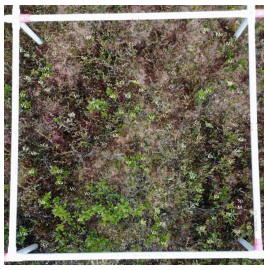
Apr 03, 2020

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



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Protocol status: In development
We are still developing and optimizing this protocol

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Protocol Integer ID: 30097

Keywords: open vegetation, virtual point frames, SamplePoint, DJI drone,

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).

Attachments

XLSX buttons_explanations...
18KB

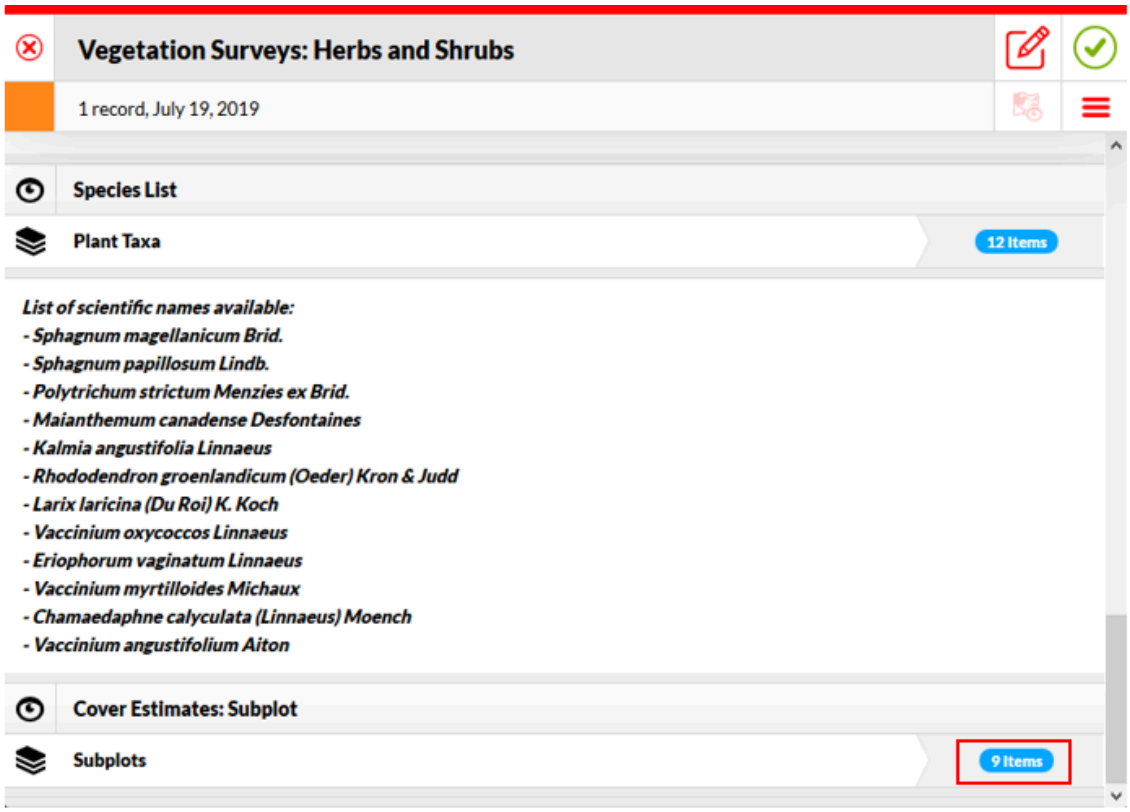
XLS BOU_TOT_21nov.XLS
3MB

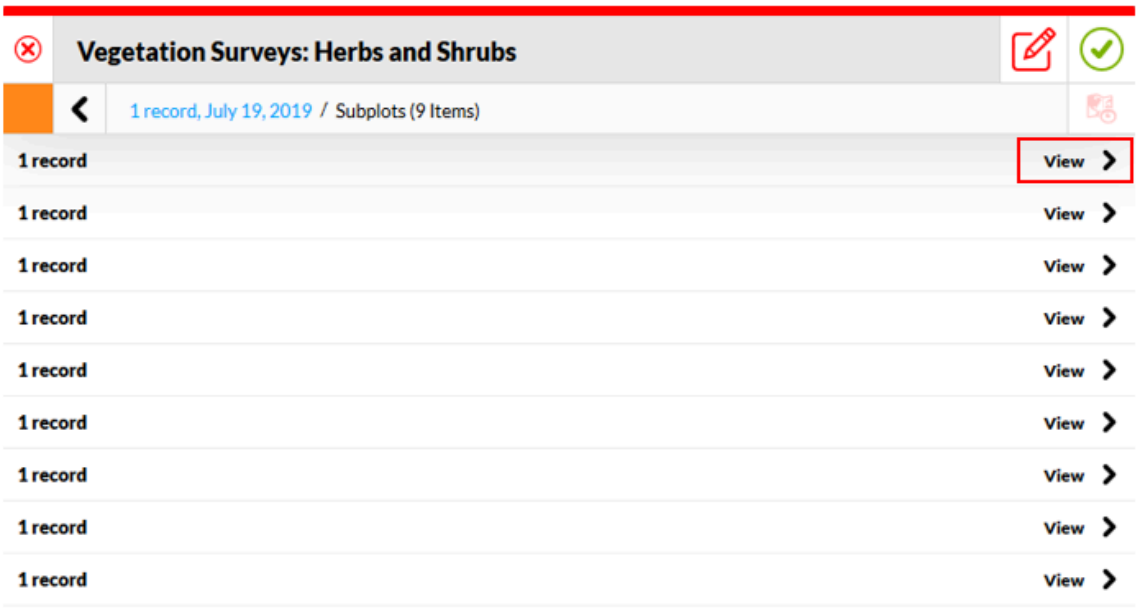
XLSX MB_TOT_15oct.xlsx
1.1MB

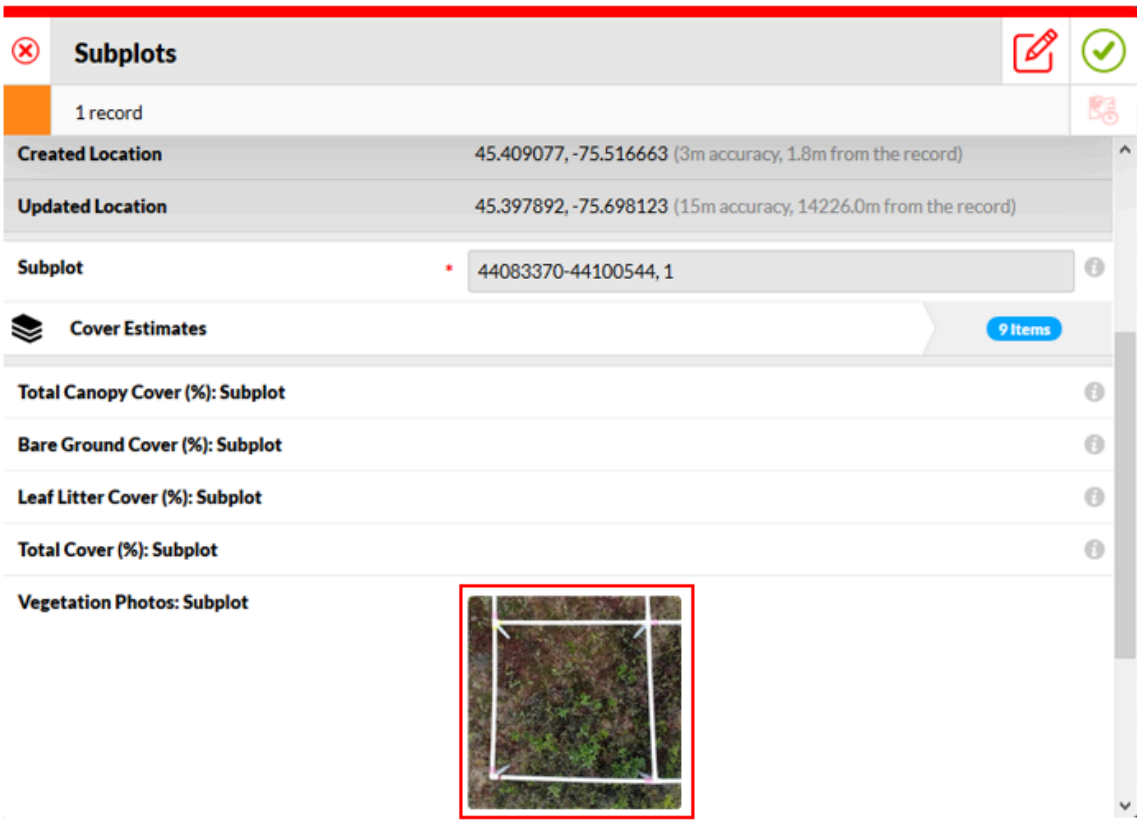
Photo Annotations

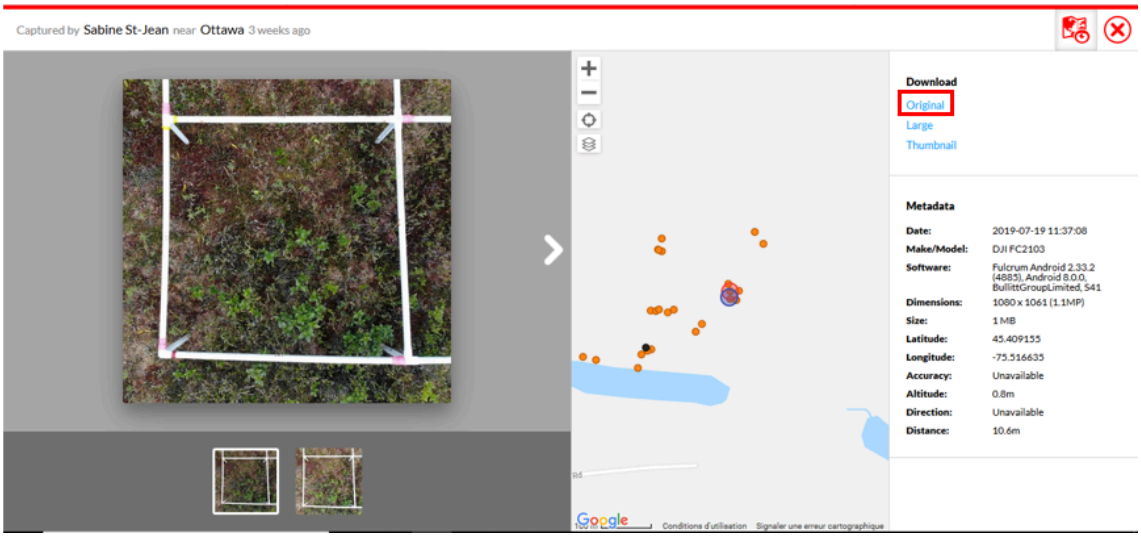
1 If the different species are difficult to tell apart visually, annotate the drone pictures.

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.



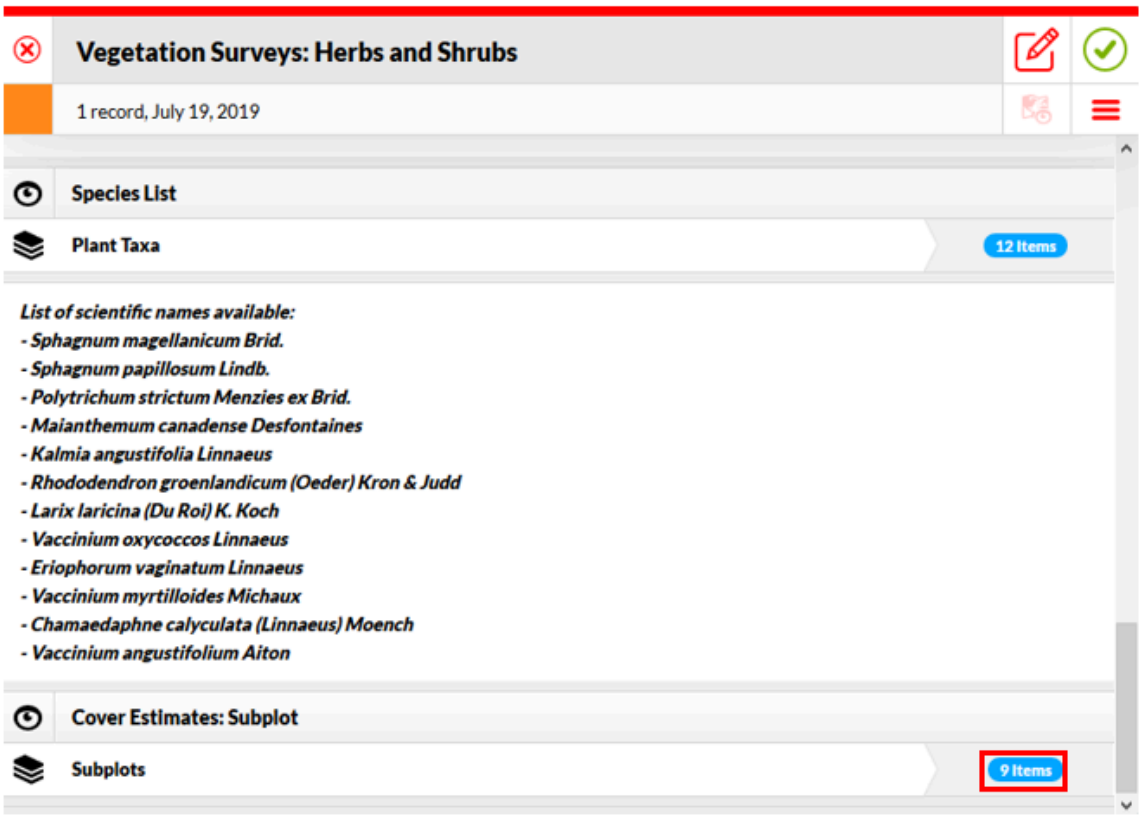

Vegetation Surveys: Herbs and Shrubs
1 record, July 19, 2019 / Subplots (9 Items)
1 record
View
1 record
View
1 record
View
1 record
View
1 record
View
1 record
View
1 record
View
1 record
View
1 record
View

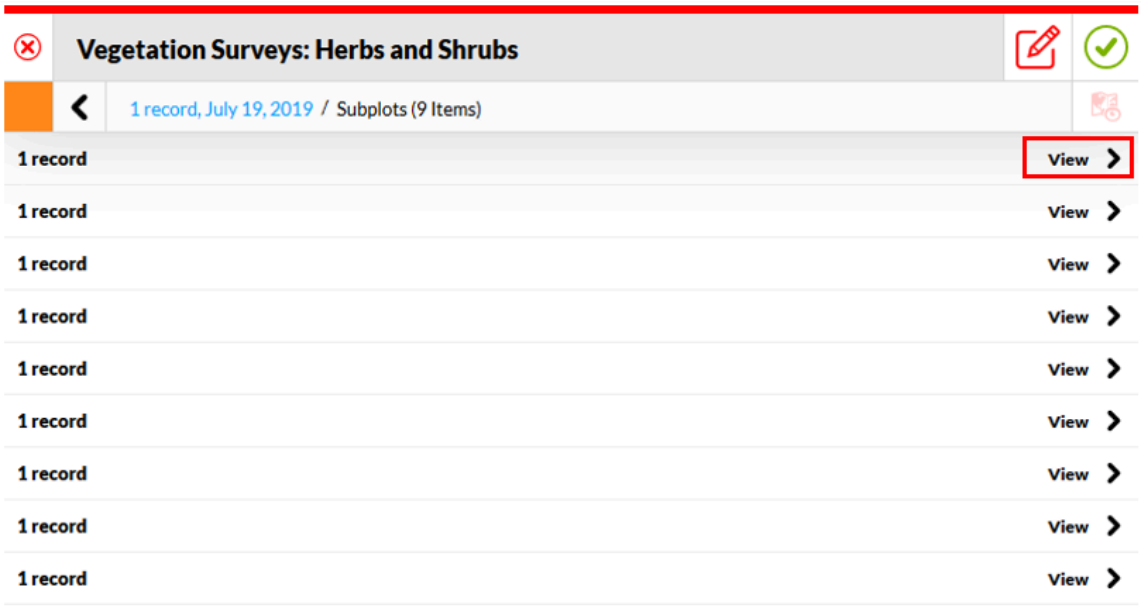

Subplots
1 record
Created Location
45.409077, -75.516663 (3m accuracy, 1.8m from the record)
Updated Location
45.397892, -75.698123 (15m accuracy, 14226.0m from the record)
Subplot
44083370-44100544, 1
Cover Estimates
9 Items
Total Canopy Cover (%): Subplot
Bare Ground Cover (%): Subplot
Leaf Litter Cover (%): Subplot
Total Cover (%): Subplot
Vegetation Photos: Subplot

