GCSE Environmental Science Coursework

An Investigation into Fresh Water Pollution in Epping Forest

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Contents Summary

Section Number **Page Number**

1 Plan Sheet 3

2 Introduction 4

2.1 Topic Choice
2.2 Location
2.3 Aim
2.4 Information required

3 Method 6

3.1 Step by Step Method Description
3.2 Reasons for choice of Methods
3.3 Method Controls
3.4 Risk Assessment

4 Results 11

4.1 Table of Results
4.2 Presentation of Results

5 Conclusion 16

5.1 Trends, patterns and anomalies
5.2 Conclusion of Hypotheses

6 Discussion 20

6.1 Relation to Scientific Theories
6.2 Problems & Issues
6.3 Suggested Solutions
6.4 People's Attitudes and Values

7 Evaluation 26

7.1 Observation Accuracy
7.2 Explanation to Anomalies
7.3 Method Improvements
7.4 Extensions to the Investigation

8 Bibliography and Acknowledgements 30

8.1 Bibliography
8.2 Acknowledgements

9 Appendix 31

9.1 Field notes and results

2 Introduction

2.1 Topic Choice

The reason for choosing the topic **"An Investigation into Fresh Water Pollution"** is that in many ways we are all affected by water pollution. The issue of water pollution has been raised and plans in certain areas have been drawn up to decrease the amount of pollution in our rivers. As environmental scientists we need to learn the importance of the issue and understand the problem that relates to nutrient enrichment and organic matter pollution, which comes under section 9.14 in the syllabus.

The locations studied are:

- Furze Ground
- Pyrles Brook

Both the above locations are in the Epping Forest region based in the County of Essex.

The first location studied was Furze Ground situated in a rural area, Debden Brook River, where two different areas were studied, upstream and downstream. In both studies tests were carried out,. The water was found to be clean, shallow and fast flowing. The riverbed consisted of sand and many pebbles.

Furze Ground is also used for recreational activities such as dog walking. The surrounding area consists of trees, fern, bracken, moss and bramble.

Pyrles Brook is situated in an urbanised residential area. The water was found to be murky, therefore difficult to find wildlife and the water was flowing slow and deep. The riverbed consisted of mainly sand and a few pebbles, occasionally some broken glass was found along with other various types of litter. The banks were very steep and uneven and a number of trees surrounded the river.

2.2 Aim

The aim of the coursework is to investigate the effects of pollution on fresh water stream, invertebrate communities.

The coursework hypothesis:

" The invertebrates will have a higher BMWP score at Furze Ground than at Pyrles Brook, because of its rural area, location and because of its low water pollution levels"

2.3 Information Required

In order to prove or disprove the hypothesis, the following tests will be carried out to obtain the relevant information:

- Kick samples

- Velocity
- Depth
- Width
- Nitrates
- Phosphates
- PH
- Oxygen level
- Temperature

Various methods are used, described in section 3 to carry out the tests to obtain the information required and to identify the differences between the two areas studied.

3 Method

Different methods were used to test for water pollution in Epping Forest, these methods were used to provide enough information to prove or disprove my hypothesis.

- **Kick sampling**
  This method allows us to find out what invertebrates live in the water. The apparatus needed to test for invertebrates are a:
  Net
  Tray
  Pot
  Spoon
  Booklet explaining how to tell what invertebrates live in the river
  Wear Wellington boots, as they will protect your feet. With a net carefully get into the centre of the river. Place your net approximately one foot away from your feet and start kicking the riverbed gently. Time yourself for 15 seconds. Place the contents in the net on to the tray and fill the pot with river water. Rinse the net with the water from the river, fill it back up again and start searching for any invertebrates. If any are found place them in the pot make sure fish are not placed with any of the invertebrates as they may eat them. Identify what invertebrates you found and record them on a recording sheet. Finally carefully tip the invertebrates back into the water. Then repeat the method to further check your results.
  This particular method was selected as it provides us with the information we need efficiently, any other method would cost too much money or take a lot more time.
  Controls: the sampler must kick for fifteen seconds at one foot away from the net; they must gently kick in every sample so it would be a fair test. The site is only kick sampled at one area. This means we would only find out what invertebrates lived in one area this limits us from more accurate information.
  The ground was uneven and very slippery so you have to be very careful and walk slowly. If hands have been in contact with water don't put them in your eyes or over any cuts as you may pick up wells disease, this is very rare.

