

Edina Trust Bulb Project Extension Guidance Teachers and Project Leaders on this Year's Results

A big thank you!

Well done to all schools that sent data for the Bulb Project this year! Your input has been invaluable in looking at our hypotheses. Even if you did not manage to get data to us this year we hope that this project has been fun and useful for teaching various curriculum topics. We have a **quick survey online** where we would love to get your feedback:

<https://www.surveymonkey.co.uk/r/VX9VBTS>

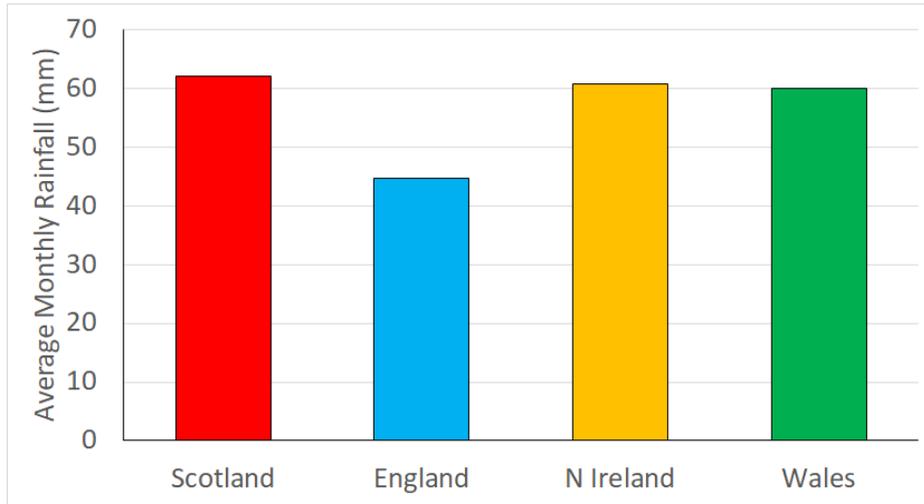
The National Museum of Wales (NMW) will produce a paper on the results of the bulbs planted in pots for all schools. This will be distributed to the schools involved and can be accessed on the NMW website: www.museumwales.ac.uk/spring-bulbs/

This year 100 schools took part in the Edina Trust's extension Bulb Project, which involves comparing the flowering dates and heights between bulbs planted in pots and bulbs planted in the ground. **A big thank you to the schools that returned their data!**

Around half of the schools returned weather records overall. We would love for more schools to return their weather records. If you had trouble submitting weather data, we would appreciate it if you can get in touch to let us know why, and how we can make it easier for schools. The same goes for flowering data too!

The PowerPoint uses the weather data and flowering dates submitted by schools to compare differences across the UK as well as differences between this year and previous years of the project.

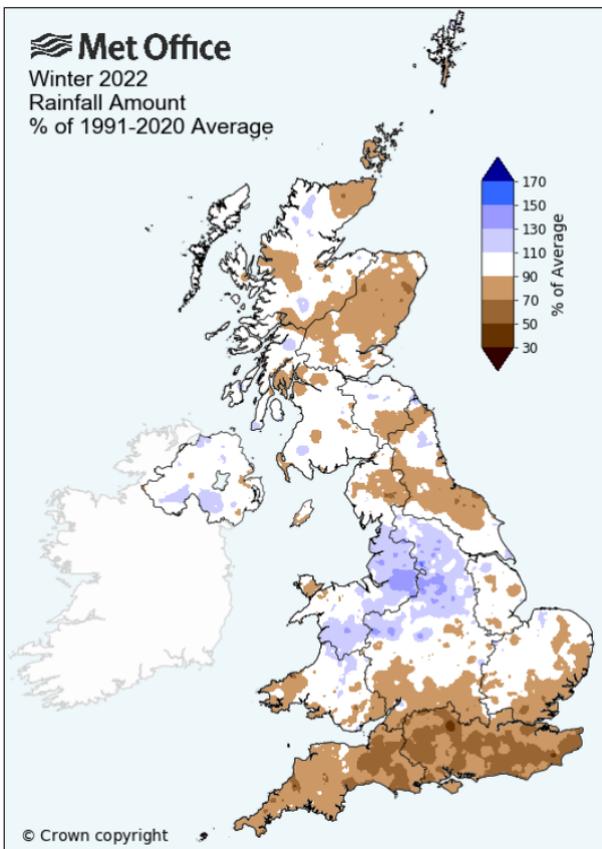
We have also created some fun quizzes that pupils can do by themselves, which don't require them to use PowerPoint. You can find more information on page 8!



