Tecnologia de solos: módulo erosão

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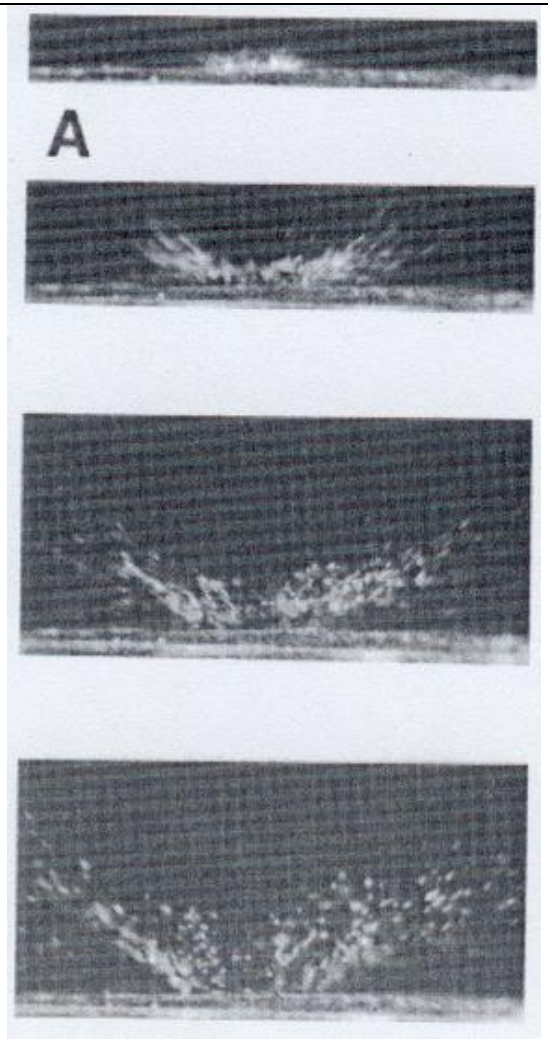
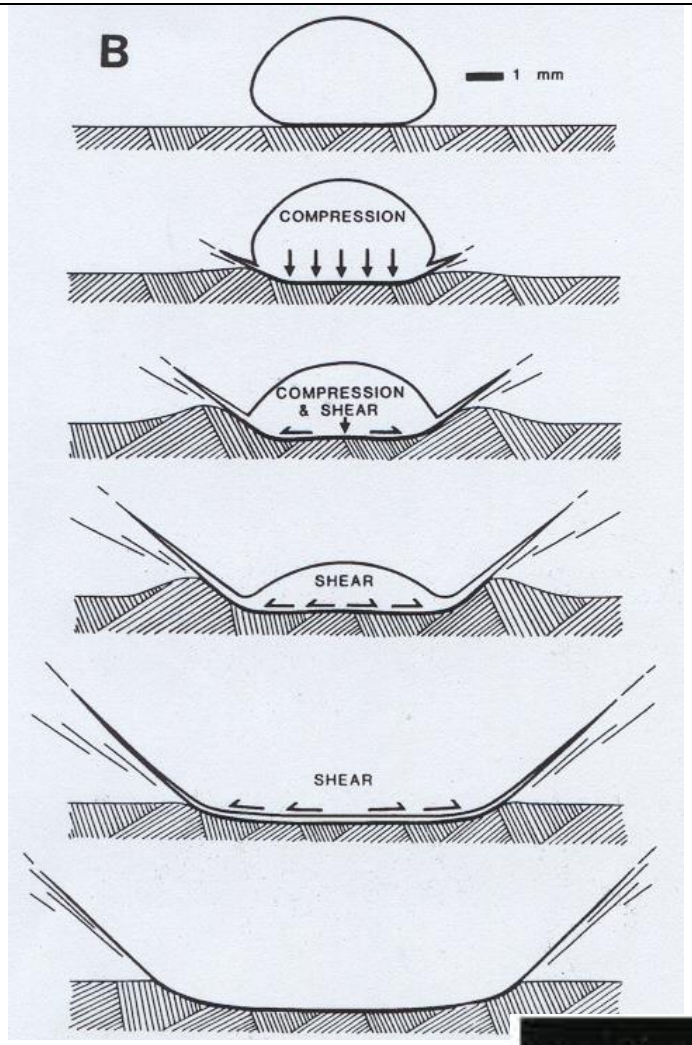




Soil shear stress: 2 to 20 kPa

High initial pressure:

extremely high ≈ 1000 kPa pressure at the very instant of impact

high capacity to deform plastic surfaces


11:01


TECHNOS
11:02


TECHNOS
12:02


TECHNOS
4:02

A erosão do solo: Processo

Desprendimento ► **Transporte** ► **Deposição**

Forças de adesão e coesão em função da agregação do solo

Impacto da gota de chuva

Enxurrada

Energia disponível para transporte vs. concentração de sedimentos na enxurrada vs. granulometria & carga

Enxurrada

Diminuição da quantidade de energia

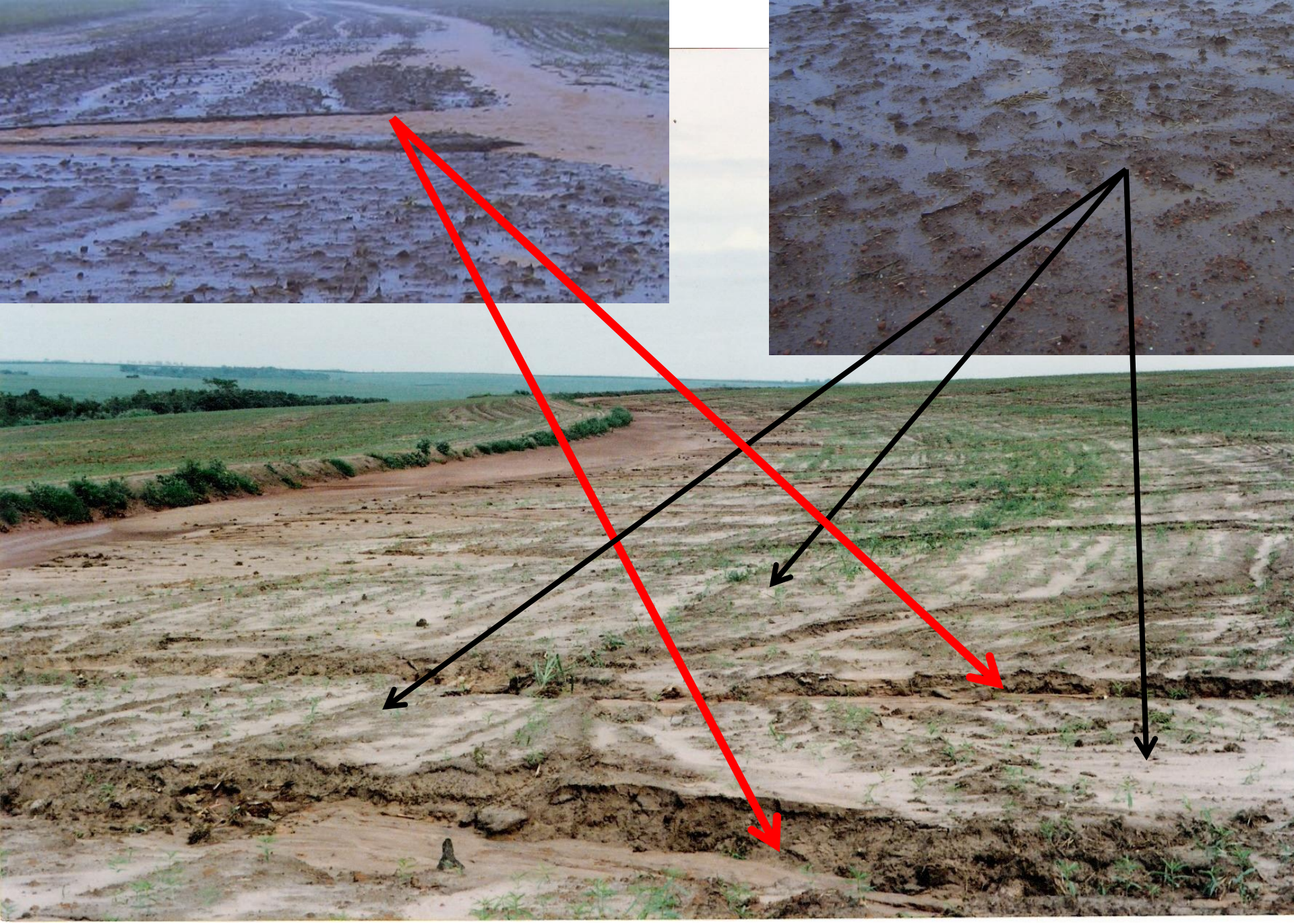
A erosão do solo: Formas

Impacto da gota → Laminar → Desprendimento seletivo → Deposição a longa distância

Enxurrada → Dispersa → Sulcos → Desprendimento → Deposição ao longo da vertente

Enxurrada → Concentrada → Voçorocas efêmeras → Desprendimento e deposição na vertente

Concentrada → Voçorocas permanentes → Desprendimento e deposição na vertente



Impactos da erosão do solo

Imediatos: concentração da enxurrada (voçorocas)

Degradação do solo: sulcos e laminar

Ambientais: deposição de sedimentos

47°46'44"
22°37'13"

47°42'31"
22°37'13"

Laminar e sulcos
27 ton ha^{-1} ano^{-1}

< -300 y
-150
0
200

N

Voçorocas
3,5 ton ha^{-1} ano^{-1}

500 750 1000 meters

47°46'44"

22°40'38"
47°42'31"

