WELSH SHEEP DIP MONITORING PROGRAMME SUMMARY REPORT

1998

Environment Agency Wales
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1.0 INTRODUCTION

Sheep are prone to infestation by a number of ectoparasites and are dipped for economic, cosmetic and welfare reasons. Sheep Scab, caused by the ectoparasites *Psoroptes ovis* or *Sarcoptes scabiei*, is perhaps the most serious condition which can cause discomfort and even death. There is therefore a need for effective treatment systems on sheep welfare grounds. Many of the ectoparasites can be treated by means other than dipping, but for sheep scab the immersion of sheep in an insecticide solution is currently the most widely accepted treatment method in Wales.

Two groups of chemicals are currently licensed for sheep dipping: organophosphates (OPs), which have the active ingredients diazinon or propetamphos, and the newer synthetic pyrethroids (SPs) such as flumethrin and cypermethrin. The latter were introduced in the early 1990s, partly because of concern over the potential effects of organophosphates on the health of farmers undertaking the dipping process. Although SPs were deemed to be less toxic to human health than OP dips, they are around 100 times more toxic to some elements of the aquatic environment.

Since 1995 there has been an increasing awareness of the environmental problems associated with the use of synthetic pyrethroid based sheep dips. Given the importance and prevalence of sheep farming within Environment Agency Wales and the Midland Region of the Environment Agency, a monitoring programme was initiated for the 1997 dipping season in order to

'Determine whether there is evidence of widespread environmental impact from sheep dipping activities, especially from the use of synthetic pyrethroid dip'

The results of this work, which were detailed in the Environment Agency internal report entitled 'Welsh Sheep Dip Monitoring Programme 1997'(March 1998), are summarised below.

Thirty-nine water quality monitoring sites selected in 10 sub-catchments were monitored for sheep dip compounds from April to November 1997. Of these, 49% failed the maximum allowable concentration (MAC) Environmental Quality Standard (EQS) for one or more of the sheep dip pesticides. The OP pesticide diazinon was the most frequent cause of MAC EQS failures. Biological monitoring revealed that 33.8 km (5%) of 679km surveyed were known or suspected as being impacted by sheep dip. Visits at 117 farms indicated that 55% of farms were using OP dips, and 19% were using SP dips. Overall 26% of farms visited were found to be at a high risk of polluting a watercourse from sheep dipping activities. A key recommendation was that the monitoring programme should be continued in 1998 as a means of targeting pollution prevention activities.

The monitoring programme for 1998 was set up with the following aims:

i. To establish whether the results of the 1997 survey were representative of a larger proportion of Wales
ii. To use chemical and biological monitoring to target pollution prevention activities in catchments believed to be at risk.

2.0 SURVEY METHODOLOGY

2.1 Location

Sub-catchments were selected within upland areas of Wales categorised as high risk due to sheep densities and geographical characteristics (Fig 1). Some of the catchments selected were those where preliminary monitoring in 1997 had indicated that there may be environmental problems associated with sheep dip. Results from the 1997 survey confirmed the peaking dipping periods were in June/July and September/October. The monitoring programme therefore extended from April until December.

2.2 Stream Chemistry

A network of 107 water quality sampling points was identified (Fig 2). Monthly water column samples were collected from this sampling network and analysed for pesticides used as active ingredients in sheep dip formulations. These were the organophosphate pesticides diazinon, propetamphos and chlorfenvinphos, and the synthetic pyrethroids cypermethrin and flumethrin. Chlorfenvinphos, which is no longer authorised as a sheep dip was included due to the possibility of farmers using old stocks.

The maximum value for each determinand recorded at each site was assessed against the maximum allowable concentration (MAC) Environmental Quality Standard (EQS) for each pesticide (Table 1). It should be noted that these figures are currently under review, and may change in future. The MAC EQS should not be exceeded at any time. Annual Average EQS failures were not calculated as the sampling period and frequencies did not allow 12 samples to be taken over a 12 month period.

Table 1 Annual Average (AA) and Maximum Allowable Concentration (MAC) Environmental Quality Standards (EQS) for sheep dip pesticides.

Pesticide	**Annual average EQS in ng/l**	**Maximum Allowable Concentration EQS in ng/l**
Diazinon (OP)	10	100
Propetamphos (OP)	10	100
Chlorfenvinphos (OP)	10	100
Cypermethrin (SP) DRAFT	0.1	1
Flumethrin (SP)	No agreed standard	No agreed standard

In response to concerns raised regarding the possibility of contamination of private drinking water supplies in upland areas, a project was set up to investigate this at 35 sites. This collaborative project was managed by the Welsh Office, and supported by the Drinking Water Inspectorate, three Local Authorities and the Environment Agency. This will be reported separately by the Welsh Office.

