Supplementary Material

Deph range (cm)	*Average deph (cm)*	*Grain Size*	
		Clay + Silt (%)	*Sand (%)*
0 – 4	*- 2*	*1.43*	*98.6*
4 – 8	*- 6*	*0*	*100*
8 – 12	*- 10*	*16.2*	*83.8*
12 – 16	*- 14*	*47.9*	*54.1*
16 – 20	*- 18*	*15.94*	*84.1*
20 – 24	*- 22*	*35.38*	*64.6*
24 – 28	*- 26*	*41.7*	*58.3*
28 – 32	*- 30*	*45.6*	*54.4*
32 – 36	*- 34*	*49.8*	*50.2*
36 – 40	*- 38*	*46.5*	*53.5*
40 – 44	*- 42*	*44.9*	*55.1*
44 – 48	*- 46*	*43.29*	*56.8*
48 – 52	*- 50*	*64*	*36*
52 – 56	*- 54*	*82.08*	*17.9*
56 – 60	*-58*	*78.91*	*21.1*
60 – 64	*-62*	*82.75*	*17.3*
64 – 68	*-66*	*78,6*	*21.4*

Table 1. Main characteristics of each segment of the core sampled.

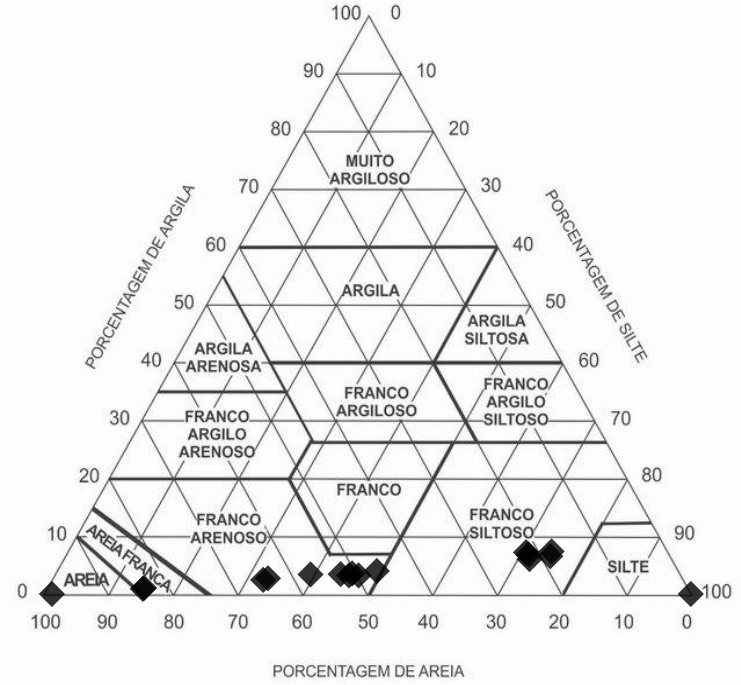


Figure 1. Ternary diagram for sediment texture classification according to the Brazilian Soil Classification System (EMBRAPA)[1], adapted from Lemos and Santos (1996).[2]

[1] **Access more information:** https://www.embrapa.br/solos/sibcs

[2] **Lemos, R. C. de, & Santos, R. D. dos. (1996).** *Manual de descrição e coleta de solo no campo* (3rd ed.). Sociedade Brasileira de Ciência do Solo; EMBRAPA-CNPS. http://www.infoteca.cnptia.embrapa.br/infoteca/handle/doc/330369

Supplementary Material

Deph range (cm)	Average deph (cm)	TDW[3] (g)	CDW[4] (g cm⁻²)	^{210}Pb (Bq kg⁻¹)	^{226}Ra (Bq kg⁻¹)	ln $^{210}Pb_{xs}$[5]	Deposition age[6]	Deposition year
0 – 4	- 2	90.3	7.2	116.5±6	38.8±3	4.4	0	2025
4 – 8	- 6	71.2	12.9	74.3±4	31.3±2	3.8	7	2018
8 – 12	- 10	76.4	18.9	77.8±4	35.5±2	3.7	11	2014
12 – 16	- 14	31.6	21.5	98.0±5	66.5±4	3.4	16	2009
16 – 20	- 18	58.5	26.1	64.8±4	34.2±2	3.4	18	2007
20 – 24	- 22	38.7	29.2	142.3±7	73.5±5	4.2	21	2004
24 – 28	- 26	21.7	30.9	164.1±9	99.8±7	4.2	26	1999
28 – 32	- 30	26	33.0	221.3±10	156.6±8	4.2	29	1996
32 – 36	- 34	31.5	35.5	127.5±7	67.1±5	4.1	33	1992
36 – 40	- 38	26.1	37.6	145.7±8	86.0±6	4.1	39	1986
40 – 44	- 42	26.2	39.7	180.4±9	122.2±7	4.1	44	1981
44 – 48	- 46	27.9	41.9	204.9±10	157.8±8	3.9	51	1974
48 – 52	- 50	23.4	43.8	190.9±9	152.2±9	3.7	47	1968
52 – 56	- 54	32	46.3	169.2±8	133.3±7	3.6	63	1962
56 – 60	-58	33.3	48.9	175.5±10	154.2±9	3.1	72	1953
60 – 64	-62	34.45	51.8	171.4±7	135.2±6	3.6	79	1946
64 – 68	-66	32.3	54.3	67.6±4	64.9±5	1.0	-	-

Table 2 Radiochemical activities data for each segment of the sediment core sampled.

