

Heatwave

LESSON PLAN

The heatwave lesson plan provides teachers and students with an opportunity to investigate the elements that contribute to a heatwave, its effects and how to stay safe and healthy.

Objectives

- ▶ Participating in this lesson will help students to:
- ▶ Understand what determines a heatwave
- ▶ How a heatwave occurs
- ▶ Learn about personal management in a heatwave

Develop knowledge of heatwaves from around the world and around Australia and relate these to Cairns.

Lesson Steps

Students read about heatwaves and the Real-life stories pages, paying attention to:

- ▶ The areas in Australia that have been affected by heatwaves
- ▶ The effects heatwaves have on life forms and materials
- ▶ Ways to cool down and manage activities.

Discuss each of the points and the varying effects a heatwave can have on different life forms. To demonstrate the effect of heat on plants, students (in pairs or small groups) to conduct the experiment on the 'Heatwaves and plants' activity sheet

Provide students with the 'My heatwave project' activity sheet. Students are to conduct research on heatwaves in the Cairns region and identify ways to manage their own activities and responses. Students present their findings to the class in a creative format.

Further resources

About heatwaves

<http://www.bom.gov.au/australia/heatwave/about.shtml> <https://www.qld.gov.au/emergency/dealing-disasters/heatwave>

Hot weather guidelines

<http://sma.org.au/resources-advice/policies-guidelines/hot-weather/>

Adelaide smashes heat record

<http://www.abc.net.au/news/2008-03-13/adelaide-smashes-heatwave-record/1071240>

Heatwaves set to become 'brutal'

<http://news.bbc.co.uk/2/hi/science/nature/3559426.stm>

Queensland State Heatwave Risk Assessment 2019

<https://www.disaster.qld.gov.au/dmp/Documents/QFES-Heatwave-Risk-Assessment.pdf>

About heatwaves

A heatwave is 'three or more days of maximum and minimum temperatures that are unusual for the location' (www.bom.gov.au).

Heatwaves result from certain combinations of temperature, humidity and air movement that result in unusually high temperatures. They can cause widespread health problems and even death.

Heatwaves are different from many other disasters (such as bushfires or severe storms) as they can affect large areas over a long period of time.

There have been many heatwaves in Australia, including the 1939 heatwave that killed 438 people in South Australia. More recently, the Cairns region has experienced its first known heatwaves.

Heat Stress

During heatwaves, a lack of wind causes heat to become trapped close to the ground. As the temperature rises, people, animals, and plants can experience heat stress.

People experience heat stress when pressure is put on the body's normal cooling processes: too much heat is absorbed and not enough is lost.

When someone is not able to cool down, their body temperature rises, their breath quickens and their pulse increases. As their body gets hotter, water is lost from blood, causing it to thicken. This may lead to heat stroke which can make people very sick, or cause them to die.

Animals can suffer the effects of heat stress. Lack of shade or water can change an animal's behaviour causing them to seek shelter under trees or near bushes, start sweating or panting, drool, drink more water and have a reduced appetite.

Dogs are particularly vulnerable in the heat. In Far North Queensland, flying foxes also suffer in excessive temperatures.

When the temperature is high for a long time, plants lose moisture and can die. Even tough, native Australian plants can suffer from heat stress. As plants start to die from the effects of heatwaves, the threat of bushfires increases.

Be Prepared

- ▶ You can avoid heat stress by following these survival steps:
- ▶ Wear lightweight, light-coloured, loose, porous clothing and a wide-brimmed hat
- ▶ Avoid direct sunlight if possible. If you have to go outside, use sunscreen and a high SPF. When you get sunburnt it limits the body's ability to cope with heat
- ▶ If you have children under the age of four, pay particular attention and consult a doctor if they appear uncomfortable
- ▶ If you are elderly, suffer from a chronic illness, or just feel unwell, see a doctor immediately
- ▶ Avoid strenuous activities and drink two to three litres of water a day, even if you are not thirsty. Limit consumption of carbonated drinks
- ▶ Do not leave children or pets in parked vehicles
- ▶ Avoid high protein foods (eg meat and dairy products) and heavy meals as these raise body temperature and increase fluid loss
- ▶ Do not take salt tablets unless prescribed by a doctor
- ▶ Keep your home cool by closing the curtains, shutters or awnings on the sunny sides and leaving windows open at night
- ▶ If you don't have air-conditioning, use fans and a damp towel to stay cool and have frequent cool shower. During the day spend as much time in air-conditioned buildings as possible, such as shopping centres and libraries
- ▶ Check on elderly and disabled neighbours and relatives to ensure they are comfortable and coping with the conditions.

