ENVIRONMENT AGENCY

Pesticide Aquatic Pollution: Incidents in England and Wales, 1992-6

PESTICIDE AQUATIC POLLUTION: INCIDENTS IN ENGLAND AND WALES, 1992-6

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Summary

This report summarises the substantiated aquatic pesticide pollution incidents investigated by the Environment Agency in 1996. It also reviews the data on 246 substantiated incidents reported over the period 1992-6, in order to identify any trends.

In 1996 there were 53 substantiated incidents, of which four were category-1 severity (major), 15 category-2 (significant) and 34 category-3 (minor). A number of these incidents reported resulted in legal action being taken by the Agency. In total there were eight prosecutions; these included the four category-1 incidents, two category-2 incidents and two category-3 incidents.

Agricultural usage accounted for 32 percent of the total number of incidents in 1996. The remainder comprised industrial (21 percent), sheep dips (15 percent), fire (9 percent) transportation (4 percent), dumping (2 percent) and other (17 percent). Agriculture was the main source of incidents over the period 1992-6 (33 percent). This area should therefore still be a focus for pollution prevention measures and promotion of best practice.

Classification of incidents into cause and type of pesticide has been reported for the first time in 1996. This shows that the majority of incidents are due to accidental spillage or malpractice. Herbicides accounted for 31 percent of the total, with insecticides 16 percent, fungicides 3 percent, others 25 percent and unknown 25 percent. Where insufficient information exists to classify an incident to one of the categories this has been recorded as unknown.

The total number of substantiated incidents has risen by 33 percent over the period 1992-6, from 40 to 53. This is largely due to an increase in substantiated category-2 and -3 incidents. It is not clear whether this reflects a real increase in incidents or an improved level of investigation by the Agency. However, any possible increase in pesticide pollution incidents is of concern, and indicates that continued improvements in practice are required to minimise pesticide incidents in the future.

1 Introduction

This report summarises the pollution incidents involving pesticides that were investigated by the Agency (and prior to its formation on 1 April 1996 the National Rivers Authority) during 1996. The data for the period 1992-6 are also reviewed. The definition of "pollution incident" in this context is an incident reported to the Agency and investigated by pollution control officers. The Agency is often able to prevent these incidents from becoming serious, and in some cases prevent pollution of watercourses due to prompt reporting and immediate action. The data are collated by the Pesticides Section of the National Centre for Ecotoxicology and Hazardous Substances (EHS) at Wallingford.

The aim of this report is to provide data to help the Agency identify the main sources and causes of pesticide pollution and to assist in the development of pesticide policy including, for example, the targeting of pollution prevention activities. This report provides additional detail on pesticide incident data to that included in the annual report "Water Pollution Incidents in England and Wales".

The incidents have been categorised according to a number of criteria. These criteria are: severity, source, cause and type of pesticide. Classification into cause of incident and type of pesticide was reported for the first time in 1996. Brief descriptions of the categories are given below.

Severity
Ranges from category-1 which is a major incident to category-3 which is a minor incident. Unsubstantiated incidents are reported incidents not substantiated on investigation (see Appendix A for definitions).

Source
Classified into the following categories: agricultural, transportation, sheep dip, industrial, fire, dumping and other.

Causes
Defined as accidental, malpractice, deliberate, vandalism and unknown (see Appendix A for definitions).

Type
Pesticides have been grouped as herbicides, insecticides, fungicides, other and unknown.

2 Incidents in 1996

In 1996 there were a total of 53 substantiated pollution incidents involving pesticides. Details of the pesticide, environmental effects, incident category and any legal proceedings are given in Appendix B.

The severity of incidents

Pollution incidents have been grouped into varying degrees of severity as defined by categories 1-3 (see Appendix A for definitions). In 1996 there were four category-1 incidents, 15 category-2 incidents and 34 category-3 incidents.

Of the four category-1 incidents in 1996, two were as a result of wood preservative spillages. The first (Anglian Region) involved spillage of permethrin and Tributyltin naphthenate. Bund failure allowed material to reach a stream, resulting in the death of 60 stickleback fish. The second (Thames Region) resulted from spillage of acypetacs zinc from a wood-treatment site into a stream, forcing closure of a drinking-water intake. No biological impact was reported.

The third category-1 incident (North West Region) was traced to sheep and foot dip (flumethrin and formaldehyde), and resulted in invertebrate fauna mortality.

High levels of pesticides (propachlor, chlorpropham, pendimethalin, triazophos and quinalphos), possibly from an outfall belonging to an airfield, affected a 3km length of a brook and constituted the fourth category-1 incident (Midlands Region). A detrimental effect on the fauna (2,000 dead fish and some dead invertebrates) resulted.

The regional distribution of all substantiated incidents is illustrated in Figure 1. The largest number of reported incidents were in the Midlands Region (15) followed by Welsh Region [1](13) and then Anglian and South West Region (8 each).

The source of incidents

The sources of the pollution incidents are illustrated in Figure 2. Source is defined by broad categories, that is, agricultural, industrial, transportation, sheep dip, fire, dumping and other. The latter category includes amenity use of pesticides.

Agricultural usage accounted for 32 percent of the total number of incidents in 1996. Agricultural use is defined in the report as pesticides used for arable crops, vegetables, fruit, flowers, forestry and grassland. Transportation (4 percent), sheep dips (15 percent), industrial (21 percent), fire (9 percent), dumping (2 percent) and other (17 percent) accounted for the remainder of the incidents.

[1]Previously known as Welsh Region, now known as Environment Agency Wales.