Three countries had incredibly close amount of rain on average per month this year – all within 2mm! Scotland reported the most by a small amount. England reported the least rain at 45mm.

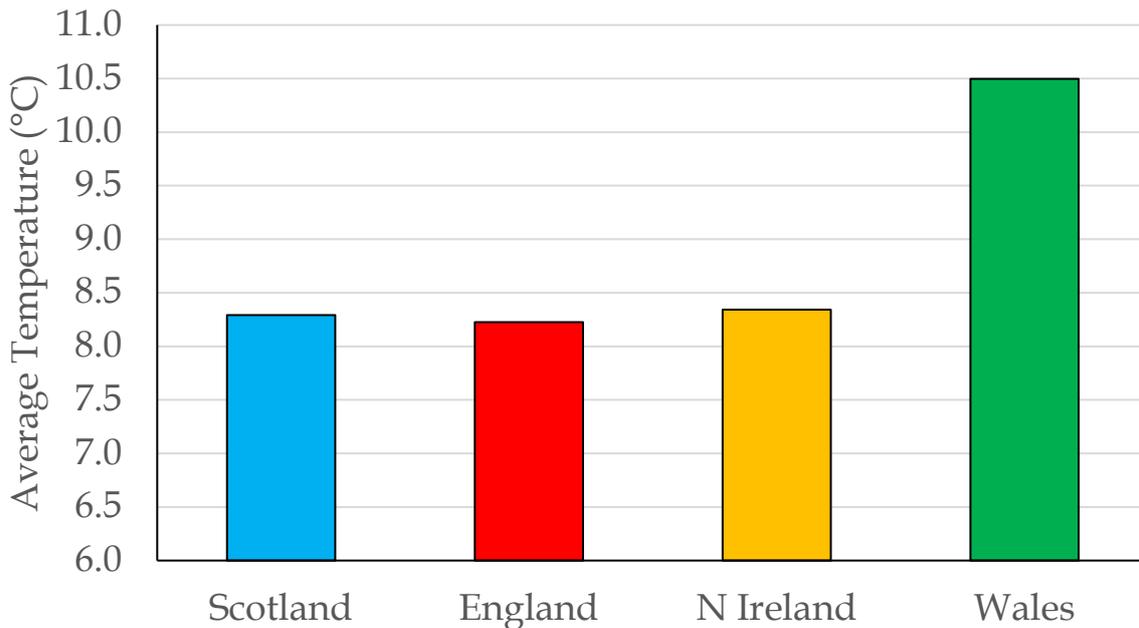
Country	Average rainfall (mm)
UK 2021-22	57
Scotland	62
England	45
N. Ireland	61
Wales	60

We can compare these figures to the Met Office data to get a better idea of rain patterns across the UK.



In the Met Office map, the brown areas saw less rain than on average, while blue areas saw more rain than average. The statement says “December rainfall totals were slightly below normal in many places, [...] giving an overall UK figure of 90% of average. **Much of January’s rainfall came during the first ten days**, and overall it was a very dry month with 50% of average UK rainfall in total. February was much wetter than average in most areas, with 152% of average overall.”

Water is of course vital for plants, but more rain does not always mean that daffodils will thrive. Daffodils will not grow underwater! Being too moist also benefits moulds that are detrimental to the daffodil bulbs. We would ask pupils to think about whether they expect bulbs to flower earlier if they get a lot of rain, or whether they would flower later?



We saw some very close temperatures as well this year. Pupils will need to look closely at the chart to see which area was the coldest. But it should be clear which one was the warmest! The table to the right shows the actual values for the average temperature in each country and across the UK.

