

Every drop counts

Advice on pesticides and water protection for farmers and sprayer operators



Every drop counts

Over the past decade, with help from The Voluntary Initiative (VI) and related activities, the farming industry has made great strides in cleaning up its act when it comes to keeping pesticides out of water. However, there is still much more to do.

Some pesticides that were regularly detected in watercourses are no longer approved or have had certain uses revoked. Additionally, new pesticide detection methods along with changes in farm rotation and crop protection practices mean that other pesticides are now being identified as increasing problems. Discontinuing use of such products is not always the best way forward. An independent review by ADAS highlighted the threat to the viability of the winter oilseed rape crop if the industry were to lose vital herbicides and metaldehyde slug pellets.

The good news is that overall, background levels of pesticides detected in water are declining and there appears to be relatively few compliance problems with aquatic toxicology standards for pesticides. However, the improvement is still not sufficient to completely protect drinking water abstraction points. In particular, peak pesticide levels in watercourses – often linked to rainfall events after applications to very wet soils – pose major problems for water companies despite extensive investment in treatment facilities to remove pesticides. Water companies must comply with the 0.1ppb EU Drinking Water Standard at the tap. With new EU legislation, including the Water Framework Directive and the Sustainable Use of Pesticides Directive,

being implemented in the UK more action is needed to protect water.

The industry as a whole should be proud of what has been achieved in keeping pesticides out of water. This has included: the H2OK? Campaign; year after year of NRoSO training events run by agrochemical distributors; advisers working together with farmers in catchments with innovative communication methods; the Pelletwise Campaign, Catchment Sensitive Farming, Water Protection Action Sheets (formerly known as decision trees); and more recently, the advent of local Catchment Officers focused on protecting the environment in specific catchments. But more needs to be done.

This publication summarises the latest knowledge on how pesticides reach water – whether a river, ditch, or underground aquifer. More importantly, it looks at ways to prevent it happening. In most instances, it is not that difficult. Sensible approaches to filling sprayers and applying pesticides can make big differences. It makes sense for the environment; it also makes economic sense when using pesticides, to ensure that **Every Drop Counts**.



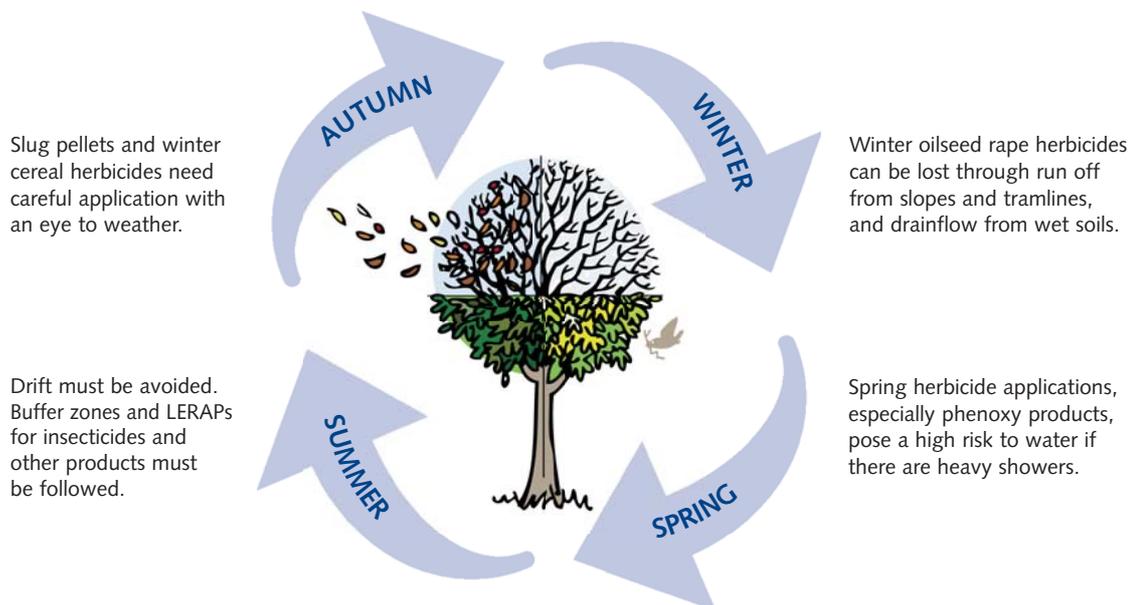
“Farmers have worked hard to protect water from pesticides – for that we should be proud. However, we must also recognise that the industry will remain under severe scrutiny and we must be willing to work with advisers and regulators to identify and adopt best practice on every farm.”