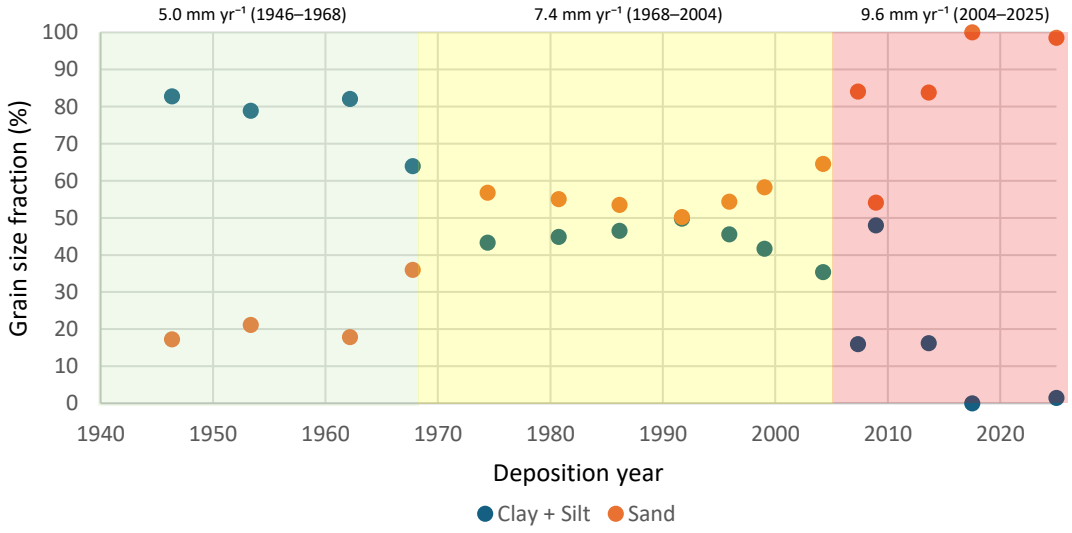


Figure 2. Temporal variation in grain size composition (%) along the sediment core, expressed as relative proportions of sand and clay + silt fractions. The data reveal a clear shift from fine-dominated sediments in earlier periods to increasing sand content in more recent deposits, indicating a progressive coarsening of the sedimentary record over time.

[3] TDW = Total Dry Weight.
[4] CDW = Cumulated Dry Weight area $^{-1}$.
[5] $^{210}Pb_{xs} = {}^{210}Pb - {}^{226}Ra$.
[6] Deposition age = CDW Sediment mass flux $^{-1}$.

EGU26-12864 | **ECS** | Orals | GM10.1

Rodrigo Agostinho Silva de Campos, Cenira Maria Lupinacci, and Fabiano Tomazini da Conceição
Tue, 05 May, 10:05–10:15 (CEST) Room G1

Supplementary Material

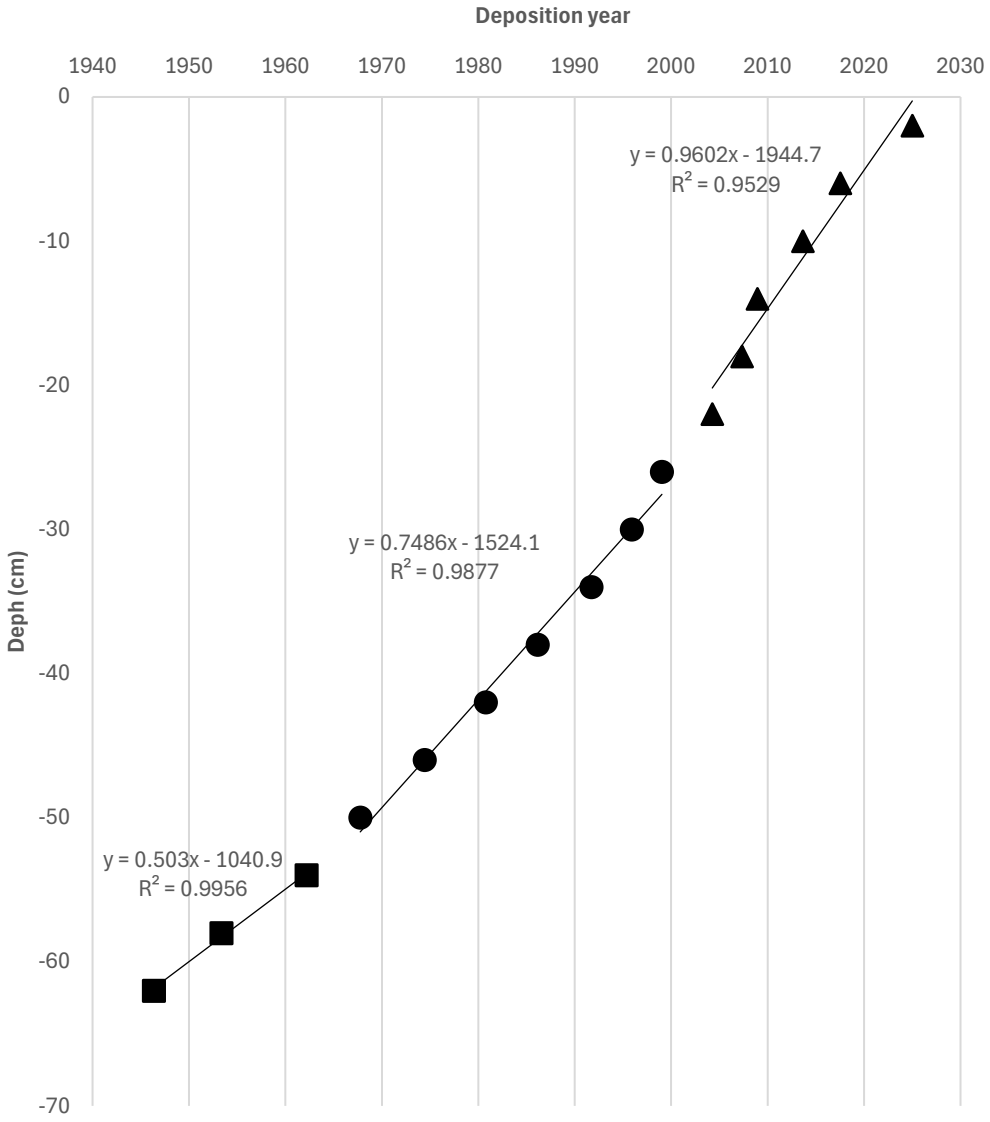


Figure 3. Relationship between depth (cm) and deposition year along the sediment core, divided into three segments with independent linear regressions. The different symbols represent each segment, highlighting temporal variations in sedimentation rates. These phases indicate a progressive acceleration of sediment accumulation, increasing from 5.0 mm yr⁻¹ (1946–1968) to 7.4 mm yr⁻¹ (1968–2004), and reaching 9.6 mm yr⁻¹ after 2004. The high coefficients of determination (R²) indicate a strong fit between depth and age within each segment.

