

## POSSIBLE WINNERS OF A CHANGING CLIMATE



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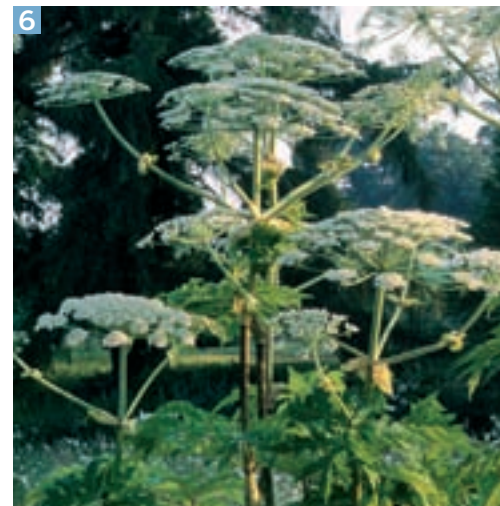
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### SOME POTENTIAL WINNERS:

Alien weeds such as Himalayan balsam **1** and giant hogweed **6**; warm-climate crops including figs **3**; *Bougainvillea* **5** and other borderline hardy plants; lovers of warm, moist conditions such as fuchsia **2**; and drought-tolerant plants including *Agave* **4**

### SOME POTENTIAL LOSERS:

Migrant birds such as swallows **7** arriving before food is available; plants sensitive to winter wet including tulips **8** and other bulbs; drought-sensitive plants such as some ferns **9** and delphiniums **10**; roses **11** and other plants that need cold winters to bloom

## POSSIBLE LOSERS OF A CHANGING CLIMATE



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# The changing climate in your garden

What is the current situation in UK gardens, and what phenomena can gardeners expect to see as the changes in climate intensify? Taking stock of recent observations and projections, **Andi Clevely** looks forward ►



**MUCH HAS CHANGED** in popular perceptions of climate change in the 10 years since my former employer stood in our Warwickshire potting shed, rubbing her hands with delight and gleefully anticipating the prospect of 'Bordeaux all year round', as forecast in newspapers at the time.

The ensuing decade was one of more-sophisticated climate models, as well as a host of significant weather events that have added realism to early simplistic prophecies. Records have tumbled: in just the past 18 months, for example, UK gardens have experienced the hottest April, July, spring, autumn and single 12-month period, together with the second-warmest winter, the wettest June and the soggiest summer.

In October 2007 Tim Flannery, an Australian climate scientist, announced that greenhouse gases driving climate change had reached levels not expected for another 10 years. These gases could remain active in the atmosphere for two centuries or longer, so even the most urgent international efforts to reduce emissions cannot prevent the need for all of us to adapt and plan for changes that are now considered inevitable.

#### Overview

Plants affect climate, both globally and locally – forests are regarded as vital carbon 'sinks' and especially important in the present era of excess atmospheric carbon dioxide (even though plant decomposition produces more CO<sub>2</sub> annually than all fossil-fuel combustion). More directly, evapotranspiration of water from foliage has a significant cooling effect on local climates.

In turn, climate influences the growth, distribution and welfare of plants. Every species has evolved over time to adapt to a particular microclimate – that specialised combination of local conditions such as temperature range, rainfall pattern and exposure to frost or wind that allows it to grow and reproduce successfully. Many species can survive a wider range of conditions than experienced in their preferred natural habitats, but there are limits to their tolerance, usually ameliorated in gardens by strategies such as frost protection or artificial



The changing climate may lead to an increase in heavy rainfall events at any time of the year. Gardeners will have to be proactive in the way they garden

watering, combined with a lack of competition and predation.

