

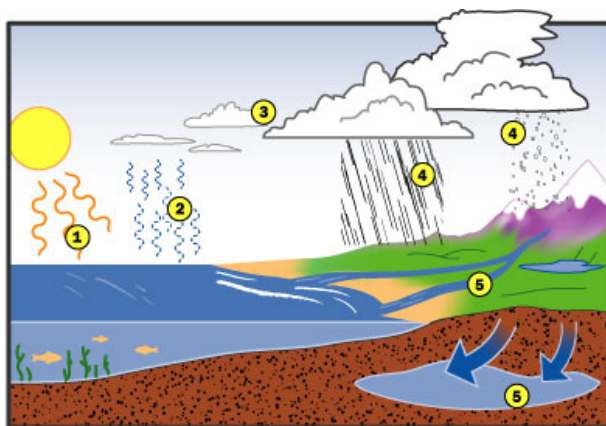
# Background Information:

## RAIN, STORMS & FLOODS

### Rain

Rain occurs where there is precipitation or condensation of atmospheric water vapour. This precipitation is deposited on the earth's surface in the form of separate drops of water falling from clouds.

Raindrops are produced by the collision and merging of cloud droplets. Raindrops are also produced by the melting of ice crystals, snowflakes, and other frozen particles. As ice crystals grow, the heavier ones fall.



- 1 The sun heats the ocean.
- 2 Ocean water evaporates and rises into the air.
- 3 The water vapor cools and condenses to become droplets, which form clouds.
- 4 If enough water condenses, the drops become heavy enough to fall to the ground as rain and snow.
- 5 Some rain collects in groundwells. The rest flows through rivers back into the ocean.

### Rainbow

A rainbow is a curved spectrum of light that displays the sun's white light as a full spectrum. It appears when the elements of sunshine and rainfall are present. The sun's light breaks up as it passes through the prism-like raindrops during a rain-shower.

This curved spectrum of light is actually made up of the true colours of red, orange, yellow, blue, and violet. These colours are always arranged according to their wavelengths, with red being at one end of the spectrum, and violet at the other.



## Severe Storms

Severe thunderstorms are localised events, usually affecting smaller areas than tropical cyclones and floods, so their devastating impact is often underestimated. These storms, which are more common than any other natural hazard, can occur anywhere in Australia. Each year, on average, severe thunderstorms are responsible for more damage (as measured by insurance costs) than tropical cyclones, earthquakes, floods or bushfires. Unfortunately, thunderstorms also kill people - between 5 and 10 deaths are caused by lightning strikes each year. More deaths occur when strong winds cause tree limbs to fall, debris to become projectiles and small boats in open water to capsize. Although many people believe that tornadoes do not occur in Australia, they have caused at least 41 deaths here.

A severe thunderstorm is defined by the Bureau of Meteorology as an atmospheric disturbance manifested in strong winds accompanied by rain, hail, or snow and is often accompanied by thunder and lightning. A severe thunderstorm can produce:

- hail with a diameter of two centimeters or more,
- wind gusts of 90 km/h or greater,
- flash floods,
- tornadoes or any combination of these.

Thunderstorms develop when warm, humid air near the ground receives an initial upward push from converging surface winds and rises rapidly in an unstable atmosphere. Thunderstorms can become severe when the atmosphere is particularly unstable and/or additional energy is drawn in from surrounding winds.

Thunderstorms are active when these three conditions occur: moisture, an unstable air mass, a lifting force (heat).

There are four types of thunderstorms:

- single-cell
- multicell cluster
- multicell lines
- supercells

Supercell thunderstorms are the strongest and are associated with severe weather conditions. Cyclones and hurricanes develop from 'Mesoscale convective systems' formed by favorable vertical wind shear within the tropics and subtropics. There are also dry thunderstorms where there is no rain but these systems can cause the outbreak of fires from the cloud-to-ground lightning that accompanies them.

## Safety in Storms

There are a few simple measures that you can take around your home, unit, property and/or business that can reduce the potential damage caused by storms. These include:

- Secure or put away any loose items from around the house, yard or balcony. These can become dangerous missiles during storms
- Clean debris from gutters, drains and downpipes
- Trim overhanging branches
- Make sure your roof is in good repair
- Prepare an Emergency Kit
- Listen to your radio for any storm warnings

When a Severe Weather Warning and Severe Thunderstorm Warnings is issued by the Bureau of Meteorology:

- Listen to your local radio station for information, updates and advice
- Move indoors, bringing children and pets with you
- Stay clear of windows
- Have your Emergency Kit handy in case you need to evacuate
- Park your car under secure cover and away from trees, powerlines, drains and low lying sections of road
- Do not go sightseeing
- Stay away from creeks, drains, causeways, gutters, streams, fallen trees or powerlines and damaged buildings
- If driving, put the hazard lights on and pull over to the side of the road keeping clear of drains, causeways, gutters, low-lying areas, streams, creeks, trees and powerlines
- If outdoors, seek secure shelter away from drains, causeways, gutters, low-lying areas, streams, creeks, trees and powerlines
- Never drive, ride or walk through floodwater

After a storm:

- Keep listening to your local radio station for information, updates and advice
- Check your house or property for damage
- Stay away from creeks, drains, causeways, gutters, streams, fallen trees or powerlines and any damaged buildings
- Check to see if your neighbours need help
- Do not go sightseeing
- For emergency assistance in floods and storms, call the SES on 132 500, or 131 444 in the Northern Territory.

## Floods

### Types of Flooding

Flooding is defined as:

- Relatively high water levels which overtop the natural or artificial banks in any part of a stream, river, estuary, lake and/or dam overland flow (flooding associated with drainage before entering a watercourse)
- Coastal inundation resulting from storm generated elevated sea levels or large waves generated by storms or tsunamis

### Riverine Flooding

Riverine flooding occurs when rivers burst their banks, inundating surrounding low lying land.

