

Climate and Weather



Dartmoor Factsheet

Dartmoor's Weather

The weather is what we observe and feel from day to day and on Dartmoor the weather can sometimes be notoriously bad; wet, foggy, windy and cold. Recently the weather on Dartmoor has hit some new extremes of wetness, droughts and heat. Does this add up to climate change?

Dartmoor's Climate

The word, 'climate' describes long term weather patterns. Meteorologists determine 'climate' by taking weather measurements over a period of 25 years and calculating the averages.

The climate of England's South-West peninsula, like much of Britain, is mainly influenced by the Atlantic Ocean. The predominant airflow comes from the west or south-west, carrying with it all the moisture that it has gathered from the relatively warm ocean current known as the mid-Atlantic Drift that flows around Britain's coast. The area's southerly and westerly location makes it generally warmer, wetter and windier than many other parts of the British Isles.

Dartmoor's granite plateaux rise above the surrounding countryside. Therefore the climate here is different from the rest of Devon. The higher altitude and exposed nature of the landscape determines the more extreme climatic conditions. First, there is a direct correlation between the pattern of rainfall and the pattern of the relief (height above sea level) of Dartmoor (see maps on page 3). As the south-westerly air flow is forced up over the hills, it cools and creates the more cloudy conditions which in turn give rise to higher levels of precipitation.

It is not surprising that many of Devon's rivers rise on Dartmoor and that the area is regarded as one of the South-West's most important sources of water. There are eight reservoirs located within the National Park. To the east of Dartmoor it is possible to trace a distinct rain shadow area; Teignmouth only receives less than half the rainfall that Princetown gets in a year, see table on page 2.

Dartmoor weather facts and sayings

'Nine months winter and three months bad weather.'

'The south wind blows, and brings wet weather, The north gives wet and cold together; The west wind comes brimful of rain; The east wind drives it back again. Then if the sun in red should set, We know the morrow must be wet, And if the eve is clad in grey The next is sure a rainy day.'



'When Hey (Hay) Tor wears a hood Manaton folk may expect no good.'

14 August 1910 - a severe thunderstorm hit south-west Dartmoor. Lightning almost continuous. One observer counted 703 flashes in 40 minutes.

21 October 1638 - a violent thunderstorm at Widecombe-in-the-Moor. A lightning bolt penetrated St Pancras church killing 4 people and leaving 62 injured.



GALES

25 January 1990 - a severe gale: many trees blown down, especially around Princetown and Postbridge.

9 March 1891 - the great blizzard began: snow fell for 36 hours and lay on high ground until May.

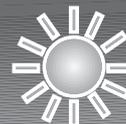
26 December 1962 - the first day of several weeks of blizzard conditions on Dartmoor.



