water for a sustainable future P–10 overview

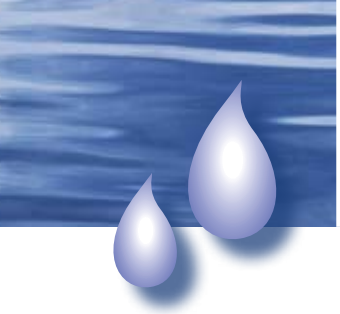
Big Understandings

1. **Water is a finite, essential, valuable and vulnerable resource.**
2. **Water in the natural environment occurs in many forms.**
3. **The natural environment is constantly changing and this impacts on water.**
4. **Building urban environments impacts on the water cycle.**
5. **In the ACT, sustainable water management practices address:**

• where water comes from • how we use water • where water goes

Unit Description

Early Childhood P-2	Later Childhood 3-5	Early Adolescence 6-8	Later Adolescence 9-10
This unit of work is designed to raise awareness in early childhood students that water is: • a precious resource • essential for healthy living • necessary for a sustainable future Students will be introduced to the key components of the natural water cycle. The students will explore central issues of: • why water is important • how we use water • where we find water in the environment?	This unit of work is designed to raise awareness in later childhood students that water: • is interconnected with our environment • features the natural and urban water cycle • is vulnerable to pollutants and change • is necessary for a sustainable future Students will be introduced to the key components of the urban water cycle. The students will explore central issues of how water: • is expelled through a variety of different systems • has a plethora of qualities and properties • is essential for life	This unit of work is designed to raise awareness in early adolescent students that: • water is a precious resource • healthy water is the responsibility of everyone • water is necessary for a sustainable future Students will be introduced to the key components of: • where water comes from and how it is distributed in the ACT and surrounding area • how human settlement has had an impact on the environment • how we can manage and conserve our water resources for a sustainable future	This unit of work is designed to raise awareness in later adolescent students that: • water in the ACT is an integral part of our interconnected natural and built environments • there are global water issues • we are all responsible for ensuring a sustainable water future Students will be introduced to the key components of how: • water in the ACT is collected from rivers and rainfall, and treated before being used in our homes • Australia's agricultural sector relies on water from the same supplies as urban communities • water issues affect communities all over the world



water
for a sustainable future

early childhood
years P–2

Australian Sustainable Schools Initiative - ACT

Unit Title: Water for a Sustainable Future

Class: Preschool to Year Two

Band of Development: Early childhood

Duration: Suggested 2-3 hours per week over 10 weeks

Teacher:

School:

The format for this unit of work is based on the **Kath Murdoch** model for integrated inquiry. The Essential Learning Achievements and Essential Content have been selected from the ACT Department of Education and Training Curriculum Framework, *Every chance to learn*.

Unit Description

This unit of work is designed to raise awareness in early childhood students that water is:

- a precious resource
- essential for healthy living
- necessary for a sustainable future

Students will be introduced to the key components of the natural water cycle.

The students will explore central issues of:

- why water is important
- how we use water
- where we find water in the environment

Big Understandings

1. Water is a finite, essential, valuable and vulnerable resource.
2. Water in the natural environment occurs in many forms.
3. The natural environment is constantly changing and this impacts on water.
4. Building urban environments impacts on the water cycle.
5. In the ACT, sustainable water management practices address:

- where water comes from
- how we use water
- where water goes

Values and Attitudes

During this unit of work students will have the opportunity to develop the following **values and attitudes:**

- appreciate the intrinsic value of the natural world and the need to preserve the environment and natural heritage for future generations
- develop an attitude of respect and caring for life in all its diversity
- appreciate their responsibility as consumers and citizens to conserve and manage environmental resources in ways that are fair to both present and future generations
- develop a sense of optimism for the future through participating in informed, positive action to address local, national and global issues relating to environmental sustainability

Schools may choose to include other worthwhile learning linked to the unit. For example:

- water safety
- floating and sinking
- water has different forms: liquid, solid, gas
- water and our bodies
- water occupations
- water is a symbol used in many world religions

Essential Learning Achievements covered in this unit are ELA 2, 3, 19, 20, 21 and 23. Essential Content has been selected from the early childhood band of development.

ELA 2 the student understands and applies the inquiry process

Essential Content

In the early childhood band of development, students have opportunities to:

- explore inquiry as a useful process for creating knowledge and understanding the world around them
- make observations about what is happening around them using all their senses
- ask questions and identify possible sources of information to seek answers
- share and communicate observations, findings, ideas and understandings

ELA 3 the student makes considered decisions

Essential Content

In the early childhood band of development, students have opportunities to:

- notice if someone else has been affected by their decision
- be aware when they have a choice
- delay a decision until they have thought about it
- set a small number of goals

ELA 19 the student understands and applies scientific knowledge

Essential Content

In the early childhood band of development, students have opportunities to understand and learn about:

- some of the ways in which living things depend on their environment and each other (e.g. basic needs for survival)
- some of the ways in which living things depend on the Earth (eg soil, water, air) and are affected by its changes

In the early childhood band of development, students have opportunities to learn to:

- ask questions about and explore phenomena, relationships and ideas
- observe, identify and describe features properties and the ways things change
- talk about their investigations and observations

ELA 20 the student acts for an environmentally sustainable future

Essential Content

In the early childhood band of development, students have opportunities to understand and learn about:

- elements of the natural environment that humans, animals and plants need for survival
- how people cooperate to care for places in a community

In the early childhood band of development, students have opportunities to learn to:

- observe and discuss changes evident in the local environment, both natural (e.g. seasonal changes) and caused by human action (e.g. changes to the built environment)
- understand why it is important to conserve resources, protect the environment and participate in positive environmental action

ELA 21 the student understands about Australia and Australians

Essential Content

In the early childhood band of development, students have opportunities to understand and learn about:

- some places and landmarks in the local community

ELA 23 the student understands world events and issues

Essential Content

In the early childhood band of development, students have opportunities to learn to:

- locate places on a globe where significant events and issues are occuring

Tuning In

Outcomes

What understandings will my students have at the end of the Tuning In stage?

Water for specific purposes can be found in various locations.

You can make inferences from observations to plan scientific investigations.

Making observations can be a useful way to learn.

Water is a finite, essential, valuable and vulnerable resource.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements)

ELA 2 understands and applies the inquiry process:

- explore inquiry as a useful process for creating knowledge and understanding the world around them

ELA 19 understands and applies scientific knowledge:

- some of the ways in which living things depend on the Earth (eg soil, water, air) and are affected by its changes
- some of the ways in which living things depend on their environment and each other (e.g. basic needs for survival)

ELA 21 understands about Australia and Australians:

- some places and landmarks in the local community

Assessment

What evidence will there be that they have learnt?

Identify water in a variety of forms.

Describe what water is.

Demonstrate where water can be found.

Give a simple explanation for why water is finite.

Give a simple explanation as to why water is an essential resource for life.

Give a simple explanation or demonstration of water as a vulnerable resource.

Draw a map of their local area showing where they could find water.

Strategy

What is/are the most effective strategy or strategies to teach this?

Whole class guided discussion and brainstorm.

Inquiry process to learn about water.

Listing questions about water.

Diagramatic representations of a body of water.

Read and select and organise interesting facts.

Use a Y chart to explain how water feels, looks and sounds.

Activity

What is the best vehicle to deliver the learning?

Read *The Wonder Thing* (Libby Hathorn and Peter Gouldthorpe). Use open-ended questions to focus students.

Water Hunt. ACTEWAGL website - clues about water. Make water labels using OHP film, hide labels around a designated area to allow students to locate and identify places and uses of water.

Whole class discussion using a Y chart about water as a precious and finite resource.

Draw or paint a picture of them enjoying water.

Investigate water as a solid, a liquid and a gas. Does the original volume stay the same? How easy is it to change from one form to the other?

Finding Out

Outcomes

What understandings will my students have at the end of the Finding Out stage?

Students will understand that there is a natural water cycle and be able to give a simple explanation of the cycle.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- explore inquiry as a useful process for creating knowledge and understanding the world around them
- ask questions & identify possible sources of information to seek answers

ELA 19 understands and applies scientific knowledge:

- some of the ways in which living things depend on the Earth (e.g. soil, water, air) and are affected by its changes

Assessment

What evidence will there be that they have learnt?

Sequence water pictorial representations of the water cycle.

Draw pictures to explain the process of the water cycle.

Write a simple explanation about the water cycle.

In simple terms explain scientific terminology associated with the water cycle (e.g. *condensation, evaporation, precipitation, transpiration).*

Strategy

What is/are the most effective strategy or strategies to teach this?

Questioning and inferring.

Making simple observations about the natural water cycle.

Locate, sort and organise relevant information.

Summarise relevant information.

Activity

What is the best vehicle to deliver the learning?

Design, make and appraise a terrarium that demonstrates the natural water cycle.

Demonstrate the process of water collection after rain by making a 'hill' from sand and pouring 'rain' from a watering can. Students can watch the water run in rivulets, join together to form a 'river 'and then collect to form a 'lake'.

