



Apr 02, 2020

Post Processing: Abundance and Distribution of Species in Open Vegetation Plots

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ABSTRACT

Here we describe the standardised protocol used by the [Canadian Airborne Biodiversity Observatory](#) (CABO) to obtain an estimation of the abundance and distribution of plant species surveyed in the open vegetation plots in sites where small drone pictures are taken using the DJI Mavic Air, being Mer Bleue Bog (Ontario) and Parc national des Îles-de-Boucherville (Québec) in 2019. The *SamplePoint* program is used to process the small drone pictures, where a virtual point frame grid is overlapped to the subplot pictures. The grid is made of 100 crosshairs, representing one crosshair every 10 cm. Every crosshair is then associated to a ground cover. This process results in an Excel spreadsheet where we can extract a percent cover for each species (measure of abundance), and see for each of the 100 crosshairs per subplot what percent cover is present (measure of distribution).

EXTERNAL LINK

<http://caboscience.org>

ATTACHMENTS

[buttons_explanations.xlsx](#)[BOU_TOT_21nov.XLS](#)[MB_TOT_15oct.xlsx](#)

Photo Annotations

- 1 If the different species are difficult to tell apart visually, annotate the drone pictures.
 - 1.1 From *Fulcrum*, download on your computer the small drone pictures from the 9 subplots of a given plot by following Vegetation Surveys: Herbs and Shrubs → Cover Estimates: Subplots → Subplots → Record [# from 1 to 9] → Vegetation Photos: Subplot → Download → Original.

Vegetation Surveys: Herbs and Shrubs

1 record, July 19, 2019

Species List

Plant Taxa 12 Items

List of scientific names available:

- *Sphagnum magellanicum* Brid.
- *Sphagnum papillosum* Lindb.
- *Polytrichum strictum* Menzies ex Brid.
- *Maianthemum canadense* Desfontaines
- *Kalmia angustifolia* Linnaeus
- *Rhododendron groenlandicum* (Oeder) Kron & Judd
- *Larix laricina* (Du Roi) K. Koch
- *Vaccinium oxycoccus* Linnaeus
- *Eriophorum vaginatum* Linnaeus
- *Vaccinium myrtilloides* Michaux
- *Chamaedaphne calyculata* (Linnaeus) Moench
- *Vaccinium angustifolium* Aiton

Cover Estimates: Subplot

Subplots 9 Items

Vegetation Surveys: Herbs and Shrubs	
1 record, July 19, 2019 / Subplots (9 Items)	
1 record	View >
1 record	View >
1 record	View >
1 record	View >
1 record	View >
1 record	View >
1 record	View >
1 record	View >

Subplots

1 record

Created Location 45.409077, -75.516663 (3m accuracy, 1.8m from the record)

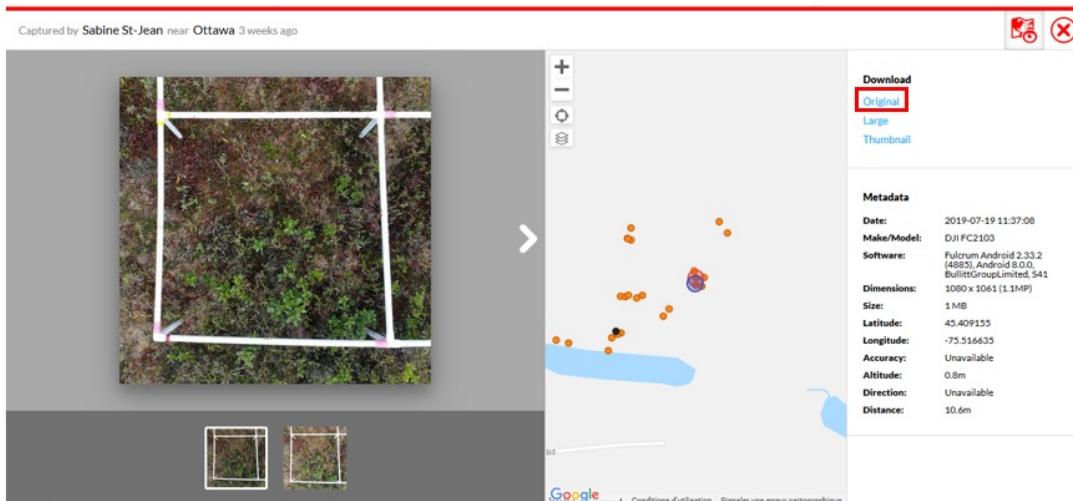
Updated Location 45.397892, -75.698123 (15m accuracy, 14226.0m from the record)

Subplot * 44083370-44100544, 1

Cover Estimates 9 Items

- Total Canopy Cover (%): Subplot
- Bare Ground Cover (%): Subplot
- Leaf Litter Cover (%): Subplot
- Total Cover (%): Subplot

Vegetation Photos: Subplot



- 1.2 Open the 9 pictures in a single PowerPoint file, with each slide corresponding to one subplot.



- 1.3 Use the species list from *Fulcrum* → Vegetation Surveys: Herbs and Shrubs → Subplot Record → Cover Estimates to locate each plant species, paying attention to the Canopy Remarks (abundance and distribution).

Vegetation Surveys: Herbs and Shrubs

1 record, July 19, 2019

Species List

Plant Taxa 12 Items

List of scientific names available:

- *Sphagnum magellanicum* Brid.
- *Sphagnum papillosum* Lindb.
- *Polytrichum strictum* Menzies ex Brid.
- *Maianthemum canadense* Desfontaines
- *Kalmia angustifolia* Linnaeus
- *Rhododendron groenlandicum* (Oeder) Kron & Judd
- *Larix laricina* (Du Roi) K. Koch
- *Vaccinium oxyccocus* Linnaeus
- *Eriophorum vaginatum* Linnaeus
- *Vaccinium myrtilloides* Michaux
- *Chamaedaphne calyculata* (Linnaeus) Moench
- *Vaccinium angustifolium* Aiton

Cover Estimates: Subplot

Subplots 9 Items

Vegetation Surveys: Herbs and Shrubs	
1 record, July 19, 2019 / Subplots (9 Items)	
1 record	View >

Subplots

1 record

Subplot * 44083370-44100544, 1

Cover Estimates 9 Items

- Total Canopy Cover (%): Subplot
- Bare Ground Cover (%): Subplot
- Leaf Litter Cover (%): Subplot
- Total Cover (%): Subplot

Vegetation Photos: Subplot

Subplots

1 record / Cover Estimates (9 Items)

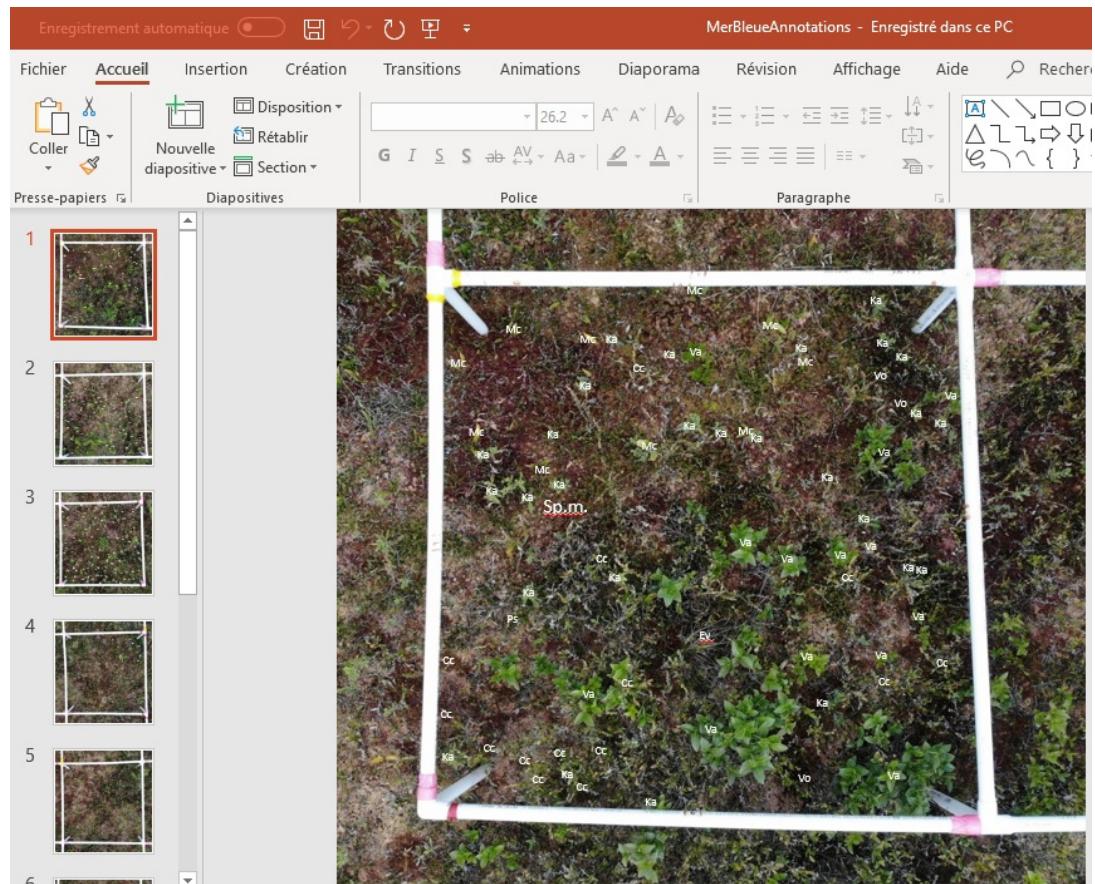
Sphagnum magellanicum Brid.	View >
Sphagnum papillosum Lindb.	View >
Polytrichum strictum Menzies ex Brid.	View >
Maianthemum canadense Desfontaines	View >
Eriophorum vaginatum Linnaeus	View >
Kalmia angustifolia Linnaeus	View >
Vaccinium oxycoccus Linnaeus	View >
Vaccinium angustifolium Aiton	View >
Chamaedaphne calyculata (Linnaeus) Moench	View >

	Cover Estimates		
	Maianthemum canadense Desfontaines		
	Metadata		
Created (device)	19/07/2019 à 11:57:13 3 weeks ago		
Updated (device)	19/07/2019 à 12:02:19 3 weeks ago		
Duration	35 seconds (Total Time) 16 seconds (Most Recent Update) 19 seconds (First Creation)		
Location	45.409164, -75.516638		
Created Location	45.409166, -75.516638 (3m accuracy, 0.2m from the record)		
Updated Location	45.409157, -75.516622 (3m accuracy, 1.5m from the record)		
	Taxon Cover		
Scientific Name	* Maianthemum canadense Desfontaines		
Canopy Cover (%)			
Cover Remarks	Bordure N milieu de l'est Milieu du NO		

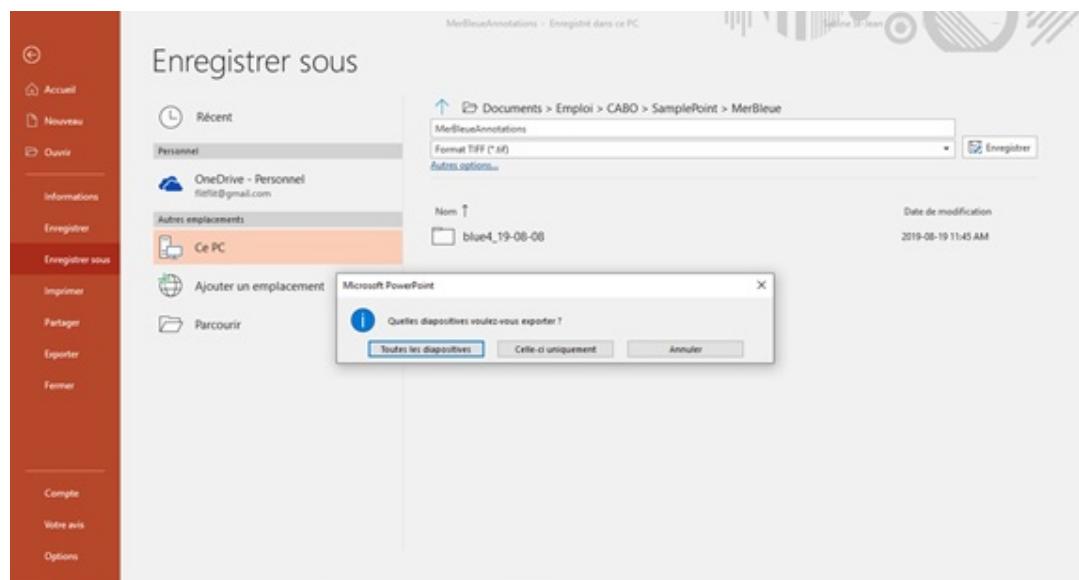
NOTES ON COVER REMARKS:

Each subplot is divided in areas identified with direction acronyms (S = south, N = north, O or W = west, E = east, C = center). If relevant, they also have a note on the number of individuals for a given species.

