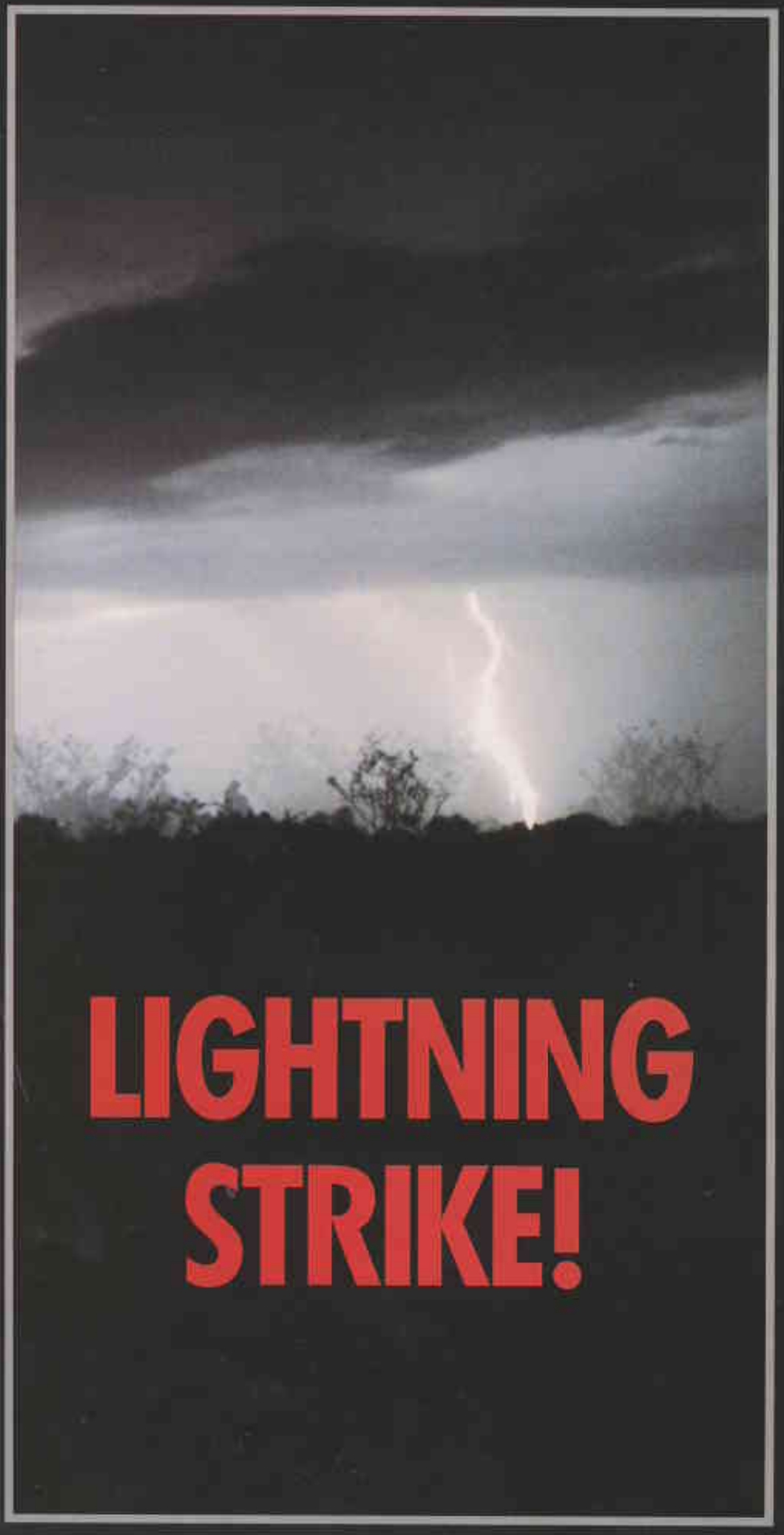


LIGHTNING STRIKE!

Few natural phenomena are more dramatic than a severe thunderstorm. The storm most feared by foresters is the dry, summer electrical storm which can cause lightning strikes and forest fires. Roger Underwood looks at lightning-strike fires in West Australian forests.

