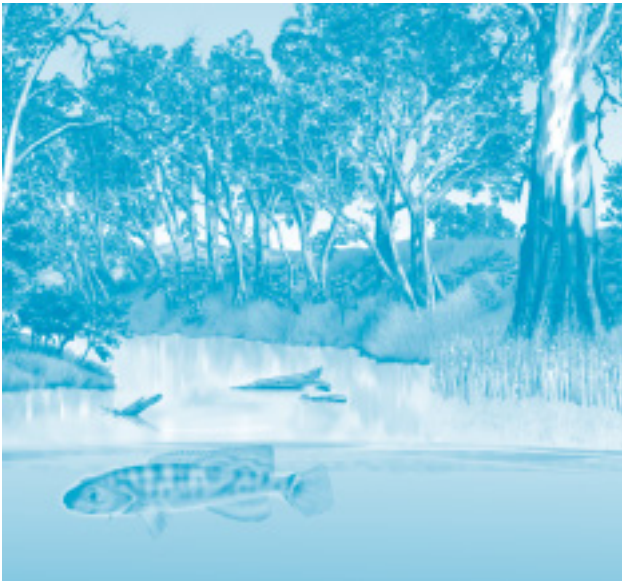




*Teacher / Leader Instructions*

# run of the River

The Healthy Rivers board game



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# run of the River

The Healthy Rivers board game



## Introduction

Rivers are the lifeblood of Victoria. They provide vital water for our homes, towns, farms and businesses. However, many Victorian rivers are stressed because too much water is taken from their systems, or because aquifers - underground water storages directly contributing groundwater to rivers - are over-used. When our rivers deteriorate, so does the quality and supply of water for homes, farms and businesses.

The 'Run of the River' board game is a fun and engaging way to learn about our precious rivers, the ways people and wildlife use rivers and creeks, and some recent approaches to the sustainable management of our rivers and water supplies.

The interactive board game is designed for secondary level students to stimulate discussion and promote understanding about an essential part of river health - its flow. It links to the Victorian Education Department's curriculum requirements (CSF II Levels 5 and 6 SOSE and Science, and Victorian Essential Learning Standards Levels 5 and 6 Science and Geography, Interpersonal Development and Civics and Citizenship). It also presents concepts relevant to VCE Environmental Science, Biology and Geography.

This board game is also a fun way for individuals and groups with an interest in our rivers to find out more about water resource management and river health issues. Whilst not a technical manual of scientific concepts with right and wrong answers, the game does aim to provoke discussion on issues where there is a range of points of view.



The 'Run of the River' board game and the pre and post game activities described in these notes aim to support people's learning about rivers. The board game and activities help players to investigate:

1. **What is a healthy river?**
2. **Why are healthy rivers important? (environmentally, socially, economically)**
3. **What are some impacts of unhealthy rivers on our lifestyle?**
4. **How can we tell if a river is healthy or not?**
5. **What is being done to protect healthy rivers?**
6. **What is being done to repair unhealthy rivers?**

Our whole water system relies on the good condition of our rivers in order to secure a supply of water for a range of uses. Water is shared between all uses including maintaining some of a river's natural cycles, while providing water for drinking and agriculture for our communities. However, we are not always as aware of the environmental consequences of water extraction and altering the natural flow patterns of rivers. The board game shows examples of ways that rivers can be managed in more environmentally sustainable ways while still allowing for human uses of rivers.



# run of the River

## The Healthy Rivers board game

### Description of the game

The 'Run of the River' board game is distributed as a set of 4 games for use by a whole class (up to 28 students). Level 1 of the game can be played in one period, then Level 2 played during a subsequent period. Alternatively both levels can be played during a double period. A group of 4 - 7 players is needed to play each game. The board piece is made from hard wearing, non-tearable, thin vinyl to ensure durability. **There is no need to laminate the board game.**

The board game illustrates a river flowing from its mountain headwaters to the river mouth. Main River represents a regulated river with a large dam (such as Dartmouth Dam). Two tributaries flow into the Main River - one tributary, Tame Creek, is regulated with a weir and the other tributary, Wild Creek, is unregulated - that is, it has no human-made structures that affect its flow.

The separate **How to Play** sheet describes the game, its components and the rules of the game.

While the game sets a range of rules for playing, there are many elements within the game for which players can develop their own set of rules. Opportunities for rule changes include (but aren't limited to):

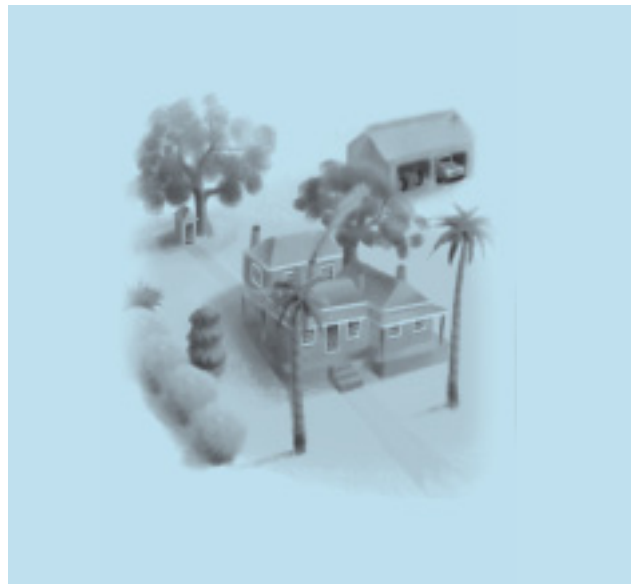
- Both Levels - Penalties and rewards on the board at key spots such as 1, 9, 11, 20, 30, 38 can be devised by players to incorporate personal positive and negative practices that affect river health (urban and rural).
- Level 2 - Water discs are currently only tradeable with Water Licences. Players could develop an alternative approach to the buying and selling of water.
- Level 2 - Water discs, \$50 notes and water licences are converted to different point values at the end of the game. Players could modify this conversion weighting to represent different environmental, social and/or economic values.