Impactos da erosão do solo

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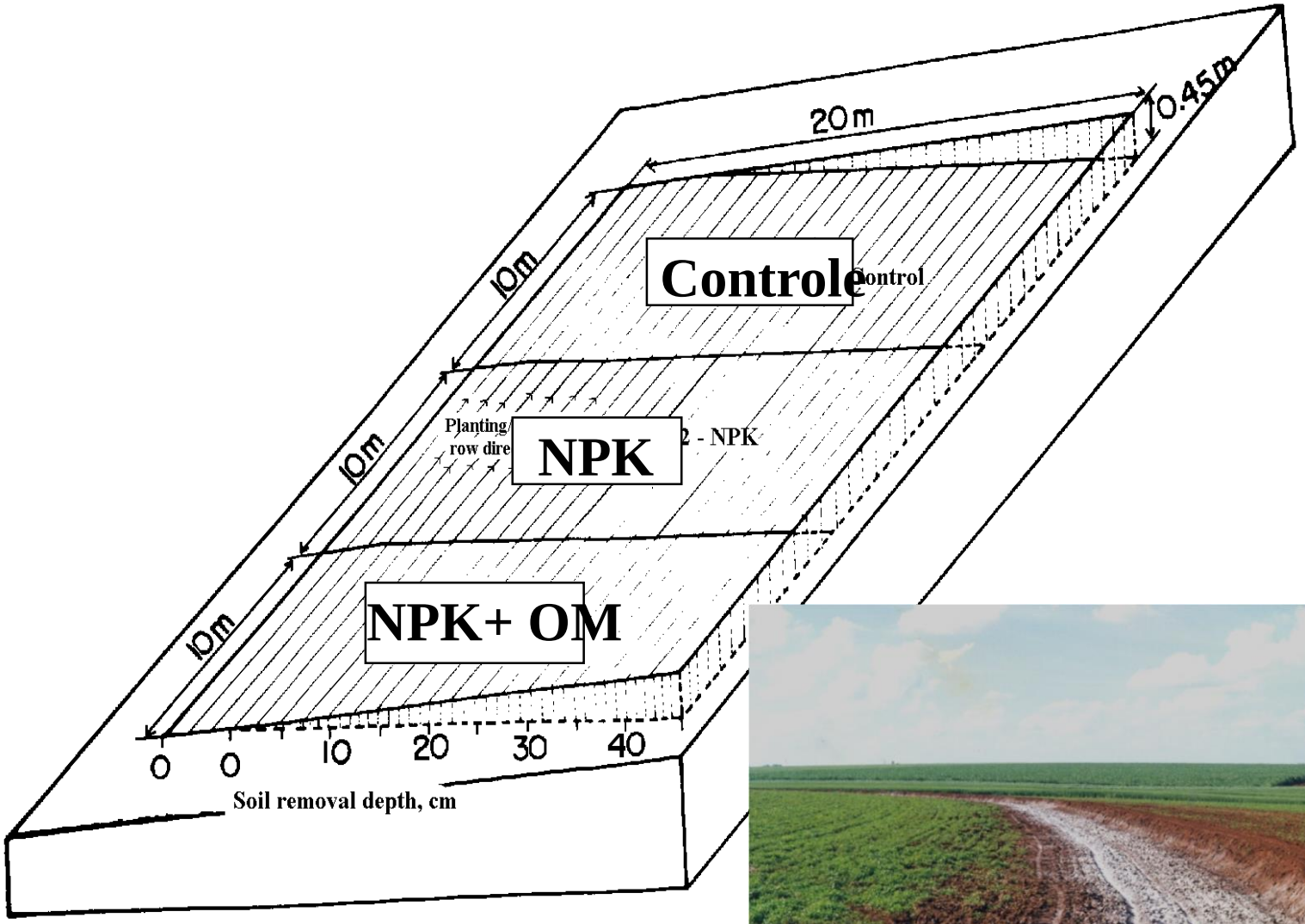
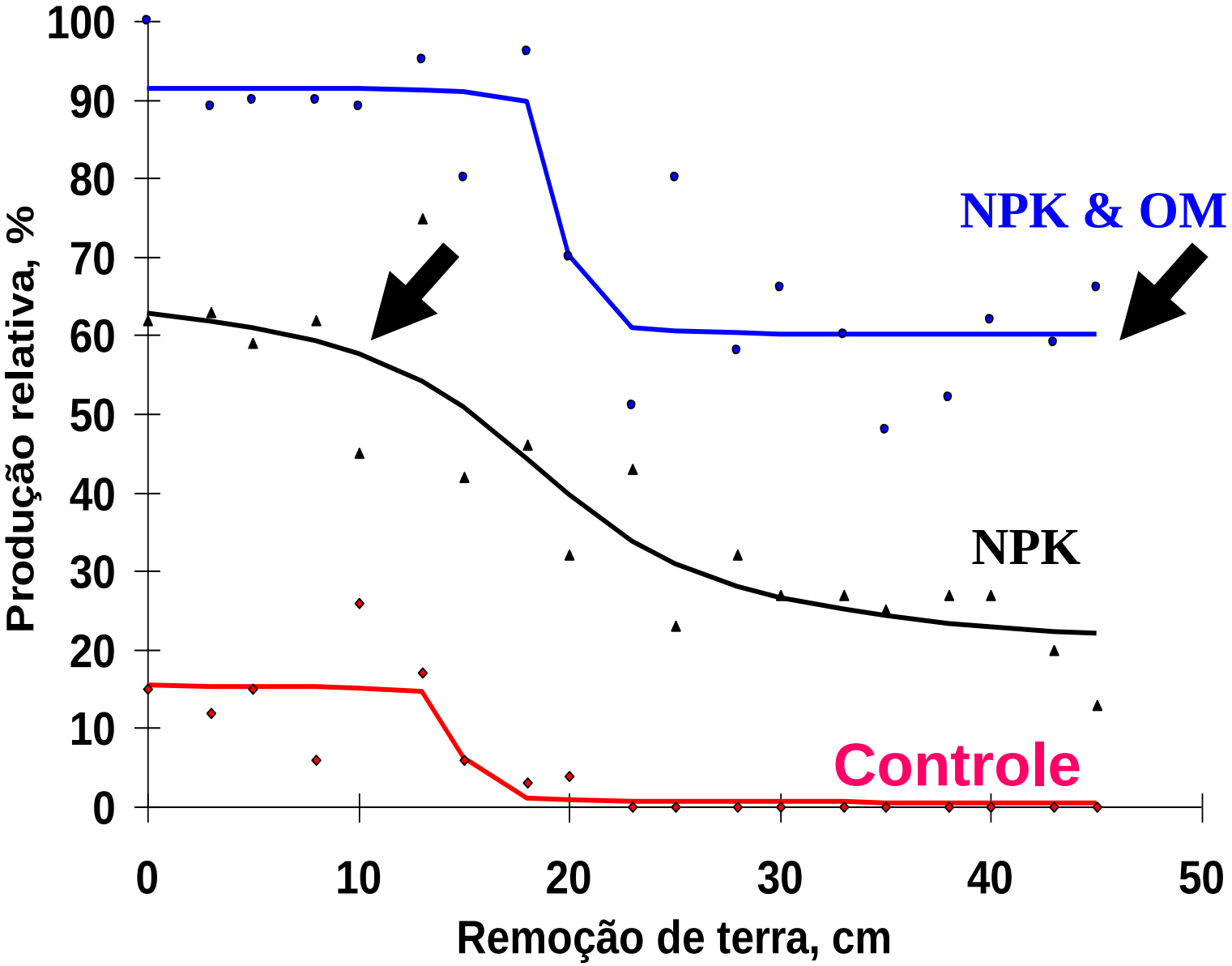
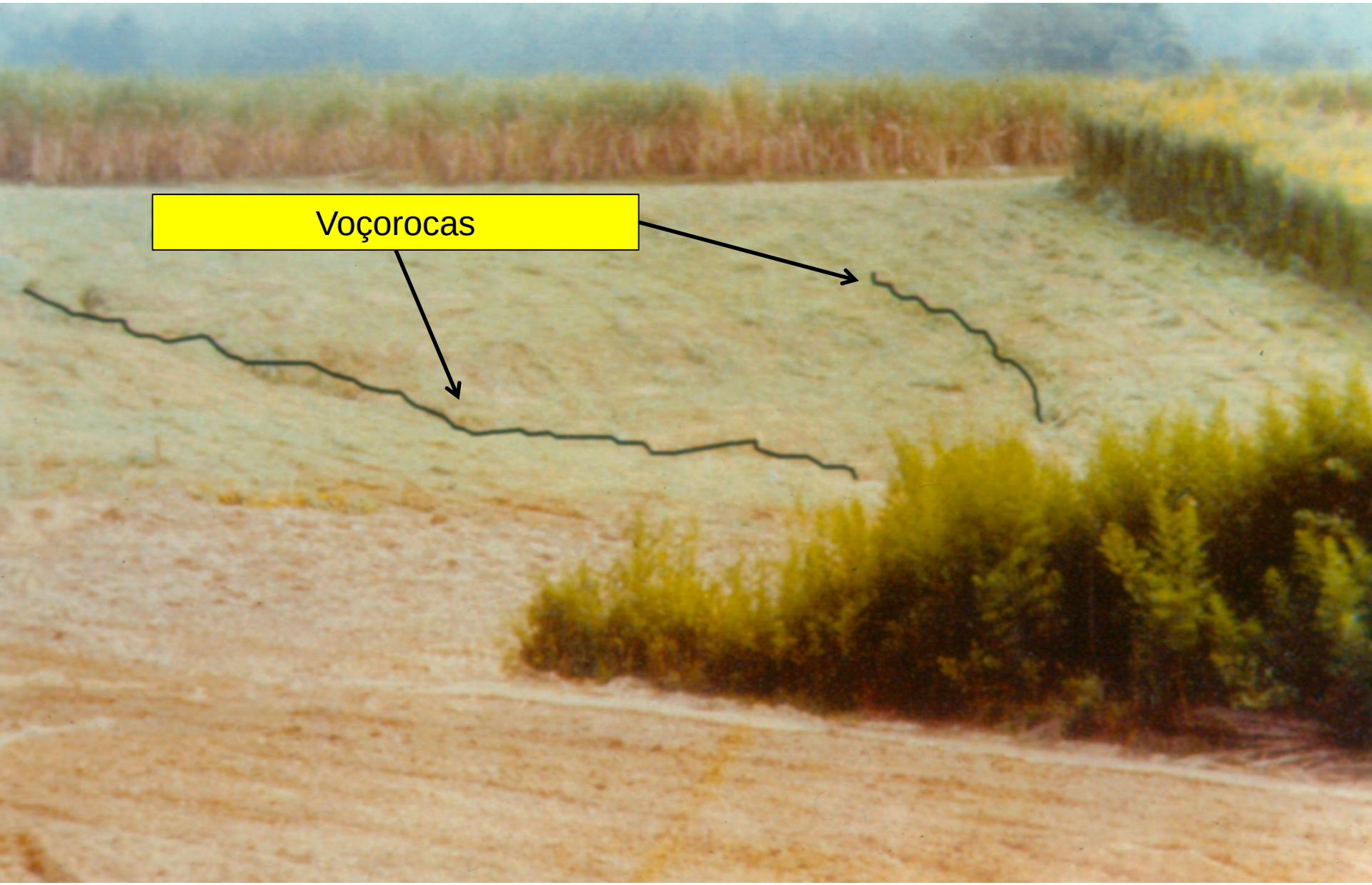
Ambientais: deposição de sedimentos


