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Faculté des sciences

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The relative contribution of the five pedogenesis factors to soil formation and soil organic matter incorporation across environmental gradients

Ph.D. thesis presented to the Faculty of Science at the University of Neuchâtel
to obtain the degree of Doctor of Science

by

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Supporting information

Thematic 1

Thematic 1: Soil organic carbon across soil types & habitats

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Tables

Table S1. 1. Preliminary tests were done on both archived and modern soil samples. Three different analyses were done in 2020 lab conditions on stored archived soil samples and their homologous of 2020: soil pH, soil organic matter content (SOM), and total carbonate content (CaCO3).

ID	Sample origin	Lab results (year)	Top (cm)	Bottom (cm)	pH	SOM (%)	CaCO3 (%)
Cho_LV	Archived	2020	0	18	4.97	17.77	0.05
Cho_LV	Archived	2020	18	35	5.41	8.01	0.01
Cho_LV	Archived	2020	35	51	6.1	6.37	0.03
Cho_LV	Archived	2020	51	6	7.49	6.36	0.02
Cho_LV	Archived	1985	0	8	5	18	0
Cho_LV	Archived	1985	8	30	5.4	8	0.6
Cho_LV	Archived	1985	30	50	6.1	6	1.5
Cho_LV	Archived	1985	50	70	7.5	6	1.9
Bev_CM	Archived	2020	0	18	7	11.4	0
Bev_CM	Archived	2020	18	28	6.6	5.5	0
Bev_CM	Archived	2020	28	40	6.7	3.5	0
Bev_CM	Archived	1993	0	8	7	11.9	0
Bev_CM	Archived	1993	8	30	6.6	6.8	0
Bev_CM	Archived	1993	30	40	6.7	4.9	0
Pon_PZ	Archived	2020	10	14	3.94	4.85	0
Pon_PZ	Archived	2020	14	28	5.56	2.99	0
Pon_PZ	Archived	2020	28	52	7.23	3.35	0
Pon_PZ	Archived	2020	52	75	7.98	3.01	26.6
Pon_PZ	Archived	2020	75	85	8.09	2.36	53.76
Pon_PZ	Archived	1984	0	6	4,3	85.7	NA
Pon_PZ	Archived	1984	6	15	3.2	74	NA
Pon_PZ	Archived	1984	20	30	3.4	4.9	NA
Pon_PZ	Archived	1984	40	50	4.2	3.1	NA
Pon_PZ	Archived	1984	65	80	4.9	1.8	NA
Pon_PZ	Archived	1984	80	85	6.2	1	NA

Table S1. 2. Table showing all soil profile identifiers, coordinates, and names according to the World Soil Reference Base for Soil Ressources (WRB 2022).

Location_ID	Environment	Latitude	Longitude	Modern soil name	Modern soil ID	Archived soil name	Archived soil ID	Date Archived
Bev	forest	551848	197176	Eutric Skeletic Cambisol	Bev_M_CM	Cambisol (Calcaric)	Bev_A_CM	1992
Bi1	alpin	665320	136478	Stagnic Dolomitic Fluvisol (Arenic)	Bi1_M_FL	Arenic Dolomitic Fluvisol	Bi1_A_FL	1989
Bi2	alpin	665230	136346	Gleyic Fluvisol (Arenic)	Bi2_M_FL	Stagnic Histic Dolomitic Fluvisol	Bi2_A_FL	1989
Bi3	alpin	664586	136996	Histic Reductic Dolomitic Gleysol (Arenic, Colluvic)	Bi3_M_GL	Epihistic Reductic Gleysol	Bi3_A_GL	1989
Bi4	alpin	665681	136160	Cambic Umbrisol	Bi4_M_UM	Cambic Umbrisol	Bi4_A_UM	1989
Boi	forest	575974	222550	Podzol	Boi_M_PZ	Podzol	Boi_A_PZ	1985
Ch1	lakeshore	551945	186936	Reductic Gleysol	Ch1_M_GL	Reductic Gleysol (Humic)	Ch1_A_GL	1983
Ch2	lakeshore	549781	185146	Calcaric Reductic Gleysol	Ch2_M_GL	Reductic Gleysol	Ch2_A_GL	1983
Cha	grassland	570360	220088	Epieutric Endocalcaric Skeletic Cambisol (Colluvic, Raptic)	Cha_M_CM	Luvisol (Calcaric)	Cha_A_LV	1985
Che	lakeshore	560088	194080	Calcaric Reductic Gleysol	Che_M_GL	Reductic Gleysol	Che_A_GL	1983
Cho	grassland	531751	189291	Haplic Luvisol	Cho_M_LV	Luvisol (Calcaric)	Cho_A_LV	1985
Cu1	lakeshore	570454	202848	Reductic Gleysol	Cu1_M_GL	Reductic Gleysol	Cu1_A_GL	1983
Cu2	lakeshore	566618	199560	Stagnic Gleysol	Cu2_M_GL	Stagnic Gleysol	Cu2_A_GL	1983
Gor	forest	548619	196886	Dystric Cambisol (Loamic)	Gor_M_CM	Luvisol	Gor_A_LV	1984
Gou	grassland	563463	233844	Eutric Leptic Cambisol	Gou_M_CM	Cambisol	Gou_A_CM	1986
Nav	alpin	615108	115154	Dolomitic Gypsic Cambisol (colluvial)	Nav_M_CM	Cambisol	Nav_A_CM	1988
Po1	riparian	575320	178790	Leptic Fluvisol	Po1_M_FL	Fluvisol (Calciaric)	Po1_A_FL	1987
Po2	riparian	575370	178630	Fluvisol (alcalic)	Po2_M_FL	Fluvisol (Brunic, Calcaric)	Po2_A_FL	1987
Pon	forest	565942	219653	Albic Stagnic Podzol	Pon_M_PZ	Podzol (Calcaric)	Pon_A_PZ	1984
Por	lakeshore	563650	197225	Reductic Gleysol	Por_M_GL	Epihistic Reductic Gleysol	Por_A_GL	1983
Ra1	forest	600154	239411	Podzol	Ra1_M_PZ	Podzol	Ra1_A_PZ	1988
Ra2	forest	600154	239408	Stagnic Gleysol	Ra2_M_PZ	Stagnic Gleysol on Podzol	Ra2_A_PZ	1988
Ro1	riparian	573562	158998	Calcaric Fluvisol	Ro1_M_FL	Fluvisol (Oxyaquic, Calcaric)	Ro1_A_FL	1989
Ro2	riparian	573269	158230	Calcaric Fluvisol	Ro2_M_FL	Fluvisol	Ro2_A_FL	1989
Roc	alpin	547615	197748	Calcaric Hyperskeletic Leptosol (colluvic)	Roc_M_LP	Hyperskeletic Leptosol	Roc_A_LP	1984
Sai	forest	548632	215407	Stagnic Podzol	Sai_M_PZ	Podzol	Sai_A_PZ	1995
Wor	riparian	589798	215812	Calcaric Fluvisol	Wor_M_FL	Fluvisol (Brunic, Calcaric)	Wor_A_FL	1989
Zer	alpin	622457	97439	Eutric Cambisol (Colluvic)	Zer_M_CM	Cambisol	Zer_A_CM	1989

Table S1. 3. Parental material. The geology was determined based on field observations and the online Swiss geological map (https://map.geo.admin.ch/), source: Atlas géologique de la Suisse au 1:25000 (Atlas géologique GA25), Office fédéral de topographie swisstopo.

Location	Location_ID	Geology
Bevaix	Bev	Alluvium
BinntalBlatt1	Bi1	Alluvium
BinntalBlatt2	Bi2	Alluvium
BinntalBlatt3	Bi3	Alluvium
BinntalBlatt4	Bi4	Alluvium
BoisRaiguel	Boi	Dolomitic alluvial sands
Chasseral	Cha	Dolomitic alluvial sands
Chasseron	Cho	Moraine
Chevroux	Che	Moraine and gneiss colluvions
Cheyres1	Ch1	Calc-schists of sandstone
Cheyres2	Ch2	Micritic limestone colluvium
Cudrefin1	Cu1	Calcareous micaschists
Cudrefin2	Cu2	Moraine
Gorgier	Gor	Calcareous marl
Goumois	Gou	Moraine
Nava	Nav	Loess over marl-limestone
Pontins	Pon	Loess over limestone
Portablan	Por	Loess over limestone
Posieux1	Po1	Calcareous marne
Raimeux1	Ra1	Loessic colluvium over limestone colluvium
Raimeux2	Ra2	Limestone plate
RocheDevant	Roc	Calcareous lake sediments
Rossens1	Ro1	Calcareous lake sediments
Rossens2	Ro2	Calcareous lake sediments
Saignolis	Sai	Calcareous lake sediments
Worben	Wor	Calcareous lake sediments
Zermatt	Zer	Calcareous lake sediments

Table S1. 4. ANOVA table for soil physico-chemical properties. One-way ANOVA table of weighted means for the effect of time (two levels; archived and modern) and location (28 levels; Bi1, Bi2, Bi3, Bi4, Bev, Boi, Che, Cu1, Cu2, Cho, Ch1, Ch2, Cha, Gor, Gou, Nav, Pon, Po1, Po2, Por, Roc, Ra1, Ra2, Ro1, Ro2, Sai, Wor, Zer), on 6 soil physicochemical properties; the relative humidity (Rh), the soil pH, the soil organic matter (SOM), the total carbon (Ctot), the total nitrogen (Ntot), and the carbon to nitrogen ratio (CN). Data for were log-transform for all variables, except for the carbon-to-nitrogen ration (CN).

Variable	Factor	Df	SSQ	F	Pr(>F)	
pH	Time	1	0.07	0.122	0.729	
	Location	27	98.09	6.476	<0.001	***
	Residuals	27	15.15			
CEC	Time	1	68	1.173	0.288	
	Location	27	10069	6.454	<0.001	***
	Residuals	27	1560			
LOI	Time	1	16	0.789	0.38	
	Location	27	1173.8	2.14	0.026	*
	Residuals	27	548.6			
C_{org}	Time	1	1.45	0.309	0.583	
	Location	27	286.96	2.266	0.018	*
	Residuals	27	126.62			
N_{tot}	Time	1	0.0157	0.578	0.453	
	Location	27	2.1401	2.924	0.003	**
	Residuals	27	0.7318			
CN	Time	1	22.1	4.891	0.035	*
	Location	27	342.6	2.806	0.004	**
	Residuals	27	122.1			

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Figures

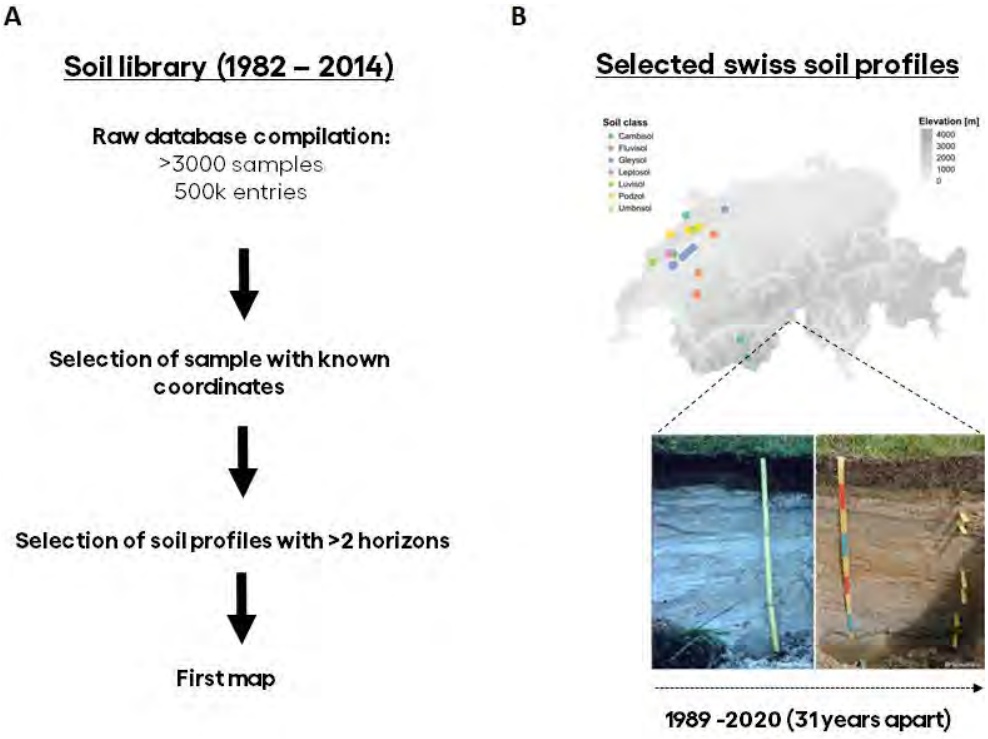


Figure S1. 1. Experimental approach. (A) The filtering process of the soil library database. First, all pieces of information available for soils were gathered in a raw database. Then, we plotted all soil profile coordinates and selected the oldest ones. We choose soil profiles that add at least 2 referenced horizons and create a first map of all potential soil profiles. (B) Selected Swiss soil profiles. Swiss map showing the archived selected soil profiles for which we had the following information: vegetation survey, soil type name, soil horizons depth, and coordinates. The zoom shows a photographic representation of one of the archived selected soil profiles for this study in region Binntal, in canton Valais (VS). The two pictures of the soil profile were taken 31 years old apart (from the left: 1989 Binntal, VS, to the right: 2020 Binntal, VS).

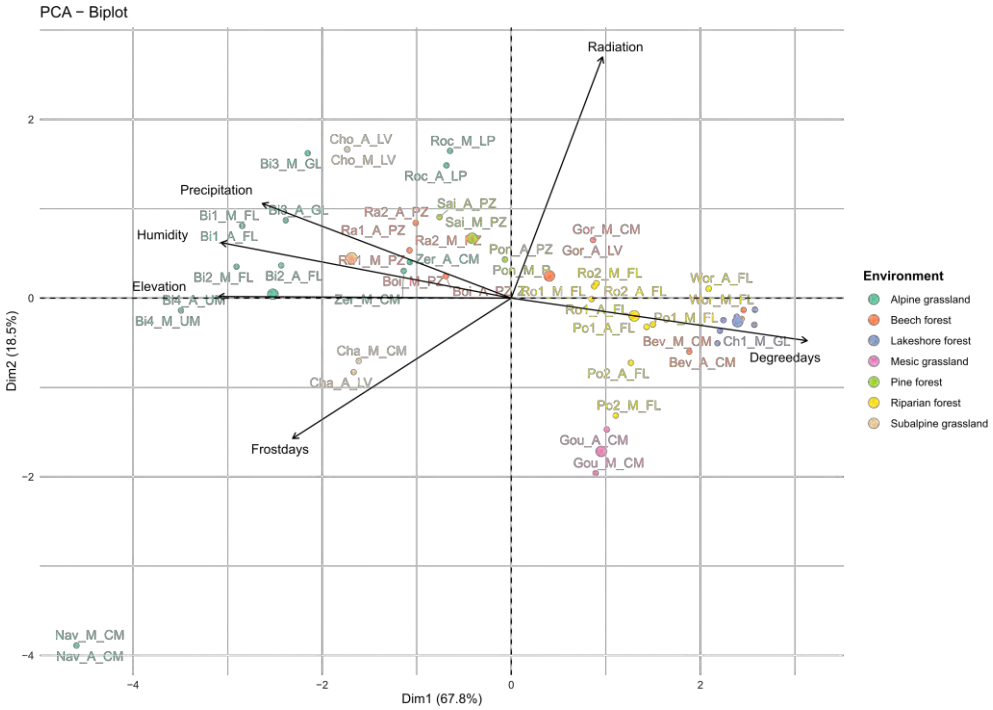


Figure S1. 2. Principal Components Analysis Biplot (PCA-Biplot) illustrating archived selected soil profiles (A) and modern soil profiles (M) as a function of climatic variables (Zimmermann & Kienast, 1999). All soil profiles are grouped along a climatic gradient from cold (frost days) and humid (humidity = average evapotranspiration, precipitations = average precipitations) to warm (degree-days) and dry (solar radiations). The PCA shows the aggregation and distribution of homologous soil profiles (i.e. archived and modern soil profiles) along a climatic gradient. On the left of the projection are the warmer environments (alluvial and lakeshore) and on the right are the colder environments (alpine, and grasslands). Grasslands environments showed a varied distribution. Colors indicate the seven environments represented here: alpine grasslands (turquoise), beech forest (orange), Lakeshore forests (purple), mesic grasslands (pink), pine forests (green), riparian forests (yellow), and subalpine grasslands (brown).

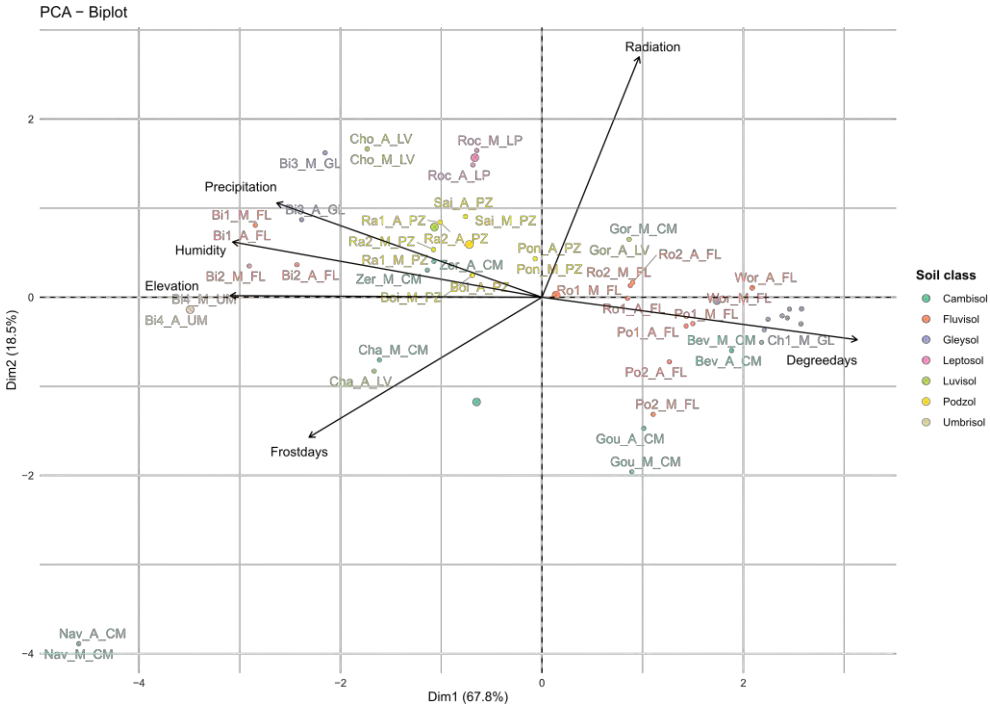


Figure S1. 3. Principal Components Analysis Biplot (PCA-Biplot) illustrating archived selected soil profiles (A) and modern soil profiles (M) as a function of climatic variables (Zimmermann & Kienast, 1999). All soil profiles are grouped along a climatic gradient from cold (frost days) and humid (humidity = average evapotranspiration, precipitations = average precipitations) to warm (degree-days) and dry (solar radiations). The PCA shows the aggregation and distribution of homologous soil profiles (i.e., archived and modern soil profiles) along a climatic gradient. Colors indicate the seven soil classes represented here: Cambisols (turquoise), Fluvisols (orange), Gleysols (purple), Leptosols (pink), Luvisols (green), Podzosols (yellow), and Umbrisols (brown).

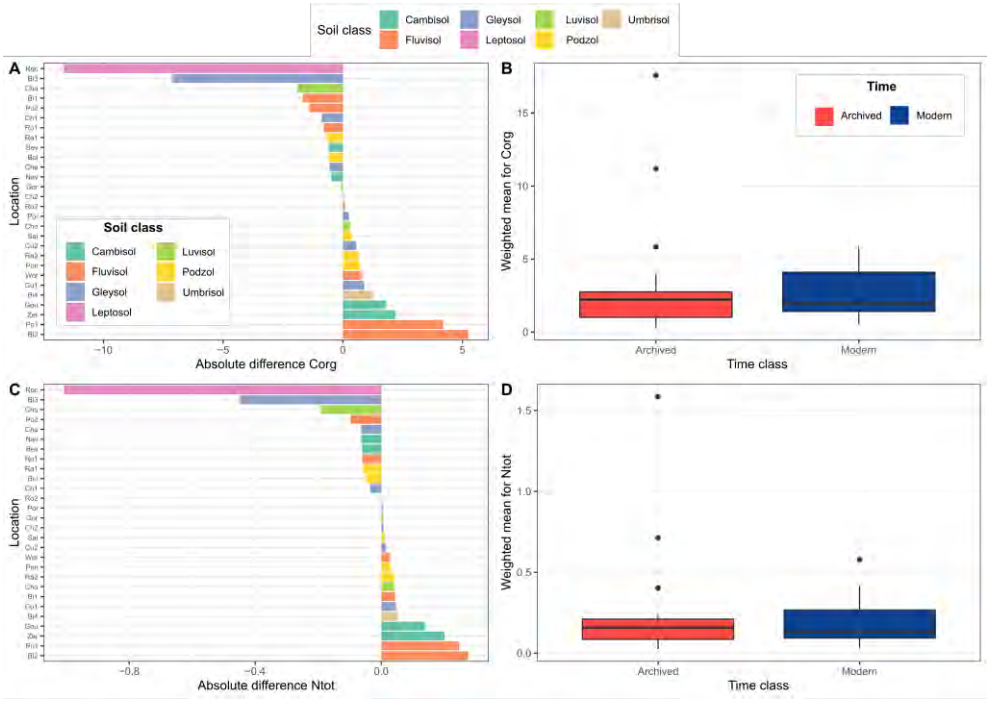


Figure S1. 4. Soil physicochemical parameter change across time. Panel (A) and (C) show the absolute differences between modern and archived soil parameters based on the horizon depth weighted means for the total carbon content (Ctot) and the total nitrogen content (Ntot). Colours indicate the different soil classes: Cambisols (turquoise), Fluvisols (orange), Gleysols (purple), Leptosols (pink), Luvisols (green), Podzols (yellow), and Umbrisols (brown). Boxplot colours indicate archived soil profiles (red) and modern soil profiles (blue). Boxplots represent, from bottom to top, minimum, first quartile, median, third quartile, and maximum, and dots represent the outliers. Asterisks indicate significant differences between time classes ($p < 0.05$).

Soil profiles descriptions

Note:

All pictures of old soil profile were made and provided by Jean-Michel Gobat.

Abbreviations:

Semeraro Sarah (SESA) and Tuchschmid Roxane (RT), all other authors not specified here are the original author or field assistants.

Legend

	Clear transition		OL litter
	Clear transition		Fragmented litter (OF)
	Distinct or gradual transition		Humified litter (OH)
	Diffuse transition		Big size roots
	Calcareous rocks and pebbles		Medium size roots
	Altered calcareous pebbles		Fine sized roots
	Crystalline rocks		Mycelium
	Altered crystalline rocks		Organic matter deeper in the solum
	Rust stains		Worm cast
r	Reduction stains		Snail shells
	Permanent water table		Very humiferous horizon
=	Sand with $CaCO_3$		Dead wood
=	Loam with $CaCO_3$		Artefact
=	Clay with $CaCO_3$		Altered root
_	Sand		
_	Loam		
_	Clay		

Bev

Soil type :	***Référentiel Pédologique (RP)***, Calcisol mésosaturé issu de calcaires durs de l'Urgonien **Classification française des sols (CPCS),** Sol brun calcique **World Reference Base for Soil Ressources 2022 (WRB)**, Cambisol (Calcaric)

Observer-s : Emery S.
Date of archiving: 01.01.1992

Locality	Forêt de Charcotet	**Altitude [m]:**	503
Municipality & canton :	La Grande-Béroche, Neuchâtel	**Humus form :**	Oligomull
Coordinates (CH1903) :	551850 197175	**Exposition:**	E-SE
Habitat type :	Beech forest		
Geological substrate :	Upper Urgonian limestone (White Urgonian)		
Vegetation type :	Melampyro-Fagetum		
Diploma title :	Influence du milieu sur la croissance radiale du chêne sessile (Quercus petraea) dans le Jura neuchâtelois		
Author(s) :	Emery, S.		
Publication type :	Diploma thesis University of Neuchâtel, 1993		

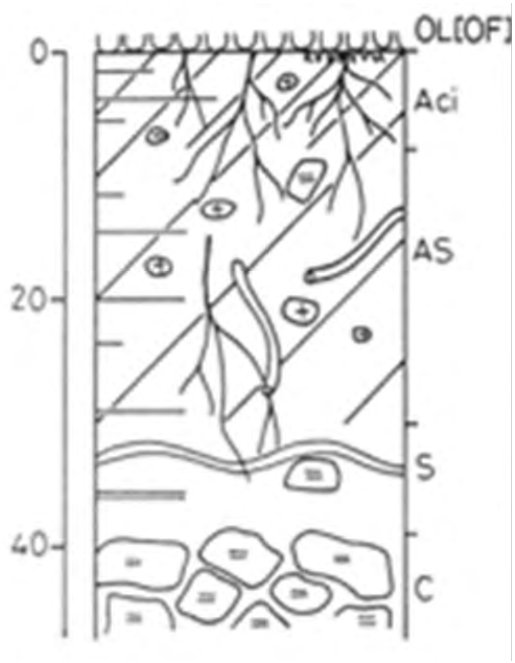
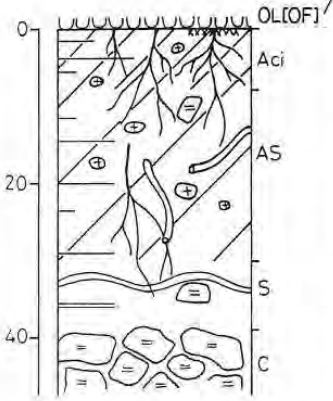


Figure S1. 5. Bev numerical version of Emery's soil profile (on the left) and the picture taken in 1993, representing the Bev soil profile (on the right).

Soil profile description
OL [OF] : NA to 0 cm depth, continuous carpet of oak, alisier and beech leaves, covering a diffuse mycelium.
Aci : 0 to 8 cm depth, brown-black (7.5YR6/2). Rich in organic matter. Silty-clay texture, containing many grains of sand. Lumpy structure, with high porosity. No effervescence at HCL. Numerous secondary fasciculated roots.
AS : 8 to 30 cm depth, dark brown (7.5YR6/2), with blackish streaks rich in organic matter. More clayey than the upper horizon. Presence of gravel with crystalline dominance. Polyhedral structure with reduced porosity. Completely decarbonated. Numerous main and secondary roots.
S : 30 to 40 cm depth, ochre-brown (10YR6/4). Slightly more clayey than above. Skeleton exclusively calcareous. Polyhedral structure. Carbonate limit at 35cm. Few roots.
C : 40 to NA cm depth, hard limestones strongly lapiezed; cracks filled with fine carbonated soil (S horizon).

Fig. 4.18. CALCISOL méso-saturé, issu de calcaires durs (CPCS: Brun calcique)

Localisation : Forêt de Charcotet (division 47), Bevaix (NE)
Coordonnées : 551.850/197.175; C.N. 1:25000 Nº 1164
Altitude : 510 m
Topographie : Milieu de pente (15 %); exposition E-SE
Roche-mère : Calcaires urgoniens inférieurs: "Urgonien jaune"
Végétation : Melampyro-Fagetum



Tapis continu de feuilles de chêne, d'alisier et de hêtre, recouvrant un mycélium diffus.

Brun-noir (7.5YR6/2). Riche en matière organique. Texture limono-argileuse, contenant beaucoup de grains de sable. Structure grumeleuse, à forte porosité. Pas d'effervescence à HCl. Nombreuses racines secondaires fasciculées.

Brun foncé (7.5YR6/2), avec traînées noirâtres riches en matière organique. Plus argileux que l'horizon supérieur. Présence de gravier à dominance cristalline. Structure polyédrique à porosité réduite. Entièrement décarbonaté. Nombreuses racines principales et secondaires.

Brun-ocre(10YR6/4). Légèrement plus argileux qu'au-dessus. Squelette exclusivement calcaire. Structure polyédrique. Limite des carbonates à 35cm. Peu de racines.

Calcaires durs fortement lapiézés; fentes remplies de terre fine carbonatée (horizon S).

Prof. (cm)	Horizon	HR %	PAF %	$CaCO_3$ %	pH			Bases échangeables (m.e./100g)	
					H_2O	KCl	ΔpH	T	S/T
00-08	Aci	2.5	11.9	0	7.0	5.9	1.1	30.4	85
08-30	AS	1.7	6.8	0	6.6	4.8	1.8	18.8	77
30-40	S	1.8	4.9	0	6.7	4.3	2.4	19.0	62

— Sol à Oligomull;
— Profil sub-saturé en surface, méso-saturé en profondeur; pH neutre dans tous les horizons;
— Très faible teneur en $CaCO_3$ total;
— Capacité de rétention en eau favorisée par la texture argileuse, mais limitée par la faible profondeur du profil.

Figure S1. 6. Bev Emery's original soil profile description (archive version). Numerical version of Emery's diploma thesis entitled: " Influence du milieu sur la croissance radiale du chêne sessile (Quercus petraea) dans le Jura neuchâtelois , 1993"

Table S1. 5. Bev physico-chemical analysis done on at the University of Neuchâtel on soil samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique Baize, D., & Girard, M. C. (2009).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Aci	0-8	10YR 4/3	11,66	31,70	14,99	25,98	15,68	2,5	11,9	5,80	0,35	16,69	7	5,37	0,00	22,94	61,99
AS	8-30	10YR 5/4	12,26	33,72	15,63	26,28	12,11	1,7	6,8	2,40	0,19	12,64	6,6	4,89	0,00	12,50	45,99
S	30-40	10YR 5/8	11,46	30,54	13,95	26,61	17,44	1,8	4,9	1,17	0,09	13,18	6,7	3,79	0,00	19,00	-

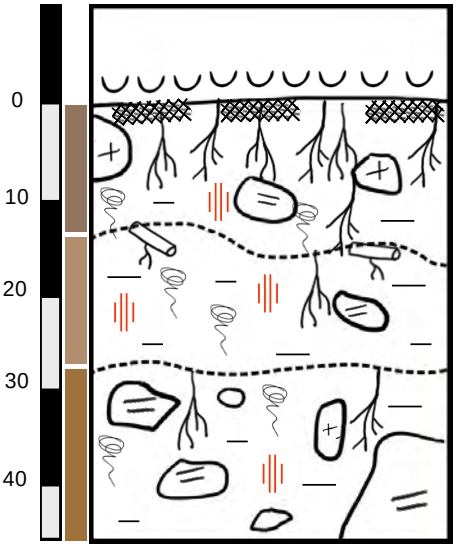
Bev_2020

Soil type :	**Référentiel Pédologique (RP)**, CALCISOL lessivé en surface, issus de dépôts morainiques, à Oligomull mésostucturé **Classification française des sols (CPCS),** Sol brun calcique **World Reference Base (WRB)**, OLIGOMULL on Eutric Skeletic Cambisol

Observer-s : NR & RT

Date : 20.07.2020

Locality	Forêt de Charcotet	**Altitude [m]:**	503,5
Municipality & canton :	La Grande-Béroche, NE	**Slope (°) :**	8°
Coordinates (CH1903) :	551848 197176	**Exposition :**	Est
Habitat type :	forest	**Humus form :**	Oligomull
Geological substrate :	Upper Urgonian limestone (White Urgonian)		
Vegetation type :	Fagion		
Remarks :	Plastic cover, grid, wooden board and PET are part of the waste found on the site		



Soil profile description

[OLn] – OLv : +2 to 0 cm depth, Transition very clear / Beech and quercus leaves of the year and past year

[**OF**] : 0 to 0.5 cm depth, Transition clear <2cm / fragmented and squeletized leaves of beech and maple

Aci : 0.5 to 14/18 cm depth, Transition gradual 4-8cm / General color: greyish brown / Munsell Color: 10YR 5/3 / Skeleton : 1 Mineral, 2 Plant, 3 Animal / General structure: lumpy & sub-polyhedral

/ Texture: sandy-loamy / Porosity: moderately porous 5-15% / pH Hellige : 5 / HCl 6M (1 to 4reaction): 0 / Stains: redox stains / Root abundance (0 to 5): 4 / Root size: fine 0-2mm , mid-size 2-5mm & big >5mm / Compactness: soft / Adhesiveness: non-sticky / Notes: rounded edged for the stones along the profil

Aci-Sci : 14/18 to 28 cm depth, Transition diffuse >8cm / General color: brownish / Munsell Color 10YR 6/4 / Skeleton 1 Mineral 2 Plant / General structure lumpy & sub-polyhedral / Texture sandy-loamy / Porosity porous 15-40% / pH Hellige 4.5 / HCl 6M (1 to 4reaction) 0 / Stains rust stains / Root abundance (0 to 5) 3 / Root size mid-size 2-5mm & big >5mm / Compactness not very compact / Adhesiveness non-sticky / Notes: Rust stains starting at 24 cm and presence of earthworm galleries in depth

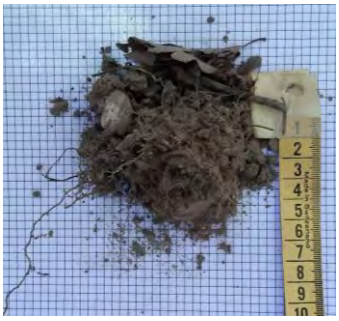
Sci : 28 to 40 cm depth, Transition gradual 4-8cm / General color ochre brown / Munsell Color 10YR 5/6 / Skeleton 1 Mineral 2 Plant / General structure polyhedral / Texture loamy-sandy / Porosity slightly porous 2-5% / pH Hellige 5 / HCl 6M (1 to 4reaction) 0 / Stains rust stains / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm / Compactness compact / Adhesiveness non-sticky / Notes: -

Rca : 40+ cm depth

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) mesostructured Oligomull
Observer-s :	NP & RT
Date :	20.07.2020

Locality	Forêt de Charcotet	**Altitude [m]:**	503,5
Municipality & canton :	La Grande-Béroche, NE	**Slope (°) :**	8°
Coordinates (CH1903) :	551848 197176	**Exposition :**	Est
Habitat type :	forest		
Geological substrate :	Upper Urgonian limestone (White Urgonian)		
Vegetation type :	Fagion		
Remarks :	Plastic cover, grid, wooden board and PET are part of the waste found on the site		



Humus form description

[OLn] – OLv : +2 to 0 cm depth, Beech and quercus leaves of the year and past year / Litter fragmentation absent & fragmented / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition very clear / Notes: none

[OF] : 0 to 0.5 cm depth, fragmented leaves of past year / Litter transformation bleached leaves & squeletized leaves / Litter fragmentation fragmented & atomized leaves / Cohesion coherent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots present / Transition clear <2cm / Notes: none

Ama: 0.5 to 14/18 cm depth, OM content not very humiferous / HCl 6M (1 to 4reaction) 0 / Texture loamy-sandy / Coarse elements yes, stones from 0.2cm (5%) to >20cm (35%) diameter / Structure lympy & sub-polyhedral / Aggregates size 5-20mm / Level of aggregation highly aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 4 / Transition gradual 4-8cm / Limit (>A horizon) irregular / Note: mesostructured

Table S1. 6. Bev_2020 physico-chemical analysis done on at the University of Neuchâtel on soil samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Aci	0.5 – 14/18	10YR 5/3	10,90	27,57	14,31	25,05	22,16	1,61	6,58	3,36	0,20	16,60	4,92	4,00	0,00	5,02	14,62
Aci-Sci	14/18-28	10YR 6/4	11,93	30,51	16,11	26,60	14,85	1,36	3,99	1,67	0,11	14,97	5,35	3,89	0,00	7,20	4,09
Sci	28-40	10YR 5/6	11,36	28,48	14,15	23,41	22,60	1,65	2,86	0,83	0,06	14,34	5,81	4,37	0,00	8,03	-

Vegetation survey

Table S1. 7. Bev_2020 vegetation survey, La Grande-Béroche, (NE). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Fagion alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1992) corresponded to a Melampyro-Fagetum.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**5**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**25**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**7**	1 à 5 %	1
Grass cover [%]	**3**	5 à 25 %	2
Moss and lichen cover [%]	**5**	5-15 %	2a
Litter cover [%]	**75**	15-25 %	2b
Rock and stone cover [%]	**5**	25 à 50 %	3
Bare ground cover [%]	**5**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Fagus sylvatica	A	4	
Corylus avellana	A	r	
Ilex aquifolium	A	2a	
Quercus pubescens petraea	A	2b	
Abies alba	A	r	
Corylus avellana	H	r	
Euphorbia amygdaloides	H	r	
Hepatica nobilis	H	r	
Prunus laurocerasus	H	r	
Ligustrum vulgare	H	r	
Fagus sylvatica	H	1	
Quercus pubescens petraea	H	1	
Dryopteris filix-mas	H	r	
Hedera helix	H	2a	

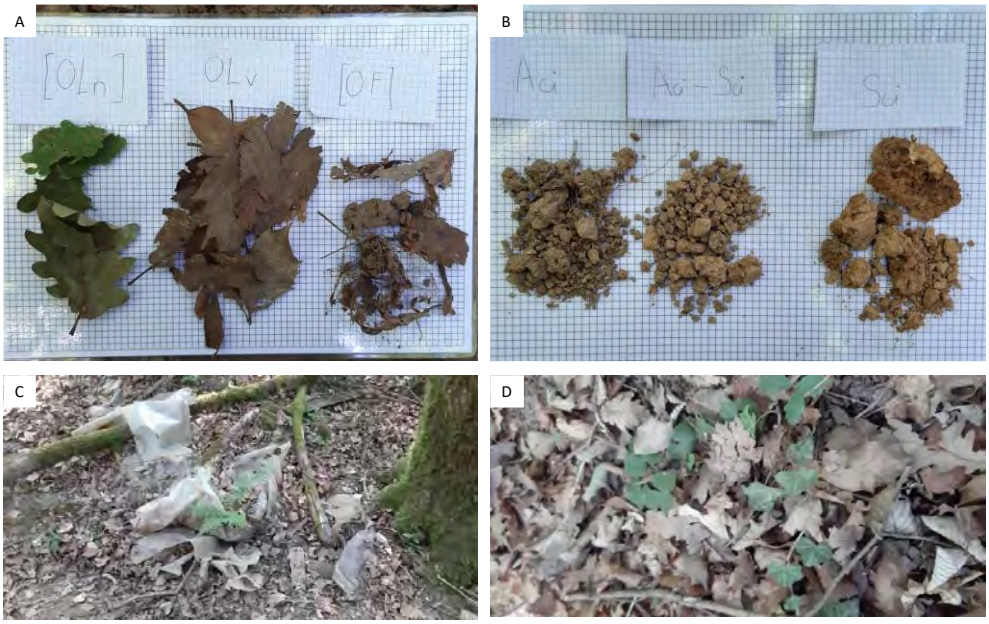


Figure S1. 7. Bev_2020 pictures taken in 2020 around the soil profile. Litter horizon's sequence A. Horizon's sequence B. Plastic waste on the site C. Litter described as an Oligomull D. © RT

Bi1

Soil type :	***Référentiel Pédologique (RP),*** Fluviosol Typique arénique dolomitique **Classification française des sols (CPCS),** Sol brun ocreux **World Reference Base for Soil Ressources 2022 (WRB),** Arenic Dolomitic Fluvisol
Observer-s :	FF & JMG
Date of archiving:	22.08.1989

Locality	Blatt, Binntal	**Altitude [m]:**	2205
Municipality & canton :	Binntal, Valais	**Humus form :**	-
Coordinates (CH1903) :	665321 136470	**LSS JMG publi n°**	122
Habitat type :	Alpine grassland, natural reserve		
Geological substrate :	Dolomitic sand		
Vegetation type :	Caricion atrofusco-saxatilis		
Publication title :	Field notebook, 115 "Végétation du Haut Val de Binn"		
Authors :	Gobat, J.-M. & Freléchoux F.		
Publication :	Field notebook, 115 Diploma thesis, Unversity of Neuchâtel, 1990		

Figure S1. 8. Bi1 Jean-Michel Gobat soil profile picture of Bi1 taken in 1993

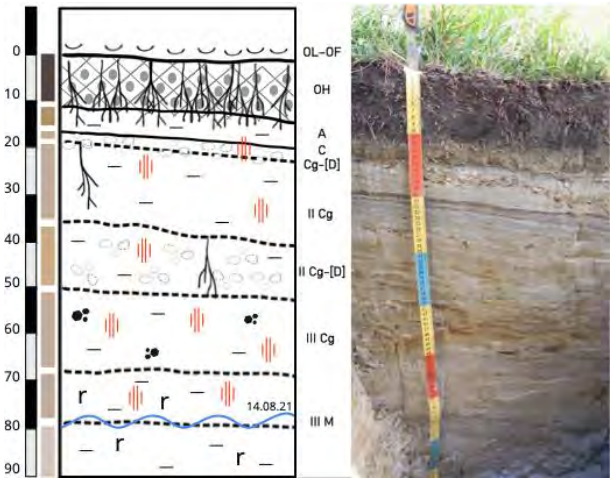
Table S1. 8. Bi1 physico-chemical analysis done on at the University of Neuchâtel on soil samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	0-4	2,5Y 2,5/1	4,22	21,03	18,07	37,85	18,83	4,81	29,32	11,96	1,13	10,58	5,45	5,04	0,15	39,26	77,99
C	4-9	2,5Y 4/4	0,90	5,24	9,13	53,02	31,70	3,61	7,18	2,59	0,22	11,56	5,85	4,99	0,18	26,73	64,85
IIC	9-60	2,5Y 9/1	0,74	1,32	4,44	69,19	24,31	0,10	0,15	5,68	0,00	-	8,3	8,06	-	-	-

Bi1_2020

Soil type :	***Référentiel Pédologique (RP),*** FLUVIOSOL TYPIQUE rédoxique, saturé en surface, multifluvique, arénique, alpin, issu de sables dolomitiques, à Leptotangel **Classification française des sols (CPCS),** Sol alluvial ***World Reference Base (WRB),*** LEPTOTANGEL on Stagnic Dolomitic Fluvisol (Arenic)
Observer-s :	SESA& RT
Date :	14.08.2020

Locality	Blatt, Binntal	**Altitude [m]:**	2205
Municipality & canton :	Binntal, VS	**Slope (°) :**	0°
Coordinates (CH1903) :	665320 136478	**Exposition :**	South
Habitat type :	alpine swamp, natural reserve	**Humus form :**	Leptotangel
Geological substrate :	Dolomitic sand		
Vegetation type :	Caricion atrofusco-saxatilis		
Remarks :	From the stone path cut into the swamp. Presence of dung and other feces (grazing in the month of September) Proximity of the swamp and the river arms that supplies the Binna. Presence of marmot.		



Soil profile description

OL–OF : +0.5 to 0 cm depth, Transition very clear / Leaves of the year still attached

OH : 0 to 10 cm depth, Transition gradual 4-8cm / Munsell Color 10YR 3/1 / pH Hellige 6 / Root abundance (0 to 5) 4

A : 10 to 14 cm depth, Transition clear <2cm / General color brown / Munsell Color 2,5Y 6/4 / Skeleton 1 Mineral 2 Plant / General structure granulate / Texture sandy / Porosity porous 15-40% /

pH Hellige 7.5 / HCl M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 4 / Root size fine 0-2mm & mid-size 2-5mm/ Compactness soft / Adhesiveness not very sticky / Notes: -

C : 14 to 15 cm depth, Transition clear <2cm / General color grey / Munsell Color 2,5Y 7/2 / Skeleton 1 Mineral 2 Plant / General structure particular / Texture sandy / Porosity porous 15-40% / pH Hellige 8 / HCl M (1 to 4 reaction) 2 / Stains redox stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm & mid-size 2-5mm/ Compactness soft / Adhesiveness non-sticky / Notes: coal stain as well as dark strips

Cg-[D] : 15 to 17.5 cm depth, Transition clear <2cm / General color greyis yellow / Munsell Color 2,5Y 7/3 / Skeleton 1 Mineral / General structure particular / Texture sandy / Porosity porous 15-40% / pH Hellige 7 / HCl M (1 to 4 reaction) 3 / Stains redox stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm & mid-size 2-5mm/ Compactness soft / Adhesiveness non-sticky / Notes: gravels

II Cg : 17.5 to 36 cm depth, Transition diffuse >8cm / General color greyis yellow / Munsell Color 2,5Y 7/2 / Skeleton 1 Mineral / General structure particular / Texture sandy / Porosity porous 15-40% / pH Hellige 8 / HCl M (1 to 4 reaction) 2 / Stains redox and coal stains / Compactness soft / Adhesiveness non-sticky / Notes: -

II Cg-[D] : 36 to 50 cm depth, Transition diffuse >8cm / General color greyis yellow / Munsell Color 2,5Y 7/4 / Skeleton 1 Mineral / General structure particular / Texture sandy / Porosity porous 15-40% / pH Hellige 7 / HCl 6M (1 to 4reaction) 3 / Stains redox stains / Compactness soft / Adhesiveness non-sticky / Notes: -.

III Cg : 50 to 68 cm depth, Transition diffuse >8cm / General color greyis yellow / Munsell Color 2,5Y 7/2 / Skeleton 1 Mineral / General structure particular / Texture sandy / Porosity moderately porous 5-15% / pH Hellige 8 / HCl 6M (1 to 4reaction) 3 / Stains redox and coal stains / Compactness soft / Adhesiveness non-sticky / Notes: humid horizon, coal stain as well as dark strips

III M : 68+ cm depth, Transition diffuse >8cm / General color greyis white / Munsell Color 2,5Y 8/1 / Skeleton 1 Mineral / General structure particular / Texture sandy / Porosity porous 15-40% / pH Hellige 8 / HCl 6M (1 to 4reaction) 3 / Stains no stains / Compactness soft / Adhesiveness non-sticky / Notes: groundwater at 80 cm.

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) Leptotangel		
Observer-s :	SESA& RT		
Date :	14.08.2020		
Locality	Blatt, Binntal	**Altitude [m]:**	2205
Municipality & canton :	Binntal, VS	**Slope (°) :**	0°
Coordinates (CH1903) :	665320 136478	**Exposition :**	South
Habitat type :	alpine swamp, natural reserve		
Geological substrate :	Dolomitic sand		
Vegetation type :	Caricion atrofusco-saxatilis		
Remarks :	From the stone path cut into the swamp. Presence of dung and other feces (grazing in the month of September) Proximity of the swamp and the river arms that supplies the Binna. Presence of marmot.		

Humus form description
OL–OF : +0.5 to 0 cm depth, Transition very clear / Leaves of the year still attached
OH : 0 to 10 cm depth, Transition gradual 4-8cm / Cohesion absent / OM content mixed material / Percentage of fine OM 70-90 % / Presence of mycelium absent / Presence roots present / Notes: none
A : 7 to 10 cm depth, OM content not very humiferous / HCl 6M (1 to 4 reaction) 0 / Texture sandy / Structure granulated / Aggregates size 2-5mm / Level of aggregation poorly aggregated / Aggregate stability unsTable S / Root abundance (0 to 5) 3 / Transition clear <2cm / Limit (>A horizon) regular / Note: -

Table S1. 9. Bi1_2020 physico-chemical analysis done on at the University of Neuchâtel on soil samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
OH	0-10	10YR 3/1	4,26	21,94	18,09	37,83	17,88	5,80	26,92	1,49	1,03	-	6,77	6,39	0,21	46,34	74,01
A	10-14	2,5Y 6/4	0,78	6,42	11,88	54,23	26,68	3,37	4,81	3,69	0,11	-	7,33	6,59	0,86	32,81	91,22
Cg	14-15	2,5Y 7/2	0,78	3,15	8,32	65,62	22,13	0,32	0,48	2,73	0,01	-	8,39	7,76	0	_	_
Cg-[D]	15-17.5	2,5Y 7/3	0,68	2,20	6,10	53,34	37,69	0,23	0,30	3,06	0,01	-	8,40	8,03	0	_	_
II Cg	17.5-36	2,5Y 7/2	0,79	3,45	10,44	63,65	19,80	0,26	0,39	3,33	0,01	-	8,46	7,85	0	_	_
II Cg -[D]	36-50	2,5Y 7/4	1,10	2,56	7,77	67,19	20,78	0,08	0,25	4,05	0,00	-	8,63	8,40	0	_	_
III Cg	50-68	2,5Y 7/2	0,74	1,67	6,21	68,67	22,48	0,04	0,13	2,65	0,00	-	8,88	8,73	0	_	_
III M	68+	2,5Y 8/1	0,87	2,43	11,99	72,25	12,47	0,07	0,14	1,49	0,00	-	8,86	8,57	0	_	_

Vegetation survey

Table S1. 10. Bi1_2020 vegetation survey, Binntal (VS). Stratum codes used: H = herbaceous, A = shrubby, B = tree-like. The Caricion atrofusco-saxatilis alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1989) corresponded to Caricion atrofusco-saxatilis.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	-	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	-	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	-	1 à 5 %	1
Grass cover [%]	**100**	5 à 25 %	2
Moss and lichen cover [%]	-	5-15 %	2a
Litter cover [%]	-	15-25 %	2b
Rock and stone cover [%]	-	25 à 50 %	3
Bare ground cover [%]	-	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Carex nigra	H	2a	
Trifolium alpestre	H	2a	
Lugisticum nutellina	H	2a	
Trifolium badium	H	2a	
Polygonum viviparum	H	1	
Selaginella selaginoides	H	1	
Polygonum viviparum	H	1	
Salix foetida	H	2a	
Carex frigida	H	1	
Carex capillaris	H	1	
Deschampsia cespitosa	H	2a	
Gentiana verna	H	1	

Figure S1.9.. Bi1_2020 pictures taken in 2020 around the soil profile. View next to profile looking South-West A. Altered sand below the first 10 cm B. Redox stains of the subsoil horizons C. © SESA

Bi2

Soil type :	***Référentiel Pédologique (RP),*** Fluviosol Typique-Réductisol typique issu de sables dolomitiques **Classification française des sols (CPCS),** Sol alluvial composé à gley **World Reference Base for Soil Ressources 2022 (WRB),** Stagnic Histic Dolomitic Fluvisol

Observer-s : FF

Date of archiving: 01.01.1989

Locality	Blatt, Binntal	**Altitude [m]:**	2193
Municipality & canton :	Binntal, Valais	**Humus form :**	-
Coordinates (CH1903) :	665228 136345	**LSS JMG publi n°**	191
Habitat type :	Alpine grassland, natural reserve		
Geological substrate :	Dolomite, schist		
Vegetation type :	Junco triglumis-Caricetum bicoloris		
Title :	Végétation du Haut Val de Binn		
Authors :	Freléchoux F.		
Publication :	Diploma thesis, University of Neuchâtel, 1990, Sol no 6		
Comments	Based on the names of the horizons and the description of the soil profile, it matches the description of soil no 1 rather than soil no 6		

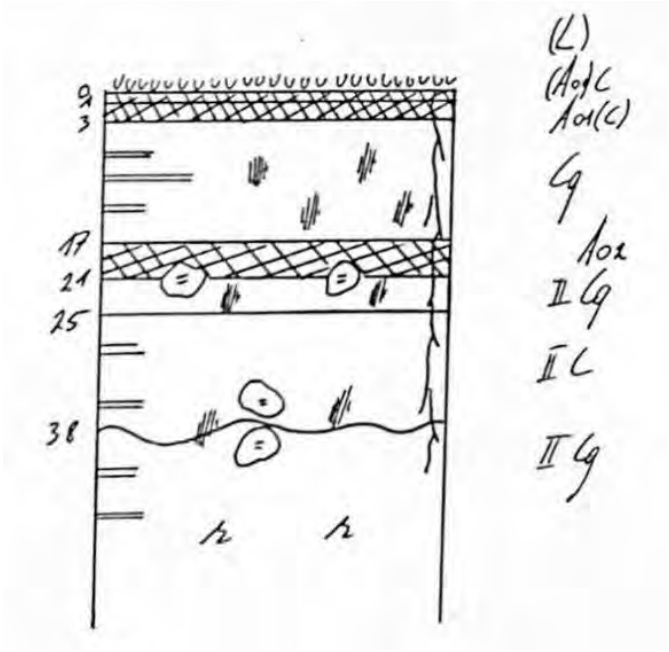
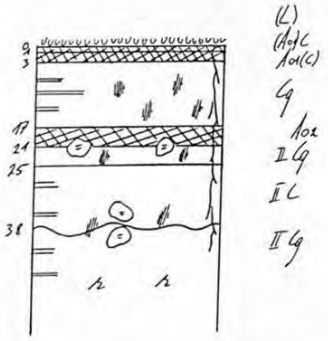


Figure S1. 10. Bi2 François Freléchoux soil profile description taken in 1990

Soil profile description
(L) : NA to 0 cm depth, some surface litter.
(Ao1)C : 0 to 1 cm depth, dolomitic silts and sands mixed with organic matter.
Ao1(C) : 1 to 3 cm depth, ditto but with more organic matter.
Cg : 3 to 17 cm depth, silts and dolomitic sands scattered with traces of oxidation.
Ao2 : 17 to 21 cm depth, buried organo-mineral horizon.
IICg : 21 to 25 cm depth, dolomitic sands with oxidation spots.
IIC : 25 to 38 cm depth, dolomitic sands.
IICg : 38 to NA cm depth, dolomitic sands with oxidation spots in the upper part, the flapping area of the slick, and reduction in the lower part.



Horizons:

(L) :	un peu de litière en surface
(A_{o1}) C :	limons et sables dolomitiques mélangés à de la matière organique
A_{o1}(C) :	idem mais avec davantage de matière organique
C_g :	limons et de sables dolomitiques parsemés de traces d'oxydation
A_{o2} :	horizon organo-minéral enfoui
II C_g :	sables dolomitiques avec taches d'oxydation
II C :	sables dolomitiques
II C_g :	sables dolomitiques avec taches d'oxydation dans la partie supérieure, zone de battement de la nappe, et de réduction dans la partie inférieure

Annexe 35 :

Sol No 1

Type de sol :	sol alluvial composé à gley
No du relevé typologique du sol :	1
No du relevé de végétation :	91
Type de végétation :	Junco triglumis - Caricetum bicoloris
Lieu :	alluvions de Blatt
Altitude :	2085 m
Pente :	0 %
Exposition :	-
Roche-mère :	dolomie
pH (électrode) :	6,9

Figure S1. 11. Bi2 original soil profile description (archive version). Numerical version of Freléchoux's diploma thesis entitled: " Végétation du Haut Val de Binn, 1990"

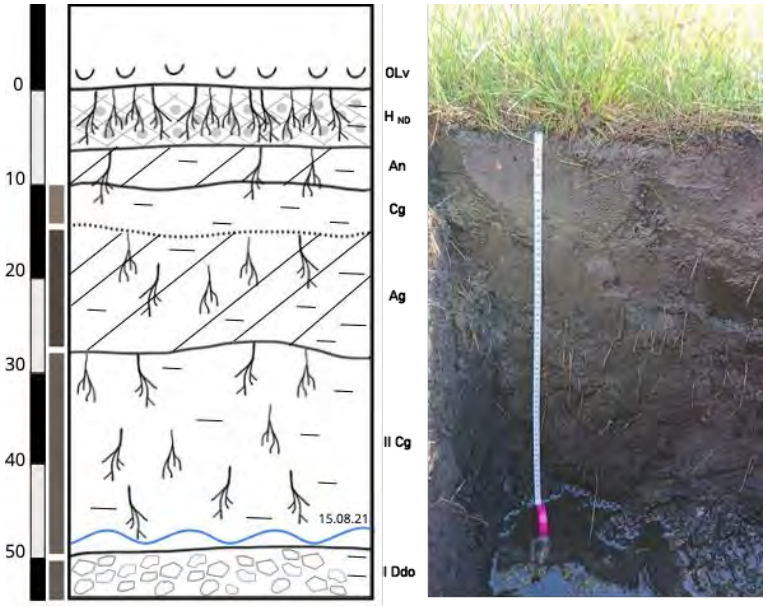
Table S1. 11. Bi2 physico-chemical analysis done on at the University on soil samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
[Ao1]C	0-1	2,5Y 6/2	0,97	6,76	13,08	61,10	18,09	1,25	9,10	13,04	0,70	18,52	5,94	5,6	0,41	17,67	54,26
Ao1 (C)	1-3	2,5Y 7/2	0,40	1,91	3,97	40,90	52,82	0,08	0,29	0,25	0,02	10,63	7,27	7,03	1,73	1,77	26,64
Cg	3-17	2,5Y 7/2	0,95	5,39	12,99	65,23	15,44	0,20	0,76	0,54	0,02	24,56	7,18	6,85	3,30	_	_
IICg	17-25	2,5Y 6/2	0,28	1,79	3,69	24,76	67,94	0,33	1,13	0,56	0,04	14,47	6,22	5,53	0,16	_	_
IIC	25-38	2,5Y 7/2	0,50	2,61	6,28	57,03	33,58	0,31	1,03	0,48	0,03	13,87	6,43	5,33	0,12	_	_
IICg	38-60	2,5Y 6/2	0,29	1,96	3,81	23,71	70,23	0,21	0,69	0,28	0,01	29,22	6,92	6,15	0,10	_	_

Bi2_2020

Soil type :	***Référentiel Pédologique (RP),*** Fluviosol Typique – Réductisol Typique multiépihistique, arénique, alpin, saturé, issu de sables dolomitiques, à Cyperaceae, à Anmoor ***Classification française des sols (CPCS),*** Sol alluvial composé à grey tourbeux ***World Reference Base (WRB),*** Anmoor on Gleyic Fluvisol (Arenic)
Observer-s :	SESA & RT
Date :	15.08.2020

Locality	Blatt, Binntal	**Altitude [m]:**	2193
Municipality & canton :	Binntal, VS	**Slope (°) :**	0°
Coordinates (CH1903) :	665230 136346	**Exposition :**	East
Habitat type :	alpine swamp, natural reserve	**Humus form :**	Anmoor
Geological substrate :	Dolomite, schist		
Vegetation type :	Caricion atrofusco-saxatilis		
Remarks :	From the cabane, walk about 15 minutes then cut through the swamp. When you open the profil, a strong smell of sulfur is released. The smell gets stronger as you go deeper. Strong micro-topography		



Soil profile description

OLv : +3 to 0 cm depth, Transition very clear /

H (undefined) : 0 to 6 cm depth, Transition clear <2cm /

An : 6 to 10 cm depth, Transition clear <2cm / no description on field nore laboratory

Cg : 10 to 14 cm depth, Transition clear <2cm / General color grey / Munsell Color 2,5Y 5/2 / Skeleton 1 Mineral 2 Plant / General structure particular / Texture sandy / Porosity porous 15-40% / pH Hellige 5.5 / HCl M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 3 / Root size fine 0-2mm & mid-size 2-5mm/ Compactness soft / Adhesiveness sticky / Notes: -

Ag : 14 to 28 cm depth, Transition diffuse >8cm / General color black / Munsell Color 2,5Y 3/1 / Skeleton 1 Animal / General structure unknown / Texture loamy / Porosity porous 15-40% / pH Hellige 5 / HCl M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 4 / Root size fine 0-2mm & mid-size 2-5mm/ Compactness not very compact / Adhesiveness very sticky / Notes: seepage along profile

II Cg : 28 to 50 cm depth, Transition clear <2cm / General color dark grey / Munsell Color 2,5Y 4/1 / Skeleton 1 Mineral 2 Plant / General structure massive / Texture loamy-sandy / Porosity porous 15-40% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 3 / Root size fine 0-2mm & mid-size 2-5mm / Compactness not very compact / Adhesiveness sticky / Notes: -.

II Ddo : 50+ cm depth, General color grey / Munsell Color 2,5Y 4/1 / Skeleton 1 Mineral / General structure particular / Texture loamy-sandy / Porosity porous 15-40% / pH Hellige 5.5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 0 / Compactness compact / Adhesiveness non-sticky / Notes: at 50 cm groundwater Table S, gravels aroun 4 cm, bubbles, and strong smell of sulphur

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) Anmoor		
Observer-s :	SESA & RT		
Date :	15.08.2020		
Locality	Blatt, Binntal	**Altitude [m]:**	2193
Municipality & canton :	Binntal, VS	**Slope (°) :**	0°
Coordinates (CH1903) :	665230 136346	**Exposition :**	East
Habitat type :	alpine swamp, natural reserve		
Geological substrate :	Dolomite, schist		
Vegetation type :	Caricion atrofusco-saxatilis		
Remarks :	From the cabane, walk about 15 minutes then cut through the swamp. When you open the profil, a strong smell of sulfur is released. The smell gets stronger as you go deeper. Strong micro-topography		

Humus form description
OLn : +3 to 0 cm depth, Transition very clear /
H (undefined) : 0 to 4 cm depth, Transition clear <2cm /
Aan : 6 to 10 cm depth, Transition clear <2cm / no description on field nore laboratory

Table S1. 12. Bi2_2020 physico-chemical analysis done on at the University of Neuchâtel on soil samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
An	6-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cg	10-14	2,5Y 5/2	0,45	3,40	5,79	27,46	62,90	0,60	2,26	1,20	0,11	11,28	5,19	4,38	0,02	0,92	90,41
Ag	14-28	2,5Y 3/1	1,78	16,61	17,81	48,89	14,92	5,36	29,77	19,84	0,99	19,97	4,92	4,49	0,21	37,01	96,07
II Cg	28-50	2,5Y 4/1	0,79	5,27	8,66	51,42	32,83	1,78	4,23	2,02	0,12	16,54	4,97	4,14	0,10	-	-
II Ddo	50+	2,5Y 4/1	0,59	4,28	9,03	49,09	35,69	1,07	2,85	1,29	0,08	16,90	4,07	3,38	0,00	-	-

Vegetation survey

Table S1. 13 Bi2_2020 vegetation survey, Binntal (VS). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Caricion atrofusco-saxatilis alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1989) corresponded to Junco triglumis-Caricetum bicoloris.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	-	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	-	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	-	1 à 5 %	1
Grass cover [%]	**95**	5 à 25 %	2
Moss and lichen cover [%]	-	5-15 %	2a
Litter cover [%]	**5**	15-25 %	2b
Rock and stone cover [%]	-	25 à 50 %	3
Bare ground cover [%]	-	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Carex bicolor	H	2a	
Equisetum variegatum	H	1	
Eleocharis quinqueflor	H	2a	
Selaginella selaginoides	H	1	
Saxifraga aizoides	H	1	
Nardus stricta	H	1	
Parnassia palustris	H	1	
Carex ferruginea	H	1	
Carex capillaris	H	1	
Eleocharis quinqueflora	H	2a	
Juncus triglumis	H	2a	
Salix foetida	H	+	

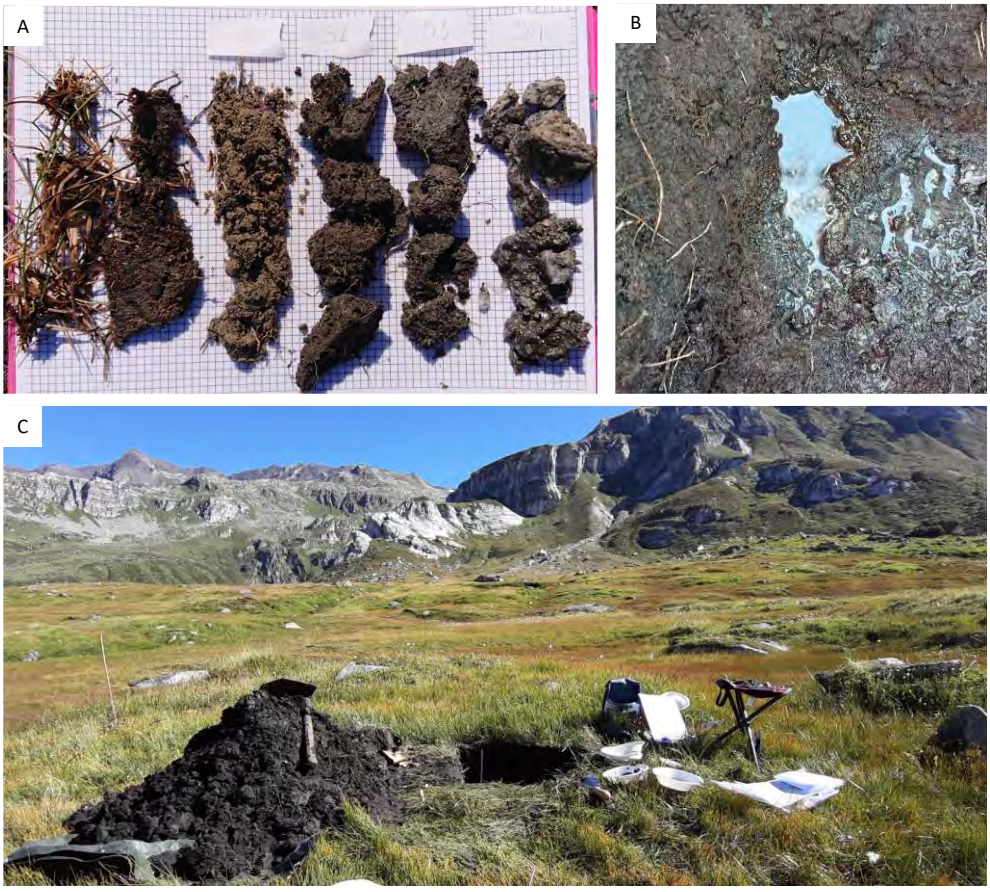


Figure S1. 12. Bi2_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. Water Table S at 50 cm with a strong smell of sulfur B. Views from the soil profile looking North C. © SESA

Bi3

Soil type :	***Référentiel Pédologique (RP),*** Réductisol Typique multiépihistique, colluvial, sur sables cristallins ***Classification française des sols (CPCS),*** Colluviosol histique à tourbe fibrique acide **World Reference Base for Soil Ressources 2022 (WRB),** Epihistic Reductic Gleysol
Observer-s : **Date of archiving:**	FF 01.01.1989

Locality	Blatt, Binntal	**Altitude [m]:**	2205
Municipality & canton :	Binntal, VS	**Humus form :**	Tourbe calcique
Coordinates (CH1903) :	664590 136982	**LSS JMG publi n°**	191
Habitat type :	alpine swamp, natural reserve		
Geological substrate :	Dolomite, schist		
Vegetation type :	Caricetum fuscae trichophoretosum		
Title :	Végétation du Haut Val de Binn		
Authors :	Freléchoux F.		
Publication :	Travail de certificat UNINE, 1990, Sol no 3		

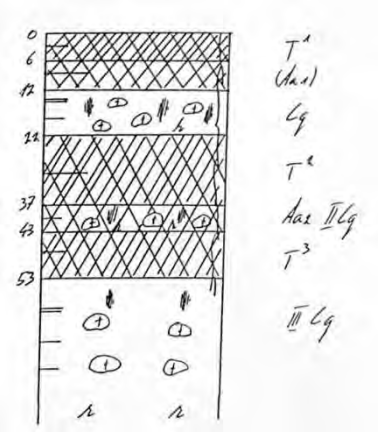


Figure S1. 13. Bi3 François Freléchoux soil profile description taken in 1989.

Soil profile description
T1 : 0 to 6 cm depth, surface peat horizon
Aa1: 6 to 12 cm depth, faint anmoor
Cg: 12 to 22 cm depth, gleyed sandy materials
T2: 22 to 37 cm depth, second peat horizon
Aa2IICg: 37 to 43 cm depth, anmoor and gleyed sands
T3: 43 to 53 cm depth, third peat horizon
IIICg: 53 to X cm depth, sands with traces of gleying

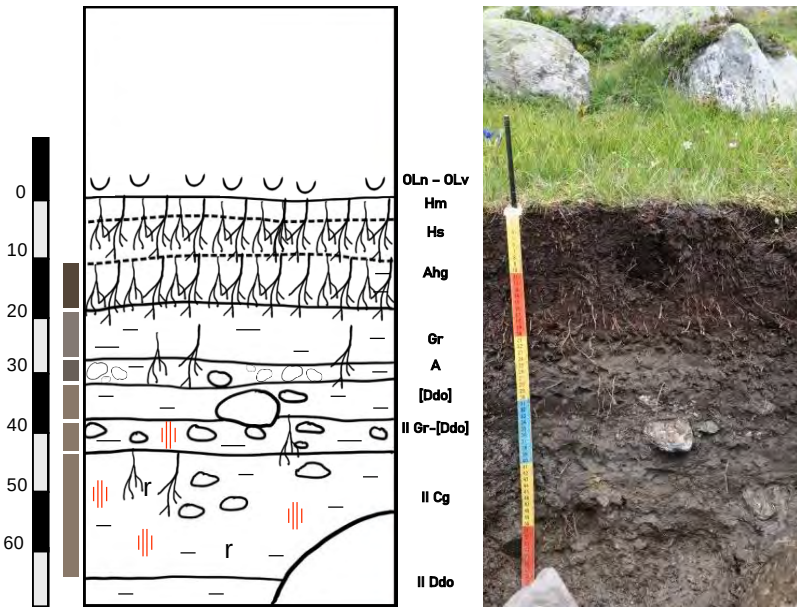
Table S1. 14. Bi3 physico-chemical analysis done on at the University of Neuchâtel on soil samples. . The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
T1	0-6	10YR 3/2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aa1	6-12	10YR 5/2	4,61	38,26	26,81	28,70	1,61	4,37	30,73	14,30	0,97	14,73	4,28	3,75	0,17	8,78	34,04
Cg	12-22	10YR 5/2	1,12	7,20	7,99	30,75	52,95	0,55	3,08	1,13	0,10	11,82	4,48	3,76	0,02	2,57	28,37
T2	22-37	10YR 3/2	3,47	25,26	18,01	31,46	21,81	5,09	46,13	19,09	1,27	15,00	4,57	3,73	0,20	-	-
Aa2IICg	37-43	10YR 5/2	0,77	5,29	6,49	26,30	61,16	0,46	4,15	2,39	0,14	16,71	4,71	4,01	0,20	-	-
T3	43-53	10YR 3/2	2,26	16,84	14,09	40,38	26,42	1,93	12,59	12,84	0,68	19,00	4,55	3,86	0,14	-	-

Bi32020

Soil type :	***Référentiel Pédologique (RP),*** Réductisol Typique multiépihistique, désaturé, polylithique, issu de sables dolomitiques, colluvial, à Epihisto Amphimoor **Classification française des sols (CPCS),** Gley oxydé à tourbe ***World Reference Base (WRB),*** Epihisto Amphimoor on Histic Reductic Dolomitic Gleysol (Arenic, Colluvic)
Observer-s :	SESA & RT
Date :	11.08.2020

Locality	Blatt, Binntal	**Altitude [m]:**	2101
Municipality & canton :	Binntal, VS	**Slope (°) :**	3°
Coordinates (CH1903) :	664586 136996	**Exposition :**	West
Habitat type :	alpine swamp, natural reserve	**Humus form :**	Epihisto Amphimoor
Geological substrate :	Dolomite, schist		
Vegetation type :	Caricion		
Remarks :	When looking up, the Mittelberghütte (visible flag), open profile some meters below a recent footpath. Profile between two stream arms at the upper edge of the marsh, presence of cow dung.		



Soil profile description

OLn–OLv : +2 to 0 cm depth, Transition very clear / Leaves of the year still attached on the plants

Hm : 0 to 2/5 cm depth, Transition distinct 2-4cm /

Hs : 2/5 to 11 cm depth, Transition distinct 2-4cm /

Ahg : 11 to 19 cm depth, Transition distinct 2-4cm / General color ochre brown / Munsell Color 2,5Y 3/2 / Skeleton 1 Plant / General structure massive / Texture sandy / Porosity porous 15-40% / pH Hellige 4.5 / HCl M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 5++ / Root size fine 0-2mm & mid-size 2-5mm/ Compactness compact / Adhesiveness very sticky / Notes: grain of sand

Gr : 19 to 28 cm depth, Transition clear <2cm / General color grey / Munsell Color 2,5Y 5/1 / Skeleton 1 Mineral 2 Plant / General structure massive / Texture sandy-loamy / Porosity slightly porous 2-5% / pH Hellige 4.5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 2 / Root size fine 0-2mm & big >5mm / Compactness compact / Adhesiveness not very sticky / Notes: -

A : 28 to 31 cm depth, Transition clear <2cm / General color dark grey / Munsell Color 2,5Y 4/1 / Skeleton 1 Mineral 2 Plant / General structure massive / Texture loamy-sandy / Porosity slightly porous 2-5% / pH Hellige 4.5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 5 / Root size fine 0-2mm & mid-size 2-5mm / Compactness compact / Adhesiveness sticky / Notes: -

[Ddo] : 31 to 38 cm depth, Transition clear <2cm / General color grey / Munsell Color 2,5Y 5/2 / Skeleton 1 Mineral / General structure particular / Texture sandy / Porosity porous 15-40% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 3 / Root size fine 0-2mm / Compactness soft / Adhesiveness non-sticky / Notes: humid

II Gr-[Ddo] : 38 to 43 cm depth, Transition clear <2cm / General color dark grey / Munsell Color 2,5Y 5/2 / Skeleton 1 Mineral / General structure massive / Texture loamy-sandy / Porosity slightly porous 2-5% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 2 / Root size fine 0-2mm / Compactness compact / Adhesiveness sticky / Notes: smell of sulfur along the profil, oxydized gravels

II Cg : 43 to 65 cm depth, Transition clear <2cm / General color grey / Munsell Color 2,5Y 6/2 / Skeleton 1 Mineral / General structure particular / Texture sandy / Porosity porous 15-40% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 0.5 / Root size fine 0-2mm / Compactness not very compact / Adhesiveness not very sticky / Notes: -

II Ddo : 65+ cm depth

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) Epi(histo)amphi		
Observer-s :	SESA & RT		
Date :	11.08.2020		
Locality	Blatt, Binntal	**Altitude [m]:**	2101
Municipality & canton :	Binntal, VS	**Slope (°) :**	3°
Coordinates (CH1903) :	664586 136996	**Exposition :**	West
Habitat type :	alpine swamp, natural reserve		
Geological substrate :	Dolomite, schist		
Vegetation type :	Caricion		
Remarks :	When looking up, the Mittelberghütte (visible flag), open profile some meters below a recent footpath. Profile between two stream arms at the upper edge of the marsh, presence of cow dung.		

