

Relict of riparian floodplain forests: natural distribution and ecology of *Ulmus laevis* in Switzerland

Fragnière et al., 2024

Appendix A: Tables and graphs

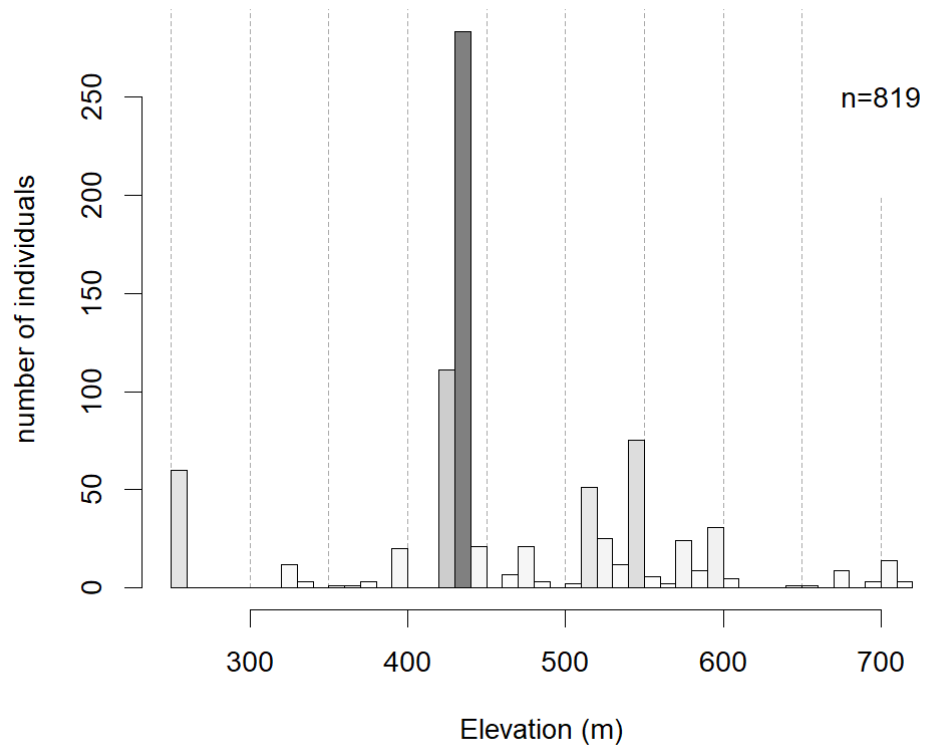
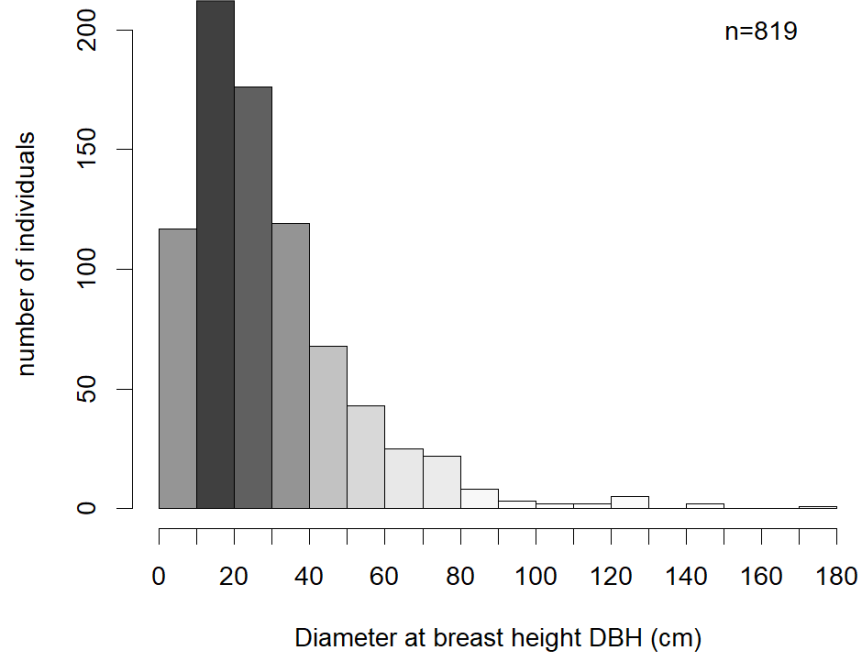