28 July 1969 - 145mm (5.69inches) of rain fell in 24 hours at North Hessary Tor

23 September 1946 - 174mm (6.83inches) of rain fell in 24 hours at Princetown.

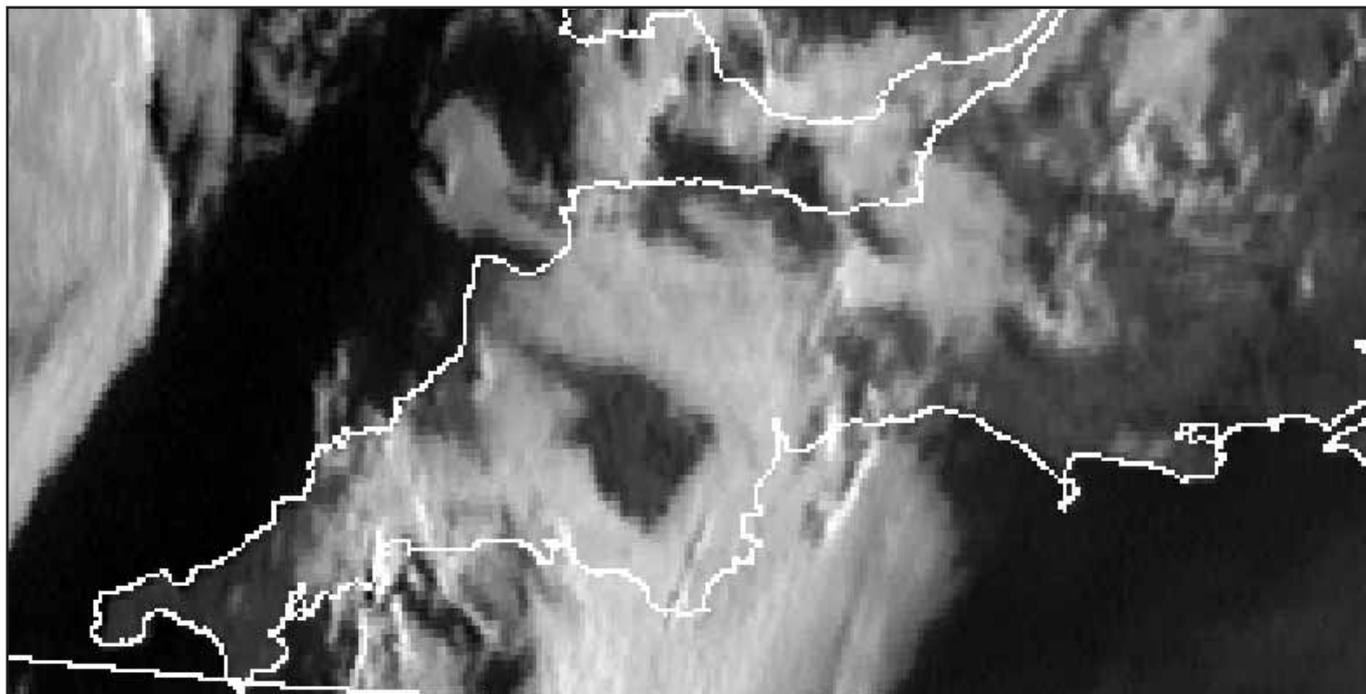
23 November 1946 - 174mm (6.83inches) of rain fell in 24 hours at Princetown.



Recent weather

Gary of Moretonhampstead says:
*"2007 has had the wettest May - July on record, on Dartmoor."
"April 2007 was the driest April on record in Moretonhampstead."
"2003 and 2006 were the warmest 2 years in Devon in the last 100 years."*

Devon and Cornwall in the fog



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The mean daily temperatures on North Hessary Tor, Princetown, at 510 metres above sea level, are always 2 to 4°C below those at Yarnar Wood, which stands at 198 metres above sea level and is tucked away in the more sheltered eastern side of the moor. When you combine the lower temperatures with the frequent strong winds and many days of poor visibility with mist and rain, it is obvious that Dartmoor's climate presents a formidable challenge for plants and animals, and for those people who work the land.

The few trees on the open moor have been twisted and shaped by the wind, and only the hardiest breeds of livestock can tolerate the winter conditions.

There are, however, a few days each year when lowland Devon is smothered by cool dank mists and only Dartmoor basks in radiant sunshine. **See the extensive early fog across Devon and Cornwall in the image above. Owing to a temperature inversion, the top of Dartmoor is warmer than the lower land and sea temperature and hence Dartmoor is clear of fog and stands out in this satellite imagery.**

Monthly Max Temp, Min Temp, Rainfall for Princetown and Teignmouth 1971 to 2000 averages

Princetown

Temperature °c

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual	No of Years
Max Temp	5.8	5.7	7.3	9.7	12.9	15.6	17.7	17.5	14.9	11.6	8.4	6.8	11.2	29
Min Temp	1.0	0.8	1.9	3.0	5.9	8.5	10.8	10.9	9.0	6.4	3.8	2.1	5.4	29

Precipitation (mm)

Rainfall	218.5	168.5	161.8	109.4	100.2	115.5	111.5	133.1	156.0	215.3	233.6	250.9	1974.2	29
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Teignmouth

