Obnova půd na výsypkách po povrchové těžbě uhlí – vliv klimatu a vegetace

Jan Frouz

L. Háněl. K Tajovsky, V Pižl, O Vindušková a mnoho dalších

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Diversita půdních organismů

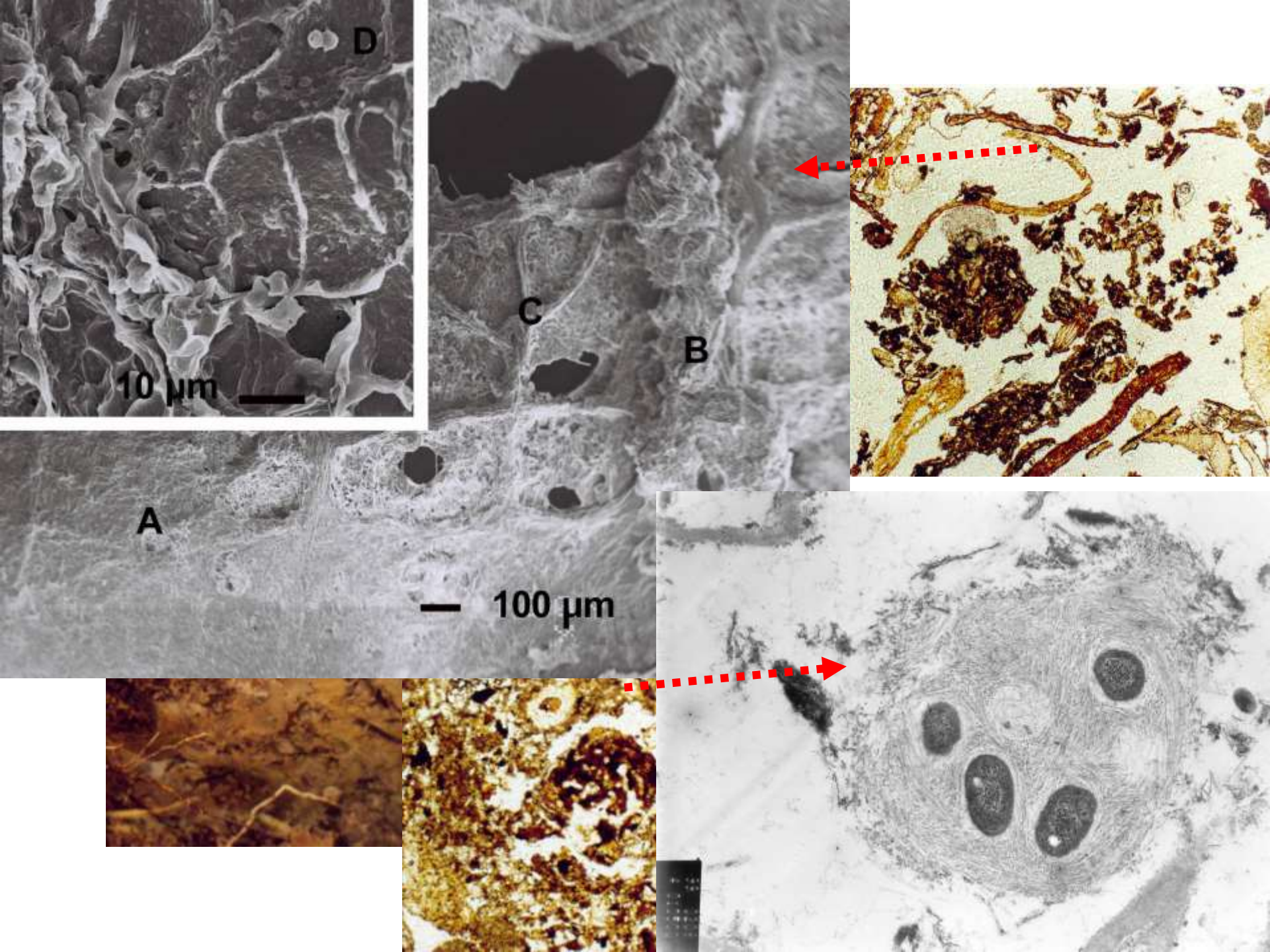
40 let stará nerekultivovaná plocha

43 druhů rostlin 100m^2

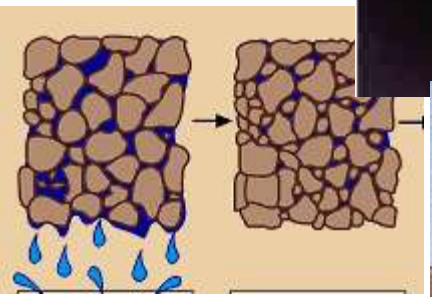
group	numbe
fungi	25
algae	49
Protozoa	20
Nematoda	43 ger
Oribatida	16
Chilopoda	7
Diplopoda	7
Lumbricidae	3

