

Journée Écologie, Environnement, Biodiversité.

Semaine INEE

Saint-Étienne – Jeudi 30 mai 2024

Visite de la friche Neyron :

un site multicontaminé au coeur d'un projet de réaménagement urbain

Supports pour la visite

Mines Saint-Etienne

Olivier Faure :

olivier.faure@mines-stetienne.fr

Frédéric Paran :

frederic.paran@mines-stetienne.fr

Steve Peuble :

steve.peuble@mines-stetienne.fr

Rachel Seillier :

rachel.seillier@mines-stetienne.fr

Frédéric Gallice :

frederic.gallice@mines-stetienne.fr

Marceau Lhospital :

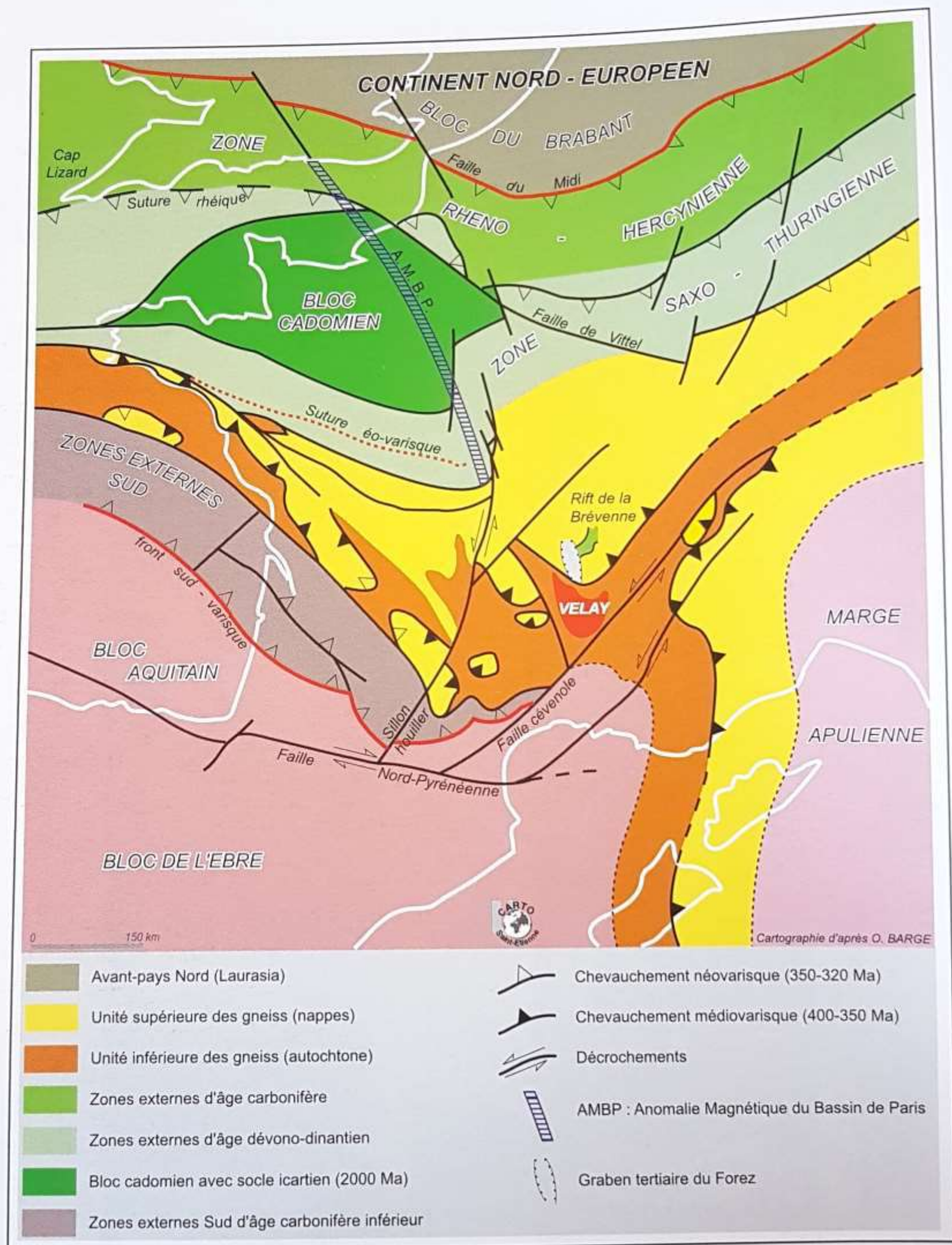
marceau.lhospital@mines-stetienne.fr

EPASE

Corinne Philibert :

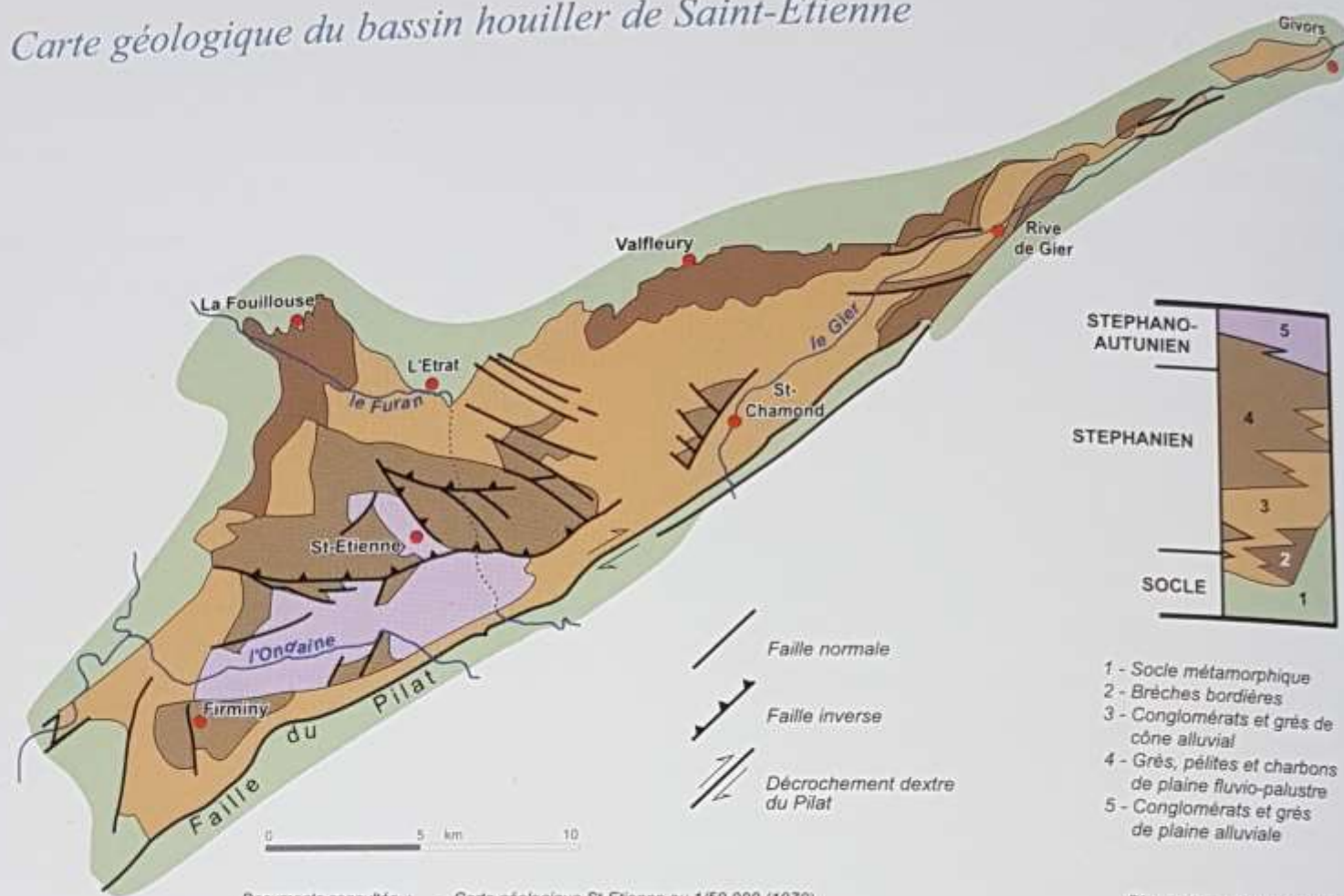
corinne.philibert@epase.fr

fig. 1 Schéma structural de la chaîne hercynienne de l'Europe de l'Ouest



Source : G. Vitel (2001) – Géologie de la Loire

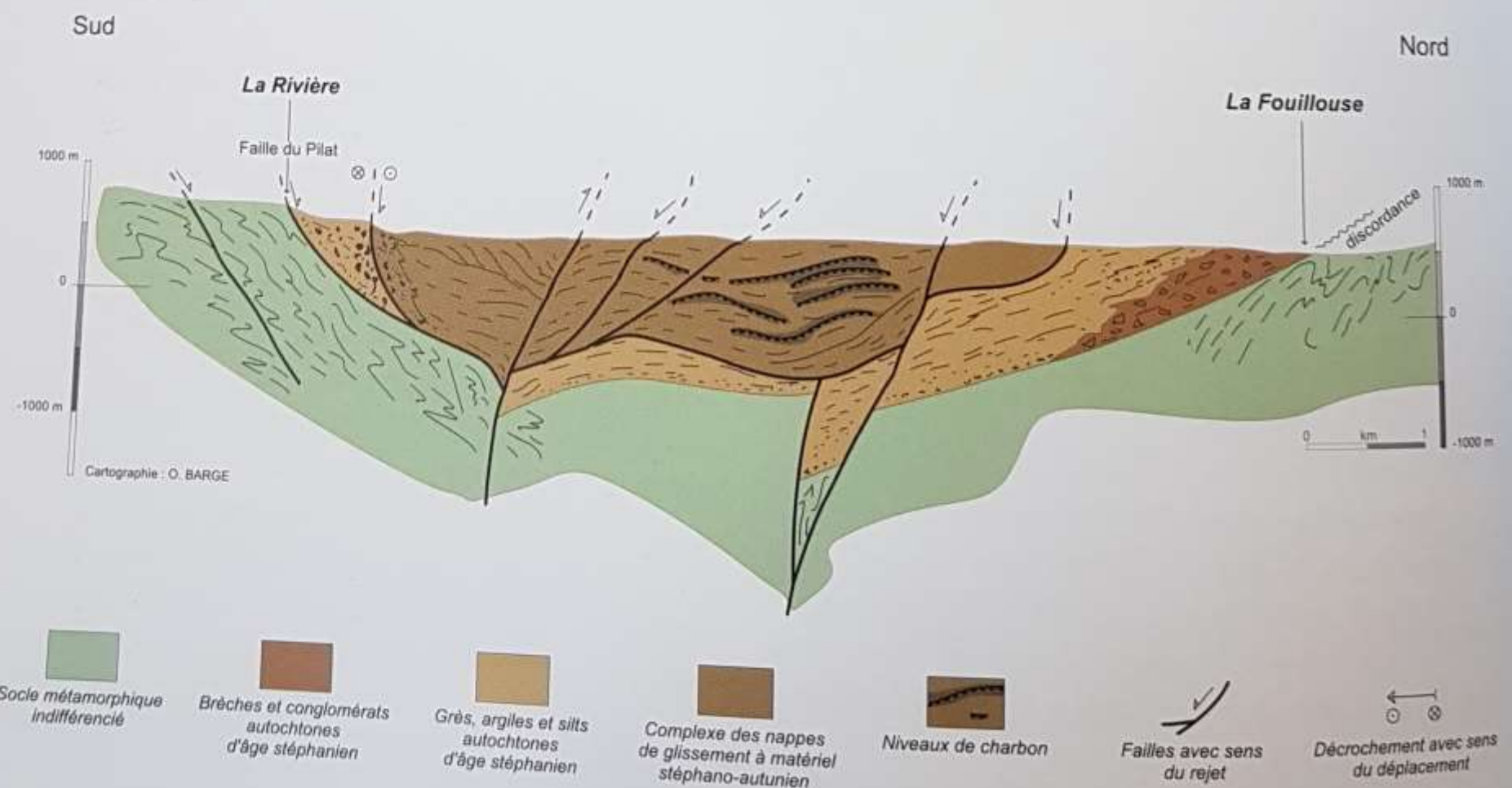
fig. 23 Carte géologique du bassin houiller de Saint-Étienne



Documents consultés :
 - Carte géologique St-Etienne au 1/50 000 (1970)
 - Bouroz (1978)
 - Doubinger et al. (1995)

D'après Becq Giraudon et al. (1995)
 Cartographie : O. BARGE

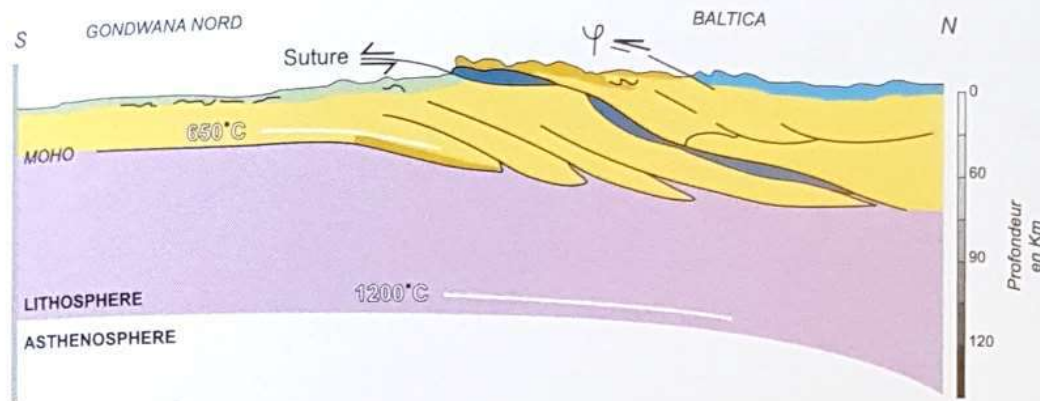
fig. 24 Coupe synthétique du bassin houiller de Saint-Étienne