Humus form description
OLn–OLv : +2 to 0 cm depth, Transition very clear / Leaves of the year still attached on the plants / Litter transformation absent / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition very clear / Notes: none
HM : 0 to 2/5 cm depth, Transition distinct 2-4cm / Notes: none
HS : 2/5 to 11 cm depth, Transition distinct 2-4cm / Notes: none
A : 11 to 19 cm depth, OM content humiferous / HCl 6M (1 to 4 reaction) 0 / Texture loamy-sandy / Structure massive / Aggregate stability unsTable S / Root abundance (0 to 5) 5 / Transition gradual 4-8cm / Limit (>A horizon) irregular / Note: -

Table S1. 15. Bi3_2020 physico-chemical analysis done on at the University of Neuchâtel on soil samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Ahg	11-19	2,5Y 3/2	2,58	17,23	16,46	42,88	20,69	3,92	28,68	16,80	0,96	17,50	5,13	4,36	0,45	14,92	12,41
Gr	19-28	2,5Y 5/1	2,66	19,24	15,99	40,57	21,54	1,71	7,45	3,86	0,31	12,57	4,94	4,08	0,14	3,72	11,40
A	28-31	2,5Y 4/1	2,81	20,81	17,84	35,52	23,02	2,67	12,39	6,35	0,48	13,18	4,91	4,13	0,02	-	-
[Ddo]	31-38	2,5Y 5/2	1,03	7,15	8,43	31,75	50,60	0,69	2,51	1,17	0,10	11,54	4,94	4,09	0,00	-	-
II Gr-[Ddo]	38-43	2,5Y 5/2	2,35	17,37	17,07	41,33	21,23	0,98	3,59	1,81	0,12	15,11	4,82	3,99	0,00	-	-
II Cg	43-65	2,5Y 6/2	0,77	4,91	6,23	25,80	64,01	0,29	1,04	0,46	0,04	12,22	4,94	4,18	0,00	-	-

Vegetation survey

Table S1. 16. Bi3_2020 vegetation survey, Binntal (VS). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The alliance was not determined for this environment. The vegetation that had been determined during the first survey (1989) corresponded to Caricetum davallianae.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**-**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**-**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**-**	1 à 5 %	1
Grass cover [%]	**85**	5 à 25 %	2
Moss and lichen cover [%]	**14**	5-15 %	2a
Litter cover [%]	**-**	15-25 %	2b
Rock and stone cover [%]	**1**	25 à 50 %	3
Bare ground cover [%]	**-**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Equisetum palustre	H	-	

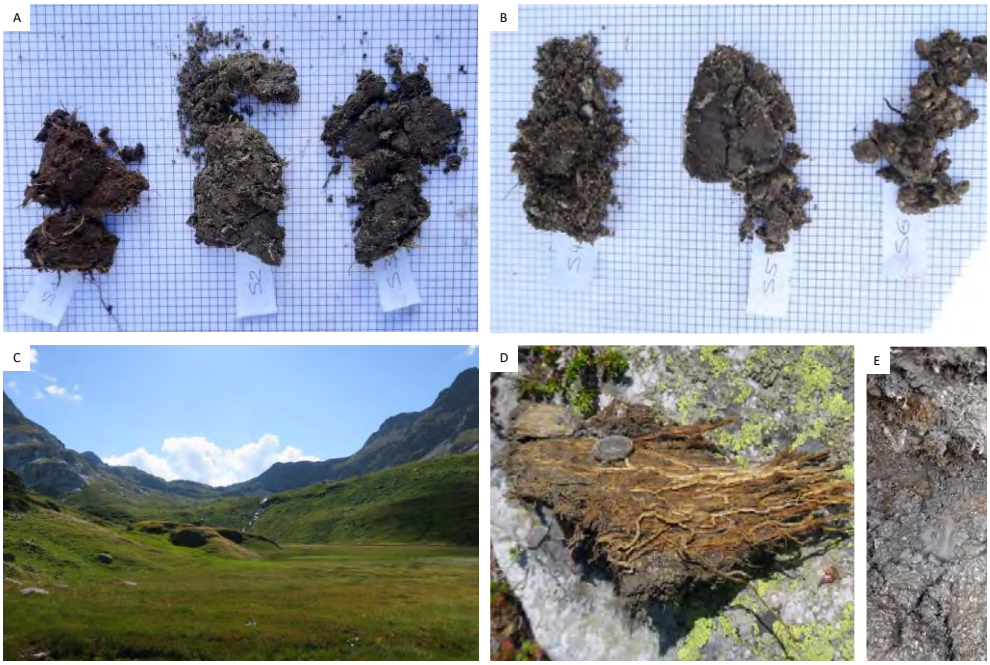


Figure S1. 14. Bi3_2020 pictures taken in 2020 around the soil profile. Horizon sequence A-B. View from the soil profile looking South-West C. Really dense roots aggregated to the rocks D. In brown the numerous fine roots among the mineral fraction E. © RT

Bi4

Soil type :	***Référentiel Pédologique (RP)***, Alocrisol Typique issu de loess et de sables de gneiss **Classification française des sols (CPCS),** Sol brun ocreux **World Reference Base for Soil Ressources 2022 (WRB),** Cambic Umbrisol

Observer-s : FF

Date of archiving: 01.01.1989

Locality	Oxefeld, Binntal	**Altitude [m]:**	2284
Municipality & canton :	Binntal, Valais	**Humus form :**	Mull
Coordinates (CH1903) :	665673 136147	**LSS JMG publi n°**	191
Habitat type :	Alpine grassland, natural reserve		
Geological substrate :	Loess and gneiss colluvions		
Vegetation type :	Caricetum curvulae		
Publication title :	Végétation du Haut Val de Binn		
Authors :	Freléchoux F.		
Publication :	Diploma thesis, University of Neuchâtel, 1990, Sol no 11		

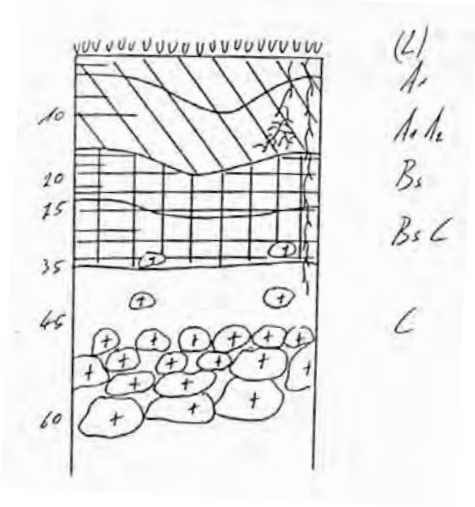


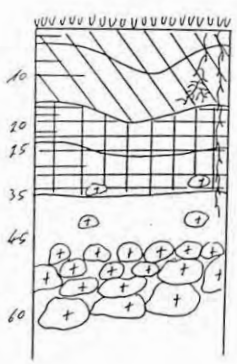
Figure S1. 15. Bi4 François Freléchoux soil profile description taken in 1989.

Soil profile description
(L) : NA to 0 cm depth, low litter bedding thickness
A1 : 0 to 10 cm depth, dark brown organo-mineral horizon.
A1A2 : 10 to 20 cm depth, eluvial part of the organo-mineral horizon.
Bs : 20 to 25 cm depth, red-brown horizon of oxidized iron accumulation.
BsC : 25 to 35 cm depth, ditto with siliceous sands.
C : 35 to 60 cm depth, siliceous sands.

Annexe 45 :

Sol No 11

Type de sol :	sol brun ocreux
No du relevé de végétation :	238
Type de végétation	Caricetum curvulae
Lieu :	sud de la cabane CAS
Altitude :	2285 m
Pente :	20 %
Exposition :	ouest
Roche-mère :	gneiss
pH (Hellige) :	4



Horizons :

(L) :	faible épaisseur de litière
A_1 :	horizon organo-minéral brun foncé
A_1A_2 :	partie éluviale de l'horizon organo - minéral
B_s :	horizon brun rouge d'accumulation de fer oxydé
B_sC :	idem avec sables siliceux
C :	sables siliceux

Figure S1. 16. Bi4 numerical version of Freléchoux's diploma thesis entitled: " Végétation du Haut Val de Binn , 1990"

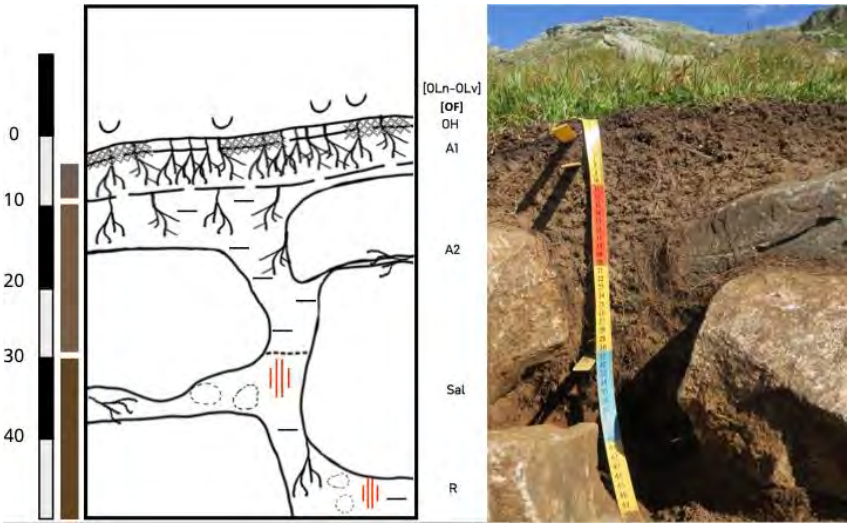
Table S1. 17. Bi4 physico-chemical analysis done on at the University of Neuchâtel on soil samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	0-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A1A2	10-20	10YR 5/3	3,42	18,55	17,29	44,79	15,94	2,16	13,08	4,95	0,39	12,83	3,61	3,21	0,18	1,25	30,82
Bs	20-25	10YR 6/4	2,41	12,09	13,25	45,52	26,73	1,60	5,65	2,42	0,19	12,85	4,1	3,77	0,07	0,51	12,45
BsC	25-35	10YR 6/4	1,42	7,53	9,60	41,24	38,33	1,04	3,17	1,36	0,11	12,53	4,33	3,9	0,05	-	-

Bi4_2020

Soil type :	***Référentiel Pédologique (RP),*** Alocrisol Humique, issu de loess et de sables de gneiss, à colluvions gneissiques, à Hémimoder mésostructuré **Classification française des sols (CPCS),** Sol brun acide ***World Reference Base (WRB),*** Hemimoder on Cambic Umbrisol
Observer-s :	SESA& RT
Date :	13.08.2020

Locality	Oxefeld, Binntal	**Altitude [m]:**	2286,5
Municipality & canton :	Binntal, VS	**Slope (°) :**	12°
Coordinates (CH1903) :	665681 136160	**Exposition :**	West
Habitat type :	alpine grassland, natural reserve	**Humus form :**	Hemimoder
Geological substrate :	loess and gneiss colluvions		
Vegetation type :	Caricion curvulae		
Remarks :	200m south of the hut, 12m below the footpath. Important presence of marmots.		



Soil profile description

[OLn-OLv] : +2 to 0 cm depth, Transition very clear / leaves of the year still attached on plants

[OF] : 0 to 0.5 cm depth, Transition clear <2cm / fragmented leaves

OH : 0.5 to 3 cm depth, Transition clear <2cm / dense fin roots

A1 : 3 to 7 cm depth, Transition clear <2cm / General color dark brown / Munsell Color 10YR 4/2 / Skeleton 1 Plant 2 Mineral / General structure granulated & lumpy / Texture loamy-sandy / Porosity slightly porous 2-5% / pH Hellige 4 / HCl M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0

to 5) 5 / Root size fine 0-2mm & mid-size 2-5mm/ Compactness not very compact / Adhesiveness not very sticky / Notes: lot of roots of trifolium alpinum

A2 : 7 to 30 cm depth, Transition gradual 4-8cm / General color grey brown / Munsell Color 10YR 4/3 / Skeleton 1 Mineral 2 Plant / General structure lumpy & sub-polyhedral / Texture loamy-sandy / Porosity slightly porous 2-5% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 3 / Root size fine 0-2mm / Compactness not very compact / Adhesiveness non-sticky / Notes: many quartz flakes along the profil, dense roots in a net around the rocks, very dry soil

Sal : 30+ cm depth, Transition gradual 4-8cm / General color ochre brown / Munsell Color 10YR 3/4 / Skeleton 1 Mineral 2 Plant / General structure microagreggated & fluffy / Texture loamy / Porosity Very porous >40% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 3 / Stains rust stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm / Compactness not very compact / Adhesiveness non-sticky / Notes: isolated spots of oxidation and concentrated around the altered rocks. Gneissic sands

R : 46 cm depth, gneiss colluvions

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al.,2018) mesostructured Hemimoder
Observer-s :	SESA & RT
Date :	13.08.2020

Locality	Oxefeld, Binntal	**Altitude [m]:**	2286,5
Municipality & canton :	Binntal, VS	**Slope (°) :**	12°
Coordinates (CH1903) :	665681 136160	**Exposition :**	West
Habitat type :	alpine grassland, natural reserve		
Geological substrate :	loess and gneiss colluvions		
Vegetation type :	Caricion curvulae		
Remarks :	200m south of the hut, 12m below the footpath. Important presence of marmots.		

Humus form description

[OLn-OLv] : +2 to 0 cm depth / Leaves of the year still attached on plants / Litter transformation absent / Litter fragmentation absent / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition clear <2cm / Notes: none

[OFzo] : 0 to 0.5 cm depth / Litter transformation absent / Litter fragmentation fragmented leaves / Cohesion absent / OM content plant material / Percentage of fine OM 30-70 % / Presence of mycelium absent / Presence roots present / Transition clear <2cm / Notes: none

OH : 0.5 to 7 cm depth / Cohesion coherent / OM content mixed material / Percentage of fine OM >90 % / Presence of mycelium absent / Presence roots abondant / Transition clear <2cm / Notes: dense fin roots

Ame : 7 to 10 cm depth, OM content humiferous / HCl 6M (1 to 4 reaction) 0 / Texture loamy-sandy / Coarse elements yes, gravel 0.2-2cm / Structure lumpy / Aggregates size 2-5mm / Level of aggregation moderately aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 5 / Transition clear <2cm / Limit (>A horizon) regular / Note: mesostructured

Table S1. 18. Bi4_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	3-7	10YR 4/2	2,85	15,49	16,98	49,00	15,67	2,11	10,26	4,44	0,31	14,16	3,90	3,55	0,08	1,14	38,19
A2	7-30	10YR 4/3	4,45	20,67	18,97	40,47	15,44	2,26	9,46	3,89	0,30	12,85	3,96	3,73	0,10	2,28	7,18
Sal	30+	10YR 3/4	1,77	12,62	13,25	40,63	31,73	4,00	11,46	4,67	0,28	16,88	4,29	4,06	0,14	-	-

Vegetation survey

Table S1. 19. Bi4_2020 vegetation survey, Binntal (VS). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Caricion curvulae alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1989) corresponded to a Caricetum curvulae.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**-**	Species ab.-dom. codes (Ad):	
Height of trees [m]	**-**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**-**	1 à 5 %	1
Grass cover [%]	**78**	5 à 25 %	2
Moss and lichen cover [%]	**7**	5-15 %	2a
Litter cover [%]	**1**	15-25 %	2b
Rock and stone cover [%]	**14**	25 à 50 %	3
Bare ground cover [%]	**-**	50 à 75 %	4
		>75 %	5
Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]			

Vegetation survey	**S**	**Ad**	Comment
Trifolium alpinum	H	2a	
Phyteuma hemisphaericum	H	+	
Polygonum viviparum	H	1	
Pulsatilla alpina	H	1	
Campanula scheuchzeri	H	1	
Poa bulbosa	H	1	
Ligusticum mutellina	H	2a	
Sempervivum montanum	H	1	
Geum montanum	H	2a	
Gentiana verna	H	1	
Carex curvula	H	2a	
Euphrasia hirtella	H	+	
Euphrasia rostkoviana	H	+	
Plantago alpina	H	2a	
Hiercicium piliferum	H	1	
Potentilla aurea	H	2a	
Phleum sp	H	1	
Nardu stricta	H	2a	
Geranium rotutonfolium	H	+	

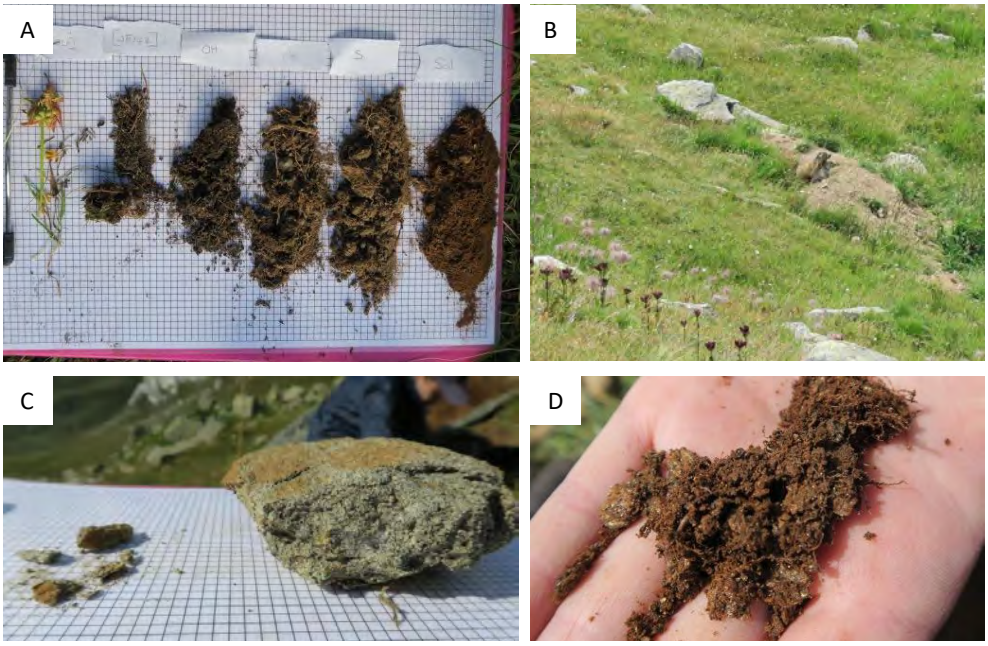


Figure S1. 17. Bi4_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. Colluvial environment with marmots B. Altered gneiss stone C. "fluffy" structure of horizon Sal D. © SESA

Boi

Soil type :	***Référentiel Pédologique (RP),*** Podzosol Meuble bathyluvique **Classification française des sols (CPCS),** Sol podzolique à gley **World Reference Base for Soil Ressources 2022 (WRB),** Podzol
Observer-s :	JMG /RJF /GV
Date of archiving:	16.07.1985

Locality	Bois-Raiguel, reserve of the bourgeoisie of Bienne	**Altitude [m]:**	1256
Municipality & canton :	Cortébert, Bern	**Humus form :**	Mor
Coordinates (CH1903) :	575975, 222550	**LSS JMG publi n°**	90, 91, 122
Habitat type :	Beech forest		
Geological substrate :	Wildegg Formation; Effingen Member: calcareous marl		
Vegetation type :	Sphagno-Piceetum blechnetosum		
Title :	- Les dessous du Sphagno-Piceetum blechnetosum dans le Jura (90) - Rapport d'excursion Chasseral (91) - Carnets de terrain (122)		
Authors :	Vadi, G. (90), Gobat, J.-M. (122)		
Publication :	Diploma thesis UniNe (90), Field notebook, 39, 334		

Soil profile description

L : +2 to 0 cm depth, Twigs

F : 0 to 2 cm depth, Loose, dry, light brown

H: 2 to 5 cm depth, Black, fine "lumps", fairly packed. Roots of all sizes 3/5. Diffuse limit

A1: 5 to 10 cm depth, Black lumps not very sTable S. Clear boundary. Silty-clay texture. Roots 1/5.

A2: 10 to 13/17 cm depth, Ash-grey band, wavy below. Clear boundary. Silty texture. Packed structure breaking up into angular "aggregates", roots 0.5/5, medium.
(Bh): 13/17 to 13/19 cm depth (lenses)
Bs1: 13/19 to 50 cm depth – no other information
Bs2: 50 to 80 cm depth – no other information
C: 80 to X cm depth – no other information
R: 42 to 60 cm depth – no other information

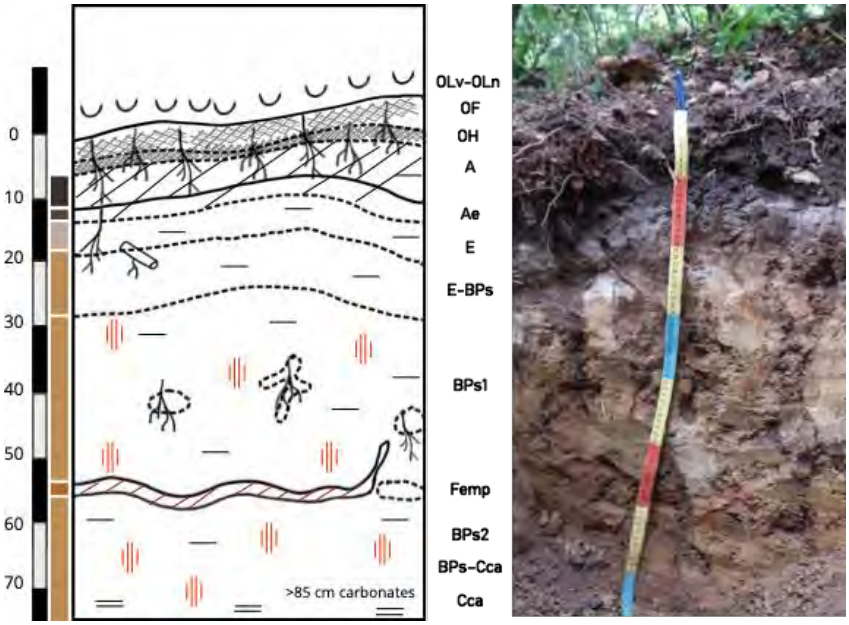
Table S1. 20. Boi physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
L	2-0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F	0-2	-	-	-	-	-	-	-	-	-	-	-	3,68	3,11	-	-	-
H	2-5	-	7,65	35,11	24,67	19,49	13,08	4,42	36,60	17,68	0,98	18,05	3,19	2,68	0,13	12,13	26,45
A1	5-10	10YR 3/1	8,26	37,93	29,91	19,82	4,08	3,29	25,89	12,93	0,86	14,97	3,23	2,63	0,11	13,69	42,82
A2	10-17	7,5YR 7/2	8,74	40,07	31,99	19,08	0,12	0,83	2,61	1,01	0,06	16,87	3,55	3,03	0,00	-	-
(Bh)	13-19	7,5YR 5/2	10,26	42,62	29,87	15,92	1,33	1,84	10,33	5,53	0,30	18,26	3,64	2,98	NA++	-	-
Bs1	17-50	10YR 6/6	11,93	42,53	30,42	15,07	0,06	1,53	3,09	0,90	0,07	13,84	3,89	3,53	0,00	-	-
Bs2	50-80	10YR 6/8	12,27	39,91	31,45	16,32	0,04	1,88	3,45		0,06	0,00	5,32	3,85	0,11	-	-
C	80-100	10YR 7/4	12,66	42,65	26,77	14,04	3,87	2,19	4,06	0,60	0,05	11,61	7,54	6,8	0,42	-	-
R	100-120	10YR 3/4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Boi_2020

Soil type :	***Référentiel Pédologique (RP),*** Podzosol placique bathycarbonaté, à Dysmoder **Classification française des sols (CPCS),** Sol podzolique à gley **World Reference Base (WRB),** Dysmoder on Podzol
Observer-s :	MN & RT
Date :	24.09.2020

Locality	Bois-Raiguel, reserve of the bourgeoisie of Bienne	**Altitude [m]:**	1256
Municipality & canton :	Cortébert, BE	**Slope (°) :**	2°
Coordinates (CH1903) :	575974 222550	**Exposition :**	South-Est
Habitat type :	Spruce forest	**Humus form :**	Eumoder
Geological substrate :	Wildegg Formation; Effingen Member: calcareous marl		
Vegetation type :	Sphagno-Piceetum		
Remarks :	Site is located 5m from the road to the north, large spruce roots making digging difficult.		



Soil profile description

OLv – OLn : +5 to 0 cm depth, Transition very clear / Mainly *picea abies* needles, *fagus sylvatica* and *sorbus aucuparia* leaves of past year, bleached leaves

OF : 0 to 3 cm depth, Transition gradual 4-8cm /

OH : 3 to 7 cm depth, Transition gradual 4-8cm /

A : 7 to 10 cm depth, Transition clear <2cm / General color black / Munsell Color 10YR 2/1 / Skeleton 1 Plant 2 Animal / General structure constructed / Structure granular / Texture loamy / Porosity porous 15-40% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 5 / Root size fine 0-2mm, mid-size 2-5mm & big >5mm / Compactness soft / Adhesiveness non-sticky / Notes: very light matirial, high density of roots of all sizes (between 2 and 20 cm of diameter) in the first 12 cm of the profile

Ae : 10 to 13 cm depth, Transition very clear / General color grey / Munsell Color 10YR 3/1 / Skeleton 1 Plant 2 Mineral / General structure constructed / Structure sub-polyhedral / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 4 / Root size fine 0-2mm, mid-size 2-5mm & big >5mm / Compactness not very compact / Adhesiveness non-sticky / Notes: aggregates 10 to >20mm.

E : 13 to 20 cm depth, Transition distinct 2-4cm / General color white / Munsell Color 10YR 7/2 / Skeleton 1 Mineral / General structure massive / Texture loamy / Porosity non porous <2% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains none / Root abundance (0 to 5) 0 / Compactness very compact / Adhesiveness non-sticky / Notes: none

E-BPs : 20 to 29 cm depth, Transition distinct 2-4cm / General color white-beige / Munsell Color 10YR 6/6 / Skeleton 1 Mineral 2 Plant / General structure massive / Texture loamy / Porosity non porous <2% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm / Compactness very compact / Adhesiveness non-sticky / Notes: large blocks

BPs1 : 29 to 54 cm depth, Transition very clear / General color beige / Munsell Color 10YR 6/6 / Skeleton 1 Mineral / General structure massive / Texture loamy / Porosity non porous <2% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm / Compactness compact / Adhesiveness not very sticky / Notes: The roots bring in deep MO. Their galleries are dark in color.

Femp : 54 to 56 cm depth, Transition very clear / General color ochre / Munsell Color 7,5YR 5/8 / Skeleton 1 Mineral / General structure particular / Texture loamy / Porosity non porous <2% / pH Hellige 4.5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 0 / Compactness very compact / Adhesiveness non-sticky / Notes: very dense

BPs2 : 56 to 85 cm depth, Transition distinct 2-4cm / General color beige-ochre / Munsell Color 10YR 6/6 / Skeleton 1 Mineral 2 Plant / General structure massive / Texture loamy / Porosity non porous <2% / pH Hellige 4.5 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm / Compactness compact / Adhesiveness not very sticky / Notes: large blocks

BPs–Cca : 85 to 96 cm depth, Transition diffuse >8cm / General color beige-grey / Munsell Color 10YR 6/4 / Skeleton 1 Mineral / General structure massive / Texture loamy / Porosity non porous <2% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 2 / Stains no stains / Root abundance (0 to 5) 0 / C ompactness compact / Adhesiveness not very sticky / Notes: large blocks

Cca : 96+ cm depth, General color grey / Skeleton 1 Mineral / General structure massive / Texture loamy / Porosity non porous <2% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 3 / Stains no stains / Root abundance (0 to 5) 0 / Compactness compact / Adhesiveness not very sticky / Notes: none

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) microstructured Dysmoder		
Observer -s :	MN & RT		
Date :	24.09.2020		
Locality	Bois-Raiguel, reserve of the bourgeoisie of Bienne	**Altitude [m]:**	1256
Municipality & canton :	Cortébert, BE	**Slope (°) :**	2°
Coordinates (CH1903) :	575974 222550	**Exposition :**	South-Est
Habitat type :	Spruce forest		
Geological substrate :	Wildegg Formation; Effingen Member: calcareous marl		
Vegetation type :	Sphagno-Piceetum		
Remarks :	Site is located 5m from the road to the north, large spruce roots making digging difficult.		

Humus form description
OLv-OLn : +5 to 0 cm depth, Litter composed of *picea abies* needles, *fagus sylvatica* and *sorbus aucuparia* leaves of past year / Litter transformation bleached leaves / Cohesion coherent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium abondant / Presence roots absent / Transition clear <2cm / Notes: none
OF : 0 to 3 cm depth, fragmented leaves of past year / Litter transformation bleached leaves & squeletized leaves / Cohesion coherent / OM content mixed material / Percentage of fine OM 0 % / Presence of mycelium abondant / Presence roots absent / Transition distinct 2-4cm / Notes: none

OH : 3 to 7 cm depth, Cohesion coherent / OM content mixed material / Percentage of fine OM 70-90 % / Presence of mycelium abondant / Presence roots present / Transition distinct 2-4cm / Notes: none

Ami: 7 to 10 cm depth, OM content very humiferous / HCl 6M (1 to 4 reaction) 0 / Texture loamy / Coarse elements no / Structure granular / Aggregates size 1-2mm / Level of aggregation poorly aggregated / Aggregate stability unsTable S / Root abundance (0 to 5) 5 / Transition very clear / Limit (>A horizon) regular / Note: microstructured

Table S1. 21. Boi_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A	7-10	10YR 2/1	8,28	40,41	30,05	18,44	2,82	4,94	37,81	19,22	1,10	17,43	3,59	2,82	0,00	23,04	51,92
Ae	10-13	10YR 3/1	8,66	38,67	29,10	17,19	6,10	2,80	20,40	10,10	0,60	16,92	3,65	2,76	0,00	10,49	5,26
E	13-20	10YR 7/2	9,16	41,64	33,14	16,02	0,05	1,24	3,41	1,77	0,08	22,11	3,59	2,9	0,00	-	-
E-BPs	20-29	10YR 6/6	14,68	42,55	25,96	16,71	0,10	2,10	3,70	0,94	0,07	13,77	3,89	3,23	0,00	-	-
BPs1	29-54	10YR 6/6	11,26	43,61	29,99	15,07	0,07	2,33	4,07	1,27	0,07	17,81	3,97	3,61	0,00	-	-
Femp	54-56	7,5YR 5/8	13,55	40,54	26,71	16,39	2,81	3,46	6,72	1,90	0,10	19,05	4,15	3,68	0,00	-	-
BPs2	56-85	10YR 6/6	12,16	42,82	30,35	14,57	0,09	2,37	3,31	0,58	0,05	12,26	4,05	3,62	0,00	-	-
BPs-Cca	85-96	10YR 6/4	16,94	48,80	21,53	13,12	0,66	2,24	2,79	0,44	0,03	12,76	7,11	6,56	11,86	-	-

Vegetation survey

Table S1. 22. Boi_2020 vegetation survey, Cortébert (BE). Stratum codes used: H = herbaceous, A = shrubby, B = tree-like. The Sphagno-Piceetum alliance was determined for this environment, according to the Guide des milieux naturels de Suisse: écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1985) corresponded to a Sphagno-Piceetum blechnetosum

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**5**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**40**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**40**	1 à 5 %	1
Grass cover [%]	**20**	5 à 25 %	2
Moss and lichen cover [%]	**4**	5-15 %	2a
Litter cover[%]	**26**	15-25 %	2b
Rock and stone cover [%]	**-**	25 à 50 %	3
Bare ground cover [%]	**-**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [S], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Picea abies	A	4	
Fagus sylvatica	A	2b	
Acer pseudoplatanus	A	r	
Sorbus aucuparia	B	4	
Fagus sylvatica	B	1	
Abies alba	B	+	
Vaccinium myrtillus	H	3	
Dryopteris filix-mas	H	2a	
Oxalis acetosella	H	2a	
Lycopodium annotinum L.	H	1	
Sorbus aucuparia	H	1	
Abies alba	H	1	
Acer pseudoplatanus	H	r	
Juncus conglomeratus (cf.)	H	r	
Salix cinerea (cf.)	H	r	
Epilobium angustifolium	H	r	

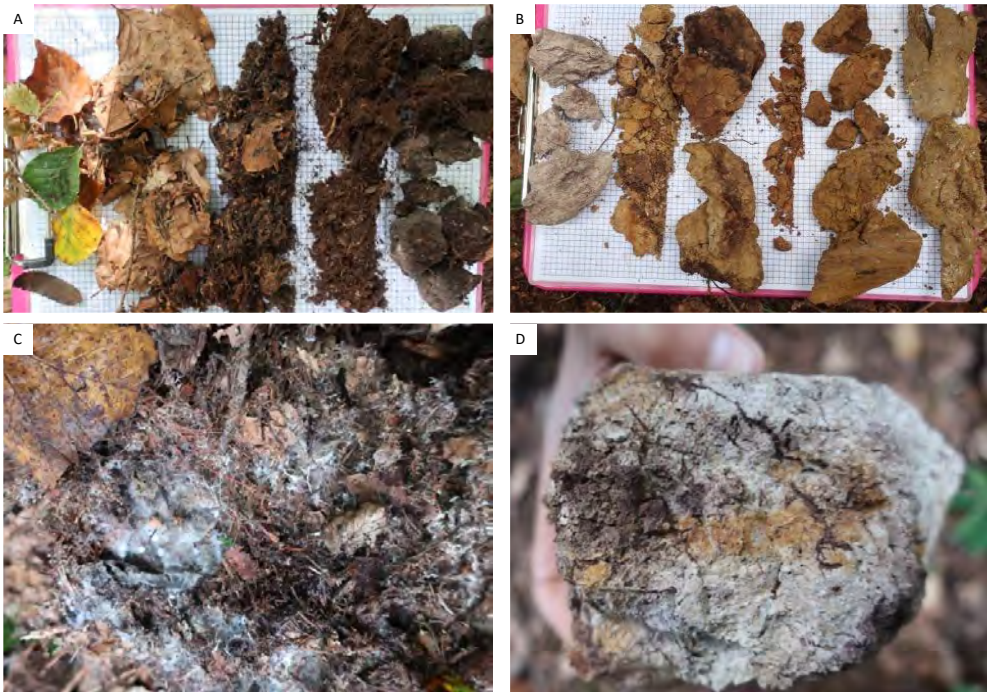


Figure S1. 18. Boi_2020, pictures taken in 2020 around the soil profile. Topsoil horizon's sequence A. Subsoil horizon's sequence B. White visible mycelium and spider web in the OF and OH horizons C. Block of very compact soil of the eluviated horizon with stains of oxidation and dead roots. D. © RT

Ch1

Soil type :	***Référentiel Pédologique (RP),*** Réductisol Typique humifère, multiphasé **Classification française des sols (CPCS),** Gley oxydé humifère polycyclique **World Reference Base for Soil Ressources 2022 (WRB),** Reductic Gleysol (Humic)
Observer-s :	JMG/ MB
Date of archiving:	15.02.1983

Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	430
Municipality & canton :	Châbles-Cheyres, Fribourg	**Humus form :**	Hydromull
Coordinates (CH1903) :	551945, 186938	**LSS JMG publi n°**	103
Habitat type :	Lakeshore forest		
Geological substrate :	Lake deposits (clays and sands at Unios)		
Vegetation type :	Alnion glutinosae		
Title :	Liste des stations d'étude Grande Cariçaie		
Authors :	Gobat, J.-M., Bueche, M., Buttler, A., Cornali, P.		
Publication :	University of Neuchâtel, 1982		

*** NO PHOTO PROVIDED ***

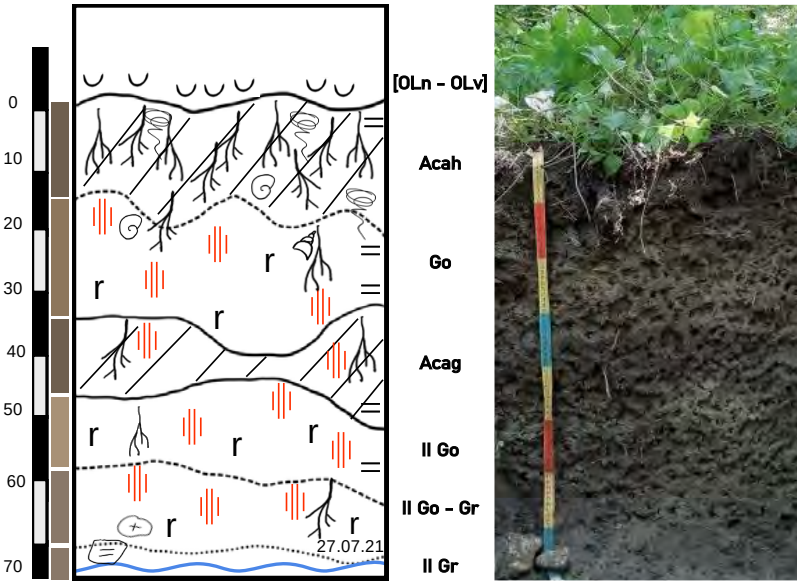
Soil profile description
Ah : 0 to 10 cm depth – no other information
AhGo: 10 to 20 cm depth – no other information
GoC: 20 to 35 cm depth – no other information
Ahb: 35 to 65 cm depth – no other information
GrIIC: 65 to X cm depth – no other information

Table S1. 23. Ch1 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Ah	0-10	2,5Y 4/2	3,71	15,24	10,41	42,21	28,42	1,32	6,88	2,81	0,20	13,80	7,79	6,75	10,16	17,97	37,55
AhGo	10-20	2,5Y 5/2	2,79	10,96	8,10	43,35	34,80	0,89	3,59	1,56	0,15	10,79	7,52	7,04	10,32	11,13	11,25
GoC	20-35	2,5Y 6/3	2,01	8,26	8,79	61,30	19,64	0,64	1,37	0,49	0,07	12,73	7,85	7,5	11,38	6,27	-
Ahb	35-65	2,5Y 4/2	5,31	22,07	10,71	31,67	30,24	1,56	6,75	3,97	0,30	15,93	7,42	6,86	8,98	19,67	-
GrIIC	65-X	2,5Y 6/2	3,49	16,54	9,79	39,07	31,11	0,62	0,97	0,42	0,04	12,84	7,59	7,58	13,12	6,44	-

Soil type :	***Référentiel Pédologique (RP),*** Réductisol typique à horizon A humifère, multiphasé, sur dépôts lacustres (lac de Neuchâtel), à Eumull mésostructuré **Classification française des sols (CPCS),** Gley oxydé polycyclique ***World Reference Base (WRB),*** Eumull on Reductic Gleysol
Observer-s :	NP & RT
Date :	27.7.2020

Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	432
Municipality & canton :	Châbles-Cheyres, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	551945 186936	**Exposition :**	North
Habitat type :	Forest on lake shore environment	**Humus form :**	Eumull
Geological substrate :	Lake deposits (clays and sands at Unios)		
Vegetation type :	Alnion glutinosae		
Remarks :	Enter the forest before the stream on the east side, in July watch out for mosquitoes and giant nettles		



Soil profile description

[OLn-OLv] : +2 to 0 cm depth, Transition very clear/ little litter, alder and ash leaves very quickly degraded

Acah : 0 to 14 cm depth, Transition distinct 2-4cm / General color brunish black / Munsell Color 2,5Y 4/2 / Skeleton mineral 2, plant 1, animal 2 / Structure lumpy & sub-polyhedral / Texture sandy / Porosity porous 15-40% / pH Hellige 6/ HCl 6M (1 to 4 reaction) 2 / Stains rust / Root abundance (0 to 5) 2 / Root size mid-size 2-5mm and fine 0-2 mm / Compactness soft / Adhesiveness not very sticky / Notes: none

Go : 14 to 34 cm depth**,** Transition clear <2cm / General color yellow-grey / Munsell Color 2,5Y 5/3 / Skeleton 1 mineral, plant 3 / Structure polyhedral and sub-polyhedral / Texture sandy / Porosity moderately porous 5-15% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 2 / Stains rust stains / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm and fine 0-2 mm / Compactness compact / Adhesiveness not very sticky / Notes: none

Acag : 34 to 45 cm depth**,** Transition clear <2cm / General color brunish black / Munsell Color 2,5Y 4/2 / Skeleton 1 mineral, plant 3 / Structure polyhedral and sub-polyhedral / Texture sandy-loamy / Porosity slightly porous 2-5% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 2 / Stains rust stains / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm and fine 0-2 mm / Compactness not very compact / Adhesiveness not very sticky / Notes: none

II Go : 45 to 56 cm depth, Transition distinct 2-4cm / General color yellow-grey / Munsell Color 2,5Y 6/3 / Skeleton 1 mineral General structure constructed and particulaire / Structure polyhedral / Texture sandy / Porosity slightly porous 2-5% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 3 / Stains rust stains / Root abundance (0 to 5) 0.5 / Root size fine 0-2 mm / Compactness not very compact / Adhesiveness not very sticky / Notes: none

II Go - Gr : 56 to 70 cm depth, Transition diffuse >8cm / General color grey rusty brown / Munsell Color 2,5Y 5/2 / Skeleton 1 mineral / General structure particular / Texture sandy / Porosity slightly porous 2-5% / pH Hellige 8 / HCl 6M (1 to 4 reaction) 3 / Stains rust stains / Root abundance (0 to 5) 0.5 / Root size fine 0-2 mm / Compactness not very compact / Adhesiveness not very sticky / Notes: dead wood fragments and shells

II Gr : 70+ cm depth, General color grey rusty brown / Munsell Color 2,5Y 5/2 / Skeleton 1 mineral / General structure class of structure / Structure type of structure / Texture sandy / Porosity slightly porous 2-5% / pH Hellige 8 / HCl 6M (1 to 4 reaction) 3 / Stains rust stains / Root abundance (0 to 5) 0.5 / Root size fine 0-2 mm / Compactness compact / Adhesiveness sticky / Notes: rocks and fragments of dead wood, water Table S at a depth of 77 cm

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) mesostructured Eumull		
Observer -s :	NP & RT		
Date :	27.07.2020		
Locality	Nature reserve of the Grande cariçaie	**Altitude [m]:**	432
Municipality & canton :	Châbles-Cheyres, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	551945 186936	**Exposition :**	North
Habitat type :	Forest on lake shore environment		
Geological substrate :	Lake deposits (clays and sands at Unios)		
Vegetation type :	Alnion glutinosae		
Remarks :	Enter the forest before the stream on the east side, in July watch out for mosquitoes and giant nettles		

Humus form description

[OLn-OLv] : +2 to 0 cm depth, litter of the year / Litter transformation absent & skeletized leaves / Litter fragmentation absent & fragmented leaves / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots present / Transition very clear / Notes: none

Ah : 0 to 14 cm depth, OM content humiferous / HCl 6M (1 to 4 reaction) 2 / Texture sandy / Coarse elements none , pebbles 2-20cm / Structure lumpy & sub-polyhedral / Aggregates size 2-5 mm / Level of aggregation moderately aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 2 / Transition very clear / Limit (>A horizon) regular & mesostructured

Table S1. 24. Ch1 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Ahca	0 - 14	2,5Y 4/2	4,22	16,59	9,84	41,89	27,46	1,74	7,25	3,66	0,28	12,95	7,83	7,07	8,20	22,25	57,69
Go	14-34	2,5Y 5/3	2,58	10,89	6,95	34,30	45,27	0,74	1,99	0,86	0,07	12,09	8,27	7,41	10,40	8,85	35,02
Acag	34-45	2,5Y 4/2	3,37	14,60	8,37	37,09	36,56	2,91	3,99	1,86	0,15	12,65	8,24	7,39	9,45	13,64	-
II Go	45-56	2,5Y 6/3	1,44	5,91	4,34	33,28	55,03	0,55	1,02	0,50	0,03	14,65	8,57	7,65	9,75	5,33	-
II Go-Gr	56-70	2,5Y 5/2	3,33	13,67	9,59	42,02	31,24	0,96	2,32	1,17	0,12	10,15	8,41	7,47	11,19	9,87	-
II Gr	70+	2,5Y 5/2	4,64	18,92	11,26	36,62	28,57	1,17	3,04	1,55	0,13	12,36	8,46	7,48	11,29	12,36	-

Vegetation survey

Table S1. 25. Ch1_2020 vegetation survey, Cheyres-Châbles (FR). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Alnion glutinosae alliance was determined for this environment, according to the Guide des milieux naturels de Suisse.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**5**	**Species ab.-dom. codes (Ad) :**	
Height of trees [m]	**35**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**10**	1 à 5 %	1
Grass cover [%]	**75**	5 à 25 %	2
Moss and lichen cover [%]	**5**	5-15 %	2a
Litter cover [%]	**8**	15-25 %	2b
Rock and stone cover [%]	**-**	25 à 50 %	3
Bare ground cover [%]	**2**	50 à 75 %	4
		>75 %	5

Strata Codes (S) : arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Alnus glutinosa	A	5	
Fraxinus excelsior	A	2b	
Euonymus europaeus	B	5	
Urtica dioica	H	3	
Urtica urens	H	3	
Circaea x intermedia	H	2	
Equisetum telmateia	H	r	

Figure S1. 19. Ch1_2020 pictures taken in 2020 around the soil profile. Horizon sequence of the first layers A. Horizon sequence of the soil profile B. Liter nearly absent described as Eumull © RT

Soil type :	**Référentiel Pédologique (RP),** Réductisol Typique **Classification française des sols (CPCS),** Gley réduit **World Reference Base for Soil Ressources 2022 (WRB),** Reductic Gleysol
Observer-s :	AB
Date of archiving:	14.03.1983

Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	430
Municipality & canton :	La Rochette, Cheyres, FR	**Humus form :**	Anmoor
Coordinates (CH1903) :	549785 185150	**LSS JMG publi n°**	47
Habitat type :	Forest on lake shore environment		
Geological substrate :	Lake and beach sediments (current lake level of 432 m)		
Vegetation type :	Cladietum marisci var. à Carex hostiana		
Title :	Etude écosystémique des marais non boisés de la rive sud du lac de Neuchâtel (Suisse)		
Authors :	Buttler, A.		
Publication :	University of Neuchâtel, 1987		

*** NO PHOTO PROVIDED ***

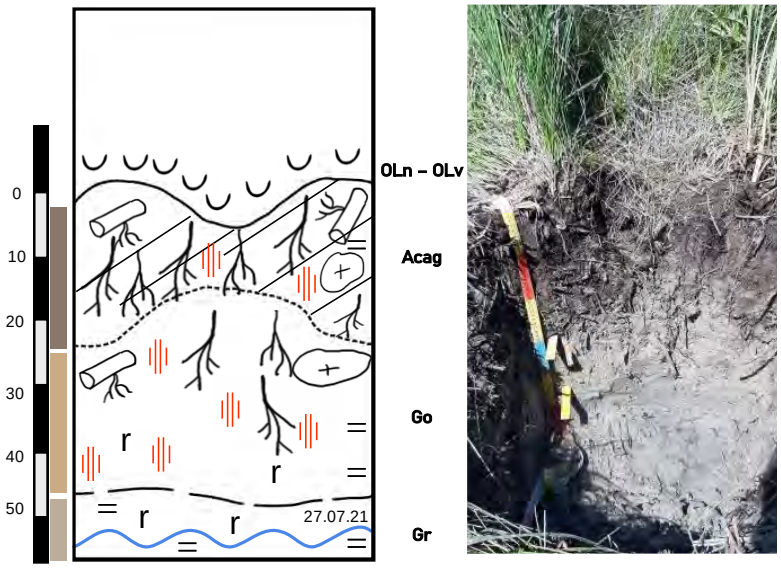
Soil profile description
Aa : 0 to 18 cm depth – no other information
Gr(o): 18 to 43 cm depth – no other information
Gr: 43 to 95 cm depth – no other information

Table S1. 26. Ch2 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits cm	Munsell dry soil	Clays %	Fine silt %	Coarse silt %	Fine sand %	Coarse sand %	RH %	LOI %	Corg %	Ntot %	C/N %	pH H_2O	pH KCl	$CaCO_3$ %	CEC cmol/kg	S/CEC %
Aa	0-18	2,5Y 5/2	15,82	49,82	13,90	13,70	6,76	3,53	25,47	13,39	0,84	15,85	7,17	7,06	56,58	34,91	88,58
Gr, (o)	18-43	2,5Y 7/2	5,50	21,27	12,45	58,85	1,93	0,41	1,39	0,50	0,04	12,63	8,09	7,9	24,29	3,62	15,00
Gr	43-95	2,5Y 7/1	1,32	3,53	1,97	7,22	85,96	0,08	0,38	0,15	0,01	15,96	8,62	8,51	12,54	-	-

Soil type :	**Référentiel Pédologique (RP),** Réductisol typique carbonaté, sur dépôts lacustres (Lac de Neuchâtel), à Hydromésomull **Classification française des sols (CPCS),** Gley oxydé **World Reference Base (WRB),** Hydro mesomull on Calcaric Reductic Gleysol
Observer-s :	RT & VT
Date :	01.08.2020

Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	430
Municipality & canton :	La Rochette, Cheyres, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	549781 185146	**Exposition :**	South
Habitat type :	Forest on lake shore environment	**Humus form :**	Hydro Mésomull
Geological substrate :	Lake and beach sediments (current lake level of 432 m)		
Vegetation type :	Magnocaricion elatae		
Remarks :	It is necessary to pass by a private land to reach the GPS point, we ask the neighbours. Beware, fly/taons with big green eyes (Chrysops relictus) that stings!		



Soil profile description

OLn – OLv : +3 to 0 cm depth, Transition clear <2cm / *Carex sp.* leaves of the year

Acag : 0 to 17-28 cm depth, Transition distinct 2-4cm / General color brown / Munsell Color 2,5Y 5/2 / Skeleton plant 1 / General structure massive / Texture loamy / Porosity porous 15-40% / pH Hellige

6.5 / HCl 6M (1 to 4 reaction) 3 / Stains rust stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm & mid-size 2-5mm / Compactness not very compact / Adhesiveness very sticky / Notes: presence of ants.

Go : 17-28 to 47cm depth**,** Transition clear <2cm / General color shades of beige / Munsell Color 2,5Y 7/5 / Skeleton plant 1 / General structure massive / Texture sandy-loamy / Porosity porous 15-40% / pH Hellige 6 / HCl 6M (1 to 4 reaction) 3 / Stains redox stains / Root abundance (0 to 5) 2 / Root size mid-size 2-5mm , fine 0-2mm / Compactness not very compact / Adhesiveness not very sticky / Notes: presence of pebbles of 20-25 cm.

Gr: 47+ cm depth**,** Transition clear <2cm / General color grey-blue / Munsell Color 5Y 7/2 / Skeleton plant 1 / General structure massive / Texture sandy-loamy / Porosity moderately porous 5-15% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 3 / Stains no stains / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm, and then fine 0-2 mm / Compactness very compact / Adhesiveness very sticky / Notes: water Table S at about 47cm.

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) Hydro Mesomull		
Observer -s :	RT & VT		
Date :	01.08.2020		
Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	430
Municipality & canton :	La Rochette, Cheyres, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	549781 185146	**Exposition :**	South
Habitat type :	Forest on lake shore environment		
Geological substrate :	Lake and beach sediments (current lake level of 432 m)		
Vegetation type :	Magnocaricion elatae		
Remarks :	It is necessary to pass by a private land to reach the GPS point, we ask the neighbours. Beware, fly/taons with big green eyes (*Chrysops relictus*) that stings!		

Humus form description

OLn – OLv : +4 to 0 cm depth, *Carex sp.* litter of the year / Litter transformation absent / Litter fragmentation absent & fragmented / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition very clear / Notes: none

Ag : 0 to 17-28 cm depth, OM content very humiferous / HCl 6M (1 to 4 reaction) 4 / Texture loamy-clay / Coarse elements none , some pebbles 2-20cm at 20 cm / Structure massive / Level of aggregation without aggregate / Aggregate stability without aggregate / Root abundance (0 to 5) 1 / Transition distinct 2-4cm / Limit (>A horizon) wavy

Table S1. 27. Ch2_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Acag	0-28	2,5Y 5/2	11,79	39,93	15,31	25,15	7,81	3,02	12,98	6.17	0.42	14,52	7,78	7,4	39,92	31,50	68,26
Go	28-47	2,5Y 7/5	5,95	27,26	15,60	50,06	1,12	0,65	1,26	0.66	0.04	19,80	8,11	7,85	24,72	5,30	13,48
Gr	47+	5Y 7/2	4,12	15,83	8,69	58,75	12,49	0,45	0,70	0.42	0.03	15,05	8,21	7,87	15,50	-	-

Vegetation survey

Table S1. 28. Ch2_2020 vegetation survey, Cheyres (FR). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Magnocaricion elatae alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1983) corresponded to a Cladietum marisci var. to Carex hostiana.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	-	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	-	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	1	1 à 5 %	1
Grass cover [%]	93	5 à 25 %	2
Moss and lichen cover [%]	5	5-15 %	2a
Litter cover [%]	1	15-25 %	2b
Rock and stone cover [%]	-	25 à 50 %	3
Bare ground cover [%]	-	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Frangula alnus	B	+	
Alnus incana	B	+	
Juncus subnodulosus	H	3	
Phragmites australis	H	2a	
Schoenus nigricans	H	2a	
Carex hostiana	H	2a	
Carex elata	H	1	
Hydrocotyle vulgaris	H	r	
Pulicaria dysenterica cf.	H	r	
Cirsium arvense cf.	H	r	
Stachys palustris cf.	H	r	

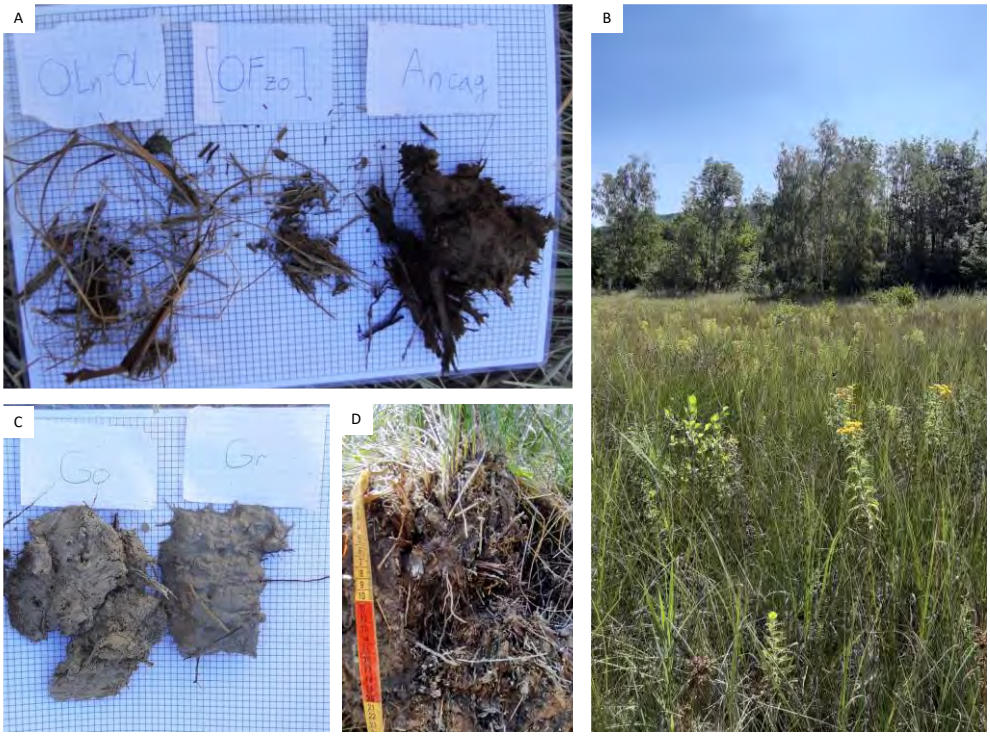


Figure S1. 20. Ch2_2020 pictures taken in 2020 around the soil profile. Horizon sequence of topsoil horizons A. View from the soil profile B. Horizon sequence of subsoil C. Really dense roots of Phragmites australis. © RT

Cha

Soil type :	***Référentiel Pédologique (RP),*** Néoluvisol dystrique bathycarbonaté, issu de loess **Classification française des sols (CPCS),** Sol brun lessivé **World Reference Base for Soil Ressources 2022 (WRB),** Luvisol (Calcaric)
Observer-s :	JMG
Date of archiving:	25.10.85

Locality	Chasseral Villeret	**Altitude [m]:**	1484
Municipality & canton :	Chasseral, BE	**Humus form :**	Mull
Coordinates (CH1903) :	570372 220090	**LSS JMG publi n°**	122
Habitat type :	Subalpine grassland		
Geological substrate :	Scree (partly slipped or transported by solifluction) from Quaternary, Pleistocene or Holocene		
Vegetation type :	Campanulo-Nardetum		
Title :	Field notebook		
Authors :	Gobat, J.-M.		
Publication :	Notebook JM 1985, 46		

Soil profile description

A1 : 0 to 14 cm depth, brown, diffuse borderline.Silty, lumpy-granular. Roots 3/5, large, no stones. Earthworms. Mull. pH Hellige = 4.0

AE : 14 to 25 cm depth, brown ochre. silty. Packed, particulate (not polyhedral like profile n°2!). Rcaines 1/5. Very homogeneous clear boundary. Boundary less than 0.5cm above the pebbles. No Bt of 2cm as in profile n°2 ! Hellige = 4.5

BtC: 25 to 55 cm depth, brown horizon. Lomoneous-clay. Crumbly, polyhedral- Pebbles 80% of the volume. 1-5cm, 1 of 30cm. CaCO3 boundary undulates 0.5 cm above pebbles, between 25 and 33cm. Roots 0.5/5.

C: 55 to X cm depth, from 55cm dense pebbles

Table S1. 29. Cha physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	0-14	10YR 5/4	15,49	37,66	25,49	18,89	2,47	3,58	19,70	7,00	0,65	10,83	4,23	3,73	0,00	21,30	6,83
A2	14-33	10YR 5/4	NA	NA	NA	NA	NA	2,93	10,39	2,98	0,37	8,14	4,71	3,66	0,00	15,23	47,39
BtC	33-55	NA	NA	NA	NA	NA	NA	NA	NA	2,92	0,30	9,71	NA	NA	NA	NA	NA

Cha_2020

Soil type :	***Référentiel Pédologique (RP),*** Brunisol eutrique issu de loess à Calcosol issu d'éboulis calcaires, à Eumull macrostructuré **Classification française des sols (CPCS),** Sol brun polygènique ***World Reference Base (WRB),*** Eumull on Epieutric Endocalcaric Skeletic Cambisol (Colluvic, Raptic)

Observer-s : AB & RT

Date : 13.09.2020

Locality	Chasseral Villeret	**Altitude [m]:**	1484
Municipality & canton :	Chasseral, BE	**Slope (°) :**	11°
Coordinates (CH1903) :	570360 220088	**Exposition :**	South
Habitat type :	grazed meadow	**Humus form :**	Eumull
Geological substrate :	Scree (partly slipped or transported by solifluction) from Quaternary, Pleistocene or Holocene		
Vegetation type :	Nardo-Agrostion		
Remarks :	Between the heifer, presence of marmots		

Soil profile description

OLv–OLn : +5 to 0 cm depth, Transition very clear /

A : 0 to 11/14 cm depth, Transition distinct 2-4cm / General color brown / Munsell Color 10YR 4/4 / Skeleton 1 Mineral 2 Plant / General structure lumpy / Texture loamy / Porosity porous 15-40% / pH Hellige 5 / HCl M (1 to 4 reaction) 0 / Stains redox stains / Root abundance (0 to 5) 5 / Root size fine 0-2mm & mid-size 2-5mm/ Compactness soft / Adhesiveness non-sticky / Notes: compaction on 5cm depth due to grazing

S : 11/14 to 19 cm depth, Transition clear <2cm / General color ochre brown / Munsell Color 10YR 4/6 / Skeleton 1 Mineral 2 Plant / General structure sub-polyhedral / Texture loamy / Porosity porous 15-40% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 4 / Root size fine 0-2mm , mid-size 2-5mm & big >5mm / Compactness soft / Adhesiveness non-sticky / Notes: -.

II Sca-Cca : 19 to 45 cm depth, Transition diffuse >8cm / General color yellow brown / Munsell Color 10YR 5/4 / Skeleton 1 Mineral 2 Plant / General structure polyhedral & sub-polyhedral / Texture loamy / Porosity slightly porous 2-5% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 3 / Stains rust stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm / Compactness compact / Adhesiveness not very sticky / Notes: >60% of rocks, redox stains on rocks, probably due to earthworm galleries, no more galleries after 45cm of depth

II Sca-Xcca : 45+ cm depth, General color yellow brown / Munsell Color 10YR 5/6 / Skeleton 1 Mineral / General structure polyhedral / Texture loamy-clay / Porosity slightly porous 2-5% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 4 / Stains rust stains / Root abundance (0 to 5) 0.5 / Root size fine 0-2mm / Compactness very compact / Adhesiveness sticky / Notes: -

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) macrostructured Eumull
Observer-s :	AB & RT
Date :	13.09.2020

Locality	Chasseral Villeret	**Altitude [m]:**	1484
Municipality & canton :	Chasseral, BE	**Slope (°) :**	11°
Coordinates (CH1903) :	570372 220090	**Exposition :**	South
Habitat type :	grazed meadow		
Geological substrate :	Scree (partly slipped or transported by solifluction) from Quaternary, Pleistocene or Holocene		
Vegetation type :	Nardo-Agrostion		
Remarks :	Between the heifer, presence of marmots		

Humus form description

OLv-OLn : +5 to 0 cm depth, Litter composed of leaves of the year / Litter transformation absent / Litter fragmentation absent & fragmented / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition very clear / Notes: none

Ama : 0 to 11/14 cm depth, OM content very humiferous / HCl 6M (1 to 4 reaction) 0 / Texture loamy / Coarse elements one / Structure lumpy / Aggregates size 5-10mm / Level of aggregation moderately aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 5 / Transition distinct 2-4cm / Limit (>A horizon) regular & macrostructured

Table S1. 30. Cha_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A	0-11/14	10YR 4/4	14,62	35,73	25,95	23,63	0,07	3,83	14,22	5,06	0,54	9,39	5,83	5,05	0,07	23,53	77,70
S	11/14-19	10YR 4/6	15,03	34,84	26,69	23,41	0,04	3,34	8,25	2,33	0,26	9,01	6,03	5,16	0,00	22,43	73,42
II Sca-Cca	19-45	10YR 5/4	11,31	30,95	20,21	21,35	16,18	2,13	4,93	1,59	0,15	10,72	7,79	7,34	44,41	-	-
II Sca-Xcca	45+	10YR 5/6	9,38	24,36	17,73	21,80	26,73	1,69	2,83	0,80	0,08	9,41	8,04	7,50	58,43	-	-

Vegetation survey

Table S1. 31. Cha_2020 vegetation survey, Chasseral (BE). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Nardo-Agrostion alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1985) corresponded to a grassland of Campanulo-Nardetum.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	-	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	-	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	-	1 à 5 %	1
Grass cover [%]	**95**	5 à 25 %	2
Moss and lichen cover [%]	-	5-15 %	2a
Litter cover[%]	**5**	15-25 %	2b
Rock and stone cover [%]	-	25 à 50 %	3
Bare ground cover [%]	-	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Nardus stricta	H	NA	
Cirsium acaule	H	NA	
Campanula rotundifolia	H	NA	
Hypericum maculatum	H	NA	
Plantago media	H	NA	
Festuca rubra	H	NA	
Koeleria pyramidata	H	NA	
Gentiana lutea	H	NA	
Agrostis capillaris	H	NA	
Briza media	H	NA	
Trifolium pratense	H	NA	
Gentiana campestris	H	NA	
Euphrasia sp.	H	NA	

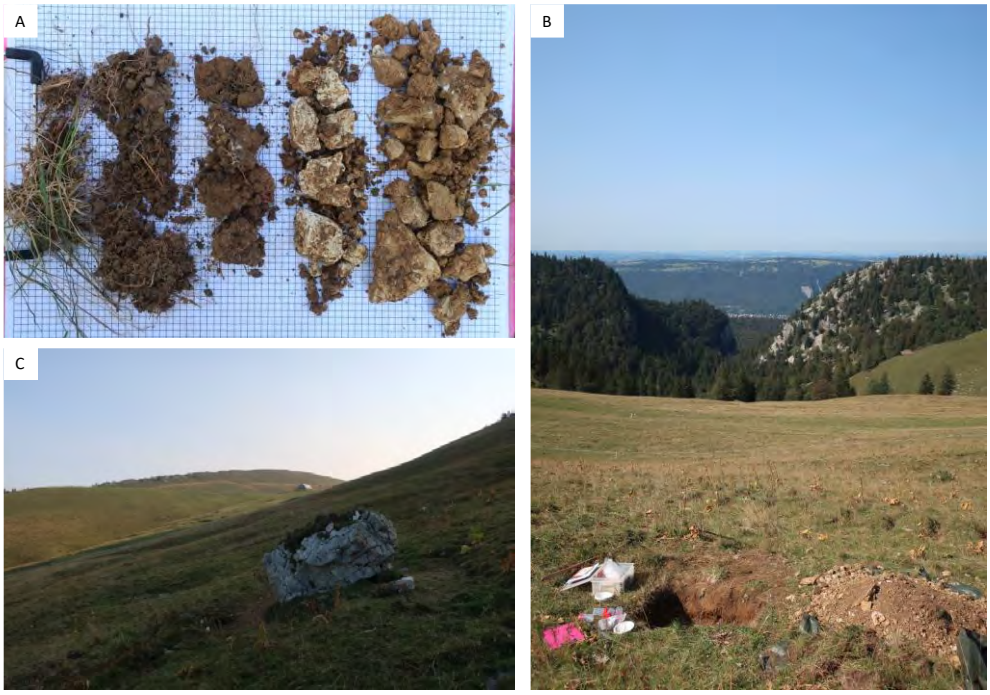


Figure S1. 21. Cha_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. Soil profile localization B. Environment looking at North-West C. © RT

Che

Soil type :	***Référentiel Pédologique (RP),*** Réductisol Typique sur dépôts lacustres **Classification française des sols (CPCS),** Gley oxydé **World Reference Base for Soil Ressources 2022 (WRB),** Reductic Gleysol
Observer-s :	JMG/ MB
Date of archiving:	15.02.1983

Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	430
Municipality & canton :	Chevroux, Vaud	**Humus form :**	Mull carbonaté
Coordinates (CH1903) :	560093 194069	**LSS JMG publi n°**	103
Habitat type :	Lakeshore forest		
Geological substrate :	Lake deposits (clays and sands at Unios)		
Vegetation type :	Fraxinio excelsoris-Quercion roboris		
Title :	Liste des stations d'étude Grande Cariçaie		
Authors :	Gobat, J.-M., Bueche, M., Buttler, A., Cornali, P.		
Publication :	University of Neuchâtel, 1982		

*** NO PHOTO PROVIDED ***

Soil profile description
Ah : 0 to 4 cm depth – no other information
AhGo : 4 to 11 cm depth – no other information
Go1: 11 to 30 cm depth – no other information
Go2: 30 to 42 cm depth – no other information

Table S1. 32. Che physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Ah	0-20	2,5Y 5/2	6,86	29,38	22,21	36,79	4,76	1,86	9,65	5,66	0,43	13,23	6,91	6,73	20,70	21,97	79,80
AhGo	20-30	2,5Y 6/3	6,11	26,55	24,23	42,75	0,34	0,90	3,10	1,50	0,14	10,61	7,67	7,45	25,55	10,18	13,40
Go1	30-40	2,5Y 7/3	5,45	22,30	20,83	51,09	0,33	0,65	1,55	0,69	0,06	10,80	7,93	7,57	24,17	-	-
Go2	40+	2,5Y 7/4	5,10	20,80	15,54	58,53	0,03	0.59	0,86	0,26	0,02	11,51	8,34	7,82	21,90	-	-

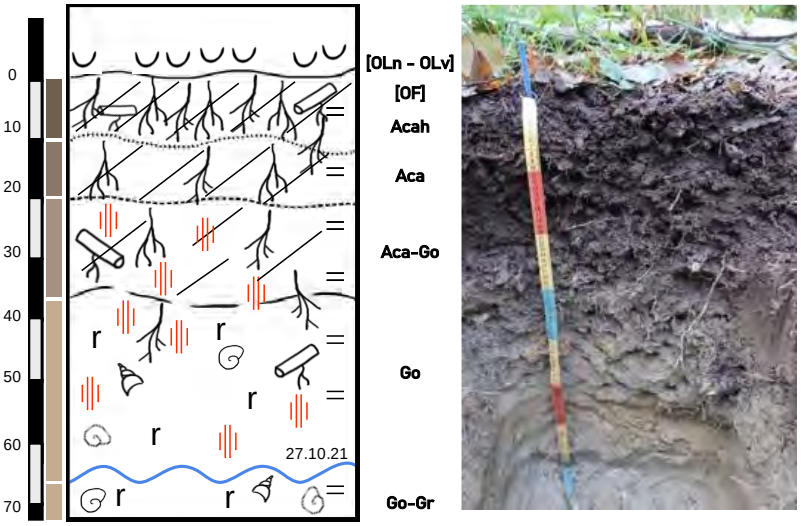
Che_2020

Soil type :	***Référentiel Pédologique (RP),*** Réductisol typique carbonaté, à horizon A humifère, sur dépôts lacustres (Lac de Neuchâtel), à Eumull mésostructuré **Classification française des sols (CPCS),** Gley oxydé ***World Reference Base (WRB),*** Eumull on Calcaric Reductic Gleysol

Observer-s : RT

Date : 27.10.2020

Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	430
Municipality & canton :	Chevroux, VD	**Slope (°) :**	0°
Coordinates (CH1903) :	560088 194080	**Exposition :**	South
Habitat type :	Forest on lake shore environment	**Humus form :**	Eumull
Geological substrate :	Lake deposits (clays and sands at Unios)		
Vegetation type :	Fraxinio excelsoris-Quercion roboris		
Remarks :	Wild boar trails & wildlife warden trail. Rain boots recommended		



Soil profile description

[OLn - OLv] : +4 to 0 cm depth, Transition very clear/ Ash-oak forest leaves of the year, no transformation or fragmentation but some cohesion due to the humidity of the environment

[OF] : 0 to 0.5 cm depth, Transition indeterminate/ fragmented and skeletonized leaves of the year with cohesion & earthworm droppings

Acah : 0.5 to 10 cm depth, Transition diffuse >8cm / General color black / Munsell Color 2,5Y 4/2 / Skeleton Mineral 1, Plant, 2, Animal 3 / General structure constructed / Structure lumpy & sub-polyhedral / Texture sandy-loamy / Porosity porous 15-40% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 3 / Stains no stains / Root abundance (0 to 5) 4 / Root size all size / Compactness not very compact / Adhesiveness sticky / Notes: none

Aca : 10 to 20 cm depth**,** Transition distinct 2-4cm / General color black sand / Munsell Color 2,5Y 5/2 / Skeleton Mineral 1, Plant 2, Animal 3 / General structure constructed / Structure sub-polyhedral / Texture sandy-loamy / Porosity porous 15-40% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 3 / Stains sand spots / Root abundance (0 to 5) 4 / Root size mid-size 2-5mm, and then fine 0-2 mm and big >5 mm / Compactness not very compact / Adhesiveness sticky / Notes: none

Aca-Go : 20 to 35 cm depth**,** Transition clear <2cm / General color black sand / Munsell Color 2,5Y 6/2 / Skeleton Mineral 1, Plant 2, Animal 3 / General structure construced / Structure sub-polyhedral / Texture sandy-loamy / Porosity moderately porous 5-15% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 4 / Stains rust stains / Root abundance (0 to 5) 2 / Root size mid-size 2-5mm, and then fine 0-2 mm and big >5 mm / Compactness compact / Adhesiveness very sticky / Notes: rust stains around the roots, presence of shells

Go : 35 to 65 cm depth, Transition clear <2cm/ General color shades of beige / Munsell Color 2,5Y 7/3 / Skeleton Mineral 1, Plant 2, Animal 3 / General structure construced / Structure sub-polyhedral / Texture sandy / Porosity moderately porous 5-15% / pH Hellige 8 / HCl 6M (1 to 4 reaction) 4 / Stains rust stains / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm, and then fine 0-2 mm and big >5 mm / Compactness not very compact / Adhesiveness very sticky / Notes: abundant shellfish

Go-Gr : 65+ cm depth, General color shades of grey / Munsell Color 2,5Y 7/3 / Skeleton Mineral 1, Plant, 2, Animal 3 / General structure construced / Structure sub-polyhedral / Texture sandy / Porosity moderately porous 5-15% / pH Hellige 8 / HCl 6M (1 to 4 reaction) 4 / Stains rust stains / Root abundance (0 to 5) 0.5 / Root size mid-size 2-5mm, and then fine 0-2 mm and big >5 mm / Compactness not very compact / Adhesiveness very sticky / Notes: very abundant shells and water Table S perched at a depth of 65 cm.

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) mesostructured Eumull
Observer -s :	RT
Date :	27.10.2020

Locality	Nature reserve of the Grande cariçaie	**Altitude [m]:**	430
Municipality & canton :	Chevroux, VD	**Slope (°) :**	0°
Coordinates (CH1903) :	560088 194080	**Exposition :**	South
Habitat type :	Forest on lake shore environment		
Geological substrate :	Lake deposits (clays and sands at Unios)		
Vegetation type :	Fraxinio excelsoris-Quercion roboris		
Remarks :	Wild boar trail & wildlife warden trail. Rain boots recommended		

Humus form description

[OLn-OLv] : +4 to 0 cm depth, litter of the year / Litter transformation absent / Litter fragmentation absent / Cohesion absent / OM content feces & plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition clear <2cm / Notes: quercus sp., corylus avellana and rubus sp. leafs

[OFzo] : 0 to 0.5 cm depth, litter of the year / Litter transformation skeletized leaves / Litter fragmentation fragmented leaves & atomized leaves / Cohesion coherent / OM content mixed material / Percentage of fine OM < 30 % / Presence of mycelium absent / Presence roots present / Transition clear <2cm / Notes: presence of white moss.

Ah : 0.5 to 10 cm depth, OM content humiferous / HCl 6M (1 to 4 reaction) 3 / Texture sandy-loamy / Coarse elements yes 2% , pebbles 2-20cm / Structure lumpy & sub-polyhedral / Aggregates size 2-5 mm to 20 mm / Level of aggregation moderately aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 4 / Transition clear <2cm / Limit (>A horizon) regular & mesostructured

Table S1. 33. Che_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Acah	0-10	2,5Y 4/2	6,01	22,79	13,73	41,87	15,60	2,31	10,90	5,71	0,41	13.92	7.63	7.29	6,26	32.74	65.03
Aca	10-20	2,5Y 5/2	4,85	20,91	15,38	44,87	13,99	1,34	5,07	2,74	0,20	13.45	7.7	7.48	9,53	23.93	28.11
Aca-Go	20-35	2,5Y 6/2	4,63	18,84	14,78	48,19	13,56	0,75	2,30	1,22	0,10	12.61	7.95	7.61	14,71	-	-
Go	35-65	2,5Y 7/3	2,27	6,60	5,00	27,33	58,81	0,25	0,31	0,35	0,01	32.33	8.64	8.26	11,49	-	-
Go-Gr	65+	2,5Y 7/3	6,05	24,12	20,43	39,61	9,80	0,67	0,62	0,33	0,02	15.80	8.5	7.82	18,69	-	-

Vegetation survey

Table S1. 34. Che_2020 vegetation survey, Chevroux (VD). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Fraxinio excelsoris-Quercion roboris alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1983) corresponded to Fraxinio excelsoris-Quercion roboris.

Area [m²] :		**Dimensions [5 x 5] :**	
Tree cover [%]	**15**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**15**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**30**	1 à 5 %	1
Grass cover [%]	**20**	5 à 25 %	2
Moss and lichen cover [%]	**5**	5-15 %	2a
Litter cover [%]	**40**	15-25 %	2b
Rock and stone cover [%]	**-**	25 à 50 %	3
Bare ground cover [%]	**5**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Fraxinus excelsior	A	r	
Populus alba	A	1	
Fagus sylvatica	A	r	
Quercus robur	A	+	
Ligustrum vulgare	H	3	
Viburnum lantana	B	1	
Corylus avellana	B	1	
Abies alba	B	+	
Crataegus monogyna	B	r	
Euonymus europaeus	B	r	
Lonicera caprifolium	B	+	
Alnus glutinosa	H	r	
Rosa sp.	H	r	
Carex sp.	H	3	
Abies alba	H	+	
Robus sp.	H	r	
Brachypodium pinnatum	H	2b	

Figure S1. 22. Che_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. Subsoil aggregates with little holes form by fine roots B. View from the soil profile C. © RT

Cho

Soil type :	***Référentiel Pédologique (RP),*** Néoluvisol oligosaturé, rédoxique, issu de loess, sur calcaire dur **Classification française des sols (CPCS),** Sol brun lessivé à pseudogley **World Reference Base for Soil Ressources 2022 (WRB),** Luvisol (Calcaric)
Observer-s :	JMG /DO
Date of archiving:	30.10.1985

Locality	Chasseron	**Altitude [m]:**	1484
Municipality & canton :	Chasseron, Vaud	**Humus form :**	Mull
Coordinates (CH1903) :	531750 , 189300	**LSS JMG publi n°**	122, 126
Habitat type :	Subalpine grassland		
Geological substrate :	Jurassic oolitic limestones and pellets		
Vegetation type :	Cynosurion-Nardion		
Title :	- Field notebook (122) - Aspects écologiques des pelouses du Chasseron (126) - Etude phytosociologique et écologie des pelouses pseudo-alpines du Chasseron		
Authors :	Gobat, J.-M. ; Duckert, O.		
Publication :	Field notebook (122), Diploma thesis, University of Neuchâtel (126)		

Soil profile description

A1 : 0 to 8 cm depth, brown, lumpy, 4/5 fine roots, clear boundary

A12 : 8 to 30 cm depth, reddish-ochre, silt, packed, earthworm holes, root 1/5, diffuse boundary.