Fig. S1 Histogram illustrating the elevations of recorded *U. laevis* trees in Switzerland. The high peak in the middle corresponds to the elevation of the large lakes (Neuchâtel, Morat), where a significant number of individuals occur.

a)



b)

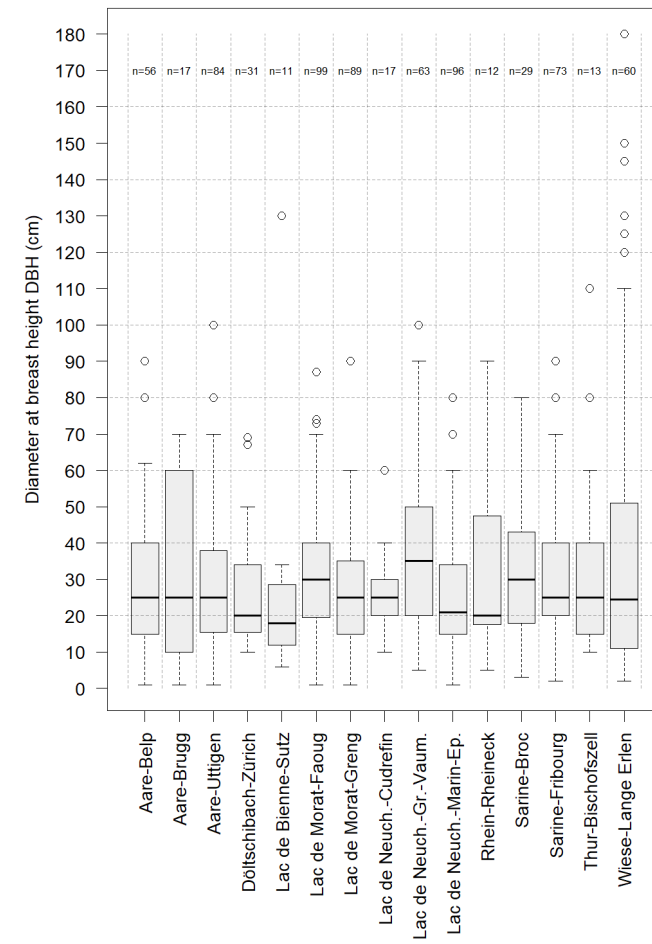


Fig. S2 Diameter at breast height (DBH) a) DBH histogram of all *U. laevis* trees recorded in Switzerland. b) DBH boxplot of the main *U. laevis* stands of Switzerland.