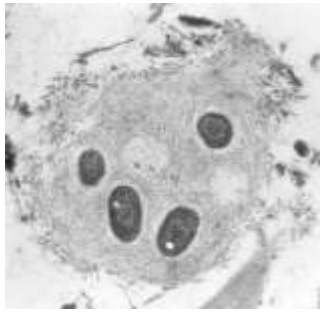
min 170 druhů půdních organismů

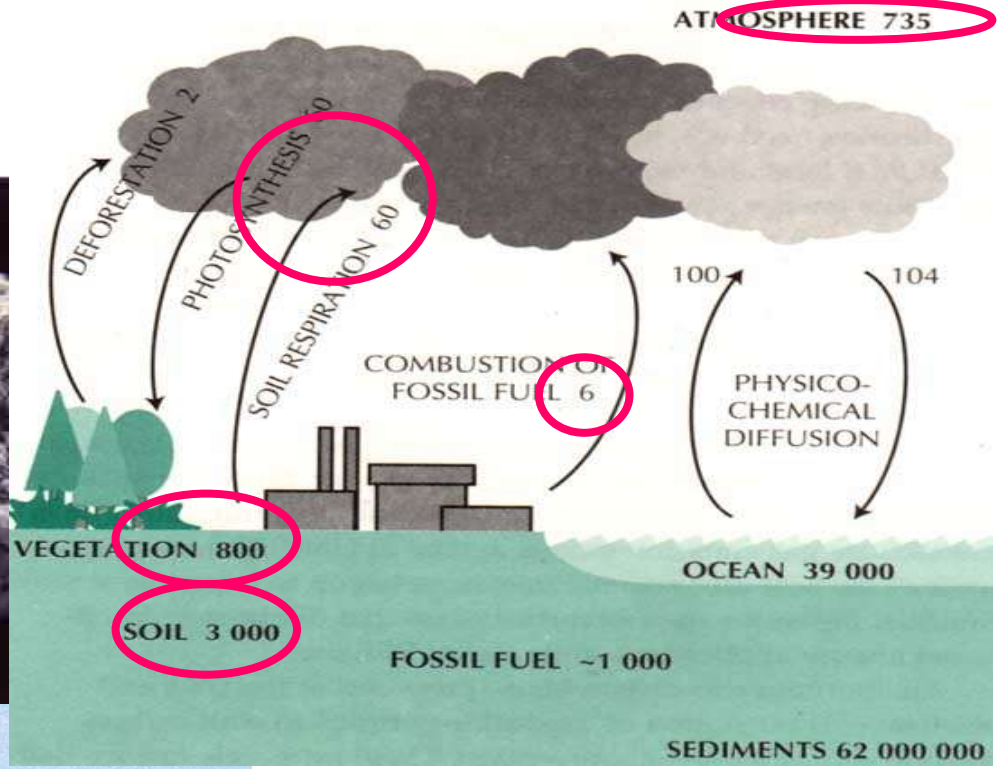
2-3 x víc 1 m^2

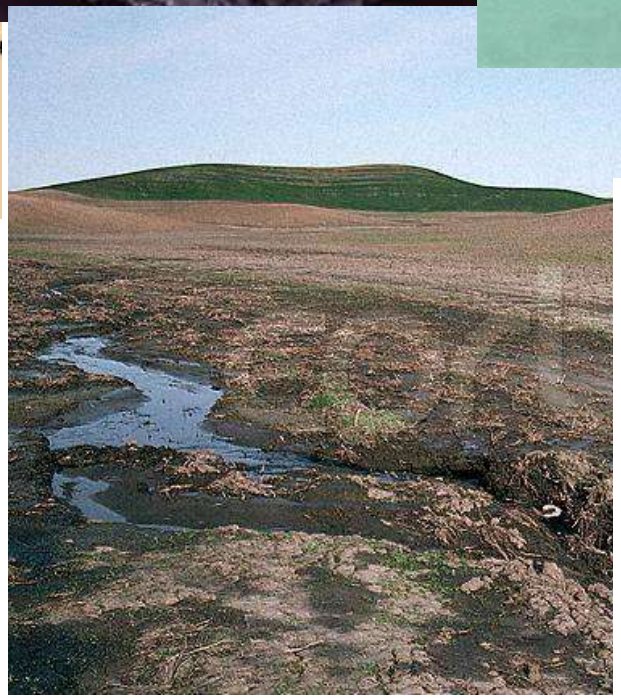

D
10 µm
C
B
A
100 µm

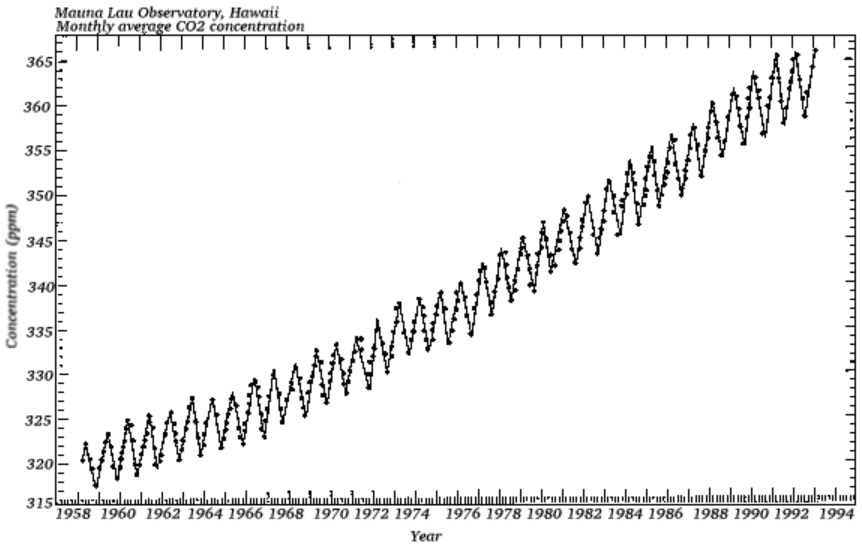
Půdní organická hmota

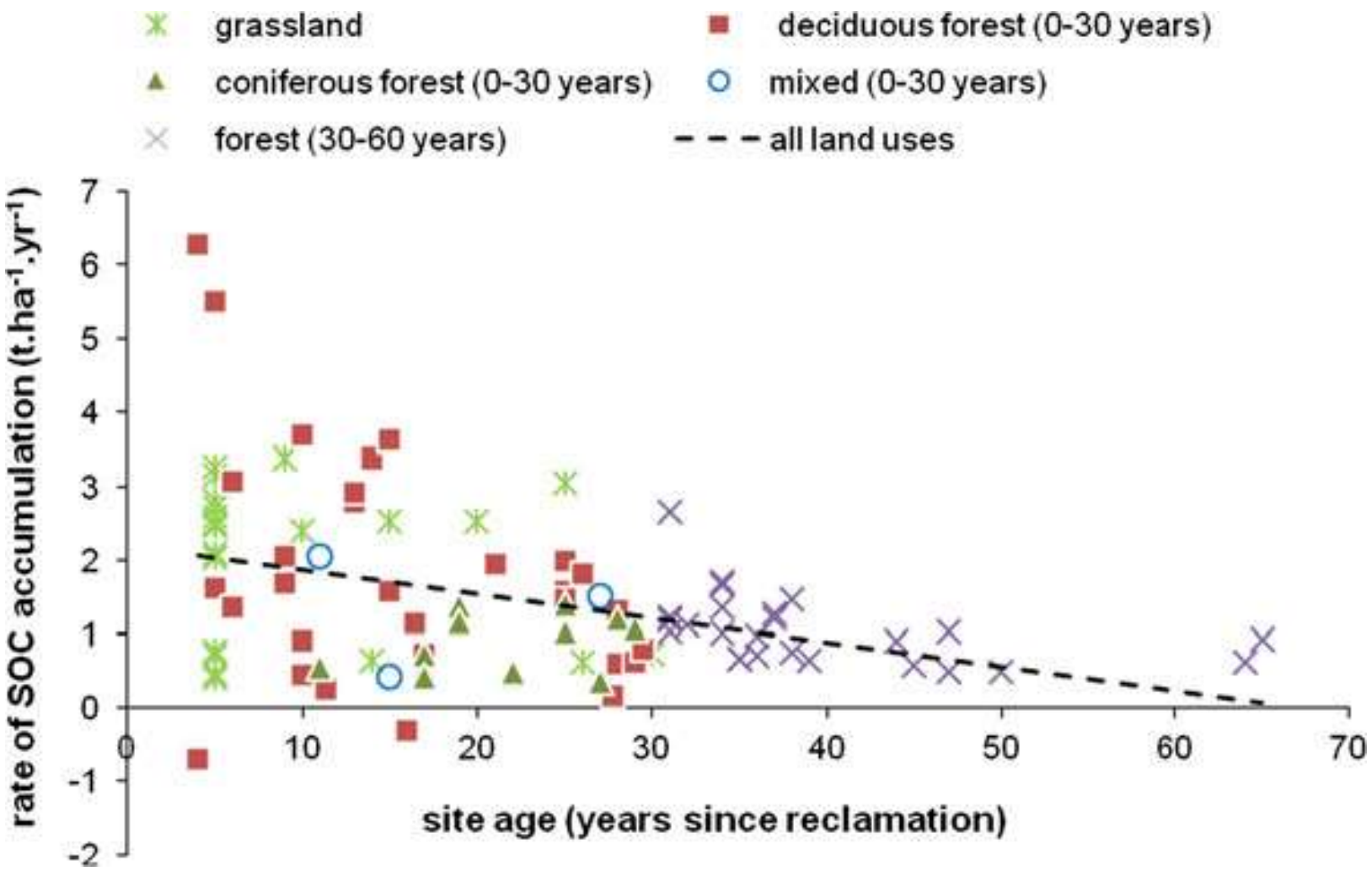


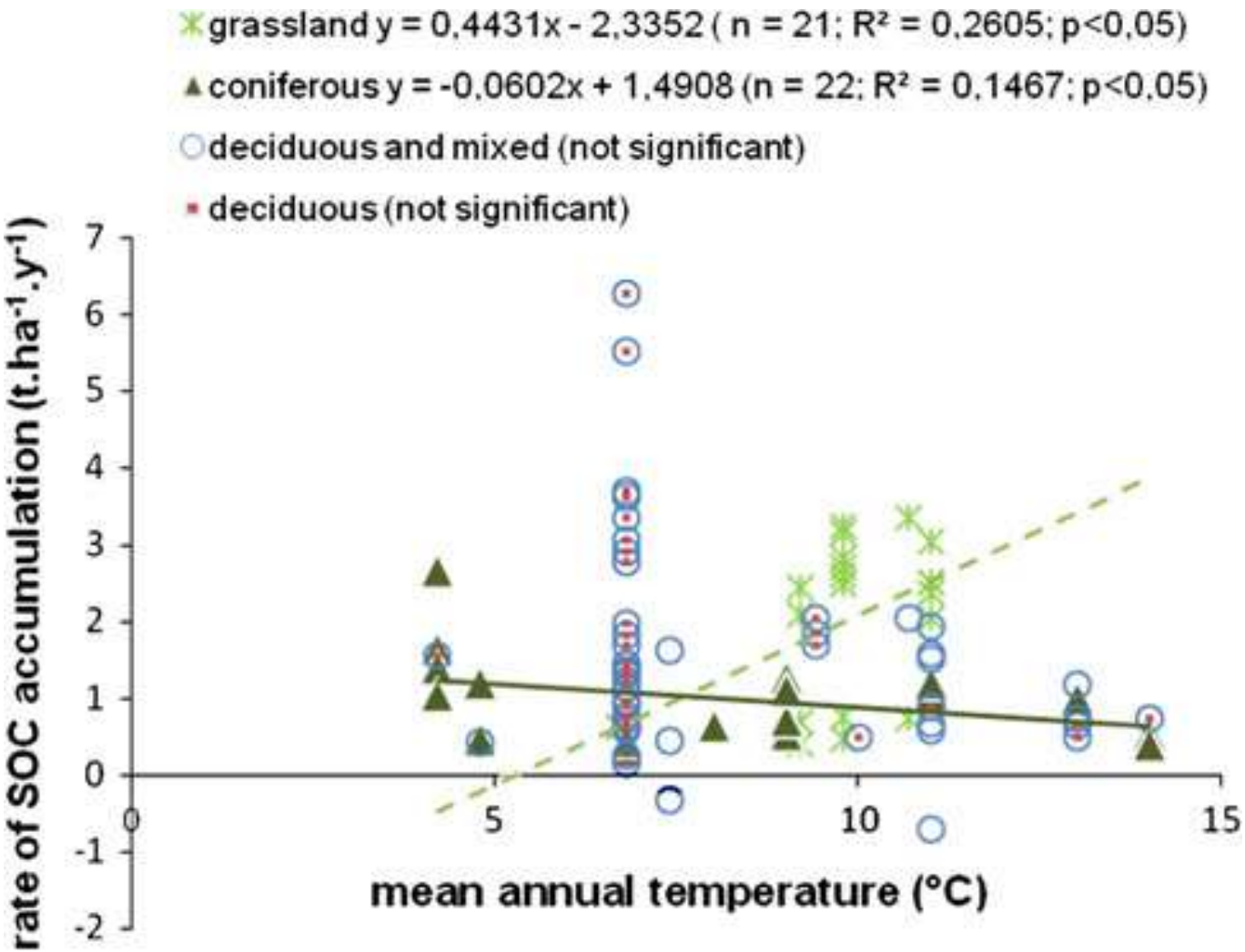


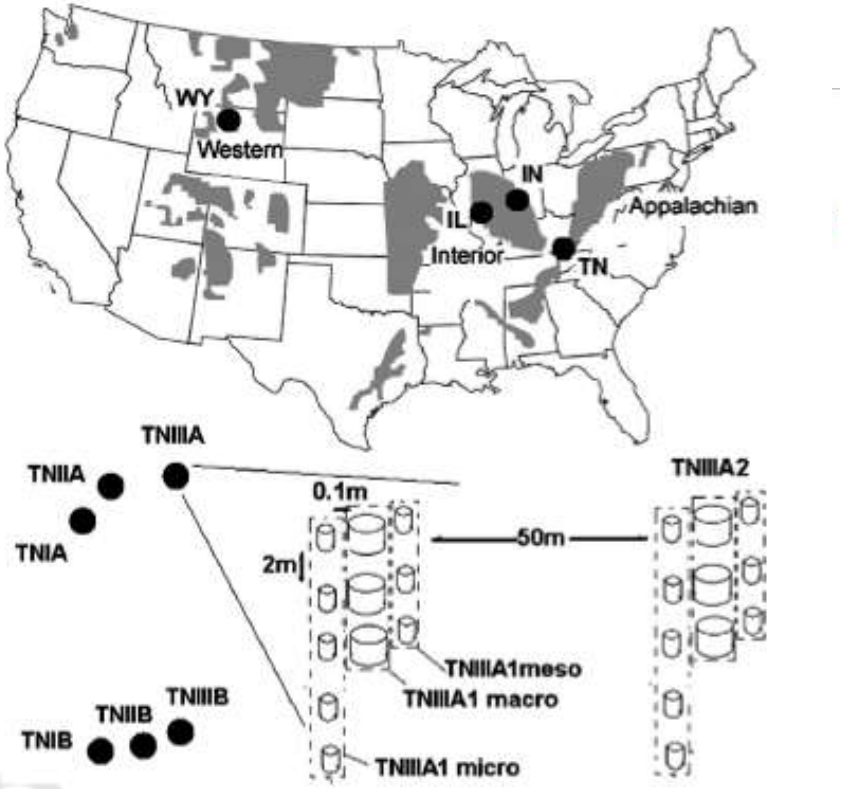







grassland
deciduous forest (0-30 years)
coniferous forest (0-30 years)
mixed (0-30 years)
forest (30-60 years)
all land uses
rate of SOC accumulation (t.ha-1.yr-1)
site age (years since reclamation)
7
6
5
4
3
2
1
0
-1
-2
0
10
20
30
40
50
60
70


grassland y = 0,4431x - 2,3352 (n = 21; R² = 0,2605; p<0,05)
coniferous y = -0,0602x + 1,4908 (n = 22; R² = 0,1467; p<0,05)
deciduous and mixed (not significant)
deciduous (not significant)
rate of SOC accumulation (t.ha-1.y-1)
7
6
5
4
3
2
1
0
-1
-2
0
5
10
15
mean annual temperature (°C)

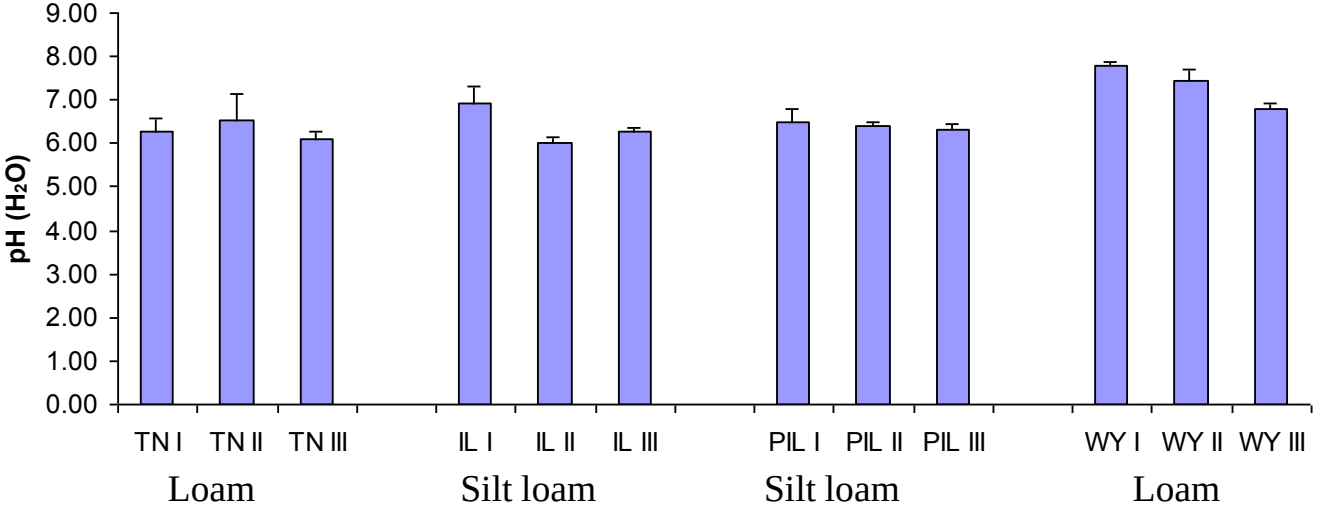


V každé oblasti dvě paralelní chronosequence každá:

2-5 let (I)

15-20 let (II)

klimax (III)




