

# Lesson One

## Water – Where does it come from and Where does it go?

### Student Objectives

By the end of this lesson students will:

- Have a greater understanding of how the natural process of the water cycle functions (some of this should be prior knowledge)
- Have a sound understanding of the concepts of Evaporation, Condensation, Precipitation, Collection and Runoff, as well as a basic understanding of the concepts of infiltration and transpiration.
- Understand how humans can impact this natural process.

### The Lesson:

#### INTRODUCTION:

Begin the unit with a class discussion about water. Discuss the importance of water (using various props) and get students to guess how much water is in each of the items selected. Examples include:

- Apple (85 % water)
- Water melon (90% water)
- Mango (82% water)
- Human (approx 60% water)

#### Discussion Points

Why is water so important?

How does the water cycle work?

Teacher to guide the discussion and possibly illustrate on the board, aiming for the students to demonstrate the water cycle key principles of

- Evaporation,
- Transpiration
- Condensation,
- Precipitation (Rain, hail, sleet and snow)
- Infiltration
- Runoff
- Stormwater
- Catchment

Students will then need to ensure they have a copy of this in their notes.

#### Discussion Points

Where does water come from?

How do clouds form?

What are some different types of cloud common to Qld?

What is the difference between storm water and wastewater? What makes them different?

#### Extension

How does Acid Rain form? (Emphasis the human influence impacting this natural process)

What impact does Acid Rain have on our environment?

#### Activity

Write a children's' story/cartoon strip that shows the journey of a single water drop as it goes through the main parts of the water cycle

#### Optional Science Activity

Design an experiment that illustrates how the concepts of evaporation / condensation / precipitation takes place.



Up a dry gully

**Discussion Point**

Where is the water stored?

Get the students to guess how much water is stored in our lakes and rivers, oceans and under the ground.

- 0.6 % Lakes & rivers
- 1.6 % Underground (groundwater)
- 97 % Oceans
- 2.4 % Frozen stores (polar caps, snow and glaciers)

**Activity**

Use a blank map of the world to demonstrate how much water is stored in our oceans. Students can then label the oceans with the correct percentage figures and label the land with the other labels.

**Extension**

Name the seven different continents on the map using a colour code system.

Write a paragraph to explain how global warming would influence the water storage at the poles.

**Conclusion**

Revisit the key concept words in the form of a quick revision quiz for students to demonstrate the understanding of the water cycle.

**Resources**

For the Teacher

- [www.apps.southeastwater.com.au](http://www.apps.southeastwater.com.au) have an excellent education program, including a water cycle game.
- Master copy of world map

For the students

- Blank world map



*Up a dry gully*



# Lesson Two – Water where its not wanted...

## Introduction to flooding & Types of flooding

### Student Objectives

By the end of this lesson, students will:

- Understand the difference between a natural hazard and a natural disaster.
- Have a greater understanding of flooding and the different types of flooding
- Have a basic understanding of where flooding in Australia occurs
- Have been introduced to the Murray-Darling Basin.

### The Lesson:

#### INTRODUCTION:

Students begin to think about some different global events that highlight the difference between a natural hazard (a naturally occurring thing that will impact people and/or the environment) as opposed to a natural disaster (the effect of a natural hazard – social, financial or environmental loss)

Natural Hazard	Natural Disaster
Earthquake	Christchurch earthquake/Japanese Earthquake
Tsunami	Japanese Tsunami
Flood	Brisbane floods
Volcano	Ruapehu Volcanic Eruption
Landslide	Threadbo Landslide
Cyclone	Cyclone Yasi

#### Discussion points

What is a natural hazard?

What is a natural disaster?

Do people have to be severely impacted for it to be a natural disaster?

So what is a flood? - Ask the students to define what they think a flood is... (most will talk about rainfall)

What can cause flooding? – Rainfall, surface runoff, Tsunami's, storm surge, flash flooding, dam failure, etc

#### Key Points

- A flood is basically water where it is not wanted.
- A more complex definition is: "A general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waters from the unusual and rapid accumulation or runoff of surface waters from any source." (Geoscience Australia)

#### Group Brainstorm activity

Using two columns or titles, come up with some positive and negative aspects of flooding.

Positive Aspects of Flooding	Negative Aspects of Flooding
Replenishes water table & catchments	Damages infrastructure
Breaks drought	Can kill livestock
Flushes out water systems	Disrupts business and affects livelihoods
Etc	etc

#### Discussion Point

Where do major floods occur in Australia?

Why is the Great Dividing Range so important?

How do floods west of the Great Dividing Range compare with those to the east? Why do they differ?