In places where land is less steep and a long way from the headwaters, flooding may rise relatively slowly (compared to flash flooding) over many hours or days. The depths may not be great but huge areas can be flooded and people and animals can be isolated for many weeks.

The expected arrival time and the depth of floodwater can often be predicted, so a flood warning can be issued. The depth of floodwater in these locations can be great and in some coastal rivers, water levels can rise many metres above their normal level.

Staying inside a house, even one which you think is high enough, may be very dangerous. If you are warned to evacuate it is always best to move to a safe location before floodwater arrives.

### Dams

Although dam failures are rare, their effects can be significant. Each major dam in Australia has emergency procedures in place to warn downstream residents of potential dam failure threats. This is a State Government responsibility. Should dam failure occur, significant downstream flooding with potentially swift flowing water and high amounts of debris can result. More information about dam construction and safety measures can be found in *Australian Construction Focus: Dam Safety in Australia – Keeping it Safe*: [http://australianconstructionfocus.com.au/associations/july\\_10/dam\\_construction\\_in\\_australia.html](http://australianconstructionfocus.com.au/associations/july_10/dam_construction_in_australia.html)

### Storm Surge

Severe low pressure systems at sea result in large waves and elevated ocean levels which can cause flooding of low-lying properties along the coast and along estuaries, embayment and coastal lagoons. Residents need to closely monitor their properties during large storm events for flooding and erosion.

### Flash Flooding

Flash flooding usually occurs along creeks and drains which have small catchment areas and results in the rapid rise of floodwater over a short period of time, sometimes only minutes.

Although a warning of the chance of heavy rain might be possible, the arrival time and depth of floodwater cannot normally be predicted. Flood depth can be many metres above the ground level but flooding does

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Australian Bureau of Meteorology: <http://www.bom.gov.au/info/thunder>  
State Emergency Service (SES) StormSafe and FloodSafe brochures

not often last more than a few hours.

Due to the life-threatening nature of flash floods, the safest action is to evacuate homes and businesses before flash flooding begins. In highly susceptible areas this may mean evacuating before heavy rainfall commences. Failure to evacuate may result in you becoming trapped inside the building. If you become trapped, it may be safer to stay inside and seek refuge at the highest point of the building than to enter floodwater. Taking refuge in a building is no guarantee of safety. It is very dangerous and may isolate you from rescue or medical treatment. Your safety depends on the structural stability of the individual property and other factors.

Evacuating early is the only safe action if you live or work in a flash flood prone area. Make early preparations to plan your evacuation and protect your property. Be alert, keep an eye on the weather and be prepared to act should flooding occur.

Never enter or attempt to travel through floodwater. This is the major cause of death in flash floods. Consider the location of your home or business and plan when you need to evacuate so that you do not have to enter floodwater to get to a safe place. If you live or work outside a flash flood prone area you should avoid entering floodwater or seek alternative routes when going about routine travel.

It is important to be aware of any flood risk that might exist where you live, where you have property, where you holiday, where you visit, where family members spend their time (school for example) and also where you work.

### Safety during floods:

When a riverine flood is likely:

- Listen to your local radio station for information, updates and advice
- Activate your FloodSafe Plan
- Locate and check your Emergency Kit
- Check if neighbours, friends and family in the area are aware of possible flooding
- Move livestock, including agisted animals, to high ground

During a riverine flood:

- NEVER enter or attempt to travel through floodwater - this is the main cause of death during floods. Floodwater may be deeper or faster flowing than you think and may contain hidden snags, debris or animals.
- Locate important papers, valuables and mementoes. Put them in your Emergency Kit and take them with you if you need to evacuate
- Stack possessions, records, stock or equipment on benches and tables. Place the electrical items on top
- Secure objects that are likely to float and cause damage
- Relocate waste containers, chemicals and poisons well above floor level
- Keep listening to your local radio station for further information, updates and advice
  
- Keep in contact with your neighbours
- Be prepared to evacuate if advised

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- Act early, as roads may become congested or close

When a flash flood is likely:

- Listen to your local radio station for information, updates and advice
- Activate your FloodSafe Plan
- Locate and check your Emergency Kit
- Locate important papers, valuables and mementoes and place them in your Emergency Kit
- Check if neighbours, friends and family in the area are aware of possible flooding
- Ensure employees are able to get home before evacuation routes close
- Stack possessions, records, stock or equipment on benches and tables. Place the electrical items on top
- Relocate waste containers, chemicals and poisons well above floor level
- Be prepared to evacuate if advised
- Act early, as roads may become congested or close

During a flash flood:

- Leave early if there is the potential for your property or business to be impacted by flash flooding
- NEVER enter or attempt to travel through floodwater - this is the main cause of death during floods. Floodwater may be deeper or faster flowing than you think and may contain hidden snags, debris or animals.
- Keep listening to your local radio station for further information, updates and advice
- In life-threatening emergencies, phone 000
- If driving in heavy rain; put your hazard lights on and pull over to the side of the road. Keep clear of drains, causeways, gutters, streams, creeks and low points on the road
- If outdoors; stay away from drains, causeways, gutters, streams, creeks, trees and powerlines

## Evacuation

During a flood the State Emergency Service (SES) and other emergency services may ask you to prepare for evacuation.

The SES aims to keep people safe and minimise the risks to life and property when floods occur so it is important that you follow evacuation advice. Being prepared will allow you to respond quickly should you need to evacuate.

- Take your Emergency Kit with you
- Turn off the electricity and gas at the mains before you leave. Turn off and secure any gas bottles
- Prepare to take your pets with you