Figure 1 - Regional distribution of incidents 1996

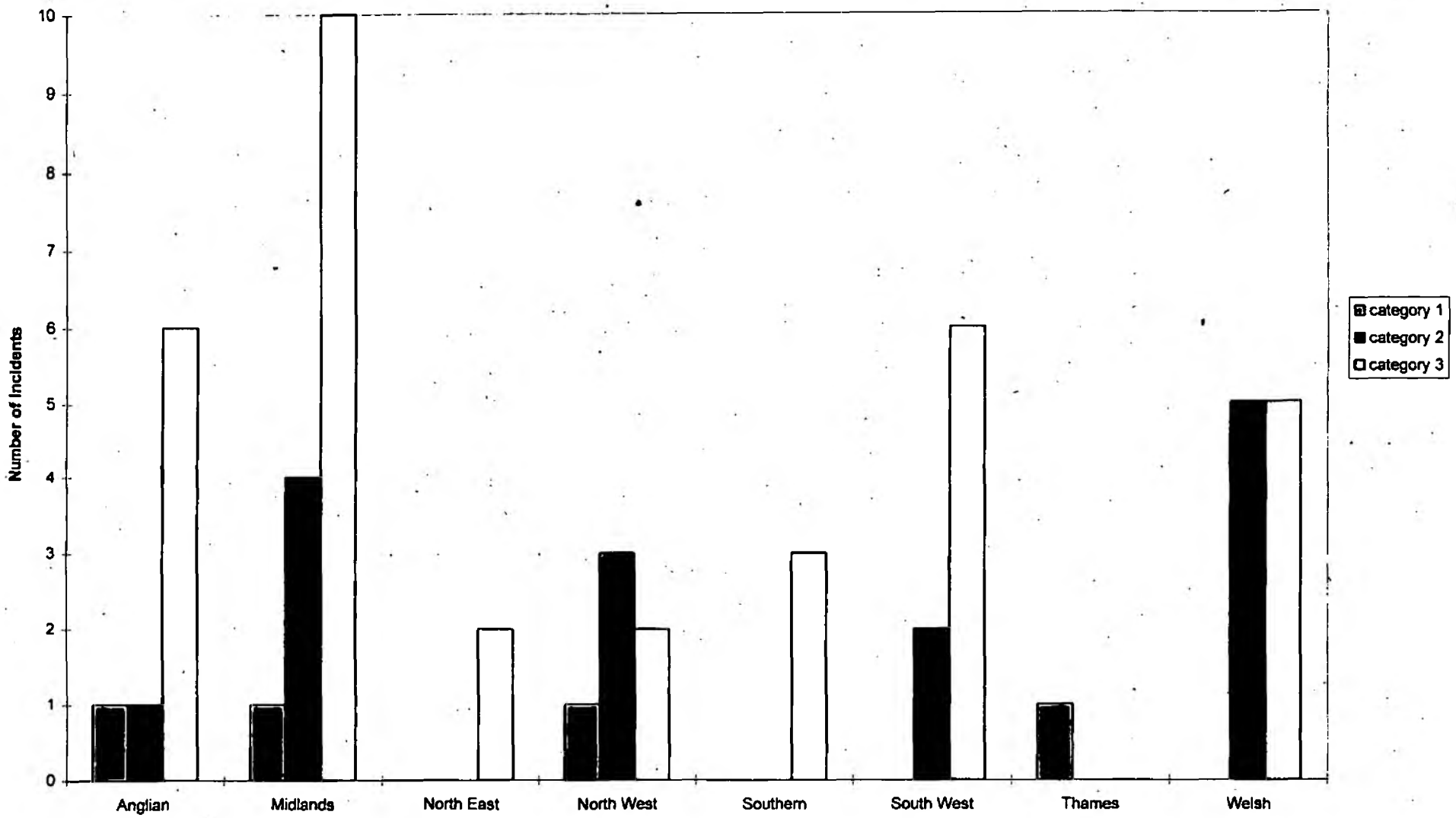


Figure 2 - Source of pollution incidents, 1996

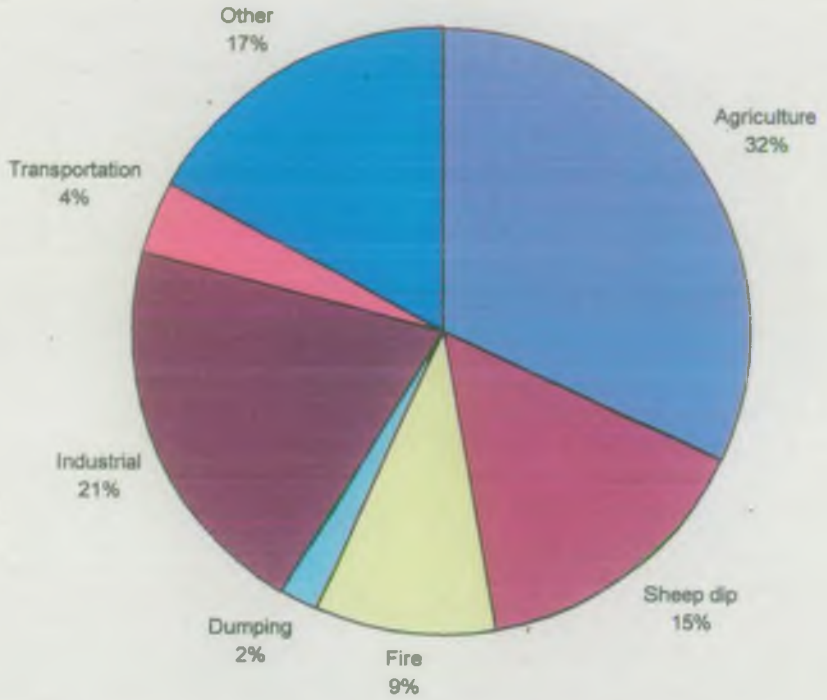


Figure 3 - Cause of pollution incidents, 1996

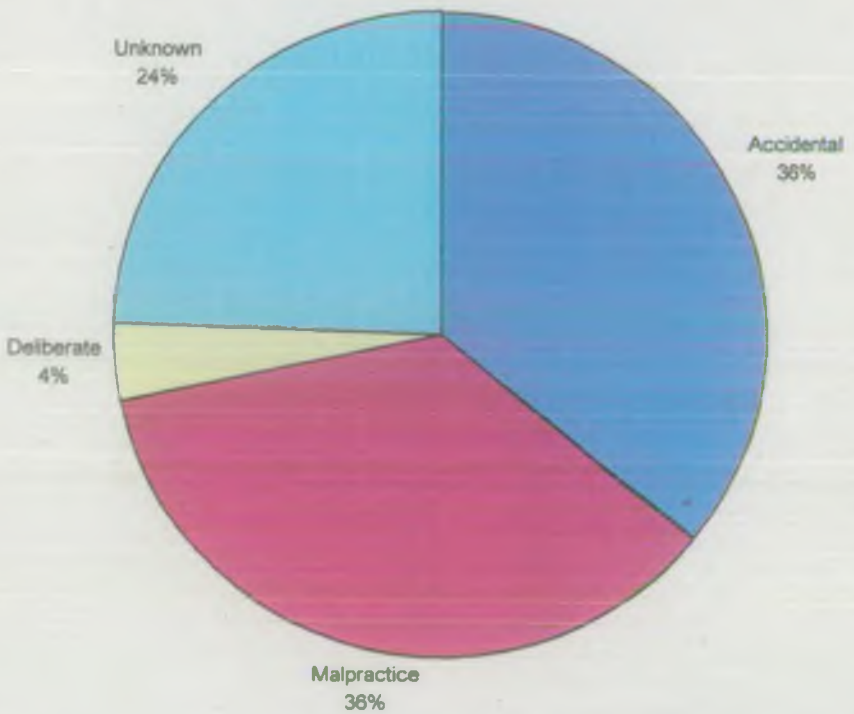
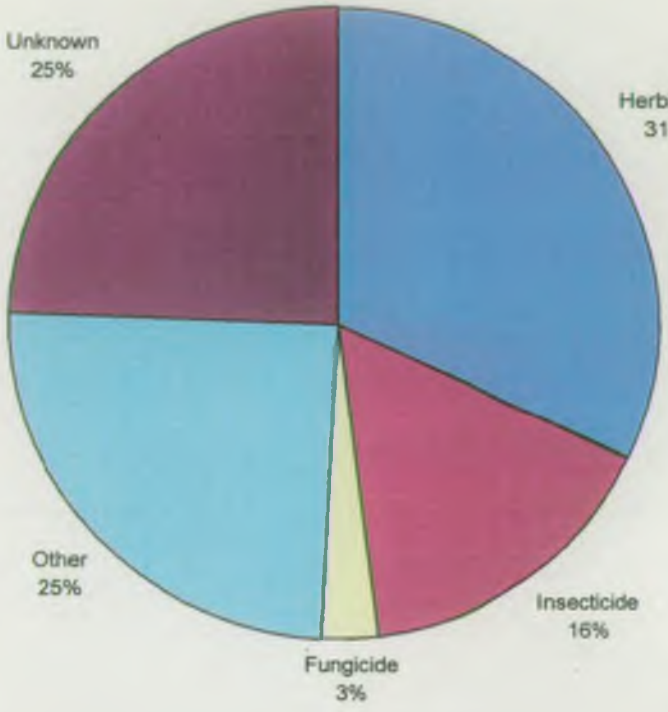


Figure 4 - Type of pesticide involved in pollution incidents, 1996



The cause of incidents

Causes of pollution incidents were assessed for the first time in 1996 and defined as accidental, malpractice, deliberate, vandalism or unknown (Figure 3).

Accidental spillage and malpractice were the most common causes, both accounting for 36 percent of incidents in 1996, followed by unknown (24 percent) and deliberate (4 percent). No reported incidents of vandalism occurred in 1996. Appendix B gives further details on the main reasons for each pollution incident. Some of the most common causes of incidents were spillages from agricultural machinery, sheep dip disposal and leaks from stores and containers. In addition, in some cases elevated levels of pesticides were found in natural waters, but no specific cause could be identified.

The type of pesticide

For 1996, pesticides were grouped into type for the first time as herbicides, insecticides, fungicides, other and unknown. For many incidents the pesticide involved was not identifiable and has been reported as 'unknown'. Analytical procedures often do not lend themselves to the sufficiently rapid determination of complex organic chemicals that is necessary to enable field staff to trace polluting discharges of this type. In addition, diffuse and point source pollution from farms is often difficult to trace.

Figure 4 shows the types of pesticide involved in incidents. Herbicides accounted for 31 percent of the incidents in 1996 with insecticides (16 percent), fungicides (3 percent), others (25 percent) and unknown (25 percent).

Legal action

All four of the category-1 incidents reported in 1996 resulted in prosecution. These incidents, two in Anglian Region (timber treatment and pesticide mixture), one in North West (sheep dip) and the other in Midlands (pesticide mixture) have already been described above.

Two of the 15 category-2 incidents reported, as well as two category-3 incidents, resulted in prosecution. Of the category-2 incidents, one occurred in Anglian Region as a result of a leaking container on a pesticide manufacturing site which released 200 litres of fluroxypyr into a watercourse. The other involved the discharge of sheep dip into a river in Welsh Region, causing severe invertebrate damage.