- 1.4 For all of the species or specimens that are difficult to identify at first sight, in PowerPoint, in a white font, note the initials of the species (generally, format is first letter of genera + first letter of species) on top of its occurrences.

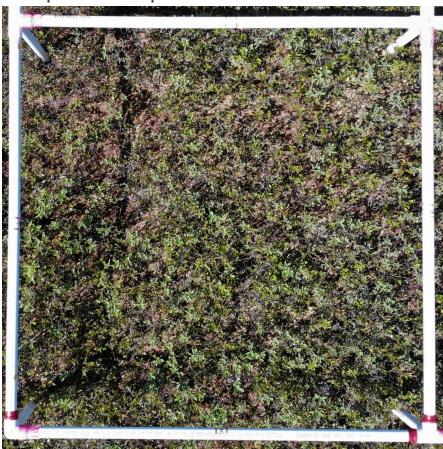


1.5 Save all PowerPoint slides (1 slide = 1 subplot) in .tif to your computer and name them in the format PlotNo.SubplotNo.



- 1.6 Crop all photos so that their shape is a tight square around the PVC pipes delimiting the subplot.

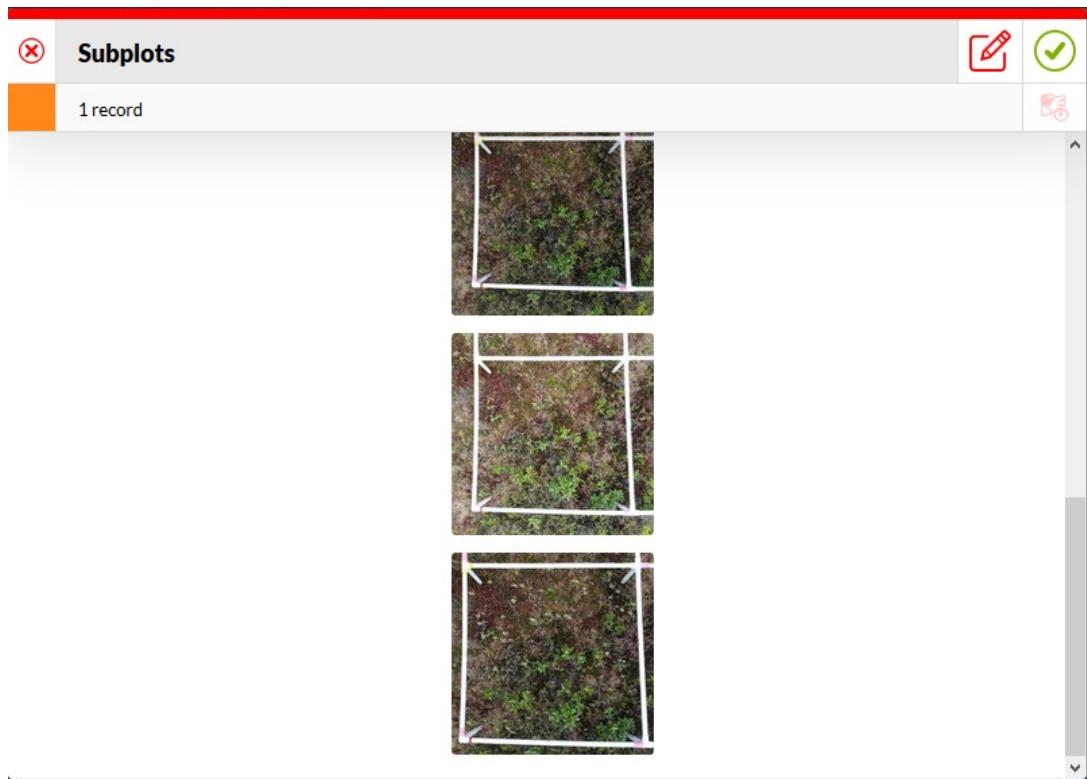
Example for subplot 1:



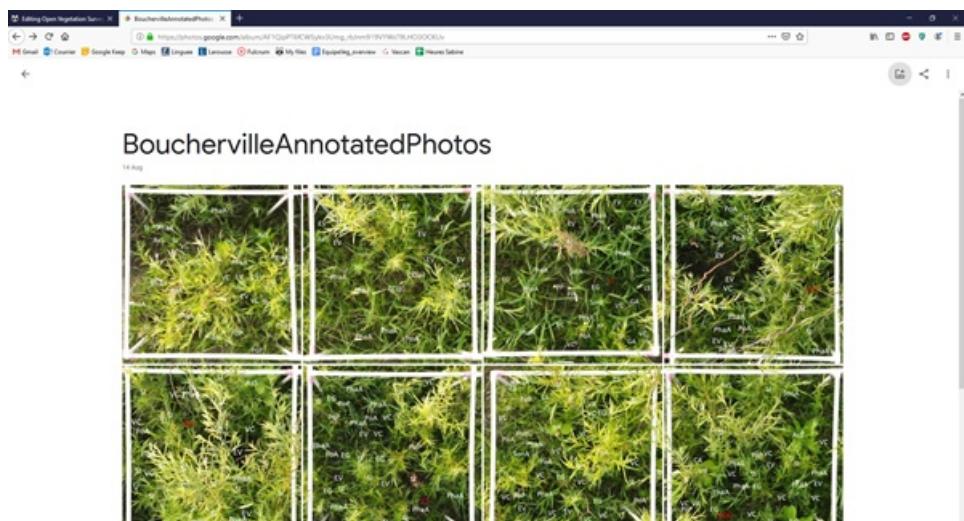
- 1.7 Save the cropped photos back to:

1) their original *Fulcrum* subplot record, under Vegetation Surveys: Herbs and Shrubs → Subplots → Record [# from 1 to 9] → Vegetation Photos: Subplot,

The screenshot shows a mobile application interface for managing subplot records. At the top, there's a header with a red 'X' icon, the title 'Subplots (editing)', a green checkmark icon, and a save icon. Below the header, it says '1 record' and 'Updated location'. The main area is titled 'Subplot' with the ID '44083370-44100544, 1'. Under this, there's a section for 'Cover Estimates' with four fields: 'Total Canopy Cover (%)', 'Bare Ground Cover (%)', 'Leaf Litter Cover (%)', and 'Total Cover (%)'. Below these is a section for 'Vegetation Photos: Subplot' with a 'Select File' button highlighted by a red box. To the right of the button is a thumbnail image of a subplot with a white crop box overlaid. There are also icons for deleting the photo and a file input field.



or 2) to a Google Photos folder, with all photos labelled with PlotNo.SubplotNo, shared with the Veg Crew Leader.



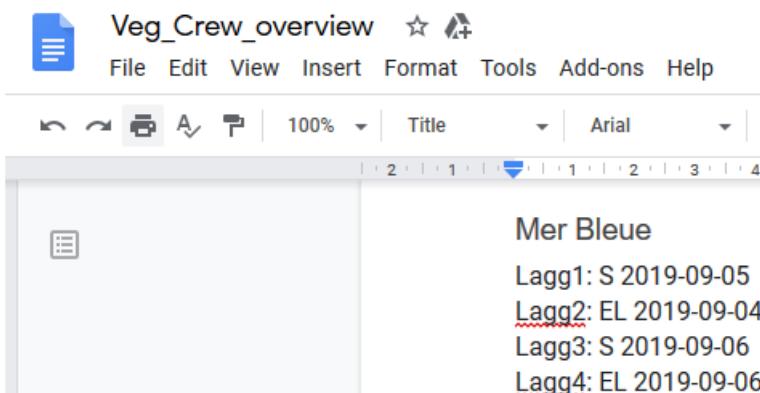
Virtual Point Framing

- 2 Classify 100 non-random crosshairs per subplot using the *SamplePoint* program, in order to obtain species distribution and abundance to the closest percent.



Save everything related to *SamplePoint* (photos to classify (see 1.7), databases (see 2.2) and buttons (see 2.8) that will be created) in the same computer directory.

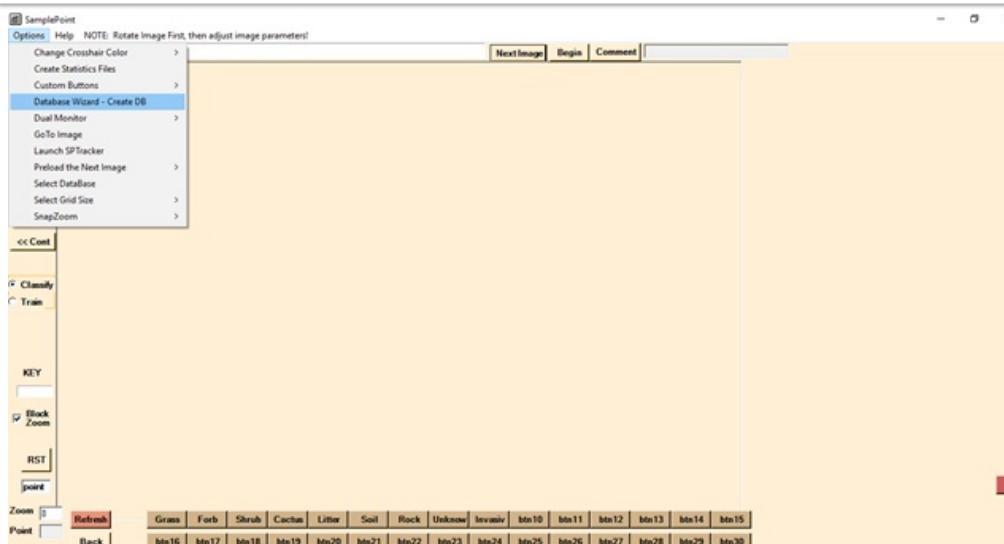
- 2.1 Indicate in the Veg_Crew_overview Google Doc on what plot(s) you will be working on that day, by writing the date and your initial next to the plot number.