#### Activity

Using a blank outline map of Australia, students need to show the great dividing range along the eastern coast of Australia. On this map, students need to show the Murray Darling Basin and major rivers in this system. Identify 5 towns/cities in Qld that have been affected by severe flooding and 3 towns/cities in each other state also affected by severe flooding.



Up a dry gully

### Optional Activity

#### Types of Floods

Introduce students to the concepts of different types of flooding – ensuring they record the differences between the different flood types.

**Flash-Floods** - Flash flooding results from relatively short, intense bursts of rainfall, often from thunderstorms. It can occur in almost all parts of Australia and poses the greatest threat of loss of life. People are often swept away after entering floodwaters on foot or in vehicles. These floods can also result in significant property damage and major social disruption. They are a serious problem in urban areas where drainage systems are often unable to cope.

**Slow-Onset Floods** - Inland rivers in the vast flat areas of Western Australia and central/western New South Wales and Queensland can often flood. These floods may take days to build-up and they can last for one or more weeks and can even last for months on some occasions.

The damage caused by floods in these areas can lead to major losses of livestock, cutting-off rural towns and damaging crops as well as major roads and railways.

**Rapid-Onset Floods** - Rapid-onset flooding can occur more quickly than slow-onset floods. These floods can be potentially much more damaging and can pose a greater risk to loss of life and property. This is because there is generally much less time to take preventative action, and a faster, more dangerous flow of water. This type of flooding can affect most of our major towns and cities.

Students can use a colour coding system to show different types of floods on their maps.

### CONCLUSION

Students are asked to differentiate between a natural hazard and disaster. Revise the key terms and principles of the lesson with a quiz format.

### Resources

#### For the Teacher

- Blank outline Map of Australia
- Unit information for Teacher

#### For the students

- Blank outline Map of Australia
- Computer access



Up a dry gully

# Lesson Three

## Flooding in South East Queensland

### Student Objectives

By the end of this lesson students will:

- Be able to locate areas of major flooding in Australia since 1970
- Have gained through student initiated research an understanding of past flooding events in SEQ
- Have started to look at ways that humans have attempted to ameliorate the effects of flooding (through dams/ controlled release etc)

### The Lesson:

#### INTRODUCTION:

Begin the lesson with a class discussion about flooding in Australia. Use student/family experience as a basis for flood history and build from there. Recent media activity should make a firm starting base if there is no experience within the group.

#### Activity

Find or research a list of notable floods in Australia from 1900 to present. Present this information as a History Road, marking the MAJOR flooding events (such as the Brisbane floods of 1974 and 2011)

Then, use a blank outline map of Australia, an on-line map or an atlas to locate each major flood event and mark it on the outline map.

#### Discussion Points – Complete these tasks in groups, then report back to the class.

- Try to identify any patterns? If so, what would cause an area to flood more often than others?
- What would be some effective flood prevention strategies for these areas?

#### Activity

Focus on SEQ and the floods that have occurred here since colonisation. As a class or in groups, discuss the following:

- Historically, why were settlements made near and on rivers?
- How have these decisions impacted us today?
- Think of 5 ways humans have attempted to control water to minimise flooding and the risks associated with flooding.

#### Optional Activity

Movie "The Deluge" (1999 – G rating)

#### Conclusion:

Movie "The Deluge" (1999 – G rating)

### Resources

#### For the Teacher

- Blank outline of Australia Map
- SE Qld Map Master copy
- Movie "The Deluge" (G) (1999) starring Ray Barrett

#### For the students

- Blank outline of Australia Map
- SEQ map blank copy



Up a dry gully

# Lesson Four

## Skills Activity - Mapping Overlay Task

### Student Objectives

By the end of this lesson, students will:

- Have an understanding of how to create an overlay map
- Have a basic understanding of the scale of flooding some neighbourhoods of Brisbane.

### The Lesson:

#### INTRODUCTION:

Begin the lesson by explaining to the students what an overlay map is (you may want to address this by asking them to tell you)

Key points to cover include:

- What an overlay is
- How they are used
- Who might use them

#### Activity

To complete this activity, students will need access to computers, the internet and have the ability to print.

