Activities in Section 5

Introduction

The water quality of the local waterway will be affected by human activities within the catchment. Chemicals, sediment, sewage, litter and fertilisers enter the waterway through stormwater runoff. The following activities involve students in investigating where these pollutants come from - at home, at school and the community.

Stage 5A3 HSIE Outcomes

5.9 Applies geographical knowledge, understanding and skills to demonstrate active and informed citizenship.

There are also links to
Fieldwork task for water or coastal management (Group A) - investigate spatial and ecological dimensions.
and Senior Geography Project (Year 11)

Keywords

pesticides ~ toxic ~ chemical ~ organic ~ chemical

Background to Activities

The activities in Section 5 involve students in investigating the various sources of stormwater pollution: in the home, the school and the local community.

Activity 5.1 – Home Environment Checklist
The home survey can be used to identify ways in which our homes could be contributing to stormwater pollution. This activity is an ideal homework assignment.

Activity 5.2 – Chemicals in the Home
This activity extends the work undertaken in Activity 5.1 to include an audit of chemicals stored in the home.

Activity 5.3 – School Drain Mapping
This activity involves students in preparing a map of the location of school stormwater drains and investigates where these drains flow to.

Activity 5.4 – School Pollution Checklist
This activity involves students in conducting a survey of school operations to identify potential sources of stormwater pollution.

Activity 5.5 – Community Survey
This activity involves students in developing a survey of the local community to identify potential sources of stormwater pollution.

Each of these activities are presented on a separate page

Activity 5.1 – Home Environment Checklist

Investigate the impact that your home may be having on the environment by completing this quiz. The higher the number of 'yes' responses – the better you are at preventing pollution.

Table 5.1 – Home Environment Checklist

Issue	Action	Yes	No
Water use	Water consumption/person/year =		
	Water saving devices are fitted to shower and toilet.		
	Leaking taps are promptly repaired.		
	Showers are kept to 3 minutes.		
	Low water use appliances (dishwasher/washing machine) are used.		
Energy use	Electricity consumption/person/year =		
	Energy saving lights are installed in all fittings.		
	All household appliances have AAA energy rating.		
	Use of heaters and dryers is minimised.		
	Ceiling and wall insulation is installed.		
	Cold water washing of clothes.		
	Solar hot water system is installed.		
	Low energy rating appliances are used.		
	'Green Power' is used for energy supply (renewable energy).		
Transport	Car use (km travelled/person/year =		
	Car use is minimised.		
	Bike or walking is used for local transport.		
	Public transport is our preferred option for travel.		
Kitchen	Food waste is composted.		
	Reusable shopping bags are used (cloth, heavy duty plastic).		
	Organic products are used whenever possible.		
	Australian grown products are used when possible.		
	When we buy take away food we take our own containers.		
Cleaning	Outdoor surfaces are kept clean by sweeping with a broom.		
	When outdoor surfaces are cleaned with a hose, no run-off escapes to the stormwater drains.		
	Least toxic alternatives are always used.		
	Paint brushes are cleaned away from stormwater drains and contaminated water is poured onto the garden or lawn.		
	Roadside gutters are regularly swept clean. Leaves etc are composted.		
Car maintenance	Car servicing is conducted at a reputable centre that implements best environmental practice or at home where drains are protected.		
	Car is washed at a car wash that recycles water and protects stormwater system or on the grass at home (no suds run to stormwater drains).		
	Used oil is recycled.		
	Car is kept well tuned to minimise air pollution.		

Garden	Garden waste is composted or mulched.		
	Water use minimised by mulching gardens.		
	Fertiliser use is minimised by using compost.		
	Pesticide use is avoided.		
	Least toxic alternatives are always used.		
	Rainwater tanks are installed and used for watering garden.		
	Mostly Australian native plants are used.		
	Area of paved and hard surfaces kept to a minimum.		
	Run-off from paved surfaces is channelled into gardens or tanks for re-use.		
Clothing	Clothing is purchased according to need rather than fashion.		
	Organic cotton, hemp or recycled clothing is used whenever possible.		
	Locally made clothing is used whenever possible.		
Renovations	Recycled or re-used materials are selected where possible.		
	Least toxic paints, floor sealers are used.		
	Builders implement effective sediment control measures.		
	Building waste is minimised or reused on-site.		