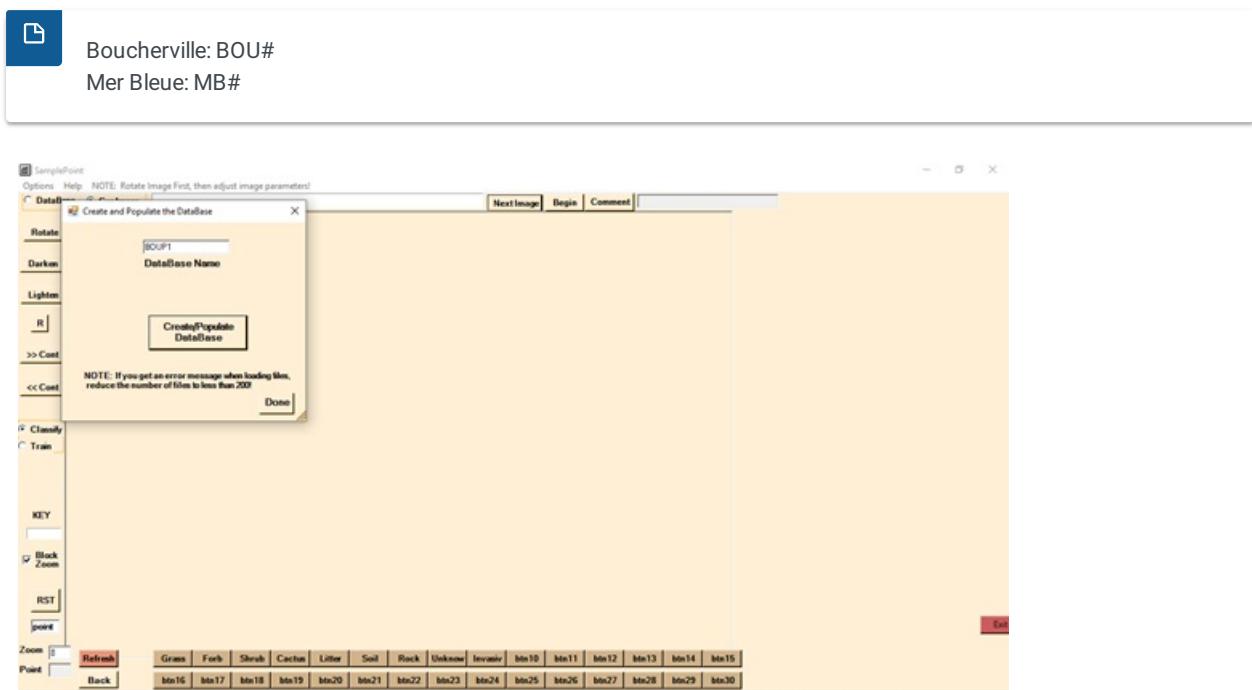
- 2.2 Create a Database in *SamplePoint*, under Options → Database Wizard - Create DB.



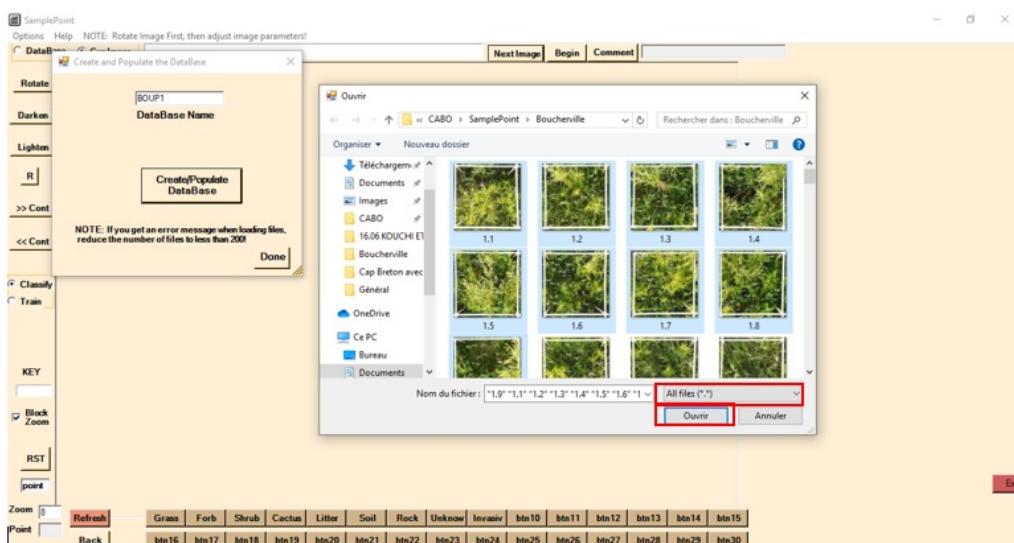
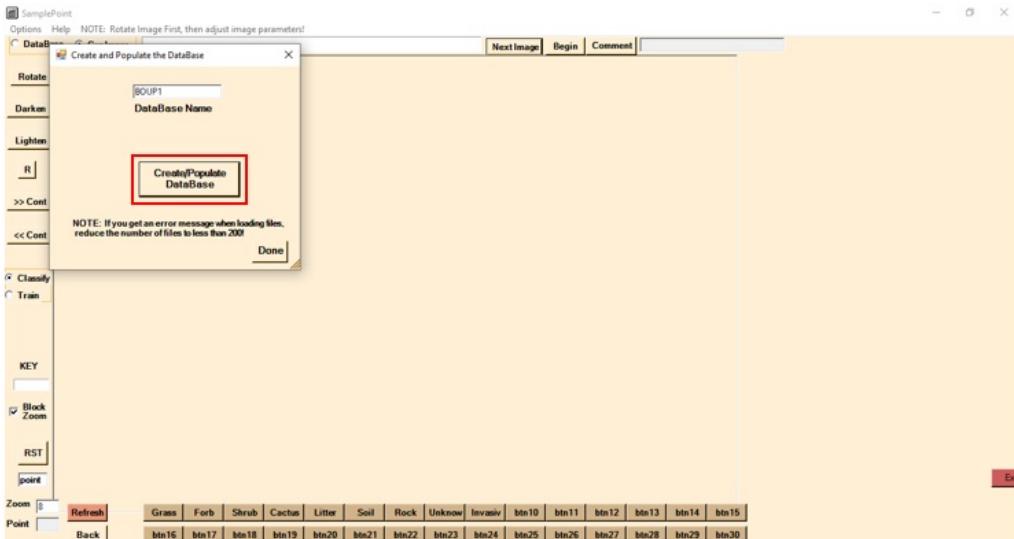
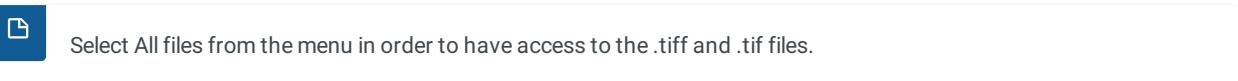
We are using one database per plot, and only later combining all the databases into one.



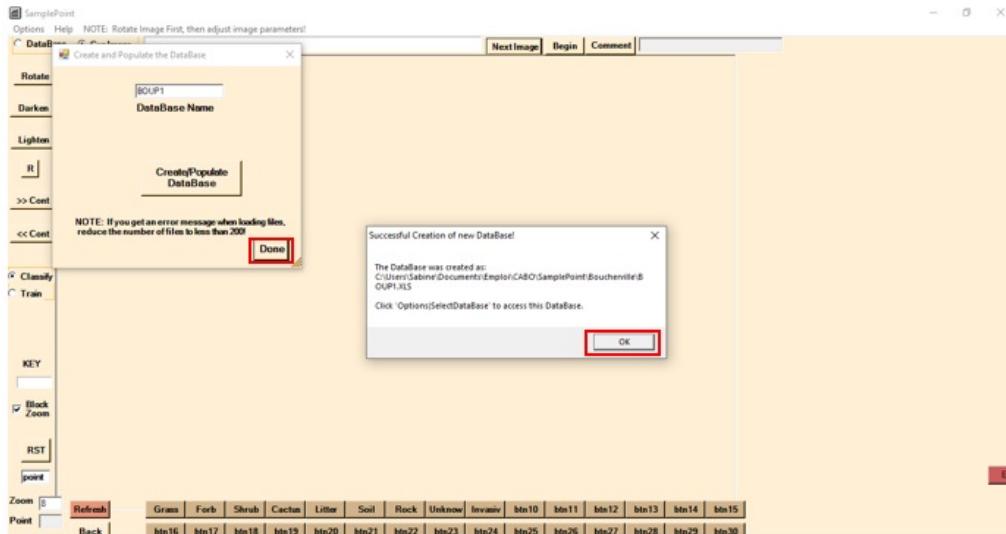
2.3 Name the database with an acronym for the site and the plot number.



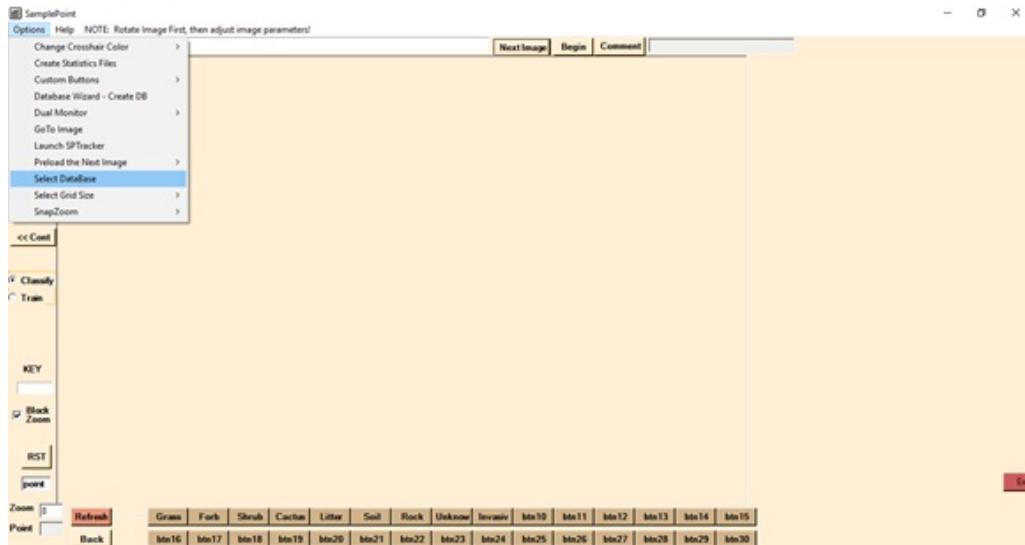
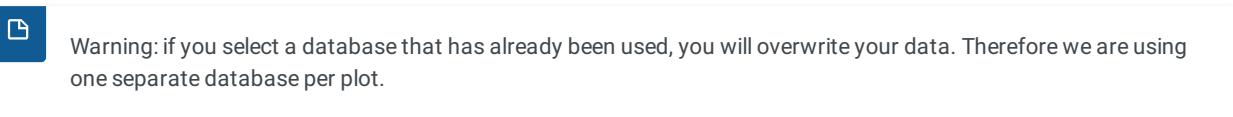
2.4 Populate the database by selecting all 9 annotated .tiff or .tif pictures of this plot.

