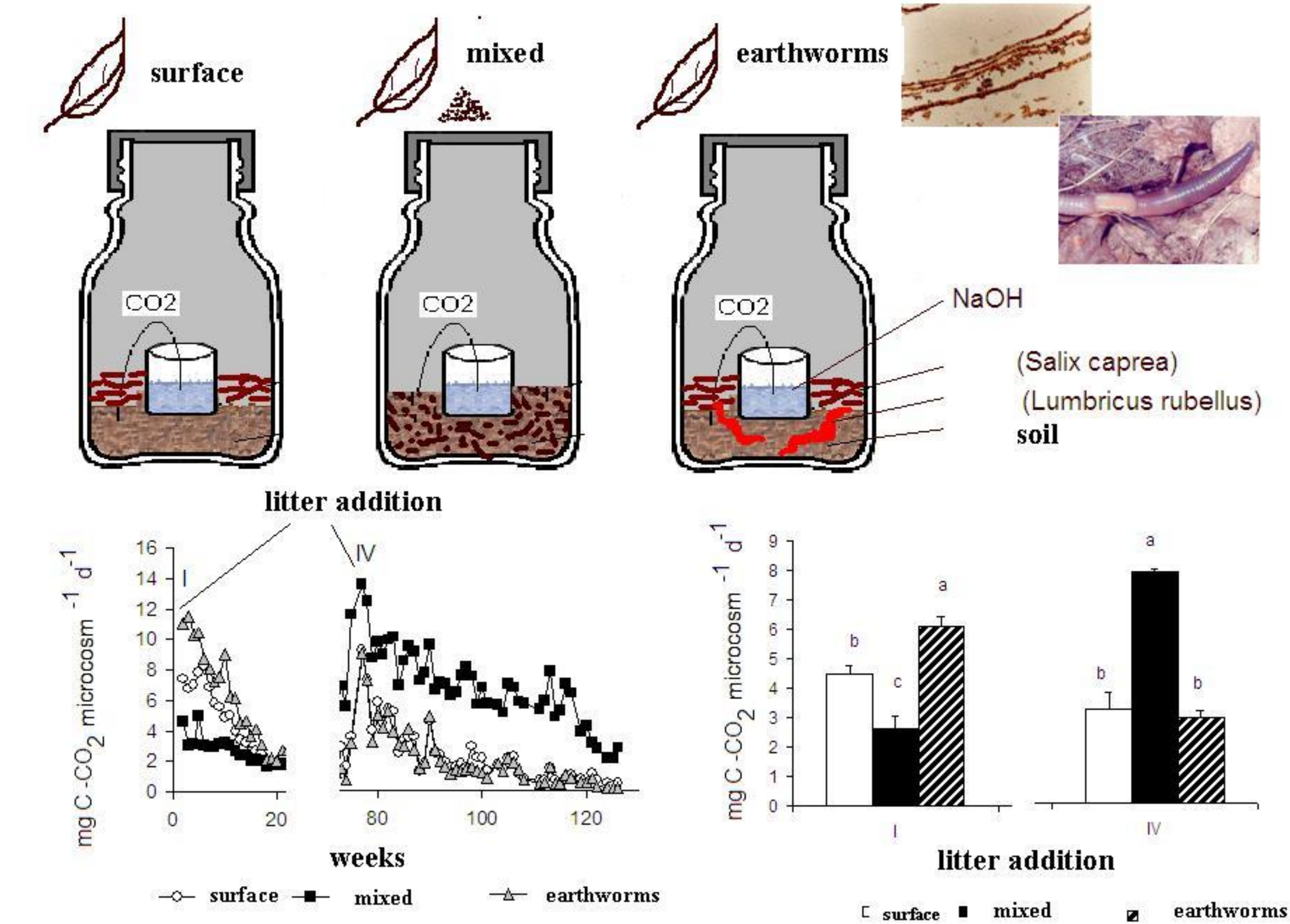
Other aggregares



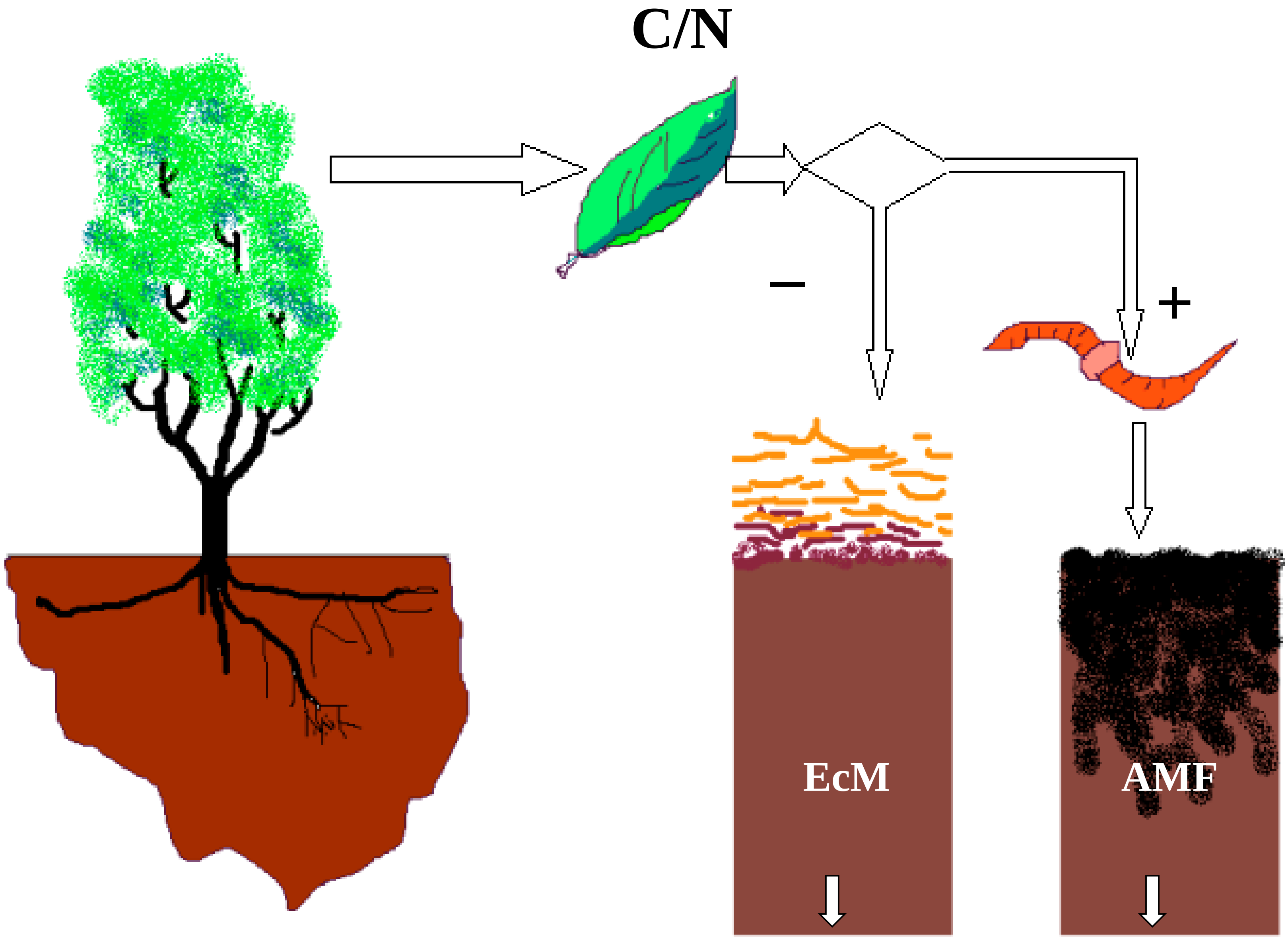
Earthworm cast

	Other aggregates	Earthworm cast
Light POM	0.34±0.21	0.84±0.55
Bounded light POM	0.18±0.12*	1.34±0.43*

Frouz J, et al., 2011. Folia Microbiologica. 56:36-43.