Discussion

- Compare water use, energy use and car use across the class.
- Make a list of activities your home could undertake to reduce environmental impact.

Water use – Reducing water use is an important step to take to protect waterways. Reduced water use means less sewage is generated and fewer dams are needed to provide water supplies.

Energy use – By reducing household energy use and converting to green power, air pollution is reduced, the impact of the 'Greenhouse Effect' and climate change is reduced. In addition air pollutants such as carbon dioxide dissolve in rain and wash into waterways through the stormwater.

Transport – It may surprise you that stormwater run-off from roads is contaminated with lead from fuel, oil, grease, brake linings and other toxic by-products of car driving. By minimising your family car usage, you are also reducing stormwater pollution as well as reducing the impacts of the 'Greenhouse Effect' and climate change.

Kitchen – Reducing solid waste and packaging will reduce the quantity of litter that enters the stormwater system. Buying organic products will reduce the amount of pesticides entering waterways.

Cleaning – Using a hose to clean outdoor surfaces can contaminate stormwater. Using a broom and keeping your street gutter free of leaves and dirt will greatly reduce stormwater pollution. Hosing down driveways and footpaths so that the run-off enters the stormwater system is against the law under the POEO Act.

Car maintenance – Keeping your car well tuned will reduce the risk of oil and grease dripping onto the road. Wash your car on the grass or at a reputable car wash to avoid suds polluting stormwater. If you change your own oil, recycle the used oil to ensure it doesn't end up down the drain. When choosing a car repairer, go to one that has good pollution prevention practices. If not sure, ask how they prevent stormwater pollution.

Garden – Avoiding using fertiliser and pesticides to reduce stormwater pollution. Composting food and garden waste and mulching gardens also helps to reduce stormwater pollution and water use. Some garden plants shed seeds which enter the stormwater system and cause weeds to grow along creek banks and bushland. Native plants need less water, no fertiliser and will encourage birds and other wildlife to come to your garden.

Clothing – Buying locally made clothes will reduce the pollution caused by transporting goods across the country. Using clothes made from hemp and organic cotton will reduce pollution of rivers.

Renovations – When building or renovating, make sure that your builder knows how to prevent stormwater pollution. Correctly installed and maintained sediment fences, maintaining vegetation cover during construction to minimise bare earth and early connection of stormwater pipes will help.

Activity 5.2 – Chemicals in the Home

Ask your parents to help you go through your cupboards and identify what chemicals you have in your home. Read the labels to identify if the bottle is potentially hazardous. (Refer to Table 5.3 for hazard information). Count how many containers of hazardous chemical are present.

Table 5.2: What chemicals are in your cupboards?

ROOM	CHEMICAL	HAZARD RATING	NUMBER OF CONTAINERS
KITCHEN	oven cleaner		
	floor cleaner and wax		
	disinfectant		
	ammonia		
	scouring powder		
	bleach		
	other		
	Total containers		
LAUNDRY	carpet cleaner		
	furniture polish		
	air freshener		
	bleach		
	stain remover		
	detergent		
	other		
	Total containers		
GARDEN	weed killer		
	insecticide		
	fertiliser		
	other		
	Total containers		
BATHROOM	tub/tile cleaner		
	drain cleaner		
	toilet cleaner		
	medicine		
	other		
	Total containers		
GARAGE	paint		
	varnish		
	glue		
	paint thinner		
	furniture stripper		
	wood preservative		
	oil and petrol		
	antifreeze		
	rat poison		
	pool chemicals		
	other		
	Total containers		
Total number of containers of hazardous chemicals in your home:			
(a) Class total number of containers: _____ (a)			
(b) Number of households surveyed in class: _____ (b)			
(c) Average number of hazardous materials per household: _____ (a/b)			
(e) Estimate of hazardous chemicals in local catchment area: _____ *(number of homes x c)*			

Table 5.3: Can household products harm you?