Both category-3 incidents resulting in prosecution were in Welsh Region. One involved sheep dip which affected a km-long stretch of a stream, killing small fish and invertebrates. The other was as a result of a leaking wood-treatment storage tank which allowed permethrin and acypetacs zinc to enter a saltmarsh and resulted in extensive invertebrate mortality. In addition, a prohibition notice was issued to prevent the repetition of a category-3 incident in the Midlands Region where prochloraz was discharged to a drain.

Figure 5 - Total number of reported and substantiated pollution incidents nationally 1992-6

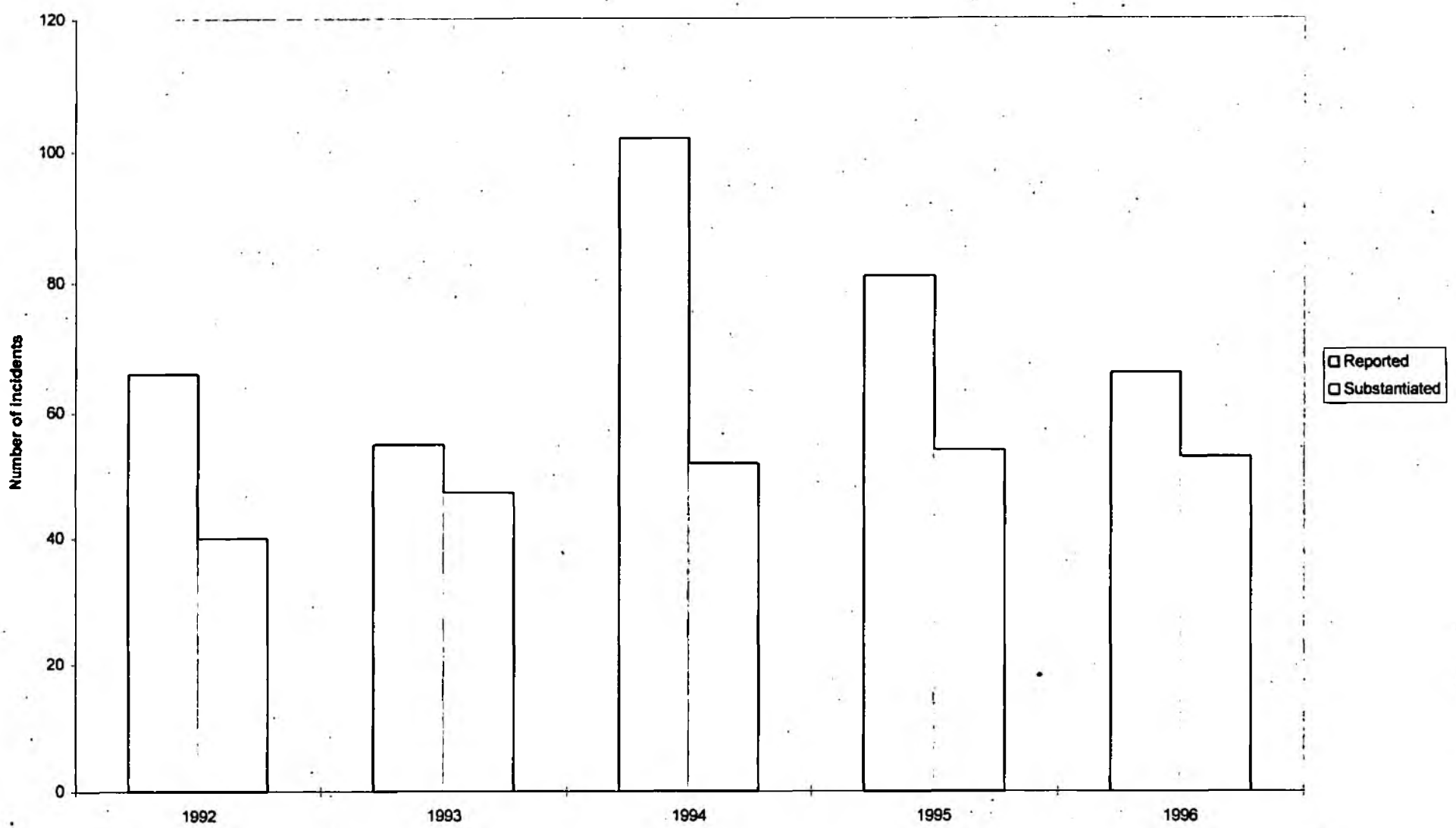


Figure 6 - Severity of pollution incidents 1992-6

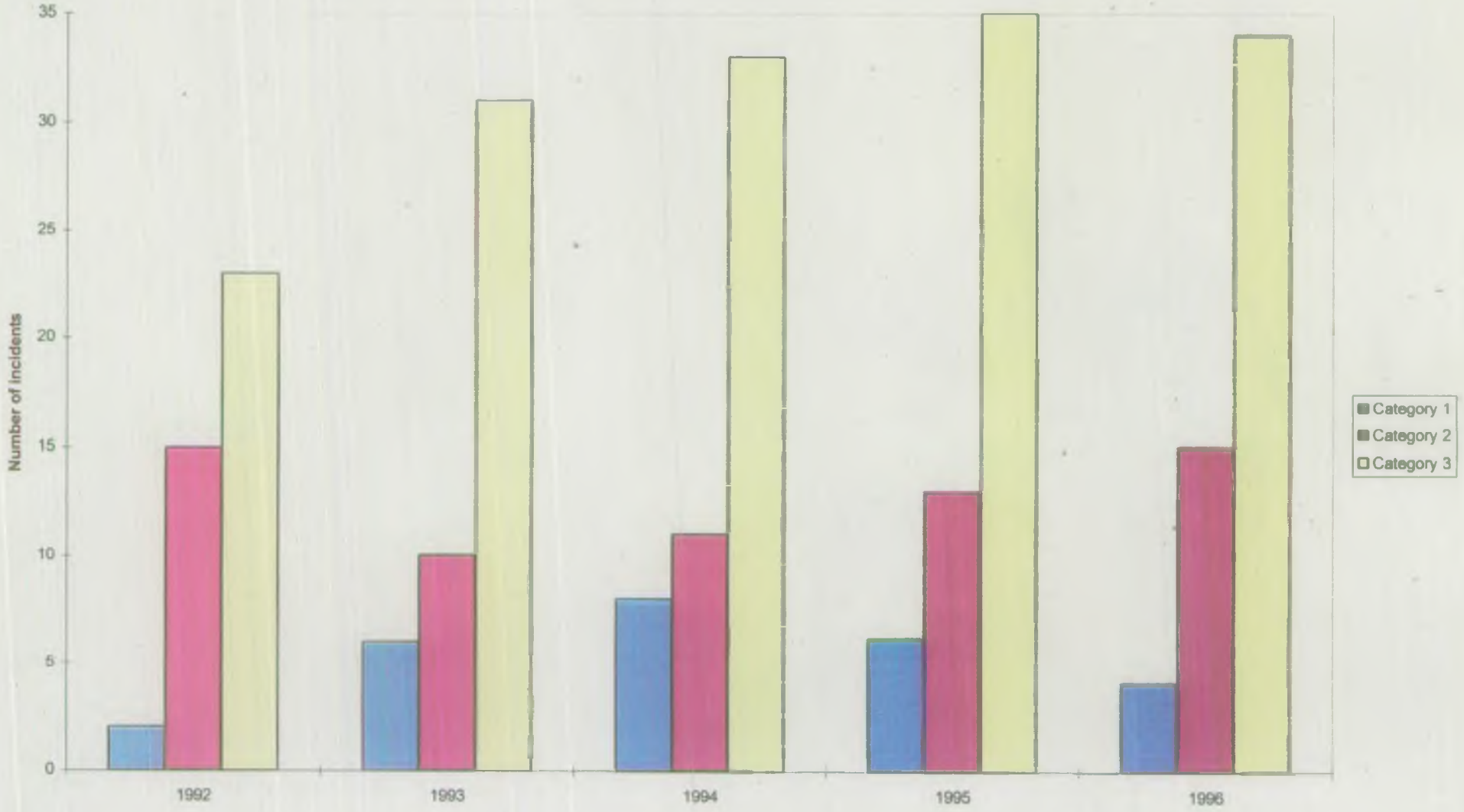


Figure 7 - Source of pollution incidents 1992-6

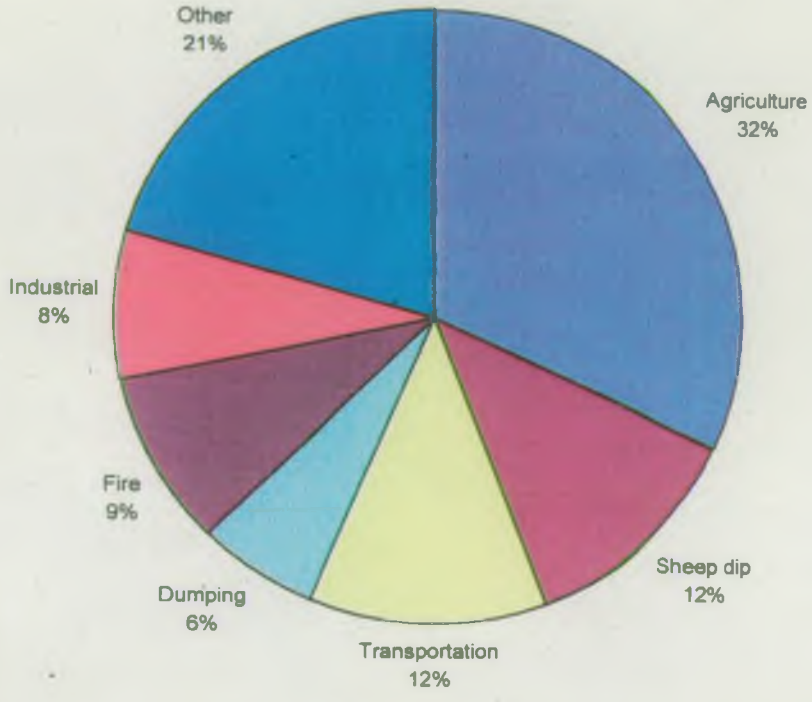
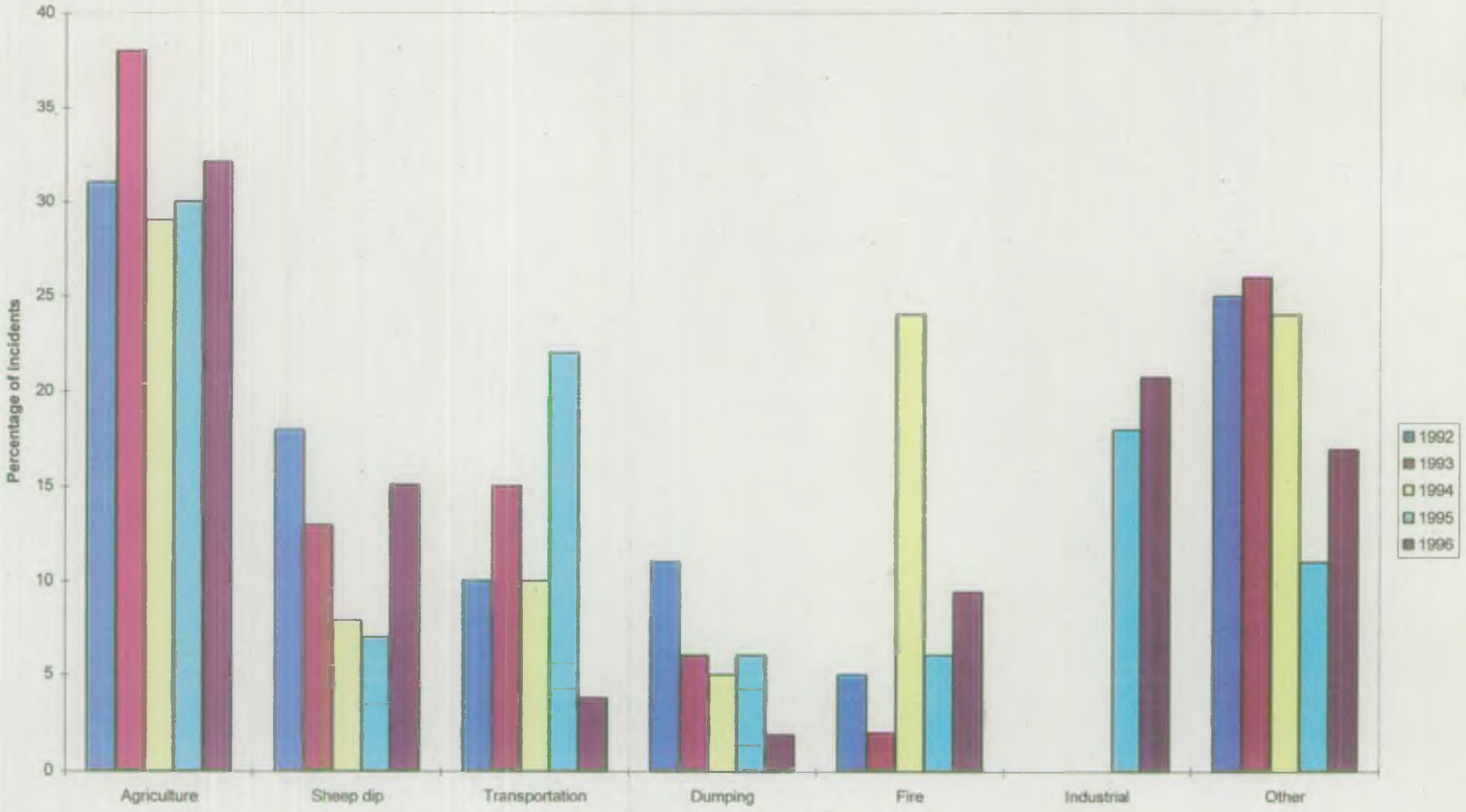


Figure 8 - Source distribution of substantiated pollution incidents 1992-6



3 Substantiated pollution incidents 1992-6

More than 350 aquatic pollution incidents involving pesticides were reported to the Agency during the period 1992-6. Of these reported incidents, 246 were to 1996 substantiated upon further investigation by pollution officers. A summary of the pesticide pollution incidents 1992-6 is included in Appendix C.