1. Use the website [www.abc.net.au/news/infographics/qld-floods/beforeafter.htm](http://www.abc.net.au/news/infographics/qld-floods/beforeafter.htm) to view aerial images of before and after the floods of 2011 in Brisbane.
2. Select two of the images shown
3. Use google maps to find maps of the areas shown and print these off. These will form the base of the overlay.
4. Use either tracing paper or an OH transparency and markers to show the levels of the 2011 floods in the selected area.
5. Research to see if you can find information regarding the flood levels of the 1974 flood in your selected area.
6. Use another sheet of tracing paper or transparency to show an estimate of the areas flooded in the 1974 flood.
7. Then answer the following questions:
  - How are these two flood events different?
  - Are there any similarities?
  - Can you identify any significant changes since 1974 compared with 2011 in your selected area?
  - Are any of these changes aimed at reducing the impacts of flooding?

#### ONLINE Option

Alternatively, should software & facilities be available, teachers might wish to complete this task as a computer based activity. Smart Draw ([www.smartdraw.com/specials/ppc/mapping-software.htm?id=148983&gclid=CPFYva77yqgCFYmBpAodzXaypg](http://www.smartdraw.com/specials/ppc/mapping-software.htm?id=148983&gclid=CPFYva77yqgCFYmBpAodzXaypg)) have free software that can be downloaded to complete this task.

Once students have researched this information, they need to feed back to the class and share what they have learnt into a pool of common knowledge.

### Resources

For the Teacher

- Web link  
[www.abc.net.au/news/infographics/qld-floods/beforeafter.htm](http://www.abc.net.au/news/infographics/qld-floods/beforeafter.htm)

For the students

- Web link  
[www.abc.net.au/news/infographics/qld-floods/beforeafter.htm](http://www.abc.net.au/news/infographics/qld-floods/beforeafter.htm)
- OH transparencies or tracing paper
- Necessary pens/markers/pencils
- Internet access
- Computers & printer



Up a dry gully

# Lesson Five

## Response to Flooding

### Student Objectives

By the end of this lesson students will:

- Understand the response of people to different flood events, using the 2011 flood events of Brisbane, Toowoomba and the Lockyer Valley
- Understand the need and relevance of our emergency response organisations.
- Have a basic understanding of how a review process is used to further enhance these organisations.

### The Lesson:

#### INTRODUCTION:

The flood events of SEQ in January 2011 were significant and catastrophic. Several different types of flooding occurred, each of which impacted the residents of the affected areas in similar yet different ways.

Have students identify areas of SEQ that had each of the flooding types, based on definitions from an earlier lesson (Lesson Two)

- Slow-Onset Flooding
- Fast-Onset Flooding
- Flash Flooding

#### Activity

Have students chose (or assign) one of the types of flooding from above, and an area of flooding that occurred in the 2011 event. They will need to research the experiences of at least three different people impacted by the flood event. These can include those who have been flooded or an emergency response person. In their research they will need to answer these questions:

1. Location at the time of flood event
2. Occupation
3. Information about the rate of water level rise
4. How they responded to the flood event
5. What assistance they needed (if any) and who supplied it
6. Concerns they had (ie for themselves, family, neighbours, friends etc)
7. Information regarding any losses.

Use these primary sources of data to complete an original 'fictitious' version for one of the following activities:

- Write a newspaper article reporting on your event
- Create a letter to a pen-friend overseas explaining what has gone on in your own 'story'
- Complete a journal/diary entry for the day of the most significant flooding
- Create a news bulletin for a radio station about the flooding, including an interview with a person impacted by the flooding
- Write a 'blog' updating readers of what you are experiencing (first person)

These activities then be displayed on the wall for others to share.

### Resources

For the Teacher

- Computer/internet access

For the students

- Computer/internet access



Up a dry gully



# Lesson Six

## Impacts of Flooding - People

### Student Objectives

By the end of this lesson students will:

- Understand the impacts of flooding to people in flood affected areas
- Understand the need to look after our catchments and protect the people and species that live in them.
- Have a basic understanding of how Councils and other Government organizations help minimize the impacts of flooding by controlling land use.

### The Lesson:

The purpose of this lesson is to look at the human impact of flooding and how the people affected cope with such catastrophic events. The depth of impact to such events varies, depending on the level of loss. For the purpose of these lessons you may wish to focus on people whose property is impacted by flooding. For a deeper impact, loss of human life may be explored.

#### INTRODUCTION:

With reference to the recent floods of Brisbane, Toowoomba and the Lockyer Valley (2011) ask students to think of ways that people have been impacted. On the board, create a large mind map with the key idea of human impact as the central theme.

Once this has been achieved, have the students copy the mind map into their notes. They will then need to categorise the impacts into these categories, drawn up in a table.