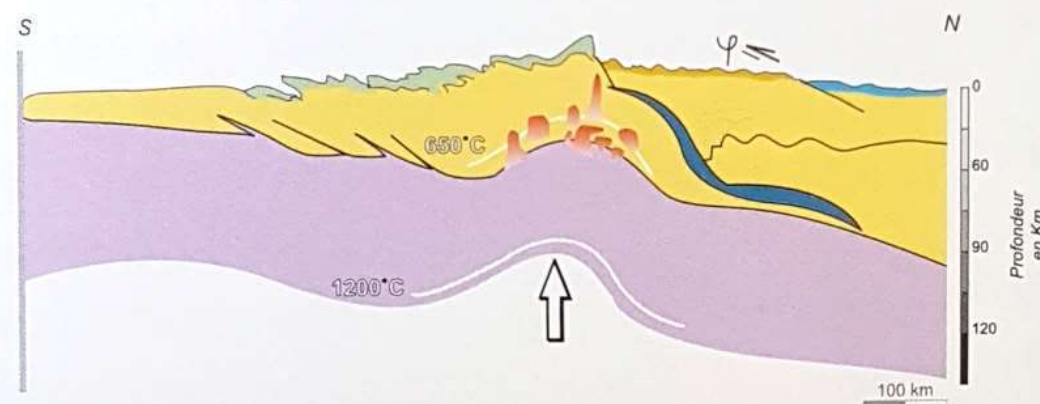
Source : G. Vitel (2001) – Géologie de la Loire

fig. 26 Schéma récapitulatif du cycle orogénique hercynien

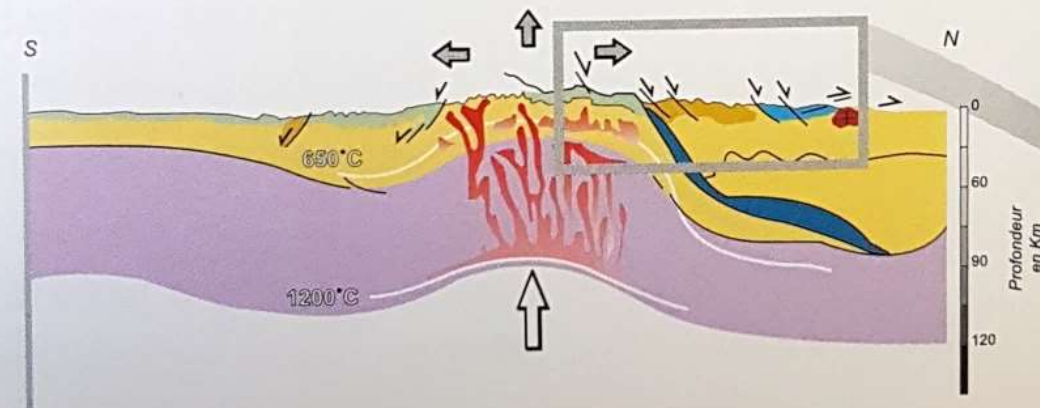
1. 400 Ma



2. 380 - 360 Ma



3. 340 - 320 Ma



4. 300 - 280 Ma

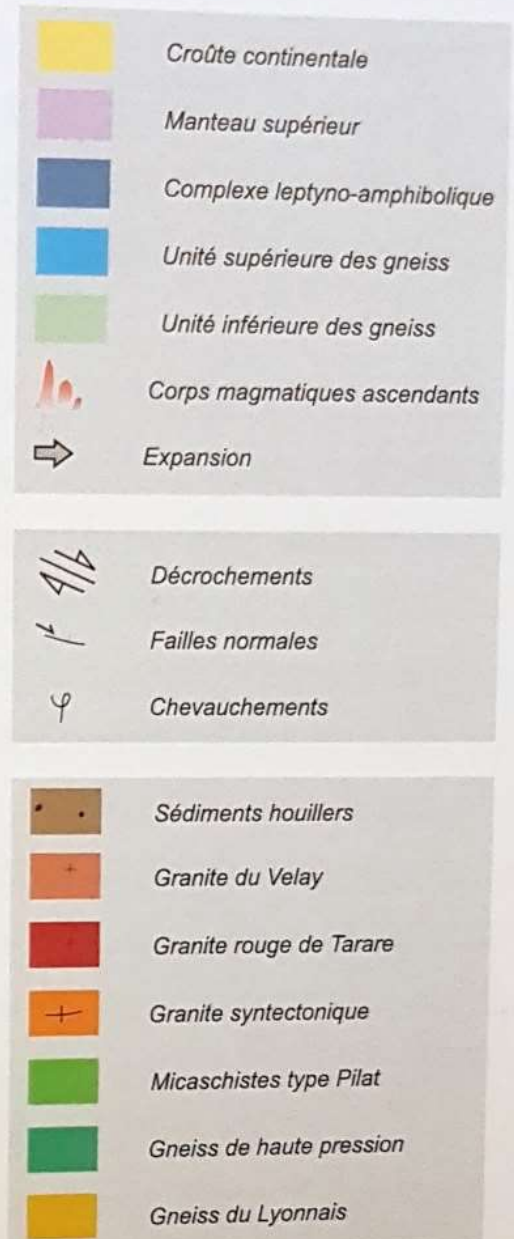
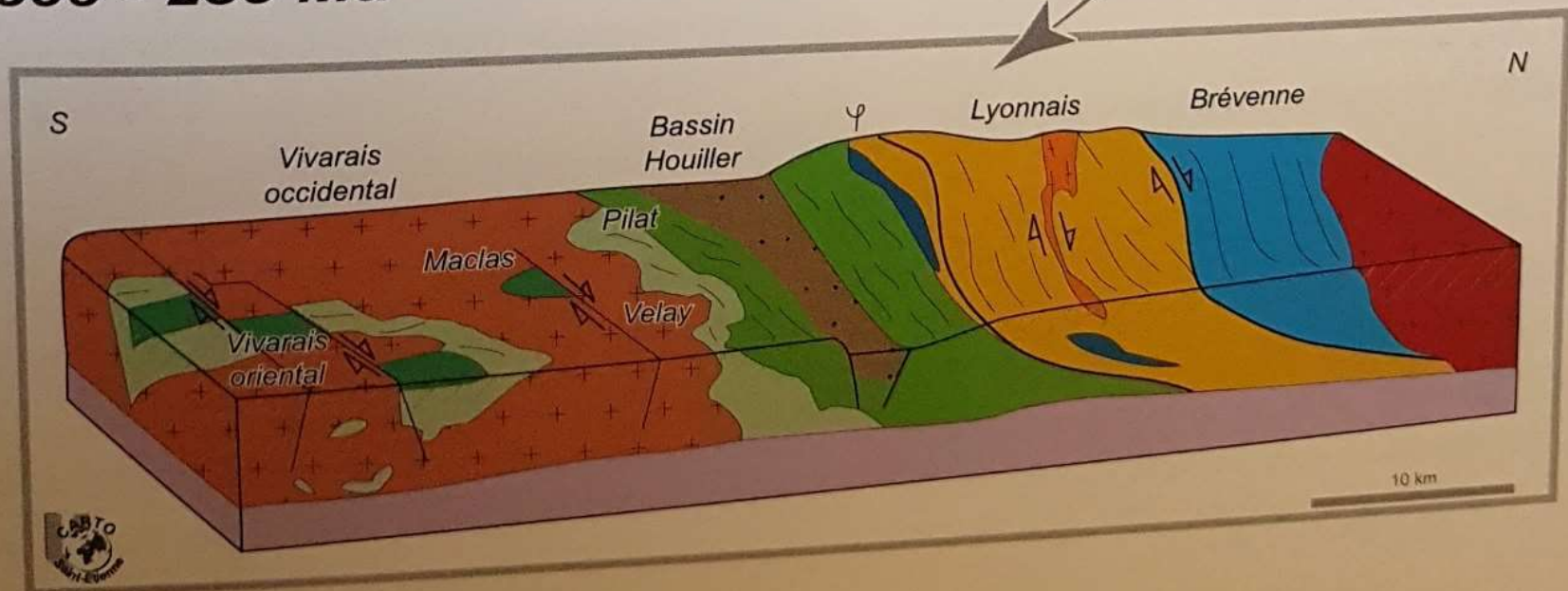
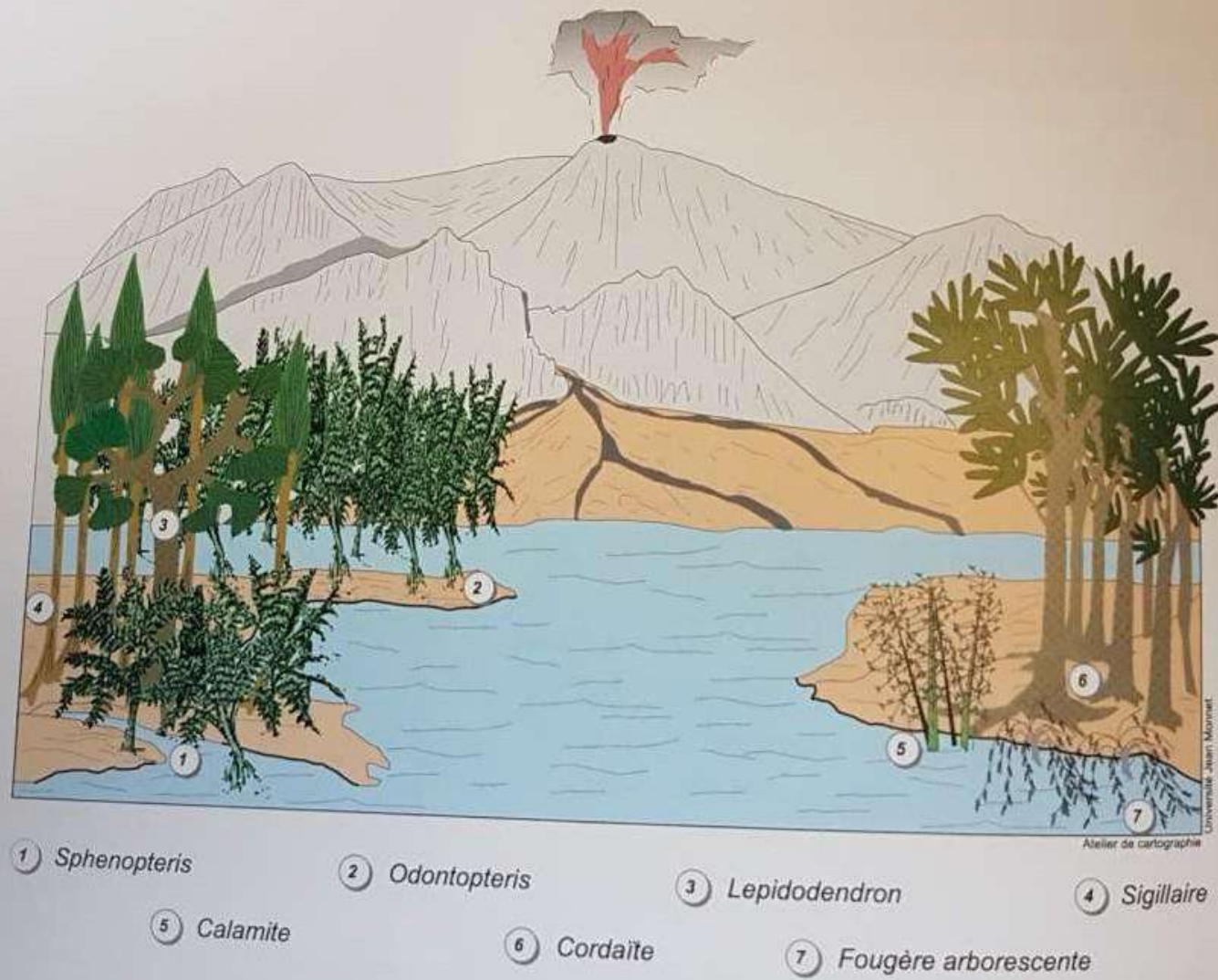


fig. 25 Paléogéographie de la région de Saint-Étienne au Carbonifère



G. Vitel (2001) – Géologie de la Loire



INTERNATIONAL STRATIGRAPHIC CHART

International Commission on Stratigraphy



Eonothem Eon	Erathem Era	System Period	Series Epoch	Stage Age	Age Ma	GSSP
Phanerozoic	Cenozoic	Quaternary	Holocene			
			Pleistocene	Upper	0.0117	
				"Ionian"	0.126	
				Calabrian	0.781	
				Gelasian	1.806	
		Neogene	Pliocene	Piacenzian	2.588	
				Zanclean	3.600	
			Miocene	Messinian	5.332	
				Tortonian	7.246	
				Serravallian	11.608	
				Langhian	13.82	
				Burdigalian	15.97	
				Aquitanian	20.43	
					23.03	
				Paleogene	Oligocene	Chattian
		Rupelian	33.9 ±0.1			
		Eocene	Priabonian		37.2 ±0.1	
			Bartonian		40.4 ±0.2	
			Lutetian		48.6 ±0.2	
			Ypresian		55.8 ±0.2	
		Paleocene	Thanetian		58.7 ±0.2	
			Selandian		~ 61.1	
			Danian			
			Mesozoic		Cretaceous	Upper
	Campanian	70.6 ±0.6				
	Santonian	83.5 ±0.7				
	Coniacian	85.8 ±0.7				
		~ 88.6				
	Turonian	93.6 ±0.8				
	Cenomanian	99.6 ±0.9				
	Lower	Albian		112.0 ±1.0		
		Aptian		125.0 ±1.0		
		Barremian		130.0 ±1.5		
		Hauterivian		~ 133.9		
		Valanginian		140.2 ±3.0		
	Berriasian	145.5 ±4.0				

Eonothem Eon	Erathem Era	System Period	Series Epoch	Stage Age	Age Ma	GSSP
Phanerozoic	Mesozoic	Jurassic		Tithonian	145.5 ±4.0	
				Kimmeridgian	150.8 ±4.0	
				Oxfordian	~ 155.6	
				Callovian	161.2 ±4.0	
				Bathonian	164.7 ±4.0	
				Bajocian	167.7 ±3.5	
				Aalenian	171.6 ±3.0	
				Toarcian	175.6 ±2.0	
				Pliensbachian	183.0 ±1.5	
				Sinemurian	189.6 ±1.5	
				Hettangian	196.5 ±1.0	
	Triassic			Rhaetian	199.6 ±0.6	
				Norian	203.6 ±1.5	
				Carnian	216.5 ±2.0	
				Ladinian	~ 228.7	
				Anisian	237.0 ±2.0	
				Olenekian	~ 245.9	
				Induan	~ 249.5	
				Changhsingian	251.0 ±0.4	
				Wuchiapingian	253.8 ±0.7	
				Wuchiapingian	260.4 ±0.7	
	Permian			Capitanian	265.8 ±0.7	
				Wordian	268.0 ±0.7	
				Roadian	270.6 ±0.7	
				Kungurian	275.6 ±0.7	
				Artinskian	284.4 ±0.7	
				Sakmarian	294.6 ±0.8	
				Asselian	299.0 ±0.8	
				Gzhelian	303.4 ±0.9	
				Kasimovian	307.2 ±1.0	
				Moscovian	311.7 ±1.1	
	Carboniferous	Pennsylvanian		Bashkirian	318.1 ±1.3	
				Serpukhovian	318.1 ±1.3	
				Visean	328.3 ±1.6	
				Tournaisian	345.3 ±2.1	
				Tournaisian	359.2 ±2.5	
				Tournaisian	359.2 ±2.5	