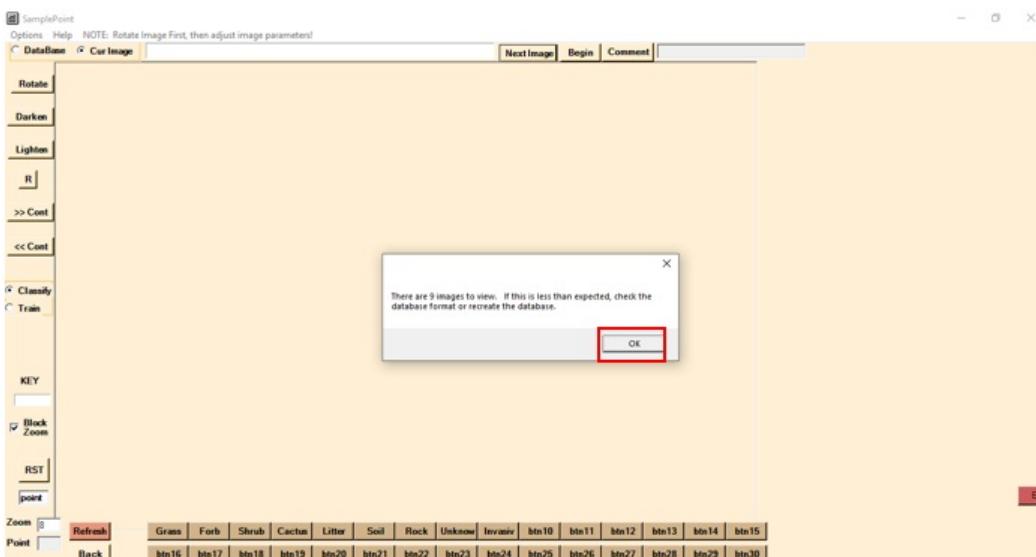
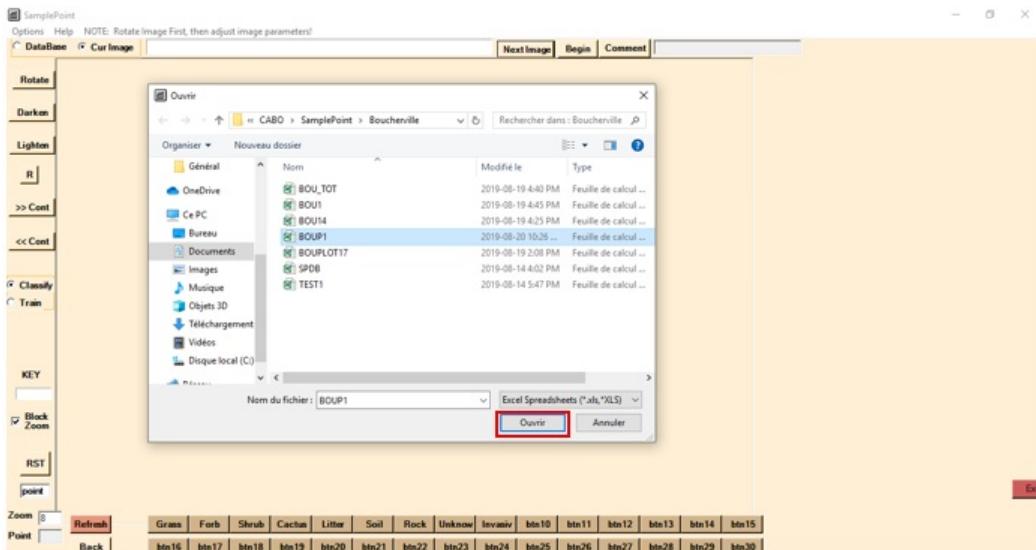


2.5 Select Done and OK to complete.



2.6 Follow Options → Select DataBase, and select the file that you want to fill, then OK to open your database in *SamplePoint*.





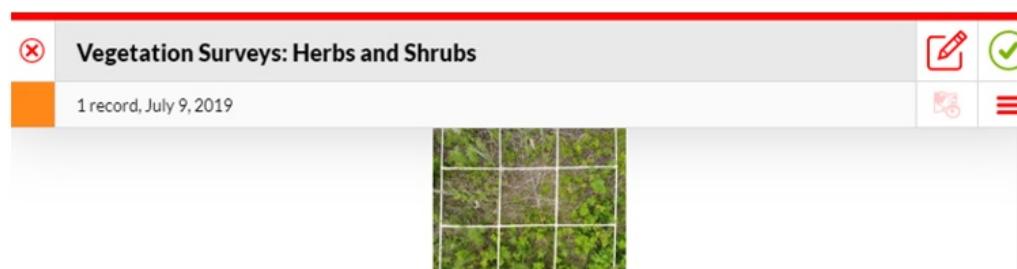
2.7 Create, upload or edit a *SamplePoint* button file for classifying the plot.

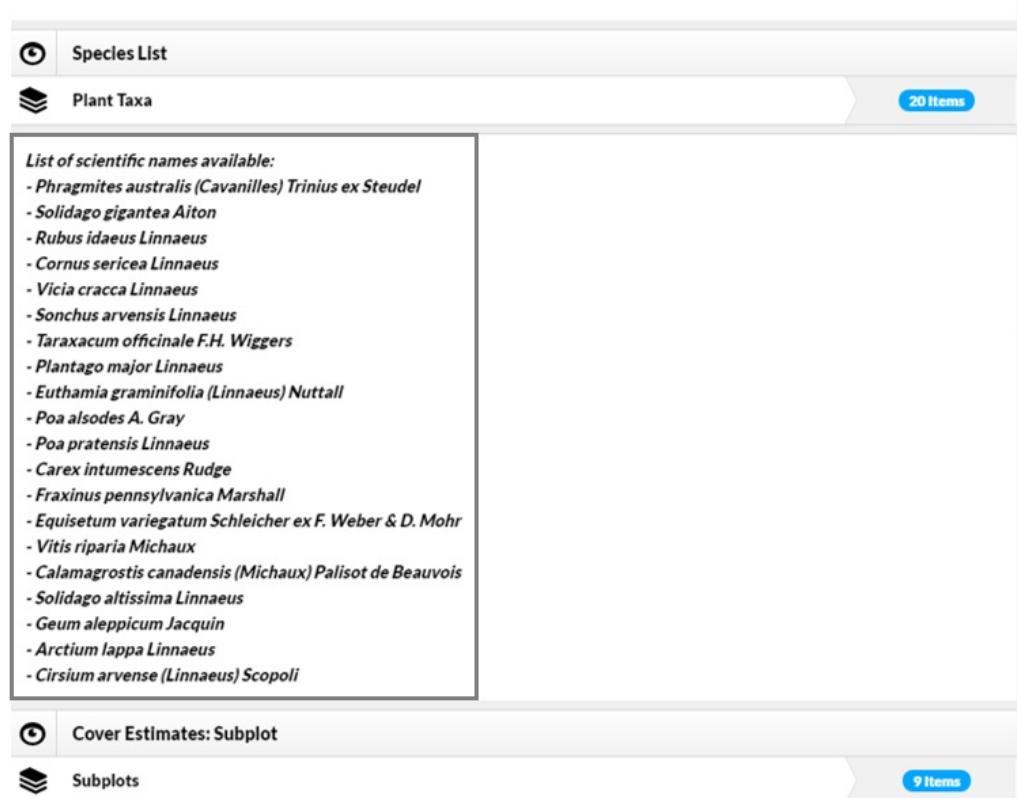
For every plot, using the plot species list in *Fulcrum*, under Vegetation Surveys: Herbs and Shrubs → [Appropriate plot] → Species List, all the species* must appear as a button in *SamplePoint*.



SamplePoint allows for a maximum of 30 classification buttons.

- *: If there are more than 30 species in your list, add a button named Other that you will edit appropriately afterwards in the plot Excel Database. Make notes of the species of these Other-classified points in each subplot where they occur.
- Always include one button named Unknown, used for when you are not sure of the plant ID (for ex.: because of shade).
- If necessary, add buttons named Ground or Water.
- If necessary, add a button named Dry for cases where a plant is unidentifiable because only a dry stem remains.




List of scientific names available:
- *Phragmites australis* (Cavannilles) Triniius ex Steudel
- *Solidago gigantea* Aiton
- *Rubus idaeus* Linnaeus
- *Cornus sericea* Linnaeus
- *Vicia cracca* Linnaeus
- *Sonchus arvensis* Linnaeus
- *Taraxacum officinale* F.H. Wiggers
- *Plantago major* Linnaeus
- *Euthamia graminifolia* (Linnaeus) Nuttall
- *Poa alsodes* A. Gray
- *Poa pratensis* Linnaeus
- *Carex intumescens* Rudge
- *Fraxinus pennsylvanica* Marshall
- *Equisetum variegatum* Schleicher ex F. Weber & D. Mohr
- *Vitis riparia* Michaux
- *Calamagrostis canadensis* (Michaux) Palisot de Beauvois
- *Solidago altissima* Linnaeus
- *Geum aleppicum* Jacquin
- *Arctium lappa* Linnaeus
- *Cirsium arvense* (Linnaeus) Scopoli

- 2.8 Create a new set of buttons in *SamplePoint* by following Options → Custom Buttons → Create Custom Button Files.



- 2.9 Fill in the button names (4 letters, see buttons_explanations joined file) and descriptions (latin or common name; no single quotation marks) for every ground cover that will be used (ex.: species, bare ground, water, unknown, or other).

Button	Description (optional)	ShortCat	Description (optional)	ShortCat
Button 1		Button 16		
Button 2		Button 17		
Button 3		Button 18		
Button 4		Button 19		
Button 5		Button 20		
Button 6		Button 21		
Button 7		Button 22		
Button 8		Button 23		
Button 9		Button 24		
Button 10		Button 25		
Button 11		Button 26		
Button 12		Button 27		
Button 13		Button 28		
Button 14		Button 29		
Button 15		Button 30		

NOTE: a description can contain any character EXCEPT the *. It must also be less than 256 characters.
NOTE: Y, y, N, and n are NOT allowed as ShortCat!

Cancel Load Existing Save Back PLMA PLAE POFR RUDL GEAL VICH SOAL SONCH SOGI ARLA VISP TAXDF PHLA unknown

Button	Description (optional)	ShortCat	Description (optional)	ShortCat
Button 1	LYSIA	Lithrum salicaria	Plantago major	PLMA
Button 2	ASCASY	Aesculus x carnea	Filum des broquets	PLAE
Button 3	CALICA	Calaenagnate canadienne	Filum des prés	POFR
Button 4	CARL	Carex L.	Rubus idaeus	RUDL
Button 5	CORE	Coronilla varia	Geum aleppicum	GEAL
Button 6	FRSPE	Fragaria ananassa	Moschata	VICH
Button 7	EQVVA	Gallium verum	Solidago alascensis	SOAL
Button 8	EUGUA	Euthamia graminifolia	Sonchus arvensis	SONCH
Button 9	GATRI	Gaultheria shallon	Solidago gigantea	SOGI
Button 10	ONSE	Oncidium sensibile	Artemisia lepida	ARLA
Button 11	CIRAR	Cirsium heterophyllum	Urtica dioica	VISP
Button 12	APDA	Apocynum androsaemifolium	Arthusa sylvatica	ANSY
Button 13	PNAU	Phragmites australis (variegata)	Taraxacum officinale	TAXDF
Button 14	AGBGG	Agrimonia gryposepala	Phytomyza eriophyes	PHLA
Button 15	FRVI	Fragaria virginiana	unknown	unknown

NOTE: a description can contain any character EXCEPT the *. It must also be less than 256 characters.
NOTE: Y, y, N, and n are NOT allowed as ShortCat!

Cancel Load Existing Save Back PLMA PLAE POFR RUDL GEAL VICH SOAL SONCH SOGI ARLA VISP TAXDF PHLA unknown

4 letter names in caps lock can be seen more clearly and thus are more convenient.

- 2.10 If a set of buttons already exists for the site, use it as a base to create this new set by clicking on Load Existing. Make the required edits by renaming the appropriate button names and descriptions.



The original button file will remain intact if the new one is given a new name.

SamplePoint
Define Custom Buttons

Description (optional)		ShortCut	Description (optional)		ShortCut
Button 1			Button 16		
Button 2			Button 17		
Button 3			Button 18		
Button 4			Button 19		
Button 5			Button 20		
Button 6			Button 21		
Button 7			Button 22		
Button 8			Button 23		
Button 9			Button 24		
Button 10			Button 25		
Button 11			Button 26		
Button 12			Button 27		
Button 13			Button 28		
Button 14			Button 29		
Button 15			Button 30		

NOTE: a description can contain any character EXCEPT the *. It must also be less than 256 characters.
NOTE: Y, y, N, and n are NOT allowed as ShortCuts!