Read and view information about the water cycle then restate the main points.

Watch video *The Magic School Bus Catches a wave*.

View the ActewAGL website - Natural Water Cycle.

Sorting Out

Outcomes

What understandings will my students have at the end of the Sorting Out stage?

Water is important to sustaining life.

We make choices about how we use water.

Understanding scientific concepts can lead to better use of water.

Changes to water systems can come from natural or human causes.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- make observations about what is happening around them using all their senses
- share & communicate observations, findings, ideas & understandings
- ask questions and identify possible sources of information to seek answers

ELA 19 understands and applies scientific knowledge:

- ask questions about & explore phenomena, relationships & ideas
- observe, identify and describe features, properties and the ways things change
- talk about their investigations and observations

ELA 20 acts for an environmentally sustainable future:

- elements of the natural environment that humans, animals and plants need for survival

Assessment

What evidence will there be that they have learnt?

Use pictures to identify how water is important to sustain life.

Classify key words and/or pictures.

Keep a reflection log demonstrating their water usage and consumption.

Role-play how to use water responsibly.

Strategy

What is/are the most effective strategy or strategies to teach this?

Working cooperatively and presenting ideas to others.

Explain, report and organise data.

Representing ideas in a range of different ways.

Identifying and making choices.

Use *Plus Minus Interesting* to explore concepts and issues.

Use *Think, Pair, Share* to explore concepts.

Activity

What is the best vehicle to deliver the learning?

In co-operative learning groups explore words and pictures to do with water.

Visit from the Waterwatch representative and an excursion to a local water catchment area.

Carry out experiments to identify different types of water.

Revisit the concept of where water is located.

List all of the ways water is used in the classroom.

- Organise and classify this list into different types of usage.
- Create a graph/grid to represent how water is used in the class/school over an agreed period of time.

Students use a reflective water learning log to record their own ways of water usage and consumption.

Role-play how to use water responsibly (e.g. washing paint brushes after use: how do we wash them? Under a running tap or in a bucket?)

Going Further

Outcomes

What understandings will my students have at the end of the Going Further stage?

Caring for water.

The impact of changing environments on water.

Use information to identify issues and make considered decisions and choices regarding water.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- notice if someone else has been affected by their decision

ELA 20 acts for an environmentally sustainable future:

- observe and discuss changes evident in the local environment, both natural (eg seasonal changes) and caused by human action (eg changes to the built environment)
- why it is important to conserve resources, protect the environment and participate in positive environmental action

Assessment

What evidence will there be that they have learnt?

List ways we can care for our local water catchments.

Illustrate the path rubbish takes from the playground through the stormwater drains to the local water catchment area.

Students interviewed by a teacher. Their understandings, values and attitudes are recorded.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion.

Inferring and classifying information.

Reflecting and making choices.

Reporting.

Reading and writing.

Visual aids.

Creating lists.

Activity

What is the best vehicle to deliver the learning?

Revisit the sand hill demonstration.

Use blocks to represent urban development. Discuss how this development impacts on the water cycle.

Role-play being a piece of rubbish that has ended up in a storm water drain. Use the pictorial maps included in the package to highlight how the rubbish travels through the local water collection system and how it impacts on the local water.

Brainstorm ways in which we can care for our local water catchments.

Making Connections

Outcomes

What understandings will my students have at the end of the Making Connections stage?

Ways to conserve our water.

Recognise their personal needs and their need for healthy water.

Recognise the need for communal effort to conserve water.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- be aware when they have a choice
- delay a decision until they have thought about it

ELA 20 acts for an environmentally sustainable future:

- why it is important to conserve resources, protect the environment and participate in positive environmental action

ELA 23 understands world events and issues:

- locate places on a globe where significant events and issues are occurring

Assessment

What evidence will there be that they have learnt?

Give verbal and/or written statements listing ways to conserve water.

Look at pictures of healthy and unhealthy water environments and state how this affects them.

Promote ways in which the school community can work together to conserve water.

Strategy

What is/are the most effective strategy or strategies to teach this?

Brainstorming using concept maps and consequence wheels.

Visual aids - posters.

Revisiting earlier work. Looking at water usage and conservation.

Activity

What is the best vehicle to deliver the learning?

Discuss and create a consequence wheel on the sustainable usage of water.

Design and make a poster depicting ways in which they can attempt to conserve water.

Write sentences, statements and slogans that reflect the importance of healthy water and its conservation.

Students brainstorm options for conserving water and promoting to the sustainability to the school community.

Taking Action

Outcomes

What understandings will my students have at the end of the Taking Actions stage?

We can all take positive actions to promote water conservation.

Evidence helps to make considered decisions.

Factors that will help to maintain a sustainable environment.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 20 acts for an environmentally sustainable future:

- why it is important to conserve resources, protect the environment and participate in positive environmental action
- how people cooperate to care for places in a community

ELA 23 understands world events and issues:

- identify and engage in activities associated with current events

Assessment

What evidence will there be that they have learnt?

Students: revisit their reflective water learning log to record their own water usage and consumption.

Identify and record any changes to their water usage.

Create a list of tips to promote water conservation.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion and consider options.

Concept Map.

Informing others.

Mini campaign in the school/classroom/unit.

Listing.

Activity

What is the best vehicle to deliver the learning?

Place posters and slogans designed by students around the school.

Students share what they have been learning in an assembly.

Create a school newsletter, offering tips on conserving water suggested by the students.

Students use their creative ideas to put into action a mini campaign promoting sustainable water practices in the school.

Display posters around the school.

Sharing Discussion and Reflection

Outcomes

What understandings will my students have at the end of the Sharing, Discussion and Reflection stage?

Reflection to consolidate what they know.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- share and communicate observations, findings, ideas and understandings

ELA 3 considered decisions:

- set a small number of goals

ELA 19 understands and applies scientific knowledge:

- some of the ways in which living things depend on the Earth (eg soil, water, air) and are affected by its changes

Assessment

What evidence will there be that they have learnt?

Demonstrate their learning by answering these questions:

- what is water?
- what is the water cycle?
- why is healthy water important?
- how do we use water?
- what is something special you have learned about water?

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion.

Recording and designing.

Justifying current understandings, values and attitudes.

Responding to the work of others.

Setting small goals.

Activity

What is the best vehicle to deliver the learning?

Sharing circle: Discuss and reflect on learning journey.

Students will answer the focus questions using pictures, discussion or writing answers.

Students will reflect on current understandings through personal interpretation of water. Using any form of media, students will design a piece of art depicting themselves and others enjoying water.

Establish small goals for the school and at home designed to achieve a reduction of water usage.

water
for a sustainable future

later childhood
years 3–5

Australian Sustainable Schools Initiative - ACT

Class: Year 3-5

Band of Development: Later childhood

Duration: Suggested 2-3 hours per week over 10 weeks

Teacher:

School:

The format for this unit of work is based on the **Kath Murdoch** model for integrated inquiry. The Essential Learning Achievements and Essential Content have been selected from the ACT Department of Education and Training Curriculum Framework, *Every chance to learn*.

Unit Description

This unit of work is designed to raise awareness in Later Childhood students that water:

- is interconnected with our environment
- features the natural and urban water cycle
- is vulnerable to pollutants and change
- necessary for a sustainable future

Students will be introduced to the key components of the urban water cycle.

The students will explore central issues of:

- how water is expelled through a variety of different systems
- has a plethora of qualities and properties
- how water is essential for life

Big Understandings

1. Water is a finite, essential, valuable and vulnerable resource.
2. Water in the natural environment occurs in many forms.
3. The natural environment is constantly changing and this impacts on water.
4. Building urban environments impacts on the water cycle.
5. In the ACT, sustainable water management practices address:

- where water comes from
- how we use water
- where water goes

Values and Attitudes

During this unit of work students will have the opportunity to develop the following **values and attitudes:**

- appreciate the intrinsic value of the natural world and the need to preserve the environment and natural heritage for future generations
- develop an attitude of respect and caring for life in all its diversity
- appreciate their responsibility as consumers and citizens to conserve and manage environmental resources in ways that are fair to both present and future generations
- develop a sense of optimism for the future through participating in informed, positive action to address local, national and global issues relating to environmental sustainability

Schools may choose to include other worthwhile learning linked to the unit. For example:

- water safety
- water and our bodies
- natural water disasters
- water in industry
- bodies of water - artificial and natural
- relationship between Indigenous peoples of Australia and water in their local area
- water is a symbol that is recognised by many world religions

Essential Learning Achievements covered in this unit are ELA 2, 3, 19, 20, 21 and 23. Essential Content has been selected from the later childhood band of development.