The total number of substantiated incidents (Figure 5) rose steadily from 40 in 1992 to 53 in 1996, representing an increase of 33 percent. The severity of incidents is shown in Figure 6; this shows that the increase in substantiated incidents is due to more category -2 and -3 incidents over the period.

Agricultural usage was consistently the largest contributor to aquatic pesticide pollution over the five-year period investigated, causing 33 percent of total incidents (Figure 7). There are no apparent trends in the source of pollution incidents during the period 1992-6 (Figure 8).

The cause of incidents and classification of pesticides into type were reported for the first time in 1996, and therefore historical trends cannot be determined.

4 Discussion

The total number of substantiated incidents has risen by 33 percent over the period 1992-6. It is not clear whether the 33 percent rise is a true reflection of increased pesticide pollution incidents. It may be due to increased awareness among public and pesticide users of environmental issues or to increased ease of reporting of incidents through the Agency's free 24-hour **emergency hotline, 0800 80 70 60**. Improved investigation by the Agency may also affect the number of substantiated incidents.

Prompt reporting and subsequent action by the Agency can often prevent an incident becoming serious, and can help protect the environment. Any possible increase in pesticide pollution incidents is of concern and indicates that continued improvements in practices are required to minimise pesticide incidents in the future.

Agricultural use remains the main source of pesticide pollution incidents and should therefore still be a focus for pollution prevention measures and promotion of best practice. The 1996 data indicate that accidental spillage and malpractice are the main causes of incidents (both 36 percent). The continued promotion of best practice is essential to increase general awareness and to try to minimise the occurrence of such incidents.

Herbicides were the most common pesticide type involved in incidents during 1996. This is expected as they are used in much greater quantities than any other pesticide type. Although fewer incidents involved insecticides and fungicides, the severity of incidents was greater because they are more toxic to aquatic life.

The Agency has produced pollution prevention guidelines both on pesticides and sheep dip, along with other pollution prevention leaflets. We are determined to ensure that pollution

prevention measures work and are effectively communicated. Routine enquiries on pesticides can be directed to the pesticides section of the National Centre for Ecotoxicology and Hazardous Substances at Wallingford.