Btg: 30 to 50 cm depth, clay-loam, melted - polyhedral, limestone pebbles, round, attacked, 2% of volume, roots 0.5/5 fine, clear boundary, Fe_2O_3 spots

BtR: 50 to X cm depth, clayey, compact-molten, light yellowish-ochre, pebbles + rock 60% of the volume, with fissure filled with clays. $CaCO_3$ at 70cm, 1mm above the pebbles,

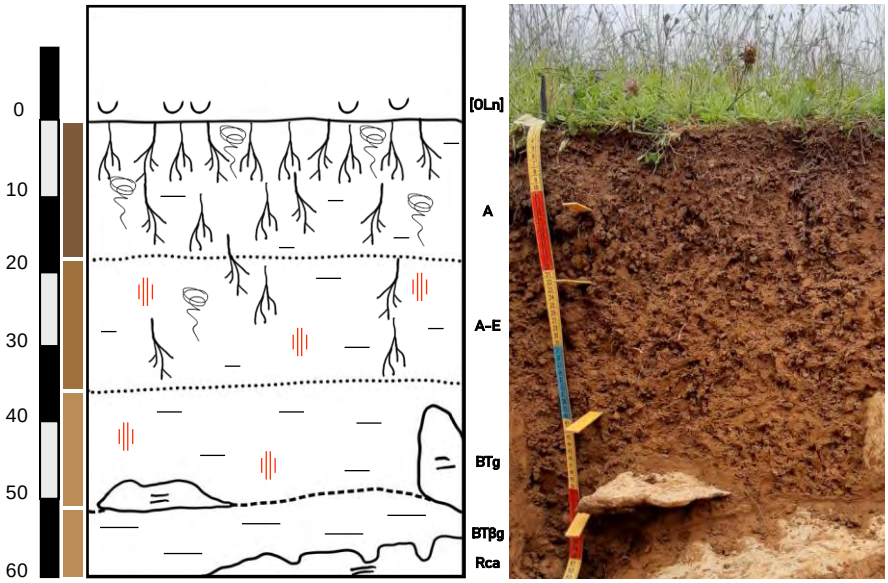
Table S1. 35. Cho physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	0-8	10YR 4/4	15,90	48,58	26,02	9,46	0,03	3,92	17,77	7,10	0,57	12,38	4,97	3,33	0,05	10,90	13,48
A2	8-30	10YR 6/4	17,09	48,94	24,91	8,94	0,11	2,84	8,01	2,47	0,22	11,01	5,41	3,66	0,01	11,03	7,77
Btg	30-50	10YR 5/6	18,05	48,55	24,09	8,97	0,34	3,09	6,37	1,73	0,17	10,11	6,1	4,62	0,03	-	-
BtR	50-70	10YR 6/6	20,41	44,98	27,21	7,37	0,03	4,44	6,36	0,85	0,09	9,08	7,49	5,77	0,02	-	-

Cho_2020

Soil type :	**Référentiel Pédologique (RP),** NÉOLUVISOL à horizon bêta, rédoxique, issu de loess, sur calcaire dure, à Mésomull macrostructuré anthropique **Classification française des sols (CPCS),** Sol brun lessivé **World Reference Base (WRB),** Mesomull on Haplic Luvisol
Observer-s :	MN, NP& RT
Date :	17.07.2020

Locality	Chasseron	**Altitude [m]:**	1527
Municipality & canton :	Chasseron, VD	**Slope (°) :**	0°
Coordinates (CH1903) :	531751 189291	**Exposition :**	South-est
Habitat type :	grazed meadow	**Humus form :**	Mesomull
Geological substrate :	Jurassic oolitic limestones and pellets		
Vegetation type :	Cynosurion		
Remarks :	Parking at the hotel, profile located 100m west of the alpine chalet on the flat surface, grazed with the use of fertilizers.		



Soil profile description

[OLn] : +5 to 0 cm depth, Transition very clear / leaves of the year still attached on the plants.

A : 0 to 18 cm depth, Transition diffuse >8cm / General color brown / Munsell Color 10YR 4/4 / Skeleton 1 Plant / Structure lumpy & sub-polyhedral / Texture sandy / Porosity porous 15-40% / pH Hellige 4.5 / HCl M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 3 / Root size fine 0-2mm / Compactness not very compact / Adhesiveness non-sticky /

A-E : 18 to 35 cm depth, Transition diffuse >8cm / General color brown / Munsell Color 10YR 5/6 / Skeleton 1 Plant / Structure lumpy & sub-polyhedral / Texture sandy-loamy / Porosity moderately porous 5-15% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 2 / Root size fine 0-2mm / Compactness not very compact / Adhesiveness non-sticky
BTg : 35 to 51 cm depth, Transition diffuse >8cm / General color brown / Munsell Color 10YR 6/6 / Skeleton 1 Plant / General structure sub-polyhedral / Texture loamy-clay / Porosity moderately porous 5-15% / pH Hellige 5.5 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm / Compactness not very compact / Adhesiveness non-sticky
BTβg : 51+ cm depth, Transition gradual 4-8cm / General color brown / Munsell Color 10YR 6/6 / Skeleton 1 Mineral 2 Plant / General structure massive / Texture loamy-clay / Porosity slightly porous 2-5% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 0 / Root size fine 0-2mm / Compactness not very compact / Adhesiveness sticky /
Rca : 60 cm depth

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) anthropic macrostructured Mesomull

Observer-s : MN, NP& RT

Date : 17.07.2020

Locality	Chasseron	**Altitude [m]:**	1527
Municipality & canton :	Chasseron, VD	**Slope (°) :**	0°
Coordinates (CH1903) :	531751 189291	**Exposition :**	South-est
Habitat type :	grazed meadow		
Geological substrate :	Jurassic oolitic limestones and pellets		
Vegetation type :	Cynosurion		
Remarks :	Parking at the hotel, profile located 100m west of the alpine chalet on the flat surface, grazed with the use of fertilizers.		

Humus form description

[OLn] : +5 to 0 cm depth, Litter composed of leaves of the year still attached on the plants / Litter transformation absent / Litter fragmentation absent / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition very clear / Notes: none

Ama: 0 to 18 cm depth, OM content not very humiferous / HCl 6M (1 to 4 reaction) 0 / Texture sandy / Coarse elements no / Structure lumpy / Aggregates size 2-10 mm / Level of aggregation moderately aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 3 / Transition very clear / Limit (>A horizon) interrupted / Note: macrostructured & anthropic

Table S1. 36. Cho_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples . The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A	0-18	10YR 4/4	15,88	45,88	27,61	10,52	0,10	3,85	13,54	5,13	0,47	10,93	5,12	4,21	0,00	32,84	32,84
A-E	18-35	10YR 5/6	15,94	45,47	27,96	10,54	0,08	3,05	6,84	2,18	0,21	10,29	5,06	4,09	0,00	4,86	4,86
BTg	35-51	10YR 6/6	15,34	41,85	30,46	11,92	0,43	3,19	4,89	1,33	0,14	9,39	6,20	5,00	0,00	14,81	-
BTβg	51+	10YR 6/6	16,13	40,93	32,33	10,29	0,33	3,89	4,91	0,79	0,09	9,02	6,48	5,41	0,00	23,95	-

Vegetation survey

Table S1. 37. Cho_2020 vegetation survey, Chasseron (VD). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Cynosurion alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1985) corresponded with Nardion.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	-	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	-	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	-	1 à 5 %	1
Grass cover [%]	**100**	5 à 25 %	2
Moss and lichen cover [%]	-	5-15 %	2a
Litter cover [%]	-	15-25 %	2b
Rock and stone cover [%]	-	25 à 50 %	3
Bare ground cover [%]	-	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Agrostis capillaris	H	1	
Anthoxanthum odoratum	H	1	
Cynosurus cristatus	H	2a	
Dactylis glomerata	H	2a	
Briza media	H	1	
Festuca rubra	H	2a	
Rhinanthus minor	H	1	
Trifolium pratens	H	2a	
Trifolium repens	H	2a	
Campanula glomerata	H	r	
Gentiana lutea	H	r	
Cirsium acaule	H	1	
Crepis capillaris	H	r	
Leucanthemum vulgare	H	1	
Rumex acetosa	H	1	
Carum carvi	H	2b	
Sanguisorba officinalis	H	2b	
Campanula scheuchzeri	H	r	
Ranunculus carinthiacus	H	1	

Figure S1. 23. Cho_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. With colored soil block from altered part of the limestone bedrock and with an earthworm gallery B. View from the soil profile looking North-East C. © RT

Cu1

Soil type :	***Référentiel Pédologique (RP),*** Réductisol Typique épihistique ***Classification française des sols (CPCS)***, Gley humifère polyphasé à tourbe eutrophe fossile superficielle **World Reference Base for Soil Ressources 2022 (WRB),** Reductic Gleysol
Observer-s :	JMG/ MB
Date of archiving:	24.08.1983

Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	430
Municipality & canton :	Chevroux, VD	**Humus form :**	Mull calcique
Coordinates (CH1903) :	570455 202833	**LSS JMG publi n°**	103
Habitat type :	Forest on lake shore environment		
Geological substrate :	Lake deposits (clays and sands at Unios)		
Vegetation type :	Birch poplar forest		
Title :	Liste des stations d'étude Grande Cariçaie		
Authors :	Gobat, J.-M., Bueche, M., Buttler, A., Cornali, P.		
Publication :	University of Neuchâtel, 1982		

*** NO PHOTO PROVIDED ***

Soil profile description
Fah : 0 to 23 cm depth – no other information
Ah: 23 to 44 cm depth – no other information
Go: 44 to 130 cm depth – no other information
[Goh]: 130 to X cm depth – no other information

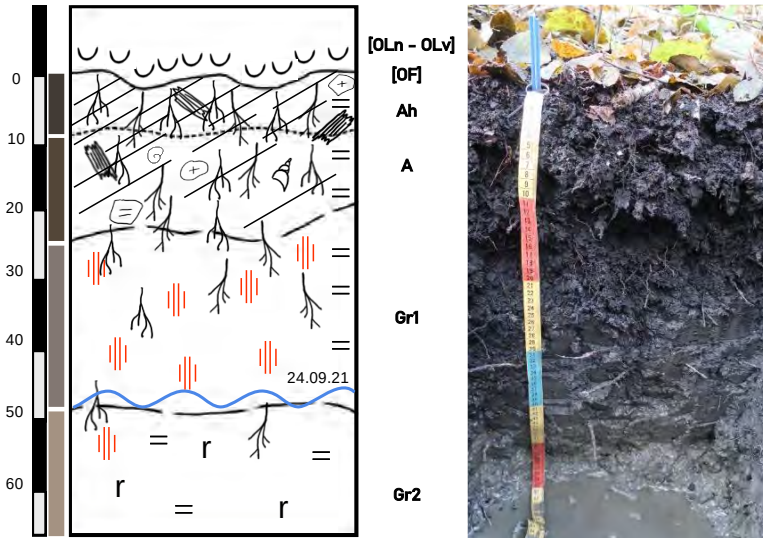
Table S1. 38. Cu1 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Fah	0-23	2,5Y 2,5/1	14,61	47,95	11,51	23,46	2,47	5,66	28,05	14,67	0,98	14,97	6,6	6,21	0,74	64,19	90,79
Ah	23-44	2,5Y 4/2	15,34	46,49	20,96	16,41	0,80	2,52	8,63	3,78	0,28	13,30	7,16	6,63	1,30	25,89	101,49
Go	44-130	2,5Y 6/1	1,74	6,82	3,68	36,21	51,56	0,18	0,52	0,27	0,02	13,75	8,21	7,83	45,40	-	-
[Goh]	130	2,5Y 5/1	8,27	28,09	10,93	40,92	11,78	2,16	11,21	6,01	0,25	23,61	7,08	6,83	33,73	-	-

Cu1_2020

Soil type :	***Référentiel Pédologique (RP),*** Réductisol typique à horizon A humifère, sur dépôts lacustres (Lac de Neuchâtel), bathycarbonaté, à Mésomull mésostructuré **Classification française des sols (CPCS),** Gley oxydé ***World Reference Base (WRB),*** Mesomull Reductic Gleysol
Observer-s :	MF& RT
Date :	24.09.2020

Locality	Nature reserve of the Grande cariçaie	**Altitude [m]:**	430
Municipality & canton :	Cudrefin, VD	**Slope (°) :**	0°
Coordinates (CH1903) :	570455 202833	**Exposition :**	Northwest
Habitat type :	Forest on lake shore environment	**Humus form :**	Mesomull
Geological substrate :	Lake deposits (clays and sands at Unios)		
Vegetation type :	Fraxinio excelsoris-Quercion roboris		
Remarks :	Heavy rainfall the days before opening the pit. Odorless soil profile despite the high redox activity.		



Soil profile description

OLn – [Olv]: +2 to 0 cm depth, Transition very clear / hazelnut leaves of the year

[OF] : 0 to 0.5 cm depth, Transition clear <2cm / fragmented and skeletonized leaves of the year with cohesion & earthworm droppings

Ah : 0.5 to 8 cm depth, Transition distinct 2-4cm / General color black / Munsell Color 2,5Y 2,5/1 / Skeleton Plant 1, Mineral 2, Animal 3 / General structure constructed / Structure lumpy / Texture loamy / Porosity porous 15-40% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 1 / Stains no stains / Root abundance (0 to 5) 3 / Root size fine 0-2mm & mid-size 2-5mm / Compactness soft / Adhesiveness sticky / Notes: dead wood on the surface and in the A horizon, with 2 cm stones and shells

A : 8 to 25 cm depth**,** Transition clear <2cm / General color black-brown/ Munsell Color 2,5Y 3/2 / Skeleton Plant 1, Mineral 2, Animal 3 / General structure constructed / Structure lumpy & sub-polyhedral / Texture loamy / Porosity porous 15-40% / pH Hellige 6.5 / HCl 6M (1 to 4reaction) 2 / Stains no stains / Root abundance (0 to 5) 3 / Root size mid-size 2-5mm , big >5mm, and then fine 0-2mm / Compactness soft / Adhesiveness sticky / Notes: none

Gr1 : 25 to 49 cm depth**,** Transition clear <2cm / General color grey / Munsell Color 2,5Y 5/1 / Skeleton Mineral 1, Plant 2 / General structure massive / Texture clayey-loamy / Porosity slightly porous 2-5% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 3 / Stains rust stains / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm, and then fine 0-2 mm and big >5 mm / Compactness compact / Adhesiveness very sticky / Notes: rust stains around the roots, presence of shells

Gr2 : 49+ cm depth, General color shades of beige / Munsell Color 2,5Y 6/2 / Skeleton Mineral 1, Plant 2 / General structure massive / Texture clayey-loamy / Porosity moderately porous 5-15% // pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 3 / Stains rust stains / Root abundance (0 to 5) 1 / Root size big >5mm , mid-size 2-5mm, and then fine 0-2mm / Compactness soft / Adhesiveness very sticky / Notes: redox stains around the roots

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) mesostructured Mesomull
Observer -s :	MF& RT
Date :	24.09.2020

Locality	Nature reserve of the Grande cariçaie	**Altitude [m]:**	430
Municipality & canton :	Cudrefin, VD	**Slope (°) :**	0°
Coordinates (CH1903) :	560088 194080	**Exposition :**	Northwest
Habitat type :	Forest on lake shore environment		
Geological substrate :	Lake deposits (clays and sands at Unios)		
Vegetation type :	Fraxinio excelsoris-Quercion roboris		
Remarks :	Heavy rainfall the days before opening the pit. Odorless soil profile		

Humus form description

OLn – [OLv] : +2 to 0 cm depth, litter of the year / Litter transformation absent / Litter fragmentation absent / Cohesion absent / OM content feces & plant material / Percentage of fine OM 0 % / Presence of mycelium present / Presence roots absent / Transition clear <2cm / Notes: presence of wood decomposing

[OFzo] : 0 to 0.5 cm depth, litter of the year / fragmentation fragmented leaves / Cohesion absent / OM content mixed material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots present / Transition clear <2cm / Notes: fin layer of very mixed material

Ah : 0.5 to 8 cm depth, OM content humiferous / HCl 6M (1 to 4 reaction) 1 / Texture loamy / Structure lumpy / Aggregates size 5 mm to 20 mm / Level of aggregation moderately aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 3 / Transition distinct 2-4cm / Limit (>A horizon) wavy & mesostructured

Table S1. 39. Cu1_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Ah	0-8	2,5Y 2,5/1	10,89	35,81	9,27	27,70	16,23	2,67	12,55	7,47	0,47	15,75	7.55	6.99	4,86	44.10	68.52
A	8-25	2,5Y 3/2	12,09	38,07	9,75	26,28	13,82	3,17	16,03	9,30	0,57	16,27	7.52	6.95	3,92	50.63	80.09
Gr1	25-49	2,5Y 5/1	16,50	54,66	14,04	11,73	3,07	2,15	6,01	2,91	0,21	14,09	7.69	6.85	1,25	-	-
Gr2	49+	2,5Y 6/2	6,46	27,38	18,81	47,06	0,29	0,51	1,28	0,57	0,05	12,28	8.4	7.65	35,47	-	-

Vegetation survey

Table S1. 40. Cu1_2020 vegetation survey, Cudrefin (VD) Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Fraxinio excelsoris-Quercion roboris alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1983) corresponded to an "birch with poplar grove".

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**5**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**25**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**10**	1 à 5 %	1
Grass cover [%]	**3**	5 à 25 %	2
Moss and lichen cover [%]	**2**	5-15 %	2a
Litter cover [%]	**84**	15-25 %	2b
Rock and stone cover [%]	**-**	25 à 50 %	3
Bare ground cover [%]	**1**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Corylus avellana	A	3	
Crataegus monogyna	A	r	
Betula sp.	A	2a	
Quercus robur	A	2b	
Populus sp	A	4	
Carya ovata	A	r	
Sorbus aucuparia	B	1	
Fraxinus excelsior	B	+	
Cornus mas	B	2b	
Rhamnus cathartica	B	2a	
Rosa sp.	H	r	
Daphne laureola	H	r	
Ligustrum vulgare	H	3	
Rubus fruticosus aggr.	H	2a	
Rhamnus cathartica	H	r	
Ribes rubrum	H	1	
Brachypodium pinnatum	H	2b	
Carex pilosa	H	1	
Clematis vitalba	L	1	

Figure S1. 24. Cu1_2020 pictures taken in 2020 around the soil profile. Horizon sequence A. Redox stain on soil block B. View from the soil profile looking North C. Litter described as a Mesomull D. © RT

Cu2

Soil type :	***Référentiel Pédologique (RP),*** Rédoxisol leptique sur moraine sur molasse **Classification française des sols (CPCS),** Pseudogley primaire **World Reference Base for Soil Ressources 2022 (WRB),** Stagnic Gleysol
Observer-s :	JMG/ MB
Date of archiving:	30.03.1983

Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	430
Municipality & canton :	Cudrefin, Vaud	**Humus form :**	Hydromull
Coordinates (CH1903) :	566623, 199558	**LSS JMG publi n°**	103
Habitat type :	Lakeshore forest		
Geological substrate :	Sandstone and mottled marl, with lacustrine limestone, under weak cover of lacustrine deposits		
Vegetation type :	Salicion cinereae with Alnus incana		
Title :	Liste des stations d'étude Grande Cariçaie		
Authors :	Gobat, J.-M., Bueche, M., Buttler, A., Cornali, P.		
Publication :	University of Neuchâtel, 1983		

Soil profile description
Ah : 16 to 0 cm depth – no other information
Ah : 0 to 16 cm depth – no other information
AhSw: 16 to 27 cm depth – no other information
SdC: 27 to 44 cm depth – no other information

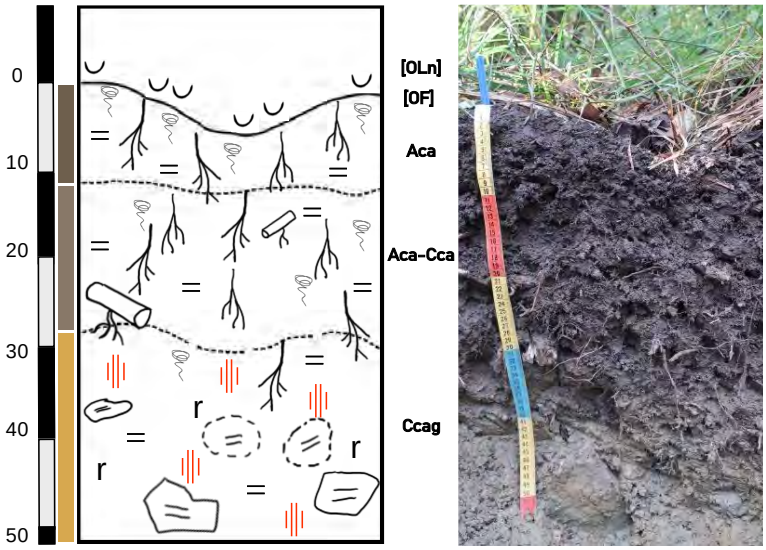
Table S1. 41. Cu2 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Ah	16-0	2,5Y 5/2	7,54	31,71	13,56	29,84	17,36	1,34	6,21	2,70	0,24	11,16	7,17	6,93	14,28	15,45	67,74
Ah	0-16	2,5Y 5/3	7,00	31,46	14,62	31,39	15,53	1,28	5,90	3,03	0,25	12,06	7,18	6,94	15,81	16,89	24,00
AhSw	16-27	2,5Y 6/4	7,15	32,63	12,89	26,52	20,81	0,69	1,97	0,94	0,08	11,92	7,82	7,62	17,25	-	-
SdC	27-44	2,5Y 8/4	16,24	66,90	13,00	2,92	0,95	1,29	1,42	0,45	0,04	11,89	8,1	7,73	24,35	-	-

Cu2_2020

Soil type :	***Référentiel Pédologique (RP),*** Rédoxisol carbonaté, leptique, sur dépôts lacustres (lac de Neuchâtel et morainiques, à Oligomull **Classification française des sols (CPCS),** Pseudogley primaire **World Reference Base (WRB),** Oligomull on Stagnic Gleysol
Observer-s :	AR & RT
Date :	22.10.2020

Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	431
Municipality & canton :	Cudrefin, VD	**Slope (°) :**	0°
Coordinates (CH1903) :	566618 199560	**Exposition :**	Southwest
Habitat type :	Forest on lake shore environment	**Humus form :**	Oligomull
Geological substrate :	Sandstone and mottled marl, with lacustrine limestone, under weak cover of lacustrine deposits		
Vegetation type :	Alnion incanae		
Remarks :	Dense forest with many shrubs, pit dug at 10m southeast of the great fir (*Abies alba*). Presence of large and small red earthworms (*Octolasion cyaneum*, *Aporrectodea noduna* and *Aporrectodea epicola*).		



Soil profile description

[OLn] : +3 to 1 cm depth, Transition very clear / Forest with Alder, Ash and Beech leaves of the year

[OLv] : +1 to 0 cm depth, Transition distinct 2-4cm / Forest with Alder, Ash and Beech leaves of the year

[OF] : 0 to 0.5 cm depth, Transition distinct 2-4cm / Forest with Alder, Ash and Beech leaves of the year

Aca : 0 to 11 cm depth, Transition distinct 2-4cm / General color black / Munsell Color 2,5Y 4/2 / Skeleton 1 Plant 2 Animal 3 Mineral / General structure constructed / Structure lumpy & sub-polyhedral / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 4 / Root size fine 0-2mm & mid-size 2-5mm / Compactness soft / Adhesiveness not very sticky / Notes: none

Aca-Cca : 11 to 28 cm depth**,** Transition gradual 4-8cm / General color brown / Munsell Color 2,5Y 5/2 / Skeleton 1 Plant 2 Animal 3 Mineral / General structure constructed / Structure polyhedral & sub-polyhedral / Texture loamy / Porosity porous 15-40% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 4 / Stains none / Root abundance (0 to 5) 4 / Root size big >5mm, mid-size 2-5mm & fine 0-2mm / Compactness not very compact / Adhesiveness sticky / Notes: none

Ccag : 28+ depth, General color beige / Munsell Color 2,5Y 7/9 / Skeleton 1 Mineral 2 Plant 2 Animal / General structure constructed & massive / Structure polyhedral / Texture loamy / Porosity slightly porous 2-5% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 4 / Stains redox stains / Root abundance (0 to 5) 4 / Root size mid-size 2-5mm, & fine 0-2 mm / Compactness compact / Adhesiveness very sticky / Notes: Heavily weathered pebbles that break into sand. Presence of rounded schistose and calcareous pebbles of 5-12 cm diameter. Waterlogged roots, presence of a red and transparent earthworm.

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) macrostructured Oligomull
Observer -s :	AR& RT
Date :	22.10.2020

Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	431
Municipality & canton :	Cudrefin, VD	**Slope (°) :**	0°
Coordinates (CH1903) :	566618 199560	**Exposition :**	Southwest
Habitat type :	Forest on lake shore environment		
Geological substrate :	Sandstone and mottled marl, with lacustrine limestone, under weak cover of lacustrine deposits		
Vegetation type :	Alnion incanae		
Remarks :	Dense forest with many shrubs, pit dug at 10m southeast of the great fir (*Abies alba*). Presence of large and small red earthworms (*Octolasion cyaneum*, *Aporrectodea noduna* and *Aporrectodea epicola*).		

Humus form description

[OLn] : +3 to 1 cm depth, Forest with Alder, Ash and Beech leaves of the year litter of the year / Litter transformation absent / Litter fragmentation absent / Cohesion absent / OM content feces & plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition very clear / Notes: none

[OLv] : +1 to 0 cm depth, Forest with Alder, Ash and Beech leaves of the year litter of the year / Litter transformation skeletized leaves / Litter fragmentation fragmented leaves / Cohesion coherent /

OM content feces & plant material / Percentage of fine OM < 30 % / Presence of mycelium absent / Presence roots absent / Transition distinct 2-4cm / Notes: none

[OFzo] : +0.5 to 0 cm depth, Forest with Alder, Ash and Beech leaves of the year litter past year / Litter transformation skeletized leaves / Litter fragmentation fragmented leaves & atomized leaves / Cohesion adhered / OM content feces & mixed material / Percentage of fine OM < 30 % / Presence of mycelium absent / Presence roots absent / Transition distinct 2-4cm / Notes: none

A : 0 to 11 cm depth, OM content humiferous / HCl 6M (1 to 4reaction) 4 / Texture sandy-loamy / Coarse elements none / Structure lumpy & sub-polyhedral / Aggregates size 1-10 mm / Level of aggregation moderately aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 4 / Transition clear <2cm / Limit (>A horizon) wavy & biomacrostructured

Table S1. 42. Cu2_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Aca	0-11	2,5Y 4/2	7.037	7,04	29,45	13,01	30,94	1,84	9,96	4.47	0.30	15.08	7.82	7.55	12,66	27,97	31,70
Aca-Cca	11-28	2,5Y 5/2	7.429	7,43	34,87	16,52	26,00	1,21	5,76	2.95	0.21	13.74	7.85	7.46	13,62	18,46	18,05
Ccag	28-X	2,5Y 7/9	12.508	12,51	51,45	13,66	16,27	1,53	1,15	0.32	0.05	7.07	8.4	7.41	4,07	-	-

Vegetation survey

Table S1. 43. Cu2_2020 vegetation survey, Cudrefin (VD). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Alnion incanae alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1983) corresponded to Salicion cinereae with Alnus incana.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**10**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**15**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**20**	1 à 5 %	1
Grass cover [%]	**20**	5 à 25 %	2
Moss and lichen cover [%]	**2**	5-15 %	2a
Litter cover [%]	**3**	15-25 %	2b
Rock and stone cover [%]	**-**	25 à 50 %	3
Bare ground cover [%]	**2**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Alnus incana cf.	A	+	
Fraxinus excelsior	A	2a	
Fagus sylvatica	A	2b	
Salix sp.	A	1	
Populus trempula cf.	A	2a	
Ligustrum vulgare	B	2a	
Crataegus monogyna	B	2b	
Cornus sanguinea	B	1	
Viburnum lantana	B	1	
Corylus avellana	B	1	
Viburnum opulus	B	1	
Lonicera caprifolium	B	1	
Rubus sp.	H	1	
Carex sp.	H	1	

Figure S1. 25. Cu2_2020 pictures taken in 2020 around the soil profile. Topsoil horizon's sequence A. Subsoil horizon's sequence B. Marbled soil block with redox stain C. Earthworms feces abundant on the site D. © RT

Gor

Soil type :	***Référentiel Pédologique (RP),*** Néoluvisol oligosaturé, issu de moraine mixte **Classification française des sols (CPCS),** Sol brun lessivé **World Reference Base for Soil Ressources 2022 (WRB),** Luvisol
Observer-s :	JMG
Date of archiving:	11.12.1984

Locality	La Grande-Béroche	**Altitude [m]:**	831
Municipality & canton :	Gorgier, Neuchâtel	**Humus form :**	Moder
Coordinates (CH1903) :	548625, 196880	**LSS JMG publi n°**	122
Habitat type :	Beech forest		
Geological substrate :	Rhodanian moraine (till)		
Vegetation type :	Luzulo-Fagetum		
Title :	Field notebook		
Authors :	Gobat, J.-M.		
Publication :	Notebook JM 1984, 19		

Soil profile description

L : 2 to 0 cm depth, litter of beech leaves + Picea needles. Surface strewn with silica+limestone pebbles (5%).

F : 0 to 4 cm depth, F in lenses, needle felting in small hollows of the ground. Lots of white mycelium, branchlets.

A1 : 0 to 2 cm depth, very thin "structural" band. Not very sTable S aggregates, 1-5mm diameter-Quartz (grains), no roots. Clear boundary. Sandy-silt. Chocolate brown. No skeleton, medium biological activity.
A2: 2 to 45 cm depth, very thick, brown-ochre, homogeneous. Silt (coarse)-sandy, very filtering. Preferential flow paths. Skeleton = 10% vol. silica and limestone (10%) (With gangue, varies pulverulent in spots. Roots of all sizes (2/5). Pebble diameter of 10-100mm. Particulate structure, compacted, rounded facets along the flows, diffuse lower limit.
B: 45 to 80 cm depth, thick, reddish-brown, with brown-gray spots (5%). Silty texture with some clay (weak). Clear polyhedral structure (facets 0.5-1c ?), not very compact. Skeleton = 20% vol, silica + limestone (15%), roots of all sizes 2/5. Pebble diameter 1-20cm. Diffuse lower boundary.
BC: 80 to 95 cm depth, transition mosaic brown-red / brown-gray, this one increasing towards the bottom of the skeleton. Roots 1/5. Clear limit at the bottom.
C: 95 to 125 cm depth, mixed moraine with silica dominance (60%). Skeleton = 80% of the volume. Very attacked limestones. Pebble size 1-10cm. Roots 1/5. Brown-grey color, with colored spots (pebbles). Very packed, but sandy-silty. Carbonates from 95cm gradual.

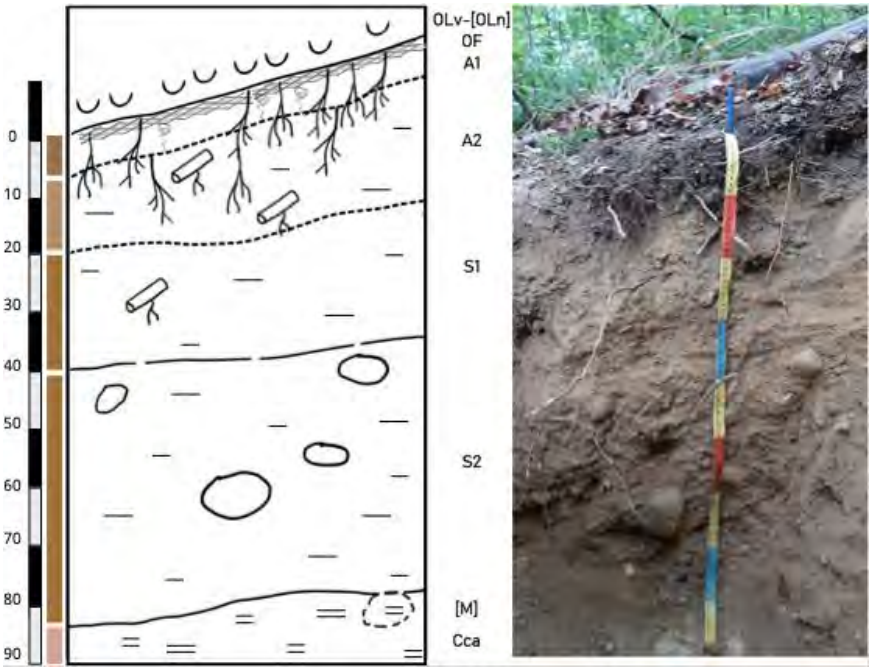
Table S1. 44. Gor physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
L	2-0	-	-	-	-	-	-	-	-	45,72	1,11	41,06	-	-	-	-	-
F	0-4	-	-	-	-	-	-	-	-	31,83	1,37	23,28	-	-	-	-	-
A1	4-8	10YR 4/2	9,58	28,35	14,84	26,01	21,22	2,68	18,53	10,07	0,47	21,33	5,19	4,73	0,07	26,65	85,97
A2	8-50	10YR 6/6	8,79	22,49	11,80	21,86	35,07	0,80	2,26	0,78	0,03	23,47	4,39	3,71	0,00	3,83	7,52
Bt	50-80	7.5YR 4/6	9,81	27,10	13,81	23,90	25,38	1,41	2,61	0,62	0,04	16,09	5,36	4,37	0,00	-	-
BtC	80-95	10YR 5/6	6,96	21,42	10,80	22,63	38,19	1,43	1,95	0,35	0,04	8,87	7,09	6,25	0,73	-	-
C	95-125	7.5YR 5/4	4,93	18,36	8,93	14,55	53,24	0,63	1,02	0,47	0,03	15,08	7,92	7,66	31,83	-	-

Gor_2020

Soil type :	***Référentiel Pédologique (RP),*** Brunisol dystrique bathycarbonaté, issu de moraine mixte, à Dysmull macrostructuré **Classification française des sols (CPCS),** Sol brun acide **World Reference Base (WRB),** Dysmull on Dystric Cambisol (Loamic)
Observer-s :	GT& RT
Date :	22.09.2020

Locality	La Grande-Béroche	**Altitude [m]:**	838
Municipality & canton :	Gorgier, NE	**Slope (°) :**	2°
Coordinates (CH1903) :	548619 196886	**Exposition :**	Northwest
Habitat type :	Forest	**Humus form :**	Dysmull
Geological substrate :	Rhodanian moraine (till)		
Vegetation type :	Luzulo-Fagenion		
Remarks :	Ground profile at the edge of a forest road, difficult access terrain (slope to climb to reach the GPS point).		



Soil profile description

OLv-[OLn] : +4 to 0 cm depth, Transition clear <2cm / Litter composed of fir (*Abies alba*) and beech (*Fagus sylvatica*), past year leaves

OF : 0 to 3 cm depth, Transition clear <2cm / fragmented leaves of fir (*Abies alba*) and beech (*Fagus sylvatica*), presence of mycelium

A1 : 3 to 5-7 cm depth, Transition distinct 2-4cm / General color greyish-beige / Munsell Color 10YR 5/4 / Skeleton 1 Mineral 2 Plant 3 Animal / General structure constructed / Structure lumpy / Texture loamy-sandy / Porosity Very porous >40% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 5 / Root size fine 0-2mm, mid-size 2-5mm & big >5mm / Compactness soft / Adhesiveness non-sticky / Notes: Composed of 5% non-calcareous gravel, presence of calcareous and crystalline pebbles of 5-10cm distributed all along the profile

A2 : 5-7 to 20 cm depth, Transition distinct 2-4cm / General color greyish-beige / Munsell Color 10YR 6/4 / Skeleton 1 Mineral 2 Plant 3 Animal / General structure constructed / Structure lumpy & sub-polyhedral / Texture loamy-sandy / Porosity porous 15-40% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 4 / Root size mid-size 2-5mm,fine 0-2mm & big >5mm / Compactness not very compact / Adhesiveness non-sticky / Notes: Composed of 10% non-calcareous gravel and pebbles

S1 : 20 to 40 cm depth, Transition clear <2cm / General color beige / Munsell Color 10YR 5/6 / Skeleton 1 Mineral / General structure constructed / Structure sub-polyhedral / Texture loamy-sandy / Porosity moderately porous 5-15% / pH Hellige 4.5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 1 / Root size big >5mm & mid-size 2-5mm / Compactness compact / Adhesiveness non-sticky / Notes: Composed of 10% non-calcareous gravel and pebbles

S2 : 40 to 85 cm depth, Transition very clear / General color ochre / Munsell Color 10YR 5/6 / Skeleton 1 Mineral / General structure constructed / Structure polyhedral / Texture loamy-sandy / Porosity moderately porous 5-15% / pH Hellige 4.5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 1 / Root size big >5mm & mid-size 2-5mm / Compactness very compact / Adhesiveness non-sticky / Notes: Composed of 20% of non-calcareous gravel and pebbles, from 56cm of depth presence of angular limestone pebbles.

Cca : 85+ cm depth / General color grey / Munsell Color 2,5YR 7/4 / Skeleton 1 Mineral / General structure particular & constructed / Structure particular & polyhedral / Texture sandy-loamy / Porosity slightly porous 2-5% / pH Hellige 7.5 / HCl 6M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 0 / Compactness very compact / Adhesiveness non-sticky / Notes: Composed of 30% of non-calcareous gravel and pebbles

[M] : 86 to 90 cm depth, General color ochre / Munsell Color 10YR 5/6 / Skeleton 1 Mineral / General structure particular / Texture loamy-sandy / Porosity non porous <2% / pH Hellige 4.5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 0 / Compactness very compact / Adhesiveness non-sticky / Notes: Composed of 30% of non-calcareous gravel and pebbles

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) macrostructured Dysmull
Observer -s :	GT & RT
Date :	22.09.2020

Locality	La Grande-Béroche	**Altitude [m]:**	838
Municipality & canton :	Gorgier, NE	**Slope (°) :**	2°
Coordinates (CH1903) :	548619 196886	**Exposition :**	Northwest
Habitat type :	Forest		
Geological substrate :	Rhodanian moraine (till)		
Vegetation type :	Luzulo-Fagenion		
Remarks :	Ground profile at the edge of a forest road, difficult access (slope to climb to reach the GPS point).		

Humus form description

OLv-[OLv] : +4 to 0 cm depth, Litter composed of fir (*Abies alba*) and beech (*Fagus sylvatica*), past year leaves / Litter transformation absent / Litter fragmentation fragmented leaves / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition clear <2cm / Notes: none

OFzo : 0 to 3 cm depth, fragmented leaves of past year / Litter transformation bleached leaves / Litter fragmentation atomized & fragmented leaves / Cohesion coherent / OM content plant material / Percentage of fine OM < 30 % / Presence of mycelium present / Presence roots absent / Transition clear <2cm / Notes: none

Ama : 3 to 5-7 cm depth, OM content not very humiferous / HCl 6M (1 to 4reaction) 0 / Texture sandy-loamy / Coarse elements yes, 5% of calcareous and crystalline gravel + pebbles / Structure lumpy / Aggregates size 2-5mm / Level of aggregation poorly aggregated / Aggregate stability unsTable S / Root abundance (0 to 5) 5 / Transition clear <2cm / Limit (>A horizon) regular / Note : macrostructured

Table S1. 45. Gor_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	3-5/7	10YR 5/4	9,59	25,80	12,88	25,23	26,51	1,58	6,95	3,34	0,18	18,42	4,38	3,45	0,00	7,70	4,48
A2	5/7-20	10YR 6/4	9,07	24,32	13,69	25,48	27,45	1,26	4,22	2,33	0,11	22,15	4,64	3,56	0,00	5,35	3,23
S1	20-40	10YR 5/6	8,74	23,77	13,76	26,14	27,58	1,44	2,55	0,76	0,07	11,56	4,47	3,70	0,00	-	-
S2	40-85	10YR 5/6	7,96	23,33	13,32	26,06	29,34	1,22	2,21	0,45	0,04	12,08	5,31	4,20	0,00	-	-
Cca	85+	2,5YR 7/4	7,49	24,66	13,54	25,76	28,55	0,74	1,13	0,43	0,03	16,87	8,10	7,62	35,34	-	-
[M]	86-90	10YR 5/6	8,41	27,53	14,02	25,21	24,83	1,39	2,31	0,88	0,05	17,20	7,60	7,12	4,27	-	-

Vegetation survey

Table S1. 46. Gor_2020 vegetation survey, Gorgier (NE). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Luzulo-Fagenion alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1984) corresponded to a Luzulo-Fagetum.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**5**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**30**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**15**	1 à 5 %	1
Grass cover [%]	**5**	5 à 25 %	2
Moss and lichen cover [%]	**2**	5-15 %	2a
Litter cover [%]	**78**	15-25 %	2b
Rock and stone cover [%]	**-**	25 à 50 %	3
Bare ground cover [%]	**-**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Fagus sylvatica	A	4	
Picea abies	A	2	
Fagus sylvatica	B	3	
Fagus sylvatica	H	4	
Pteridium aquilinum	H	2a	
Oxalis acetosella	H	1	
Carex sylvatica	H	1	
Hedera helix	H	+	
Vaccinium myrtillus	H	+	
Luzula sp.	H	2a	

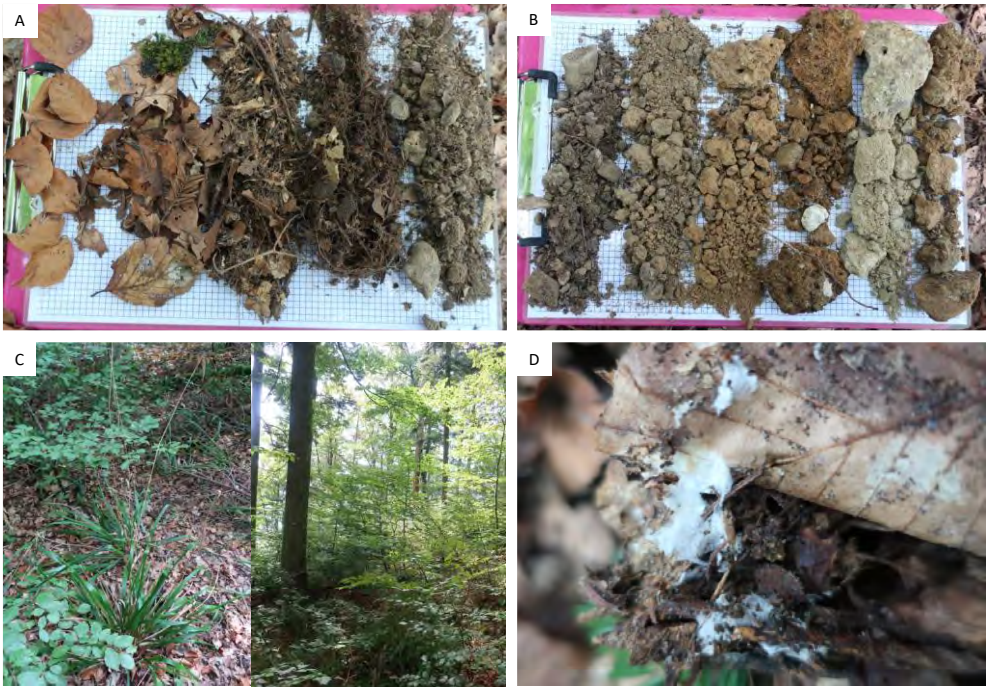


Figure S1. 26. Gor_2020 pictures taken in 2020 around the soil profile. Horizon's sequence of topsoil A. Horizons sequence of subsoil B. Vegetation type C. Mycelium present in the litter D. © RT

Gou

Soil type :	***Référentiel Pédologique (RP),*** Calcisol pachique issu de lehm d'altération **Classification française des sols (CPCS),** Sol brun calcique **World Reference Base for Soil Ressources 2022 (WRB),** Cambisol
Observer-s :	JMG
Date of archiving:	09.04.1986

Locality	Le Theusseret, Goumois	**Altitude [m]:**	612,6
Municipality & canton :	Goumois, Jura	**Humus form :**	Mull
Coordinates (CH1903) :	563511 233862	**LSS JMG publi n°**	122
Habitat type :	Mesic grassland		
Geological substrate :	Alteration silts and colluviums, mixed with scree		
Vegetation type :	Cynosurion		
Title :	Field notebook n°122		
Authors :	Gobat, J.-M.		
Publication :	Field notebook (54)		

Soil profile description

L : 1 to 0 cm depth, grass litter.

A1 : 0 to 30 cm depth, brown, no pebbles, lumpy-polyhedral structure. Average porosity. Silty-clay texture. Micros well visible. Fine and medium roots (of a spruce), hair 3/5.

(B): 30 to 80 cm depth, polyhedral structure, fine, compacted. Silty texture. Light brown to ochre. Very homogeneous. A limestone pebble of 5cm in diameter. No reaction to HCl. Earthworms at 70cm. Fine roots 1/5.

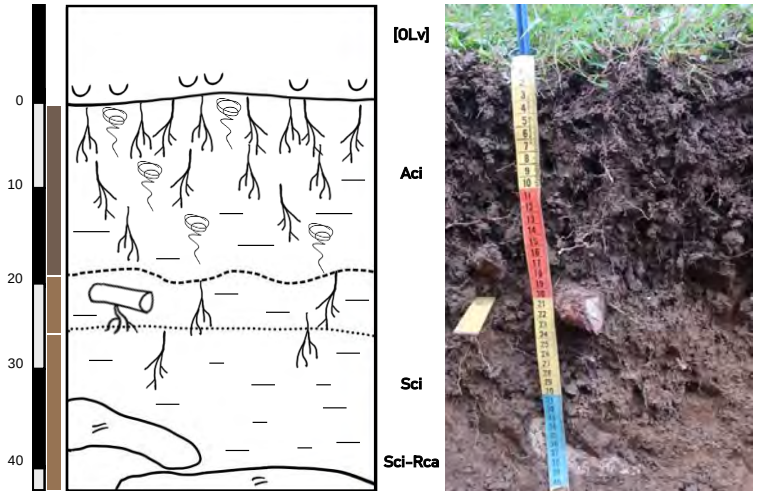
Table S1. 47. Gou physico-chemical analysis done on at the University of Neuchâtel on archived soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	0-25	10YR 5/3	15,22	50,60	25,15	7,93	0,03	3,16	9,56	3,29	0,35	9,28	4,82	4,15	0,04	18,75	21,52
A1(B)	25-60	10YR 6/4	16,20	51,55	25,50	5,91	0,11	2,93	6,97	1,85	0,19	9,59	4,7	4,21	0,06	19,77	20,02
(B)	60-80	10YR 6/4	16,88	53,42	25,14	4,54	0,34	2,59	6,37	1,68	0,17	9,63	5,23	4,36	0,00	-	-

Gou_2020

Soil type :	***Référentiel Pédologique (RP),*** Calcisol leptique, oligosaturé, sur Dalle calcaire, à Eumull macrostructuré **Classification française des sols (CPCS),** Sol brun calcique **World Reference Base (WRB),** Eumull on Eutric Leptic Cambisol
Observer-s :	GT& RT
Date :	13.09.2020

Locality	Le Theusseret, Goumois	**Altitude [m]:**	612,5
Municipality & canton :	Goumois, JU	**Slope (°) :**	6°
Coordinates (CH1903) :	563463 233844	**Exposition :**	North
Habitat type :	grazed meadow	**Humus form :**	Eumull
Geological substrate :	Alteration silts and colluviums, mixed with scree		
Vegetation type :	Cynosurion		
Remarks :	Site in a field recently grazed by cows, thin soil, presence of many large earthworms on the first 5 cm of depth.		



Soil profile description

[OLv] : 2 to 0 cm depth, Transition very clear

Aci : 0 to 19 cm depth, Transition distinct 2-4cm / General color dark brown / Munsell Color 10YR 4/2 / Skeleton 1 Plant 2 Animal / General structure lumpy & sub-polyhedral / Texture loamy-clay / Porosity moderately porous 5-15% / pH Hellige 5 / HCl M (1 to 4 reaction) 0 / Stains coal stains / Root abundance (0 to 5) 4 / Root size fine 0-2mm, mid-size 2-5mm & big >5mm / Compactness not very compact / Adhesiveness sticky / Notes: presence of mycelium up to 19 cm of depth, large earthworms up to 40 cm

Sci : 19 to 24 cm depth, Transition clear <2cm / General color ochre brown / Munsell Color 10YR 5/4 / Skeleton 1 Mineral 2 Animal / General structure lumpy & sub-polyhedral / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains coal stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm / Compactness not very compact / Adhesiveness non-sticky / Notes: lots of bioturbation, solid aggregates

Sci-Rca : 24 to x cm depth, Transition diffuse >8cm / General color light brown / Munsell Color - / Skeleton 1 Mineral 2 Animal / General structure lumpy & sub-polyhedral / Texture loamy-sandy / Porosity moderately porous 5-15% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm / Compactness not very compact / Adhesiveness not very sticky / Notes: lighter colored aggregate, very solid polyhedral and hydrophobic, see picture.

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) macrostructured Eumull
Observer-s :	GT& RT
Date :	13.09.2020

Locality	Le Theusseret, Goumois	**Altitude [m]:**	612,5
Municipality & canton :	Goumois, JU	**Slope (°) :**	6°
Coordinates (CH1903) :	563463 233844	**Exposition :**	North
Habitat type :	grazed meadow		
Geological substrate :	Alteration silts and colluviums, mixed with scree		
Vegetation type :	Cynosurion		
Remarks :	Site in a field recently grazed by cows, thin soil, presence of many large earthworms on the first 5 cm of depth.		

Humus form description

[OLn] : +2 to 0 cm depth, Leaves of the year still attached on the plants / Litter transformation absent / Litter fragmentation absent / Cohesion absent / OM content feces and plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition very clear / Notes: none

Ama: 0 to 19 cm depth, OM content humiferous / HCl 6M (1 to 4reaction) 0 / Texture loamy-clay / Coarse elements none / Structure lumpy / Aggregates size 5 to 20 mm / Level of aggregation highly aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 4 / Transition very clear / Limit (>A horizon) regular / Note: anthropic & macrostructured

Table S1. 48. Gou_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Aci	0-19	10YR 4/2	14,89	49,86	26,77	7,56	0,91	2,94	10,92	4,57	0,41	11,23	5,08	4,40	0,00	20,68	54,57
Sci	19-24	10YR 5/4	15,50	49,65	27,00	7,39	0,46	2,77	7,58	2,24	0,24	9,16	5,55	4,75	0,00	25,62	42,10

Vegetation survey

Table S1. 49. Gou_2020 vegetation survey, Le Theusseret (BE). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Cynosurion alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1986) corresponded to a Cynosurion.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	-	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	-	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	-	1 à 5 %	1
Grass cover [%]	**100**	5 à 25 %	2
Moss and lichen cover [%]	-	5-15 %	2a
Litter cover[%]	-	15-25 %	2b
Rock and stone cover [%]	-	25 à 50 %	3
Bare ground cover [%]	-	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [S], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
NA	NA	NA	

Figure S1. 27. Gou_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. Soil profile localization looking South-West B. Topsoil layer described as Eumull C. Sub-polyhedral structure visible in big soil aggregates D. © RT

Nav

Soil type :	***Référentiel Pédologique (RP),*** Calcisol colluvial issu de calcschistes **Classification française des sols (CPCS),** Sol brun calcique **World Reference Base for Soil Ressources 2022 (WRB),** Cambisol
Observer-s :	JMG
Date of archiving:	13.07.1988

Locality	Roche de Nava, Tsahèlett	**Altitude [m]:**	2700
Municipality & canton :	Anniviers, Valais	**Humus form :**	Mull
Coordinates (CH1903) :	615099 115159	**LSS JMG publi n°**	122
Habitat type :	Alpine grassland		
Geological substrate :	Dolomites and banded marbles		
Vegetation type :	Elynetum		
Title :	Field notebook (122)		
Authors :	Gobat, J.-M.		
Publication :	Field notebook (100)		

Soil profile description

A1 : 0-4 to 20 cm depth, pH 5, HCl limit at about 15cm, effervescence 3/5 down (not more)

B : 4/20 to 43 cm depth, pH 6,5

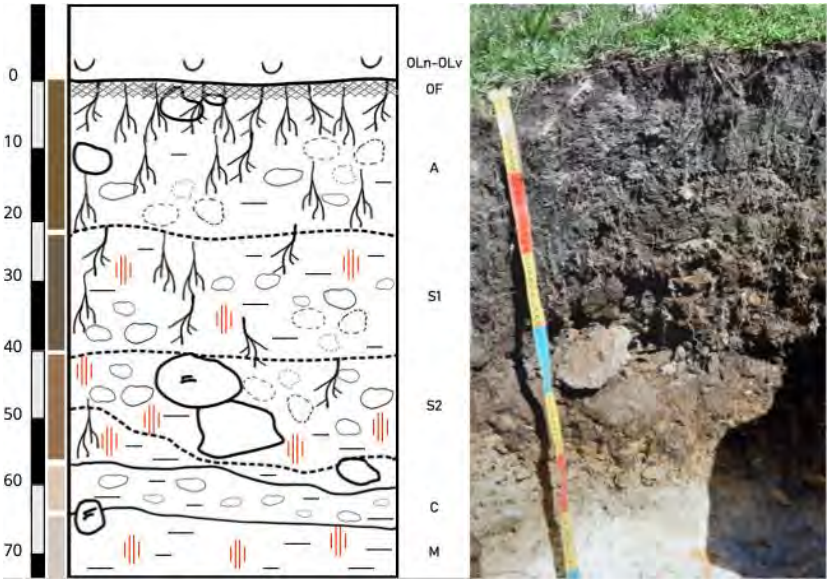
(B)C: 43 to 80 cm depth, pH 7

Table S1. 50.. Nav physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	4-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(B)	10-43	2,5Y 5/3	5,87	33,12	12,83	10,37	37,81	1,54	4,56	1,87	0,23	8,14	7,03	6,52	0,00	13,69	19,03
(B)C	43-80	2,5Y 4/3	4,10	30,09	15,27	19,25	31,29	1,01	2,27	0,96	0,14	6,97	7,49	7,25	0,00	8,60	_

Soil type :	***Référentiel Pédologique (RP),*** Brunisol à calcschistes, à horizons de profondeur gypseux, à Dysmull mésostructuré ***Classification française des sols (CPCS),*** Rendzine dolomitique colluvial à gypse **World Reference Base (WRB),** Dysmull on Dolomitic Gypsic Cambisol (colluvial)
Observer-s :	NP& RT
Date :	6.08.2020

Locality	Roche de Nava, Tsahèlett	**Altitude [m]:**	2697
Municipality & canton :	Anniviers, VS	**Slope (°) :**	11°
Coordinates (CH1903) :	615108 115154	**Exposition :**	Est
Habitat type :	alpine lawn	**Humus form :**	Dysmull
Geological substrate :	dolomites and banded marbles		
Vegetation type :	Seslerietalia variae		
Remarks :	Very heterogeneous environment with outcrop and scree, site at the edge of the S-E slope. red, brown, green and gray grasshoppers.		



Soil profile description

OLn-OLv : +0.5 to 0 cm depth, Transition very clear /

OF : 0 to 1 cm depth, Transition clear <2cm /

A : 1 to 21 cm depth, Transition clear <2cm / General color brown & grey mixed / Munsell Color 2,5Y 4/2 / Skeleton 1 Mineral 2 Plant / General structure lumpy / Texture sandy-loamy / Porosity

moderately porous 5-15% / pH Hellige 4.5 / HCl M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 2 / Root size fine 0-2mm & mid-size 2-5mm / Compactness not very compact / Adhesiveness non-sticky / Notes: little humid, felted aggregates due to the alteration of the blue schist, rust stains on the other schists, fine branched roots, grey-green and light grey aggregates

S 1 : 21 to 41 cm depth, Transition gradual 4-8cm / General color ochre brown / Munsell Color 2,5Y 4/4 / Skeleton 1 Mineral 3 Plant / General structure sub-polyhedral / Texture loamy-sandy / Porosity moderately porous 5-15% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm & mid-size 2-5mm / Compactness not very compact / Adhesiveness not very sticky / Notes:

S 2 : 41 to 56 cm depth, Transition distinct 2-4cm / General color mixed colors / Munsell Color 10YR 5/4 / Skeleton 1 Mineral 3 Plant / General structure sub-polyhedral / Texture loamy-sandy / Porosity moderately porous 5-15% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 0.5 / Root size mid-size 2-5mm / Compactness not very compact / Adhesiveness sticky / Notes: humid horizon, marked and varied colors in spots

C : 56 to 64 cm depth, Transition clear <2cm / General color beige / Munsell Color 2,5Y 9,5/2 / Skeleton 1 Mineral / General structure particular / Texture loamy-sandy / Porosity slightly porous 2-5% / pH Hellige 6 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 0 / Compactness compact / Adhesiveness sticky / Notes: humid

M : 64+ cm depth, Transition clear <2cm / General color white / Munsell Color 10YR 9,5/1 / Skeleton 1 Mineral / General structure particular / Texture loamy-sandy / Porosity slightly porous 2-5% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 0 / Compactness soft / Adhesiveness non-sticky / Notes: humid

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) mesostructured Dysmull		
Observer-s :	NP& RT		
Date :	6.08.2020		
Locality	Roche de Nava, Tsahèlett	**Altitude [m]:**	2697
Municipality & canton :	Anniviers, VS	**Slope (°) :**	11°
Coordinates (CH1903) :	615108 115154	**Exposition :**	Est
Habitat type :	alpine lawn		
Geological substrate :	dolomites and banded marbles		
Vegetation type :	Seslerietalia variae		
Remarks :	Very heterogeneous environment with outcrop and scree, site at the edge of the S-E slope. red, brown, green and gray grasshoppers.		

Humus form description

OLn-OLv : +0.5 to 0 cm depth, leaves of the year and past year / Litter transformation absent / Litter fragmentation absent / Cohesion coherent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition very clear / Notes: none

OF : 0 to 1 cm depth, fragmented leaves of past year / Litter transformation absent / Litter fragmentation absente / Cohesion coherent / OM content plant material / Percentage of fine OM < 30 % / Presence of mycelium absent / Presence roots abondant / Transition very clear / Notes: none

A: 1 to 21 cm depth, OM content not very humiferous / HCl 6M (1 to 4reaction) 0 / Texture loamy-sandy / Coarse elements yes, blocks de 0.2 cm (5%) to >20 cm diameter (10%) / Structure sub-polyhedral / Aggregates size 5-20 mm / Level of aggregation moderately aggregated / Aggregate stability unsTable S / Root abundance (0 to 5) 0 / Transition clear <2cm / Limit (>A horizon) regular / Note: mesostructured

Table S1. 51. Nav_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A	1-21	2,5Y 4/2	5,98	35,97	19,69	21,68	16,68	1,43	5,27	1,06	0,27	3,91	5,40	4,29	0,00	6,80	2,70
S1	21-41	2,5Y 4/4	4,18	23,80	13,87	16,74	41,41	0,78	2,27	0,91	0,23	3,99	6,95	6,20	0,00	5,08	3,57
S2	41-56	10YR 5/4	4,41	36,42	20,27	20,32	18,60	0,75	1,19	0,47	0,07	7,16	7,56	6,62	0,00	6,09	-
C	56-64	2,5Y 9,5/2	2,70	19,45	16,18	19,13	42,42	0,12	0,13	0,08	0,02	4,37	7,59	6,43	0,00	0,92	-
M	64-x	10YR 9,5/1	10,80	36,37	20,05	17,39	15,39	0,28	0,18	0,07	0,00	-	7,14	6,04	0,00	1,40	-

Vegetation survey

Table S1. 52. Nav_2020 vegetation survey, Roche de Nava (VS). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Seslerietalia variae alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1988) corresponded to Elynetum.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**-**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**-**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**-**	1 à 5 %	1
Grass cover [%]	**58**	5 à 25 %	2
Moss and lichen cover [%]	**5**	5-15 %	2a
Litter cover [%]	**-**	15-25 %	2b
Rock and stone cover [%]	**35**	25 à 50 %	3
Bare ground cover [%]	**2**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Cerastium latifolium	H	1	
Gentiana bavarica	H	1	
Poa alpina	H	2b	
Erigeron uniflorus	H	1	
Erigeron neglectus	H	1	
Ligusticum mutellinoides	H	1	
Ligusticum mutellina	H	1	
Leontodon cf. helveticus	H	2a	
Lotus alpinus	H	2b	
Myosotis alpestris	H	2b	
Bartsia alpina	H	2a	
Viola calcarata	H	2a	
Galium uliginosum	H	1	
Cirsium acaule	H	r	
Senecio incanus subsb. incanus	H	2a	
Sempervivum montanum	H	r	
Poa laxa	H	2b	
Anthyllis vulneraria	H	1	
Knautia arvensis	H	2a	
Anthoxanthum alpinum	H	2a	

Helianthemum nummularium	H	r	
Achillea nana	H	r	
Aster alpinus	H	r	

Figure S1. 28. Nav_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. Altered schist stone B. Soil profile localization C. Grasshoppers very abundant on profile localization D. © RT

Po1

Soil type :	***Référentiel Pédologique (RP),*** Fluviosol Juvénile calcaire
	Classification française des sols (CPCS), Sol alluvial
	World Reference Base for Soil Ressources 2022 (WRB), Fluvisol (Calciaric)

Observer-s : JMG

Date of archiving: 08.05.1987

Locality	Possieux, Sarine	**Altitude [m]:**	576,9
Municipality & canton :	Posieux, FR	**Humus form :**	Mull
Coordinates (CH1903) :	575298 178777	**LSS JMG publi n°**	122
Habitat type :	Alluvial island		
Geological substrate :	Recent alluvium		
Vegetation type :	*Salicion elaeagni*		
Title :	Carnets de terrain		
Authors :	Gobat, J.-M.		
Publication :	Carnet JM 1984, 73		

Soil profile description

A1C : 6 to 25 cm depth – no other information

A2C: > 25 cm depth – no other information

Table S1. 53. 48bis Po1 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1C	6-25	2,5Y 6/2	1,83	6,35	6,24	37,65	47,94	0,48	1,95	1,14	0,08	13,46	7,62	7,41	34,40	7,24	3,17
A2C	25+	2,5Y 6/1	0,59	1,82	1,29	6,78	89,52	0,22	0,75	0,29	0,05	6,21	8,12	8,11	46,45	1,02	22,86

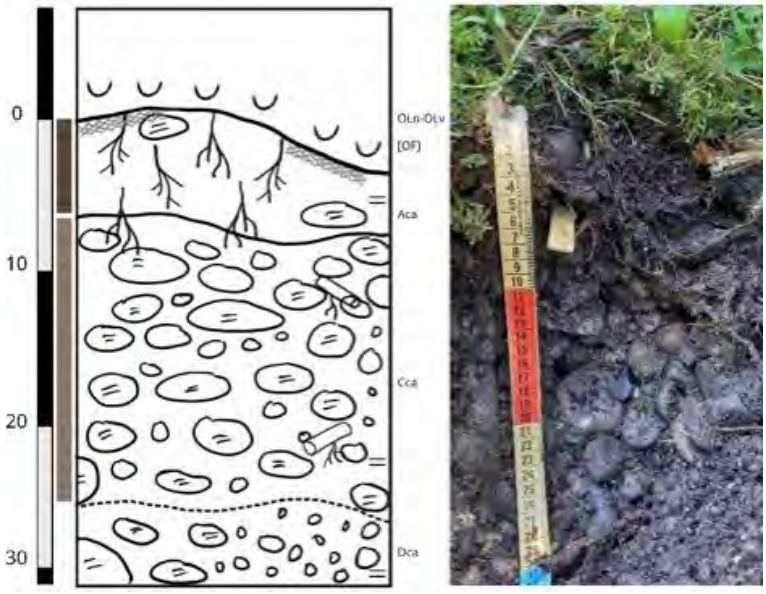
Po1_2020

Soil type :	***Référentiel Pédologique (RP),*** Fluviosol ttypique leptique, carbonaté, développé sur alluvions grossières, à Oligomull mésostructuré **Classification française des sols (CPCS),** Sol d'apport alluvial ***World Reference Base (WRB),*** Oligomull on Leptic Fluvisol

Observer-s : GA & RT

Date : 25.07.2020

Locality	Posieux, Sarine	**Altitude [m]:**	577
Municipality & canton :	Posieux, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	575320 178790	**Exposition :**	South-est
Habitat type :	alluvial island	**Humus form :**	Oligomull
Geological substrate :	Recent alluvium		
Vegetation type :	Salicetea purpureae		
Remarks :	Mosses on rocks, numerous fecal pellets, many small earthworms, ants and shells		



Soil profile description

OLn – OLv : +2 to 0 cm depth

[OF] : 0 to 0.5 cm depth

Aca : 0.5 to 6 cm depth, Transition clear <2cm / General color dark brown / Munsell Color 2,5Y 3/2 / Skeleton 1 Animal 1 Plant 2 Mineral / General structure particular / Texture sandy / Porosity Very porous >40% / pH Hellige 6 / HCl M (1 to 4 reaction) 3 / Stains no stains / Root abundance (0 to 5) 5 / Root size fine 0-2mm / Compactness soft / Adhesiveness not very sticky / Notes: -

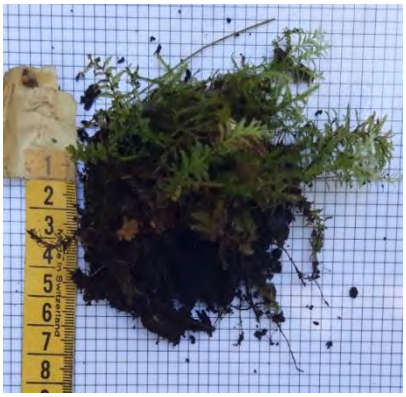
Cca : 6 to 26 cm depth, Transition distinct 2-4cm / General color grey yellow / Munsell Color 2,5Y 5/2 / Skeleton 1 Mineral 2 Plant / General structure particular / Texture sandy / Porosity moderately porous 5-15% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 3 / Stains no stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm / Compactness soft / Adhesiveness non-sticky / Notes: -

Dca : 26+ cm depth, Transition distinct 2-4cm / General color grey / Munsell Color 2,5Y 5/2 / Skeleton 1 Mineral / Porosity moderately porous 5-15% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 3 / Stains no stains / Compactness compact / Notes: -

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) mesostructured Oligomull
Observer-s :	GA& RT
Date :	25.07.2020

Locality	Posieux, Sarine	**Altitude [m]:**	577
Municipality & canton :	Posieux, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	575320 178790	**Exposition :**	South-est
Habitat type :	alluvial island		
Geological substrate :	Recent alluvium		
Vegetation type :	Salicetea purpureae		
Remarks :	Mosses on rocks, numerous fecal pellets, many small earthworms, ants and shells		



Humus form description
OLn-OLv : +2 to 0 cm depth, Litter composed of dead wood and divers leafs leaves of the year and last year / Litter transformation absent / Litter fragmentation absent & fragmented / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition very clear / Notes: none
[OFzo] : 0 to 0.5 cm depth, fragmented leaves of past year / Litter transformation absent / Litter fragmentation atomized leaves / Cohesion coherent / OM content mixed material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots present / Transition indeterminate / Notes: none
Ame: 0,5 to 6 cm depth, Transition clear <2cm/ General color dark brown / Munsell Color 2,5Y 3/2 / pH Hellige 6 / OM content humiferous / HCl 6M (1 to 4reaction) 3 / Texture sandy / Coarse elements yes, gravel 0.2-2cm / Structure lumpy / Aggregates size 2-5mm / Level of aggregation moderately aggregated / Aggregate stability unsTable S / Root abundance (0 to 5) 5 / Transition distinct 2-4cm / Limit (>A horizon) interrupted / Notes: mesotructured

Table S1. 54. Po1_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Aca	0.5 - 6	2,5Y 3/2	11,06	30,51	11,72	23,63	23,07	5,39	25,45	12,81	0,85	15,00	7,58	7,40	25,24	52,28	78,52
Cca	6 - 26	2,5Y 5/2	1,36	4,49	3,05	10,94	80,16	0,98	3,96	2,26	0,14	15,77	7,82	7,14	39,43	17,00	23,86

Vegetation survey

Table S1. 55. Po1_2020 vegetation survey, Posieux, Hauterive (FR). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Salicetea purpureae alliance was determined for this environment, according to the Guide des milieux naturels de Suisse: écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1987) corresponded to a collinean alluvial shrubby willows (Salicion elaeagni).