20 m
0.45m
10m
10m
10m
Controle
Control
Planting
row dire
NPK
2 - NPK
NPK+ OM
0
0
10
20
30
40
Soil removal depth, cm

Erosão simulada vs. produtividade do milho (89/90)

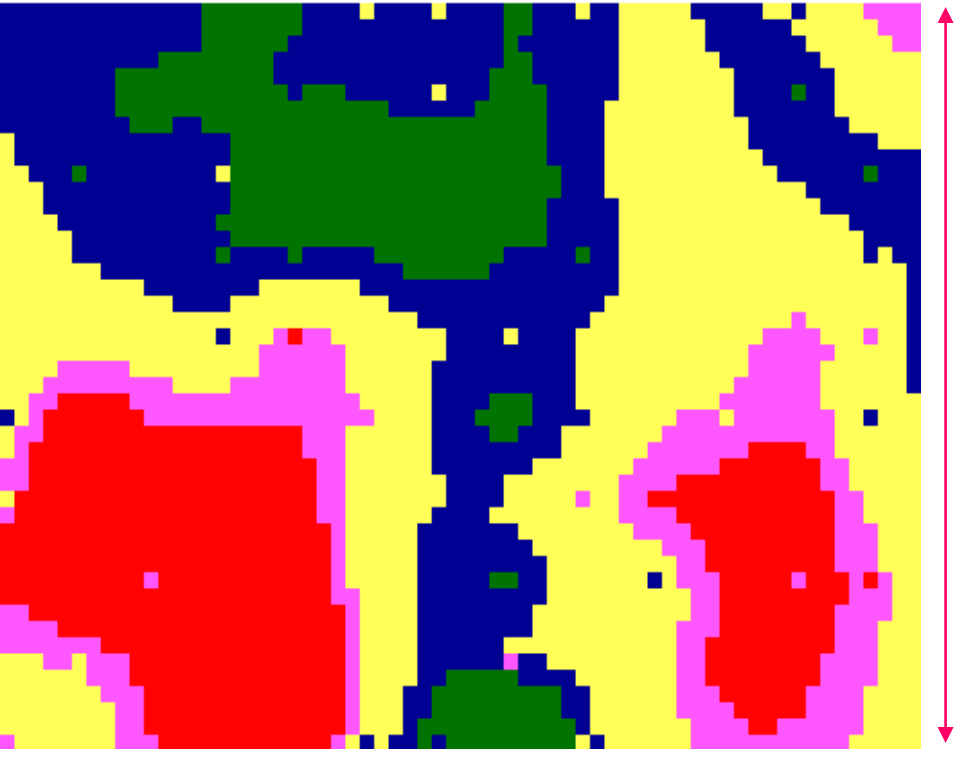



Voçorocas

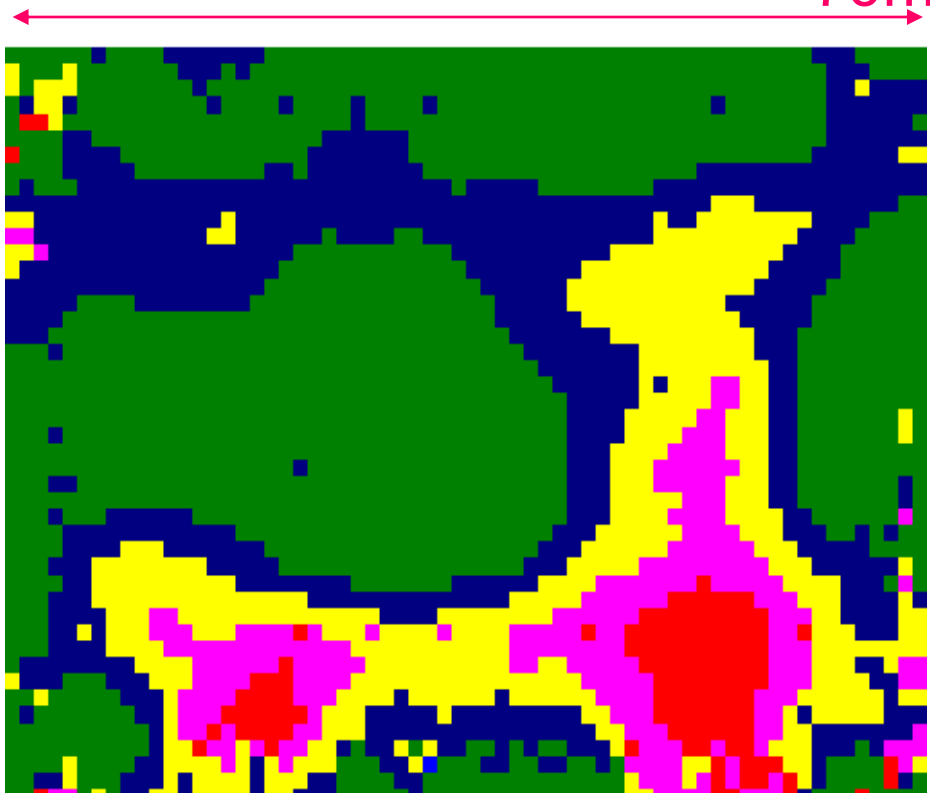
Produtividade de *Crotalaria juncea* vs espessura solo