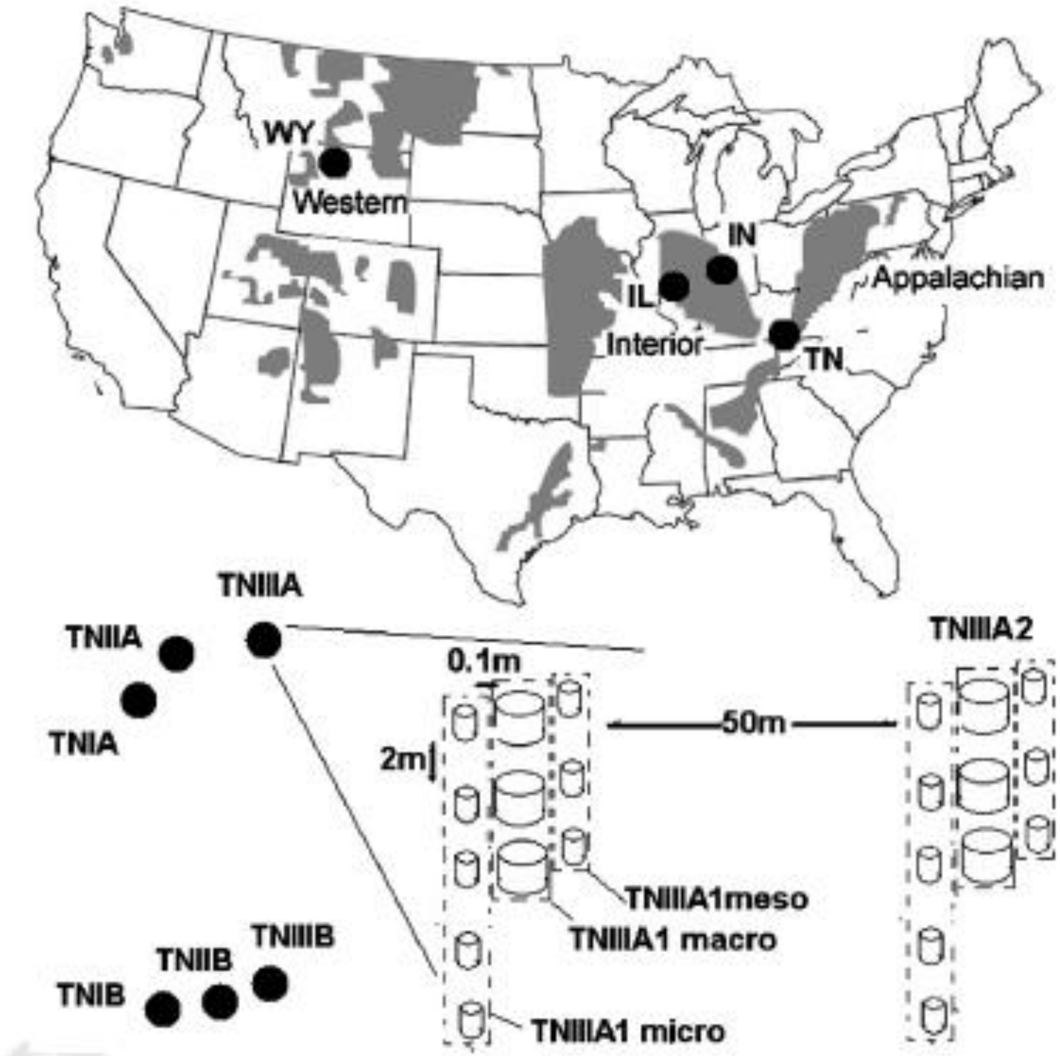


Frouz et al., 2014 Soil Biology and Biochemistry, 78: 58-64.



Frouz et al., 2013.
Forest Ecology and Management,
309: 87-95.

soil chemistry
microbial properties
mycorrhiza



In each area two parallel chronosequences

each consists of 3 sites:

2-5 year old reclaimed sites (I)

15-20 year old reclaimed sites (II)

local climax (III)

soil chemistry microflora, microfauna, macrofauna were studied

Frouz et al. 2013. Soil Biology and Biochemistry, 67: 212-225.