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**5**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**3**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**30**	1 à 5 %	1
Grass cover [%]	**50**	5 à 25 %	2
Moss and lichen cover [%]	**10**	5-15 %	2a
Litter cover [%]	**8**	15-25 %	2b
Rock and stone cover [%]	**2**	25 à 50 %	3
Bare ground cover [%]	**-**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Salix alba	A	5	
Cornus sanguinea	B	5	
Cornus sanguinea	H	3	
Rubus caesius	H	3	
Euonymus europaeus	H	1	
Knautia dipsacifolia	H	1	
Galium album	H	1	
Vicia cracca	H	1	
Lactuca muralis	H	r	
Brachypodium sylvaticum	H	1	

Figure S1. 29. Po1 pictures taken in 2020 around the soil profile. Horizon's sequence A. Vegetation on the site B. Young organo-mineral horizon with shells and grains of sand C. © RT

Po2

Soil type :	***Référentiel Pédologique (RP),*** Fluviosol Typique humifère carbonaté ***Classification française des sols (CPCS***), Sol alluvial **World Reference Base for Soil Ressources 2022 (WRB),** Fluvisol (Brunic, Calcaric)
Observer-s :	JMG
Date of archiving:	08.05.1987

Locality	Possieux, Sarine	**Altitude [m]:**	581
Municipality & canton :	Posieux, FR	**Humus form :**	Mull
Coordinates (CH1903) :	575358 178633	**LSS JMG publi n°**	122
Habitat type :	Alluvial island		
Geological substrate :	Recent alluvium		
Vegetation type :	*alluvial steppe with Pinus silvestris*		
Title :	Carnets de terrain		
Authors :	Gobat, J.-M.		
Publication :	Carnet JM 1984, 75		

*** NO PHOTO PROVIDED ***

Soil profile description
A1C : 4 to 15 cm depth – no other information
A2C: > 15 cm depth – no other information

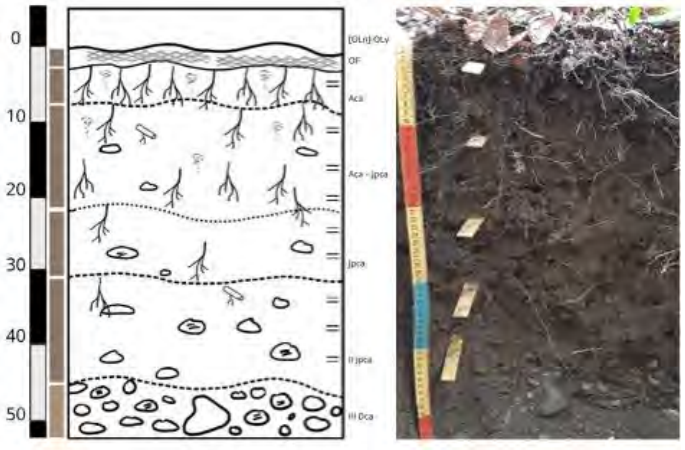
Table S1. 56. Po2 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1C	4-15	2,5Y 4/2	3,86	13,45	14,51	47,63	20,54	1,88	9,32	4,78	0,35	13,52	6,95	6,94	20,63	25,24	67,80
C	15+	2,5Y 6/2	1,45	4,96	3,94	37,00	52,66	0,46	1,55	1,01	0,07	14,41	7,48	7,46	27,14	6,76	6,57

Po2_2020

Soil type :	***Référentiel Pédologique (RP),*** Fluviosol typique carbonaté, polylithique, sur alluvions récents mixtes, à Dysmull mésostructuré **Classification française des sols (CPCS),** Sol d'apport alluvial ***World Reference Base (WRB),*** Dysmull on Fluvisol (alcalic)
Observer-s :	NP & RT
Date :	23.07.2020

Locality	Possieux, Sarine	**Altitude [m]:**	579
Municipality & canton :	Posieux, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	575370 178630	**Exposition :**	South-Est
Habitat type :	Forest border	**Humus form :**	Dysmull
Geological substrate :	Recent alluvium		
Vegetation type :	Galio-Fagenion		
Remarks :	forest edge, lots of human traffic, partial land clearing		



Soil profile description

[OLn] – OLv : +4 to 0 cm depth, Transition clear <2cm / beech leaves of the year

OF : 0 to 2/4 cm depth, Transition clear <2cm / fragmented leaves of beech

Aca : 2/4 to 6 cm depth, Transition distinct 2-4cm/ General color greyish brown / Munsell Color 2,5Y 5/2 / Skeleton 1 Plant 2 Mineral 3 Animal / General structure lumpy / Structure lumpy / Texture sandy / Porosity Very porous >40% / pH Hellige 6.5 / HCl M (1 to 4reaction) 3 / Stains no stains / Root abundance (0 to 5) 3 / Root size fine 0-2mm & mid-size 2-5mm/ Compactness not very compact / Adhesiveness not very sticky / Notes: healthy, moist roots and dead woods, very few pebbles

Aca – Jpca : 6 to 21 cm depth, Transition distinct 2-4cm / General color greyish brown / Munsell Color 2,5Y 5/2 / Skeleton 1 Plant 2 Mineral 3 Animal / General structure lumpy& sub-polyhedral / Structure lumpy / Texture sandy / Porosity Very porous >40% / pH Hellige 6.5 / HCl 6M (1 to 4reaction) 4 / Stains no stains / Root abundance (0 to 5) 2 / Root size fine 0-2mm & mid-size 2-5mm

/ Compactness not very compact / Adhesiveness not very sticky / Notes: increase of pebbles with depth of the profile and mixed pebbles

Jpca : 21 to 30 cm depth, Transition gradual 4-8cm / General color brownish grey / Munsell Color 2,5Y 5/2 / Skeleton 1 Plant 2 Mineral 3 Animal / General structure sub-polyhedral / Structure polyhedral / Texture sandy-loamy / Porosity porous 15-40% / pH Hellige 8 / HCl 6M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm, mid-size 2-5mm size & big >5mm / Compactness not very compact / Adhesiveness not very sticky / Notes: -

II Jpca : 30 to 44 cm depth, Transition distinct 2-4cm / General color brownish grey / Munsell Color 2,5Y 5/2 / Skeleton 1 Plant 2 Mineral 3 Animal / General structure sub-polyhedral / Structure polyhedral / Texture sandy-loamy / Porosity porous 15-40% / pH Hellige 8 / HCl 6M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm, mid-size 2-5mm size & big >5mm / Compactness not very compact / Adhesiveness not very sticky / Notes: -

III Dca : 44+ cm depth, Transition distinct 2-4cm/ General color brownish grey / Munsell Color 2,5Y 6/3 / Skeleton 1 Mineral / General structure sub-polyhedral / Structure polyhedral / Texture sandy / Porosity moderately porous 5-15% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 0 / Root size fine 0-2mm / Compactness compact / Adhesiveness not very sticky / Notes: -

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) mesostructured Dysmull		
Observer-s :	NP & RT		
Date :	23.07.2020		
Locality	Posieux, Sarine	**Altitude [m]:**	579
Municipality & canton :	Posieux, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	575370 178630	**Exposition :**	South-Est
Habitat type :	Forest border		
Geological substrate :	Recent alluvium		
Vegetation type :	Galio-Fagenion		
Remarks :	forest edge, lots of human traffic, partial land clearing		

Humus form description

[OLn] – OLv : +4 to 0 cm depth, Litter composed of beech leaves of the year and last year / Litter transformation bleached leaves / Litter fragmentation absent & fragmented / Cohesion absent / OM content plant material & feces / Percentage of fine OM 0 % / Presence of mycelium present / Presence roots absent / Transition indeterminate / Notes: none

OFzo : 0 to 2/4 cm depth, fragmented leaves of past year / Litter transformation bleached leaves / Litter fragmentation fragmented leaves / Cohesion coherent / OM content mixed material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots present / Transition diffuse >8cm / Notes: none

Ame: 2/4 to 6 cm depth, OM content not very humiferous / HCl 6M (1 to 4reaction) 4 / Texture sandy / Coarse elements none / Structure lumpy / Aggregates size 5-10mm / Level of aggregation poorly aggregated / Aggregate stability unstable / Root abundance (0 to 5) 4 / Transition clear <2cm / Limit (>A horizon) young, wavy & mesostructured

Table S1. 57. Physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Aca	2/4 to 6	2,5Y 5/2	4,11	12,97	7,64	33,46	41,81	1,21	4,27	2,02	0,17	11,84	7,95	7,41	35,57	22,51	43,97
Aca – Jpca	6 to 21	2,5Y 5/2	1,12	3,30	2,51	18,56	74,50	0,63	1,72	0,89	0,07	12,60	8,24	7,57	45,96	7,55	5,20
Jpca	21 to 30	2,5Y 5/2	3,69	11,54	6,63	32,45	45,69	0,66	1,50	0,85	0,06	13,84	8,27	7,54	48,09	6,72	_
II Jpca	30 to 44	2,5Y 5/2	2,28	6,98	3,81	20,76	66,17	0,51	1,15	0,59	0,05	11,98	8,44	7,83	51,75	4,87	_
III Dca	44+	2,5Y 6/3	0,86	2,30	1,07	4,92	90,85	0,29	0,44	0,29	0,02	19,43	8,68	8,19	59,29	1,95	_

Vegetation survey

Table S1. 58. Po2_2020 vegetation survey, Posieux (FR). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Galio-Fagenion alliance was determined for this environment, according to the Guide des milieux naturels de Suisse: écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1987) corresponded to an alluvial steppe with Pinus silvestris.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**10**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**30**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**4**	1 à 5 %	1
Grass cover [%]	**50**	5 à 25 %	2
Moss and lichen cover [%]	**2**	5-15 %	2a
Litter cover [%]	**33**	15-25 %	2b
Rock and stone cover [%]	**0**	25 à 50 %	3
Bare ground cover [%]	**1**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Fagus sylvatica	A	5	
Albies alba	A	2b	
Fagus sylvatica	B	5	
Crataegus monogyna	B	r	
Acer pseudoplatanus	B	r	
Cornus sp.	B	r	
Corylus avellana	H	+	
Hedera helix	H	2a	
Rubus sp. aggr.	H	1	
Fagus sylvatica	H	2a	
Crataegus monogyna	H	r	
Quercus pubescens petraea	H	r	
Cirsium vulgare	H	1	
Stachys sylvatica	H	1	
Frangula alnus	H	r	
Gallium album	H	r	
Carex sp.	H	2a	
Solidago gigantea	H	1	

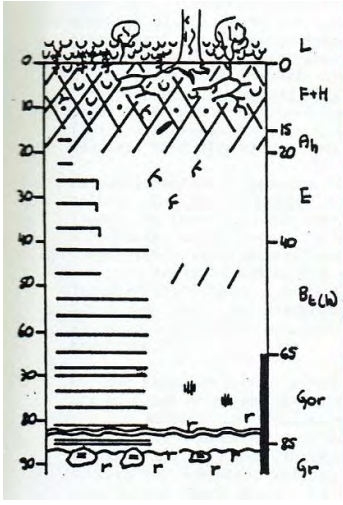
Eupatorium cannabinum	H	2a	
Cornus sp.	H	1	
Pinus sylvestris	H	1	
Carex flacca	H	1	
Inula conyzae	H	1	
Bromus sp.	H	1	
Viola sp.	H	1	
Hypericum perforatum	H	1	
Medicago lupulina	H	1	
Oenothera biennis aggr.	H	r	
Galeopsis tetrahit	H	r	
Aconitum lycoctonum vulparia	H	1	
Euphorbia dulcis	H	r	
Convallaria majalis	H	2a	
Ulmus glabra	H	+	
Polygonatum multiflorum	H	r	
Albies alba	H	1	
Salix caprea	H	r	
Plantago major	H	r	
Clematis vitalba	H	r	
Lonicera xylosteum	H	+	

Figure S1. 30. Po2_2020 pictures taken in 2020 around the soil profile. Horizon's sequence of the topsoil A. Horizon's sequence of the subsoil B. View from the soil profile looking East C. © RT

Pon

Soil type :	***Référentiel Pédologique (RP),*** Podzosol Meuble réductique bathycarbonaté **Classification française des sols (CPCS),** Sol podzolique sur gley **World Reference Base for Soil Ressources 2022 (WRB),** Podzol (Calcaric)
Observer-s :	JMG / SSP
Date of archiving:	04.09.1984

Locality	Les Pontins	**Altitude [m]:**	1098,9 m
Municipality & canton :	Les Pontins, Bern	**Humus form :**	Mor
Coordinates (CH1903) :	565935, 219629	**LSS JMG publi n°**	20, 122
Habitat type :	Pine forest		
Geological substrate :	Slope scree, Dry cones		
Vegetation type :	Sphagno-Piceetum blechnetosum		
Title :	- Organic soils (20) - Field notebook (122) - Les dessous du Sphagno-piceetum blechnetosum dans le Jura		
Authors :	Swiss pedological society (20), Gaelle Vadi		
Publication :	Excrusion guide SSP 31.8.-1.9.1984 (20), 1984 Diploma thesis in biology, 1997		



Soil profile description

L : 5 to 0 cm depth, litter of undecomposed spruce needles, with live sphagnum mosses. Fairly loose structure.

F+H : 0 to 15 cm depth, very loose, fairly dry, brown fermentation (upper) and humification (lower) horizon. Formed of dead sphagnum moss mixed with twigs. Remains clearly recognizable. Roots.

A1 : 15 to 20 cm depth, organo-mineral silty-sandy horizon, forming small lumps. Gray-brown color. Contact between humus-bearing horizons and leached horizons. Clear boundary. Roots.
A2: 20 to 40 cm depth, yellowish-brown-beige eluvial horizon with compacted particulate structure. Silty texture, becoming slightly clayey at the bottom of the horizon. Some plant remains in the upper part. Diffuse boundary.
Bs: 40 to 65 cm depth, yellow clay-silt horizon with brown (fragmentary B?) and grey patches. Compact structure. Decarbonated.
Btg: 65 to 85 cm depth, top of the gley horizon, alternating dry and wet (variations in the water Table S). clay texture, sticky molten structure, impermeable. Mixed yellow-red-greenish-gray colors. Appearance of carbonates at 82cm
Gr: 65 to X cm depth, reduced carbonate gley horizon, permanently bathed by water flowing down the limestone slope. Very clayey, with a few limestone pebbles embedded in the clay.

Table S1. 59. Pon physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

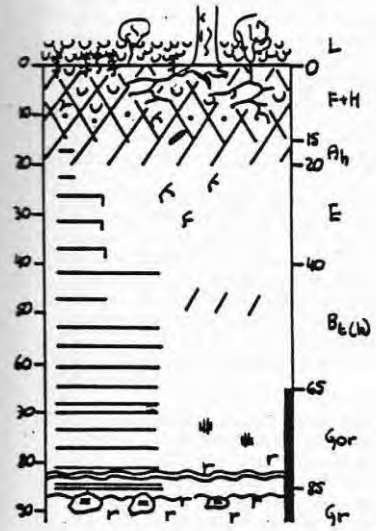
Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
F+H	0-6	7,5YR	10,635	41,316	28,266	19,699	0,085	2,52	12,38	28,42	1,22	23,32	3,28	2,61	0,00	11,51	4,40
Ah	6-15	10YR 6/4	11,244	41,791	29,070	17,879	0,016	1,62	4,85	5,62	0,35	15,95	3,94	3,12	0,00	5,90	0,88
E	20-30	10YR 6/6	12,260	40,635	28,687	18,325	0,094	1,86	2,99	1,90	0,12	16,05	5,56	4,41	0,00	-	-
Bt(h)	40-50	10YR 6/8	-	-	-	-	-	2,36	3,35	0,65	0,06	10,12	7,23	4,07	0,00	-	-
Gor	65-80	2,5Y 8/4	25,701	56,757	13,364	4,115	0,063	2,36	3,01	0,49	0,04	11,74	7,98	7,12	26,60	-	-
Gr	80-85	2,5Y 7/3	33,391	57,900	7,377	1,243	2,575	1,52	2,36	0,35	0,03	10,58	8,09	7,32	53,76	-	-

SOL PODZOLIQUE A MOR SUR GLEY CARBONATE (prov.) 59

=LSS 263

Lieu: Bordure S de la tourbière des Pontins, sur Saint-Imier
Végétation: Forêt d'épicéas à sphaignes (Sphagno-Piceetum blechnetosum), avec Picea abies, Sorbus aucuparia, Blechnum spicant, Vaccinium myrtillus, Sphagnum girgensohnii, S. acutifolium
Topographie: Bande étroite au bas d'une pente calcaire.
Géologie: Matériel allochtone (?) sur marno-calcaires de l'Oxfordien, mêlés de colluvium (éboulis) du Séquanien.

PROFIL



Description du profil

L : +5-0cm : Litière d'aiguilles d'épicéas non décomposées, mêlées aux sphaignes vivantes. Structure assez lâche.

F+H : 0-15cm : Horizon de fermentation (sup.) et d'humification (inf.) très lâche, assez sec, brun. Formé de sphaignes mortes mêlées de brindilles. Restes bien reconnaissables. Racines.

Ah : 15-20cm : Horizon organo-minéral limono-sableux, formant de petits grumeaux. Couleur brun-gris. Contact entre les horizons humifères et les lessivés. Limite nette. Racines.

E : 20-40cm : Horizon éluvial brun-jaunâtre-beige, de structure particulaire tassée (tassement compacte!). Texture limoneuse, devenant légèrement argileuse dans le bas de l'horizon. Quelques restes de végétaux dans la partie supérieure. Limite diffuse.

Bt(h) : 40-65cm : Horizon de texture argilo-limoneuse, de couleur jaune, avec taches brunes (Bt fragmentaire ?) et grises. Structure compacte. Décarbonaté.

Gor : 65-85cm : Haut de l'horizon de gley, à alternance sec-humide (variations de la nappe). Texture argileuse, structure fondue collante, imperméable. Couleurs mélangées jaune-rouge-gris verdâtre. Apparition des carbonates à 82cm.

Gr : dès 85cm: Horizon de gley carbonaté réduit, baigné en permanence par l'eau s'écoulant de la pente calcaire. Très argileux, avec quelques cailloux calcaires pris dans l'argile.

Niveaux de la nappe phréatique: moyen: -89cm
maximal: -70cm
minimal: -120cm

Conductivité de l'eau phréatique: 348 micro-ohms

Remarques: - Ce profil complexe présente deux systèmes hydrologiques:
* Une imbibition d'eau acide (précipitations) dans les horizons organiques, qui suffit à la croissance des sphaignes.
* Un apport d'eau calcaire de la pente voisine, en profondeur, mais qui ne concerne pas la végétation en place, isolée de cette eau par les épais horizons Z et B.
- La podzolisation devrait être confirmée par des analyses de la migration du fer et des composés organiques.

ANALYSES PHYSICO-CHIMIQUES

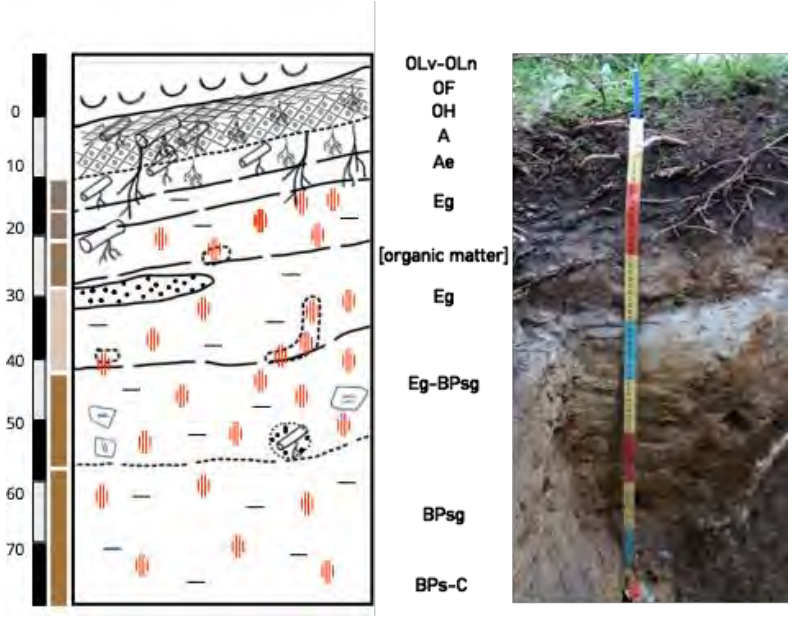
Ech.	Prof. (cm)	Horiz.	Humid. (%)	Perte feu %	pH H20	Eléments échangeables (mé/100g)					Eléments mob.		Azote tot.%	C org. (%)	C/N
						Ca	Mg	K	Na	S	Fe	Al			
514	0-6cm	F	79,4	85,7	4,3	14,0	2,5	3,3	0,3	20,1	34,1	99,9	1,12	44,6	40
515	6-15cm	F+H	77,3	74,0	3,2	16,7	2,1	0,6	0,3	19,7	13,2	45,4	1,30	38,5	30
516	20-30cm	E	26,3	4,9	3,4	0,7	0,2	0,1	t	1,0	90,4	268,5	0,16	t	—
517	40-50cm	$B_{t(h)}$	25,7	3,1	4,2	1,1	0,2	0,1	t	1,4	124,7	350,1	0,08	t	—
517b	65-80cm	G_{or}	29,2	1,8	4,9	3,1	0,3	0,1	t	3,5	—	—	—	—	—
517c	80-85cm	G_r	24,7	1,0	6,2	—	0,4	0,1	t	—	—	—	—	—	—

Figure S1. 31. Pon scan from thesis " Les dessous du Sphagno-piceetum blechnetosum dans le Jura ", Gaelle Vadi, 1997

Pon_2020

Soil type :	***Référentiel Pédologique (RP),*** Podzosol meuble rédoxique, bathycarbonaté, issu de loess, à Dysmoder microstructuré **Classification française des sols (CPCS),** Sol podzolique sur gley ***World Reference Base (WRB),*** Dysmoder on Albic Stagnic Podzol
Observer-s :	GA, GG& RT
Date :	08.09.2020

Locality	Les Pontins	**Altitude [m]:**	1095
Municipality & canton :	Les Pontins, BE	**Slope (°) :**	2°
Coordinates (CH1903) :	565942 219653	**Exposition :**	South
Habitat type :	Forest	**Humus form :**	Dysmoder
Geological substrate :	Slope scree, Dry cones		
Vegetation type :	Sphagno-Piceetum		
Remarks :	Soil profile located 2 m north of the forest pathway.		



Soil profile description

OLv-OLn : +2 to 0 cm depth, Transition clear <2cm / Bedding composed of spruce, beech, some mountain ash and honeysuckle leaves of the year & past year leaves

OF : 0 to 2 cm depth, Transition distinct 2-4cm

OH : 2 to 9 cm depth, Transition distinct 2-4cm

A : 9 to 15 cm depth, Transition clear <2cm / General color dark black / Munsell Color 10YR 5/2 / Skeleton 1 Plant / General structure constructed / Structure lumpy / Texture sandy-loamy / Porosity

Very porous >40% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 5 / Root size mid-size 2-5mm & big >5mm / Compactness soft / Adhesiveness not very sticky / Notes: presence of mycelium

Ae : 15 to 18.5 cm depth**,** Transition clear <2cm / General color grey / Munsell Color 10YR 6/4 / Skeleton 1 Mineral 2 Plant / General structure constructed & particulaire / Structure sub-polyhedral / Texture sandy-loamy / Porosity slightly porous 2-5% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 2 / Root size mid-size 2-5mm & big >5mm / Compactness not very compact / Adhesiveness not very sticky / Notes: none
Eg : 18.5 to 25 cm depth**,** Transition clear <2cm / General color grey-brown marbled / Munsell Color 10YR 5/3 / Skeleton 1 Mineral / General structure constructed / Structure polyhedral & lamellae / Texture sandy-loamy / Porosity slightly porous 2-5% / pH Hellige 4.5 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm / Compactness compact / Adhesiveness non-sticky / Notes: none
[organic matter] : 25 to 30, Transition clear <2cm / General color brown / Skeleton 1 Mineral / General structure particulaire / Texture sandy-loamy / Porosity slightly porous 2-5% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains none / Compactness compact / Adhesiveness sticky / Notes: none
Eg : 30 to 36/40 cm depth**,** Transition clear <2cm / General color white / Munsell Color 10YR 8/2 / Skeleton 1 Mineral / General structure constructed / Structure polyhedral & lamellae / Texture loamy / Porosity slightly porous 2-5% / pH Hellige 5.5 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 0 / Compactness compact / Adhesiveness not very sticky / Notes: none
Eg-BPsg : 40 to 56 cm depth**,** Transition gradual 4-8cm / General color ochre / Munsell Color 10YR 5/6 / Skeleton 1 Mineral / General structure constructed / Structure polyhedral & lamellae / Texture loamy / Porosity slightly porous 2-5% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains lot of rust stains / Root abundance (0 to 5) 0.5 / Root size mid-size 2-5mm / Compactness compact / Adhesiveness not very sticky / Notes: three angular calcareous pebbles of 5 cm in diameter
BPsg : 56 to 90 cm depth**,** Transition gradual 4-8cm / General color ochre / Munsell Color 10YR 5/6 / Skeleton 1 Mineral / General structure massive / Texture loamy-clay / Porosity slightly porous 2-5% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains lot of rust stains / Root abundance (0 to 5) 0.5 / Root size mid-size 2-5mm / Compactness compact / Adhesiveness sticky / Notes: none
BPs-C : 90+ cm depth**,** General color beige / Skeleton 1 Mineral / General structure massive / Texture clay / Porosity slightly porous 2-5% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Notes: none

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) microstructured Dysmoder
Observer -s :	GA, GG& RT
Date :	08.09.2020

Locality	Les Pontins	**Altitude [m]:**	1095
Municipality & canton :	Les Pontins, BE	**Slope (°) :**	2°
Coordinates (CH1903) :	565942 219653	**Exposition :**	South
Habitat type :	Forest on lake shore environment		
Geological substrate :	Slope scree, Dry cones		
Vegetation type :	Sphagno-Piceetum		
Remarks :	Soil profile located north of the forest road.		

Humus form description

OLv-OLn : +2 to 0 cm depth, Bedding composed of spruce, beech bryophyte (Fagus sylvatica), some mountain ash and honeysuckle leaves of the year & past year / Litter transformation absent / Litter fragmentation absent & fragmented leaves / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition clear <2cm / Notes: none

OF : 0 to 2 cm depth, fragmented leaves of past year / Litter transformation bleahced and skeletized leaves / Litter fragmentation atomized & fragmented leaves / Cohesion absent / OM content plant material / Percentage of fine OM 30-70 % / Presence of mycelium present / Presence roots absent / Transition distinct 2-4cm / Notes: none

OH : 2 to 9 cm depth, Litter transformation bleached leaves / Litter fragmentation atomized leaves / Cohesion absent / OM content plant material / Percentage of fine OM 70-90 % / Presence of mycelium abondant / Presence roots present / Transition distinct 2-4cm / Notes: none

Ami : 9 to 15 cm depth, OM content not very humiferous / HCl 6M (1 to 4 reaction) 0 / Texture sandy-loamy / Coarse elements none / Structure lumpy & sub-polyhedral / Aggregates size 1-5 mm / Level of aggregation poorly aggregated / Aggregate stability unsTable S / Root abundance (0 to 5) 4-5 / Transition clear <2cm / Limit (>A horizon) irregular, biomicrostructured

Table S1. 60. Pon_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A	9-15	10YR 5/2	9,03	39,74	31,12	20,09	0,02	2,08	8,93	4,68	0,28	16,54	3,48	2,76	0,00	11,81	0,87
Ae	15-18	10YR 6/4	8,00	33,63	34,17	24,19	0,01	1,31	3,56	1,67	0,08	21,99	3,81	3,30	0,00	4,19	0,00
Eg1	18-25	10YR 5/3	10,24	43,13	29,10	17,53	0,00	2,00	8,15	4,31	0,17	24,98	3,86	3,31	0,00	-	-
[OM]	25-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eg2	30-36	10YR 8/2	9,87	41,15	29,18	19,78	0,03	0,95	1,72	0,57	0,03	17,66	3,88	3,30	0,00	-	-
Eg-BPsg	36-56	10YR 5/6	11,49	42,64	27,39	18,38	0,09	1,76	2,84	1,00	0,07	13,35	4,03	3,53	0,00	-	-
BPsg	56-90	10YR 6/6	14,03	41,42	26,02	18,44	0,08	2,51	3,48	0,82	0,06	14,16	4,14	3,64	0,00	-	-
BPs-C	90+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Vegetation survey

Table S1. 61. Pon_2020 vegetation survey, Les Pontins (BE). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Sphagno-Piceetum alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1984) corresponded to Sphagno-Piceetum blechnetosum.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**5**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**40**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**3**	1 à 5 %	1
Grass cover [%]	**20**	5 à 25 %	2
Moss and lichen cover [%]	**60**	5-15 %	2a
Litter cover [%]	**17**	15-25 %	2b
Rock and stone cover [%]	**-**	25 à 50 %	3
Bare ground cover [%]	**-**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Picea abies	A	3	
Fagus sylvatica	A	4	
Sorbus aucuparia	A	1	
Lonicera caprifolium	B	r	
Abies alba	B	1	
Dryopteris filix-mas	H	3	
Vaccinium myrtillus	H	3	
Equisetum telmateia	H	+	
Lycopodium annotium	H	4	
Polypodium vulgare	H	r	
Brachypodium sylvaticum	H	r	
Oxalis acetosella	H	3	
Maianthemum bifolium	H	+	
Prenanthes purpurea	H	r	
Acer pseudoplatanus	H	1	
Hieracium sp.	H	r	
Lonicera nigra L.	H	+	
Blechnum spicant	H	+	

Figure S1. 32. Pon_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. View from the soil profile looking South-East B. Iron oxide stain C. Outgassing of CO_2 during reaction with 6M HCl D. Sphagnum moss carpet on the soil profile. © RT

Por

Soil type :	***Référentiel Pédologique (RP),*** Réductisol Typique épihistique **Classification française des sols (CPCS),** Tourbe eutrophe sur anmoor **World Reference Base for Soil Ressources 2022 (WRB),** Epihistic Reductic Gleysol
Observer-s :	AB
Date of archiving:	24.02.83

Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	430
Municipality & canton :	Portablan, FR	**Humus form :**	Tourbe eutrophe
Coordinates (CH1903) :	563650 197275	**LSS JMG publi n°**	47
Habitat type :	Forest on lake shore environment		
Geological substrate :	Lake and beach sediments (current lake level of 432 m)		
Vegetation type :	Caricetum elatae var. à Carex lasiocarpa		
Title :	Etude écosystémique des marais non boisés de la rive sud du lac de Neuchâtel (Suisse)		
Authors :	Buttler, A.		
Publication :	University of Neuchâtel, 1987		

*** NO PHOTO PROVIDED ***

Soil profile description
T : 0 to 27 cm depth – no other information
Aa: 27 to 30 cm depth – no other information
Gr1: 30 to 52 cm depth – no other information
Gr2: 52 to 85 cm depth – no other information

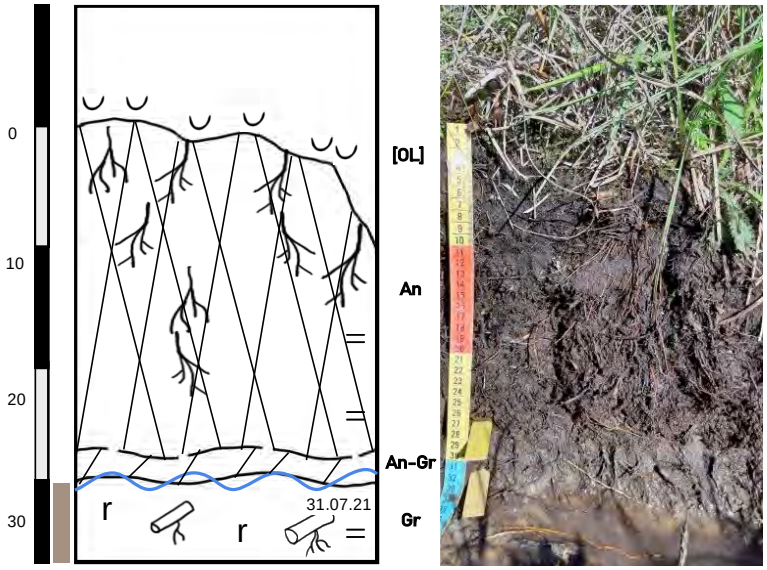
Table S1. 62. Por physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
T	0-27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aa	27-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gr1	30-52	2,5Y 7/3	2,45	11,82	6,38	59,93	19,42	0,27	0,80	0,28	0,02	13,11	8,2	8,1	18,50	4,46	7,46
Gr2	52-85	2,5Y 7/3	6,38	23,94	14,16	51,77	3,77	0,47	1,13	0,32	0,03	10,20	8,34	8,03	24,55	6,95	23,42

Soil type :	***Référentiel Pédologique (RP)***, Réductisol typique à Epihisto Anmoor
	Classification française des sols (CPCS), Gley à Epihisto Anmoor
	World Reference Base (WRB), Epihisto Anmoor on Reductic Gleysol

Observer-s : RT& VT
Date : 31.7.2020

Locality	Nature reserve of the Grande Cariçaie	**Altitude [m]:**	430
Municipality & canton :	Portablan, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	563650 197275	**Exposition :**	South
Habitat type :	Lake shore environment	**Humus form :**	Epihisto Anmoor
Geological substrate :	Lake deposits (clays and sands at Unios)		
Vegetation type :	Magnocaricion elatae		
Remarks :			



Soil profile description

[OL] : +10 to 0 cm depth, Transition clear <2cm / Bryophyte and dead carex leaf still attached

An : 0 to 27 cm depth, Transition clear <2cm / General color brown / Munsell Color none / Skeleton plant 1 / General structure massive / Texture sandy / Porosity porous 15-40% / pH Hellige 6.5/ HCl 6M (1 to 4 reaction) 3 / Stains none / Root abundance (0 to 5) 5 / Root size mid-size 2-5mm & fine 0-2 mm / Compactness compact / Adhesiveness no-sticky / Notes: presence of ants

An-Gr : 27 to 30 cm depth**,** Transition very clear/ General color light brown/ Munsell Color none / Skeleton plant 1 / General structure massive / Texture sandy / Porosity moderately porous 5-15% /

pH Hellige 7 / HCl 6M (1 to 4 reaction) 0 / Root abundance (0 to 5) 2 / Root size mid-size 2-5mm & fine 0-2 mm / Compactness compact / Adhesiveness non-sticky / Notes: none

Gr : 30+ cm depth**,** General color grey / Munsell Color 2,5Y 6/2 / Skeleton plant 1 / General structure particular / Texture sandy / Porosity slightly porous 2-5% / pH Hellige 8 / HCl 6M (1 to 4 reaction) 0 / Stains none / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm and fine 0-2 mm / Compactness not very compact / Adhesiveness non-sticky / Notes: none

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) Epihisto Anmoor
Observer -s :	RT
Date :	31.07.2020

Locality	Nature reserve of the Grande cariçaie	**Altitude [m]:**	430
Municipality & canton :	Portablan, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	563650 197275	**Exposition :**	South
Habitat type :	Lake shore environment		
Geological substrate :	Lake deposits (clays and sands at Unios)		
Vegetation type :	Magnocaricion elatae		
Remarks :			

Humus form description
[OL] : +10 to 0 cm depth, litter of the year / Litter transformation absent & skeletized leaves / Litter fragmentation absent & fragmented leaves / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots present / Transition clear <2cm / Notes: none
Aa : 0 to 27 cm depth, Litter transformation absent / Cohesion absent / OM content plant material / Presence of mycelium absent / Presence roots present / Transition gradual 4-8cm / Notes: none
Aa-Gr : 27 to 30 cm depth, OM content very humiferous / HCl 6M (1 to 4 reaction) 0 / Texture sandy / Coarse elements none / Structure particular / Level of aggregation without aggregate / Aggregate stability without aggregate / Root abundance (0 to 5) 5 / Transition distinct 2-4cm / Limit (>A horizon) wavy /

Table S1. 63. Por_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
An-Gr	27-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gr	30+	2,5Y 6/2	1,50	5,79	3,32	50,30	39,09	0,35	0,99	0,56	0,03	18,01	8,46	8	10,14	5,19	6,73

Vegetation survey

Table S1. 64. Por_2020 vegetation survey, Portalban (FR). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Magnocaricion elatae alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1983) corresponded to Caricetum elatae var. to Carex lasiocarpa.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**-**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**-**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**-**	1 à 5 %	1
Grass cover [%]	**90**	5 à 25 %	2
Moss and lichen cover [%]	**5**	5-15 %	2a
Litter cover [%]	**5**	15-25 %	2b
Rock and stone cover [%]	**-**	25 à 50 %	3
Bare ground cover [%]	**-**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Frangula alnus	B	+	
Carex lasiocarpa	H	3	
Phragmites australis	H	2a	
Cirsium arvense cf.	H	1	
Hydrocotyle vulgaris	H	+	

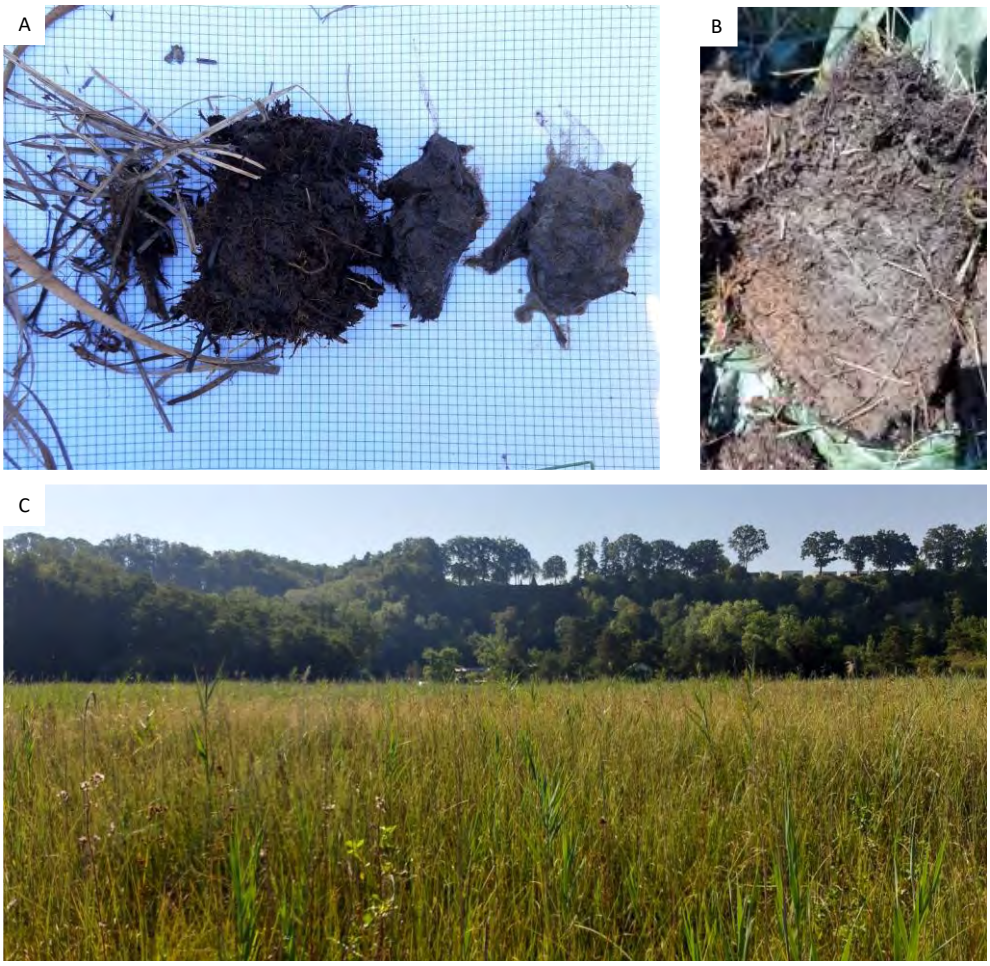


Figure S1. 33. Por_2020 pictures taken in 2020 around the soil profile. Horizon sequence A. Poorly decomposed organic matter B. View from the soil profile looking South C. © RT

Ra1

Soil type :	***Référentiel Pédologique (RP)***, Podzosol Ocrique bathycarbonaté sur dalle du Callovien **Classification française des sols (CPCS),** Sol brun sur podzolique **World Reference Base for Soil Ressources 2022 (WRB),** Podzol
Observer-s :	JMG /RJF /GV
Date of archiving:	08.09.1988

Locality	Raimeux, Grandval	**Altitude [m]:**	1218
Municipality & canton :	Raimeux, Bern	**Humus form :**	Mull
Coordinates (CH1903) :	600096, 239443	**LSS JMG publi n°**	122
Habitat type :	Beech forest		
Geological substrate :	Colluvium, loess and marlstone		
Vegetation type :	Sphagno-Piceetum blechnetosum		
Title :	- Les dessous du Sphagno-Piceetum blechnetosum dans le Jura (90) - Carnets de terrain (122)		
Authors :	Vadi, G. (90), Gobat, J.-M. (122)		
Publication :	Diploma thesis work, UniNe (90), Field notebook, 93		

Soil profile description
A1 : 0 to 6 cm depth – no other information
(B)Bs : 6 to 35 cm depth – no other information
BsC: 35 to 50 cm depth, limit HCl at 40cm – no other information
R: 50 to X cm depth – no other information

Table S1. 65. Ra1 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	0-6	10YR 5/3	8,20	31,91	25,90	15,98	18,02	2,77	17,64	7,54	0,49	15,34	3,85	3,28	0,15	8,93	9,34
(B)Bs	6-35	10YR 6/6	11,62	40,05	31,82	16,39	0,09	1,63	5,59	2,08	0,16	13,30	4,46	3,81	0,05	5,98	7,59
BsC	35-50	10YR 5/6	12,18	40,96	30,64	15,76	0,13	1,80	5,21	1,47	0,15	10,03	6,1	5,4	0,23	-	-

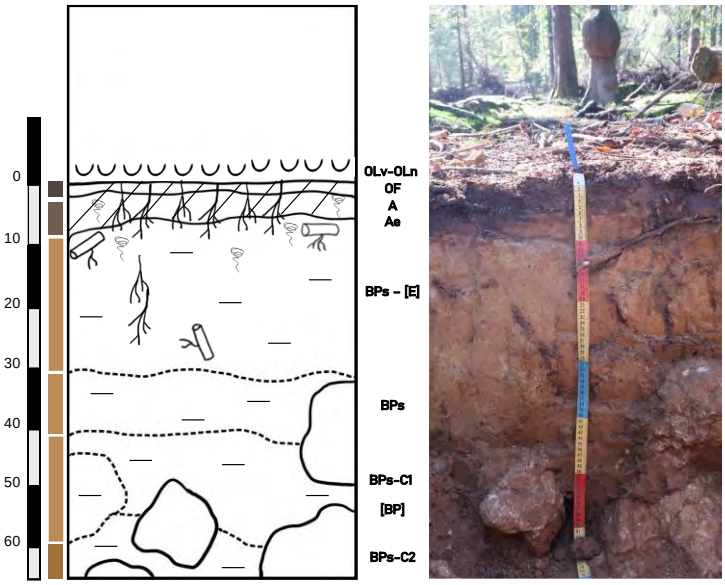
Ra1_2020

Soil type :	***Référentiel Pédologique (RP),*** Podzosol ocrique bathycarbonaté, sur dalle du Callovien, à Dysmull mésostructuré **Classification française des sols (CPCS),** Sol brun podzolique **World Reference Base (WRB),** DYSMULL on Podzol

Observer-s : GT& RT

Date : 30.09.2020

Locality	Raimeux, Grandval	**Altitude [m]:**	1218
Municipality & canton :	Raimeux, BE	**Slope (°) :**	1°
Coordinates (CH1903) :	600154 239411	**Exposition :**	Nord-East
Habitat type :	forest subalpin	**Humus form :**	Dysmull
Geological substrate :	colluvium, loess and marlstone		
Vegetation type :	Sphagno-Piceetum		
Remarks :	Piles of chopped wood everywhere Presence of octolasion cyaneum		



Soil profile description

OLn-OLv : +2 to 0 cm depth, Transition distinct 2-4cm / Bleached needles of *picea* and fragmented beech leaves of the year and last year

OF : 0 to 0.5 cm depth, Transition clear <2cm

A : 0.5 to 3 cm depth, Transition very clear/ General color dark brown / Munsell Color 10YR 3/1 / Skeleton 1 Mineral 2 Animal / General structure constructed / Structure granular / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 4 / HCl M (1 to 4 reaction) 0 / Stains no stains / Root

abundance (0 to 5) 0 / Compactness soft / Adhesiveness not very sticky / Notes: big worms and red ants

Ae : 3 to 6 cm depth, Transition clear <2cm / General color greyish brown / Munsell Color 10YR 4/2 / Skeleton 1 Mineral / General structure constructed / Structure sub-polyhedral / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 0 / Compactness not very compact / Adhesiveness non-sticky / Notes: -

BPs – [E] : 6 to 32 cm depth, Transition very clear / General color ochre and white / Munsell Color 10YR 6/6 / Skeleton 1 Mineral / General structure massive & constructed / Structure colunar / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 1 / Root size big >5mm / Compactness compact / Adhesiveness non-sticky / Notes: -

BPs : 32 to 40 cm depth, Transition distinct 2-4cm / General color ochre / Munsell Color 10YR 6/6 / Skeleton 1 Mineral / General structure massive / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 4 / HCl 6M (1 to 4reaction) 0 / Stains rust stains / Root abundance (0 to 5) 0 / Compactness very compact / Adhesiveness non-sticky / Notes: -

BPs-C1 : 40 to 55 cm depth, Transition distinct 2-4cm / General color ochre / Munsell Color 10YR 6/6 / Skeleton 1 Mineral / General structure massive / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 0 / Compactness very compact / Adhesiveness not very sticky / Notes: -

[BP] : 45 to 60 cm depth, Transition very clear/ General color grey / Munsell Color 10YR 5/6 / Skeleton 1 Mineral / General structure massive & constructed / Structure sub-polyhedral / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 1 / Stains rust stains / Root abundance (0 to 5) 0 / Compactness very compact / Adhesiveness not very sticky / Notes: at 57 cm galleries of earthworms, clay accumulation

BPs-C2 : 55+ cm depth, Transition distinct 2-4cm / General color dark ochre / Skeleton 1 Mineral / General structure massive / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 1 / Stains rust stains / Root abundance (0 to 5) 0 / Compactness very compact / Adhesiveness not very sticky / Notes: clay accumulation

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) mesostructured Dysmull
Observer-s :	GT& RT
Date :	30.09.2020

Locality	Raimeux, Grandval	**Altitude [m]:**	1218
Municipality & canton :	Raimeux, BE	**Slope (°) :**	1°
Coordinates (CH1903) :	600154 239411	**Exposition :**	Nord-East
Habitat type :	forest subalpin		
Geological substrate :	colluvium, loess and marlstone		
Vegetation type :	Sphagno-Piceetum		
Remarks :	Piles of chopped wood everywhere		

Humus form description

OLn-OLv : +2 to 0 cm depth, Transition distinct 2-4cm / Bleached needles of *picea* and fragmented beech leaves of the year and last year / Litter transformation bleached leaves / Litter fragmentation absent & fragmented / Cohesion coherent / OM content mixed material / Percentage of fine OM 0 % / Presence of mycelium present / Presence roots absent / Notes: none

OF : 0 to 0.5 cm depth, Transition clear <2cm / fragmented leaves of XX / Litter transformation bleached leaves & squeletized leaves / Litter fragmentation fragmented & atomized leaves / Cohesion coherent / OM content mixed material / Percentage of fine OM < 30 % / Presence of mycelium present / Presence roots present / Notes: none

Ame: 7 to 10 cm depth, OM content humiferous / HCl 6M (1 to 4reaction) 0 / Texture loamy / Coarse elements none / Structure granulated / Aggregates size 2-5mm / Level of aggregation poorly

aggregated / Aggregate stability unsTable S / Root abundance (0 to 5) 4 / Transition distinct 2-4cm / Limit (>A horizon) regular
Ae: 7 to 10 cm depth, OM content not very humiferous / HCl 6M (1 to 4reaction) 0 / Texture loamy / Coarse elements none / Structure sub-polyhedral / Aggregates size 2-5mm / Level of aggregation poorly aggregated / Aggregate stability unsTable S / Root abundance (0 to 5) 3 / Transition distinct 2-4cm / Limit (>A horizon) regular / Note: mesostructured

Table S1. 66. Ra1_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limit	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A	0-3	10YR 3/1	6,41	27,52	32,66	27,22	6,20	3,18	19,50	9,54	0,76	12,63	3,54	3,01	0,00	12,44	6,33
Ae	3-6	10YR 4/2	7,79	29,90	36,09	26,06	0,16	2,32	11,74	5,39	0,44	12,36	3,77	3,14	0,00	10,54	4,81
BPs-[E]	6-32	10YR 6/6	8,54	30,35	36,39	24,68	0,05	1,21	2,64	1,01	0,06	15,98	4,10	3,80	0,00	-	-
BPs	32-40	10YR 6/6	9,74	30,94	34,78	24,36	0,18	1,68	3,91	1,15	0,11	10,72	6,27	5,31	0,10	-	-
[BP]	45-60	10YR 6/6	10,80	36,37	20,05	17,39	15,39	2,19	3,80	0,85	0,08	10,62	5,85	4,74	0,00	-	-
BPs-C1	40-55	10YR 5/6	10,34	31,95	33,41	24,09	0,21	1,85	4,19	9,54	0,76	12,63	7,49	6,64	0,00	-	-

Vegetation survey

Table S1. 67. Ra1_2020 vegetation survey, Raimeux (BE). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Sphagno-Piceetum alliance was determined for this environment, according to the Guide des milieux naturels de Suisse: écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1988) corresponded to a Sphagno-Piceetum blechnetosum.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**4**	**Species ab.-dom. codes (Ad) :**	
Height of trees [m]	**20**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**-**	1 à 5 %	1
Grass cover [%]	**10**	5 à 25 %	2
Moss and lichen cover [%]	**10**	5-15 %	2a
Litter cover [%]	**80**	15-25 %	2b
Rock and stone cover [%]	**-**	25 à 50 %	3
Bare ground cover [%]	**-**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Picea abies	A	4	
Vaccinium myrtillus	H	3	
Oxalis acetosella	H	1	

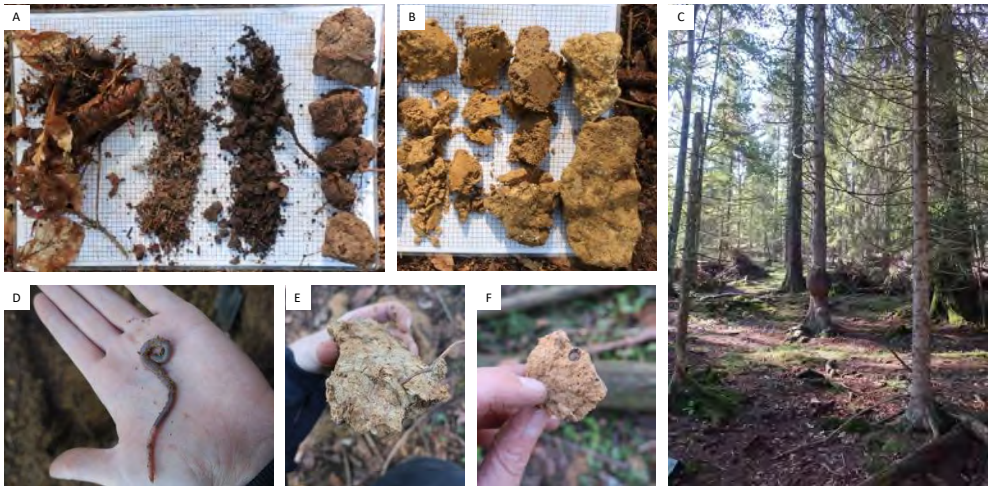


Figure S1. 34. Ra1_2020 pictures taken in 2020 around the soil profile. Topsoil horizon's sequence A. Subsoil horizon's sequence B. View from the soil profile with piles of chopped wood in the background C. Presence of Octolasion cyaneum D. very compact soil block with oxidation spots E. Gallery of earthworms covered with feces in very dense soil block F. © RT

Ra2

Soil type :	***Référentiel Pédologique (RP),*** Rédoxisol sur Podzosol Ocrique, bathycarbonaté **Classification française des sols (CPCS),** Pseudogley sur podzol **World Reference Base for Soil Ressources 2022 (WRB),** Stagnic Gleysol on Podzol
Observer-s :	JMG /RJF /GV
Date of archiving:	08.09.1988

Locality	Raimeux, Grandval	**Altitude [m]:**	1218
Municipality & canton :	Raimeux, Bern	**Humus form :**	Hydromull
Coordinates (CH1903) :	600096, 239443	**LSS JMG publi n°**	122
Habitat type :	Beech forest		
Geological substrate :	Colluvium, loess and marlstone		
Vegetation type :	Ranunculus et Agrostis		
Title :	Field notebook (122)		
Authors :	Gobat, J.-M. (122)		
Publication :	Field notebook, 94		

*** NO PHOTO PROVIDED ***

Soil profile description
A1 : 0 to 13 cm depth, mull superimposed on ancient pozolic (cf. La Vattay)
A2g : 13 to 20 cm depth, old A2 in gleying
Bsg: 20 to 50 cm depth, old Bs
BtgC: 50 to 65 cm depth, HCl limit at 55cm
R: 65 to X cm depth, pH 7

Table S1. 68. Ra2 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	0-13	10YR 5/1	5,86	23,42	38,47	32,24	0,01	1,30	9,14	3,85	0,31	12,23	3,99	3,38	0,05	6,87	3,25
A2g	13-20	10YR 6/3	5,45	19,36	38,79	36,39	0,00	0,58	2,44	0,42	0,04	10,69	4,41	3,68	0,12	5,06	3,35
Bsg	20-50	2,5Y 7/4	5,57	17,16	37,53	39,74	0,01	0,57	1,41	0,91	0,08	11,12	4,82	4,07	0,00	-	-
BtgC	50-65	2,5Y 7/4	4,99	14,00	36,08	44,93	0,00	0,64	1,47	0,59	0,04	14,42	7,31	5,32	0,00	-	-

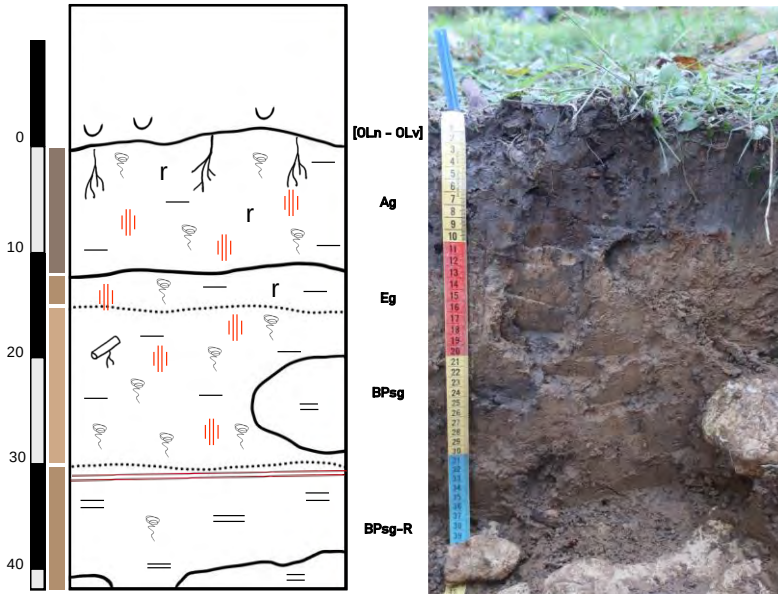
Ra2_2020

Soil type :	***Référentiel Pédologique (RP),*** Rédoxisol développé dans un Podzosol ocrique bathycarbonaté, sur dalle du Callovien, à Hydro Eumull **Classification française des sols (CPCS),** Pseudogley sur sol podzolique ***World Reference Base (WRB),*** Hydro Eumull on Stagnic Gleysol

Observer-s : GT& RT

Date : 30.09.2020

Locality	Raimeux, Grandval	**Altitude [m]:**	1218
Municipality & canton :	Raimeux, BE	**Slope (°) :**	1°
Coordinates (CH1903) :	600154 239408	**Exposition :**	South-west
Habitat type :	forest subalpin	**Humus form :**	Hydro Eumull
Geological substrate :	colluvium, loess and marlstone		
Vegetation type :	-		
Remarks :	Piles of chopped wood everywhere		



Soil profile description

[OLn - OLv] : +2 to 0 cm depth, Transition very clear

Ag : 0 to 12 cm depth, Transition very clear / General color dark greyish brown / Munsell Color 10YR 5/2 / Skeleton 1 Animal 2 Plant / General structure massive & constructed / Structure lumpy / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 4 / HCl M (1 to 4 reaction) 0 / Stains redox stains / Root abundance (0 to 5) 2 / Root size fine 0-2mm & mid-size 2-5mm / Compactness not very compact / Adhesiveness sticky / Notes: compaction on 5cm depth due to grazing

Eg : 12 to 14 cm depth, Transition clear <2cm / General color beige / Munsell Color 10YR 6/4 / Skeleton 1 Mineral 2 Animal / General structure massive / Texture loamy / Porosity moderately

porous 5-15% / pH Hellige 4 / HCl 6M (1 to 4 reaction) 0 / Stains redox stains / Root abundance (0 to 5) 2 / Root size mid-size 2-5mm / Compactness compact / Adhesiveness sticky / Notes: -.

BPsg : 14 to 30 cm depth, Transition gradual 4-8cm / General color ochre brown & dark grey / Munsell Color 10YR 7/4 / Skeleton 1 Mineral 2 Animal / General structure massive / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains redox stains / Root abundance (0 to 5) 1 / Root size big >5mm / Compactness compact / Adhesiveness very sticky / Notes: earthworm galleries

BPsg-R : 30+ cm depth, Transition gradual 4-8cm / General color ochre brown / Munsell Color 10YR 6/4 / Skeleton 1 Mineral / General structure massive / Structure polyhedral / Texture loamy-sandy / Porosity moderately porous 5-15% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 1 / Stains redox stains / Root abundance (0 to 5) 0 / Compactness very compact / Adhesiveness very sticky / Notes: carbonate limite at 30 cm

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) Hydro Eumull
Observer-s :	GT & RT
Date :	30.09.2020

Locality	Raimeux, Grandval	**Altitude [m]:**	1218
Municipality & canton :	Raimeux, BE	**Slope (°) :**	1°
Coordinates (CH1903) :	600154 239408	**Exposition :**	South-west
Habitat type :	forest subalpin		
Geological substrate :	colluvium, loess and marlstone		
Vegetation type :	-		
Remarks :	Piles of chopped wood everywhere		

Humus form description

[OLn - OLv] : +2 to 0 cm depth, Litter composed of Hazelnut and maple leaves of the year / Litter transformation absent / Litter fragmentation absent & fragmented / Cohesion coherent / OM content mixed material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition clear <2cm / Notes: none

Ag : 0 to 12 cm depth, OM content not very humiferous / HCl 6M (1 to 4reaction) 0 / Texture loamy / Structure lumpy / Aggregates size NA / Level of aggregation moderately aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 2 / Transition very clear / Limit (>A horizon) wavy / Note: -

Table S1. 69. Ra2_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Ag	0-12	10YR 5/2	0,18	8,29	32,68	34,33	24,22	1,76	7,39	3,38	0,22	15,05	5,32	4,69	0,18	11,73	21,41
Eg	12-14	10YR 6/4	0,00	9,18	34,57	33,59	22,48	1,44	4,09	1,41	0,13	10,80	4,79	4,19	0,00	8,35	2,69
BPsg	14-30	10YR 7/4	0,04	9,60	34,77	33,37	22,21	1,43	3,39	1,03	0,09	11,31	6,07	5,39	0,04	-	-
BPsg-R	30+	10YR 6/4	0,54	10,08	35,35	32,58	21,93	1,66	3,88	1,35	0,11	12,04	6,93	6,45	0,54	-	-

Vegetation survey

Table S1. 70. Ra2_2020 vegetation survey, Raimeux (BE). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. No alliance was determined. The vegetation that had been determined during the first survey (1988) corresponded to a Ranunculus - Agrostis.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**4**	**Species ab.-dom. codes (Ad) :**	
Height of trees [m]	**20**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**-**	1 à 5 %	1
Grass cover [%]	**40**	5 à 25 %	2
Moss and lichen cover [%]	**10**	5-15 %	2a
Litter cover [%]	**1**	15-25 %	2b
Rock and stone cover [%]	**3**	25 à 50 %	3
Bare ground cover [%]	**47**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Lysimachia nemorum	H	4	
Caltha palustris	H	2	
Oxalis acetosella	H	r	
Achemilla sp.	H	r	
Fragaria vesca	H	r	
Carex sp.	H	r	
Veronica chamaedrys	H	r	

Figure S1. 35. Ra2_2020 pictures taken in 2020 around the soil profile. Topsoil horizon's sequence A. Litter described as Hydro Eumull C. Zoom on the transition between the redox-processes and the podzolisation processes visible in the soil profile D. © RT

Ro1

Soil type :	***Référentiel Pédologique (RP)***, Fluviosol Typique rédoxique calcaire **Classification française des sols (CPCS),** Sol alluvial **World Reference Base for Soil Ressources 2022 (WRB),** Fluvisol (Oxyaquic, Calcaric)
Observer-s :	JMG
Date of archiving:	18.08.1989

Locality	Rossens	**Altitude [m]:**	697
Municipality & canton :	Gruyère, Fribourg	**Humus form :**	-
Coordinates (CH1903) :	573563 158991	**LSS JMG publi n°**	122
Habitat type :	Riparian forest		
Geological substrate :	Recent alluvial deposits		
Vegetation type :	Ulmo-Fraxinetum		
Title :	Field notebook		
Authors :	Gobat, J.-M.		
Publication :	Notebook JM 1984, 107		

Soil profile description

A1 : 0 to 11 cm depth, silty-sandy, very homogeneous.

A1 (C) : 11 to 40 cm depth, partially compacted.

Cg: 40 to 80 cm depth, partially compacted.

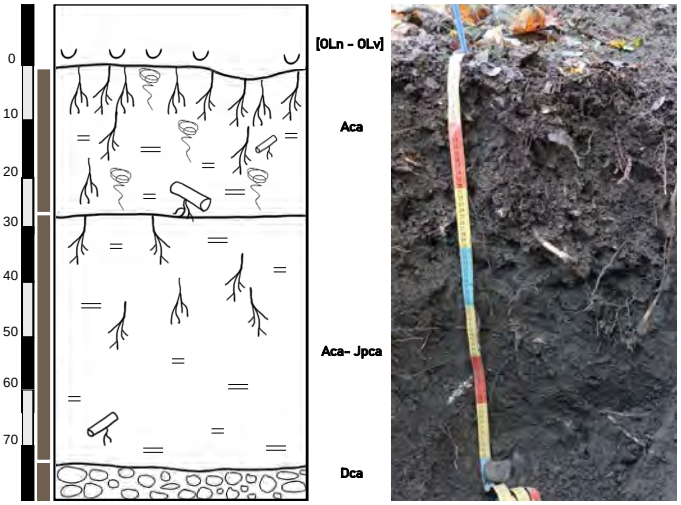
Table S1. 71. Ro1 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	0-11	2,5Y 4/2	11,60	37,48	17,99	25,54	7,38	1,60	8,50	3,49	0,31	11,07	7,27	7	34,31	20,35	83,29
(A1)C	11-40	2,5Y 5/2	9,62	34,11	18,17	30,10	7,99	1,09	4,48	2,14	0,17	12,63	7,53	7,33	37,56	13,17	52,58
Cg	40-80	2,5Y 5/2	7,80	29,58	23,81	38,14	0,68	0,74	2,89	1,45	0,10	14,22	7,91	7,53	39,78	-	-

Ro1_2020

Soil type :	***Référentiel Pédologique (RP),*** Fluviosol typique carbonaté, sur alluvions récents, à Mésomull macrostructuré **Classification française des sols (CPCS),** Sol d'apport alluvial ***World Reference Base (WRB),*** Mesomull on Calcaric Fluvisol
Observer-s :	AB & RT
Date :	12.10.2020

Locality	Rossens	**Altitude [m]:**	698
Municipality & canton :	Gruyère, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	573562 158998	**Exposition :**	South-east
Habitat type :	forest, alluvial env.	**Humus form :**	Mesomull
Geological substrate :	Recent alluvial deposits		
Vegetation type :	Fraxinio excelsoris-Quercio roboris		
Remarks :	9 m east of the concrete block		



Soil profile description

[OLn - OLv] : +5 to 0 cm depth, Transition very clear / Beech and maple leaves of the year

Aca : 0 to 26 cm depth, Transition clear <2cm / General color brownish-grey / Munsell Color 2,5Y 5/2 / Skeleton 1 Mineral 2 Animal & Plant / General structure lumpy & sub-polyhedral / Structure lumpy / Texture sandy-loamy / Porosity Very porous >40% / pH Hellige 5 / HCl M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 3 / Root size fine 0-2mm , mid-size 2-5mm & big >5mm / Compactness soft / Adhesiveness very sticky / Notes: hight humidity in the profil, lot of turbation, but no worms presents

Aca-Jpca : 26 to 70 cm depth, Transition clear <2cm / General color brownish-grey / Munsell Color 2,5Y 5/2 / Skeleton 1 Mineral 2 Animal & Plant / General structure lumpy & sub-polyhedral / Texture sandy-loamy / Porosity Very porous >40% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 4 / Stains no stains

/ Root abundance (0 to 5) 2 / Root size fine 0-2mm , mid-size 2-5mm & big >5mm / Compactness soft / Adhesiveness very sticky / Notes: -.

Dca : 70+ cm depth, General color grey / Munsell Color 2,5Y 5/2 / Skeleton 1 Mineral / General structure particulaire, sub-polyhedral / Texture loamy-sandy / Porosity Very porous >40% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 0 / Compactness compact / Adhesiveness very sticky / Notes: >70cm pebbles between 3 and 12 cm

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) macrostructured Mesomull		
Observer-s :	AB& RT		
Date :	12.10.2020		
Locality	Rossens	**Altitude [m]:**	698
Municipality & canton :	Gruyère, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	573562 158998	**Exposition :**	South-east
Habitat type :	forest, alluvial env.		
Geological substrate :	Recent alluvial deposits		
Vegetation type :	Fraxinio excelsoris-Quercio roboris		
Remarks :	9 m east of the concrete block		

*** NO PHOTO PROVIDED ***

Humus form description

[OLn - OLv] : +5 to 0 cm depth, Litter composed of Hazelnut and maple leaves of the year / Litter transformation absent and skeletized leaves / Litter fragmentation atomized leaves & fragmented / Cohesion coherent / OM content feces and plant material / Percentage of fine OM < 30 % / Presence of mycelium absent / Presence roots absent / Transition clear <2cm / Notes: none

Ama: 10 to 26 cm depth, OM content humiferous / HCl 6M (1 to 4reaction) 4 / Texture sandy-loamy / Coarse elements none / Structure lumpy / Aggregates size 5-20 mm / Level of aggregation moderately aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 4 / Transition very clear / Limit (>A horizon) regular / Note : macrostructured

Table S1. 72. Ro1_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples.. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Aca	0-26	2,5Y 5/2	8,83	30,67	18,91	32,10	9,49	0,90	3,37	1,64	0,12	13,18	7,87	7,39	36,67	11,66	46,20
Aca-Jpca	26-70	2,5Y 5/2	7,62	27,28	18,82	37,53	8,75	0,72	2,34	1,11	0,09	11,94	8,04	7,58	38,62	9,01	24,98
Dca	70+	2,5Y 5/2	5,67	19,50	12,54	21,83	40,46	0,57	1,95	0,76	0,07	11,68	8,06	7,67	37,84	-	-

Vegetation survey

Table S1. 73. Ro1_2020 vegetation survey, Rossens (FR). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Fraxinio excelsoris-Quercio roboris alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1989) corresponded to an alluvial forest with Ulmo-Fraxinetum.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**5**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**15**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**3**	1 à 5 %	1
Grass cover [%]	**20**	5 à 25 %	2
Moss and lichen cover [%]	**7**	5-15 %	2a
Litter cover [%]	**40**	15-25 %	2b
Rock and stone cover [%]	**-**	25 à 50 %	3
Bare ground cover [%]	**30**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Acer platanoides	A	2b	
Acer campestre	A	3	
Abies alba	A	2b	
Fagus sylvatica	A	2a	
Acer pseudoplatanus	A	2b	
Lonicera xylosteum	B	4	
Corylus avellana	B	1	
Fagus sylvatica	H	+	
Asarum europaeum	H	+	
Geranium sp.	H	+	
Acer platanoides	H	4	
Crataegus monogyna	H	+	
Mercurialis perennis	H	1	

Figure S1.36. Ro1_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. View from the profile looking West with a concrete block B. Litter observed as Mesomull C. © RT

Ro2

Soil type :	**Référentiel Pédologique (RP),** Fluviosol Typique
	Classification française des sols (CPCS), Sol alluvial
	World Reference Base for Soil Ressources 2022 (WRB), Fluvisol

Observer-s :	JMG
Date of archiving:	18.08.1989

Locality	Rossens	**Altitude [m]:**	697
Municipality & canton :	Gruyère, Fribourg	**Humus form :**	-
Coordinates (CH1903) :	573268 158233	**LSS JMG publi n°**	122
Habitat type :	Riparian forest		
Geological substrate :	Recent alluvial deposits		
Vegetation type :	Riparian forest, river transitional riparian zone		
Title :	Field notebook		
Authors :	Gobat, J.-M.		
Publication :	Field notebook JM 1984, 108		

Soil profile description
LA1: 0 to 27 cm depth, silty-organic, lumpy.
(A1)C : 27 to 54 cm depth, fine sand and pebbles.
(C): 54 to 80 cm depth, coarse sands and pebbles.

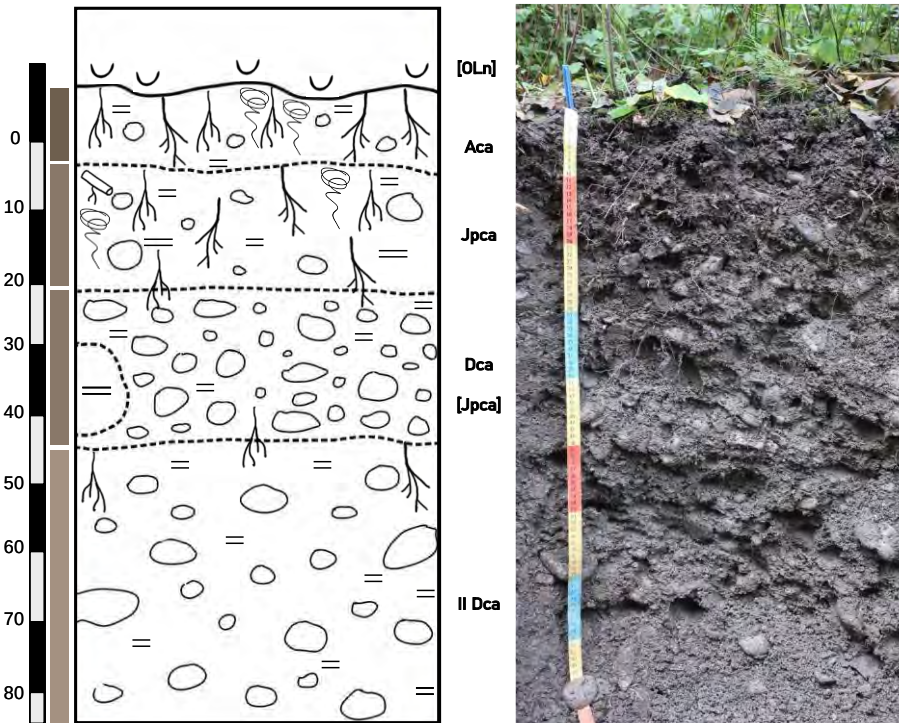
Table S1. 74. Ro2 physico-chemical analysis done on at the University of Neuchâtel on archived soil samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	0-27	2,5Y 4/2	9,74	30,48	16,70	27,97	15,11	1,21	6,15	2,62	0,21	12,32	7,38	7,09	38,52	19,57	54,20
(A1) C	27-54	2,5Y 5/1	1,55	4,82	2,15	7,01	84,47	0,27	1,13	0,43	0,04	11,83	8,01	7,88	56,25	4,56	4,03
C	54-80	2,5Y 5/1	0,61	1,63	0,51	2,73	94,52	0,14	0,57	0,23	0,01	19,41	8,66	8,29	66,47	-	-

Ro2_2020

Soil type :	***Référentiel Pédologique (RP),*** Fluviosol typique polylithique, carbonaté, à Eumull macrostructuré **Classification française des sols (CPCS),** Sol d'apport alluvial **World Reference Base (WRB),** Eumull on Calcaric Fluvisol
Observer-s :	AB & RT
Date :	12.10.2020

Locality	Rossens	**Altitude [m]:**	697
Municipality & canton :	Gruyère, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	573269 158230	**Exposition :**	East
Habitat type :	forest, alluvial env.	**Humus form :**	Eumull
Geological substrate :	Recent alluvial deposits		
Vegetation type :	Fraxinion		
Remarks :	At west of the anti-tank obstacles / "toblorones", between the creek Precence of lombricus rubellus & lumbricus terrestris		



Soil profile description

[OLn] : +5 to 0 cm depth, Transition very clear / Hazelnut and maple leaves of the year, presence of

Aca : 0 to 10 cm depth, Transition distinct 2-4cm / General color brownish-grey / Munsell Color 2,5Y 4/2 / Skeleton 1 Animal 2 Plant / General structure lumpy & sub-polyhedral / Structure lumpy / Texture loamy-sandy / Porosity Very porous >40% / pH Hellige 7 / HCl M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 3 / Root size fine 0-2mm & mid-size 2-5mm / Compactness soft / Adhesiveness sticky / Notes: -

Jpca : 10 to 26 cm depth, Transition distinct 2-4cm / General color brownish-grey / Munsell Color 2,5Y 5/2 / Skeleton 1 Mineral 2 Plant / General structure lumpy & sub-polyhedral / Texture loamy-sandy / Porosity Very porous >40% / pH Hellige 7 / HCl 6M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 2 / Root size fine 0-2mm & mid-size 2-5mm / Compactness not very compact / Adhesiveness sticky / Notes: -.

Dca : 26 to 48 cm depth, Transition distinct 2-4cm / General color grey / Munsell Color 2,5Y 6/2 / Skeleton 1 Mineral / General structure particulaire / Texture sandy / Porosity moderately porous 5-15% / pH Hellige 6.5 / HCl M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 1 / Root size fine 0-2mm & mid-size 2-5mm / Compactness compact / Adhesiveness not very sticky / Notes: high humidity

[Jpca] : 36 to 46 cm depth, Transition clear <2cm / General color grey / Munsell Color 2,5Y 5/2 / Skeleton 1 Mineral / General structure constructed & particulaire / Structure sub-polyhedral / Texture loamy / Porosity moderately porous 5-15% / pH Hellige 7 / HCl M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) none / Compactness not very compact / Adhesiveness very sticky / Notes: -

II Dca : 48+ cm depth, General color grey / Munsell Color 2,5Y 6/2 / Skeleton 1 Mineral / General structure particulaire / Texture sandy / Porosity moderately porous 5-15% / pH Hellige 6.5 / HCl 6M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 0 / Compactness not very compact / Adhesiveness not very sticky / Notes: high humidity

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) macrostructured Eumull
Observer-s :	AB & RT
Date :	12.10.2020

Locality	Rossens	**Altitude [m]:**	697
Municipality & canton :	Gruyère, FR	**Slope (°) :**	0°
Coordinates (CH1903) :	573269 158230	**Exposition :**	East
Habitat type :	forest, alluvial env.		
Geological substrate :	Recent alluvial deposits		
Vegetation type :	Fraxinion		
Remarks :	At west of the anti-tank obstacles / "toblorones", between the creek		

Humus form description

[OLn] : +2 to 0 cm depth, Litter composed of corylus, cornus and populus leaves of the year / Litter transformation absent / Litter fragmentation absent & little fragmented / Cohesion absent / OM content feces and plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition clear <2cm / Notes: none

Ama : 0 to 10 cm depth, OM content humiferous / HCl 6M (1 to 4reaction) 4 / Texture loamy-sandy / Coarse elements yes, 2-20 cm / Structure lumpy and sub-polyhedral / Aggregates size 5-10 mm / Level of aggregation moderately aggregated / Aggregate stability unsTable S / Root abundance (0 to 5) 3 / Transition very clear / Limit (>A horizon) regular / Note: macrostructured

Table S1. 75. Ro2_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Aca	0-10	2,5Y 4/2	10,31	33,40	14,26	24,62	17,41	1,27	6,28	3,48	0,26	13,43	7,90	7,38	24,98	19,55	62,36
Jpca	10-26	2,5Y 5/2	11,20	35,33	15,17	23,41	14,89	0,97	3,62	2,04	0,15	13,43	8,00	7,46	33,04	16,03	37,45
Dca	26-48	2,5Y 6/2	5,75	15,76	2,81	4,19	71,49	0,44	1,14	0,51	0,04	12,13	8,35	7,71	51,01	-	-
[Jpca]	36-46	2,5Y 5/2	10,60	38,68	16,99	15,34	18,40	0,86	2,45	1,17	0,10	11,72	8,05	7,55	35,30	-	-
II Dca	48+	2,5Y 6/2	2,79	6,48	0,14	2,15	88,44	0,31	0,69	0,23	0,02	11,42	8,64	8,12	55,22	-	-

Vegetation survey

Table S1. 76. Ro2_2020 vegetation survey, Rossens (FR). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Fraxinion alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1989) corresponded to a Ripisylve of river transition.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**3**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**10**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**45**	1 à 5 %	1
Grass cover [%]	**30**	5 à 25 %	2
Moss and lichen cover [%]	**10**	5-15 %	2a
Litter cover [%]	**5**	15-25 %	2b
Rock and stone cover [%]	**-**	25 à 50 %	3
Bare ground cover [%]	**10**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Fraxinus excelsior	A	4	
Corylus avellana	A	2a	
Picea abies	A	1	
Crataegus monogyna	B	1	
Viburnum lantana	B	1	
Cornus sp.	B	1	
Corylus avellana	B	1	
Prunus padus	B	+	
Viburnum opulus	B	+	
Populus tremula	B	+	
Ligustrum vulgare	B	1	
Rubus caesius	H	3	
Solidago gigante	H	4	

Figure S1. 37. Ro2_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. Presence of lombricus rubellus B. Presence of lumbricus terrestris C. Worm cast abundant on Litter D. © RT

Roc

Soil type :	***Référentiel Pédologique (RP),*** Peyrosol pierrique colluvial issu de calcaire dur **Classification française des sols (CPCS),** Sol humo-calcaire **World Reference Base for Soil Ressources 2022 (WRB),** Hyperskeletic Leptosol
Observer-s :	JMG
Date of archiving:	11.12.1984

Locality	Roche-Devant	**Altitude [m]:**	831
Municipality & canton :	La Grande-Béroche, Neuchâtel	**Humus form :**	Mull
Coordinates (CH1903) :	547600, 197750	**LSS JMG publi n°**	122
Habitat type :	Alpine grassland		
Geological substrate :	Calcareous scree		
Vegetation type :	Sorbo-Aceretum		
Title :	Field notebook		
Authors :	Gobat, J.-M.		
Publication :	Notebook JM 1984, 21		

Soil profile description

L : 3 to 0 cm depth, maple leaf litter, irregularly distributed over the surface

A11C : 0 to 40 cm depth, very organic, reddish-brown-black humus between pebbles. Skeleton = 80% of volume, increasingly colored by OM towards the bottom. Size: 5-50cm. Fine loamy soil, in fine lumps (0.5-5mm), not very sTable S, especially at the top of the horizon. Earthworms, water seepage. Roots 5/5 (hairy + large Acer. Diffuse lower limit.

A12C : 40 to 100 cm depth, same skeleton, but MO better incorporated and a little lighter. Grumeaux larger and more sTable S. Skeleton 90% of volume. Roots 4/5, all sizes. Many snail shells. HCl 4/5 on surface, 5/5 from 10cm.