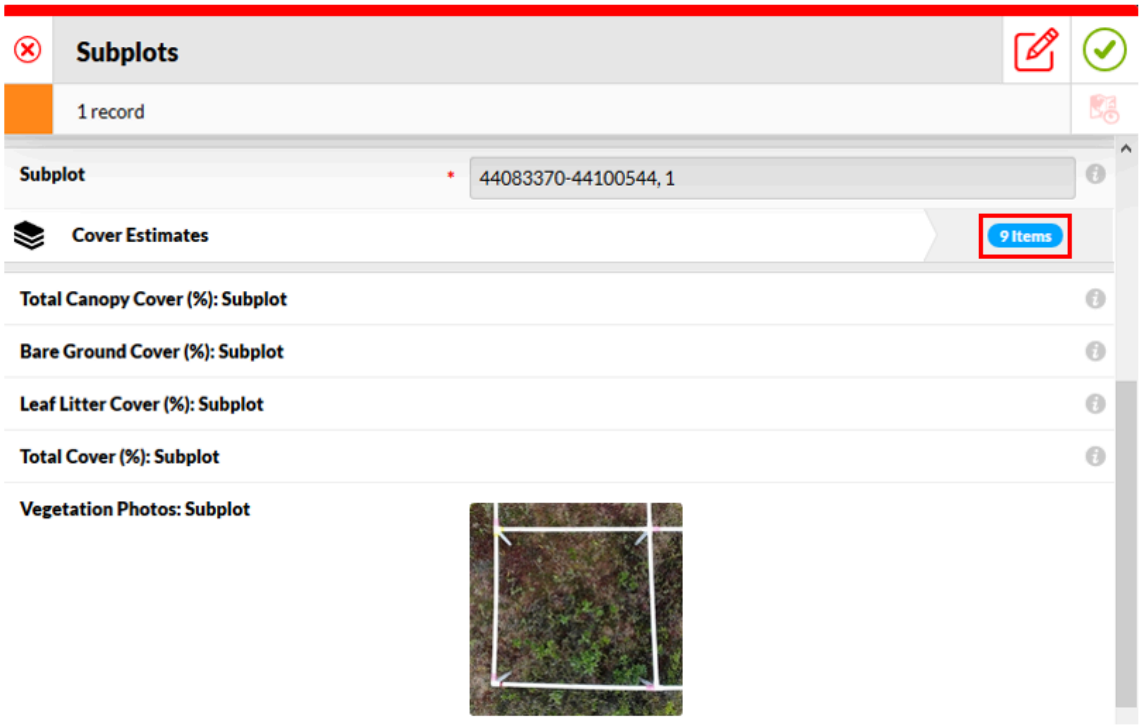


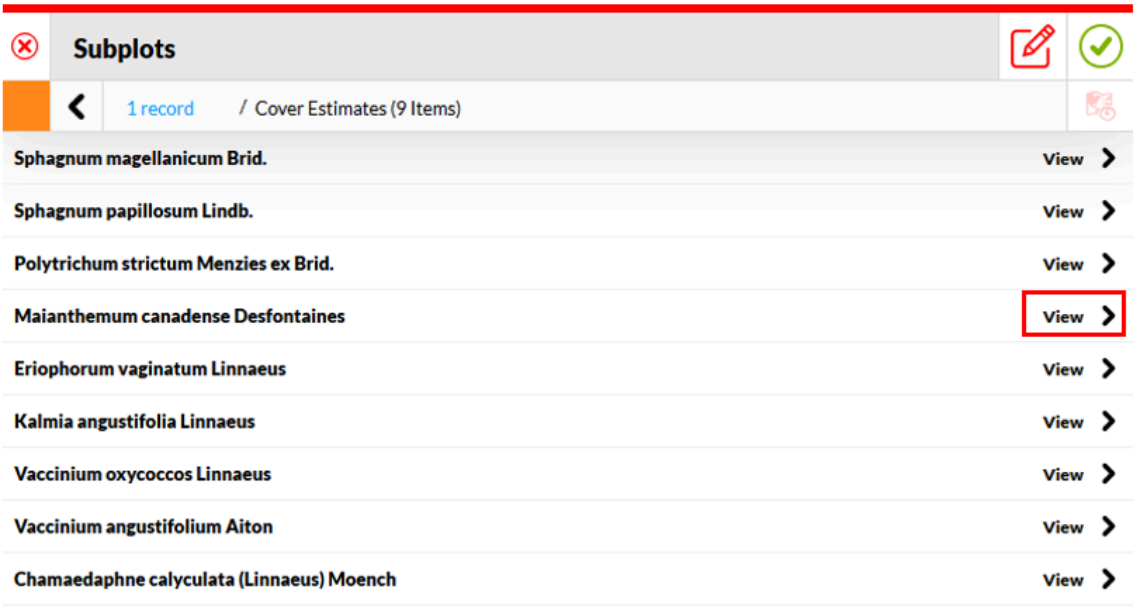
1.2 Open the 9 pictures in a single PowerPoint file, with each slide corresponding to one subplot.

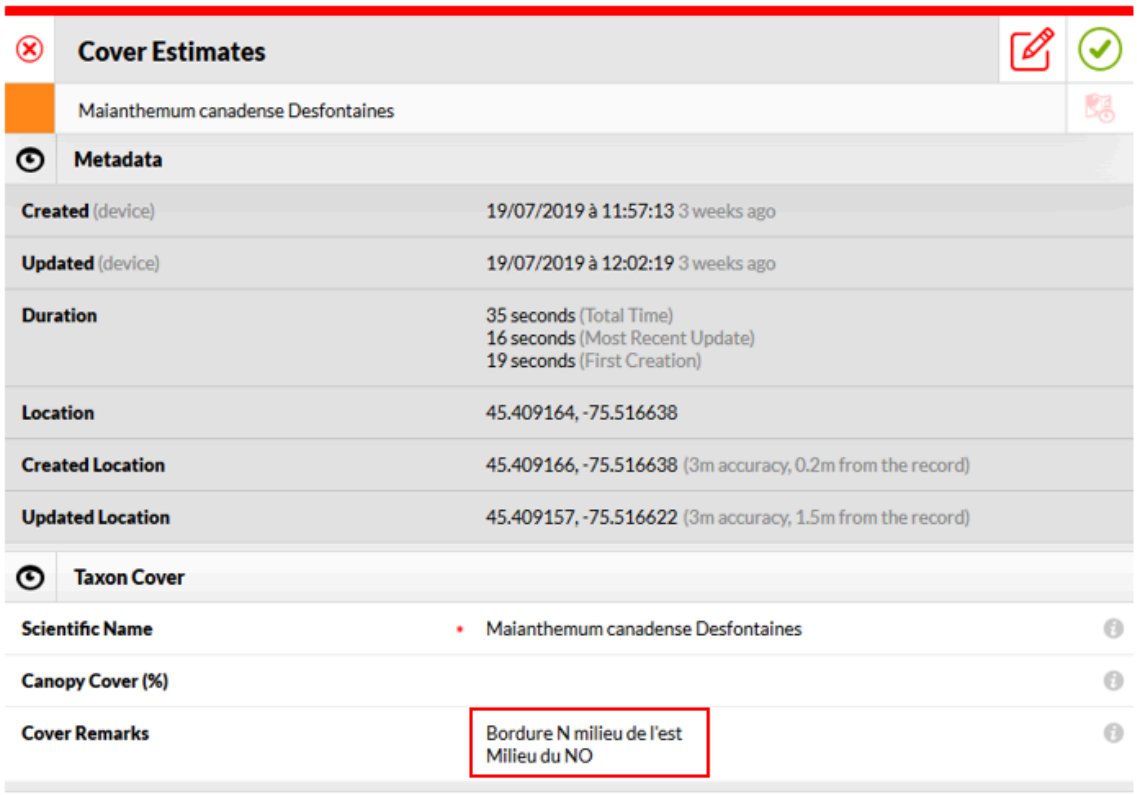
1.3 Use the species list from *Fulcrum* → Vegetation Surveys: Herbs and Shrubs → Subplot Record → Cover Estimates to locate each plant species, paying attention to the Canopy Remarks (abundance and distribution).


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 oxycoccos 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
1 record View

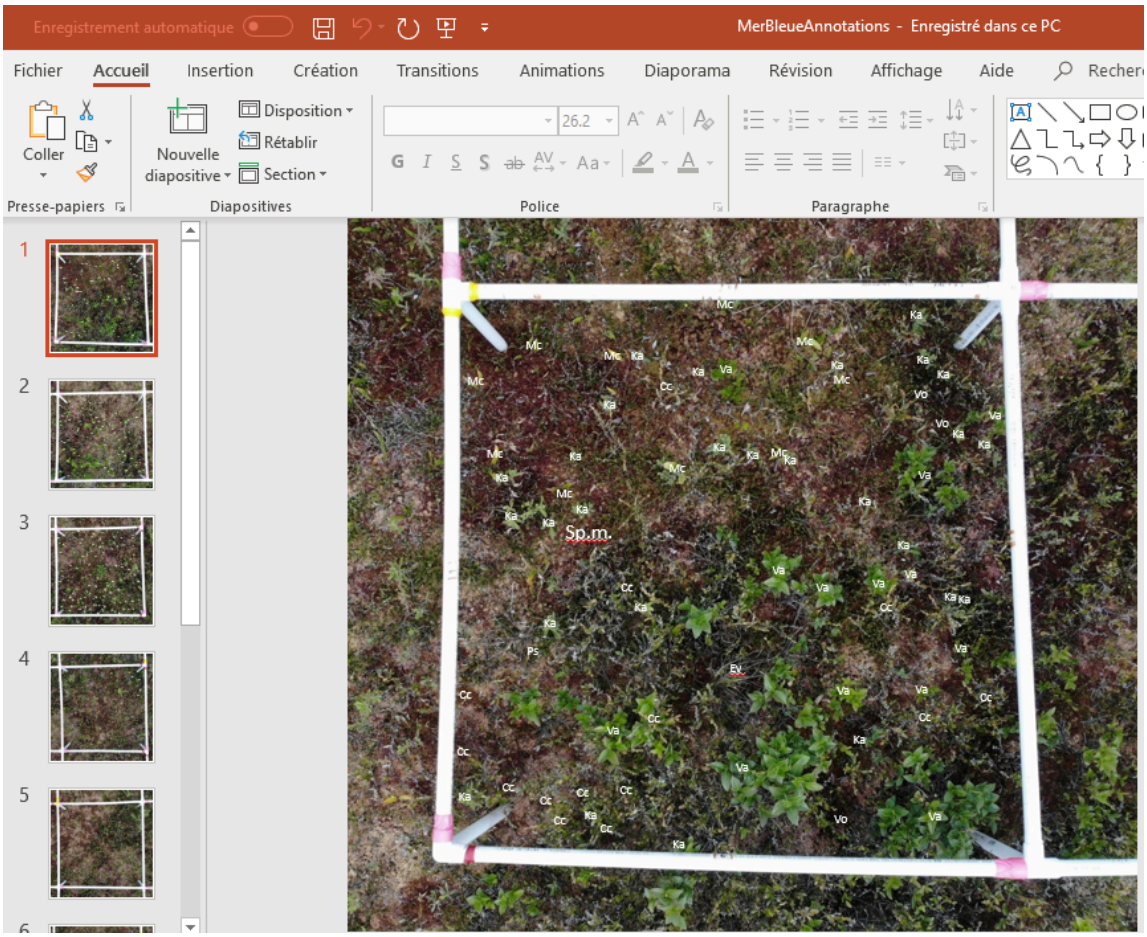

Subplots
1 record
Subplot
44083370-44100544, 1
Cover Estimates
9 Items
Total Canopy Cover (%): Subplot
Bare Ground Cover (%): Subplot
Leaf Litter Cover (%): Subplot
Total Cover (%): Subplot
Vegetation Photos: Subplot


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 oxycoccos Linnaeus View
Vaccinium angustifolium Aiton View
Chamaedaphne calyculata (Linnaeus) Moench View

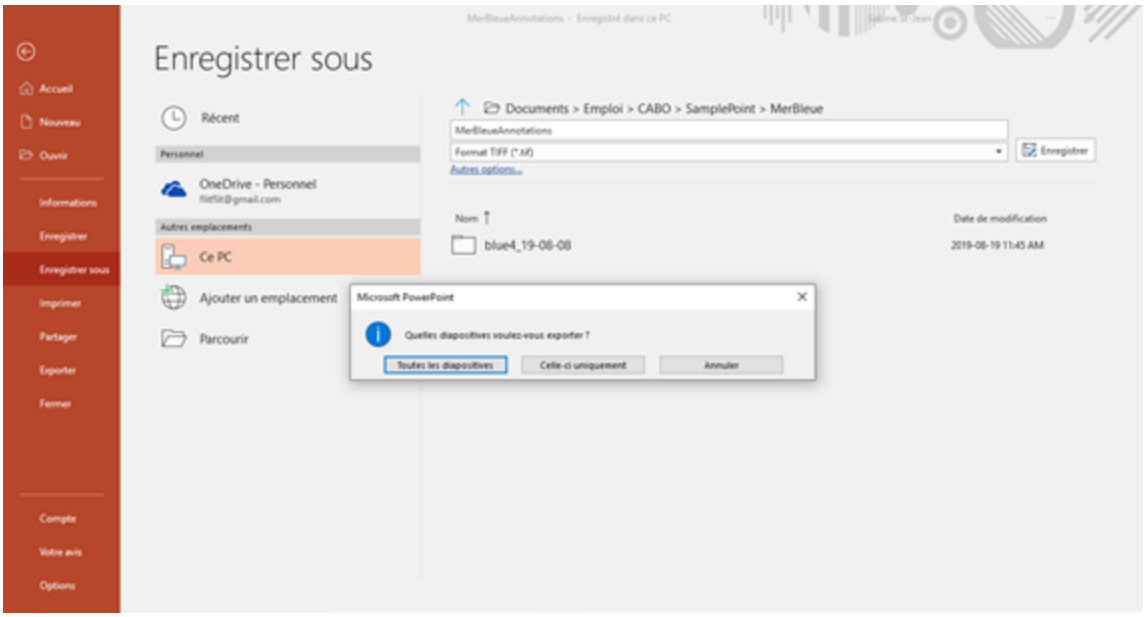


NOTES ON COVER REMARKS:
Each subplot is divided in areas identified with direction acronyms (S = south, N = north, O or W = west, E = east, C = center). If relevant, they also have a note on the number of individuals for a given species.

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 intials of the species (generally, format is first letter of genra + first letter of species) on top of its occurences.

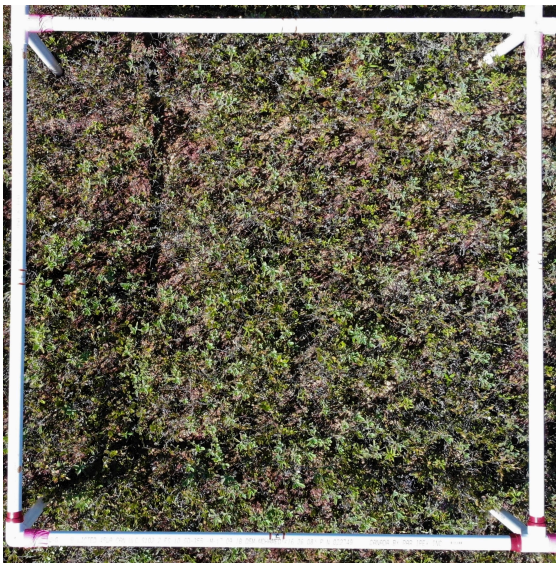


1.5 Save all PowerPoint slides (1 slide = 1 subplot) in .tif to your computer and name them in the format PlotNo.SubplotNo.