TOXICITY RATING	LETHAL DOSE FOR 70 KG HUMAN	HOUSEHOLD PRODUCTS
Practically non-toxic	More than 1 litre	Food, candy, lead pencils, eye makeup
Slightly toxic	500 mL to 1 litre	Dry cell batteries, glass cleaner, deodorants, soap
CAUTION: Moderately toxic	20 mL to 500 mL	Antifreeze, automotive cleaners, bleach, detergents, dry cleaners, oven cleaner, general cleaners, fuels, lubricating oils, stain removers, disinfectants, floor polish, shoe polish, paint
WARNING: Very toxic	5 mL to 20 mL	Toilet cleaners, engine cleaners, fertilisers, paint brush cleaner, paint and varnish remover, fireworks, mildew proofing, air sanitiser, lacquer thinner, pesticides, DDT, chlordane, heptachlor, lindane, mirex, diazon, malathion, 2-4D
DANGER: Extremely toxic	1 drop to 5 mL	Some insecticides, fungicides, rodenticides, herbicides, aldrin, eldrin, bidrin, paraquat, some fertiliser and mercury batteries
DANGER: SUPER TOXIC		A few pesticides like: paroxon, phosdrin, parathion, isobenzan, pyrazoyan

Table 5.4: Non-toxic alternatives to toxic household cleaning products

CLEANING PRODUCT	NON–TOXIC ALTERNATIVE
Bleach	Oxygen bleaches, sun-bleaching of clothes *Key question*: Is protecting the environment more important than bright white clothes?
Deodorisers	An open box of baking soda, herbal arrangements, cedar chips, cinnamon and cloves
Drain cleaners	Using a plunger, followed by ¼ cup of baking soda and ½ cup of vinegar. Allow to sit for 15 minutes, then rinse with boiling water. Mechanical methods can also be used – one method involves using a long metal rod called an 'eel'. The best alternative is prevention, particularly hair removal and by inserting a screen in the drain to catch material before it enters the drain.
Dusting	Use ¼ cup of white vinegar in two litres of water. Apply using a soft cloth.
Furniture polish	Rub with 20 mL of lemon oil mixed in 500 mL of mineral oil.
Glass cleaner	Use 2 tablespoons of vinegar in 1 litre of water.
Mildew stain remover	Use ½ cup vinegar mixed with 1 litre of warm water.
Spot cleaning carpets	Apply soda water immediately to any spill, blot dry and repeat. Sprinkle with corn flour and vacuum after 30 minutes.
Toilet cleaner	Use baking soda or vinegar.
Pesticide	Herbal sprays and companion planting. Plant native species.
Fertilisers	Use composted food and vegetable waste to maintain soil fertility.

From Activity 5.2, you may have found dangerous chemicals in your cupboard that your family wishes to dispose of safely.

Do not place dangerous chemicals in your usual garbage collection.
These chemicals cannot be disposed of in the normal waste stream because they are toxic. Special precautions have to be made to dispose of them in special 'secure' landfill sites.

Sydney Water and Waste Service NSW have household chemical collection days once a year. To find out the next collection day, call 1800 814 719 or your local council.

The table below lists chemicals that can be safely recycled or disposed of at Kimbriki Waste Management Centre at Mona Vale Road, Terry Hills.