C: 100 to X cm depth, R

Table S1. 77. Roc physico-chemical analysis done on at the University of Neuchâtel on soils samples . The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
L	2-0	-	-	-	-	-	-	-	-	43,74	1,50	29,22	-	-	-	-	-
A11C	0-40	10YR 2/2	16,30	51,90	14,77	14,37	2,61	9,56	62,59	28,95	2,57	11,25	6,52	6,22	11,28	84,26	104,37
A12C	40-100	10YR 3/2	17,97	40,58	14,47	13,75	13,22	3,80	18,96	10,00	0,93	10,71	7,31	7,02	48,60	-	-
C	100-X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

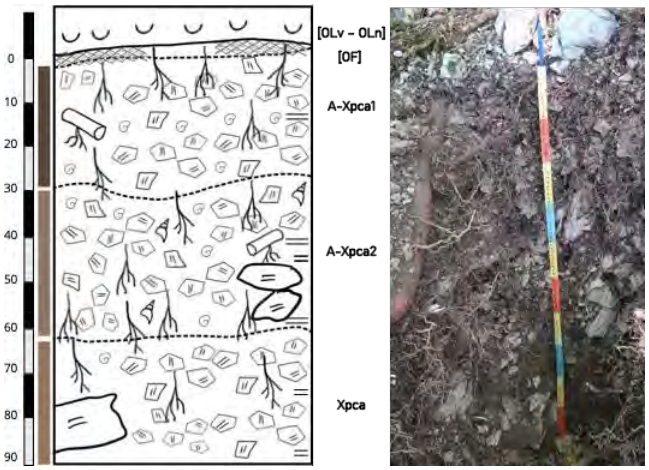
Roc_2020

Soil type :	***Référentiel Pédologique (RP),*** Peyrosol pierrique, colluvial, vif, de calcaire dur, à Oligomull mésostructuré **Classification française des sols (CPCS),** Sol humo-calcaire ***World Reference Base (WRB),*** Oligomull on Calcaric Hyperskeletic Leptosol (colluvic)

Observer-s : GT& RT

Date : 16.09.2020

Locality	Roche-Devant	**Altitude [m]:**	1292
Municipality & canton :	La Grande-Béroche, NE	**Slope (°) :**	16°
Coordinates (CH1903) :	547606 197726	**Exposition :**	South
Habitat type :	Scree slope	**Humus form :**	Oligomull
Geological substrate :	Scree		
Vegetation type :	Lunario-Acerion		
Remarks :	Difficult terrain, rugged site and difficult to access (by foot or by car, road to picnic Table Ss accessible by 4x4). Access to the GPS point by foot from the picnic Table Ss. Possible rock fall, presence of red and black ants		



Soil profile description

[OLv – OLn] : +5 to 0 cm depth, Transition very clear /

[OF] : 0 to 3 cm depth, Transition gradual 4-8cm /

A-Xpca1 : 3 to 30 cm depth, Transition distinct 2-4cm / General color brown-black / Munsell Color 10YR 3/2 / Skeleton 1 Mineral 2 Plant / General structure constructed / Structure lumpy & sub-polyhedral / Texture loamy / Porosity Very porous >40% / pH Hellige 6 / HCl 6M (1 to 4 reaction) 3 /

Stains no stains / Root abundance (0 to 5) 5 / Root size fine 0-2mm , mid-size 2-5mm & big >5mm / Compactness soft / Adhesiveness non-sticky / Notes: empty white shells of land snail

A-Xpca2 : 30 to 65 cm depth, Transition distinct 2-4cm / General color brown-black / Munsell Color 10YR 5/2 / Skeleton 1 Mineral 2 Plant / General structure constructed / Structure sub-polyhedral / Texture loamy-sandy / Porosity Very porous >40% / pH Hellige 7 / HCl 6M (1 to 4reaction) 3 / Stains no stains / Root abundance (0 to 5) 5 / Root size fine 0-2mm , mid-size 2-5mm & big >5mm / Compactness soft / Adhesiveness non-sticky / Notes: empty white shells of land snail & empty freshwater snail shells.

Xpca : 65+ cm depth, General color brown-beige / Munsell Color 10YR 5/3 / Skeleton 1 Mineral 2 Plant / General structure constructed / Structure sub-polyhedral / Texture loamy-sandy / Porosity Very porous >40% / pH Hellige 7.5 / HCl 6M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 4 / Root size fine 0-2mm & mid-size 2-5mm / Compactness not very compact / Adhesiveness non-sticky / Notes: none

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) mesostructured Oligomull
Observer -s :	GT& RT
Date :	16.09.2020

Locality	Roche-Devant	**Altitude [m]:**	1292
Municipality & canton :	La Grande-Béroche, NE	**Slope (°) :**	16°
Coordinates (CH1903) :	547606 197726	**Exposition :**	South
Habitat type :	Scree slope		
Geological substrate :	Scree		
Vegetation type :	Lunario-Acerion		
Remarks :	Difficult terrain, rugged site and difficult to access (by foot or by car, road to picnic Table Ss accessible by 4x4). Access to the GPS point by foot from the picnic Table Ss. Possible rock fall, presence of red and black ants		

Humus form description

[OLv-OLn] : +5 to 0 cm depth, Litter composed of Hazelnut and maple leaves of the year / Litter transformation absent / Litter fragmentation absent & fragmented / Cohesion coherent / OM content mixed material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition clear <2cm / Notes: none

[OF] : 0 to 3 cm depth, fragmented leaves of past year / Litter transformation absent & squeletized leaves / Litter fragmentation absente & fragmented leaves / Cohesion coherent / OM content mixed material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots present / Transition diffuse >8cm / Notes: none

Ame : 3 to 30 cm depth, OM content very humiferous / HCl 6M (1 to 4 reaction) 4 / Texture loamy-sandy / Coarse elements yes, blocks de 2cm to >20cm diameter / Structure lumpy / Aggregates size 2-5mm / Level of aggregation poorly aggregated / Aggregate stability unsTable S / Root abundance (0 to 5) 5 / Transition gradual 4-8cm / Limit (>A horizon) irregular / Note : mesostructured

Table S1. 78. Roc_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples.. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A-Xpca1	3-30	10YR 3/2	13,59	37,38	19,19	17,98	11,86	4,51	20,94	9,32	1,04	9,00	7,60	7,26	67,11	48,01	66,19
A-Xpca2	30-65	10YR 5/2	11,58	33,54	18,22	16,94	19,65	1,93	6,87	4,83	0,37	13,15	8,06	7,69	77,41	-	-
Xpca	65+	10YR 5/3	-	-	-	-	-	1,92	6,78	3,37	0,36	9,34	8,11	7,59	79,97	-	-

Vegetation survey

Table S1. 79. Roc_2020 vegetation survey, La Grande-Béroche (NE). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Lunario-Acerion alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1984) corresponded to Sorbo-Aceretum.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**5**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**10**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**-**	1 à 5 %	1
Grass cover [%]	**5**	5 à 25 %	2
Moss and lichen cover [%]	**10**	5-15 %	2a
Litter cover [%]	**3**	15-25 %	2b
Rock and stone cover [%]	**77**	25 à 50 %	3
Bare ground cover [%]	**5**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Acer sp.	A	5	
Corylus avellana	B	r	
Mercurialis perennis	H	+	
Helleborus foetidus	H	r	
Galium aparine cf.	H	r	

Figure S1. 38. Roc_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. Proximity of the cirque with a very slippery slope B. Litter on the studied site described as a Oligomull C. © RT

Sai

Soil type :	***Référentiel Pédologique (RP),*** Podzosol Meuble bathyluvique **Classification française des sols (CPCS),** Sol podzolique **World Reference Base for Soil Ressources 2022 (WRB),** Podzol
Observer-s :	GV
Date of archiving:	19.07.1995

Locality	Les Saignolis	**Altitude [m]:**	1251,5 m
Municipality & canton :	Le Locle, Neuchâtel	**Humus form :**	-
Coordinates (CH1903) :	548625, 215400	**LSS JMG publi n°**	90
Habitat type :	Pine forest		
Geological substrate :	Calcareous marne		
Vegetation type :	Sphagno-Piceetum blechnetosum		
Title :	Les dessous du Sphagno-Piceetum blechnetosum dans le Jura		
Authors :	Vadi, G.		
Publication :	Diploma thesis work, University of Neuchâtel, 1997		

*** NO PHOTO PROVIDED ***

Soil profile description
OL : 1 to 0 cm depth, litter made up of spruce needles, twigs, a few leaves and spikes, not very thick.
OFr : 0 to 2 cm depth, needle and leaf debris, general brown color, little mycelium, fine and medium roots 3/5, horizontal limit, diffuse transition, pH 4.5.
OFm: 2 to 5 cm depth, more decomposed debris, darker to burgundy in color than OFr, fine, medium and large roots, wavy border, clear transition, pH 4, fine, medium and large roots 4/5, wavy border, clear transition, pH 4. This is the main rooting level.
AE: 5 to 19 cm depth, gray-brown horizon, polyhedral then particulate structure, fine sandy texture, fine and medium roots 2/5, strong porosity, wavy boundary, sharp transition, pH 5.
Eh: 19 to 29 cm depth, silvery-white horizon tinged with a hint of brown, polyhedral structure then particulate, fine sandy texture, fine roots 0.5/5, presence of a few small coals, strong porosity, wavy boundary, diffuse transition, pH 4.
BPs: 29 to 39 cm depth, ochre-orange horizon with small pockets of E in its first centimetres, polyhedral structure, silty-sandy texture, fine roots 0.5/5, medium to high porosity, horizontal boundary, diffuse and gradual transition that is above all marked at texture level, pH 4.

BPsBT: 37 to 46 cm depth, ochre-orange-colored horizon with traces of iron oxidation, molten structure, silty-clay texture, no roots, medium to low porosity, wavy boundary, diffuse transition, pH 4.
C: 46 to 60 cm depth, ochre-grey horizon, hardened then particulate structure, sandy-silt texture, fine roots 1/5, high porosity, horizontal boundary, sharp transition, pH 4.5.
C: 60 to 75 cm depth, ochre-grey horizon with grey flecks, mellow structure, clay texture (with some sand), low porosity, pH 5. Carbonate limit at 75 cm.
MmIIC: 75 to 100 cm depth, ochre-grey horizon with white streaks formed by very small gravels, molten structure, clay-loam texture, low porosity, pH 6, effervescence at HCl 4/4. From 77 to 79 cm, a pocket of white "sand" appears, with a particulate (calcareous sand) and fused (clay matrix) structure, pH 7, effervescence at HCl 4/4. This is probably the alteration residue of a pebble.
IIC: 100 to X cm depth, yellowish-gray, melt-structured horizon, silty-sandy texture (coarse sands), gravels 1 to 10 mm in diameter, medium to low porosity, pH 6.5, effervescence at HCl 4/4. This is a fairly compact horizon, which is difficult for the auger to penetrate.

Table S1. 80. Sai physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
OFr	0-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OFm	2-4	-	-	-	-	-	-	-	-	12,13	0,68	17,77	-	-	-	-	-
AE	4-18	7.5YR 6/2	16,74	50,97	21,60	9,52	1,17	1,70	11,02	5,20	0,31	16,78	3,42	2,71	0,14	7,85	8,62
Eh	18-25	10YR 8/1	14,06	49,76	26,64	9,49	0,05	0,70	2,04	1,10	0,05	20,15	3,46	3,28	0,00	6,72	2,65
BPs	25-37	10YR 7/6	22,24	50,89	18,78	7,96	0,13	2,48	3,13	0,55	0,04	13,04	4,06	3,42	0,00	-	-
BPsBT	37-43	10YR 7/6	23,76	47,61	19,23	9,26	0,14	2,60	2,94	0,46	0,04	10,89	4,08	3,48	0,00		
C	43-60	10YR 7/4	23,51	47,60	17,11	11,54	0,24	2,95	3,17	0,40	0,05	7,53	4,66	3,77	0,00		
Mm	60-75	2.5Y 7/4	27,66	43,42	17,39	11,49	0,04	3,06	3,26	0,36	0,04	10,20	6,54	5,77	0,23		
MmIIC	75-100	2.5Y 7/4	21,24	38,51	16,78	20,81	2,66	2,28	2,61	0,19	0,03	7,17	7,93	7,21	17,18		
IIC	100-120	2.5Y 8/3	14,83	31,36	17,09	16,26	20,09	1,23	1,40	0,14	0,02	7,55	8,16	7,56	46,37		

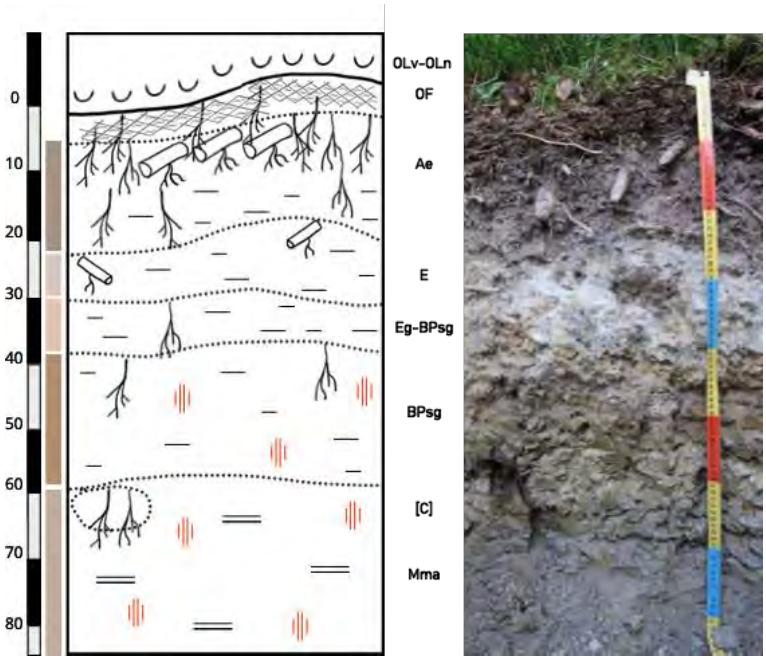
Sai_2020

Soil type :	***Référentiel Pédologique (RP),*** Podzosol meuble rédoxique, bathyluvique, sur marne calcaire, à Hémimoder mésostructuré **Classification française des sols (CPCS)**, Sol pozolique à pseudogley **World Reference Base (WRB),** Hemimoder on Stagnic Podzol

Observer-s : SESA & RT

Date : 13.07.2020

Locality	Les Saignolis	**Altitude [m]:**	1251
Municipality & canton :	Le Locle, NE	**Slope (°) :**	11°
Coordinates (CH1903) :	548632 215407	**Exposition :**	Nord-East
Habitat type :	forest, natural reserve	**Humus form :**	Hemimoder
Geological substrate :	calcareous marne		
Vegetation type :	Sphagno-Piceetum		
Remarks :	On the border of the high swamp, at the top of the doline before the flat, be careful with the very deep dolines.		



Soil profile description

OLn – OLv : +2 to 0 cm depth, Transition clear <2cm / beech leaves of the year, fruits of acer skeletized, beached needles, sphaignes green and dead

OF : 0 to 5 cm depth, Transition gradual 4-8cm /

Ae : 5 to 22 cm depth, Transition gradual 4-8cm / General color - / Munsell Color 10YR 6/2 / Skeleton 1 Mineral 2 Plant / General structure construted / Structure lumpy & polyhedral / Texture sandy / Porosity moderately porous 5-15% / pH Hellige 54 / HCl M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 5 / Root size fine 0-2mm , mid-size 2-5mm & big >5mm / Notes: -

E : 22 to 30 cm depth, Transition gradual 4-8cm / General color - / Munsell Color 10YR 8/1 / Skeleton 1 Mineral 2 Plant / General structure constructed / Structure polyhedral / Texture sandy-loamy / Porosity slightly porous 2-5% / pH Hellige 4.5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 2 / Root size fine 0-2mm , mid-size 2-5mm & big >5mm / Notes: -.

Eg-BPsg : 30 to 38 cm depth, Transition gradual 4-8cm / General color - / Munsell Color 10YR 8/3 / Skeleton 1 Mineral / General structure constructed / Structure polyhedral / Texture loamy-sandy / Porosity slightly porous 2-5% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm / Notes: -

BPsg : 38 to 60 cm depth, Transition gradual 4-8cm / General color - / Munsell Color 10YR 6/4 / Skeleton 1 Mineral / General structure constructed / Structure polyhedral / Texture loamy-sandy / Porosity slightly porous 2-5% / pH Hellige 5.5 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm / Notes: presence of more or less important white pockets and lumpy aggregates around the roots

[C] : 50 to 66 cm depth, Transition gradual 4-8cm/ General color - / Munsell Color 2,5Y 6/3 / Skeleton 1 Mineral / General structure constructed and particular / Structure sub-polyhedral / Texture sandy / Porosity slightly porous 2-5% / pH Hellige 5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Notes: presence of sand and small very hard white blocks

Mma : 60+ cm depth, General color - / Munsell Color 2,5Y 7/2 / Skeleton 1 Mineral / General structure massive / Texture clay / Porosity slightly porous 2-5% / pH Hellige 6 / HCl 6M (1 to 4 reaction) 4 / Stains rust stains / Compactness very compact / Adhesiveness sticky / Notes: -

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) mesostructured Hemimoder
Observer-s :	SESA & RT
Date :	13.07.2020

Locality	Les Saignolis	**Altitude [m]:**	1251
Municipality & canton :	Le Locle, NE	**Slope (°) :**	11°
Coordinates (CH1903) :	548632 215407	**Exposition :**	Nord-East
Habitat type :	forest, natural reserve		
Geological substrate :	calcareous marne		
Vegetation type :	Sphagno-Piceetum		
Remarks :	On the border of the high swamp, at the top of the doline before the flat, be careful with the very deep dolines.		

Humus form description

OLn – OLv : +2 to 0 cm depth, Beech leaves of the year, fruits of acer skeletized, beached needles, sphaignes green and dead / Litter transformation bleached and skeletized leaves / Litter fragmentation absent & fragmented / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition clear <2cm / Notes: none

OF : 0 to 5 cm depth, fragmented leaves of past year / Litter transformation bleached leaves & squeletized leaves / Litter fragmentation absente & fragmented leaves / Cohesion coherent / OM content mixed material / Percentage of fine OM 30-70 % / Presence of mycelium absent / Presence roots present / Transition gradual 4-8cm / Notes: none

Ame : 5 to 22 cm depth, OM content not very humiferous / HCl 6M (1 to 4 reaction) 0 / Texture loamy-sandy / Coarse elements none / Structure lumpy and polyhedral / Aggregates size 2-10 mm / Level of aggregation moderately aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 4 / Transition gradual 4-8cm / Limit (>A horizon) regular / Note : mesostructured

Table S1. 81. Sai_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Ae	5-22	10YR 6/2	17,79	43,99	23,68	14,43	0,11	1,52	6,38	3,26	0,21	15,71	3,70	3,12	0,00	6,99	4,95
E	22-30	10YR 8/1	18,26	44,72	23,82	12,92	0,02	0,67	1,53	0,84	0,04	23,53	4,38	3,52	0,02	5,52	3,24
Eg-BPsg	30-38	10YR 8/3	-	-	-	-	-	2,35	2,07	0,92	0,05	18,64	4,94	3,77	0,03	-	-
BPsg	38-60	10YR 6/4	28,59	42,39	17,03	11,88	0,11	3,51	3,37	0,92	0,05	17,18	5,77	4,72	0,50	-	-
[C]	50-66	2,5Y 6/3	23,28	43,91	16,93	15,20	0,67	3,74	2,41	0,88	0,03	26,23	7,94	7,09	14,22	-	-
Mma	60+	2,5Y 7/2	20,95	39,79	16,38	20,67	2,21	3,29	1,97	0,44	0,03	15,40	8,20	7,28	23,18	-	-

Vegetation survey

Table S1. 82. Sai_2020 vegetation survey, Les Saignolis (NE). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Sphagno-Piceetum alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1995) corresponded to a Sphagno-Piceetum blechnetosum.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**5**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**25**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**23**	1 à 5 %	1
Grass cover [%]	**45**	5 à 25 %	2
Moss and lichen cover [%]	**30**	5-15 %	2a
Litter cover [%]	**2**	15-25 %	2b
Rock and stone cover [%]	**-**	25 à 50 %	3
Bare ground cover [%]	**-**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Picea abies	A	1	
Fagus sylvatica	A	+	
Acer pseudoplatanus	A	1	
Sorbus aucuparia	A	1	
Corylus avellana	A	+	
Sorbus mougeotii	A	r	
Fagus sylvatica	B	2a	
Lonicera nigra	B	1	
Picea abies	B	2a	
Sorbus aucuparia	B	1	
Vaccinium myrtillus	H	1	
Equisetum telmateia	H	1	
Lycopodium annotinum	H	2a	
Dryopteris filix-mas	H	r	

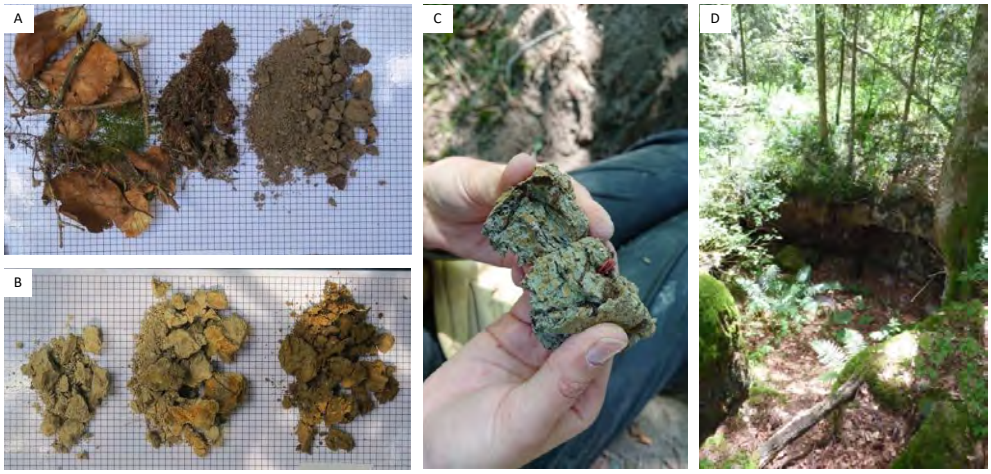


Figure S1. 39. Sai_2020 pictures taken in 2020 around the soil profile. Topsoil horizon's sequence A. Subsoil horizon's sequence B. Redox stain on a subsoil aggregate C. Doline next to the soil profile D. © RT & SESA

Wor

Soil type :	***Référentiel Pédologique (RP),*** Fluviosol Brunifié calcaire **Classification française des sols (CPCS),** Sol alluvial brunifié **World Reference Base for Soil Ressources 2022 (WRB),** Fluvisol (Brunic, Calcaric)
Observer-s :	JMG
Date of archiving:	17.08.1989

Locality	Worben, alte Aare	**Altitude [m]:**	436
Municipality & canton :	Kampelen Bern	**Humus form :**	-
Coordinates (CH1903) :	589760 215798	**LSS JMG publi n°**	122
Habitat type :	Riparian forest		
Geological substrate :	Recent alluvial deposits		
Vegetation type :	Molinio-Pinetum alluvial		
Title :	Field notebook		
Authors :	Gobat, J.-M.		
Publication :	Notebook JM 1984, 102		

Soil profile description
A1 : 0 to 12 cm depth, lumpy, sandy-loamy
(B)C : 12 to 38 cm depth, sandy
IIC: 38 to 80 cm depth, pebbles + coarse sand

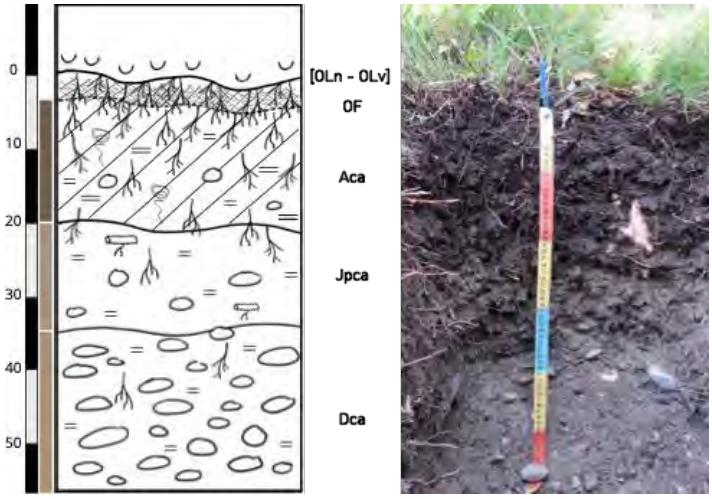
Note: $CaCO_3$ to surface = prararendzine

Table S1. 83. Wor physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	0-12	2,5Y 4/3	5,95	16,60	9,58	26,96	40,91	1,36	7,37	4,06	0,32	12,78	7,27	7,08	22,90	21,19	63,46
(B)C	12-38	2,5Y 6/3	3,27	11,25	10,25	34,17	41,05	0,50	1,79	0,73	0,08	9,52	7,8	7,64	29,97	7,84	1,52
IIC	38-80	2,5Y 7/2	0,88	2,50	1,68	14,08	80,86	0,15	0,45	0,19	0,01	13,01	8,31	8,3	27,09	_	_

Soil type :	***Référentiel Pédologique (RP),*** Fluviosol typique carbonaté, sur alluvions récents, à Oligomull mésostructuré **Classification française des sols (CPCS),** Sol d'apport alluvial ***World Reference Base (WRB),*** Oligomull on Calcaric Fluvisol
Observer-s :	MN & RT
Date :	18.10.2020

Locality	Worben, alte Aare	**Altitude [m]:**	437
Municipality & canton :	Kampelen BE	**Slope (°) :**	0°
Coordinates (CH1903) :	589798 215812	**Exposition :**	South-West
Habitat type :	alluvial env.	**Humus form :**	Oligomull
Geological substrate :	Recent alluvial deposits		
Vegetation type :	Molinio-Pinion		
Remarks :	10 m north-east of the field in the direction of the forest. Between the field and the ancient dry bar of the aare, presece of octolasion cyaneum		



Soil profile description

[OLn - OLv] : +2 to 0 cm depth, Transition very clear / Litter composed of quercus and carex leafs

OF : 0 to 3 cm depth, Transition very clear

Aca : 3 to 20 cm depth, Transition clear <2cm / General color dark brown / Munsell Color 2,5Y 4/2 / Skeleton 1 Mineral 2 Plant / General structure lumpy / Structure lumpy / Texture loamy / Porosity porous 15-40% / pH Hellige 5 / HCl M (1 to 4 reaction) 3 / Stains no stains / Root abundance (0 to 5) 5 / Root size fine 0-2mm & mid-size 2-5mm/ Compactness not very compact / Adhesiveness non-sticky / Notes: amat of grain of sand in the horizon

Jpca : 20 to 35 cm depth, Transition clear <2cm / General color beige / Munsell Color 2,5Y 6/3 / Skeleton 1 Mineral 2 Plant 3 Animal / Structure sub-polyhedral / Texture sandy / Porosity Very porous >40% / pH Hellige 6 / HCl 6M (1 to 4 reaction) 3 / Stains no stains / Root abundance (0 to 5) 3 / Root size mid-size 2-5mm & fine 0-2mm / Compactness not very compact / Adhesiveness sticky / Notes: -.

Dca : 35+ cm depth, Transition clear <2cm / General color beige / Munsell Color 2,5Y 6/2 / Skeleton 1 Mineral / General structure particulaire / Texture sandy / Porosity Very porous >40% / pH Hellige 6 / HCl 6M (1 to 4 reaction) 4 / Stains no stains / Root abundance (0 to 5) 0 / Compactness compact / Adhesiveness sticky / Notes: very badly sorted pebble with coarse sand

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) mesostructured Oligomull		
Observer-s :	MN & RT		
Date :	18.10.2020		
Locality	Worben, alte Aare	**Altitude [m]:**	437
Municipality & canton :	Kampelen BE	**Slope (°) :**	0°
Coordinates (CH1903) :	589798 215812	**Exposition :**	South-West
Habitat type :	alluvial env.		
Geological substrate :	Recent alluvial deposits		
Vegetation type :	Molinio-Pinion		
Remarks :	10 m north-east of the field in the direction of the forest. Between the field and the ancient dry bar of the aare		

Humus form description

[OLn - OLv] : +2 to 0 cm depth, Litter composed of quercus and carex leafs / Litter transformation bleached leaves / Litter fragmentation absent & fragmented / Cohesion coherent / OM content plant material & feces / Percentage of fine OM < 30 % / Presence of mycelium present / Presence roots absent / Transition very clear / Notes: important presence of turicula

OFzo : 0 to 3 cm depth, fragmented leaves of past year / Litter transformation absent & squeletized leaves / Litter fragmentation fragmented & atomized leaves / Cohesion coherent / OM content mixed material / Percentage of fine OM 30-70 % / Presence of mycelium present / Presence roots present / Transition very clear / Notes: very dense roots, with grain of sands and small pebble

Ame: 3 to 20 cm depth, OM content humiferous / HCl 6M (1 to 4reaction) 3 / Texture loamy-sandy / Coarse elements yes, blocks de 0.2cm to >20cm diameter / Structure lumpy / Aggregates size 1-5mm / Level of aggregation poorly aggregated / Aggregate stability sTable S / Root abundance (0 to 5) 5 / Transition clear <2cm / Limit (>A horizon) wavy / Note: mesostructured

Table S1. 84. Wor_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
Aca	3-20	2,5Y 4/2	7,31	23,76	14,93	23,71	30,30	1,54	7,29	4,21	0,27	15,80	7,76	7,27	19,56	28,34	61,29
Jpca	20-35	2,5Y 6/3	1,12	3,30	2,51	18,56	74,50	0,26	0,81	0,40	0,02	16,61	8,32	7,93	25,56	4,39	1,56
Dca	35+	2,5Y 6/2	0,43	1,26	0,66	4,51	92,76	0,15	0,38	0,20	0,01	18,21	8,75	8,50	32,35	-	-

Vegetation survey

Table S1. 85. Wor_2020 vegetation survey, Worben (BE). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Molinio-Pinion alliance was determined for this environment, according to the Guide des milieux naturels de Suisse: écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1989) corresponded to an alluvial steppe with Molinio-Pinetum alluvial.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**2**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**15**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**5**	1 à 5 %	1
Grass cover [%]	**90**	5 à 25 %	2
Moss and lichen cover [%]	**2**	5-15 %	2a
Litter cover [%]	**2**	15-25 %	2b
Rock and stone cover [%]	**1**	25 à 50 %	3
Bare ground cover [%]	**-**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Quercus pubescens petraea	A	2	
Pinus sylvestris	A	4	
Crataegus monogyna aggr.	H	1	
Viburnum lantana	H	+	
Rubus sp.	H	2a	
Cornus alba	H	2a	
Carex alba	H	2a	
Carex sylvatica	H	2b	
Clematis vitalba	H	+	
Frangula alnus	H	+	

Figure S1. 40. Wor_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. Very dense fin roots in the organo-mineral horizon B. View from the soil profile looking North-West C. Picture of an Octolasion cyaneum present in the soil profile D. ©RT

Zer

Soil type :	***Référentiel Pédologique (RP)***, Calcisol colluvial issu de schistes lustrés
	Classification française des sols (CPCS), Sol brun calcique colluvial
	World Reference Base for Soil Ressources 2022 (WRB), Cambisol

Observer-s : JMG

Date of archiving: 22.06.1989

Locality	Zermatt Trift	**Altitude [m]:**	2184
Municipality & canton :	Zermatt, Valais	**Humus form :**	Mull
Coordinates (CH1903) :	622467, 97431	**LSS JMG publi n°**	122
Habitat type :	Alpine grassland		
Geological substrate :	Suspended rubble and dry rubble cone, calcschist		
Vegetation type :	Astragalo-Seslerietum		
Title :	Field notebook (122)		
Author(s) :	Gobat, J.-M.		
Publication :	Field notebook (463)		

Soil profile description

A1 : 0 to 4 cm depth, pH 5.5

A1 (B) : 4 to 11 cm depth, pH 5.5

(B): 11 to 30 cm depth, pH 6

(B)C: 30 to 42 cm depth

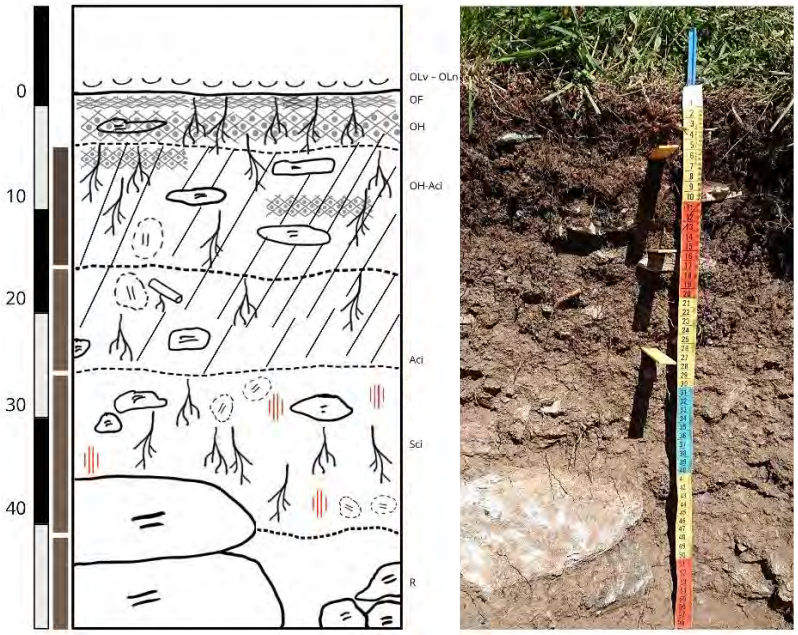
C: 42 to 60 cm depth, pH 7

Table S1. 86. Zer physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Classification française des sols (CPCS) from Aubert G., & Duchaufour, P. (1967).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	Corg	Ntot	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
A1	0-4	2,5Y 7/4	4,53	31,67	21,10	19,89	22,82	2,21	13,10	6,89	0,57	12,08	5,78	5,35	0,05	19,44	61,57
A(B)	4-11	10YR 3/2	4,21	32,11	22,52	22,25	18,91	1,36	6,18	2,60	0,27	9,62	5,91	5,35	0,16	11,62	50,46
(B)	11-42	10YR 4/2	3,69	31,57	26,22	27,68	10,84	1,33	5,18	2,33	0,22	10,56	6,49	5,91	0,24	-	-
C	42-60	2,5Y 5/4	-	-	-	-	-	0,54	2,13	0,82	0,11	7,25	7,53	7,35	8,58	-	-

Soil type :	***Référentiel Pédologique (RP),*** Calcisol colluvial, mésaturé, issu de calcschistes, à pachyamphi **Classification française des sols (CPCS),** Sol brun calcique colluvial ***World Reference Base (WRB)***, Pachyamphi on Eutric Cambisol (Colluvic)
Observer-s :	SESA & RT
Date :	21.08.2020

Locality	Zermatt Trift	**Altitude [m]:**	2187,5
Municipality & canton :	Zermatt, VS	**Slope (°) :**	15°
Coordinates (CH1903) :	622457 97439	**Exposition :**	South-West
Habitat type :	alpine lawn	**Humus form :**	Pachyamphi
Geological substrate :	Suspended rubble and dry rubble cone, calcschist		
Vegetation type :	Seslerion variae		
Remarks :	Above the footpath along the river Triftbach. Profile dug under the rocky bar. Grassland altered by recent boulder falls. Very friable and unsTable S ground.		



Soil profile description

OLv – OLn : +3 to 0 cm depth, Transition very clear / leaves of the year, mostly attached to the plants.

OF : 0 to 0.5 cm depth, Transition clear <2cm /

OH : 0.5 to 5/7 cm depth, Transition gradual 4-8cm / sand grains and fine roots with angular gravels

OH-Aci : 5/7 to 15 cm depth, Transition gradual 4-8cm / General color greyish brown / Munsell Color 10YR 3/2 / Skeleton 1 Mineral 2 Plant / General structure gritty / Texture sandy-loamy / Porosity porous 15-40% / pH Hellige 6 / HCl M (1 to 4 reaction) 0 / Stains stains / Root abundance (0 to 5) 5 / Root size fine 0-2mm, mid-size 2-5mm & big >5mm/ Compactness not very compact / Adhesiveness non-sticky / Notes: Many stones in the first 15 cm.

Aci : 15 to 25 cm depth, Transition clear <2cm / General color greyish brown / Munsell Color 10YR 4/2 / Skeleton 1 Mineral 2 Plant / General structure lumpy & gritty / Texture sandy-loamy / Porosity moderately porous 5-15% / pH Hellige 5.5 / HCl 6M (1 to 4 reaction) 0 / Stains no stains / Root abundance (0 to 5) 4 / Root size fine 0-2mm , mid-size 2-5mm & big >5mm / Compactness not very compact / Adhesiveness non-sticky / Notes: -.

Sci : 25 to 42 cm depth, Transition clear <2cm / General color light greyish brown / Munsell Color 10YR 4/2 / Skeleton 1 Mineral 2 Plant / General structure polyhedral / Texture loamy-sandy / Porosity slightly porous 2-5% / pH Hellige 6 / HCl 6M (1 to 4 reaction) 0 / Stains rust stains / Root abundance (0 to 5) 1 / Root size mid-size 2-5mm / Compactness compact / Adhesiveness non-sticky / Notes: washed and very dry appearance along the profil, altered blocks

Rca : 42+ depth, presence of silt, at 45 cm very altered stones and presence of aggregates due to bioturbation.

Humus form description

Humus form type :	European Humus Forms Reference Base (Zanella et al., 2018) microstructured Pachyamphi
Observer-s :	SESA & RT
Date :	21.08.2020

Locality	Zermatt Trift	Altitude [m]:	2187,5
Municipality & canton :	Zermatt, VS	Slope (°) :	15°
Coordinates (CH1903) :	622457 97439	Exposition :	Nord-West
Habitat type :	alpine lawn		
Geological substrate :	Suspended rubble and dry rubble cone, calcschist		
Vegetation type :	Seslerion variae		
Remarks :	Above the footpath along the river Triftbach. Profile dug under the rocky bar. Grassland altered by recent boulder falls. Very friable and unsTable S ground.		

Humus form description

OLv – Oln : +3 to 0 cm depth, Litter composed of Hazelnut and maple leaves of the year and past year / Litter transformation absent / Litter fragmentation absent / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots absent / Transition clear <2cm / Notes: none

OFzo : 0 to 0.5 cm depth, fragmented leaves of past year / Cohesion absent / OM content plant material / Percentage of fine OM 0 % / Presence of mycelium absent / Presence roots present / Transition clear <2cm / Notes: none

OH : 0.5 to 5/7 cm depth / Cohesion absent / OM content plant material / Percentage of fine OM 70-90 % / Presence of mycelium absent / Presence roots abondant / Transition gradual 4-8cm / Notes: sand grains and fine roots with angular gravels
OH-Ami: 5/7 to 15 cm depth, OM content not very humiferous / HCl 6M (1 to 4 reaction) 0 / Texture sandy / Coarse elements yes, pebbles 2-20cm / Structure gritty / Aggregates size 1-2mm / Level of aggregation poorly aggregated / Aggregate stability unsTable S / Root abundance (0 to 5) 5 / Transition gradual 4-8cm / Limit (>A horizon) regular
Ami/Ame: 15 to 25 cm depth, OM content not very humiferous / HCl 6M (1 to 4reaction) 0 / Texture sandy / Coarse elements yes, pebbles 2-20cm / Structure lumpy and gritty / Aggregates size 1-5mm / Level of aggregation moderately aggregated / Aggregate stability unsTable S / Root abundance (0 to 5) 5 / Transition distinct 2-4cm / Limit (>A horizon) regular / Note: microstructured

Table S1. 87. Zer_2020 physico-chemical analysis done on at the University of Neuchâtel on soils samples. The horizons letters were assigned to each horizon according to the Référentiel Pédologique from Baize D., & Girard M. C. (2008).

Horizon	Limits	Munsell	Clays	Fine silt	Coarse silt	Fine sand	Coarse sand	RH	LOI	C_{org}	N_{tot}	C/N	pH H_2O	pH KCl	$CaCO_3$	CEC	S/CEC
	cm	dry soil	%	%	%	%	%	%	%	%	%	%			%	cmol/kg	%
OH-Aci	5/7 to 15	10YR 3/2	4,02	36,20	24,61	20,73	14,44	3,61	16,80	8,80	0,76	11,59	7,13	6,60	-	36,90	74,38
Aci	15 to 25	10YR 4/2	4,52	41,59	27,48	21,59	4,81	2,32	8,98	4,80	0,46	10,44	7,15	6,46	0,16	25,20	56,47
Sci	25 to 42	10YR 4/2	3,10	30,08	25,58	24,25	16,99	1,66	4,28	2,14	0,23	9,44	7,21	6,18	0,00	-	-

Vegetation survey

Table S1. 88. Zer_2020 vegetation survey, Zermatt (VS). Stratum codes used: H = herbaceous, B = shrubby, A = tree-like. The Seslerion variae alliance was determined for this environment, according to the Guide des milieux naturels de Suisse : écologie, menaces, espèces caractéristiques (Delarze et al., 2015). The vegetation that had been determined during the first survey (1989) corresponded to an Astragalo-Seslerietum.

Area [m²] :		**Dimensions [a x b] :**	
Tree cover [%]	**-**	**Species ab.-dom. codes (Ad):**	
Height of trees [m]	**-**	1-2 individuals, < 0.1 %	r
Total cover [%]		0.1 à 1 % surface	+
Shrub cover [%]	**-**	1 à 5 %	1
Grass cover [%]	**80**	5 à 25 %	2
Moss and lichen cover [%]	**-**	5-15 %	2a
Litter cover [%]	**15**	15-25 %	2b
Rock and stone cover [%]	**5**	25 à 50 %	3
Bare ground cover [%]	**-**	50 à 75 %	4
		>75 %	5

Strata Codes (S): arboreal [A], shrubby [B], and herbaceous [H]

Vegetation survey	**S**	**Ad**	**Comment**
Juniperus communis	H	NA	
Galium anisophyllon	H	NA	
Briza media	H	NA	
Rhinanthus alectorolophus	H	NA	
Achillea millefolium	H	NA	
Plantago serpentina	H	NA	
Cirsium acaule	H	NA	
Campanula scheuchzeri	H	NA	
Astragalus penduliflorus	H	NA	
Carex flacca	H	NA	
Trifolium pratense	H	NA	
Sesleria caerulea (L.) Ard.	H	NA	
Equisetum arvense	H	NA	
Carlina acaulis	H	NA	
Festuca nigrescens	H	NA	
Koeleria pyramidata	H	NA	
Plantago media	H	NA	
Trifolium montanum	H	NA	
Silene vulgaris	H	NA	

Figure S1. 41. Zer_2020 pictures taken in 2020 around the soil profile. Horizon's sequence A. Soil profile localization looking South-East B. Flowers under the magnifying glass on the left and HCl 6M reacting with carbonate stone on the right C. © SESA

Thematic 2

Thematic 2: Geology and soil evolution

The relative contribution of geological substrates on soil evolution and pedogenesis in Switzerland

In process with clay analysis ongoing:
Sarah Semeraro[1], Roxane Tuchschmid[1], Jean-Michel Gobat[1], Thierry Adatte[2], Brahimsamba Bomou[2], Sergio Rasmann[1], Renée-Claire Le Bayon[1]

[1]Institute of Biology, University of Neuchâtel, Switzerland, [2]Institute of Earth Sciences (ISTE), University of Lausanne, Switzerland

Method – XRD Analysis

The spectral counter (THERMO ARL water cooled silicon detector) eliminates the Cu Kb, the Fe parasitic emissions and others.

Fixed (routine) analysis conditions:

- X-ray powder diffractometer (SCINTAG XDS 2000)
- the spectral counter (THERMO ARL water cooled silicon detector)
- wave length: 1.5406Å Cu Ka1
- generator power: 45 kV and 40 mA
- goniometer type: q/q
- goniometer radius: 250 mm
- emitting slits: 2 mm, 4 mm
- receiving slits: 0.5 mm, 0.3 mm
- continuous scan
- round (ø 25 mm) glass plates

Variable analysis conditions:

- goniometer speed (range from 1°/min to 10°/min.)
- acquisition step size (chopper increment) (.03 or .05 °2q)
- sample spinning or not

Tables

Table S2. 1. Results of the ANOVA for the redundancy analysis (RDA) examining the effect of soil age on the variance of soil mineralogy.

Variable	Factor	Df	F value	Pr (<F)	
soil_age	1	129.25	6.0297	0.001	***
Residual	42	900.29			

Table S2. 2. Mineral list. Shown is the liste on mineral found in all covered environments

Sample._ref	Sample origin	Site3	Environment	Soil_age	Canton	Phyllosilicates	Quartz	Feldspath.k	Plagioclase.na	Calcite	Dolomite	Goethite	Indosés
p4_S5	2020	Ch1	Lakeshore	old	FR	10.08	28	18.9	11.15	19.45	1.69	1.08	9.64
p6_S4	2020	Cud1	Lakeshore	old	VD	14.32	30.23	6.77	17.1	17.75	2.14	0	11.7
p12_S2	2020	Por	Lakeshore	old	FR	18.53	45.08	13.67	9.68	6.32	0.93	0	5.79
p16_S3	2020	Ch2	Lakeshore	old	FR	12.89	29.26	12.44	22.94	11.69	0.98	0	9.8
p18_S3	2020	Cud2	Lakeshore	old	VD	20.44	21.45	22.48	11.02	12.99	1.89	0	9.73
p26_S6	2020	Pon	Forest	old	BE	28.86	46.2	14.18	0.85	0.37	0.37	1.61	7.55
p30_S5	2020	Gor	Forest	old	NE	22.45	25.89	1.98	2.95	22.56	0	0	24.16
p32_S2	2020	Roc	Alpine	young	NE	12.14	5.41	2.34	0.8	64.56	7.58	0	7.17
p40_S7	2020	Boi	Forest	old	BE	26.35	36.45	2.29	1.62	9.45	0.45	1.77	21.63
p43_S4	2020	Cha	Grassland	old	BE	20.73	24.38	0.87	0.71	28.45	0	0	24.86
p46_S4	2020	Cho	Grassland	old	VD	37.9	27.9	2.43	0.9	0.25	0.41	2.11	28.11
p50_S2	2020	Gou	Grassland	old	JU	30.67	31.67	7.18	1.81	0.2	0	0	28.47
p67_S2	2020	Po1	Alluvial	old	FR	14.88	42.59	1.74	4.12	25.67	1.26	0	9.74
p68_S3	2020	Po2	Alluvial	old	FR	16.67	24.6	1	4.96	48.54	1.78	0	2.45
p77_S4	2020	Nav	Alpine	old	VS	34.25	55.91	0.65	1.34	0.14	0	0	7.72
p77_S5	2020	Nav	Alpine	old	VS	28.91	62.45	0.69	1.24	0.21	0	0	6.5
p80_S6	2020	Ra1	Forest	old	BE	31.45	48.13	2.67	0.98	0.83	0.45	1.81	13.68
p81_S4	2020	Ra2	Forest	old	BE	28.45	46.99	2.03	1.39	0.25	0.49	1.25	19.14
p85_S3	2020	Zer1	Alpine	old	VS	13.67	8.46	1.21	63.11	0.19	0	0	13.36
p89_S6	2020	Bi1	Alpine	young	VS	12.56	0.57	0	2.16	0	48.89	0	35.82
p90_S2	2020	Wor	Alluvial	young	BE	14.89	24.9	1.78	20.45	19.67	0.76	0	17.56
p93_S2	2020	Ro1	Alluvial	young	FR	20.12	22.56	1.16	2.86	34.23	5.89	0	13.19
p94_S4	2020	Ro2	Alluvial	young	FR	15.79	21.43	0.72	3.33	47.23	4.2	0	7.3
p98_S3	2020	Bi2	Alpine	young	VS	13.69	32.67	3.67	6.9	0.27	0.73	1.24	40.83
p99_S6	2020	Bi3	Alpine	old	VS	14.79	38.63	7.25	4.93	0.42	2.1	1.3	30.58
p104_S3	2020	Bi4	Alpine	young	VS	12.67	13.9	27.81	14.1	0.45	2	3.02	26.04
p118_S3	2020	Bev	Forest	old	NE	23.9	45.34	2.76	7.89	0.29	0.46	1.31	18.05
p121_S6	2020	Sai	Forest	old	NE	33.67	35.67	1.02	0.71	16.2	0	1.59	11.14
S0009	soil_library	Che	Lakeshore	old	VD	14.78	23.41	25.13	11.08	7.43	0.6	0	17.57
S0028	soil_library	Cud1	Lakeshore	old	VD	16.56	23.9	5.89	6.9	25.9	4.78	0	16.07
S0061	soil_library	Ch2	Lakeshore	old	FR	11.91	35.75	8.54	29.89	3.35	0.38	0	10.17
S0073	soil_library	Cud2	Lakeshore	old	VD	23.9	24.9	1.1	3.76	22.43	3.98	0	19.93
S0201	soil_library	Roc	Alpine	young	NE	20.45	6.52	0.86	0.94	23.99	0.58	1.39	45.26

S0318	soil_library	Boi	Forest	old	BE	29.89	38.34	1.56	2.45	0.39	0.42	0	26.95
S0431	soil_library	Gou	Grassland	old	JU	29.45	33.89	1.93	2.53	0.24	0.76	1.18	30.03
S0524	soil_library	Po1	Alluvial	old	FR	12.87	27.55	7.9	7.99	22.78	1.04	1.83	18.04
S0527	soil_library	Po2	Alluvial	old	FR	15.89	37.12	17.9	3.87	19.43	2.17	0	3.62
S0585	soil_library	Ra1	Forest	old	BE	27.98	45.98	1.49	2.96	0.36	0.38	2.01	18.86
S0619	soil_library	Bi1	Alpine	young	VS	6.17	1.36	0.71	6.38	4.96	76.9	0	3.53
S0625	soil_library	Wor	Alluvial	young	BE	15.92	25.87	15.78	5.9	9.56	0	0.98	25.99
S0637	soil_library	Ro1	Alluvial	young	FR	17.58	30.87	0.9	4.96	31.89	2.01	0	11.79
S0640	soil_library	Ro2	Alluvial	young	FR	15.86	22.36	0.53	2.55	47.92	2.4	0	8.38
S1138	soil_library	Bi2	Alpine	young	VS	17.9	15.45	7.67	17.34	1.73	0	0	39.91
S1173	soil_library	Bi4	Alpine	young	VS	21.56	13.67	3.98	4.23	0.5	0.62	0	55.45
S1417	soil_library	Sai	Forest	old	NE	34.9	19.56	0.81	0.67	17.9	0	0	26.16
S1418	soil_library	Sai	Forest	old	NE	23.89	20.45	1.25	0.31	31.23	0	1.59	21.28

Figures

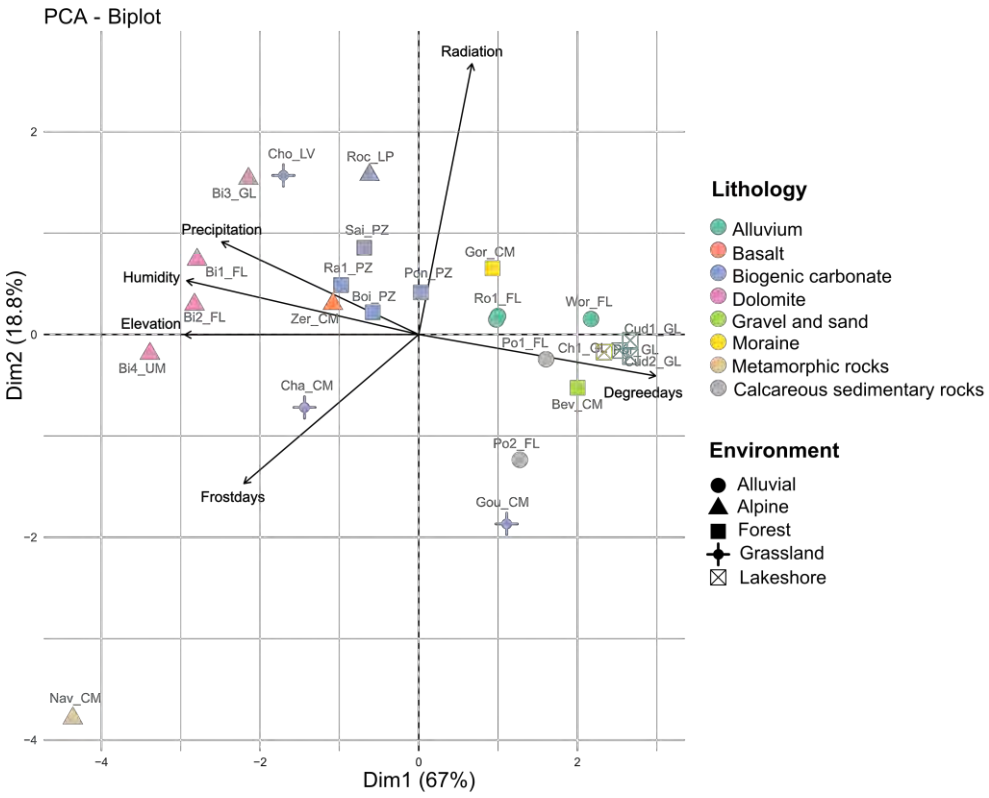


Figure S2. 1. This principal component analysis (PCA) biplot visualizes lithology data for each soil sample sourced from the Macrostrat database (Peters et al., 2018). Lithology types are differentiated by color: alluvium (light green), basalt (orange), biogenic carbonate (purple), dolomite (pink), gravel and sand (lime green), moraine (yellow), metamorphic rocks (brown) , and calcareous sedimentary rocks (grey). Environment types are distinguished by shape: alluvial (full circle), alpine (full triangle), forest (full square), grassland (cross and circle), and lakeshore (crossed square).

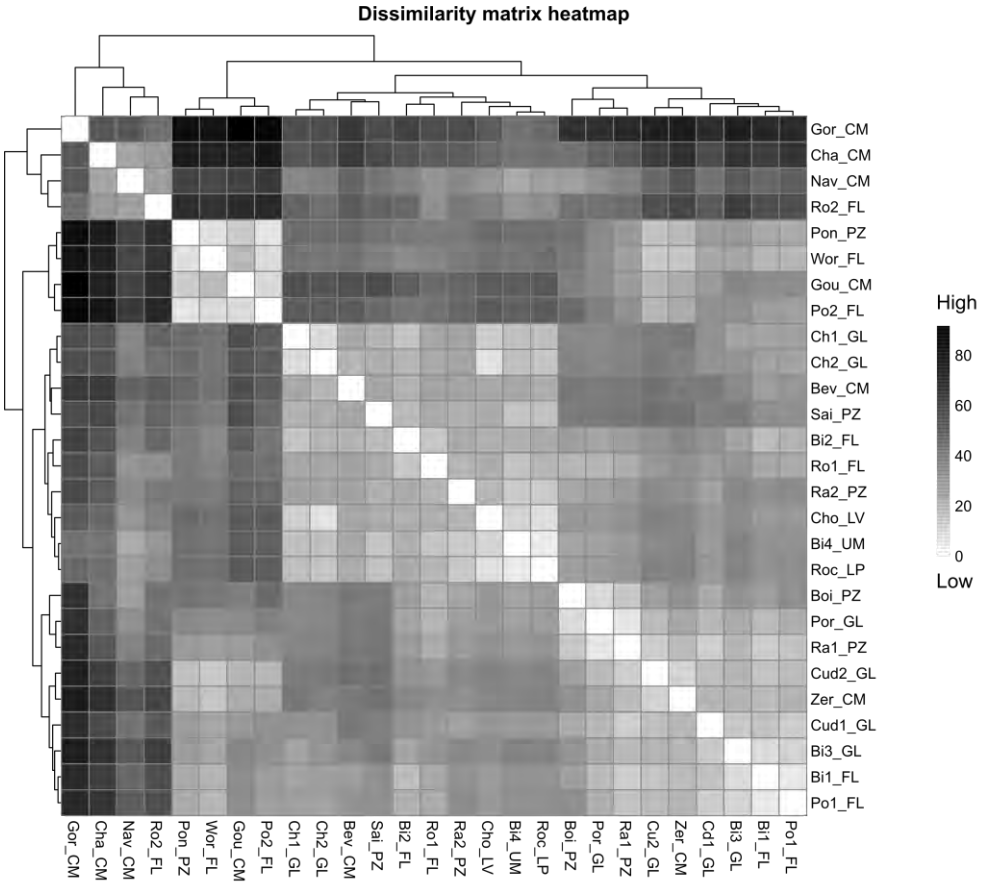


Figure S2. 2. Heatmap of soil profile dissimilarity matrix. This heatmap visualizes the dissimilarity between soil profiles, with the color gradient ranging from white to blue. White represents low dissimilarity (high similarity), while black indicates high dissimilarity (low similarity). The heatmap includes hierarchical clustering of both rows and columns, grouping similar profiles and attributes. Clusters with distinct color patterns suggest that profiles of the same or similar soil types are grouped. Short branches in the dendrogram indicate high-profile similarity, whereas long branches suggest a lower similarity. Samples of the same soil type that are clustered together and show specific colors indicate that profiles of the same type share more similarities with each other than with profiles of other types. The dendrograms along the margins illustrate these hierarchical groupings and the overall structure of soil profile similarities and differences within the dataset. The sample codes reflect the site names and soil type abbreviations, providing context for the data points.

Thematic 3

Solar radiation explains litter degradation along alpine elevation gradients better than other climatic or edaphic parameters

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Tables

Table S3. 1. Two-way ANOVA table for the effect of elevation zone (two levels; alpine and subalpine), exposition (two levels; north and south), region (two levels; Valais, Ticino), and interaction between zone and exposition on 11 soil physicochemical properties; total nitrogen (Ntot), total carbon (Ctot), carbon to nitrogen ratio (C/N), relative humidity (Rh), pH, soil organic matter (SOM), cation-exchange capacity (CEC), total carbonates (CaCO3), clay, silt, and sand content.

Variable	Factor	Df	SSQ	F value	Pr (<F)	
Total nitrogen content (N_{tot})	Elevation Zone (Z)	1	0.0199	0.935	0.345711	
	Exposition (E)	1	0.0505	2.369	0.140275	
	Region	1	0.4056	19.033	0.000335	***
	Z * E	1	0.1337	6.273	0.021526	*
	Residuals	19	0.4049			
Total carbon content (C_{tot})	Elevation Zone (Z)	1	0.36	0.049	0.82662	
	Exposition (E)	1	25.32	3.423	0.07989	.
	Region	1	28.82	3.896	0.06312	.
	Z * E	1	79.92	10.805	0.00388	**
	Residuals	19	140.53			
Carbon-to-nitrogen ratio (CN)	Elevation Zone (Z)	1	2.6	0.305	0.587	
	Exposition (E)	1	1.9	0.216	0.647	
	Region	1	372.9	43.356	2.65e-06	***
	Z * E	1	6.1	0.712	0.409	
	Residuals	19	163.4			
Residual humidity (Rh)	Elevation Zone (Z)	1	10.31	2.263	0.149	
	Exposition (E)	1	2.93	0.643	0.432	
	Region	1	6.54	1.435	0.246	
	Z * E	1	31.17	6.837	0.017	*
	Residuals	19	86.61			
Soil organic matter (SOM)	Elevation Zone (Z)	1	4.51	1.106	0.30625	
	Exposition (E)	1	6.45	1.581	0.22391	
	Region	1	11.14	2.732	0.11480	
	Z * E	1	54.21	13.289	0.00172	**
	Residuals	19	77.50			
Soil water pH (pH)	Elevation Zone (Z)	1	0.004	0.006	0.93967	
	Exposition (E)	1	1.796	2.379	0.13947	
	Region	1	8.193	10.853	0.00381	**
	Z * E	1	0.548	0.726	0.40469	
	Residuals	19	14.342			
Soil cation-exchange-capacity (CEC)	Elevation Zone (Z)	1	388.1	5.787	0.027808	*
	Exposition (E)	1	448.3	6.685	0.019249	*
	Region	1	1101.3	16.421	0.000828	***
	Z * E	1	529.9	7.901	0.012027	*
	Residuals	17	1140.1			
Soil total carbonates content ($CaCO_3$)	Elevation Zone (Z)	1	0.1467	5.367	0.03326	*
	Exposition (E)	1	0.1598	5.845	0.02714	*
	Region	1	0.3961	14.492	0.00141	**
	Z * E	1	0.1607	5.879	0.02676	*
	Residuals	17	0.4647			
Soil clay content (clay)	Elevation Zone (Z)	1	3.6	0.276	0.605	
	Exposition (E)	1	8.7	0.662	0.426	
	Region	1	790.6	60.649	2.59e-07	***
	Z * E	1	1	0.074	0.788	
	Residuals	19	248.9			
Soil silt content (silt)	Elevation Zone (Z)	1	100	0.968	0.338	
	Exposition (E)	1	160	1.547	0.229	
	Region	1	4337	41.968	3.3e-06	***
	Z * E	1	16	0.156	0.698	
	Residuals	19	1964			

Soil sand content (sand)	Elevation Zone (Z)	1	467	5.809	0.0262	*
	Exposition (E)	1	639	7.961	0.0109	*
	Region	1	10748	133.823	4.8e-10	***
	Z * E	1	22	0.275	0.6059	
	Residuals	19	1526			

Table S3. 2. Summary tables of all 19 measured variables used for the identification of solar radiation as the primary driver of both green and rooibos teabags decomposition rate

Variable type	Variable	Measurement scale
Climate	Humidity	Raster layer of a climatic model (25m precision)
	Elevation	Raster layer of a climatic model (25m precision)
	Frostdays	Raster layer of a climatic model (25m precision)
	Precipitations	Raster layer of a climatic model (25m precision)
	Radiation	Raster layer of a climatic model (25m precision)
	Degreedays	Raster layer of a climatic model (25m precision)
Edaphic	Total nitrogen content (N_{tot})	Plot scale (400m^2 under forest and 25m^2 in grasslands)
	Total carbon content (C_{tot})	Plot scale (400m^2 under forest and 25m^2 in grasslands)
	Carbon-to-nitrogen ratio (CN)	Plot scale (400m^2 under forest and 25m^2 in grasslands)
	Residual humidity (Rh)	Plot scale (400m^2 under forest and 25m^2 in grasslands)
	Soil organic matter (SOM)	Plot scale (400m^2 under forest and 25m^2 in grasslands)
	Soil water pH (pH)	Plot scale (400m^2 under forest and 25m^2 in grasslands)
	Soil cation-exchange-capacity (CEC)	Plot scale (400m^2 under forest and 25m^2 in grasslands)
	Soil total carbonates content ($CaCO_3$)	Plot scale (400m^2 under forest and 25m^2 in grasslands)
	Soil clay content (clay)	Plot scale (400m^2 under forest and 25m^2 in grasslands)
	Soil silt content (silt)	Plot scale (400m^2 under forest and 25m^2 in grasslands)
	Soil sand content (sand)	Plot scale (400m^2 under forest and 25m^2 in grasslands)
Microbial	Soil respiration (CO_2 efflux)	Plot scale (n= 24 x 3 replicate measurements)
	Microbial carbon source consumption (EcoPlates)	Plot scale (n= 24 x 5 subsamples and 3 replicate measurements)

Table S3. 3. Tea bag burial experiment. Details about the burial, the recollection date, and the respective exposure time in the field (days) are listed below for each plot.

Site	Burial	Recollection	Exposure time [days]
VNM (1 - 2 - 3)	30.9.2020	25.5.2021	237
VNH (1 - 2 - 3)	01.10.2020	30.6.2021	272
VSM (1 - 2 - 3)	30.9.2020	24.5.2021	236
VSH (1 - 2 - 3)	29.9.2020	30.6.2021	274
TNM (1 - 2 - 3)	09.10.2020	21.5.2021	224
TNH (1 - 2 - 3)	08.10.2020	29.6.2021	264
TSM (1 - 2 - 3	07.10.2020	21.5.2021	226
TSH (1 - 2 - 3)	07.10.2020	28.6.2021	264

Table S3. 4. Soil respiration (LICOR) measurement settings.

Instrument name: 81A-0921	Software version 4.0.0	
Chamber size: d = 20 cm	Area = 317.8 cm2	V_{chamb}er = 4823.9 cm3 (autom).
V_{irga} = 19 cm3	Offset: adjusted specifically for each measurement position	
Pre-purge: 30 sec	Post-purge: 30 sec	Observation length: 120 sec

Figures

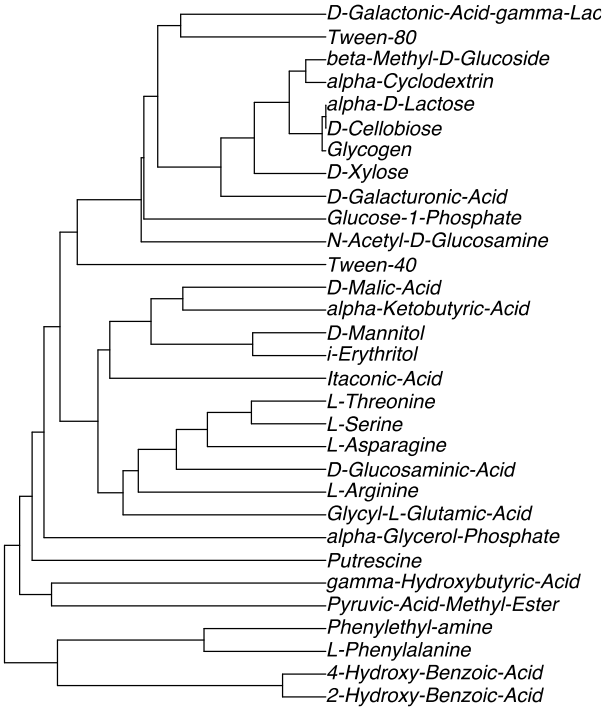

Figure S3. 1. Chemical tree of all carbon sources in the EcoPlates.

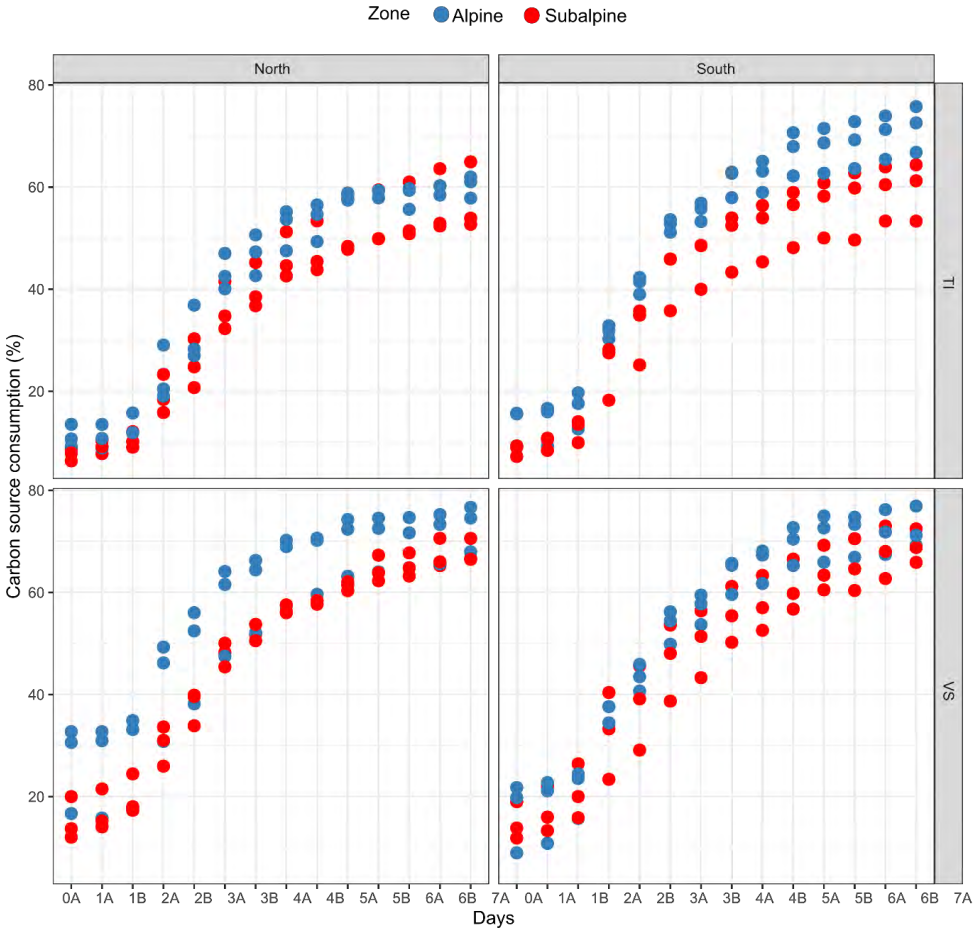

Figure S3. 2. Carbon consumption across time and sites. Scatterplots show the evolution across seven days in the total carbon consumption (sum of all different carbon sources as shown in Figure S1) across the two regions (Ticino (TI) and Valais (VS), the north and south slopes, and in the subalpine (red dots) and alpine (blue dots) sites.

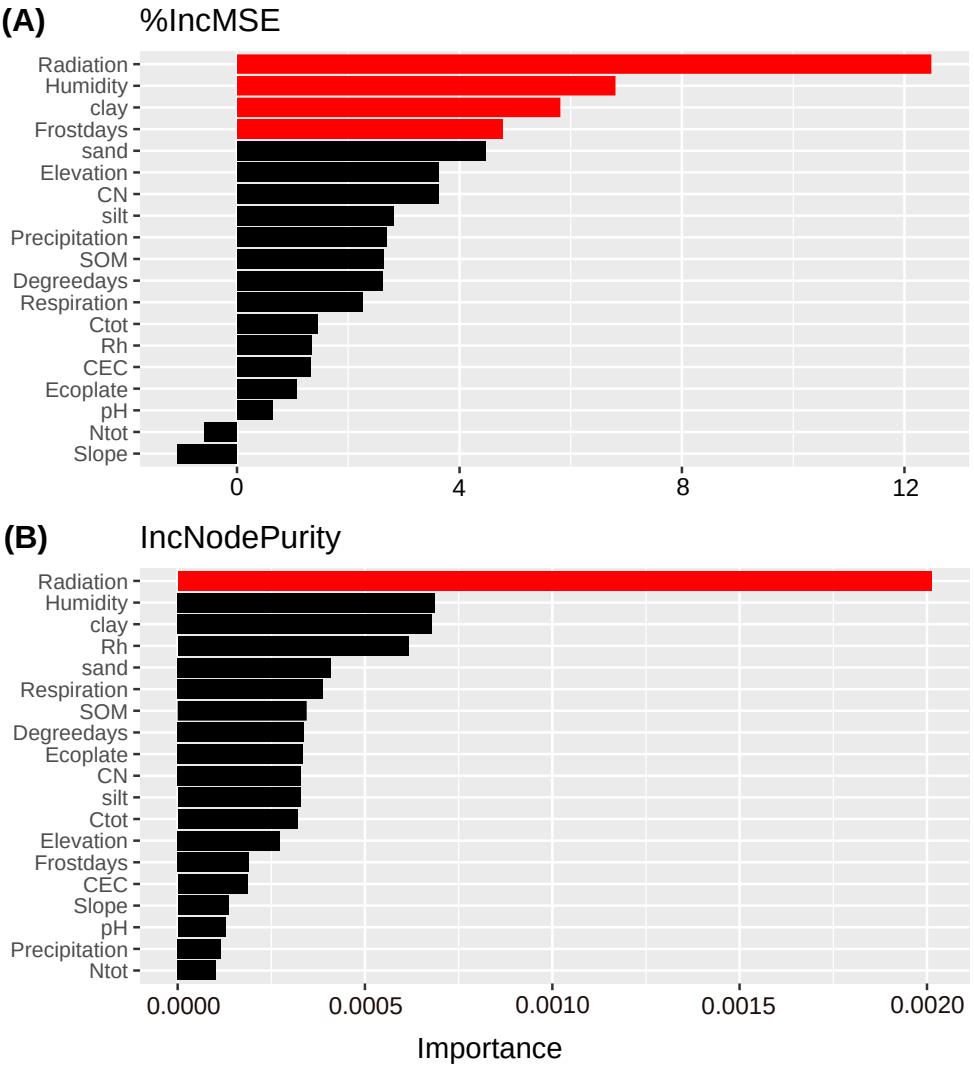

Figure S3. 3. Random forest variable importance plot for the green tea degradation. Shown are (A) %IncMSE, indicating the average increase in squared residuals of the test set when variables are randomly permuted (little importance = little change in model when variable is removed or added), and (B) IncNodePurity, indicating the increase in homogeneity, for relating tea organic matter degradation to all climatic, edaphic and microbial-related variables. Red bars indicate significant values ($p < 0.05$) for explaining the importance of each response variable in the Random Forest model.

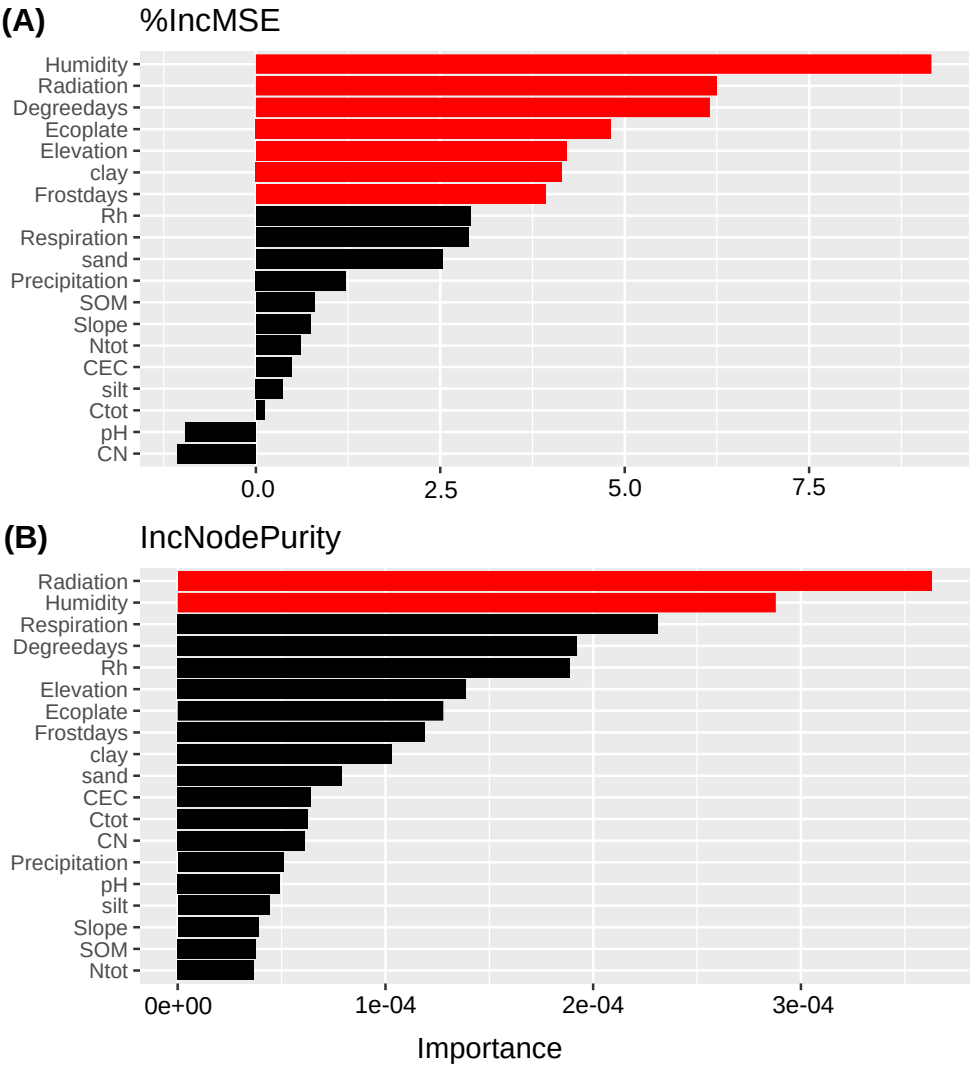

Figure S3. 4. Random forest variable importance plot for the rooibos tea degradation. Shown are (A) %IncMSE, indicanting the average increase in squared residuals of the test set when variables are randomly permuted (little importance = little change in model when variable is removed or added), and (B) IncNodePurity, indicating the increase in homogeneity, for relating tea organic matter degradation to all climatic, edaphic and microbial-related variables. Red bars indicate significant values ($p < 0.05$) for explaining the importance of each response variable in the Random Forest model.