TNI


TNII


TNIII


INI


INII

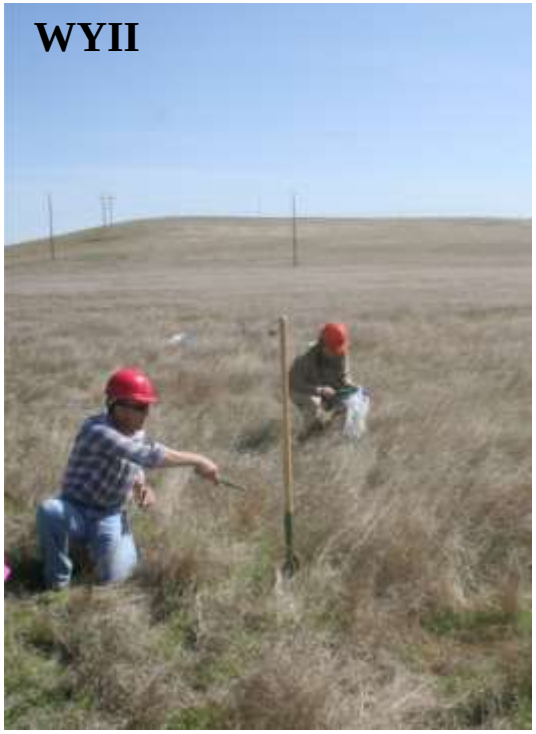

INIII


ILI


ILII

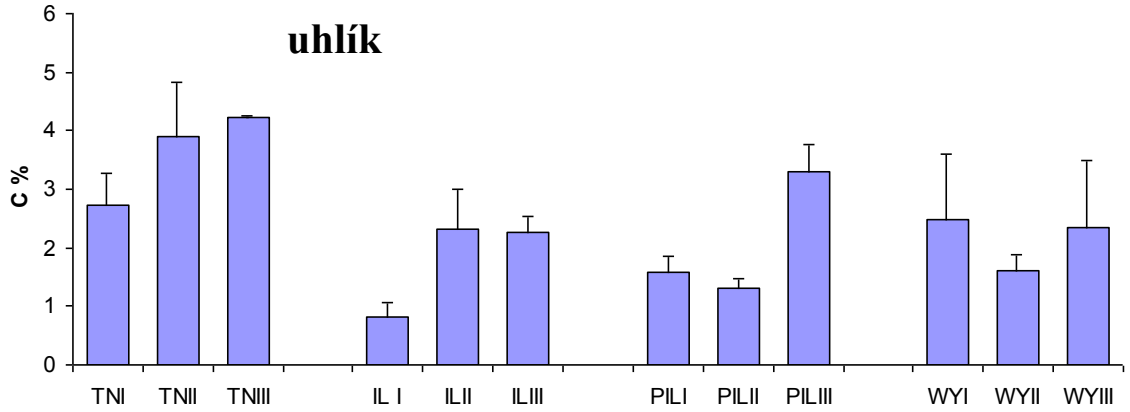

ILIII

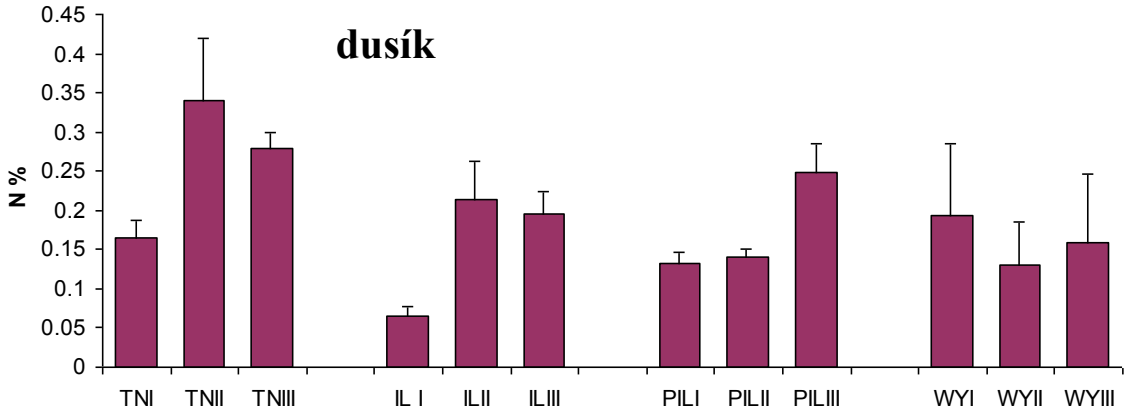

WYI

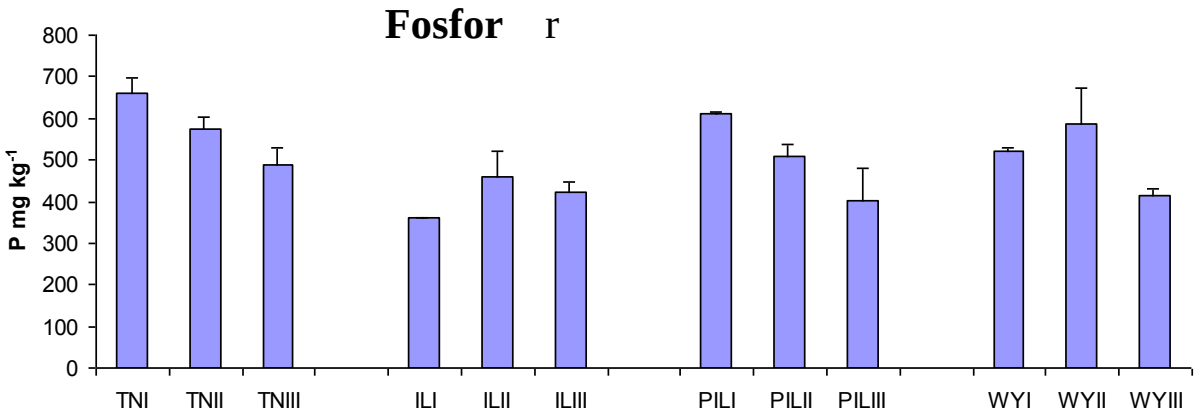

WYII


WYIII

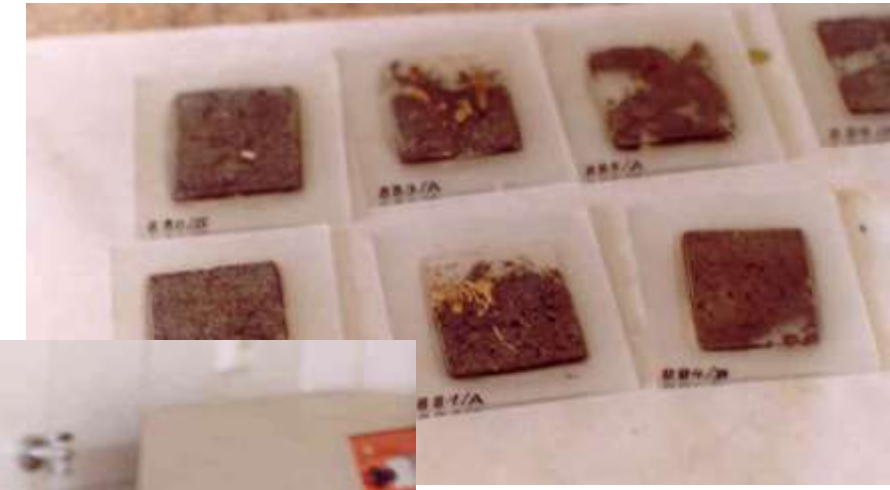
Půdní chemie

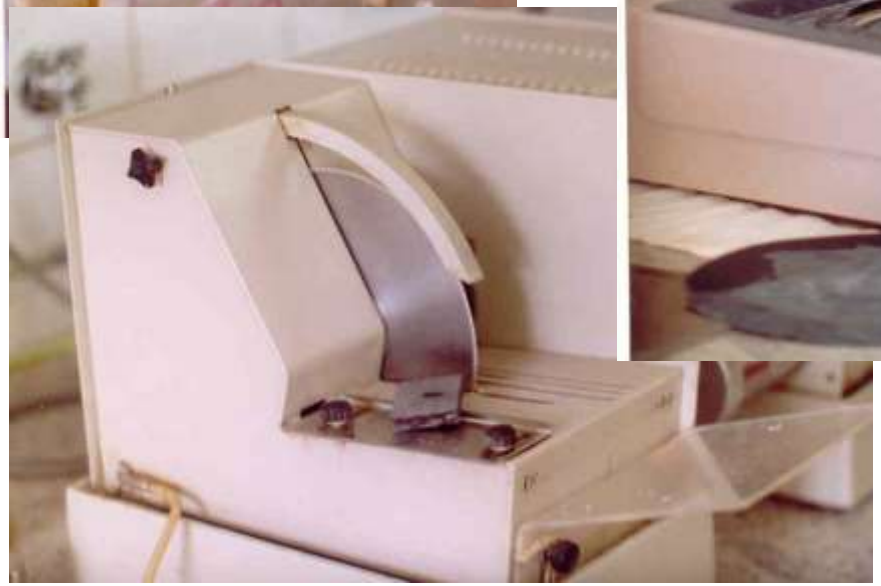




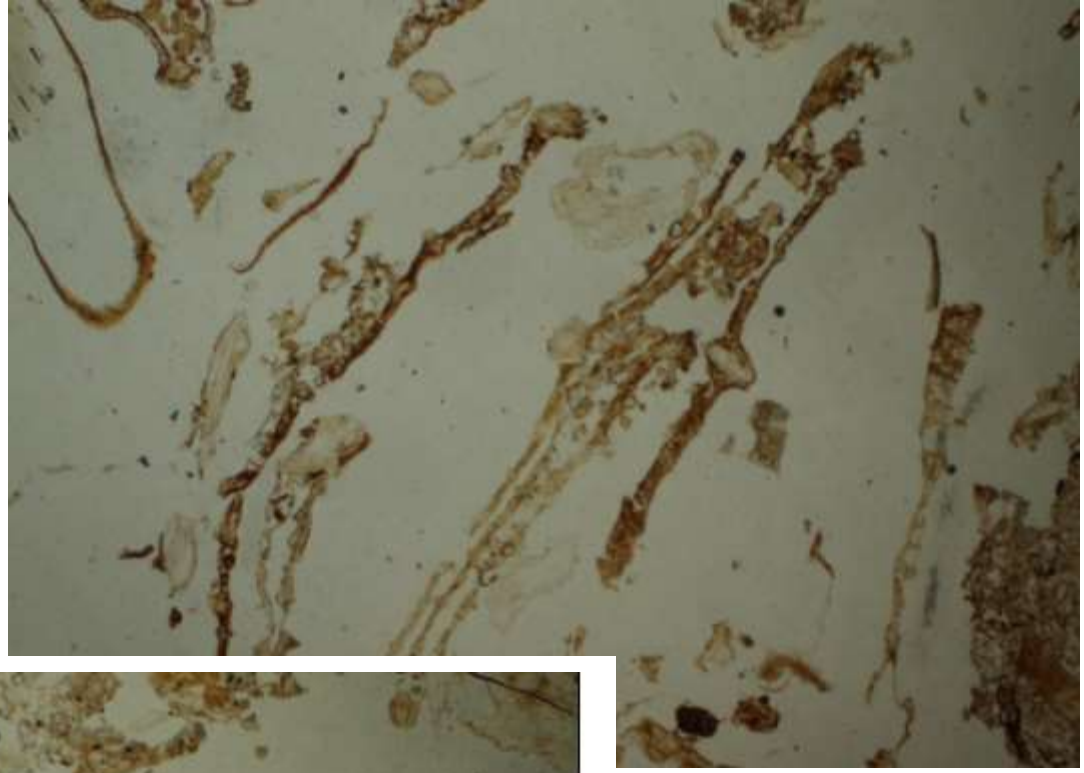


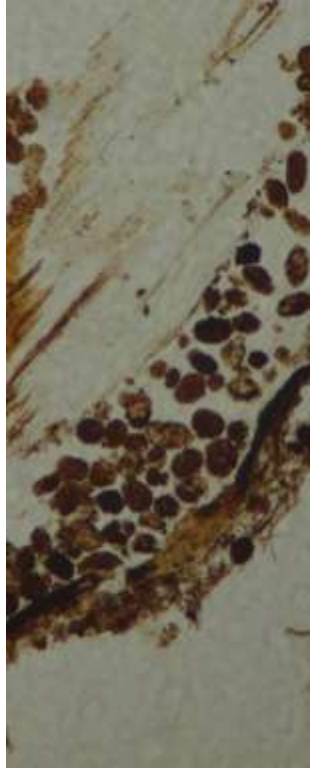
Půdní mikromorfologie

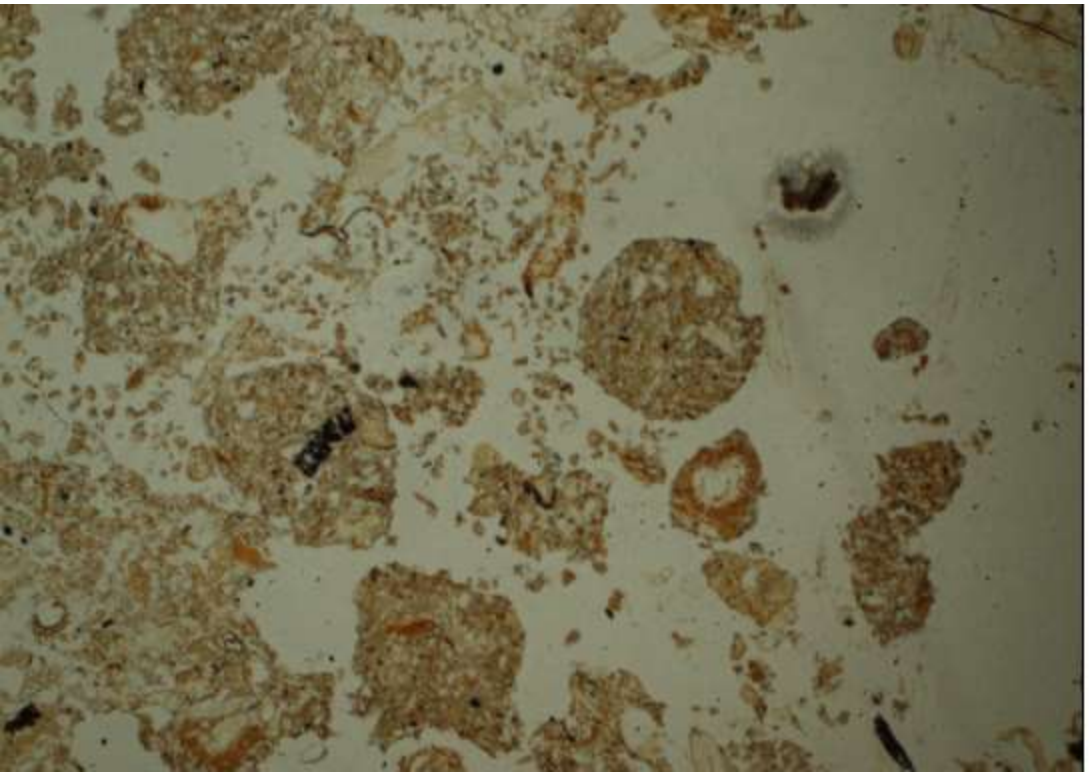


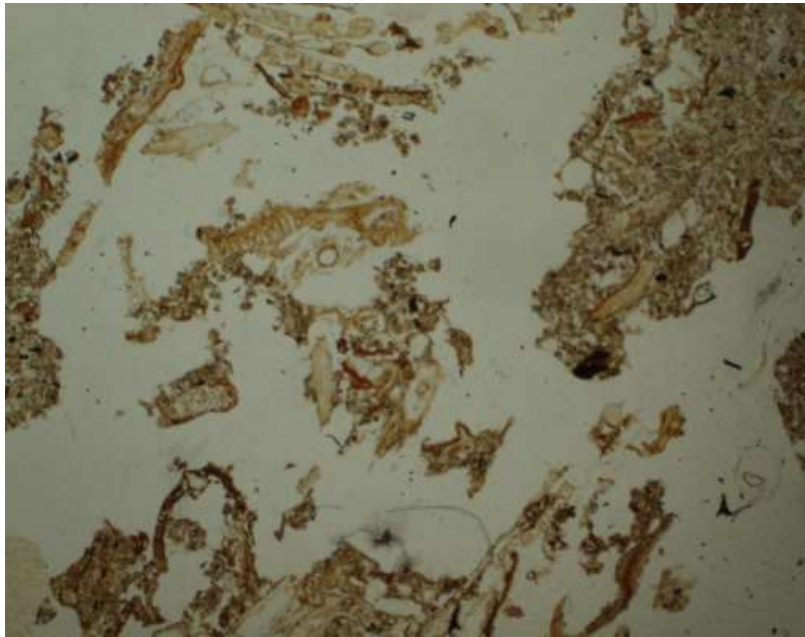


TN IN (Klimax)