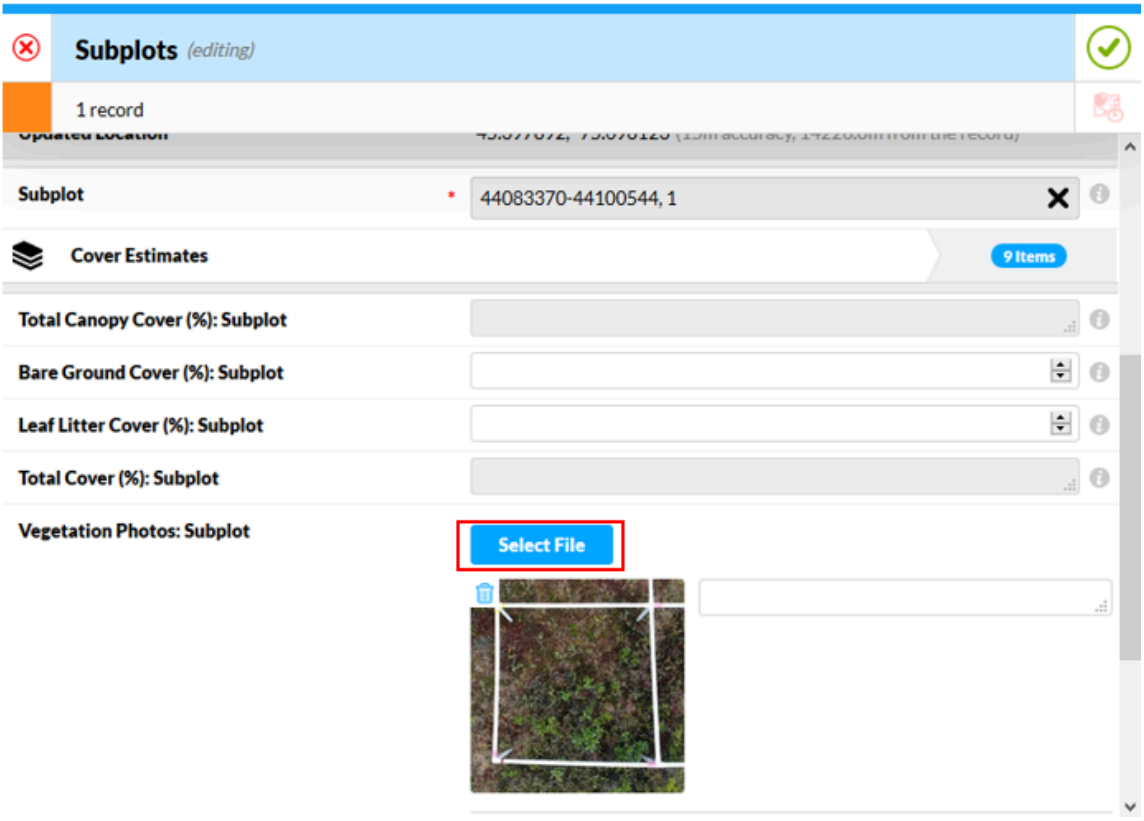


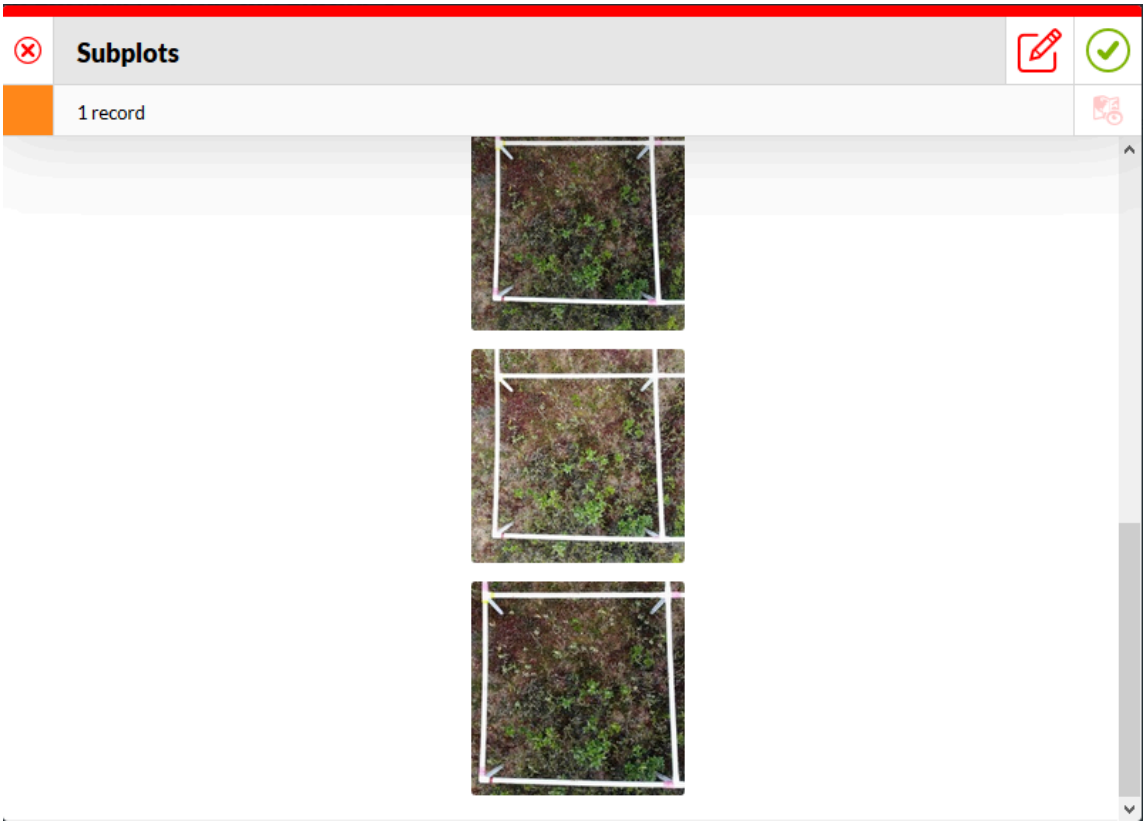
1.6 Crop all photos so that their shape is a tight square around the PVC pipes delimiting the subplot.

Example for subplot 1:

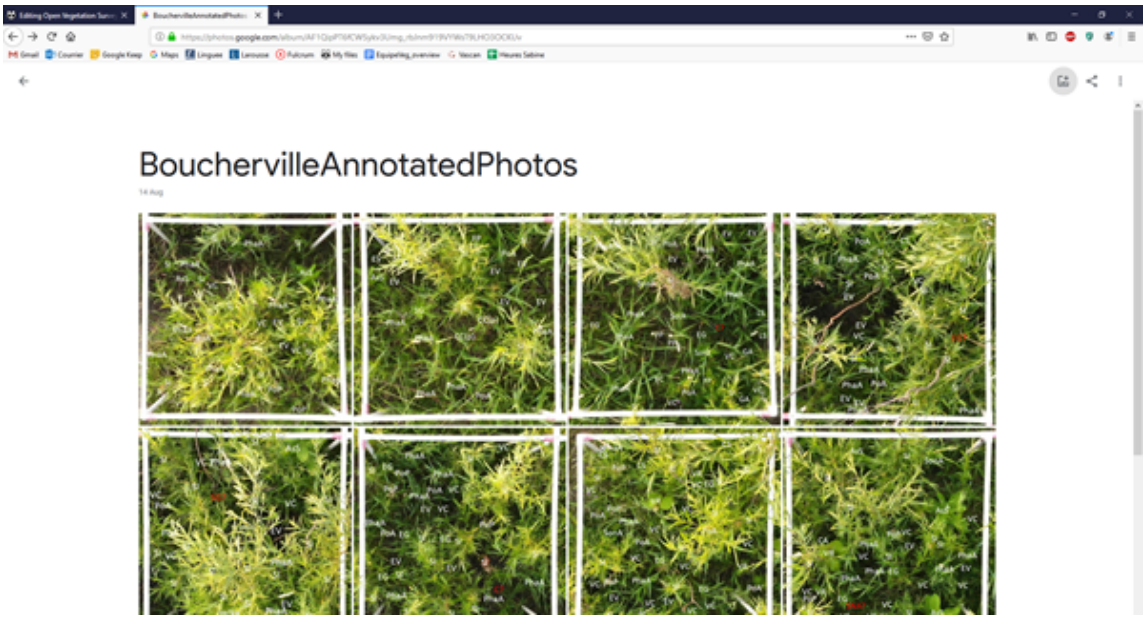


1.7 Save the cropped photos back to:
1) their original *Fulcrum* subplot record, under Vegetation Surveys: Herbs and Shrubs → Subplots → Record [# from 1 to 9] → Vegetation Photos: Subplot,


Subplots (editing)
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
Select File



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



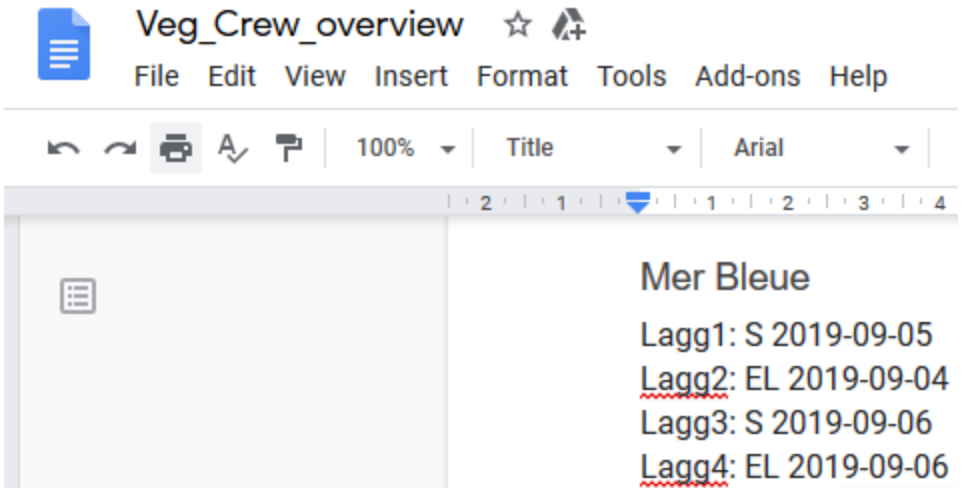
Virtual Point Framing

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

Note

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.

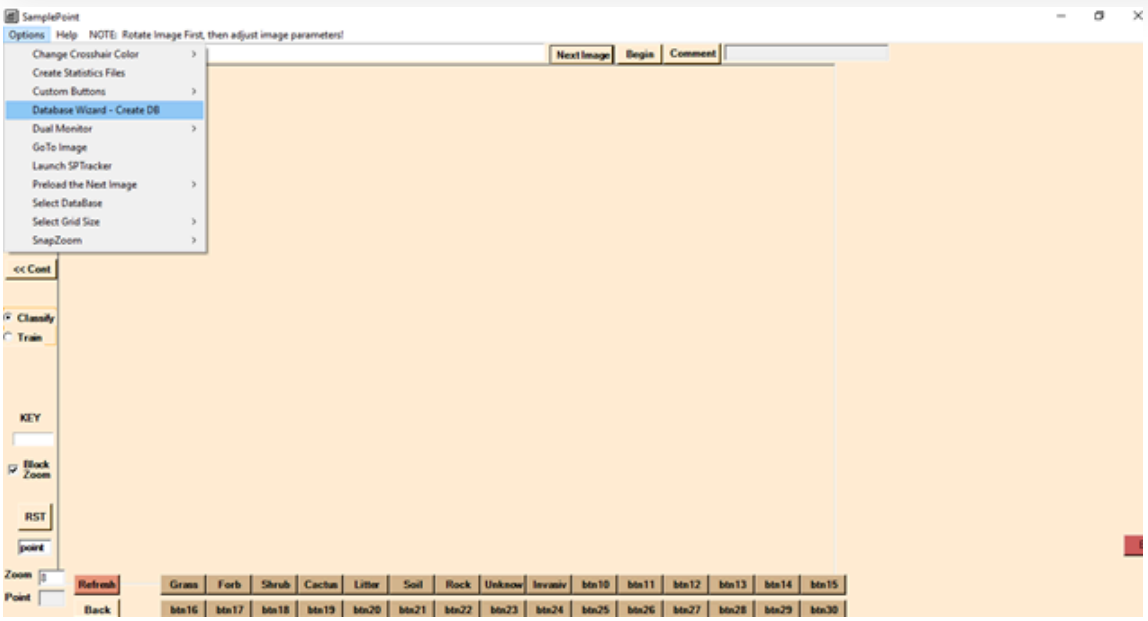
2.1 Indicate in the Veg_Crew_overview Google Doc on what plot(s) you will be working on that day, by writing the date and your initial next to the plot number.



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

Note

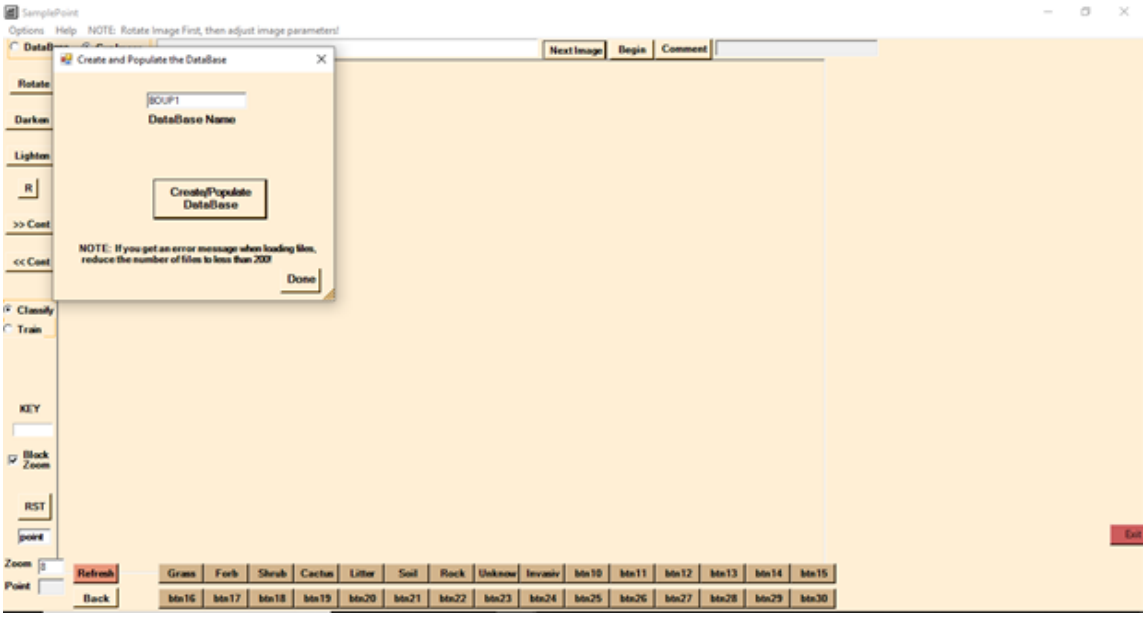
We are using one database per plot, and only later combining all the databases into one.