Heatwave experiment

This experiment will allow you to observe the changes that plant life experience when there is a heatwave

What you will need:

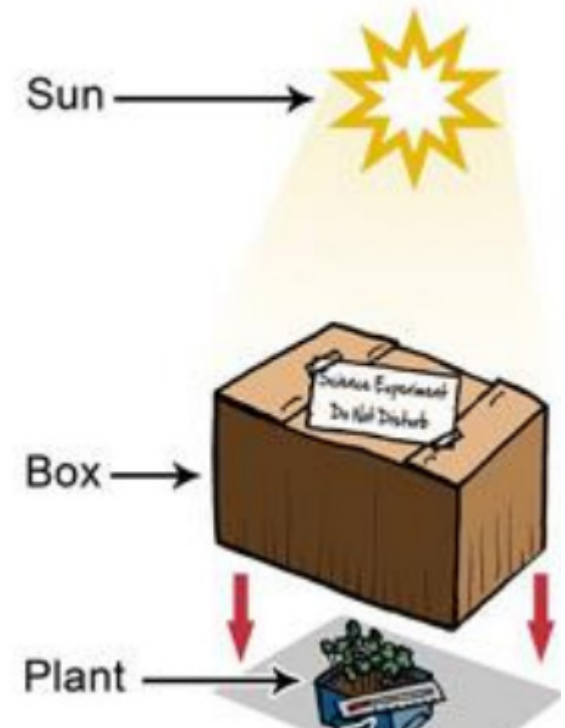
- ▶ A potted-plant (make sure it is lush and green)
- ▶ A box to cover the plant
- ▶ A thermometer

Instructions:

- ▶ Place the plant in a sunny location
- ▶ Place the thermometer next to the plant but not on the ground
- ▶ Cover the plant completely with the box
- ▶ Write "science experiment do not disturb" on the box, so nobody touches it
- ▶ Every day, check and record the temperature in the box
- ▶ Once the temperature reaches a constant high point for a few days, you have created heatwave-like conditions in the box
- ▶ Conduct regular temperature checks and observations to see how the conditions effect the plant
- ▶ As you conduct the experiment, record your observations and questions to the following questions

Questions:

1. Explain the steps and processes you used to conduct your experiment.
2. How does this experiment create heatwave-like conditions?
3. What temperature did the box reach?
4. How long did it take to reach this temperature?
5. Describe what happened to the plant
6. What changes could you make to this experiment that may change the results? Think about the colour of the box, or using different materials to covert the plant.



Heatwave project

This project will help you understand how your local area has been affected by heatwaves and ways in which people can ensure they stay cool during heatwaves.

Has there been a heatwave in your town?

Use your local library, newspapers and the internet to conduct research to find out when and how the Cairns region has been affected by a heatwave.

Record details such as when the heatwave happened, the temperatures reached, the length of the heatwave and the effects on the local people, animals and environment.

Keeping your cool

Investigate how body temperature can be affected by the clothing that people wear. Think about the material used to make the clothing and its colour.

Get four similar-sized glass jars and half fill them with water. Wrap each jar in a different material (such as cotton, leather, synthetic materials, wool) and leave them outside in the sun for an hour.

Record the temperature of the water in each jar before you put it in the sun and after it has been in the sun for an hour. Is there a difference in the temperature of the jars after one hour?

Repeat the experiment using the same material for each jar, but in different colours (eg wrap all jars in cotton but use four different colours). Record the temperatures again. What do you notice?

How could the knowledge you gained from these experiments help you to stay cool in a heatwave?

Safety note: the water and glass jars may become very hot after sitting in the sun, so you will need to be careful when recording the temperatures.

Real life heatwave stories

Heatwaves occur all over the world, but is Australia more used to the heat and better prepared for heatwaves? Do people in Australia die during heatwaves?

Heatwaves in Australia

Australia has a long history of heatwaves. The worst recorded was in 1939 when 438 people died.

This heatwave affected South Australia, Victoria and New South Wales.

Heatwaves have accounted for more deaths in Australia than any other climatic event. Here are some of the worst heatwaves on record:

- ▶ January 1896 – 437 people died
- ▶ January 1908 – 246 people died
- ▶ December 1912 – 142 people died
- ▶ February 1921 – 147 people died
- ▶ January 1927 – 130 people died
- ▶ February 1959 – 105 people died
- ▶ January 1939 – 438 people died
- ▶ February 1973 – 26 people died
- ▶ February 1981 – 15 people died
- ▶ February 1993 – 17 people died
- ▶ February 2004 – 12 people died
- ▶ January 2009 – 374 people died

Extremes

The highest recorded temperature in Australia was 50.7°C in Oodnadatta in South Australia in 1960.

Marble Bar in Western Australia holds the record for the longest number of hot days in a row: the temperature was above 37.8°C for 160 days in 1923-24.

The hottest recorded day in Sydney was in 1939 when it reached 45.3°C.

How were temperatures in the Cairns heatwaves recorded? How hot did it get in the central city?

Heatwaves around the world

Europe

One of the most severe heatwaves occurred in Europe in August 2003 when the temperature stayed above 40°C for two weeks.