Gwyn Jones, Vice President, NFU

What is a pesticide?

'Pesticide' is a very broad definition within the Food and Environment Protection Act 1985 which includes herbicides, fungicides, insecticides, molluscicides, growth regulators, soil sterilants, rodenticides and wood preservatives among others.

Protecting water - A year round challenge



And every time applications are made, pesticides are handled and machinery cleaned down be sure to take account of the attendant risks.

Key points

- Work with your BASIS-registered agronomist to identify local and catchment level risks to surface and ground waters from pesticides. Check if there are local water company abstraction points or if your farm is within a Drinking Water Protected Area or associated Safeguard Zone.
- Identify fields, crops and situations with a greater risk of pesticides reaching surface or groundwater.
- Establish a grass buffer strip, at least 6m wide, beside all surface watercourses.
- Review crop protection plans with your agronomist and identify products where the extra advice in Water Protection Advice Sheet (WPAS see page 9) should be followed.
- Draw a plan of your pesticide handling area(s), identifying nearest surface water sites and all drains. Ensure water is protected and eliminate any activities that threaten water.
- Ensure all drainage water/run-off from handling areas drains into a lined biobed or a sump prior to disposal to an area with a groundwater permit.
- Minimise cultivations and retain surface trash to protect soil structure and keep soil, pesticides and nutrients in the field.
- Minimise run off and erosion from tramlines by running them across, or around, slopes and use low ground pressure tyres.
- Follow WPAS for key pesticides. Check weather forecast and soil conditions before spraying.
- Make sure all pesticide application equipment is tested annually and maintained in season; consider options such as low-drift nozzles.
- Ensure label requirements for a LERAP, or a buffer zone, are followed.

Avoid spraying if:

- Soils are very dry and deeply cracked
- Field drains are flowing, or likely to flow, within the next 7 days
- Heavy rain is likely within the next 48 hours.



Drinking water: the big challenge

Water monitoring becomes ever more sophisticated and anyone using crop protection products incorrectly should not believe that poor practice will escape detection.

Crop protection products are essential tools for farmers. Ensuring these products do not enter watercourses or ground water at unacceptable levels is essential to avoid their use being lost or restricted.

From the water companies' perspective, when levels of pesticides in the drinking water supplied at the tap exceeds the Drinking Water Standard the companies are in breach of regulations and the water must be treated. For pesticides that can be removed, the process can be costly; while for pesticides that cannot be removed by existing technologies, there is the complication of mixing and diverting other water resources, stopping abstraction or risking failure at the tap.

“ We have a legal duty to monitor pesticide levels likely to be a problem in water sources used for drinking water production, in order to ensure that we do not exceed strict standards set for tap water. We are working with the farming community to establish the best ways to protect such water sources and let farmers get on with their job. ”



Sarah Mukherjee,
Director of Environment, Water UK

EU Drinking Water Standard

0.1ppb is the European Drinking Water Standard that water companies must meet for most pesticides individually and 0.5ppb in total. This is a minute amount and very hard to envisage, but here are some equivalents:

- In just one second, two nozzles can deliver enough pesticide to exceed the 0.1ppb standard in 1.5 miles of water in a good-sized brook
- 1 second in 320 years, 1p in £100 million, a grain of wheat in 390 tonnes
- 1 baked bean in twenty one million cans of baked beans
- 1 stem of hay in 111,000 20kg bales

Grassland – the Achilles' heel?

While arable farms apply pesticides regularly and on larger farms have dedicated sprayer operators, the grassland sector has far more occasional use. For instance, weedkillers are used on grassland on average just once every five years and only five per cent of the grassland area is sprayed in any one year.

Yet many grassland herbicides are still routinely detected by water companies and environment agencies. Therefore, those whose farms are predominantly grass and forage-based should either ensure there is someone on the holding who is correctly trained and holds the appropriate certificates of competence. Or, consider using a contractor with the training, correct machinery and knowledge to ensure that both crops and surrounding water sources are protected.



“ The Red Tractor assurance schemes for livestock all require that farmers who use pesticides store them properly and that they are applied correctly by competent workers. As a minimum they must comply with legal requirements for pesticide storage, training and record keeping. ”

David Clarke, Chief Executive, Assured Food Standards

Key risks for improvement

Recent surveys¹, undertaken on behalf of the VI and Catchment Sensitive Farming (CSF), highlight that many farmers recognise areas where they can improve their practices.