Cancel Load Existing Save Back PLMA POAL POPR RUID GEAL VCR SOAL SONCH SOGI ARLA VIRIP ANSY TAXOF PHLA unknown

SamplePoint
Define Custom Buttons

Description (optional)		ShortCut	Description (optional)		ShortCut
Button 1	LYSA	Lithrum salicaria	Button 16	PLMA	Partage major
Button 2	ASCSY	Aesculus syriaca	Button 17	POAL	Poa alodes
Button 3	CALCA	Calamagrostis canadensis	Button 18	POPR	Poa pratensis
Button 4	CARL	Carex L.	Button 19	RUID	Rubus idaeus
Button 5	CORSE	Coronaria sibirica	Button 20	GEAL	Geum aleppicum
Button 6	FRPE	Fraxinus pennsylvanica	Button 21	VICR	Viola cracca
Button 7	EQVA	Equisetum variegatum	Button 22	SOAL	Solidago altissima
Button 8	EUGR	Euthamia graminifolia	Button 23	SONCI	Sonchus arvensis
Button 9	GATR	Gaultheria trifolia	Button 24	SOGI	Solidago gigantea
Button 10	ONSE	Oenothera serrulata	Button 25	ARLA	Arctium lappa
Button 11	CIRAR	Osmunda cinnamomea	Button 26	VIRIP	Vitis riparia
Button 12	APOAN	Apocynum androsaemifolium	Button 27	ANSY	Anthriscus sylvestris
Button 13	PHAU	Phragmites australis (Cavallines) Trin ex Steudel subsp. Australis	Button 28	TAXOF	Taraxacum officinale
Button 14	agrigrig	Agrostis gigantea	Button 29	PHLA	Phalaris arundinacea
Button 15	FRVI	Fragaria virginiana	Button 30	unknown	unknown

NOTE: a description can contain any character EXCEPT the *. It must also be less than 256 characters.
NOTE: Y, y, N, and n are NOT allowed as ShortCuts!

Cancel Load Existing Save Back PLMA POAL POPR RUID GEAL VCR SOAL SONCH SOGI ARLA VIRIP ANSY TAXOF PHLA unknown

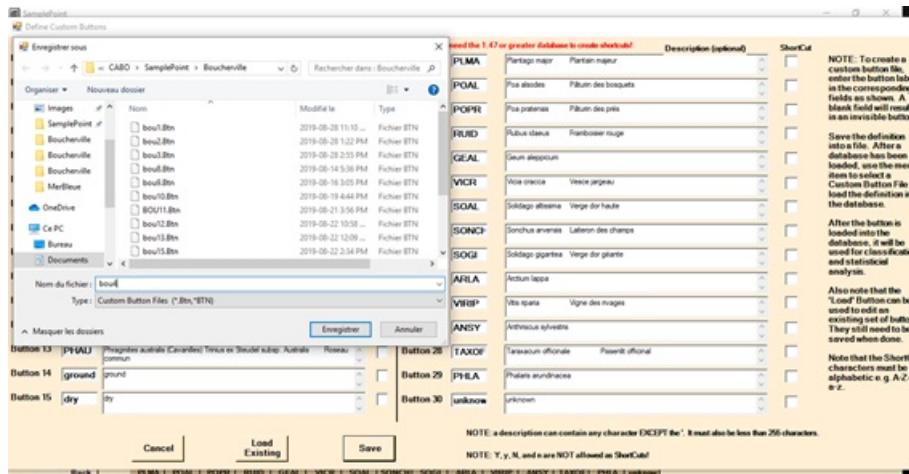
SamplePoint
Define Custom Buttons

Description (optional)		ShortCut	Description (optional)		ShortCut
Button 1	CAIN	Carex intumescens	Button 16	PLMA	Partage major
Button 2	ASCSY	Aesculus syriaca	Button 17	POAL	Poa alodes
Button 3	CALCA	Calamagrostis canadensis	Button 18	POPR	Poa pratensis
Button 4	CARL	Carex L.	Button 19	RUID	Rubus idaeus
Button 5	CORSE	Coronaria sibirica	Button 20	GEAL	Geum aleppicum
Button 6	FRPE	Fraxinus pennsylvanica	Button 21	VICR	Viola cracca
Button 7	EQVA	Equisetum variegatum	Button 22	SOAL	Solidago altissima
Button 8	EUGR	Euthamia graminifolia	Button 23	SONCI	Sonchus arvensis
Button 9	GATR	Gaultheria trifolia	Button 24	SOGI	Solidago gigantea
Button 10	agrigrig	Agrostis gigantea	Button 25	ARLA	Arctium lappa
Button 11	CIRAR	Osmunda cinnamomea	Button 26	VIRIP	Vitis riparia
Button 12	APOAN	Apocynum androsaemifolium	Button 27	ANSY	Anthriscus sylvestris
Button 13	PHAU	Phragmites australis (Cavallines) Trin ex Steudel subsp. Australis	Button 28	TAXOF	Taraxacum officinale
Button 14	ground	commun	Button 29	PHLA	Phalaris arundinacea
Button 15	dry	dry	Button 30	unknown	unknown

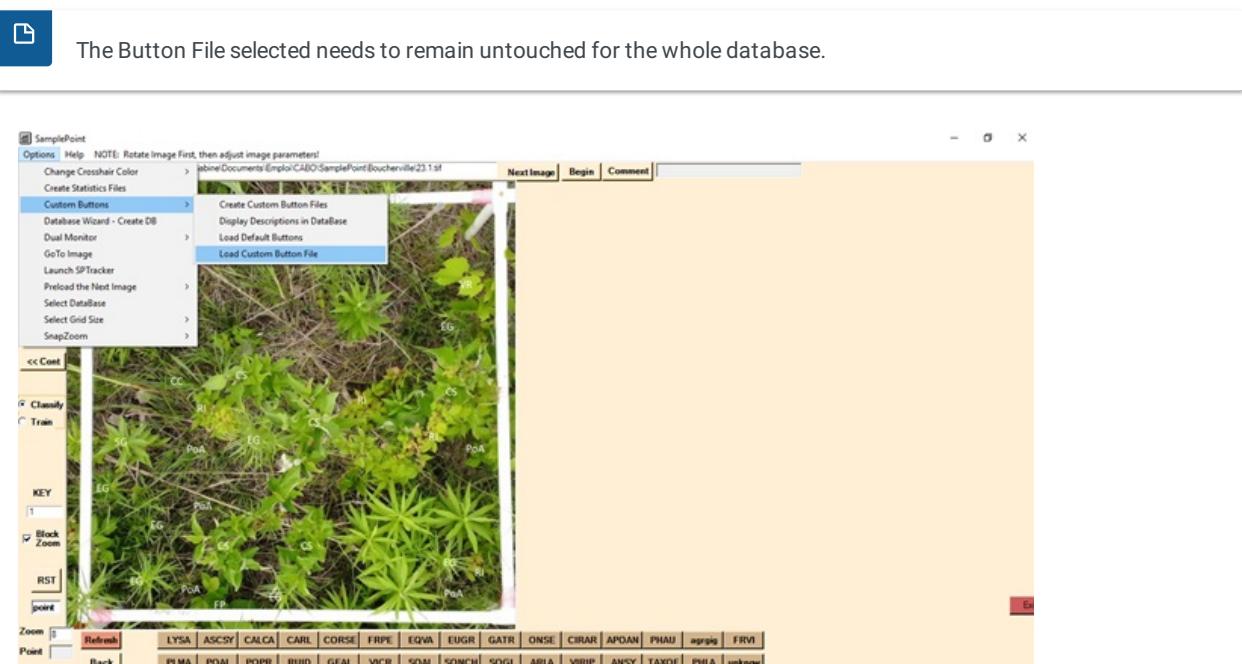
NOTE: a description can contain any character EXCEPT the *. It must also be less than 256 characters.
NOTE: Y, y, N, and n are NOT allowed as ShortCuts!

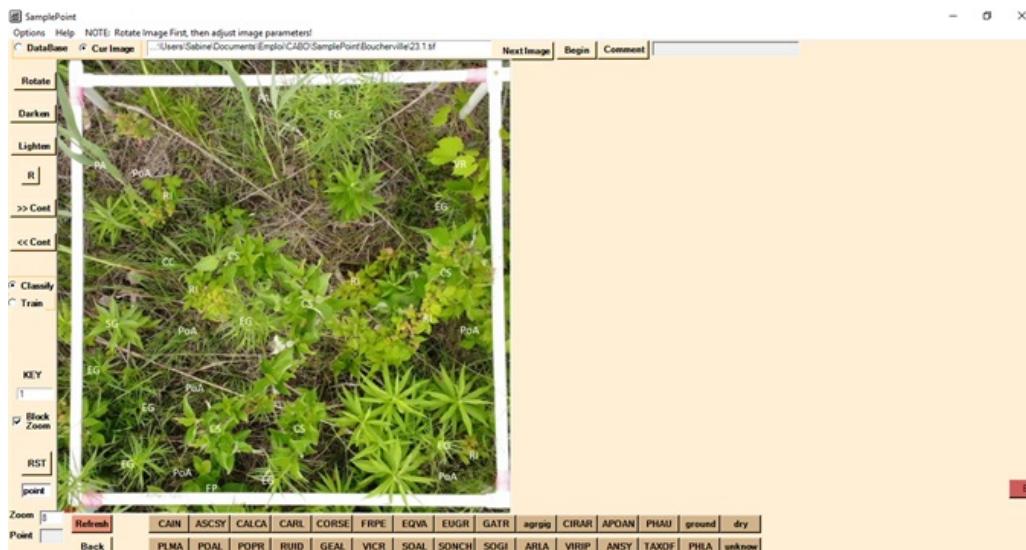
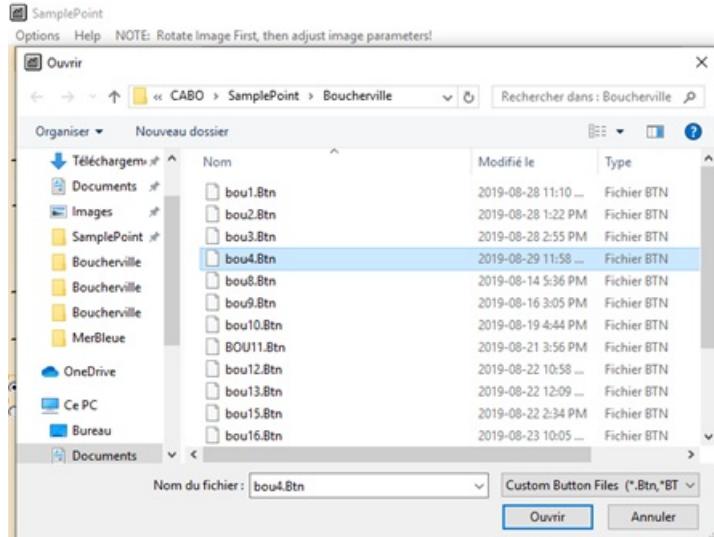
Cancel Load Existing Save Back PLMA POAL POPR RUID GEAL VCR SOAL SONCH SOGI ARLA VIRIP ANSY TAXOF PHLA unknown

2.11 Save and name this new custom button file.



2.12 In *SamplePoint*, follow Options → Custom Buttons → Load Custom Button File to select and load the buttons that you will be using to classify the photos from your database.





- 2.13 Edit the picture as needed. The rotation has to be done once only, before classification. The rest can be done at any point and undone by clicking on R.