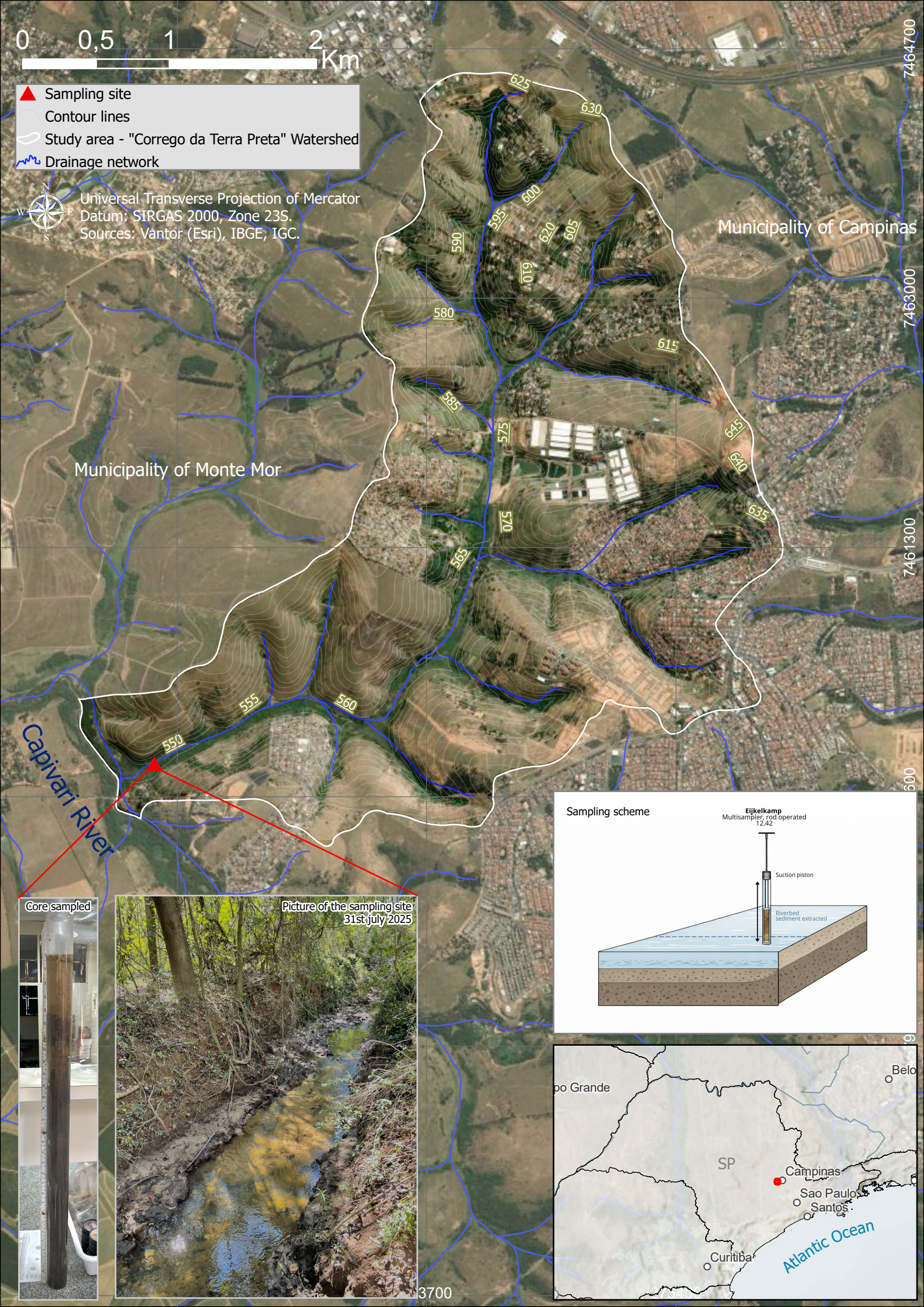
Acceleration and grain-size inversion of riverbed sedimentation driven by anthropogenic landscape reorganization (SE Brazil)
Rodrigo Agostinho Silva de Campos, Cenira Maria Lupinacci, and Fabiano Tomazini da Conceição
Tue, 05 May, 10:05–10:15 (CEST) Room G1

