

GETTING THE DRIFT

A COMMUNITY GUIDE TO PESTICIDES
SPRAYED IN THE NSW NORTHERN RIVERS



ABOUT US

The **Environmental Defender's Office NSW** (EDO) is a community legal centre specialising in public interest environmental law. We help individuals and community groups who are working to protect the natural and built environment. The EDO NSW is part of a national network of EDOs which help to protect the environment through law in each of the States and Territories. It has an active program of casework, education, policy and law reform and scientific services. In addition, we provide free initial legal advice to the community. The NSW office has been in operation since 1985 and is funded primarily through the NSW Public Purpose Fund. The NSW Northern Rivers office was opened in Lismore in 2006.

The **National Toxics Network** (NTN) is a community organisation working to ensure a toxic-free future for all. Formed in 1993, NTN has grown as a national network giving a voice to community and environmental organisations across Australia, New Zealand and the South Pacific. NTN is the Australian focal point for the International POPs (Persistent Organic Pollutants) Elimination Network (IPEN).

DISCLAIMER

This publication is intended to provide general information about pesticide regulation and use in the NSW Northern Rivers. While all care has been taken in its preparation, it relies substantially on information provided by third parties. It is not a substitute for legal advice in individual cases.

CURRENCY

The information in this booklet, including weblinks, was current as at 31 August 2010. The authors welcome notice of corrections or additional information. Please send these to edonr@edo.org.au

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about this booklet

The Environmental Defender's Office and National Toxics Network often receive requests for information from the public regarding their rights in relation to pesticide use and exposure in the NSW Northern Rivers. This booklet has been compiled to help inform residents of this region about the most common and potentially hazardous pesticides that may be sprayed on agricultural or public land near them, and to provide information about the relevant legislation and regulations that govern the use of pesticides in NSW.

With access to information, people can make more informed choices about where to live, whether and when to drink rainwater, when children should play outside, what to ask neighbouring farmers about their activities and what to do if they feel their rights have been infringed or their health has been affected by spray drift.

The information in this booklet is based on current, independent and peer-reviewed data from multiple sources including the Australian Pesticides and Veterinary Medicines Authority (APVMA) and Pesticide Action Network (PAN) databases. The tables were assembled by compiling lists of all registered pesticides in the APVMA database for each of the selected industries or crops. These lists were then supplied to the relevant industry bodies for checking, since many registered pesticides are not commonly used, or are not used in the Northern Rivers region. The tables may therefore not be comprehensive. Also, there was no industry input for the stonefruit, nursery, turf farm or other industries, so they have not been included in this first edition.

More detailed information about specific pesticide products is provided on the product labels (many of which are available on the APVMA database) and the material safety data sheet (MSDS) for each pesticide, which can be obtained from the manufacturer or from the APVMA website.

This is a companion publication to the NTN's *Community Information and Action Kit: The Threat of Pesticide Spray Drift* (2009) and the EDO's *Rural Landholder's Guide to Environmental Law* (2008), both of which are available in hard copy or as PDF downloads from the EDO and NTN websites.

There are potential sources of pesticide exposure and contamination in the Northern Rivers that the tables in this booklet do not cover. These include building pest treatments, old chemical containers,¹ old rubbish dumps, contaminated agricultural land,² and cattle tick dip sites, many of which are still in use (see box on page 9).

What is a pesticide?

Pesticides are chemicals used to control pests. They include herbicides, fungicides, insecticides, fumigants, bactericides, rodenticides, baits, lures, repellents and pesticides used on animals to control external parasites. This booklet focuses on pesticides applied to crops and weeds by various spraying methods, including ground rigs, fan blasts, backpacks and aerial application by cropdusters.

why is this booklet needed?

The Northern Rivers region combines rich agricultural land and high rainfall with relatively high numbers of people living on urban fringes, rural residential properties and small farms. This mix of land uses can sometimes lead to conflict between neighbours where pesticides are used.

Unless they are using certified organic practices to manage their farms, farmers and agribusinesses are likely to use pesticides to protect their livestock and crops from insect pests and for weed management. Pesticides are also used by public authorities such as local councils and contractors to control weeds on public land — for instance, roadside spraying, Bitou bush control on coastal land, and other weed management in public parks and bushland. Other landholders may also use chemicals to control pests and weeds.

When pesticides are used, spray and vapour drift can occur as a result of factors including deliberate or accidental misuse, changing weather conditions and poorly maintained and calibrated equipment. Pesticide residues can also move from where they are applied as a result of rain and the movement of dust. (This is called the secondary movement of pesticides.)