Table 5.5: Safe disposal of household chemicals

Chemical	**Safe Method of Disposal**
• Sump oil	Quantities of up to 20 litres can be disposed of at your local Waste Management Centre. This oil is collected and recycled.
• Paint • Paint solvents (turpentine, kerosene, white spirit and thinners) • Household cleaners (polish, oven cleaners and aerosols) • Lubricating grease	Quantities of up to 20 litres or 20 kg can be taken to local Waste Management Centre. Tip paints into minimum number of tins.
Other liquid wastes and chemicals including: • garden chemicals (weed killer, pesticides, herbicides, rat poison) • medicines • petrol/lawnmower fuels • pool chemicals • solvents • acids and alkalis • unknown chemicals	These chemicals are NOT accepted at local Waste Management Centres. They need to be disposed of in secure landfill. Contact free call 1800 814 719 for information about Household Chemical Collection Days. For more information on waste minimisation and solid waste disposal please contact: Waste Service NSW Phone 1300 651 116 Fax (02) 9934 7185 Email info@wasteservice.nsw.gov.au Website: www.wasteservice.nsw.gov.au For school project info phone (02) 9934 7022

TO REDUCE CHEMICAL WASTE

- Use less hazardous alternatives – ask your local hardware for advice.
- Buy only the quantity that you need.
- Ask neighbours or friends to use leftover chemicals such as pool chlorine or turpentine.

FOR MORE INFORMATION:

Total Environment Centre
Level 2, 362 Kent Street, SYDNEY NSW 2000
Phone 9299 5599 Fax 9299 4411
Email: toencen@magna.com.au
Website: www.tec.ncc.nsw.org.au

The Clean House Effect (Planet Ark Shop)
445 King Street, Newtown NSW 2042
Phone 9516 4681 Fax 9516 3862

Activity 5.3 – Mapping the School Drains

You will need

- A map of the school playground showing the layout of buildings, playgrounds and streets.
- Optional: Fluorescein dye for mapping stormwater system (available from APS Colours, 8 Abbott Road, Seven Hills, NSW 2147. Phone (02) 9839 4000)

Pre-Work

Review environmental legislation (POEO Act) and Section 3: Stormwater and Sewage.

What to do

1. Conduct the survey as a whole class or form small teams of students.
2. Walk around the school grounds and street, noting the location of stormwater drains and potential sources of pollution.
3. Mark on the map the following features:
   - Location of stormwater drains in street gutters
   - Location of stormwater drains in the school yard
   - Gradient of the street and school yard, showing the direction of water flow towards the stormwater drains
4. Note the condition of the drains.
   - Are they clogged with leaves or litter?
   - Is there any sediment or mud entering the drain?
   - Are there any signs of other pollutants entering the stormwater system?
   - Can you see any potential pollutants on the street or in the school yard? (Look for things that could wash into the stormwater system if it rained.)
5. Note any potential pollution sources on your map.
6. Trace the stormwater drains back up to their source. If buildings are elevated, check under them to see whether the drains are connected to the stormwater or sewerage system.
7. Where do the stormwater drains flow to? (Your school principal or local council may be able to help with maps of the stormwater system).
8. You can actually test where the stormwater drains run by using fluorescein dye or different coloured ping pong balls. Place the dye or balls into a stormwater or drain inlet and trace where it comes out. (Be sure to collect the ping pong balls afterwards). *(When students from Brookvale Primary School mapped their stormwater drains, they were shocked to discover that the drain from their art and craft centre was connected to the stormwater system. Every time they washed their brushes and paints off they were polluting the local creek! They have since closed off the drains and wash their equipment in buckets which are tipped out on the garden.)*
9. Check the down pipe connection from school buildings. Are the gutters and downpipes connected to the stormwater system (as they should be) or to the sewerage system (which is illegal). Again some fluoresceine dye will tell you where the gutters are connected.
10. Mark all of the above on your school map.
11. Back in the classroom, discuss the following questions:
    (a) What would be the impact on the local creek if litter, leaves, sediment or other pollutants are entering the stormwater drains around the school?
    (b) What would be the impact if roof gutters were connected to the sewerage system?

    (Refer to Section 3 – Sewage and Stormwater for more background information about these impacts).

Activity 5.4 – School Stormwater Pollution Checklist

To investigate the ways in which the school may be contributing to stormwater pollution, divide the class into research teams. Each team can be allocated a portion of school activities to survey. The checklist will help to identify potential risk areas in the day-to-day operation of the school. The school cleaner and principal will be important sources of information.

