Biophysical Interactions

Checking the pulse of the Hawkesbury River

Name _____

Google site

https://sites.google.com/education.nsw.gov.au/stage-6-geography/home

Outcomes

Senior Geography
Outcomes

P2 describes the interactions between the four components which define the biophysical environment

P3 explains how a specific environment functions in terms of biophysical factors

P6 identifies the vocational relevance of geographical perspective

P8 selects, organises and analyses relevant geographical information from a variety of sources

P9 uses maps, graphs and statistics, photographs and fieldwork to conduct geographical inquiries

P10 applies mathematical ideas and techniques to analyse geographical data

Health and safety issues

As you are working out in the field you need to be aware that:

- Ground materials can be slippery
- Edges of the river can be quite deep and muddy
- Some animals can deliver painful or venomous bites

Kayaking

- PFD supplied by Brewongle EEC must be worn at all times while in the water
- Old, enclosed shoes must be worn in the water and kayaks
- You need to bring a change of clothes, footwear, hat, towel, water bottle and sunscreen
- Appropriate behaviour at all times and follow safety instructions

Investigation task

Sydney Water has requested a detailed assessment and report on the current ecological status of the river and adjacent land in the Sackville Reach. This report will inform future decision making regarding water entitlements and provide a basis from which ecosystem rehabilitation can begin. The report will require a detailed assessment of the following areas:

- Water quality (hydrological and physio-chemical)
- Riverbank and riparian zone health (erosion, run-off and biodiversity)
- Biological characteristics via plankton surveys

Background research tasks – to be completed before visit

Visit the Pre-visit activities pages of the program website. Read through the three sections of the pre-visit activities (Hawkesbury River, Data Collection Method and Site Info), then answer the following questions.
https://sites.google.com/education.nsw.gov.au/stage-6-geography/pre-visit

1. What is a catchment?

_____

_____

_____

2. Identify and describe the location and nature of the Hawkesbury Nepean Catchment.

Location: _____

Size: _____

Natural habitats: _____

_____

3. What is an 'ecosystem service'?

_____

_____

_____

4. List 4 'ecosystem services' that the river provides:

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_____

_____

_____

5. Choose 1 Natural Resource Management Issue (for example, “Issues affecting Land and Soil”) and explain the issues below.

_____

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6. Explain why river nutrient loads are decreasing.

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7. List some of the physical, chemical and biological parameters you will be measuring.

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8. Using the diagram on the following page, consider how adjacent landforms may influence the depth and speed of the river. Describe this relationship for each of the points (A-D) marked on the diagram.

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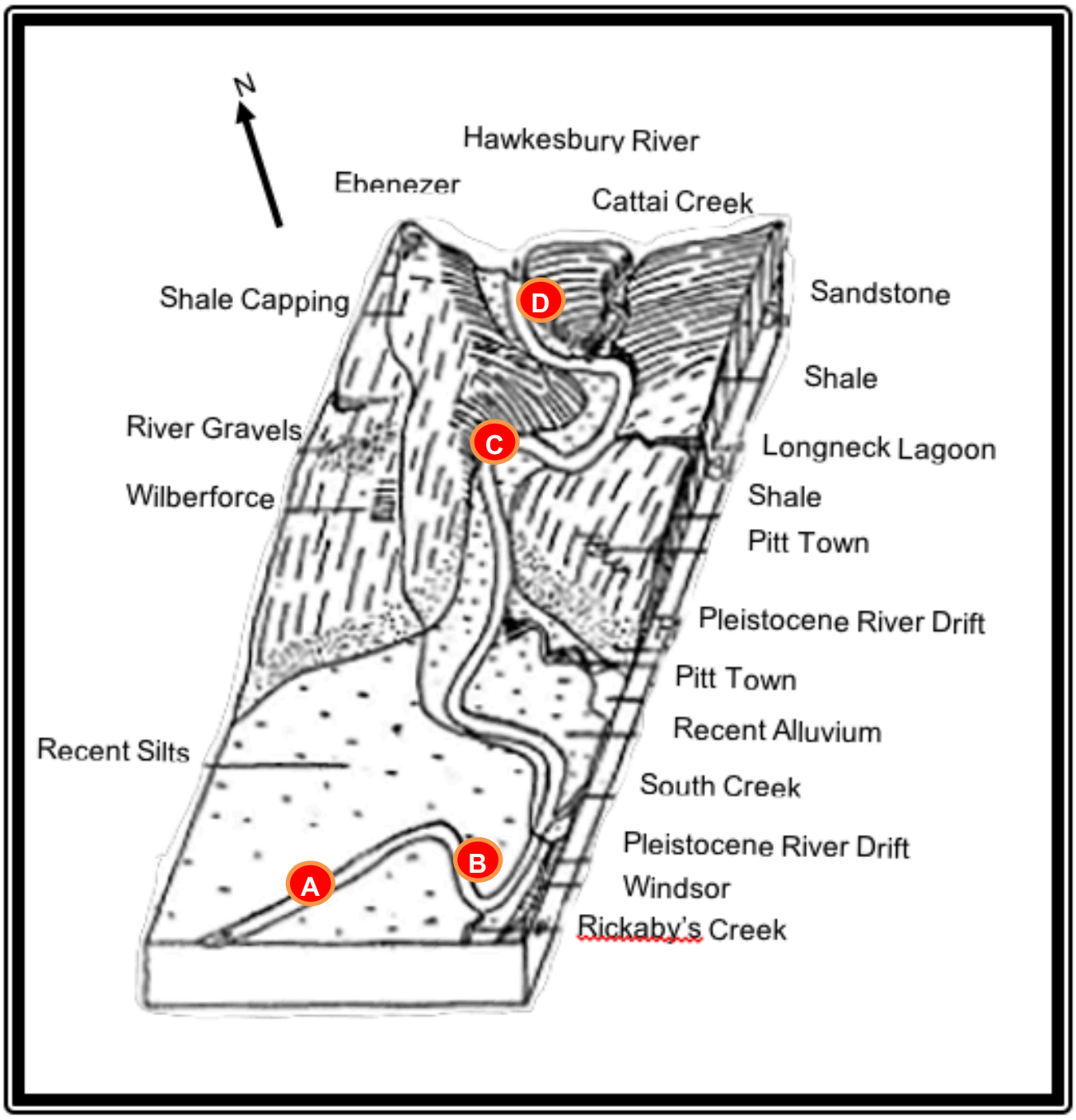