ALTHOUGH they occurred nearly 30 years ago, the months of January and February 1961 remain two of the most notorious in the history of Western Australian forestry.

During those months, low pressure troughs extending down the west coast and the formation of intense tropical cyclones caused persistent high temperatures, strong cyclonic winds and unusually severe thunderstorm activity. The thunderstorms produced an unprecedented number of lightning fires. The fire storms in the jarrah and karri forests that summer destroyed several towns, including Dwellingup and Karridale, and burnt out hundreds of thousands of hectares of forest and farmland in the South-West.

Weather conditions like those of January and February 1961 occur nearly every summer in WA's forest country, although fortunately not usually over so prolonged a spell. Rarely does a year go by without fires being started by lightning in the forest country. The most feared conditions are those when severe electrical thunderstorms cross the coast near Yanchep, and run down the length of the forest to the south coast at Walpole and Denmark; if rain does not fall at the same time, dozens of forest fires usually result.

Lightning is also frequent in south coast areas, and was the cause of the terrible bushfires in the Fitzgerald River National Park in December 1989. Experienced firefighters in this region can recall numberless occasions when dry thunderstorms, with their flickering lightning barrage, roll in from the north-west in the van of a cold front. If the bush and the paddocks are dry after a hot spell, if the lightning strikes in an inaccessible spot high up in the ranges, and if strong hot winds accompany the change in weather (as they usually do), south coast firefighters know that hard, dangerous and dirty times are ahead.

LIGHTNING - AN ANCIENT CONCERN

Lightning is one of the most ancient human concerns. In the times when prehistoric people had still not learnt to kindle fire, some lightning strikes may have been welcome, for example, those which ignited dry vegetation and provided them with fire for light, warmth and cooking. But lightning would have more often been seen as a supernatural power or heavenly portent.

In modern times, lightning is still regarded as a fearsome force. It not only starts forest and cropland fires, but can kill people and livestock, destroy buildings, strike down or damage aircraft and disrupt communications and electronic systems.

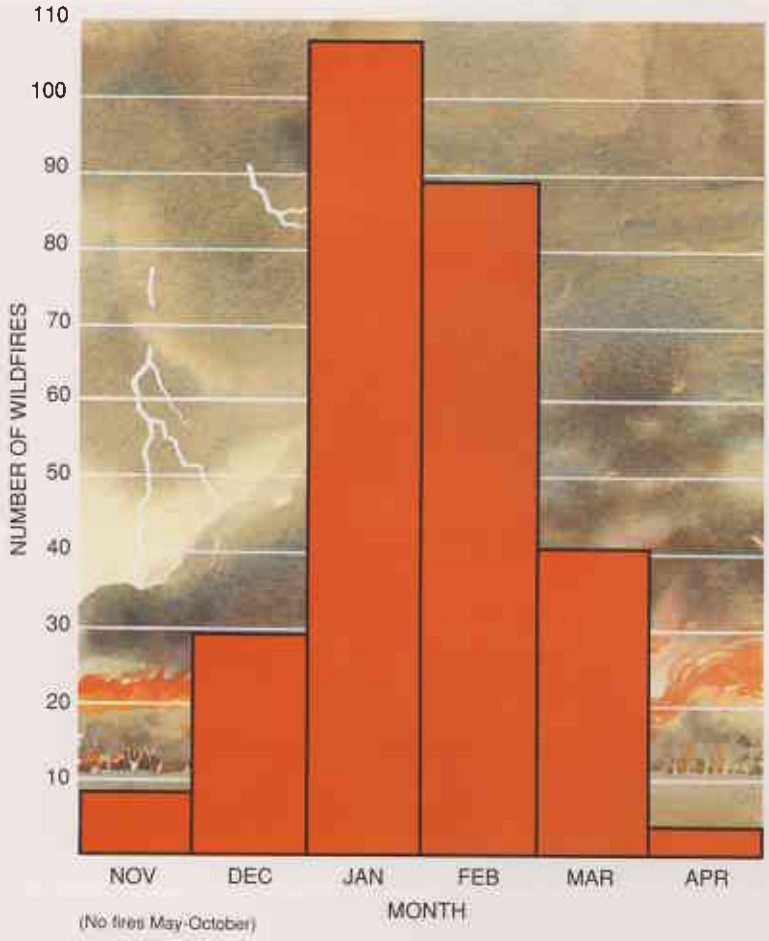
Most lightning strikes are associated with severe thunderstorms, when the atmosphere becomes turbulent and unstable and massive electrical charges build up. Eventually, the electricity "earths out" and a crackling flame sears to the ground. If it strikes a dry tree in bushland which has been curing under summer skies a bushfire is the inevitable result.