- Economic impact (loss of property and possessions, with or without insurance)
- Emotional impacts (such as loss of life, special or significant items eg photos, loss or misplacement of pets)
- Infrastructural impacts (community facilities, government or council owned infrastructure, roads and other community infrastructure such as power/phone lines)

Some of the effects of flooding are short term, while others are longer term, intangible or even permanent. Have the students separate the Economic, Emotional and Infrastructural impacts into a grid, as shown below:

Economic	Short term	Long term
Emotional Impacts	Short term	Long term
Infrastructural impacts	Short term	Long term

#### Teacher note:

Short term impacts include death, injury, loss of infrastructure damage to property & business, damage to crops and disease/threat of disease.

Long term impacts include rebuilding homes, businesses and infrastructure, uninsured losses, loss in trade and industry, public perceptions of place and the costs associated with insurance

Intangible impacts include emotional and psychological damage, sentimental loss, sleeplessness, nervousness, irritability and fatigue, depression and the impact of all of these aspects on relationships.

#### Discussion:

Have any of these flood situations and effects impacted people in the class or family/friends that students might know?

### Resources

#### For the Teacher

- Web link  
[www.abc.net.au/news/infographics/qld-floods/beforeafter.htm](http://www.abc.net.au/news/infographics/qld-floods/beforeafter.htm)

#### For the students

- Web link  
[www.abc.net.au/news/infographics/qld-floods/beforeafter.htm](http://www.abc.net.au/news/infographics/qld-floods/beforeafter.htm)
- OH transparencies or tracing paper
- Necessary pens/markers/pencils
- Internet access
- Computers & printer



Up a dry gully

# Lesson Seven

## What can we do to Lesson the Impacts of Floods on People?

### Student Objectives

By the end of this lesson students will:

- Have a basic understanding of the roles of Emergency services, such as the SES
- Have a basic understanding of what each household can do to be prepared for an emergency situation like a flood

### The Lesson:

This lesson is the perfect opportunity to involve a guest speaker such as a representative from the local SES or Fire Service to come and speak to the students about the role they play in the community in a disaster situation. For more details, contact the SES on 1300 369 003 (state headquarters) or see [www.ses.qld.gov.au](http://www.ses.qld.gov.au)

#### INTRODUCTION:

Watch a video clip from [www.youtube.com](http://www.youtube.com) to stimulate a discussion about Emergency Services such as:

[www.youtube.com/watch?v=PIQI4t-6y7Q&feature=related](http://www.youtube.com/watch?v=PIQI4t-6y7Q&feature=related) is an excellent youtube video which gives the history of the SES and how they have evolved into what we know today. (Approx 7 mins in length)

[www.youtube.com/watch?v=Wah1V82xvec](http://www.youtube.com/watch?v=Wah1V82xvec) provides some excellent coverage of the 2011 floods in Qld

[www.youtube.com/watch?v=ArsIQZ55NcA&feature=related](http://www.youtube.com/watch?v=ArsIQZ55NcA&feature=related) audio of the "Orange Suits and Lace Up boots" song... no visuals though (unfortunately!)

**Learning** – Who are the Emergency Services we can contact/rely on in a natural disaster emergency?

#### Group task

In groups of no more than 3, students are to spend 15 minutes doing some power research (online) on their allocated emergency service provider. They are then to nominate a spokesperson who will feed back their information to the rest of the class. This information is to be used to create a star diagram in the students notes highlighting the available emergency services, their roles and responsibilities.

Allocation of the power research groups can be done randomly by drawing a Service Provider name out of a hat, or selecting from a list on the board. Alternatively, you can get the students to come up with as many different emergency service providers and then get them to choose the one that they would most like to power research to feed back to the class. The trick with this research is that it needs to be done under pressure.

Suggestions include:

- SES
- Qld Fire and Rescue
- Swift water rescue
- Qld Ambulance Service
- Police
- Emergency Management Qld
- EMQ Helicopter Rescue
- Rural Fire Service
- Emergency Services Cadets

Research needs to include: Who, what, where, when, why & how...

Once the students have completed their star diagrams in their notes, they need to construct a flow chart that shows the overall structure of the Emergency Service Regime and how it all fits together (see [www.emergency.qld.gov.au/about/default.htm](http://www.emergency.qld.gov.au/about/default.htm) for more information).

#### Conclusion

How do the Emergency Services help support the community in times of Natural disaster?

How could you go about joining some of these services?

### Resources

For the Teacher

- Internet access with data projection
- Possible guest speaker (check with SES)

For the students

- Computer/internet access



Up a dry gully

# Lesson Eight

## Impact of Floods on the Environment

### Student Objectives

By the end of this lesson students will:

- Have a basic understanding of the importance of flooding to the ecosystem

### The Lesson:

#### INTRODUCTION:

Begin a revision activity on the board of the water cycle. Get the students to name the different parts of the cycle and give a basic explanation of how that part of the cycle works

#### Discussion points

How does flooding impact the water cycle (where does it fit on the water cycle?)