ELA 2 the student understands and applies the inquiry process

Essential Content

In the early childhood band of development, students have opportunities to:

- create questions and predictions for investigation and testing
- conduct searches for information and use a range of sources, (e.g. information texts, artefacts, maps, images)
- explain the inquiry approach taken and communicate their findings or conclusions, generalising about them using specific instances they have observed, data they have analysed or information they have assembled.
- attempt to convince others about the reasonableness of their findings
- reflect on their inquiry experience, identify what went well and difficulties encountered, and suggest improvements to the investigation

ELA 3 the student makes considered decisions

Essential Content

In the early childhood band of development, students have opportunities to:

- develop and apply a small number of criteria for judging the quality of a decision
- identify possible consequences of different decisions
- make decisions about how to complete a learning task and put them into effect

ELA 19 the student understands and applies scientific knowledge

Essential Content

In the early childhood band of development, students have opportunities to understand and learn about:

- some interactions between living things, and between living things and their environment
- identifiable causes for some of the short and long term changes to the surface of the Earth or the atmosphere (e.g. volcanic activity, soil erosion, air pollution)

In the early childhood band of development, students have opportunities to learn to:

- examine and predict events, speculate about how and why things happen, and compare explanations from different sources, using scientific language

ELA 20 the student acts for an environmentally sustainable future

Essential Content

In the early childhood band of development, students have opportunities to understand and learn about:

- natural cycles and systems in the environment (e.g. water cycle, food chains)
- some effects of human action on natural environments (e.g. land clearing, air and water pollution)
- renewable and non-renewable resources, and the need to conserve non-renewable resources

In the early childhood band of development, students have opportunities to learn to:

- take responsibility for caring for a local environment (e.g. part of school grounds, class garden, local park)

ELA 21 the student understands about Australia and Australians

Essential Content

In the early childhood band of development, students have opportunities to understand and learn about:

- a range of natural environments and features in Australia, how these have shaped Australia's settlement and development and how people have shaped these environments

ELA 23 the student understands world events and issues

Essential Content

In the early childhood band of development, students have opportunities to understand and learn about:

- significant geographic areas (e.g. deserts, seas, continents) and reference points in the world (e.g. countries, capital cities, the equator, poles)

Tuning In

Outcomes

What understandings will my students have at the end of the Tuning In stage?

Identify what the student knows about water in their environment.

The location and the usage of water in the ACT.

Identify key attributes of a typical ACT riparian zone.

Water is an integral element in the environment.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- conduct searches for information and use a range of sources, (e.g. information texts, artefacts, maps, images)

ELA 19 understands and applies scientific knowledge:

- identifiable causes for some of the short and long term changes to the surface of the Earth or the atmosphere (e.g. volcanic activity, soil erosion, air pollution)

ELA 20 acts for an environmentally sustainable future:

- some effects of human action on natural environments (e.g. land clearing, air and water pollution)

Assessment

What evidence will there be that they have learnt?

Respond to key questions about water.
(What is water? Where does water go? Where do we find water in the ACT? How is water essential for life? Why is water essential for life?)

State where water is found in the ACT.

Construct a concept map showing the qualities of a typical ACT riparian zone.

Concept map to represent their relationship with water.

Strategy

What is/are the most effective strategy or strategies to teach this?

Brainstorming.

Discussion.

Drawing and making diagrams.

Listing questions and making statements.

Constructing concept maps.

Activity

What is the best vehicle to deliver the learning?

Whole class discussion using a KWL or Y charts to answer key water questions (e.g. concept of water for life).

Concept map that allows the students to list their personal water usage and experience, highlighting the changes that can occur (e.g. personal water usage impacts on water supply and retention within the ACT).

Water visualization process guiding students to think about changes in environment affected by the changes in water *(e.g. What is water quality? Why is it important? What if...?)*.

Finding Out

Outcomes

What understandings will my students have at the end of the Finding Out stage?

Identify key components of the urban water system.

Identify different processes of water treatment within the ACT.

Explain differences between treated and untreated water.

Explore how and why the urban and natural water systems are interconnected.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- create questions and predictions for investigation and testing

ELA 19 understands and applies scientific knowledge:

- identifiable causes for some of the short and long term changes to the surface of the Earth or the atmosphere (e.g. volcanic activity, soil erosion, air pollution)

ELA 20 acts for an environmentally sustainable future:

- natural cycles and systems in the environment (e.g. water cycle, food chains)
- some effects of human action on natural environments (e.g. land clearing, air and water pollution)

Assessment

What evidence will there be that they have learnt?

Identify key terms associated with water systems.

Describe the ACT water treatment process as an interconnected water system.

List differences between treated and untreated water.

Explain why water treatment is necessary and essential for healthy life.

Explain the relationship between natural and urban water systems.

Strategy

What is/are the most effective strategy or strategies to teach this?

Listening.

Questioning.

Discussion.

Observation and note taking.

Locating and selecting relevant information.

Comparing and contrasting.

Inferring information.

Activity

What is the best vehicle to deliver the learning?

Visit the ACTEW website to view the wastewater system.

Visit ACT Waste Water Treatment Plant and observe the interconnected systems.

Waterwatch excursion to local body of water. Investigate and assess water quality through collecting samples.

Observe, compare and contrast the difference between treated and untreated water, (e.g. assess water quality and view micro-organisms through microscopes).

Discuss the similarities and differences between water samples.

Sorting Out

Outcomes

What understandings will my students have at the end of the Sorting Out stage?

Where and what is the Riparian Zone.

The Riparian Zone and water have an important relationship.

The Riparian Zone needs to be healthy.

The importance of water quality and the Riparian Zone.

Develop and apply criteria to assess water quality.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- develop and apply a small number of criteria for judging the quality of a decision

ELA 19 understands and applies scientific knowledge:

- some interactions between living things, and between living things and their environment
- examine and predict events, speculate about how and why things happen, and compare explanations from different sources, using scientific language
- identifiable causes for some of the short and long term changes to the surface of the Earth or the atmosphere (e.g. volcanic activity, soil erosion, air pollution)

ELA 20 acts for an environmentally sustainable future:

- natural cycles and systems in the environment (e.g. water cycle, food chains)

ELA 23 understands world events and issues:

- significant geographic areas (e.g. deserts, seas, continents) and reference points in the world (e.g. countries, capital cities, the equator, poles)

Assessment

What evidence will there be that they have learnt?

Identify key terms associated with Riparian Zone. (Geomorphologic structure, vegetation, fauna and flora.)

Explain the direct relationship between the Riparian Zone and water quality.

State why the health of the Riparian Zone affects water.

List conditions required for healthy water.

Present water data in a logical grid or rubric.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion.

Listing and making statements.

Viewing.

Testing and checking collection of data.

Organisation and classification.

Make connections and identifying patterns.

Present ideas to others.

Activity

What is the best vehicle to deliver the learning?

Visit a local body of water to identify the Riparian Zones. Sketch the Riparian Zone.

Construct a diorama to represent the key components of the Riparian Zone.

List the conditions required for healthy water.

Develop a grid or rubric to represent the water samples collected as valid data.

Classify and organise water samples according to various properties and criteria.

Going Further

Outcomes

What understandings will my students have at the end of the Going Further stage?

Importance of caring for the Riparian Zone.

Water is changeable and vulnerable to pollutants.

Importance of water quality and appropriate recreational water use in the ACT.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- explain the inquiry approach taken and communicate their findings or conclusions, generalising about them using specific instances they have observed, data they have analysed or information they have assembled

ELA 3 makes considered decisions:

- identify possible consequences of different decisions

ELA 21 understands about Australia and Australians:

- a range of natural environments and features in Australia, how these have shaped Australia's settlement and development and how people have shaped these environments

Assessment

What evidence will there be that they have learnt?

State ways in which they can care for the Riparian Zone.

List some pollutants that change water quality.

List some appropriate recreational water activities.

List different bodies that have had responsibility for water in the ACT and how they have contributed.

Design a public poster/pamphlet that demonstrates useful information for appropriate recreational activity.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion.

Speaking and listening.

Reading and viewing.

Individual and group research.

Dramatisation and role-play.

Activity

What is the best vehicle to deliver the learning?

Discussion on water as a recreational amenity (e.g. changing river system, loss of vegetation, habitat and biodiversity).

Revisit earlier questions and identify roles of responsibility for water management in the ACT.

List recreational activities involving water on and around water in the ACT (e.g. fishing, picnicking, swimming, sailing and motor sports).

Investigate the impact of recreational activities on the water quality.

Role-play different ways to care for the Riparian Zone to ensure water quality is maintained.

Making Conclusions

Outcomes

What understandings will my students have at the end of the Making Connections stage?

Changes in the ACT water system impact on water quality.

Water quality is a collective and individual responsibility.

The benefits of an appropriately managed water system in the ACT.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- identify possible consequences of different decisions

ELA 19 understands and applies scientific knowledge:

- identifiable causes for some of the short and long term changes to the surface of the Earth or the atmosphere (e.g. volcanic activity, soil erosion, air pollution)

ELA 20 acts for an environmentally sustainable future:

- some effects of human action on natural environments (e.g. land clearing, air and water pollution)

Assessment

What evidence will there be that they have learnt?

State why changes in water systems impact on water quality.