Many countries were affected:

- ▶ 14,802 people died in France
- ▶ 7,000 people died in Germany
- ▶ 4,200 lives were lost in both Spain and Italy
- ▶ 1,300 people died from heat stress in Portugal

- ▶ 1,400 lives were lost in the Netherlands
- ▶ 900 people died in London

India

In May 2003, temperatures of 45-49°C claimed over 1,600 lives throughout the country. In the state of Andhra Pradesh alone, approximately 1,200 people died from the heat.

In May 2006, the temperature in New Delhi climbed to 44.5°C and caused the death of 53 people. Neighbouring cities were also affected, with 27 other deaths being reported from eastern Orissa state over one weekend.

United States of America

The 1930s in America were known as the 'Dust Bowl' decade.

Drought and numerous long heatwaves destroyed farms throughout the mid-west states, driving farmers from their land and killing nearly 15,000 people in ten years.

In July 1901, a heatwave in the mid-west caused the loss of 9,508 lives.

There have also been other major heatwaves in the Los Angeles region, which have caused many deaths:

- ▶ 1939 – 546 people died
- ▶ 1955 – 946 people died
- ▶ 1963 – 580 people died

Far North Queensland

In northern parts of Australia in particular, people are supposedly used to the heat. But when temperatures reach new heights and humidity levels are also high, there are new challenges.

Think back to the heatwaves in Cairns.

What do you remember about the very hot days and nights?

What happened at school and at home that was different?

What did you learn to help you manage better during future heatwaves?

Curriculum links

Classroom resources provided by Cairns Regional Council



Curriculum links

11	Geography	ACHGE012: Geographical knowledge and understanding; Overview of natural and ecological hazards	An overview of the nature of natural hazards (atmospheric, hydrological, and geomorphic) and ecological hazards
11	Geography	ACHGE013: Geographical knowledge and understanding; Overview of natural and ecological hazards	The concept of risk as applied to natural and ecological hazards
11	Geography	ACHGE014: Geographical knowledge and understanding; Overview of natural and ecological hazards	The temporal and spatial distribution, randomness, magnitude, frequency and scale of spatial impact of natural and ecological hazards at a global scale
11	Geography	ACHGE015: Geographical knowledge and understanding; Overview of natural and ecological hazards	The role of spatial technologies in the study of natural and ecological hazards
11	Geography	ACHGE022: Geographical knowledge and understanding; Overview of natural and ecological hazards	The nature and causes of the selected hazard and how the activities of people can intensify its impacts
11	Geography	ACHGE023: Geographical knowledge and understanding; Overview of natural and ecological hazards	The magnitude, frequency, duration, temporal spacing and effects of the hazard
11	Geography	ACHGE024: Geographical knowledge and understanding; Overview of natural and ecological hazards	The diffusion and resulting spatial distribution of the hazard, and how an understanding of biophysical and human processes can be used to explain its spread
11	Geography	ACHGE025: Geographical knowledge and understanding; Overview of natural and ecological hazards	The physical and human factors that explain why some places are more vulnerable than others
11	Geography	ACHGE027: Geographical knowledge and understanding; Overview of natural and ecological hazards	The sustainable risk management policies, procedures and practices designed to reduce the impacts of the hazard through preparedness, mitigation, prevention and adaptation
12	Science	ACSES094: Science as a human endeavour; The cause and impact of Earth hazards	People can use scientific knowledge to inform the monitoring, assessment and evaluation of risk
12	Science	ACSES097: Science as a human endeavour; The cause and impact of Earth hazards	Scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability
12	Science	ACSES098: Science as a human endeavour; The cause and impact of Earth hazards	Earth hazards result from the interactions of Earth systems and can threaten life, health, property, or the environment; their occurrence may not be prevented but their effect can be mitigated
12	Science	ACSES100: Science as a human endeavour; The cause and impact of Earth hazards	Monitoring and analysis of data, including earthquake location and frequency data and ground motion monitoring, allows the mapping of potentially hazardous zones, and contributes to the future prediction of the location and probability of repeat occurrences of hazardous Earth events, including volcanic eruptions, earthquakes and tsunamis

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12	Science	ACSES101: Science as a human endeavour; The cause and impact of Earth hazards	Major weather systems generate cyclones, flood events and droughts; the occurrence of these events affects other Earth processes and interactions (for example, habitat destruction, ecosystem regeneration)
12	Science	ACSES102: Science as a human endeavour; The cause and impact of Earth hazards	Human activities, including land clearing, can contribute to the frequency, magnitude and intensity of some natural hazards (for example, drought, flood, bushfire, landslides) at local and regional scales
12	Science	ACSES103: Science as a human endeavour; The cause and impact of Earth hazards	The impact of natural hazards on organisms, including humans, and ecosystems depends on the location, magnitude and intensity of the hazard, and the configuration of Earth materials influencing the hazard (for example, biomass, substrate)