Eonothem Eon	Erathem Era	System Period	Series Epoch	Stage Age	Age Ma	GSSP
Phanerozoic	Paleozoic	Devonian		Famennian	359.2 ±2.5	
				Frasnian	374.5 ±2.6	
				Givetian	385.3 ±2.6	
				Eifelian	391.8 ±2.7	
				Emsian	397.5 ±2.7	
				Pragian	407.0 ±2.8	
				Lochkovian	411.2 ±2.8	
				Pridoli	416.0 ±2.8	
				Ludlow	418.7 ±2.7	
				Gorstian	421.3 ±2.6	
	Silurian			Homerian	422.9 ±2.5	
				Sheinwoodian	426.2 ±2.4	
				Telychian	428.2 ±2.3	
				Aeronian	436.0 ±1.9	
				Rhuddanian	439.0 ±1.8	
				Hirnantian	443.7 ±1.5	
				Katian	445.6 ±1.5	
				Sandbian	455.8 ±1.6	
				Darriwilian	460.9 ±1.6	
				Dapingian	468.1 ±1.6	
	Ordovician			Floian	471.8 ±1.6	
				Tremadocian	478.6 ±1.7	
				Stage 10	488.3 ±1.7	
				Stage 9	~ 492 *	
				Stage 8	~ 496 *	
				Paibian	~ 499	
				Guzhangian	~ 503	
				Drumian	~ 506.5	
				Stage 5	~ 510 *	
				Stage 4	~ 515 *	
	Cambrian			Stage 3	~ 521 *	
				Stage 2	~ 528 *	
				Fortunian	542.0 ±1.0	
				Terreneuvian		
				Terreneuvian		
				Terreneuvian		
				Terreneuvian		
				Terreneuvian		
				Terreneuvian		
				Terreneuvian		
				Terreneuvian		

This chart was drafted by Gabi Ogg. Intra Cambrian unit ages with * are informal, and awaiting ratified definitions.

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Eonothem Eon	Erathem Era	System Period	Age Ma	GSSP GSSA
Precambrian	Proterozoic		542	
			~635	
			850	
			1000	
			1200	
			1400	
			1600	
			1800	
			2050	
			2300	
			2500	
	Archean		2800	
			3200	
			3600	
	Hadean (informal)		~4600	

Subdivisions of the global geologic record are formally defined by their lower boundary. Each unit of the Phanerozoic (~542 Ma to Present) and the base of Ediacaran are defined by a basal Global Boundary Stratotype Section and Point (GSSP), whereas Precambrian units are formally subdivided by absolute age (Global Standard Stratigraphic Age, GSSA). Details of each GSSP are posted on the ICS website (www.stratigraphy.org).

Numerical ages of the unit boundaries in the Phanerozoic are subject to revision. Some stages within the Cambrian will be formally named upon international agreement on their GSSP limits. Most sub-Series boundaries (e.g., Middle and Upper Aptian) are not formally defined.

Colors are according to the Commission for the Geological Map of the World (www.cgmw.org).

The listed numerical ages are from 'A Geologic Time Scale 2004', by F.M. Gradstein, J.G. Ogg, A.G. Smith, et al. (2004; Cambridge University Press) and 'The Concise Geologic Time Scale' by J.G. Ogg, G. Ogg and F.M. Gradstein (2008).