Temperature °c

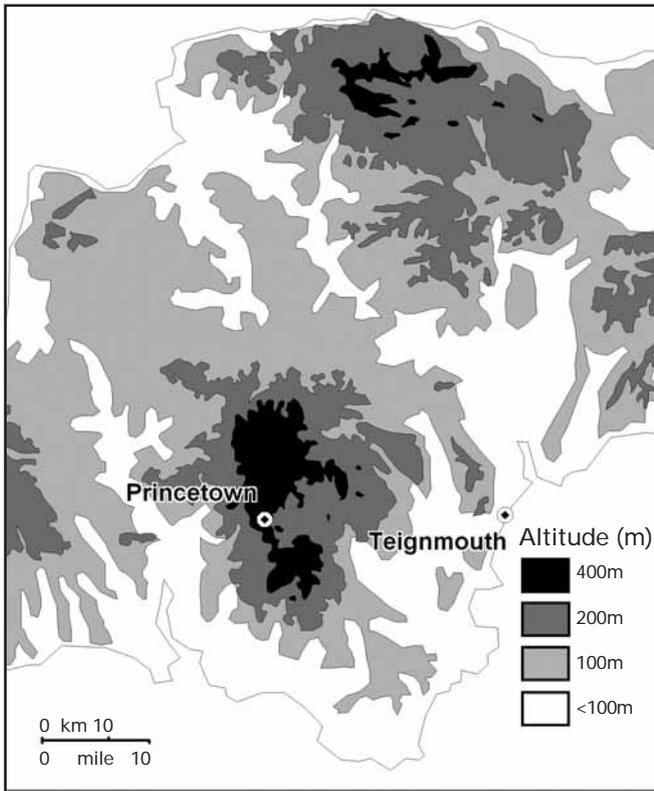
	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual	No of Years
Max Temp	9.0	8.9	10.5	12.2	15.3	18.2	20.6	20.4	18.1	14.8	11.7	9.9	14.2	29
Min Temp	3.7	3.5	4.6	5.7	8.6	11.2	13.5	13.4	11.4	8.9	6.0	4.8	8.0	29

Precipitation (mm)

Rainfall	101.8	82.7	68.1	54.8	52.0	51.0	36.4	56.9	66.5	83.2	83.8	112.8	850.0	29
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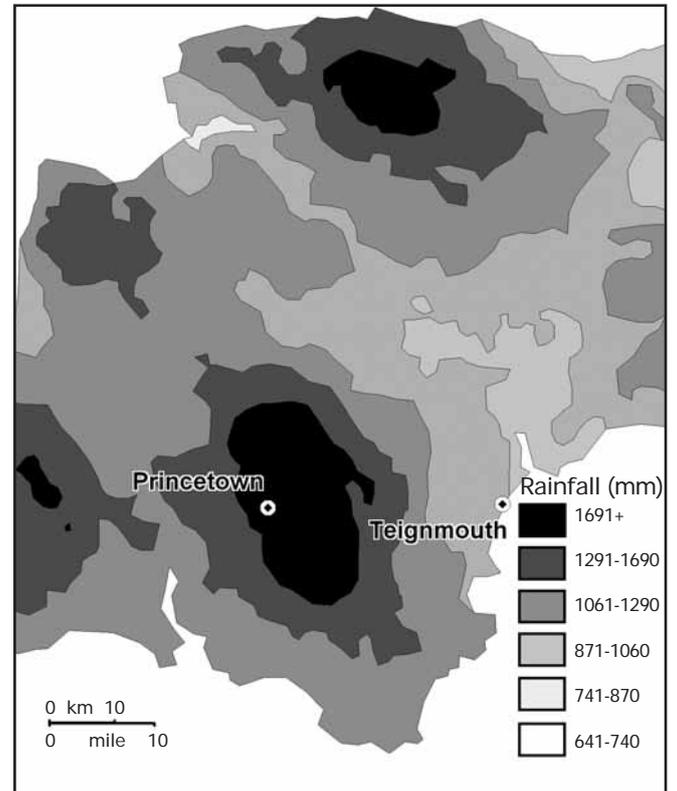
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Altitude



South west boundary © MapInfo 1998, GisNET data licenced to MapInfo by GISdata Limited. © GDc Ltd 1993.

Rainfall



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Questions to consider

- 1) Compare the climate figures for Princes town 1971 to 2000 with 1964 to 1991. Do they show any consistent changes in temperature or rainfall?
- 2) What would happen to the length of the Dartmoor growing season if the climate gets warmer?
- 3) What impact might this have on the vegetation and appearance of Dartmoor?
- 4) What impact might this have on the livestock and farmers who depend on this vegetation?
- 5) How might climate change affect the water industry on Dartmoor?
- 6) Suggest what impact a warmer climate might have on the recreational and tourist use of Dartmoor.

Monthly Max Temp, Min Temp, Rainfall for Princes town 1964 to 1991 averages

Princes town

Temperature °c

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual	No of Years
Max Temp	5.6	5.5	7.1	9.7	12.7	15.5	17.6	17.6	14.8	11.8	8.2	6.8	11.1	17
Min Temp	0.8	0.8	1.8	2.9	5.8	8.5	10.7	10.8	8.9	6.6	3.6	2.2	3.3	18

Precipitation (mm)

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual	No of Years
Rainfall	247	181	193	114	117	131	130	142	160	212	214	263	2104	25

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What is Climate Change?