All application methods of pesticides can create spray drift if the label instructions and appropriate weather conditions for spraying are not followed. Even applying some pesticides according to the label instructions can result in the movement of pesticide residues offsite.

What is spray drift?

The APVMA defines spray drift or vapour drift as the physical movement of spray droplets (and their dried remnants) through the air from the nozzle to any non- or off-target site at the time of application or soon thereafter.³

This definition does not include the secondary movement of agricultural chemicals to non- or off-target sites caused by volatility, erosion, surface or groundwater transport or windblown soil particles that occurs after application. Post-application drift can occur hours or even days after application.

how are pesticides regulated?

Commonwealth

Pesticides are regulated nationally up to the point of sale by the APVMA.⁴ That is, the Australian Government decides what pesticides can be sold and the conditions under which they must be applied. For instance, the APVMA specifies 'no spray zones' for ground and aerial application — buffer zones between an application area and an area downwind that needs to be protected. These distances vary according to the product method of application, droplet size, wind speed, etc.⁵

Some pesticides can still be used legally in Australia even though they may be banned in other countries or there may be strong evidence of their toxicity to humans, other animals, native vegetation and waterways (see, for example, Endosulfan, discussed below under Top Ten Toxics). However, extra restrictions on use apply to pesticides listed as restricted in Schedule 4 of the

Agricultural and Veterinary Code Regulations 1995 (the AgVet Code). These include bifenthrin, chlorpyrifos and endosulfan (all of which appear in the tables in this booklet), and sodium monofluoroacetate (or 1080), which is commonly used as a fox bait.⁶

The APVMA's Chemical Review Program reviews the registration of existing pesticides to determine whether changes are necessary to the registration or whether the registration should be withdrawn. However, this is a slow process which rarely results in pesticides being withdrawn or banned.⁷ The APVMA can act more quickly when necessary.⁸

State and local

State and territory governments are responsible for ensuring that pesticides are used according to labels and permits. Pesticide use in NSW is regulated under the *Pesticides Act 1999*⁹ and *Pesticide Regulation 2009*.¹⁰ The Act makes it an offence to use a pesticide in a way that causes injury or likely injury to another person, damage or likely damage to another person's property, or harm to a non-target plant or animal, including threatened species or other protected animals.

The Act also requires that only APVMA-registered or -permitted pesticides be used; that instructions on the label be read and followed¹¹; that pesticides be stored in properly labelled containers; and so on. The Act also provides for a range of remedies for breaches, ranging from penalty notices to substantial fines. However, there have been few successful prosecutions since the Act commenced in 2000.¹²

The Regulation has additional requirements relating to record-keeping, training and notification. It also requires public authorities, such as local councils and government agencies, to have a **Pesticide Use Notification Plan**¹³ which establishes how the community will be notified when they use, or allow the use of, pesticides in public places that they own or control, such as parks and ovals. These plans must be available on the council's or agency's website.

Under the Regulation, pest management technicians or people who engage them also need to give at least five working days' notice of their intention to spray in the common areas of multiple occupancy residential complexes or within 20 metres of 'sensitive places' such as kindergartens, schools, nursing homes and community health centres.¹⁴

Pesticide control orders can also be issued under section 38 of the Act to protect public health, property, the environment or trade, or to implement a decision or policy of the APVMA. While there are control orders for endosulfan and 1080, among others, of particular relevance to the Northern Rivers is control order Air-1 (1987), which requires that

any person applying a pesticide from an aircraft shall not release, discharge or apply such pesticide within a distance of 150 metres horizontally from the boundary of any dwelling, school premises, factory premises, or any public place without the owner of the property on which the pesticide is applied or his/her nominee having obtained prior consent in writing from the occupier of the dwelling, school, factory, or public place, or person in charge, as the case may be...¹⁵

Some local councils also maintain **chemical sensitivity registers** – that is, records of people who have notified them that they are either sensitive to particular chemicals, or organic growers whose certification requires them not to use pesticides and to avoid any contamination from

neighboring properties. Sometimes listing requires a medical certificate, while other councils only require self-identification. Councils should inform people on these registers when they are intending to spray on public land in their area, although they are not obliged to do so.

Despite this legal framework, there are concerns about regulatory, compliance and communication gaps between the APVMA and State agencies. People who believe they have been exposed to pesticides may sometimes find themselves shunted between agencies without a satisfactory answer or investigation of their situation.