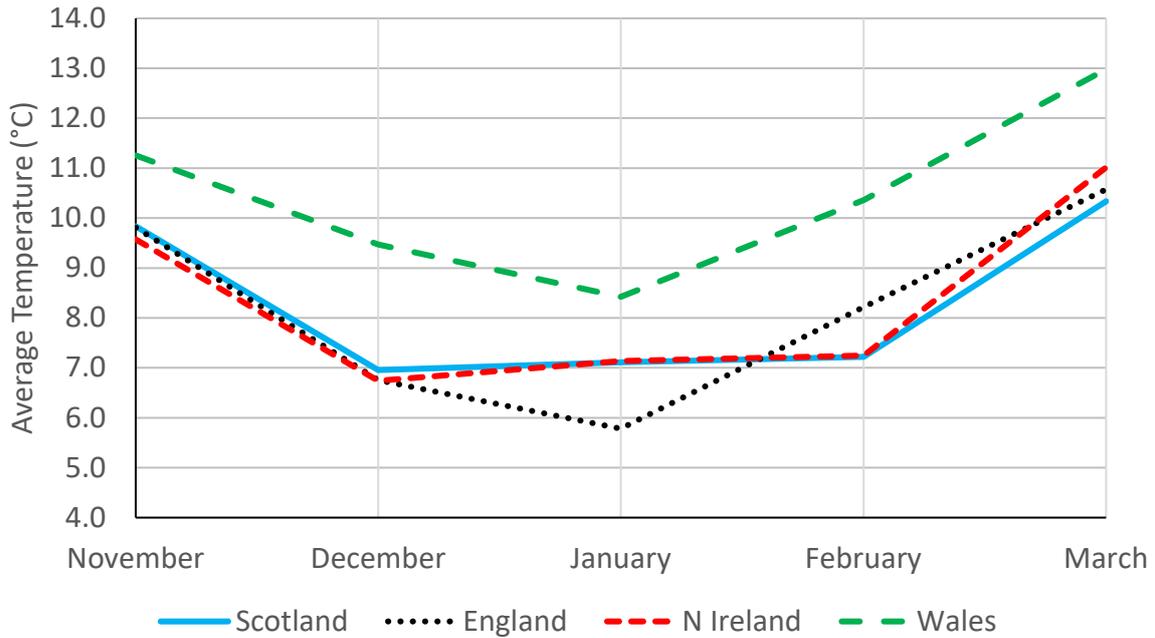
Country	Average Temperature (°C)
UK 2019	7.4
Scotland	8.3
England	8.2
N. Ireland	8.3
Wales	10.5

Normally we see Scotland being the coldest country but that wasn't the case this year. The Met Office report states: "December 2021 saw temperatures averaging out above normal generally, particularly for minima, with fewer frosts than average. [...]. England and Wales were notably cold by night during parts of January, but overall it was another rather mild month, especially in Scotland, with the final week particularly mild; monthly mean temperatures were 0.8 °C above average." So perhaps Scotland seeing a relatively mild winter compared to the 'notably cold' nights in England and Wales evened out the temperatures more. A lot of the Welsh schools are located in the south of Wales, so perhaps that is what increased the average temperature. But we can't be sure!

Bulbs are sensitive to temperature changes and begin to grow as the soil warms up in spring. This means that a mild winter can cause daffodils to flower earlier, or a cold spring can cause them to flower later.

As with rainfall, it is not always good to be too warm. As well as potential drought, too much warmth can be beneficial to pests such as the Large Narcissus Fly. The fly's larvae live inside and eat daffodil bulbs. Due to the warmer climate this fly, which was once only found in the South-West, has been able to spread across the UK¹.

¹ <https://thedaffodilsociety.com/wordpress/a-guide-to-dafodils/pests-diseases/>



This graph shows the temperature each month from November 2021 – March 2022. We can see there was a decrease in temperature until January, and then the average jumped back up in March. Below are the average temperatures each month in the four countries:

°C	November	December	January	February	March
Scotland	9.8	7.0	7.1	7.2	10.3
England	9.8	6.8	5.8	8.2	10.6
N. Ireland	9.6	6.7	7.1	7.2	11.0
Wales	11.3	9.5	8.4	10.4	13.0

Wales was the warmest in every month. Looking specifically at January, England was the coldest, experiencing a temperature drop not seen in N Ireland or Scotland, however it increased to a higher average temperature in February.