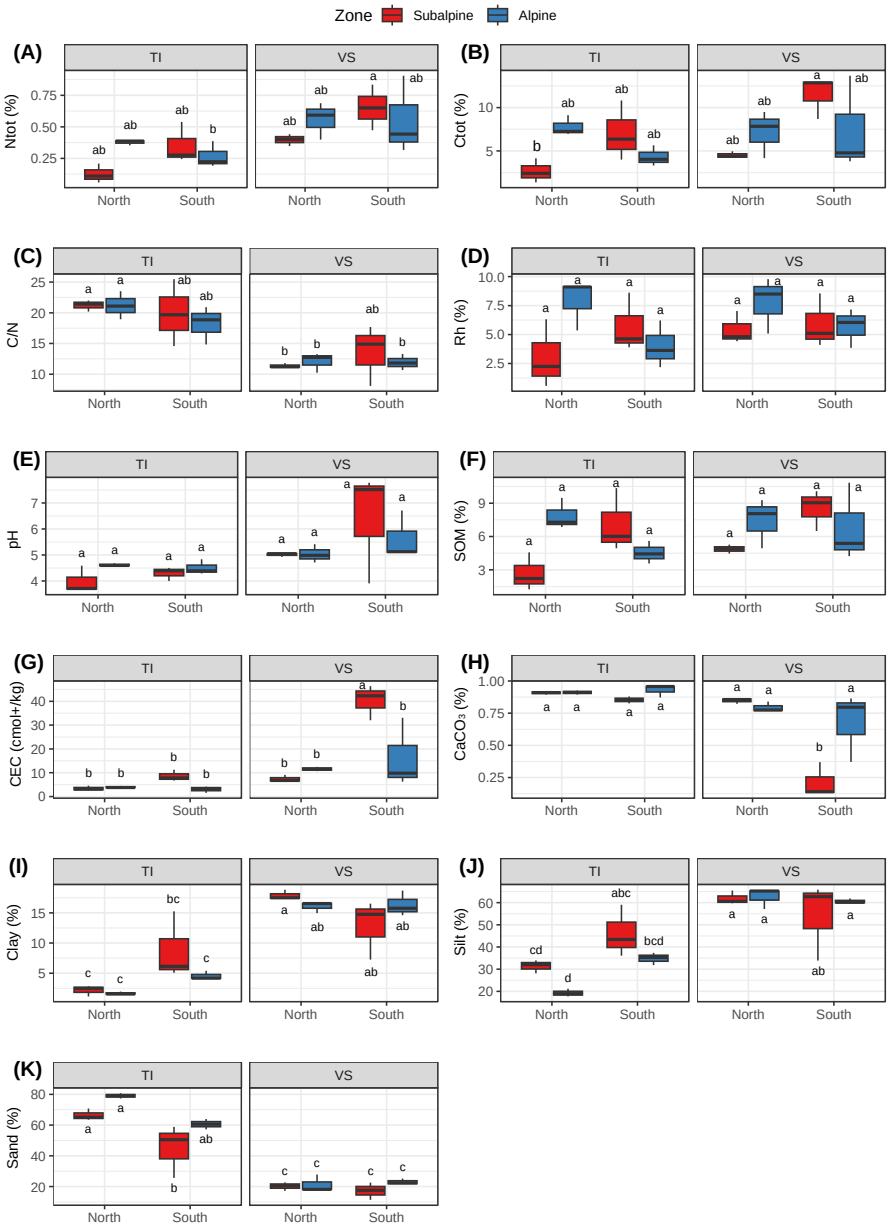

Figure S3. 5. Soil physicochemical properties boxplot illustrating (A) soil total nitrogen content [Ntot], (B) soil total carbon content [Ctot], (C) the carbon-to-nitrogen ration [C/N], (D) soil residual humidity [RH], (E) soil water pH [pH], (F) soil organic matter content [SOM], (G) soil cation- exchange-capacity [CEC], (H) the total carbonate content [CaCO3], (I) soil clay content [clay], (J) soil silt content [silt], (K) soil sand content [sand]. The boxplot shows differences in soil physicochemical properties across region, elevation and exposition. Colors indicate the two-elevation zone represented: alpine (blue), and subalpine sites (red).

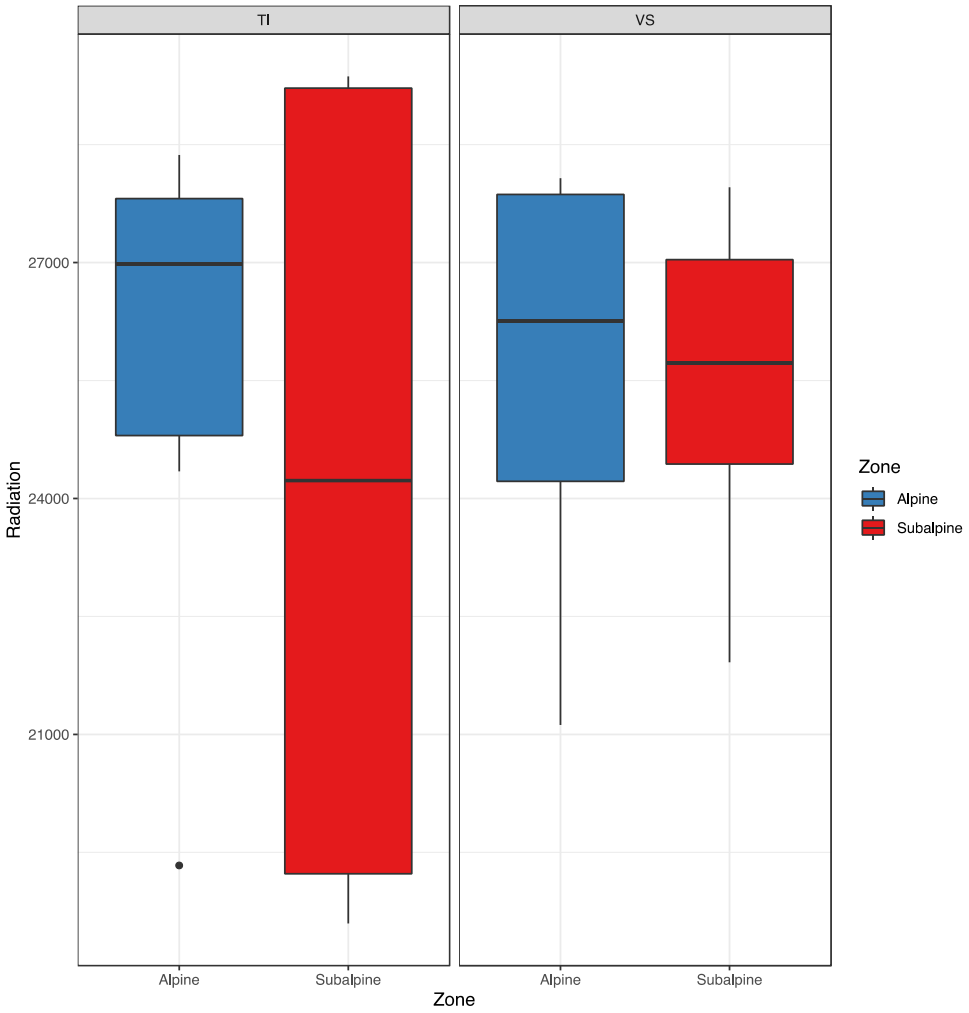

Figure S3. 6. Effect of elevation on solar radiation. Boxplots representing average annual solar radiation across two regions (Ticino = TI, or Valais = VS) of the Swiss Alps. Red color (warm) represents the sub-alpine zone (~1400 m above sea level), and blue color (cold) represents the alpine zone (~2000 m above sea level). N = 24 sites. Solar radiation is independent of elevation (ANOVA; elevation effect; $F_{1,21} = 0.30$, $p = 0.59$, and region effect; $F_{1,21} = 0.19$, $p = 0.67$).

Supporting Information for:

Humus forms and organic matter decomposition in the Swiss Alps

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Methods for soil physicochemical properties analysis

To define and characterize the organomineral horizon properties of our different humus forms, we collected soil samples during the summer of 2020 on 24 sites across two regions. On each site, we described and named soil organomineral horizons according to the Référentiel Pédologique (Baize & Girard, 2009) by including the following descriptors (Jabiol & Baize, 2011): horizon depth, structure (e.g., lumpy, single grain, massive), texture (i.e., sand, silt, clay), color (Munsell soil color chart), roots abundance index, soil pH (Hellige), carbonate's reaction by HCl 6M, and coarse elements. All rock particles bigger than 2 cm in diameter were removed for each soil sample. Soil samples were air-dried at 40° C for 4 days and sieved at 2 mm before soil physicochemical properties analysis: Soil relative humidity was assessed after drying the soils at 120° C for three days. Soil pH was determined with a BlueLine electrode (SI Analytics, Thermo Fisher Scientific, MA, USA) and a Metrohm 827 pH meter in distilled water (Metrohm, AG, Switzerland). Soil organic matter (Burke et al., 1989) was estimated from the loss of ignition (LOI), assessed by calcination of samples at 450°C (Nabertherm L9/C6, Gerber instruments, ZH, Switzerland), and corrected by the "Howard" correction factor (Allen, Grimshaw, Parkinson, & Quarmby, 1974). Soil total cationic exchange capacity (CEC) and saturation rate (S/CEC) were quantitated with cobalt hexamine trichloride (Ciesielski & Sterckeman, 1997) by Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES; Optima 2100 DV, PerkinElmer, MA, USA). Soil total carbonates (when observed in the field) were estimated by $CaCO_3$ dissolution after HCl 6M addition, measuring the CO_2 volume released according to the Calcimeter Bernard method. Total carbon, total nitrogen, and organic carbon (only for carbonated soils) were measured with an elemental analyzer (FLASH 2000, Thermo Fisher Scientific, MA, USA). Soil particle size was measured with a Laser Diffraction Particle Size Analyzer with Aqueous Liquid Module (ALM) and Auto Prep Station (APS) at the University of Lausanne (LS 13 320, Beckman Coulter, IN, USA).

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Tables

Table S3. 5. Sites coordinates

Site_id	Coordinates_WGS 84
TSM1	46°30′08.818″N 8°46′27.403″E
TSM2	46°30′03.378″N 8°46′38.568″E
TSM3	46°29′56.661″N 8°46′46.235″E
TNM1	46°28′18.872″N 8°45′23.236″E
TNM2	46°28′18.273″N 8°45′39.160″E
TNM3	46°28′16.413″N 8°45′48.073″E
VSM1	46°12′49.881″N 7°02′23.317″E
VSM2	46°12′47.304″N 7°02′25.342″E
VSM3	46°12′48.612″N 7°02′30.935″E
VNM1	46°12′38.577″N 6°57′56.665″E
VNM2	46°12′41.840″N 6°57′53.334″E
VNM3	46°12′37.084″N 6°57′54.303″E
TSH1	46°30′55.210″N 8°47′43.566″E
TSH2	46°30′56.568″N 8°47′43.788″E
TSH3	46°30′57.593″N 8°47′42.317″E
TNH1	46°26′42.258″N 8°43′50.692″E
TNH2	46°26′41.289″N 8°43′53.340″E
TNH3	46°26′42.032″N 8°43′44.362″E
VSH1	46°13′20.222″N 7°03′27.947″E
VSH2	46°13′19.473″N 7°03′25.624″E
VSH3	46°13′17.731″N 7°03′28.623″E
VNH1	46°12′23.060″N 6°56′52.627″E
VNH2	46°12′21.773″N 6°56′47.083″E
VNH3	46°12′18.716″N 6°56′37.684″E

Table S3. 6. Table summarizing soil types, associations and alliances, as well as plant species observed, by site. Only the 10 most abundant species at each site were recorded for this study. For plant taxonomy we used the following books: the Flore de la Suisse (Binz, A., & Thommen, E. 1941) and the Flora Helvetica (Lauber, K., Wagner, G., Gygax, A., Eggenberg, S., & Michel, A. 2001).

Site	Référentiel pédologique	World Reference Base for Soil Resources	Humus system	Phytosociological alliances	Phytosociological associations	Most abundant plant species
TSM1	Organosol Insaturé	Umbrisol	Lignoform	Dicrano-Pinion	Calluno-Pinetum	Picea abies
						Pinus sylvestris
						Betula pendula
						Vaccinium myrtillus
						Corylus avellana
						Hieracium murorum aggr.
						Solidago virgaurea
						Laserpitium gaudinii
						Sorbus aucuparia
						Lathyrus linifolius
TSM2	Régosol	Leptosol	Mor	Dicrano-Pinion	Calluno-Pinetum	Picea abies
						Pinus sylvestris
						Hieracium murorum aggr.
						Sorbus aria
						Sorbus aucuparia
						Vaccinium myrtillus
						Calamagrostis varia
						Phyteuma betonicifolium
						Luzula luzuloides
						Solidago virgaurea
TSM3	Organosol Insaturé	Umbrisol	Lignoform	Dicrano-Pinion	Calluno-Pinetum	Picea abies
						Vaccinium myrtillus
						Pinus sylvestris
						Hieracium murorum aggr.
						Sorbus aucuparia
						Corylus avellana
						Solidago virgaurea
						Sorbus aria
						Luzula luzuloides
						Rubus idaeus
TNM1	Organosol Holorganique	Histosol	Lignoform	Vaccinio-Piceion	Larici-Piceetum	Picea abies

						Oxalis acetosella
						Calamagrostis varia
						Larix decidua
						Dryopteris filix-mas
						Maianthemum bifolium
						Luzula sylvatica
						Saxifraga cuneifolia
						Prenanthes purpurea
						Hieracium murorum aggr.
TNM2	Organosol Holorganique	Histosol	Lignoform	Vaccinio-Piceion	Homogyno-Piceetum	Picea abies
						Calamagrostis varia
						Larix decidua
						Vaccinium myrtillus
						Maianthemum bifolium
						Hieracium murorum aggr.
						Festuca rubra aggr.
						Luzula sylvatica
						Oxalis acetosella
						Abies alba
TNM3	Régosol	Histosol	Lignoform	Vaccinio-Piceion	Larici-Piceetum	Picea abies
						Calamagrostis varia
						Larix decidua
						Hieracium murorum aggr.
						Maianthemum bifolium
						Oxalis acetosella
						Festuca rubra aggr.
						Abies alba
						Luzula sylvatica
						Sorbus aucuparia
VSM1	Brunisol Dystrique	Cambisol	Mull	Fagion	Abieti-Fagetum	Picea abies
						Corylus avellana
						Sorbus aria
						Larix decidua
						Sorbus aucuparia
						Veratrum album
						Chaerophyllum hirsutum
						Abies alba
						Carex sp.

						Aconitum lycoctonum
VSM2	Peyrosol	Leptosol	Mull	Fagion	Abieti-Fagetum	Picea abies
						Abies alba
						Fagus sylvatica
						Acer pseudoplatanus
						Sorbus aria
						Corylus avellana
						Sorbus aucuparia
						Mercurialis perennis
						Lamium galeobdolon
						Carex digitata
VSM3	Peyrosol	Leptosol	Mull	Fagion	Abieti-Fagetum	Picea abies
						Abies alba
						Corylus avellana
						Acer pseudoplatanus
						Laburnum alpinum
						Fagus sylvatica
						Calamagrostis arundinacea
						Polygonatum verticillatum
						Luzula nivea
						Hieracium murorum aggr.
VNM1	Brunisol Dystrique	Cambisol	Mull	Abieti-Piceion	Adenostylo-Abietetum	Abies alba
						Petasites albus
						Adenostyles alliariae
						Oxalis acetosella
						Picea abies
						Galium odoratum
						Dryopteris filix-mas
						Sorbus aucuparia
						Sanicula europaea
						Lonicera nigra
VNM 2	Brunisol Dystrique	Cambisol	Mull	Abieti-Piceion	Adenostylo-Abietetum	Abies alba
						Galium odoratum
						Oxalis acetosella
						Petasites albus
						Sanicula europaea
						Hieracium murorum aggr.

						Picea abies
						Dryopteris filix-mas
						Veronica urticifolia
						Adenostyles alliariae
VNM3	Brunisol Dystrique	Cambisol	Mull	Abieti-Piceion	Adenostylo-Abietetum	Picea abies
						Abies alba
						Oxalis acetosella
						Adenostyles alliariae
						Petasites albus
						Viola biflora
						Sanicula europaea
						Galium odoratum
						Dryopteris filix-mas
						Lamium galeobdolon
TSH1	Colluviosol	Regosol	Rhizoform	Nardion strictae	Hypochoerido-Nardetum	Nardus stricta
						Festuca rubra aggr.
						Carex sempervirens
						Trifolium alpinum
						Anthoxanthum alpinum
						Juncus trifidus
						Phyteuma betonicifolium
						Solidago virgaurea
						Silene nutans
						Silene rupestris
TSH2	Colluviosol	Regosol	Rhizoform	Nardion strictae	Hypochoerido-Nardetum	Nardus stricta
						Carex sempervirens
						Vaccinium vitis-idaea
						Trifolium alpinum
						Juniperus communis ssp. nana
						Anthoxanthum alpinum
						Phyteuma betonicifolium
						Rhododendron ferrugineum
						Vaccinium myrtillus
						Calluna vulgaris
TSH3	Colluviosol	Regosol	Rhizoform	Nardion strictae	Hypochoerido-Nardetum	Nardus stricta
						Trifolium alpinum
						Avenella flexuosa
						Anthoxanthum alpinum

						Carex sempervirens
						Juncus trifidus
						Calluna vulgaris
						Phyteuma betonicifolium
						Juniperus communis ssp. nana
						Silene rupestris
TNH1	Organosol Insaturé	Umbrisol	Rhizoform	Caricion curvulae	Carici curvulae-Nardetum	Vaccinium gaultherioides
						Carex curvula
						Festuca rubra aggr.
						Nardus stricta
						Avenella flexuosa
						Vaccinium myrtillus
						Agrostis schraderiana
						Trifolium alpinum
						Potentilla aurea
						Anthoxanthum alpinum
TNH2	Organosol Saturé	Umbrisol	Rhizoform	Rhododendro-Vaccinion	Rhododendro ferruginei-Vaccinietum	Vaccinium gaultherioides
						Vaccinium myrtillus
						Nardus stricta
						Trifolium alpinum
						Carex sempervirens
						Arnica montana
						Leontodon helveticus / L. hispidus aggr.
						Rhododendron ferrugineum
						Festuca rubra aggr.
						Agrostis schraderiana
TNH3	Organosol Insaturé	Umbrisol	Rhizoform	Rhododendro-Vaccinion	Rhododendro ferruginei-Vaccinietum	Vaccinium gaultherioides
						Nardus stricta
						Rhododendron ferrugineum
						Trifolium alpinum
						Juniperus communis ssp. nana
						Vaccinium myrtillus
						Arnica montana
						Carex curvula
						Avenella flexuosa
						Agrostis schraderiana

VSH1	Brunisol Dystrique	Cambisol	Mull	Nardion strictae	Hypochoerido-Nardetum	Nardus stricta
						Prunella vulgaris
						Carex sempervirens
						Pulsatilla alpina ssp. apiifolia
						Carlina acaulis
						Juniperus communis ssp. nana
						Arnica montana
						Vaccinium myrtillus
						Vaccinium gaultherioides
						Trollius europaeus
VSH2	Brunisol Dystrique	Cambisol	Rhizoform	Nardion strictae	Geo montani-Nardetum	Nardus stricta
						Pulsatilla alpina ssp. apiifolia
						Gentiana purpurea
						Agrostis capillaris
						Arnica montana
						Thymus serpyllum aggr.
						Carlina acaulis
						Vaccinium myrtillus
						Geum montanum
						Hieracium lactucella
VSH3	Brunisol Dystrique	Cambisol	Rhizoform	Nardion strictae	Geo montani-Nardetum	Arnica montana
						Nardus stricta
						Pulsatilla alpina ssp. apiifolia
						Vaccinium myrtillus
						Carlina acaulis
						Vaccinium gaultherioides
						Gentiana purpurea
						Agrostis capillaris
						Geum montanum
						Alchemilla vulgaris aggr.
VNH1	Alocrisol Typique	Cambisol	Rhizoform	Nardion strictae	Geo montani-Nardetum	Nardus stricta
						Avenella flexuosa
						Leontodon helveticus / L. hispidus aggr.
						Trifolium alpinum
						Gentiana purpurea
						Festuca rubra aggr.
						Vaccinium gaultherioides
						Homogyne alpina

						Carex sempervirens
						Vaccinium myrtillus
VNH2	Alocrisol Typique	Cambisol	Rhizoform	Nardion strictae	Geo montani-Nardetum	Nardus stricta
						Avenella flexuosa
						Leontodon helveticus / L. hispidus aggr.
						Trifolium alpinum
						Ligusticum mutellina / L. mutellinoides aggr.
						Plantago alpina
						Vaccinium myrtillus
						Agrostis capillaris
						Rhododendron ferrugineum
						Festuca rubra aggr.
VNH3	Brunisol Dystrique	Cambisol	Rhizo Oligomull	Nardion strictae	Geo montani-Nardetum	Arnica montana
						Avenella flexuosa
						Ligusticum mutellina / L. mutellinoides aggr.
						Agrostis capillaris
						Festuca rubra aggr.
						Trifolium pratense
						Anthyllis vulneraria
						Carex sempervirens
						Leontodon helveticus / L. hispidus aggr.
						Plantago alpina

Figures

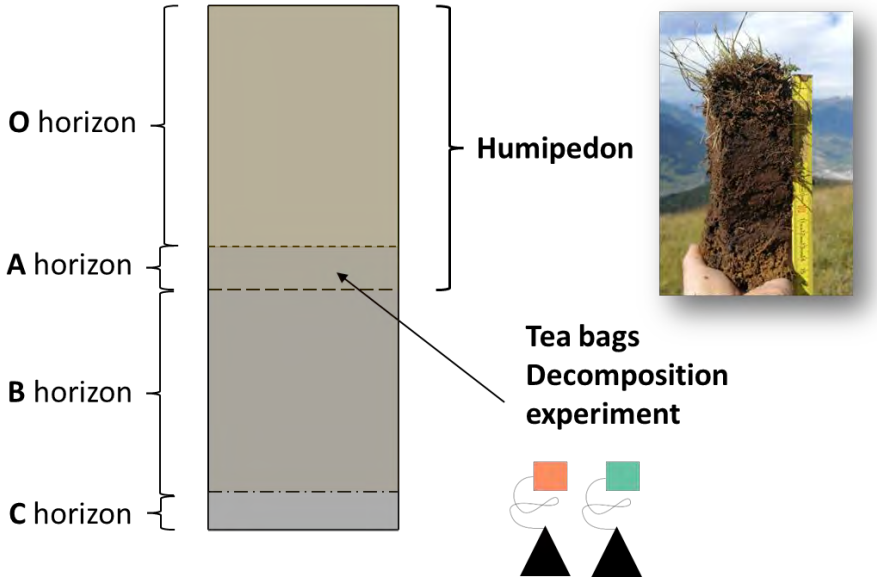


Figure S3. 7. Concept. The Humipedon, an integral part of the pedon, is characterized by a combination of organic horizons (O) and organomineral horizons (A). Arrow shows the approximate horizon into which the tea bags were buried to study litter decomposition across sites in the Alps.

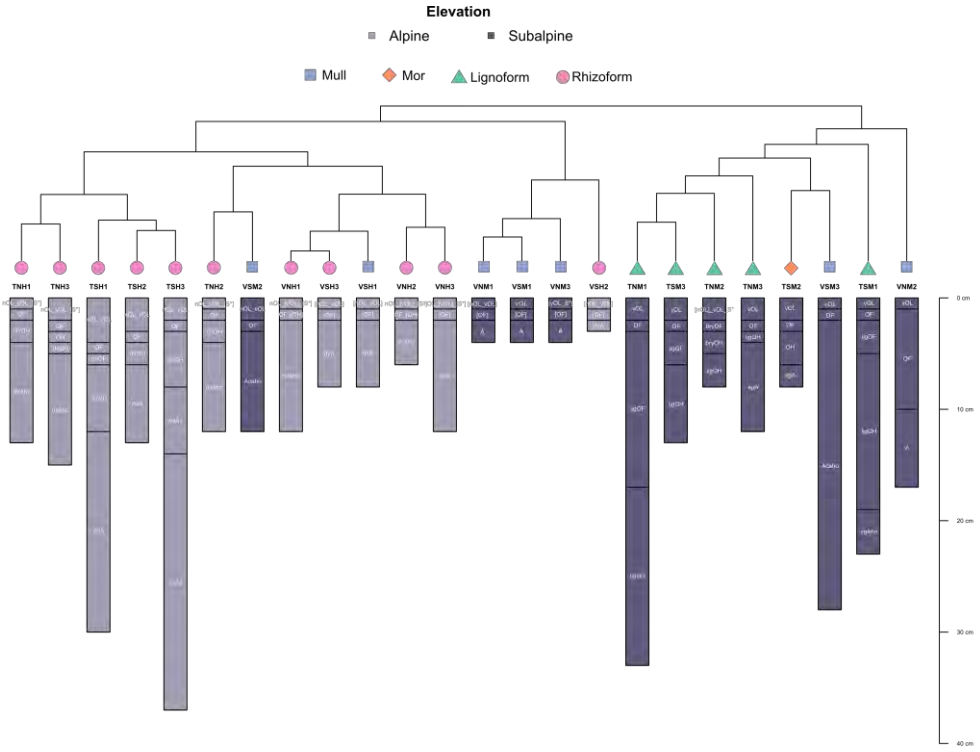


Figure S3. 8. Humus forms and elevation. Shown is the divisive hierarchical clustering of 24 humus forms based on 11 macrorests groups of the Ponge analysis, including Monocotyledon leaves and stem (Monocot), Dicotyledon fragmented leaf, intact leaf, skeletonized leaf, dicotyledon stem (Dicot), fragmented and intact Abies sp., Larix sp., Picea sp., Pinus sp. needle, Gymnosperm cones and twig (Needle&Cones), Roots from 0-2mm and > 2mm (Roots), Wood (Wood), Bryophytes, holorganic, mineral, mycelium, organomineral layers, and other. Colors indicate the altitude of the humus forms: Alpine (light grey) and subalpine (dark grey).

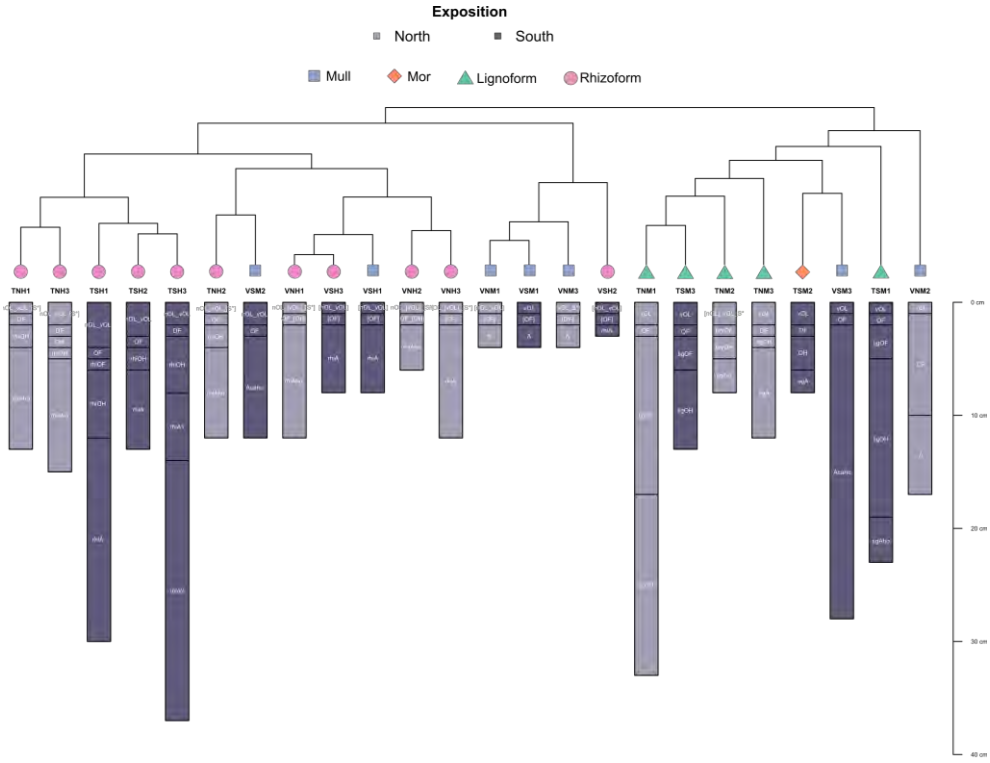


Figure S3. 9. Humus forms and exposition. Shown is the divisive hierarchical clustering of 24 humus forms based on 11 macrorests groups of the Ponge analysis, including Monocotyledon leaves and stem (Monocot), Dicotyledon fragmented leaf, intact leaf, skeletonized leaf, dicotyledon stem (Dicot), fragmented and intact Abies sp., Larix sp., Picea sp., Pinus sp. needle, Gymnosperm cones and twig (Needle&Cones), Roots from 0-2mm and > 2mm (Roots), Wood (Wood), Bryophytes, holorganic, mineral, mycelium, organomineral layers, and other. Colors indicate the exposition of the humus forms: north-exposed (light grey), and south-exposed (dark grey).

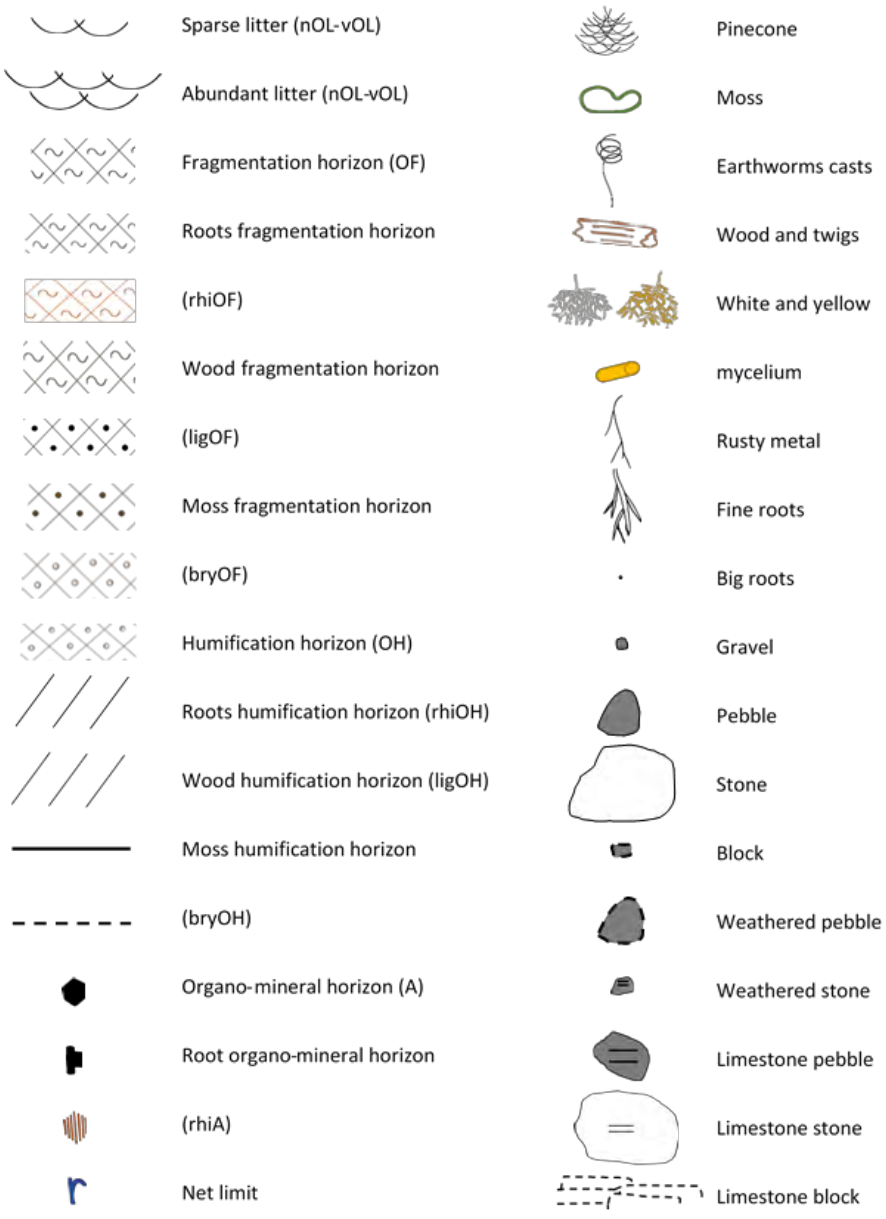
Appendix A

Ponge small-volume method detailed analysis can be downloaded at: https://datadryad.org/stash/share/2GKtlk4f5WPTN4daanQwc358JKWRx9nmbXP8o55IoFE ,

Appendix B - Soil profiles and humus forms

Legends

Horizons and soils were named according to the *Référentiel Pédologique* Zanella, Ponge, Jabiol et al. (2018)

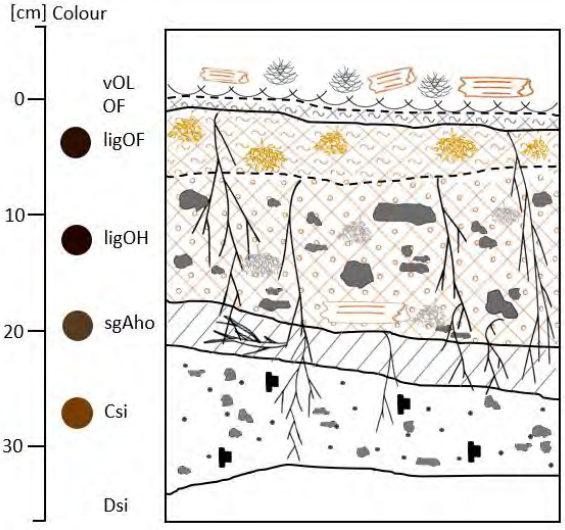


TSM1 : ORGANOSOL INSATURÉ, Osco (TI)

Soil type: *Référentiel Pédologique (RP)*, ORGANOSOL INSATURÉ, leptique, issu de gneiss, à Lignomoder
World Reference Base for Soil Ressources (WRB), Umbrisol

Observers:	Maud FAZZARI, Pascal KIPF	**Date :**	28.08.2020
Locality	Osco	**Altitude [m]:**	1498
Municipality & canton:	Faido, TI	**Slope (°):**	20°
Coordinates (CH1903 / LV03):	702521, 150999	**Exposition:**	SSW
Geological substrate:	Gneiss	**Habitat type:**	Forest
Plant community (association):	Calluno-Pinetum	**Weather:**	Dry and sunny
Remarks:	Many mycelium, many mesofauna and no earthworms. Wet organic horizons.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

vOL: +2/0.5 – 0 cm ; Mainly *Pinus* and also *Picea* needles, cones, barks and twigs. Many mesofauna but no earthworms. Ponge cube volume 25 cm^3.

OF: 0 – 1 cm ; *Pinus* and *Picea* fragmented needles, barks and twigs. Ponge cube volume 25 cm^3.

ligOF: 1 – 4/6 cm ; Framented wood, fibrous and light material with small pieces of wood ; Munsell Color 7.5YR 3/3 ; Root abundance 1/5, fine and mid-size ; Presence of yellow mycelium (Munsell Color 2.5Y 6/8). Ponge cube volume 75 cm^3.

ligOH: 4/6 – 17/21 cm ; Fine and light material ; Munsell Color 7.5YR 2.5/3 ; Root abundance 3/5, fine and mid-size ; Coarse elements abundance 5 % gravel, 20 % pebbles, 25 % stones ; Presence of white mycelium ; Note: presence of a decaying wood skeleton. Ponge cube volume 300 cm^3.

sgAho : 17/21 – 21/25 cm ; Munsell Color 10YR 4/2 ; Humiferous ; Structure single grain, mesostructured by roots, poorly aggregated and unstable ; Texture sandy loam ; HCl 6M 0/4 ; pH 3.76 ; Root abundance 3/5, mid-size and big ; Not very compact ; Coarse elements abundance 20 % gravel, 30 % pebbles ; Notes: very dry horizon, angular coarse elements. Ponge cube volume 75 cm^3.

Csi : 21/25 – 32/34 cm ; Munsell Color 10YR 4/6 ; Structure massive ; Texture sandy loam ; HCl 6M 0/4 ; pH 4.11 ; Root abundance 1/5, mid-size and fine ; Compact ; Coarse elements abundance 20 % gravel, 30 % pebbles ; Notes: very dry horizon, angular coarse elements.

Photo of humus form and Ponge diagram: lignomoder

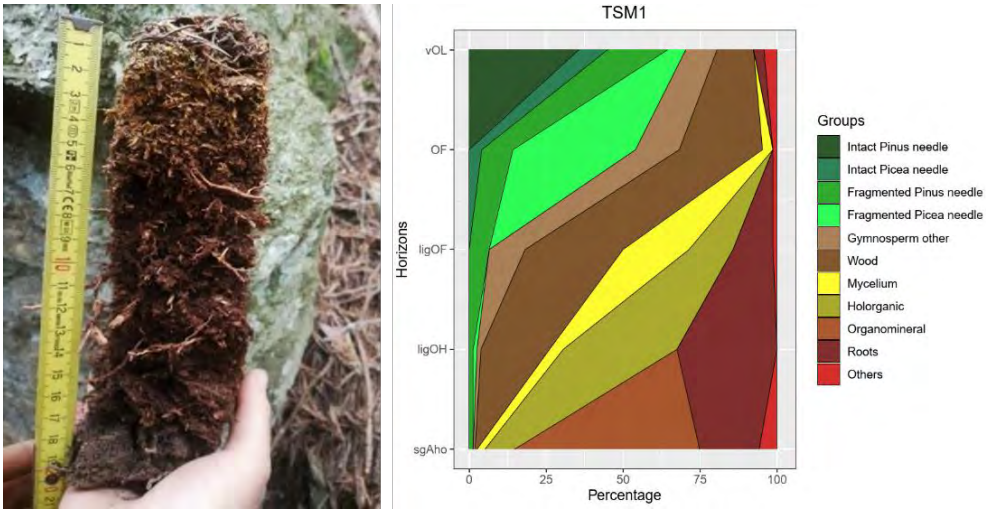


Table S3. 7. TSM1 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
sgAho	17/21 – 21/25	63.47	32.76	3.78	2.60	16.97	9.95	0.33	30.56	3.76	8.43	4.84
Csi	17/21 – 21/25	68.99	27.26	3.75	1.79	6.71	3.16	0.16	20.26	4.11	4.21	1.14

TSM2 : REGOSOL, Osco (TI)

Soil type: *Référentiel Pédologique (RP)*, REGOSOL d'apport, issu de gneiss, à Humimor
World Reference Base for Soil Ressources (WRB), Leptosol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 28.08.2020

Locality	Osco	**Altitude [m]:**	1455
Municipality & canton:	Faido, TI	**Slope (°):**	35°
Coordinates (CH1903 / LV03):	702762, 150835	**Exposition:**	SSW
Geological substrate:	Gneiss	**Habitat type:**	Forest
Plant community (association):	Calluno-Pinetum	**Weather:**	Dry and sunny
Remarks:	Many ants, few mesofauna and no earthworms. Very dry profile.		

Diagram and photo of the soil profile:

Soil profile and humus form description:

vOL: +3/2 – 0 cm ; Mainly *Pinus* and also *Picea* needles, cones, barks and twigs. Many ants but no earthworms. Ponge cube volume 50 cm^3.

OF: 0 – 3/4 cm ; *Pinus* and *Picea* fragmented needles, barks and twigs. Ponge cube volume 75 cm^3.

OH: 3/4 – 6 cm ; Fine and light material ; Munsell Color 10YR 3/3 ; Root abundance 1/5, fine and mid-size ; Coarse elements abundance 5 % coarse sands, 2 % pebbles. Ponge cube volume 25 cm^3.

sgA : 6 – 7/10 cm ; Munsell Color 10YR 4/3 ; not very humiferous ; Structure single grain, mesostructured by roots , poorly aggregated and unstable ; Texture sandy loam ; HCl 6M 0/4 ; pH

4.29 ; Root abundance 2/5, fine, mid-size and big ; Not very compact ; Coarse elements abundance 5 % gravel, 2 % pebbles. Ponge cube volume 12.5 cm^3.

Msi : 7/10 – 48 cm and + ; Munsell Color 10YR 5/8 ; Structure particulate ; Texture sandy loam ; HCl 6M 0/4 ; pH 4.94 ; Root abundance 2/5, mid-size and big ; Soft compactness ; Coarse elements abundance 10 % gravel, 6 % pebbles, 4 % stones ; Notes: very dry horizon, angular coarse elements.

Photo of humus form and Ponge diagram: Humimor

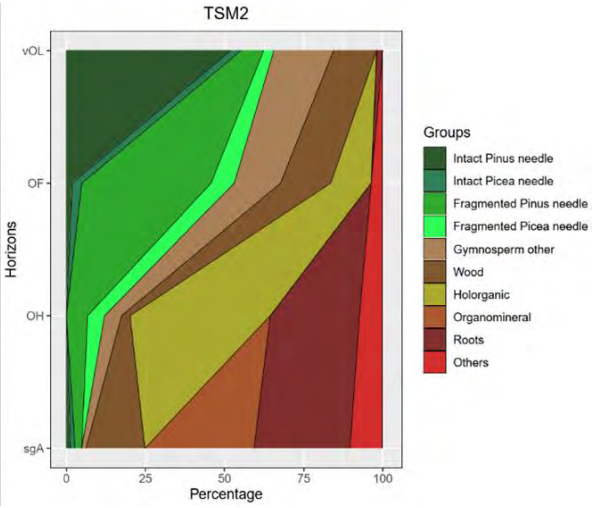


Table S3. 8. TSM2 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
sgA	6 – 7/10	68.51	28.44	3.05	2.58	13.34	6.29	0.25	24.87	4.29	7.83	21.51
Msi	7/10 – 48 +	53.77	40.90	5.33	1.91	5.44	2.23	0.09	23.97	4.94	1.24	29.74

TSM3 : ORGANOSOL INSATURÉ, Osco (TI)

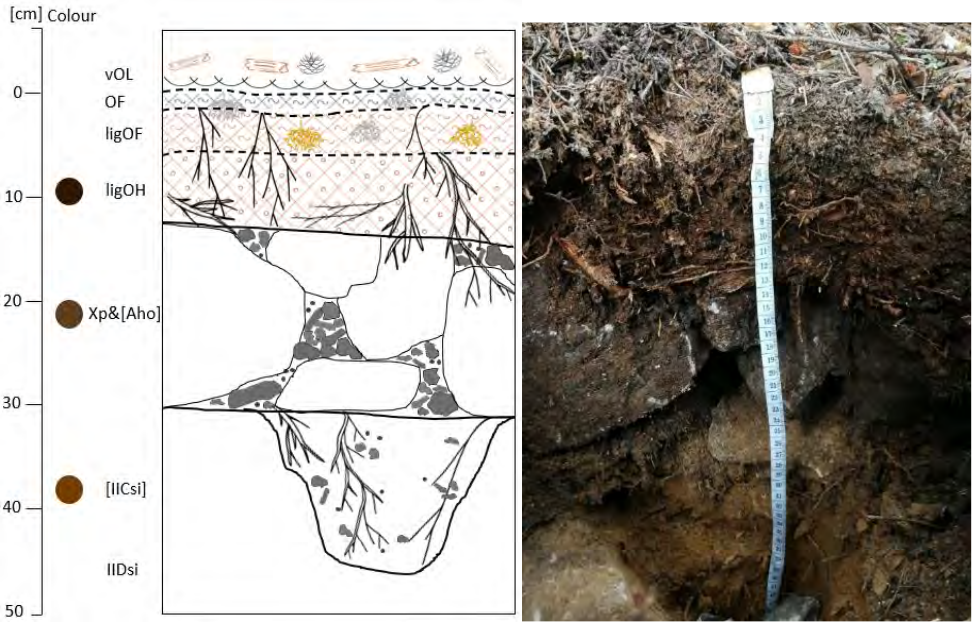
Soil type: *Référentiel Pédologique (RP)*, ORGANOSOL INSATURÉ, sur éboulis de gneiss, à Lignomoder

World Reference Base for Soil Ressources (WRB), Umbrisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 28.08.2020

Locality	Osco	**Altitude [m]:**	1440
Municipality & canton:	Faido, TI	**Slope (°):**	20°
Coordinates (CH1903 / LV03):	702929, 150630	**Exposition:**	S
Geological substrate:	Gneiss	**Habitat type:**	Forest
Plant community (association):	Calluno-Pinetum	**Weather:**	Dry and sunny
Remarks:	Many mycelium, many mesofauna and no earthworms. Very dry profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

vOL: +4/1 – 0 cm ; Mainly *Pinus* and also *Picea* needles, cones, barks, twigs and buds. Many mesofauna but no earthworms. Ponge cube volume 37.5 cm^3.

OF: 0 – 2 cm ; *Pinus* and *Picea* fragmented needles, barks, twigs and buds ; Presence of white mycelium. Ponge cube volume 37.5 cm^3.

ligOF: 2 – 6 cm ; Framented wood, fibrous and light material ; Root abundance 2/5, fine and mid-size ; Presence of yellow and white mycelium. Ponge cube volume 87.5 cm^3.

ligOH: 6 – 12/14 cm ; Fine and light material ; Munsell Color 7.5YR 2.5/3 ; Root abundance 4/5, mid-size and big ; Note: presence of some decaying pine cones. Ponge cube volume 150 cm^3.
Xp&[Aho] : 12/14 – 31 cm ; Munsell Color 10YR 4/3 ; Very humiferous ; Structure single grain, poorly aggregated and unstable ; Texture sandy loam ; HCl 6M 0/4 ; pH 3.94 ; Root abundance 2/5, fine, mid-size and big ; Soft compactness ; Coarse elements abundance 5 % gravel, 10 % pebbles, 25 % stones and 50 % blocks ; Notes: very dry horizon, angular coarse elements, presence of several spiders and nests.
[IICsi] : 31 – 31/46 cm ; Munsell Color 10YR 4/6 ; Structure particulate ; Texture sandy loam to loam; HCl 6M 0/4 ; pH 4.80 ; Root abundance 3/5, mid-size and big ; Not very compact ; Coarse elements abundance 10 % gravel, 5 % pebbles ; Notes: very dry horizon, weathered angular coarse elements.

Photo of humus form and Ponge diagram: lignomoder

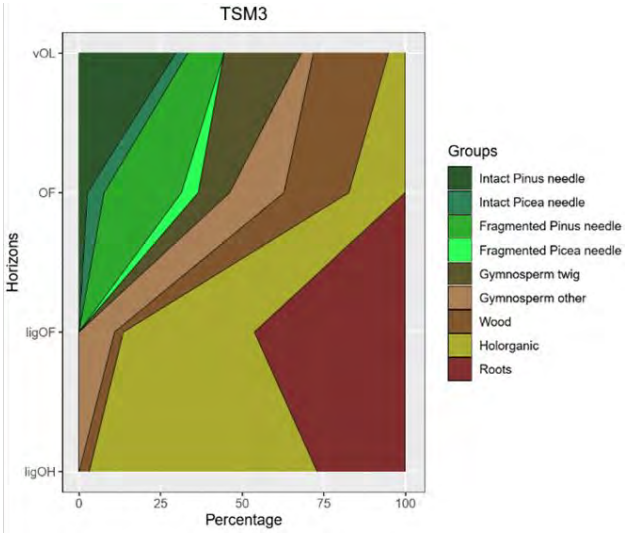


Table S3. 9. TSM3 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
Aho	12/14 – 31	63.02	33.20	3.78	4.28	22.11	11.65	0.56	20.82	3.94	11.87	19.09
[IICsi]	31 – 31/46	45.26	47.65	7.08	4.42	10.06	4.93	0.21	23.43	4.80	6.10	19.55

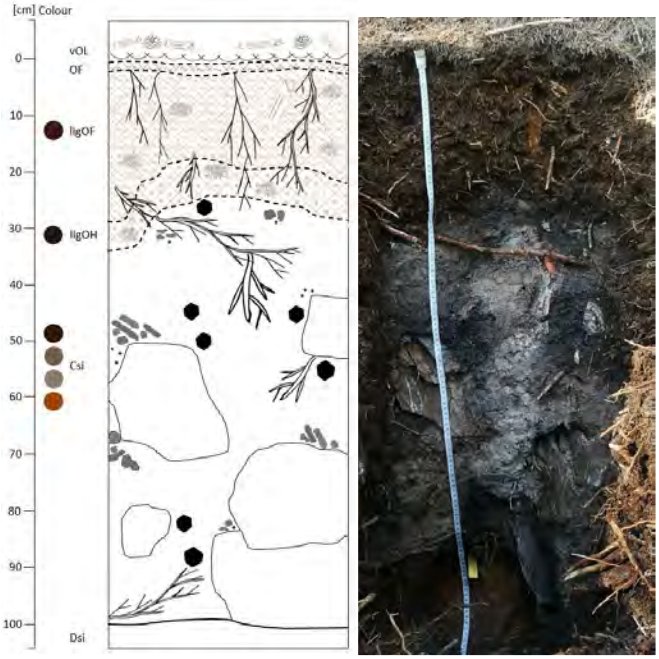
TNM1 : ORGANOSOL holorganique, Dalpe (TI)

Soil type: *Référentiel Pédologique (RP)*, ORGANOSOL holorganique leptique, sur éboulis de gneiss, à Lignomor
World Reference Base for Soil Ressources (WRB), Histosol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 26.08.2020

Locality	Dalpe	**Altitude [m]:**	1614
Municipality & canton:	Dalpe, TI	**Slope (°):**	30°
Coordinates (CH1903 / LV03):	701210, 147581	**Exposition:**	NNE
Geological substrate:	Gneiss	**Habitat type:**	Forest
Plant community (association):	Larici-Piceetum	**Weather:**	Dry and cloudy
Remarks:	Many mycelium, few mesofauna and no earthworms. Very dry profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

vOL: +2/1 – 0 cm ; Mainly *Larix* and also *Picea* needles, cones, barks and twigs. Few mesofauna but no earthworms. Ponge cube volume 25 cm^3.

OF: 0 – 2 cm ; *Larix* and *Picea* fragmented needles, barks and twigs. Ponge cube volume 50 cm^3.

ligOF: 2 – 17/29 cm ; Framented wood, fibrous and light material ; Munsell Color 5YR 3/3 ; Root abundance 3/5, mid-size, fine and big ; Presence of mycelium ; Note: presence of some large pieces of decaying wood. Ponge cube volume 525 cm^3.
ligOH: 17/29 – 24/33 cm ; Fine and light material ; Munsell Color 7.5YR 2.5/2 ; Root abundance 3/5, big and mid-size ; Presence of mycelium. Ponge cube volume 137.5 cm^3.
IICsi : 24/33 – 100 cm ; Munsell Color in mosaic (7.5YR 3/2, 7.5YR 5/2, 7.5YR 6/1, 7.5YR 5/8) ; Structure particulate ; Texture sandy loam ; HCl 6M 0/4 ; pH 3.68 ; Root abundance 1/5, big and mid-size ; Not very compact ; Coarse elements abundance 5 % gravel, 10 % pebbles and 20 % blocks ; Notes: very dry horizon, angular coarse elements highly altered in sheets, fine material keeping the shape of the original pebble, presence of well weathered coal stains with a few pieces of coal.

Photo of humus form and Ponge diagram: lignomor

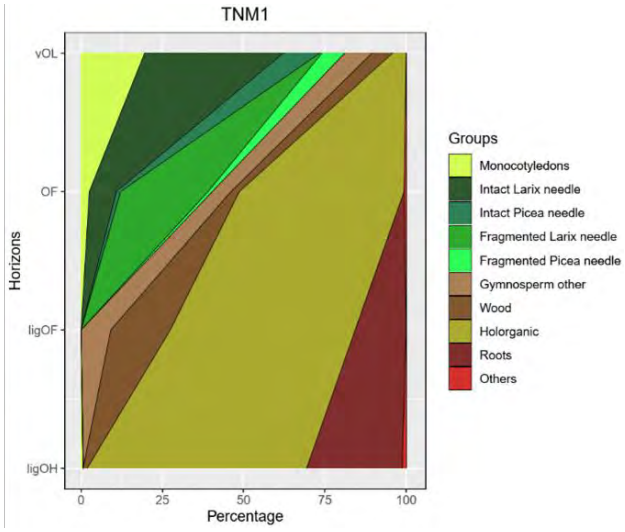


Table S3. 10. TNM1 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
IICsi	24/33 – 100	70.74	28.10	1.16	0.57	2.49	1.38	0.06	21.42	3.68	2.62	9.43

TNM2 : ORGANOSOL holorganique, Dalpe (TI)

Soil type: *Référentiel Pédologique (RP),* ORGANOSOL holorganique leptique, sur éboulis de gneiss, à Lignomor
World Reference Base for Soil Ressources (WRB), Histosol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 26.08.2020

Locality	Dalpe	**Altitude [m]:**	1571
Municipality & canton:	Dalpe, TI	**Slope (°):**	30°
Coordinates (CH1903 / LV03):	701550, 147568	**Exposition:**	N
Geological substrate:	Gneiss	**Habitat type:**	Forest
Plant community (association):	Homogyno-Piceetum	**Weather:**	Dry and cloudy
Remarks:	Many mycelium, many mesofauna and no earthworms. Very dry profile.		

Diagram and photo of the soil profile:

Soil profile and humus form description:

[nOL]-vOL-S*: +2/1 – 0 cm ; Mainly Bryophyte, also *Poaceae* leaves, *Larix* and *Picea* needles, cones, barks and twigs. Many mesofauna but no earthworms. Ponge cube volume 50 cm^3.

bryOF: 0 – 1 cm ; Mainly Bryophyte, also *Poaceae* leaves, *Larix* and *Picea* needles and barks ; Light material ; Presence of a small amount of mycelium. Ponge cube volume 25 cm^3.

bryOH: 1 – 4/5 cm ; Fine and light material ; Munsell Color 10YR 3/4 ; Root abundance 4/5, fine and mid-size ; Presence of many mycelium. Ponge cube volume 75 cm^3.

ligOH: 4/5 – 6/10 cm ; Fine and light material ; Munsell Color 10YR 2/2 ; Root abundance 3/5, big and mid-size ; Presence of many mycelium ; Note: presence of very altered wood skeletons. Ponge cube volume 100 cm^3.

IICsi : 6/10 – 33/42 cm ; Munsell Color in mosaic (10YR 4/2, 10YR 6/2, 10YR 3/6, 10YR 5/6) ; Structure particulate ; Texture sandy loam ; HCl 6M 0/4 ; pH 3.71 ; Root abundance 1/5, fine, mid-size and big ; Not very compact ; Coarse elements abundance 5 % gravel, 5 % pebbles, 5 % stones and 15 % blocks ; Notes: very dry horizon, weathered angular coarse elements.

Photo of humus form and Ponge diagram: lignomor

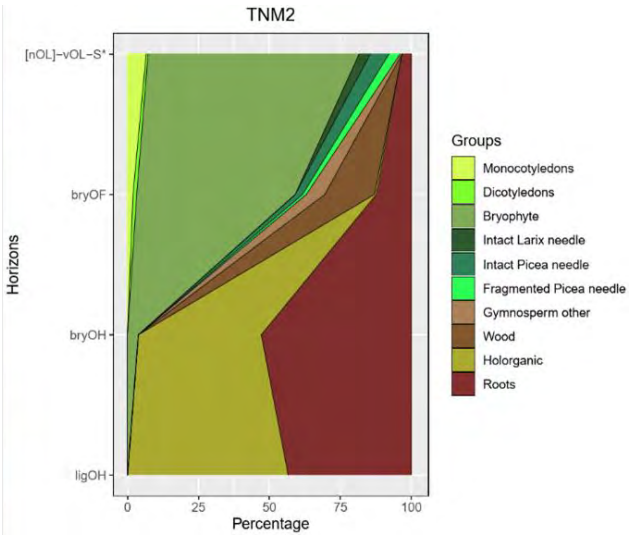


Table S3. 11. TNM2 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
IICsi	6/10 – 33/41	63.53	33.98	2.49	2.25	4.45	2.42	0.11	21.99	3.71	4.55	4.05

TNM3 : REGOSOL d'apport, Dalpe (TI)

Soil type: *Référentiel Pédologique (RP)*, REGOSOL d'apport, à charges grossières, sur éboulis de gneiss, à Lignomor
World Reference Base for Soil Ressources (WRB), Leptosol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 26.08.2020

Locality	Dalpe	**Altitude [m]:**	1544
Municipality & canton:	Dalpe, TI	**Slope (°):**	35°
Coordinates (CH1903 / LV03):	701741, 147514	**Exposition:**	NNE
Geological substrate:	Gneiss	**Habitat type:**	Forest
Plant community (association):	Larici-Piceetum	**Weather:**	Dry and cloudy
Remarks:	Many mycelium, few mesofauna and no earthworms. Very dry profile.		

Diagram and photo of the soil profile:

Soil profile and humus form description:

vOL: +2/1 – 0 cm ; *Poaceae* leaves, *Picea* and *Larix* needles, cones, barks and twigs. Few mesofauna and no earthworms. Ponge cube volume 25 cm^3.

OF: 0 – 1 cm ; *Poaceae* leaves, *Picea* and *Larix* fragmented needles and barks. Ponge cube volume 25 cm^3.

ligOH: 1 – 3/4 cm ; Fine, fibrous and light material ; Munsell Color 10YR 2/2 ; Root abundance 5/5, big and mid-size ; Presence of mycelium. Ponge cube volume 75 cm^3.

sgA: 3/4 – 12 cm ; Munsell Color 10YR 4/6 ; Not very humiferous ; Structure single grain, mesostructured by roots, poorly aggregated and unstable ; Texture sandy loam ; HCl 6M 0/4 ; pH 4.36 ; Root abundance 3/5, fine, mid-size and big ; Soft compactness ; Coarse elements abundance 10 % gravel, 5 % pebbles ; Note: presence of mycelium. Ponge cube volume 125 cm^3.

Msi : 12 – 84/90 cm ; Munsell Color 10YR 5/6 ; Structure particulate ; Texture sandy loam ; HCl 6M 0/4 ; pH 5.01 ; Root abundance 2/5, fine, mid-size and big ; Soft compactness ; Coarse elements abundance 5 % gravel, 5 % pebbles, 10 % stones and 10 % blocks ; Notes: very dry horizon, angular coarse elements.

Photo of humus form and Ponge diagram: lignomor

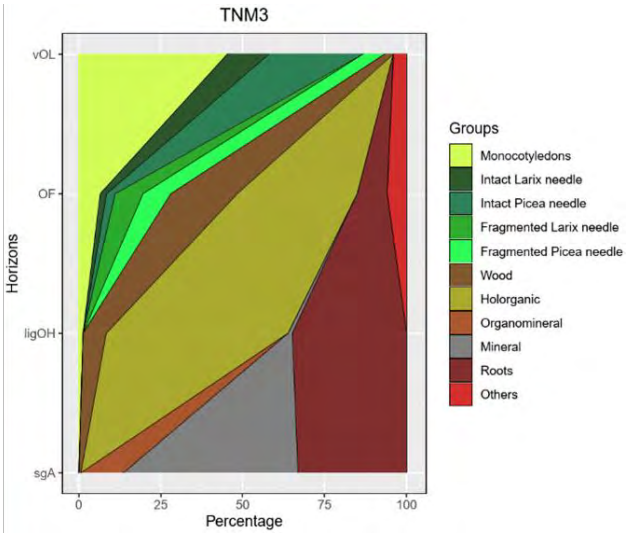


Table S3. 12. TNM3 Physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
sgA	3/4 – 12	56.31	39.40	4.29	5.70	8.62	4.18	0.18	23.16	4.36	4.60	42.55
Msi	12 – 84/90	58.60	38.28	3.12	5.11	2.77	0.84	0.04	19.62	5.01	1.05	6.10

VSM1 : BRUNISOL DYSTRIQUE colluvial, La Forcle (VD)

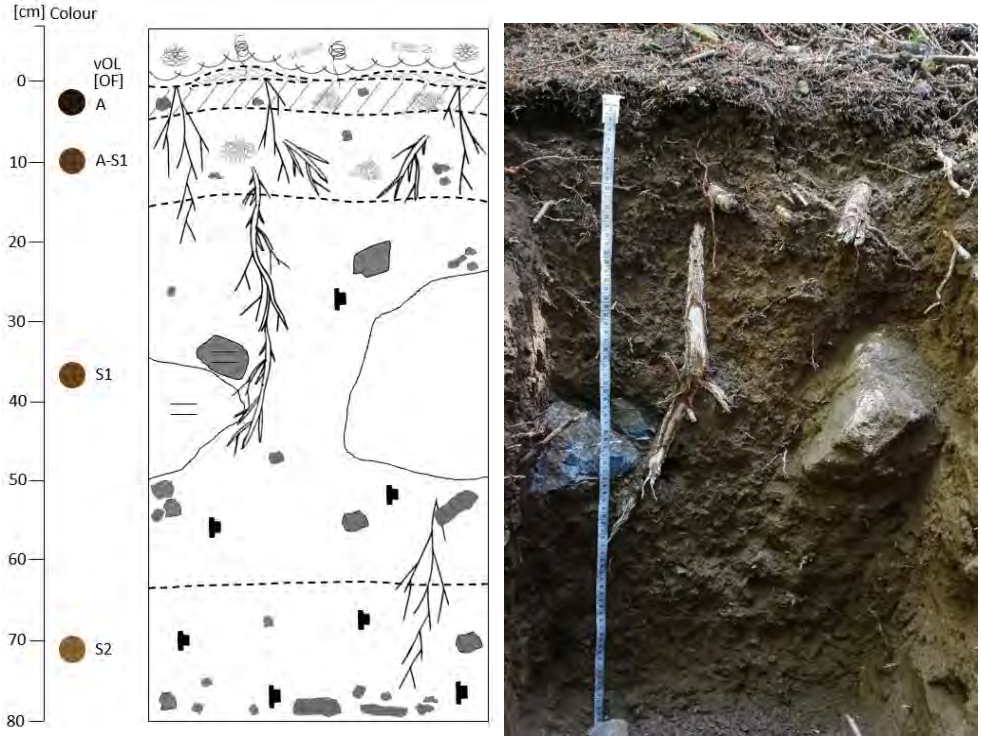
Soil type: *Référentiel Pédologique (RP)*, BRUNISOL DYSTRIQUE colluvial, issu d'éboulis mixte, à Oligomull

World Reference Base for Soil Ressources (WRB), Cambisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 15.08.2020

Locality	La Forcle	**Altitude [m]:**	1367
Municipality & canton:	Lavey-Morcles, VD	**Slope (°):**	15°
Coordinates (CH1903 / LV03):	569222, 118123	**Exposition:**	SSW
Geological substrate:	Mixed scree	**Habitat type:**	Forest
Plant community (association):	Abieti-Fagetum	**Weather:**	Cloudy, after rain
Remarks:	Many mesofauna, earthworms and mycelium.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

vOL: +2/1 – 0 cm ; Mainly *Picea* and also *Abies* needles, cones, barks and twigs. Presence of earthworms castings and many mesofauna. Ponge cube volume 25 cm^3.

[OF]: 0 – 0/1 cm ; Mainly *Picea* and also *Abies* fragmented needles and barks. Ponge cube volume 25 cm^3.

A: 0/1 – 4 cm ; Munsell Color 7.5YR 2.5/2 ; Not very humiferous ; Structure lumpy, mesostructured, moderately aggregated and stable ; Texture silty loam ; HCl 6M 0/4 ; pH 5.87 ; Root abundance 1/5, fine and mid-size ; Soft compactness ; Coarse elements abundance 5 % pebbles ; Note: presence of white mycelium and earthworms. Ponge cube volume 75 cm^3.

A-S1: 4 – 15 cm ; Munsell Color 10YR 4/3 ; Structure sub-polyhedral ; Texture silty loam ; HCl 6M 0/4 ; pH 5.05 ; Root abundance 4/5, fine, mid-size and big ; Soft compactness ; Coarse elements abundance 5 % pebbles ; Note: presence of white mycelium and earthworms.

S1: 15 – 63 cm ; Munsell Color 10YR 4/4 ; Structure polyhedral ; Texture silty loam ; HCl 6M 0/4 ; pH 5.80 ; Root abundance 2/5, mid-size and big ; Compact ; Coarse elements abundance 10 % pebbles, 10 % stones, 20 % blocks ; Notes: angular mixed coarse elements.

S2: 63 – 80 cm and + ; Munsell Color 10YR 5/4 ; Structure polyhedral ; Texture silty loam ; HCl 6M 0/4 ; Root abundance 1/5, fine and mid-size ; Very compact ; Coarse elements abundance 10 % pebbles, 5 % stones ; Notes: angular mixed coarse elements.

Photo of humus form and Ponge diagram: oligomull

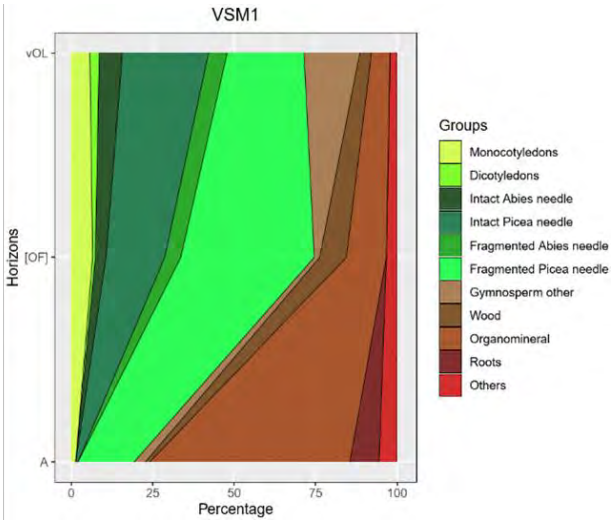


Table S3. 13. VSM1 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Corg [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
A	0/1 – 4	23.94	62.54	13.52	4.80	14.42	7.47	7.29	0.42	17.56	5.87	20.91	81.20
A-S1	4 – 15	26.38	60.41	13.21	2.49	7.28	3.04	2.87	0.25	11.83	5.05	10.86	63.84
S1	15 – 63	23.14	63.71	13.15	1.91	3.98	1.13	1.20	0.10	10.52	5.80	10.66	97.51

VSM2 : PEYROSOL, La Forcle (VD)

Soil type: *Référentiel Pédologique (RP)*, PEYROSOL pierrique, humifère, calcaire, issu d'éboulis calcaire, à Dysmull
World Reference Base for Soil Ressources (WRB), Leptosol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 16.08.2020

Locality	La Forcle	**Altitude [m]:**	1345
Municipality & canton:	Lavey-Morcles, VD	**Slope (°):**	30°
Coordinates (CH1903 / LV03):	569265, 118043	**Exposition:**	SSW
Geological substrate:	Limestone	**Habitat type:**	Forest
Plant community (association):	Abieti-Fagetum	**Weather:**	Cloudy, after rain
Remarks:	Many mesofauna, earthworms and mycelium.		

Diagram and photo of the soil profile:

Soil profile and humus form description:

nOL-vOL: +3/2 – 0 cm ; Mainly *Fagus sylvatica* leaves and also *Abies* and *Picea* needles, cones, barks and twigs. Presence of earthworms castings and many mesofauna. Ponge cube volume 62.5 cm^3.

OF: 0 – 1.5 cm ; Mainly *Fagus sylvatica* leaves and also *Abies* and *Picea* needles, cones, barks and twigs. Presence of many mycelium ; Note: very fibrous due to the presence of mycelium. Ponge cube volume 37.5 cm^3.

Acaho: 1.5 – 12 cm ; Munsell Color 10YR 2/2 ; Very humiferous ; Structure lumpy, mesostructured, moderately aggregated and stable ; Texture silty loam ; HCl 6M 1/4 ; pH 7.45 ; Root abundance 4/5, mid-size, fine and big ; Soft compactness ; Coarse elements abundance 10 % pebbles, 20 % stones, 5 % blocks ; Notes: fibrous due to the mycelium, presence of many mesofauna and earthworms, angular limestone coarse elements. Ponge cube volume 262.5 cm^3.
Xpcaho: 12 – 52 cm and + ; Munsell Color 10YR 2/2 ; Very humiferous ; Structure lumpy ; Texture silty loam ; HCl 6M 3/4 ; pH 7.57 ; Root abundance 3/5, mid-size, fine and big ; Soft compactness ; Coarse elements abundance 10 % pebbles, 40 % stones, 30 % blocks ; Notes: presence of mycelium, many mesofauna and earthworms, angular limestone coarse elements.

Photo of humus form and Ponge diagram: dysmull

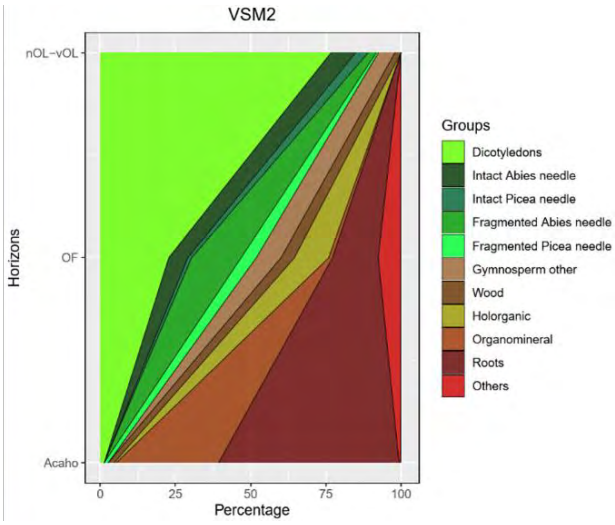


Table S3. 14. VSM2 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Corg [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
Acaho	1.5 – 12	21.66	64.51	13.83	9.72	34.46	24.76	21.20	1.59	15.44	7.45	80.58	91.83
Xpcaho	12 – 52+	24.30	62.07	13.63	8.47	26.38	18.30	16.34	1.15	13.89	7.57	48.45	90.41

VSM3 : PEYROSOL, La Forcle (VD)

Soil type: *Référentiel Pédologique (RP)*, PEYROSOL pierrique, humifère, calcaire, issu d'éboulis calcaire, à Dysmull
World Reference Base for Soil Ressources (WRB), Leptosol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 16.08.2020

Locality	La Forcle	**Altitude [m]:**	1402
Municipality & canton:	Lavey-Morcles, VD	**Slope (°):**	35°
Coordinates (CH1903 / LV03):	569385, 118083	**Exposition:**	SSW
Geological substrate:	Limestone	**Habitat type:**	Forest
Plant community (association):	Abieti-Fagetum	**Weather:**	Cloudy, after rain
Remarks:	Few mesofauna, earthworms and mycelium.		

Diagram and photo of the soil profile:

Soil profile and humus form description:

vOL: +2/1 – 0 cm ; Mainly *Picea* and also *Abies* needles, cones, barks and twigs. Presence of a few earthworms castings and mesofauna. Ponge cube volume 37.5 cm^3.

OF: 0 – 2/3 cm ; Mainly *Picea* and also *Abies* needles, cones, barks and twigs. Presence of mycelium ; Note: fibrous due to the presence of mycelium. Ponge cube volume 62.5 cm^3.

Acaho: 2/3 – 28 cm ; Munsell Color 7.5YR 2.5/2 ; Very humiferous ; Structure lumpy, mesostructured, moderately aggregated and stable ; Texture silty loam ; HCl 6M 2/4 ; pH 7.78 ; Root abundance 5/5, fine, mid-size and big ; Soft compactness ; Coarse elements abundance 10 % pebbles, 10 % stones ; Notes: presence of a few mesofauna and earthworms, angular limestone coarse elements. Ponge cube volume 637.5 cm^3.
Xpca: 28 – 53 cm and + ; Munsell Color 7.5YR 2.5/2 ; Relatively humiferous ; Structure lumpy ; Texture silty loam ; HCl 6M 4/4 ; pH 8.04 ; Root abundance 3/5, fine and big ; Soft compactness ; Coarse elements abundance 5 % pebbles, 20 % stones, 60 % blocks ; Notes: presence of a few mesofauna and earthworms, angular limestone coarse elements.

Photo of humus form and Ponge diagram: dysmull

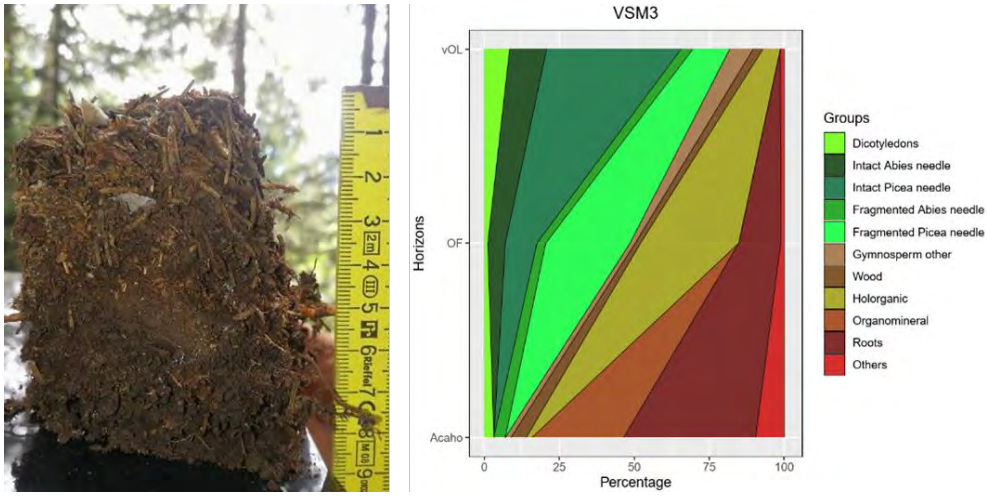


Table S3. 15. VSM3 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Corg [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
Acaho	2/3 – 28	17.63	65.85	16.52	8.54	20.13	12.85	11.63	0.65	17.69	7.78	46.34	95.45
Xpcaho	28 – 53+	22.11	62.74	15.15	3.88	12.54	9.07	6.58	0.49	14.06	8.04	35.59	101.50

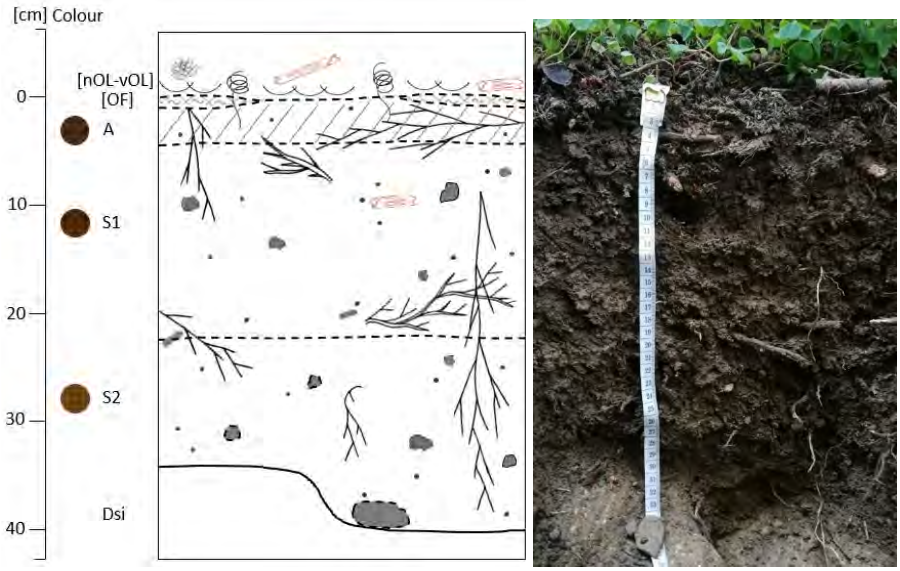
VNM1 : BRUNISOL DYSTRIQUE, Valassier (VS)

Soil type: *Référentiel Pédologique (RP),* BRUNISOL DYSTRIQUE leptique, issu d'éboulis siliceux, à Mésomull
World Reference Base for Soil Ressources (WRB), Cambisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 20.08.2020

Locality	Valassier	**Altitude [m]:**	1450
Municipality & canton:	Vérossaz, VS	**Slope (°):**	20°
Coordinates (CH1903 / LV03):	563504, 117806	**Exposition:**	NEE
Geological substrate:	Siliceous scree	**Habitat type:**	Forest
Plant community (association):	Adenostylo-Abietetum	**Weather:**	Sunny, after rain
Remarks:	Few mesofauna and many earthworms.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

[nOL-vOL]: +1/0 – 0 cm ; Mainly *Abies* and also *Picea* needles, cones and twigs. Presence of earthworms castings. Ponge cube volume 12.5 cm^3.