> 11,3	> 80
9,3-11,3	60 - 80
7,1-9,3	40 - 60
6,0 - 7,1	20 - 40
< 6,0	< 20

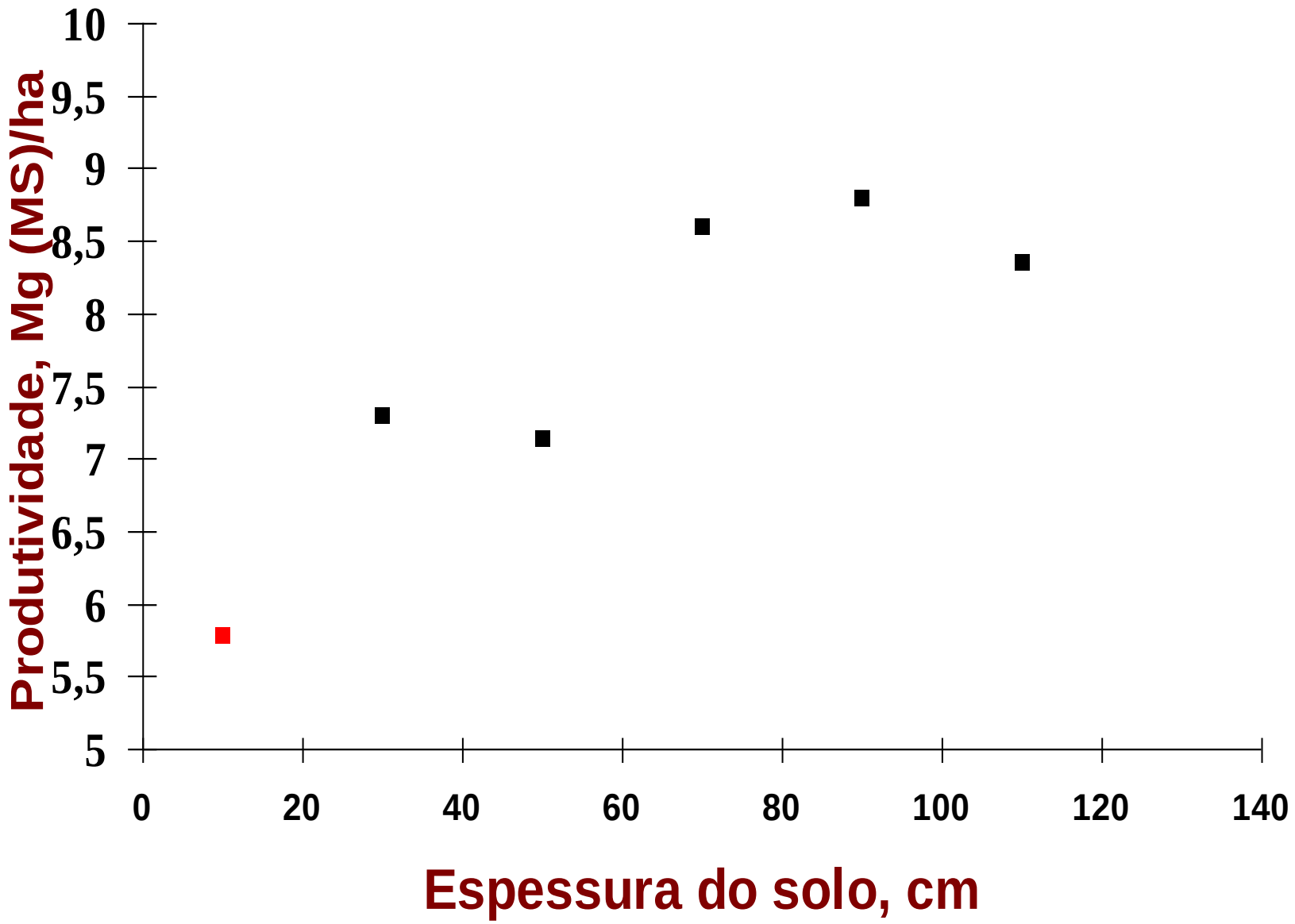
Produtividade, Mg (MS) / ha

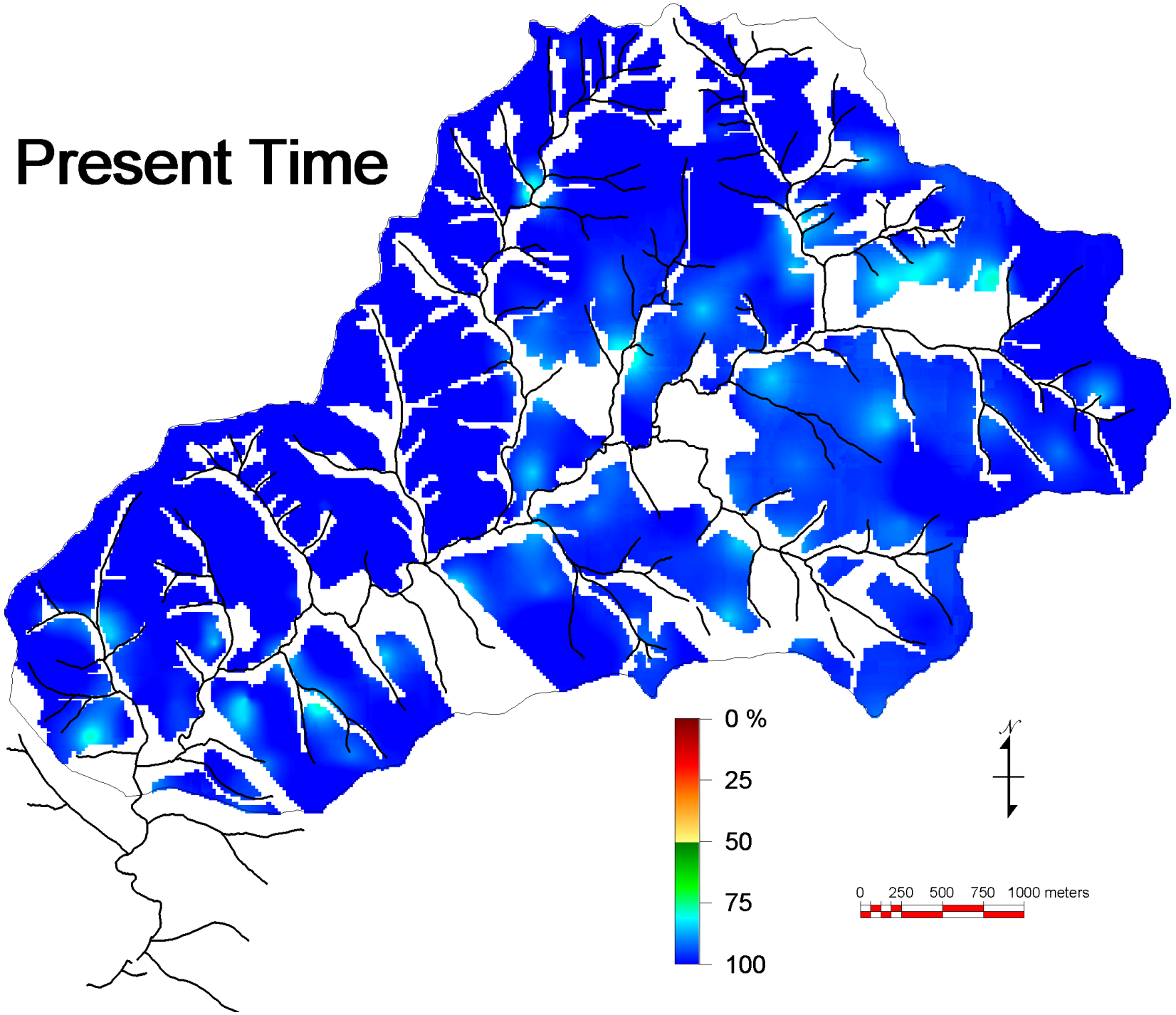


Espessura do solo, cm

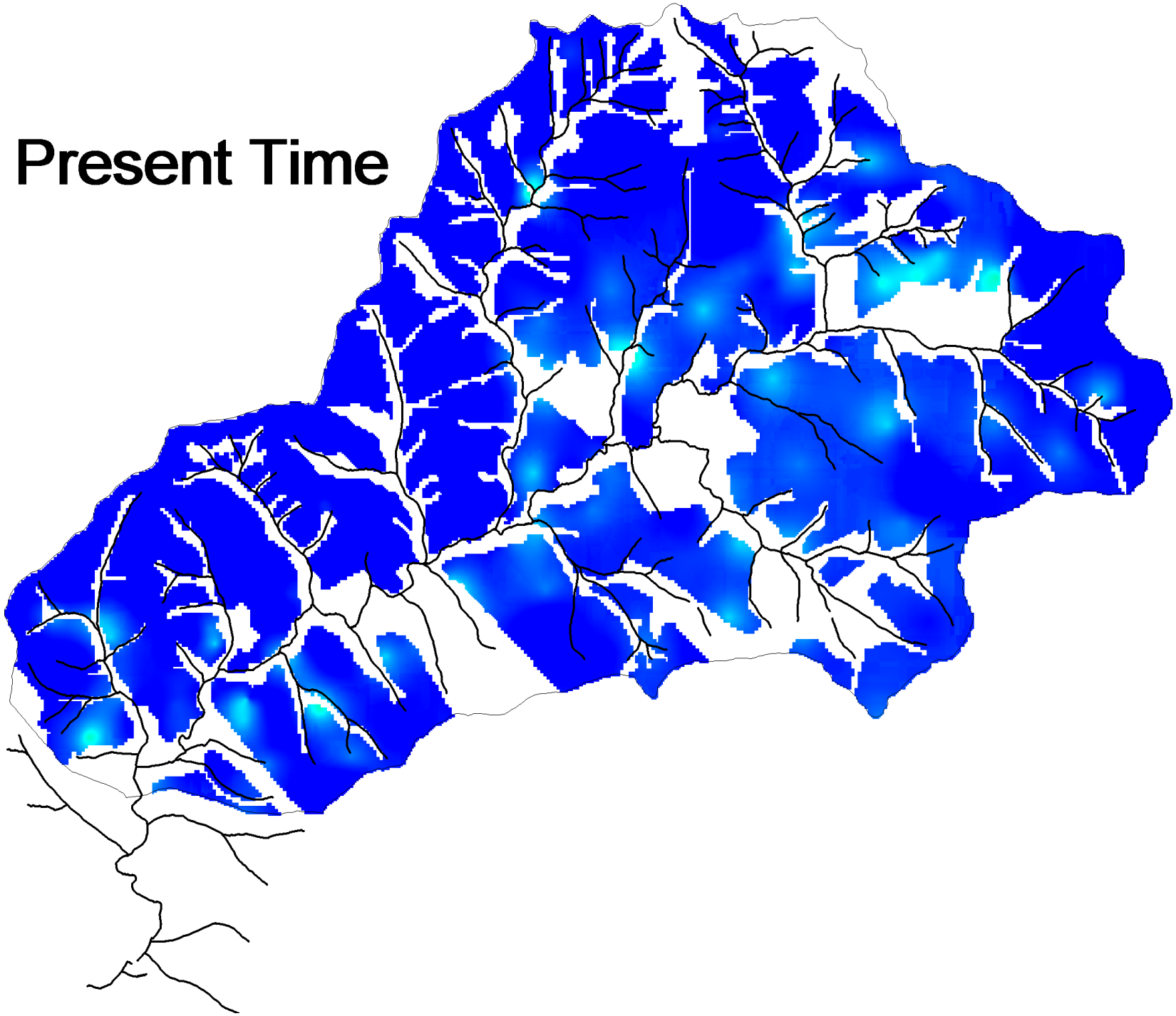


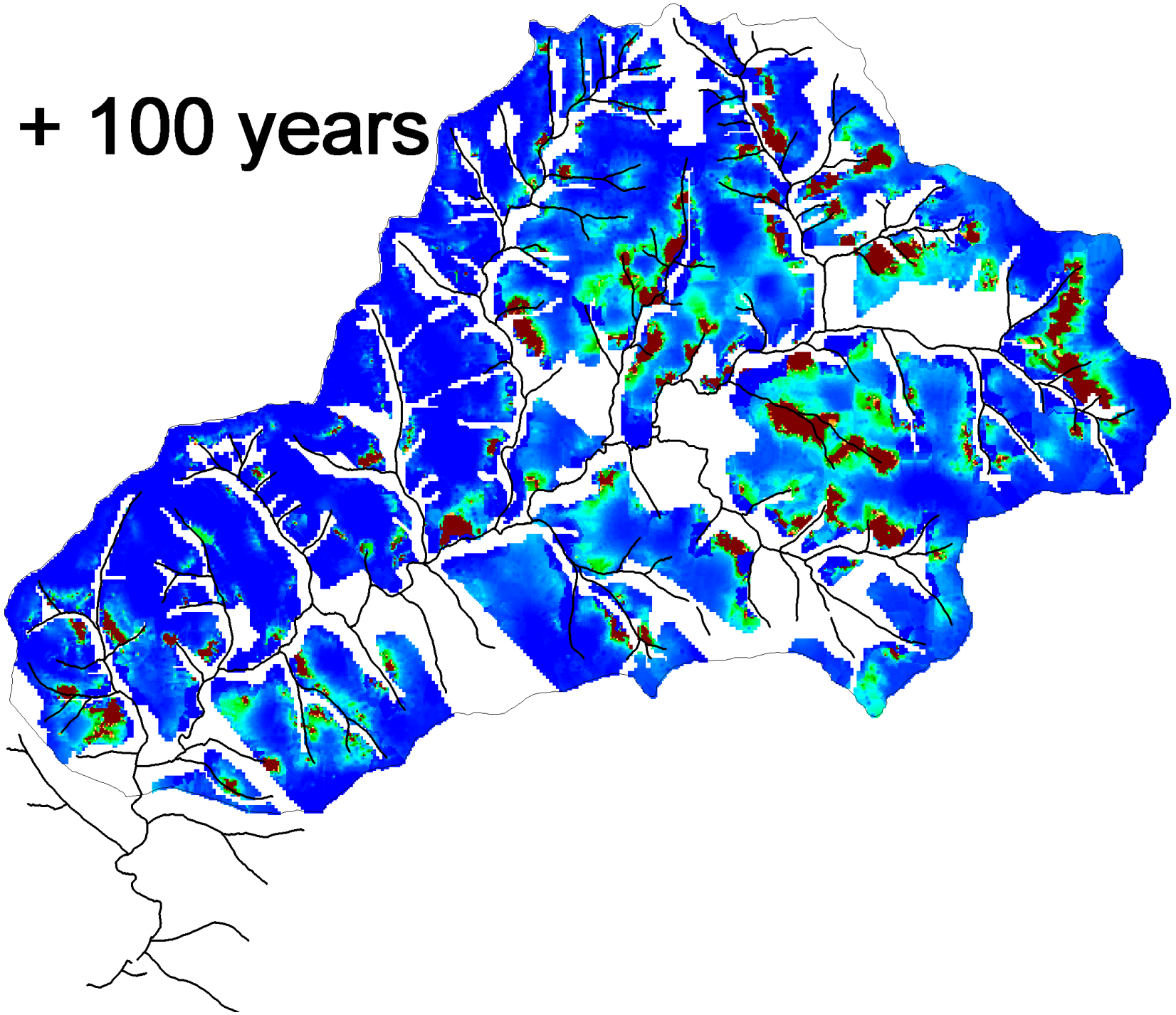
Produtividade da Crotalária vs espessura do solo