### Climate scenarios

Student groups select a climate scenario at the start of their game. This translates into different numbers of water discs being provided to players, to reflect the different amounts of water available in rivers in drought, normal and flood years.

Scenario	Number of water discs for each player
drought year	10
normal year	20
flood year	30

At the end of the game time, compare the 'results' of groups playing different climate scenarios. Alternatively, the game could be played twice by the same group, replaying the game with a different scenario to compare their results.



# run of the River

The Healthy Rivers board game



## Game levels

The game can be played at two levels.

**Level 1** introduces players to how a river works and the importance of flow.

**Level 2** challenges players to balance human demands for water with the need for natural functions of rivers to continue.

### Level 1 of game

#### Environmental flows of a river:

- How a river functions naturally
- Key aspects of river health.

Level 1 of the board game may be suitable for some upper primary level students.

### Level 2 of game

#### Balancing natural functions and human needs:

- Ways that rivers are altered and the resulting environmental impacts
- Practical ways environmental impacts are being reduced while still allowing for human uses of rivers.

If a player runs out of water discs or money, he/she exits the game. The game ends when ALL players (except those who have exited the game) have reached the river mouth (estuary/terminal lake).

At Level 1 of the game, the winning player is the one with the most water discs at the end of the game.

At Level 2 of the game, the winning player is the one with the highest combined value (from water discs, licences and money) at the end of the game.

At Level 2, the winner of the game is an important point to be discussed - the environmental condition of the river is essential in sustaining the river's social and economic values. So the winning player is the one that most successfully balanced the environmental, economic and social complexities of river management.



## Game components

### For Level 1 each group of players needs:

- 'Run of the River' game board
- 1 dice
- player tokens (choose from 8 supplied)
- one set of Level 1 Water Ways cards
- one set of Level 1 People Power cards
- set of water discs

### For Level 2 each group of players needs:

- 'Run of the River' game board
- 1 dice
- player tokens (choose from 8 supplied)
- one set of Level 2 Water Ways cards
- one set of Level 2 People Power cards
- \$4,000 play money (\$500 for each player plus \$500 for the Water Bank)
- a set of Water Licences (7)
- set of water discs

Teacher / Leader Instructions

# run of the River

The Healthy Rivers board game



## Pre game activities

1. Make sure students understand the following terms (see glossary on page 15):  
Aquatic, estuary, geomorphology, groundwater, levee bank, macro-invertebrate, exotic and native species, regulated river, unregulated river.

2. **River Life** - Students select an example of river life illustrated in the board game (e.g. Dragonfly, Water Boatman, River Red Gum, Platypus, Heron, as shown on the cover of these instructions) and research:

What type of river habitat does this plant/animal require - in particular the flow requirements (e.g. river bank only, deep water, shallow water)?

What does it eat? What eats it?

How does it cope with drought/flood?

How do dams or weirs affect its life cycle or survival ability?

3. **Native Fish** - Students select one of the following fish species to research their ecology and links with river flows and river health:

Murray Cod (north Victoria)

Australian Grayling (south Victoria)

Golden Perch/Yellowbelly

In what ways do rises in water levels (e.g. Spring floods) affect spawning and fish migration?

4. **River Users** - Students select one of the agencies/groups of people interested in rivers (different students select different agencies/groups):

1. Farmers
2. Irrigators
3. Industry
4. Department of Sustainability and Environment
5. Department of Primary Industry
6. Water Authority
7. Catchment Management Authority
8. Local Government (Council/Shire)
9. Environment Protection Authority (EPA)
10. Department of Environment and Heritage (Federal Government)
11. Waterwatch Facilitator
12. Waterwatch community monitor
13. Local Landcare group
14. Town residents
15. School students
16. Canoeists
17. Anglers
18. Recreationists (e.g. camper/picnicker)
19. Tourism operators
20. Environment group
21. Indigenous group
22. Land developers
23. Can you think of another group not on this list?

What is the agency's/group's connection with rivers and/or water use? In what ways do they use rivers? How does this affect rivers, creeks and estuaries? How do they affect the community?

5. **River Management** - Ask a water manager from your region to give you a talk about their job and the connection to the river (see resources list for link to your region). They could be from a:

- Rural Water Authority
- Urban Water Authority
- Catchment Management Authority
- Waterwatch Program



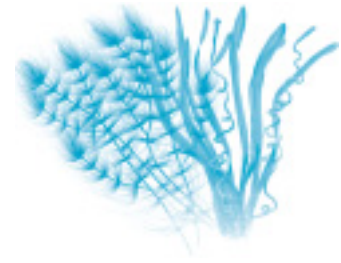




Teacher / Leader Instructions

# run of the River

The Healthy Rivers board game



## Playing the game

1. Allow enough time to discuss the game during/after the groups have finished playing.
2. Organise the class into groups of 4 - 7 players.
3. Check that students understand the terminology (see pre game activities).
4. Give each group a 'Run of the River' game cylinder. The cylinder has all the components needed to play the game (Level 1 and 2).
5. Check if student groups have any questions about how to play the game.  
Groups should play Level 1 before playing Level 2.  
Have they assigned a Water Banker? Have they chosen a climate scenario?
6. Groups play the game.
7. As a class, discuss the game results.

### Level One:

Ask students to describe:

- features of a healthy river
- some impacts on people if their local river is unhealthy.

### Level Two:

Ask students to describe:

- ways that rivers are altered by human activities
- ways that rivers are being repaired or protected.