Common pesticide classes

Organophosphates (OPs) are insecticides that affect the nervous system by suppressing the enzyme that regulates acetylcholine, a neurotransmitter. OPs have high acute toxicity and the mode of action is the same in insects and humans. Clinical effects of OP exposure in humans range from mild flu-like symptoms with low-level exposures to life-threatening respiratory failure with larger exposures. OPs are readily absorbed through the skin, mucous membranes and respiratory system.

Carbamates affect the nervous system in the same way as OPs. There are several subgroups within the carbamates as they can be used as insecticides, herbicides and fungicides.

Organochlorines (OCs) are insecticides, many of which have been banned due to their long-term health and environmental effects and capacity to bioaccumulate — that is, to build up in the tissue of organisms (eg, DDT and chlordane). Many are endocrine (hormone) disruptors. A commonly used OC in Australia, but banned in over 60 countries, is endosulfan.

Pyrethroids are insecticides and a synthetic version of the naturally occurring pyrethrins. Some synthetic pyrethroids are toxic to the nervous system and some are suspected endocrine disruptors.

Herbicides can be 'selective' or 'non-selective.' Examples include phenoxyacetic acid herbicides (2,4-D, MCPA), triazoles (amitrole), triazines (atrazine), benzoic acids (dicamba), bipyridiums (diquat, paraquat) and others such as glyphosate. They vary widely in toxicity.

Are pesticides safe?

It is unlawful to promote or advertise any pesticide as 'safe'.¹⁶ All pesticides are designed to kill pests so they are inherently toxic.

The risk of adverse health or environmental effects from a pesticide occurs as a result of its inherent toxic properties, the concentration at which it is applied, and the potential for exposure to it. A highly toxic pesticide may only present a limited risk if there is no chance of exposure to it. On the other hand, a moderately toxic pesticide may present unacceptably high levels of risk if exposure to it is high, repeated or prolonged.¹⁷

Some people and environments are inherently more sensitive to pesticide exposure than others. The risks to humans are different to the risks to native animals and plants, pets, livestock or aquatic environments. In general, pregnant women, babies and children are far more susceptible to the toxic effects of pesticide exposures, as are people who are chemically sensitive, ill or elderly.

People and ecosystems also vary in their reactions to pesticide exposures, so it is difficult to make generalised statements about the risk posed by particular pesticides. Nevertheless, clinical trials, population studies and pollution records provide clear evidence of the hazard posed by some pesticides to human health and the environment. The chemical class the pesticide belongs to gives an indication of the likely risks.

There may be impacts on health from breathing airborne pesticides, from touching residues on surfaces, coming into contact with contaminated dirt or dust, or drinking contaminated rainwater. Children's biology and behaviour places them at greater at risk of exposure and harm, as they are still rapidly developing and often eat dirt and play outside in close proximity to the ground. Exposure can also occur indoors.

Pesticides can also cause unintended damage to plants, pets and native animals.¹⁸ They can enter waterways and cause fish kills and damage to other marine organisms, sometimes killing them in large numbers.¹⁹ Some pesticides also have harmful impacts on native animals and plants even if they are not directly sprayed, since many animals are not aware of property boundaries and are not stopped by fences. Pesticides can drift cross-country or the runoff may pollute groundwater or surrounding forests and waterways. The impacts – whether one-off or cumulative – may take weeks, months or even years to become evident.

While the registration and labelling of pesticides in Australia are based on the APVMA's assessment of the available scientific evidence, there are often large gaps in the scientific data that prevent a comprehensive assessment of toxicity and risks. For instance, it is difficult to conduct studies of long-term, low-dose exposures to human populations and ecosystems before a chemical is registered for use. Whether such studies are ever conducted often depends on government funding or university or industry research priorities. As a result, many pesticides in common use have been inadequately researched for their potential long-term impacts.

Glyphosate

Glyphosate²⁰ is said to be the most commonly used herbicide in the world,²¹ and is likely to also be the most common in the Northern Rivers. It is used in all the main agricultural industries as well as to control weeds on public and residential land. It is now sold under many brand names, but was originally manufactured by Monsanto and has been sold since 1974 as **Roundup**.[®]

Glyphosate is used to control many broadleaved and narrow-leaved plants, especially deep-rooted perennials. It is effective against tough weeds such as bamboo and blackberries and many grasses. It is non-selective (ie, harmful to all growing plants) and can persist in some soils for up to three years in cool climates and for 4-180 days in warmer climates.²²