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

Note

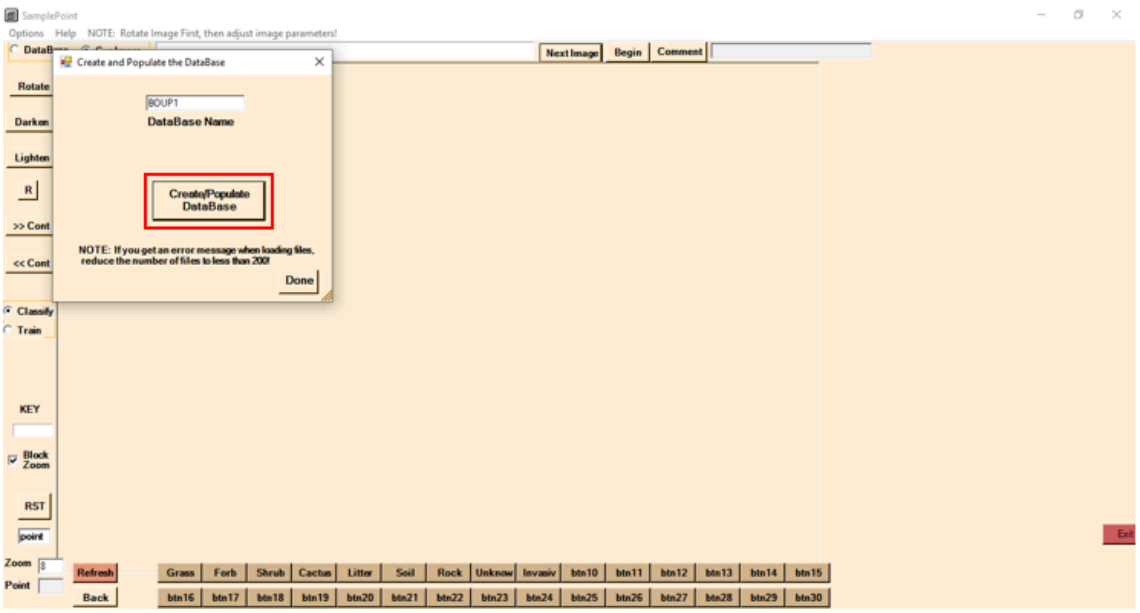
Boucherville: BOU#
Mer Bleue: MB#

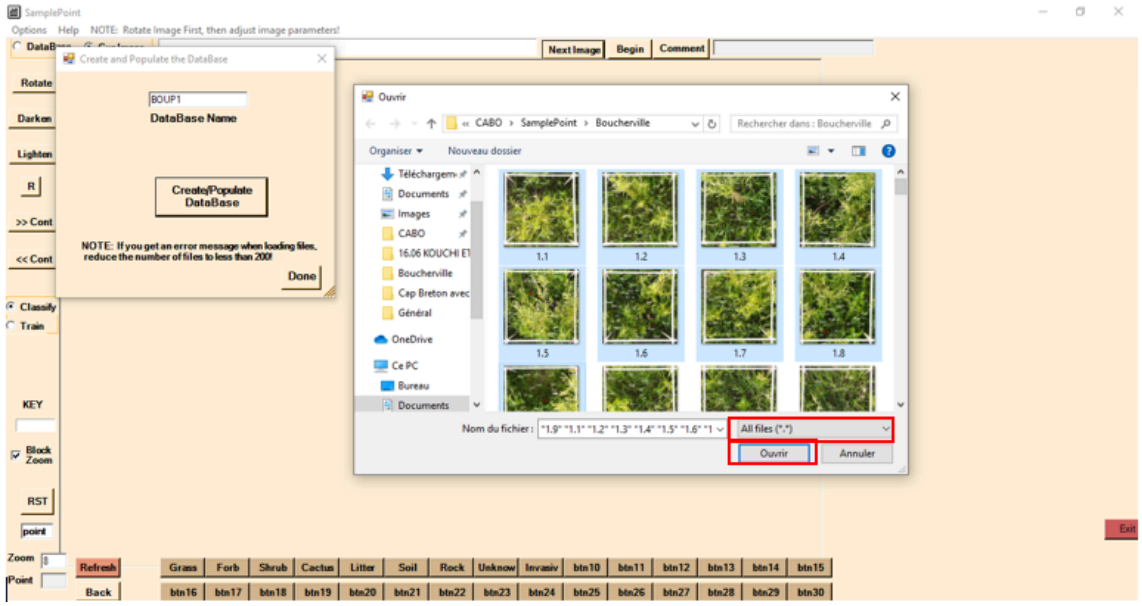


2.4 Populate the database by selecting all 9 annotated .tiff or .tif pictures of this plot.

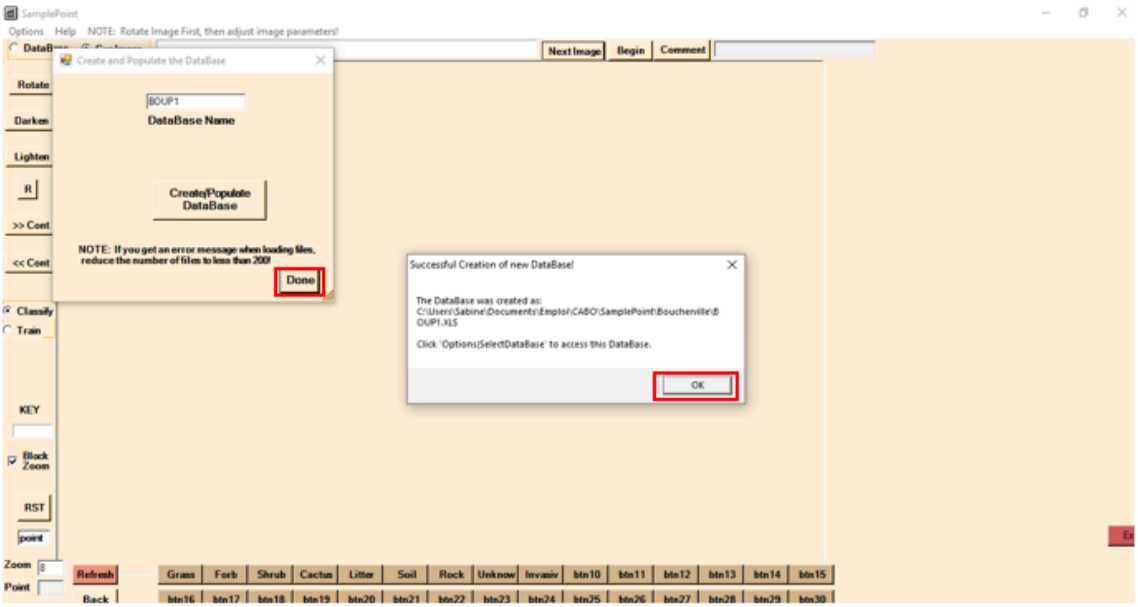
Note

Select All files from the menu in order to have access to the .tiff and .tif files.





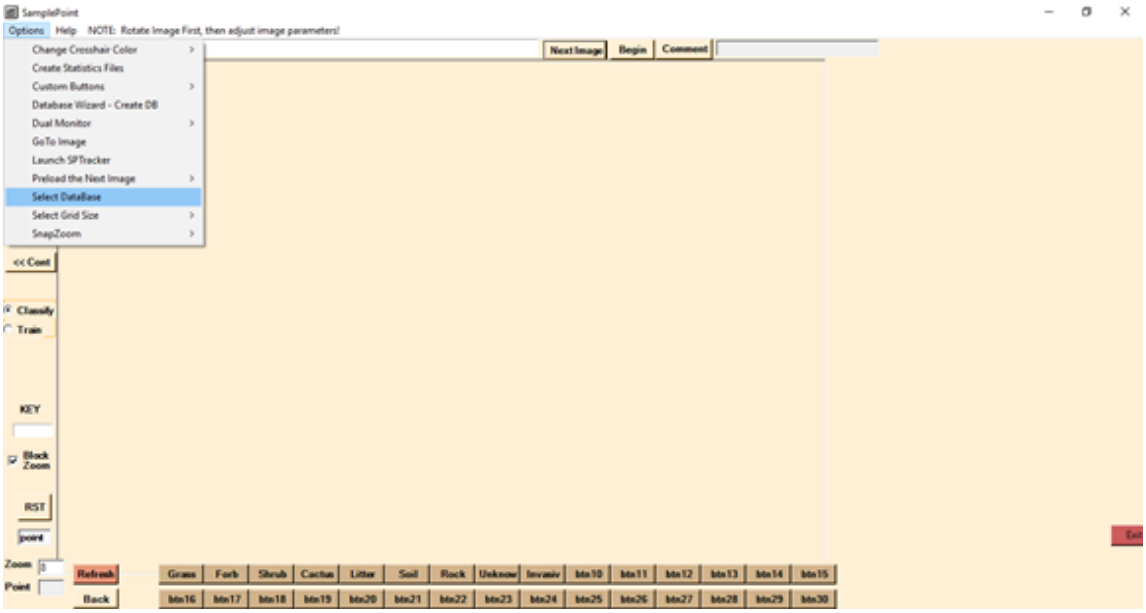
2.5 Select Done and OK to complete.



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

Note

Warning: if you select a database that has already been used, you will overwrite your data. Therefore we are using one separate database per plot.


SamplePoint
Options Help NOTE: Rotate Image First, then adjust image parameters!
Change Crosshair Color
Create Statistics Files
Custom Buttons
Database Wizard - Create DB
Dual Monitor
GoTo Image
Launch SPTracker
Preload the Next Image
Select DataBase
Select Grid Size
SnapZoom
Next Image
Begin
Comment
<< Cont
Classify
Train
KEY
Block Zoom
RST
point
Zoom
Point
Refresh
Back
Grass
Forb
Shrub
Cactus
Litter
Soil
Rock
Unknow
Invasiv
btn10
btn11
btn12
btn13
btn14
btn15
btn16
btn17
btn18
btn19
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btn23
btn24
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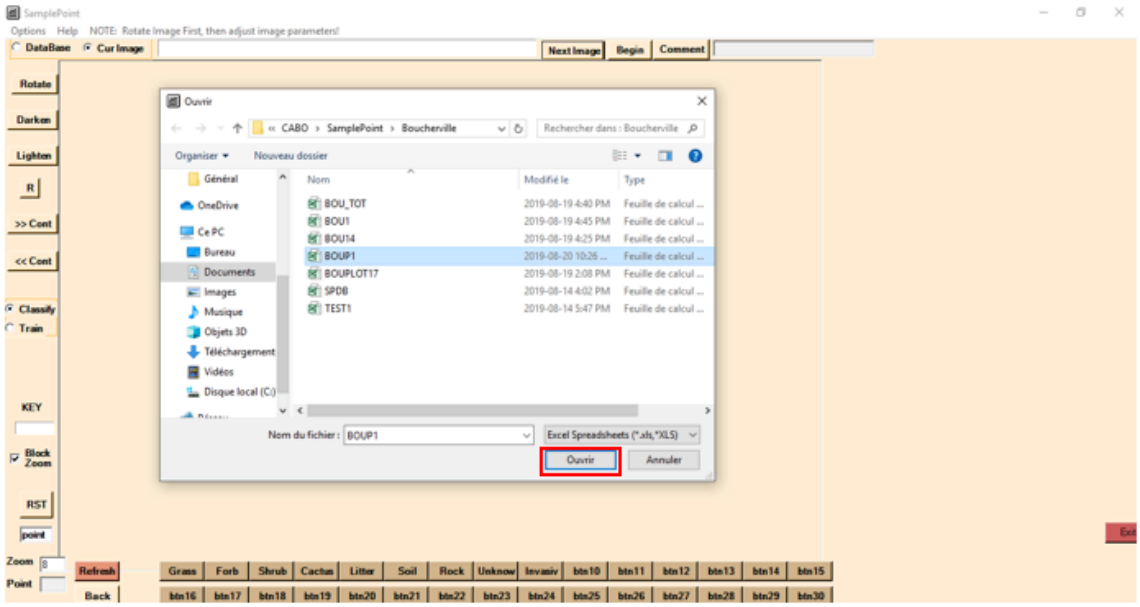
btn26
btn27
btn28
btn29
btn30


SamplePoint
Options Help NOTE: Rotate Image First, then adjust image parameters!
DataBase
Cur Image
Next Image
Begin
Comment
Rotate
Darken
Lighten
R
>> Cont
<< Cont
Classify
Train
KEY
Block Zoom
RST
point
Zoom
Point
Refresh
Back
Ouvrir
« CABO › SamplePoint › Boucherville
Rechercher dans : Boucherville
Organiser
Nouveau dossier
Général
OneDrive
Ce PC
Bureau
Documents
Images
Musique
Objets 3D
Téléchargement
Vidéos
Disque local (C:)
Nom
Modifié le
Type
BOU_TOT
BOU1
BOU14
BOUP1
BOUPLOT17
SPDB
TEST1
Nom du fichier : BOUP1
Excel Spreadsheets (*.xls,*XLS)
Ouvrir
Annuler
Grass
Forb
Shrub
Cactus
Litter
Soil
Rock
Unknow
Invasiv
btn10
btn11
btn12
btn13
btn14
btn15
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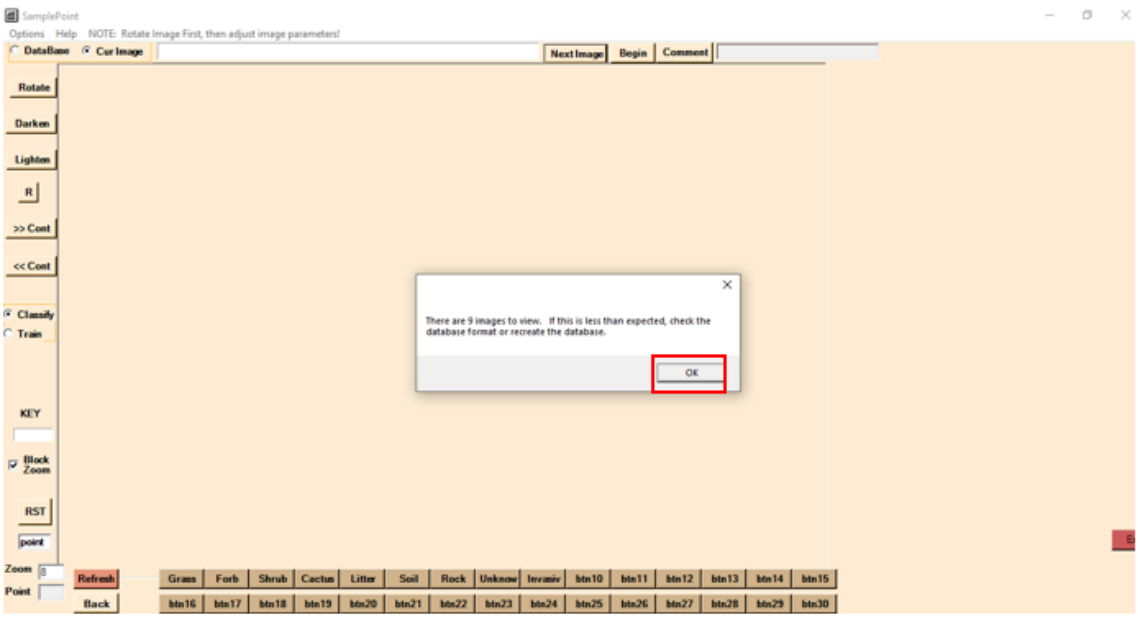
btn29
btn30



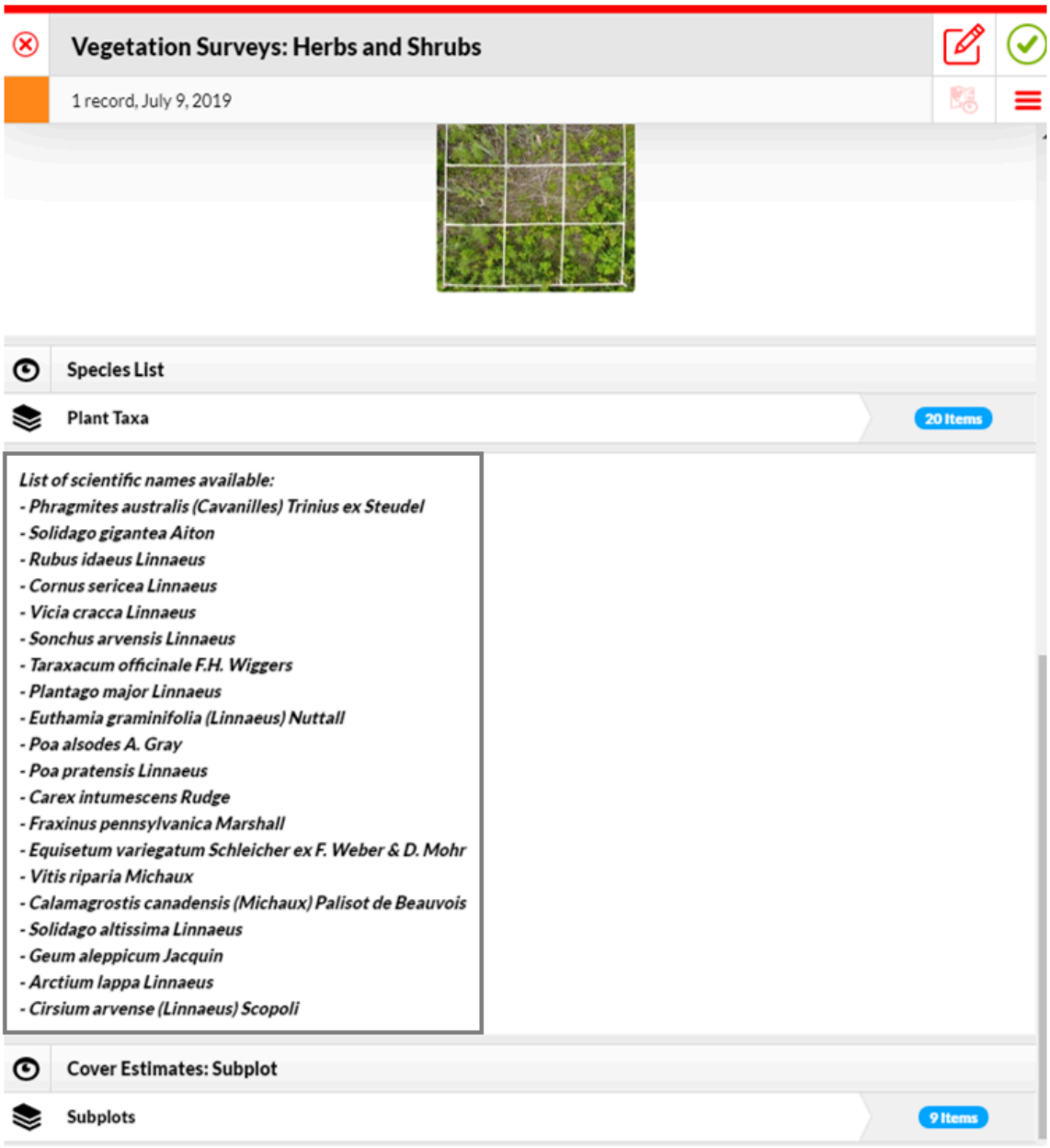
2.7 Create, upload or edit a *SamplePoint* button file for classifying the plot.

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*.