These thresholds of tolerance cannot change as fast as the climate is currently altering, although unfortunately for gardeners some quick-growing weeds have an evolutionary advantage: in one experiment wild mustard subjected to severe drought at flowering time was observed to advance maturity by two weeks over just seven generations. Some ecologists

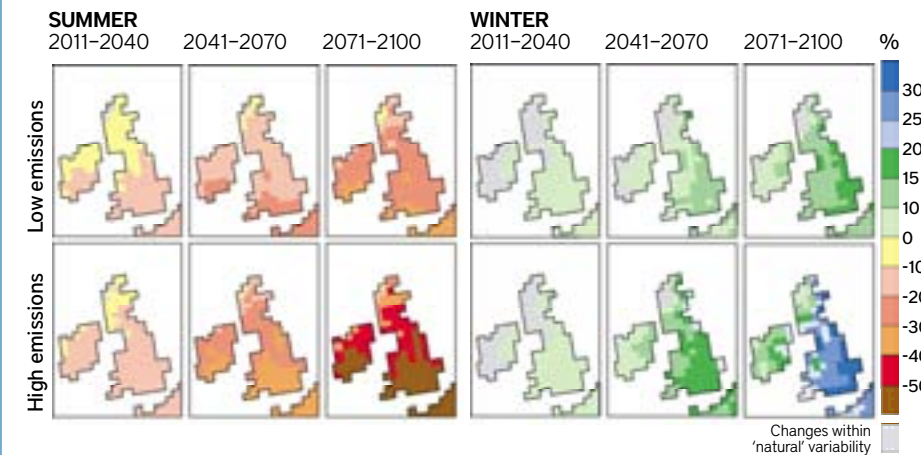
forecast an 'evolution explosion' as certain plants and wildlife adjust to earlier springs, longer growing seasons and unpredictable weather events. However, globally, most scientists believe climate change will also cause unprecedented levels of extinction.

#### Strange behaviour

Up until the past few years, phenology (the study of recurring phenomena) was

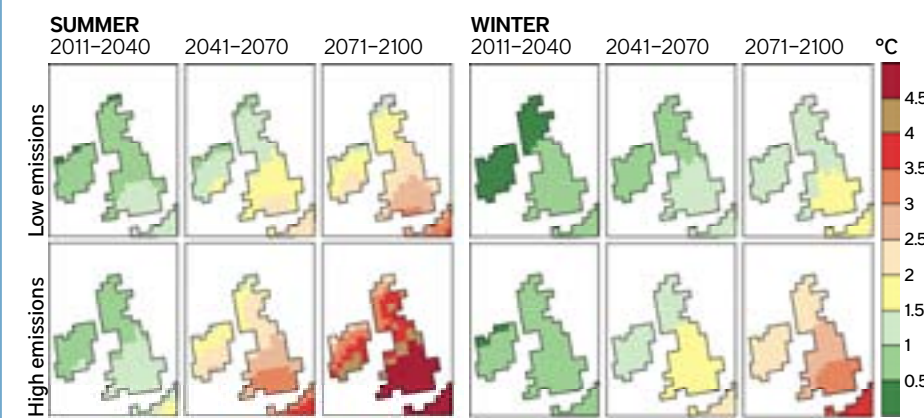
## PROJECTED UK RAINFALL

Percentage rainfall increase (based on 1961–1990 average) in summer (below left) and winter (below right) in 30-year periods centred on the 2020s, 2050s and 2080s. Models show drier summers and wetter winters, with the South East worst affected. Given high emissions, rainfall may halve in summer and rise by 30 percent in winter. Top row: low-emissions scenario: global CO<sub>2</sub> emissions controlled to below 525 parts per million by 2080 (current level 370ppm). Bottom row: high-emissions scenario, global CO<sub>2</sub> emissions continue to rise at current rates of increase, reaching 810ppm by 2080.



## PROJECTED UK TEMPERATURES

Changes in UK temperature (°C) compared to 1961–1990 averages in the 2020s, 2050s and 2080s in summer (below left) and winter (below right). Even with global emissions reduced to less than today's levels, summer temperatures in the South East are set to rise by up to 3°C. If nothing is done to control greenhouse-gas emissions, by 2080 average summer temperatures could rise by 5°C, and 3°C in winter. Top row: low-emissions scenario. Bottom row: high-emissions scenario.