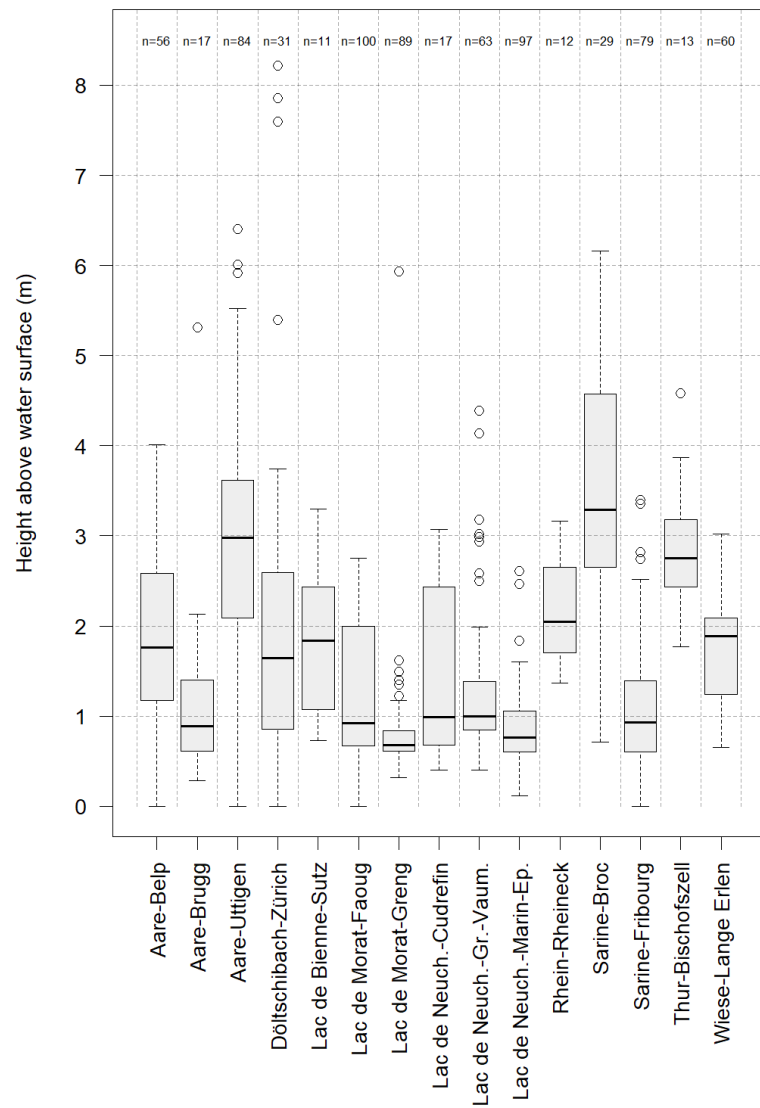


Fig. S3 Height of individual trees above the water surface of the closest water body. Boxplot of the main *U. laevis* stands of Switzerland.

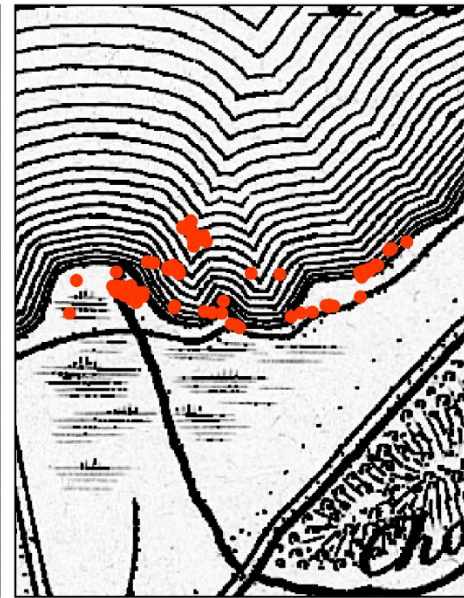