2.3 Stream biology

Biological surveys were undertaken in 65 of the sub-catchments in July/August and October/November at over 660 sites. Due to high river levels and floods in October, some sampling was either delayed or could not be completed.

The biological surveys consisted of one-minute kick samples amongst stream gravels at key locations, followed by bank-side assessment for invertebrate composition. Each site was given a score according to the standard Biological Monitoring Working Party (BMWP) methodology.

Sites which had suffered severe biological impacts, due to sheep dip pollution, in 1997 were reassessed to establish how quickly the fauna recovered, and whether there was any indication of long term impacts.

2.3 Pollution prevention activities and farm visit programme

A programme of farm visits was undertaken within a total of twenty sub-catchments. Seven hundred properties were visited in total, of which 348 were subjected to a full inspection when it had been established that the farmers employed some sort of treatment. A common site inspection form was used to record information such as the site location details, type of dip used, structure of dipping facility, disposal method for used dip and the overall risk to watercourses from the sheep dipping operation (Appendix).

This was complimented by talks to farmers groups and training boards, attendance at agricultural shows and markets, press releases and articles, and the distribution of guidance notes. Mobile dip contractors were contacted and offered advice on minimising the risks of dipping.

In consultation with the Agency, additional farm visits were carried out by ADAS on behalf of the Welsh Office in sheep rearing catchments.

2.5 Sewage Treatment Works monitoring

As part of the 1997 monitoring programme two Sewage Treatment Works (STWs) effluents were monitored and found to contain sheep dip chemicals. As a result an additional six STWs were monitored during 1998, selected on the basis of their rural locations, and receiving inputs from either livestock markets or fell mongers. After initial results at these works, an additional four STWs were added to this programme in the autumn giving twelve in total. Biological monitoring was carried out in the receiving watercourses of some of the STWs.

3.0 RESULTS

3.1 Stream chemistry

Direct comparison of 1997 and 1998 data is not possible due to changes in detection levels, monitoring regimes and weather conditions. The results for synthetic pyrethroids (SPs) have been influenced by improved detection levels in 1998, as it was believed that the presence of SPs was under represented in Environment Agency Wales sites in 1997. Sampling frequencies were reduced in 1998 to enable more sites to be covered, and many of the sampling points were selected lower down the catchments, affording greater dilution. Due to a relatively wet spring, and a very wet autumn, river levels were generally higher, leading to dilution of pesticides.

The presence of sheep dip pesticides was found to be widespread, with 75 % of 107 river sites monitored giving positive (above detection level) results. Overall 52% of the 107 sites across Wales recorded positive results for the Organophosphate (OP) dip diazinon, and 34% for the OP dip propetamphos. Synthetic pyrethroid (SP) dips were also found at 33% of sites for cypermethrin and 6% for flumethrin. There were differences observed between the Agency areas (Fig 3.1). For 1997, the incidence of positive records for OPs was 95% for diazinon and 64% for propetamphos respectively, while that for SPs was 23% both for cypermethrin, and for flumethrin. No positive results were recorded for chlorfenvinphos at river sites suggesting that this sheep dip chemical, which is no longer authorised, was not being widely used.

The impact of weather on the timing of dipping was reflected in the monitoring results. Weather conditions may have influenced reduced dipping activity in June and July. However, dipping was then carried out right through the autumn, some as late as November and December due to the poor weather, in order to protect sheep through to lambing time. Few positive results were recorded in April, May and June, but the number increased in July and August, peaking in October, and continuing right through to December (Fig. 3.2)

Thirty-one sites (29%) of the 107 monitored failed the Maximum Allowable Concentration (MAC) Environmental Quality Standards (EQS) for one or more sheep dip pesticides. Thirteen sites (12%) failed the MAC EQS for one or more of the OPs and twenty-one (20%) failed the EQS MAC for cypermethrin. In 1997, 49 % of 39 sites failed the MAC for one or more sheep dip pesticides, but the majority of these were due to OPs rather than SPs.