Reclaimed 15-year-old & Not reclaimed & Climax

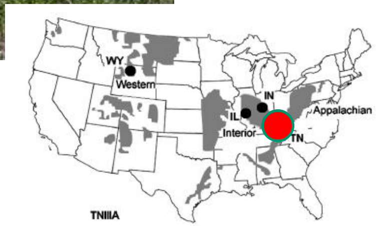
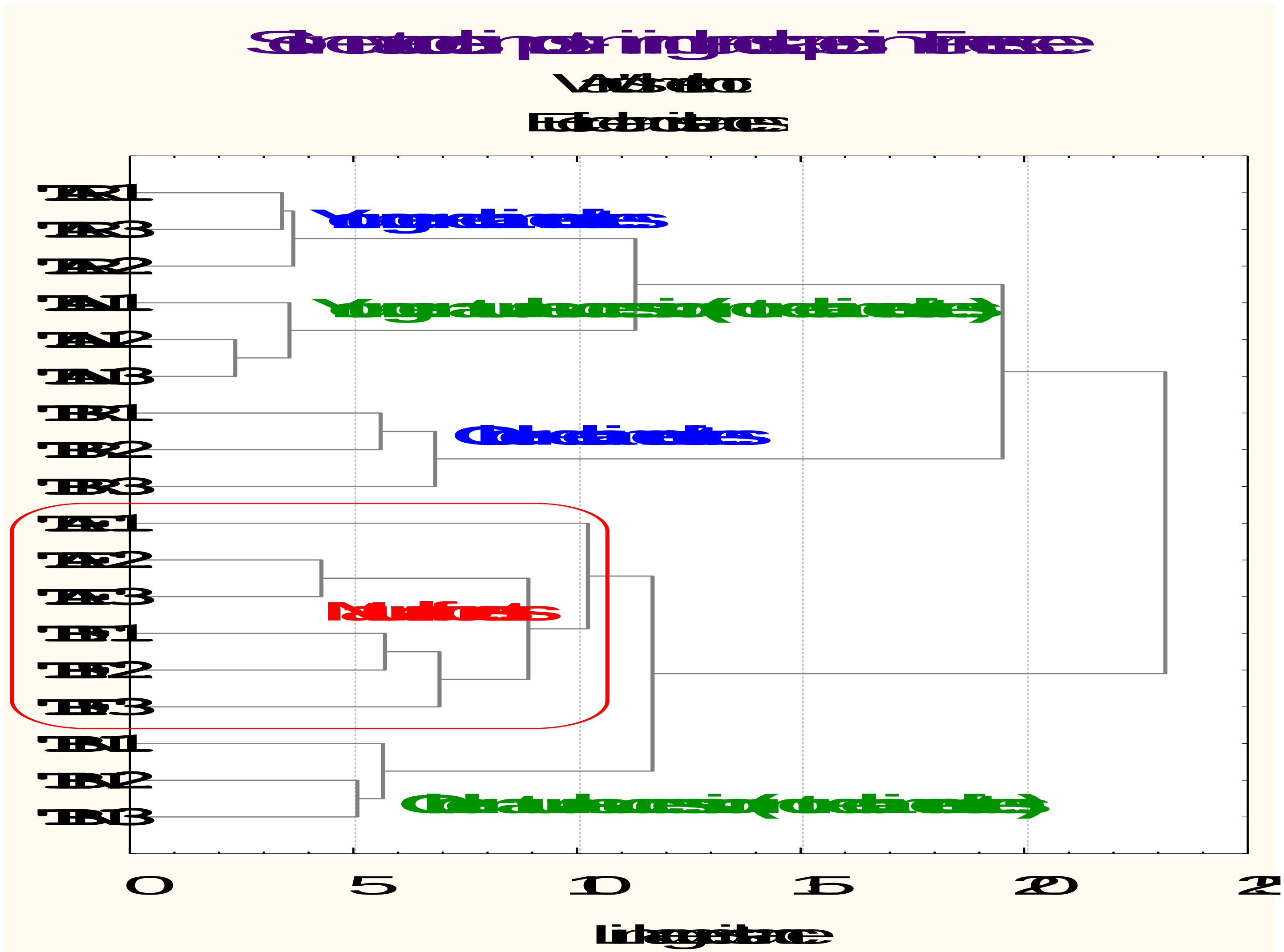