- Oxygen levels
  This method allows us to find out how much oxygen is in the water, this will tell us if eutrophication has occurred and how polluted the water is. To carry out the experiment the only apparatus needed is an oxygen probe.
  To measure oxygen levels you must use an oxygen probe. Switch the probe on and flick the switch to AIR and then press SET 100, wait till the umber reaches 100 and then flick back down to OXYGEN. Dip the probe into the water making sure the probe does not touch the riverbed. Hold for one to two minutes until the number stabilizes.
  This method is used, as it is the only method available to use, any other would be far too expensive and would take too long to test.
  Controls: you must keep the probe in the water for one to two minutes, make sure the probe does not touch the ground and if possible make sure the experiment is carried out near riffles in the river.
  When carrying out the experiment make sure you do not tilt too much over the edge of the bank or you may come off balance and fall in the river.

- Nitrates, phosphates and pH tests
  By finding out nitrate, phosphate and pH levels we will know if the water is polluted, the higher the level the pollutants that lurk in the water. Apparatus:

Bottles
Litmus paper for nitrates, phosphates and ph level
Score card for each litmus paper

Collect a sample of water from each of the sites then place nitrate, phosphate and pH litmus paper in the water making sure you know which ones which. Compare the colours of the papers to the scorecards on the back of the packs of litmus paper. Record your results in a table.

The water could be more accurately analysed in a laboratory, but the funds were not sufficient.

Controls: there were no controls for this method and there were no risks involved.

- Depth, Width and velocity

  Measuring depth, width and velocity allows you to compare different sites. The apparatus needed for this experiment: metre ruler
  Cork
  Tape measure

  Depth: to measure depth you need a metre ruler, put the ruler in the water at ¼ width ½ width and ¾ width, take the measurements down and work out an average.
  Width: take a tape measure and measure from the bank of the river to the other side.
  Velocity: take a metre ruler stick and place it in the water, if it moves with the current hold it. Drop the cork in at one end and time it, when it reaches the other end stop the timer and record your results. Do this three times and take an average.

  Controls: when measuring depth keeps the ruler at an angle or the water will flow straight into it and the water level will increase. Do not put down hard on the measure stick or the ruler may g through the riverbed. When measuring velocity makes sure you drop the cork at the same height every time.

  There are no risks involved with this method.

- Temperature

  A higher temperature may mean that some invertebrates are not able to live in those waters, as they are not sustainable for certain types of life. Apparatus needed for the experiment: thermometer
  Place the thermometer in the river; make sure the temperature has stabilized before recording it in your recording sheet.
  There are no risks for this method but the temperature will be affected by the time of year and the time of day.

Results

The numbers of samples taken were adequate and were large enough to make my results worthwhile. Fifteen samples were taken from each area; each sample was taken at a different place along the river.

Below are the results from Pyrles Brook

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	sum	count	average
flatworm																	
true worm										5	1	3			9	3	3
leech				1											1	1	1
freshwater shrimp	1	1	2			1									5	4	1.25
freshwater hoglouse																	
stonefly nymph							2	1	1						4	3	1.333
damselfly nymph																	
mayfly nymph										4	3				7	2	3.5
caseless caddisfly larvae								2	3						5	2	2.5
cased caddisfly larvae	3	4													7	2	2.5
midge larvae												1			1	1	1
non-biting midge larvae																	
biting midge larvae	10									2					12	2	6
blackfly larvae							1		1						2	2	1
cranefly larvae							2		3						5	2	2.5
lesser water boatman																	
greater water boatman							2								2	1	2
beetles																	
freshwater mite																	
water spider																	
snails																	
bivalves																	
abundance	14	5	2	1	0	1	7	3	8	11	4	4	0	0			
species richness	3	2	1	1	0	1	4	2	4	3	2	2	0	0			
															average		
temperature	11	11	11	11	11	12	12	12	12	9	8	9	10	10	10.6429		
oxygen (%)	10	10	13	12	11	9	9	9		10	9	9	9	9	9.14286		
water depth (cm)	5.67	11	8	53	11	10	10	10		5.7	24.3	15.6	15.6	16	13.5786		
water width (cm)	190	194	180	180	11	180	141	141		90	140	220	220	220	162.571		
velocity (ms)	0.33	0.2		0.1	0.1	0.1	3.67	3.7		0.5	0.13	0.15	0.15	0.2	0.66357		