3.2 Stream biology

Extensive biological surveys were carried out in 65 sub-catchments in upland areas, with a total of 1432 km covered between a network of 661 sites, more than double the length covered in the surveys in 1997. The results showed that atleast126.5km (9%) were known or suspected of being affected by sheep dip. In 1997, 679km were surveyed, and 5% was known or suspected of being impacted by sheep dip. In 1998 biological surveys were better targeted in catchments using chemical results from 1997 and 1998, which may account for some of the increase.

The 1998 survey represented approximately 10% of the high risk areas, and therefore the results suggest that up to 1200km of upland watercourses could potentially be affected by sheep dip.

In addition, a further 11% of river length surveyed in 1998 showed signs of biological impacts from other sources. Known causes included acidification, run off from abandoned metal mine sites, and organic pollution from silage and manure, in 2% of river lengths affected. At a number of sites, representing 9% of river length surveyed, the exact cause could not be determined due to high river flows preventing further investigation, or sites showing signs of recovery following an incident believed to have occurred some weeks or months before the survey.

Therefore, a significant conclusion of the 1998 survey is that 20% of the upland watercourses surveyed showed signs of impoverished biological fauna due to pollution. Of this 9% was suspected as being due to sheep dip pesticides, 2% other known causes, and an additional 9% which could not be confirmed to be due to any of these. Although high river flows may have masked the impacts in some cases due to difficulties in sampling, the results suggest that even in wet years, when dilution in watercourses is higher, sheep dip pesticides can still have a significant environmental impact.

Resurveys at sites which suffered sheep dip pollution in 1997 showed that in the majority of cases recovery of the invertebrate fauna was good. Where recovery had not occurred, this was attributed to further incidents of sheep dip pollution within the catchment, or possibly longer term impacts associated with disposal of used dip to inappropriate land or soakaway.

Only one survey included fisheries monitoring, and an assessment of salmonid distribution and growth rates was unable to detect any decreased productivity. Further fisheries investigations are recommended at those sites where biological recovery has not been complete.

3.3 Pollution prevention activities and farm visit programme

Seven hundred properties were visited as part of the 1998 pollution prevention campaign. Of these, 348 were occupied by sheep farmers using some form of treatment, such as dipping or injection, and were inspected accordingly. About half of the properties visited were found not to require a full inspection. This is nearly three times the number of farms inspected in 1997. Therefore any comparison of the results should be treated with caution. Farm visits could be targeted more effectively if better information was made available on the location of dips, or those farms known to stock sheep.

Organophosphate (OP) dips were used by 44% of farms inspected. Synthetic pyrethroid (SP) dips were used by just over a quarter of farms (28%). A new type of treatment method used by some farmers (6%) is the use of jetters or showers, which use a pumped system of spray jets to soak the sheep without immersing them fully in a dip bath. Injections and pour-ons were used at 9% of farms inspected.

Awareness amongst farmers on the risks of sheep dipping, and particularly the need for safe disposal was generally good. Fewer sites overall were found to be of high risk compared to 1997 (16 % cf 26%) and well over half (60%) were considered to be low risk. A proportion of farmers were found to dispose of used dip to land (nearly 80%), and 19% of farmers disposed of used dip to soakaway or direct discharge.

In some cases the need to dispose of pesticide containers properly, and the risks associated with allowing recently dipped sheep to have access to watercourses were not recognised. Also the greater toxicity of SP dips to aquatic life was not always known, due to the misconception that as it is safer for operators then it must be safer for the environment.

The use of jetters or showers, which use smaller volumes of chemicals, appears to be on the increase. The environmental risks of this activity, from the location of the equipment, management of sheep and disposal of spent dip are still high, and pollution prevention guidance specific to these methods of treatment is needed.

The campaign also targeted mobile dipping contractors, who were being employed more frequently by farmers. Although some contractors did discuss their operations when approached by the Agency, some operators were reluctant to do so, and greater efforts will be made to target these in future.

3.4 Sewage Treatment Works monitoring

Positive results for sheep dip pesticides were recorded at eleven out of the twelve Sewage Treatment Works (STWs) monitored. Nine of the STWs had significant levels in the final effluent, on at least one sampling occasion, the highest being 3880 ng/l for diazinon and 244 ng/l cypermethrin. Downstream monitoring was not carried out, so it is not known what levels were present in the receiving water following dilution of the effluent. However, these results suggest that further monitoring should be carried out to assess the environmental significance of these results.

3.5 Pollution Incidents

Seventeen substantiated pollution incidents were recorded in 1998, sixteen of which were detected during biological surveys, and one was reported by a member of the public. Of these eleven were directly attributable to synthetic pyrethroid dips and dipping activities, one was due to organophosphate dip, and one was due to both types of dip. The exact cause of the sheep dip pollution in the remaining four cases could not be confirmed.