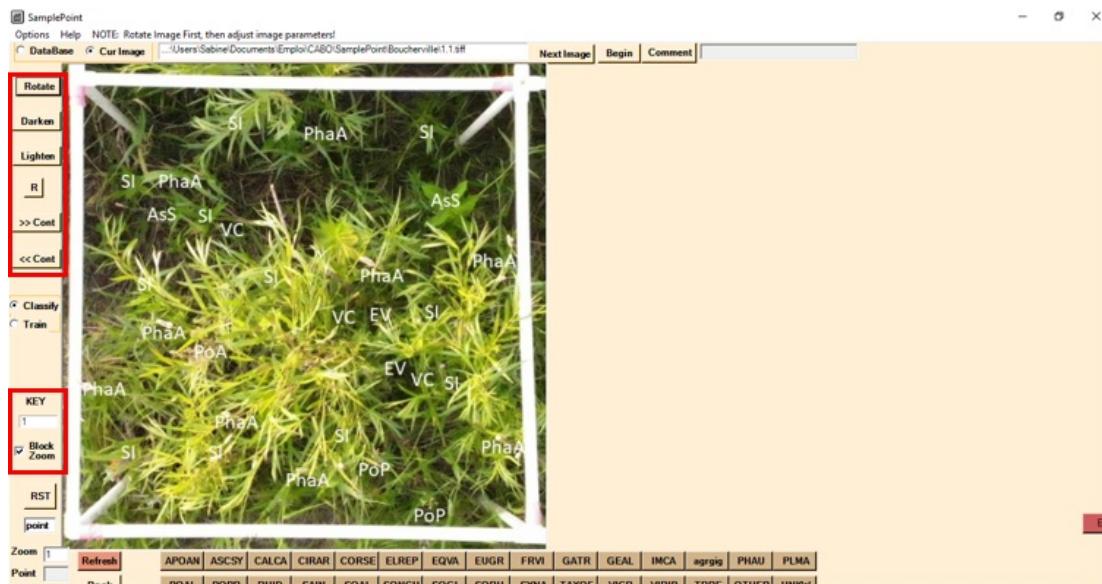
Use the buttons on the left menu to Rotate*, Darken, Lighten, reset (R), increase contrast (>> Cont), or lower contrast (<< Cont) of the picture.

Key indicates the Subplot number.

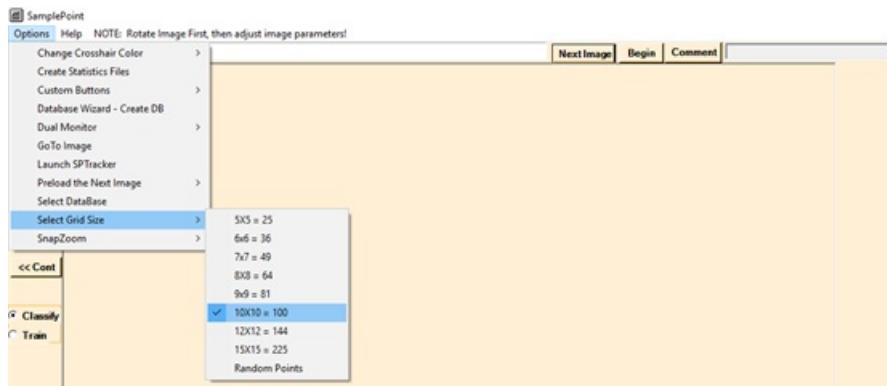
Leave Block Zoom ticked. Only untick it if your computer performances are slow.

*: Use the subplot number (title of the picture) and compare the picture in *SamplePoint* to its copy in *Fulcrum*** to know what rotation is needed.

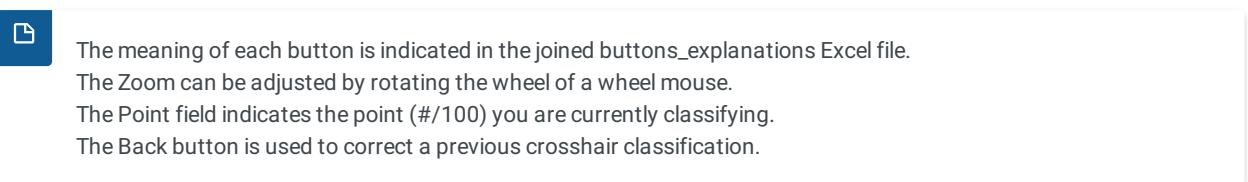
**: Especially useful for subplot no. 5.



- 2.14 Under Options → Select Grid Size, select $10 \times 10 = 100$. This means that we are using a 10×10 grid of points (100 crosshairs) to classify each subplot.



- 2.15 Click on Begin to start classifying. The 100 crosshairs are now regularly placed on the image, and one crosshair at a time (the red one) will be activated. To classify it, click on one of the 30 buttons of the lower menu.





- 2.16 To classify each crosshair, help yourself by opening (ideally on a different monitor) the *Fulcrum* Vegetation Survey: Herbs and Shrubs of that specific plot. Before starting to work on each subplot, open in two different tabs 1) the species list for the subplot and 2) the Original picture (not annotated) of that subplot.

 Compare the *Fulcrum* species list to the annotated picture on *SamplePoint* to locate where the different species are. Use the zoom in the Original picture, as well and the Lighten, Darken, and contrast options in *SamplePoint* to help identify less obvious plants.

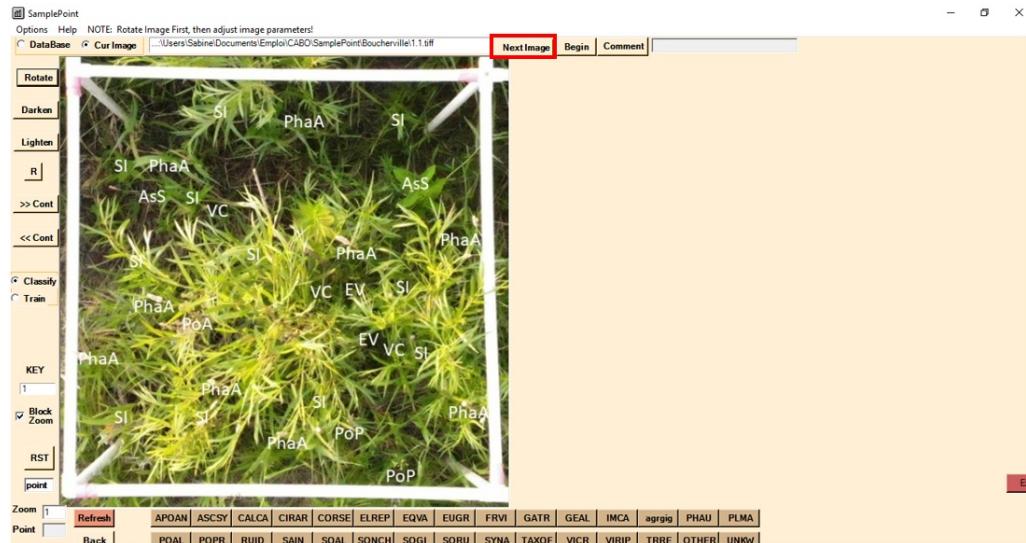
Subplots			
	1 record / Cover Estimates (7 items)		
	Asclepias syriaca Linnaeus		
	Phalaris arundinacea Linnaeus		
	Vicia cracca Linnaeus		
	Salix interior Rowlee		
	Equisetum variegatum Schleicher ex F. Weber & D. Mohr		
	Poa pratensis Linnaeus		
	Poa alsodes A. Gray		

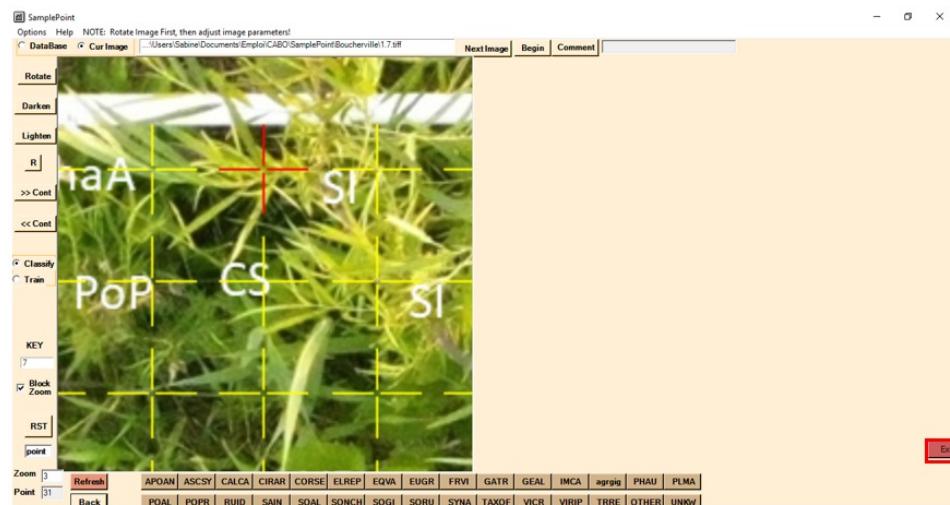
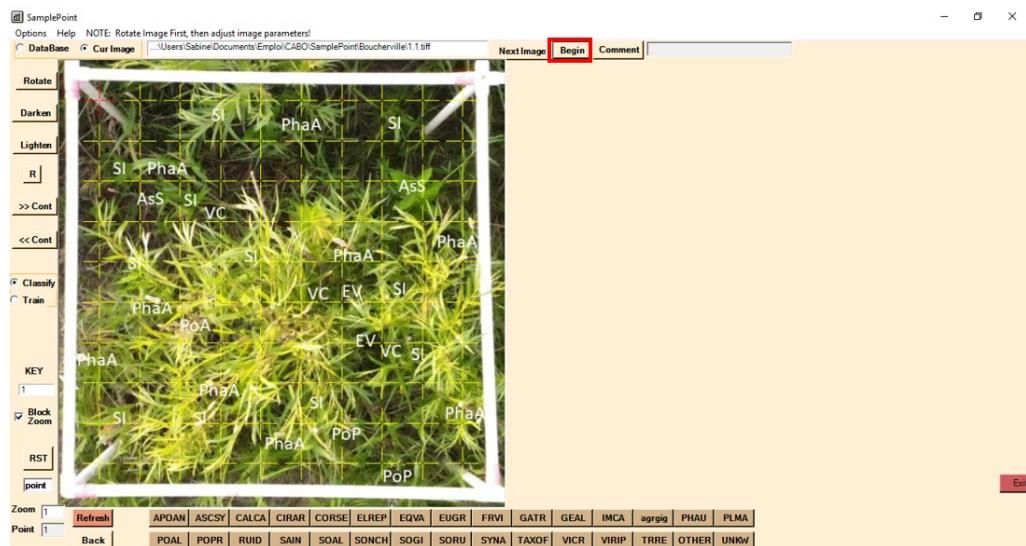


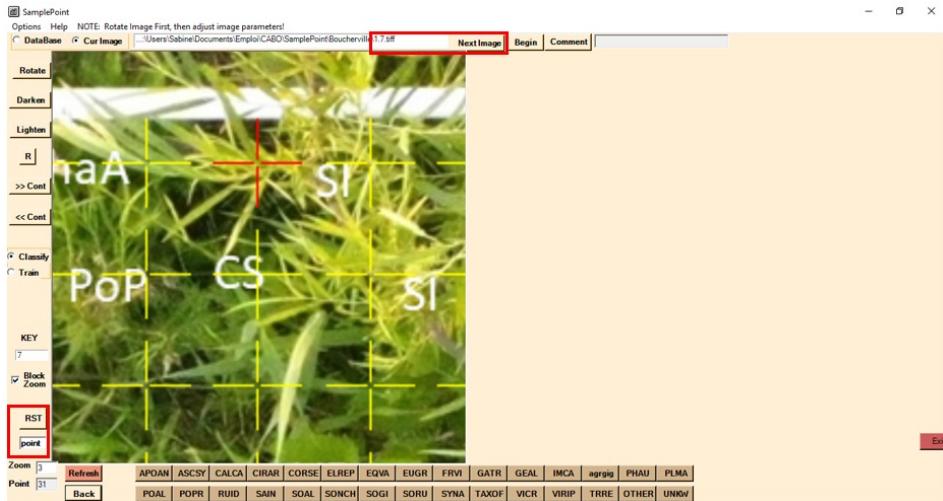
- 2.17 When the 100 points of an image have been classified, click on Next Image, then Begin to start again for the next image (= key = subplot).