[OF]: 0 – 0/1 cm ; Mainly *Abies* and also *Picea* needles. Ponge cube volume 12.5 cm^3.

A: 0/1 – 4 cm ; Munsell Color 10YR 3/3 ; Not very humiferous ; Structure lumpy, mesostructured, moderately aggregated and stable ; Texture silty loam ; HCl 6M 0/4 ; pH 5.34 ; Root abundance 2/5, fine and mid-size ; Not very compact ; Coarse elements abundance 5 % gravel ; Note: presence of earthworms. Ponge cube volume 87.5 cm^3.

S1: 4 – 22 cm ; Munsell Color 10YR 3/4 ; Structure polyhedral ; Texture silty loam ; HCl 6M 0/4 ; pH 5.11 ; Root abundance 2/5, mid-size and big ; Not very compact ; Coarse elements abundance 5 % gravel, 5 % pebbles ; Notes: presence of earthworms, presence of a piece of decaying wood.
S2: 22 – 34/40 cm ; Munsell Color 10YR 4/4 ; Structure sub-polyhedral ; Texture silty loam ; HCl 6M 0/4 ; Root abundance 2/5, mid-size and fine ; Not very compact ; Coarse elements abundance 5 % gravel, 5% pebbles, 5% stones ; Notes: presence of earthworms, angular siliceous coarse elements mainly consisting of sandstone and shale, some chemically altered.

Photo of humus form and Ponge diagram: mésomull

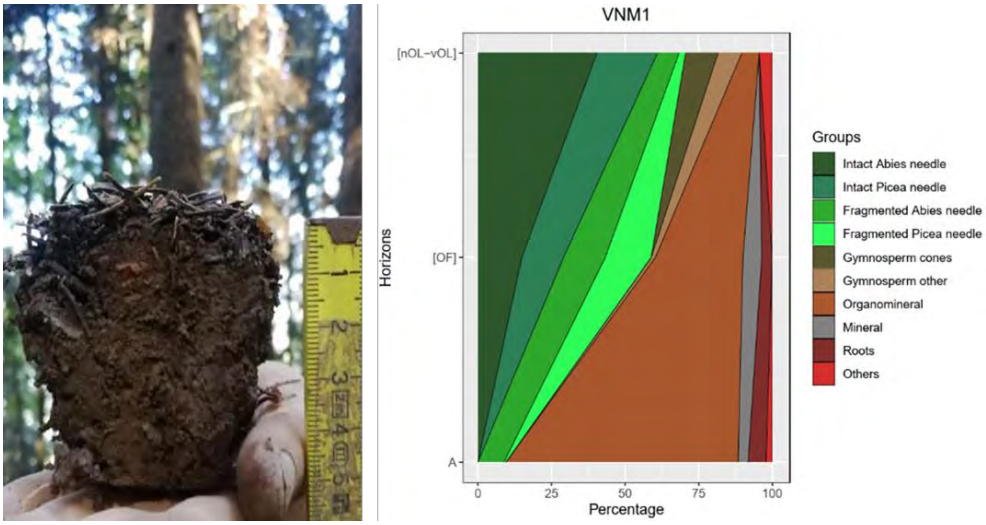


Table S3. 16. VNM1 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
A	0/1 – 4	14.56	67.74	17.69	10.67	14.87	7.40	0.53	13.95	5.34	13.92	24.74
S1	4 – 22	16.50	66.45	17.05	11.45	12.12	5.97	0.45	13.30	5.11	10.34	10.39

VNM2 : BRUNISOL DYSTRIQUE, Valassier (VS)

Soil type: *Référentiel Pédologique (RP)*, BRUNISOL DYSTRIQUE à horizon rédoxique de profondeur, graveleux, issu de grès et de schiste, à Dysmull
World Reference Base for Soil Ressources (WRB), Cambisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 20.08.2020

Locality	Valassier	**Altitude [m]:**	1450
Municipality & canton:	Vérossaz, VS	**Slope (°):**	25°
Coordinates (CH1903 / LV03):	563433, 117907	**Exposition:**	NEE
Geological substrate:	Sandstone and shale	**Habitat type:**	Forest
Plant community (association):	Adenostylo-Abietetum	**Weather:**	Sunny, after rain
Remarks:	Few mesofauna and many earthworms, angular siliceous coarse elements mainly consisting of sandstone and shale		

Diagram and photo of the soil profile:

Soil profile and humus form description:

vOL: +1/0.5 – 0 cm ; *Abies* and *Picea* needles, cones, barks and twigs. Presence of many earthworms castings. Ponge cube volume 25 cm^3.

OF: 0 – 2/10 cm ; *Abies* and *Picea* fragmented needles, cones, barks and twigs ; Root abundance 4/5, mid-size, fine and big. Presence of feces pellets. Ponge cube volume 50 cm^3.

A: 2/10 – 4/17 cm ; Munsell Color 10YR 4/4 ; Not very humiferous ; Structure lumpy, mesostructured, moderately aggregated and unstable ; Texture silty loam ; HCl 6M 0/4 ; pH 5.17 ; Root abundance 2/5, mid-size, big and fine ; Not very compact ; Coarse elements abundance 5 % gravel ; Note: presence of earthworms. Ponge cube volume 200 cm^3.
S1: 4/17 – 45/48 cm ; Munsell Color 10YR 4/3 ; Structure polyhedral ; Texture silty loam ; HCl 6M 0/4 ; pH 5.15 ; Root abundance 2/5, mid-size and big ; Not very compact ; Coarse elements abundance 10 % gravel, 5% pebbles, 5% stones ; Note: presence of earthworms.
S2: 45/48 – 68 cm ; Munsell Color 7.5YR 4/2 ; Structure sub-polyhedral ; Texture silty loam ; HCl 6M 0/4 ; Root abundance 2/5, mid-size, big and fine ; Not very compact ; Coarse elements abundance 50 % gravel, 10% pebbles ; Notes: presence of earthworms, red-brown stains of oxidized sandstone (Munsell Color 7.5YR 5/6).
g: 68 – 80/84 cm ; Munsell Color 10YR 4/3 ; Structure massive ; Texture silty loam ; HCl 6M 0/4 ; Root abundance 1/5, fine ; Very compact ; Coarse elements abundance 35 % gravel, 20% pebbles, 2% stones ; Notes: redox stains (Munsell Color 7.5YR 6/8 and 2.5Y 4/1), stone with oxidized iron, presence of mycelium, sticky and non-porous horizon.
Csi: 80/84 – 120 cm and + ; Munsell Color 10YR 3/3 ; Structure massive ; Texture silty loam ; HCl 6M 0/4 ; Root abundance 1/5, fine ; Very compact ; Coarse elements abundance 30 % gravel, 35% pebbles ; Notes: red-brown stains of oxidized sandstone (Munsell Color 7.5YR 5/6), very weathered pebbles, sticky and non-porous horizon.

Photo of humus form and Ponge diagram: dysmull

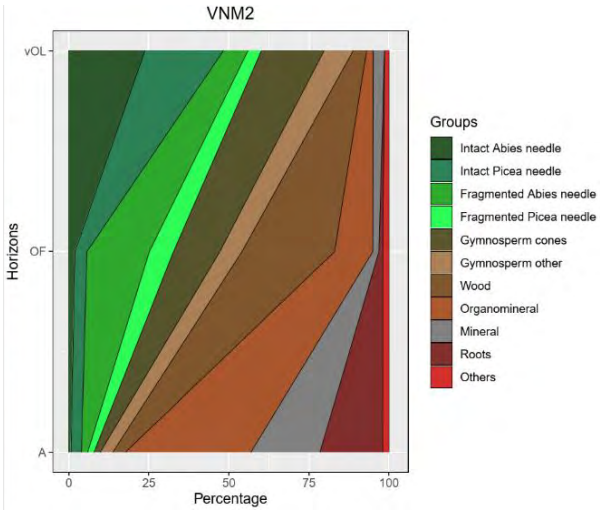


Table S3. 17. VNM2 Physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
A	2/10 – 4/17	19.18	64.90	15.92	8.27	11.05	5.30	0.34	15.69	5.17	12.43	36.80
S1	4/17 – 45/48	36.61	51.82	11.57	2.78	4.69	1.55	0.17	9.39	5.15	8.40	17.30

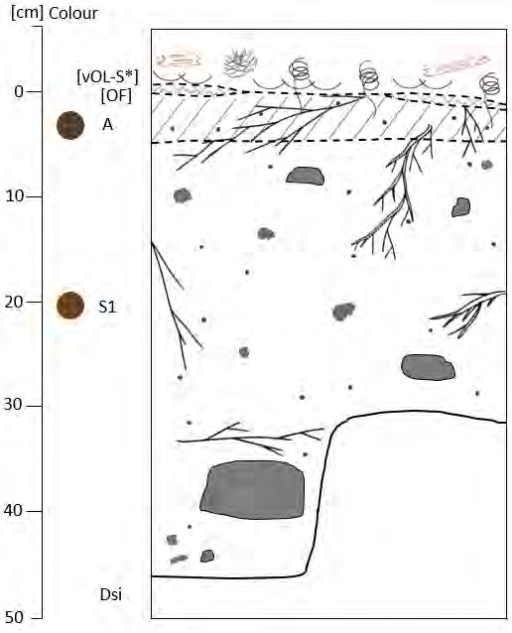
VNM3 : BRUNISOL DYSTRIQUE, Valassier (VS)

Soil type: *Référentiel Pédologique (RP)*, BRUNISOL DYSTRIQUE leptique, issu d'éboulis siliceux, à Mésomull
World Reference Base for Soil Ressources (WRB), Cambisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 21.08.2020

Locality	Valassier	**Altitude [m]:**	1458
Municipality & canton:	Vérossaz, VS	**Slope (°):**	25°
Coordinates (CH1903 / LV03):	563453, 117760	**Exposition:**	NEE
Geological substrate:	Siliceous scree	**Habitat type:**	Forest
Plant community (association):	Adenostylo-Abietetum	**Weather:**	Sunny, after rain
Remarks:	Few mesofauna and many earthworms, angular siliceous coarse elements mainly consisting of sandstone and shale		

Diagram and photo of the soil profile:



Soil profile and humus form description:

[vOL-S*]: +1/0 – 0 cm ; *Abies* and *Picea* needles, cones, barks and twigs ; Presence of bryophytes. Presence of many earthworms castings. Ponge cube volume 12.5 cm^3.

[OF]: 0 – 0/0.5 cm ; *Abies* and *Picea* fragmented needles, cones, barks and twigs. Ponge cube volume 12.5 cm^3.

A: 0/0.5 – 4/5 cm ; Munsell Color 10YR 4/2 ; Not very humiferous ; Structure lumpy, mesostructured, moderately aggregated and stable ; Texture silty loam ; HCl 6M 0/4 ; pH 5.61 ; Root abundance 2/5, mid-size ; Not very compact ; Coarse elements abundance 5 % gravel ; Note: presence of earthworms. Ponge cube volume 75 cm^3.
S: 4/5 – 30/47 cm ; Munsell Color 10YR 4/4 ; Structure polyhedral ; Texture silty loam ; HCl 6M 0/4 ; pH 4.84 ; Root abundance 1/5, fine, mid-size and big ; Not very compact ; Coarse elements abundance 5 % gravel, 2% pebbles, 5% stones, 2% blocks ; Note: presence of earthworms.

Photo of humus form and Ponge diagram: mesomull

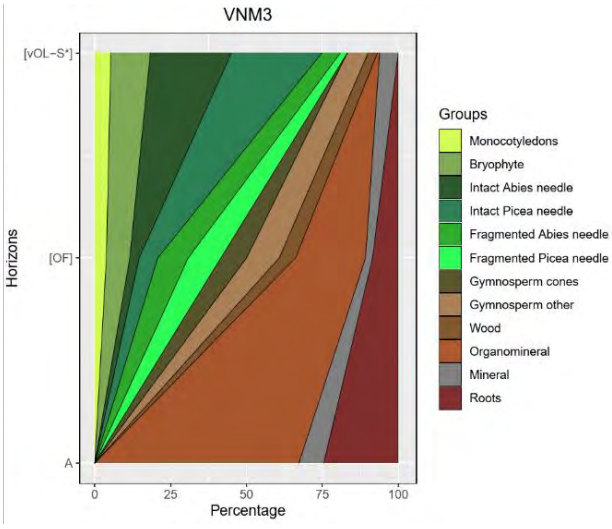


Table S3. 18. VNM3 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
A	0/0.5 – 4/5	15.87	67.35	16.77	9.42	13.11	5.93	0.45	13.10	5.61	11.75	41.99
S1	4/5 – 30/47	17.77	64.94	17.29	6.26	8.70	3.50	0.31	11.34	4.84	8.08	8.67

TSH1 : COLLUVIOSOL, Predelp (TI)

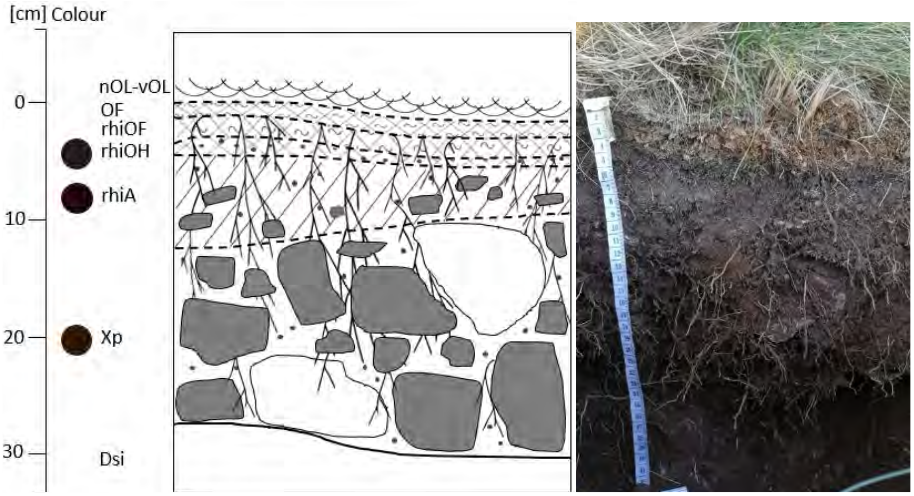
Soil type: *Référentiel Pédologique (RP),* COLLUVIOSOL leptique, pierreux, issu de gneiss, à Rhizomoder

World Reference Base for Soil Ressources (WRB), Colluvic Regosol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 27.08.2020

Locality	Predelp	**Altitude [m]:**	2128
Municipality & canton:	Faido, TI	**Slope (°):**	23°
Coordinates (CH1903 / LV03):	704120, 152459	**Exposition:**	SSE
Geological substrate:	Gneiss	**Habitat type:**	Grassland
Plant community (association):	Hypochoerido-Nardetum	**Weather:**	Dry and sunny
Remarks:	No trace of earthworms and mesofauna. Dry profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

nOL-vOL: +5/3– 0 cm ; *Nardus* leaves and stems. Ponge cube volume 100 cm^3.

OF: 0 – 1/2 cm ; Mainly *Nardus* leaves and stems, also holorganic and dicotyledons leaves. Ponge cube volume 25 cm^3.

rhiOF: 1/2 – 3/4 cm ; Fragmented dead roots, *Nardus* base ; Root abundance 5/5, fine and mid-size. Ponge cube volume 50 cm^3.

rhiOH: 3/4 – 4/5 cm ; Fine and light material ; Munsell Color 7.5YR 3/1 ; pH 4.47 ; Root abundance 5/5, fine and mid-size ; Coarse elements abundance 3 % gravel ; Notes: presence of silt and sand in the whole horizon. Ponge cube volume 25 cm^3.

rhiA: 4/5 – 9/12 cm ; Munsell Color 7.5YR 2.5/3 ; Not very humiferous ; Structure lumpy to single grain, micro- to mesostructured by roots, poorly aggregated and unstable ; Texture sandy loam ; HCl 6M

0/4 ; pH 4.43 ; Root abundance 5/5, fine ; Not very compact ; Coarse elements abundance 10 % gravel, 10 % pebbles ; Note: angular gneiss as coarse elements. Ponge cube volume 125 cm^3.

Xp: 9/12 – 27/30 cm ; Munsell Color 7.5YR 3/3 ; Structure lumpy to single grain ; Texture sandy loam ; HCl 6M 0/4 ; pH 4.70 ; Root abundance 4/5, fine and mid-size ; Not very compact ; Coarse elements abundance 10 % gravel, 15 % pebbles, 50 % stones, 10 % blocks ; Note: angular gneiss as coarse elements.

Photo of humus form and Ponge diagram: rhizomoder

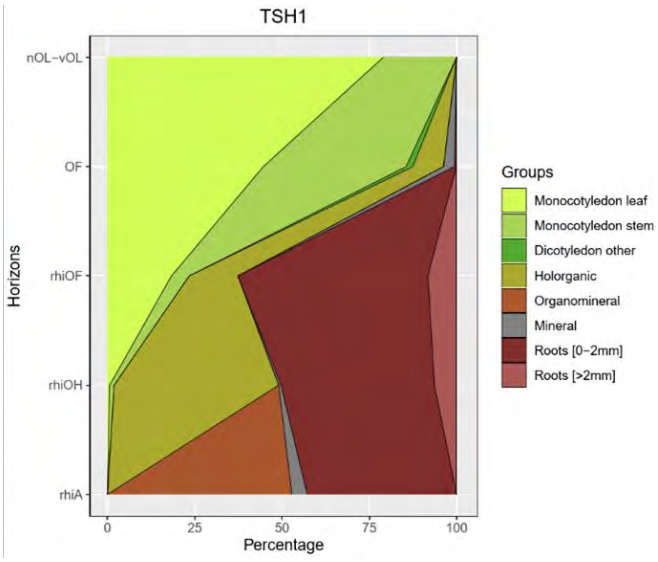


Table S3. 19. TSH1 Physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
rhiOH	3/4 – 4/5	46.44	45.88	7.68	4.38	32.08	16.39	1.21	13.56	4.47	9.93	13.23
rhiA	4/5 – 8/12	60.04	33.56	6.40	3.44	12.24	6.06	0.51	11.87	4.43	4.87	12.22
Xp	8/12 – 27/30	67.42	29.79	2.79	5.74	12.70	6.22	0.47	13.32	4.70	3.22	10.13

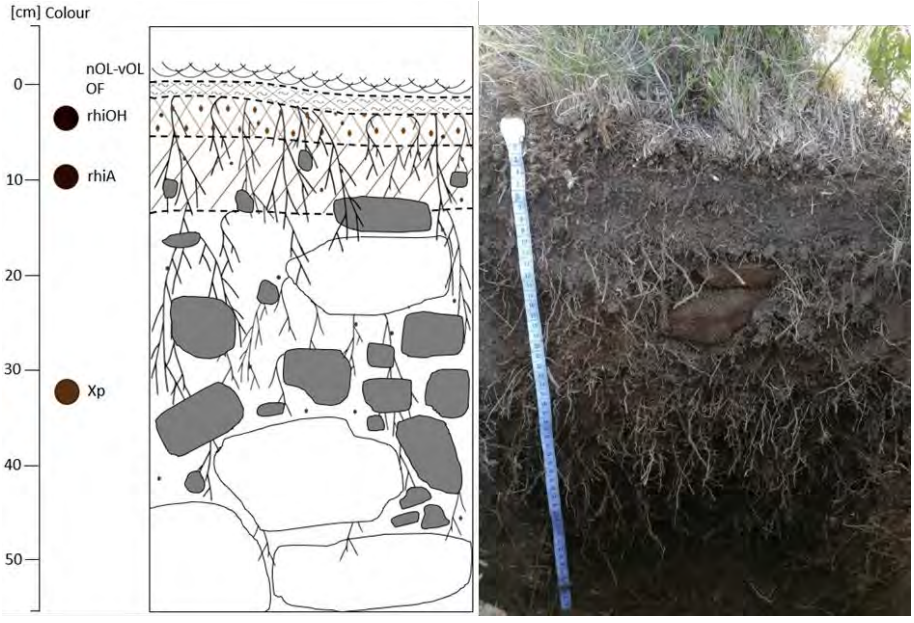
TSH2 : COLLUVIOSOL, Predelp (TI)

Soil type: *Référentiel Pédologique (RP),* COLLUVIOSOL, pierreux, issu de gneiss, à Rhizomoder
World Reference Base for Soil Ressources (WRB), Colluvic Regosol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 27.08.2020

Locality	Predelp	**Altitude [m]:**	2143
Municipality & canton:	Faido, TI	**Slope (°):**	23°
Coordinates (CH1903 / LV03):	704124, 152501	**Exposition:**	SSE
Geological substrate:	Gneiss	**Habitat type:**	Grassland
Plant community (association):	Hypochoerido-Nardetum	**Weather:**	Dry and sunny
Remarks:	No trace of earthworms and mesofauna. Dry profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

nOL-vOL: +4/1– 0 cm ; *Nardus* leaves and stems, also *Carex sempervirens* and dicotyledons leaves. Ponge cube volume 25 cm^3.

OF: 0 – 1/3 cm ; Mainly *Nardus* leaves and stems, also holorganic and dicotyledons leaves. Ponge cube volume 50 cm^3.

rhiOH: 1/3 – 5/6 cm ; Fine and light material ; Munsell Color 7.5YR 2.5/2 ; Root abundance 5/5, fine, mid-size and big ; Coarse elements abundance 3 % gravel ; Notes: presence of silt and sand in the whole horizon. Ponge cube volume 75 cm^3.

rhiA: 5/6 – 13 cm ; Munsell Color 7.5YR 3/3 ; Structure lumpy to single grain, micro- to mesostructured by roots, poorly aggregated and unstable ; Texture sandy loam ; HCl 6M 0/4 ; pH 4.86 ; Root abundance 5/5, fine and mid-size ; Not very compact ; Coarse elements abundance 3 % gravel, 5 % pebbles ; Note: angular gneiss as coarse elements. Ponge cube volume 175 cm^3.
Xp: 13 – 55 cm and + ; Munsell Color 10YR 3/4 ; Structure single grain ; Texture sandy loam to loamy sand ; HCl 6M 0/4 ; pH 4.76 ; Root abundance 4/5, fine and mid-size ; Not very compact ; Coarse elements abundance 3 % gravel, 10 % pebbles, 30 % stones, 30 % blocks ; Note: angular gneiss as coarse elements.

Photo of humus form and Ponge diagram: rhizomoder

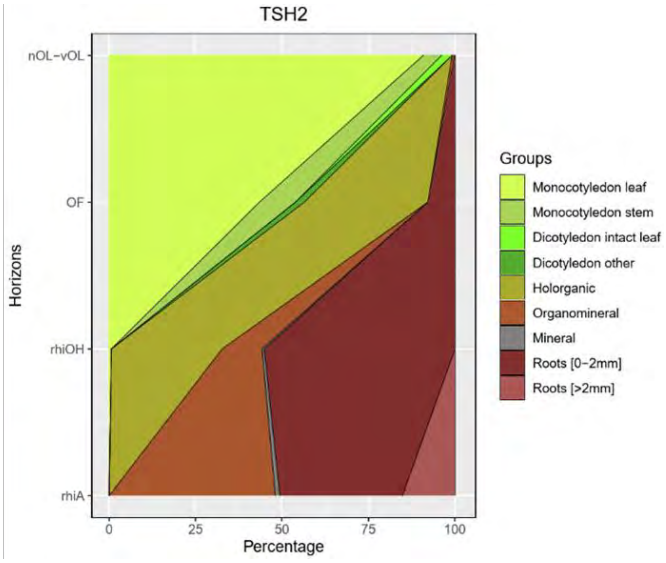


Table S3. 20. TSH2 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
rhiA	5/6 – 13	55.59	39.51	4.90	6.69	12.51	5.52	0.33	16.49	4.86	4.00	2.37
Xp	13 – 55 and +	71.68	26.55	1.77	6.78	9.54	4.14	0.23	17.99	4.76	1.97	0.00

TSH3 : COLLUVIOSOL brunifié, Predelp (TI)

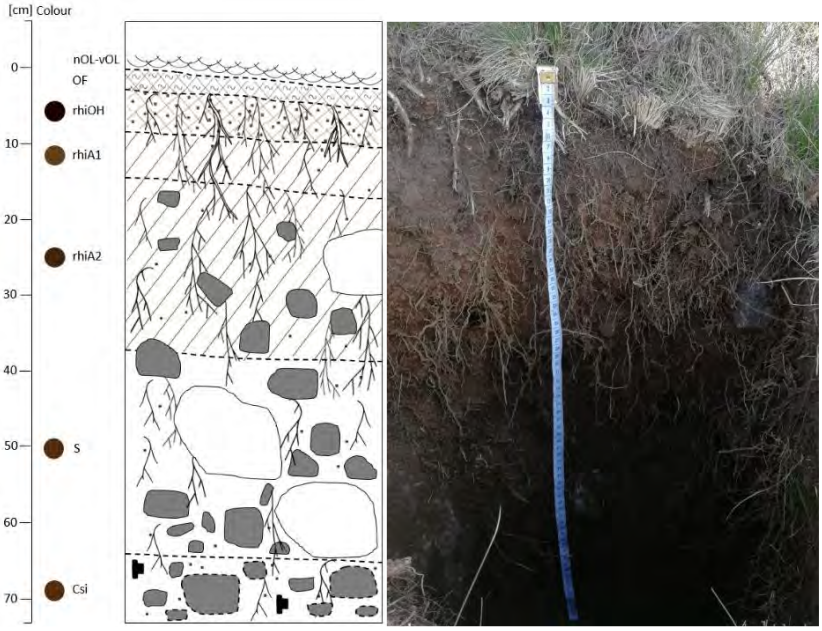
Soil type: *Référentiel Pédologique (RP)*, COLLUVIOSOL brunifié, pierreux, issu de gneiss, à Rhizomoder

World Reference Base for Soil Ressources (WRB), Colluvic Regosol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 27.08.2020

Locality	Predelp	**Altitude [m]:**	2165
Municipality & canton:	Faido, TI	**Slope (°):**	23°
Coordinates (CH1903 / LV03):	704092, 152532	**Exposition:**	SSE
Geological substrate:	Gneiss	**Habitat type:**	Grassland
Plant community (association):	Hypochoerido-Nardetum	**Weather:**	Dry and sunny
Remarks:	No trace of earthworms and mesofauna. Dry profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

nOL-vOL: +3/1– 0 cm ; Mainly *Nardus* leaves and stems, also dicotyledons leaves. Ponge cube volume 25 cm^3.

OF: 0 – 3 cm ; *Nardus* leaves and stems, holorganic. Ponge cube volume 50 cm^3.

rhiOH: 3 – 8 cm ; Fine and light material ; Munsell Color 7.5YR 2.5/2 ; Root abundance 5/5, fine, mid-size and big ; Coarse elements abundance 3 % gravel ; Note: presence of silt and sand in the horizon. Ponge cube volume 100 cm^3.

rhiA1: 8 – 14 cm ; Munsell Color 10YR 4/3 ; Not very humiferous ; Structure single grain, micro- to mesostructured by roots, poorly aggregated and unstable ; Texture sandy loam ; HCl 6M 0/4 ; pH 4.59 ; Root abundance 4/5, fine, mid-size and big ; Not very compact ; Coarse elements abundance 5 % gravel, 3 % pebbles ; Note: angular gneiss as coarse elements. Ponge cube volume 150 cm^3.
rhiA2: 14 – 37 cm ; Munsell Color 10YR 3/3 ; Structure single grain, micro- to mesostructured by roots, poorly aggregated and unstable ; Texture sandy loam ; HCl 6M 0/4 ; pH 4.24 ; Root abundance 5/5, fine and mid-size ; Not very compact ; Coarse elements abundance 5 % gravel, 5 % pebbles, 10 % stones, 5 % blocks ; Note: angular gneiss as coarse elements. Ponge cube volume 575 cm^3.
S: 37 – 64 cm ; Munsell Color 10YR 3/4 ; Structure sub-polyhedral ; Texture sandy loam ; HCl 6M 0/4 ; pH 4.94 ; Root abundance 2/5, fine and mid-size ; Not very compact ; Coarse elements abundance 5 % gravel, 5 % pebbles, 20 % stones, 20 % blocks ; Note: angular gneiss as coarse elements.
Csi: 64 – 73 cm and + ; Munsell Color 10YR 3/4 ; Structure particulate ; Texture loamy sand ; HCl 6M 0/4 ; pH 4.76 ; Root abundance 1/5, fine ; Compact ; Coarse elements abundance 10 % gravel, 10 % pebbles, 15 % stones ; Note: slightly to highly weathered gneiss as coarse elements.

Photo of humus form and Ponge diagram: rhizomoder

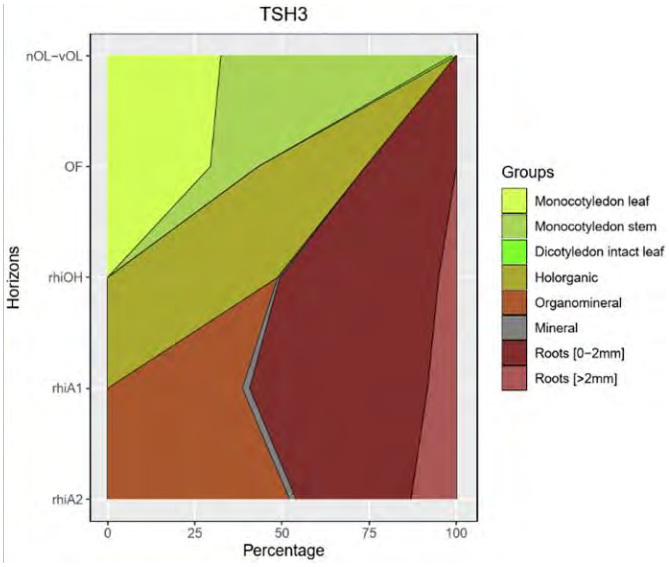


Table S3. 21. TSH3 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
rhiA1	8 – 14	65.33	29.14	5.53	2.82	11.20	5.90	0.43	13.75	4.59	2.28	13.16
rhiA2	14 – 37	60.83	35.91	3.26	7.26	10.84	5.50	0.34	15.96	4.24	2.79	16.86
S	37 – 64	64.52	33.33	2.15	2.69	4.73	1.95	0.11	18.49	4.94	0.96	0.00

TNH1 : ORGANOSOL INSATURÉ à COLLUVIOSOL, Campo Tencia (TI)

Soil type: *Référentiel Pédologique (RP)*, ORGANOSOL INSATURÉ à COLLUVIOSOL, sableux, issu de gneiss, à RhizomoderTNM1
World Reference Base for Soil Ressources (WRB), Umbrisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 25.08.2020

Locality	Campo Tencia	**Altitude [m]:**	2182
Municipality & canton:	Faido, TI	**Slope (°):**	15°
Coordinates (CH1903 / LV03):	699285, 144565	**Exposition:**	NNE
Geological substrate:	Gneiss	**Habitat type:**	Grassland
Plant community (association):	Carici curvulae-Nardetum	**Weather:**	Dry and sunny
Remarks:	No trace of earthworms or mesofauna. Relatively dry profile.		

Diagram and photo of the soil profile:

Soil profile and humus form description:

nOL-vOL-[S*]: +0.5 – 0 cm ; Mainly *Nardus* and *Carex curvula* leaves and stems, also dicotyledons intact leaves and stems. Presence of bryophytes. Ponge cube volume 12.5 cm^3.

OF: 0 – 0.5/1 cm ; Mainly fragmented *Nardus* leaves and stems, and holorganic. Ponge cube volume 12.5 cm^3.

rhiOH: 0.5/1 – 3/4 cm ; Fine, fibrous and light material ; Munsell Color 10YR 3/3 ; Root abundance 5/5, fine ; No coarse elements. Ponge cube volume 62.5 cm^3.

rhiAho: 3/4 – 12/14 cm ; Munsell Color 7.5YR 2.5/2 ; Humiferous ; Structure lumpy, microstructured by roots, poorly aggregated and unstable ; Texture loamy sand ; HCl 6M 0/4 ; pH 4.31 ; Root abundance

5/5, fine and mid-size ; Not very compact ; Coarse elements abundance 2 % gravel, 5 % pebbles ; Note: sticky horizon. Ponge cube volume 225 cm^3.

Xp: 12/14 – 37 cm ; Munsell Color 10YR 2/2 ; Structure lumpy, microstructured by roots, poorly aggregated and unstable ; Texture loamy sand ; HCl 6M 0/4 ; pH 4.84 ; Root abundance 3/5, fine and mid-size ; Not very compact ; Coarse elements abundance 2 % gravel, 5 % pebbles, 20 % stones, 40 % blocks ; Notes: presence of coarse sand, angular gneiss as coarse elements. Ponge cube volume 600 cm^3.

IIA: 37 – 51 cm ; Munsell Color 7.5YR 2.5/3 ; Structure lumpy, microstructured, poorly aggregated and unstable ; Texture unknown ; HCl 6M 0/4 ; Root abundance 2/5, fine ; Not very compact ; Coarse elements abundance 2 % gravel, 5 % pebbles, 5 % stones ; Notes: presence of coarse sand, angular gneiss as coarse elements.

IICsi: 51 – 62 cm and + ; Munsell Color 10YR 3/4 ; Structure particulate ; Texture unknown ; HCl 6M 0/4 ; Root abundance 1/5, fine ; Not very compact ; Coarse elements abundance 10 % gravel, 10 % pebbles, 10 % stones, 5 % blocks ; Notes: presence of coarse sand, slightly weathered gneiss as coarse elements.

Photo of humus form and Ponge diagram: rhizomoder

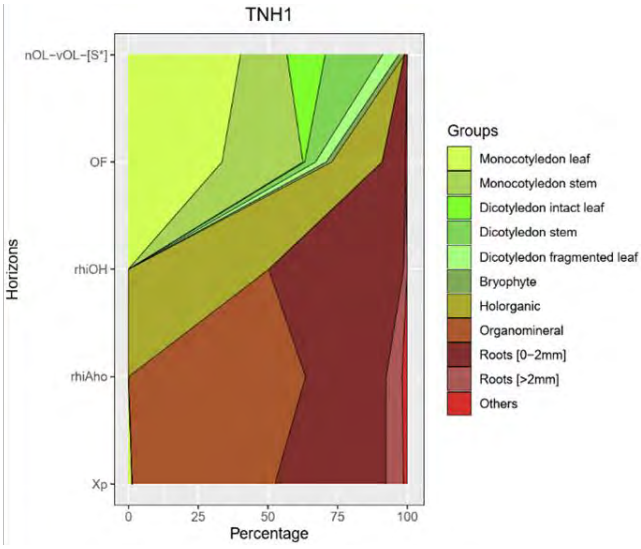


Table S3. 22. TNH1 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
rhiAho	3/4 – 12/14	74.53	22.54	2.93	5.85	18.20	9.25	0.55	16.90	4.31	5.78	7.60
Xp	12/14 – 37	83.28	15.66	1.06	4.92	9.70	4.91	0.24	20.80	4.84	1.93	2.95

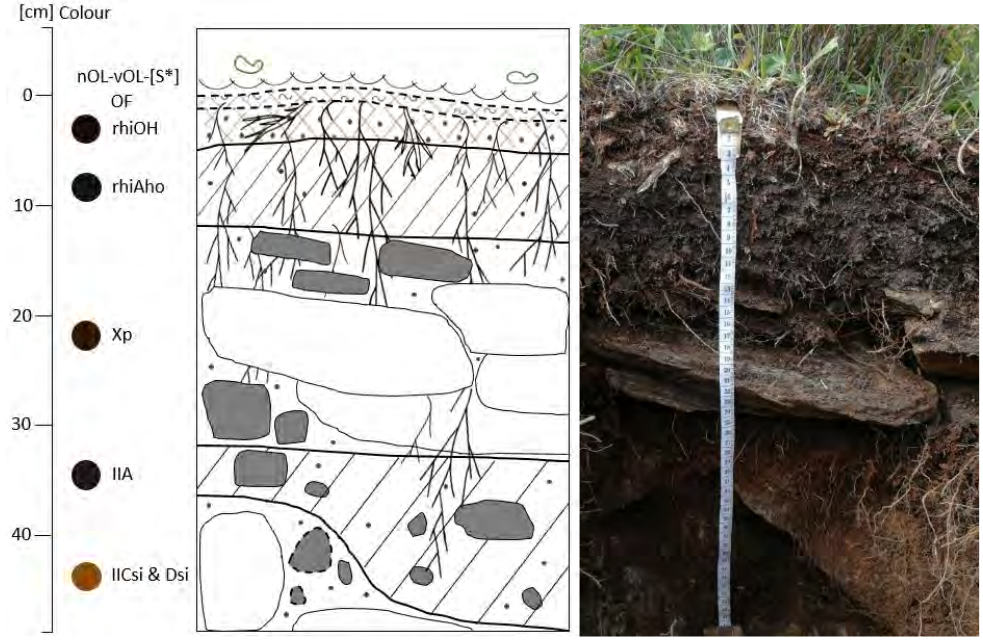
TNH2 : ORGANOSOL SATURÉ à COLLUVIOSOL, Campo Tencia (TI)

Soil type: *Référentiel Pédologique (RP)*, ORGANOSOL SATURÉ à COLLUVIOSOL, sableux, issu de gneiss, à Rhizomoder
World Reference Base for Soil Ressources (WRB), Umbrisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 25.08.2020

Locality	Campo Tencia	**Altitude [m]:**	2178
Municipality & canton:	Faido, TI	**Slope (°):**	10°
Coordinates (CH1903 / LV03):	699342, 144536	**Exposition:**	NNE
Geological substrate:	Gneiss	**Habitat type:**	Grassland
Plant community (association):	Rhododendro ferruginei-Vaccinietum	**Weather:**	Dry and sunny
Remarks:	No trace of earthworms or mesofauna. Relatively dry profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

nOL-vOL-[S*]: + 1/0.5 – 0 cm ; Mainly dicotyledons leaves and stems, also *Nardus* leaves and stems. Ponge cube volume 12.5 cm^3.

OF: 0 – 1 cm ; Mainly fragmented dicotyledons leaves, also *Nardus* leaves and holorganic. Ponge cube volume 25 cm^3.

rhiOH: 1 – 4 cm ; Fine, fibrous and light material ; Munsell Color 10YR 2/2 ; Root abundance 5/5, fine, mid-size and big ; No coarse elements. Ponge cube volume 75 cm^3.

rhiAho: 4 – 12 cm ; Munsell Color 10YR 2/1 ; Humiferous ; Structure lumpy, mesostructured by roots, poorly aggregated and unstable ; Texture loamy sand ; HCl 6M 0/4 ; pH 4.32 ; Root abundance 5/5, fine and mid-size ; Not very compact ; Coarse elements abundance 2 % gravel ; Note: sticky horizon. Ponge cube volume 200 cm^3.
Xp: 12 – 32 cm ; Munsell Color 7.5YR 2.5/3 ; Structure granular ; Texture loamy sand ; HCl 6M 0/4 ; pH 4.93 ; Root abundance 3/5, fine ; Not very compact ; Coarse elements abundance 5 % gravel, 20 % stones, 60 % blocks ; Notes: presence of coarse sand, angular gneiss as coarse elements.
IIA: 32 – 36/48 cm ; Munsell Color 10YR 2/2 ; Structure lumpy, microstructured, poorly aggregated and unstable ; Texture sandy loam ; HCl 6M 0/4 ; pH 4.57 ; Root abundance 1/5, fine ; Not very compact ; Coarse elements abundance 2 % gravel, 2 % pebbles, 2 % stones ; Notes: very sticky horizon, angular gneiss as coarse elements.
IICsi & Dsi: 36/48 – 48 cm and + ; Munsell Color 7.5YR 5/6 ; Structure particulate ; Texture sandy loam ; HCl 6M 0/4 ; Root abundance 0/5 ; Not very compact ; Coarse elements abundance 5 % gravel, 5 % pebbles, 5 % stones, 50 % blocks ; Notes: presence of coarse sand, slightly weathered gneiss as coarse elements.

Photo of humus form and Ponge diagram: rhizomoder

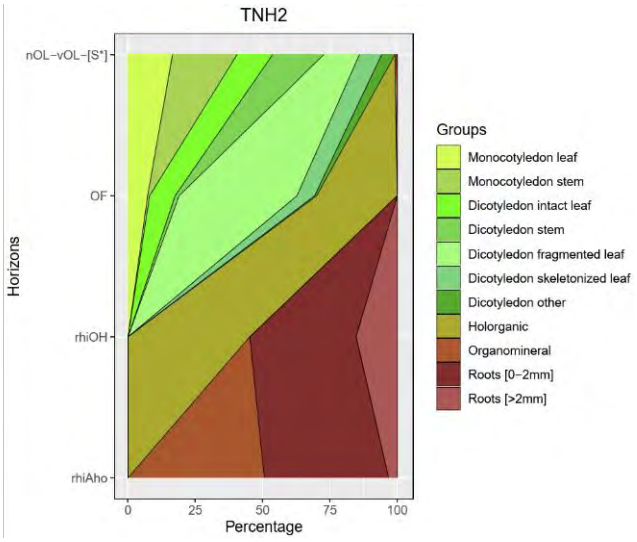


Table S3. 23. TNH2 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
rhiAho	4 – 12	78.37	19.19	2.45	3.30	18.56	9.94	0.51	19.43	4.32	6.38	84.26
Xp	12 – 32	82.33	16.76	0.91	13.01	11.94	5.48	0.25	22.21	4.93	3.25	3.26
IIA	32 – 36/48	67.27	31.15	1.58	13.01	16.13	7.82	0.33	23.58	4.57	3.59	2.48

TNH3 : ORGANOSOL INSATURÉ, Campo Tencia (TI)

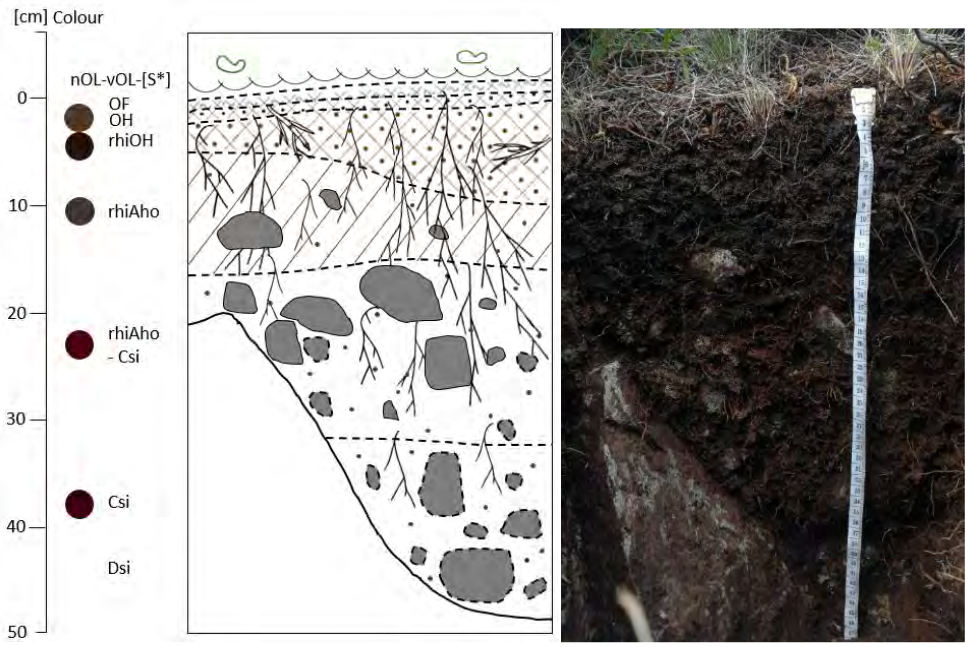
Soil type: *Référentiel Pédologique (RP)*, ORGANOSOL INSATURÉ, sableux, issu de gneiss, à Rhizomoder

World Reference Base for Soil Ressources (WRB), Umbrisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 24.08.2020

Locality	Campo Tencia	**Altitude [m]:**	2194
Municipality & canton:	Faido, TI	**Slope (°):**	13°
Coordinates (CH1903 / LV03):	699150, 144556	**Exposition:**	NNE
Geological substrate:	Gneiss	**Habitat type:**	Grassland
Plant community (association):	Rhododendro ferruginei-Vaccinietum	**Weather:**	Dry and sunny
Remarks:	No trace of earthworms or mesofauna. Relatively dry profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

nOL-vOL-[S*]: +2/1 – 0 cm ; Mainly dicotyledons leaves, also *Nardus* leaves. Ponge cube volume 37.5 cm^3.

OF: 0 – 1 cm ; Mainly fragmented dicotyledons leaves, also *Nardus* leaves. Ponge cube volume 25 cm^3.

OH: 1 – 2 cm ; Fine and light material ; Munsell Color 10YR 3/3 ; No coarse elements. Ponge cube volume 25 cm^3.

rhiOH: 2 – 5/10 cm ; Fine, fibrous and light material ; Munsell Color 10YR 2/2 ; Root abundance 5/5, fine, mid-size and big ; No coarse elements ; Note: contains approximately 20% sand. Ponge cube volume 125 cm^3.
rhiAho: 5/10 – 15/16 cm ; Munsell Color 5YR 2.5/1 ; Very humiferous ; Structure lumpy, mesostructured by roots, moderately aggregated and unstable ; Texture loamy sand ; HCl 6M 0/4 ; pH 4.44 ; Root abundance 5/5, fine and mid-size ; Not very compact ; Coarse elements abundance 2 % gravel, 2 % pebbles, 5 % stones ; Notes: very sticky horizon, angular gneiss as coarse elements. Ponge cube volume 150 cm^3.
rhiAho-Csi: 15/16 – 20/32 cm ; Munsell Color 7.5YR 2.5/3 ; Structure granular ; Texture loamy sand ; HCl 6M 0/4 ; pH 4.72 ; Root abundance 4/5, fine and mid-size ; Not very compact ; Coarse elements abundance 10 % gravel, 10 % pebbles, 10 % stones ; Notes: sticky horizon, angular moderately weathered gneiss as coarse elements.
Csi: 32 – 48/49 cm ; Munsell Color 7.5YR 2.5/2 ; Structure particulate ; Texture loamy sand ; HCl 6M 0/4 ; Root abundance 1/5, fine ; Not very compact ; Coarse elements abundance 10 % gravel, 10 % pebbles, 10 % stones, 10 % blocks ; Note: angular weathered gneiss as coarse elements.

Photo of humus form and Ponge diagram: rhizomoder

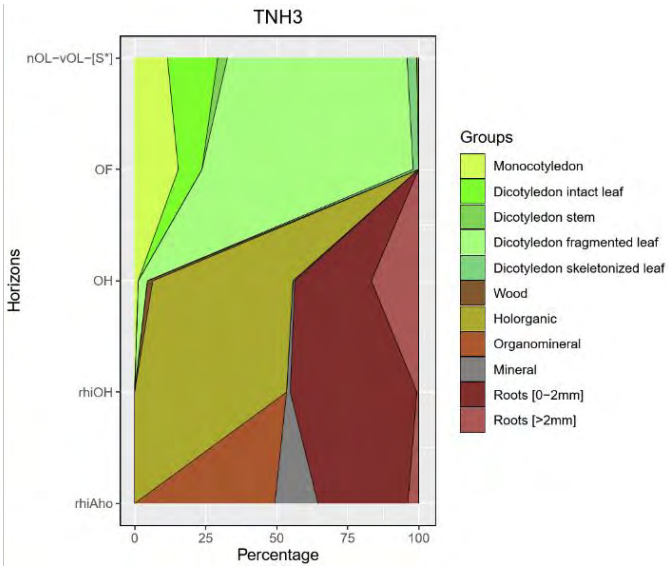


Table S3. 24. TNH3 Physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
rhiAho	5/10 – 15/16	75.04	22.88	2.08	7.13	21.92	11.87	0.54	21.85	4.44	3.94	3.76
rhiAho-Csi	15/16 – 20/32	79.02	19.84	1.14	10.62	16.69	7.05	0.28	24.76	4.72	3.64	5.64

VSH1 : BRUNISOL DYSTRIQUE, La Tourche (VD)

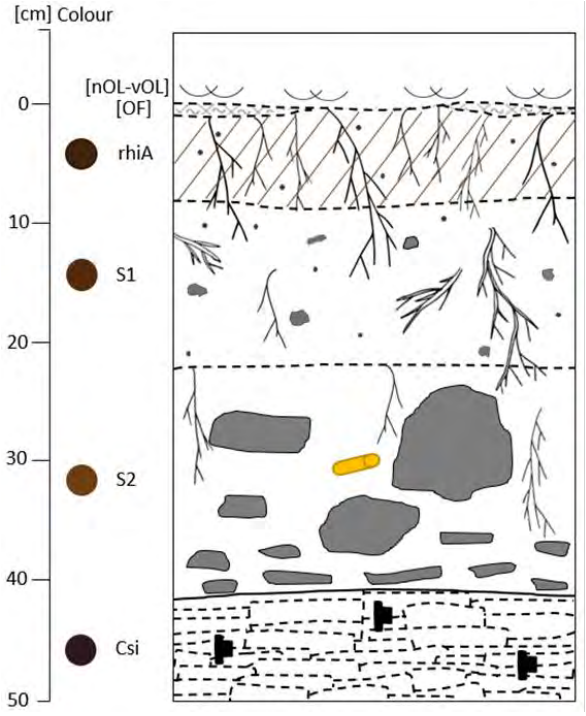
Soil type: *Référentiel Pédologique (RP)*, BRUNISOL DYSTRIQUE, issu de schiste et de loess, à Rhizomull

World Reference Base for Soil Ressources (WRB), Cambisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 17.08.2020

Locality	La Tourche	**Altitude [m]:**	2052
Municipality & canton:	Lavey-Morcles, VD	**Slope (°):**	25°
Coordinates (CH1903 / LV03):	570612, 119053	**Exposition:**	SWW
Geological substrate:	Shale and loess	**Habitat type:**	Grassland
Plant community (association):	Hypochoerido-Nardetum	**Weather:**	Cloudy, after rain
Remarks:	Few mesofauna and earthworms. Damp profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

[nOL-vOL]: +1/0 – 0 cm ; Mainly *Nardus* leaves and stems and also dicotyledons leaves. Ponge cube volume 12.5 cm^3.

[OF]: 0 – 0/0.5 cm ; Mainly *Nardus* leaves and stems ; Note: difficult to separate from the next horizon. Ponge cube volume 12.5 cm^3.

rhiA: 0/0.5 – 8 cm ; Munsell Color 10YR 3/3 ; Not very humiferous ; Structure lumpy, mesostructured by roots, moderately aggregated and stable ; Texture silty loam ; HCl 6M 0/4 ; pH 5.43 ; Root abundance 5/5, fine and mid-size ; Compact ; Coarse elements abundance 2 % gravel ; Note: presence of earthworms. Ponge cube volume 187.5 cm^3.
S1: 8 – 22 cm ; Munsell Color 10YR 3/4 ; Structure polyhedral ; Texture silty loam ; HCl 6M 0/4 ; pH 5.02 ; Root abundance 3/5, fine and big ; Not very compact ; Coarse elements abundance 2 % gravel, 5 % pebbles ; Note: presence of earthworms.
S2: 22 – 41 cm ; Munsell Color 10YR 4/4 ; Structure sub-polyhedral ; Texture silty loam ; HCl 6M 0/4 ; Root abundance 1/5, fine ; Not very compact ; Coarse elements abundance 10 % pebbles, 35 % stones ; Notes: friable shale as coarse elements, presence of a piece of rusty metal.
Csi: 41 – 50 cm and + ; Munsell Color 5YR 2.5/1 ; Structure sheeted ; HCl 6M 0/4 ; Root abundance 0/5 ; Compact ; Note: very weathered, friable and rusty shale.

Photo of humus form and Ponge diagram: rhizomull

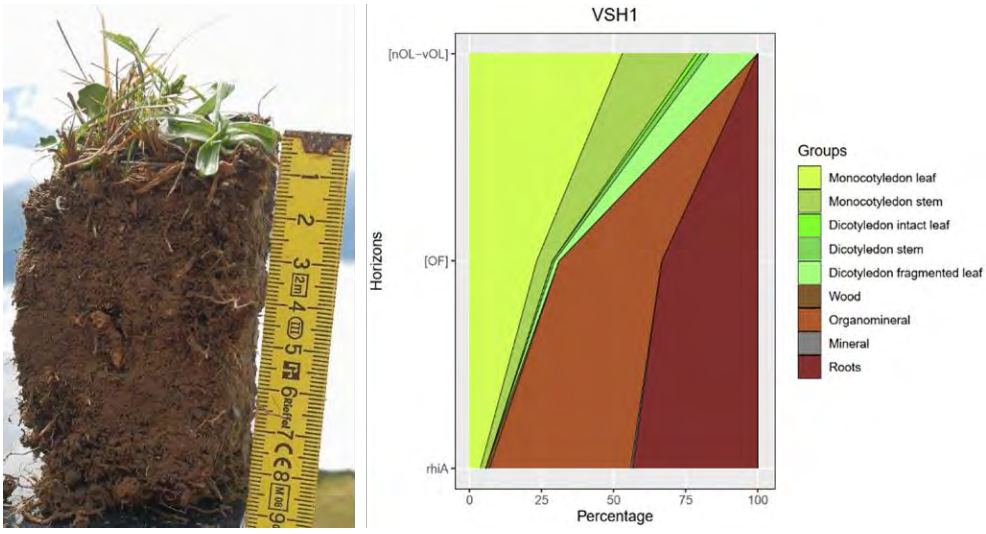


Table S3. 25. VSH1 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
rhiA	0/0.5 – 8	24.76	57.45	17.79	4.08	12.60	5.87	0.51	11.45	5.43	8.91	13.67
S1	8 – 22	23.81	58.22	17.97	3.31	8.34	4.13	0.42	9.78	5.02	5.11	13.19

VSH2 : BRUNISOL DYSTRIQUE, La Tourche (VD)

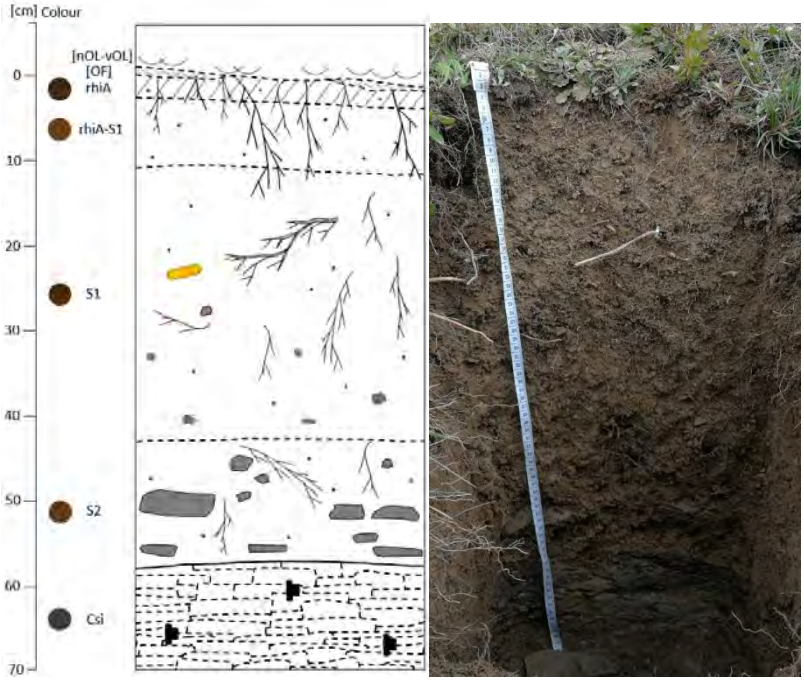
Soil type: *Référentiel Pédologique (RP)*, BRUNISOL DYSTRIQUE, issu de schiste et de loess, à Rhizomull

World Reference Base for Soil Ressources (WRB), Cambisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 17.08.2020

Locality	La Tourche	**Altitude [m]:**	2028
Municipality & canton:	Lavey-Morcles, VD	**Slope (°):**	35°
Coordinates (CH1903 / LV03):	570562, 119030	**Exposition:**	SWW
Geological substrate:	Shale and loess	**Habitat type:**	Grassland
Plant community (association):	Geo montani-Nardetum	**Weather:**	Cloudy, after rain
Remarks:	Few mesofauna and many earthworms. Damp profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

[nOL-vOL]: +2/0 – 0 cm ; Mainly *Nardus* leaves and stems and also dicotyledons leaves. Ponge cube volume 25 cm^3.

[OF]: 0 – 0/0.5 cm ; Mainly *Nardus* leaves. Ponge cube volume 6.25 cm^3.

rhiA: 0/0.5 – 3 cm ; Munsell Color 10YR 3/3 ; Not very humiferous ; Structure lumpy, mesostructured by roots, moderately aggregated and stable ; Texture silty loam ; HCl 6M 0/4 ; pH 5.34 ; Root

abundance 5/5, fine and mid-size ; Compact ; Coarse elements abundance 5 % gravel. Ponge cube volume 62.5 cm^3.

rhiA-S1: 3 – 11 cm ; Munsell Color 10YR 4/4 ; Not very humiferous ; Structure lumpy to sub-polyhedral ; Texture silty loam ; HCl 6M 0/4 ; pH 4.90 ; Root abundance 4/5, fine and mid-size ; Not very compact ; Coarse elements abundance 5 % gravel ; Note: presence of earthworms and mesofauna.

S1: 11 – 43 cm ; Munsell Color 10YR 3/4 ; Structure sub-polyhedral ; Texture silty loam ; HCl 6M 0/4 ; pH 4.97 ; Root abundance 2/5, fine, mid-size and big ; Not very compact ; Coarse elements abundance 5 % gravel, 5 % pebbles ; Notes: presence of earthworms, poorly developed structure, presence of a piece of rusty metal.

S2: 43 – 57 cm ; Munsell Color 10YR 4/4 ; Structure sub-polyhedral ; Texture silty loam ; HCl 6M 0/4 ; Root abundance 1/5, fine and mid-size ; Not very compact ; Coarse elements abundance 5 % gravel, 10 % pebbles, 10 % stones ; Notes: poorly developed structure, friable shale as coarse elements, sticky horizon.

Csi: 57 – 70 cm and + ; Munsell Color 2.5YR 4/1 ; Structure sheeted ; HCl 6M 0/4 ; Root abundance 0/5 ; Compact ; Note: very weathered, friable and rusty shale.

Photo of humus form and Ponge diagram: rhizomull

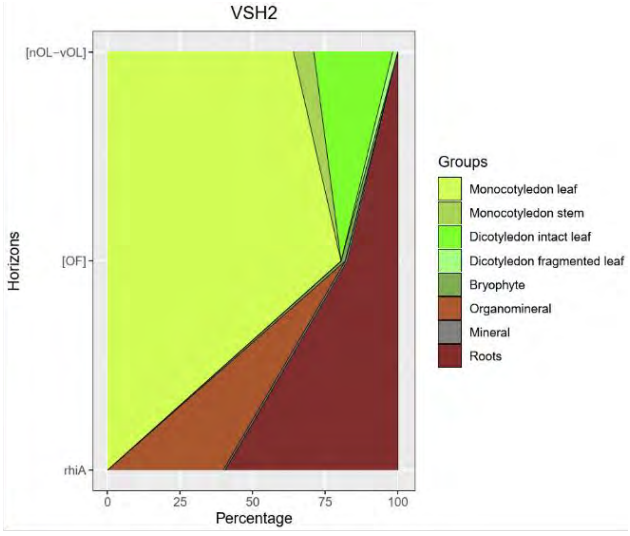


Table S3. 26. VSH2 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
rhiA	0/0.5 – 3	21.96	59.40	18.65	7.82	11.95	6.06	0.51	11.81	5.34	6.73	17.84
rhiA-S1	3 – 11	21.87	58.73	19.40	3.57	9.85	4.70	0.44	10.68	4.90	4.84	9.79
S1	11 – 43	17.98	62.35	19.72	8.63	9.65	4.32	0.42	10.40	4.97	4.69	8.53

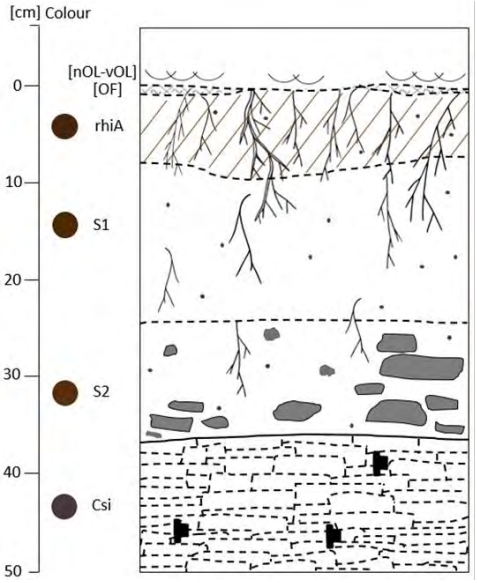
VSH3 : BRUNISOL DYSTRIQUE, La Tourche (VD)

Soil type: *Référentiel Pédologique (RP)*, BRUNISOL DYSTRIQUE, issu de schiste et de loess, à Rhizomull
World Reference Base for Soil Ressources (WRB), Cambisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 18.08.2020

Locality	La Tourche	**Altitude [m]:**	2040
Municipality & canton:	Lavey-Morcles, VD	**Slope (°):**	35°
Coordinates (CH1903 / LV03):	570626, 118976	**Exposition:**	SWW
Geological substrate:	Shale and loess	**Habitat type:**	Grassland
Plant community (association):	Geo montani-Nardetum	**Weather:**	Cloudy, after rain
Remarks:	Few mesofauna and many earthworms. Damp profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

[nOL-vOL]: +1/0 – 0 cm ; Mainly *Nardus* leaves and stems and also dicotyledons leaves. Ponge cube volume 12.5 cm^3.

[OF]: 0 – 0/0.5 cm ; Mainly *Nardus* leaves and stems. Ponge cube volume 6.25 cm^3.

rhiA: 0/0.5 – 7/9 cm ; Munsell Color 10YR 3/3 ; Not very humiferous ; Structure lumpy, mesostructured by roots, moderately aggregated and stable ; Texture silty loam ; HCl 6M 0/4 ; pH 5.35 ; Root abundance 5/5, fine, mid-size and big ; Compact ; Coarse elements abundance 2 % gravel. Note: presence of earthworms. Ponge cube volume 187.5 cm^3.

S1: 7/9 – 24 cm ; Munsell Color 10YR 3/6 ; Structure sub-polyhedral ; Texture silty loam ; HCl 6M 0/4 ; pH 4.90 ; Root abundance 2/5, fine and mid-size ; Not very compact ; Coarse elements abundance 5 % gravel ; Notes: presence of earthworms, poorly developed structure.
S2: 24 – 36 cm ; Munsell Color 10YR 3/4 ; Structure sub-polyhedral ; Texture silty loam ; HCl 6M 0/4 ; Root abundance 1/5, fine ; Not very compact ; Coarse elements abundance 5 % gravel, 15 % pebbles, 10 % stones ; Notes: poorly developed structure, friable shale as coarse elements.
Csi: 36 – 49 cm and + ; Munsell Color 2.5YR 4/1 ; Structure sheeted ; HCl 6M 0/4 ; Root abundance 0/5 ; Compact ; Note: very weathered, friable and rusty shale.

Photo of humus form and Ponge diagram: rhizomull

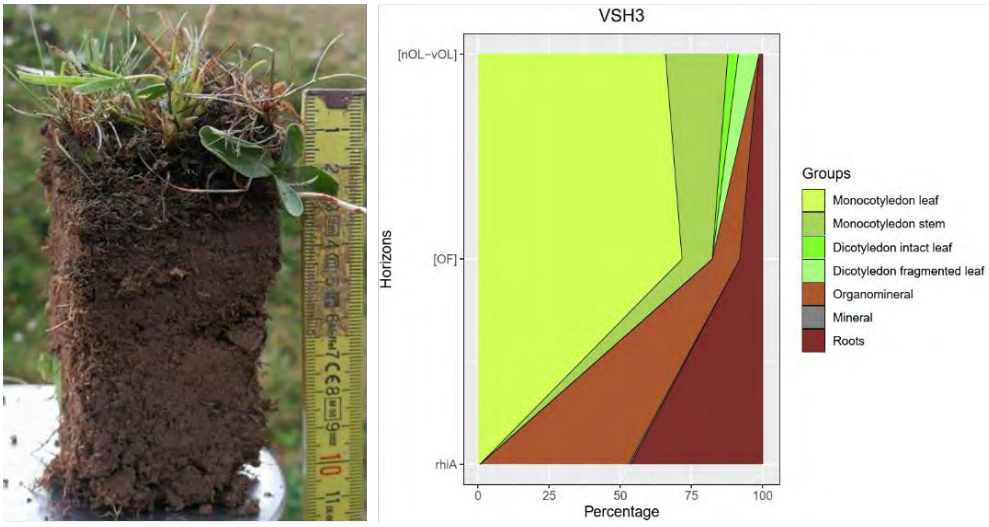


Table S3. 27. VSH3 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
rhiA	0/0.5 – 7/9	19.30	61.58	19.12	5.10	14.29	6.37	0.52	12.34	5.35	8.80	18.63
S1	7/9 – 24	19.49	61.22	19.28	7.29	9.62	4.09	0.40	10.21	4.90	4.59	10.24

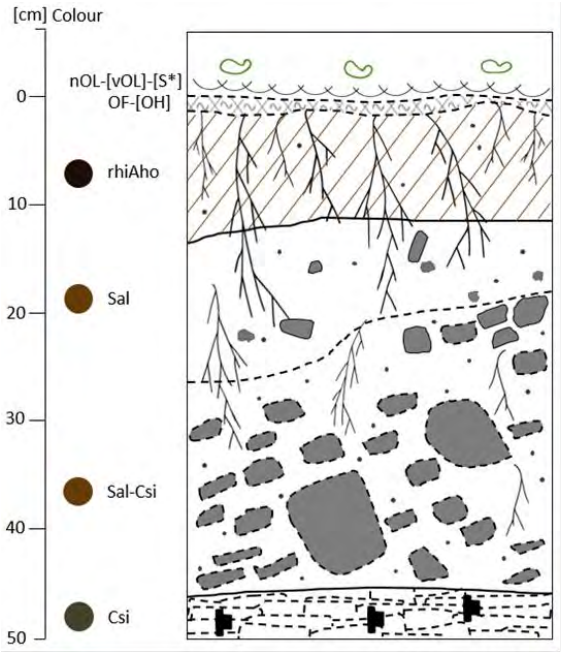
VNH1 : ALOCRISOL TYPIQUE*, Valerette (VS)

Soil type: *Référentiel Pédologique (RP)*, ALOCRISOL TYPIQUE*, issu de schiste et de loess, à Rhizomoder
World Reference Base for Soil Ressources (WRB), Cambisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 19.08.2020

Locality	Valerette	**Altitude [m]:**	2041
Municipality & canton:	Monthey, VS	**Slope (°):**	20°
Coordinates (CH1903 / LV03):	562128, 117335	**Exposition:**	NNW
Geological substrate:	Shale and loess	**Habitat type:**	Grassland
Plant community (association):	Geo montani-Nardetum	**Weather:**	Sunny
Remarks:	Profile dug on a small mound. No trace of earthworms. Damp profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

nOL-[vOL]-[S*]: +1 – 0 cm ; Mainly *Nardus* leaves and stems and also bryophytes and dicotyledons leaves. Ponge cube volume 25 cm^3.

OF-[OH]: 0 – 0.5/1.5 cm ; Mainly *Nardus* leaves and stems, small fraction of holorganic. Ponge cube volume 25 cm^3.

rhiAho: 0.5/1.5 – 11/13 cm ; Munsell Color 10YR 2/2 ; Very humiferous ; Structure lumpy, mesostructured by roots, highly aggregated and stable ; Texture silty loam ; HCl 6M 0/4 ; pH 4.30 ; Root abundance 5/5, fine ; Compact ; Coarse elements abundance 2 % gravel ; Note: slightly darker layer at the bottom of the horizon. Ponge cube volume 275 cm^3.
Sal: 11/13 – 18/26 cm ; Munsell Color 10YR 3/6 ; Structure micro- and mesogranular ; Texture silty loam ; HCl 6M 0/4 ; pH 4.41 ; Root abundance 3/5, fine ; Not very compact ; Coarse elements abundance 2 % gravel, 5 % pebbles ; Notes: shale and sandstone as coarse elements, very sticky horizon.
Sal-Csi: 18/26 – 46 cm ; Munsell Color 10YR 3/6 ; Structure micro- and mesogranular ; Texture silty loam ; HCl 6M 0/4 ; Root abundance 1/5, fine ; Not very compact ; Coarse elements abundance 20 % gravel, 50 % pebbles, 10 % stones ; Notes: weathered and friable shale as coarse elements, very sticky horizon.
Csi: 46 – 50 cm and + ; Munsell Color 2.5Y 4/1 ; Structure sheeted ; HCl 6M 0/4 ; Root abundance 0/5 ; Very compact ; Note: moderately weathered, friable and rusty shale.

Photo of humus form and Ponge diagram: rhizomoder

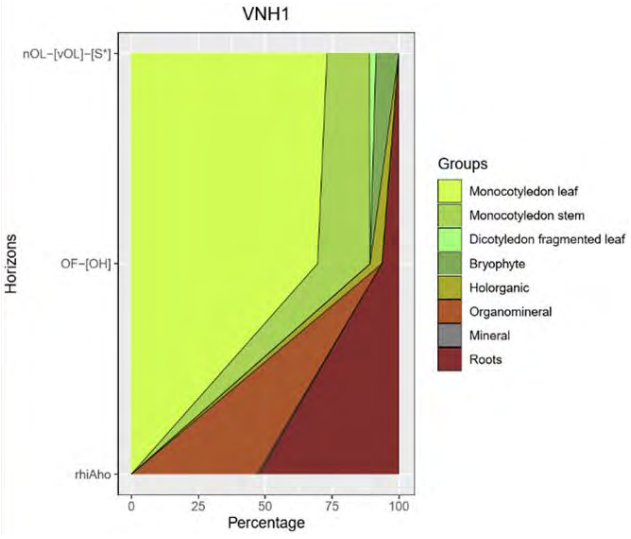


Table S3. 28. VNH1 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
rhiAho	0.5/1.5 – 11/13	17.36	67.81	14.83	5.27	26.95	14.39	0.98	14.62	4.30	12.93	11.94
Sal	11/13 – 18/26	19.56	63.43	17.00	9.48	9.41	3.68	0.28	13.11	4.41	7.78	4.93

* Aluminium analyses are required to confirm the soil classification.

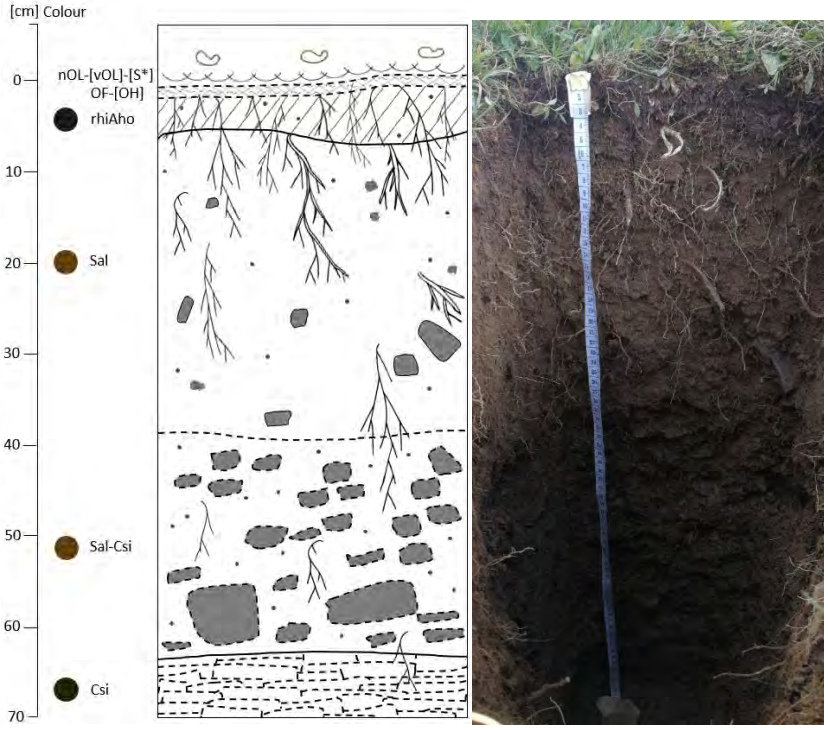
VNH2 : ALOCRISOL TYPIQUE*, Valerette (VS)

Soil type: *Référentiel Pédologique (RP)*, ALOCRISOL TYPIQUE*, issu de schiste et de loess, à Rhizomoder
World Reference Base for Soil Ressources (WRB), Cambisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 19.08.2020

Locality	Valerette	**Altitude [m]:**	2026
Municipality & canton:	Monthey, VS	**Slope (°):**	28°
Coordinates (CH1903 / LV03):	562009, 117296	**Exposition:**	NNW
Geological substrate:	Shale and loess	**Habitat type:**	Grassland
Plant community (association):	Geo montani-Nardetum	**Weather:**	Sunny
Remarks:	Few earthworms. Damp profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

nOL-[vOL]-[S*]: +1/0.5 – 0 cm ; Mainly *Nardus* leaves and stems, also bryophytes and dicotyledons leaves. Ponge cube volume 25 cm^3.

OF-[OH]: 0 – 1 cm ; Mainly *Nardus* leaves and stems, also bryophytes, dicotyledons leaves and holorganic. Ponge cube volume 25 cm^3.

rhiAho: 1 – 5/7 cm ; Munsell Color 7.5YR 2.5/2 ; Very humiferous ; Structure lumpy, meso- to microstructured by roots, highly aggregated and stable ; Texture silty loam ; HCl 6M 0/4 ; pH 4.62 ; Root abundance 5/5, fine and mid-size; Compact ; Coarse elements abundance 5 % gravel ; Note: presence of earthworms. Ponge cube volume 125 cm^3.
Sal: 5/7 – 38/39 cm ; Munsell Color 10YR 3/6 ; Structure micro- and mesogranular ; Texture silty loam ; HCl 6M 0/4 ; pH 4.57 ; Root abundance 3/5, mid-size, fine and big ; Not very compact ; Coarse elements abundance 5 % gravel, 5 % pebbles, 5 % stones ; Notes: presence of earthworms, unweathered shale and sandstone as coarse elements, weathered reddish gravel, sticky horizon.
Sal-Csi: 38/39 – 63 cm ; Munsell Color 10YR 3/6 ; Structure micro- and mesogranular ; Texture silty loam ; HCl 6M 0/4 ; Root abundance 1/5, fine ; Not very compact ; Coarse elements abundance 20 % gravel, 40 % pebbles, 10 % stones ; Notes: weathered and friable shale as coarse elements, patches of highly weathered shale (Munsell Color 2.5Y 3/2), weathered reddish gravel, very sticky horizon.
Csi: 63 – 69 cm and + ; Munsell Color 2.5Y 3/2 ; Structure sheeted ; HCl 6M 0/4 ; Root abundance 1/5, fine ; Not very compact ; Notes: highly weathered, sticky and rusty shale (spreads like clay over the finger), only 2-3 fine roots.