Our hypotheses

Next, we look back at our hypotheses – our predictions about daffodils’ flowering and height:

1. Schools that record higher temperatures during the Bulb Project will have the earliest flowering daffodils. The effect of temperature will be more pronounced with the daffodils in pots compared to those in the ground.
2. Schools that record more daily rainfall during the Bulb Project will have the earliest flowering daffodils.
3. On average, daffodils in pots will flower before those planted in the ground.

Daffodils flowered first in Wales, followed by Northern Ireland, England, and Scotland was the latest this year. The average flowering dates are listed in the table to the right.

	Pots	Ground
Scotland	19 th March	17 th March
England	10 th March	4 th March
N. Ireland	15 th March	4 th March
Wales	4 th March	25 th Feb

Our hypothesis was that daffodils in pots would flower first. But daffodils flowered earlier in the ground in every country! This was a surprising result for us! Was it because of the temperature and rainfall this year? It was warmer than average, with less rainfall than usual. Or was it because other factors influenced the result more strongly than the insulation effect that we based our hypothesis on? We have found in the past that sometimes our hypothesis is supported by the results, and sometimes the results contradict our expectations.

We need to consider the other factors that could influence which bulbs grow and flower first.

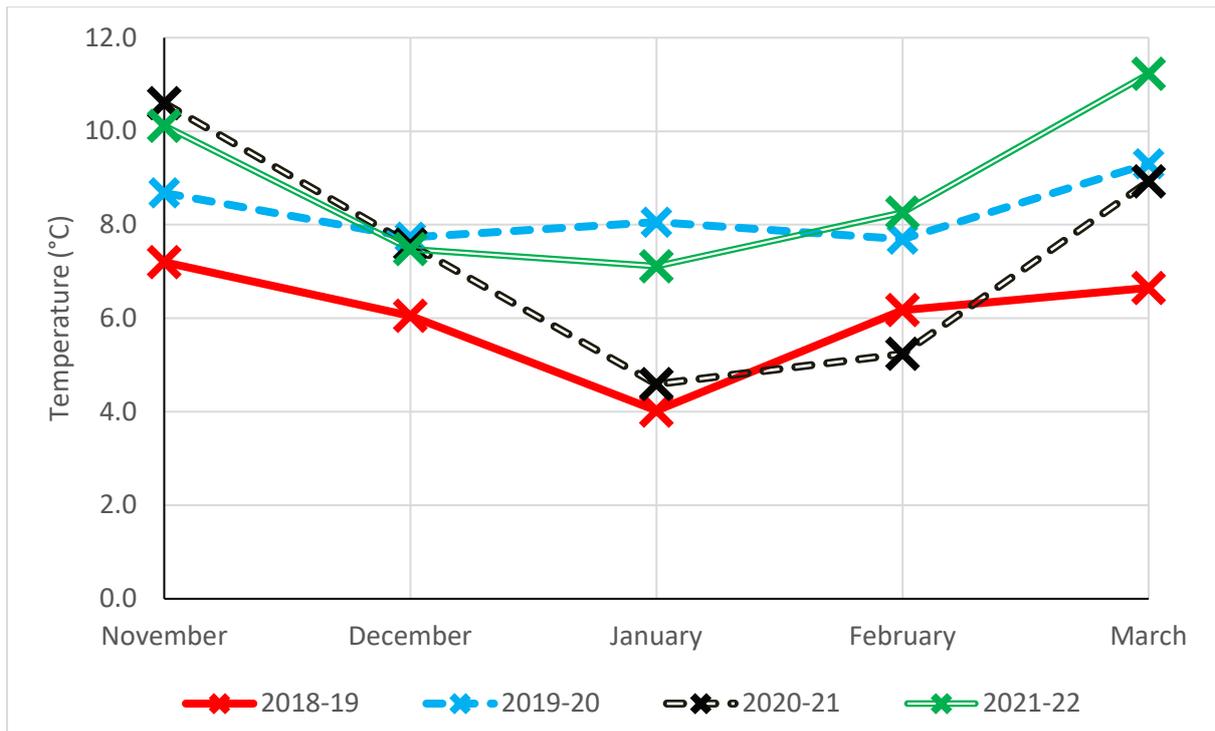
Here are the average flowering dates across the whole of the UK compared to last year:

	2021	2022
 Daffodils in Pots	12 th March	12 th March
 Daffodils in the Ground	13 th March	5 th March

The average flowering date for daffodils planted in pots was the same in 2021 and in 2022! But this year, daffodils planted in the ground flowered earlier.