a) Lac de Neuchâtel, Marin



b) Lac de Neuchâtel, vers Grandson



c) Lac de Morat, Faoug



d) Lac de Morat, Greng

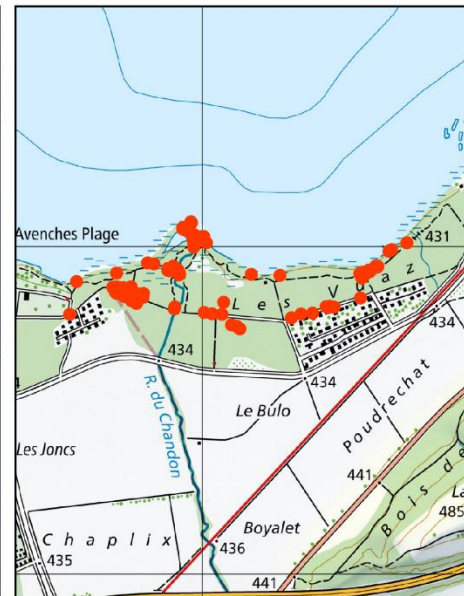
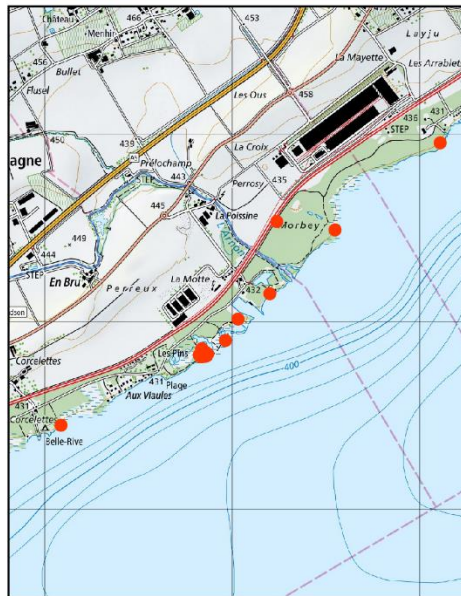