Ten areas highlighted as key risks:

In the yard



Storage – a small leak can soon cause a serious pollution incident.



Sprayer maintenance – a leaking pipe, or loose connection, means lost product and a threat to water quality.



Filling areas – the washings from a single foil cap can lead to excess pesticide levels some 30km downstream.



Washing – soon generates large volumes of dilute solution. This must be trapped for safe disposal.



Disposal – empty containers need to be cleaned and disposed of through a waste or recycling contractor.

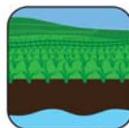
In the field



Cracked soils – allow chemical movement down the soil profile to drains and aquifers.



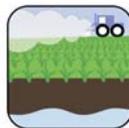
Run off and soil erosion – remove products in solution and attached to soil particles.



Tramlines – should run across slopes to avoid run-off carrying pesticides to water.



Application timing – Rainfall within 48 hours of application increases run-off and drain flow risks.



Drift – not only poses threats to water quality, but also to aquatic life.

The challenging treatments

Some plant protection products show up regularly in water monitoring and continue to pose a challenge to the industry as a whole. These include:

Oilseed rape herbicides, such as carbetamide, propyzamide and metazachlor. Effective application depends on balancing the threat of loss to water due to poor soil or weather conditions against correct timing for efficacy. These products are used extensively on winter oilseed rape, the UK's third largest arable crop. With no alternatives, the crop which provides a vital opportunity to control blackgrass would barely be viable.

Slug pellets based on metaldehyde. New guidelines, devised under the Pelletwise campaign, aim to reduce the risk of metaldehyde reaching water by reducing application rates and improving application techniques. Again, slugs pose a serious challenge to production of many autumn sown crops to find out more visit www.pelletwise.co.uk



“ It’s all about keeping the pesticides where they should be - in the field and on the crop rather than in watercourses where they can impact on water quality. ”

Will Dryburgh, CSF Officer, Borders



¹. The surveys can be found under reports in the library section at www.voluntaryinitiative.org.uk

How pesticides can reach water – from your ‘yard’

Around 40% of pesticides detected in surface water are believed to result from poor practice in the handling area.

Typical causes of losses can be:

Spills – either directly from pesticide containers, from measuring equipment, or from the sprayer itself.

Splashes – even small quantities of pesticide can affect water quality. Washings from the foil cap from a container may carry enough pesticide to be detected 30km downstream.

Washings – from rinsing out containers or sprayers, cleaning protective clothing or from washing down equipment can all pose risks to water quality.

Overall, these issues pose problems when the design of the filling station has not taken account of the potential for pesticide loss in terms of the right surface, location in relation to watercourses and drains, or lack of facilities to capture any losses that inevitably will occur.



Splashes on foil seal – are sufficient to put 30km of a good size stream above the Drinking Water Standard.



Sprayer wash down – hosing down a sprayer generates large volumes of dilute liquid.



Open drain – Drains that run straight to ditches or other watercourses can quickly channel pesticides into water.



Open container on bench, or trailer – Spills of concentrated products cause trouble if there is no provision to deal with the incident promptly.



“ With a little thought and planning farmers and operators can do a lot to prevent losses from filling areas without heavy capital investment. Organising the filling site, spill trays under the hopper and tank overflow, having materials on hand to deal with spills, makes a big difference. ”

Tom Robinson, Organiser, Farm Sprayer Operator of the Year Award

How pesticides can reach water from the field

Incorrect and untimely applications can lead to pesticides moving from target crops into water.

Movement from soil to water

Pesticides move from soil to water in two main ways:

Drainflow losses occur when:

- pesticides are applied to very dry/cracked soils
- when heavy rainfall occurs within 48 hours of pesticide application
- pesticides are applied to very wet or saturated soils and small amounts of rain flush them through the soil profile

As a result pesticides, in solution or attached to soil particles, can enter watercourses via drains or soil movement. This is a particular problem in autumn and winter, and when field drains are effective.

Run-off occurs when pesticides are applied to compacted, wet or frozen ground, especially when rain falls shortly after application. Then pesticides are washed off the soil surface into nearby watercourses. Such run-off may occur with pesticides dissolved in water or attached to soil particles as erosion. Poorly placed tramlines can increase this problem.