Note

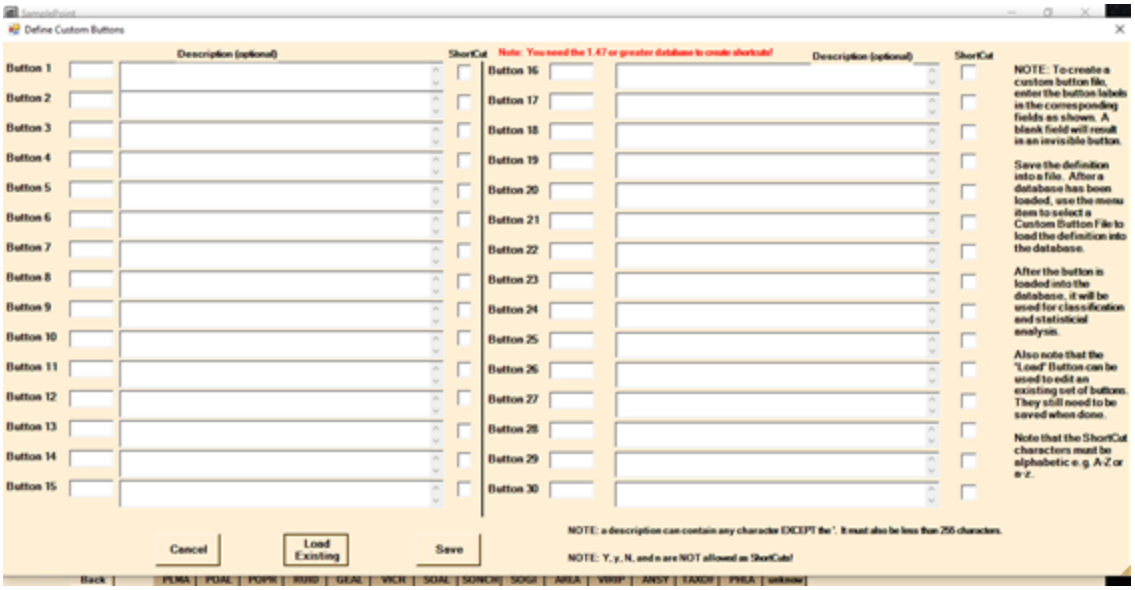
SamplePoint allows for a maximum of 30 classification buttons.

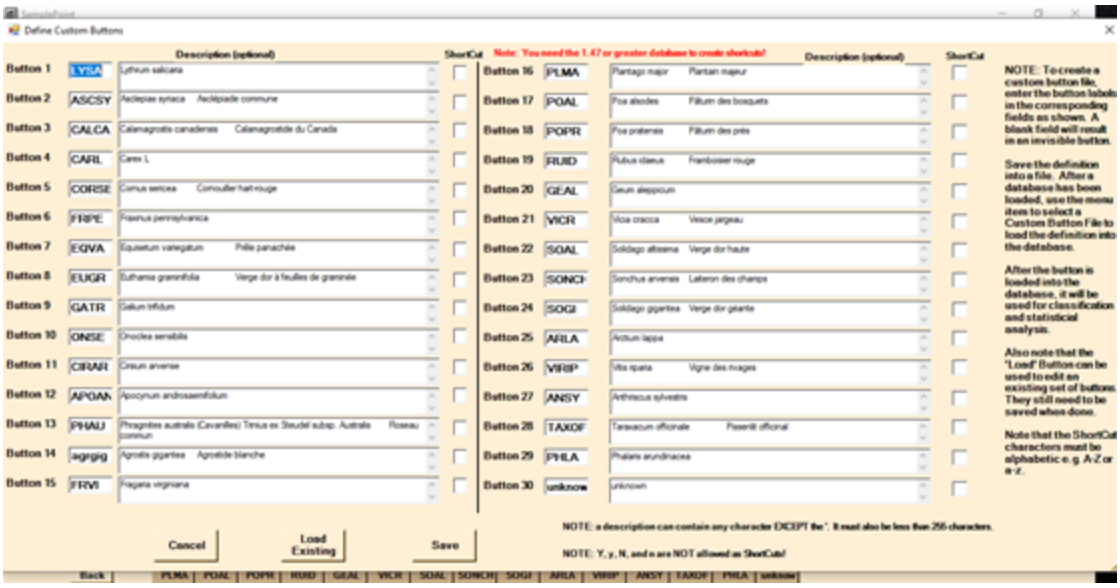
- *: If there are more than 30 species in your list, add a button named Other that you will edit appropriately afterwards in the plot Excel Database. Make notes of the species of these Other-classified points in each subplot where they occur.
- Always include one button named Unknown, used for when you 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.



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).



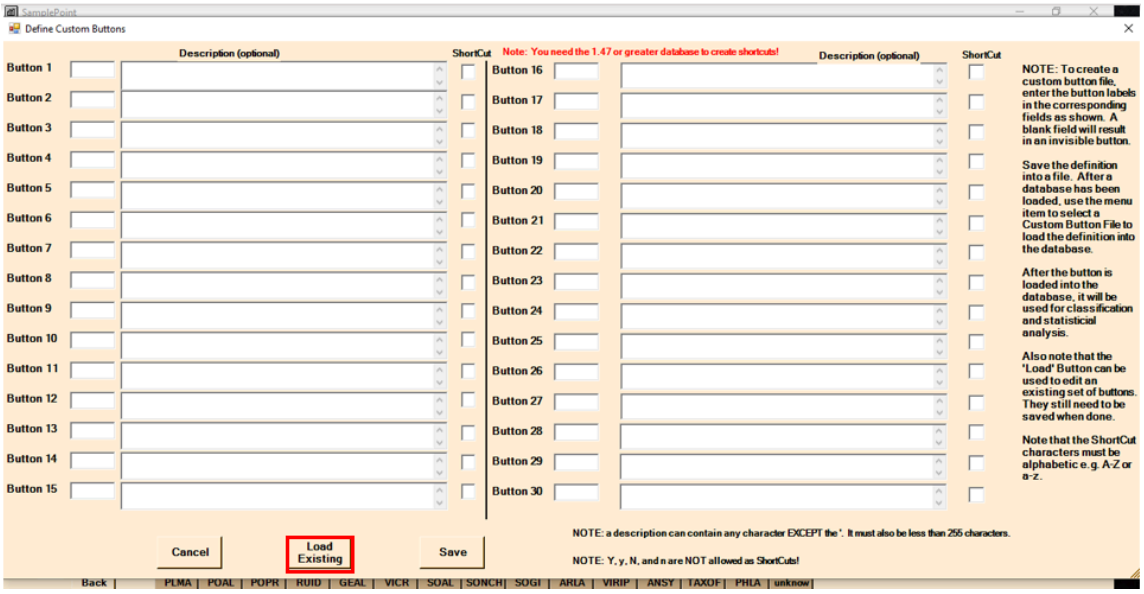


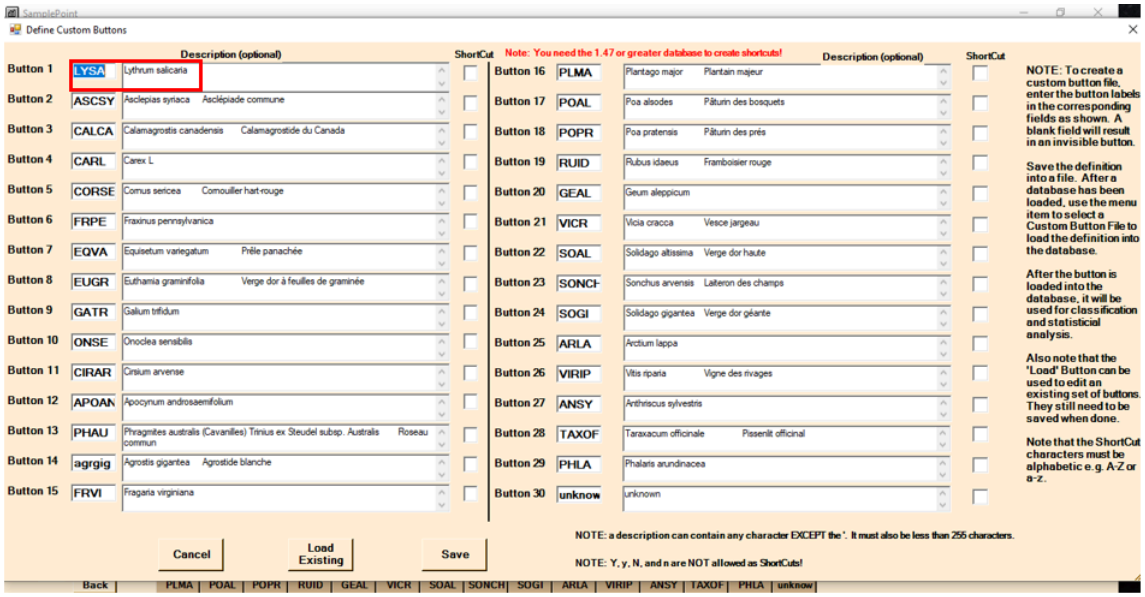
4 letter names in caps lock can be seen more clearly and thus are more convenient.

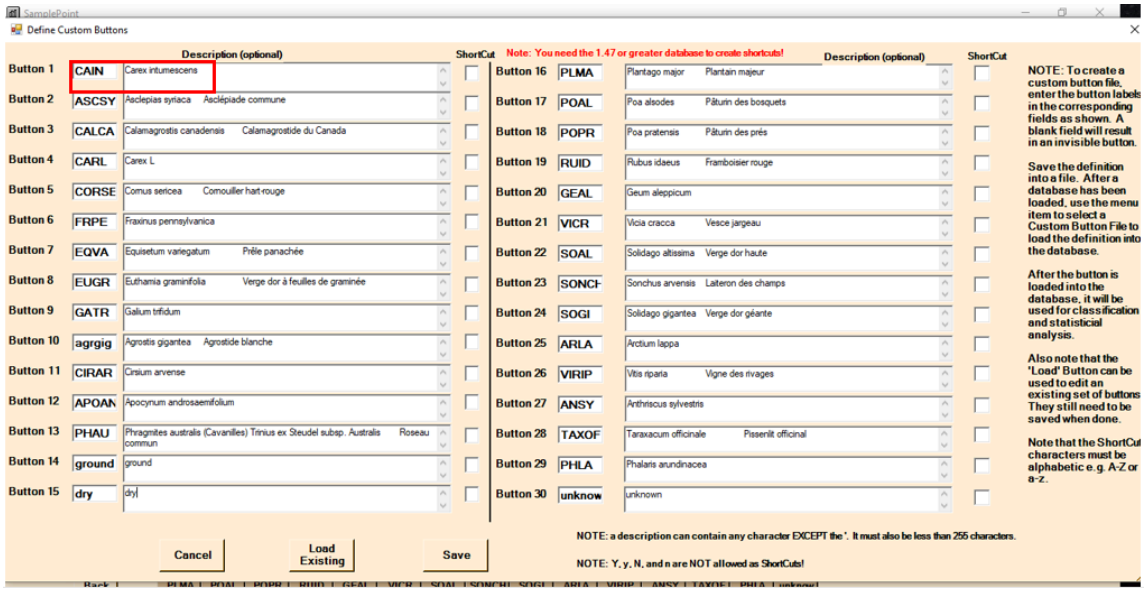
2.10 If a set of buttons already exists for the site, use it as a base to create this new set by clicking on Load Existing. Make the required edits by renaming the appropriate button names and descriptions.

Note

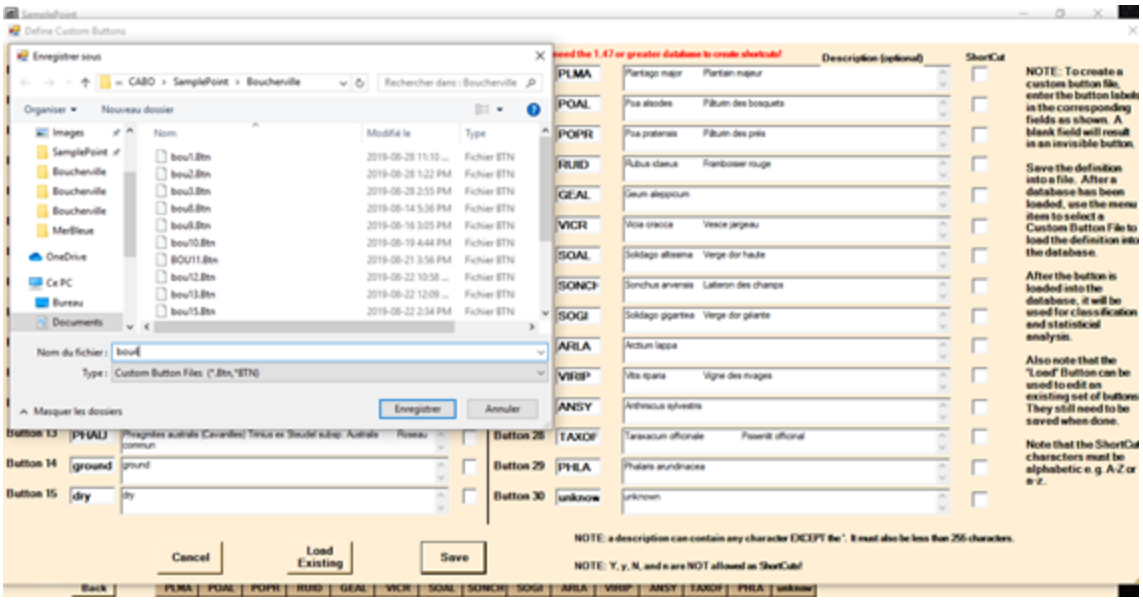
The original button file will remain intact if the new one is given a new name.







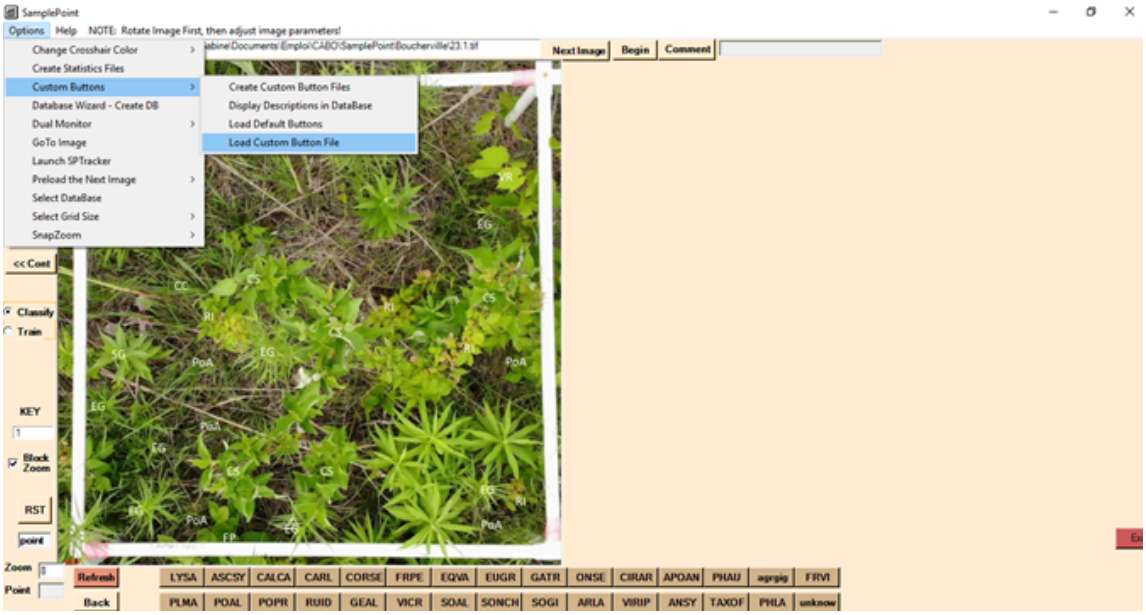
2.11 Save and name this new custom button file.

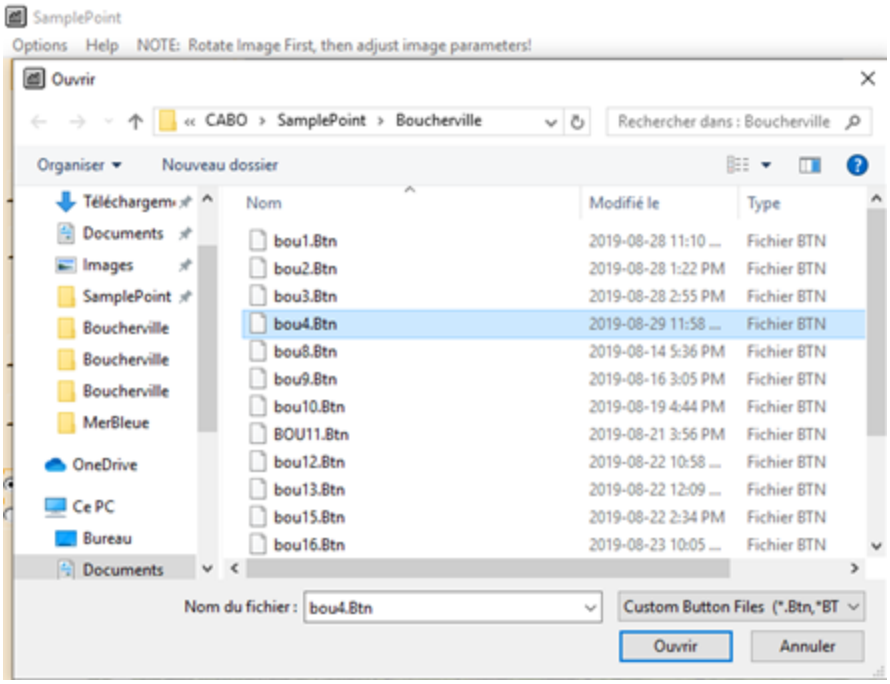


2.12 In *SamplePoint*, follow Options ⟶ Custom Buttons ⟶ Load Custom Button File to select and load the buttons that you will be using to classify the photos from your database.