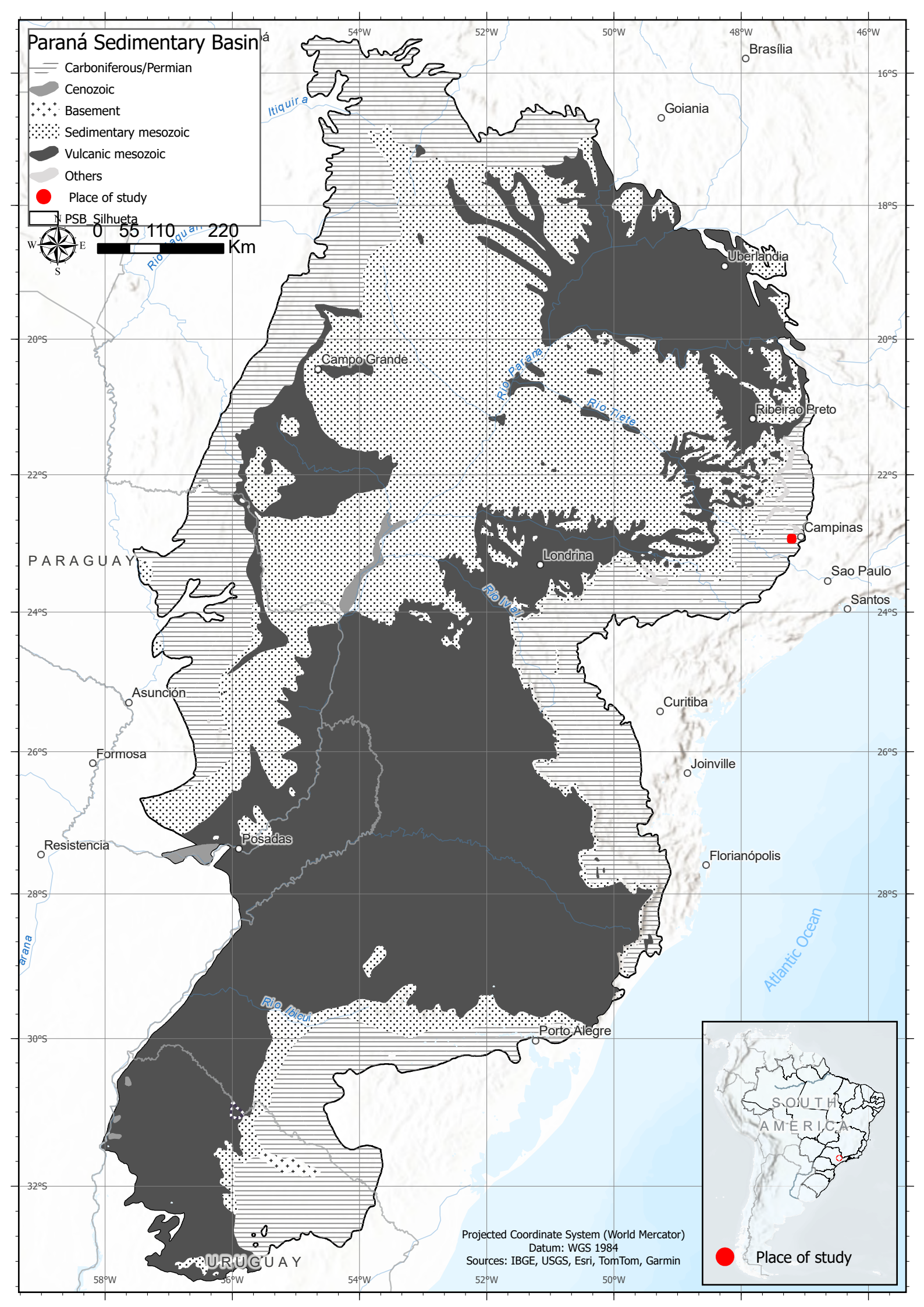
Supplementary Material

Color/Code	LULC Classes	Description
#1f8d49	Forest formation	Vegetation types characterized by the predominance of tree species, with high tree density, closed canopy, and vertical stratification. Includes Dense, Open, and Mixed Ombrophilous Forests, Seasonal Semideciduous and Deciduous Forests, and Pioneer formations.
#519799	Wetlands	Vegetation associated with floodplains or areas influenced by fluvial and/or lacustrine dynamics, characterized by the predominance of hydrophilic vegetation, including emergent, submerged, or floating aquatic plants.
#d6bc74	Grassland	Vegetation dominated by herbaceous species and grasses, with few scattered trees and shrubs, typically presenting an open or absent canopy. Occurs on soils ranging from deep to shallow, including rocky terrains (rupestrian grasslands). Includes park savannas, steppe grasslands, and pioneer shrub and herbaceous formations.
#edde8e	Pasture	Planted pasture areas directly associated with livestock activities. Natural pasture areas are predominantly classified as grassland formations or flooded grasslands and may or may not be subjected to grazing practices.
#db7093	Sugarcane	Areas cultivated with sugarcane monoculture.
#ffefc3	Mosaic of land uses	Areas used for agricultural and livestock activities where it is not possible to distinguish between pasture and cropland, including fallow land. These areas may also include peri-urban zones, such as smallholdings and rural properties. Transitional areas are also included, where secondary vegetation is developing on abandoned pastures or undergoing ecological restoration, without yet reaching forest structure.
#d4271e	Urban area	Areas with a high density of buildings and road infrastructure, including both built-up and non-built urban spaces.
#db4d4f	Other non-vegetated areas	Natural areas with exposed soil resulting from climatic events (e.g., landslides, floods) and areas with impermeable surfaces (e.g., infrastructure, urban expansion, or mining) not classified within their respective categories.
#2532e4	Water	Rivers, lakes, reservoirs, and other surface water bodies.
#f5b3c8	Soybean	Areas cultivated with soybean monoculture (first cropping season).

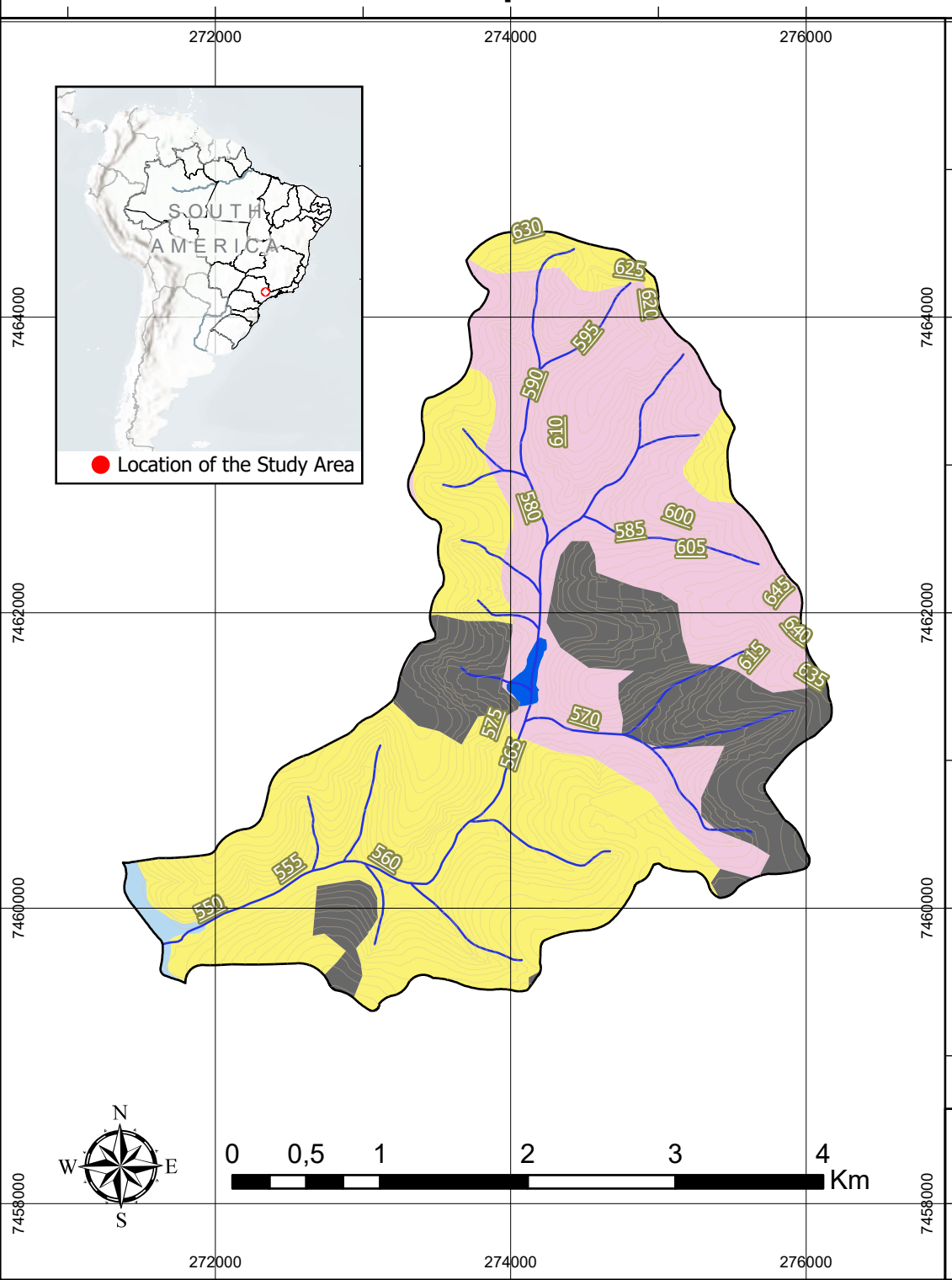
Supplementary Material

Table 3. Land-use and land-cover (LULC) classes used in the study, including color codes and corresponding descriptions. The classification scheme follows the MapBiomas framework, derived from Landsat-based products (30 m spatial resolution), ensuring consistency across all temporal analyses. Each class represents a distinct land-use or vegetation type, ranging from natural formations (e.g., forest formation, wetland, and grassland formation) to anthropogenic uses (e.g., pasture, sugarcane, urban areas, and mosaic of land uses). In the Brazilian context, the expression and characteristics of each class may vary according to the biome; in this study, the area is located within the Atlantic Forest domain, where these classes reflect specific ecological and land-use configurations.


