Stats in the Wild

Activity ③

Flora Explorer

Data moves

Grouping (using, creating or highlighting subsets)	**Filtering** (showing/ hiding subsets)	**Ordering** (sorting into an order)	**Summarising** (computing or calculating to describe a characteristic of a dataset)
Linking (identifying corresponding case(s) in one representation and another representation)	**Inspecting** (hovering, clicking on or locating an object to gain information)	**Expanding datasets** (adding data, merging or joining datasets)	**Creating new variables** (e.g. rates/ proportions from existing data)

Data forms

Choosing or creating a representation for a purpose
Finding and using relationships or patterns

Adapted from Hudson, R. A., Mojica, G. F., Lee, H. S., & Casey, S. (2024) *Data Moves as a Focusing Lens for Learning to Teach with CODAP.* Computers in the Schools, 1–26. https://doi.org/10.1080/07380569.2024.2411705

Overview

1	2	3	4	5
Explore Scotland's native flora (plants)	**Collect** data in the wild	**Tidy and summarise** data	**Create** models of data	**Evaluate and critique** a model

You will need

- MWS Activity 3 Small Grids. pdf **(printed)**
- MWS Activity 3 Large Grids. pdf **(printed)**
- MWS Activity 3 Modelling Spreadsheet.xlsx
- Quadrat (metal grid)
- Microsoft Excel **(or other spreadsheet software)**
- Camera **(optional)**
- *Seek* app **(pre-downloaded)**

Rycroft-Smith & Macey
Research Group Ltd

Maths Week
Scotland

ROYAL
STATISTICAL
SOCIETY
DATA | EVIDENCE | DECISIONS

Activity

You are surrounded by many different types of plants and animals in your local area. In this activity you will **collect data** about plant species in a local green space and use it to **create a simulation**.

1 **Explore** Scotland's native flora (plants)

Identify 5-10 outdoor plants in your local environment. You could look in your garden, a local park, or around your school. To help identify the plants you could look on websites such as https://www.nature.scot/plants-animals-and-fungi or take a photo and use Google Lens or the *Seek* app on a smartphone.

For each plant write down the plant's common name, any alternative names that you know it by, and any features that might help you identify it, for example:
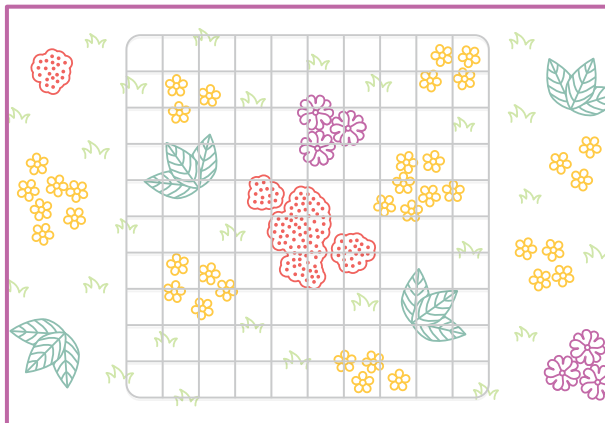
Colour of stem, leaf, flower, or fruit

Leaf shape

Number of petals

Approximate height

In your classroom, **compare your list** of plants with other students in your class and discuss any similarities or differences.

2 **Collect** data in the wild

In groups, go outside to a school field, park or common, or nearby green space and **put down a quadrat** (metal grid) on a patch of ground so that it is covering a selection of plants.

> ! Take care **not to disturb** wildlife any more than is necessary, and **do not remove** any creatures or plants from their habitat.

Using a data collection sheet (you will need several printed copies of *MWS Activity 3 Large Grids.pdf*), **label each square** in the grid based on the plants you can see under the corresponding section of the quadrat.

You can use the *Seek* app to help identify plants or take photos so that you can research them when you are back in the classroom.

Repeat the activity 5-10 times (filling in 5-10 new grids in the data collection sheets) around the green space you are in.

You will need to consider:

- How to record your data on the data collection forms (e.g. by writing the name of a plant, assigning each plant a colour and colouring the grid square, or assigning each plant type a number and numbering the grid)
- What to do if more than one type of plant is contained within a section of the quadrat
- How to work together to position or hold the quadrat over taller plants so they are not damaged while collecting your data
- Why and how you choose where to put the quadrat
- Whether some plants are over- or under-represented in your sample

> 💡 If you have used a camera to take photos of individual plants, it might be a good idea to **take a picture of each quadrat in place**. This will make recording your data a lot easier!

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3 | **Tidy and summarise** data

Next you will **create a dataset** which you will use to build your model.

Look at your data collection sheets. If you have recorded more than one type of plant for each grid square in the quadrats you will need to **simplify the data** before you can use it in the model.
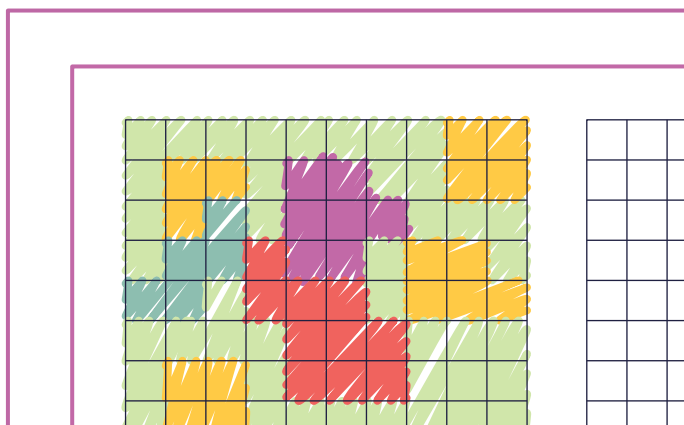
Using a blank 10x10 grid (you will need a printed copy of *MWS Activity 3 Small Grids.pdf*), for each of your quadrat samples **record a single plant type** in each grid square.