Note

The Button File selected needs to remain untouched for the whole database.


SamplePoint
Options Help NOTE: Rotate Image First, then adjust image parameters!
Change Crosshair Color
Create Statistics Files
Custom Buttons
Database Wizard - Create DB
Dual Monitor
GoTo Image
Launch SPTracker
Preload the Next Image
Select DataBase
Select Grid Size
SnapZoom
Create Custom Button Files
Display Descriptions in DataBase
Load Default Buttons
Load Custom Button File
Next Image
Begin
Comment
<< Cont
Classify
Train
KEY
Block Zoom
RST
point
Zoom
Point
Refresh
Back
LYSA ASCSY CALCA CARL CORSE FRPE EQVA EUGR GATR ONSE CIRAR APOAN PHAU agrgig FRVI
PLMA POAL POPR RUID GEAL VICR SOAL SONCH SOGI ARLA VIRIP ANSY TAXOF PHLA unknow


SamplePoint
Options Help NOTE: Rotate Image First, then adjust image parameters!
Ouvrir
« CABO › SamplePoint › Boucherville
Rechercher dans : Boucherville
Organiser
Nouveau dossier
Nom
Modifié le
Type
bou1.Btn 2019-08-28 11:10 ... Fichier BTN
bou2.Btn 2019-08-28 1:22 PM Fichier BTN
bou3.Btn 2019-08-28 2:55 PM Fichier BTN
bou4.Btn 2019-08-29 11:58 ... Fichier BTN
bou8.Btn 2019-08-14 5:36 PM Fichier BTN
bou9.Btn 2019-08-16 3:05 PM Fichier BTN
bou10.Btn 2019-08-19 4:44 PM Fichier BTN
BOU11.Btn 2019-08-21 3:56 PM Fichier BTN
bou12.Btn 2019-08-22 10:58 ... Fichier BTN
bou13.Btn 2019-08-22 12:09 ... Fichier BTN
bou15.Btn 2019-08-22 2:34 PM Fichier BTN
bou16.Btn 2019-08-23 10:05 ... Fichier BTN
Téléchargem
Documents
Images
SamplePoint
Boucherville
Boucherville
Boucherville
MerBleue
OneDrive
Ce PC
Bureau
Documents
Nom du fichier : bou4.Btn
Custom Button Files (*.Btn,*BT
Ouvrir
Annuler

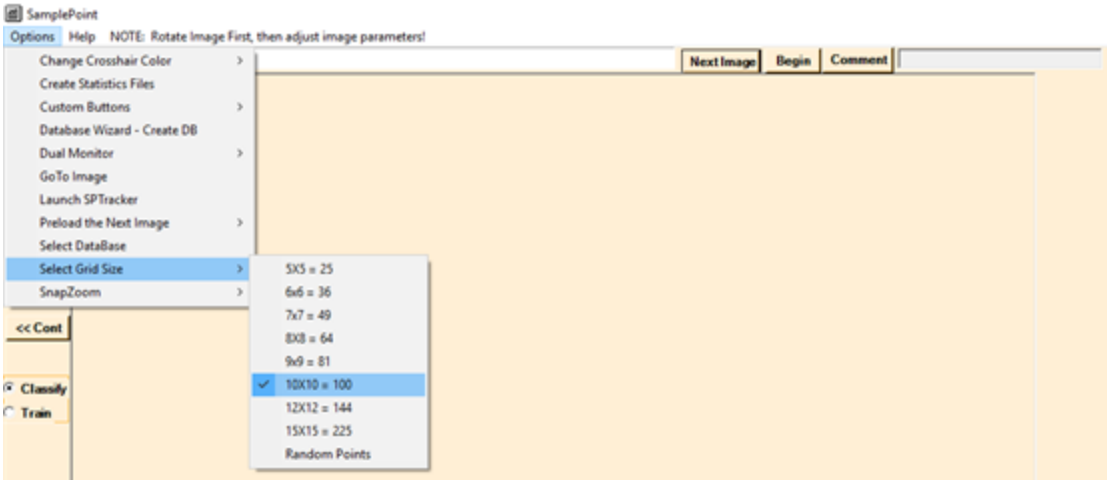
2.13 Edit the picture as needed. The rotation has to be done once only, before classification. The rest can be done at any point and undone by clicking on R.

Note

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.

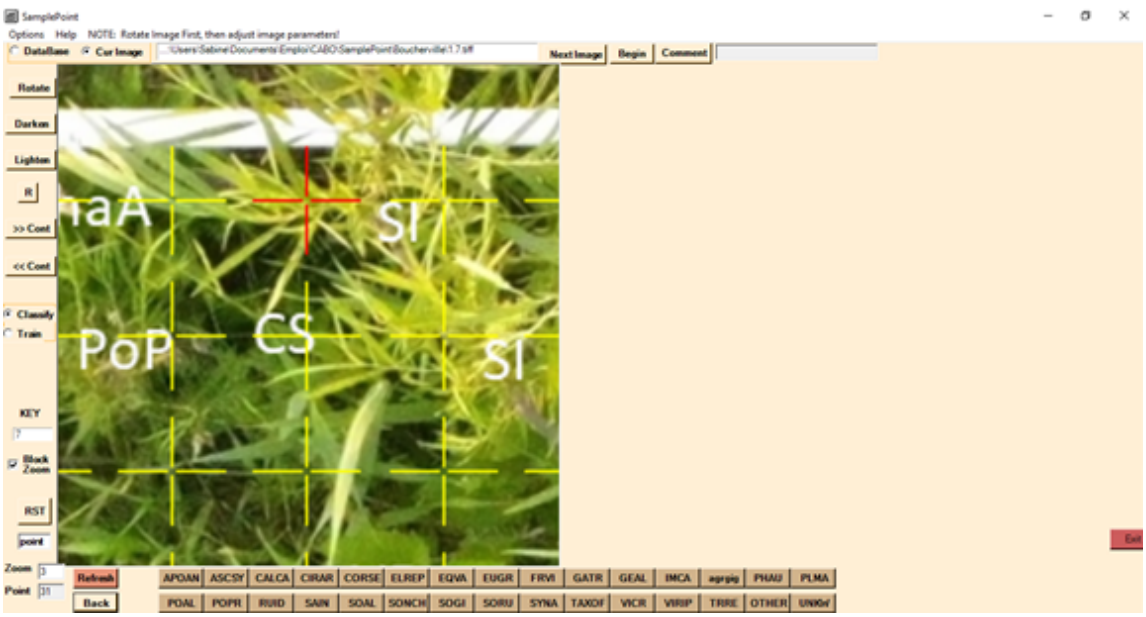
2.14 Under Options ⟶ Select Grid Size, select 10×10 = 100. This means that we are using a 10×10 grid of points (100 crosshairs) to classify each subplot.



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.

Note

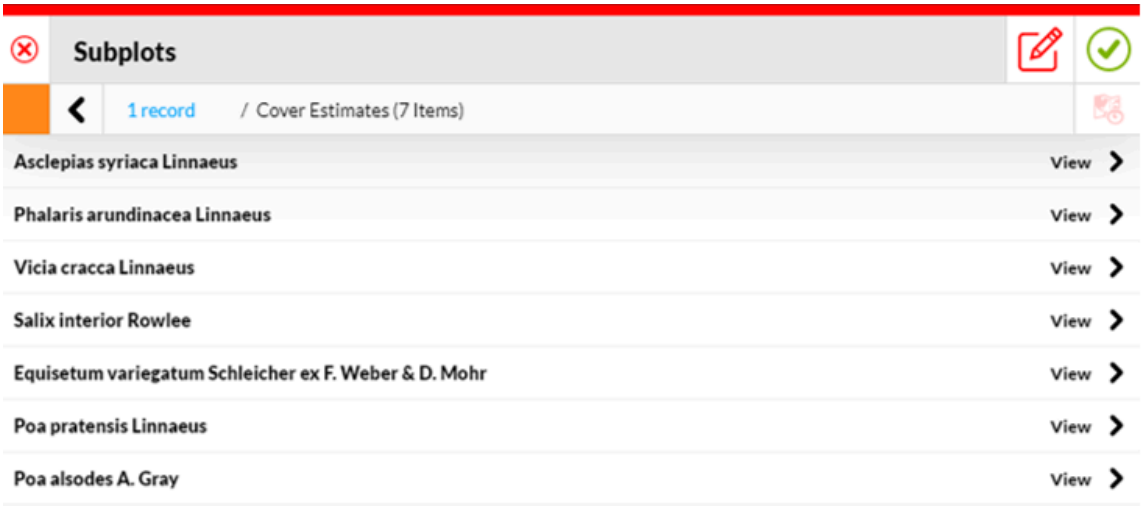
The meaning of each button is indicated in the joined buttons_explanations Excel file.
The Zoom can be adjusted by rotating the wheel of a wheel mouse.
The Point field indicates the point (#/100) you are currently classifying.
The Back button is used to correct a previous crosshair classification.

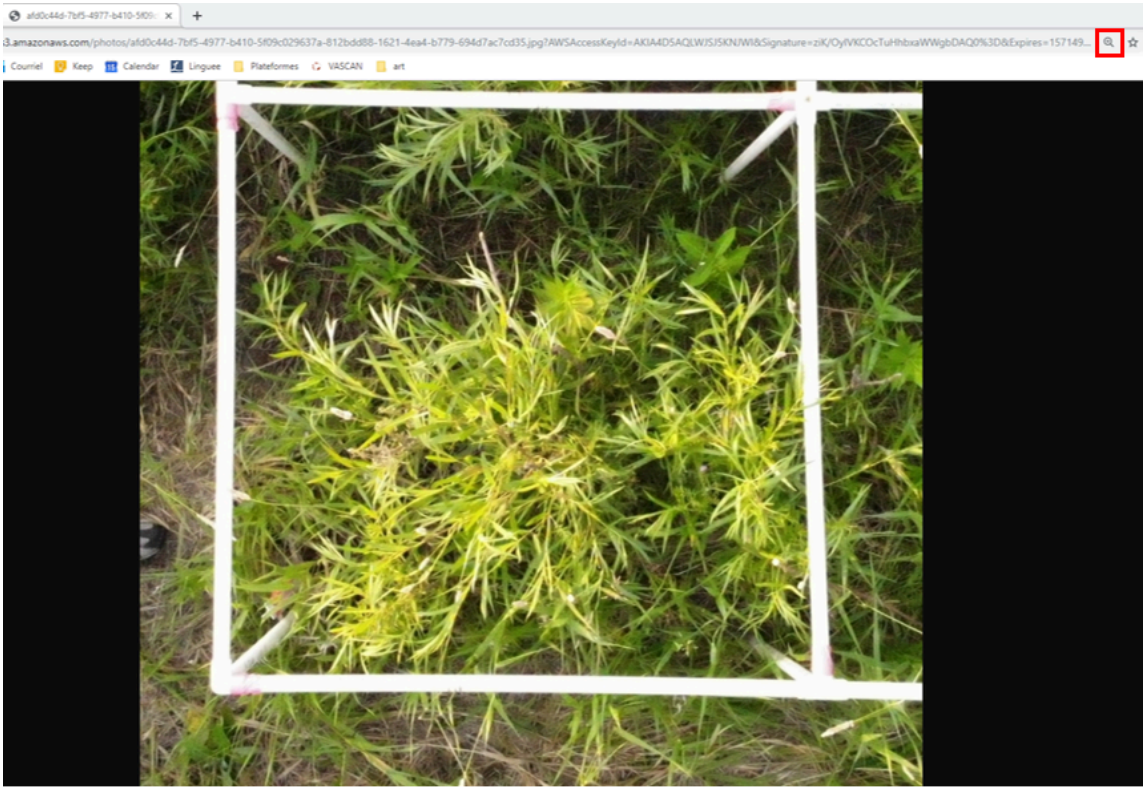


2.16 To classify each crosshair, help yourself by opening (ideally on a different monitor) the *Fulcrum* Vegetation Survey: Herbs and Shrubs of that specific plot. Before starting to work on each subplot, open in two different tabs 1) the species list for the subplot and 2) the Original picture (not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

Note

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.

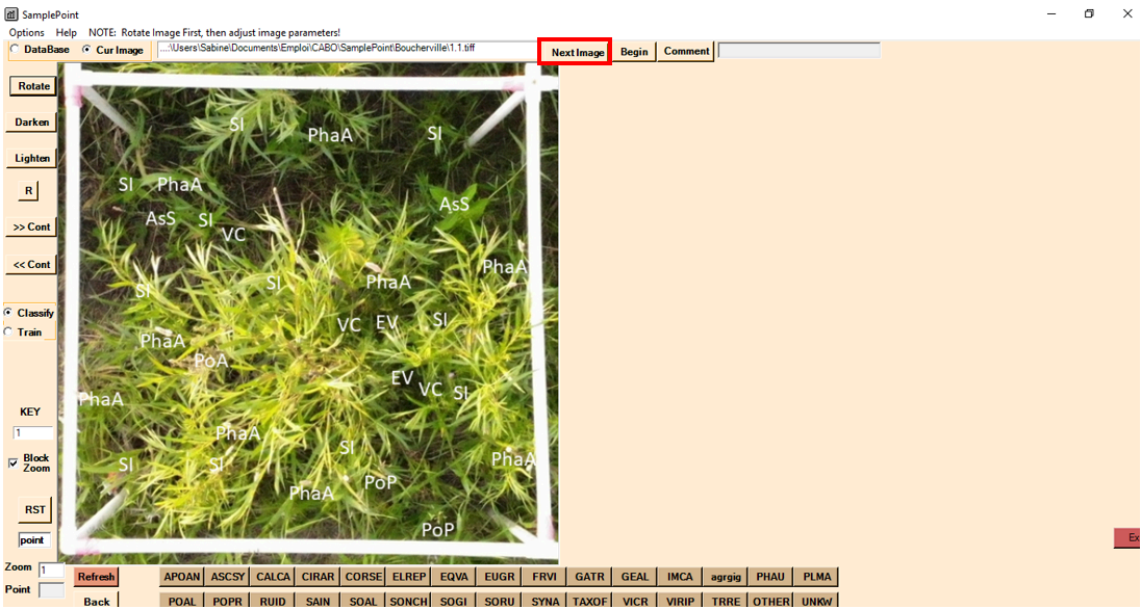




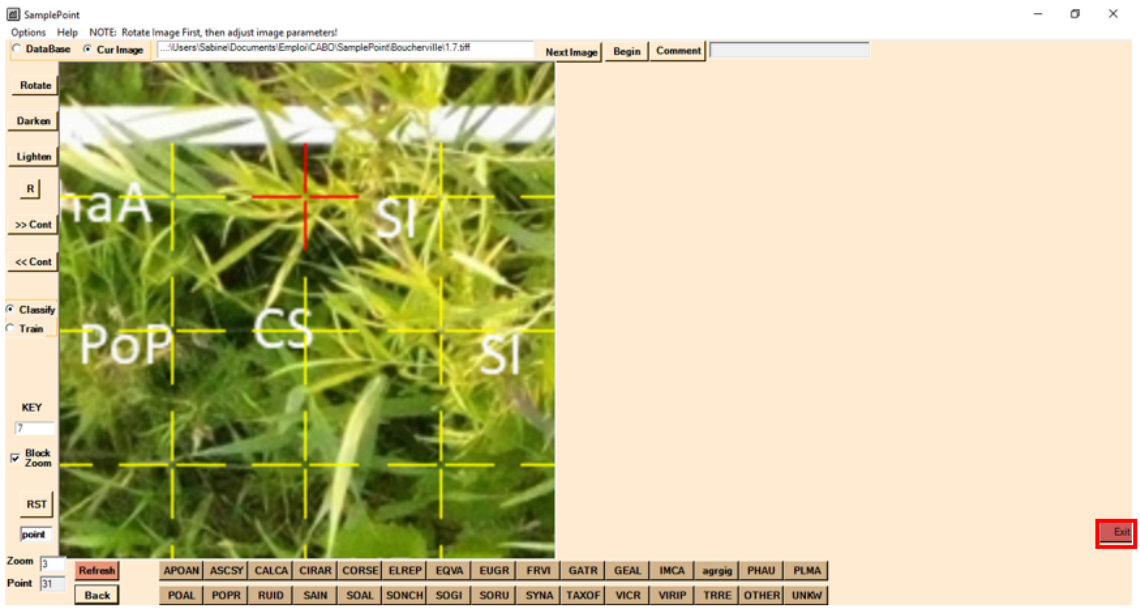
2.17 When the 100 points of an image have been classified, click on Next Image, then Begin to start again for the next image (= key = subplot).