4.0 OVERVIEW

Overall the results of the 1998 survey have confirmed that pollution by sheep dip pesticides is widespread in upland Wales. Positive results for sheep dip chemicals were recorded at 75% of sites, and levels were environmentally significant at 29% of sites. Biological surveys suggest that up to 1200km could be affected by sheep dip.

Pollution prevention visits suggest that although awareness of the risks associated with sheep dipping is increasing amongst farmers, practices have not changed sufficiently to allay concerns. Usage as indicated by farmers suggests a downward trend in the use of OP dips, and an upward trend in the use of SP dips. Substantiated incidents confirmed to be due to sheep dip were all but one due to SP dips. As SP dips are around 100 times more toxic to aquatic life than OP dips, this may provide some explanation for the increase in the proportion of river length impacted as indicated by biological monitoring compared to 1997.

Sewage Treatment Works receiving effluents from livestock markets and fell mongers have been identified as potential point sources of sheep dip pesticides that also need to be minimised.

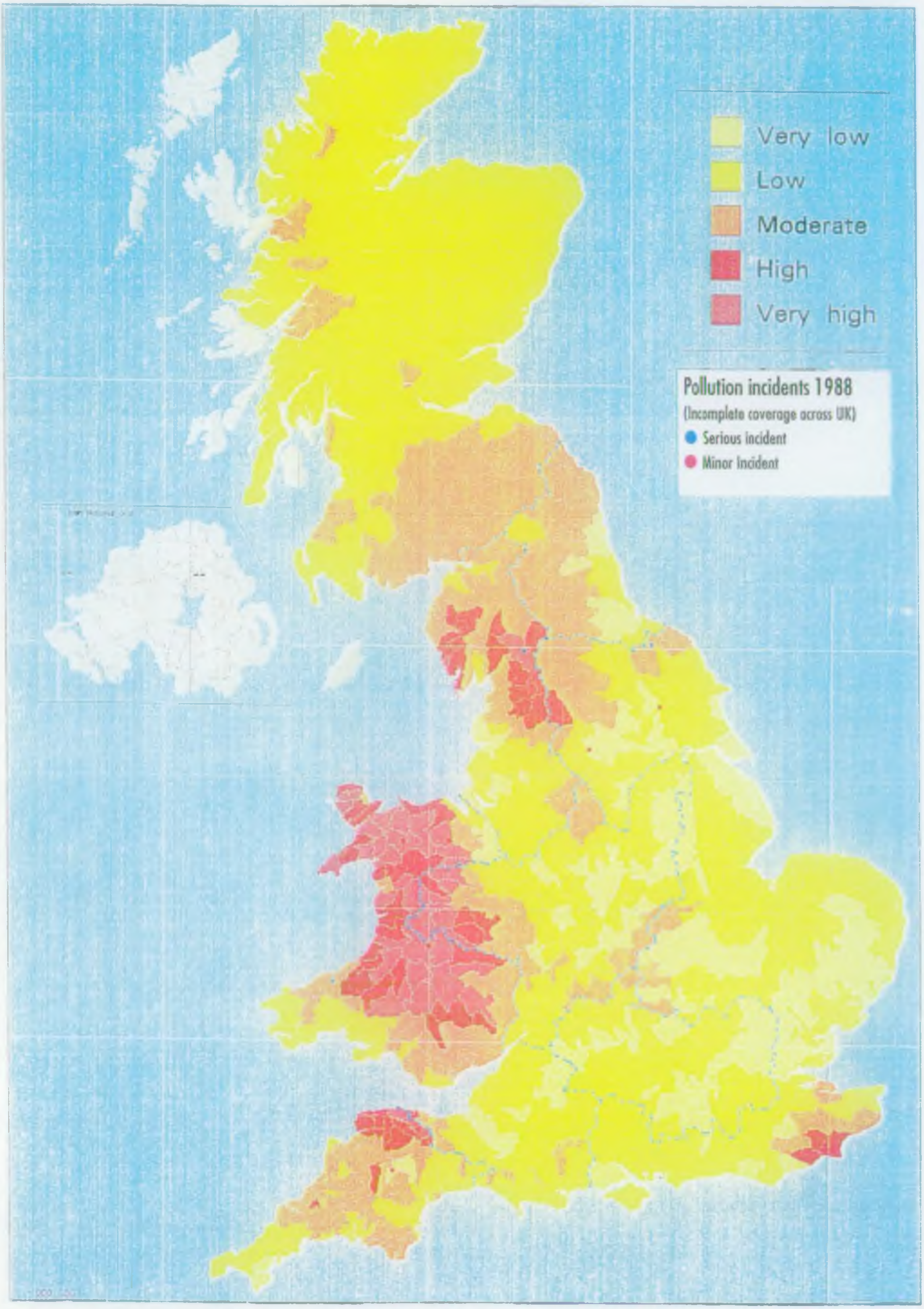
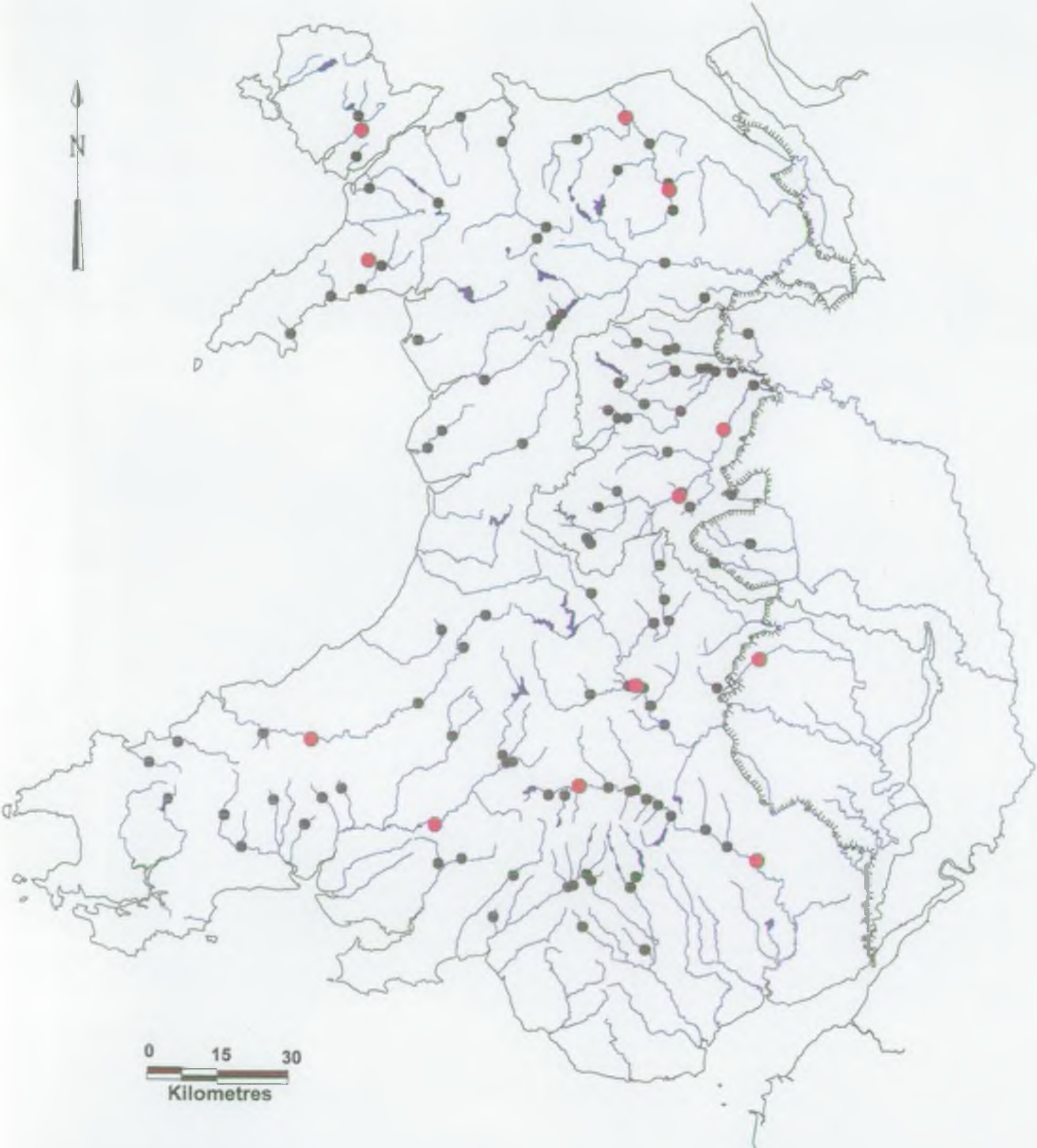