You will need to consider how to decide which plant type to record in each square. For example, you could record the plant type that covers the highest proportion of the square.

Once you have a complete set of data grids, use the spreadsheet provided to **record your data** (in the [Data] tab). Write the names of all the plants you recorded in the [Name of plant] column, and the counts from each sample in the corresponding columns.

B	C	D	E	F	G	H	I	J	K	L	M	N
	Data											
Name of plant	Number of grid squares in sample 1	Number of grid squares in sample 2	Number of grid squares in sample 3	Number of grid squares in sample 4	Number of grid squares in sample 5	Number of grid squares in sample 6	Number of grid squares in sample 7	Number of grid squares in sample 8	Number of grid squares in sample 9	Number of grid squares in sample 10	Mean of samples	*Proportion for models*
Rye grass (Example)	75	80	40	66	73	4	99	82	4	3	52.6	100.0

The mean average will be calculated in the first row of the [Proportion of models] column automatically. **Copy and paste the formula** down each row so that an average is calculated for each plant.

> **!** If you copy and paste the formula before filling in the table, **you might get an error message** because the row is empty. This will disappear once you start adding data!

4 **Create** models of data

Setting up the model

The [Proportion of models] column represents each plant's mean average count as a proportion of the total average count. For example, 100% means you found that plant type in all your samples. 25% means that on average 25% of the quadrat squares contained that plant.

> **!** Check that the numbers in this column **add up to 100**. You can use the *=SUM()* formula to do this!

Building up the model

The model you will create uses a random number generator and conditional formatting in Excel to simulate your data collection sheets.

In the spreadsheet select the [Model] tab. You will create a proportional model based on your data by **filling in the *Model* table**.

On paper, write a list of each plant type and next to it write the value from the [Proportion of models] column of the [Data] tab rounded to the nearest 10%. Check that these add to 100. If not, you will need to decide how to deal with this, perhaps by leaving out a plant species, or combining two plant species.

Return to the [Model] tab and **fill in the *Model* table** using the proportions so that every plant species gets the number of rows equivalent to its rounded percentage. For example, if the proportion of Rye Grass is 70 percent it would get 7 rows in the model.

Create a key for your model. For each plant species, **assign a colour in the *Key* table**.

Next create the **conditional formatting scheme**. Select all the cells in the simulated quadrat and use your key to set up a conditional formatting scheme so that each cell is colour coded to match the *Model* table. To do this, click on the ▦ **Conditional Formatting** icon on the tool bar and select ▦ **Manage Rules...**
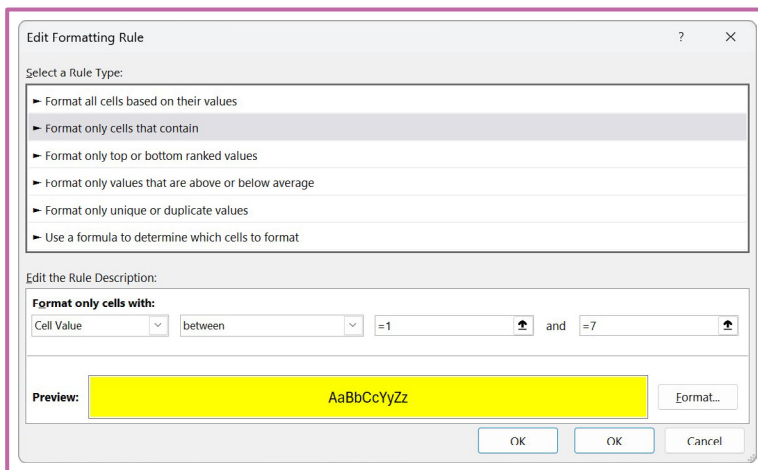
For each plant type you will need to create a rule based on the *Model* table, for example, if Rye Grass has rows 1 to 7 in the table, you will need to create a rule to *Format only cells that contain* for a cell value between 1 and 7.

Make sure you assign the colour that matches your key.

In the simulated quadrat, each cell uses the *=RANDBETWEEN(1,10)* function to generate a random number between 1 and 10 and then colour-codes it according to your model. Run the simulation by pressing the [F9] key to regenerate the random numbers.

Now **test your model**. Run the simulation 5-10 times and fill in the table. Take a screenshot of each simulated quadrat and save them in a document.

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5   **Evaluate and critique** a model

Compare the results to your original data and consider:
- How much do the simulated quadrats look like the quadrats in your data collection sheet?
- How much do the quadrats look like the real-world? (You can compare your simulated quadrats to any photos you took of the real-world quadrats when you were collecting data)
- How are they similar?
- How are they different?
- What are the limitations of the model?
- How might the model be improved?