Pure glyphosate is generally considered to have a low acute toxicity rating.²³ However, negative health effects have been noticed when it is mixed with other chemicals, especially surfactants²⁴ in formulations available to the public. For instance, a recent study has shown that glyphosate is toxic to human placental cells and that Roundup[®] is 'always more toxic than its active ingredient (glyphosate)' and that the toxicity 'depends on its formulation and several are more toxic than the glyphosate itself.'²⁵

Health studies overseas suggest a link between farmers using glyphosate and certain types of cancer,

although it is unclear whether this is a function of past exposure to other agricultural chemicals, current exposure to glyphosate, or some other component of the formulation.²⁶

Glyphosate is water-soluble and is 'increasingly found in the environment at levels that have caused significant effects on species that underpin the entire aquatic food chain. Glyphosate and/or Roundup® can alter the composition of natural aquatic communities, potentially tipping the ecological balance giving rise to harmful algal blooms.²⁷ The surfactant in some formulations has also been found to kill fish and tadpoles. Special care must, therefore, be taken when using it near waterways or wetlands. Recognition of this impact has led to the development of a formulation with a surfactant which is believed to be less toxic to amphibians.

Alternatives to glyphosate include the manual or mechanical control of weeds, steam spraying or the use of grazing animals under or around crops.

What should you do if you are concerned?

If you believe you, your family, house, land, water supply or animals may have been affected by spray drift, without endangering yourself, talk to your neighbour or whoever is spraying nearby and try to find out what pesticide they are using. If they won't tell you, or if you suspect that spraying is contrary to the label or unsafe, contact the NSW Department of the Environment, Climate Change and Water (DECCW) information line (131 555) and report the incident. Compliance with the Act and Regulation are its responsibility. DECCW should also report all adverse incidents to the APVMA. Individuals can also make an adverse incident report directly to the APVMA.

It is helpful to keep a written record including information about the weather conditions and details of the incident. You can also take photographs or video footage of the application. You may also need to take soil and water samples as soon as possible after exposure has occurred and have them tested at an accredited testing laboratory such as the National Measurement Institute (<http://www.measurement.gov.au>). (Any pesticide testing should be accurate to a concentration of 0.01 parts per billion [ppb].) This may be relevant where you believe pesticide residue may have affected your water supply or streams, or the lawn or soil that children play on, or if you have observed unusual animal deaths or vegetation dieback.

More detailed information on spray drift incidents, including a Reporting Form, can be found in the NTN booklet *Community Information and Action Kit: The Threat of Pesticide Spray Drift (2009)*, which can be downloaded free from the NTN website.



Noosa River fish hatchery

The Sunland Fish Hatchery at Noosaville on the Sunshine Coast is surrounded on three sides by a macadamia farm. In 2008, fish kills in the Noosa River and the presence of two-headed fish larvae in the hatchery were linked by aquaculture veterinarian Dr Matt Landos to the spraying of the fungicide carbendazim on a nearby macadamia farm.²⁸ According to a 2009 media report, 'Residents of neighbouring properties and the [macadamia] plantation's former owner have been diagnosed with cancer in the past two years.'²⁹ The Queensland Government established a taskforce to investigate the incidents. Its first interim report, in June 2009, was inconclusive about the causes. Its second interim report, in March 2010, noted 'three additional incidents reported at the hatchery involving further deformities and mortalities of fish, adding to the six events or syndromes listed in Interim Report 1,' as well as 'reports of a number of sick animals (including horses and ducks) and people near the fish hatchery that are claimed to be the result of chemical contamination.' It was also inconclusive, and noted that 'The investigation has been complex and difficult due partly to the inability to obtain definitive test results, the lack of definitive scientific evidence regarding cause-effect relationships, the continued emergence of new issues and the differing opinions of members of the Taskforce and Scientific sub-Committee.'³⁰

How could we be better protected?

Important measures that would help to reassure the community about the use of pesticides include:

1. Mandatory prior notification of all immediate neighbours for all intended spray events.
2. Regular, independent and publicly accessible testing of air quality, surrounding soils and water sources.
3. The prohibition or suspension of pesticides that have been removed from sale in a significant number of other countries or which are regarded by international regulatory agencies such as the World Health Organisation (WHO), or by a number of independent scientists whose research has been published in peer-reviewed journals, to constitute a significant risk to human health or the environment.
4. A shift from a risk management approach that assumes a product is safe to use until proven otherwise to one that adopts the precautionary principle³¹ that underpins much environmental law in Australia and internationally.³²

These measures are not currently mandated in NSW or elsewhere in Australia. However, with sufficient public pressure on governments, they could be introduced. For instance, NSW legislation is required to be reviewed every five years (although that does not always happen on time). These reviews present a good opportunity to have a say. Regulations can be amended by the relevant Minister without the need for Parliamentary approval. If you want to encourage regulatory reform, contact or join the NTN or a similar group lobbying for change in the way pesticides are regulated in Australia.

