Heatwave lesson plan

In this lesson, students develop their understanding of heatwaves and conduct an experiment to investigate the impact of heatwaves on plants.

Students explore heatwave risk in Australia and demonstrate ways to prepare for and respond to heatwave conditions. Students explore historical heatwave events and evaluate the impact of heatwaves on people and the environment.

Australian Curriculum: Science, Geography
UPPER PRIMARY / LOWER SECONDARY

ITEMS

- Teacher lesson plan
- Student assignments
- About heatwaves
- Real life stories
- Heatwaves: Be prepared
- Related links

Australian Institute for Disaster Resilience

Contents

Lesson plan	**2**
About heatwaves	**4**
Heatwaves: Be prepared	**6**
Student assignment: Heatwave and plants	**8**
Student assignment: My heatwave project	**11**
Real life stories	**13**
Related links	**15**

Heatwave lesson plan

Objectives

Participating in this lesson will enable students to:

- define a heatwave using appropriate terminology
- simulate heatwave conditions, record observations and draw conclusions about the impact of heatwaves on plants
- communicate appropriate protective actions to prepare for and respond to a heatwave
- research and present findings on the threat and impacts of heatwaves on communities in Australia.

REQUIRED RESOURCES

- Computers with internet access
- Education for Young People website
- 'Heatwaves and plants' activity sheet
- 'My heatwave project' activity sheet

Learning areas

YEAR 6 SCIENCE

ACSSU096	Sudden geological changes and extreme weather events can affect Earth's surface
ACSHE098	Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions
ACSHE100	Scientific knowledge is used to solve problems and inform personal and community decisions

YEAR 7 GEOGRAPHY

ACHGK042	Causes, impacts and responses to an atmospheric or hydrological hazard
ACHGS047	Develop geographically significant questions and plan an inquiry
ACHGS048	Evaluate sources for their reliability and usefulness
ACHGS052	Apply geographical concepts to draw conclusions
ACHGS053	Present findings, arguments and ideas
ACHGS054	Reflect on their learning to propose individual and collective action in response to a contemporary geographical challenge

Lesson steps

Heatwaves and plants

Students to read the About heatwaves and Real life stories pages and pay attention to:

1. the areas in Australia that are affected by heatwaves
2. the effects heatwaves have on life forms and materials
3. ways to cool down.

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.

My heatwave project

Provide students with 'My heatwave project' activity sheet. Students are to conduct research on heatwaves in their local town and ways to stay cool.

1. **Has there been a heatwave in your town?**

   Students use their local library, newspapers or internet to research whether their local area has been affected by a heatwave and if so, when it occurred; temperatures reached; length of the heatwave; and the effects on the local people, animals and environment.

2. **Keeping your cool**

   Students are to conduct an experiment, following the steps in the project sheet, to investigate how body temperature can be affected by the clothing people wear.

3. **Students present their findings to the class in a creative format of their choice.**

About heatwaves

A heatwave is a prolonged period of hot weather.

The Bureau of Meteorology defines a heatwave as 'three or more days of maximum and minimum temperatures that are unusual for the location' (www.bom.gov.au).

Heatwaves are dangerous to people and animals as it becomes more difficult to keep cool and stay hydrated under heatwave conditions.

Heatwaves

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

There have been many heatwaves in Australia, including the 1939 heatwave which killed 438 people in South Australia.

Heatwaves also have other effects. They can cause crop losses and the death of livestock, and severely damage roads and highways, bridges, railway lines and electrical equipment.

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.

Why are heat waves dangerous?

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.

Heat stress – people

Heat stress results when pressure is put on the body's normal cooling process: too much heat is absorbed and not enough is lost. When someone is not able to cool down, their body temperature rises, their breathing quickens and their pulse increases. As their body gets hotter, water is lost from their blood causing it to thicken. This may lead to heatstroke which can result in serious, or even fatal, consequences.

Heat stress – animals

Animals can also 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 and panting, drool, drink more water and have a reduced appetite.

Heat stress – plants

Plants and crops are also affected by severe heat. 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 bushfire increases.

Heatwaves: Be prepared

Heatwaves cause stress on the body's normal cooling process: too much heat is absorbed and not enough is lost.

The effects of heatwaves can be serious for people, animals and plants.

This image indicates what can happen to a person suffering from heat stress. The symptoms can include hot and dry skin, fainting, lack of sweat and a raised core body temperature. In extreme cases, heat stress can cause organ damage or even death.