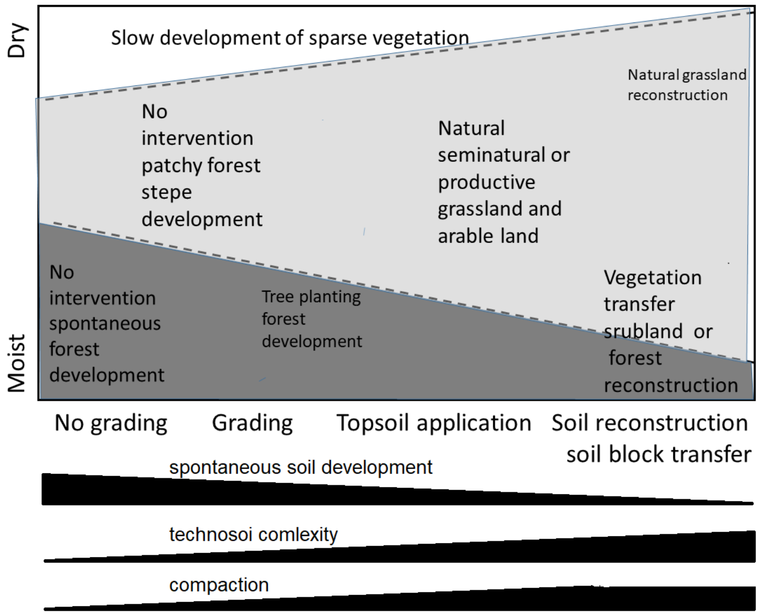
Fig. 2. Cluster analysis of soil nematodes in coal post-mining sites subjected to assisted reclamation (TAR, TBR), left to natural succession (TAN, TBN) and in climax forests FAF, TBF) in Tennessee.

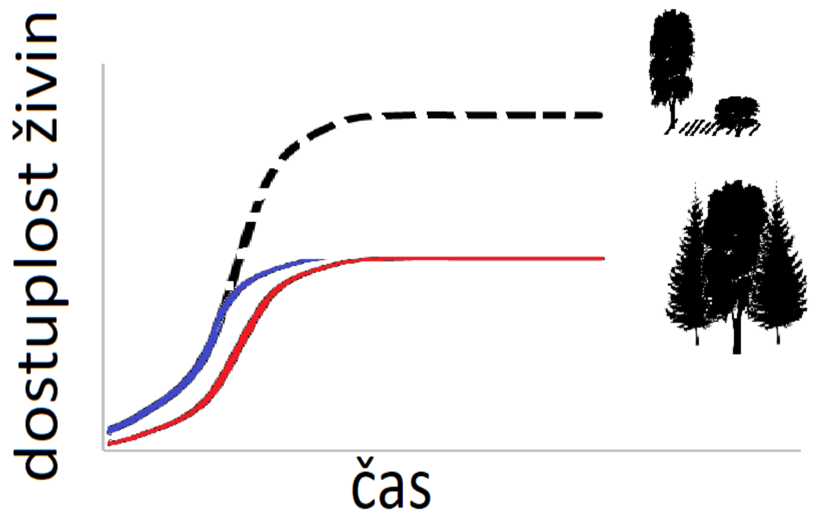


When topsoil was applied restored ecosystems get closer to the climax faster in dry areas rather than in humid ones, apparently doe to ecosystem simplicity

Fast return of simple shortgrass community is possible only if abiotic soil environment is preserved (restored). If the abiotic environment is degraded then resilience is very low.

Shrnutí (take home mesage)





Existuje trade of mezi přípravou půdy a kompakcí, komplexnější rekonstrukce půdy přináší riziko kompakce zvýhodňuje traviny znevýhodňuje dřeviny, na začátku urychluje vývoj, později rozdíl zaniká nebo jej může i zpomalit. Přínos závisí na klimatu.

Řada rekultivačních postupů se snaží urychlit vývoj ekosystému tím, že zvyšuje dostupnost živin. To přináší riziko přestřelení živinové dostupnosti a ustavení jiného typu ekosystému, riziko je tím větší, čím více je cílový ekosystém oligotrofní a více se opírající o druhy rostlin s konzervativní růstovou strategií

Děkuji za pozornost