Describe key consequences and risks of a dysfunctional water system.

Explain why it is important to maintain the ACT water systems.

List key conditions needed for healthy water.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion.

Reflect.

Interpret and synthesis.

Sequence.

Generalise.

Activity

What is the best vehicle to deliver the learning?

Construct a jigsaw/game identifying the various conditions needed for quality water control within the ACT.

Construct a consequence wheel to demonstrate knowledge and understanding about ACT water systems.

Write reports that show the key conditions for healthy water.

Taking Action

Outcomes

What understandings will my students have at the end of the Taking Actions stage?

Ways of improving water and water environments in the ACT.

Acknowledgement of a personal responsibility for water care in the ACT.

Recognise a collective responsibility to water management practices in the ACT.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- make decisions about how to complete a learning task and put them into effect

ELA 20 acts for an environmentally sustainable future:

- renewable and non-renewable resources, and the need to conserve non-renewable resources
- take responsibility for caring for a local environment (e.g. part of school grounds, class garden, local park)

Assessment

What evidence will there be that they have learnt?

Design a personal and group action plan to support the ACT water system.

Set a personal goal for using water in a sustainable manner.

Design an informative poster/pamphlet that demonstrates appropriate water care and practice.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion.

Reflection.

Respond.

Consider options.

Timeframe.

Participation.

Activity

What is the best vehicle to deliver the learning?

Join initiatives designed to maintain land, water and sustainable environment practices. (e.g. Waterwatch, Landcare).

Monitor a local body of water over an agreed period of time.

Design and distribute information pamphlets/ posters about water care and management.

Share explanations with other students within the school.

Hold an information workshop for the community to highlight the need for cooperative sustainable practices.

Conduct a Water Audit at school and home.

Sharing Discussion and Reflection

Outcomes

What understandings will my students have at the end of the Sharing, Discussion and Reflection stage?

ACT water systems.

ACT water and water quality.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- attempt to convince others about the reasonableness of their findings
- reflect on their inquiry experience, identify what went well and difficulties encountered, and suggest improvements to the investigation

Assessment

What evidence will there be that they have learnt?

Individual flow chart on ACT water.

Present key understandings and knowledge about ACT water systems.

Answer key questions about water in the ACT.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion.

Reflection.

Sharing work with others.

Diagrams and charts representing knowledge.

Evaluating key issues throughout the unit.

Activity

What is the best vehicle to deliver the learning?

Revisit earlier work to evaluate knowledge of ACT water systems (e.g. natural and urban water systems).

Construct a flow chart illustrating understanding and knowledge about ACT water systems.

Role-play current knowledge and understandings about water in the ACT.

Identify further areas of investigation.

water
for a sustainable future

early adolescence
years 6–8

Australian Sustainable Schools Initiative - ACT

Class: Year 6 - 8

Band of Development: Early adolescence

Duration: Suggested 2-3 hours per week over 10 weeks

Teacher:

School:

The format for this unit of work is based on the **Kath Murdoch** model for integrated inquiry. The Essential Learning Achievements and Essential Content have been selected from the ACT Department of Education and Training Curriculum Framework, *Every chance to learn*.

Unit Description

This unit of work is designed to raise awareness in early adolescent students that:

- water is a precious resource
- healthy water is the responsibility of everyone
- necessary for a sustainable future

Students will be introduced to the key components of:

- where water comes from and how it is distributed in the ACT and surrounding area
- that human settlement has had an environmental impact
- how we can manage and conserve our water resources for a sustainable future

Big Understandings

1. Water is a finite, essential, valuable and vulnerable resource.
2. Water in the natural environment occurs in many forms.
3. The natural environment is constantly changing and this impacts on water.
4. Building urban environments impacts on the water cycle.
5. In the ACT, sustainable water management practices address:

- where water comes from
- how we use water
- where water goes

Values and Attitudes

During this unit of work students will have the opportunity to develop the following values and attitudes:

- appreciate the intrinsic value of the natural world and the need to preserve the environment and natural heritage for future generations
- develop an attitude of respect and caring for life in all its diversity
- appreciate their responsibility as consumers and citizens to conserve and manage environmental resources in ways that are fair to both present and future generations
- develop a sense of optimism for the future through participating in informed, positive action to address local, national and global issues relating to environmental sustainability

Schools may choose to include other worthwhile learning linked to the unit. For example:

- water safety
- water energy
- water and our bodies
- water disasters
- water profiles - individual, class, whole school stormwater system
- water calculators
- biodegradable/non biodegradable substances

Essential Learning Achievements covered in this unit are ELA 2, 3, 19, 20, and 21.

Essential Content has been selected from the early adolescence band of development.

ELA 2 the student understands and applies the inquiry process

Essential Content

In early adolescence band of development, students have opportunities to:

- understand variations of the inquiry process used in particular subject areas (e.g. in historical research, surveys, census data analysis, scientific testing, mathematical analysis)
- select and use appropriate forms of the inquiry process for particular purposes
- formulate questions, predictions or propositions suitable for investigation and clarify the inquiry focus

ELA 3 the student makes considered decisions

Essential Content

In early adolescence band of development, students have opportunities to:

- use the inquiry process to gather information from a variety of sources to identify additional options
- assess the impact and consequences of decisions they have already made to identify whether they will impact on their future choices
- develop criteria to judge future decisions
- predict possible benefits, consequences and risks

ELA 19 the student understands and applies scientific knowledge

Essential Content

In early adolescence band of development, students have opportunities to learn to:

- apply scientific knowledge and language in interpreting information and forming explanations, arguments and lines of reasoning
- use their scientific understandings to consider and respond to appropriate ethical and social issues relevant to them (e.g. those related to health and wellbeing)

ELA 20 the student acts for an environmentally sustainable future

Essential Content

In the early adolescence band of development, students have opportunities to understand and learn about:

- some of the processes by which human activities change natural environments in positive and negative ways (e.g. reduce feral cat population in a national park, small native animal and bird populations increase, animal and bird activity encourages native plant growth; overuse of organo-phosphate fertilisers on farms, run-off into waterways, increased nutrient load in rivers, toxic algal blooms, native fish extinction)
- responsibilities of global citizenship for individuals, organisations and governments and the roles and responsibilities of companies, producers and consumers in relation to sustainability

In the early adolescence band of development, students have opportunities to learn to:

- conduct case study investigations into local and/or national ecosystems to identify changes and predict their impacts
- investigate practical ways for individuals, households or communities to conserve resources (e.g. waste recycling, energy and water saving,) and evaluate their practicality and effectiveness
- participate in raising awareness about environmental issues
- examine issues of sustainability of the natural, built or social environment, extending from local to global perspectives (e.g. investigate arguments and studies about climate change and its effects; generate probable, possible and preferred future scenarios for future sustainable living).

ELA 21 the student understands about Australia and Australians

Essential Content

In early adolescence band of development, students have opportunities to understand and learn about:

- the characteristics that make Australia unique (e.g. landforms, basins, climate, weather, resources, vegetation, flora and fauna, natural hazards, latitude and longitude)

In the early adolescence band of development, students have opportunities to learn to:

- use geographical language, tools and conventions to interpret and create representations of Australia's physical and human geography (e.g. a variety of maps, diagrams, images and data)
- find out about, discuss and evaluate historical events using appropriate genres, sources and evidence
- identify and suggest reasons for different perspectives in accounts of history and contemporary society

Tuning In

Outcomes

What understandings will my students have at the end of the Tuning In stage?

State prior knowledge about water.

Water is a valuable and natural resource.

Urban & natural water cycles.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- formulate questions, predictions or propositions suitable for investigation, and clarify the inquiry focus

ELA 19 understands and applies scientific knowledge:

- apply scientific knowledge and language in interpreting information and forming explanations, arguments and lines of reasoning

ELA 20 acts for an environmentally sustainable future:

- some of the processes by which human activities change natural environments in positive and negative ways (e.g. reduce feral cat population in a national park, small native animal and bird populations increase, animal and bird activity encourages native plant growth; overuse of organo-phosphate fertilisers on farms, run-off into waterways, increased nutrient load in rivers, toxic algal blooms, native fish extinction)

Assessment

What evidence will there be that they have learnt?

Create a KWL chart to clarify what they know about water and ask three questions that will lead them to find out more.

Demonstrate correct use of terminology about water: condensation, precipitation, evaporation, catchment area, dam, hydrogen and oxygen, pollution.

Share and discuss the idea that water is a valuable, finite and precious resource.

Write why we need to look after water.

Retell how water restrictions impact on their lives.

Strategy

What is/are the most effective strategy or strategies to teach this?

Listing.

Discussions.

Reflection.

Questions.

Brainstorming.

Activity

What is the best vehicle to deliver the learning?

Using the water cycle as a focus, discuss and create a Y chart or KWL chart.

Commence weekly, reflective journal about their learning during the unit.

Read newspapers for articles about water.

Using a LUAC activity (three level guide) investigate ACT water restrictions.