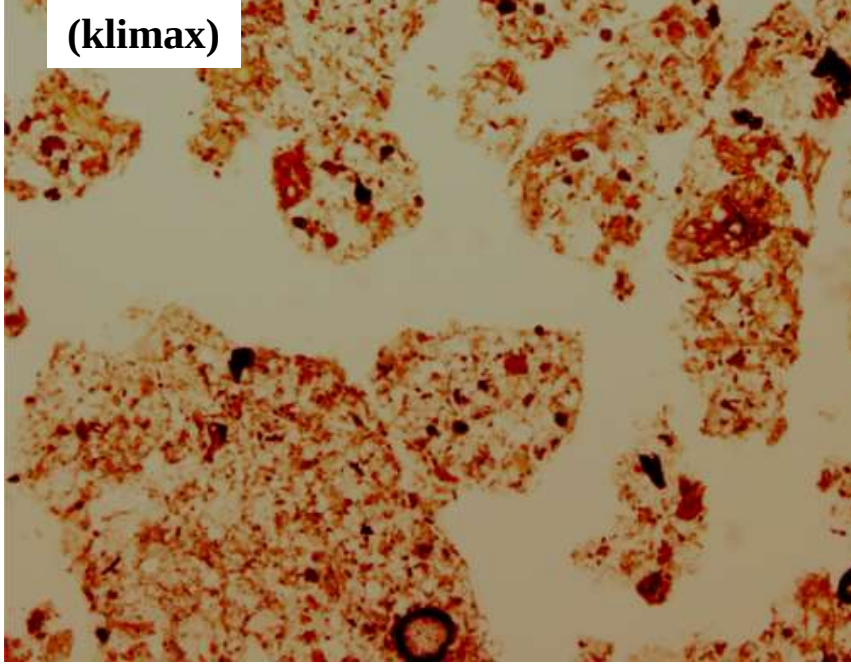


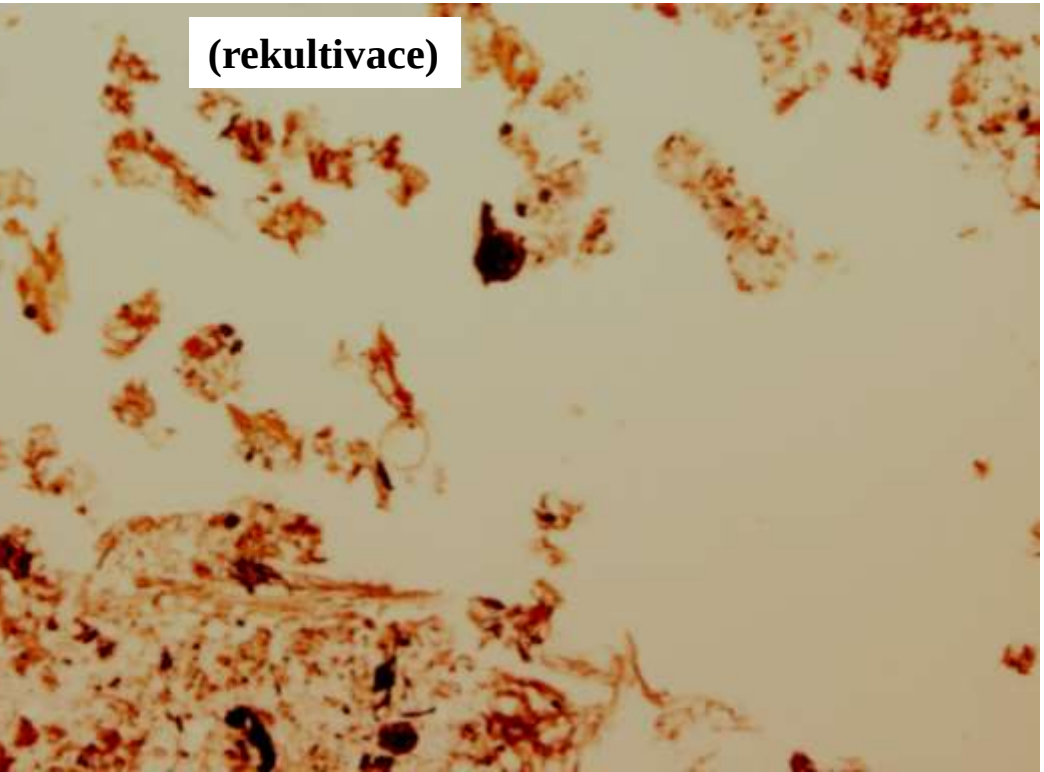


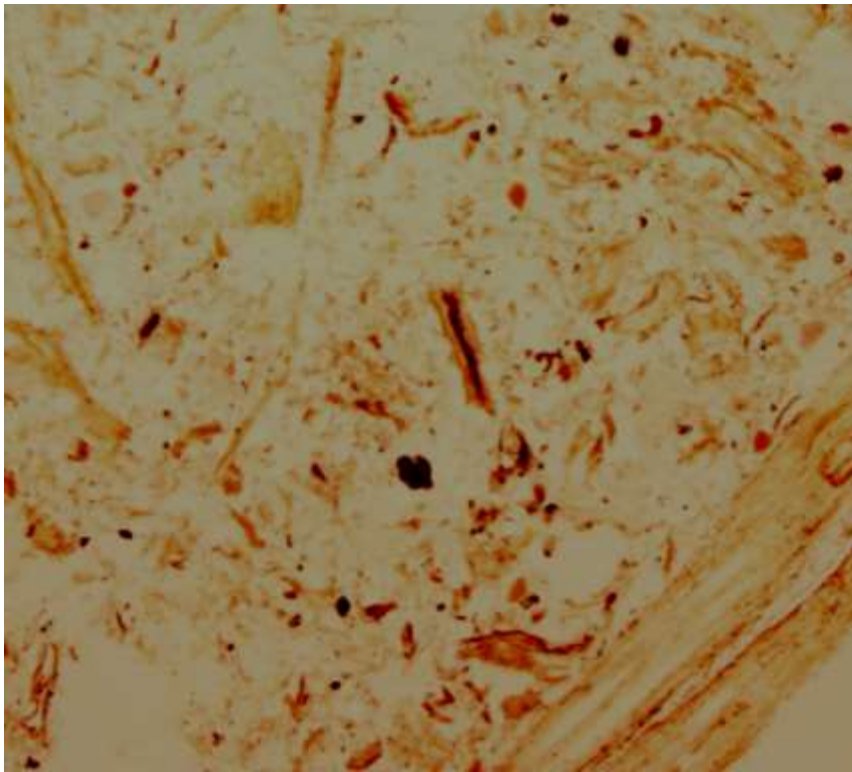


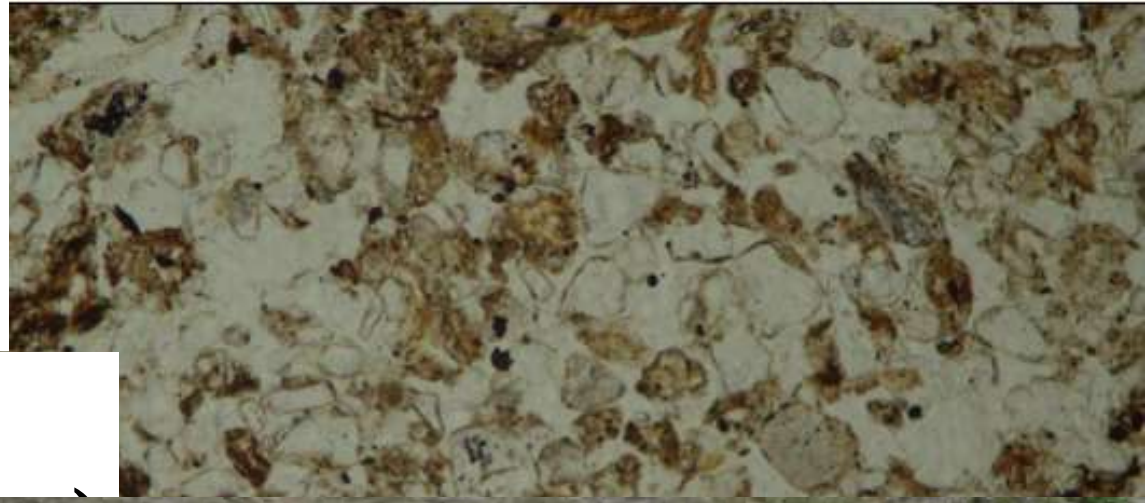

IN TN (rekultivace)
10cm


IL

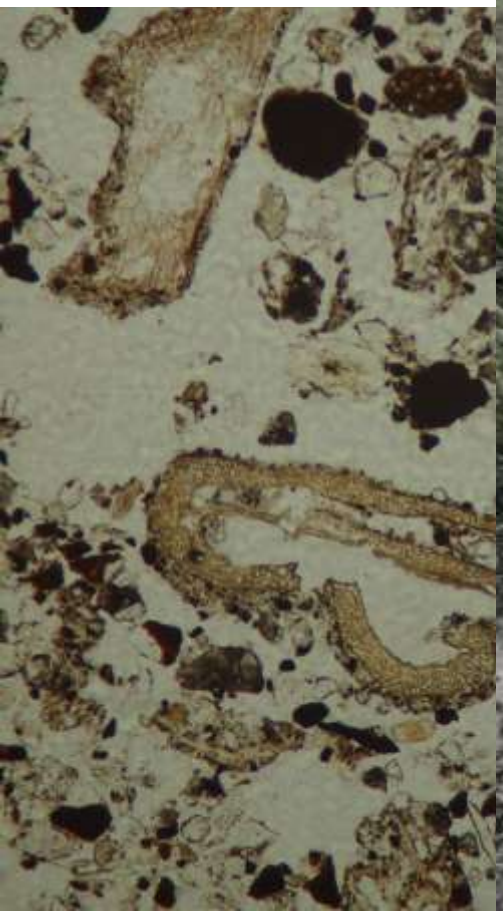

(klimax)


(rekultivace)

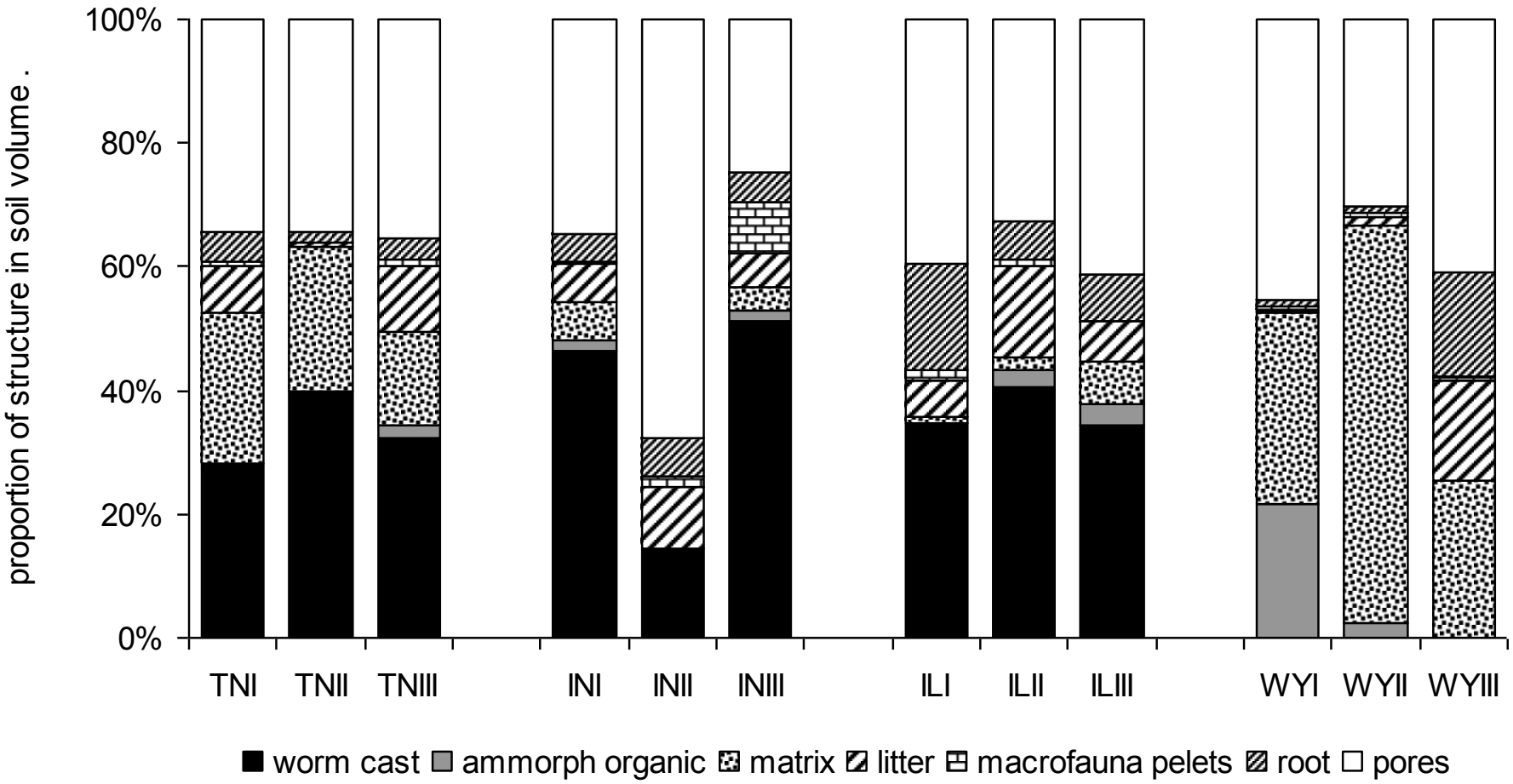


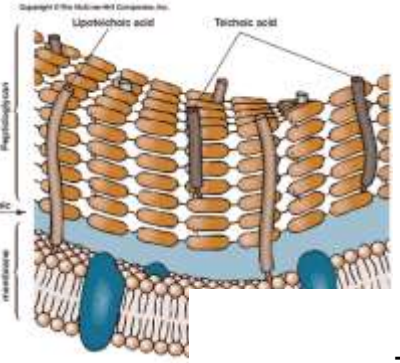


WY



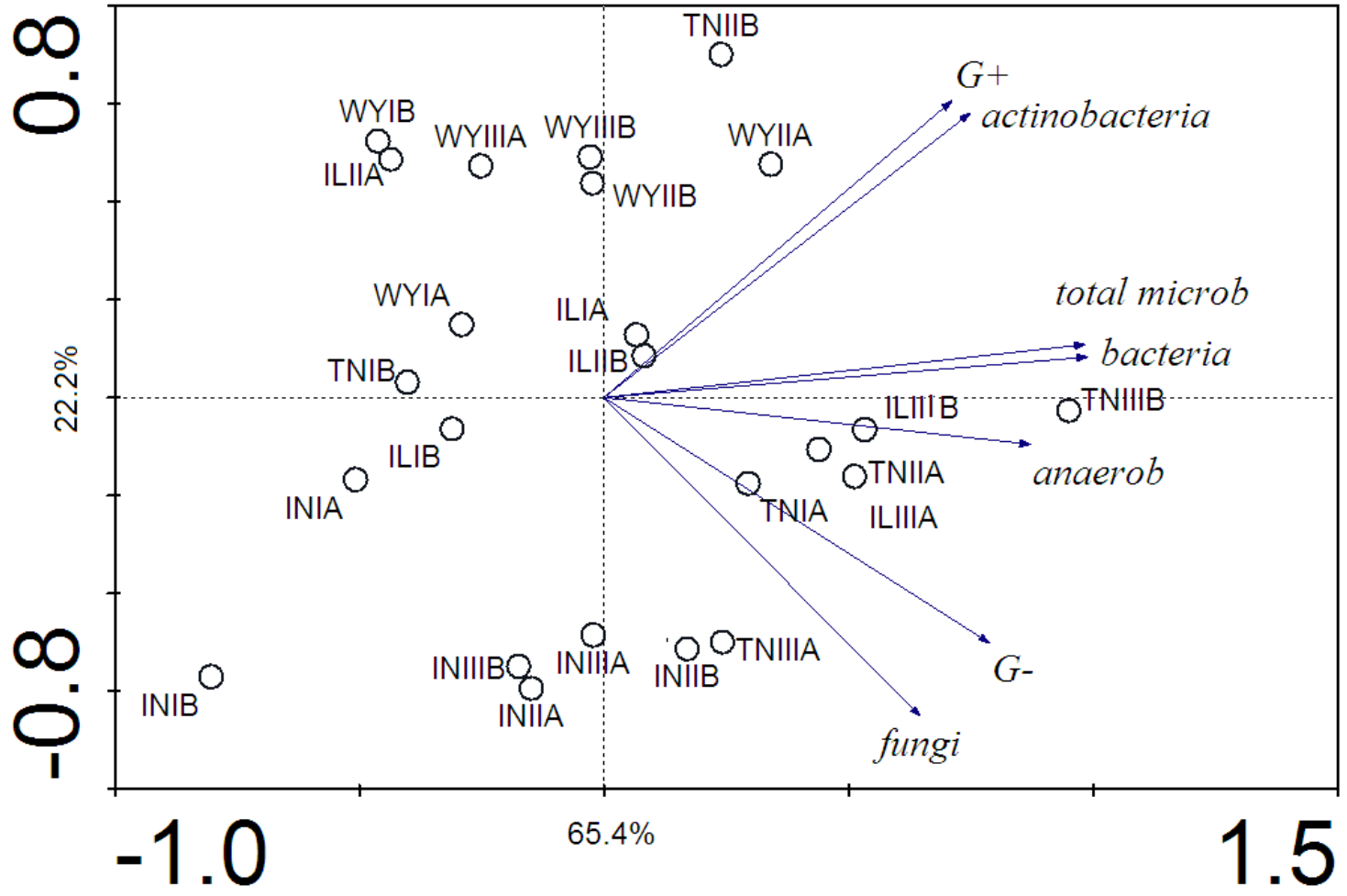
WY (rekultivace)