Compare the results of the groups playing different climate scenarios (normal, drought and flood years). How did the amount of water available (water discs provided at the start) affect the game? Did anyone run out of water or run very low?

How does this game relate to the real world - are there ever occasions when the river water supplies run out? If so, describe some.

Discuss with students some of the issues raised by the game of balancing the demands of human uses of water with Environmental Water Reserves for rivers.

8. At the end of the game, students follow the instructions on page 1 of the 'How to Play' guide to pack up the game into the cylinder.

## Post game activities

1. **River life** - Students identify as many of the animals and plants illustrated on the board game as they can, using field guides (Note the illustrations are not to scale). Students choose one of these species and describe the river conditions the organism needs for a healthy habitat and successful breeding. Different students should select different species. As a class compare the requirements of the different aquatic species. A full list of the species illustrated on the board game is provided on the cover of this Teacher/Leader Instruction book.
2. **Environmental Water Reserve** - Students write up two lists, or create some graphics, to summarise the main natural and human factors identified in the board game that affect the flow of a river.

Use this list to identify how you would determine and manage your local river's Environmental Water Reserve.

3. **River Management** - What is the Government's role in managing rivers? Students research government strategies relating to issues discussed in the board game, particularly rivers and environmental sustainability, such as the *Victorian River Health Strategy*. Were there any issues the board game didn't identify? What issues does the document identify for rivers? What solutions does it present? Student teams can prepare a class presentation on 'Healthy Rivers'.
4. **Communities and rivers** - The board game introduces the concept of the importance of river health for managing catchments. Discuss the consequences and difficulties if river users upstream use most of the water before it reaches downstream river users. Describe the potential impact on people and the river downstream. Ask students to suggest the difficulties that might occur when managing waterways that cross state or management agency boundaries. What issues may come up for the different managers involved with water?
5. **Environmental Water Reserve** - The boardgame is focused on the importance of a river's flow for its ecological health. Is it likely that establishing an Environmental Water Reserve to rivers will solve all problems facing our waterways? Discuss. What else might we need to do? (e.g. reduce water use, undertake complementary actions such as land and riparian management, nutrient and sediment reductions, re-instate fish passages, re-snagging etc.).

# run of the River

## The Healthy Rivers board game

### Game cards

#### Water Ways cards Level 1

**1. Natural river flows change with the seasons and years**

*Answer multiple choice:* In southern Australia, river flows after winter and spring are usually:

- a) high
- b) low
- c) average.

**Answer: a - If correct, go forward 2 places.**

**2. Natural river flows change with the seasons and years**

*Answer true or false:* Rivers in southern Australia naturally have high water flows in winter and spring and low water flows in summer and autumn.

**Answer: True**

**3. Natural river flows change with the seasons and years**

*Answer true or false:* Rivers in southern Australia have low flow levels at all times of the year. **Answer: False**

**4. Natural river flows change with the seasons and years**

*Answer multiple choice:* Water enters a creek or river by:

- a) flowing from the catchment
- b) seeping in from groundwater
- c) all of the above

**Answer: c - If correct, go forward 2 places.**

**5. River flows affect native plants and animals**

*Answer true or false:* Native plants and animals that live in or near rivers rely on naturally lower water levels during summer and higher levels during winter.

**Answer: True**

**6. River flows affect native plants and animals**

*Answer true or false:* If water is extracted from a river during summer, when the river is already naturally at a very low level, it does not affect the river's plants and animals. **Answer: False**

**7. River flows affect native plants and animals**

*Answer true or false:* High water levels help aquatic animals to move up and down rivers. **Answer: True**

**8. River flows affect native plants and animals**

*Answer true or false:* Aquatic plants and animals in southern Australia are adapted to low water levels in winter. **Answer: False**

**9. River flows affect native plants and animals**

*Answer true or false:* Aquatic animals rely on high water levels in summer to move up and down rivers, to feed, breed and to take shelter. **Answer: False**

**10. River flows affect native plants and animals**

*Answer true or false:* Low flow levels in a river trigger some aquatic animals such as fish to breed.

**Answer: False**

**11. River flows affect native plants and animals**

*Answer true or false:* Native fish such as Murray Cod, Australian Grayling and Golden Perch need spring floods to breed successfully. **Answer: True**

**12. River flows affect native plants and animals**

*Answer multiple choice:* Billabongs are important to a river because they:

- a) increase flow
- b) provide important habitat for a range of animals, including waterbirds
- c) decrease water quality.

**Answer: b - If correct, go forward 2 places.**

**13. River flows affect habitat**

*Answer true or false:* When river levels are lower, there is more aquatic habitat (food and shelter) available for animals such as fish and aquatic macro-invertebrates.

**Answer: False**

**14. River flows affect habitat**

*Answer true or false:* Higher water levels help aquatic animals to move between pools, river sections, billabongs and lakes. **Answer: True**

**15. River flows affect habitat**

*Answer true or false:* Large floods scour riverbeds helping to create deep pools which provide refuge for aquatic animals during times of low flow.

**Answer: True**

**16. River flows affect habitat**

*Answer multiple choice:* Colonial nesting water birds, such as Royal Spoonbills, only breed:

- a) when its cold
- b) when food is scarce
- c) when floodplain breeding areas are flooded

**Answer: c - If correct, move forward 2 places.**

**17. River flows affect habitat**

*Answer true or false:* Some waterbirds only breed successfully when a river floods its floodplain as this provides the right kind of breeding and nursing conditions. **Answer: True**

# run of the River

## The Healthy Rivers board game

### 18. River flows affect habitat

*Answer true or false:* When a river is at low water levels, it is good for the migration of fish and other aquatic organisms. **Answer: False**

### 19. River flows affect estuaries (or terminal lake)

*Answer true or false:* During low flow, river mouths can be closed, preventing fish like Australian Grayling from migrating upstream. **Answer: True**

### 20. River flows affect estuaries

*Answer true or false:* Populations of estuarine animals such as fish, crabs, scallops and prawns do not need freshwater to survive. **Answer: False**

### 21. High flows revive rivers

*Answer multiple choice:* High water levels in rivers help to:

- a) mix and transport nutrients
- b) reduce the number of aquatic animals
- c) kill exotic species.