Draw and label a diagram of the water cycle, and explain the progress of water through the cycle using correct terminology.

Finding Out

Outcomes

What understandings will my students have at the end of the Finding Out stage?

Where water comes from in the ACT.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- formulate questions, predictions or propositions suitable for investigation and clarify the inquiry focus

ELA 21 understands about Australia and Australians:

- the characteristics that make Australia unique (e.g. landforms, basins, climate, weather, resources, vegetation, flora and fauna, natural hazards, latitude and longitude)
- use geographical language, tools and conventions to interpret and create representations of Australia's physical and human geography (e.g. a variety of maps, diagrams, images and data)

Assessment

What evidence will there be that they have learnt?

Use various ICT to represent their thinking about water in the ACT.

Name the four dams in the ACT region, and the rivers that source them, and locate them on a map. (Resources available on ACTEW website.)

Students are able to present the facts they have collected about an ACT dam.

Describe some of the geographical features of the ACT.

Identify and evaluate the drought as a key event in the ACT region.

Strategy

What is/are the most effective strategy or strategies to teach this?

ICT research.

Discussion.

Small group work.

Mapping.

Activity

What is the best vehicle to deliver the learning?

Map the ACT water system, including the dams and rivers, using resources such as the Waterwatch kit, and on the ACTEW website.

Choose one dam in our region and find out three facts about the dam. (When was it built? An interesting fact or issue about the dam? Which dam is closest to your school? Where did the dam get its name? What is the capacity of the dam? What is the catchment area of the dam? What type of dam is it? How has drought and fire affected the dams? How do our recreation activities impact on our water supply?)

Discuss how the affects of drought are impacting on the dams and rivers of the ACT.

Sorting Out

Outcomes

What understandings will my students have at the end of the Sorting Out stage?

Humans exist in a diverse environment.

Water in the ACT is dependent on a greater natural system.

The place of water in the different physical environments found in Australia.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- understand variations of the inquiry process used in particular subject areas (e.g. in historical research, surveys, census data analysis, scientific testing, mathematical analysis)

ELA 21 understands about Australia and Australians:

- use geographical language, tools and conventions to interpret and create representations of Australia's physical and human geography (e.g. a variety of maps, diagrams, images and data)

Assessment

What evidence will there be that they have learnt?

Identify Australia's river systems and mountain ranges.

View indigenous and population maps of Australia.

Answer the following questions:

What do they tell us about human dependence on water?

What is the link between population areas and water?

How humans are part of the natural ecosystem.

Name the parts of those systems that directly supply the ACT with water.

Complete a map of Australia showing the different physical environments and habitats.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion to make connections.

Mapping activities.

Viewing maps, photographs, pictures and illustrations to identify different environments including rainforests, deserts, woodlands, grasslands, scrublands, and forests.

Activity

What is the best vehicle to deliver the learning?

Map Australia's river systems and mountain ranges.

Discuss as a class the water cycle as it relates to Australia as a whole. Establish that the water used in the ACT comes from sources outside the ACT.

In class, students complete a map of Australia showing different natural environments.

LUAC glossary activity: students match terms with definitions of different environments including rainforests, deserts, woodlands, grasslands, scrublands, and forests.

Going Further

Outcomes

What understandings will my students have at the end of the Going Further stage?

Human settlement and lifestyles have an impact on the natural environment.

Use of research and ICT and presentation skills.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- select and use appropriate forms of the inquiry process for particular purposes

ELA 20 acts for an environmentally sustainable future:

- conduct case study investigations into local and/or national ecosystems to identify changes and predict their impacts

ELA 21 understands about Australia and Australians:

- find out about, discuss and evaluate historical events using appropriate genres, sources and evidence
- identify and suggest reasons for different perspectives in accounts of history and contemporary society

Assessment

What evidence will there be that they have learnt?

Prepare a research report, exposition, poster or essay demonstrating their understanding of change over time. Relating to ACT waterways. May use a range of print, media and ICT sources. Acknowledging the sources of information.

Students create a digital file of their response to predictions about the future of our lakes (Burley Griffin, Ginninderra, Tuggeranong, and Gungahlin). The file must contain evidence of their research into the past and present; include photos, and their predictions for the future.

Strategy

What is/are the most effective strategy or strategies to teach this?

Compare and contrast environments at different points in time.

Reading and viewing.

ICT research skills.

Individual investigations.

Presentations by guest speakers.

Visiting and experiencing local waterways.

Activity

What is the best vehicle to deliver the learning?

Investigate how the Ngunnawal people survived in the ACT without dams.

1. Look at maps showing different environments in Australia, and showing pre-European settlement, and a current population map. Identify where populations lived in relation to water. Compare the maps at different points in Australia's history.
2. Invite a guest speaker with knowledge of how the Ngunnawal people lived to discuss the importance of water, and its use.
3. Complete a research report or exposition.

Predict the future - look at the past and the present, then predict what our water environments will look like in the future. Fifty years ago none of the ACT's lakes had been built. Students research what the area looked like, and talk to someone who remembers the area prior to flooding. Use photos, articles and maps of the area to see how it has changed.

Taking Action

Outcomes

What understandings will my students have at the end of the Taking Actions stage?

Life choices will contribute to a sustainable future, specifically in relation to our water supply.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- assess the impact and consequences of decisions they have already made to identify whether they will impact on their future choices

ELA 20 acts for an environmentally sustainable future:

- investigate practical ways for individuals, households or communities to conserve resources (e.g. waste recycling, energy and water saving) and evaluate their practicality and effectiveness
- participate in raising awareness about environmental issues
- responsibilities of global citizenship for individuals, organisations and governments and the roles and responsibilities of companies, producers and consumers in relation to sustainability

Assessment

What evidence will there be that they have learnt?

Use language that demonstrates their commitment to reducing consumer waste that makes its way to our water environments.

Make a personal commitment to reducing the amount of rubbish they leave in the community.

Design a poster containing information that educates the community about the damage caused by rubbish in our waterways.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion.

Brainstorm and mind map.

Creating posters that inform others.

Activity

What is the best vehicle to deliver the learning?

Develop a pledge that students will then make, demonstrating their lifelong commitment to reducing rubbish and water waste in their community.

Mini campaign: using posters developed by students, and the pledges they have written, students organise an awareness raising campaign to inform others about the need to make a personal commitment to a sustainable future.

Making Connections

Outcomes

What understandings will my students have at the end of the Making Connections?

Water as a finite, essential, valuable and vulnerable resource.

The natural environment as constantly changing and this will impact on water.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- develop criteria to judge future decisions
- predict possible benefits, consequences and risks

ELA 20 acts for an environmentally sustainable future:

- examine issues of sustainability of the natural, built or social environment, extending from local to global perspectives (e.g. investigate arguments and studies about climate change and its effects; generate probable, possible and preferred future scenarios for future sustainable living)

Assessment

What evidence will there be that they have learnt?

Voice an opinion on why water is/isn't a valuable resource.

Write an exposition arguing why taking care of our environment is necessary for a sustainable future.

Strategy

What is/are the most effective strategy or strategies to teach this?

Debate.

Discussion.

Writing.

Synthesising ideas.

Generalising.

Activity

What is the best vehicle to deliver the learning?

Discuss how all sectors of our society (government, industry, community) need to take responsibility for ensuring water is treated as a finite, vulnerable and valuable resource.

Debate: "We all must take responsibility for valuing water".

Sharing Discussion and Reflection

Outcomes

What understandings will my students have at the end of the Sharing, Discussion and Reflection stage?

Reflections on their learning about waterways in Australia, and how to act for a sustainable water future.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- use the inquiry process to gather information from a variety of sources to identify additional options
- develop criteria to judge future decisions

ELA 19 understands and applies scientific knowledge:

- use their scientific understandings to consider and respond to appropriate ethical and social issues relevant to them (e.g. those related to health and wellbeing)

ELA 20 acts for an environmentally sustainable future:

- participate in raising awareness about environmental issues

Assessment

What evidence will there be that they have learnt?

State what they have learned.

Describe an action they are going to or have taken for sustainable water futures.

Explain something they have learned about where they live that they didn't know before.

Complete an evaluation of the unit answering the following questions:

- what have we achieved in this unit of work?
- what was the worst part of the unit?

  what was the best part of the unit?
- what actions will we take to support a sustainable water future?

Strategy

What is/are the most effective strategy or strategies to teach this?

Reflection.

Discussion.

Activity

What is the best vehicle to deliver the learning?

Journal of individual reflection of work completed during the unit.

Participate in group-debrief and evaluation of unit.

Initiate and organise a whole-school or community forum on water.

water
for a sustainable future

later adolescence
years 9–10

Australian Sustainable Schools Initiative - ACT

Class: Year 9 - 10

Band of Development: Later adolescence

Duration: Suggested 2-3 hours per week over 10 weeks

Teacher:

School:

The format for this unit of work is based on the **Kath Murdoch** model for integrated inquiry. The Essential Learning Achievements and Essential Content have been selected from the ACT Department of Education and Training Curriculum Framework, *Every chance to learn*.

