

Phenology at Kew

Plants, like all living things, respond constantly to the weather and climate. Many alter very visibly through the year as each new season unfolds in ways that are so predictable it is difficult to imagine that they could ever change. Yet seasonal patterns of flowering and growth have shifted over recent years and the most likely cause is climate change. So, can we measure this shift? And what does it tell us?

What is phenology?

Phenology is the study of the timing of natural events in the lives of living things in relation to climate. Every year spring flowers open, butterflies emerge, birds arrive for the summer, and autumn brings fruit, vibrant colours and leaf fall. Seasonal changes in growing conditions influence plant, fungal and animal behaviour either directly or through long association. But when will these events happen each year?

Kew is an ideal place to study phenology since it has a long history, rich and stable plant collections, abundant wildlife and weather records going back more than two hundred years. At Kew the dates when the first flowers appear on one hundred different plants are recorded annually. These individuals were designated in 2000 and are known as the 'Kew 100'. They include trees, shrubs, perennials and bulb areas of both native and exotic species. Many flower in the spring and early summer but there are also autumn and winter-flowering plants. The results are compared with a detailed 50-year set of observations collected by Kew botanist Nigel Hepper (now retired) who recorded local flowering dates for many of the same species, starting in 1952.

A window on climate change

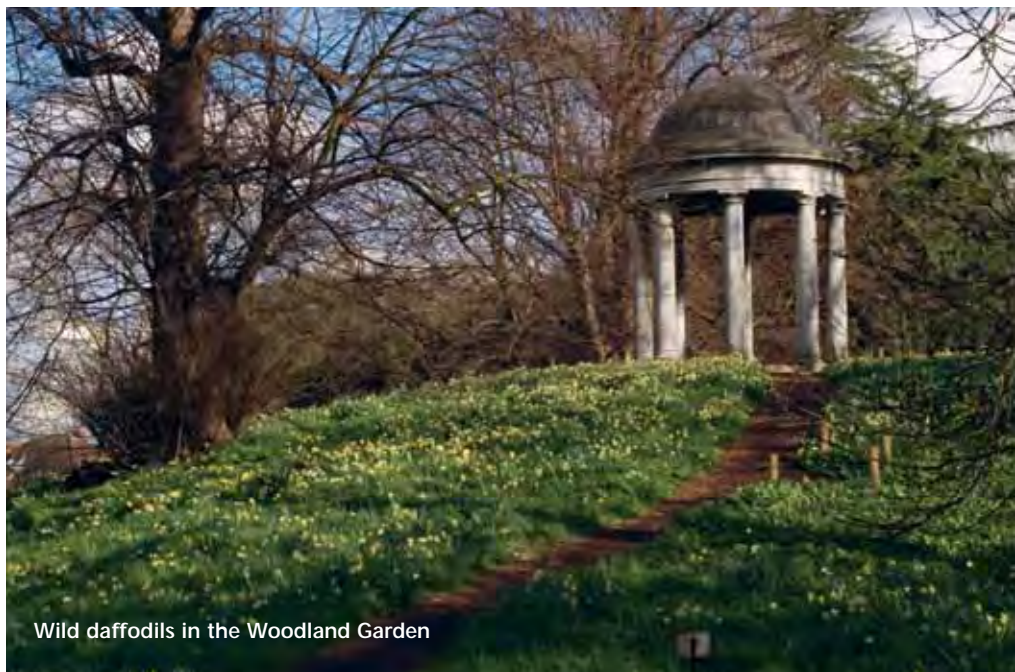
Climate change is affecting the weather and seasons throughout the world, but ideas like 'a 4°C global average temperature rise' can seem too abstract to understand. Since phenology studies local organisms' responses to weather and climate, it provides an easily appreciated early warning of the effects of climate change in our lives.

Once phenological observations have given us the idea there is something to investigate, other scientific disciplines can look at how these responses come about.

Climate change at Kew – some facts and figures

Plants and animals here are often adapted to respond to the variations from season to season typical of the UK and parts of Europe. But in the majority of plants, date of first flowering varies more from year to year because of the weather. So to distinguish long-term trends, we look at averages; and because of the long run of data we hold at Kew, we look at decades. In some early spring species, there is already a trend in earlier flowering noticeable from the 1950s. Different species react differently and show different changes. On the whole, in most species, the trends are most obvious from the 1980s – which is when we're told the pace of warming has increased.