#### Activity

Read the Article “environmental Impact of Floods – Feb 2011” from the wildlife Rescue website [www.wildlife.org.au/news/2011/flooding5.html](http://www.wildlife.org.au/news/2011/flooding5.html) (Or view it as a word document below)

From your reading, construct a flow diagram that shows the environmental impact of the recent Qld floods on the environment. The starting point of your flow diagram needs to be “High Rainfall”. Be sure to show which effects are short term (such as algal blooms) versus those which are longer term (such as the loss of life of some species due to contamination). Based on this article, are the floods a positive or negative thing for the environment?

#### Extension Activity

For those that like a bit more of a challenge, along the path of your flow diagram, attempt to show how humans can alter the effect of the flooding by different activities such as controlling water releases from dams or moving flora and fauna to safe locations.

#### Discussion Points

For most of the environment it seems all ‘doom & gloom’ when flooding hits. What are some of the positive aspects of the flood event for the environment? Try to steer the discussion in the direction of

- recharging the water table (especially good for the Murray Darling system) to help reduce salinity in the soil
- Distribution of sediment provides fresh nutrient for flood plains and thus increases soil fertility.

#### Conclusion

Give the students a quick quiz about how we can minimise the impacts of flooding through our daily lives (watching rubbish placement etc)

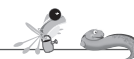
### Resources

#### For the Teacher

- Water cycle diagram (teacher reference only)
- Access to [www.wildlife.org.au/news/2011/flooding5.html](http://www.wildlife.org.au/news/2011/flooding5.html)
- Or the print out supplied below:

#### For the students

- Article as supplied by the teacher (either view electronically or photocopied)



Up a dry gully

# Environmental Impact of Floods - February 2011

(Courtesy of [www.wildlife.org.au/news/2011/flooding5.html](http://www.wildlife.org.au/news/2011/flooding5.html))

While the massive-clean up is well underway in Queensland, the full environmental impact of the floods is still being assessed.

The recent floods have devastated much of the Queensland landscape. Only time will tell how our ecosystems will bounce back from this natural disaster. Floods are a natural part of the Queensland environment but the widespread and intense nature of the current floods affecting around 80% of the state is unprecedented. It is too early to tell the full extent of the impact; the reality is we may never know. We do know that while some species will thrive others may have been killed or forcibly relocated to higher ground. Scientists suggest that ground dwelling fauna such as small mammals and reptiles may be the worst hit.



*Dirty water reaches northern part of Moreton island.  
Photo ©Healthy Waterways*

The health of our waterways has been impacted significantly as many rivers and creeks were eroded, contaminated and littered with debris. Large numbers of fish have died left stranded as waters receded. The erosion of river banks is of particular concern for freshwater turtles such as the Mary River and Fitzroy River turtles. Exotic species such as carp, tilapia and red slider turtles may have spread with the floodwaters. Many riparian zones were damaged from rapid flowing water which striped away vegetation and exposed soils making them more prone to rapid erosion from future rains. The foolishness of clearing riverine vegetation has now been exposed.

Soils and waterways may have been contaminated by chemicals from nearby industrial and commercial premises – this is of particular for food producers. During the floods only 15% of the states 57 coal mines were fully operational. The coal industry lobbied the Government to temporarily drop environmental regulations and allow 44 mines to pump out millions of litres of contaminated floodwater into creeks and rivers. A large number of permits were issued. One can only contemplate the impact of such a huge release of highly toxic materials on our waterways. The current approval process and assessment criteria have clearly failed to stop environmental harm from occurring. The Government must review the current regulations. The floods should be a wake-up call to the Government about its attitude to development approvals. The Government has been warned repeatedly about approving development in flood plains but still it is allowed to happen. It is the public and ordinary folk in the high-risk areas who carry the burden of these poor planning decisions. No doubt Governments will continue this practice, if so they must lift the standards of design and enforce enhanced regulation.