Direct spraying of watercourses and drift

Failure to turn off booms when turning at headlands, poorly placed tramlines or lack of grass buffer strips result in spray solution being applied directly to ditches or other watercourses. Application in windy conditions, or where no buffer strip is in place, can lead to spray being blown from target crops into watercourses.

Losses to groundwater

Pesticides, especially those that are more soluble and mobile, may leach through soil into groundwater. Losses may be higher in thin sandy soils, soils with low organic content (less than 1%), or where dry ground is heavily cracked. Risks are higher where the water table is close to the soil surface.

Pesticide chemistry and use

The basic chemistry of a crop protection product determines its characteristics (including how soluble, mobile and persistent it is in the environment), but popularity, dose rate and the timing of application all impact on whether or not a product is likely to turn up in water. Where a product is widely used on major crops and at times of year when soils are wet or there is plenty of rain the risks of that product being detected in water are that much greater.

Oilseed rape herbicides

Increased oilseed rape area and the need to improve blackgrass control has resulted in greater use of the herbicides: propyzamide, carbetamide and metazachlor; this has increased the frequency of their detection in water. These products are autumn/winter applied and in the case of propyzamide and carbetamide optimum timing may be when soils are very wet and drains are starting to flow. These pesticides can also be lost off the surface after heavy rainfall and through deep cracks if applied too early before soils have wetted up.

Urons

The popularity of the urons (chlorotoluron) together with relatively high dose rates, medium solubility and persistence, and application when drains are likely to be flowing, means good field practice is crucial to keep them out of watercourses.

Phenoxys

These are soluble and not strongly absorbed, therefore when conditions are wet the phenoxys (mecoprop-p, MCPA, 2,4-D and dichlorprop-p) can enter field drains then move to streams and rivers. Water companies find these products difficult to remove. Fortunately, their low persistence means that they are less likely to enter groundwater. Also their main use period, in spring, is after the main drain flow period. However, sudden rainfall events such as thunderstorms a day or so after spraying can result in run-off.



“ The value of buffer strips beside watercourses shouldn't be underestimated. They protect valuable watercourses from run off and help meet LERAP requirements, whilst contributing to the aims of the Campaign for the Farmed Environment and The Voluntary Initiative. They also help biodiversity. ”

Jim Egan, Technical Director, FWAG

Best practice in the yard

Time spent on preparation for spray operations can pay big dividends when it comes to water protection.

Storage

Stores should be secure and frost free. They need a bund to stop leaks from spills and burst containers. Storage capacity should be adequate to handle the maximum amount of product likely to be stored, although for very bulky items, e.g. slug pellets, alternative arrangements may be necessary. Ensure there is provision for first aid and fire fighting too.

Records

It is important to keep track of products delivered and used. Such records are invaluable and, in case of a fire, copies should be kept in a separate location to the store.

Handling area

Design your site to handle any spills and splashes. All surplus water should either run to contained drainage or a suitable biobed. Ensure any run-off from handling areas cannot enter storm drains or watercourses. For small volumes of work, it may be adequate to fill on grassland, provided it is well away from any drains, ditches or gateways.

Ensure the filling area is suitably equipped for measuring chemicals, handling spills, and washing and draining empty containers.



“ Modern sprayers offer a high degree of sophistication, but like any other equipment need regular servicing and calibration to perform correctly, efficiently and save money. ”

Duncan Russell, National Sprayer Testing Scheme Manager

Equipment preparation

A pre-season check should ensure you have all the necessary equipment for the pesticides you plan to use, including gloves, faceshields, etc. Field sprayers should undergo an annual test using the National Sprayer Testing Scheme. Knapsack sprayers should also be checked for leaks and loose joints.

Washing and cleaning

Should be undertaken well away from watercourses. Wash down in the field using a clean water tank, internal tank rinsing nozzles for inside the sprayer as well as a hose and brush for the exterior. Alternatively wash down in the handling area ensuring washings are drained to a sump or lined biobed.

Stocktaking and disposal

At the end of each season part-used containers are often left over. As approvals for crop protection products are constantly changing, it is important to stock take at least twice a year and ensure that products in store are still authorised for storage and use. Where products are obsolete, they must be disposed of using an approved contractor.



Lined biobeds can treat sprayer washings and drainage from pesticide handling areas

Best practice in the field

Use a range of control strategies

While plant protection products are valuable tools, they can work much more effectively and economically when integrated with other control techniques such as crop rotation, cultivation and resistant varieties.