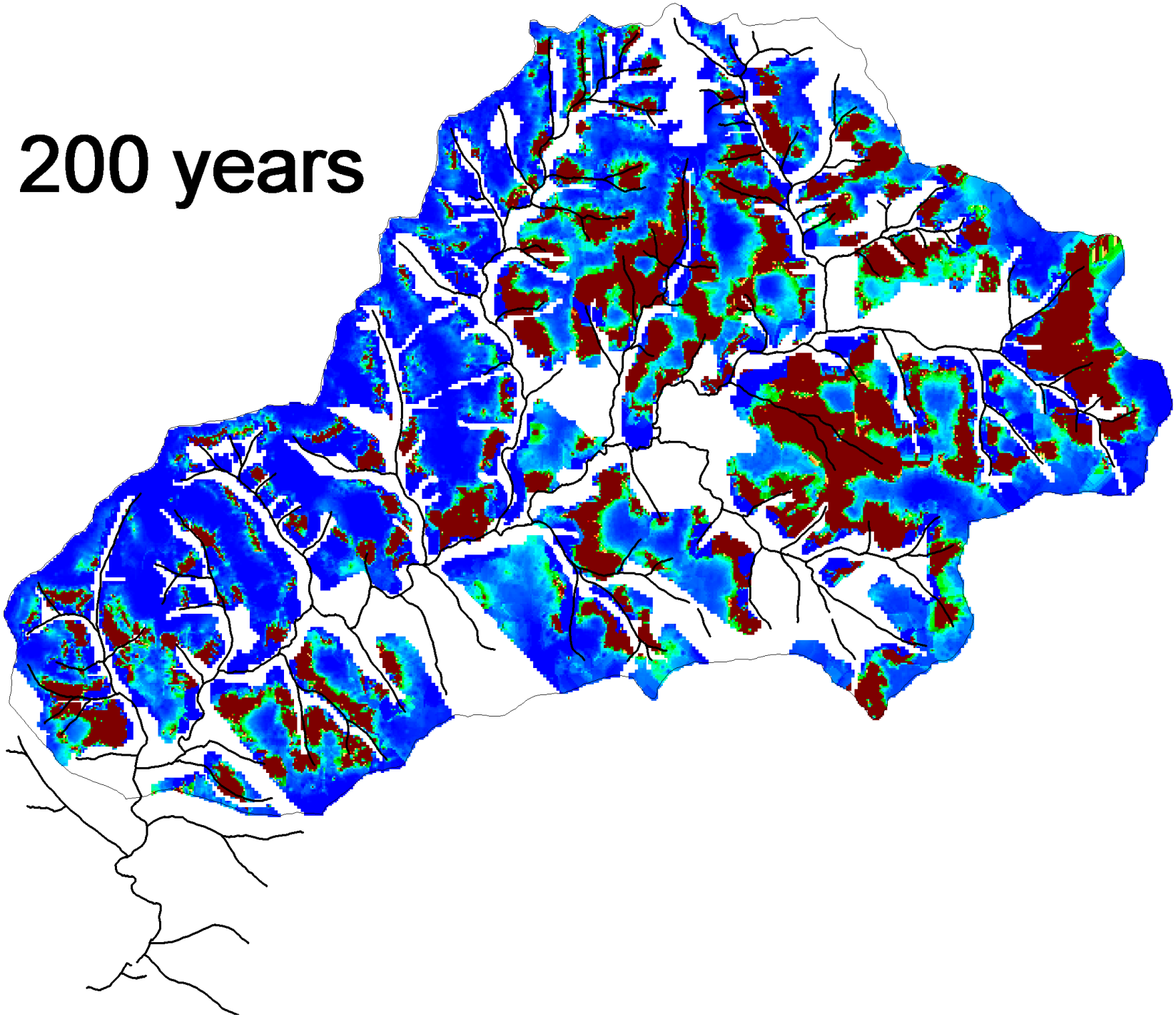

Present Time
0 %
25
50
75
100
N
0 250 500 750 1000 meters

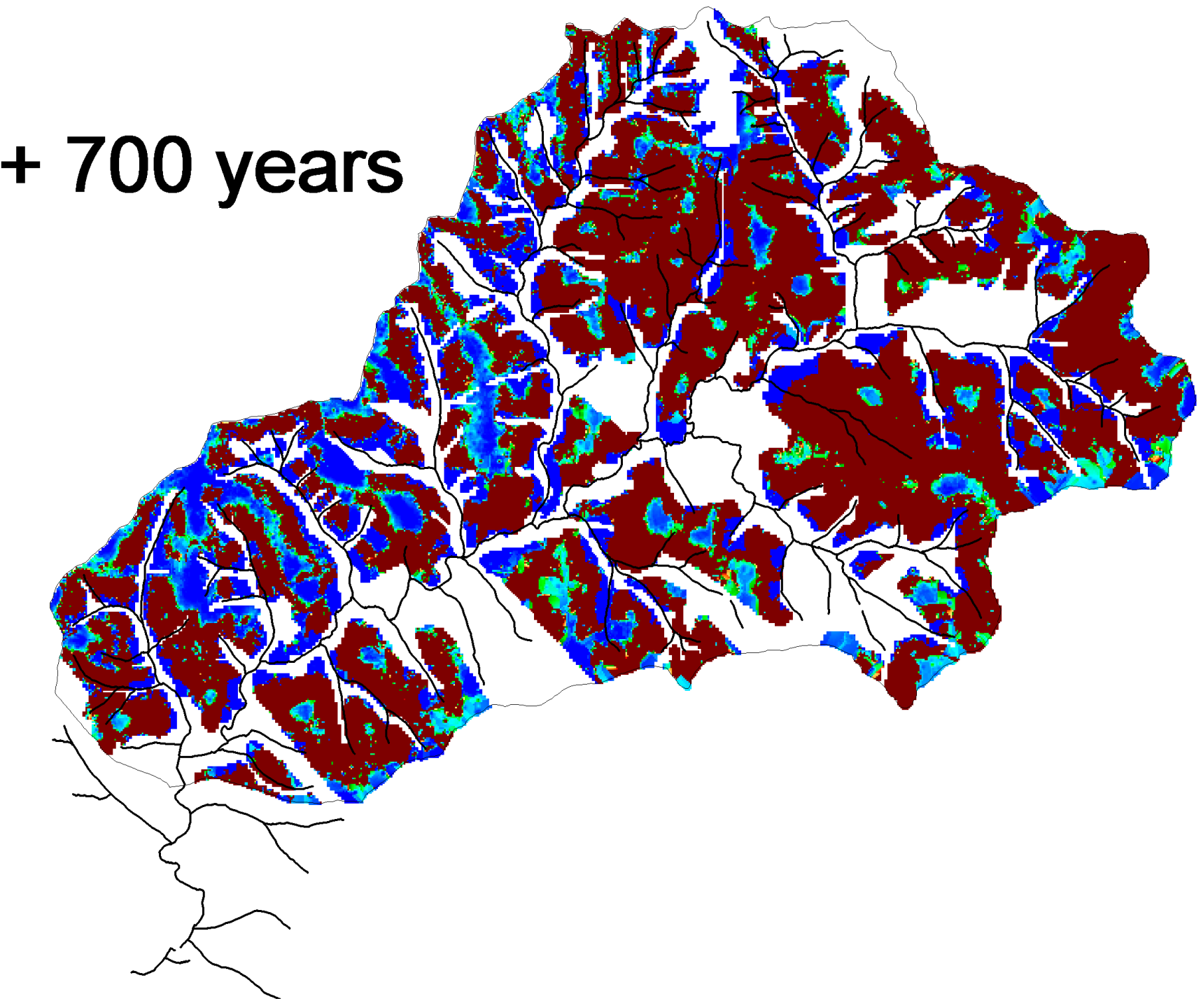
Present Time



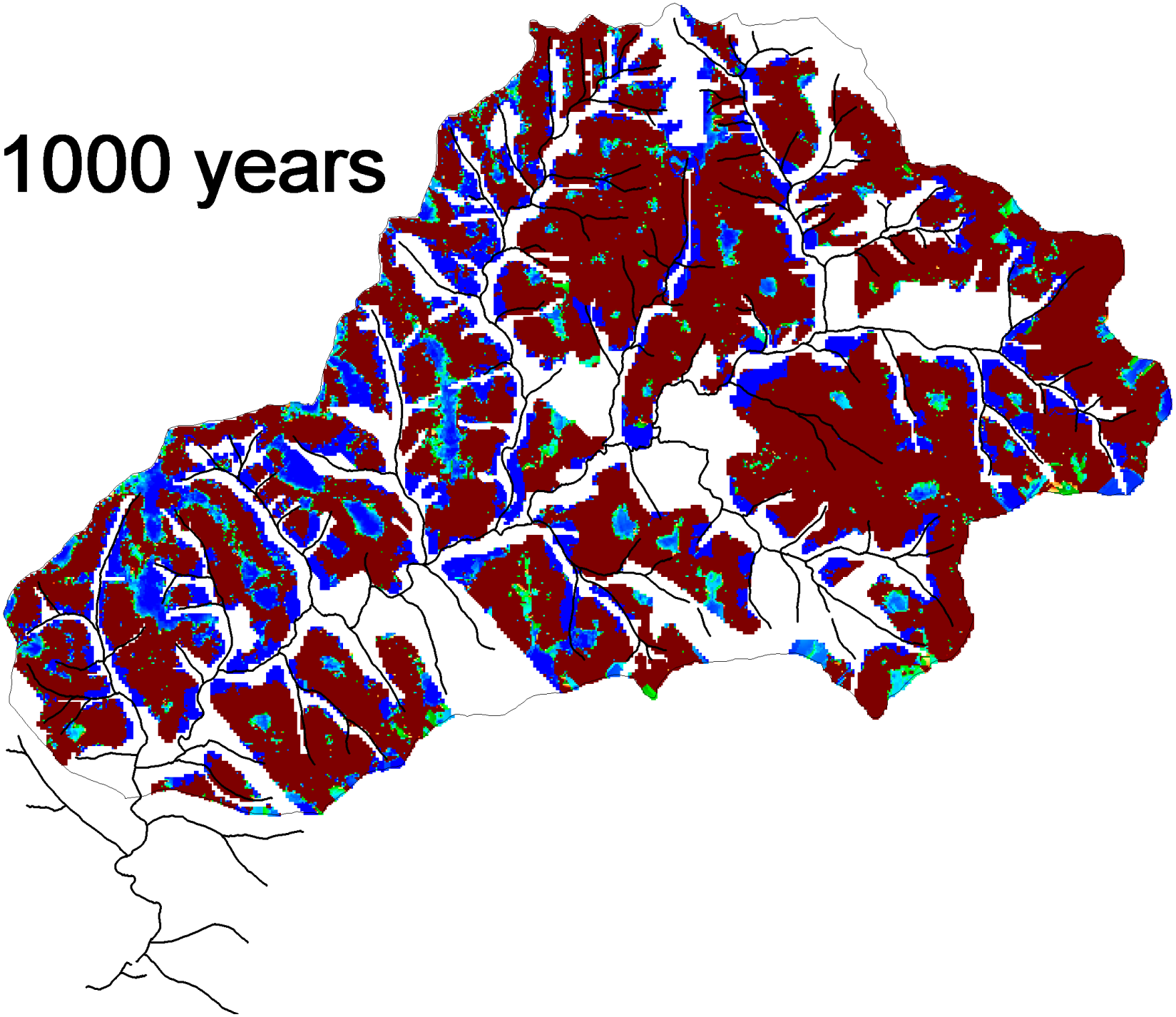

+ 100 years

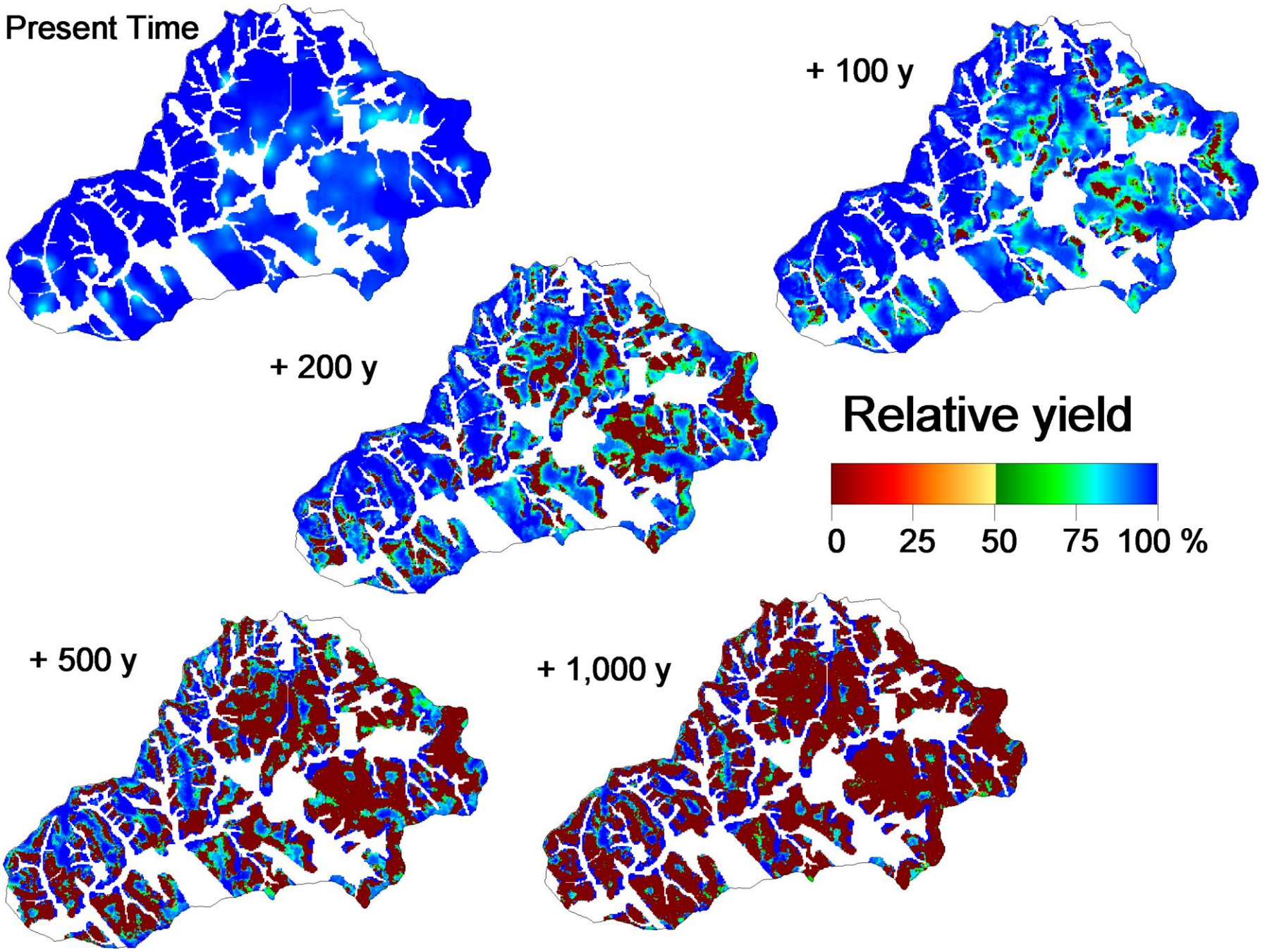
+ 200 years

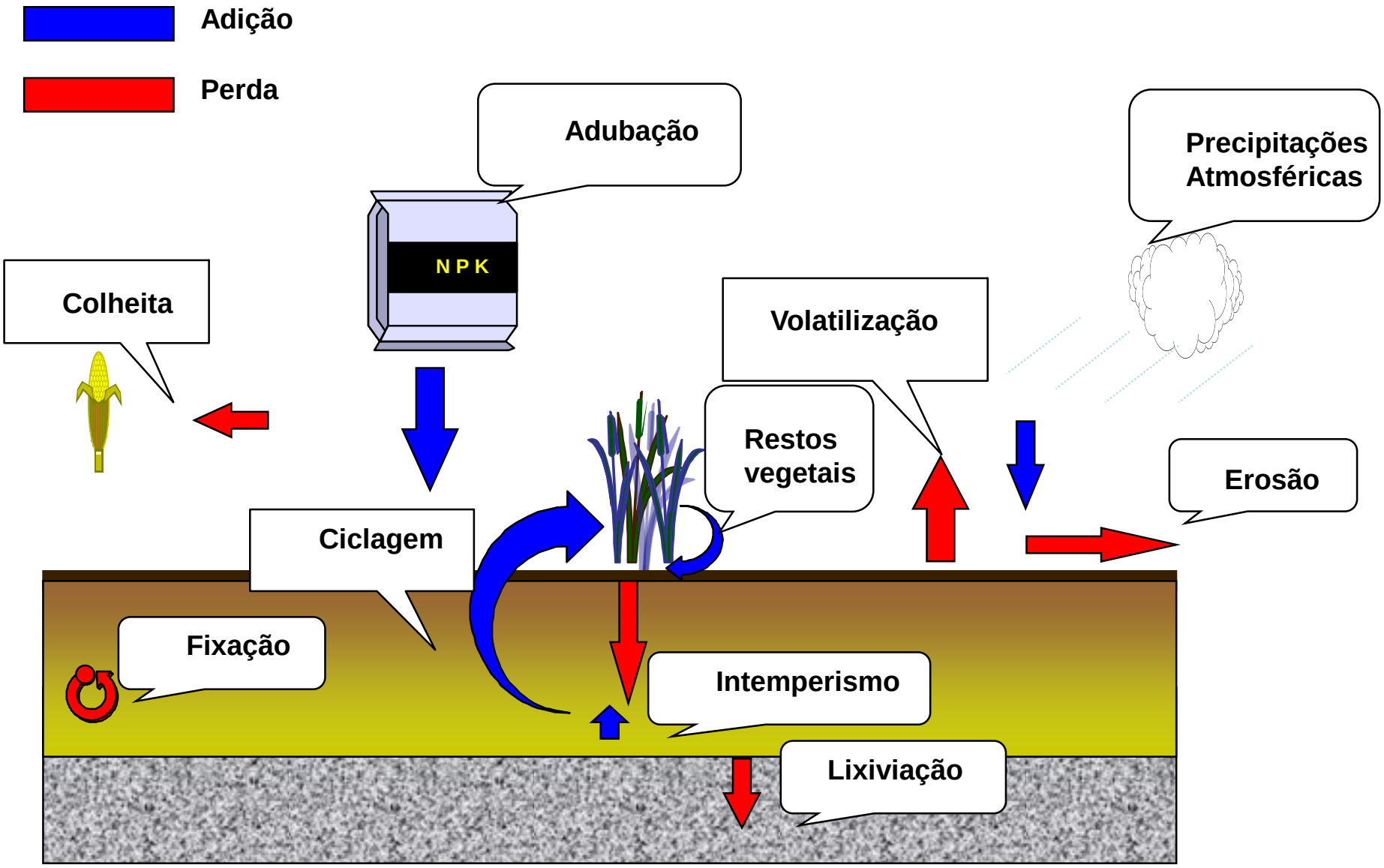


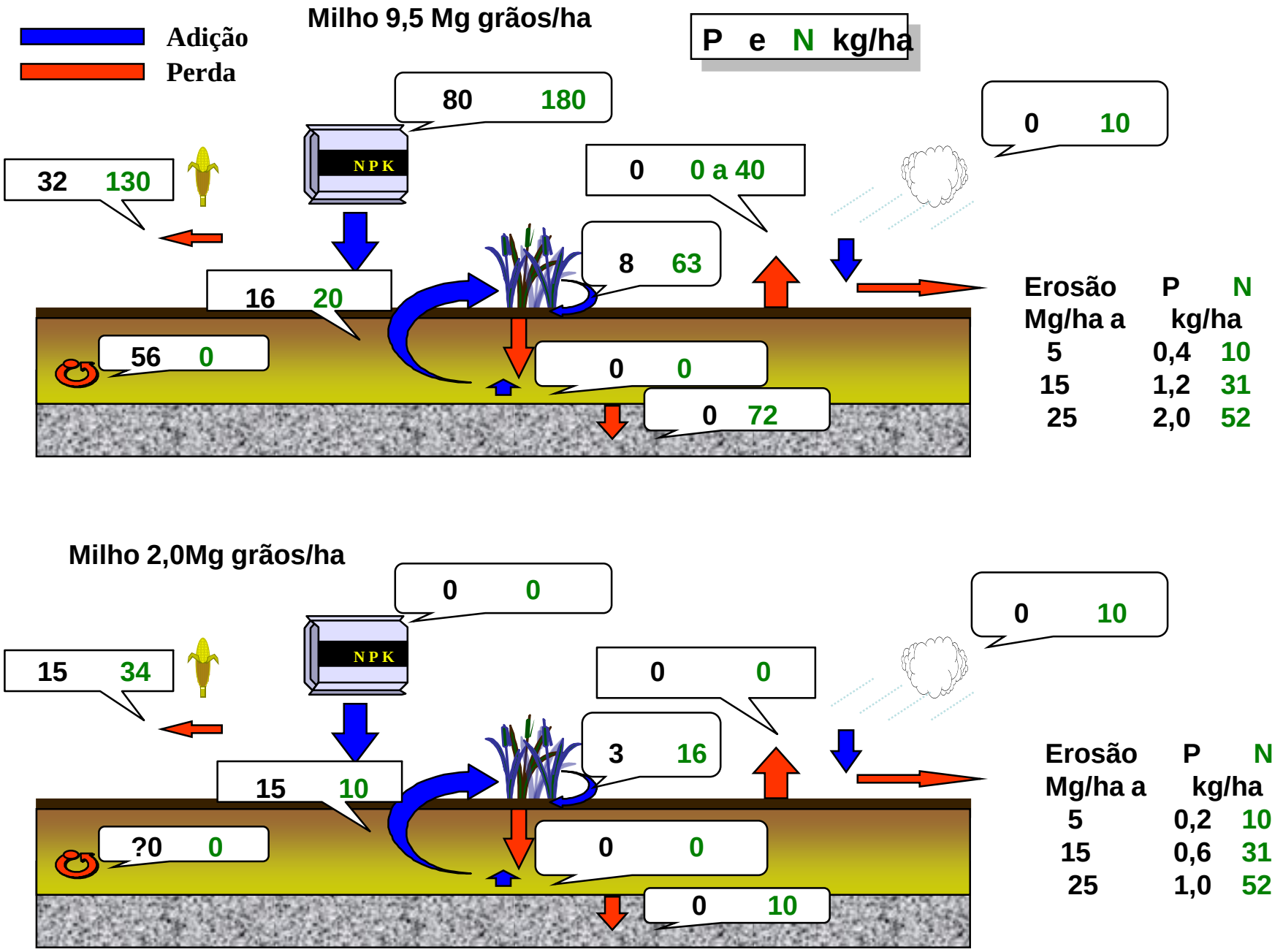

+ 700 years

+ 1000 years



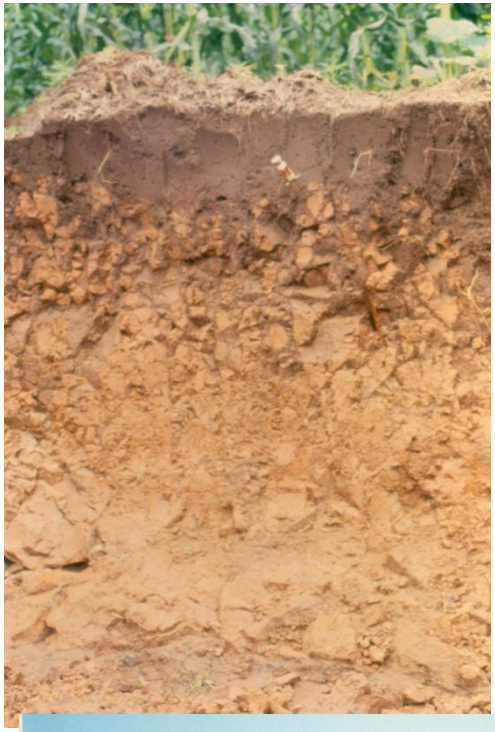