Unit Description

This unit of work is designed to raise awareness in later adolescent students that:

- water in the ACT is an integral part of our interconnected natural and built environments
- there are global water issues
- we are all responsible for ensuring a sustainable water future

Students will be introduced to the key components of:

- water in the ACT is collected from rivers and rainfall, and treated before being used in our homes
- Australia's agricultural sector relies on water from the same supplies as urban communities
- water issues affect communities all over the world

Big Understandings

1. Water is a finite, essential, valuable and vulnerable resource.
2. Water in the natural environment occurs in many forms.
3. The natural environment is constantly changing and this impacts on water.
4. Building urban environments impacts on the water cycle.
5. In the ACT, sustainable water management practices address:

- where water comes from
- how we use water
- where water goes

Values and Attitudes

During this unit of work students will have the opportunity to develop the following values and attitudes:

- appreciate the intrinsic value of the natural world and the need to preserve the environment and natural heritage for future generations
- develop an attitude of respect and caring for life in all its diversity
- appreciate their responsibility as consumers and citizens to conserve and manage environmental resources in ways that are fair to both present and future generations
- develop a sense of optimism for the future through participating in informed, positive action to address local, national and global issues relating to environmental sustainability

Schools may choose to include **other worthwhile learning** linked to the unit. *For example:*

This unit can be adapted to be used for Year 9 Exhibitions. Content could be taught in KLA's according to the following table, with students using the 'Going Further' task of investigating a water issue for their major Exhibitions task.

Cross-curricular content:

English	Maths	Science	SOSE
Journal writing Report writing Speaking - debates and discussion	Collection and analysis of data Graphing and data representation	Development of scientific knowledge Scientific terminology Scientific matters	Recognising interrelationships between politics, economics, society, cultures and environments Mapping

Schools may choose to include other worthwhile learning linked to the unit. For example:

Essential Learning Achievements covered in this unit are ELAs 2, 3, 19, 20 and 21. Essential Content has been selected from the later adolescence band of development.

ELA 2 the student understands and applies the inquiry process

Essential Content

In the later adolescence band of development, students have opportunities to:

- understand the possibility of multiple perspectives and partial explanations of phenomena being investigated
- understand the nature of a controlled experiment and when it might be necessary to conduct one
- formulate questions, hypotheses, propositions and conjecture suitable for testing, or investigation in relevant disciplines and frame these to clarify the purpose and scope of the inquiry
- decide on the most suitable methods, including safe use of equipment and selection of suitable technologies, for collecting, managing and analysing data and information, and for communicating findings
- identify sources and collect data and information in systematic ways to improve reliability (e.g. use refined searches to locate a range of relevant sources, control variables, use repeat trials and replication of experiments with appropriate sample sizes, seek counter-examples or explore proofs to verify truth of propositions)

ELA 3 the student makes considered decisions

Essential Content

In the later adolescence band of development, students have opportunities to:

- evaluate the role of intuition, feelings, values, beliefs in decision-making and strengthen their capacity for moral and ethical decisions
- make plans and decisions and put them into effect as part of topics, themes or activities across the school's curriculum
- identify sources of information and opportunities in relation to post-school education and training as a basis for future plans and decisions

ELA 19 the student understands and applies scientific knowledge

Essential Content

In the later adolescence band of development, students have opportunities to understand and learn about:

- instances in which progress in science can be affected by and influence social issues and priorities (e.g. water purification, alternative energy sources, space exploration, ethics of biotechnology)
- scientific concepts and models to explain the interdependence of populations of organisms and the environment, and predict the consequences of changes to an ecosystem

In later adolescence band of development, students have opportunities to learn to:

- apply scientific knowledge in exploring and constructing views around ethical and social issues relating to science (e.g. genetic modification, stem cell research, animal testing of products, nuclear energy)

ELA 20 the student acts for an environmentally sustainable future

Essential Content

In the later adolescence band of development, students have opportunities to understand and learn about:

- key concepts used in contemporary information and debates about environmental sustainability (e.g. biodiversity, carrying capacity, ecological footprint, preservation, conservation, wilderness, heritage, sustainability, sustainable development)
- events that have significant effects on regional or global ecosystems and describe related environmental, social or economic consequences (e.g. drought, cyclones, bushfires, earthquakes, El Nino, climate change)
- how peoples' views on the environment influence government policy and non government organisations, and the ways in which governments attempt to address issues of development and sustainability

In the later adolescence band of development, students have opportunities to learn to:

- apply relevant scientific understandings to form personal views and make responsible and informed decisions about issues concerning sustainability (e.g. salinity, nuclear energy production, land degradation)
- consider and explain their own decisions about lifestyle choices and participation in social actions for environmental sustainability
- examine examples of individual and global actions to create sustainable futures, assess their strengths and limitations, and propose further appropriate actions.

ELA 21 the student understands about Australia and Australians

Essential Content

In the later adolescence band of development, students have opportunities to understand and learn about:

- natural and human processes that form and transform Australian environments over time (e.g. explanations of the origins of Australia, factors changing communities, geographical issues affecting Australian environments)

In the later adolescence band of development, students have opportunities to learn to:

- select and apply geographical tools and processes (e.g. maps, graphs, photographs, flow charts, fieldwork, action research) to gather, interpret and present geographical information on Australia
- analyse theories and arguments, and explain silences and gaps, in accounts of past and current events.

Tuning In

Outcomes

What understandings will my students have at the end of the Tuning In stage?

Able to identify what they know about water and water supply in the ACT.

The water cycle in natural and urban environments.

Personal use of water and patterns of water consumption in the ACT.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- understand the nature of a controlled experiment and when it might be necessary to conduct one
- decide on the most suitable methods, including safe use of equipment and selection of suitable technologies, for collecting, managing and analysing data and information, and for communicating findings.

ELA 21 understands about Australia and Australians:

- natural and human processes that form and transform Australian environments over time (e.g. explanations of the origins of Australia, factors changing communities, geographical issues affecting Australian environments)

Assessment

What evidence will there be that they have learnt?

Ability to use appropriate terminology: condensation, precipitation, evaporation, catchment area, dam, hydrogen and oxygen, pollution.

Discuss where the ACT water supply comes from, and how it is distributed to homes.

Demonstrate their awareness of local catchment areas.

Students present findings of household water consumption.

Strategy

What is/are the most effective strategy or strategies to teach this?

Identifying prior knowledge.

Brainstorming.

Concept mapping.

Reviewing.

Class and small group discussion.

Activity

What is the best vehicle to deliver the learning?

Draw a diagram of the natural and urban water cycle.

Collection of personal data on household water consumption: students gather information using an agreed template identifying individual household water consumption.

Find and analyse Australian Bureau of Statistics data on household water consumption.

Finding Out

Outcomes

What understandings will my students have at the end of the Finding Out stage?

The ACT's water supply, where it comes from and how its residents use water.

Catchments and dams in the ACT.

ACT residents can collect their own water (water harvesting).

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- understand the possibility of multiple perspectives and partial explanations of phenomena being investigated
- identify sources and collect data and information in systematic ways to improve reliability (e.g. use refined searches to locate a range of relevant sources, control variables, use repeat trials and replication of experiments with appropriate sample sizes, seek counter-examples or explore proofs to verify truth of propositions)

ELA 20 acts for an environmentally sustainable future:

- key concepts used in contemporary information and debates about environmental sustainability (e.g. biodiversity, carrying capacity, ecological footprint, preservation, conservation, wilderness, heritage, sustainability, sustainable development)
- events that have significant effects on regional or global ecosystems and describe related environmental, social or economic consequences (e.g. drought, cyclones, bushfires, earthquakes, El Nino, climate change)

ELA 21 understands about Australia and Australians:

- select and apply geographical tools and processes (e.g. maps, graphs, photographs, flow charts, fieldwork, action research) to gather, interpret and present geographical information on Australia

Assessment

What evidence will there be that they have learnt?

Use ICT to show how to locate and select information about water supply in the ACT.

In groups, students retell and explain current information and facts about how catchments work in the local area.

Through individual pictorial representations students will demonstrate their understanding by explaining features of the residential water supply in the ACT.

Strategy

What is/are the most effective strategy or strategies to teach this?

Viewing, comparing and contrasting graphs and maps.

Mapping and illustrating tasks.

ICT research.

Discussion, revision and summarising.

Activity

What is the best vehicle to deliver the learning?

Analysis and graphing of Canberra rainfall statistics available on the Bureau of Meteorology site.

Illustrate domestic water use in ACT urban areas: students pictorially represent how water is distributed to their homes and how wastewater is expelled.

Catchment mapping exercise: using a map of the ACT and the ACTEW website, locate and identify the four dams in the ACT, and the two catchment areas.

Invite a guest speaker from Waterwatch and conduct an excursion to a local catchment area.

Sorting Out

Outcomes

What understandings will my students have at the end of the Sorting Out stage?

Social and environmental issues affecting urban water supply.

The ways in which water is treated before it reaches our homes.