Only spray when necessary

It makes financial and environmental sense only to spray when necessary. Treatment thresholds exist for many pests, diseases and weeds. For some pests, national surveys give a guide to likely crop loss; in many other instances field or crop inspection is necessary. If in doubt, consult a BASIS-registered agronomist.

Plan work

Always take account of weather and soil conditions when planning any spraying activity. Spraying should not take place when:

- Heavy rain is expected within next 48 hours
- Ground is waterlogged, frozen or snow covered
- Ground is dry and cracked.

Water Protection Action Sheets (WPAS) are available for key pesticides that are finding their way into water: bentazone, carbetamide, chlortoluron, clopyralid, propyzamide, mecoprop-p, metaldehyde based slug pellets, metazachlor

Latest WPAS can be downloaded from the library section of the VI website.

Always consult the latest versions when planning spraying operations.



“When the pressure is on to complete work, it is all too easy to try to go when ground conditions or weather forecast are not favourable. This is just money and pesticides down the drain.”

Steven Bailey, Catchment Sensitive Farming Co-ordinator for The Severn

Minimise overlaps

Plan field work and layout of tramlines to minimise any short working and overlaps. Precision technology with the ability to shut off a specific boom section can significantly improve accuracy, especially in short workings or headlands.

Protect watercourses

When working beside watercourses it is vital to ensure that plant protection products do not reach water, either by direct spraying or from drift. Where available, make use of GPS mapping and automated sprayer control to enhance protection of watercourses across the farm. Install 6m grass buffer strips next to watercourses, use wider strips - up to 20m - for long or steep slopes.

Optimise soil management

Managing soil correctly will reduce soil erosion and run off, and well managed soil will help protect watercourses. Plan operations to maintain soil structure and organic matter content that will reduce rapid drainage.

Deep subsoiling (and mole draining) can help remove pans and compaction, but may allow a more rapid movement of pesticides through the soil structure. Thus, only subsoil just below pan depth to remove any identified compaction and avoid subsoiling or mole draining before using any of the products with a WPAS.

Min or No-till techniques can help reduce soil erosion and compaction and increase organic matter levels in the soil. Leaving plenty of surface trash will also help protect soils from rain drop impact.

Minimise risk of chemical movement

Sprays applied to a sloping field are more susceptible to losses through run off or drainflow. Creating tramlines across the slope, using low ground pressure tyres and establishing grass buffer zones – at least 6m wide at the bottom of slopes beside watercourses will considerably add to water protection.

For slopes over 5 degrees, consider other features to reduce surface run-off such as beetle banks that follow contour lines.

Best pesticide practice around the farm

Heavy rain within 24-48 hours of application can lead to pesticides washing into watercourses

Washings from a single foil seal can be detected miles downstream

Care in application and timing greatly reduce the risk of drift or run-off

Buffer areas between cropping and watercourses will do much to reduce the risk of run-off and gain stewardship rewards

Occasional treatment of grassland demands professional standards in application



Run-off can be a problem especially in forestry

Drift control is always important but especially so in orchards

Horticulture faces different crop protection challenges, but must meet the same standards

Water companies have a legal duty to meet drinking water standards

Delivering clean water is good for the environment and for farming's image



Useful enquiry numbers

Catchment Sensitive Farming Officers
Consult website www.naturalengland.org/csf

Scottish Environment Protection Agency:
Consult phone book or www.sepa.org.uk

Natural England:
03708 506 506

Environment Agency:
General Enquiries: **08708 506 506**
Emergency Hotline: **0800 80 70 60**

Websites offering more information:

Business Link Farming – www.businesslink.gov.uk
Campaign for the Farmed Environment – www.cfeonline.org.uk
Chemicals Regulation Directorate – www.pesticides.gov.uk
Crop Protection Association – www.cropprotection.org.uk
Cross compliance – www.crosscompliance.org.uk
Environment Agency – www.environment-agency.gov.uk
Environmental Regulations – www.netregs.gov.uk
Health and Safety Executive – www.hse.gov.uk
National Association of Agricultural Contractors – www.naac.co.uk
National Register of Sprayer Operators – www.nroso.org.uk
National Sprayer Testing Scheme – www.nsts.org.uk
Natural England – www.naturalengland.org.uk
Pelletwise – www.pelletwise.co.uk
Scottish Environment Protection Agency – www.sepa.org.uk
The Voluntary Initiative – www.voluntaryinitiative.org.uk



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The Voluntary Initiative is a programme of measures which promotes responsible pesticide use.