0 0,5 1 2 Km
Sampling site
Contour lines
Study area - "Corrego da Terra Preta" Watershed
Drainage network
Universal Transverse Projection of Mercator
Datum: SIRGAS 2000, Zone 23S.
Sources: Vantor (Esri), IBGE, IGC.
Municipality of Campinas
Municipality of Monte Mor
Capivari River
625
630
600
595
590
620
605
610
580
615
585
575
645
640
635
570
565
555
560
550
7464700
7463000
7461300
600
3700
Sampling scheme
Eijkelkamp
Multisampler, rod operated
12.42
Suction piston
Riverbed
sediment extracted
Core sampled
Picture of the sampling site
31st july 2025
Belo
po Grande
SP
Campinas
Sao Paulo
Santos
Curitiba
Atlantic Ocean


Paraná Sedimentary Basin
Carboniferous/Permian
Cenozoic
Basement
Sedimentary mesozoic
Vulcanic mesozoic
Others
Place of study
PSB_Silhueta
0 55 110 220
Km
Brasília
Goiania
Uberlandia
Campo Grande
Ribeirao Preto
Campinas
Londrina
Sao Paulo
Santos
Asunción
Curitiba
Formosa
Joinville
Posadas
Resistencia
Florianópolis
Porto Alegre
PARAGUAY
URUGUAY
Atlantic Ocean
Rio Paraná
Rio Tiete
Rio Ivai
Rio Ibicui
Itiquira
54°W
52°W
50°W
48°W
46°W
16°S
18°S
20°S
22°S
24°S
26°S
28°S
30°S
32°S
58°W
56°W
SOUTH AMERICA
Projected Coordinate System (World Mercator)
Datum: WGS 1984
Sources: IBGE, USGS, Esri, TomTom, Garmin
Place of study

Spatial distribution of soil classes in the study area (SiBCS)



Red-Yellow Argisols (Argissolos Vermelho-Amarelos)

Argisols are mineral soils characterized by the presence of a textural B horizon (Bt) underlying an A or E horizon within the upper 200 cm of the soil profile. They exhibit a marked increase in clay content with depth, resulting from illuviation processes. These soils typically present low-activity clays and low base saturation or, alternatively, aluminic character in most of the B horizon. In tropical environments, they are commonly associated with well-drained, weathered landscapes and correspond broadly to Acrisols (WRB) or Ultisols (Soil Taxonomy), reflecting advanced pedogenetic development under intense leaching conditions.

Quartzarenic Neosols (Neossolos Quartzarênicos)

Quartzarenic Neosols are weakly developed mineral soils lacking any diagnostic B horizon and typically exhibiting an A–C horizon sequence. They are characterized by sandy textures (sand or loamy sand) throughout the profile up to at least 200 cm depth and are predominantly composed (>95%) of quartz, with minimal presence of weatherable minerals. These soils reflect limited pedogenic development and are commonly associated with highly permeable substrates and low nutrient retention capacity. In international classification systems, they correspond to Arenosols (WRB) or Quartzipsamments (Soil Taxonomy).

Haplic Gleysols (Gleissolos Háplicos)

Gleysols are poorly to very poorly drained mineral soils characterized by the presence of a gley horizon within the upper 50 cm, or between 50 and 150 cm when directly underlying A or E horizons. They form under conditions of prolonged water saturation, leading to reductive processes and the development of greyish colors, mottling, and hydromorphic features. These soils lack diagnostic B horizons above the gley horizon and are typically associated with floodplains, wetlands, and areas influenced by fluctuating water tables. They correspond directly to Gleysols in the WRB system, representing environments with strong hydrological control on pedogenesis.