**Answer: a - If correct, go forward 3 places.**

### 22. High flows revive rivers

*Answer true or false:* Floods help to recharge rivers, wetlands and groundwater. **Answer: True**

### 23. High flows revive rivers

*Answer true or false:* Floods provide water, sediment and nutrients to floodplains for farming and wildlife.

**Answer: True**

### 24. High flows revive rivers

*Answer true or false:* Floods wash organic material from the floodplain into the adjoining waterway. This provides food and stimulates breeding of aquatic life.

**Answer: True**

### 25. High flows revive rivers

*Answer multiple choice:* Floodplains need to be flooded by water:

- a) all of the time
- b) occasionally
- c) never.

**Answer: b - If correct, go forward 2 places.**

### 26. High flows revive rivers

*Answer multiple choice:* River Red Gums rely on occasional floods. Floods:

- a) revive floodplain trees and trigger seeds to germinate
- b) reduce aquatic plants and animals
- c) none of the above.

**Answer: a - If correct, go forward 2 places.**

### 27. High flows revive rivers

*Answer true or false:* Floods always damage the health of a river. **Answer: False**

### 28. High flows revive rivers

*Answer true or false:* After a flood, microscopic animals breed rapidly, creating abundant food for other aquatic animals. **Answer: True**

### 29. High flows revive rivers

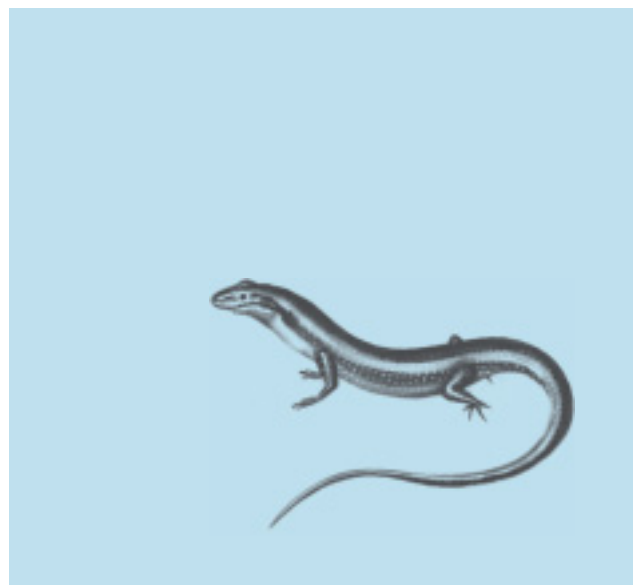
*Answer true or false:* Without high flows, sediments and other fine material in rivers would smother aquatic habitats and stress plants and animals.

**Answer: True**

### 30. River flows shape the river

*Answer true or false:* High flows help to shape and maintain river channels and diverse instream habitats.

**Answer: True**





# run of the River

## The Healthy Rivers board game

### Water Ways cards Level 2

- 1. Natural river flows change with the seasons and years**  
*Answer true or false:* Less rainwater reaches rivers when many crops are grown in a river's catchment.  
**Answer: True**
- 2. Natural river flows change with the seasons and years**  
*Answer true or false:* Catchment dams can prevent rainwater from reaching the river. **Answer: True**
- 3. Natural river flows change with the seasons and years**  
*Answer multiple choice:* Changes to land use can affect a river by:  
a) increasing the number of large storms  
b) altering the amount and timing of water reaching the river  
c) all of the above.  
**Answer: b - If correct, go forward 1 place.**
- 4. Natural river flows change with the seasons and years**  
*Answer multiple choice:* Concrete and bitumen stop much of the rain falling in towns and cities from soaking into the soil. This causes:  
a) more water than normal to flow into urban rivers  
b) less water than normal to flow into urban rivers  
c) stormwater systems to sit idle.  
**Answer: a - If correct, go forward 1 place.**
- 5. Natural river flows change with the seasons and years**  
*Answer true or false:* The quality, amount and timing of water reaching the river is not affected by levee banks or culverts. **Answer: False**
- 6. Natural river flows change with the seasons and years**  
*Answer true or false:* Weirs built along a river will alter the amount and timing of water flowing downstream.  
**Answer: True**
- 7. Natural river flows change with the seasons and years**  
*Answer true or false:* Extracting, storing and releasing water from a river out of sequence with natural river flow patterns improves river health. **Answer: False**
- 8. Natural river flows change with the seasons and years**  
*Answer multiple choice:* Extracting water from unregulated rivers for human uses during summer can make the river's summer water level:  
a) even lower than natural  
b) even higher than natural  
c) no different to normal.  
**Answer: a - If correct, go forward 1 place.**
- 9. River flows affect native plants and animals**  
*Answer true or false:* Reduced river flows can concentrate water pollutants which affects aquatic life.  
**Answer: True**
- 10. River flows affect native plants and animals**  
*Answer true or false:* Reduced river flows do not affect aquatic animals such as fish and macro-invertebrates.  
**Answer: False**
- 11. River flows affect native plants and animals**  
*Answer multiple choice:* Bores extract groundwater for human use for industry, farming and irrigation. Over-extracting groundwater:  
a) can reduce the river's water level  
b) can increase the river's water level  
c) does not affect rivers, as groundwater is underground.  
**Answer: a - If correct, go forward 1 place.**
- 12. River flows affect native plants and animals**  
*Answer true or false:* If too much water is extracted from a river for human purposes, aquatic habitats can dry up causing some of its aquatic plants and animals to die. **Answer: True**
- 13. River flows affect native plants and animals**  
*Answer multiple choice:* Low river flow in winter can affect wildlife populations because some aquatic organisms:  
a) only eat when river flows are high  
b) aren't able to migrate to breeding areas  
c) all of the above.  
**Answer: b - If correct, go forward 1 place.**
- 14. River flows affect native plants and animals**  
*Answer true or false:* Rain runoff in urban areas can carry pollutants from the streets into the river harming the plants and animals living in the river. **Answer: True**
- 15. River flows affect habitats**  
*Answer multiple choice:* Levee banks affect river health by:  
a) preventing a river from naturally flooding selected areas  
b) improving water quality  
c) triggering water birds to breed.  
**Answer: a - If correct, move forward 1 place.**
- 16. River flows affect habitats**  
*Answer true or false:* Reduced river flows and flooding are good for riverside habitats such as River Red Gum floodplains, billabongs and wetlands. **Answer: False**