On rare occasions, lightning has been known to strike without warning from a clear sky. This phenomenon is the basis of the phrase "a bolt from the blue". Other rare phenomena associated with the electrical charges in the atmosphere are *St Elmo's Fire*, the greenish-white lights that play around the masts and rigging of ships and aircraft wing-tips; and *ball lightning*, or balls of fire, which appear to float in the air at ground level or in the tree tops. St Elmo's Fire has never been known to start a forest fire, but there are many reports of fireballs doing so.

In 1961, fires caused by lightning burnt hundreds of thousands of hectares of South-West forests and farmland and destroyed the town of Dwellingup.▲

A jarrah tree at Marrinup killed by lightning. The trees immediately around it were burnt by the flash.
Photo - Tim Birmingham◄

Photo previous page - Neil Burrows



LIGHTNING-CAUSED WILDFIRES IN THE JARRAH BELT 1975 - 89

THE LIGHTNING SEASON IN THE FOREST COUNTRY

In the South-West of WA, thunderstorms occur in every month of the year, but are most frequent in winter. Lightning from winter storms often strikes the forest. The bolt is often so powerful that huge trees are blown to matchsticks. However, bushfires rarely result from strikes during the winter months, because the jarrah and karri bush is usually saturated by heavy rains at that time.

However, as summer approaches and the forests begin to dry out, forest fires caused by lightning start to occur. It is possible to document this phenomenon because the Department of Conservation and Land Management (CALM) has records of lightning strike fires in the jarrah forest which go back many decades. The month, year and exact location of each fire started by lightning is known (see chart above).

These records show that forest fires started by lightning occur in the spring, summer or autumn months. They are most frequent when forest fuels are driest and the weather is hottest (that is, in the period between about Christmas and Easter), but there is no time during the drier months that firefighters can safely assume no lightning fires will occur.

SPRING AND AUTUMN FIRES

Historic data on the season and frequency of lightning strike fires can contribute to the debate on spring and autumn burning in the jarrah forest. As described in the Autumn 1990 edition of *LANDSCOPE*, foresters carry out prescribed burning during the cooler months to assist the control of bushfires. Prescribed burning reduces the levels of inflammable fuel on the forest floor, making wildfires easier to tackle. However, the burning program is controversial, and CALM is sometimes criticised for burning in spring, as it is seen as "unnatural".

Fire records show that whether or not humans start fires in the forest, lightning strikes certainly will, and the fires which they cause occur right across the spring, summer and autumn months. All it takes is a combination of dry fuel and a lightning strike.

As far as fires in the forest go, however, nature no longer has a free hand. Even bushfires are now "unnatural" to the extent that they are deliberately extinguished. All forest fires which pose a threat to human values are fought by CALM and volunteer firefighters, and are contained to as small a size as possible. The earlier in the summer, and the moister the fuels, the easier firefighting becomes, and the smaller the wildfires in the forest. However, before foresters began putting them out, fires started by lightning in spring or early summer may well have lasted longer and burnt a larger area than those started late in autumn. This is because fires in eucalypt forest are extremely persistent. Dry trees and logs smoulder for months and provide sources of new fires as the weather warms up and vegetation dries out over the summer. There are many accounts from foresters who worked in the jarrah forest before

So-called 'sheet' lightning is caused by clouds scattering light from distant flashes of 'fork' lightning.◄

Over the entire Earth, there are about 100 lightning flashes per second, or about four billion kilowatts of power.
Photos - Tim Birmingham▼

the second World War of fires starting in November and burning unchecked through the summer months.