August 2009

UN QUARTIER OUVRIER

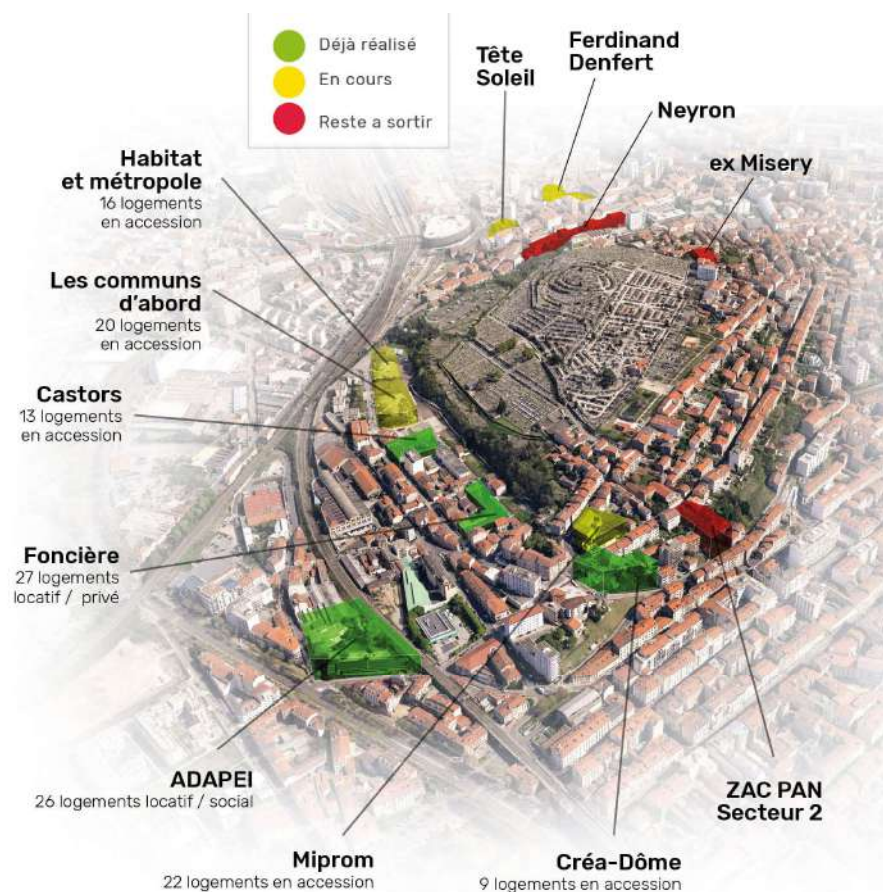


NOS FABRICATIONS

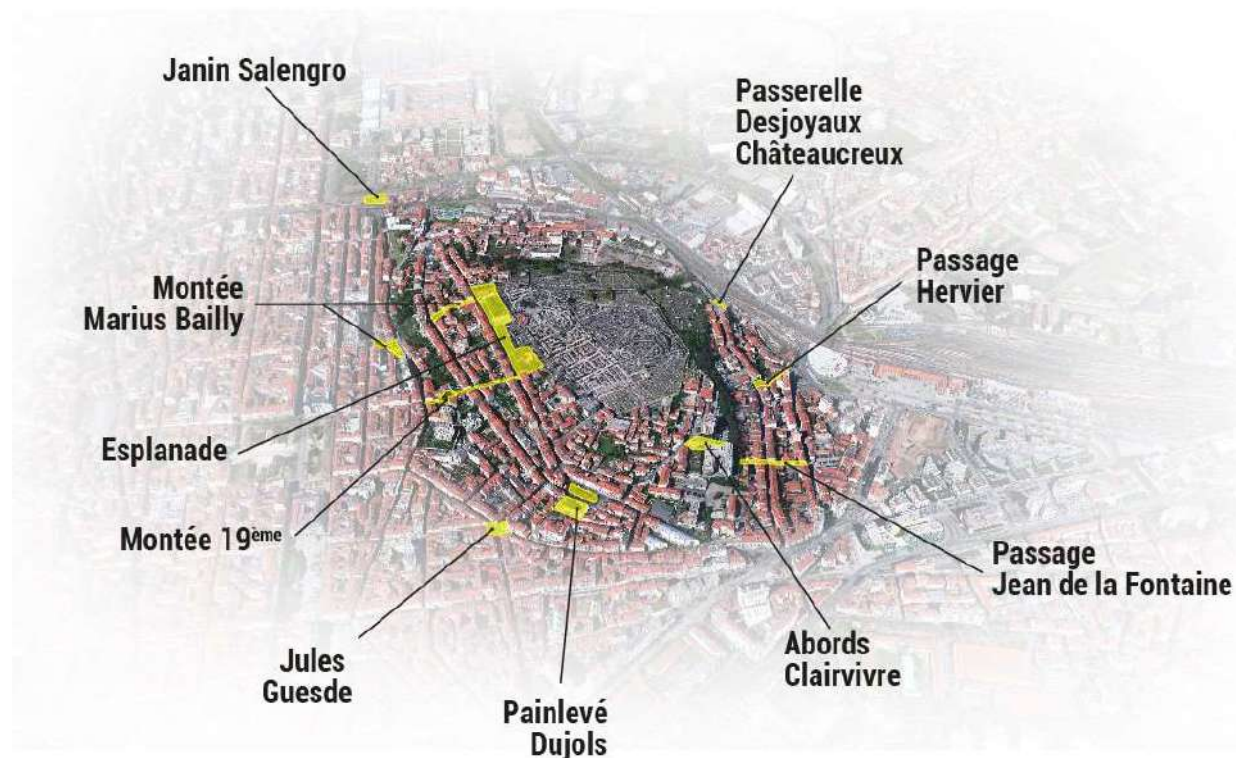


PROJET URBAIN D'ENSEMBLE – CRET DE ROC

MUTATIONS IMMOBILIERES



REQUALIFICATIONS D'ESPACES PUBLICS





EK05

EK06

EK25

1930

EK06 : espace paysager

EK25 : pas de halle

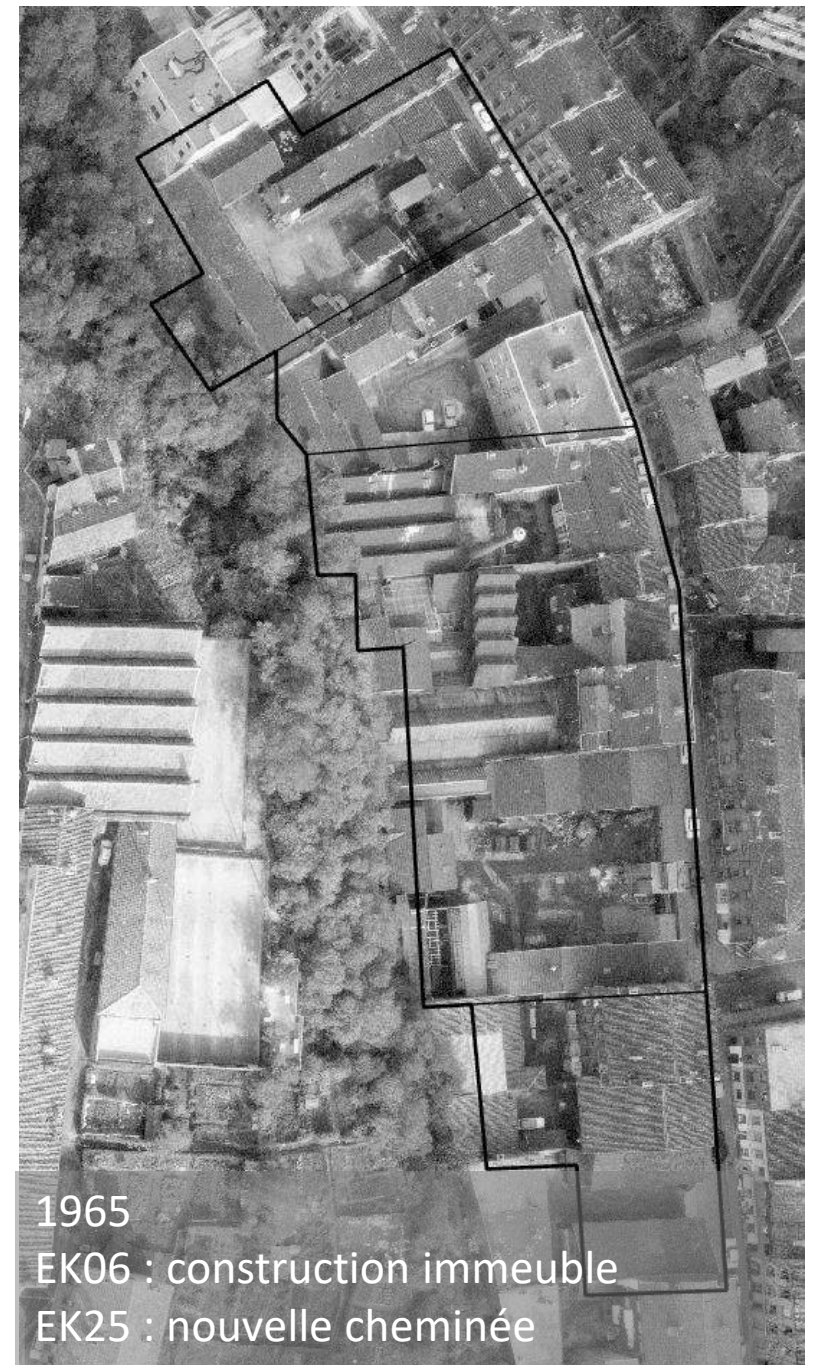


1958

EK05 : nouveaux bâtiments

EK06 : espace paysager

EK25 : halle construite



1965

EK06 : construction immeuble

EK25 : nouvelle cheminée



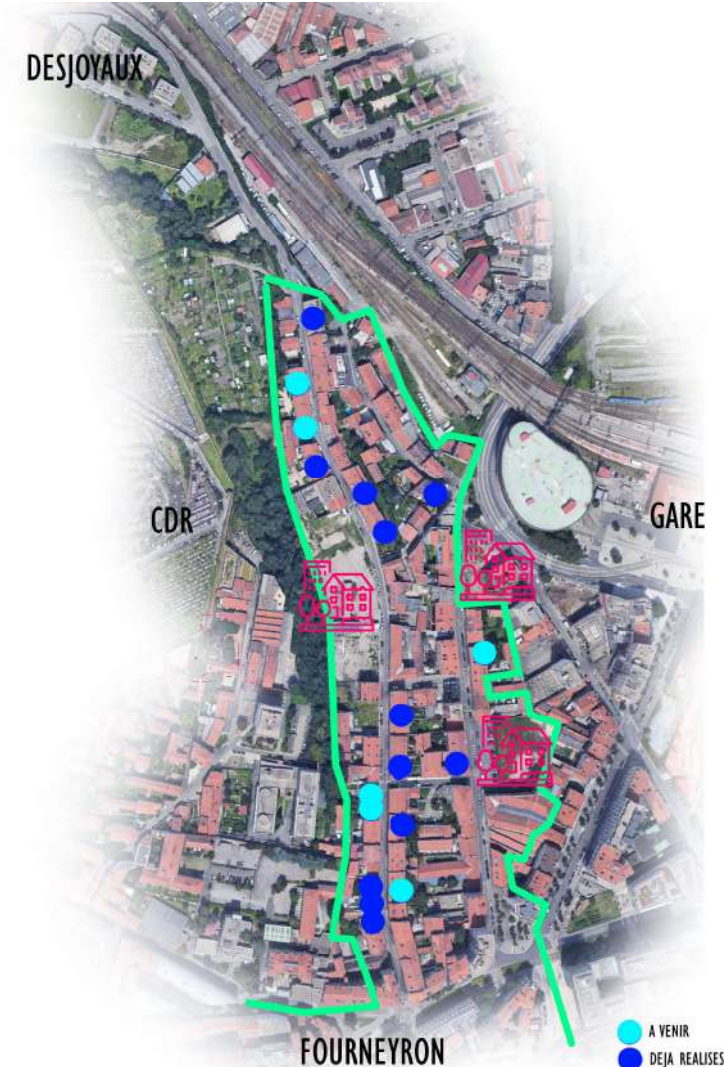
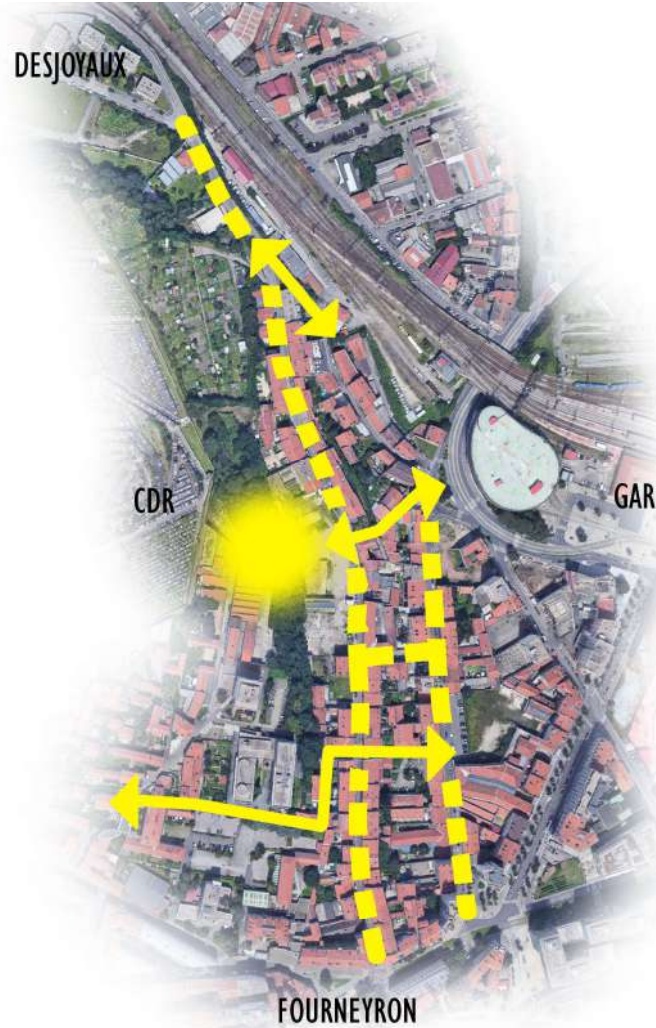
PROJET URBAIN NEYRON-FERDINAND

AGIR SUR LE QUARTIER DANS SON ENSEMBLE

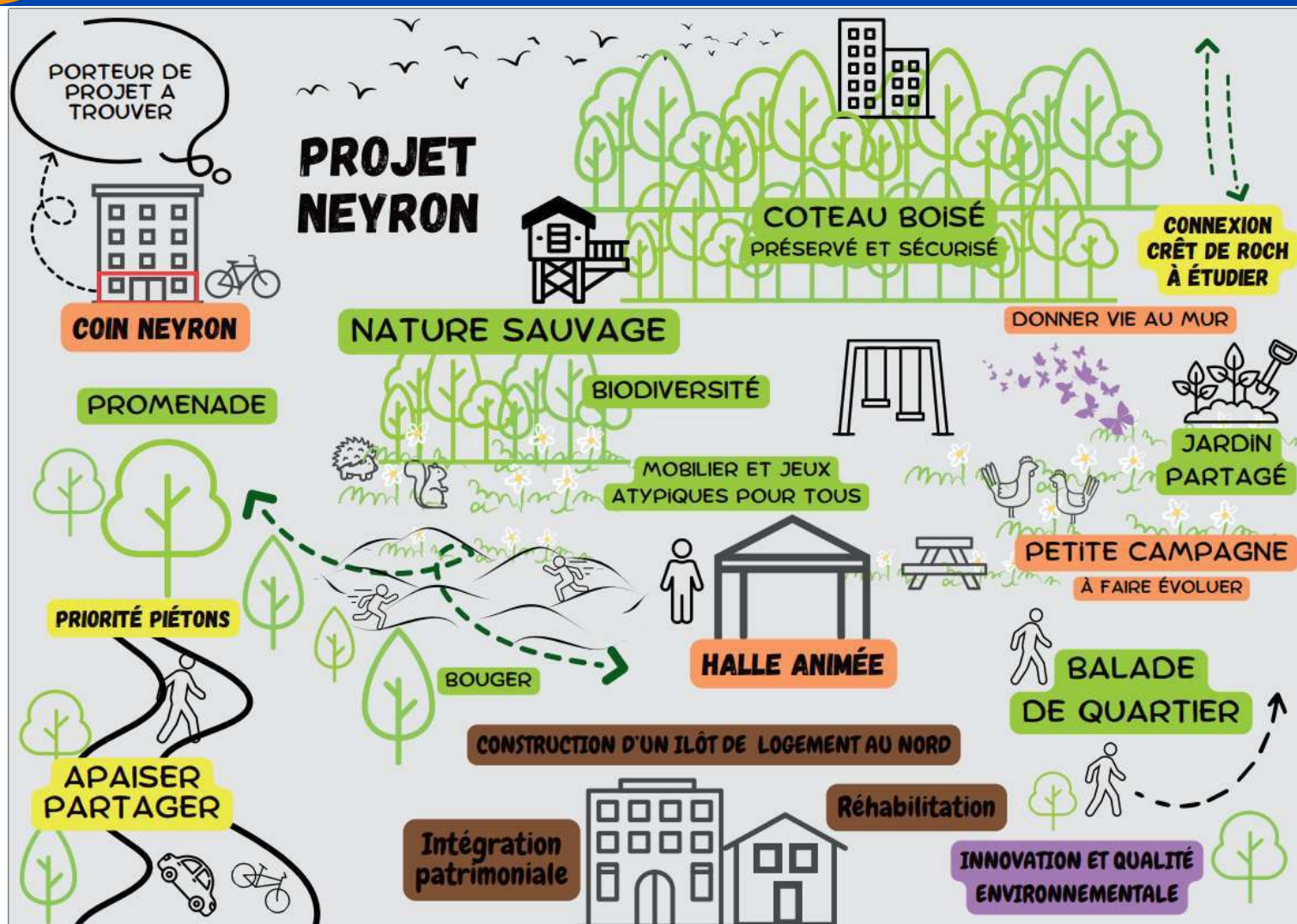
LES ENJEUX :

- Améliorer la qualité de vie
- Offrir des lieux d'échanges et de rencontres
- Faciliter les déplacements

UNE ACTION COORDONNEE SUR LES ESPACES PUBLIC ET L'HABITAT



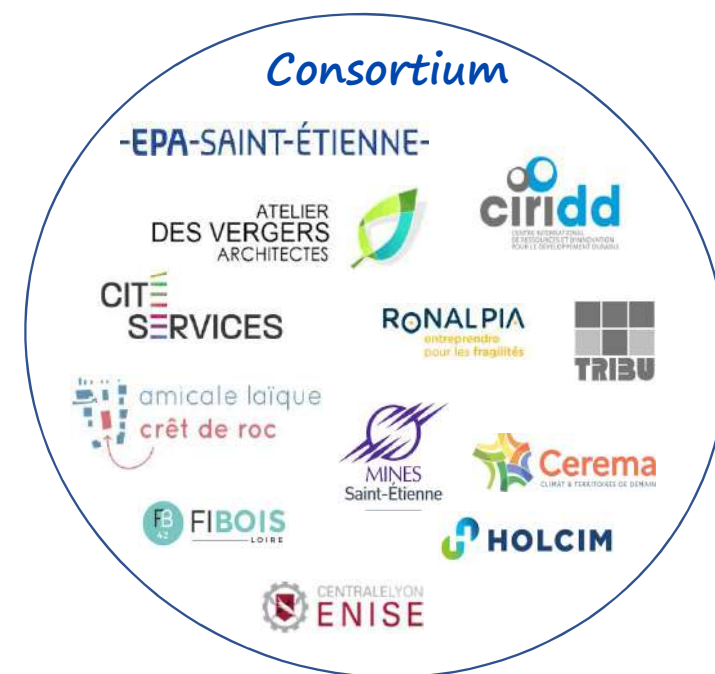
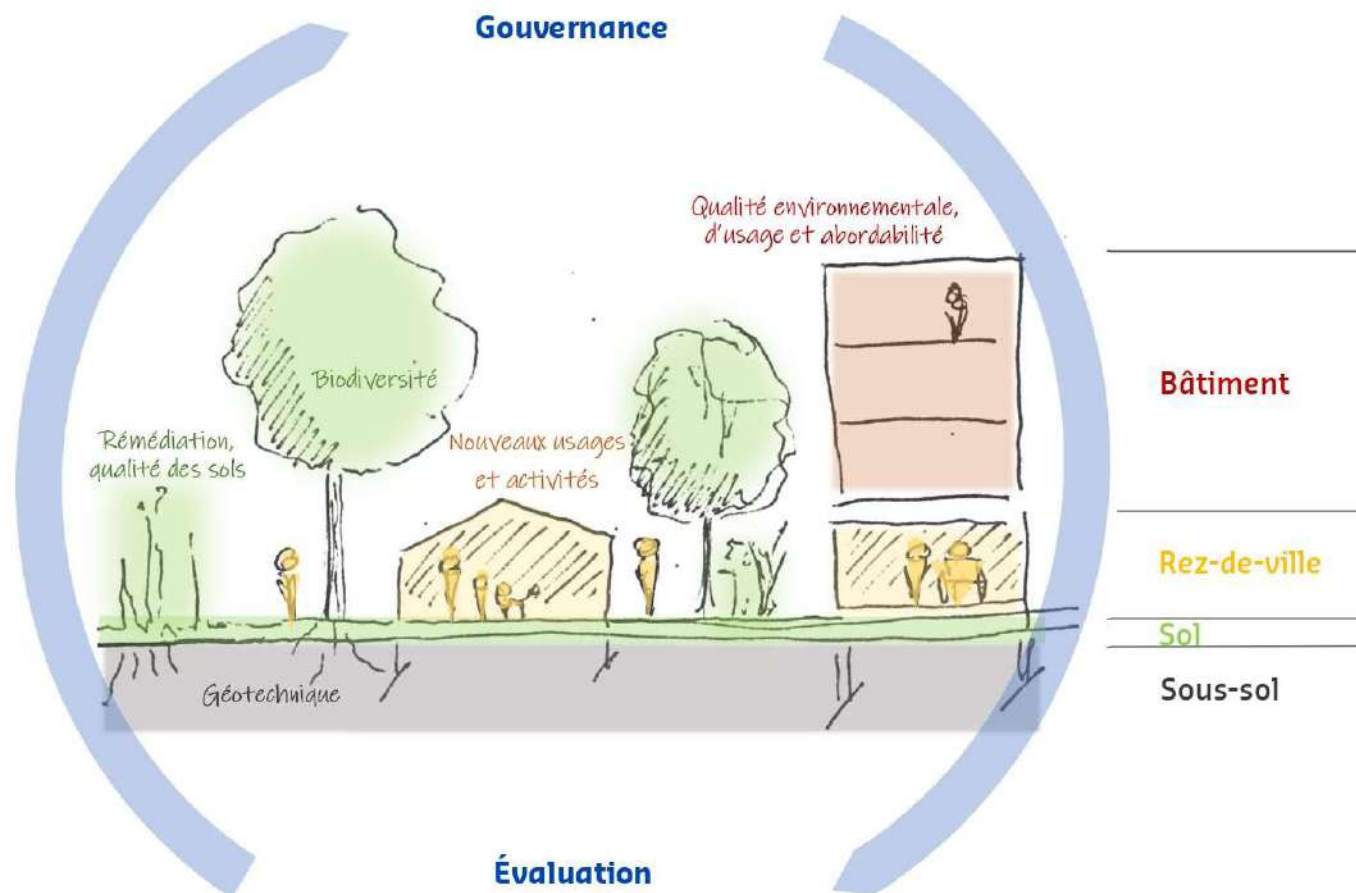
ORIENTATIONS RETENUES AU REGARD DES ETUDES ET DE LA CONCERTATION