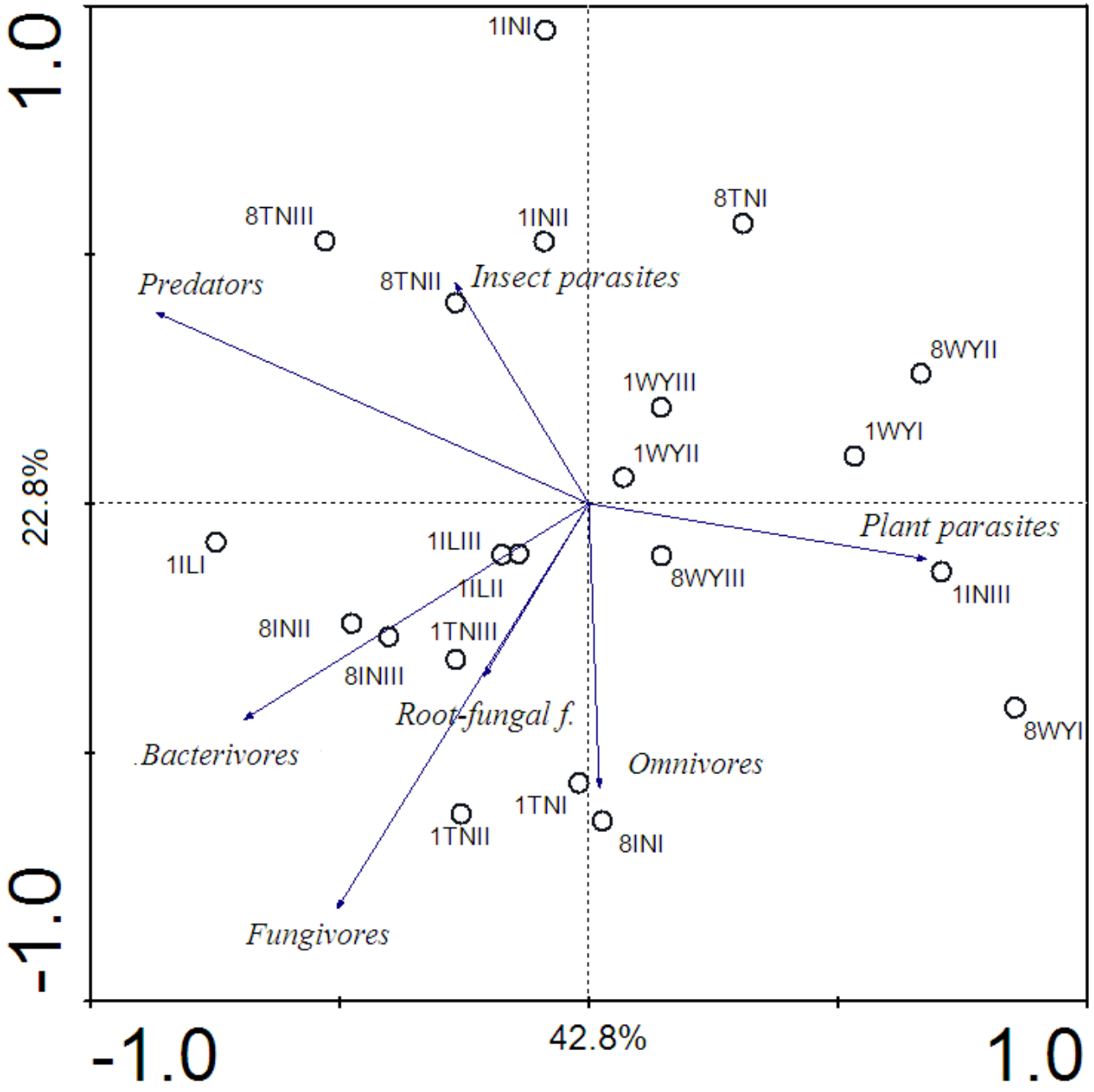

proportion of structure in soil volume .
100%
80%
60%
40%
20%
0%
TNI
TNII
TNIII
INI
INII
INIII
ILI
ILII
ILIII
WYI
WYII
WYIII
worm cast
ammorph organic
matrix
litter
macrofauna pelets
root
pores



PCA based on microbial PLFA

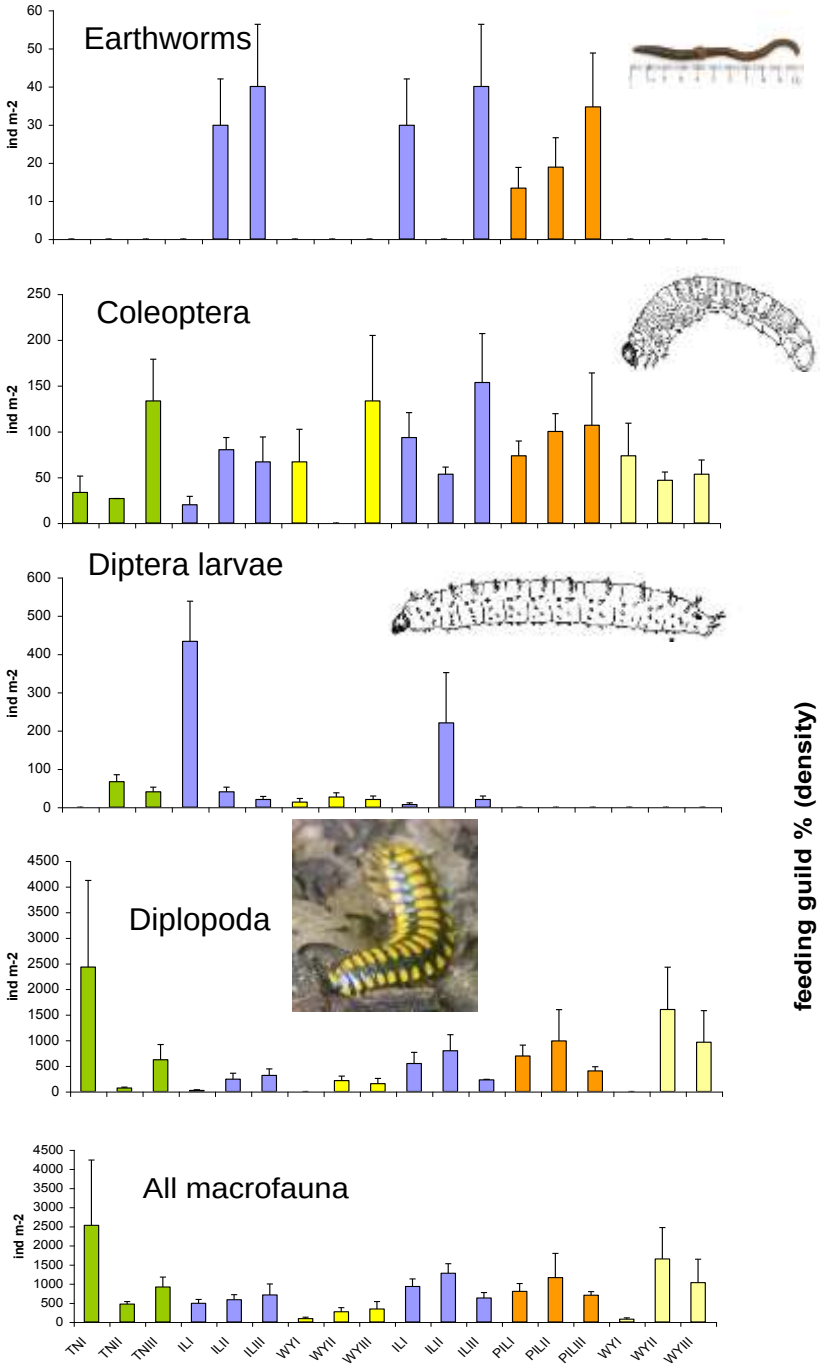
Sukcesní stáří

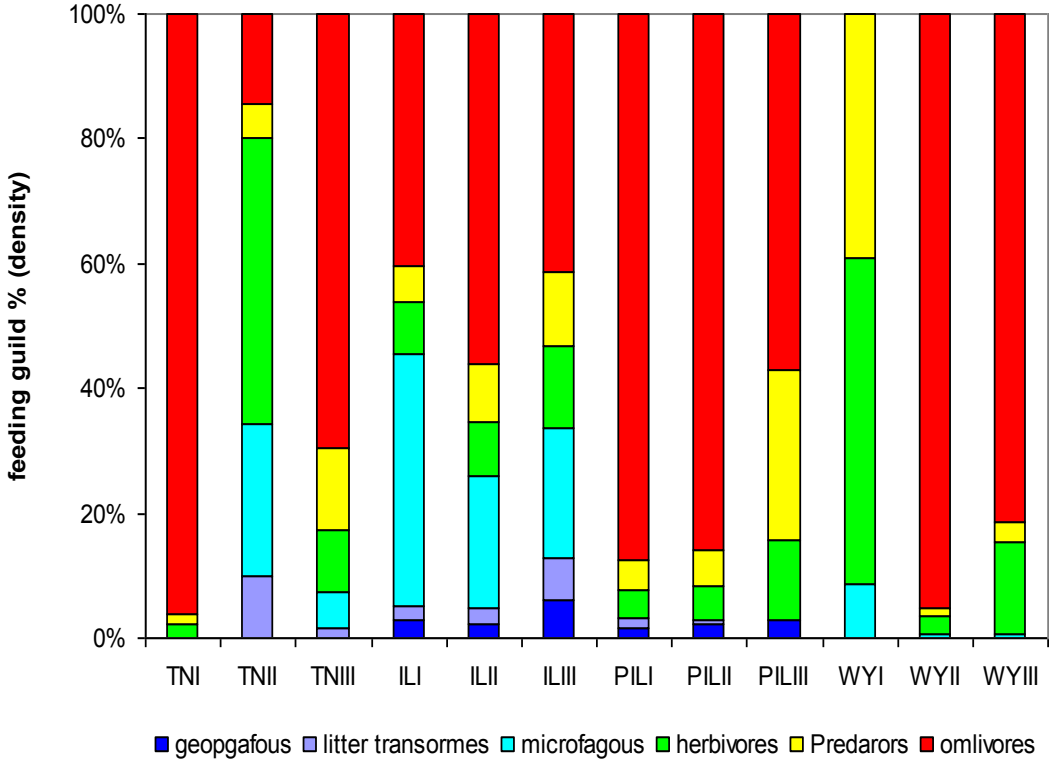


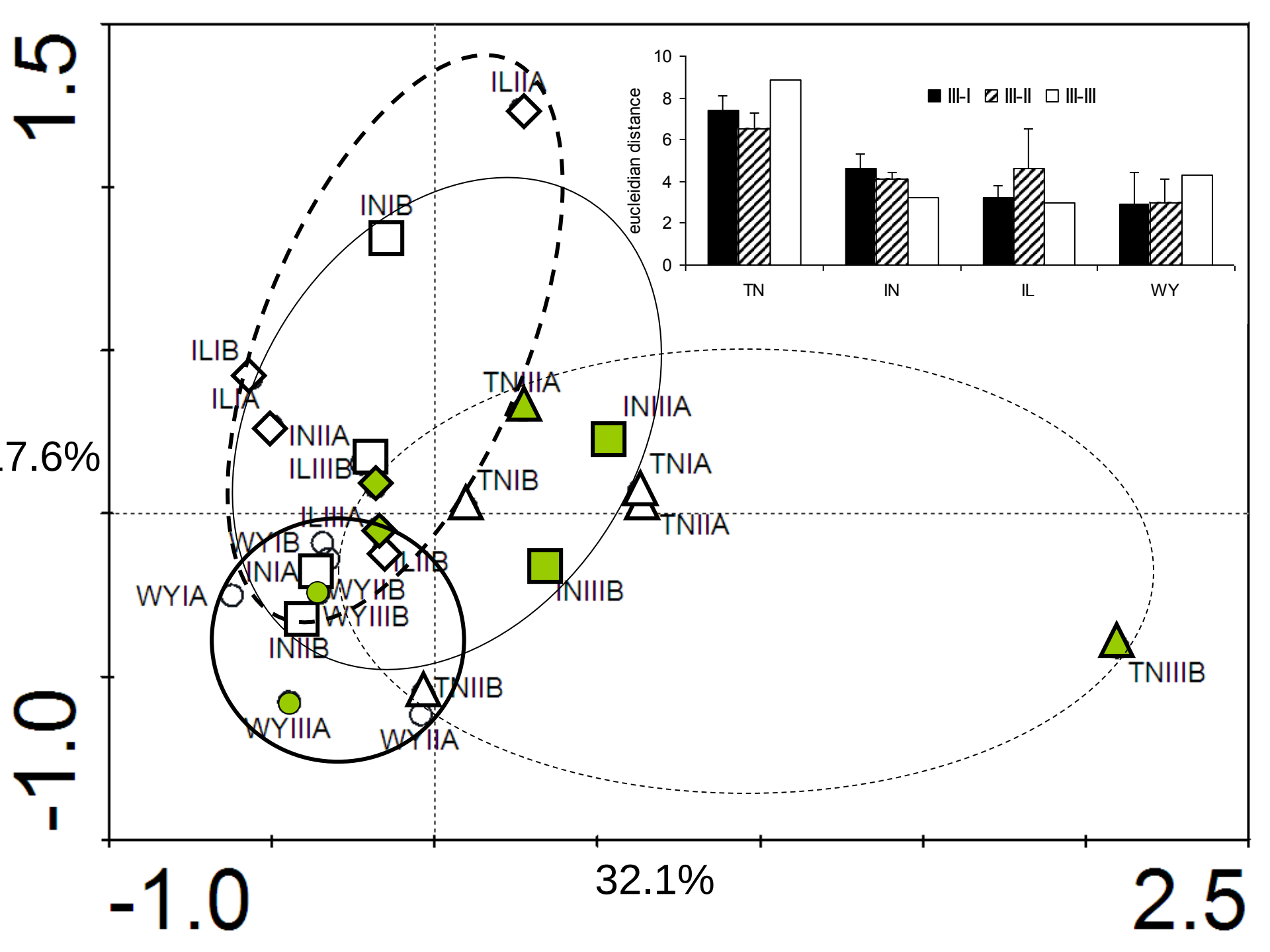

1.0
22.8%
-1.0
-1.0
42.8%
1.0
1INI
8TNIII
1INII
8TNI
Predators
8TNII
Insect parasites
8WYII
1WYIII
1WYI
1WYII
Plant parasites
1ILI
1ILIII
1ILII
8WYIII
1INIII
8INII
1TNIII
8INIII
Root-fungal f.
8WYI
Bacterivores
Omnivores
1TNI
1TNII
8INI
Fungivores

půdní makrofauna

Mravenci tvoří významnou část makrofauny
Žížaly a ostatní saprofágní makrofauna chybí ve WY.