The climate of the Earth has always changed; in the past it has altered as a result of natural causes. Nowadays, however, the term 'climate change', also sometimes referred to as global warming, is used when we talk about changes in our climate which have happened since the early part of the 1900s. The changes we've seen over recent years and those which are predicted in the future are thought to be mainly because of human behaviour rather than due to natural changes in the atmosphere.

The **greenhouse effect** is very important when we talk about climate change as it relates to the gases which keep the Earth warm. It is the additional greenhouse gases which humans have released which are thought to pose the greatest threat.

In 1827 the French mathematician Fourier proposed the greenhouse gas concept: the Earth's atmosphere is trapping heat from the sun, thus making the average surface temperature on Earth a comfortable 15°C. Without this protective blanket of a small amount of greenhouse gasses - mainly carbon dioxide, water vapour and methane - our planet would be a frozen desert, with an average temperature of -18°C.

Then in 1896, the Swedish Nobel prize winner Arrhenius asked: "If the human population should burn so much fossil fuel that the carbon dioxide level in the atmosphere should double, what would the temperature rise be?" Somewhere between 2.0 - 4.5°C said the United Nations Intergovernmental Panel on Climate Change in 2007. Compare this with the 5°C change that separates us from the last Ice Age. The climate is warming. That is now clear from increases in the global average air and ocean temperatures, widespread melting of snow and ice, and rising sea levels. A further 5°C temperature rise would transform the world, involving major shifts in climate, economic and social disruption, migration and conflict.

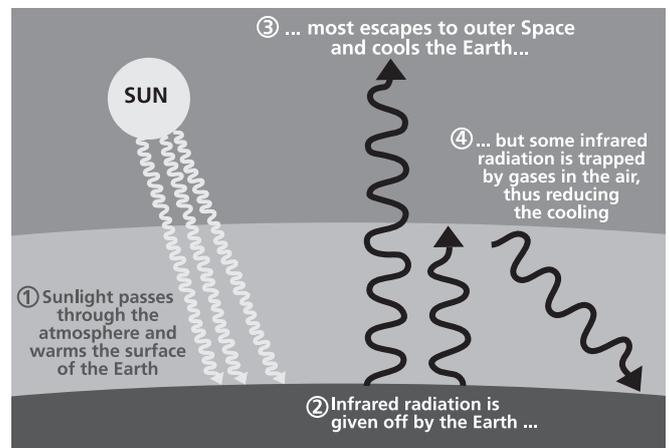
What has caused climate change?

The facts

The Earth's climate varies naturally. However, most scientists agree that the increased warming since the 1970s can only be explained by human activities. The main human influence on global climate is through increasing emissions of greenhouse gases such as carbon dioxide and methane.

This happens through the burning of fossil fuels and through changes in land use such as deforestation, landfill and increasing livestock production. Households and personal travel account for between 40% and 50% of UK's greenhouse gas emissions. This includes heating, electricity, consumption of goods, 'food miles' and refuse. Further emissions are generated through transport - mostly car and air travel. Aircraft emissions into the upper atmosphere are three times as damaging as emissions at ground level and are rising sharply. Carbon offsetting is not the answer. What's required is mitigation - a lasting reduction in emissions - from the current average of 2.6 tonnes per person in the UK to a fair 0.33 tonnes per person across the globe by 2030.

The Greenhouse Effect



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Climate facts

- Carbon dioxide levels in the atmosphere are already at least 25% higher than at any time during the past 650,000 years.
- During the 20th century the Earth's surface has warmed by 0.74°C. This trend is accelerating, largely due to human activity such as burning of fossil fuels and deforestation.

Some of the Impacts

Rising sea levels

As temperatures rise, the sea will absorb heat from the atmosphere, causing it to expand and therefore creating sea level rises. If the entire Western Antarctic ice sheet melts, the water produced will raise sea levels by 5-6 metres. Some islands will be affected by sea level rises and a lot their habitats will be threatened. One example is of the small island Tuvalu in the Pacific, which already has severe flooding which is damaging homes and affecting drinking water. The islanders have already started to leave and the rest will have to do so in coming years if the trend continues.

Flooding

Major floods that have only happened in the past every 100 years on average may now start to happen every 10 or 20 years. The flood season may become longer and there will be flooding in places where flooding wasn't a problem before. The UK has experienced devastating floods throughout the last five years, which have affected thousands of people and caused millions of pounds worth of damage. Five million people in England and Wales are now at risk from flooding every year.