# run of the River

## The Healthy Rivers board game

### 17. River flows affect habitats

*Answer multiple choice:* Catchment dams capture rain runoff. This means that:

- a) less rain runoff reaches the local river
- b) more rain runoff reaches the local river
- c) the same amount of rain runoff reaches the local river.

**Answer: a - If correct, move forward 1 place.**

### 18. River flows affect habitats

*Answer true or false:* Reduced high river flows and reduced flooding can result in narrow river channels.

**Answer: True**

### 19. River flows affect habitats

*Answer true or false:* If water is extracted from a river for human purposes during summer, when the river is already at a low level, it can benefit the river's native plants and animals. **Answer: False**

### 20. River flows affect estuaries/terminal lakes

*Answer true or false:* Extracting water from the river increases the amount of freshwater reaching the river mouth. **Answer: False**

### 21. River flows affect estuaries

*Answer multiple choice:* River mouths may become blocked when river flows are reduced. This:

- a) is unnatural, as estuaries should always be open
- b) prevents migrating fish from swimming upstream
- c) has no affect on water quality.

**Answer: b - If correct, go forward 2 places.**

### 22. River flows affect estuaries

*Answer multiple choice:* If there is less water flowing into an estuary, river channels can fill in or shift, affecting:

- a) Yabbies in irrigation channels
- b) Plants and animals living in the top of the catchment
- c) boating and the health of estuarine habitats, fish and prawns.

**Answer: c - If correct, go forward 3 places.**

### 23. High flows revive rivers

*Answer multiple choice:* Levee banks help people protect land from flooding. They also:

- a) decrease the number of exotic plants
- b) prevent floodwaters from reviving the floodplain
- c) increase river flows.

**Answer: b - If correct, go forward 1 place.**

### 24. High flows revive rivers

*Answer true or false:* Floods make our rivers unhealthy.

**Answer: False**

### 25. River flows affect water quality

*Answer true or false:* Lower water levels reduce water quality issues in rivers such as salinity and algal blooms benefiting people and wildlife. **Answer: False**

### 26. River flows affect water quality

Dams alter the condition of the river downstream. Low flow, low water levels and high nutrients downstream can encourage blue-green algal blooms.

**Go back 3 places.**

### 27. River flows affect human uses

Reduced river flows and lower river levels can mean that water pollutants get concentrated, affecting water use for people and livestock. **Go back 1 place.**

### 28. River flows affect human uses

Farms on floodplains can benefit from sediments and nutrients deposited by floodwaters. **Go forward 1 place.**

### 29. River flows affect human uses

*Answer true or false:* Reduced river flow, high nutrient levels and warm temperatures can lead to an algal bloom. This affects wildlife and reduces human uses of the river for drinking water, swimming, fishing and boating. **Answer: True**

### 30. River flows affect human uses

Unhealthy rivers and poor water quality affect people and local communities. If the river has poor water quality, the water cannot be used for some livestock, crops and businesses, affecting the local economy.

**Go back 2 places.**

### 31. River flows affect human uses

A local indigenous community relies on the local river being healthy to pass on important elements of their culture to the next generation. **Go forward 2 places.**

### 32. River flows affect human uses

Our rivers are part of our history and many people feel a strong connection with them. Unhealthy rivers affect people and local communities. **Go back 1 place.**

### 33. River flows affect human uses

*Answer true or false:* There is no limit to the amount of water available in a river - we just need to find better ways to extract, store and transport the water.

**Answer: False**

# run of the River

## The Healthy Rivers board game

### 34. River flows affect human uses

*Answer true or false:* There is a limit to the amount of water available in a river. We need to use the water in a way that meets the needs of people as well as the environment. **Answer: True**

### 35. Dams and weirs control river flow levels and timing

*Answer true or false:* Water is often released from storage dams in winter when farmers need water for irrigation. **Answer: False**

### 36. Dams and weirs control river flow levels and timing

Large dams often control floodwaters. This can prevent the flooding of property downstream but affects the health of the river. **Go back 1 place.**

### 37. Dams and weirs control river flow levels and timing

Releasing stored water from large dams in summer when farmers need the water causes the river's downstream level to be much higher than it naturally would be. This helps people, but is not good for river health. **Go back 1 place.**

### 38. Dams and weirs control river flow levels and timing

*Answer true or false:* If lots of water is released from a water storage dam into a river during summer, it upsets the river's natural flow pattern. **Answer: True**

### 39. Dams and weirs control river flow levels and timing

*Answer true or false:* Water storage dams have no affect on floods in our rivers. **Answer: False**

