



# Stream Pollution

*Version 4.0*

## OBJECTIVES

1. To examine the state of water quality in the study area.
2. To locate and identify the sources and types of pollution.
3. To examine the impacts of stream pollution and nearby land uses in affecting the environmental quality of rural landscape and remedial measures.

## EQUIPMENT LIST

	Items	Qty.	Checked	Returned
1.	Adhesive labels	x 1	<input type="checkbox"/>	<input type="checkbox"/>
2.	Base map (Individual)	x 1	<input type="checkbox"/>	<input type="checkbox"/>
3.	Clipboard (Individual)	x 1	<input type="checkbox"/>	<input type="checkbox"/>
4.	Cloth	x 2	<input type="checkbox"/>	<input type="checkbox"/>
5.	Compass	x 4	<input type="checkbox"/>	<input type="checkbox"/>
6.	Deionised water (Wash bottle)	x 1	<input type="checkbox"/>	<input type="checkbox"/>
7.	Forceps	x 1	<input type="checkbox"/>	<input type="checkbox"/>
8.	pH paper	x 1	<input type="checkbox"/>	<input type="checkbox"/>
9.	pH paper index	x 1	<input type="checkbox"/>	<input type="checkbox"/>
10.	Plastic bottles	x 1	<input type="checkbox"/>	<input type="checkbox"/>
11.	Rubber gloves	x 4	<input type="checkbox"/>	<input type="checkbox"/>
12.	Sampling bottles	x 4	<input type="checkbox"/>	<input type="checkbox"/>
13.	Stream flow meter	x 1	<input type="checkbox"/>	<input type="checkbox"/>
14.	Total dissolved solids (TDS) meter	x 1	<input type="checkbox"/>	<input type="checkbox"/>
15.	Test tube	x 4	<input type="checkbox"/>	<input type="checkbox"/>
16.	Thermometer	x 1	<input type="checkbox"/>	<input type="checkbox"/>
17.	Timer	x 1	<input type="checkbox"/>	<input type="checkbox"/>
18.	White tile (with 'X' mark)	x 1	<input type="checkbox"/>	<input type="checkbox"/>

## Laboratory Work

1. Beakers	6. Solution A
2. Boiling tubes	7. Solution B
3. Filter funnel	8. Solution C
4. Filter paper	9. Spectrophotometer
5. Measuring cylinder	10. Test tubes

## **FIELD WORK**

### **F1 Data Collection**

1. Refer to Map 1.1.
2. At each sampling point, by referring to Table 1.2,
  - a) complete Table 1.1,
  - b) conduct tests on water quality (including temperature, pH, smell and total dissolved solids, TDS),
  - c) record the data in Table 1.1 and 1.4,
  - d) collect a bottle of stream water back to the laboratory for tests (including phosphate content, ammonia content, etc.).
3. Around each sampling point, map the land use in the vicinity of the sampling site in the Data Sheet (students are advised to go about 100 - 200 m upstream to see what the land use is).

## **LABORATORY WORK**

### **L1 Ammonia Test**

1. Collect a filtered 25 ml water sample into a boiling tube. (Use filter paper, beaker and measuring cylinder.)
2. Add 1 ml of solution C (Nessler's reagent) in it.
3. Agitate the mixture for 20 seconds.
4. A YELLOW colour indicates the presence of ammoniacal nitrogen.
5. Assess the concentration of ammonia by using the spectrophotometer provided.

### **L2 Phosphate Test**

1. Collect a filtered 25 ml water sample into another boiling tube. (Use filter paper, beaker and measuring cylinder.)
2. Add 1 drop of solution A (ammonium molybdate / H<sub>2</sub>SO<sub>4</sub> solution) and 1 drop of solution B (5% stannous chloride solution).
3. Agitate the mixture for 20 seconds.
4. A BLUE colour indicates the presence of phosphate.
5. Assess the concentration of phosphate by using the spectrophotometer provided.

## **DATA PROCESSING**

1. According to Table 1.3, convert the findings in the field test into 4-point-scale marks.
2. Test phosphate, ammonia, dissolved oxygen content and calculate the flow speed of the stream water collected from each sampling points and convert the results into 5-point-scale marks. (refer to Table 1.5.)
3. By referring to Table 1.6, pool the findings of all sample points in Table 1.7, and then assess the degree of stream pollution at each sampling point.
4. Using an appropriate method, show the degree of pollution along the stream on the base map provided.

## **DISCUSSION**

- Q1. Briefly describe the state of water quality along the stream, and then analyse the relationship between human activities and the degree of pollution.
- Q2. Test the hypothesis:  
"Degree of pollution increases downstream in the study area." Accept it or not? Give reasons.
- Q3. Suggest remedial measures to improve the stream water quality of the study area.