1. School Grounds and Outdoor Surfaces

	Yes	No
(a) Outdoor surfaces are cleaned using a broom, vacuum or shovel (never hosed).		
(b) Sweepings are properly disposed of away from stormwater drains.		
(c) Run-off from graffiti cleaning is prevented from entering the stormwater drains.		
(d) School gardens are planted with local native plants.		
(e) School gardens are mulched to reduce water use.		

2. Maintaining Stormwater Drains

	Yes	No
(a) Garbage is covered and stored in an area where it cannot contaminate or pollute the stormwater drain during rain.		
(b) Spill clean up kits are kept on site and maintained.		
(c) Stormwater drains are kept free of litter, leaves and dirt.		

3. Handling and Storing Materials

	Yes	No
(a) Containers awaiting recycling or disposal are covered and properly labelled as to their contents.		
(b) Materials are handled carefully and the school is kept orderly to prevent spills.		
(c) Containers for storage of liquids are kept well away from stormwater drains and in properly covered and bunded areas.		
(d) Delivery areas are bunded to prevent possible contamination from spills and breakages occurring during transfer of goods.		
(e) Dumpsters and other waste containers are kept covered.		

4. Managing Wastes – List the kinds of waste that your school generates

Type of Waste	***Hazardous***	***Recycled***	How has the school reduced waste?

5. Education

	Yes	No
(a) School stormwater drains are clearly marked with a suitable sign e.g. 'This Drain is Only for Rain'.		
(b) Site signs are used to remind staff and students of ways to avoid pollution in the school.		
(c) School pollution prevention practices are publicised by the school.		
(d) The school community is educated about water quality, waste management and procedures for preventing pollution.		
(e) The school community is encouraged to attend workshops or have other continuing environmental management training.		

6. Protecting the Environment

	Yes	No
(a) When choosing products for use in your school, the most environmentally friendly product is always used.		
(b) Your school follows best environmental practice through all stages from purchasing through to minimisation and recycling of waste (whole life cycle).		
(c) Your school is actively involved in caring for the local environment.		

7. Stormwater Management

	Yes	No
(a) A spill prevention and clean-up plan has been developed by the school.		
(b) Appropriate spill clean-up equipment is kept on site.		
(c) The school community is familiar with the clean-up plan and know how to respond promptly to a spill.		
(d) When undertaking building and renovation work within the school, contractors ensure appropriate measures are taken to prevent stormwater pollution (e.g. installing sediment fencing).		
(e) The school community is aware of the school's commitment to protecting the environment.		
(f) The school community is aware of current environmental legislation.		

8. Identify School Risks

From the checklist, identify the areas of risk in the school operations. Make a list of the issues of concern. (Any 'no' responses indicate a potential pollution risk.)

Activity 5.5 – Community Pollution Survey

- Refer to the EPA *Who Cares about the Environment?* survey for further ideas about survey questions.
- Develop and conduct a survey (knowledge, attitudes, behaviour).
- Analyse results of survey and report to the school community, parents, local media, local government.

What to do

1. Brainstorm a list of different types of land use in the catchment. (e.g. industry, commercial, residential, sporting fields, market gardens, public gardens and parks, schools etc).
2. Brainstorm a list of issues that are impacting on the water quality of your local waterway.
3. Brainstorm a list of behaviours that would contribute to this pollution.
4. Suggest reasons for these environmental behaviours.
5. Suggest alternative environmentally appropriate behaviours.
6. From the above information, have students develop potential questions that could be asked to investigate:
   - knowledge (what people know about the local environment)
   - attitudes (what people think about different environmental issues)
   - behaviours (what people are actually doing to damage or protect the environment)

   Question types could be closed (e.g. yes/no, true/false) or open (invite comment).