It is important to be aware of how to protect yourself and your family to avoid heat stress.

Be prepared

You can avoid heat stress by following these survival tips:

- 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 with a high Sun Protection Factor (SPF). When you get sunburnt, it limits the body's ability to cope with heat.

- If you have a baby or children under the age of four, pay particular attention to the above advice 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 per day, even if you are not thirsty. Limit consumption of alcohol or carbonated drinks.
- Do not leave children (or pets) in parked vehicles.

.

Ensure animals have access to shade and water.

- Avoid high protein foods (e.g. meat, 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 damp towels to stay cool and have frequent cool showers. During the day, spend as much time as possible in air-conditioned buildings (such as shopping centres, libraries or museums).
- Check on elderly neighbours and relatives to ensure they are comfortable and coping with the conditions.

STUDENT ASSIGNMENT

Heatwaves and plants

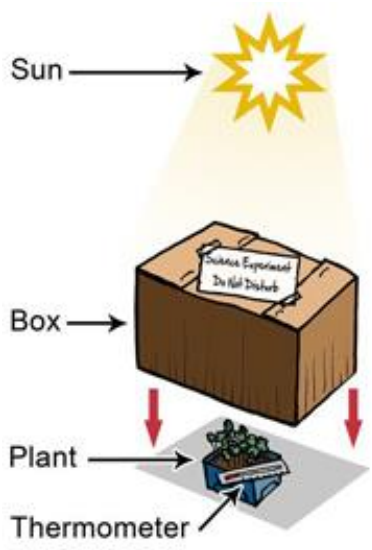
Student name: . . . . . Date / /

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 when you begin the experiment)
- a box to cover the plant
- a thermometer

Instructions:



- Place the plant in a sunny location (e.g. on a window sill or outside).
- 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 your box, so nobody touches it.
- Each day, check and record the temperature in the box.
- Once the temperature reaches a consistent high point for a few days, you have created heatwave-like conditions within the box.
- Conduct regular temperature checks and observations to see how the conditions affect the plant.
- As you conduct the experiment, record your observations and answer the following questions.

Observations

Explain the steps and processes you used to conduct your experiment.

How does this experiment work to create heatwave-like conditions?

What temperature did the box reach?

How long did it take to reach this temperature?

Describe what happened to the plant.

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 cover the plant.

If you have time, make some of these changes and conduct the experiment again.

STUDENT ASSIGNMENT

My heatwave project

The projects on this page will help you understand:

- if and how your local area has been affected by heatwaves
- ways in which people can ensure they stay cool during a heatwave.

1 Has there been a heatwave in your town?

Use your local library, newspapers and the internet to conduct research to find out if your local area has been affected by a heatwave.

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

2 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 etc.) 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 one hour. Is there a difference in the temperature of each jar after one hour?

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

How could the knowledge you have 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 heatwave 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 fatalities	February 1959	–	105 fatalities
January 1908	–	246 fatalities	January 1973	–	26 fatalities
December 1912	–	143 fatalities	February 1981	–	15 fatalities
February 1921	–	147 fatalities	February 1993	–	17 fatalities
January 1927	–	130 fatalities	February 2004	–	12 fatalities
January 1939	–	438 fatalities	January 2009	–	374 fatalities

Extremes

The highest recorded temperature in Australia was 50.7°C at 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 to 45.3°C.

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:

- 4200 lives were lost in both Spain and Italy
- 14,802 people died in France
- 7000 people died in Germany
- 1300 people died from heat stress in Portugal
- 1400 lives were lost in the Netherlands
- 900 people died in London.

India

In May 2003, temperatures of 45-49°C claimed over 1600 lives throughout the country. In the state of Andhra Pradesh alone, approximately 1200 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 Midwest states, driving farmers from their land and killing nearly 15,000 people in ten years.

In July 1901, a heatwave in the Midwest caused the loss of 9508 lives. There have also been other major heatwaves in the Los Angeles region, which have caused many deaths:

1939 – 546 fatalities
1955 – 946 fatalities
1963 – 580 fatalities

Related links

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

/ End.

Australian Institute for Disaster Resilience

ADDRESS

370 Albert Street, East
Melbourne VIC 3002

CONTACT

p : +61 3 9419 2388
e : enquiries@aidr.org.au

WEBSITE

www.aidr.org.au
www.schools.aidr.org.au