The flow on effects of high volumes of fresh water, sediments, nutrients, pesticides and other contaminants in waterways poses a huge threat to marine environments such as Moreton Bay, the Great Sandy and Great Barrier Reef marine parks. Mangrove habitats are particularly susceptible as they act as a net catching sediment and all sorts of debris often causing damage to their root systems. Toxic flood plumes are expected to have a significant impact on seagrass beds, corals and wetlands. Excessive silt and sediments will smother corals and seagrasses. The widespread nature of the plume will also limit the ability of species such as dugong and sea turtles to find alternative food and could cause malnutrition and death. High sediment and nutrient loads can result in algal blooms and



*Up a dry gully*

increased disease and mortality of many marine species. Excessive scouring of riverbeds could expose acid sulphate soils which wash into the marine environment. The toxic flood plume covering much of the coast poses a threat to the Queensland seafood industry with species like prawns expected to be heavily impacted. In Moreton Bay, voluntary halts on fishing continued for weeks after the flooding event.

The Government is currently evaluating and assessing the environmental impacts of the floods. It is inevitable that the environment will suffer significant short and long term impacts. There will be numerous flow-on effects as we start to see many environmental programs cut back as dollars are directed to rebuilding the state. The Gillard Government has already proposed cuts to climate change programs in order to fund flood recovery. The flood recovery must be a green recovery and cutting greenhouse gas reduction programs to fund it is not a smart solution. While no single extreme weather event can be directly attributed to climate change, the recent floods are consistent with what climate scientists have been warning for decades. If we cut carbon pollution we can reduce the severity of extreme weather events and help protect our people and our economy.

Calling for the building of new dams is not the solution. We must look at ways to redevelop our cities smarter, greener and more resilient to the impacts of extreme weather events such as this. Reassessing design and development regulations must be part of the solution. Traditional catchment management has concentrated on preventing floods. We need to look at alternatives by focusing on minimising the damage rather than the occurrence. There is a need to identify ways of living and working in flood prone areas, while protecting high value assets. People living in flood prone areas should be helped to be 'flood ready', similar to people living in bushfire risk areas. If we can learn to accept that floods are a part of the natural cycle in the Australian climate, we can become better equipped to deal with them when they occur.



*Up a dry gully*



# Lesson Nine

## Managing the Risk – Flood Mitigation

### Student Objectives

By the end of this lesson, students will:

- Understand the need be prepared for flood events
- Have a basic understanding of ways humans attempt to control waterways so that floods can be 'managed' (within reason)

### The Lesson:

#### INTRODUCTION:

Start the lesson with the image shown below (it can also be seen at several websites:

<http://papundits.wordpress.com/2011/02/05/a-few-more-inches-and-heaven-help-brisbane/> - which has some interesting statistics about the flood event of 2011) and several other websites, found by googling "Wivenhoe Dam 2011 Floods – images)

Unsure of the original source of this image – it was widely circulated via email (source used)



#### Discussion Points

Ask the students what they see in this image.

What does it show – what are humans attempting to accomplish here?

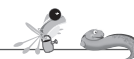
#### Learning – 'Managing' nature – Flood Mitigation

There are several ways in which man can attempt to control or manage flooding. Some of these methods are extreme in action while others are less significant.

The most extreme methods to mitigate flooding hazards involves engineering. This can be broken down into two key categories – 'Hard' engineering, which involves the construction of dams and the like and 'soft' engineering, which works more on a land drainage basis.

Have the students classify each of the following types of engineering into either 'hard' or 'soft' categories. (some of these might be debateable, dependant on the size of the structure)

- Flood walls
- Embankments & levees
- Channel improvements
- Relief channels
- Flood reservoirs
- Flood plain zoning
- Flood proofing
- Flood abatement



Up a dry gully

### Quick Quiz – General Knowledge

To show examples of hard engineering, have students come up with the names of as many different dams in SEQ as possible in 2 minutes (may want to do this activity in pairs/small groups. Share ideas on the board.

Dam Name	
Atkinson Dam	Lake Kurwongbah
Baroon Pocket Dam	Lake Macdonald
Bill Gunn Dam	Lake Manchester
Borumba Dam	Leslie Harrison Dam
Bromelton Dam	Little Nerang Dam
Cedar Pocket Dam	Maroon Dam
Clarendon Dam	Moogerah Dam
Cooloolabin Dam	North Pine Dam
Enoggera Dam	Somerset Dam
Ewen Maddock Dam	Wappa Dam
Gold Creek Dam	Wivenhoe Dam
Hinze Dam	

#### History of Wivenhoe Dam

Research the basic history of Wivenhoe Dam, starting with the 1974 floods. In your research, find and include the dates for the following highlights:

- 1974 flood
- Proposed Dam building
- Research into the proposed area. Features of significance?
- Starting the dam
- Capturing water
- Completion of the Dam
- First time Maximum Capacity reached
- Dam capacity today

Display your research in cartoon form, using a 5cm x 5cm grid for each key piece of information. You must have a minimum of 8 squares in your cartoon.