Fortunately, the first heavy winter rains put a quick end to the fire season in South-West forests. Even so, I have known a marri tree, struck and killed by lightning, to smoulder right through a Northcliffe winter, and then burst into life and start a bushfire in the early months of the following spring. And I have known many occasions when a dry spell in mid-winter in the northern jarrah forest allows bushfires to start.

It is interesting to speculate how fires like this might have waxed and waned through the forest in the days before humans played a role in lighting and extinguishing fires. Our knowledge of the progressive drying and wetting of the forest as the seasons pass, together with historic records of thunderstorms, indicate that bushfires would have occurred naturally in the forest in the spring as well as in the summer and autumn months.

It is also known that Aborigines were a source of fire in the forest. They lit up the bush to facilitate hunting, to bring up certain plants, for ceremonial purposes and simply to "clean the country". Aborigines lived in the South-West for more than 40 000 years and would have frequented the jarrah forest in spring, when fresh water is plentiful.

FIRE RECORDS

Good record-keeping is an essential tool of the firefighter. Data about fire causes, start points, weather conditions, rates of spread and details about the suppression operation can be used to help plan future firefighting operations.

Records of forest fires in the South-West go back to the 1930s and 1940s, but there are gaps in the early records and the best data is for the period from about 1960 onwards. There are some interesting trends. One of the major fire causes of 30 years ago is now almost unheard of - the steam locomotive. Unfortunately arson, and fires started by campers and picnickers, are now much more frequent, and fires caused by lightning strikes continue to concern forest firefighters, just as they have always done.

Roger Underwood is CALM's General Manager. He has 30 years experience of fire management in WA forests and worked as a firefighter during the 1961 lightning fire in the karri forest.

Photo - John Steward

MORE ABOUT LIGHTNING

The earth, its atmosphere and the ionosphere form a vast electrical condenser, through which massive electrical charges constantly move. These processes are still poorly understood by scientists, despite research programs which have been going on for more than 150 years. However, it appears that lightning is discharged from a thunderstorm as follows.

In a cumulo-nimbus thundercloud, the top of the cloud is positively charged, while the bottom (near the freezing level) is negative. As the cloud "boils", negatively charged ice particles are carried rapidly upwards until they come into contact with the upper, positively charged cloud. The electric stress which ensues causes a great discharge, and electricity flashes between clouds or from a cloud to the Earth.

Meteorologists estimate that over the entire Earth, the frequency of lightning averages about 100 flashes per second and that this rate of discharge represents about 4 000 000 000 kilowatts of power.

Lightning flashes can be many kilometres long, but are usually less than 15 centimetres in diameter. The temperature of the air through which lightning passes is raised to incandescent white heat, estimated to reach 30 000 degrees Celcius. The violent expansion of this heated air exceeds the speed of sound, resulting in the sonic boom we call thunder.

All lightning is "fork" lightning. The so-called "sheet" lightning is merely the reflection or scattering of light from distant flashes by clouds.

The light from a lightning flash is seen almost instantaneously, while the thundercrack follows later. The distance of a flash of lightning can be estimated by counting the seconds between the sight and the sound of the explosion - every three seconds represents about one kilometre.

Although a person struck directly by lightning is usually killed, the effects are unpredictable. On rare occasions sick people have been cured by the effect.

Each weekend, hundreds of novice scuba divers take the plunge. Get the most out of your diving on page 10.

A very different landscape replaces what was once a thriving timber industry. Rediscover Cannington in the 1850s. See page 42.

Seaweed! Delicate and beautiful, or slimy and smelly? Decide for yourself on page 20.

LANDSCOPE

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How do birds fly? How do some reach speeds of over 80 kilometres per hour? Learn about avian aerodynamics on page 28.

Western Australia grows some rare and stunning native spider orchids. Their alluring nature will delight the reader on page 34.

FEATURES

REGULARS

COVER

*Back in the early 1970s, Western Australia proclaimed the numbat (*Myrmecobius fasciatus*) as its State emblem which may have saved its life. With the help of scientists and new techniques, these delightful creatures are now fighting back against extinction. See page 15.*

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