

Year 4

Lesson 3

What we drink comes back

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Learning objectives

Students will be able to:

- recognise that all water is continually recycled and that treatment is important to maintain quality
- understand the potential impacts of incorrect disposal of materials in sinks and drains
- undertake experiments to filter water samples.

Learning outcomes

Subject	Strand & content descriptors
Science	<p>Science understanding:</p> <ul style="list-style-type: none"> • Living things, including plants and animals, depend on each other and the environment to survive. (ACSSU073) <p>Science as human endeavour</p> <ul style="list-style-type: none"> • Science knowledge helps people to understand the effect of their actions. (ACSHE062) <p>Science inquiry skills</p> <ul style="list-style-type: none"> • With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge. (ACSIS064) • Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate. (ACSIS066) • Compare results with predictions, suggesting possible reasons for findings. (ACSIS216)
English	<p>Literacy</p> <ul style="list-style-type: none"> • Plan, draft and publish imaginative, informative and persuasive texts, containing key information and supporting details for a widening range of audiences, demonstrating increasing control over text structures and language features. (ACELY1694) • Use a range of software including word processing programs to construct, edit and publish written text, and select, edit and place visual, print and audio elements. (ACELY1697)

Important questions

- What happens to water flushed down the toilet or drained from the sink?
- Why is it important to treat water before pumping it to the ocean?
- What role does filtration play in maintaining water quality?



Background information – caring for our water

When we have finished using water we simply dispose of it, flush the toilet or pull the plug. We rarely consider where it goes or what happens to it. Treating and disposing of wastewater (or sewage) is a critical consideration for all communities. Inadequate treatment can cause environmental harm by introducing nutrients, heavy metals and other pollutants into waterways. Additionally, human health may be impacted through the distribution of pathogens and bacteria.

How Is Wastewater Treated?

Wastewater is typically treated through a series of five major steps followed by processes to reuse or to dispose of the remaining products. This treatment requires an intricate balance of physical, biological, and chemical processes. They include:

- Preliminary Treatment includes screening to remove large objects (such as sticks, rags, leaves, and trash) and the settling of grit (heavy, sandy, abrasive matter). The material is collected and discarded, and the remaining flow moves on to primary treatment.
- Primary Treatment involves the reduction of the wastewater flow to remove easily settleable and floatable solids using primary tanks known as primary clarifiers. Solids removed from this process are often sent to the solids handling portion of the plant.
- Secondary Treatment is designed to grow naturally occurring microorganisms to digest organic material, sometimes remove nutrients, and then to settle to the bottom of a secondary sedimentation basin. After secondary treatment, 85% to 90% of solids have been removed from the wastewater.
- Tertiary (or Advanced) Treatment is used to improve the quality of the water even more, especially if the plant's permit requires more stringent effluent limits. Usually this entails lower effluent solids and nutrients, such as nitrogen and phosphorus levels.
- Disinfection destroys pathogenic organisms (bugs) in the effluent before it is discharged into the receiving water body to help protect the public from exposure to pathogens (harmful bugs). Alternatives for disinfection include exposure to ultraviolet light, and the infusion of ozone.
- Solids handling involves the treatment of the solids removed from the wastewater treatment processes for beneficial use or to be made acceptable for landfills.

Important: Wastewater is often confused with stormwater.

Stormwater is rainfall runoff or water used in homes and businesses – hosing litter from a driveway – that runs into the gutters.

Wastewater is contained and travels directly to wastewater treatment plants.

Linking locally

Most wastewater in Logan City is converted to treated effluent and discharged to the Logan River (Loganholme) and the Albert River (Beenleigh).



Logan City has four wastewater treatment plants:

- Loganholme wastewater treatment plant (discharges to the Logan River);
- Beenleigh wastewater treatment plant (discharges to the Albert River and to customers in the Gold Coast region);
- Jimboomba wastewater treatment plant (discharges to irrigation of Golf club)
- Flagstone wastewater treatment plant (discharges to irrigation)

The Beenleigh wastewater treatment plant supplies recycled water to recycled water carriers via its filling stations and fixed site customers in the Gold Coast district, mainly horticultural industries.

Lesson plan – What we drink comes back

Ask students a series of questions to gauge their understanding of the natural water cycle and the way water is collected, cleaned and transported within your community. For example:

- Could the water you brushed your teeth with this morning and the water you swam in at the beach in the holidays be the same?
- What happens to the water, soap and dirt that flow down the shower plug?
- How does the water from the ocean become water in the dam?

Use **Activity sheet 1 'The water cycle'** if necessary.

In small groups asks students to identify how water is used in the house and what happens to the water during this process; for example water used in showers, sinks and washing machines goes down the drain; water used to wash the car may flow to the street drain or soak into the ground; some of the water in the swimming pool may evaporate.

Discuss what happens to the water that 'disappears' down the plughole. Differentiate between stormwater and wastewater.

Ask students to identify the impact of untreated stormwater entering waterways and oceans. Use the poster 'Our urban watercycle' to assist.

Make a Water Filter

Make two samples of dirty water in clear containers, showing the students the different types and particle size of the materials; for example: fine dirt or sand; leaves or grass clippings; small pieces of plastic litter. Food colouring to represent oil or other liquids or a squirt of dishwashing liquid to represent run off from car cleaning can also be added.

Students undertake research and planning to design a working filter that will remove contaminants from the water samples. This should include identification of:

Materials to make the filter body (e.g. soft drink bottle or other plastic container).
Filtering mediums (e.g. chux cloths; filter papers; sand/gravel).



Filter construction (including explanation of filter layers and expectations of what will be trapped in each layer).

Introducing a range of filtering tools, a funnel, colander and a fine strainer for example, and asking students to predict what type of materials would be trapped by each of the filters and why will it assist in the planning process.

Students then make predictions as to the effectiveness of their filter and the expected improvement in quality of the water sample.

Students undertake filtering and compare their results with predictions. Students present their findings using appropriate terminology and graphical support, noting how factors such as the speed or volume of water and the configuration or condition of filter layers and materials affected the process.

Resource requirements

- Activity sheet 1 'The water cycle'.
- Poster – 'Our urban watercycle'.
- Water samples.
- Various filter materials as identified (for example: filter papers; chux cloths, cotton wool, sand, aquarium gravel or similar).
- Filter containers (for example soft drink bottles or plastic containers).

Additional activities

English: Treat your pipes right! Putting the wrong things down the toilet, sink or drain can block and damage pipes causing sewage overflows. They also cause problems in wastewater treatment plants causing blockages and increasing maintenance costs.

Kitchen: Scrape food stuff into the bin before washing, don't put coffee grounds down the sink, use a sink strainer to catch small items and put these in the bin.

Allow fat or oil in trays or dishes to cool and harden and then wipe with kitchen paper and dispose of in the bin.

Bathroom: Only toilet paper and human waste should go down the toilet – no face wipes, cotton buds or band aids. Always keep a bin in the bathroom.

Ask students what items should not go down the drain and practices to reduce blockages in pipes.

Students plan and publish a text, using suitable software and associated aspects, to a selected audience (their household; school community; the general public) to encourage correct disposal behaviours.