You can stop working on a plot at any time (at the end of a plot, at the end of a subplot, or through a subplot) by clicking on the Exit button in the lower right corner of the screen. Make a note of the point where you stopped. To start back where you left, click Next image on the top menu until you reach the desired image. Then, enter the number of the point in the point field in the left menu and hit RST (restart).







Data Combining

3 Combine all the databases into one. Keep the originals as a backup.

The screenshot shows a Windows File Explorer window. The left sidebar shows a navigation tree with 'Accès rapide', 'Bureau', 'Téléchargement', 'Documents', 'Images', 'SamplePoint', 'Boucherville', 'Boucherville', 'MerBleue', 'OneDrive', 'Ce PC', 'Bureau', 'Documents', 'Images', 'Musique', 'Objets 3D', 'Téléchargement', 'Vidéos', and 'Disque local (C:)'. The main pane displays a list of CSV files from the 'SamplePoint' folder. The files are sorted by name and contain data with columns for species names and numerical values. A red box highlights the 'boucherville' file in the list.

File Name	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12	Column 13	Column 14	Column 15	Column 16	Column 17	Column 18	Column 19	Column 20	Column 21	Column 22	Column 23	Column 24	Column 25	Column 26	Column 27	Column 28	Column 29	Column 30	Column 31	Column 32	Column 33	Column 34	Column 35	Column 36	Column 37	Column 38	Column 39	Column 40	Column 41	Column 42	Column 43	Column 44	Column 45	Column 46	Column 47	Column 48	Column 49	Column 50	Column 51	Column 52	Column 53	Column 54	Column 55	Column 56	Column 57	Column 58	Column 59	Column 60	Column 61	Column 62	Column 63	Column 64	Column 65	Column 66	Column 67	Column 68	Column 69	Column 70	Column 71	Column 72	Column 73	Column 74	Column 75	Column 76	Column 77	Column 78	Column 79	Column 80	Column 81	Column 82	Column 83	Column 84	Column 85	Column 86	Column 87	Column 88	Column 89	Column 90	Column 91	Column 92	Column 93	Column 94	Column 95	Column 96	Column 97	Column 98	Column 99	Column 100	Column 101	Column 102	Column 103	Column 104	Column 105	Column 106	Column 107	Column 108	Column 109	Column 110	Column 111	Column 112	Column 113	Column 114	Column 115	Column 116	Column 117	Column 118	Column 119	Column 120	Column 121	Column 122	Column 123	Column 124	Column 125	Column 126	Column 127	Column 128	Column 129	Column 130	Column 131	Column 132	Column 133	Column 134	Column 135	Column 136	Column 137	Column 138	Column 139	Column 140	Column 141	Column 142	Column 143	Column 144	Column 145	Column 146	Column 147	Column 148	Column 149	Column 150	Column 151	Column 152	Column 153	Column 154	Column 155	Column 156	Column 157	Column 158	Column 159	Column 160	Column 161	Column 162	Column 163	Column 164	Column 165	Column 166	Column 167	Column 168	Column 169	Column 170	Column 171	Column 172	Column 173	Column 174	Column 175	Column 176	Column 177	Column 178	Column 179	Column 180	Column 181	Column 182	Column 183	Column 184	Column 185	Column 186	Column 187	Column 188	Column 189	Column 190	Column 191	Column 192	Column 193	Column 194	Column 195	Column 196	Column 197	Column 198	Column 199	Column 200	Column 201	Column 202	Column 203	Column 204	Column 205	Column 206	Column 207	Column 208	Column 209	Column 210	Column 211	Column 212	Column 213	Column 214	Column 215	Column 216	Column 217	Column 218	Column 219	Column 220	Column 221	Column 222	Column 223	Column 224	Column 225	Column 226	Column 227	Column 228	Column 229	Column 230	Column 231	Column 232	Column 233	Column 234	Column 235	Column 236	Column 237	Column 238	Column 239	Column 240	Column 241	Column 242	Column 243	Column 244	Column 245	Column 246	Column 247	Column 248	Column 249	Column 250	Column 251	Column 252	Column 253	Column 254	Column 255	Column 256	Column 257	Column 258	Column 259	Column 260	Column 261	Column 262	Column 263	Column 264	Column 265	Column 266	Column 267	Column 268	Column 269	Column 270	Column 271	Column 272	Column 273	Column 274	Column 275	Column 276	Column 277	Column 278	Column 279	Column 280	Column 281	Column 282	Column 283	Column 284	Column 285	Column 286	Column 287	Column 288	Column 289	Column 290	Column 291	Column 292	Column 293	Column 294	Column 295	Column 296	Column 297	Column 298	Column 299	Column 300	Column 301	Column 302	Column 303	Column 304	Column 305	Column 306	Column 307	Column 308	Column 309	Column 310	Column 311	Column 312	Column 313	Column 314	Column 315	Column 316	Column 317	Column 318	Column 319	Column 320	Column 321	Column 322	Column 323	Column 324	Column 325	Column 326	Column 327	Column 328	Column 329	Column 330	Column 331	Column 332	Column 333	Column 334	Column 335	Column 336	Column 337	Column 338	Column 339	Column 340	Column 341	Column 342	Column 343	Column 344	Column 345	Column 346	Column 347	Column 348	Column 349	Column 350	Column 351	Column 352	Column 353	Column 354	Column 355	Column 356	Column 357	Column 358	Column 359	Column 360	Column 361	Column 362	Column 363	Column 364	Column 365	Column 366	Column 367	Column 368	Column 369	Column 370	Column 371	Column 372	Column 373	Column 374	Column 375	Column 376	Column 377	Column 378	Column 379	Column 380	Column 381	Column 382	Column 383	Column 384	Column 385	Column 386	Column 387	Column 388	Column 389	Column 390	Column 391	Column 392	Column 393	Column 394	Column 395	Column 396	Column 397	Column 398	Column 399	Column 400	Column 401	Column 402	Column 403	Column 404	Column 405	Column 406	Column 407	Column 408	Column 409	Column 410	Column 411	Column 412	Column 413	Column 414	Column 415	Column 416	Column 417	Column 418	Column 419	Column 420	Column 421	Column 422	Column 423	Column 424	Column 425	Column 426	Column 427	Column 428	Column 429	Column 430	Column 431	Column 432	Column 433	Column 434	Column 435	Column 436	Column 437	Column 438	Column 439	Column 440	Column 441	Column 442	Column 443	Column 444	Column 445	Column 446	Column 447	Column 448	Column 449	Column 450	Column 451	Column 452	Column 453	Column 454	Column 455	Column 456	Column 457	Column 458	Column 459	Column 460	Column 461	Column 462	Column 463	Column 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646	Column 647	Column 648	Column 649	Column 650	Column 651	Column 652	Column 653	Column 654	Column 655	Column 656	Column 657	Column 658	Column 659	Column 660	Column 661	Column 662	Column 663	Column 664	Column 665	Column 666	Column 667	Column 668	Column 669	Column 670	Column 671	Column 672	Column 673	Column 674	Column 675	Column 676	Column 677	Column 678	Column 679	Column 680	Column 681	Column 682	Column 683	Column 684	Column 685	Column 686	Column 687	Column 688	Column 689	Column 690	Column 691	Column 692	Column 693	Column 694	Column 695	Column 696	Column 697	Column 698	Column 699	Column 700	Column 701	Column 702	Column 703	Column 704	Column 705	Column 706	Column 707	Column 708	Column 709	Column 710	Column 711	Column 712	Column 713	Column 714	Column 715	Column 716	Column 717	Column 718	Column 719	Column 720	Column 721	Column 722	Column 723	Column 724	Column 725	Column 726	Column 727	Column 728	Column 729	Column 730	Column 731	Column 732	Column 733	Column 734	Column 735	Column 736	Column 737	Column 738	Column 739	Column 740	Column 741	Column 742	Column 743	Column 744	Column 745	Column 746	Column 747	Column 748	Column 749	Column 750	Column 751	Column 752	Column 753	Column 754	Column 755	Column 756	Column 757	Column 758	Column 759	Column 760	Column 761	Column 762	Column 763	Column 764	Column 765	Column 766	Column 767	Column 768	Column 769	Column 770	Column 771	Column 772	Column 773	Column 774	Column 775	Column 776	Column 777	Column 778	Column 779	Column 780	Column 781	Column 782	Column 783	Column 784	Column 785	Column 786	Column 787	Column 788	Column 789	Column 790	Column 791	Column 792	Column 793	Column 794	Column 795	Column 796	Column 797	Column 798	Column 799	Column 800	Column 801	Column 802	Column 803	Column 804	Column 805	Column 806	Column 807	Column 808	Column 809	Column 810	Column 811	Column 812	Column 813	Column 814	Column 815	Column 816	Column 817	Column 818	Column 819	Column 820	Column 821	Column 822	Column 823	Column 824	Column 825	Column 826	Column 827	Column 828	Column 829	Column 830	Column 831	Column 832	Column 833	Column 834	Column 835	Column 836	Column 837	Column 838	Column 839	Column 840	Column 841	Column 842	Column 843	Column 844	Column 845	Column 846	Column 847	Column 848	Column 849	Column 850	Column 851	Column 852	Column 853	Column 854	Column 855	Column 856	Column 857	Column 858	Column 859	Column 860	Column 861	Column 862	Column 863	Column 864	Column 865	Column 866	Column 867	Column 868	Column 869	Column 870	Column 871	Column 872	Column 873	Column 874	Column 875	Column 876	Column 877	Column 878	Column 879	Column 880	Column 881	Column 882	Column 883	Column 884	Column 885	Column 886	Column 887	Column 888	Column 889	Column 890	Column 891	Column 892	Column 893	Column 894	Column 895	Column 896	Column 897	Column 898	Column 899	Column 900	Column 901	Column 902	Column 903	Column 904	Column 905	Column 906	Column 907	Column 908	Column 909	Column 910	Column 911	Column 912	Column 913	Column 914	Column 915	Column 916	Column 917	Column 918	Column 919	Column 920	Column 921	Column 922	Column 923	Column 924	Column 925	Column 926	Column 927	Column 928	Column 929	Column 930	Column 931	Column 932	Column 933	Column 934	Column 935	Column 936	Column 937	Column 938	Column 939	Column 940	Column 941	Column 942	Column 943	Column 944	Column 945	Column 946	Column 947	Column 948	Column 949	Column 950	Column 951	Column 952	Column 953	Column 954	Column 955	Column 956	Column 957	Column 958	Column 959	Column 960	Column 961	Column 962	Column 963	Column 964	Column 965	Column 966	Column 967	Column 968	Column 969	Column 970	Column 971	Column 972	Column 973	Column 974	Column 975	Column 976	Column 977	Column 978	Column 979	Column 980	Column 981	Column 982	Column 983	Column 984	Column 985	Column 986	Column 987	Column 988	Column 989	Column 990	Column 991	Column 992	Column 993	Column 994	Column 995	Column 996	Column 997	Column 998	Column 999	Column 1000
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key	image	Comment	GridSize	Point1	Point2	Point3	Point4	Point5	Point6	Point7
1	5.1.tif		100	SOGI, 154, 172, SOGL, 120, 1, FRPE, 162, 1, FRPE, 132, 1, FRPE, 111, 1, FRPE, 155, 1, SOGI, 118, 1						
2	5.2.tif		100	SOGI, 32, 37, 16, FRPE, 132, 1, CARL, 42, 44, EQVA, 90, 94, CALCA, 41, 5, CALCA, 54, 5, POAL, 129,						
3	5.3.tif		100	APOAN, 136, 15, GEAL, 37, 33, CALCA, 26, 2, CALCA, 123, CALCA, 112, CALCA, 90, 1, CALCA, 115,						
4	5.4.tif		100	APOAN, 255, 25, UNKW, 55, 51, CALCA, 85, 5, SOGI, 99, 11, UNKW, 58, 5, CALCA, 92, 1, CALCA, 38,						
5	5.5.tif		100	PLMA, 73, 82, 6, EUGR, 129, 1, FRPE, 91, 10, SOGI, 101, 1, SOGI, 88, 11, CALCA, 84, 5, SOGI, 103,						
6	5.6.tif		100	POAL, 132, 139, EUGR, 167, 1, SOGI, 112, 1, SOGI, 87, 11, SOGI, 52, 74, FRVI, 73, 91, FRVI, 45, 41						
7	5.7.tif		100	SOGI, 142, 168, 1, SOGI, 110, 1, CALCA, 135, SOGI, 122, 1, CALCA, 88, 1, CALCA, 163, CALCA, 88,						
8	5.8.tif		100	FRPE, 129, 156, POAL, 100, 1, SOGI, 158, 1, SOGI, 175, 2, EQVA, 104, 1, EQVA, 87, 95, EQVA, 55, 8						
9	5.9.tif		100	CALCA, 90, 100, CALCA, 57, 5, CALCA, 80, 5, CALCA, 58, 5, ASCSY, 143, CALCA, 51, 5, SOGI, 93, 12						
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22										