Physical and built environments are interdependent and interconnected.

Use of water in the ACT affects people outside the ACT.

The ACT has implemented sustainable water practices within the private and public sector.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- understand the possibility of multiple perspectives and partial explanations of phenomena being investigated
- formulate questions, hypotheses, propositions and conjecture suitable for testing or investigation in relevant disciplines and frame these to clarify the purpose and scope of the inquiry

ELA 3 makes considered decisions:

- identify sources of information and opportunities in relation to post-school education and training as a basis for future plans and decisions

ELA 19 understands and applies scientific knowledge:

- instances in which progress in science can be affected by, and influence social issues and priorities (e.g. water purification, alternative energy sources, space exploration, ethics of biotechnology)
- scientific concepts and models to explain the interdependence of populations of organisms and the environment, and predict the consequences of changes to an ecosystem

Assessment

What evidence will there be that they have learnt?

Present information in a clear and organised way demonstrating how they plan and understand the inquiry process.

Demonstrate an understanding of how water is treated, and of the ACT's sustainable water practices through an ICT report task. Give reasons why or why not the practices may be an opportunity to bring about a sustainable future.

In co-operative learning groups students verbalise their understandings, values and attitudes on the interdependence and interconnectedness of natural and built environments.

Strategy

What is/are the most effective strategy or strategies to teach this?

Create and organise data.

Grouping and labeling.

Construction of text type.

ICT research.

Making connections.

Peer discussion and questioning.

Activity

What is the best vehicle to deliver the learning?

Report writing: using resources on ACTEWagl website relating to water treatment and sustainable practices within the ACT, students summarise in their own words their understandings using ICT applications available.

Identify the interconnectedness of Australia's water systems, particularly ACT rivers, the Murray-Darling river system and irrigation.

Glossary task: Students will create and organise water terminology in groupings relating to natural and urban environments.

Going Further

Outcomes

What understandings will my students have at the end of the Going Further stage?

World issues surrounding the supply and demand for water.

Water as essential for industry.

ACT residents' requirements being different to those in other states and recognition of our dependence on external resources.

Global water issues including health, supply, consumption and usage.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- identify sources and collect data and information in systematic ways to improve reliability (e.g. use refined searches to locate a range of relevant sources, control variables, use repeat trials and replication of experiments with appropriate sample sizes, seek counter-examples or explore proofs to verify truth of propositions)

ELA 19 understands and applies scientific knowledge:

- scientific concepts and models to explain the interdependence of populations of organisms and the environment, and predict the consequences of changes to an ecosystem
- apply scientific knowledge in exploring and constructing views around ethical and social issues relating to science (e.g. genetic modification, stem cell research, animal testing of products, nuclear energy)
- instances in which progress in science can be affected by and influence social issues and priorities (e.g. water purification, alternative energy sources, space exploration, ethics of biotechnology)

ELA 20 acts for an environmentally sustainable future:

- key concepts used in contemporary information and debates about environmental sustainability (e.g. biodiversity, carrying capacity, ecological footprint, preservation, conservation, wilderness, heritage, sustainability, sustainable development)
- events that have significant effects on regional or global ecosystems and describe related environmental, social or economic consequences (e.g. drought, cyclones, bushfires, earthquakes, El Nino, climate change)
- how peoples' views on the environment influence government policy and ways in which governments attempt to address issues of development and sustainability

ELA 21 understands about Australia and Australians:

- analyse theories and arguments, and explain silences and gaps, in accounts of past and current events

Assessment

What evidence will there be that they have learnt?

Identify through discussion their understanding that 70% of water is used in industry, specifically agriculture.

Use ICT to demonstrate their understanding of an international water issue.

Participate in a role-play of the Franklin River debate.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion.

Research and locating sources.

Viewing.

Reading.

Representing ideas in a range of ways.

Contextualising new understandings, values and ideas.

Activity

What is the best vehicle to deliver the learning?

Graphing activities: industry water usage in Australia using resources on the Australian Bureau of Statistics website.

Research task: complete a case study on a major water issue involving water retention, distribution and usage around the world, for example the Three Gorges Dam, Aral Sea, Murray River, Colorado River, Nile River, Zambezi River, the Ganges, water pollution in Bangladesh and West Africa.

Excursion to Old Parliament House to complete Franklin River role plays, or use online unit.

Making Connections

Outcomes

What understandings will my students have at the end of the Making Connections stage?

The need for responsible, safe and sustained supply of water.

Water supply and usage is an issue in all parts of the world.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 2 understands and applies the inquiry process:

- decide on the most suitable methods, including safe use of equipment and selection of suitable technologies, for collecting, managing and analysing data and information, and for communicating findings

ELA 3 makes considered decisions:

- evaluate the role of values and beliefs in decision-making and strengthen their capacity for moral and ethical decisions

ELA 20 acts for an environmentally sustainable future:

- key concepts used in contemporary information and debates about environmental sustainability (e.g. biodiversity, carrying capacity, ecological footprint, preservation, conservation, wilderness, heritage, sustainability, sustainable development)
- apply relevant scientific understandings to form personal views and make responsible and informed decisions about issues concerning sustainability (e.g. salinity, nuclear energy production, land degradation)

Assessment

What evidence will there be that they have learnt?

Self-assess current understandings, values and attitudes.

Write statements of generalisation about water in local, nation and global environmental systems and resource issues.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion.

Synthesising and interpreting.

Reflection and self-assessing.

Feedback, summarising and elaborating on current understandings, values and attitudes

Activity

What is the best vehicle to deliver the learning?

Journal activity: students reflect on their current understandings in either a written or visual journal.

Concept map: construct a concept map or consequence wheel about the safe and sustained supply of water.

Discussion of all inquiry based learning throughout the unit.

Debate: to dam or not to dam?

Revisit and summarise earlier work.

Taking Action

Outcomes

What understandings will my students have at the end of the Taking Actions stage?

Student ability to contribute positively to the conservation of water.

Personal responsibility for sustainable water use in our community.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements).

ELA 3 makes considered decisions:

- make plans and decisions and put them into effect as part of topics, themes or activities across the school's curriculum

ELA 20 acts for an environmentally sustainable future:

- apply relevant scientific understandings to form personal views and make responsible and informed decisions about issues concerning sustainability (e.g. salinity, nuclear energy production, land degradation)
- consider and explain their own decisions about lifestyle choices and participation in social actions for environmental sustainability
- examine examples of individual and global actions to create sustainable futures, assess their strengths and limitations, and propose further appropriate actions.

Assessment

What evidence will there be that they have learnt?

Express why they have a personal responsibility for water conservation.

Develop a personal action plan showing how they can continue to conserve water in their home and school.

Strategy

What is/are the most effective strategy or strategies to teach this?

Personal reflection.

Discussion.

Activity

What is the best vehicle to deliver the learning?

Development of personal action plans: what do my family and I do to conserve water? What else can we do?

Development of a school-based action plan for water conservation. This could include creating posters to raise awareness amongst the school community.

Sharing Discussion and Reflection

Outcomes

What understandings will my students have at the end of the Sharing, Discussion and Reflection stage?

World and local issues concerning water.

Their part in ensuring a safe and sustainable water supply.

Essential Content

What do I want them to have opportunities to learn? (Taken from identified Essential Learning Achievements)

ELA 3 makes considered decisions:

- evaluate the role of values and beliefs in decision-making and strengthen their capacity for moral and ethical decisions

ELA 19 understands and applies scientific knowledge:

- apply scientific knowledge in exploring and constructing views around ethical and social issues relating to science (e.g. genetic modification, stem cell research, animal testing of products, nuclear energy)

ELA 20 acts for an environmentally sustainable future:

- examine examples of individual and global actions to create sustainable futures, assess their strengths and limitations, and propose further appropriate actions

Assessment

What evidence will there be that they have learnt?

Students are able to participate in class discussions, demonstrating their understanding of the issues of water supply and usage.

Present and share journal reflections demonstrating their learning about water issues.

Present their findings on an international water issue to their peers and community.

Students are able to develop questions for in-class test that reflect their knowledge of water supply and use in the ACT.

Strategy

What is/are the most effective strategy or strategies to teach this?

Discussion.

Reflection.

Responding.

Activity

What is the best vehicle to deliver the learning?

Revisit journal and reflect on their learning journey.

End of unit test/quiz with student generated questions.

Students organise a community forum (or exhibitions fair) to share their learning on water issues.