Water bodies

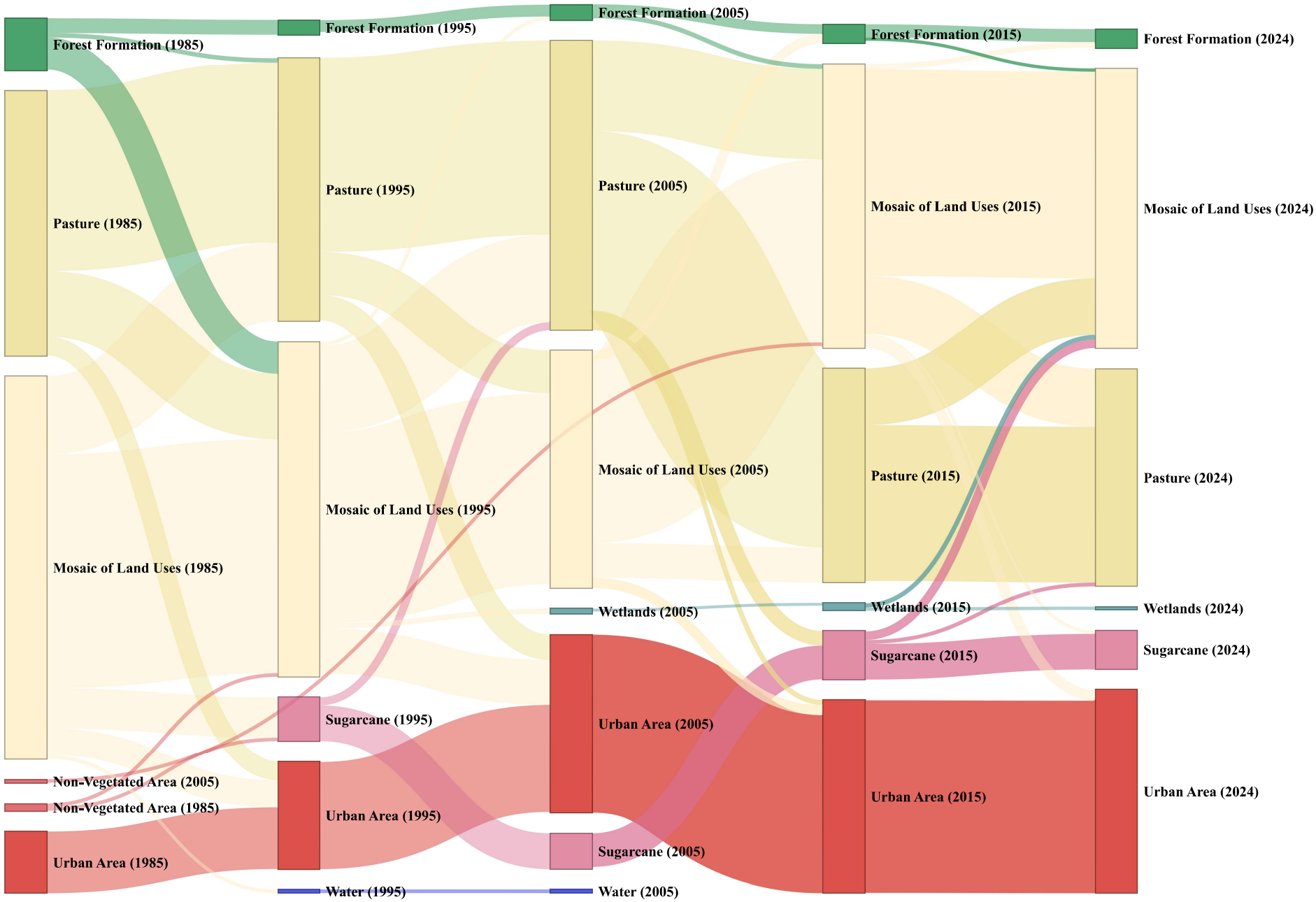
Urban area

Contour lines

Study area - "Corrego da Terra Preta" Watershed

Drainage network

Universal Transverse Projection of Mercator
Coordinate system: SIRGAS 2000 / UTM Zone 23S | Datum: SIRGAS 2000
Universal Transverse Mercator (UTM)
Data sources: Soil classes based on the Brazilian Soil Classification System (SiBCS); hydrography and administrative boundaries derived from IBGE and complementary geospatial datasets.


Forest Formation (1985)
Pasture (1985)
Mosaic of Land Uses (1985)
Non-Vegetated Area (2005)
Non-Vegetated Area (1985)
Urban Area (1985)
Forest Formation (1995)
Pasture (1995)
Mosaic of Land Uses (1995)
Sugarcane (1995)
Urban Area (1995)
Water (1995)
Forest Formation (2005)
Pasture (2005)
Mosaic of Land Uses (2005)
Wetlands (2005)
Urban Area (2005)
Sugarcane (2005)
Water (2005)
Forest Formation (2015)
Mosaic of Land Uses (2015)
Pasture (2015)
Wetlands (2015)
Sugarcane (2015)
Urban Area (2015)
Forest Formation (2024)
Mosaic of Land Uses (2024)
Pasture (2024)
Wetlands (2024)
Sugarcane (2024)
Urban Area (2024)

Transition Matrices for Land-Use

Derived from MapBiomas Collection 9 (198

Period: 1985 - 1995		
From (Origin)	To (Destination)	Area (km²)
Urban area	Urban area	1015.2
Forest formation	Urban area	0.9
Mosaic of land uses	Urban area	448.2
Pasture	Urban area	309.6
Mosaic of land uses	Sugarcane	665.1
Other non-vegetated areas	Sugarcane	59.4
Pasture	Sugarcane	28.8
Forest formation	Forest formation	246.6
Mosaic of land uses	Forest formation	20.7
Forest formation	Mosaic of land uses	531.9
Mosaic of land uses	Mosaic of land uses	3865.5
Other non-vegetated areas	Mosaic of land uses	61.2
Pasture	Mosaic of land uses	1083.6
Mosaic of land uses	Other non-vegetated areas	32.4
Pasture	Other non-vegetated areas	12.6
Mosaic of land uses	Outras Lavouras Temporárias	17.1
Pasture	Outras Lavouras Temporárias	12.6
Forest formation	Pasture	71.1
Mosaic of land uses	Pasture	1296
Other non-vegetated areas	Pasture	7.2
Pasture	Pasture	2991.6
Mosaic of land uses	Water bodies	57.6
Pasture	Water bodies	19.8
Water bodies	Water bodies	7.2
Forest formation	Silvicultura	6.3

Period: 2005 - 2015

From (Origin)	To (Destination)	Area (km²)
Urban area	Urban area	2945.7
Mosaic of land uses	Urban area	168.3
Pasture	Urban area	83.7
Wetland	Wetland	46.8
Mosaic of land uses	Wetland	44.1
Pasture	Wetland	4.5
Water bodies	Wetland	35.1
Sugarcane	Sugarcane	556.2
Mosaic of land uses	Sugarcane	5.4
Pasture	Sugarcane	240.3
Formação Campestre	Formação Campestre	6.3
Mosaic of land uses	Formação Campestre	6.3
Forest formation	Forest formation	155.7
Mosaic of land uses	Forest formation	153
Pasture	Forest formation	1.8
Urban area	Mosaic of land uses	5.4
Wetland	Mosaic of land uses	41.4
Sugarcane	Mosaic of land uses	35.1
Formação Campestre	Mosaic of land uses	4.5
Forest formation	Mosaic of land uses	75.6
Mosaic of land uses	Mosaic of land uses	3032.1
Other non-vegetated areas	Mosaic of land uses	59.4
Pasture	Mosaic of land uses	1503.9
Water bodies	Mosaic of land uses	25.2
Soybean	Mosaic of land uses	1.8
Urban area	Other non-vegetated areas	3.6
Mosaic of land uses	Other non-vegetated areas	10.8
Other non-vegetated areas	Other non-vegetated areas	15.3
Sugarcane	Pasture	3.6
Forest formation	Pasture	20.7
Mosaic of land uses	Pasture	574.2
Pasture	Pasture	2962.8
Water bodies	Pasture	4.5
Soybean	Pasture	8.1
Urban area	Water bodies	5.4
Mosaic of land uses	Water bodies	0.9
Water bodies	Water bodies	10.8
Pasture	Soybean	9.9