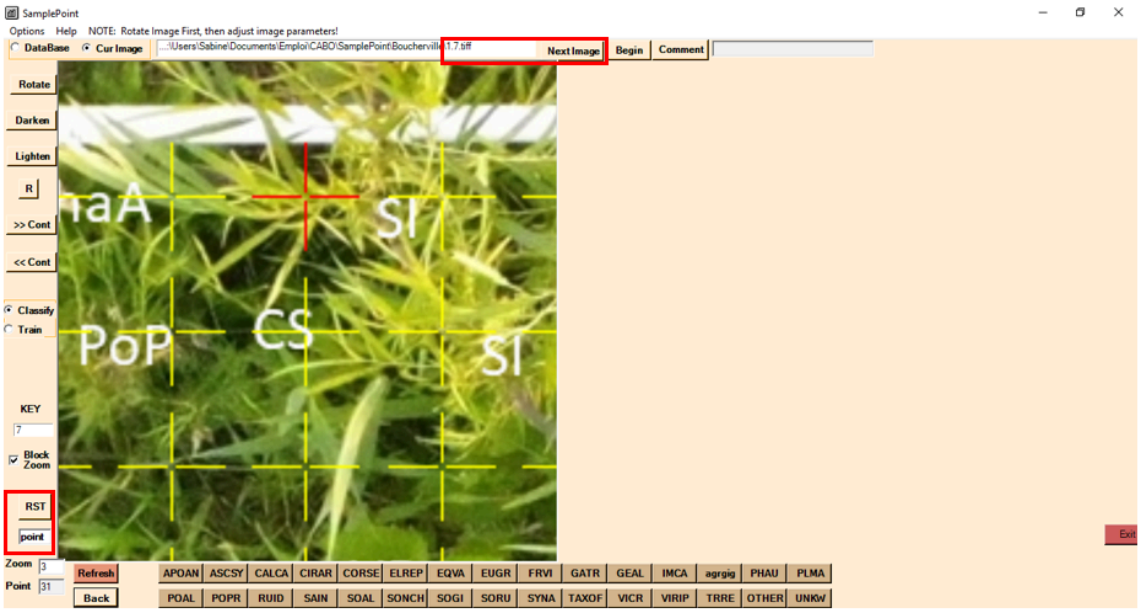
Note

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).


SamplePoint
Options Help NOTE: Rotate Image First, then adjust image parameters!
DataBase Cur Image
Next Image Begin Comment
Rotate Darken Lighten R >> Cont << Cont
Classify Train
KEY Block Zoom RST point
Zoom Point Refresh Back
APOAN ASCSY CALCA CIRAR CORSE ELREP EQVA EUGR FRVI GATR GEAL IMCA agrgig PHAU PLMA
POAL POPR RUID SAIN SOAL SONCH SOGI SORU SYNA TAXOF VICR VIRIP TRRE OTHER UNKW

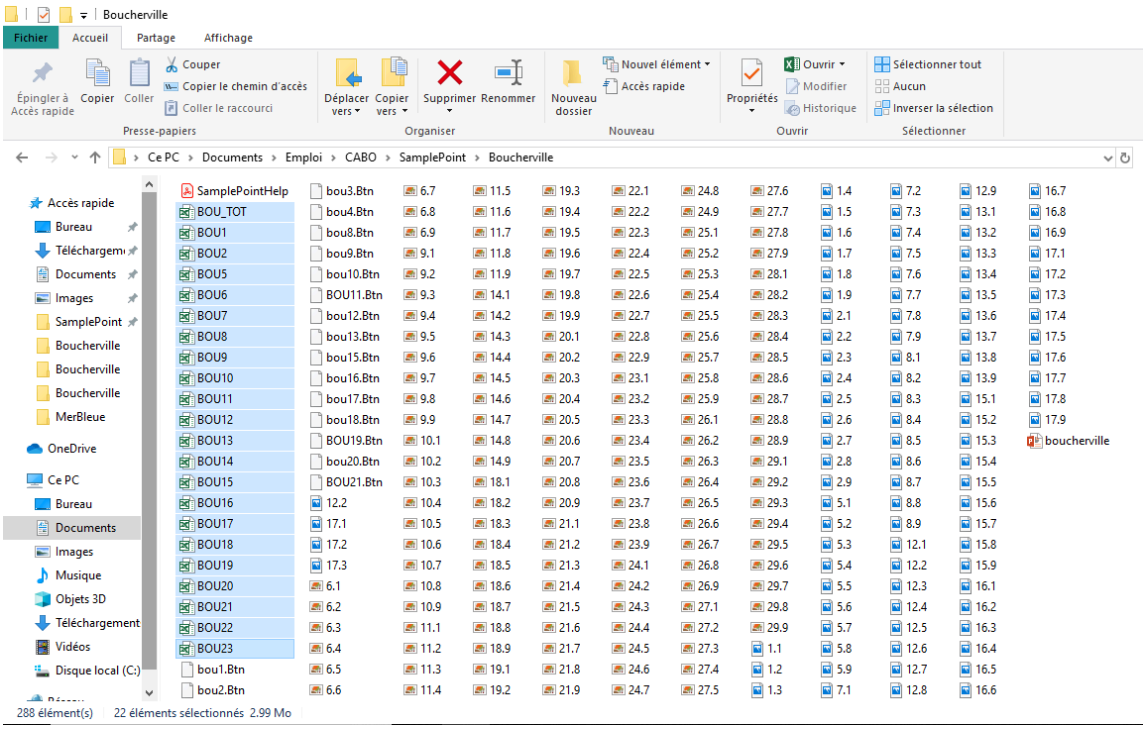

SamplePoint
Options Help NOTE: Rotate Image First, then adjust image parameters!
DataBase Cur Image
Next Image Begin Comment
Rotate Darken Lighten R >> Cont << Cont
Classify Train
KEY Block Zoom RST point
Zoom Point Refresh Back
APOAN ASCSY CALCA CIRAR CORSE ELREP EQVA EUGR FRVI GATR GEAL IMCA agrgig PHAU PLMA
POAL POPR RUID SAIN SOAL SONCH SOGI SORU SYNA TAXOF VICR VIRIP TRRE OTHER UNKW

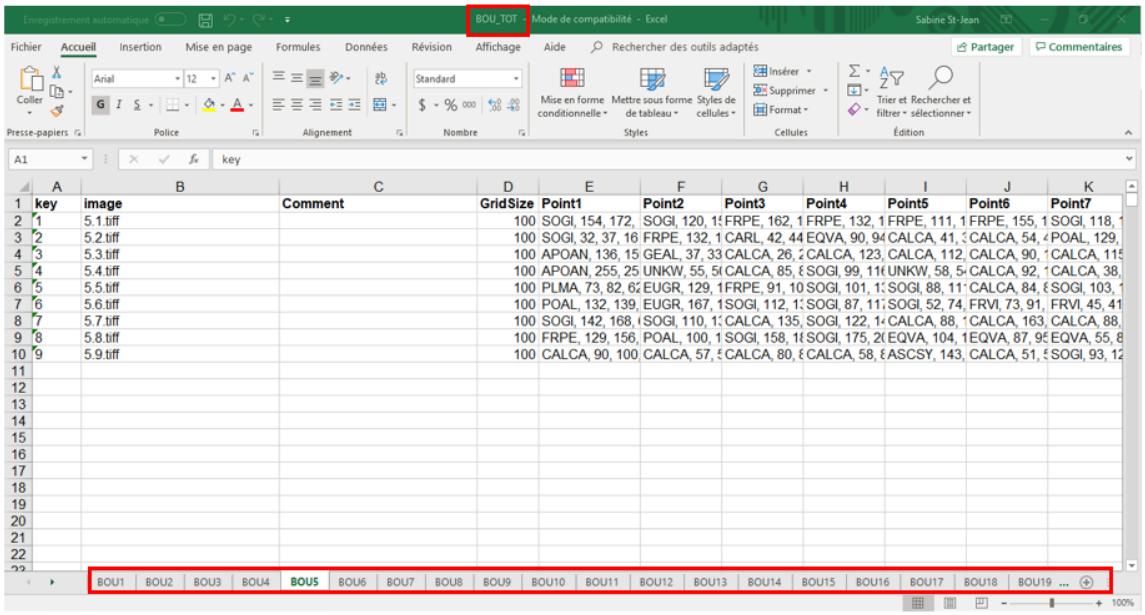




Data Combining

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



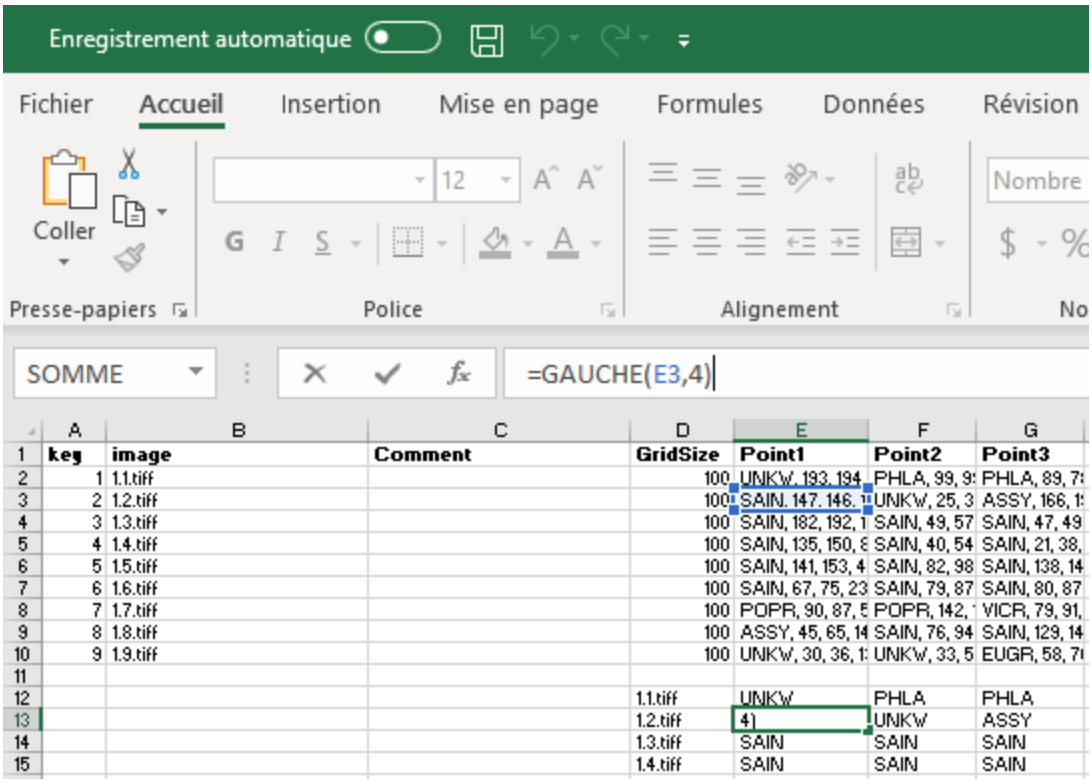


	key	image	Comment	GridSize	Point1	Point2	Point3	Point4	Point5	Point6	Point7
2	1	5.1.tiff		100	SOGI, 154, 172,	SOGI, 120, 1	FRPE, 162, 1	FRPE, 132, 1	FRPE, 111, 1	FRPE, 155, 1	SOGI, 118, 1
3	2	5.2.tiff		100	SOGI, 32, 37, 16	FRPE, 132, 1	CARL, 42, 44	EQVA, 90, 94	CALCA, 41, 3	CALCA, 54, 4	POAL, 129,
4	3	5.3.tiff		100	APOAN, 136, 15	GEAL, 37, 33	CALCA, 26, 2	CALCA, 123,	CALCA, 112,	CALCA, 90, 1	CALCA, 115
5	4	5.4.tiff		100	APOAN, 255, 25	UNKW, 55, 5(	CALCA, 85, 8	SOGI, 99, 11(	UNKW, 58, 5-	CALCA, 92, 1	CALCA, 38,
6	5	5.5.tiff		100	PLMA, 73, 82, 62	EUGR, 129, 1	FRPE, 91, 10	SOGI, 101, 1:	SOGI, 88, 11'	CALCA, 84, 8	SOGI, 103, 1
7	6	5.6.tiff		100	POAL, 132, 139,	EUGR, 167, 1	SOGI, 112, 1:	SOGI, 87, 11:	SOGI, 52, 74,	FRVI, 73, 91,	FRVI, 45, 41
8	7	5.7.tiff		100	SOGI, 142, 168,	SOGI, 110, 1:	CALCA, 135,	SOGI, 122, 1-	CALCA, 88, 1	CALCA, 163,	CALCA, 88,
9	8	5.8.tiff		100	FRPE, 129, 156,	POAL, 100, 1	SOGI, 158, 1(	SOGI, 175, 2(	EQVA, 104, 1(	EQVA, 87, 9!	EQVA, 55, 8
10	9	5.9.tiff		100	CALCA, 90, 100	CALCA, 57, 5	CALCA, 80, 8	CALCA, 58, 8	ASCSY, 143,	CALCA, 51, 5	SOGI, 93, 12

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.

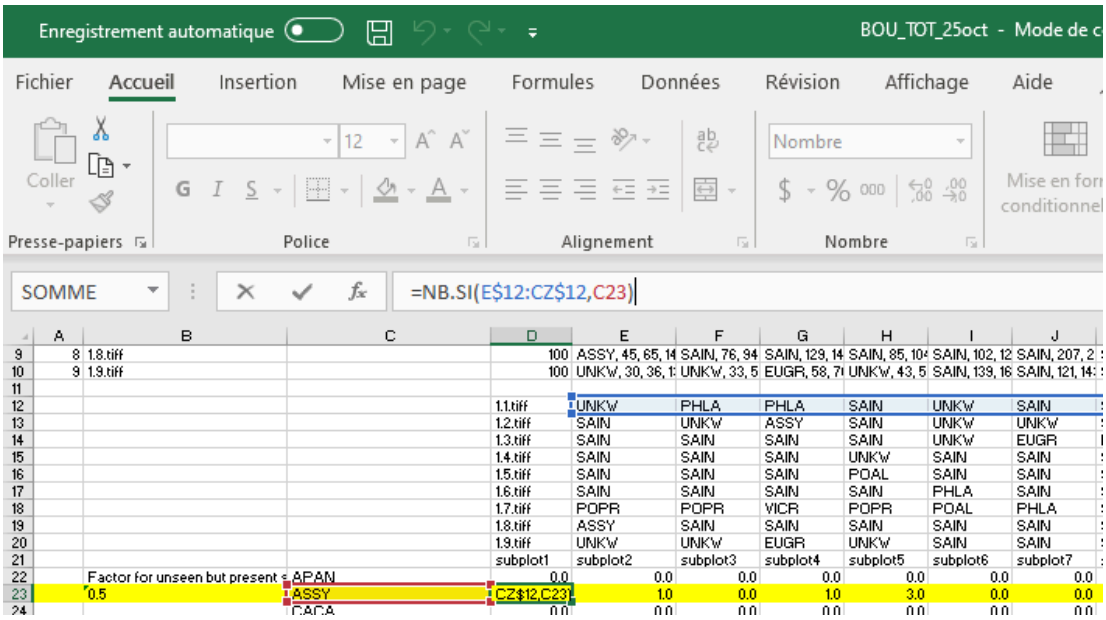


	A	B	C	D	E	F	G
1	key	image	Comment	GridSize	Point1	Point2	Point3
2	1	1.1.tiff		100	UNKW, 193, 194	PHLA, 99, 9	PHLA, 89, 7
3	2	1.2.tiff		100	SAIN, 147, 146, 1	UNKW, 25, 3	ASSY, 166, 1
4	3	1.3.tiff		100	SAIN, 182, 192, 1	SAIN, 49, 57	SAIN, 47, 49
5	4	1.4.tiff		100	SAIN, 135, 150, 8	SAIN, 40, 54	SAIN, 21, 38,
6	5	1.5.tiff		100	SAIN, 141, 153, 4	SAIN, 82, 98	SAIN, 138, 14
7	6	1.6.tiff		100	SAIN, 67, 75, 23	SAIN, 79, 87	SAIN, 80, 87
8	7	1.7.tiff		100	POPR, 90, 87, 5	POPR, 142, 1	VICR, 79, 91,
9	8	1.8.tiff		100	ASSY, 45, 65, 14	SAIN, 76, 94	SAIN, 129, 14
10	9	1.9.tiff		100	UNKW, 30, 36, 1	UNKW, 33, 5	EUGR, 58, 7
11							
12				1.1.tiff	UNKW	PHLA	PHLA
13				1.2.tiff	4)	UNKW	ASSY
14				1.3.tiff	SAIN	SAIN	SAIN
15				1.4.tiff	SAIN	SAIN	SAIN

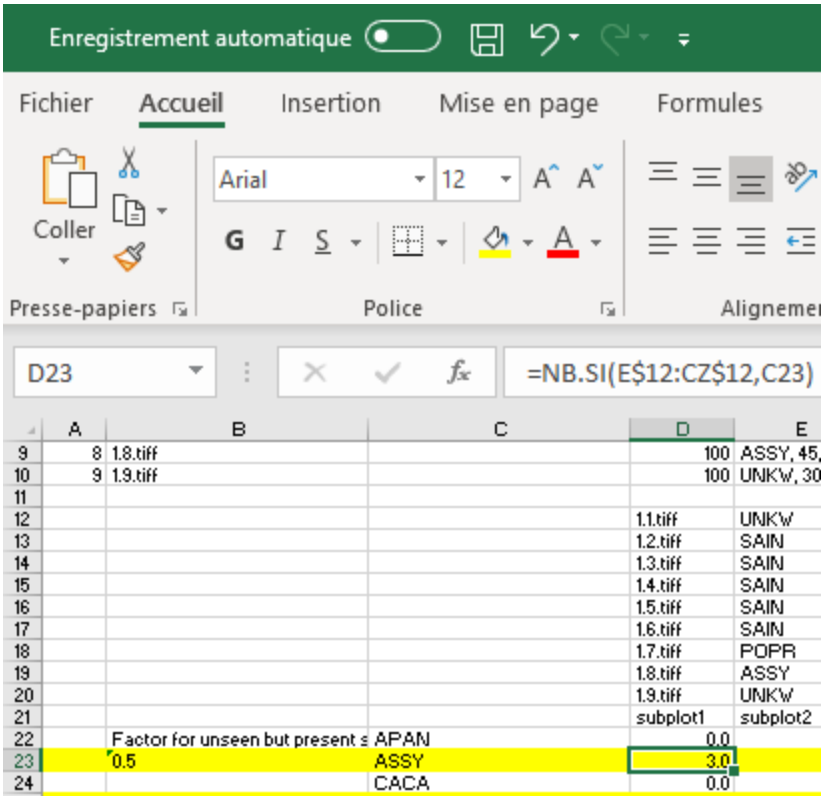
5 In Excel, create a final table to calculate the percent cover (abundance) of each species in each subplot.