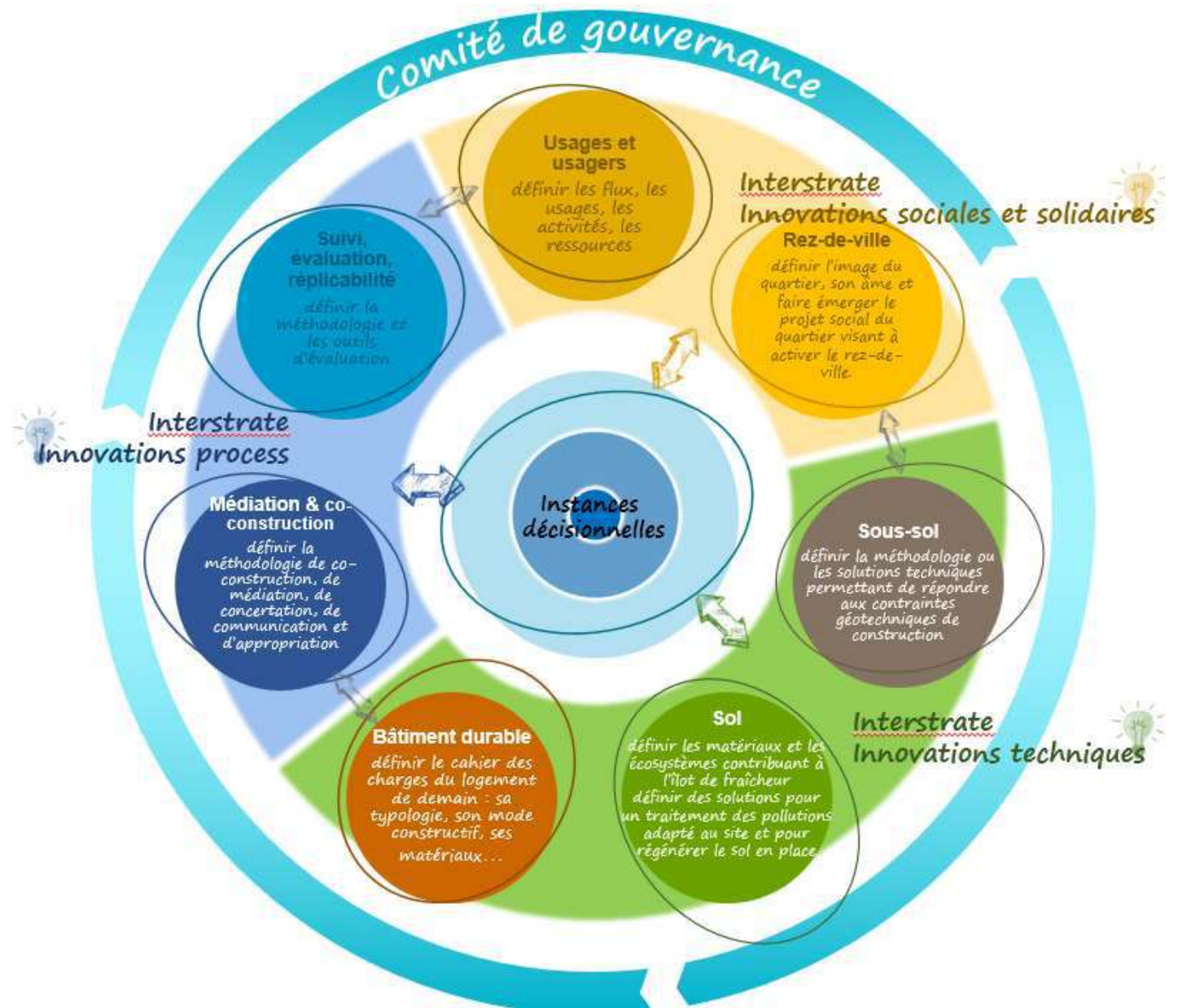


Un projet qui répond aux enjeux:

- Création d'un espace public et d'un îlot de fraîcheur
- Support pour une centralité / une vie de quartier
- Habitat neuf et réhabilitation
- Mémoire du site par la préservation de la halle

PROJET DEMONSTRATEUR VILLE DURABLE





Échantillonnage de terrain : sols et plantes

© Ville de Saint-Etienne

1/550^e



92 plantes MSE

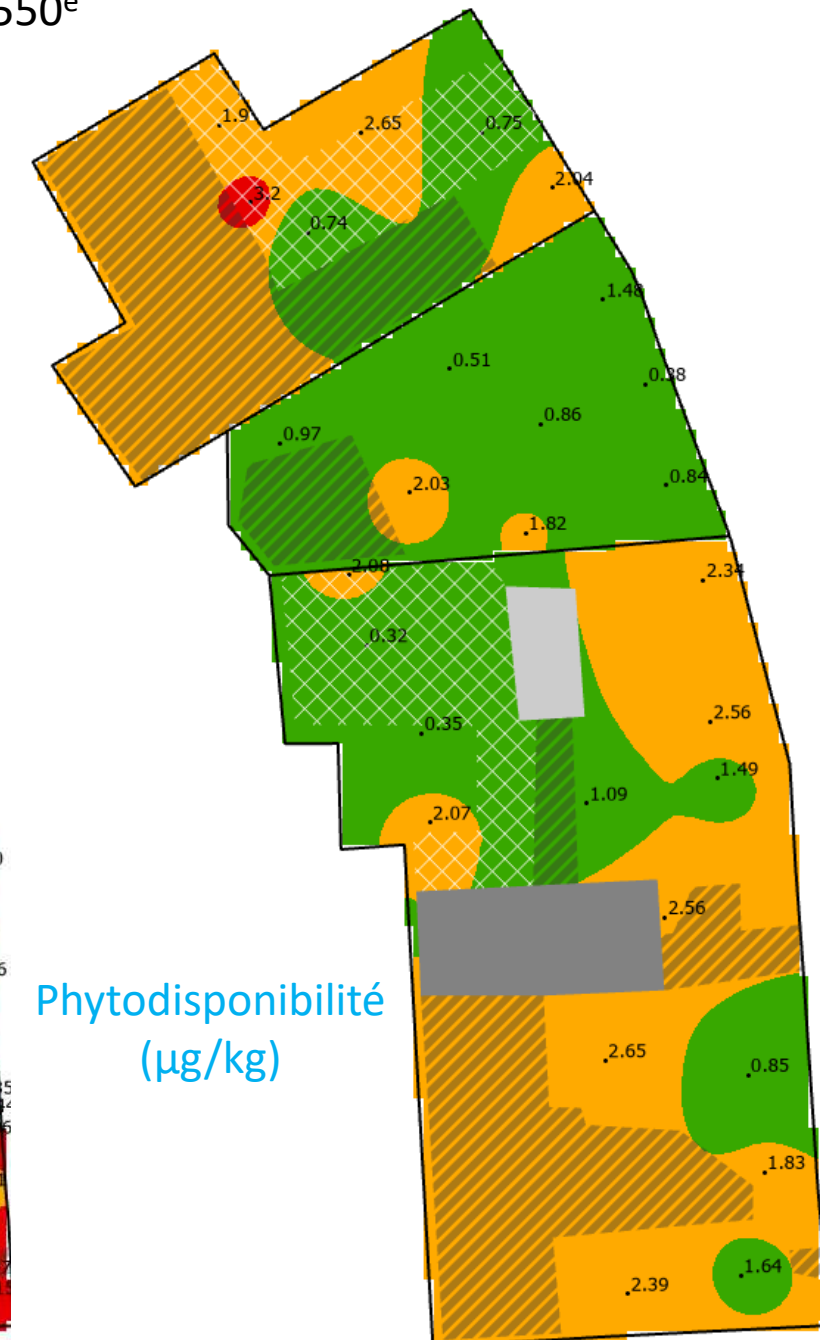
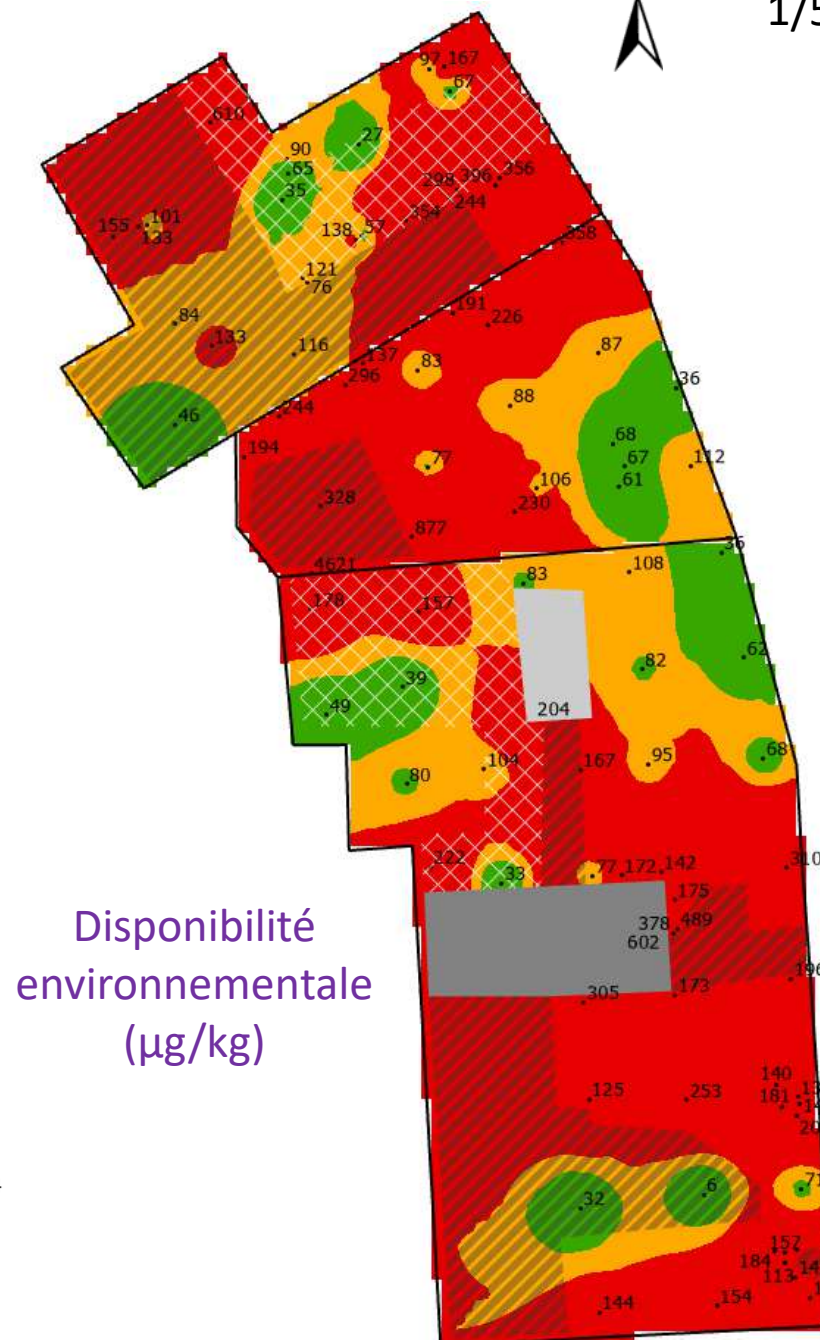
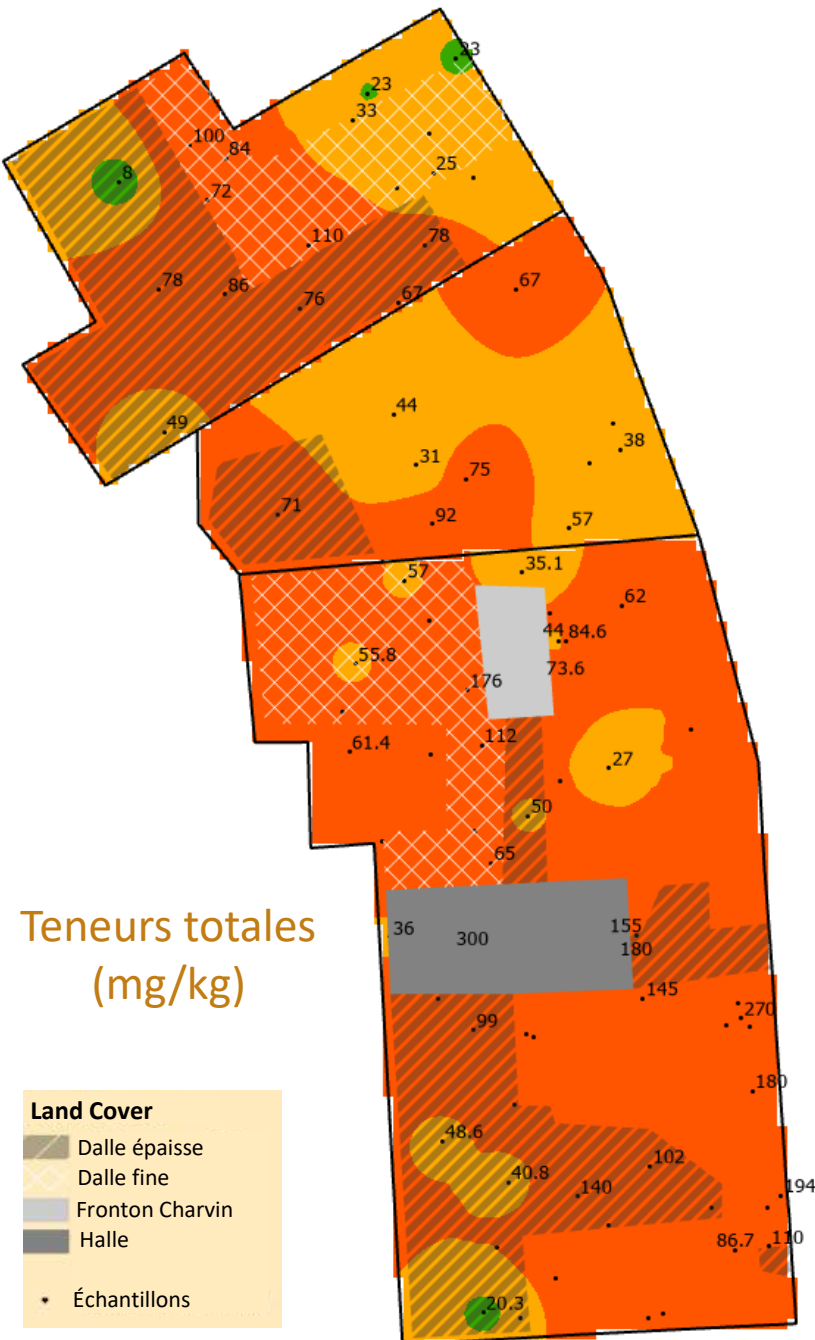
- Pools ●
- Renouée ●
- Buddleja ●

77 sols MSE ▲
86 sols TESORA +

*Distribution spatiale des
échantillons de sols et de plantes*



Cartes des teneurs en Arsenic (As)



Cartes des teneurs en Chrome (Cr)