Human health

The climate we live in affects many areas of our lives. The quality of the food we eat, the water we drink and our homes are all dependent on our climate and weather. Some scientists have suggested that a warmer world will be a sicker world. While there is not complete agreement that this will be the case, the Department of Health has looked at the likely health consequences in the UK.

With winters becoming milder, there are likely to be up to 20,000 fewer cold-related deaths. However, there is a danger that bacteria would no longer die-off seasonally during normal prolonged cold spells meaning that diseases may spread more widely.

More heat waves will increase the number of hot-weather related deaths. Exposure to higher levels of UV light could cause an extra 5,000 deaths a year from skin cancer and may cause an increase of up to 2,000 cases of cataracts. Warmer summers may cause extra cases of food poisoning.

Higher average global temperatures mean that diseases, or their carriers, may be able to move to areas that were previously too cold for them to survive. It is possible that a mild strain of malaria will become established in some parts of the UK for up to four months of the year.

Agriculture

The crops we produce and the animals we farm could alter significantly with climate change. The weather is an essential part of farming and changes in temperature and rainfall will be important in sustaining crop growth and grazing patterns. For the UK, temperature rises look likely to mean the crops we would normally see growing in the south of the country will be able to be grown further north. The United Nations believes there will be a shift northwards of between 200 and 300 kilometres for every degree of warming. This would be similar to the south of England in 2060 having the kind of weather the Loire Valley, in France, experiences now.

However increased dryness in the summer could affect the quality and yields of the crop due to an increase in drought and heat waves. The types of crops grown in the UK may also have to change.

Agricultural pests

Researchers are already finding that pests, such as aphids, are starting to hatch earlier in the year. In the last 10-15 years they've been arriving in springtime and the population of aphids appears to be growing too. Aphids are a real problem as they can cause so much damage to crops - if they arrive earlier in the year they can get the produce when it's very fragile - causing more damage than they used to.

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● **Impact on people**

- **By 2050, 200 million people across the globe may become permanently displaced due to rising sea levels, heavier floods, and more intense droughts.**
- **A temperature rise of just 2.1°C will expose between 2.3 and 3 billion people to the risk of water shortages.**

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Wildlife

The affects of climate change aren't going to be restricted to humans. The possible dangers for plants and animals throughout the world are a great concern to environmentalists. Birds, fish, and land-based animals are all going to be under threat as their habitats (the places that they live) and climate alter. Plants, trees and shrubs are also going to have to adapt. Less snow in winter, warmer temperatures in summer and more winter rain will affect wildlife across the world.

UK species

The mountainous Cairngorm National Park in Scotland is likely to be affected considerably. They are used to cold, snowy conditions. However, the snow is disappearing and it is now thought the mosses, plants and birds will soon be affected too. The habitats which exist there are used to Arctic-like conditions, but in the future the weather is expected to be more like that presently found in southern England and so the wildlife will be dramatically affected and some may disappear.

One of the main concerns with species shifting from where they are now is that if climate change occurs very quickly, some wildlife may not be able to adapt and move quick enough and so may not survive. Beech woodlands, commonly found in southern England are one of those threatened. With drier conditions forecast for the south, beech trees will struggle to survive.

On Dartmoor it is likely that the skylark, now a very common bird in the summer, will gradually move north as the climate heats up... so in the future we may not hear its lovely song.

Dartmoor impacts

- The climate has always changed, as the fossil remains of hippopotamus and straight-tusked elephant from Buckfastleigh Caves testify. However, the rate at which the climate is currently changing is the fastest for at least 10,000 years and may be too rapid to enable many species and habitats to adapt.
- By 2080 the mean summer temperatures on Dartmoor may rise by more than 4°C.
- Winters will become wetter and stormier, while summers will become much drier.
- The warming climate is already affecting Dartmoor's vegetation - causing some of the increased bracken and gorse growth and making access to certain parts of the Moor more difficult.

TOMORROW'S CLIMATE
Today's Challenge™

Further information available from our web site

www.dartmoor-npa.gov.uk

Visit the A-Z to access resources listed.

Other publications:

- *Dartmoor National Park Management Plan*

Other information:

- *Climate Change: I can change the future...* online exhibition
 - *Change Your world* online game
- Why not visit the Dartmoor National Park Authority web site www.dartmoor-npa.gov.uk and visit **LEARNING ABOUT, CLIMATE CHANGE: I can change the future exhibition** or the **FUN ZONE**, to play the *Change Your World* online game. Play the game to find out how your actions can help the planet!

For further information, and a list of other Fact Sheets available, contact the:

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