and Land-Cover Change Data

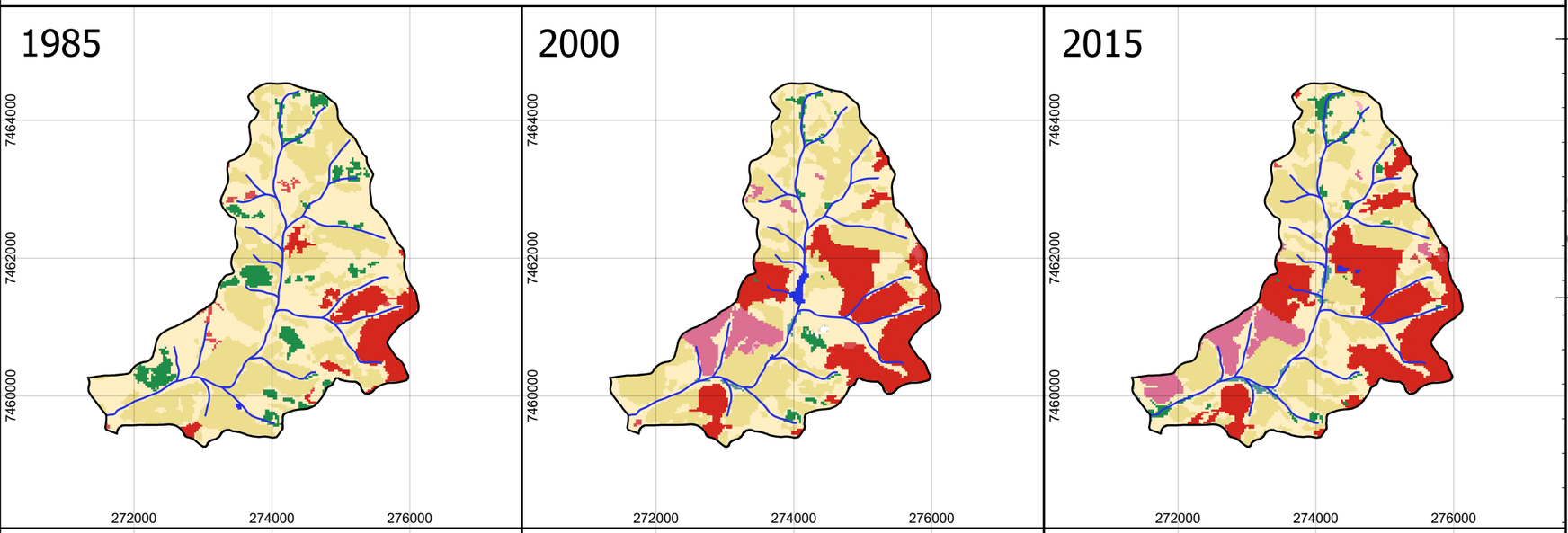
5–2024), Landsat-based classification

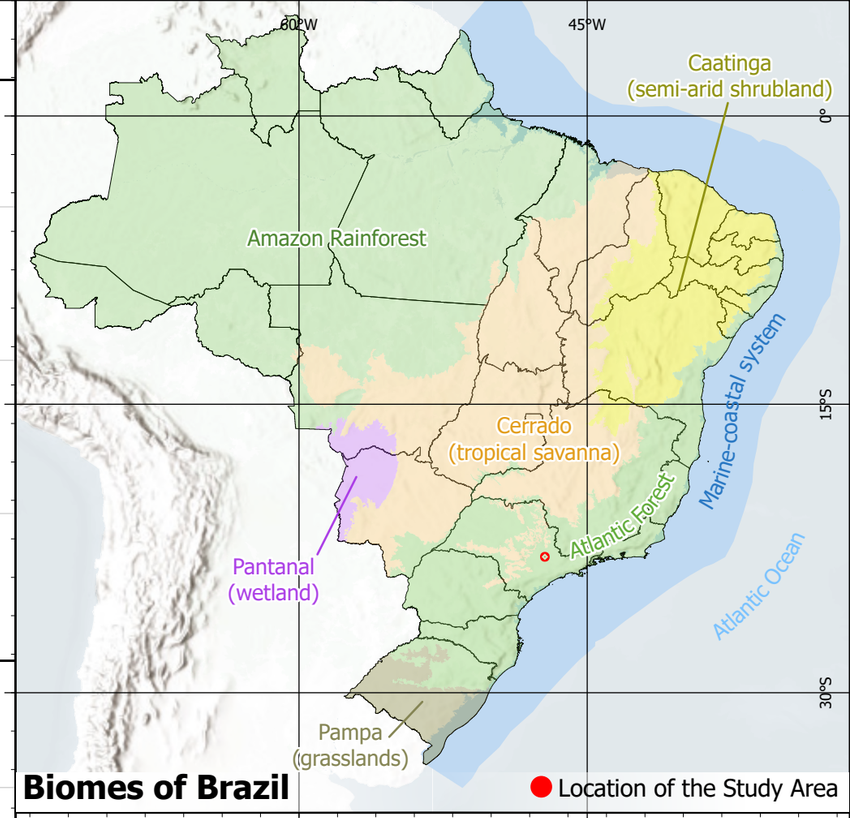
Period: 1995 - 2005		
From (Origin)	To (Destination)	Area (km²)
Urban area	Urban area	1772.1
Sugarcane	Urban area	3.6
Forest formation	Urban area	12.6
Mosaic of land uses	Urban area	743.4
Other non-vegetated areas	Urban area	9.9
Outras Lavouras Temporárias	Urban area	0.9
Pasture	Urban area	417.6
Mosaic of land uses	Wetland	88.2
Sugarcane	Sugarcane	590.4
Mosaic of land uses	Sugarcane	4.5
Mosaic of land uses	Formação Campestre	0.9
Pasture	Formação Campestre	9.9
Forest formation	Forest formation	194.4
Mosaic of land uses	Forest formation	54.9
Pasture	Forest formation	0.9
Silvicultura	Forest formation	1.8
Urban area	Mosaic of land uses	1.8
Sugarcane	Mosaic of land uses	27.9
Forest formation	Mosaic of land uses	38.7
Mosaic of land uses	Mosaic of land uses	3153.6
Other non-vegetated areas	Mosaic of land uses	3.6
Outras Lavouras Temporárias	Mosaic of land uses	28.8
Pasture	Mosaic of land uses	710.1
Water bodies	Mosaic of land uses	26.1
Silvicultura	Mosaic of land uses	4.5
Mosaic of land uses	Other non-vegetated areas	33.3
Other non-vegetated areas	Other non-vegetated areas	31.5
Pasture	Other non-vegetated areas	9.9
Sugarcane	Pasture	131.4
Forest formation	Pasture	21.6
Mosaic of land uses	Pasture	1446.3
Pasture	Pasture	3205.8
Water bodies	Pasture	1.8
Mosaic of land uses	Water bodies	17.1
Pasture	Water bodies	1.8
Water bodies	Water bodies	56.7
Pasture	Soybean	9.9