Appendix A

Severity of incidents

Environment Agency definitions of pollution incident categories

Category-1

A major incident involving one or more of the following:

a) persistent effect on water quality
b) closure of public water supply
c) extensive fish mortality - greater than 100 notable fish
d) excessive breaches of consent conditions
e) substantial remedial measures
f) substantial effect on amenity /conservation

Category-2

A significant incident involving one or more of the following:

a) notification of abstractors necessary
b) significant fish mortality - 10 to 100 notable fish
c) significant impact on invertebrate fauna
d) water unfit for stock
e) bed of watercourse contaminated
f) reduced amenity value

Category-3

Minor pollution incident, one or more of:

a) less than 10 notable fish deaths
b) only local contamination
c) minimal impact on amenity/conservation

Unsubstantiated

Introduced from January 1995. A reported incident which, on investigation, was not substantiated.

Causes of incidents

Accidental	-	pollution occurred as an unavoidable accident although the polluter was following the rules for good practice;
Malpractice practice	-	pollution occurred due to disregard or ignorance of the rules of good by the polluter;
Deliberate	-	pollution was deliberately caused by the pesticide user;
Vandalism	-	pollution was deliberately caused by a person other than the pesticide user.

Appendix B

Substantiated pollution incidents 1996

	Incident	Pesticide	Environmental effect	Incident category	Incident source	Prosecution
	Anglian Region					
1	High levels of pesticide in ditch at pesticide manufacturing site. Outflow from ditch prevented, water pumped and treated at on-site GAC plant.	Chlorpyrifos	None reported	3	Industry	N
2	Pesticide from leaking container at manufacturing site entered watercourse. Outflow blocked and water tankered out.	Fluroxypyr	Turned water milky white	2	Industry	Y
3	Fire at farm, approximately 10 litres of pesticide washed into dry ditch.	Unknown	None reported	3	Fire	N
4	Spillage of timber treatment fluid; failure of bund allowed the material to reach stream.	Permethrin, Tributyltin napthenate	60 dead stickleback	1	Industry	Y
5	Pipe split on sprayer, releasing spray on to road. Later washed down drain.	Permethrin	None reported	3	Agriculture	N
6	Spillage of herbicide on to road, contained and removed.	Unknown	None reported	3	Agriculture	N
7	Sprayer filling in yard, tank burst, dilute pesticide spilled. Most contained in below ground-tank, some overflowed into yard drains.	Carbetamide Simazine	None reported	3	Other	N
8	Fire at business premises. No firewater runoff; foam used.	Aluminium phosphide	None reported	3	Fire	N
	Midlands Region					
9	Insecticide oil concentrate spilt to drain. No evidence of contamination of nearby brook. Contaminated soil excavated.	Unknown	None reported	3	Industry	N
10	Vapours from dog/fox repellent applied to fence migrated into factory next door causing respiratory problems for some employees.	Bone oil	None reported	3	Industry	N
11	Herbicide sprayed on rail embankment close to reservoir.	2,4-D, Dicamba, Trichlopyr	None reported	3	Other	N
12	Fire in farm shed containing pesticides. Contaminated fire-fighting water was collected and disposed of by water specialist.	Chlorpyrifos, Deltamethrin, others	None reported	2	Fire	N
13	High level of permethrin (0.13 µg/l) found during routine monitoring in effluent at water reclamation works. Were not aware of environmental quality standard of 0.01 µg/l. Advice on dosing given.	Permethrin	None reported	3	Other	N

14	Cuprinol wood preservative was bubbling up through soil. Suspected leaking sump in factory. Contaminated soil excavated.	Acypetacs zinc Permethrin	None reported	3	Industry	N
15	Pollution of drinking water source in a well at a residence. Source not found.	Unknown	None reported	3	Other	N
16	Chemicals discharged to drains. Prohibition notice issued.	Prochloraz	None reported	3	Agriculture	N
17	Spray tractor and tank 1/3 full of herbicide slid into brook on their side. Recovered intact.	Glyphosate	None reported	3	Agriculture	N
18	Pesticides deliberately discharged to road drain from spray tank. Abstraction closed.	Unknown	None reported	2	Agriculture	N
19	Dead fish and invertebrates found in brook near discharging pipe.	Unknown	Significant effect on aquatic fauna	2	Other	N
20	High levels of pesticides found in brook, 3 km length affected. Associated with low dissolved oxygen levels. Possibly from outfall belonging to airfield. No evidence of dumping.	Propachlor, Chlorpropham, Pendimethalin, Triazophos, Quinalphos also Benzotriazole (corrosion inhibitor).	Detrimental effect on aquatic fauna, 2,046 dead fish and also dead invertebrates	1	Industry	Y
21	Accidental spill of 200 litres dilute pesticides during mixing on to farm yard and into brook.	Cypermethrin, Carbendazim, Chlorothalonil	None reported	2	Agriculture	N
22	High levels of pesticide found in raw and final water at water treatment works.	Isoproturon, Chlorotoluron	None reported	3	Agriculture	N
23	High levels of pesticide found in reservoir and intake.	Clopyralid	None reported	3	Agriculture	N
	North East Region					
24	Fire at chemical store. Small amount of pesticide washed down drains with 1400 litres of water.	Aluminium phosphide	None reported	3	Fire	N
25	Lorries on fire, pesticide drums exploding. Water used.	Unknown	None reported	3	Fire	N
	North West Region					
26	Biological monitoring revealed significant impact on invertebrate fauna over 25km of stream.	Sheep dip - Flumethrin Foot dip - Formaldehyde	Detrimental effect on aquatic fauna	1	Sheep dip	legal action pending
27	Biological monitoring revealed impact on invertebrate fauna. Contaminated run-off from sheep pens suspected.	Unknown	Minor effect on aquatic fauna	3	Sheep dip	N
28	Biological monitoring revealed significant impact on invertebrate fauna for about 1.5km along stream. Run-off from sheep-holding pens suspected.	Cypermethrin and possibly other sheep dip pesticides	Significant impact on aquatic fauna	2	Sheep dip	N