- 4 In Excel, create another version of the existing species per dot per subplot table, that doesn't contain the RGB values. To do so, copy the name of the image column and the point numbers row. Then, for a given point * subplot cell, write the formula =LEFT(E3,4). This new table must contain 900 cells (100 points * 9 subplots).

E3 being the name of the original cell, and 4 being the amount of characters kept, starting from the left.

key	image	Comment	GridSize	Point1	Point2	Point3
1	1.1.tif		100	UNKW, 193, 194, PHLA, 99, 9, PHLA, 89, 7,		
2	1.2.tif		100	SAIN, 147, 146, 1, UNKW, 25, 3, ASSY, 166, 1,		
3	1.3.tif		100	SAIN, 182, 192, 1, SAIN, 49, 57, SAIN, 47, 49		
4	1.4.tif		100	SAIN, 135, 150, 5, SAIN, 40, 54, SAIN, 21, 38,		
5	1.5.tif		100	SAIN, 141, 153, 4, SAIN, 82, 98, SAIN, 138, 14		
6	1.6.tif		100	SAIN, 67, 75, 23, SAIN, 79, 87, SAIN, 80, 87		
7	1.7.tif		100	POPR, 90, 87, 5, POPR, 142, 1, VICR, 79, 91,		
8	1.8.tif		100	ASSY, 45, 65, 14, SAIN, 76, 94, SAIN, 123, 14		
9	1.9.tif		100	UNKW, 30, 36, 1, UNKW, 33, 5, EUGR, 58, 7,		
10						
11						
12				1.1.tif	UNKW	PHLA
13				1.2.tif	UNKW	ASSY
14				1.3.tif	SAIN	SAIN
15				1.4.tif	SAIN	SAIN

- 5 In Excel, create a final table to calculate the percent cover (abundance) of each species in each subplot.

- The subplot numbers are now used as the top row, and the species button names as the left column.

- In each new cell, write the formula =COUNTIF(E\$12:CZ\$12, C23) where E\$12:CZ\$12 is the list of the 100 buttons for the given subplot, and C23 is the name Excel is searching for.

A	B	C	D	E	F	G	H	I	J
9	8 18.tif		100	ASSY, 45, 65, 14 SAIN, 76, 34 SAIN, 12, 14 SAIN, 85, 10 SAIN, 102, 12 SAIN, 207, 2					
10	9 19.tif		100	UNK, 30, 36, 1 UNK, 33, 5 EUGR, 58, 7 UNK, 43, 5 SAIN, 133, 16 SAIN, 121, 14					
11			11.tif	UNK	PHLA	PHLA	SAIN	UNK	SAIN
12			12.tif	SAIN	UNK	ASSY	SAIN	UNK	UNK
13			13.tif	SAIN	SAIN	SAIN	UNK	EUGR	
14			14.tif	SAIN	SAIN	SAIN	UNK	SAIN	
15			15.tif	SAIN	SAIN	SAIN	POAL	SAIN	
16			16.tif	SAIN	SAIN	SAIN	PHLA	SAIN	
17			17.tif	SAIN	SAIN	VICR	POAL	PHLA	
18			18.tif	POPR	POPR	SAIN	SAIN	SAIN	
19			19.tif	ASSY	SAIN	SAIN	SAIN	SAIN	
20			20.tif	UNK	UNK	EUGR	UNK	SAIN	
21			subplot1	subplot2	subplot3	subplot4	subplot5	subplot6	subplot7
22	Factor for unseen but present ≤ APAN			0.0	0.0	0.0	0.0	0.0	0.0
23	0.5	ASSY	E\$12:CZ\$12	C23	10	0.0	10	3.0	0.0
24	CACA			0.0	0.0	0.0	0.0	0.0	0.0

- The value that will appear in the new cell is the relative abundance of the given species in the given subplot.

A	B	C	D	E
9	8 18.tif		100	ASSY, 45,
10	9 19.tif		100	UNK, 30
11			1.1.tif	UNK
12			1.2.tif	SAIN
13			1.3.tif	SAIN
14			1.4.tif	SAIN
15			1.5.tif	SAIN
16			1.6.tif	SAIN
17			1.7.tif	POPR
18			1.8.tif	ASSY
19			1.9.tif	UNK
20			subplot1	subplot2
21	Factor for unseen but present ≤ APAN		0.0	
23	0.5	ASSY	3.0	
24	CACA		0.0	

- At the end of the table, add one row to calculate the sum of the relative abundances. The sum should be of 100.

Enregistrement automatique H ↻ ↻ ⌂

Fichier Accueil Insertion Mise en page Formules Données

Coller Presse-papiers Police Alignement

SOMME : X ✓ f_x =SOMME(D22:D62)

	A	B	C	D	E
27		ELRE		0.0	0.0
28		EQVA		2.0	5.0
29		EUGR		0.0	0.0
30		FRVI		0.0	0.0
31		GATR		0.0	0.0
32		GEAL		0.0	0.5
33		IMCA		0.0	0.0
34		AGGI		0.0	2.0
35		PHAU		0.0	0.0
36		PLMA		0.0	0.0
37		POAL		0.5	2.0
38		POPR		0.5	0.0
39		RUID		0.0	0.0
40		SAIN		69.0	31.0
41		SOAL		0.0	0.0
42		SOAR		0.0	0.0
43		SOGI		0.0	2.0
44		SORU		0.0	0.0
45		SYNA		0.0	0.0
46		TAOF		0.0	0.0
47		VICR		1.0	0.0
48		VIRI		0.0	0.0
49		TRRE		0.0	0.0
50		OTHR		0.0	0.0
51		UNKW		18.0	20.0
52		LYSA		0.0	0.0
53		PHLA		7.0	37.0
55		PHPR		0.0	0.0
56		ASIN		0.0	0.0
57		OHMA		0.0	0.0
58		TRDU		0.0	0.0
59		PHPY		0.0	0.0
60		EUMA		0.0	0.0
61		SALL		0.0	0.0
62		CARL		0.0	0.0
63			0 D22:D62	7	101.0
64					
65					

- Add one last row under the previous one, containing the number of species per subplot. The formula to enter is
=COUNTIF(D22:D62, ">0")
where the cells D22:D62 are the percent cover values across all species within the subplot, and >0 accounts for presence.

A	B	C	D	E
27		ELRE	0.0	0.0
28		EQVA	0.0	0.0
29		EUGR	0.0	0.0
30		FRVI	0.0	0.0
31		GATR	0.0	0.0
32		GEAL	0.0	0.0
33		IMCA	0.0	0.0
34		AGGI	84.0	87.0
35		PHAU	1.0	0.0
36		PLMA	0.5	1.0
37		POAL	0.0	0.0
38		POPR	0.0	0.0
39		RUID	0.0	0.0
40		SAIN	0.0	0.0
41		SOAL	0.0	0.0
42		SOAR	0.0	2.0
43		SOGI	1.0	0.0
44		SORU	0.0	0.0
45		SYNA	0.0	0.0
46		TAOF	0.0	1.0
47		VICR	0.0	0.0
48		VIRI	0.0	0.5
49		TRRE	0.0	0.0
50		OTHR	0.0	0.0
51		UNKW	0.0	0.0
52		FRPE	3.0	2.0
53		CARL	0.0	0.0
54		BEPo	0.0	0.0
55		CACR	0.0	0.0
56		0	0.0	0.0
57		0	100.5	100.5
58		">0")		7

- 6 Species that occur within the *Fulcrum* subplot species list BUT that are not observed by the point frame are assigned an abundance value of 0.5% in the Excel spreadsheet to account for their presence.



The last column (no. of species per subplot) of the table generated at step 5 is useful to compare your data to the *Fulcrum* records, when looking for absent species. Ground covers that are not species should be left out of the count.

Enregistrement automatique

Fichier Accueil Insertion Mise en page Formule

Coller Presse-papiers Police Alignement

F69

A	B	C	D
33	IMCA	0.0	
34	AGGI	0.0	
35	PHAU	0.0	
36	PLMA	0.0	
37	POAL	0.0	
38	POPR	0.0	
39	RUID	0.0	
40	SAIN	69.0	
41	SOAL	0.0	
42	SOAR	0.0	
43	SOGI	0.0	
44	SORU	0.0	
45	SYNA	0.0	
46	TAOF	0.0	
47	VICR	10	
48	VIRI	0.0	
49	TPRE	0.0	
50	OTHR	0.0	
51	UNKV	18.0	
52	LYSA	0.0	
53	PHLA	7.0	
55	PHPR	0.0	
56	ASIN	0.0	
57	QHMA	0.0	
58	TRDU	0.0	
59	PHPR	0.0	
60	EUMA	0.0	
61	SALL	0.0	
62	CARL	0.0	
63		0	100.0
64			5

The Excel spreadsheet generated from *SamplePoint* only contains 5 species, while the original *Fulcrum* record contains 7 in the same subplot.

Subplots

1 record / Cover Estimates (7 Items)

Asclepias syriaca Linnaeus	View >
Phalaris arundinacea Linnaeus	View >
Vicia cracca Linnaeus	View >
Salix interior Rowlee	View >
Equisetum variegatum Schleicher ex F. Weber & D. Mohr	View >
Poa pratensis Linnaeus	View >
Poa alsodes A. Gray	View >

A	B	C	D
33		IMCA	0.0
34		AGGI	0.0
35		PHAU	0.0
36		PLMA	0.0
37		POAL	0.5
38		POPR	0.5
39		RUID	0.0
40		SAIN	69.0
41		SOAL	0.0
42		SOAR	0.0
43		SOGI	0.0
44		SORU	0.0
45		SYNA	0.0
46		TAOF	0.0
47		VICR	1.0
48		VIRI	0.0
49		TRRE	0.0
50		OTHR	0.0
51		UNKV	18.0
52		LYSA	0.0
53		PHLA	7.0
55		PHPN	0.0
56		ASIN	0.0
57		QHMA	0.0
58		TROU	0.0
59		PHPN	0.0
60		EUMA	0.0
61		SALL	0.0
62		CARL	0.0
63			101.0
64			1

The species that were absent from the Excel spreadsheet generated from *SamplePoint* but present in the original *Fulcrum* record are given a value of abundance of 0.5% to account for their presence even though they were not targeted by the 100 crosshairs.

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