#### Graphing Activity – Interpretation of Data

For this activity you will need access to the SEQ water website, via [www.seqwater.com.au/public/dam-levels](http://www.seqwater.com.au/public/dam-levels)

Using the “Historical Dam Storage Data”, answer the following questions:

1. The data recorded in this graph goes back to when?
2. What was the average volume of water (%) at the start of the graph
3. What is the lowest overall water storage volume (%) in the past decade? (show % and date)
4. What is the highest overall water storage volume (%) in the past decade (Show % and date)
5. What are the current levels for the following dams:
  - Wivenhoe (ML & %)
  - Somerset (ML & %)
  - Dam of your choice (ML & %)
6. How does this graph illustrate the capacity we have for flood mitigation. Is there any data shown to support your theory?

#### Conclusion

Has Wivenhoe Dam been able to help control water and hence flooding in the way it was intended?  
What possible scenario could we have faced in Jan 2011 had Wivenhoe Dam not been in place?

#### Extension activity

Dam building and flooding of land areas in dam catchments are quite controversial at the best of times. Before a dam can be built, what has to be considered? Think in terms of important social, historical, cultural factors. Were there any important historical or cultural sites that had to be considered and relocated as a result of building the Wivenhoe Dam catchment area? (eg cemeteries, buildings of historical significance) and how was this achieved?

#### Resources

For the Teacher	For the students
<ul style="list-style-type: none"> <li>• Internet access to the listed website links</li> <li>• Possible data projection of the image as an introduction</li> </ul>	<ul style="list-style-type: none"> <li>• Internet access for graphing activity</li> </ul>



Up a dry gully

# Lesson Ten

## Dams – Meeting the Needs of All?

### Student Objectives

By the end of this lesson students will:

- Understand that different people have differing values and hence perceptions
- Be able to argue either for or against an idea (in this case a Dam) but using points of view and persuasion.
- Have a basic understanding of how political decisions are made.

### The Lesson:

#### INTRODUCTION:

From the previous lesson, students should have some understanding of the research and consultation that has to be completed before a major development such as a dam can take place. The purpose of this lesson is to give students the opportunity to see things from a different point of view and see how political decisions are made. Introduction to this lesson may best be made with a role play, where the teacher takes on the role of a protestor who has a particular point of view and really drives their point home (ie placard with a slogan against the idea – in this case the dam).

Alternatively, if role play is outside your comfort zone or just not your thing, a video presentation from: [www.youtube.com/watch?v=uNbF8isrOLs&NR=1](http://www.youtube.com/watch?v=uNbF8isrOLs&NR=1) shows a commercial against the dam and [www.youtube.com/watch?v=v3BcveG2DZg&NR=1](http://www.youtube.com/watch?v=v3BcveG2DZg&NR=1) gives an overview of the proposed project, with a view opposing the dam. This does show people passionate about saving their properties and many of the key players. It gives a good basic introduction

#### Case study – Traverston Crossing Dam

More recently, the Traverston Crossing Dam on the Mary River has provided a lot of controversy and has been widely covered by the media (2009). Find out the key facts about this issue and hold a class debate about whether or not it should have gone ahead, with those that support the proposed dam and those opposed to the concept.

Before getting into the research, have students place stakeholders along a values continuum line - those that strongly agree with the dam and those that are strongly opposed to the dam. Suggested stake holders to include:

- local farmer,
- Local resident,
- down stream resident,
- an environmentalist,
- a lung fish,
- an earth moving business contractor,
- a local diesel mechanic,
- a concrete business owner,
- two different residents of Brisbane
- An elderly lady living in the Mary Valley
- A fisherman
- A local MP
- State Premier
- Prime Minister

Once the students have completed a values continuum, have them divide into groups representing one of the above parties (or work as individuals) to complete their research and consolidate an argument either for or against the proposed dam.

Hold a class debate, with an adjudicator (or a mock hearing with an elected council) and try to make your own decision as to whether or not the proposed dam should go ahead.

Finally, formulate a class opinion as to whether or not you agree with the final outcome of not building the dam. Was this the best decision for all the stakeholders concerned?