It is important to keep in mind that the lockdown restrictions might have affected the results. Schools may not have had access to their bulbs to report flowering dates all through February and March in 2020 or in 2021.

The slide shows the difference in flowering dates between bulbs in pots and in the ground, and between Spring 2021 and Spring 2022. These are the average flowering dates across the whole UK.



This is a graph showing the temperatures sent in by schools during the last four years of the Bulb Project. Daffodils flowered earlier in the ground this year, but the flowering date for bulbs in pots was the same. 2020-21 had a bigger drop in temperature in January and February, and was still colder than 2021-22 in March. Perhaps the effect on daffodils planted in the ground is stronger than for daffodils planted in pots? But we can't be sure, and in the past we have found the results to be the other way around! We will have to continue analysing data in future years of the project.

 **Do you think there could be other reasons for bulbs to flower earlier or later?**

Here are some ideas of things that might affect daffodil flowering dates...



Soil quality



Shade



Pests & diseases

I'm not a bee! I'm a Narcissus Fly and I eat daffodil bulbs. I look like a bee so other animals think I can sting!

The slide shows some of our ideas for other factors that might be affecting the growth of the daffodils. They might explain why the results don't always match our predictions.

1. Soil Quality

We cannot be sure how much of an effect the type of soil or compost has on the growth of daffodils. Compost will hold moisture more effectively than soil, and different types of compost will hold moisture more effectively – we recommend peat-free compost due to environmental concerns. Using compost over soil should also reduce weed growth since it should not contain any stray seeds. Good drainage is important as waterlogged soil can cause the bulbs to rot, and the pH and amount of nutrients, e.g. nitrogen and potassium, in the soil will also affect growth. We would have to find a way for all schools to use the same compost to eliminate this from our investigation.

2. Sunlight/Shade

Plants need sunlight in order to grow. Bulbs that are grown in shaded areas might grow taller in search of light, or they may not get enough sunlight to warm up and might flower later. We ask schools to keep their pots near the bulbs planted in the ground, if possible, to reduce the impact of this. There is not much else we can do as the amount of shade and hours of sunlight will differ between all schools.

3. Pests and Diseases

We don't have much control over this. We advise schools to keep their bulbs in a cool, dry place before planting day. Let us know if you notice your flowers are affected by pests!

Mystery Bulbs

Spoilers: the mystery bulbs this year were grape hyacinths! Were you able to see the mystery bulbs flowering yet this year? They may open as late as May. We would like to encourage pupils to have a look for hyacinths flowering near where they live as well!

Follow Up Activities

1. Kahoot Quizzes

We have created some fun quizzes that pupils can complete using the website Kahoot! There are three different quizzes, relating to temperature and rainfall results sent in by pupils all around the UK. The separate rainfall and temperature versions are intended to be for higher ability levels, while the combined one for a lower ability level. The links to these quizzes can be found at www.edinatrust.org.uk/bp-results

We would love to hear your feedback!

2. Bulb Project Board Game

A professionally printed copy of this game was sent to all schools last October. However, if you direct pupils to our website linked below, they will find a board game that can be downloaded and printed. This game is designed to encourage discussion about the various factors that could have affected the growth of your daffodils and crocuses.

Please go to this web page to download the board game and instructions:

<https://www.edinatrust.org.uk/bp-results>

3. Investigate more results by looking at the Met Office Climate Maps and Data

You can look at climate summaries for each season and each month going back to 2018 among many other things. What patterns can you see? How do the results recorded by the Met Office compare to the Bulb Project results?

<https://www.metoffice.gov.uk/research/climate/maps-and-data>