Fig. 1 Map showing the pollution risk to surface waters from waste sheep dip

ASIANTAETH YR AMGYLCHEDD CYMRU
ENVIRONMENT AGENCY WALES

Fig 2. Water quality monitoring network included in the 1998 sheep dip monitoring programme



- River water quality monitoring sites
- Sewage treatment works final effluent monitoring sites
- England / Wales Boundary

Fig 3.1 Detections of Sheep Dip Chemicals at River Monitoring Sites 1998

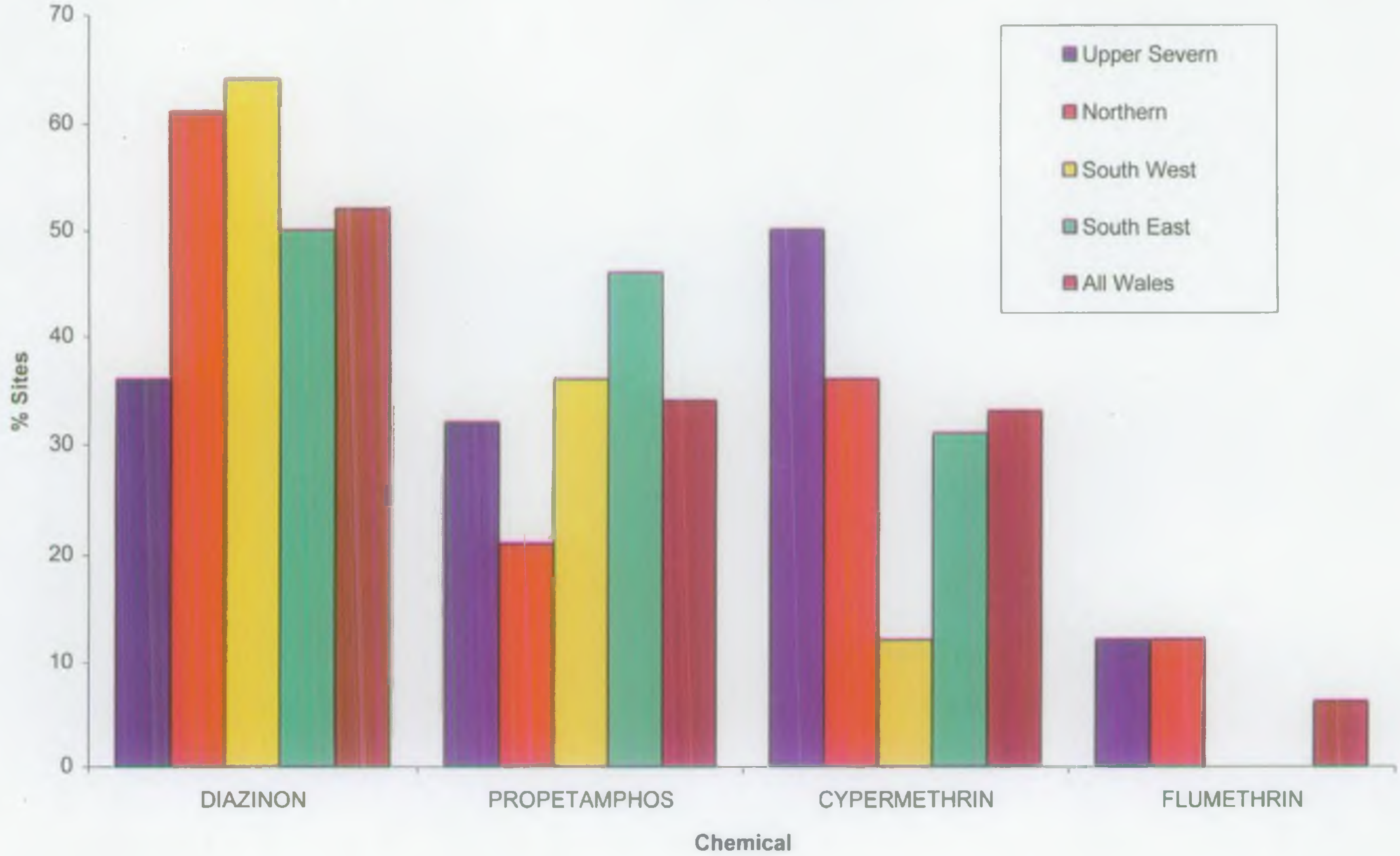
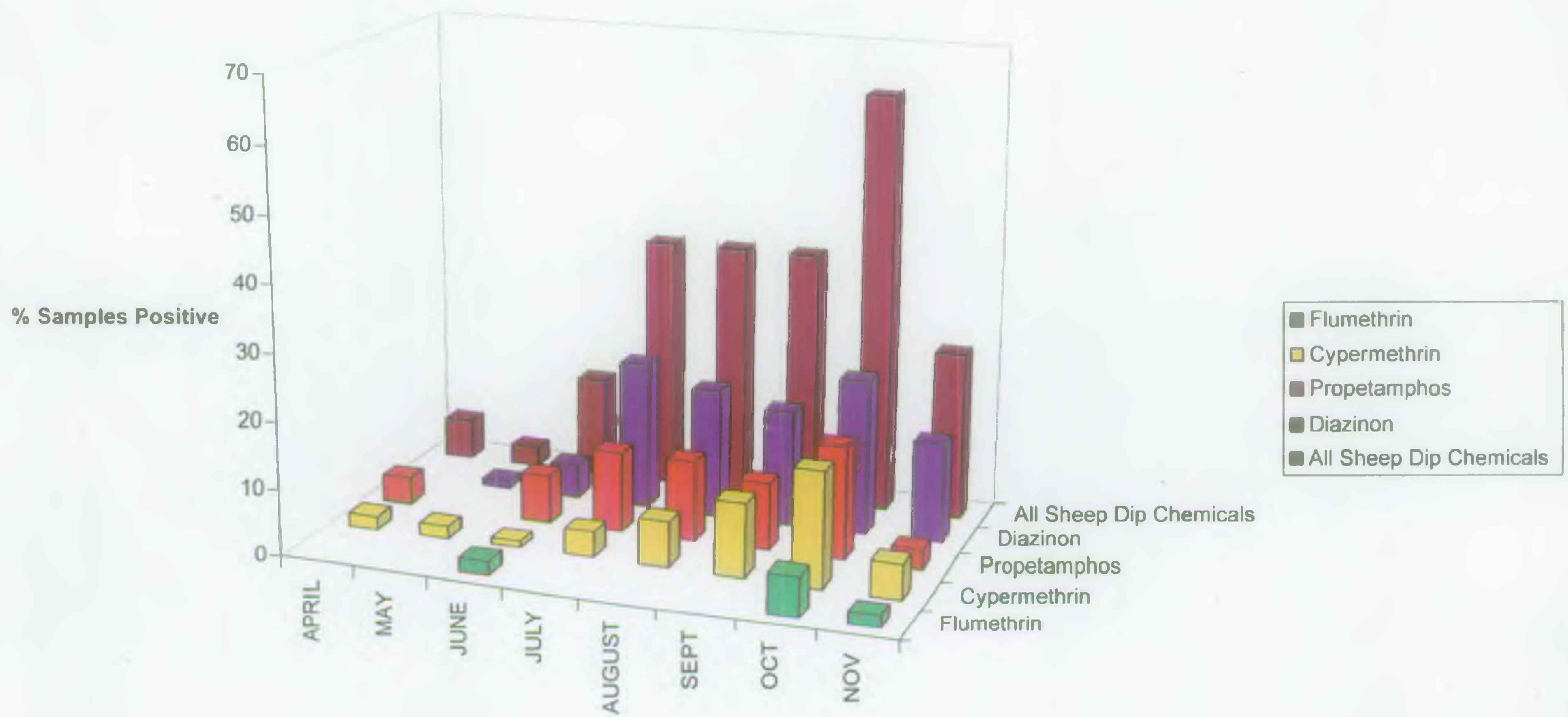