### 40. Dams and weirs affect river life

Dams can stop fish from moving up and down the river. This affects recreational fishing by reducing the number of fish reaching breeding grounds and reducing the recruitment of younger fish. **Go back 2 places.**

### 41. Dams and weirs affect river life

*Answer true or false:* Water storage dams often release water into the river in summer and hold water back in winter. This is the opposite of how a river would natural flow. **Answer: True**

### 42. Dams and weirs affect river life

*Answer true or false:* Dams capture and store nutrients and sediments which reduce the supply in the river downstream. **Answer: True**

### 43. Dams and weirs affect river life

Weirs and dams can stop aquatic animals (such as eels and other fish) from swimming upstream or downstream for breeding. Weirs and dams can also stop the eggs or larvae of aquatic animals, and the seeds of aquatic plants from moving along the river. **Go back 2 places.**

### 44. Dams and weirs affect river life

*Answer true or false:* Stratification in a dam means there is cold water at the bottom and warm water at the top. **Answer: True**

### 45. Dams and weirs affect river life

*Answer multiple choice:* Water deep down in a large dam is very cold and if released from the base can:

- a) reduce water flow levels
- b) reduce the growth and germination of aquatic plants
- c) trigger algal blooms.

**Answer: b - If correct, go forward 2 places.**

### 46. Dams and weirs affect river life

Allowing small to medium size floods to occur in our waterways in winter and spring (when floods would naturally occur) will help our rivers become healthier. **Go forward 2 places.**

### 47. Dams and weirs affect river life

*Answer true or false:* It is less harmful to river health if water is extracted at times of the year that better match the natural flow of the river. **Answer: True**

### 48. Water Licence Wild Card

This card allows you can buy one Water Licence from another player. A licence can be bought for \$150 but does **not** entitle you to 20 water discs. The Wild Card can only be used during this turn.

### 49. Water Licence Wild Card

This card allows you can buy one Water Licence from another player. A licence can be bought for \$150 but does **not** entitle you to 20 water discs. The Wild Card can only be used during this turn.

### 50. Water Licence Wild Card

This card allows you can buy one Water Licence from another player. A licence can be bought for \$150 but does **not** entitle you to 20 water discs. The Wild Card can only be used during this turn.

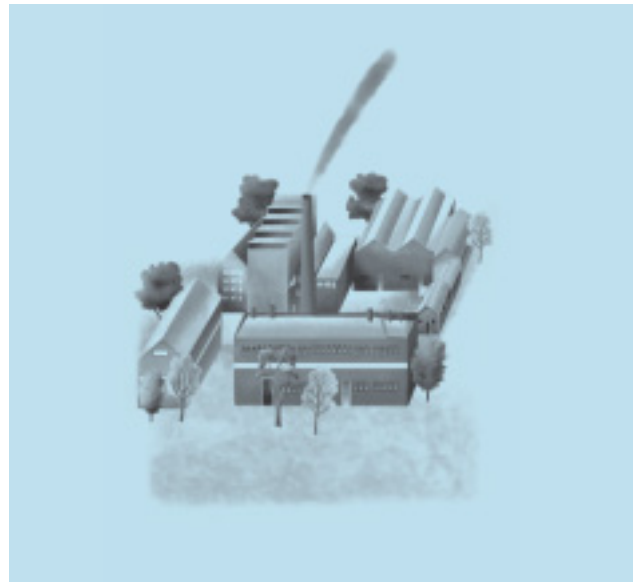


# run of the River

## The Healthy Rivers board game

### People Power cards Level 1

1. So much water is extracted from the river upstream that less than a third of the water reaches the river mouth. **Pay 5 water discs.**
2. Farmers and community groups work with their local Catchment Management Authority to investigate how groundwater interacts with their river. **Collect 2 water discs.**
3. Land clearing in the river catchment has led to soil washing into the river. The sediment smothers small aquatic plants and animals and reduces water quality. **Pay 2 water discs.**
4. Livestock and people are trampling the riverbank, causing erosion. This reduces water quality and damages river habitat. **Pay 2 water discs.**
5. Your local community supports water being released from the local river dam at times in winter/spring to better mimic the river's natural seasonal flow. This helps to restore the river's health. **Collect 2 water discs.**
6. Local Indigenous community Elders share their knowledge about wetland plants and their uses with the next generation. **Collect 2 water discs.**
7. A pipeline is built to carry irrigation water more efficiently than along an open channel. **Collect 2 water discs.**
8. Neighbours upstream remove exotic willows from the river's bank. This allows more water to flow down the river, improving river health. **Collect 2 water discs.**
9. Weirs and dams act as fish barriers, preventing fish from swimming past them. Fish ladders are installed beside the local weir or dam to allow fish to move upstream and downstream. **Collect 2 water discs.**
10. Water released from deep down in a dam is very cold and can harm river health. The Water Authority now decides to release water from near the top of the storage dam. This helps to improve the river's health. **Collect 2 water discs.**
11. A Waterwatch group monitors the river and reports to the community on river health. **Collect 2 water discs.**
12. You help a local community group to replant an eroded riverside area. This restores habitat for wildlife and improves water quality. **Collect 2 water discs.**
13. The local *River Management Plan* identifies ways that townspeople, farmers and industry can use the river's water while still keeping the river's water level at healthy levels. **Collect 3 water discs.**
14. The *Environmental Water Reserve* provides your local river with water releases from a storage dam. This flushing flow washes away concentrated pollutants and brings nutrients for aquatic life. **Collect 3 water discs.**
15. The local *River Health Strategy* identifies ways to meet the water quality targets set by the EPA (Environment Protection Authority). **Collect 3 water discs.**