1/550^e

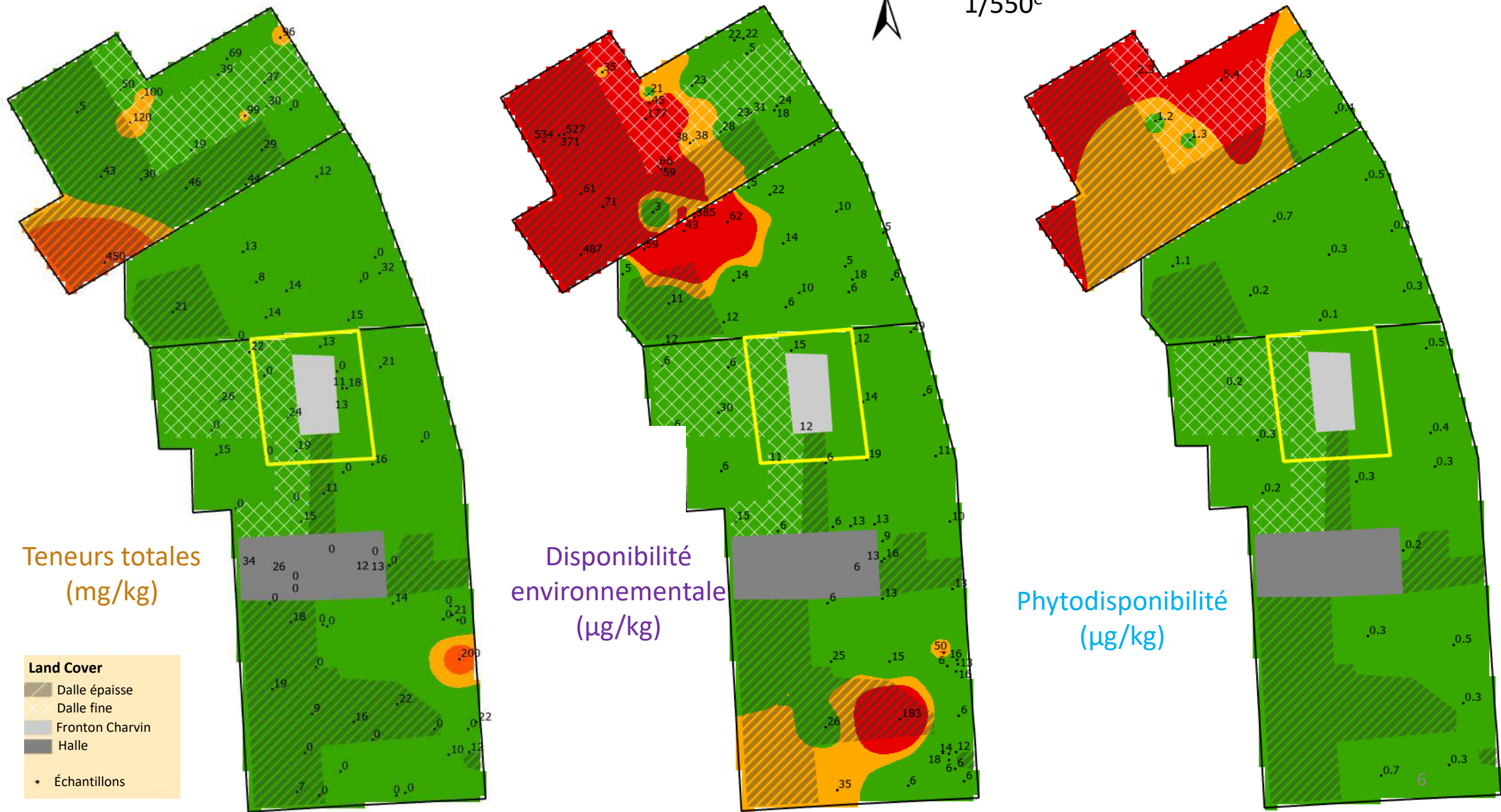
Teneurs totales
(mg/kg)

Land Cover

- Dalle épaisse
- Dalle fine
- Fronton Charvin
- Halle
- Échantillons

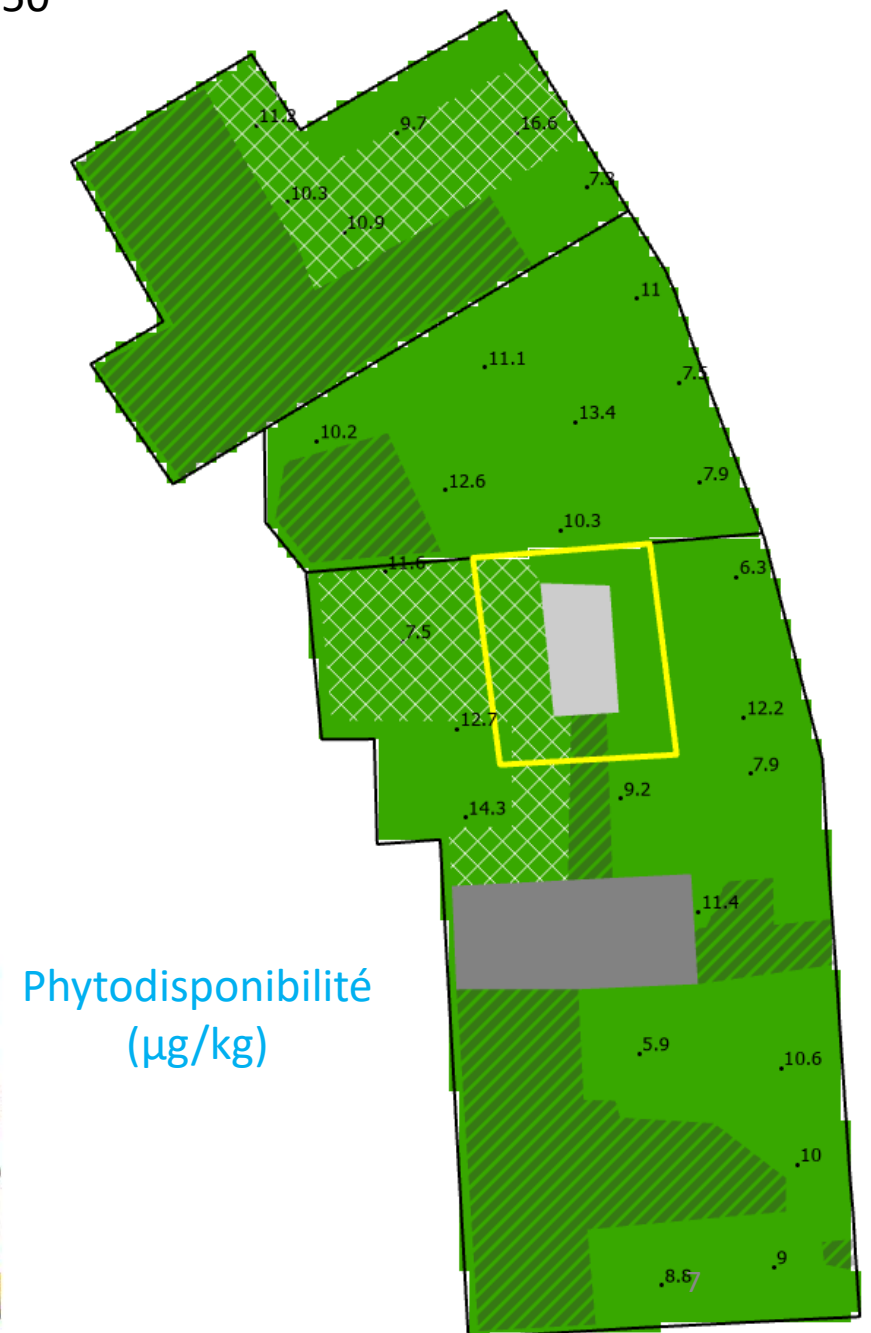
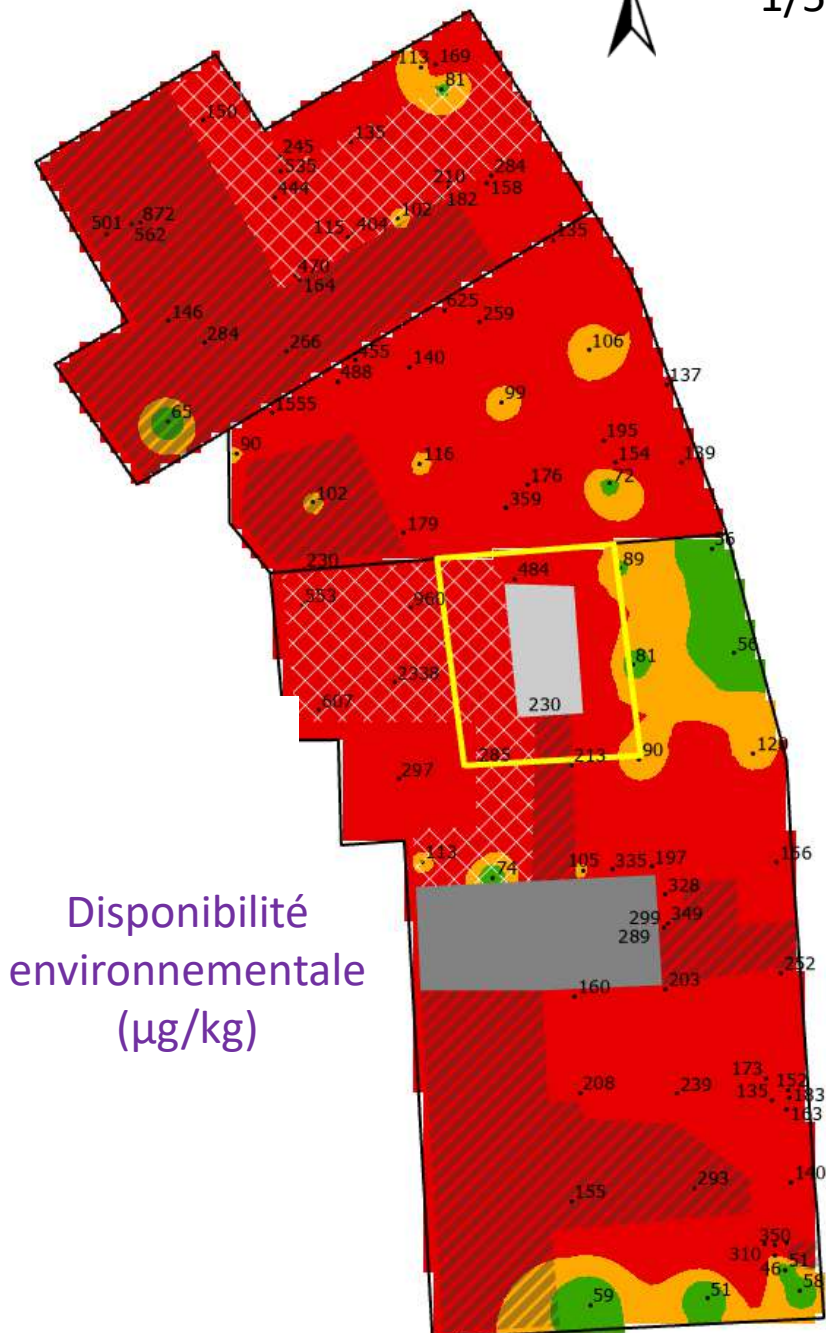
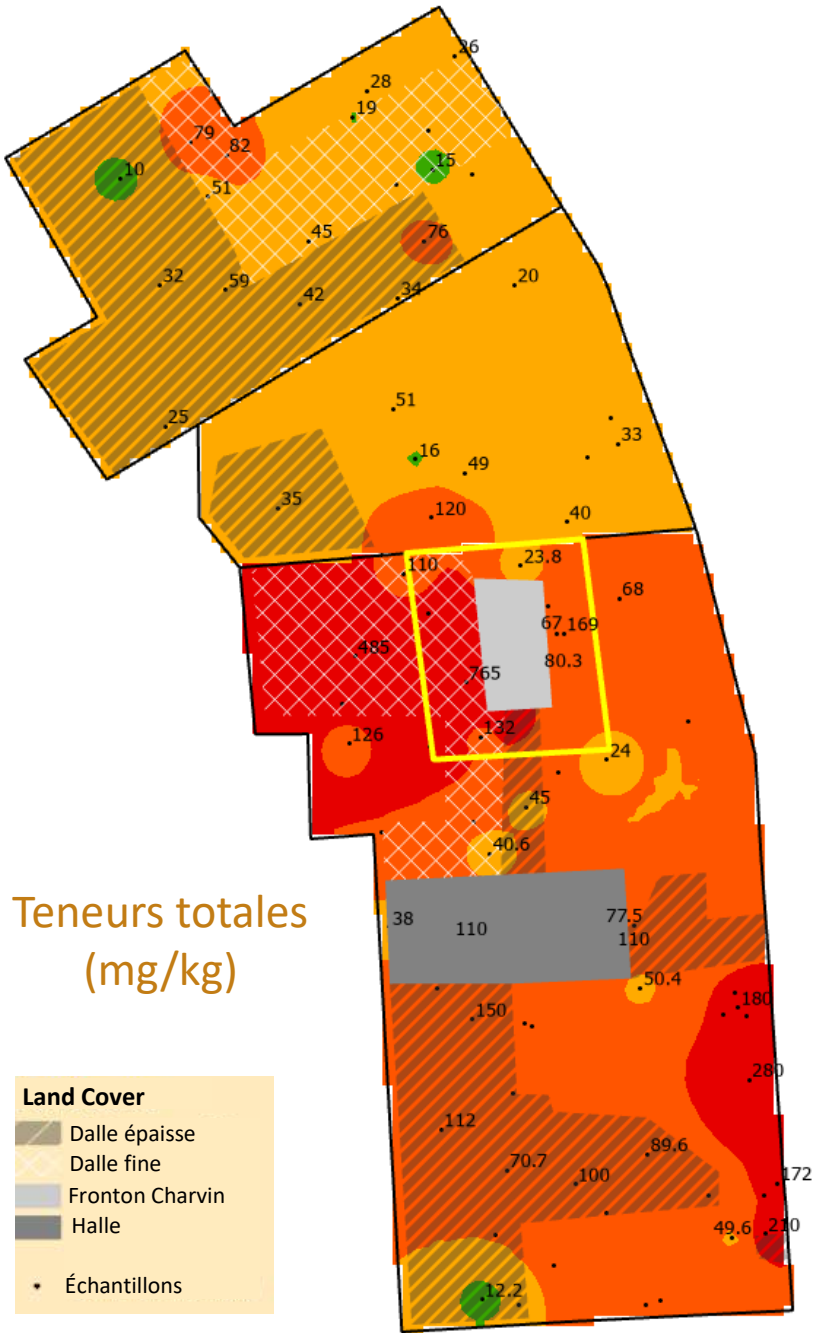
Disponibilité
environnementale
(µg/kg)

Phytodisponibilité
(µg/kg)