Fig 3.2 Samples recorded positive for Sheep Dip chemicals 1998



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POLLUTION PREVENTION VISIT - SHEEP DIPPING OPERATIONS

FILE REFERENCE ____________________

APPENDIX 2 National sheep dip site inspection form

1. Site Details

Occupier & Site Address

Name: ____________________

Address: ____________________

____

____

Tel (Inc STD Code) ____________________

2. Owners Address

Name ____________________

Address: ____________________

____

____

____

Tel: __________ Contact: __________

3.
Date of Visit: ____________________

Duration on Site: __________ Hrs __________ Mins

Inspected By: ____________________

Form Checked (PCO): __________ Date: __________

Follow up required yes ☐ No ☐

Re-visit date: ______ / ______ / ______

Letter Required: Yes ☐ No ☐

Letter Sent: ______ / ______ / ______

4. Catchment

NGR of Dip Site (8 Figs) ____________________

PROXIMITY TO W/COURSE? ____________________ m

5. Discharge Found? Yes ☐ No ☐

Discharge Point NGR (8 Figs) ____________________

6. Risk to Groundwaters? Yes ☐ No ☐

Abstractions at risk: ____________________

____

____

Risk Status High ☐ Medium ☐ Low ☐

7. Risk to Surface Waters? Yes ☐ No ☐

Details: ____________________

____

Risk Status : High ☐ Medium ☐ Low ☐

8. STRUCTURE OF DIP TANK

PERMANENT SITE

Roof over dip Yes ☐ No ☐

MATERIAL?

BRICK ☐

CONCRETE ☐

GRP ☐

PLASTIC ☐

STEEL ☐

OTHER (PLEASE SPECIFY) ☐

Does structure appear to be in good state of repair? Yes ☐ No ☐

Presence of drain hole? Yes ☐ No ☐

Risk Status: High ☐ Medium ☐ Low ☐

9. COLLECTING/DRAINOFF AREAS

Permeable Floor ☐ Impermeable Floor ☐

Draining apron diversion when not in use? Yes ☐ No ☐

Drain off Returned to Dip Yes ☐ No ☐

Capacity of Drain off Pen? (No. sheep) __________

Drain off Period __________ minutes

Risk of leakage by splashing Yes ☐ No ☐

Age of 'Permanent' Dip Tank

1 - 5 yrs	☐	15 - 20 yrS	☐
5 - 10yrs	☐	20 - 25 yrs	☐
10-15 yrs	☐	> 25	☐

10. Pesticide Usage

Type of Dip O/P ☐ S/P ☐

Product name(s) ____________________

____

Pesticide Storage

Quantity used? ____________________ litres

Volume stored? ____________________ litres

Locked Store ☐ Unlocked Store ☐

Risk Status : High ☐ Medium ☐ Low ☐

Operator awareness of pollution risk

High ☐ Medium ☐ Low ☐

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11. Mobile Dips

Mobile Dip Used Yes ☐ No ☐ (If NO go to 12)

Dedicated Area? Yes ☐ No ☐

Permeable Base? Yes ☐ No ☐

Distance from watercourse? ____________ m

Distance from surface water drains? ____________ m

Could dip enter surface water drain system? Yes ☐ No ☐

Contractor Details

Name: ____________

Address: ____________

____

Tel: ____________

Pesticide Usage

Supplied by Contractor ☐

Type of dip O/P ☐ S/P ☐

Product Names(s) ____________

____

Risk status: High ☐ Medium ☐ Low ☐

Need to relocate to dedicated area? Yes ☐ No ☐

12. Access to Pasture

Direct from holding area Yes ☐ No ☐

Does access cross w/course Yes ☐ No ☐

Drinking water supply - from stream Yes ☐ No ☐

- from trough(s) Yes ☐ No ☐

Time held in pasture prior to release ____________ hrs

13. Disposal of spent dip

Discharge to watercourse Yes ☐ No ☐

discharge to soakaway Yes ☐ No ☐

Diluted with water Yes ☐ No ☐

Diluted with slurry Yes ☐ No ☐

Drain to slurry lagoon Yes ☐ No ☐

Drain to tank Yes ☐ No ☐

Spread on land Yes ☐ No ☐

Area used for spreading ____________ (Ha)

Land type (e.g. soil/ slope/ geology) ____________

____

____

Proximity to w/course ____________ metres

On-Farm disposal Yes ☐ No ☐

Off-Farm disposal Yes ☐ No ☐

Removed by waste contractor Yes ☐ No ☐

Removed by mobile dipping contractor Yes ☐ No ☐

Treatment prior to spreading Yes ☐ No ☐
(eg Addition of lime)

Please specify ____________

____

____

____

Risk status High ☐ Medium ☐ Low ☐

14. Disposal of unused dip

Returned to supplier Yes ☐ No ☐

Returned to manufacturer Yes ☐ No ☐

Stored for future use Yes ☐ No ☐

Dilute in bath & spread Yes ☐ No ☐

* onto/ * into land (delete as necessary)

Suitability of land Yes ☐ No ☐

Used by > 1 farmer Yes ☐ No ☐

Total No. sheep dipped ____________

15. Comments and remedial works identified/ agreed with timescale for completion.

____

____

____

____

____

____

16. Overall risk

High ☐ Medium ☐ Low ☐