# run of the River

## The Healthy Rivers board game

### People Power cards Level 2

1. You are caught taking water from the river without a water licence. **Pay 5 water discs.**
2. You take more water from the river than is allocated by your water licence. **Pay 5 water discs.**
3. Residents in your town adopt water conservation actions in their gardens, saving river water and money. **Collect 2 water discs and \$50.**
4. Residents purchase water saving devices such as rainwater tanks, saving water and receiving a \$ rebate on the cost of their purchase. **Collect 2 water discs and \$50.**
5. Local industries extracting river water put water conservation and water reuse practices in place. This reduces the amount of river water they use and saves money. **Collect 2 water discs and \$100.**
6. Your local council makes their sports grounds and parks more water efficient, reducing the amount of water needed for watering gardens and grass. This saves money and large amounts of river water. **Collect 2 water discs and \$100.**
7. Measures are put in place in your town to use rain runoff from the streets to water parks and gardens. This saves money over time and greatly reduces the amount of stormwater runoff entering the local river, making the river healthier. **Collect 2 water discs and \$100.**
8. To help improve water quality and the health of their local river, a group of landowners agree to roster their water withdrawal from the river so they extract water on different days instead of all at the same time. **Collect 2 water discs.**
9. Farming families work with their neighbours to ensure that groundwater is extracted sustainably. **Collect 2 water discs.**
10. Your farming community adopts water conservation actions, saving river water and money. **Collect 2 water discs and \$100.**
11. Local farmers shift to growing less water demanding crops. This reduces water demand and costs for their farms. **Collect 2 water discs and \$100.**
12. You shift from a flood irrigation system to a more efficient drip irrigation system. This water conservation practice reduces water demand and costs for your family farm. **Collect 2 water discs and \$100.**
13. You help your grandfather to use water more efficiently on the family farm. Water reuse and recycling practices means less water needs to be extracted from the river. **Collect 2 water discs and \$100.**
14. Local farmers provide water troughs for their livestock. They fence off the river banks which reduces the erosion caused by trampling. The riverbank regenerates and the river's water quality improves. **Collect 2 water discs.**
15. Farming leaders help to reduce the algal blooms that have been occurring in their local river by reducing the amount of nutrient run-off from their properties. This also helps them avoid pollution fines. **Collect 2 water discs.**
16. Whole farm planning improves the health of local rivers by reducing the amount of herbicide and pesticide run-off from properties. This also helps farmers to avoid pollution fines. **Collect 2 water discs.**
17. You extract your river water allocation in winter rather than summer, reducing your impact on the river's level and health. You store the water in your farm dams until it is needed in summer. **Collect 2 water discs.**
18. Irrigators donate some of their allocated river water back to the river to help regenerate River Red Gums. **Collect 2 water discs.**
19. You have been fined for allowing polluted wash water from your factory to flow into the local river and pollute it. River health suffers. **Pay \$100.**
20. You have been fined for allowing polluted runoff from your farm to flow into the local river and pollute it. River health suffers. **Pay \$100.**
21. You have been fined for wasting water by hosing your driveway. River health suffers. **Pay \$100.**
22. You have been fined for wasting water by leaving a sprinkler on for hours in your garden. River health suffers. **Pay \$100.**
23. A local Indigenous Co-operative runs an eco-tourism business raising awareness of the local river catchment. **Collect 2 water discs and \$50.**
24. **Water Licence Wild Card**  
This card allows you can buy one Water Licence from another player. A licence can be bought for \$150 but does **not** entitle you to 20 water discs. The Wild Card can only be used during this turn.
25. **Water Licence Wild Card**  
This card allows you can buy one Water Licence from another player. A licence can be bought for \$150 but does **not** entitle you to 20 water discs. The Wild Card can only be used during this turn.

# run of the River

## The Healthy Rivers board game

### References

#### **Water Learn It! Live It!**

Contact your local water authority for this Education manual.

#### **Our Water Our Future**

Contact DSE Customer Service (phone 136 186) for a copy of the Government's 50 year action plan for sustainable water management.

#### **Victorian River Health Strategy**

Contact DSE Customer Service (phone 136 186) for a copy of Victoria's policy framework for river management.

#### **Environmental Flows Brochure**

Contact Queensland's Department of Natural Resources and Mines Public Affairs Branch on phone 07 3224 2997 for a scientific explanation of the importance of flows.

### Websites

There are a growing number of great resources to support the Run of the River board game. The following websites provide a good starting point for gathering information about rivers in Victoria.

#### *Government*

Department of Sustainability & Environment's River Health Program [www.dse.vic.gov.au/riverhealth](http://www.dse.vic.gov.au/riverhealth)

Catchment Management Authorities  
[www.vcmc.vic.gov.au/](http://www.vcmc.vic.gov.au/) › External links

Victorian Water Managers [www.vicwater.org.au](http://www.vicwater.org.au)

Murray Darling Basin Commission Kids River Health Conference [www.riverhealth.com](http://www.riverhealth.com)

Land & Water Australia (Australian Government)  
[www.rivers.gov.au](http://www.rivers.gov.au)

#### *Education support sites*

Waterwatch Victoria [www.vic.waterwatch.org.au](http://www.vic.waterwatch.org.au)

Waterwatch Australia [www.waterwatch.org.au](http://www.waterwatch.org.au)

Melbourne Water [www.melbournewater.com.au/education](http://www.melbournewater.com.au/education)

Fish

[www.mdbc.gov.au/education/education.htm](http://www.mdbc.gov.au/education/education.htm)

[www.angfa.org.au](http://www.angfa.org.au)

[www.nativefish.asn.au](http://www.nativefish.asn.au)

Snowy River Rehabilitation

[www.dse.vic.gov.au](http://www.dse.vic.gov.au) DSE Home › Water › Water Saving and Recycling Projects › Major Water Savings Projects › The Snowy River Project