Diagrammatic representation of the Hawkesbury River north of Windsor towards Ebenezer and Sackville, showing change from lowland to highland.

Activity 1

Water quality assessment field data collection sheet					
Sample site location:		Hawkesbury River at Sackville North		GPS Easting	
				GPS Northing	
Sample collection time:			Sample collection date:		
Weather conditions:	previous 24hrs;		previous 48 - 120hrs;		
Tide: ebb tide [running out to low] / flood tide [running in to high]					
River width (m):					

Hydrological parameters

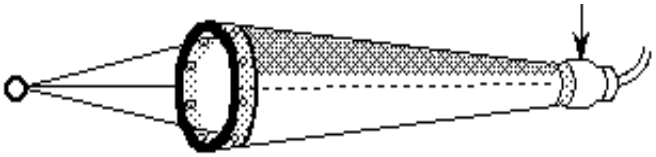
Site number	Site location Hawkesbury River at Sackville North	River depth	Distance from N/S riverbank in metres	Secchi depth (Turbidity)	Surface temperature
1	Near beach on south side of river bend				
2	Middle of river, directly below yellow aerial powerline marker.				
3	Directly adjacent to cave				

Biological collection method

Collection of phytoplankton, zooplankton and invertebrates. This method must be repeated for each net (phytoplankton **and** zooplankton) at different locations in the river to obtain a random selection of samples.

Method:

1. Fasten plankton net to the buckle or strap of life jacket.
2. Hold the bottle underwater beside your kayak until it is full of water. This helps weight the throw and ensures the net sinks below the surface to collect the sample from the water column.
3. Using an underarm throw, throw the net out and draw/pull it back towards you. Do this a total of **10 times**.
4. Use the net to concentrate the sample in the bottle by holding the net over the top of the bottle and pouring some of the water out.
5. Hold the bottle upright in your kayak. Once back to shore, detach the bottle from the net and securely place the lid on the sample bottle.



A: Brewongle

B: Launch point & water quality test location

C: Site of riverbank slump erosion

1: Sample site 1

2: Sample site 2

3: Sample site 3

Activity 2

Environmental conditions			
Date:		Time:	
Current weather conditions:			
Date of last rain:		Rainfall mm:	
Visual observations	river water quality:		
	riverine vegetation:		
	hillside vegetation:		
Human impacts seen:			

Physio-chemical water quality parameters			
Parameter & units of measurement	ANZECC trigger values for ecosystem protection	Result	Discussion
Temperature (Temp) °C	N/A		
pH	6.5 - 7.5		
Dissolved Oxygen (DO) % saturation	85 - 110		
Dissolved Oxygen (DO) mg/L	>5		
Electrical Conductivity (EC) uS/cm	200 - 300		
Turbidity ntu	<50		
PO_4 mg/L	0.02		
NO_x mg/L	0.04		

Current erosion condition assessment

Checklist 7: Riverbank Erosion Condition

Types of Erosion – does your site show any of these features?

SLUMPING | **Score**

Before bank slump | After

Big slumps high up on the bank, or extending further back

- Not present = 0
- Present but uncommon (< 10% of bank) = 1
- Occupy between 10 and 50% of the bank length = 3
- Occupy more than 50% of the banks length = 5

Potential cause is flood damage. Manage by revegetating with deep rooted native trees.