   For example what kind of liquids are used by a company in its day-to-day operations? How are these chemicals stored and transported?
7. As a class, decide who will be surveyed and the most appropriate questions for your survey.
8. Conduct the survey
9. Compile and report on survey results by analysing the results and reporting on key findings:
   - For closed questions, have students tally the responses for each category and show their results as a percentage (table and/or graph).
   - For open response questions, categorise key words responses and collate survey responses.
10. Ask students to analyse the results. (e.g. describe and summarise results; suggest reasons for the findings).
11. Make a list of potential pollution sources. (These may be actual pollutants used by a business or it may be an attitude or lack of knowledge that is the problem.)

(On the following pages is an example of a community survey. This survey is used by school students to investigate stormwater pollution issues in local industrial areas as part of Oz GREEN's 'kids, companies and creeks' project.)

Questions 2, 4, 12 and 13 investigate stormwater knowledge.

Question 3 investigates attitudes.

Questions 5, 6, 7, 8, 9 and 11 investigate behaviour.

Sample Community Survey

Name: _____

Address: _____

Phone: _____ Fax: _____ Interviewee name: _____

1. **What do you do in the catchment?** (Circle appropriate responses)

   1. Resident 2. Industry 3. Auto services 4. Food/catering 5. Warehouse

   6. Building supplies 7. Retail 8. Engineering/manufacturing 9. Chemical

   10. Printing 11. Commercial 12. Other_____

2. Are the following statements true or false?	**True/False**
(a) The stormwater drain in the street runs into the local creek.	
(b) The best way to clean up an oil spill is to scrub it with detergent and hose it off to the gutter.	
(c) Stormwater from the gutters goes to the sewage treatment plant for treatment.	
(d) When it rains the sewage system leaks and overflows into our local creek.	
(e) It is safe to swim at the beach after rain.	

3. What do you see as the underlying causes of pollution in our local waterways?	**Agree**	**Don't agree**
(a) Lack of education – people don't know how to protect local waterways.		
(b) Pollution prevention practices cost too much for businesses to afford.		
(c) People don't really care what happens to the local environment.		
(d) Environmental protection laws are not enforced by the government or council.		
(e) Other		

4. **Do you know where the stormwater drain from your place goes?** ☐ Yes ☐ No

5. **How does your company clean equipment and work areas?** _____

6. **How does your company manage spills and accidental pollution on site?**

   _____

7. **How does your company prepare staff to ensure they know how to prevent pollution?** _____

8. **Does your company have any pollution management plans or methods?** ☐ Yes ☐ No

9. How does your company currently dispose of waste?

Glass _____ Food _____ Paper _____

Metal _____ Waste oil _____ Chemicals _____

Waste water _____ Garden waste _____ Other (specify) _____

_____

10. Are any of the following materials used as part of your business?

☐ Oil/grease	☐ De-greaser	☐ Paint/thinner/resin
☐ Dyes/inks	☐ Sand/earth/gravel	☐ Detergent/soap/cleaning fluids
☐ Acids/alkalis/chemicals	☐ Cement	☐ Photographic chemicals
☐ Food products	☐ Fertiliser	☐ Packaging

☐ Other _____

11. In the past two years has your company:	**Yes or No**
• been visited by staff from Council or NSW EPA offering help on pollution prevention?	
• decided for environmental reasons to re-use or recycle wastes instead of throwing them away?	
• stopped cleaning up by hosing out factory floor?	
• installed stormwater pollution prevention signs in the workplace (e.g. drain stencils)?	
• conducted on site training for staff in pollution prevention?	
• involved staff in preparing pollution prevention plans for our business?	
• installed pollution prevention devices such as bunding drains, waste water collection pit?	

12. Are you aware of current environmental legislation relating to water pollution? ☐ Yes ☐ No

12. Are you aware that it is illegal to allow any materials to enter the stormwater? ☐ Yes ☐ No

13. Are you aware that your company can be fined by Council and EPA officers if you cause water pollution?
☐ Yes ☐ No

How much can these fines be? _____

14. Comment

_____

_____

_____