Broken River Project [www.thebrokenriver.com.au](http://www.thebrokenriver.com.au)

Victorian Association of Environmental Education  
[www.vaee.vic.edu.au](http://www.vaee.vic.edu.au)

#### *Community advocacy*

Environment Victoria's Healthy Rivers Campaign  
[www.envict.org.au](http://www.envict.org.au)

Waterkeepers Australia [www.waterkeepers.org.au](http://www.waterkeepers.org.au)

NSW Council of Freshwater of Anglers' Freshwater Fisher newsletter [www.freshwateranglers.com.au](http://www.freshwateranglers.com.au)

#### *Specific Environmental flow / Environmental Water Reserve sites*

Wimmera CMA

[www.wcma.vic.gov.au/index.php/environmental\\_flows](http://www.wcma.vic.gov.au/index.php/environmental_flows)

West Gippsland CMA

[www.wgcma.vic.gov.au](http://www.wgcma.vic.gov.au) Our Catchment › Water › River Health › Environmental Flows



Teacher / Leader Instructions

# run of the River

The Healthy Rivers board game



## Glossary

Other glossaries for you to look at:

<http://www.rivers.gov.au/model/glossary.htm>

**Algal bloom:** A condition which occurs when excessive nutrient levels and other physical and chemical conditions facilitate rapid growth of algae. Algal blooms may cause changes in water colour, smell and toxicity. The decay of the algal bloom may reduce dissolved oxygen levels in the water.

**Aquatic:** Pertaining to water; a plant or animal that lives in water, whether it be freshwater, seawater or brackish (a combination of both).

**Aquifer:** A layer of underground sediments which holds water and allows water to flow through it. See the Department of Sustainability & Environment's Groundwater Notes for more details.

**Billabong:** A section of cut-off stream channel usually on a floodplain.

**Bore:** A hole drilled into the ground that allows the piping of an underground water source (aquifer).

**Catchment:** The region which drains all the rainfall, other than that removed by evaporation, into a stream, which then carries the water to the sea or lake.

**Culverts:** A pipe that syphons water from one point to another, particularly used to protect infrastructure such as roads from flooding rain events.

**Dam:** A human constructed basin for collecting water. This can mean the digging out of a large hole or in large dams, a structure built across a watercourse to maintain water levels and confine and keep back flowing water.

**Ecology:** The study of the interrelation between living organisms and their environment.

**Environmental flow:** The flow regime required to maintain rivers in a healthy condition. Includes components of the flow regime such as minimum flows, floods and flushing flows.

**Environmental Water Reserve:** The share of water resources set aside to maintain the environmental values of a water system and other water services which are dependent on the environmental condition of the system.

**Estuary:** A semi-enclosed coastal water body where salt from the open sea mixes with freshwater in a river.

**Exotic species:** Term used to describe organisms (plants and animals) that do not originally come from Australia.

**Fish barrier:** An artificial obstacle in a river (e.g. a dam wall, weir or culvert) that affects (halts or delays) fish migration.

**Fish ladder:** A construction that allows fish to swim around a man-made obstacle in a river (eg. weir). The construction design can include a series of ascending pools, or a gently sloping channel made up of a series of cells separated by small vertical slots.

**Floodplain:** A flat area adjacent to a stream that is covered by floods every year or two.

**Flow regime:** The pattern of the flow of water in a river over time. All elements of a river's pattern of flow are important - timing (when), duration (how long) and flow frequency (how often).

**Flushing flow:** An artificial flood to remove sediments or to prevent narrowing of the channel.

**Geomorphology:** The study of landforms and the processes which shape them.

**Groundwater:** All subsurface water, generally occupying the pores and crevices of rock and soil.

**Habitat:** An area in which a specific plant or animal naturally lives, grows and reproduces; the area that provides a plant or animal with adequate food, water, shelter and living space.

**Irrigation:** Irrigation (in agriculture) is the replacement or supplementation of rainfall with water from another source in order to grow crops. In contrast, agriculture that relies only on direct rainfall is sometimes referred to as dryland farming.

**Levee bank:** A raised embankment along the edge of a river channel. Natural levees result from periodic overbank flooding, when coarser sediment is immediately deposited because of a reduction in river velocity. Levee banks are often constructed by humans living in low-lying areas as protection against flooding.

**Macro-invertebrate:** An invertebrate (animal without a backbone) that is visible to the naked eye.

**Native species:** Organisms (plant and animals) originally living or growing in a certain place.

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**Nutrients:** Substances required for the growth of plants, e.g. nitrogen and phosphorus.

**Organic material:** Any material which originated as a living organism (i.e. peat moss, compost, manure).

**Regeneration:** Renewal of vegetation (grasses, shrubs, trees) by natural or artificial means.

**Regulated river:** A river system where the flow of a river is controlled by releasing water from large dams or weirs.

**Run-off:** The discharge of water derived from rain or snow falling on a surface.

**Run of the River:** The natural flow generated from rainfall run-off in the catchment. As distinct from the flow that is 'regulated' by controlled releases from dams or weirs to supply water to downstream users.

**Salinity:** The concentration of ions dissolved in water.

**Sedimentation:** The deposition or settling out of suspended soil particles from the water column.

**Stormwater:** Rainwater that runs off roofs, roads, carparks, gardens and footpaths into stormwater drains and flow into our creeks, rivers and bays.

**Stratification:** The division of water in rivers, estuaries and bays into layers with different compositions (for example, temperatures, salinity and oxygen levels).

**Tributary:** A stream that discharges into a main river.

**Unregulated river:** A river system where no major dams or weirs have been built on a river to assist in the supply or extraction of water.

**Weir:** A dam across a river (see Dam definition).