Present Time
+ 100 y
+ 200 y
Relative yield
0
25
50
75
100 %
+ 500 y
+ 1,000 y


Adição
Perda
Adubação
N P K
Precipitações Atmosféricas
Colheita
Volatilização
Restos vegetais
Erosão
Ciclagem
Fixação
Intemperismo
Lixiviação


Adição
Perda
Milho 9,5 Mg grãos/ha
P e N kg/ha
80 180
NPK
0 10
32 130
0 0 a 40
8 63
16 20
56 0
0 0
0 72
Erosão P N
Mg/ha a kg/ha
5 0,4 10
15 1,2 31
25 2,0 52
Milho 2,0Mg grãos/ha
0 0
NPK
0 10
15 34
0 0
3 16
15 10
?0 0
0 0
0 10
Erosão P N
Mg/ha a kg/ha
5 0,2 10
15 0,6 31
25 1,0 52

Agricultura com pouca utilização de insumos

Agricultura Industrial



Impactos da erosão do solo

Imediatos: concentração da enxurrada

Degradação do solo: sulcos e laminar

Ambientais: deposição de sedimentos

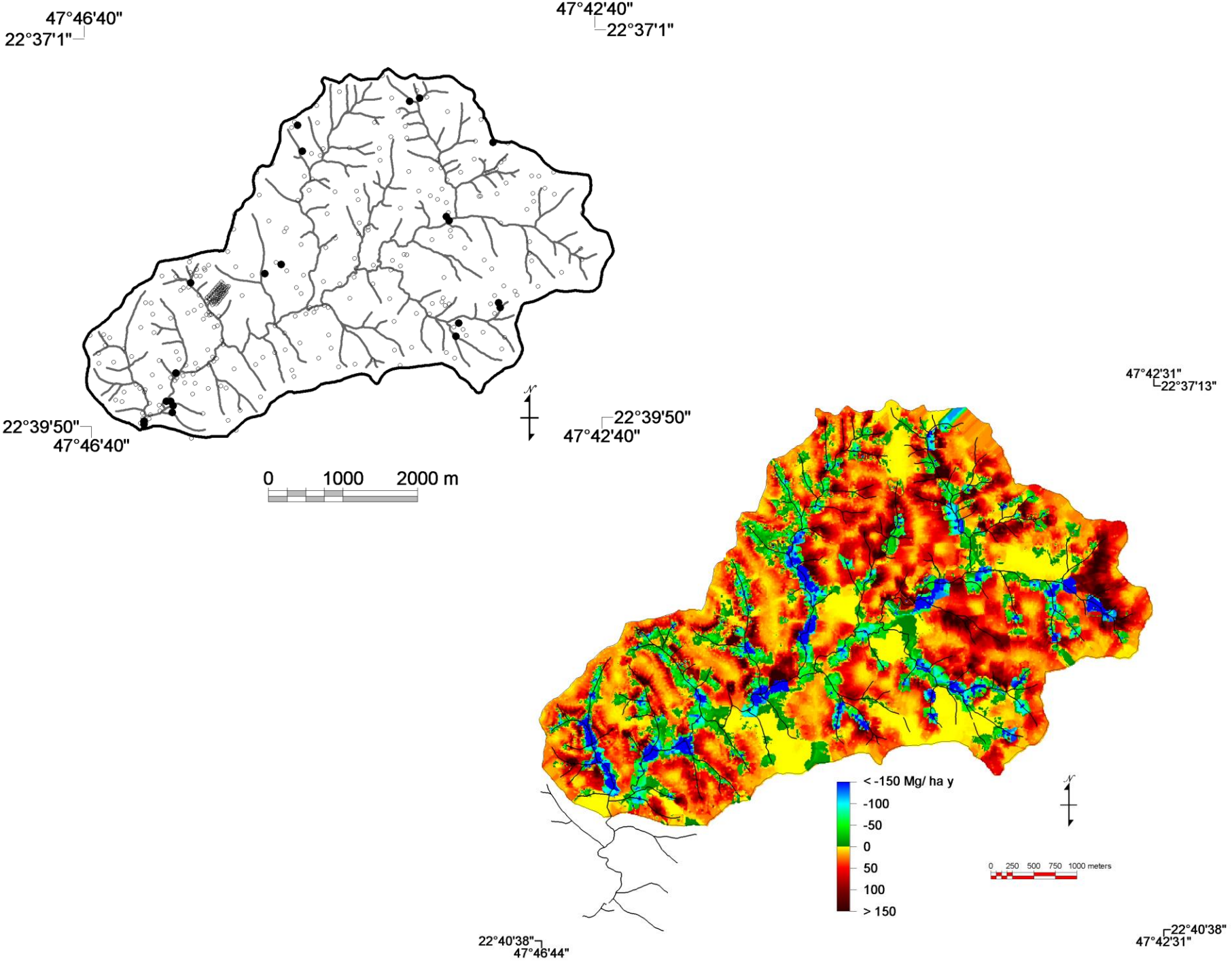
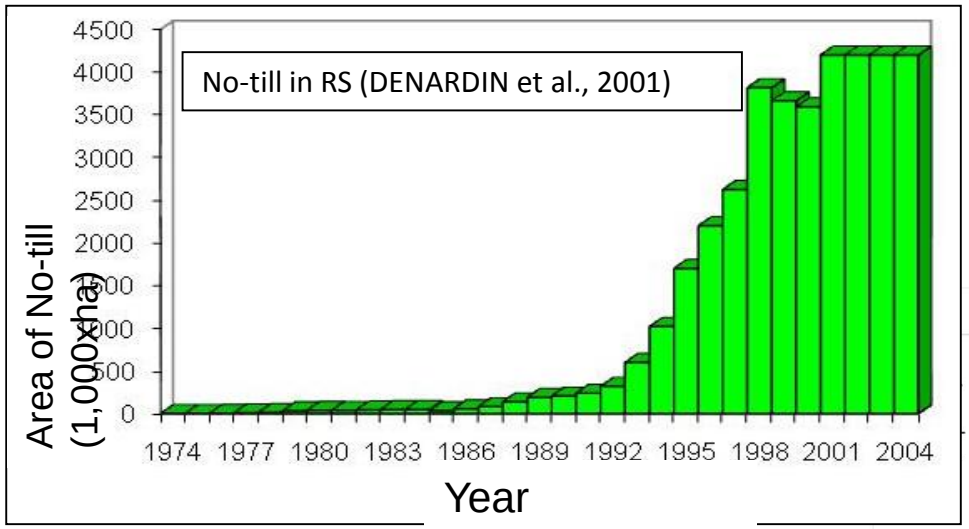