**DATA SHEET**

Group: \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Site: \_\_\_\_\_

Observable sewage discharge point(s): Yes / No

Present weather: \_\_\_\_\_

Has there been rained in the past 3 days? \_\_\_\_\_

General description of the site: \_\_\_\_\_

Landuse in the vicinity: \_\_\_\_\_

**Table 1.1 - Characteristics of Stream Appearance**

Water level:	<input type="checkbox"/> Full	<input type="checkbox"/> Normal	<input type="checkbox"/> Low	
Floating matter: (Type: _____)	<input type="checkbox"/> None	<input type="checkbox"/> Some	<input type="checkbox"/> Plentiful	<input type="checkbox"/> Abundant
Suspended sediments:	<input type="checkbox"/> None	<input type="checkbox"/> Some	<input type="checkbox"/> Plentiful	<input type="checkbox"/> Abundant
Green algae:	<input type="checkbox"/> None	<input type="checkbox"/> Some	<input type="checkbox"/> Plentiful	<input type="checkbox"/> Abundant
Sewage fungus:	<input type="checkbox"/> None	<input type="checkbox"/> Some	<input type="checkbox"/> Plentiful	<input type="checkbox"/> Abundant
Colour:	<input type="checkbox"/> Clear	<input type="checkbox"/> Less clear	<input type="checkbox"/> Brown	<input type="checkbox"/> Black
Turbidity:	<input type="checkbox"/> Clear	<input type="checkbox"/> Fairly low	<input type="checkbox"/> Moderate	<input type="checkbox"/> High

**Table 1.2 - Guide for Stream Characteristics**

<u>Stream channel characteristics and nature of flow</u>	
water movement	- stagnant / slow / moderate / fast flowing
stream bed	- rocky / sandy / muddy / weedy
<u>Stream appearance</u>	
floating matter	- specify type and quantity: e.g. oil, foam, faecal matter, etc.
colour	- none, slightly brown, black and soapy looking
stones in shallow	- note the nature and colour of deposit on stones in shallow parts of stream
green algae	- note the location and quantity
sewage fungus	- note the location and quantity
turbidity	- fill a test tube with stream water and view from above to see how clearly visible is a cross drawn on the white tile

**Table 1.3 - 4-Point Scale (on stream appearance, etc.)**

Assessment Unit	0	1	2	3
Floating matter	None	Some	Plentiful	Abundant
Suspended sediment	None	Some	Plentiful	Abundant
Green algae	None	Some	Plentiful	Abundant
Sewage fungus	None	Some	Plentiful	Abundant
Colour	Clear	Less Clear	Brown	Black
Turbidity	Clear	Fairly Low	Moderate	High
Smell	None	Some	Moderate	High

**Table 1.4 - Other Properties of Stream Water**

pH: _____	Temperature: _____ °C	TDS: _____ ppm			
Dissolved oxygen: _____ mg/L	Flow speed: _____ m/s				
Smell:	<input type="checkbox"/> None	<input type="checkbox"/> Some	<input type="checkbox"/> Moderate	<input type="checkbox"/> Strong	
Phosphate content:	<input type="checkbox"/> Very Low	<input type="checkbox"/> Low	<input type="checkbox"/> Moderate	<input type="checkbox"/> High	<input type="checkbox"/> Very High
Ammonia content:	<input type="checkbox"/> Very Low	<input type="checkbox"/> Low	<input type="checkbox"/> Moderate	<input type="checkbox"/> High	<input type="checkbox"/> Very High

**Table 1.5 - 5-Point Scale (on other properties)**

Assessment Unit	0	1	2	3	4
Stream Flow Speed (m/s)	very high ( $\geq 0.8$ )	high (0.6 - $<0.8$ )	moderate (0.4 - $<0.6$ )	low (0.2 - $<0.4$ )	very low ( $<0.2$ )
Ammonia Content (ppm)	very low ( $<1$ )	low (1 - $<10$ )	moderate (10 - $<20$ )	high (20 - $<30$ )	very high ( $\geq 30$ )
Phosphate Content (ppm)	very low ( $<1$ )	low (1 - $<10$ )	moderate (10 - $<20$ )	high (20 - $<30$ )	very high ( $\geq 30$ )
Dissolved Oxygen (mg/L)	very high ( $>7.5$ )	high (7.5 - $>5.0$ )	moderate (5.0 - $>3.5$ )	low (3.5 - $>2.0$ )	very low ( $\leq 2.0$ )
TDS (ppm)	very low ( $<50$ )	low (50 - $<100$ )	moderate (100 - $<200$ )	high (200 - $<400$ )	very high ( $\geq 400$ )

**Table 1.6 - Degree of Pollution**

Assessment Unit	Degree of Pollution
less than 5.0	clean
5.0 - 10.0	slightly polluted
10.1 - 15.0	moderately polluted
over 15.0	severely polluted

**Table 1.7 - Summary of Total Scores for the Sites**

Group	Site									
	1	2	3	4	5	6	7	8	9	10
1										
2										
3										
4										
5										
6										
7										
8										