- 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)

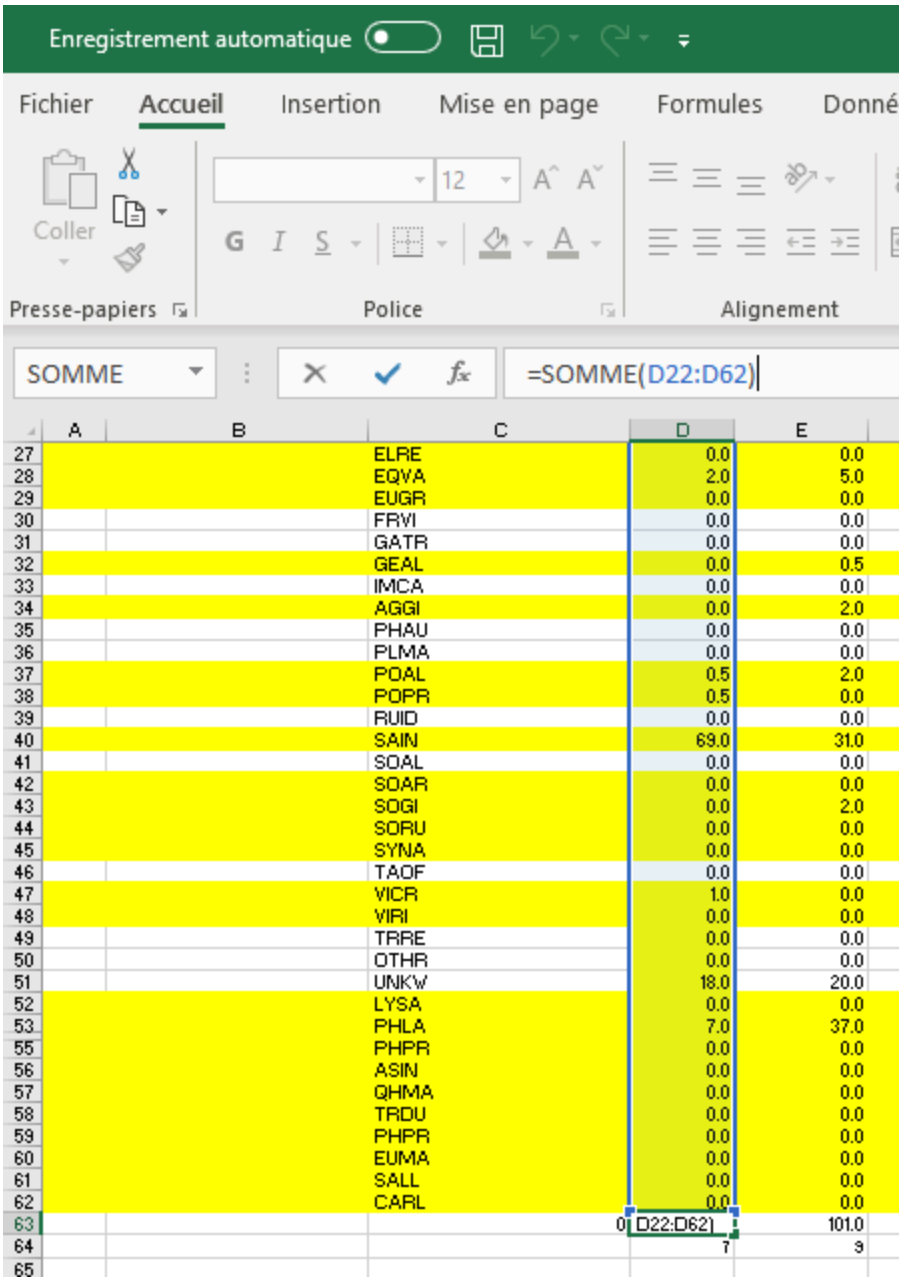
where E$12:CZ$12 is the list of the 100 buttons for the given subplot, and C23 is the name Excel is searching for.



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



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

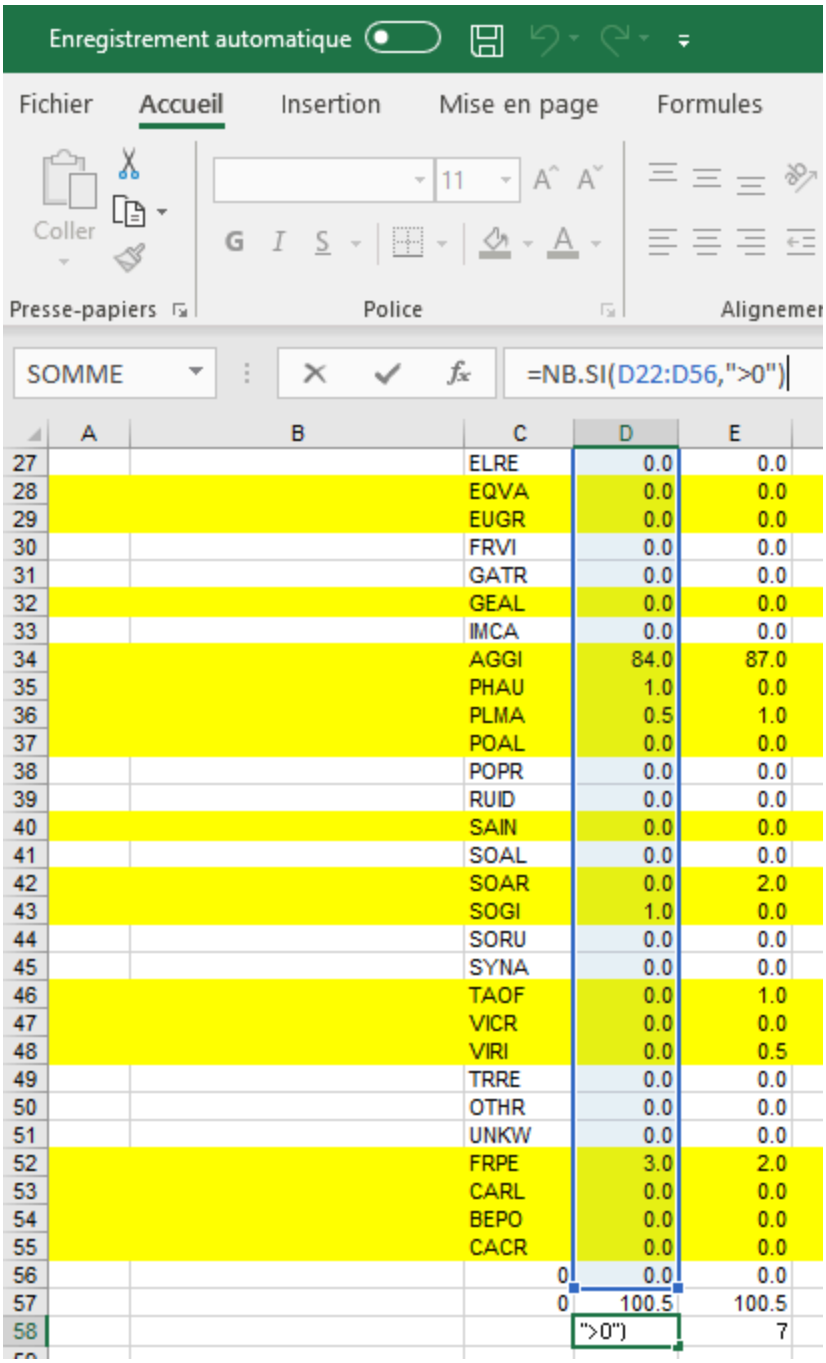


	A	B	C	D	E
27			ELRE	0.0	0.0
28			EQVA	2.0	5.0
29			EUGR	0.0	0.0
30			FRVI	0.0	0.0
31			GATR	0.0	0.0
32			GEAL	0.0	0.5
33			IMCA	0.0	0.0
34			AGGI	0.0	2.0
35			PHAU	0.0	0.0
36			PLMA	0.0	0.0
37			POAL	0.5	2.0
38			POPR	0.5	0.0
39			RUID	0.0	0.0
40			SAIN	69.0	31.0
41			SOAL	0.0	0.0
42			SOAR	0.0	0.0
43			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			QHMA	0.0	0.0
58			TRDU	0.0	0.0
59			PHPR	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)	101.0
64				7	9
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.

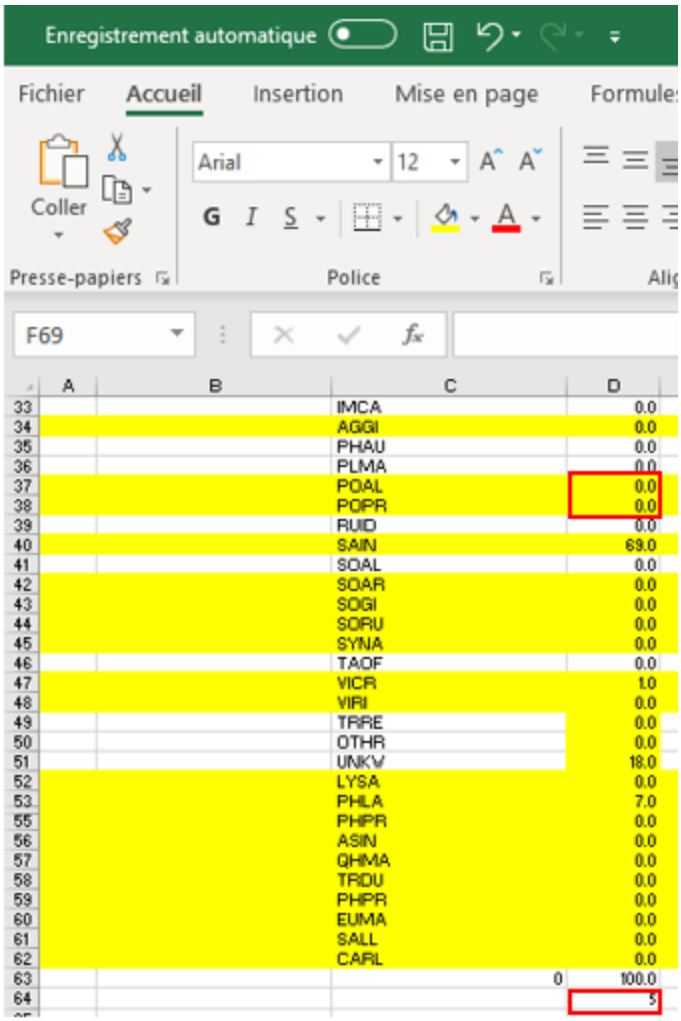


	A	B	C	D	E
27			ELRE	0.0	0.0
28			EQVA	0.0	0.0
29			EUGR	0.0	0.0
30			FRVI	0.0	0.0
31			GATR	0.0	0.0
32			GEAL	0.0	0.0
33			IMCA	0.0	0.0
34			AGGI	84.0	87.0
35			PHAU	1.0	0.0
36			PLMA	0.5	1.0
37			POAL	0.0	0.0
38			POPR	0.0	0.0
39			RUID	0.0	0.0
40			SAIN	0.0	0.0
41			SOAL	0.0	0.0
42			SOAR	0.0	2.0
43			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.

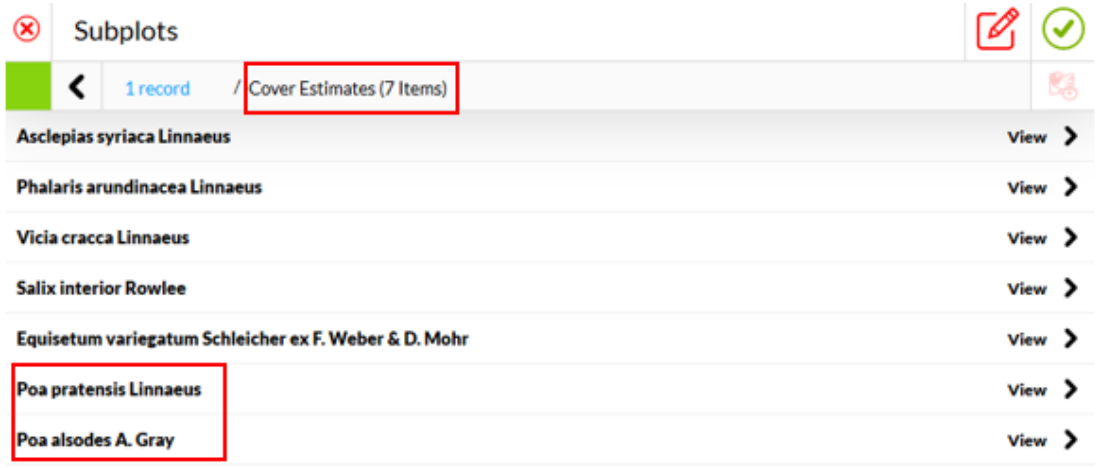
Note

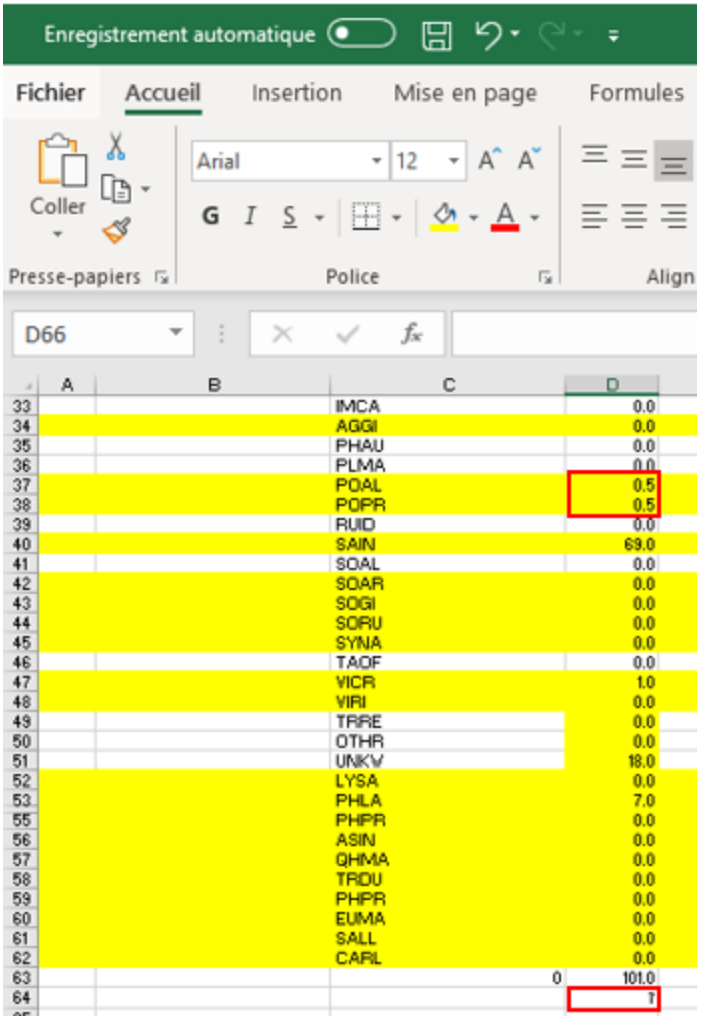
The last column (no. of species per subplot) of the table generated at step 5 is useful to compare your data to the *Fulcrum* records, when looking for absent species. Ground covers that are not species should be left out of the count.



	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	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			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 orignal *Fulcrum* record contains 7 in the same subplot.





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.