Fig. S4 Comparison between ~1850 (Dufour map), before the Jura water correction, and 2022 (swisstopo map), in the region of Lake Neuchâtel and Lake Morat. Red dots indicate present *U. laevis* trees location. Areas where *U. laevis* occurs today were historically mostly under water.

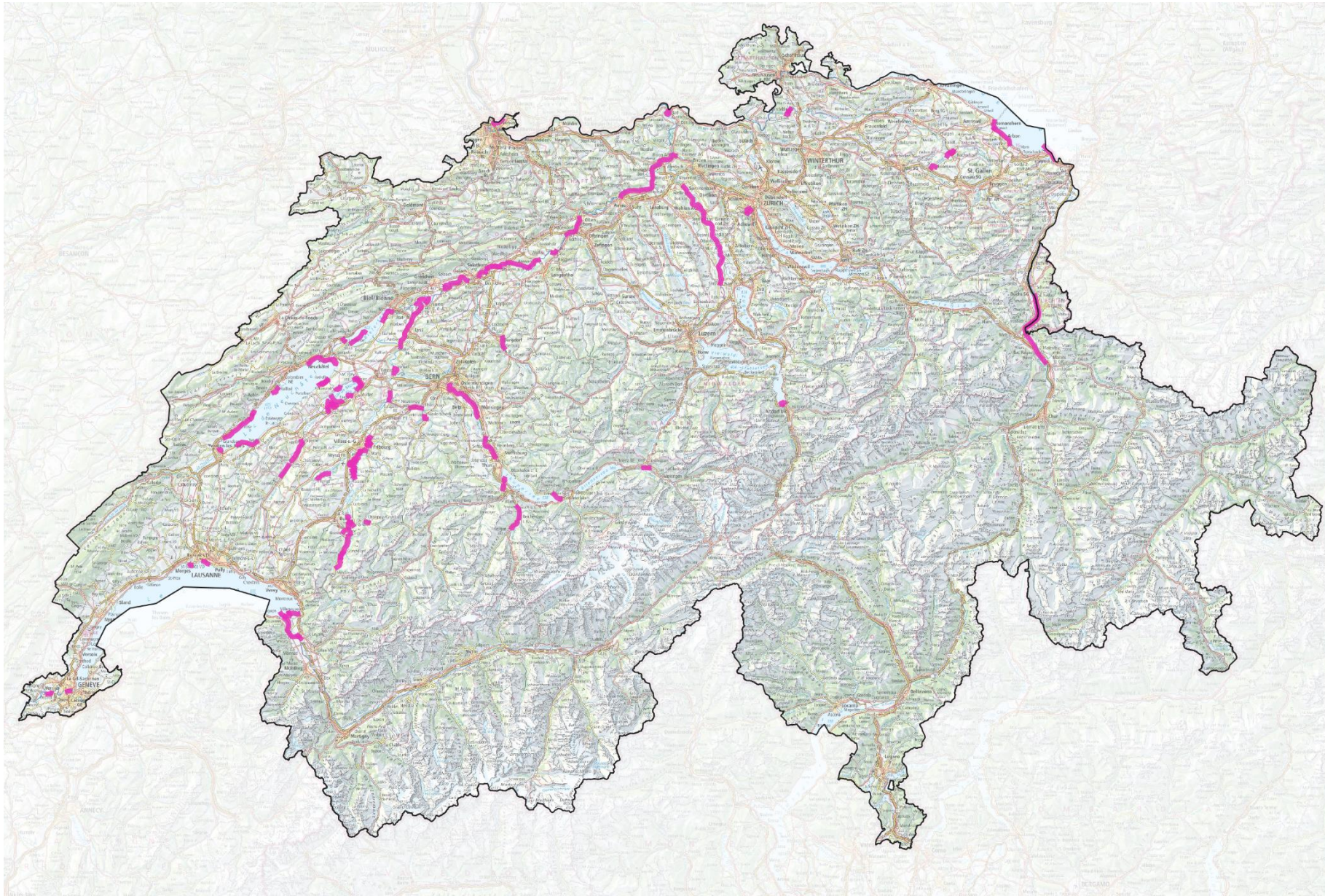


Fig. S5 Explored areas (purple): more than 400 km along rivers and lakes in Switzerland. Areas where data/information were available were visited in priority. Then, many extra areas were explored that could be suitable. We selected areas where riparian forest situated close to waterbody, and close to the water level, in regions where *U. laevis* could occur (similar to areas where it was found elsewhere). Those areas were avoided: 1) heavily urbanized on channelized areas, 2) unforested river shores, 3) steep rivers and lakes with sloping banks. The southern shore of lake Neuchâtel was not much explored as it is a very well studied area.

Tab. S1 Soil analysis data.

