

UK Biodiversity Indicators 2019

This document supports
B4. Spring Index

**Technical background document:
Advice on the calculation of the Spring Index**

For further information on B4. Spring Index
<http://www.jncc.gov.uk/ukbi-B4>

For further information on the UK Biodiversity Indicators visit
<http://www.jncc.gov.uk/ukbi>

Calculation of the UK Spring Index, June 2019

The Spring Index is calculated as the average of those locations that record all of the following 4 biological events: first flowering of hawthorn (*Crataegus monogyna*), first flowering of horse chestnut (*Aesculus hippocastanum*), first appearance of orange tip butterfly (*Anthocharis cardamines*), and first sighting of a swallow (*Hirundo rustica*). For example, in the year 2000, there were 126 locations in the UK recording all 4 events. For these locations a simple single average is calculated and is the Spring Index for that year, for example the average of 504 (=126*4) records. As there is no missing data the Spring Index can be calculated in 2 ways: the average of the 4 events or the average of the 126 locations (the same value will be returned). After the spring index is calculated the raw data are not used again. The number of locations will vary from year to year. The Spring Index varies year to year mostly because of differences in the temperature.

The average date of these events is now (1999-2018) about 6 to 7 days in advance of the average for the period 1891 to 1947. The Spring Index is calculated by using the difference in the two time periods which are 1891 to 1947 and 1999 to 2018. The Index shows a very significant relationship with mean March-April Central England Temperature, which appears to be stronger when mean temperatures exceeded 7°C. For the UK Spring Index, the relationship in years with mean March-April temperatures below 7°C was

Spring Index = 146.8 -3.28×Temperature, R²=38.5%, p<0.001

The equivalent for years when mean March-April temperatures exceeded 7°C was

Spring Index = 170.5 -6.81×Temperature, R²=80.0%, p<0.001

Data for the 1891 to 1947 period come from the phenological network of the Royal Meteorological Society and as published in the *Quarterly Journal of the Royal Meteorological Society*. This was a voluntary network of recorders that submitted their phenological observations to a central coordinator. All these data have now been digitised and loaded into the Nature's Calendar database. The UK Phenology Network/Nature's Calendar scheme runs along broadly similar lines. It also involves volunteers contributing their observations and is run and coordinated by the Woodland Trust. Here we use their data from 1999 onwards. The number of records varies from year to year, but the current scheme is substantially bigger than the earlier one.

Only locations that contribute all 4 events are used in the calculation of the Index to avoid bias to one or more of the 4 events. Since locations reflect the distribution of volunteer recorders they are not evenly spread across the country, but rather reflect the density of human population, with a greater number of recorders in the South-East and fewer in the North.

The reliability of the data is dependent on the frequent and timely observations of the natural world by the volunteer recorders. Using the average of all recorders who satisfy the 4 event criteria ensures that the influence of any single potentially erroneous record (e.g. species misidentification) is minimised. However, the data show such a strong relationship with temperature that we have confidence in their reliability.