ROBIN GRIGGS. DATA SOURCE: UKCIP02 CLIMATE CHANGE SCENARIOS (FUNDED BY DEFRA, PRODUCED BY TYNDALL AND HADLEY CENTRES FOR UKCIP)

a slightly obscure statistical discipline to most people, but recording the climate's impact on flora and fauna has suddenly become a national pastime, thanks to media publicity and popular interactive websites. Reports and records are almost unanimous in confirming a number of significant and progressive changes in plant reactions.

Possibly the most obvious is their response to the retiming of the seasons,

a shift directly linked to rising temperatures. Over the past 30 years the arrival of spring throughout Europe has advanced on average by six to eight days, while autumn has been delayed by three days. Local records reveal remarkable changes. At the Royal Botanic Gardens, Kew, for example, first flowering of *Narcissus pseudonarcissus* has advanced by 10 days per decade: in 2007, first blooms appeared on 23

January; *Galanthus nivalis* flowered there on 25 January, compared with a month later in the 1950s.

Flowering of hawthorn (*Crataegus*), a traditional cue for gardeners to begin sowing and planting, now occurs as early as 16 April compared with 11 May on average, two or three decades ago. Indeed, its popular name 'may' is increasingly an historical misnomer. Similarly, 20 years ago gathering elderflowers for wine and 'champagne' was consistently an early June event for my family, but last year my daughters picked supplies in London and south Staffordshire in late April.

Some hedgerow elders (*Sambucus nigra*) are flowering a second time in September, together with a number of garden plants such as delphiniums, weigela, ceanothus and crab apples, testimony to the impact of a longer growing season on secondary growth. A similar effect has been noted for fungi: one 50-year study showed that 120 species around Salisbury have started fruiting twice annually, a phenomenon unrecorded before 1976 and thought to result from higher temperatures in autumn and February.

#### Changing rules

Plants do not respond passively to climate change, and, with 85 percent of garden plants estimated to originate in warmer regions, many will react favourably to mild conditions – but not all. Trials with various food crops have shown only half the beneficial effects anticipated from raised carbon dioxide levels, together with some loss of yield and photosynthesis due to increased ground-level ozone. Low-level ozone, a pollutant formed in part by the reaction of sunlight on vehicle exhaust gases, is itself a powerful greenhouse gas. It ►



management should be a high priority.

Soil management will need extra care as higher temperatures accelerate humus breakdown while heavy rain leaches out resulting soluble nutrients, damages soil structure and tilth, and can cause surface erosion and waterlogging.

Mulching protects from the wear and tear of droughts and storms, as well as reducing evaporation of soil moisture; adding organic matter to light soils limits water and nutrient loss (see pp44–47). Weeds will grow faster and will need to be controlled by extra mulching and hand-weeding (helping boost vital compost supplies).

Some fungi are notorious diseases of plants – many gardeners noticed rust (*Uromyces appendiculatus*) on runner

well as sound gardening practices to limit their impact will be important.

#### Future gardening

Concern over meeting unpredictable change with appropriate gardening skills should not be allowed to overshadow anticipated benefits, and most gardeners can probably feel fairly sanguine about future prospects.

Although still a risk, the frequency and intensity of frosts are expected to decline, which should enhance the survival chances of many garden plants, especially those such as grevilleas, tree ferns and cannas currently of borderline status. Recently, bananas have flowered in Wales for the first time.

So far warming has already pushed some gardens up about half a Plant Hardiness Zone (most UK gardens are now said to be in zones 8a–8b, with average minimum winter air temperatures between -6.7 and -12.2°C), or even higher in parts of gardens where a more benign microclimate prevails.

A longer growing season will favour late-flowering plants and crops such as sweet corn or borlotti beans that only just manage to achieve sowing-to-maturity in some parts of the country. Vegetable cropping schemes and rotations may require subtle adjustment, but most kitchen gardeners should welcome the extra latitude for planning and selecting cultivars, and potentially higher productivity from the plot.

Ornamental gardeners will be able to explore an expanding range of flowers, whether to satisfy a sense of adventure or as a prudent measure to match changing microclimates within gardens.