Photo of humus form and Ponge diagram: rhizomoder

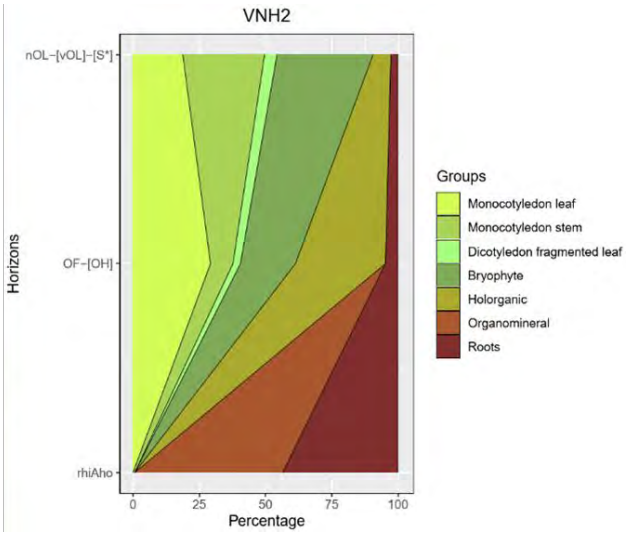


Table S3. 29. VNH2 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
rhiAho	1 – 5/7	23.40	61.57	15.03	4.76	28.09	13.45	1.02	13.13	4.62	11.74	15.94
Sal	5/7 – 38/39	21.20	62.17	16.63	7.77	8.15	3.29	0.35	9.36	4.57	5.80	5.20

* Aluminium analyses are required to confirm the soil classification.

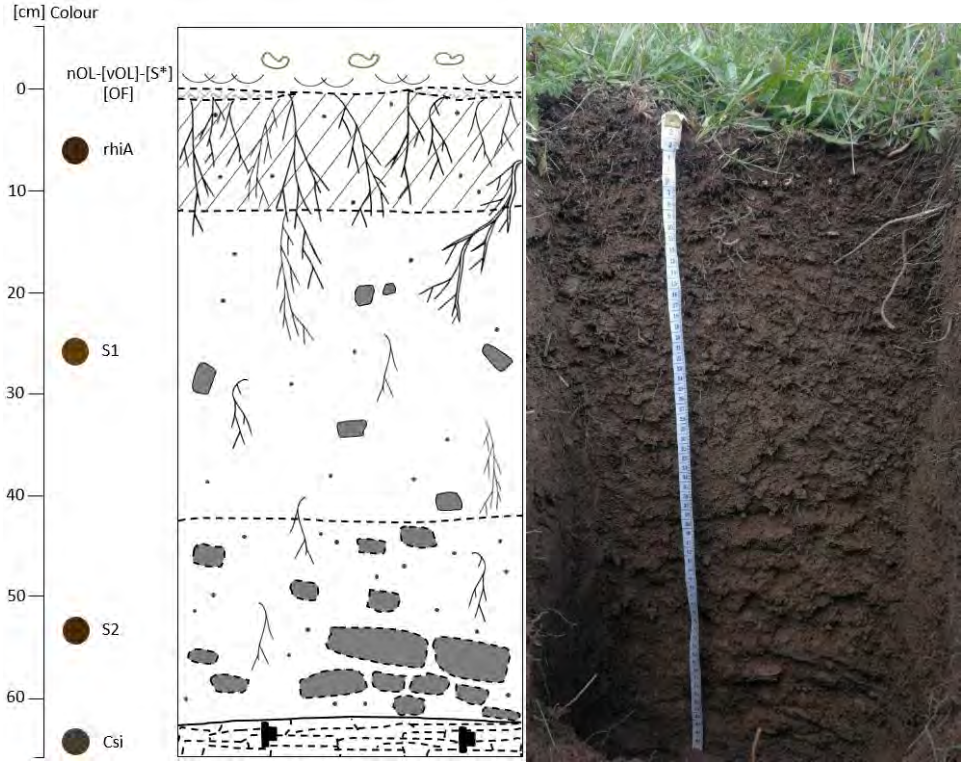
VNH3 : BRUNISOL DYSTRIQUE, Valerette (VS)

Soil type: *Référentiel Pédologique (RP)*, BRUNISOL DYSTRIQUE, issu de schiste et de loess, à Rhizomull
World Reference Base for Soil Ressources (WRB), Cambisol

Observers: Maud FAZZARI, Pascal KIPF **Date :** 18.08.2020

Locality	Valerette	**Altitude [m]:**	2029
Municipality & canton:	Monthey, VS	**Slope (°):**	25°
Coordinates (CH1903 / LV03):	561807, 117203	**Exposition:**	NW
Geological substrate:	Shale and loess	**Habitat type:**	Grassland
Plant community (association):	Geo montani-Nardetum	**Weather:**	Sunny
Remarks:	Many earthworms. Damp profile.		

Diagram and photo of the soil profile:



Soil profile and humus form description:

nOL-[vOL]-[S*]: +1 – 0 cm ; *Nardus* leaves and stems, bryophytes. Ponge cube volume 25 cm^3.

[OF]: 0 – 0/0.5 cm ; Mainly *Nardus* leaves and stems, also bryophytes and dicotyledons leaves. Ponge cube volume 12.5 cm^3.

rhiA: 0/0.5 – 12 cm ; Munsell Color 10YR 3/3 ; Not very humiferous ; Structure lumpy, mesostructured by roots, highly aggregated and stable ; Texture silty loam ; HCl 6M 0/4 ; pH 5.60 ; Root abundance 5/5, fine, mid-size and big; Compact ; Coarse elements abundance 5 % gravel ; Notes: presence of many earthworms, darker and more humiferous horizon in the first 3/4 cm, a separation of the horizon in two would have been possible. Ponge cube volume 287.5 cm^3.
S1: 12 – 42 cm ; Munsell Color 10YR 3/6 ; Structure sub-polyhedral ; Texture silty loam ; HCl 6M 0/4 ; pH 5.22 ; Root abundance 2/5, fine and mid-size ; Not very compact ; Coarse elements abundance 5 % gravel, 5 % pebbles ; Notes: presence of many earthworms, unweathered shale and sandstone as coarse elements, weathered reddish gravel, very sticky horizon.
S2: 42 – 62 cm ; Munsell Color 10YR 3/4 ; Structure sub-polyhedral ; Texture silty loam ; HCl 6M 0/4 ; Root abundance 1/5, fine ; Not very compact ; Coarse elements abundance 10 % gravel, 20 % pebbles, 10 % stones ; Notes: weathered and friable shale as coarse elements, weathered reddish gravel, very sticky horizon.
Csi: 62 – 65 cm and + ; Munsell Color 2.5Y 4/1 ; Structure sheeted ; HCl 6M 0/4 ; Root abundance 0/5 ; Compact ; Notes: weathered, friable and rusty shale.

Photo of humus form and Ponge diagram: rhizomull

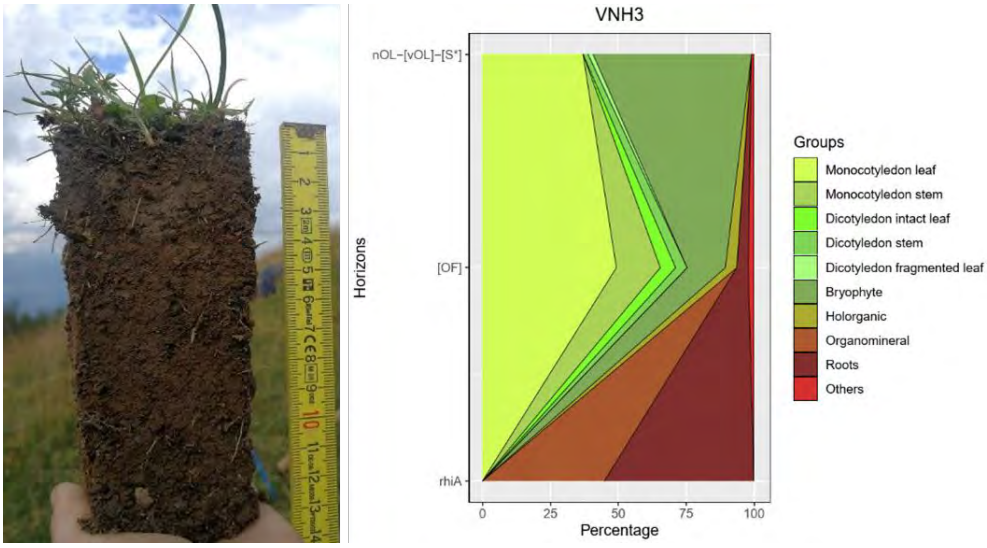


Table S3. 30. VNH3 physico-chemical analysis done on at the University of Neuchâtel and Lausanne on soils samples. Details of the analytical methods are presented in the supplementary materials.

Horizon	Limits [cm]	Sand [%]	Silt [%]	Clay [%]	RH [%]	LOI [%]	Ctot [%]	Ntot [%]	C/N	pH H2O	CEC [cmol/kg]	S/CEC
rhiA	0/0.5 – 12	21.68	60.96	17.35	12.51	13.57	6.02	0.56	10.84	5.60	15.31	36.54
S1	12 – 42	19.12	62.13	18.75	4.85	8.26	3.49	0.33	10.45	5.22	9.78	8.71

Appendix C

Vegetation survey following Braun–Blanquet can be downloaded at:
https://datadryad.org/stash/share/2GKtlk4f5WPTN4daanQwc358JKWRx9nmbXP8o55loFE

Supporting Information for :

Phytochemical variation and decomposition of leaves and roots in mountain environments

In preparation for publication :

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Supplementary methods

Liquid-chromatography-mass-spectrometry – Aqueous methanolic extracts of each plant sample (total n = 379) were analyzed by ultra-high performance liquid chromatography - quadrupole time-of-flight mass spectrometry (UHPLC-QTOFMS) using an Acquity UPLC™ I-Class coupled to a Synapt XS (Waters, Milford, USA). The system was controlled by MassLynx v.4.2. An Acquity UPLC™ HSS T3 column (100 × 2.1 mm, 1.8 µm) maintained at 25 °C was used at a flow rate of 0.5 ml/min. Mobile phases consisted of H2O + 0.05% formic acid (solvent A) and acetonitrile + 0.05% formic acid (solvent B). A linear gradient from 0 to 100% B in 10.0 min was applied. The injection volume was 0.5 µl. MS detection was performed in negative electrospray ionization and using data-dependent acquisition (DDA). The resolution was set to 22'000 (at m/z 554). Data were acquired in continuum mode. The capillary voltage was set to -1.0 kV, the cone voltage to -25V, the source temperature to 140 °C, the desolvation temperature to 500 °C, the desolvation gas flow to 1000 L/h, the cone gas flow to 150 L/h, the nebulizer gas flow to 6.5 bars, and the collision gas (Ar) flow to 2.0 L/min. DDA settings were as follows: MS1 mass range and scan time 50–1200 Da and 0.1 s, respectively, top 7 MS/MS (0.05 s scan time each), intensity threshold 15'000 counts per s, MS/MS selection window 4 Da, peak deisotoping activated, dynamic exclusion of 1.5 s after acquisition. An exclusion list of the 150 most intense background ions was generated from a blank sample run just before the plant samples. For MS/MS acquisition, a ramped collision energy of 5-40 V (at m/z 50) and 20-70 V (at m/z 1200) was set. Quality control samples were prepared by pooling aliquots of all samples and run 4 times before the batch and about every 30 samples during the batch.

MZmine analysis – Feature detection was performed using noise levels for MS1 and MS2 of 1500 and 40, respectively. The parameters for ADAP chromatogram builder were: minimum group size in number of scans 5, group intensity threshold 2000, minimum height intensity 2000, m/z tolerance 0.015 Da or 15 ppm. The chromatogram deconvolution algorithm used was wavelets (ADAP) and parameters were: threshold 10, minimum feature height 1500, coefficient/area threshold 50, peak duration range 0.01-0.5 min, RT wavelet range 0.00-0.06, m/z center calculation median, m/z and RT range for MS2 scan pairing 0.1 and 0.12.

The isotope peak grouper parameters were: m/z tolerance 0.015 Da or 15 ppm, retention time tolerance 0.07, maximum number of charges 2, most intense isotope. The joint aligner parameters were: m/z tolerance 0.015 Da or 15 ppm, retention time tolerance 0.1, weight for m/z 50, weight for RT 50. Only features with a minimum of 2 isotopes and MS2 spectra were retained by filtration. No gap-filling was applied.

Feature annotation – (M+ H)+ and (M+ Na)+ ions in positive ionization mode were explored in the annotation. The following elements were allowed to compute the molecular formulas: hydrogen, oxygen and carbon (infinite number of atoms), nitrogen (up to 10 atoms), phosphorus (up to five atoms), and sulfur (up to five atoms). Compounds were annotated using CSI:FingerID by matching predicted fingerprints to the “bio” structure database and compound classes were assigned using CANOPUS.

Tables

Table S3. 31 . Location and characteristics of study plots. In total, eight sites were selected, four in canton Ticino (region 1) and four in canton Valais-Vaud (region 2). In each region, two transects with north and south exposure were chosen. Along every transect, two elevations were chosen. Within the eight sites selected sites, we did each time three replicates' plots.

site_id	site_name	replic_plot	region	canton	exposition	coordinates (lat/long)	Geology
TSM1	Osco_Ebaritt	1	T	Ticino	SSW	46°30'08.854"N 8°46'27.432"E	Micaschist and gneiss
TSM2	Osco_Ebaritt	2	T	Ticino	SSW	46°30'03.388"N 8°46'38.582"E	Micaschist and gneiss
TSM3	Osco_Ebaritt	3	T	Ticino	S	46°29'56.677"N 8°46'46.235"E	Micaschist and gneiss
TNM1	Dalpe	1	T	Ticino	NNE	46°28'18.869"N 8°45'23.236"E	Quartzite muscovite schist
TNM2	Dalpe	2	T	Ticino	N	46°28'18.269"N 8°45'39.165"E	Quartzite muscovite schist
TNM3	Dalpe	3	T	Ticino	NNE	46°28'16.593"N 8°45'48.237"E	Quartzite muscovite schist
VSM1	La Forcle	1	V	Valais-Vaud	SSW	46°12'49.930"N 7°02'23.377"E	Glacial moraine and limestone
VSM2	La Forcle	2	V	Valais-Vaud	SSW	46°12'47.307"N 7°02'25.346"E	Glacial moraine and limestone
VSM3	La Forcle	3	V	Valais-Vaud	SSW	46°12'48.612"N 7°02'30.925"E	Glacial moraine and limestone
VNM1	Valassier	1	V	Valais-Vaud	NEE	46°12'38.597"N 6°57'56.688"E	Flysch
VNM2	Valassier	2	V	Valais-Vaud	NEE	46°12'41.844"N 6°57'53.333"E	Flysch
VNM3	Valassier	3	V	Valais-Vaud	NEE	46°12'37.084"N 6°57'54.303"E	Flysch
TSH1	Predelp	1	T	Ticino	SSE	46°30'55.217"N 8°47'43.576"E	Micaschist and gneiss
TSH2	Predelp	2	T	Ticino	SSE	46°30'56.578"N 8°47'43.797"E	Micaschist and gneiss
TSH3	Predelp	3	T	Ticino	SSE	46°30'57.590"N 8°47'42.312"E	Micaschist and gneiss
TNH1	Campo Tencia	1	T	Ticino	NNE	46°26'42.252"N 8°43'50.697"E	Gneiss
TNH2	Campo Tencia	2	T	Ticino	NNE	46°26'41.289"N 8°43'53.340"E	Gneiss
TNH3	Campo Tencia	3	T	Ticino	NNE	46°26'42.032"N 8°43'44.366"E	Gneiss
VSH1	La Tourche	1	V	Valais-Vaud	SWW	46°13'20.229"N 7°03'27.943"E	Flysch
VSH2	La Tourche	2	V	Valais-Vaud	SWW	46°13'19.476"N 7°03'25.615"E	Flysch
VSH3	La Tourche	3	V	Valais-Vaud	SWW	46°13'17.737"N 7°03'28.613"E	Flysch
VNH1	Valerette	1	V	Valais-Vaud	NNW	46°12'23.060"N 6°56'52.622"E	Flysch
VNH2	Valerette	2	V	Valais-Vaud	NNW	46°12'21.786"N 6°56'47.097"E	Flysch
VNH3	Valerette	3	V	Valais-Vaud	NW	46°12'18.723"N 6°56'37.694"E	Flysch

Table S3. 32. Plant community matrix for the 24 sites surveyed in the study.

Species	TS M1	TS M2	TS M3	TN M1	TN M2	TN M3	VS M1	VS M2	VS M3	VN M1	VN M2	VN M3	VS H1	VS H2	VS H3	VN H1	VN H2	VN H3	TS H1	TS H2	TS H3	TN H1	TN H2	TN H3
Abies_alba	0	0	0	0	1.5	1	0.1	20	13.1	21	28.2	15.5	0	0	0	0	0	0	0	0	0	0	0	0
Acer_pseudoplatanus	0	0	0	0	0	0	0.05	10.1	2.3	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0
Aconitum_lycoctonum	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Adenostyles_alliariae	0	0	0	0	0	0	0	0	0	10	3	6	0	0	0	0	0	0	0	0	0	0	0	0
Agrostis_capillaris	0	0	0	0	0	0	0	0	0	0	0	0	0.25	5	4	2	5	8	0	0	0	0	0	0
Agrostis_rupestris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0.05	0	0	0
Agrostis_schraderiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	5	3	0.8
Ajuga_pyramidalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0
Alchemilla_alpina	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0.2	0.8	0	0.05	0.1	0	0	0	0	0	0
Alchemilla_vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	1.8	0.3	1.5	0	0	0.3	0	0	0	0	0.05	0
Alnus_viridis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0
Alopecurus_pratensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0
Anemone_nemorosa	0	0	0	0	0	0	0.05	0	0	1.3	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Anthoxanthum_alpinum	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.05	0.05	0	0.05	0.5	4	1	2	1.7	0.05	0
Anthyllis_vulneraria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
Aquilegia_vulgaris	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arnica_montana	0	0	0	0	0	0	0	0	0	0	0	0	6	4	12	0	0	19	0.05	0.05	0	0.4	6	2
Astrantia_minor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.7	0.1	0.05	0	0	0	0.2	0.05	0.05
Avenella_flexuosa	0	0	0	0	0	0	0	0	0	0	0	0	0.3	2	1	8	8	8	0	0.1	3	12	0.2	0.8
Bartsia_alpina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0.1	0	0	0	0	0	0	0
Betula_pendula	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachypodium_pinnatum	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachypodium_sylvaticum	0	0	0	0	0	0	0	0	0.05	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0

Briza_media	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0
Calamagrostis_arundinacea	0	0	0	0	0	0	0	0.05	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calamagrostis_varia	0.05	0.15	0	10	12	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calluna_vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0.15	0.2	0	0	0
Campanula_barbata	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0.2	0.4	0	0.3	0.05	0	0	0	0	0	0
Campanula_rotundifolia	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0
Campanula_scheuchzeri	0	0	0	0	0	0	0	0	0	0	0	0	0.15	0.4	0.1	0.05	0.1	0.2	0.05	0	0	0.1	0.05	0
Cardamine_hirsuta	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0
Carduus_defloratus	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex_curvula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0.8	1
Carex_digitata	0	0	0	0	0	0	0	0.2	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex_pallescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.3	0.3	0	0	0	0	0	0
Carex_sempervirens	0	0	0	0	0	0	0	0	0	0	0	0	8	1	0.3	2	0.4	6	8	25	1.5	0.7	6	0
Carex_sp	0.05	0.05	0.05	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0
Carex_sylvatica	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Carlina_acaulis	0	0	0	0	0	0	0	0	0	0	0	0	7	4	6	0	0	0	0	0	0	0	0	0
Centaurea_montana	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cephalanthera_longifolia	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium_arvense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0.05	0	0	0.05	0	0	0	0	0
Chaerophyllum_hirsutum	0	0	0	0	0	0	0.15	0	0	0	0	0.05	1	0.2	0.1	0	0	0	0	0	0	0	0	0
Chaerophyllum_villarsii	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coeloglossum_viride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0
Colchicum_autumnale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0
Convallaria_majalis	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corylus_avellana	0.5	0.05	0.3	0	0	0	2	1	2	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0
Crepis_conyzifolia	0	0	0	0	0	0	0	0	0	0	0	0	1.2	1	0.6	0	0	0	0	0	0	0	0	0
Crepis_pyrenaica	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0

Crocus_albifidus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0
Dactylorhiza_maculata	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0
Dactylorhiza_majalis	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0
Deschampsia_cespitosa	0	0	0	0	0	0	0	0	0	0	0	0	2	0.2	0	0	0	0	0	0	0	0	0	0
Diphasiastrum_alpinum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Dryopteris_filix_mas	0	0	0	1.2	0.1	0.1	0	0	0	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0
Empetrum_nigrum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0
Equisetum_arvense	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphrasia_minima	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0.05	0.05	0.2	0.5	1	0	0	0	0	0.05	0
Fagus_sylvatica	0	0	0	0	0	0	0	20	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca_ovina_aggr	0	0	0.05	0	0	0	0	0	0	0	0	0	0.5	0.2	0	0	0	2	0	0	0	0	0	0
Festuca_supina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Festuca_rubra_aggr	0.05	0.05	0.05	0.2	2	2	0	0	0	0	0	0	1.2	0.6	1	4	3	8	25	0.1	0.1	12	3	0.2
Festuca_sp	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca_violacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Fragaria_vesca	0	0	0.05	0	0	0	0.05	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraxinus_excelsior	0	0	0	0	0	0	0.05	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium_anisophyllon	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.4	0.15	0	0	0	0.05	0	0	0	0	0
Galium_odoratum	0	0	0	0	0	0	0	0	0	3	8	1.5	0	0	0	0	0	0	0	0	0	0	0	0
Galium_rotundifolium	0	0	0	0	0	0	0.05	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
Gentiana_acaulis	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0.1	1.5	0.1	0.05	0	0	0	0.1	0.05
Gentiana_campestris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0
Gentiana_purpurea	0	0	0	0	0	0	0	0	0	0	0	0	0	7	4	5	0.3	0	0	0	0	0	0	0
Geranium_robertianum	0	0	0.05	0	0	0	0	0	0	0.05	0.5	0.05	0	0	0	0	0	0	0	0	0	0	0	0
Geranium_sylvaticum	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geum_montanum	0	0	0	0	0	0	0	0	0	0	0	0	0.8	3	3	0	0.05	0	0	0	0	0	2	0

Gnaphalium_sylvaticum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0
Gymnocarpium_dryopteris	0	0	0	0.15	0	0.05	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Helianthemum_nummularium_aggr	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0
Helictotrichon_versicolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0.05	0	0	0	0.1	0.05	0.05
Heracium_alpinum	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.2	0.05	0.05
Hieracium_lactucella	0	0	0	0	0	0	0	0	0	0	0	0	0.05	2	0.1	0	0	0	0.05	0	0	0	0	0
Hieracium_murorum_aggr	0.3	1.2	7	0.5	2	3	0.05	0.05	0.2	0	4	0.05	0	0	0	0	0	0	0	0	0	0	0	0
Homogyne_alpina	0	0	0	0.05	0.05	0.05	0	0	0	0	0	0	0.05	0.1	0.2	2	0.5	0.2	0	0	0	1	0.1	0.05
Huperzia_selago	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0.05	0.05	0.1	0	0	0	0	0	0
Hypericum_perforatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.05	0	0	0	0	0	0	0	0	0
Juncus_trifidus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.1	1.5	0	0	0
Juniperus_communis_nana	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	2.5	0.1	0	0.05	3
Laburnum_alpinum	0	0	0	0	0	0	0	0.05	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamium_galeobdolon	0	0	0	0	0	0	0.05	0.2	0.05	0.5	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Larix_decidua	0	0	0	6	10	5	1	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0
Laserpitium_gaudinii	0.15	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lathyrus_linifolius	0.1	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lathyrus_sp	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lathyrus_vernus	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leontodon_helveticus_hispidus_aggr	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.2	0.05	9	10	8	0	0	0	0.1	4	0.05
Leucanthemum_adustum	0	0	0	0	0	0	0	0	0	0	0	0	0.15	2	0.2	0	0	0	0	0	0	0	0	0
Ligusticum_mutellina_mutellinoides_aggr	0	0	0	0	0	0	0	0	0	0	0	0	0.15	0	0.05	0.1	6	8	0	0	0	0.05	0.05	0
Loiseleuria_procumbens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0
Lonicera_alpigena	0	0	0	0	0	0	0	0.05	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lonicera_nigra	0	0	0	0.1	0.05	0	0	0	0	1.5	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	0
Lonicera_xylosteum	0	0	0	0	0	0	0	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Lotus_corniculatus	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0.05	0.05	0	0	1	0	0	0	0	0.05	0
Luzula_luzuloides	0.05	0.05	0.15	0	0	0.05	0	0	0	0	0.5	0.05	0	0	0	0	0	0	0	0	0	0	0	0
Luzula_multiflora_aggr	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.05	0.05	0	0.05	0	0	0	0	0	0	0
Luzula_nivea	0	0	0	0	0	0	0.05	0.1	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luzula_pilosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.15	0	0	0	0	0	0	0	0
Luzula_sudetica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0.5	0.05	0.05	0	0	0	0	0
Luzula_sylvatica	0	0	0	1	2	1	0	0	0	0.05	0	0	0	0	1.4	0	0	0	0	0	0	0	0	0
Lycopodium_annotinum	0	0	0	0	0.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lysimachia_nemorum	0	0	0	0	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0
Maianthemum_bifolium	0.05	0	0	1.2	2.5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melampyrum_sylvaticum	0	0	0.1	0	0.05	0.05	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melica_uniflora	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercurialis_perennis	0	0	0	0	0	0	0	0.2	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Milium_effusum	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nardus_stricta	0	0	0	0	0	0	0	0	0	0	0	0	13	18	12	40	30	1.5	45	40	70	12	10	19
Neottia_nidus_avis	0	0	0	0	0	0	0.05	0	0	0.1	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0
Nigritella_rhellicani	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0.05	0.05	0	0	0.05	0	0	0	0	0	0
Orthilia_secunda	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxalis_acetosella	0	0	0	12	1.8	2	0	0	0	10	8	6	0	0	0	0	0	0	0	0	0	0	0	0
Paris_quadrifolia	0	0	0	0	0	0	0	0.1	0.1	1	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Pedicularis_tuberosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0.05	0	0	0	0
Petasites_albus	0	0	0	0	0	0	0	0	0	10	8	6	0	0	0	0	0	0	0	0	0	0	0	0
Phleum_rhaeticum	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0.2	0	0	0	0	0	0	0	0	0
Phyteuma_betonicifolium	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	0.05	0.05	0	0	0	3	0.5	0.1	0	0	0
Phyteuma_hemisphaericum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0.05	0.05	0.05
Phyteuma_orbiculare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0.1	0	0	0	0

Phyteuma_spicatum	0	0	0	0	0	0	0	0.05	0	0.2	1	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Picea_abies	25.2	23.7	23.2	20	25	30	40.6	34	27.5	6.5	5	26.5	0	0	0	0	0	0	0	0	0	0	0	0
Pinus_sylvestris	12	10	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago_alpina	0	0	0	0	0	0	0	0	0	0	0	0	0.8	1.5	0.15	0.3	5	3	0	0	0	0	0	0
Plantago_atrata	0	0	0	0	0	0	0	0	0	0	0	0	0.05	1.5	0.15	0	0	0	0	0	0	0	0	0
Plantago_lanceolata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.15	0	0	0	0	0	0
Plantago_major	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala_chamaebuxus	0	0	0	0	0	0	0.05	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala_comosa	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.05	0.05	0	0	0	0	0	0	0	0	0
Polygala_vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.05	0.05	0	0	0	0	0	0	0	0	0
Polygonatum_odoratum	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonatum_verticillatum	0	0.05	0	0	0	0	0.05	0.15	0.3	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum_viviparum	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0.1	0	0	0	0	0.05	0
Polypodium_vulgare_aggr	0.05	0	0	0.05	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla_aurea	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0.05	0.05	1	0.05	0.2	0	0	0	2	1	0
Potentilla_erecta	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0.3	0.8	0	0.05	0	0	0	0	0	0	0
Prenanthes_purpurea	0	0	0	0.7	0.1	0.05	0.05	0.05	0.1	0.1	0.5	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Primula_elatior	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0
Primula_farinosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0
Primula_veris	0	0	0	0	0	0	0.05	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Prunella_vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	8	0.05	0.1	0	0	0	0	0	0	0	0	0
Pseudorchis_albida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0.2	0
Pulsatilla_alpina_ssp_apiifolia	0	0	0	0	0	0	0	0	0	0	0	0	7	12	10	0	0	0	0	0	0	0	0	0
Ranunculus_aconitifolius	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0
Ranunculus_acris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0
Ranunculus_montanus_aggr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0.1	0	0	0	0	0	0	0

Ranunculus_villarsii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0
Rhinanthus_alectorolophus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.5	0	0	0	0	0	0
Rhododendron_ferrugineum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	3	0	0	0.3	0	0	4	7
Rubus_fruticosus_aggr	0	0	0	0	0	0	0	0.05	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubus_idaeus	0.05	0.05	0.15	0.05	0	0.05	0	0	0	0	1	0.2	0	0	0	0	0	0	0	0	0	0	0	0
Salix_retusa	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Sambucus_racemosa	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0
Sanicula_europaea	0	0	0	0	0	0	0	0	0	1.5	8	3	0	0	0	0	0	0	0	0	0	0	0	0
Saxifraga_cuneifolia	0	0	0	0.8	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sempervivum_montanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.05	0	0.05	0.05	0.05
Sesleria_caerulea	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silene_nutans	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0.1	0.05	0	0	0	0
Silene_rupestris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.05	0.1	0	0	0
Silene_vulgaris	0	0	0.05	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soldanella_alpina	0	0	0	0	0	0	0.05	0	0	0	0	0	0.05	0	0	0.1	0.7	0.5	0	0	0	0	0.05	0
Solidago_virgaurea	0.2	0.05	0.2	0	0	0	0.05	0	0.1	0.5	0.05	0	0	0	0	0	0	0	0.4	0.05	0	0.5	0.2	0.05
Sorbus_aria	0.05	1	0.25	0	0	0.05	1	2	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sorbus_aucuparia	0.2	0.8	2.7	0.05	0.15	0.5	0.5	1	0.05	3	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	0
Stachys_sylvatica	0	0	0	0	0	0	0	0	0	0.2	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Teucrium_chamaedrys	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thalictrum_minus	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thesium_alpinum	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.05	0.05	0	0	0	0	0	0	0	0	0
Thymus_serpyllum_aggr	0	0	0	0	0	0	0	0	0	0	0	0	0.5	4	0.5	0	0	0	0	0.05	0	0	0	0
Trifolium_alpinum	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.05	0.3	6	6	0.05	7	11	10	3	8	4
Trifolium_pratense	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.05	0	0	7	0	0	0	0	0	0
Trollius_europaeus	0	0	0	0	0	0	0	0	0	0	0	0	3	0.8	1	0	0	2	0	0	0	0	0	0

Vaccinium_gaultherioides	0	0	0	0	0	0	0	0	0	0	0	0	4	0.3	6	4	0.2	0	0	0	0	15	22	45
Vaccinium_myrtillus	1.5	0.2	12	0.05	9	0.15	0.05	0	0	0	0.5	0	4	3	10	2	5	0	0	0.2	0.05	7	16	3
Vaccinium_vitis_idaea	0.05	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0.05	0.05	0	0	18	0	0	0	0
Valeriana_tripteris	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veratrum_album	0	0	0	0.05	0	0	0.25	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Veronica_chamaedrys	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Veronica_officinalis	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Veronica_urticifolia	0	0	0	0	0	0	0	0	0.1	0.05	2	0.8	0	0	0	0	0	0	0	0	0	0	0	0
Viburnum_lantana	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viola_biflora	0	0	0	0	0	0	0	0	0	0.05	0.05	4	0	0	0	0	0	0	0	0	0	0	0	0
Viola_collina	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viola_sp	0.05	0	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table S3. 33. List of collected plants for phytochemical analysis. The 10 main species in each of the 24 plots are named on this table.

N. species	Species	N. species	Species
TSM1 1	Picea abies	TSH1 1	Nardus stricta
TSM1 2	Pinus sylvestris	TSH1 2	Festuca rubra aggr.
TSM1 3	Betula pendula	TSH1 3	Carex sempervirens
TSM1 4	Vaccinium myrtillus	TSH1 4	Trifolium alpinum
TSM1 5	Corylus avellana	TSH1 5	Anthoxanthum alpinum
TSM1 6	Hieracium murorum aggr.	TSH1 6	Juncus trifidus
TSM1 7	Solidago virgaurea	TSH1 7	Phyteuma betonicifolium
TSM1 8	Laserpitium gaudinii	TSH1 8	Solidago virgaurea
TSM1 9	Sorbus aucuparia	TSH1 9	Silene nutans
TSM1 10	Lathyrus linifolius	TSH1 10	Silene rupestris
TSM2 1	Picea abies	TSH2 1	Nardus stricta
TSM2 2	Pinus sylvestris	TSH2 2	Carex sempervirens
TSM2 3	Hieracium murorum aggr.	TSH2 3	Vaccinium vitis idaea
TSM2 4	Sorbus aria	TSH2 4	Trifolium alpinum
TSM2 5	Sorbus aucuparia	TSH2 5	Juniperus communis ssp. nana
TSM2 6	Vaccinium myrtillus	TSH2 6	Anthoxanthum alpinum
TSM2 7	Calamagrostis varia	TSH2 7	Phyteuma betonicifolium
TSM2 8	Phyteuma betonicifolium	TSH2 8	Rhododendron ferrugineum
TSM2 9	Luzula luzuloides	TSH2 9	Vaccinium myrtillus
TSM2 10	Solidago virgaurea	TSH2 10	Calluna vulgaris
TSM3 1	Picea abies	TSH3 1	Nardus stricta
TSM3 2	Vaccinium myrtillus	TSH3 2	Trifolium alpinum
TSM3 3	Pinus sylvestris	TSH3 3	Avenella flexuosa
TSM3 4	Hieracium murorum aggr.	TSH3 4	Anthoxanthum alpinum
TSM3 5	Sorbus aucuparia	TSH3 5	Carex sempervirens
TSM3 6	Corylus avellana	TSH3 6	Juncus trifidus
TSM3 7	Solidago virgaurea	TSH3 7	Calluna vulgaris
TSM3 8	Sorbus aria	TSH3 8	Phyteuma betonicifolium
TSM3 9	Luzula luzuloides	TSH3 9	Juniperus communis ssp. nana
TSM3 10	Rubus idaeus	TSH3 10	Silene rupestris
TNM1 1	Picea abies	TNH1 1	Vaccinium gaultherioides
TNM1 2	Oxalis acetosella	TNH1 2	Carex curvula
TNM1 3	Calamagrostis varia	TNH1 3	Festuca rubra aggr.
TNM1 4	Larix decidua	TNH1 4	Nardus stricta
TNM1 5	Dryopteris filix-mas	TNH1 5	Avenella flexuosa
TNM1 6	Maianthemum bifolium	TNH1 6	Vaccinium myrtillus
TNM1 7	Luzula sylvatica	TNH1 7	Agrostis schraderiana
TNM1 8	Saxifraga cuneifolia	TNH1 8	Trifolium alpinum
TNM1 9	Prenanthes purpurea	TNH1 9	Potentilla aurea
TNM1 10	Hieracium murorum aggr.	TNH1 10	Anthoxanthum alpinum
TNM2 1	Picea abies	TNH2 1	Vaccinium gaultherioides
TNM2 2	Calamagrostis varia	TNH2 2	Vaccinium myrtillus
TNM2 3	Larix decidua	TNH2 3	Nardus stricta
TNM2 4	Vaccinium myrtillus	TNH2 4	Trifolium alpinum
TNM2 5	Maianthemum bifolium	TNH2 5	Carex sempervirens
TNM2 6	Hieracium murorum aggr.	TNH2 6	Arnica montana
TNM2 7	Festuca rubra aggr.	TNH2 7	Leontodon helveticus hispidus aggr.
TNM2 8	Luzula sylvatica	TNH2 8	Rhododendron ferrugineum
TNM2 9	Oxalis acetosella	TNH2 9	Festuca rubra aggr.
TNM2 10	Abies alba	TNH2 10	Agrostis schraderiana
TNM3 1	Picea abies	TNH3 1	Vaccinium gaultherioides
TNM3 2	Calamagrostis varia	TNH3 2	Nardus stricta
TNM3 3	Larix decidua	TNH3 3	Rhododendron ferrugineum
TNM3 4	Hieracium murorum aggr.	TNH3 4	Trifolium alpinum

TNM3 5	Maianthemum bifolium	TNH3 5	Juniperus communis ssp. nana
TNM3 6	Oxalis acetosella	TNH3 6	Vaccinium myrtillus
TNM3 7	Festuca rubra aggr.	TNH3 7	Arnica montana
TNM3 8	Abies alba	TNH3 8	Carex curvula
TNM3 9	Luzula sylvatica	TNH3 9	Avenella flexuosa
TNM3 10	Sorbus aucuparia	TNH3 10	Agrostis schraderiana
VSM1 1	Picea abies	VSH1 1	Nardus stricta
VSM1 2	Corylus avellana	VSH1 2	Prunella vulgaris
VSM1 3	Sorbus aria	VSH1 3	Carex sempervirens
VSM1 4	Larix decidua	VSH1 4	Pulsatilla alpina ssp. apiifolia
VSM1 5	Sorbus aucuparia	VSH1 5	Carlina acaulis
VSM1 6	Veratrum album	VSH1 6	Juniperus communis ssp. nana
VSM1 7	Chaerophyllum hirsutum	VSH1 7	Arnica montana
VSM1 8	Abies alba	VSH1 8	Vaccinium myrtillus
VSM1 9	Carex sp.	VSH1 9	Vaccinium gaultherioides
VSM1 10	Aconitum lycoctonum	VSH1 10	Trollius europaeus
VSM2 1	Picea abies	VSH2 1	Nardus stricta
VSM2 2	Abies alba	VSH2 2	Pulsatilla alpina ssp. apiifolia
VSM2 3	Fagus sylvatica	VSH2 3	Gentiana purpurea
VSM2 4	Acer pseudoplatanus	VSH2 4	Agrostis capillaris
VSM2 5	Sorbus aria	VSH2 5	Arnica montana
VSM2 6	Corylus avellana	VSH2 6	Thymus serpyllum aggr.
VSM2 7	Sorbus aucuparia	VSH2 7	Carlina acaulis
VSM2 8	Mercurialis perennis	VSH2 8	Vaccinium myrtillus
VSM2 9	Lamium galeobdolon	VSH2 9	Geum montanum
VSM2 10	Carex digitata	VSH2 10	Hieracium lactucella
VSM3 1	Picea abies	VSH3 1	Arnica montana
VSM3 2	Abies alba	VSH3 2	Nardus stricta
VSM3 3	Corylus avellana	VSH3 3	Pulsatilla alpina ssp. apiifolia
VSM3 4	Acer pseudoplatanus	VSH3 4	Vaccinium myrtillus
VSM3 5	Laburnum alpinum	VSH3 5	Carlina acaulis
VSM3 6	Fagus sylvatica	VSH3 6	Vaccinium gaultherioides
VSM3 7	Calamagrostis arundinacea	VSH3 7	Gentiana purpurea
VSM3 8	Polygonatum verticillatum	VSH3 8	Agrostis capillaris
VSM3 9	Luzula nivea	VSH3 9	Geum montanum
VSM3 10	Hieracium murorum aggr.	VSH3 10	Alchemilla vulgaris aggr.
VNM1 1	Abies alba	VNH1 1	Nardus stricta
VNM1 2	Petasites albus	VNH1 2	Avenella flexuosa
VNM1 3	Adenostyles alliariae	VNH1 3	Leontodon helveticus hispidus aggr.
VNM1 4	Oxalis acetosella	VNH1 4	Trifolium alpinum
VNM1 5	Picea abies	VNH1 5	Gentiana purpurea
VNM1 6	Galium odoratum	VNH1 6	Festuca rubra aggr.
VNM1 7	Dryopteris filix-mas	VNH1 7	Vaccinium gaultherioides
VNM1 8	Sorbus aucuparia	VNH1 8	Homogyne alpina
VNM1 9	Sanicula europaea	VNH1 9	Carex sempervirens
VNM1 10	Lonicera nigra	VNH1 10	Vaccinium myrtillus
VNM2 1	Abies alba	VNH2 1	Nardus stricta
VNM2 2	Galium odoratum	VNH2 2	Avenella flexuosa
VNM2 3	Oxalis acetosella	VNH2 3	Leontodon helveticus hispidus aggr.
VNM2 4	Petasites albus	VNH2 4	Trifolium alpinum
VNM2 5	Sanicula europaea	VNH2 5	Ligusticum mutellina mutellinoides aggr.
VNM2 6	Hieracium murorum aggr.	VNH2 6	Plantago alpina
VNM2 7	Picea abies	VNH2 7	Vaccinium myrtillus
VNM2 8	Dryopteris filix-mas	VNH2 8	Agrostis capillaris
VNM2 9	Veronica urticifolia	VNH2 9	Rhododendron ferrugineum
VNM2 10	Adenostyles alliariae	VNH2 10	Festuca rubra aggr.
VNM3 1	Picea abies	VNH3 1	Arnica montana
VNM3 2	Abies alba	VNH3 2	Avenella flexuosa
VNM3 3	Oxalis acetosella	VNH3 3	Ligusticum mutellina mutellinoides aggr.

VNM3 4	Adenostyles alliariae	VNH3 4	Agrostis capillaris
VNM3 5	Petasites albus	VNH3 5	Festuca rubra aggr.
VNM3 6	Viola biflora	VNH3 6	Trifolium pratense
VNM3 7	Sanicula europaea	VNH3 7	Anthyllis vulneraria
VNM3 8	Galium odoratum	VNH3 8	Carex sempervirens
VNM3 9	Dryopteris filix-mas	VNH3 9	Leontodon helveticus hispidus aggr.
VNM3 10	Lamium galeobdolon	VNH3 10	Plantago alpina

Table S3. 34. Two-way anova results table for testing the effect of elevation (alpine verus subalpine) and organ (leaves verus roots) on the amount of phenol-based compounds

	Df	SumSq	MeanSq	F-value	Pr(>F)	
Elevation (Ele)	1	127729775	127729775	38.294	<0.001	***
Organ (O)	1	414802842	414802842	124.361	<0.001	***
Species	48	469837216	9788275	2.935	<0.001	***
Ele X O	1	10627644	10627644	3.186	0.0771	.
Residuals	108	360232062	3335482			

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Figures

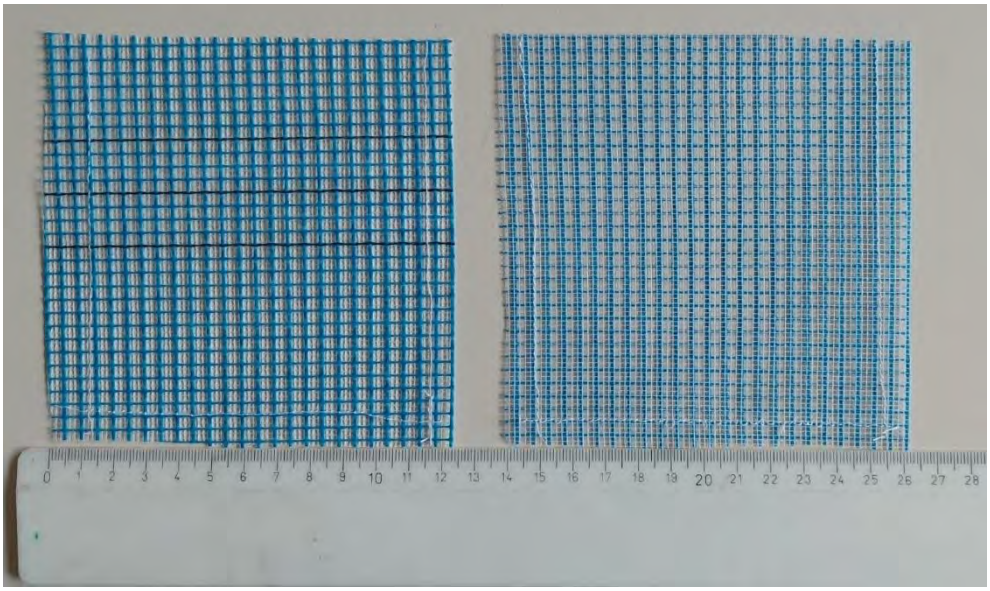

Figure S3. 10. Litter bags. The image displays two-sided mesh litter bags used in the experiment. The top of the picture shows the opening of the litter bag, illustrating its design and mesh structure.

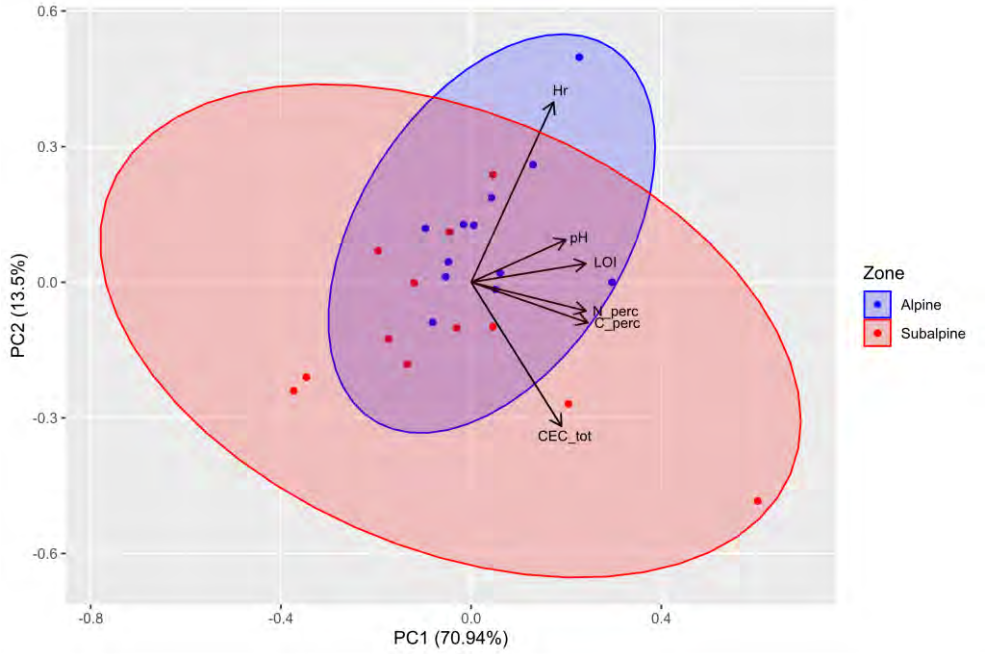

Figure S3. 11. Soil physico-chemical parameters. Shown is the principal component analysis (PCA) of the measured soil physicochemical parameters across 24 sites, including; relative humidity (Hr), soil pH, organic matter content (LOI), total organic carbon (C_perc), total nitrogen content (N_perc), and total cation-exchange capacity (CEC_tot). Ellipses represent 95% confidence intervals, around the alpine (blue), and subalpine (red) sites.

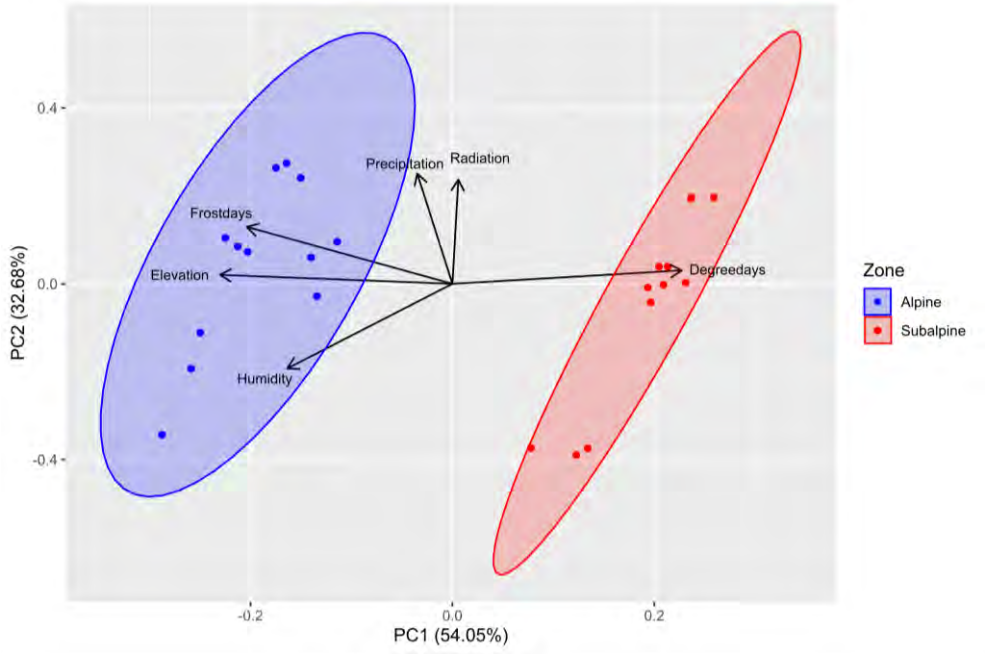

Figure S3. 12. Climatic variables. Shown is the principal component analysis (PCA) of the measured climatic parameters, including; Degreedays, annual mean precipitation, evapotranspiration (humidity), frost days, solar radiation, and elevation across 24 sites. Ellipses represent 95% confidence intervals, around the alpine (blue), and subalpine (red) sites.

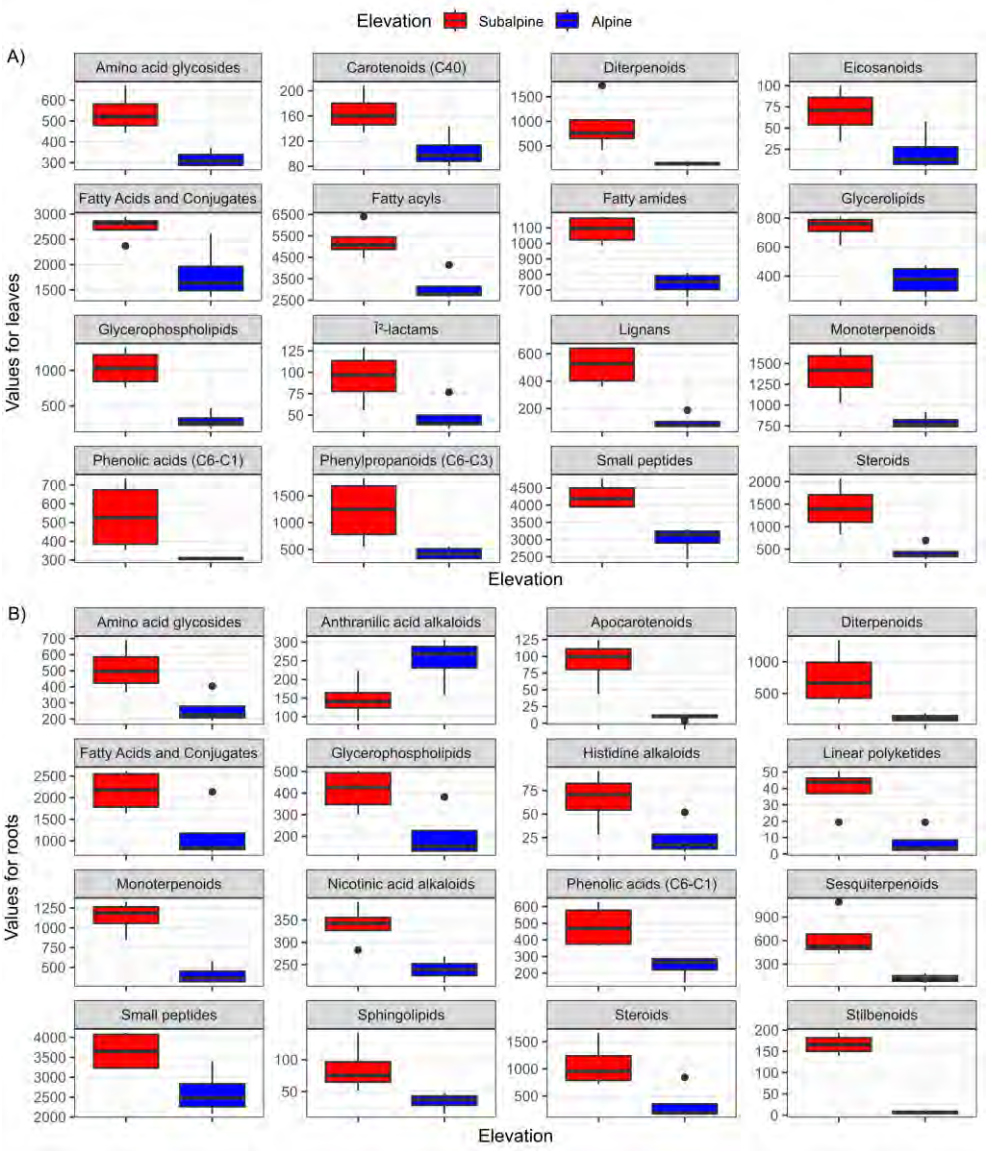

Figure S3. 13. Effect of elevation on the community-level superclasses of metabolites. Boxes represent litter material from the subalpine (red) and alpine (blue) origin, respectively. Here are represented only superclasses that showed significant differences (Anova, $p < 0.05$)

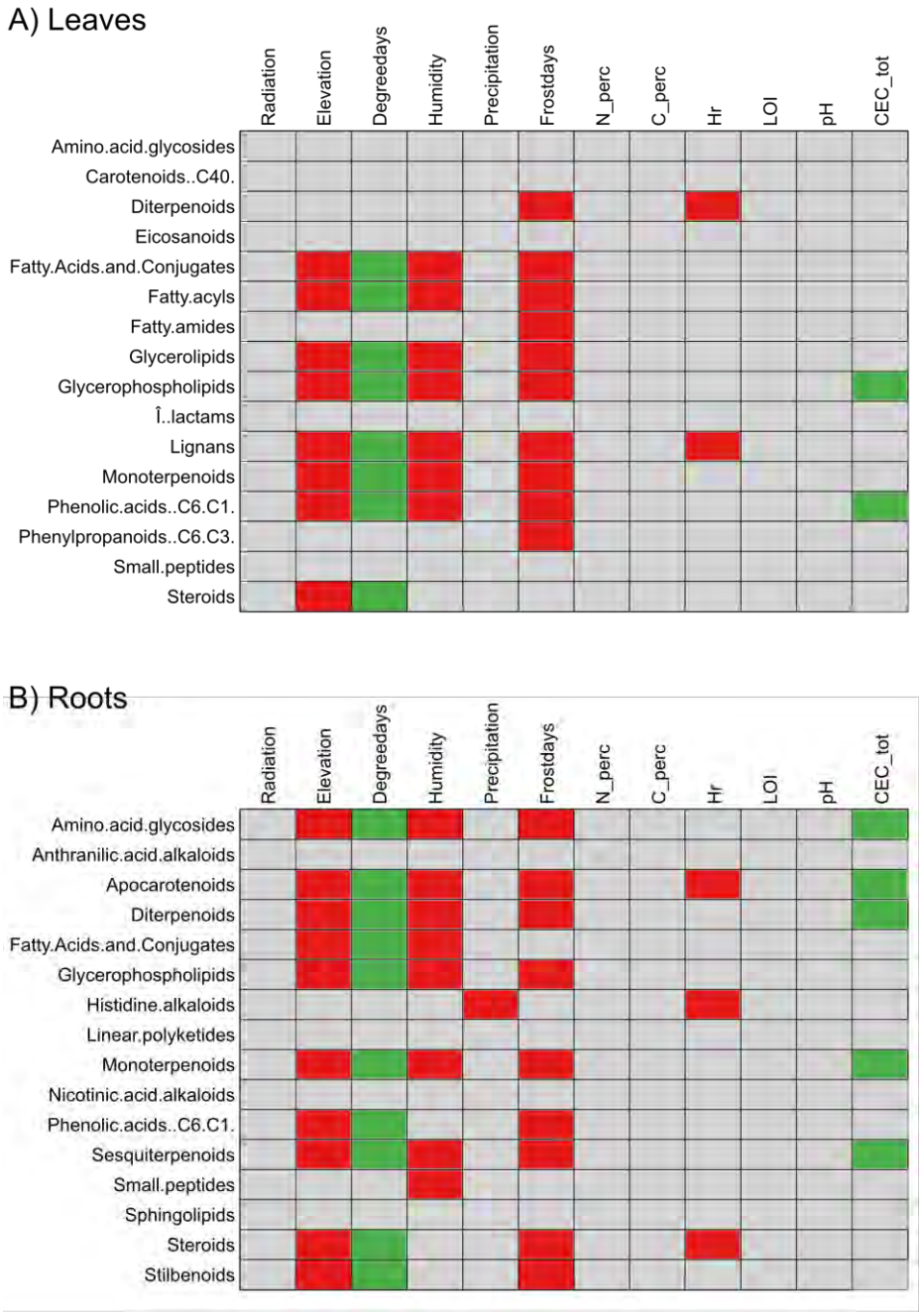

Figure S3. 14. Fourth-corner analysis results. Shown are the negative (red) and positive (green) associations of chemical superclasses present in the 49 species of plants sampled across our study areas, and environmental factors (climatic and edaphic factors). Coloured squared indicate significant association ($p < 0.05$).

Thematic 4

Biological and functional diversity linked to soil quality of soil arthropods along elevation gradients

In preparation for submission in European Journal of Soil Biology (2024):
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Tables

Table S4. 1. Arthropod identification. Detailed list of all identified individuals per site, including the number of individual and abundance per group, and total abundance per site for all three replicates per sites.

VNL	Site sample replicate 1		Site sample replicate 2		Site sample replicate 3		Total	
	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)
Acari	773	69.9	1016	67.64	456	58.69	2245	66.32
Araneae	1	0.09	0	0	0	0	1	0.03
Chilopoda	4	0.36	1	0.07	12	1.54	17	0.5
Coleoptera	0	0	1	0.07	0	0	1	0.03
Collembola	289	26.13	330	21.97	231	29.73	850	25.11
Diplopoda	3	0.27	1	0.07	1	0.13	5	0.15
Diplura	0	0	4	0.27	15	1.93	19	0.56
Diptera larva	5	0.45	7	0.47	6	0.77	18	0.53
Hemiptera	0	0	68	4,53	34	4.38	102	3.013
Other holometabolus adult	0	0	0	0	0	0	0	0
Other holometabolus larva	10	0.9	2	0.13	5	0.64	17	0.5
Hymenoptera	2	0.18	2	0.13	0	0	4	0.12
Isopoda	0	0	0	0	1	0.13	1	0.03
Pauropoda	4	0.36	6	0.4	4	0.51	14	0.41
Protura	1	0.09	37	2.46	7	0.9	45	1.33
Psocoptera	0	0	0	0	0	0	0	0
Symphyla	9	0.81	16	1.06	2	0.26	27	0.8
Thysanoptera	5	0.45	11	0.73	3	0.39	19	0.56
Total	1106	100	1502	100	777	100	3385	100

VNM	Site sample replicate 1		Site sample replicate 2		Site sample replicate 3		Total	
	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)
Acari	405	53.36	315	38.37	609	45.93	1329	45.73
Araneae	1	0.13	1	0.12	0	0	2	0.07
Chilopoda	4	0.53	1	0.12	9	0.68	14	0.48
Coleoptera	0	0	2	0.24	1	0.07	3	0.1
Collembola	286	37.68	388	47.26	621	46.83	1295	44.56
Diplopoda	1	0.13	1	0.12	1	0.07	3	0.1
Diplura	8	1.05	1	0.12	4	0.3	13	0.45
Diptera larva	2	0.26	13	1.58	3	0.23	18	0.62

Hemiptera	7	0.92	62	7.55	25	1.88	94	3.23
Other holometabolus adult	3	0.39	7	0.85	1	0.07	11	0
Other holometabolus larva	9	1.18	4	0.49	10	0.75	23	0.79
Hymenoptera	0	0	1	0.12	0	0	1	0.03
Isopoda	1	0.13	0	0	0	0	1	0.03
Pauropoda	9	1.18	5	0.61	9	0.68	23	0.79
Protura	22	2.9	20	2.44	33	2.49	75	2.58
Psocoptera	0	0	0	0	0	0	0	0
Symphyla	0	0	0	0	0	0	0	0
Thysanoptera	1	0.13	0	0	0	0	1	0.03
Total	759	100	821	100	1326	100	2906	100

VNH	Site sample replicate 1		Site sample replicate 2		Site sample replicate 3		Total	
	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)
Acari	861	79.72	401	65.63	1116	87.73	2378	80.26
Araneae	1	0.09	2	0.33	2	0.16	5	0.17
Chilopoda	1	0.09	0	0	0	0	1	0.03
Coleoptera	0	0	0	0	2	0.16	2	0.07
Collembola	207	19.17	190	31.09	106	8.33	503	16.98
Diplopoda	0	0	0	0	1	0.08	1	0.03
Diplura	0	0	0	0	2	0.16	2	0.07
Diptera larva	1	0.09	1	0.16	4	0.31	6	0.2
Hemiptera	4	0.37	9	1.47	4	0.31	17	0.57
Other holometabolus adult	1	0.09	0	0	0	0	1	0.03
Other holometabolus larva	4	0.37	3	0.49	13	1.02	20	0.67
Hymenoptera	0	0	0	0	1	0.08	1	0.03
Isopoda	0	0	0	0	0	0	0	0
Pauropoda	0	0	3	0.49	1	0.08	4	0.13
Protura	0	0	1	0.16	13	1.02	14	0.47
Psocoptera	0	0	0	0	0	0	0	0
Symphyla	0	0	0	0	5	0.39	5	0.17
Thysanoptera	0	0	1	0.16	2	0.16	3	0.1
Total	1080	100	611	100	1272	100	2963	100

VSL	Site sample replicate 1		Site sample replicate 2		Site sample replicate 3		Total	
	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)
Acari	667	69.77	1400	69.37	863	68.17	2930	69.1
Araneae	0	0	3	0.15	3	0.24	6	0.14

Chilopoda	9	0.94	12	0.59	10	0.79	31	0.73
Coleoptera	2	0.21	1	0.05	1	0.08	4	0.09
Collembola	233	24.37	446	22.1	331	26.14	1010	23.82
Diplopoda	3	0.31	1	0.05	1	0.08	5	0.12
Diplura	12	1.25	4	0.2	16	1.26	32	0.75
Diptera larva	13	1.36	3	0.15	3	0.24	19	0.45
Hemiptera	6	0.63	51	2.53	1	0.08	58	1.37
Other holometabolus adult	0	0	2	0.1	1	0.08	3	0.07
Other holometabolus larva	3	0.31	5	0.25	5	0.39	13	0.31
Hymenoptera	0	0	3	0.15	0	0	3	0.07
Isopoda	1	0.1	0	0	1	0.08	2	0.05
Pauropoda	0	0	3	0.15	3	0.24	6	0.14
Protura	4	0.42	59	2.92	18	1.42	81	1.91
Psocoptera	0	0	0	0	0	0	0	0
Symphyla	1	0.1	18	0.89	5	0.39	24	0.57
Thysanoptera	2	0.21	7	0.35	4	0.32	13	0.31
Total	956	100	2018	100	1266	100	4240	100

VSM	Site sample replicate 1		Site sample replicate 2		Site sample replicate 3		Total	
	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)
Acari	1382	71.57	2186	84.01	2422	75.12	5990	77.22
Araneae	0	0	1	0.04	0	0	1	0.01
Chilopoda	1	0.05	7	0.27	2	0.06	10	0.13
Coleoptera	0	0	1	0.04	1	0.03	2	0.03
Collembola	370	19.16	271	10.41	536	16.62	1177	15.17
Diplopoda	1	0.05	3	0.11	2	0.06	6	0.08
Diplura	3	0.15	5	0.19	4	0.12	12	0.15
Diptera larva	10	0.52	3	0.11	0	0	13	0.17
Hemiptera	123	6.37	108	4.15	210	6.51	441	5.68
Other holometabolus adult	5	0.26	0	0	1	0.03	6	0.08
Other holometabolus larva	13	0.67	8	0.31	14	0.43	35	0.45
Hymenoptera	0	0	2	0.08	0	0	2	0.03
Isopoda	0	0	0	0	0	0	0	0
Pauropoda	7	0.36	3	0.11	2	0.06	12	0.15
Protura	12	0.62	2	0.08	26	0.81	40	0.52
Psocoptera	0	0	0	0	0	0	0	0
Symphyla	3	0.15	0	0	0	0	3	0.04
Thysanoptera	1	0.05	2	0.08	4	0.12	7	0.09
Total	1931	100	2602	100	3224	100	7757	100

VSH	Site sample replicate 1		Site sample replicate 2		Site sample replicate 3		Total	
	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)	Nb of individuals	Abundance (%)
Acari	550	76.28	437	68.71	364	77.78	1351	74.03
Araneae	0	0	0	0	5	1.07	5	0.27
Chilopoda	0	0	1	0.16	0	0	1	0.05
Coleoptera	2	0.28	1	0.16	2	0.43	5	0.27
Collembola	141	19.56	105	16.51	68	14.53	314	17.2
Diplopoda	0	0	0	0	1	0.21	1	0.05
Diplura	0	0	1	0.16	1	0.21	2	0.11
Diptera larva	1	0.14	9	1.41	2	0.43	12	0.66
Hemiptera	16	2.22	71	11.16	5	1.07	92	5.04
Other holometabolus adult	1	0.14	0	0	0	0	1	0.05
Other holometabolus larva	1	0.14	2	0.31	3	0.64	6	0.33
Hymenoptera	0	0	0	0	1	0.21	1	0.05
Isopoda	0	0	0	0	0	0	0	0
Pauropoda	1	0,14	0	0	4	0.85	5	0.27
Protura	3	0.42	3	0.47	4	0.85	10	0.55
Psocoptera	1	0	0	0	0	0	1	0
Symphyla	1	0,13869626	0	0	6	1.28	7	0.38
Thysanoptera	3	0.42	6	0.94	2	0.43	11	0.6
Total	721	100	636	100	468	100	1825	100

Table S4. 2. Ecological indices ANOVA table. Effect of elevation (three levels; alpine grassland, subalpine forest, and mountain forest) on the arthropod diversity, species richness, abundance, and the QBS-Ar index.

Variable	Factor	Df	SSQ	F value	Pr (<F)	
Arthropod diversity (H)	Elevation	2	0.173	2.829	0.091	
	Residuals	15	0.458			
Arthropod species richness (S)	Elevation	2	19.11	9.556	0.019	*
	Residuals	15	27.33	1.822		
Arthropod abundance (J)	Elevation	2	0.012	0.006	0.349	
	Residuals	15	0.082	0.005		
QBS-Ar index	Elevation	2	1039	519	0.002	**
	Residuals	15	8073	538		

Table S4. 3. QBS index results by collection number, plot and site. QBS-Ar indices are not summed but combined. A group found several times only counts as one at the higher scale. If the group has different EMIs, only the highest is counted.

	North exposed						south exposed					
SUBALPINE	Replicate plot1		Replicate plot2		Replicate plot3		Replicate plot1		Replicate plot2		Replicate plot3	
Collection nb	1	2	1	2	1	2	1	2	1	2	1	2
QBS per plot	126	157	147	167	172	112	141	148	153	174	154	172
Total QBS per plot	171		187		172		158		199		194	
Total QBS per site	192						209					
MOUNTAIN	Replicate plot1		Replicate plot2		Replicate plot3		Replicate plot1		Replicate plot2		Replicate plot3	
Collection nb	1	2	1	2	1	2	1	2	1	2	1	2
QBS per plot	147	141	131	85	127	146	123	122	82	131	113	149
Total QBS per plot	157		148		163		173		163		149	
Total QBS per site	178						199					
ALPINE	Replicate plot1		Replicate plot2		Replicate plot3		Replicate plot1		Replicate plot2		Replicate plot3	
Collection nb	1	2	1	2	1	2	1	2	1	2	1	2
QBS per plot	52	56	47	90	87	168	119	92	98	82	138	127
Total QBS per plot	77		97		169		130		128		163	
Total QBS per site	180						185					

Figures

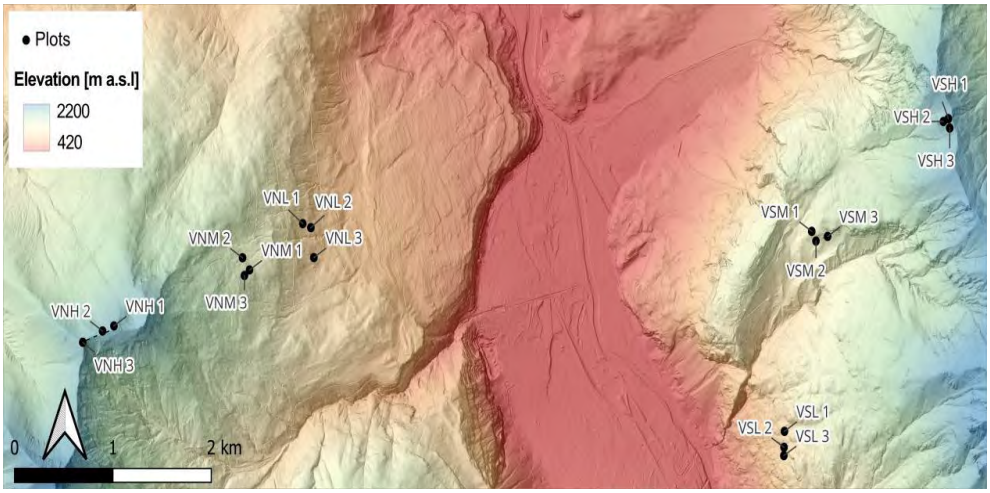

Figure S4. 1. Map showing the plots according to the elevation. Black points represent the different plots. The color gradient presented in the map represents the elevational gradient, with red representing regions of the collinear zone, beige orange corresponding to the mountain zones, greyish regions being in the subalpine zones, and blue illustrating the regions of the alpine zones.

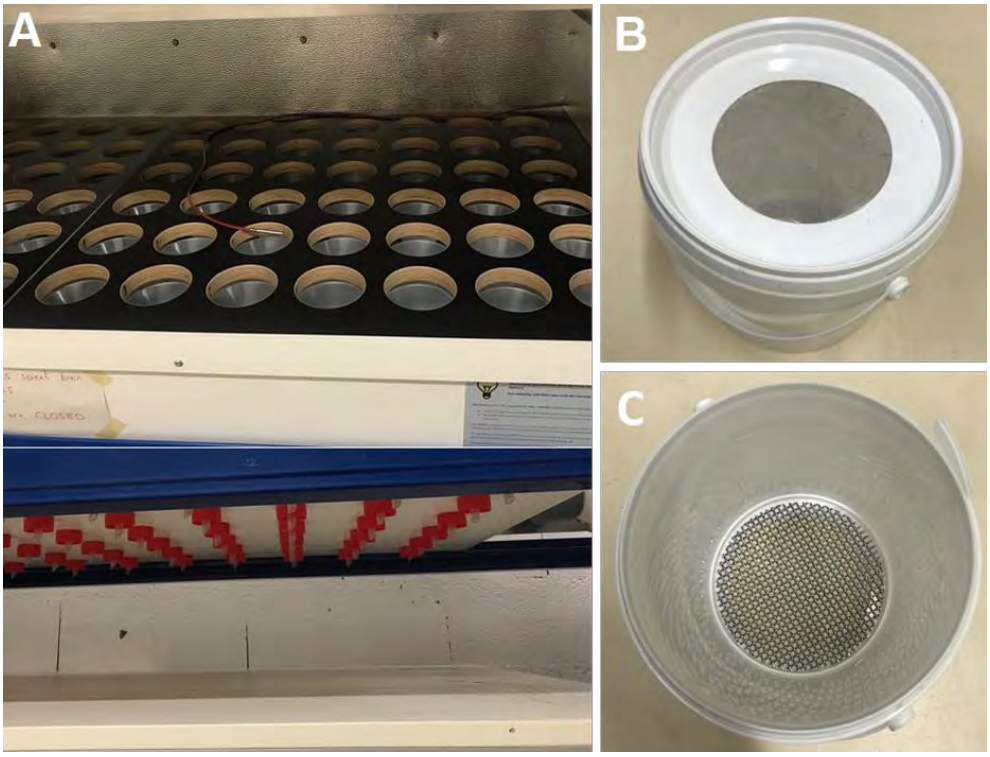

Figure S4. 2. MacFadyen extractor. Equipment used for the extraction of arthropods, (A) shows the set-up of the support into which we place the buckets containing the soil core, and right below each bucket, arthropods fall directly into a screw-top jar filled with alcohol. (B) buckets in which soil cores are placed on the bottom on the 2mm mesh. The lid of the bucket also comprehends a mesh to avoid organisms to escape. The soil cores were positioned upside down (top of the soil core at the bottom of the bucket) to facilitate microarthropod migration. This orientation allows easier access for the arthropods to exit the sample and be collected efficiently, minimizing mortality within the soil matrix. The 2 mm mesh placed at the bottom of each bucket prevent soil, stones, and grass from falling into the collection container. (©) N.Rytz.

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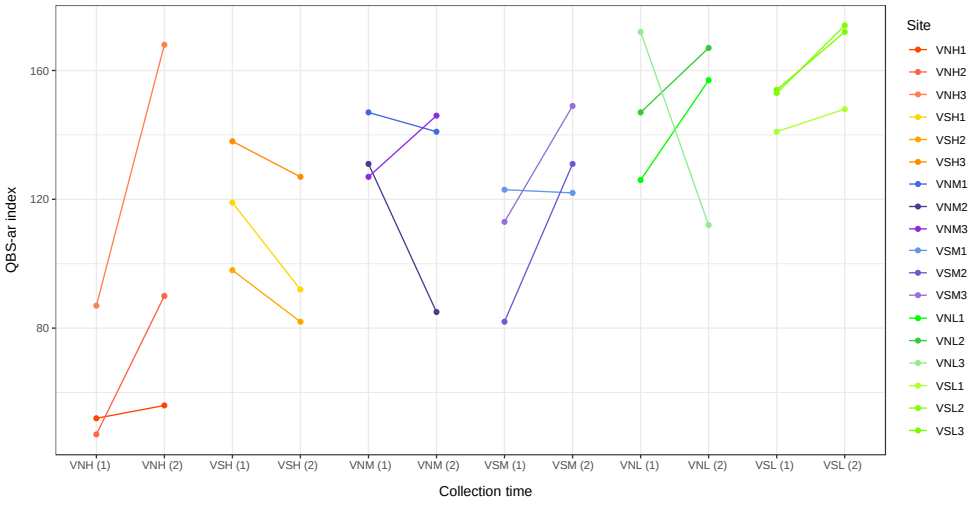

Figure S4. 3. QBS-Ar index collection time. The first collection was in May 2022 for the plots in low and middle altitude and in July for the high altitude. The second collection was in October for the low and middle altitude, and in September for the high altitude.