Abb	Site	River_Lake	Canton	Date	Gravel	pH	Organic matter (%)	Clay (%)	Silt (%)	Sand (%)	CaCO3 tot (%)	CEC (meq./100g)	pc_sat (%)	H (%)	K (%)	Ca (%)	Mg (%)	Na (%)	N_tot	C_N_ratio
AG_Br1	Brugg	Aare	AG	10.06.2022	0	7.6	4.3	10	45.6	44.5	18	15.3	96.9	3.1	0.8	89.9	5.4	0.7	0.2	11.9
BE_Mü1	Münsingen-Belp	Aare	BE	21.06.2022	2	7.6	3	3	17.7	79.3	22.3	10.4	100	0	1.3	91.5	6.9	0.4	0.1	12.3
BE_Mü2	Münsingen-Belp	Aare	BE	21.06.2022	0	7.6	2.4	5.9	16.1	78	22.6	7.4	100	0	1.9	89.8	7.6	0.6	0.1	10.8
BE_Su1	Sutz/Latrigen (Biel)	Lac de Bienne	BE	29.06.2022	0	7.3	27.5	29.8	50.2	20	12.4	55.1	86.3	13.7	0.4	79.3	6.2	0.4	1.2	13.9
BE_Ut1	Uttigen	Aare	BE	14.06.2022	3	7.2	14.3	12.1	21.1	66.8	17.4	27.1	85.5	14.5	0.7	81.1	3.6	0.1	0.5	16.3
BE_Ut2	Uttigen	Aare	BE	14.06.2022	3	7.2	22.5	17.6	13.8	68.6	17.7	51.9	86.9	13.1	0.7	83.1	3.1	0.1	0.8	15.9
BS_La1	Lange Erlen	Wiese	BS	10.05.2022	3	6.3	4.4	10.4	24.3	65.3	1	14.8	52	48	0.9	42.2	8.7	0.3	0.2	12.2
BS_La2	Lange Erlen	Wiese	BS	25.06.2022	3	6.8	6.4	9	32	58.9	1	14	54	46	0.8	48.8	4	0.3	0.3	13.7
FR_Br1	Broc-Grandvillard	Sarine	FR	23.05.2022	1	7.4	7	14.2	29.1	56.7	37.5	17.2	92.8	7.2	1	87.7	4	0.1	0.3	12.8
FR_Br2	Broc-Grandvillard	Sarine	FR	23.05.2022	0	7	13.5	10.5	14.5	75	37.3	22.6	69.3	30.7	0.5	64.6	4.1	0.1	0.4	20
FR_Co1	Corpataux	Sarine	FR	17.06.2022	3	7.6	2.5	4.5	7.8	87.7	17.4	7.9	100	0	1.3	90.4	7.9	0.4	0.2	9.6
FR_Co2	Corpataux	Sarine	FR	01.06.2022	3	7.5	3	3.8	10.1	86	32.6	6.6	100	0	1.7	91.2	6.7	0.4	0.1	12.5
FR_Fr1	Fribourg	Sarine	FR	07.06.2022	0	7.7	1.6	1.6	3.6	94.8	24.2	6.5	100	0	1.3	93.6	4.7	0.4	0.1	10.1
FR_Gr1	Greng	Lac de Morat	FR	04.05.2022	0	7.4	9.6	8.9	19	72.1	15.5	25.5	91.5	8.5	0.2	82.9	8	0.4	0.4	13
NE_Ma1	Marin-Epagnier	Lac de Neuchâtel	NE	18.05.2022	2	7.4	6.7	9	22.4	68.6	24.7	20.6	93.2	6.8	0.6	79.5	12.8	0.3	0.3	12.1
NE_Ma2	Marin-Epagnier	Lac de Neuchâtel	NE	18.05.2022	1	7.3	6.6	9.7	26.8	63.5	30.3	18.8	91.9	8.1	0.4	81.5	9.7	0.3	0.4	10.6
SG_Rh1	Rheineck	Rhein	SG	15.08.2022	0	7.8	4.7	15.1	71.1	13.9	19.8	11.5	100	0	0.8	91.8	7.1	0.3	0.3	10
TG_Bi1	Bischofszell	Thur	TG	17.08.2022	3	7.5	4.5	11.7	35.2	53.1	32.1	16.1	95.5	4.5	0.9	84.2	10.2	0.2	0.3	10.5
VD_Cu1	Cudrefin	Lac de Neuchâtel	VD	31.05.2022	0	7.2	14.9	1.1	4.7	94.3	4.8	30.4	86.3	13.7	0.4	81	4.7	0.2	0.4	22.7
VD_Fa1	Faug	Lac de Morat	VD	11.05.2022	3	7.6	2.2	2.9	6.9	90.2	6.6	7.5	100	0	1.2	92	6.1	0.6	0.1	9.8
VD_Gr1	Grandson	Lac de Neuchâtel	VD	27.05.2022	3	7.3	16.2	5.9	7.9	86.2	25.9	32.3	87.6	12.4	0.3	83.8	3.3	0.2	0.6	15.7
VD_Gr2	Grandson	Lac de Neuchâtel	VD	27.05.2022	3	7.4	12.8	9.1	16.8	74.1	37.6	38.1	90.4	9.6	0.5	83.3	6.4	0.3	0.6	12.8
VD_Va1	Vaumarcus	Lac de Neuchâtel	VD	15.06.2022	3	7.4	18.5	7.7	9.6	82.8	29.9	47.3	90.7	9.3	0.2	87.7	2.7	0.1	0.7	16
ZH_Ch1	Cholbenhofbach	Döltschibach	ZH	19.05.2022	2	7.6	3.8	11.5	28	60.6	37.1	11.6	96.2	3.8	1	77	18	0.2	0.2	11.5