1.5
-1.0
7.6%
-1.0
32.1%
2.5
ILIIA
INIB
ILIB
ILIA
INIIA
ILIIIB
ILIIIA
WYIB
INIA
WYIA
WYIIB
WYIIIB
INIIB
WYIIIA
WYIIA
TNIIIA
TNIB
TNIIB
INIIIA
TNIA
TNIIA
INIIIB
ILIIB
TNIIIB
eucleidian distance
10
8
6
4
2
0
III-I
III-II
III-III
TN
IN
IL
WY

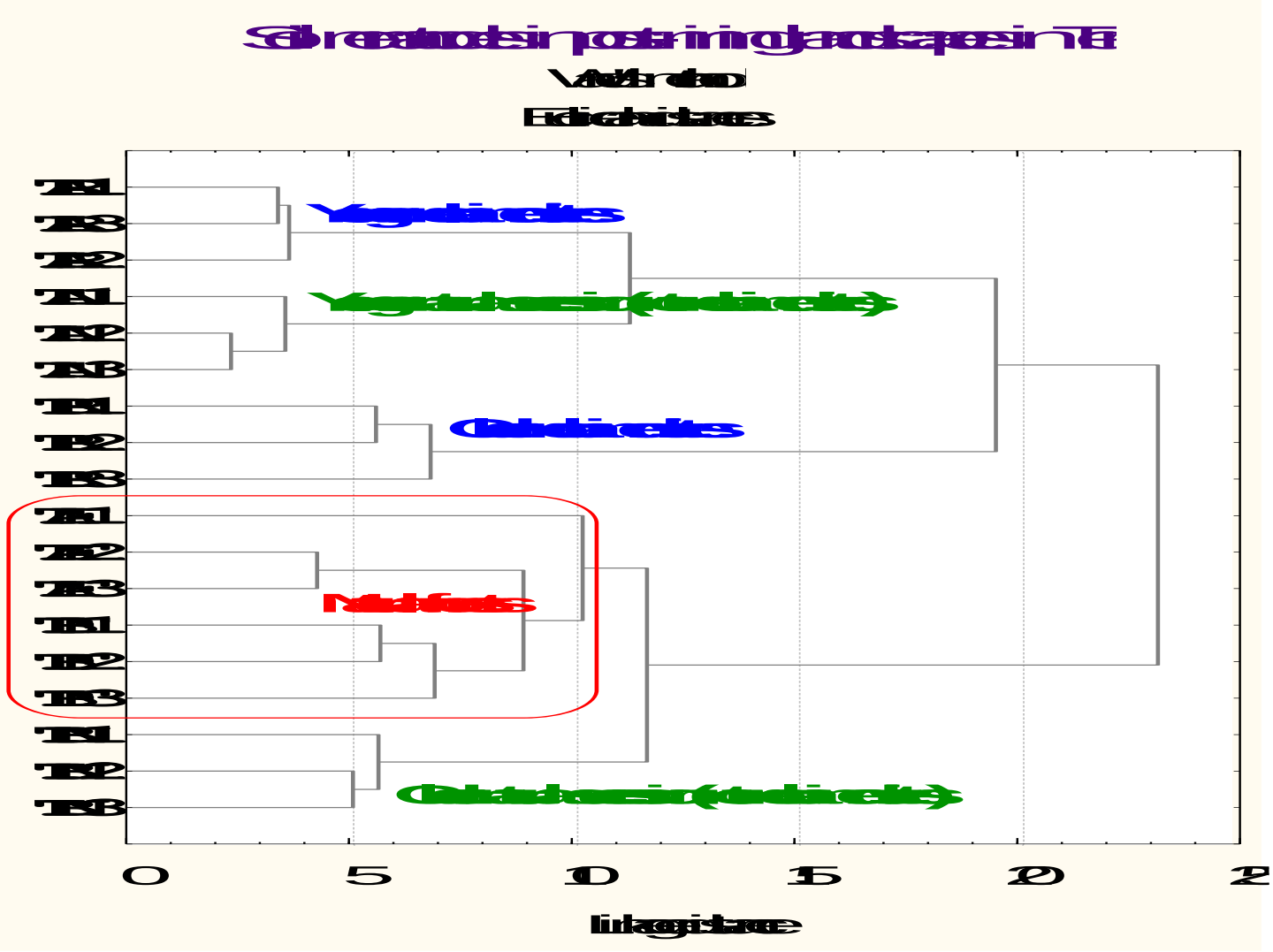
Rekutlivovaná 15-let stará & Nerekultivovaná & Klimax

Klimax

Rekultivovaná 30-let

Nerekultivovaná 40-let

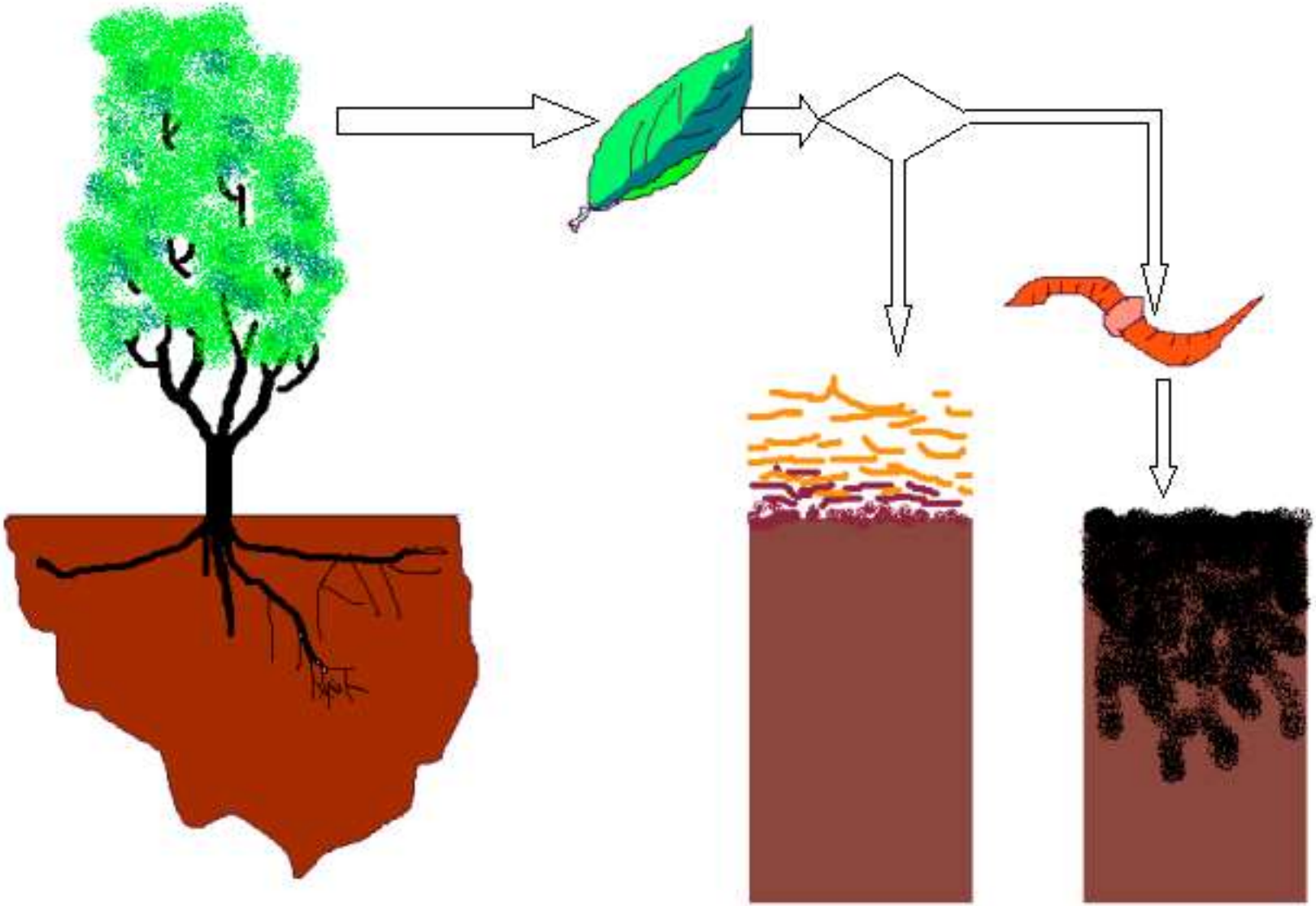
Fig. 2. Cluster analysis of soil nematodes in coal post-mining sites subjected to assisted reclamation (TAR, TBR), left to natural succession (TAN, TBN) and in climax forests FAF, TBF) in Tennessee.



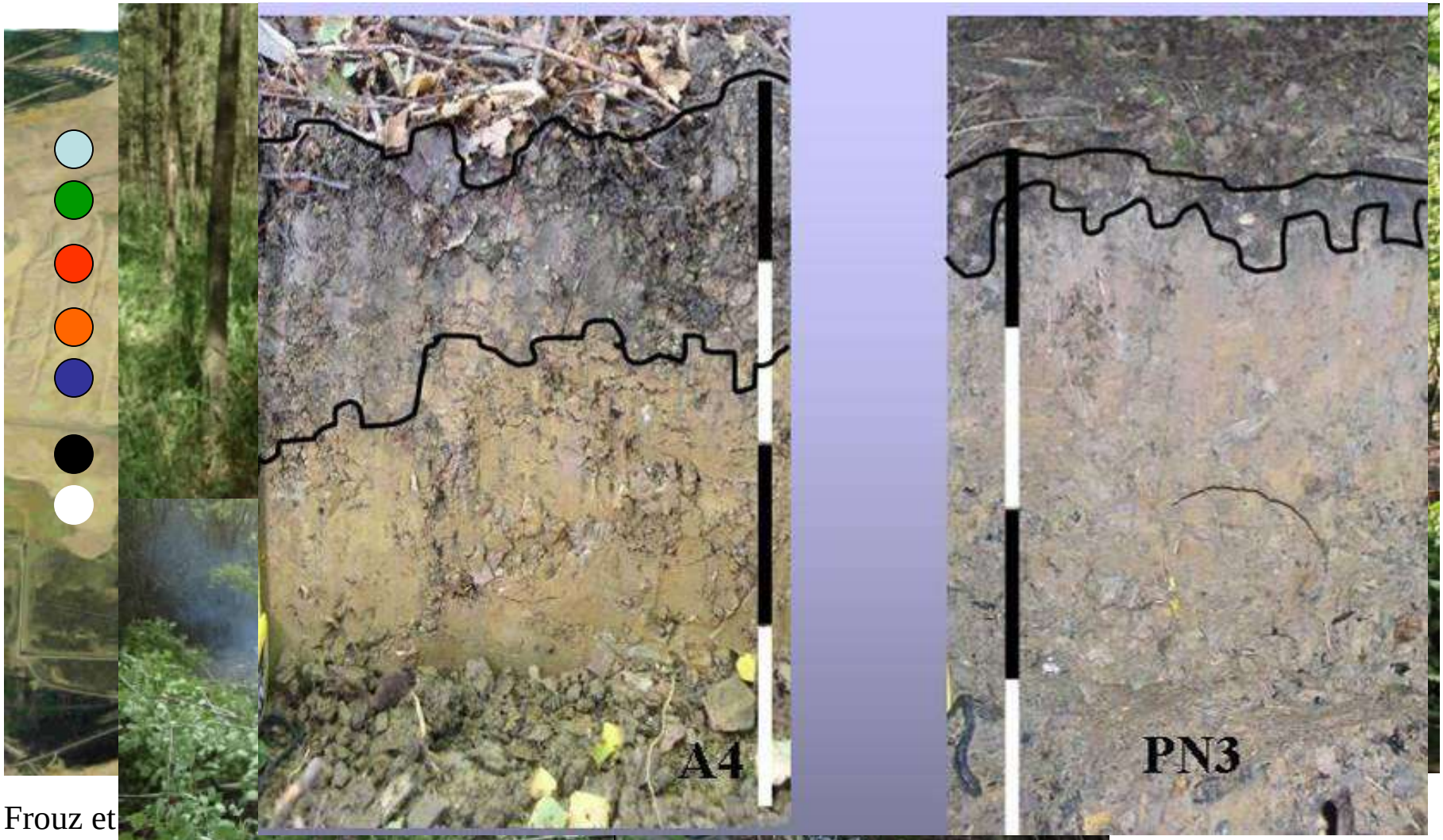
Ekosystémy s navážkou zemin je dříve přiblíží k nenarušeným kontrolám v suchých než ve vlhkých oblastech

Při obnově lesních ekosystémů ve vlhkých oblastech je přínos navážka problematický často negativní

Naproti tomu při obnově travinných ekosystémů v suchých oblastech navážka významně urychluje rozvoj ekosystémů

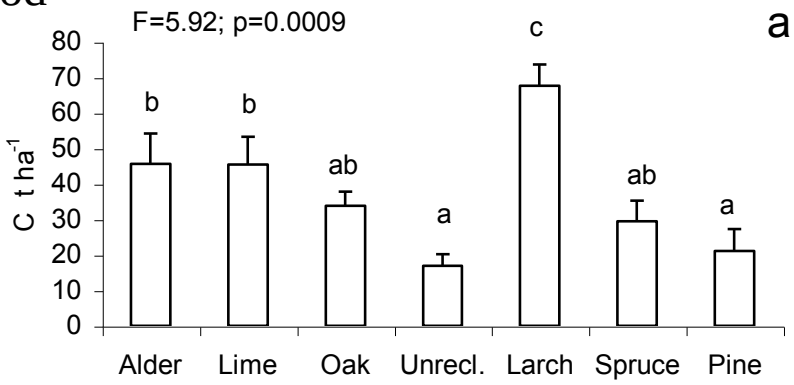


7 typů lesa na jedné výsypce (podkrušnohorská Sokolovsko)