### Resources

For the Teacher

- Internet access if using the videos as your introduction
- Placard if demonstrating as your introduction

For the students

- Internet access to research different points of view



Up a dry gully

# Lesson Eleven

## Being Flood Wise at Home – Being Prepared

### Student Objectives

By the end of this lesson students will:

- Understand the importance of being prepared for a natural disaster
- Have a basic understanding of having a flood action plan or emergency action plan for their home.
- Be able to chat to family members about how to be prepared for an emergency

### The Lesson:

#### INTRODUCTION:

The point of this lesson is for it to be as practical and hands on as possible, so having a kit for kids to look at would be a great way to start this lesson! It may even be possible if you haven't had any visitors earlier in the unit to have a member of the SES come and visit.

EMQ have an excellent pdf hand out that outlines everything needed in an emergency kit available online at [www.emergency.qld.gov.au/emq/css/emergencykitpdf.asp](http://www.emergency.qld.gov.au/emq/css/emergencykitpdf.asp) Provide students with a copy of this to view and take home (if possible)

Ask how many students have an emergency kit in their homes? How many have an emergency action plan for their families?

#### Activity

1. Have students go through the different sections of the "Emergency Kit" list and come up with a rationale for the inclusion of each of these items.
2. Then have the students highlight the different things that would be needed for each student's household.
3. Are there any special items that would be needed for their household? (ie pet-food, nappies for younger siblings, medications?)
4. What would everyone do in the event of an emergency – where would they aim to meet up and how would they communicate in the event that power was lost or mobile coverage was restricted?
5. Do they have neighbours that need special consideration? (eg elderly or special needs?)

#### Preparing Your Home:

EMQ have another excellent pdf resource that outlines how to prepare your home for an emergency available at [www.emergency.qld.gov.au/emq/css/preparehome.asp](http://www.emergency.qld.gov.au/emq/css/preparehome.asp)

Have the students draw a floor plan of their own home and identify the following:

1. Location of emergency kit/kit items.
2. Safest room in the house
3. Location of mains for gas, water and power

Be sure the students use all the key map conventions.

#### Being Flood Ready

While there is no pdf sheet, another excellent source of information for being "flood ready" can be found at [www.emergency.qld.gov.au/emq/css/flood.asp](http://www.emergency.qld.gov.au/emq/css/flood.asp)

Students need to identify if they live in a flood prone area. Go over the flood preparedness data to ensure that students are prepared in the event of a flood, should they live in a flood prone area. If the student does not live in a flood prone area, do they have a family member that does and could use assistance?

#### Other online resources include:

<http://72hours.org/index.html> - might be American, but the principles are still the same!

[www.emergency.qld.gov.au/emq/css/beprepared.asp](http://www.emergency.qld.gov.au/emq/css/beprepared.asp) - some excellent resources, particularly specific to different types of natural hazards & preparedness. Well worth a look!

### Resources

#### For the Teacher

- Emergency Kit to demonstrate/show to class
- Internet access to obtain pdf files listed above

#### For the students

- PDF handouts as listed above
- OR internet access to read through the pdf files.



Up a dry gully

# Lesson Twelve

## Introducing the Scenario

These lesson plans work on the premise that you will be looking at investigating scenario 7 "Flooding".

The direction you take from here will be entirely dependent on how you choose to investigate and present your selected scenario. However, these lessons should have provided a good base from on which students can build.

Factors to consider/things to think about include:

- When working out how you are going to present your findings, consider individual strengths and weaknesses (or of group members if working in a group) For example - are you have a technical genius? Is one member of the group good at writing/art/super creative?)
- Brainstorming – come up with lots of ideas and narrow it down. Remember to keep it practical and realistic. You will have a deadline to meet!
- Agree on an idea as a class/group
- Grow the idea – Break the task down and decide who is going to do what?
- Work out resources you will need to make your idea a reality. Who is going to provide the materials you will need. Do you need your teacher to supply anything? Are you going to need computer/internet access during class time for research?
- Plan and set goals to make your idea come to life. This is particularly important if you are making a model as it takes a lot of time and can't be made the day before!
- Keep in touch with your teacher. Let them know if you encounter a problem
- Have fun!

### Resources

For the Teacher

- Scenario
- Competition guidelines
- Up a Dry Gully Fact sheet

For the students

- Scenario
- Up a Dry Gully Fact sheet



Up a dry gully

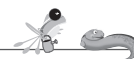
# Lessons Thirteen & beyond...

## Building Your Ideas and Making Them a Reality

From here on, the students will need to formulate their ideas and make them come to life. Under supervision of the teacher, students will need to look at their selected scenario, work together as a group and keep the communication channels open with the teacher.

Remember this is not about the biggest, flashiest idea, but the team that best demonstrates their understanding of the scenario and helps come up with solutions to the water challenges of the future.

Should you require any additional help, please do not hesitate to contact us.



*Up a dry gully*