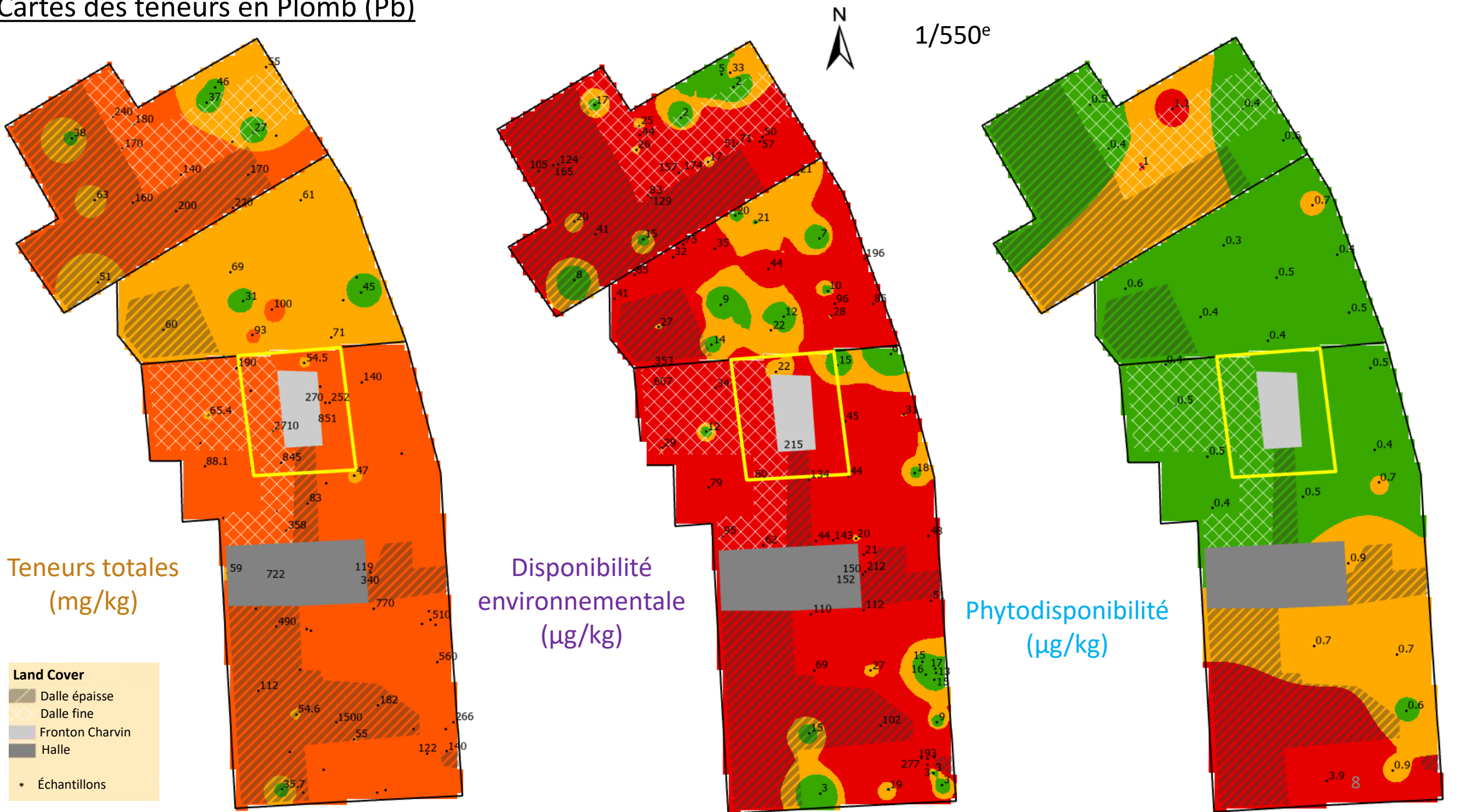


Cartes des teneurs en Cuivre (Cu)

1/550^e



Cartes des teneurs en Plomb (Pb)



Cartes des teneurs en Arsenic (As)



1/550^e

Phytodisponibilité
(µg/kg)

Buddleja

Fallopia

Land Cover

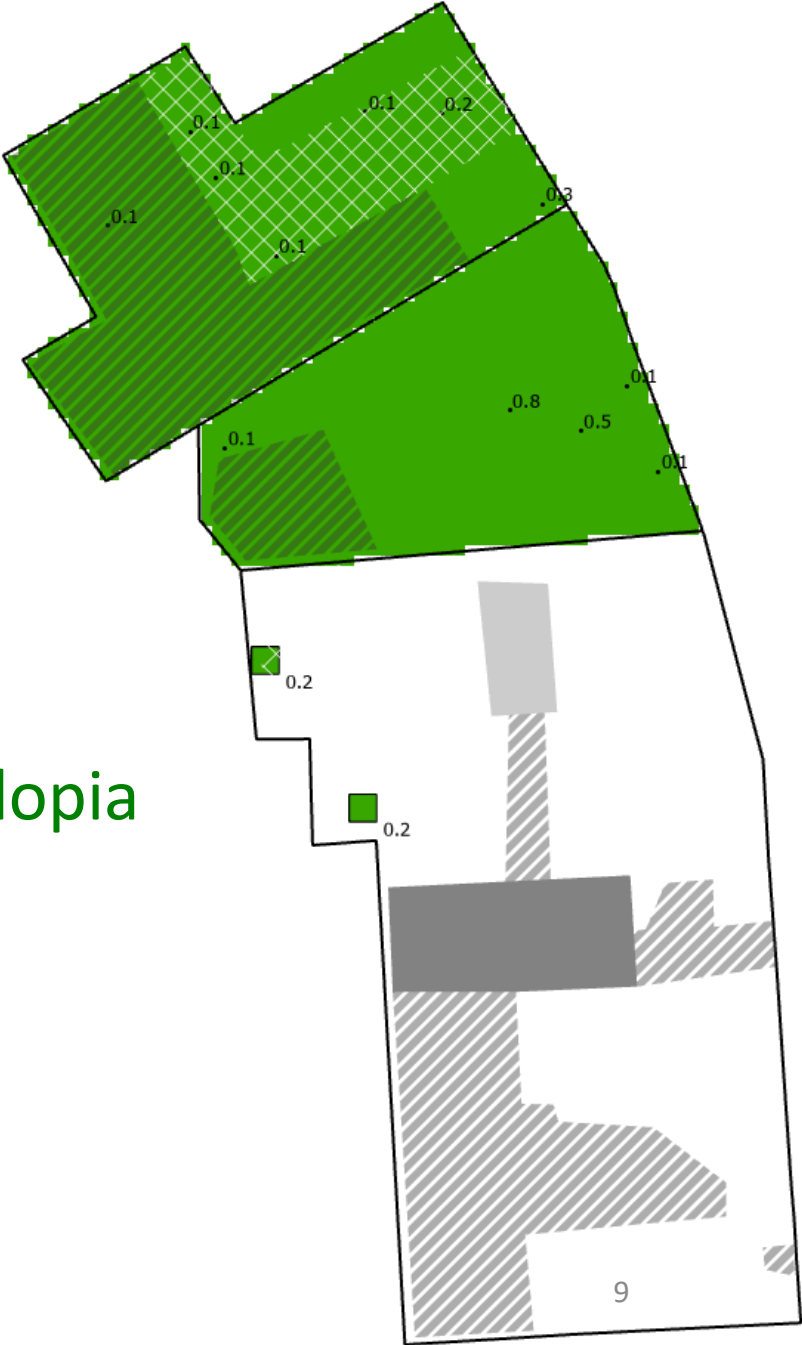
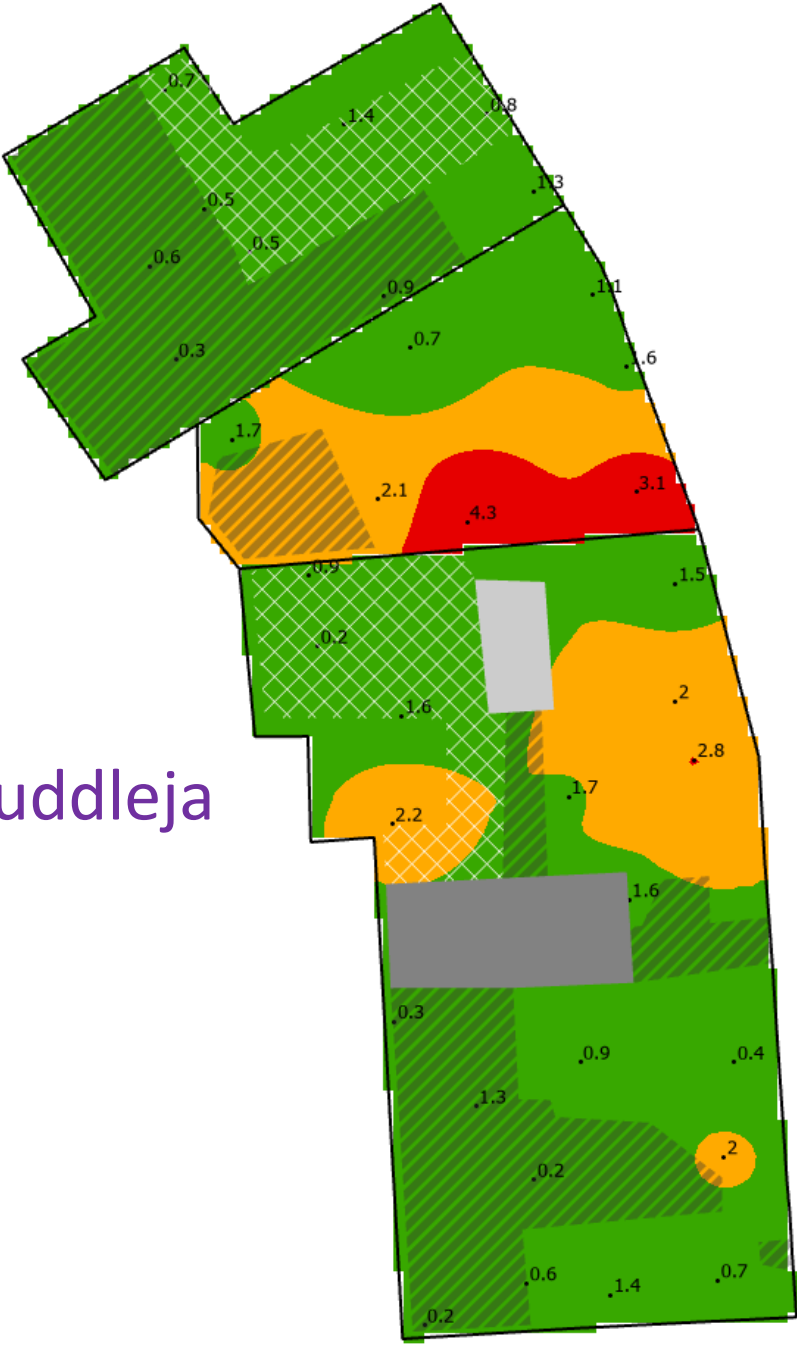
Dalle épaisse

Dalle fine

Fronton Charvin

Halle

Échantillons



Cartes des teneurs en Plomb (Pb)



1/550^e

Phytodisponibilité
(µg/kg)

Buddleja

Fallopia

Land Cover

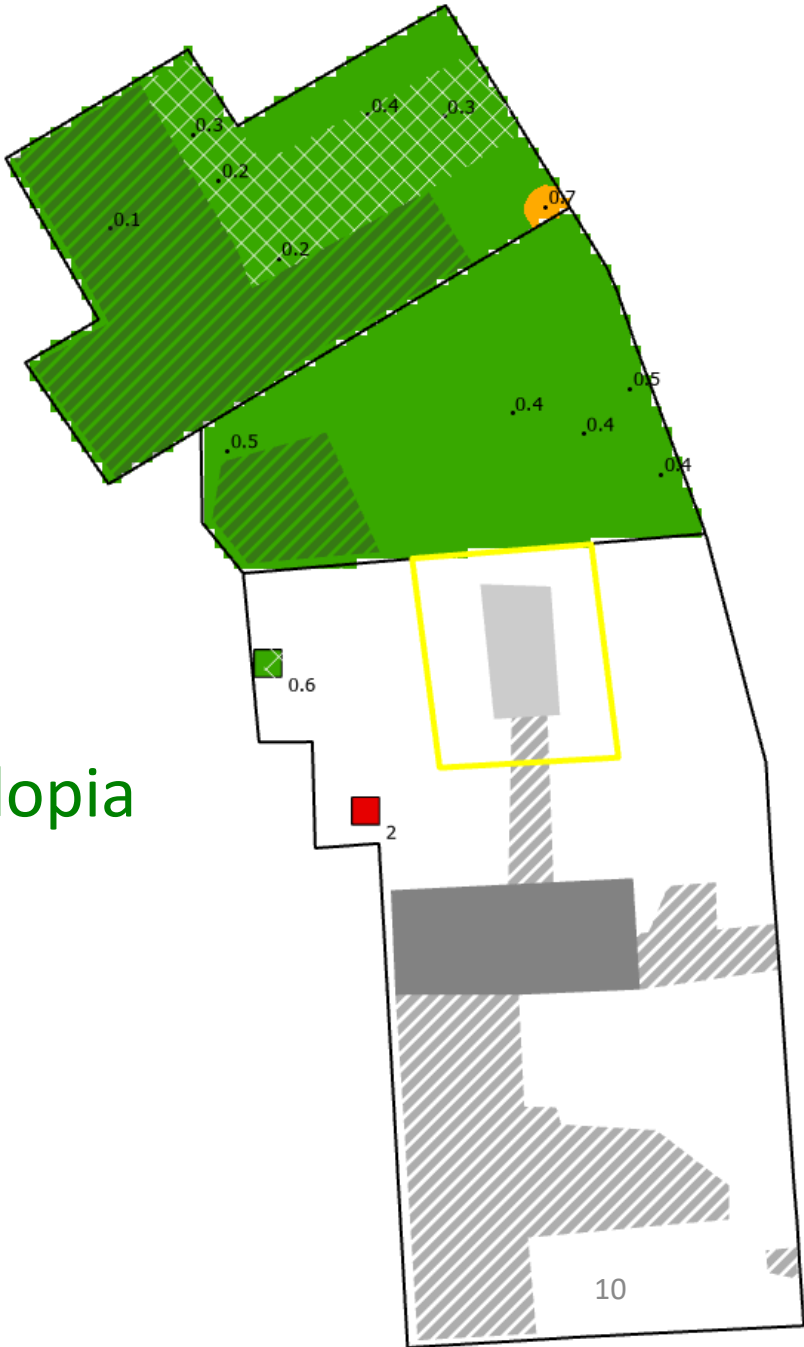
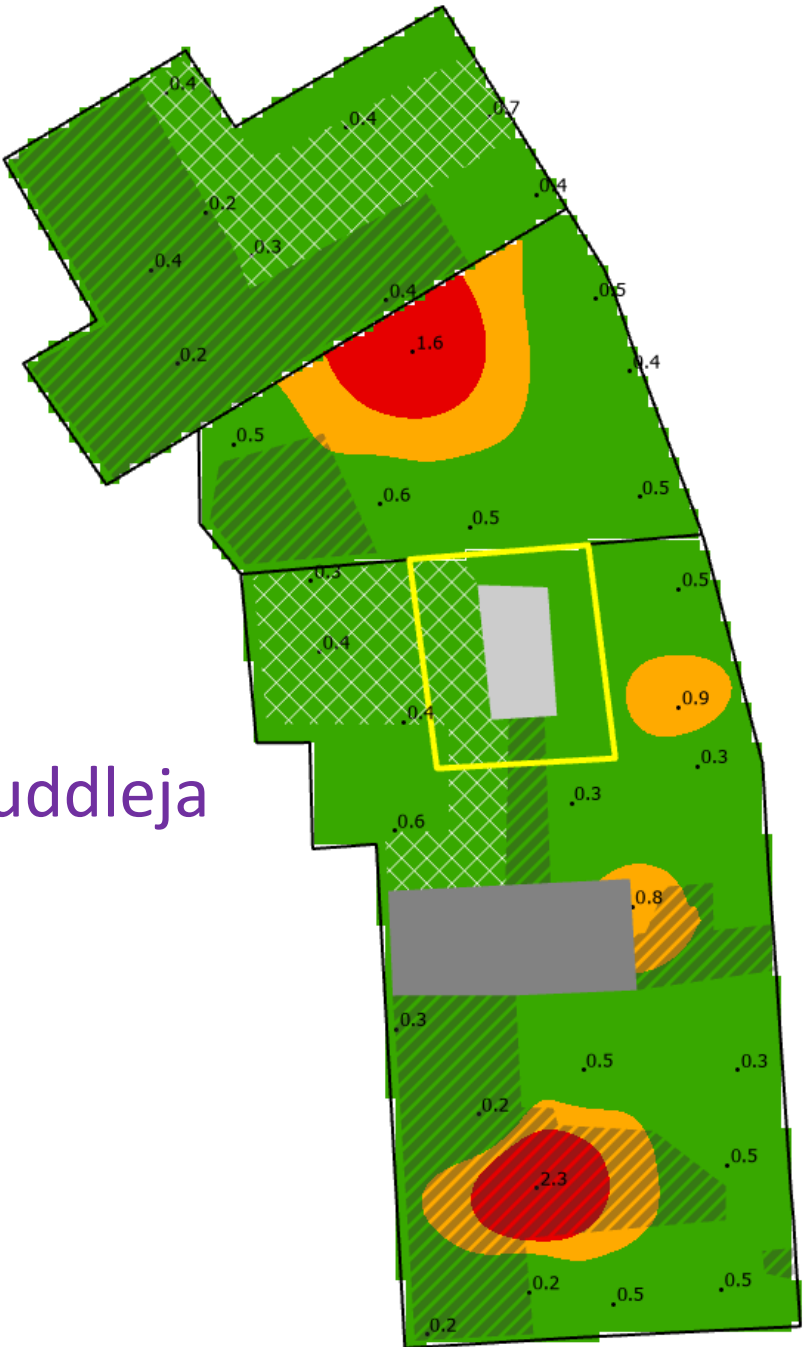
Dalle épaisse