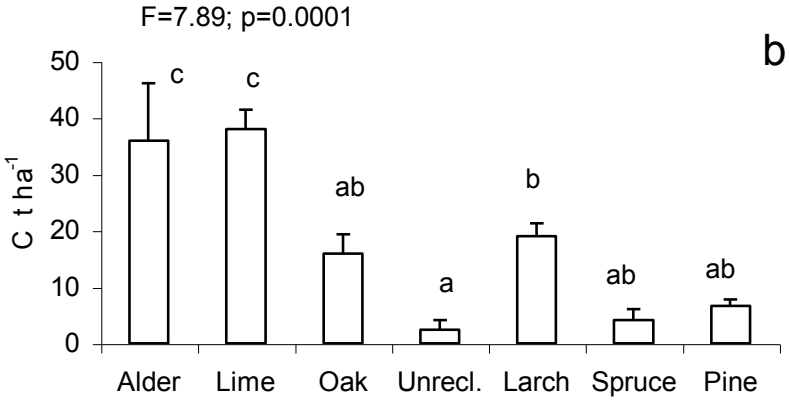


Frouz et

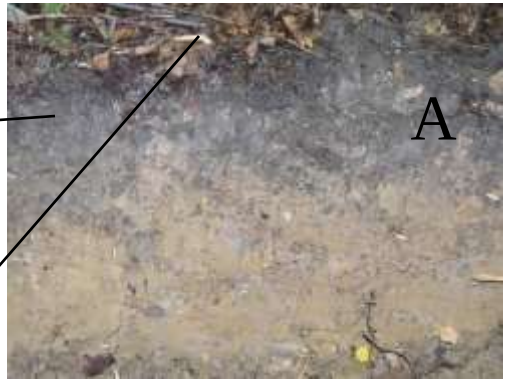
Carbon in wood



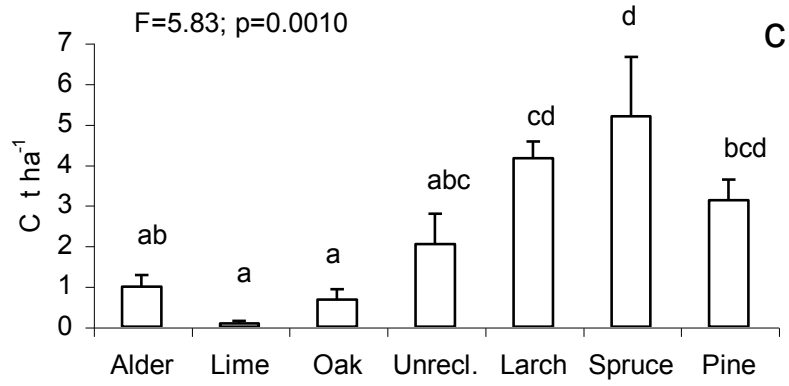
Carbon in A layer of soil



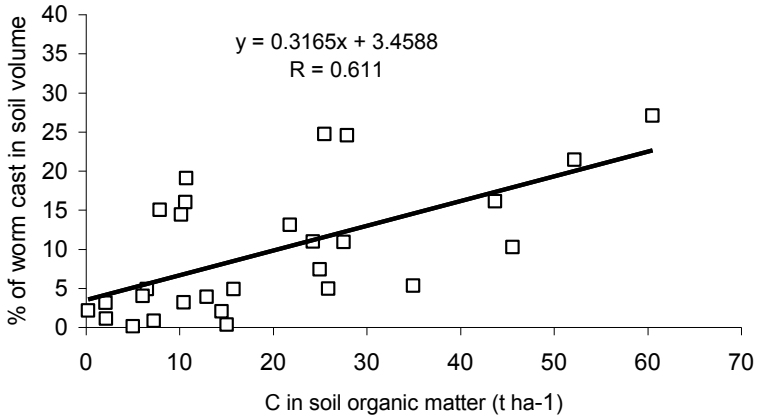
LF (Oa Oe)

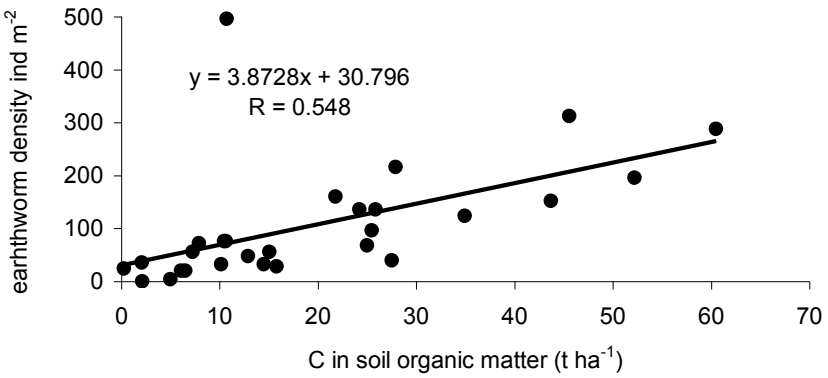


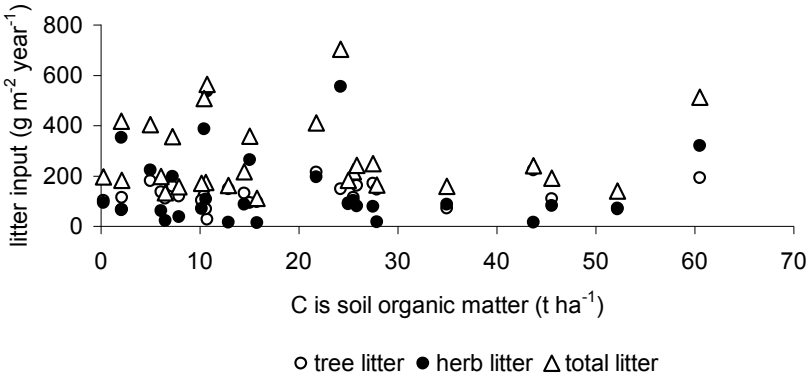
Carbon in Oe layer



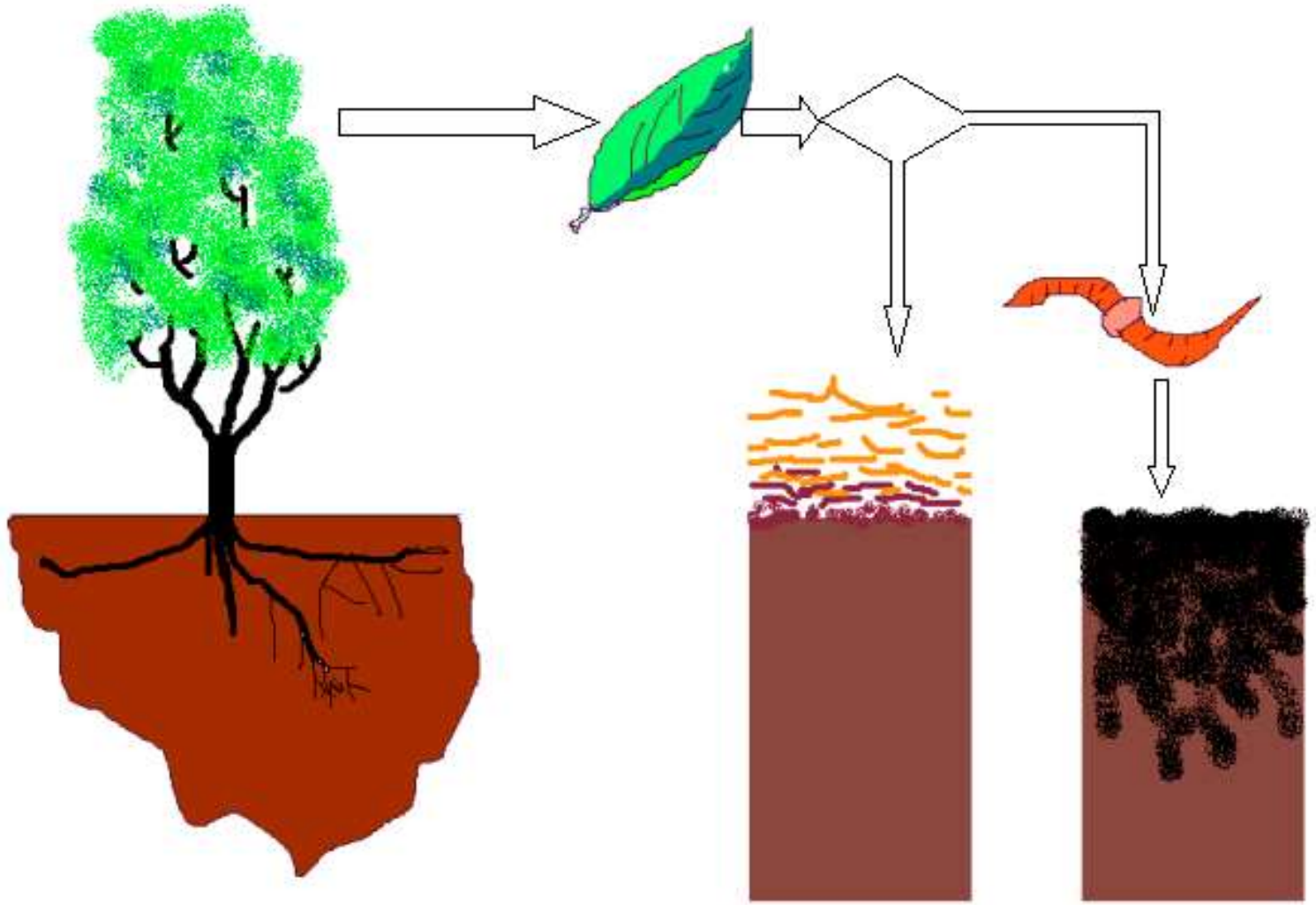
Frouz et al., 2009. Biogeochemistry 94(2): 111-121



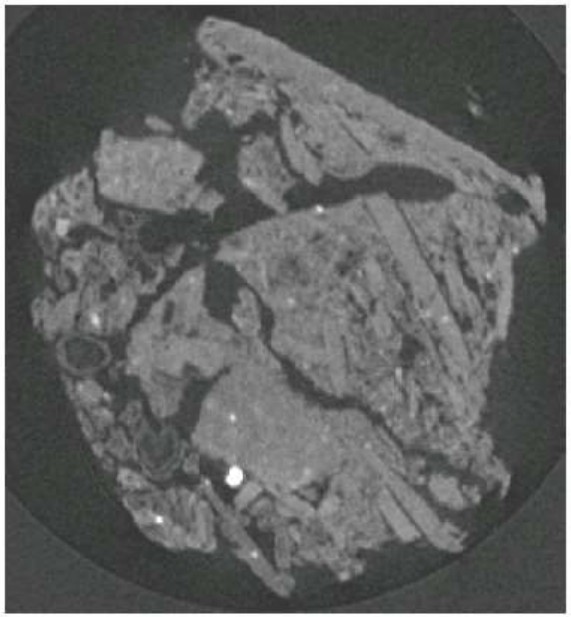




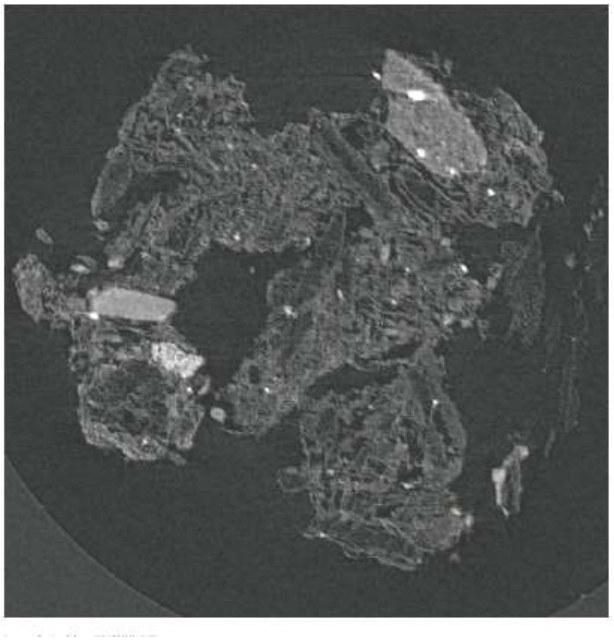
Frouz et al., 2009. Biogeochemistry 94(2): 111-121



Frouz et al. 2013 Forest ecology management



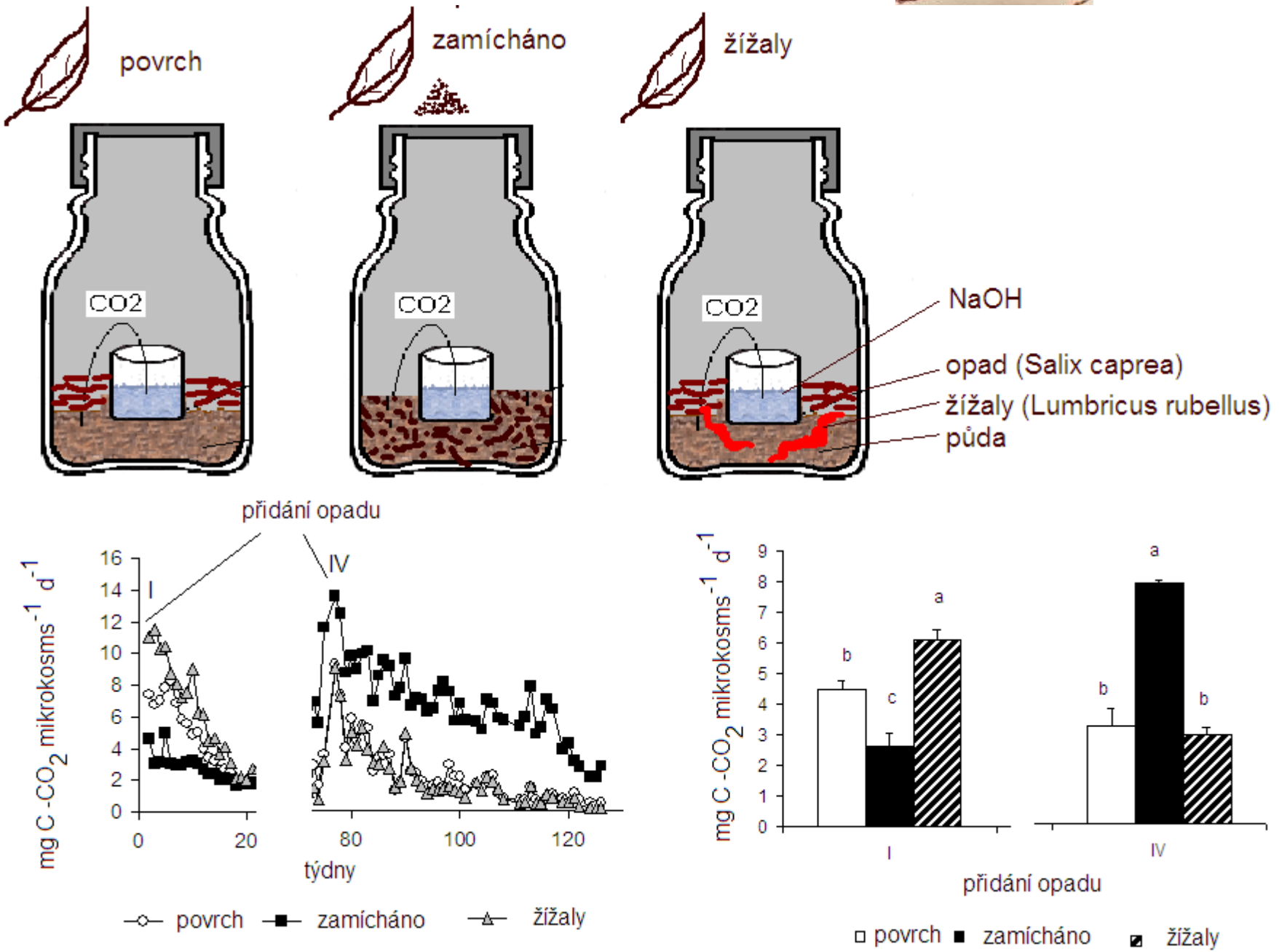
Other aggregates



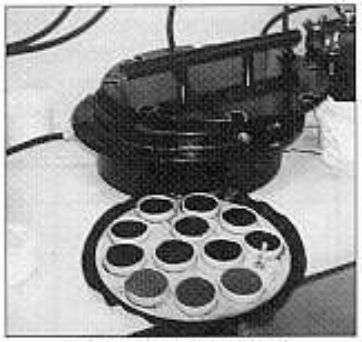
Earthworm cast

	Other aggregates	worm casts
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.