Score

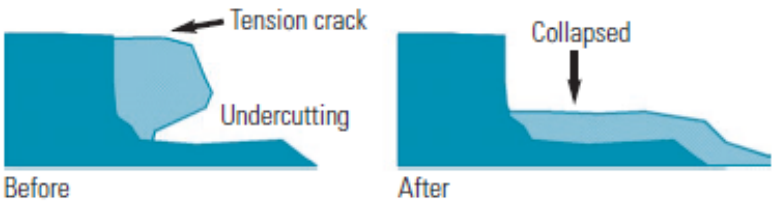
Before bank slump | After

Localised smaller slumps either on the base, slope or top of the bank

- Not present = 0
- Present but uncommon (< 10% of bank) = 1
- Occupy between 10 - 50% of the bank length = 3
- Occupy more than 50% of the banks length = 5

Potential causes are lack of vegetation, flood damage, stock or human access on sandy banks. Manage by planting deep-rooted natives and controlling access.

Score



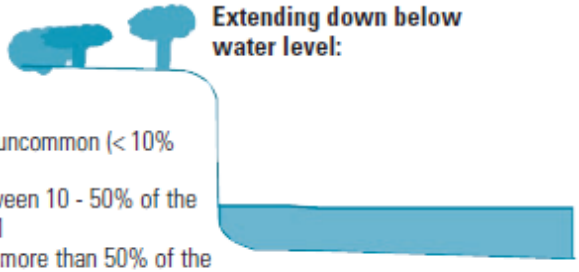
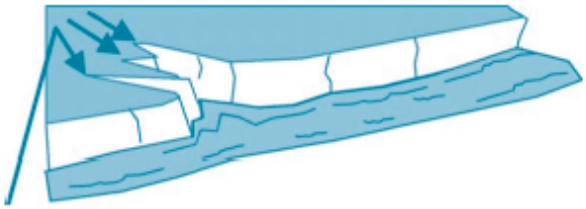
Before | After

Undercutting of bank base and toppling

- Not present = 0
- Present but uncommon (< 10% of bank) = 1
- Between 10 - 50% of the bank length = 3
- Common on more than 50% of the banks length = 5

Potential causes are lack of deep rooted native vegetation, wind or wave action in larger rivers or speed of stream flow in smaller streams. Manage by paying special attention to protecting the toe of the bank. Plant native vegetation which does not mind wet feet. Encourage in-stream vegetation and retain snags against the bank if they are not causing erosion.

Score

VERTICAL BANK SECTIONS	Score
 **Extending down below water level:** • Not present = 0 • Present but uncommon (< 10% of bank) = 0 • Occupy between 10 - 50% of the bank length = 1 • Common on more than 50% of the banks length = 3 Potential causes of channel widening are speed and volume of water flow. Manage by revegetating with native plants from the top of the bank.	
GULLY EROSION	**Score**
 **Running perpendicular to the river down the face of the bank:** • Not present = 0 • Present but uncommon (< 10% of bank) = 0 • Impacts between 10 - 50% of the bank length = 1 • Common on more than 50% of the bank length = 2 Potential causes are runoff from adjacent land, poor drainage, lack of vegetation in appropriate areas and stormwater. Manage by addressing drainage issues. Plant water soaking native shrubs and trees at heads of gullies.	
TOTAL SCORE (SUM OF SCORES) =	

Assigning an Erosion Risk Class

TOTAL SCORE (SUM OF SCORES ABOVE) =			
Current Erosion Condition Class assigned from above Total Score	☐ Erosion Condition Class 1 Total score 0-4 Bank generally in good condition with little or no erosion.	☐ Erosion Condition Class 2 Total score 5-8 Bank in a fair condition with erosion becoming a significant problem	☐ Erosion Condition Class 3 Total score 9 to 21 Bank appears to be significantly degraded with most of the bank suffering some form of erosion

Activity 3 – biological									
Parameter	Species diversity	Species ID	Taste and odour imparting	Filter clogging algae	Clean water algae	Polluted water algae	Other surface water algae	Other	Zooplankton
Plankton identification	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								

Vertbrate ID	1		4	
	2		5	
	3		6	

Conclusions and recommendations

1. List any physio-chemical water quality data results that were outside ANZECC trigger values.

_____

_____

2. Explain why you think these results fell outside the 'normal' range set by ANZECC.

_____

_____

3. Compare your data to the historical data located on the fieldwork Activity 2 section of the website. Are your results consistent with past results? Are there any trends emerging?

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_____

4. Describe some management actions that you would recommend be undertaken to improve water quality outcomes in the Hawkesbury River (for example, how can our community continue to reduce nutrient loads in the river?).

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5. How many different plankton species did you identify? How do the numbers of phytoplankton (plants) and zooplankton (animals) compare? What do your plankton results indicate about river health?

_____

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6. Has the riverbank been altered from its natural state? Describe these alterations and the impact they might have on the measured erosion.

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_____

7. What management actions would you recommend that the land owner implements to reduce erosion risk and improve the current erosion condition?

8. Discuss how reducing erosion will improve water quality in the Hawkesbury River.

9. Can you now provide a paragraph that answers the Inquiry Question “What are the effects of human impacts on the functioning of the Hawkesbury Nepean Catchment and the quality of water in the river system?