Arum maculatum L.								r		+	+	+	+						+		+	1		+		r	+	r
Barbarea vulgaris R. Br.																							r					
Betula pendula Roth																1												
Brachypodium sylvaticum (Huds.) P. Beauv.	1	+			+																			r	1			
Bromus sterilis L.																							r					
Calystegia sepium (L.) R. Br.														r					+						+			
Cardamine hirsuta L.																							+					
Carex acutiformis Ehrh.					r						1	1	1		+	3			1									
Carex alba Scop.				+	r	2																						
Carex elata All.														+			3		+									
Carex flacca Schreb.						+								+											+			
Carex muricata aggr.				r																								
Carex nigra (L.) Reichard																		+										
Carex panicea L.														+														
Carex pendula Huds.												r													r			
Carex remota L.																									r			
Carex sylvatica Huds.	+						2	r							r	+				+								
Carpinus betulus L.		+																									2	
Chaerophyllum hirsutum L.																									+			
Chrysosplenium alternifolium L.																							+					
Circaea lutetiana L.								+											+				r					
Cirsium arvense (L.) Scop.								r																				
Cirsium oleraceum (L.) Scop.								+																	r			
Cornus sanguinea L.	r	1		2	2	2	2	2	1	+	2	2			2	+	2	3	3	2	2	1	2	+	1	+	2	
Corylus avellana L.		3	3	2	2	3	2	2		2				1			+	+	+	1	2	1	3		+	1	2	
Crataegus laevigata (Poir.) DC.																											+	
Crataegus monogyna Jacq.	+	+			1	r		3			2	2	2		1	1	+	+	+	1	+	+	r		+	+	2	
Deschampsia cespitosa (L.) P. Beauv.																								+	+			
Dryopteris carthusiana (Vill.) H. P. Fuchs										+																		
Dryopteris dilatata aggr.										r																		
Dryopteris filix-mas (L.) Schott		1		r		+																		r				
Elymus caninus (L.) L.																					+		+		+			
Epilobium hirsutum L.													r															
Equisetum arvense L.							+	r						+	+		r			+			r		+			
Equisetum hyemale L.	+		2					1	5							4						4			2			
Erysimum virgatum Roth																							r					
Euonymus europaeus L.		+			r				+	+	r			1	+		r			2		1			+	r		
Eupatorium cannabinum L.	r																											
Euphorbia dulcis L.																							r					
Euphorbia platyphyllos L.																								r				
Fagus sylvatica L.	+		2				3												+			2						
Filipendula ulmaria (L.) Maxim.								+		+	+			r	r		+	r	+						+			
Frangula alnus Mill.													1	1														
Fraxinus excelsior L.	2	1		2	1	+	1	2	2		2	3	2	3	1	r	2	2	1	1	+	+	4	r	+	+	2	
																											3	
																											2	

[illegible]

Ranunculus aconitifolius L.									+																				
Ranunculus auricomus aggr.																					1								
Ranunculus ficaria L.									1	3	5	1	4								+					+			
Ranunculus lanuginosus L.									r																				
Ribes rubrum L.																					+								
Rosa						r						r				r									r				
Rubus armeniacus Focke					r																								
Rubus caesius L.	2	2		+	1	1		2	3	3	2	3	2	+	3	1	1	4	1	+	2	+		2	1	2	+	+	
Rubus fruticosus aggr.			+	r			3	2												r	+		1				+	+	
Salix alba L.			2		2				4	2			+			+	3			+			3	3	2	2			
Salix caprea L.		+			2																								
Salix cinerea L.												1																	
Salix elaeagnos Scop.				2																					1				
Salix purpurea L.														+															
Sambucus nigra L.																				+	r						1		
Solidago gigantea Aiton																									+				
Sonchus asper Hill																									r				
Stachys sylvatica L.					r																								
Tamus communis L.	r																												
Taraxacum officinale aggr.	r																												
Thalictrum aquilegiifolium L.		r																											
Tilia cordata Mill.		2			2																+								
Tilia platyphyllos Scop.				2		2																							
Ulmus glabra Huds.	2	2			2	+	1							3	1			+		1	+	2	1		3	2			
Ulmus laevis Pall.	2	3	4	2	3	2	3	3	2	4	3	2	4	2	2	3	3	3	4	2	3	2	3	2	3	2	2	2	4
Ulmus minor Mill.		3																								1			
Urtica dioica L.				r					1	2												+	3			+	+		
Viburnum lantana L.		r		1																					+				
Viburnum opulus L.					+	r			2	2			1	+	2	1	1	3	2	+	+								
Viola reichenbachiana Boreau					r																				r				