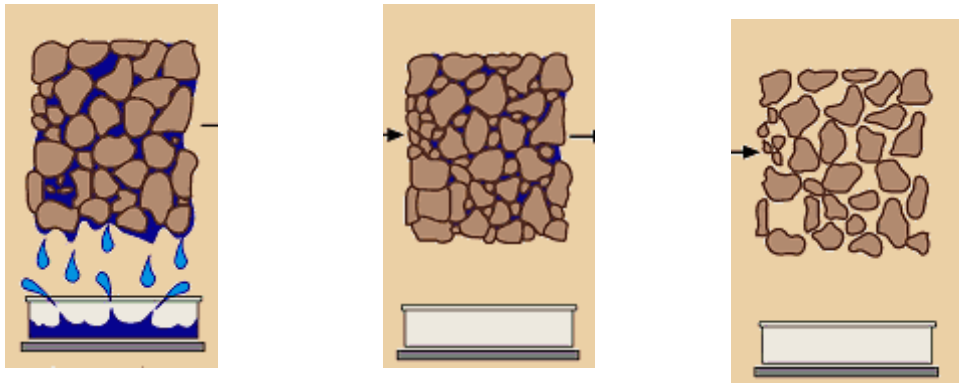

povrch
zamícháno
žížaly
CO2
CO2
CO2
NaOH
opad (Salix caprea)
žížaly (Lumbricus rubellus)
půda
přidání opadu
mg C -CO2 mikrokosms-1 d-1
I
IV
0
2
4
6
8
10
12
14
16
0
20
80
100
120
týdny
povrch
zamícháno
žížaly
mg C -CO2 mikrokosms-1 d-1
0
1
2
3
4
5
6
7
8
9
b
c
a
b
a
b
I
IV
přidání opadu
povrch
zamícháno
žížaly

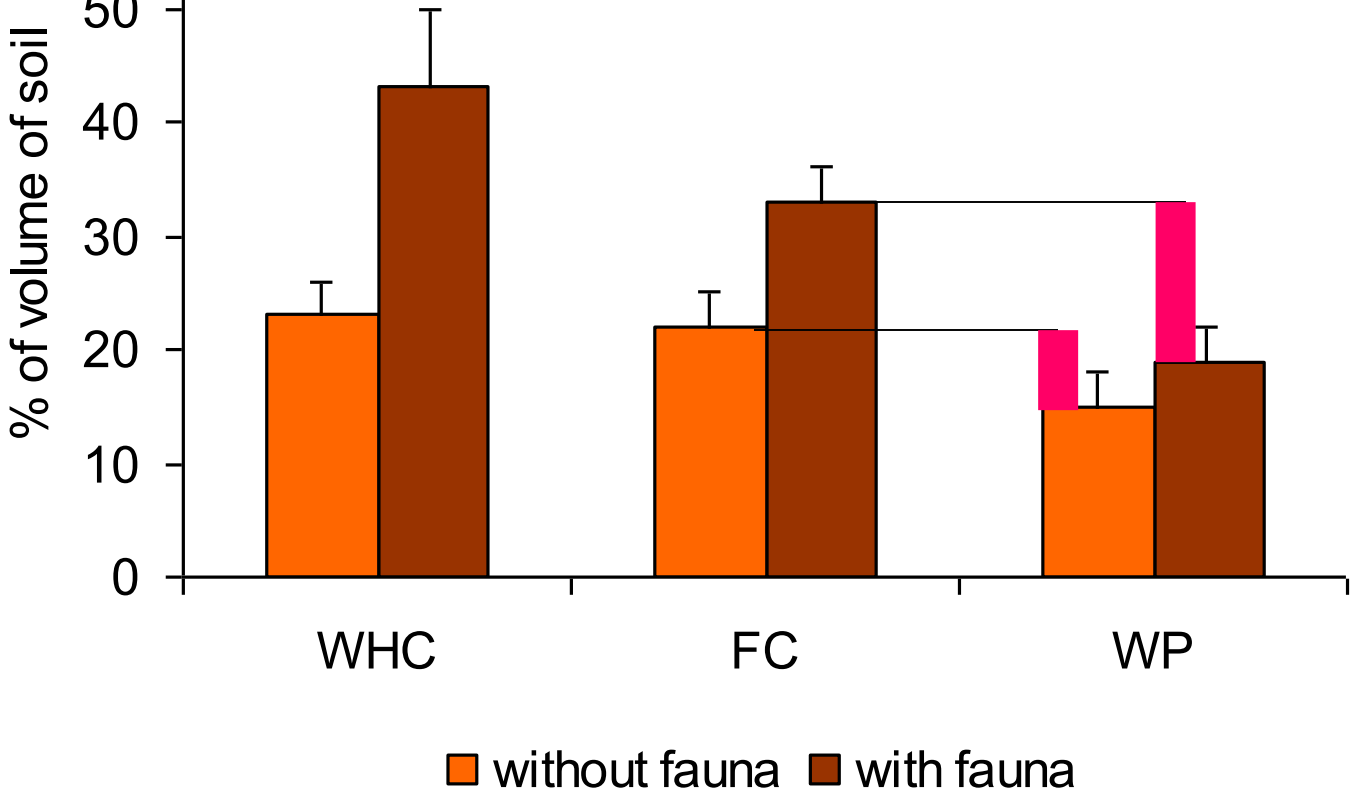
Effect of SOM accumulation on soil water budget



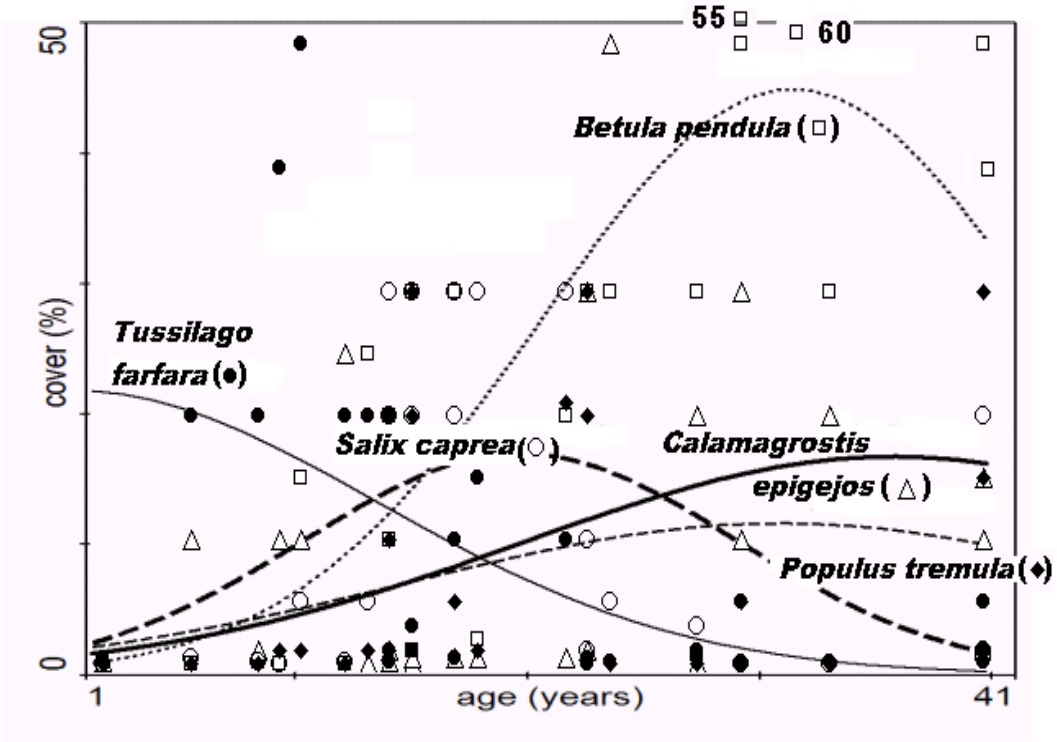
15 Bar laboratory apparatus

1/3 (.333) Bar laboratory apparatus

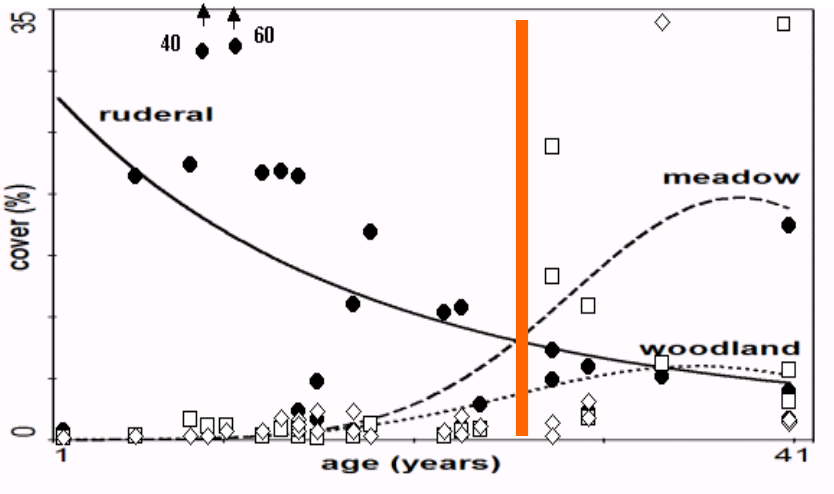


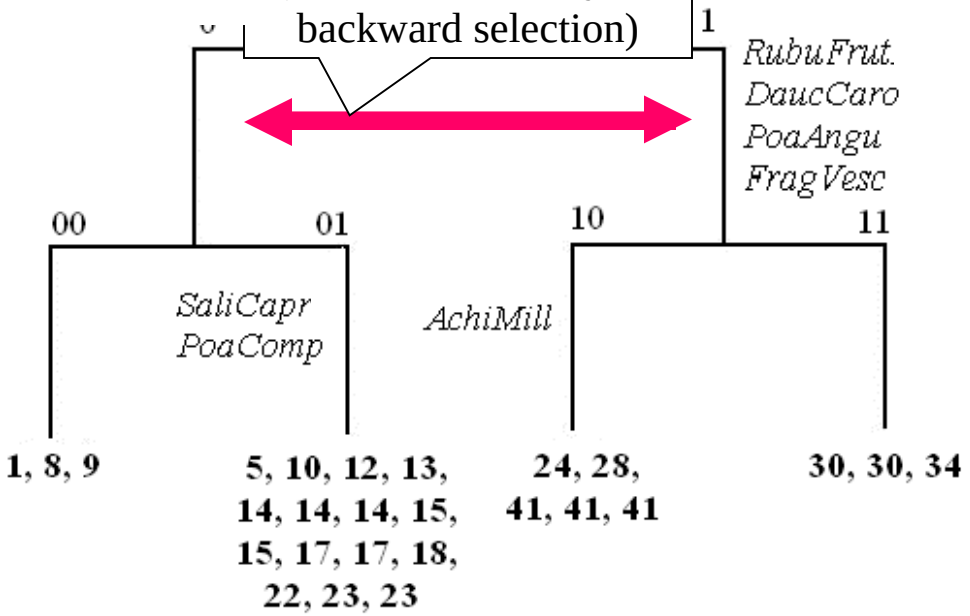


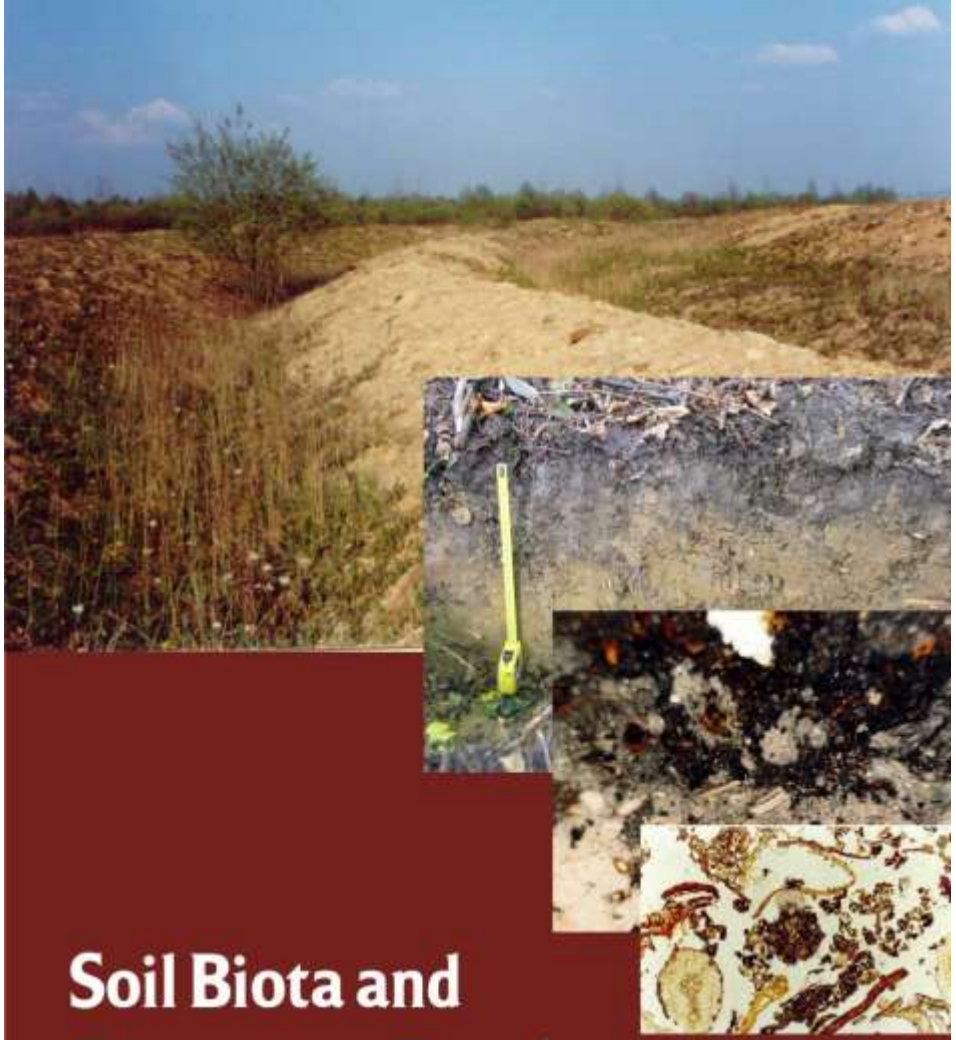
Plant community changes



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







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Editor
Jan Frouz

CRC Press
Taylor & Francis Group
A SCIENCE PUBLISHERS BOOK

Supported by Czech Science Foundation
grants no.: 526/01/1055 and 526/03/1259

Grant agency of the Academy of Sciences of the Czech Republic grant S600220501

and

mining company
Sokolovská Uhelná a.s.

Děkuji vám za pozornost