29	Biological monitoring revealed long-term impact on invertebrate fauna. Run-off from sheep dipping/pens area suspected.	Unknown	Long-term significant impact on aquatic fauna	2	Sheep dip	N
30	Spill occured in warehouse, was contained and dry clean-up operation carried out.	Unknown	None	3	Industry	N
31	Drum leaking at dock on estuary.	Glyphosate	Unknown, unlikely to be significant in that location	2	Transport	N
	Southern Region					
32	Spray tank fell from tractor as turning corner; pesticide spilled on to road and into drainage ditches.	Unknown	None reported	3	Agriculture	N
33	High pesticide levels in water samples. May have been used on maize crops but not possible to trace source.	MCPB, Bentazone, Atrazine, Cyanazine	None reported	3	Agriculture	N
34	Skip leaking chemicals to highway drain. Skip later removed, gutter swept with granules.	Unknown	None reported	3	Industrial	N
	South West Region					
35	A maize field was sprayed very close to a river. River over-topped to flood land and was probably contaminated.	Unknown	Minor - river in spate	3	Agriculture	N
36	After desilting of pond, mercury and lindane contamination was suspected downstream.	Gamma-HCH	None reported	3	Other	N
37	Old rusty gallon-sized tins of weedkiller washed down with water which entered a stream. Possible contamination of stream and river. Farmer was asked to remove drums.	Unknown	None reported	3	Agriculture	N
38	Levels of 1000 ng/l Mecoprop detected in reservoir for 1 month. Source not found.	Mecoprop	Impact on reservoir	2	Agriculture	N
39	Roundup sprayed through drain in patio to watercourse. As volume involved was minimal, no further action taken.	Glyphosate	None reported	3	Other	N
40	50-gallon drum of Roundup fell from a lorry and an unknown quantity was lost to drains. Fire brigade attended. Drum was recovered. No major spillage.	Glyphosate	None reported	3	Transport	N
41	Contractors sprayed pesticides which drained into tributary of river. Stream was sampled. No obvious pollution or pesticide run-off found.	Unknown	None reported	3	Agriculture	N

42	Dead fish and eels found in stream. Source identified as agricultural store with poor containment and pollution prevention practice. Formal warning given, advised on prevention.	Unknown cocktail	Fish kill, no invertebrates	2	Agriculture	N
	Thames Region					
43	Spillage of wood preservative from treatment site into stream and river.	Acepetacs zinc	Water intake closed, no biological impact reported	1	Industry	Y
	Welsh Region					
44	Direct introduction of sheep dip into stream, 1 km of stream affected. Small fish kill, total-wipe out of invertebrates.	Propetamphos	Fish kill less than 10, severe invertebrate damage	3	Sheep dip	Y
45	Elevated levels of diuron detected at intake.	Diuron	None reported	2	Other	N
46	2,4-D traced in potable water supply. Source not found.	2,4-D	None reported	3	Agriculture	N
47	Sheep dip spill into river.	Propetamphos	Fish kill > 10. Severe invertebrate mortality	2	Sheep dip	N
48	Old pesticide container dumped on river bank. Removed. Contents not identified.	Unknown	No effect on water course	3	Dumping	N
49	Leaking wood treatment storage tank entered salt marsh. Samples taken.	Permethrin Acypetacs zinc	Invertebrate mortality	3	Industrial	Y
50	Sheep dip spill into river.	Unknown	Severe invertebrate damage.	2	Sheep dip	Y
51	Spillage of sheep dip. Dregs from mobile sheep dip poured onto the ground and then flowed into the river.	Unknown sheep dip	None reported	3	Sheep dip	N
52	Elevated levels of atrazine detected at water treatment works.	Atrazine	None reported	2	Agriculture	N
53	Diuron detected at potable abstraction.	Diuron	None reported	2	Other	N

Appendix C - Summary of pesticide pollution incidents 1992-6

Region	Total number of reported incidents					Substantiated incidents															Unsubstantiated incidents				
						Category 1					Category 2					Category 3									
	1992	1993	1994	1995	1996	1992	1993	1994	1995	1996	1992	1993	1994	1995	1996	1992	1993	1994	1995	1996	1992	1993	1994	1995	1996
Anglian	22	15	15	14	12	0	0	1	1	1	8	4	3	2	1	7	9	11	10	6	7	2	0	1	4
Midlands	3	7	1	12	16	0	2	0	3	1	2	2	1	1	4	1	1	0	6	10	0	2	0	2	1
North East	3	9	11	5	3	1	3	2	0	0	0	0	4	0	0	1	6	4	0	2	1	0	1	5	1
North West	7	5	3	7	6	0	0	2	0	1	1	0	0	2	3	0	5	1	5	2	6	0	0	0	0
Southern	3	2	13	6	5	0	0	2	1	0	0	2	0	3	0	1	0	5	2	3	2	0	6	0	2
South West	6	11	20	18	13	0	0	1	1	0	1	1	2	1	2	2	6	10	9	6	3	4	7	7	5
Thames	15	3	19	16	1	1	0	0	0	1	1	1	0	2	0	9	2	1	2	0	4	0	18	12	0
Welsh	7	3	20	3	10	0	1	0	0	0	2	0	1	2	5	2	2	1	1	5	3	0	18	0	0
Totals	**66**	**55**	**102**	**81**	**66**	**2**	**6**	**8**	**6**	**4**	**15**	**10**	**11**	**13**	**15**	**23**	**31**	**33**	**35**	**34**	**26**	**8**	**50**	**27**	**13**