Resources and References

Books and Articles

Barnham, K 2006, *Save Water*, Hodder Wayland, Great Britain

Boehm-Jerome, K 2003, *Protecting the Planet*, Rigby, Port Melbourne

Bowden, R 2006, *Water Supply*, Franklin Watts Australia, Sydney

Cole, J and Degan, B (1996 – 2007), The Magic School Bus Catches a Wave, The Magic School Bus Series, Scholastic Inc, New York

Donegan, L 2001, *Where Are We Going Wrong?* Campaign Earth, User Friendly Resource Enterprises Ltd, Annandale NSW

Gouldthorpe, P and Hathorn, L 1995, *The Wonder Thing.* Viking, Ringwood, Victoria

Jakab, C 2007, *Clean Air and Water, Global Issues,* MacMillan Education Australia Pty Ltd, South Yarra, Victoria

Jarman, M 2006, *The Impact of Big Business*, Franklin Watts Australia, Sydney

Lang, J 2007, *How to Succeed with Education for Sustainability*, Curriculum Corporation, Carlton, Victoria

Our Environment, Topics to Go, 2007, Rigby, Port Melbourne

Rushton, S 2005, *Our Healthy Waterways*, Curriculum Corporation, Carlton, Victoria

Stewart, S 2004, *Save our Earth*, Pearson Education Australia

Winters, B 2000, *Every Drop Counts*, Gould League, Victoria

Websites

ACT Sustainable Schools website - provides excellent links to websites and other resources about water.
http://www.sustainableschools.act.gov.au/water

ACT WasteWater Treatment Plant website http://www.actewagl.com.au/wastewater/treatment/

ACTEWAGL Education Resources website http://www.actewagl.com.au/education/water/default.aspx

Australian Bureau of Statistics (ABS) website http://www.abs.gov.au

BBC news, World Water Crisis website
http://news.bbc.co.uk/hi/english/static/in_depth/world/2000/world_water_crisis/default.stm

Bureau of Meteorology (BOM) website http://www.bom.gov.au

Birrigai Outdoor Education Centre website www.birrigai.act.gov.au

Cooperative Research Centre for Water Quality and Treatment website http://www.waterquality.crc.org.au

Landcare Australia website http://www.landcareonline.com/

LUAC Three Level Guide; Glossary Activity website http://www.decs.act.gov.au/schools/pdf/luachandbook.pdf

Old Parliament House Franklin River Classroom Program website http://www.oph.gov.au/content.asp?pageID=228

Ollie's Island and Ollie Saves the Planet website http://www.olliesworld.com/

Scholastic's The Magic School Bus books website http://www.scholastic.com/magicschoolbus/books/tvtiein/more3.htm

The National Capital Authority⋯›Educational and Understanding⋯› Capital facts
http://www.nationalcapital.gov.au/education_and_understanding/factsheets/ngunnawal_country.asp

Waterwatch Australia website http://www.waterwatch.org.au/index.html

CD-ROMs, DVDs, Videos, Kits, and Posters

Ollie's World Series

Ollie Saves the Planet 2002, CD-ROM, Sustain Ability International Pty Ltd, Camberwell, Victoria
Ollie's Island 2007, CD-ROM, Sustain Ability International Pty Ltd, Camberwell, Victoria

The Magic School Bus Series

The Magic School Bus, Wet All Over (1996 – 2001), Television program, Scholastic Inc, New York
The Magic School Bus, catches a wave (1996 – 2001), DVD, Scholastic Inc, New York

Glossary

algae Plants that contain chlorophyll and float freely in water. Seaweed is a form of algae.

atom The smallest particle of a chemical element.

bacteria Microscopic one-celled life forms that live in colonies.

borehole A deep hole dug or drilled to reach water stored beneath the ground.

billabong A small, permanent wetland formed when a stream changes its course.

biodegradable Able to decompose or rot or to be broken down naturally.

catchment A geographical area where water is collected by the natural landscape.

clarification To remove impurities from a liquid.

coagulation A process for purifying water in water treatment.

condensation When vapour particles come together to form droplets of water.

conservation Protection from unnecessary change, loss or injury.

contaminate To make impure, unclean, or unfit for use through contact or addition.

contamination The act of making something unclean or polluted, such as when chemicals are poured into a water supply.

dam A strong wall built across a river valley to hold the water back.

desalination The process of removing the salt from saline water in order to produce fresh water that is suitable for human consumption.

disinfection Disinfectants are antimicrobial agents that are applied to non-living objects to destroy microorganisms, the process of which is known as disinfection.

domestic wastewater Municipal or domestic wastewater is the sewage generated from residences, institutions, commercial or industrial establishments. The wastewater flows in sewer collection lines to a sewage treatment plant, where it is treated prior to discharge.

droplet A tiny amount of liquid.

effluent Liquid waste, usually from urban, industrial or agricultural areas.

environment The word 'environment' means 'home'. Earth is our home planet and provides all the necessary requirements for life.

erosion The removal of soil or rock by the forces of wind, waves, ice and rain.

evaporation The change of a liquid such as water to vapour.

filtration To filter liquid.

flushed To wash away with water.

flocculation Flocculants, or flocculating agents, are chemicals that promote flocculation by causing colloids and other suspended particles in liquids to aggregate, forming a floc. Flocculants are used in water treatment processes to improve the sedimentation or filterability of small particles. For example, a flocculant may be used in swimming pool or drinking water filtration to aid removal of microscopic particles which would otherwise cause the water to be cloudy and which would be difficult or impossible to remove by filtration alone.

herbicides Chemicals used to kill unwanted plants such as weeds.

hydrology The study of water.

industrial wastewater The manufacture of products requires vast amounts of water. The resulting water is often contaminated with harmful chemicals.

infiltration The process by which water passes through a porous material such as soil, sand, gravel or rock.

irrigation Irrigation is the artificial application of water to the soil usually for assisting in growing crops. In crop production it is mainly used to replace missing rainfall in periods of drought, but also to protect plants against frost.

lagoon Any small, pondlike body of water

macro-invertebrate Macro-invertebrates are animals that are visible with the naked eye (macro) and are without a backbone (invertebrates). They help us to find out about the health of a waterway. They are very sensitive animals, living in the waterway for up to a year.

nutrient A substance that provides living things with nourishment.

pollute To make unclean, foul or unhealthy.

precipitation All forms of water in the atmosphere that falls to the ground.

pump A pump is a device used to move liquids or slurries. A pump moves liquids from lower pressure to higher pressure, and overcomes this difference in pressure by adding energy to the system (such as a water system).

recycled To reprocess something already used into something for further use.

Glossary

reservoir A human-made lake.

riparian area A riparian zone is the area between land and a flowing surface water body. Plant communities along the river margins are called riparian vegetation, characterized by hydrophilic plants. Riparian zones are significant in ecology, environmental management, and civil engineering due to their role in soil conservation, their biodiversity, and the influence they have on aquatic ecosystems. Riparian zones occur in many forms including grassland, woodland, wetland or even non-vegetative. In some regions the terms riparian woodland, riparian forest, riparian buffer zone or riparian strip are used to characterize a riparian zone. The word "riparian" is derived from Latin ripa, meaning river bank.

river A river is a natural waterway that transits water through a landscape from higher to lower elevations. It is an integral component of the water cycle. The water within a river is generally collected from precipitation through surface runoff, groundwater recharge (as seen at baseflow conditions / during periods of lack of precipitation) and release of stored water in natural reservoirs, such as a glacier.

sediment Material such as sand or soil that settles out or is left behind by water.

septic tank A septic tank, the key component of a septic system, is a small scale sewage treatment system common in areas with no connection to main sewerage pipes provided by private corporations or local governments.

sewage Wastewater that is taken from inside a building through sewer pipes to a sewerage treatment plant.

sewerage plant A place where dirty waste water is cleaned.

silt Sediment of soil and sand that settles out or is left behind by water.

sprinkler A device for irrigation of lawns or crops.

stormwater Rainwater from rooves, streets, etc that goes down drains into waterways

sustainability The quest for a sustainable society; one than can persist over generations without destroying the social and life-supporting systems that current and future generations of humans (and all other species on Earth) depend on.

transpiration Transpiration is the evaporation of water from plants. It occurs on the leaves while the stomata are open for the passage of CO_2 and O_2 during photosynthesis.

treatment facilities Water treatment plant and system operators treat water so that it is safe to drink. Liquid waste treatment plant and system operators, also known as wastewater treatment plant and system operators, remove harmful pollutants from domestic and industrial liquid waste so that it is safe to return to the environment.

urban An urban area is an area with an increased density of human-created structures in comparison to the areas surrounding it. This term is at one end of the spectrum of suburban and rural areas. An urban area is more frequently called a city or town.

urban design Urban design concerns the arrangement, appearance and functionality of towns and cities, and in particular the shaping and uses of urban public space.

wastewater Dirty or discarded water.

water Water is the chemical substance with chemical formula H_2O: one molecule of water has two hydrogen atoms covalently bonded to a single oxygen atom. Water is a tasteless, odorless liquid at ambient temperature and pressure, and appears colorless in small quantities, although it has its own intrinsic very light blue hue.

water butt/tank A large barrel that catches rainwater.

water cycle How water moves around the world.

water quality Water quality is commonly defined by its physical, chemical, biological and aesthetic (appearance and smell) characteristics. A healthy environment is one in which the water quality supports a rich and varied community of organisms and protects public health.

water vapour Tiny droplets of water in the air.

wetland A land habitat in which the presence of water for all or most of the year is a dominant feature.