Almost all of the plants that flower in the first half of the year are opening earlier, especially spring bulbs. The flowering times of snowdrops, daffodils and crocuses have advanced dramatically as average temperatures have risen and

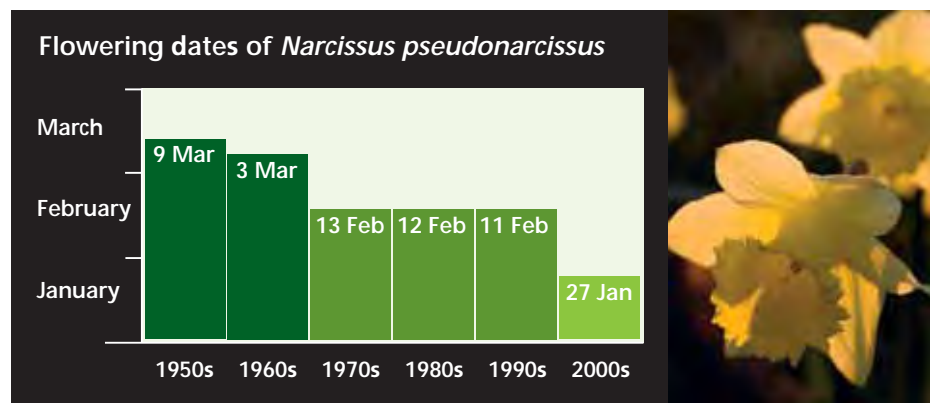


Wild daffodils in the Woodland Garden

winters become milder. Snowdrops opened around the end of February in the 1950s, but over the decades flowering has gradually become earlier, and since the 1990s they've opened in January. The flowering of the wild daffodil has advanced from March to January – by 41 days since records began.

Springwatch and Autumnwatch

Kew is proud to work with diverse scientific partners to advance scientific knowledge and support conservation around the world. In the UK, we contribute phenology records for all requested native plants and animals (timing events such as the first ladybirds mating, the onset of leaf colour changes in autumn, and the first ripe blackberries) to Springwatch and Autumnwatch. These national



recording schemes are organised by the UK Phenology Network. Thousands of volunteers submit their observations, which are collected together across the United Kingdom, and anyone can track the signs of the arrival of spring and the advance of autumn across the country online. The UK Phenology Network is also able to draw upon a remarkable historical legacy of records dating back several centuries. Its studies of

phenology and climate help feed into scientific advice that the government and business need to plan the future.

Get involved

Learn more about the UK Phenology Network and take part in Springwatch and Autumnwatch by visiting www.naturescalendar.org.uk and, for kids especially, www.naturedetectives.org.uk

Common name	Botanical name	1980s average opening date	2000s average opening date	Days earlier
wood anemone	<i>Anemone nemorosa</i>	1 April	13 March	19 days
common box	<i>Buxus sempervirens</i>	1 April	13 March	19 days
winter aconite	<i>Eranthis hyemalis</i>	29 January	11 January	18 days
wild daffodil	<i>Narcissus pseudonarcissus</i>	12 February	27 January	16 days
golden crocus	<i>Crocus chrysanthus</i>	15 February	4 February	11 days
common snowdrop	<i>Galanthus nivalis</i>	10 February	30 January	11 days
common lilac	<i>Syringa vulgaris</i>	29 April	18 April	11 days
Judas tree	<i>Cercis siliquastrum</i>	3 May	24 April	9 days
Indian horse chestnut 'Sydney Pearce'	<i>Aesculus indica</i> 'Sydney Pearce'	1 June	23 May	9 days
common laburnum	<i>Laburnum anagyroides</i>	30 April	22 April	8 days



More information

For more information about phenology, recording at Kew and the Kew 100 results visit www.kew.org and follow the *Conservation & wildlife* link: the phenology database is at the bottom of the page.

Information sheets are also available on *Climate change – an introduction* and *Climate change – what is Kew doing?* at www.kew.org/ksheets