Dalle fine

Fronton Charvin

Halle

Échantillons



Cartes de l'indice intégré d'excès de danger

1/550^e



Teneurs totales
(mg/kg)



Disponibilité
environnementale
(µg/kg)

Phytodisponibilité
(µg/kg)

Cartes de l'indice intégré d'excès de danger



1/550^e

Buddleja

Fallopia

Land Cover

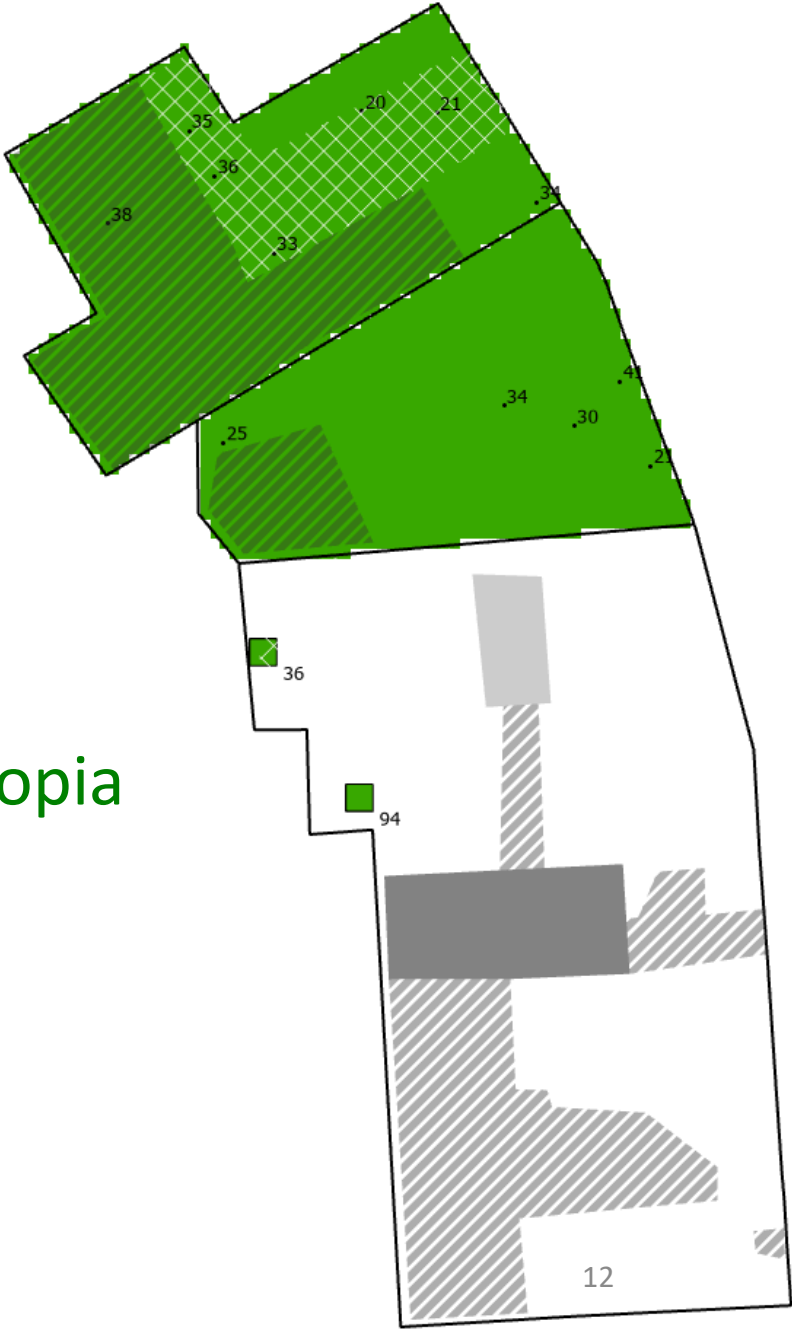
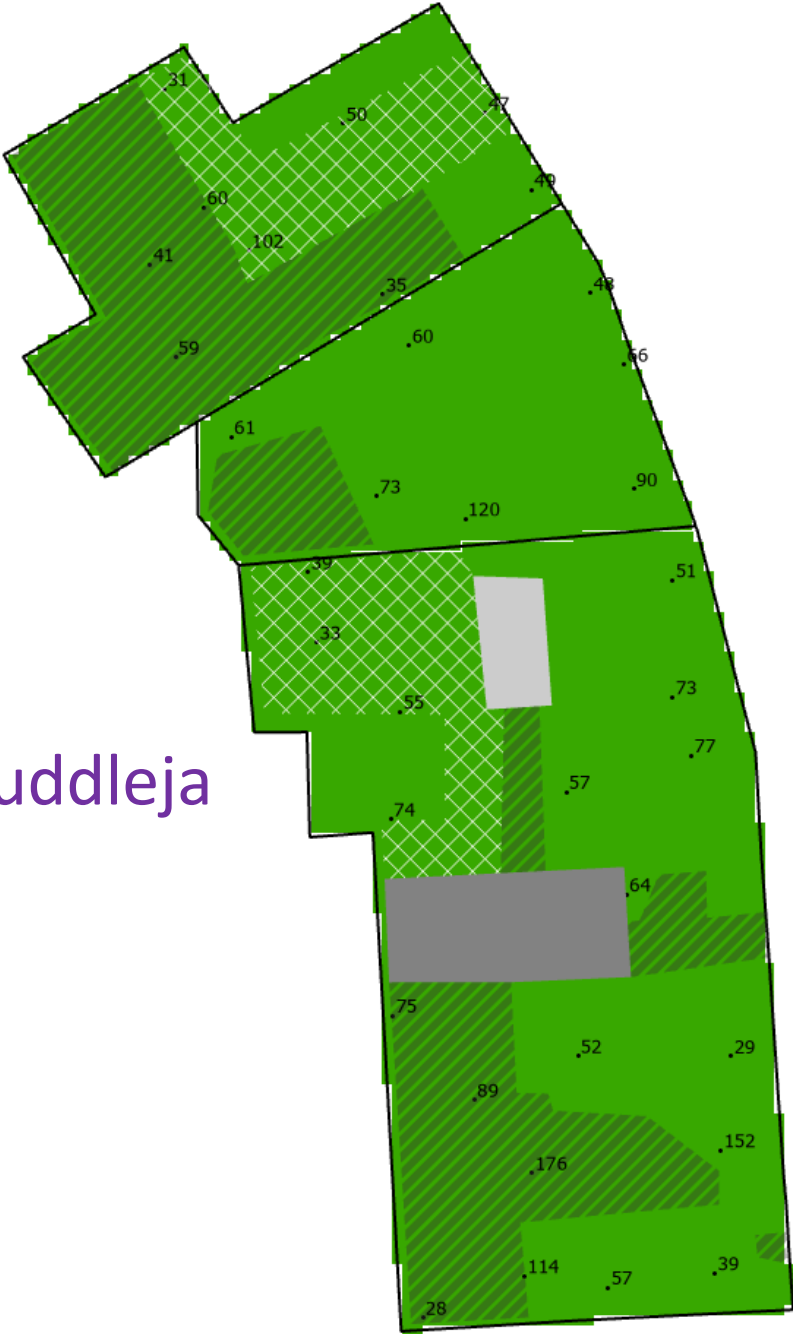
Dalle épaisse

Dalle fine

Fronton Charvin

Halle

Échantillons



Ce que nous disent les plantes du site Neyron

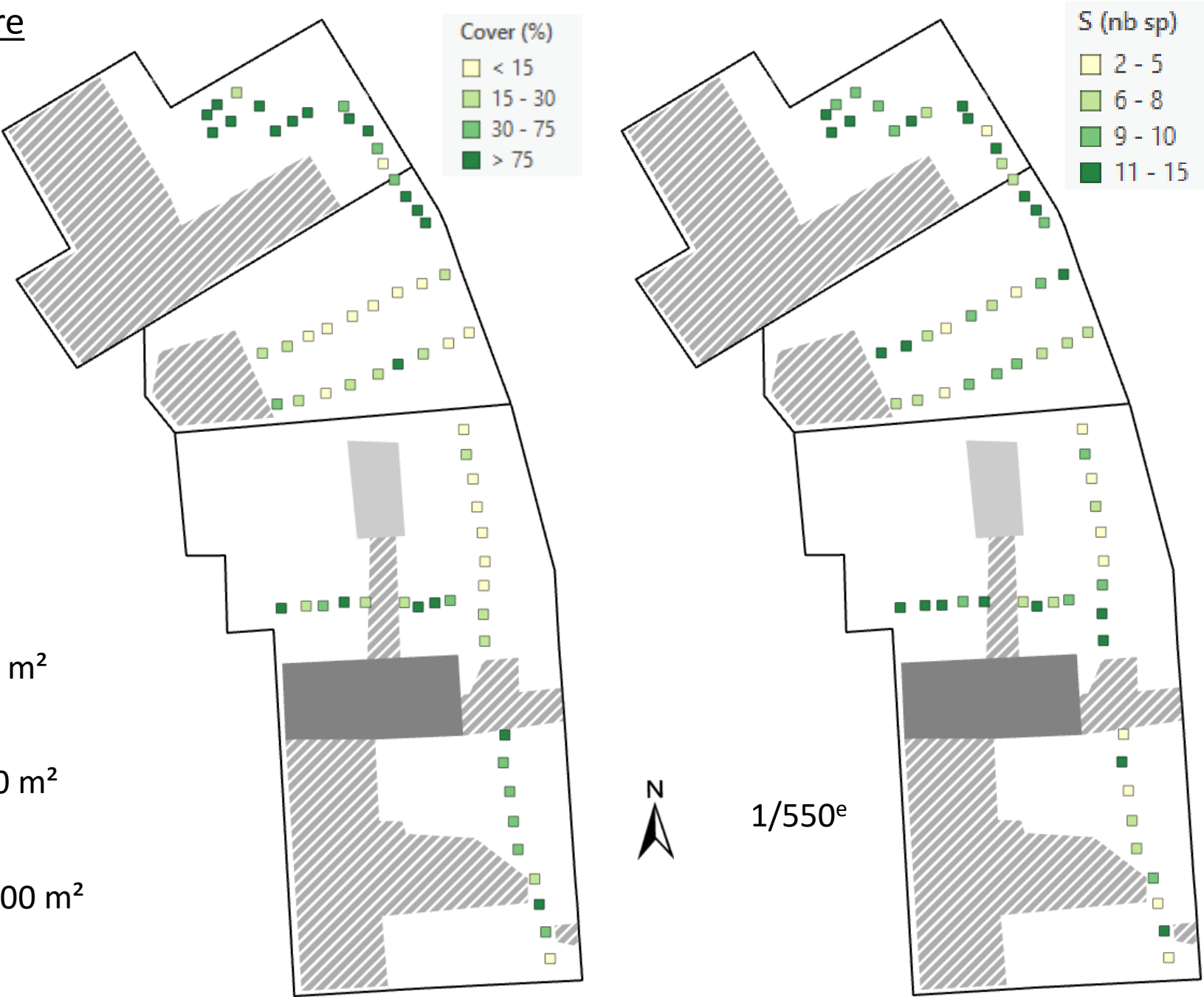
Au sujet de la toxicité du substrat : nombre d'espèces et recouvrement végétal

Au total sur le site : 145 espèces

% d'homologies de composition entre les parcelles

	EK05	EK06	EK25
EK05	100	-	-
EK06	58	100	-
EK25	37	45	100

- EK5 : ≈ 1370 m² ; 82 espèces ; 6 sp./100 m²
 ≈ **78% recouvrement**
- EK6 : ≈ 1100 m² ; 82 espèces ; 7,5sp./100 m²
 ≈ **31% recouvrement**
- EK25 : ≈ 3200 m² ; 107 espèces ; 3,3sp./100 m²
 ≈ **44% recouvrement**



Comparaison des seuils de contaminations entre le référentiel national (MNGSSP) et le référentiel local (SIGMINES)