Period: 2015 - 2024

From (Origin)	To (Destination)	Area (km²)
Urban area	Urban area	3191.4
Sugarcane	Urban area	6.3
Mosaic of land uses	Urban area	175.5
Pasture	Urban area	35.1
Water bodies	Urban area	5.4
Wetland	Wetland	48.6
Mosaic of land uses	Wetland	40.5
Wetland	Sugarcane	0.9
Sugarcane	Sugarcane	588.6
Mosaic of land uses	Sugarcane	51.3
Pasture	Sugarcane	24.3
Formação Campestre	Formação Campestre	12.6
Forest formation	Forest formation	216.9
Mosaic of land uses	Forest formation	88.2
Urban area	Mosaic of land uses	6.3
Wetland	Mosaic of land uses	74.7
Sugarcane	Mosaic of land uses	143.1
Forest formation	Mosaic of land uses	53.1
Mosaic of land uses	Mosaic of land uses	3425.4
Other non-vegetated areas	Mosaic of land uses	15.3
Pasture	Mosaic of land uses	937.8
Wetland	Other non-vegetated areas	6.3
Forest formation	Other non-vegetated areas	2.7
Mosaic of land uses	Other non-vegetated areas	43.2
Other non-vegetated areas	Other non-vegetated areas	14.4
Sugarcane	Pasture	63.9
Forest formation	Pasture	37.8
Mosaic of land uses	Pasture	958.5
Pasture	Pasture	2569.5
Soybean	Pasture	9.9
Water bodies	Water bodies	11.7
Mosaic of land uses	Soybean	1.8
Pasture	Soybean	7.2

Land-Use and Land-Cover Change (1985–2024)





Legend

- Forest formation
- Wetland
- Grassland
- Pasture
- Sugarcane
- Mosaic
- Urban
- Non-vegetated
- Water
- Soybean
- Study area - "Corrego da Terra Preta" Watershed
- Drainage network

N W E S

1,5 0,75 0 1,5 3 4,5 6 Km

Projection: UTM Zone 23S (SIRGAS 2000)
Data source: MapBiomas Collection 9 (1985–2024), Landsat-based classification
Hydrography: ANA.

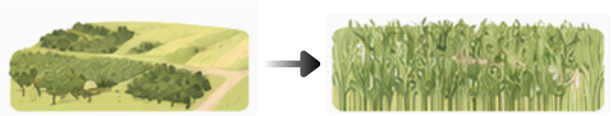
1. ANTROPOGENIC LANDSCAPE REORGANIZATION

Anthropogenic drivers of landscape change (1985–2024)

Urban expansion

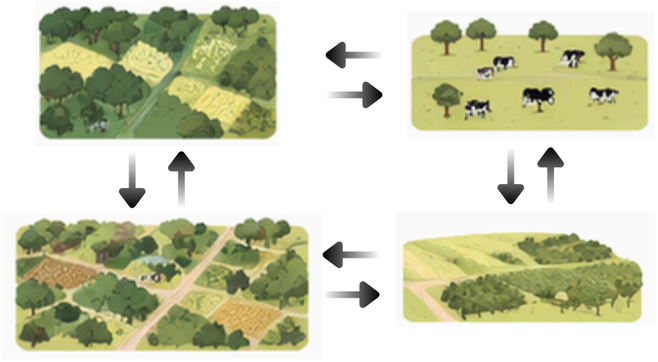
1985 2024

Sugarcane expansion



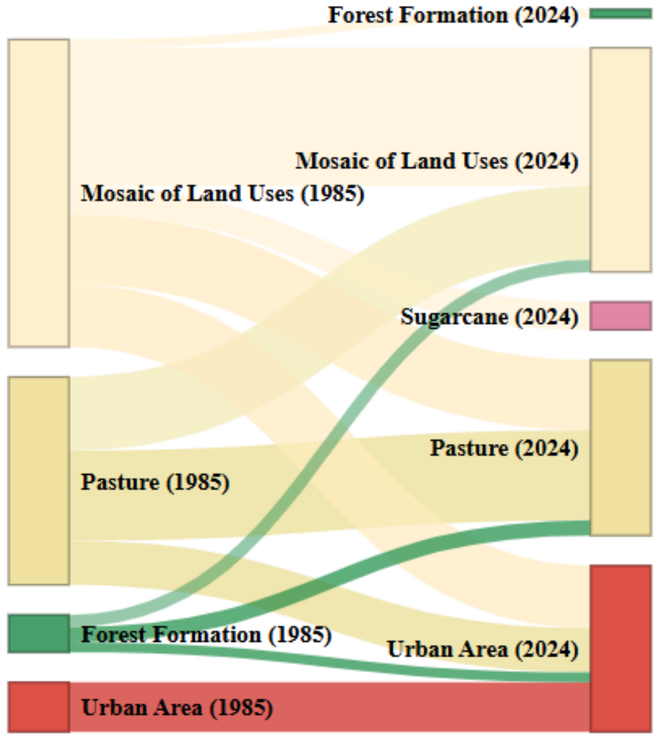
1985 2024

Dynamic land-use reconfiguration through mosaic transitions



2. LULC TRANSITIONS AND CONNECTIVITY

Main land cover transitions (1985 - 2024)

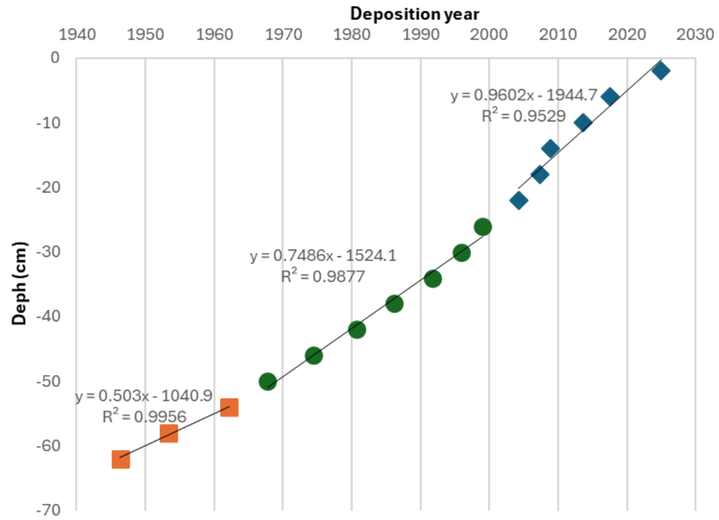


Increased surface disturbance

Enhanced sediment-source connectivity

3. FLUVIAL SEDIMENTARY RESPONSE

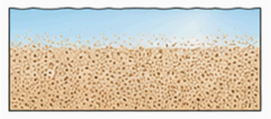
Accelerated sediment accumulation (sedimentation rates)



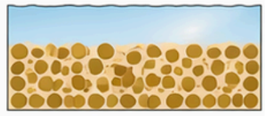
Grain-size inversion

From fine-dominated to sand-dominated sediments

Fine-dominated
(silt and clay)



Sand-dominated
(sands)



Anthropogenic land-use reorganization controls sedimentation regimes, expressed as changes in sedimentation rates and sediment texture in fluvial systems.