47°46'40"
22°37'1"
47°42'40"
22°37'1"
22°39'50"
47°46'40"
N
22°39'50"
47°42'40"
0 1000 2000 m
47°42'31"
22°37'13"
< -150 Mg/ ha y
-100
-50
0
50
100
> 150
N
0 250 500 750 1000 meters
22°40'38"
47°46'44"
22°40'38"
47°42'31"

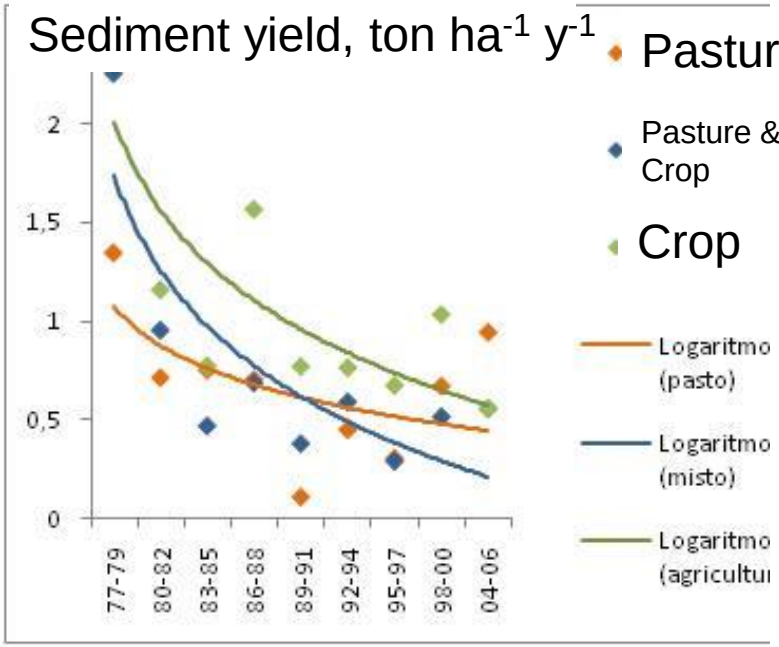
Table 1. Organochlorine compound concentrations in soils, colluviums, sediments, and organisms from the Ceveiro watershed (Brazil).

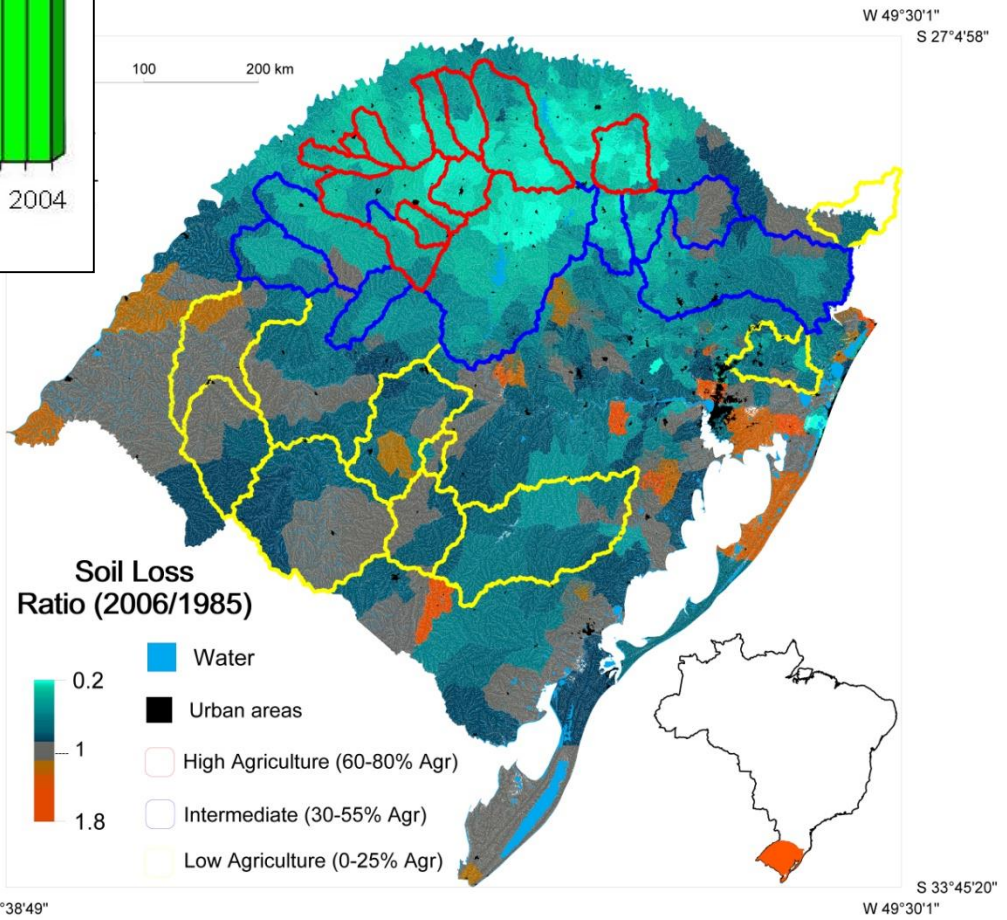
Sample	Type	Depth	Lindane	Heptachlor-epoxide cis	Heptachlor-epoxide trans
		m	μg kg^{-1}		
1	soil	0–0.2	4.0	<1	<1
	worm†	0–0.2	<2	2.0	<2
2	soil	0–0.2	<1	3.0	<1
	worm	0–0.2	<3	25.0	<3
3	soil	0–0.2	4.0	<1	<1
	worm	0–0.2	<3	<3	<3
4	soil	0–0.2	1.0	<1	<1
	worm	0–0.2	2.0	<2	<2
	larvae‡	0–0.2	23.0	41.0	3.0
5	soil	0–0.2	1.0	<1	<1
6	soil	0–0.2	1.0	<1	<1
7	soil	0–0.2	1.5	<1	<1
8	soil	0–0.2	2.8	<1	<1
9	soil	0–0.2	<1	<1	<1
10	soil	0–0.2	<1	1.7	<1
	$\bar{x}$ soil§		1.7a		
11	colluvium¶	0–0.2	4.0	<1	<1
	worm	0–0.2	<3	<3	<3
12	colluvium	0–0.2	<1	<1	<1
	worm	0–0.2	<3	<3	<3
13	colluvium	0–0.2	<1	1.0	<1
	worm	0–0.2	<3	<3	<3
14	colluvium	0–0.2	2.0	<1	<1
15	colluvium	0–0.2	1.4	<1	<1
16	colluvium	0–0.2	3.0	<1	<1
17	colluvium	0–0.2	3.0	<1	<1
18	colluvium	0–0.2	<1	<1	<1
19	colluvium	0–0.2	<1	<1	<1
20	colluvium	0–0.2	<1	<1	<1
	$\bar{x}$ colluvium		1.6a		
21	sediment#	0–0.1	2.0	1.0	<1
22	sediment	0–0.05	3.5	<1	<1
23	sediment	0.05–0.1	2.4	<1	<1
24	sediment	0.1–0.2	6.3	<1	<1
25	sediment	0.2–0.3	3.6	<1	<1
26	sediment	0.3–0.5	1.7	<1	<1
	$\bar{x}$ sediment		3.3b		

† Geophagous earthworm *Pontoscolex corethrurus* (Müller, 1857) expressed in dry matter (lyophilized).
‡ Bug larvae *Migdolus fryanus* (Westwood, 1863) expressed in dry matter (lyophilized).
§ Mean values calculated considering the measured rates or half the concentration of the detection limit. Different characters after mean values indicate significant (* or $p < 0.05$) differences according to Duncan test.
¶ Recently deposited sediments located at the floodplain positions along the main stream.
# Submerged sediments deposited in a water reservoir at the watershed outlet position.

Bio-acumulação
Enriquecimento


No-till in RS (DENARDIN et al., 2001)
Area of No-till (1,000xha)
4500
4000
3500
3000
2500
2000
0
1974 1977 1980 1983 1986 1989 1992 1995 1998 2001 2004
Year


Sediment yield, ton ha-1 y-1
2
1,5
1
0,5
0
77-79
80-82
83-85
86-88
89-91
92-94
95-97
98-00
04-06
Pasture
Pasture & Crop
Crop
Logaritmo (pasto)
Logaritmo (misto)
Logaritmo (agricultu


W 49°30'1"
S 27°4'58"
100
200 km
Soil Loss Ratio (2006/1985)
0.2
1
1.8
Water
Urban areas
High Agriculture (60-80% Agr)
Intermediate (30-55% Agr)
Low Agriculture (0-25% Agr)
S 33°45'20"
W 57°38'49"
S 33°45'20"
W 49°30'1"