#### Conservation issues

Gardeners could play a crucial support role as conditions change. Congenial microclimates within gardens may provide safe havens for plants distressed by increased heat, rainfall or drought. Studies in Manchester confirm the cooling effect of green spaces in cities as plants absorb and then evaporate water into the atmosphere. Urban gardens provide vital corridors and habitats for safe movement of wildlife, as birds, butterflies and plants shift

beans, almost unknown until recently, while potato blight, a consequence of warm wet spells, affected crops widely after last summer's floods. Other pests and diseases are likely to become more prevalent, including new arrivals (see pp52–55), some of which are already established and moving northwards at an estimated 18–38 miles per year. Increased vigilance and ingenuity as

### 'THE LOSERS ARE LIKELY TO BE CONSERVATIVE GARDENERS UNWILLING TO ADJUST TO CHANGING CIRCUMSTANCES'

interferes with photosynthesis, stunting plant growth.

Some important food plants need a period of prolonged cold weather to stimulate flowering. Our blackcurrants, for example, react to this vernalisation with a more synchronised spring bud break, and for nearly 10 years yields in Herefordshire have steadily declined as a result of mild winters (in Tasmania, ironically, cultivars are suffering from a sharp increase in cold nights).

Other examples of noteworthy behaviour are legion, increasing all the time and likely to do so for the foreseeable future. So we will all need to review our gardening habits to mitigate the more unwelcome impacts of extreme weather events. In addition to the well-publicised practical steps everyone can take to help limit their personal contribution to greenhouse-gas emissions – including moderation in the use of garden lighting, heating and petrol-driven machines – there are specific areas that could benefit from a fresh appraisal.

The prospect of more frequent summer droughts and variable annual rainfall arriving in longer torrential cloudbursts suggests that efficient water



### FLOWERING TOGETHER

The garden plants on this plate – all in bud or bloom – were collected at RHS Garden Wisley on 27 February 2007. It illustrates the diversity of garden plants that can be found flowering at the same time, given a mild season. Some, such as rosemary, usually flower in late winter, while others such as rose or *Osteospermum* are associated with spring or summer but increasingly are seen flowering at other times of year.

- 1 *Osteospermum* 'Trewidden Pink'
- 2 *Vinca minor* 'La Grave'
- 3 *Rosmarinus officinalis* 'Sissinghurst Blue'
- 4 *Leucojum aestivum*
- 5 *Magnolia x soulangeana*
- 6 *Photinia davidiana*
- 7 *Lithodora zahnii*
- 8 *Ranunculus creticus*
- 9 *Rosa* 'Flower Carpet Coral'
- 10 *Spiraea thunbergii*
- 11 *Ribes sanguineum* 'Tydeman's White'
- 12 *Magnolia stellata*
- 13 *Lathraea clandestina*
- 14 *Ypsilandra thibetica*
- 15 *Lithodora diffusa* 'Star'

their range northward at an estimated 4 miles per decade.

Inevitably there will be casualties, but the real losers are likely to be conservative gardeners unwilling to adjust to changing circumstances. For most, climate change could offer stimulating opportunities if we take one year at a time, monitoring the welfare of existing plants and trying new ones in favoured spots, then sharing observations and

experiences with others – for example on the climate forum on RHS Online.

After all, our temperate climate has always been fickle, presenting a fresh challenge at the start of every season, so experience should have conditioned us to be optimistic and resourceful. ■

*Andi Clevely* is a garden writer, broadcaster and author

**Further reading** *Weather in the Garden*, Jane Taylor; John Murray 1998, ISBN 9780719557262

**Share your experiences and pick up tips** on RHS Online: visit [www.rhs.org.uk/climate](http://www.rhs.org.uk/climate) and follow the links to post comments and read those of experts and other gardeners on the climate-change forums and blogs. ● Compare flowering times of the 'Kew 100' in the Royal Botanic Gardens, Kew at [data.kew.org/wild/phenology/](http://data.kew.org/wild/phenology/)