More information

NSW ENVIRONMENTAL DEFENDER'S OFFICE: www.nsw.edo.org.au

RURAL LANDHOLDERS GUIDE:

www.edo.org.au/edonsw/site/pdf/pubs/rural_landholders_2nd_ed.pdf

NATIONAL TOXICS NETWORK: www.ntn.org.au

PESTICIDE SPRAY DRIFT KIT: www.ntn.org.au/ntndocs/ntn_spraydrift.pdf

AUSTRALIAN PESTICIDES AND VETERINARY MEDICINES AUTHORITY: www.apvma.gov.au

PESTICIDE ACTION NETWORK DATABASE: www.pesticideinfo.org

INTERNATIONAL CHEMICAL SAFETY CARDS: www.cdc.gov/niosh/ipcsneng/nengsyn.html

INTERNATIONAL POPS ELIMINATION NETWORK (IPEN): www.ipen.org

SAFER SOLUTIONS (TOTAL ENVIRONMENT CENTRE): www.safersolutions.org.au/a-z-of-chemicals

BEYOND PESTICIDES: www.beyondpesticides.org

TOXIPEDIA: www.toxipedia.org

AUSTRALIAN GOVERNMENT TEACHING MODULE ON MANAGING CHEMICAL RISK:

www.environment.gov.au/education/publications/epa/modules/module5.html

WWF/NTN LIST OF AUSTRALIA'S MOST DANGEROUS PESTICIDES

www.wwf.org.au/publications/alistofaustraliasmostdangerouspesticides.pdf

NSW GOVERNMENT PESTICIDES SITE: www.environment.nsw.gov.au/pesticides

Cattle tick dip sites

Between 1920 and the 1980s, approximately 1,647 cattle tick dips were built between the Queensland border and Grafton and west to Tenterfield: the Dip Quarantine Area.³³ Arsenic insecticides were used until the mid-1950s, when most dips were converted to DDT, which continued to be used until 1962. Each time the dip was cleaned or emptied, the chemical contents were emptied into a burial pit close by or onto the ground next to the dip-bath, which became known as the 'scooping mound'. By 1962, the use of DDT in dips was replaced with a range of other tickicides including carbamates, organophosphates and pyrethroids. Documents obtained from freedom of information requests to the NSW Department of Agriculture in 1991 showed extremely high contamination levels of DDT, arsenic and organophosphates in the soil surrounding the dips.³⁴ Residents can find out where dips are situated by using the cattle dip site locator: <http://www.agric.nsw.gov.au/tools/dipsite-locator>. However, no information is provided on the contamination levels. For land purchasers, additional information about land contamination, including site contamination reports, where known, is supplied on the Section 149 certificates issued by local councils. 41 houses built on top of former dip sites were bought back by the NSW Government in the late 1990s, but not all were demolished.³⁵

TOP TEN TOXICS

This is a list of some of the most toxic chemicals which may be in use in the Northern Rivers, selected on the basis of their hazard rating and known risks (in alphabetical order). This does not mean that any use on crops or weeds according to labels is hazardous.

ATRAZINE is a triazine herbicide used on sugarcane. It is a carcinogen, groundwater contaminant and suspected endocrine disruptor. It was prohibited in the European Union (EU) in 2003 because of concerns about groundwater contamination. It is currently under investigation by the United States Environmental Protection Agency (EPA) for health impacts. Atrazine and diuron residues from sugarcane farms have been accused of harming the health of the Great Barrier Reef.³⁶ The APVMA conducted a review of atrazine from 1995-2008, as a result of which (along with other minor changes) label instructions were amended to reduce the risk of atrazine entering waterways.³⁷ (**SIMAZINE** also belongs to the triazine group of herbicides and is chemically similar. The APVMA stated in June 2009 that it would commence a review of simazine within the next six months.)³⁸

2,4-D (Dichlorophenoxyacetic acid) is a phenoxy herbicide used on cereal grass crops (such as corn), macadamias, pastures and sugarcane. It is a possible carcinogen and potential groundwater contaminant. It is rated as a poison by the APVMA. It is not approved for use on lawns and gardens in some countries. In May 2010 the APVMA announced that it had commenced a review of the spray drift risk associated with its use, after a scientific risk analysis found that 'it can pose risks to aquatic organisms, non-target terrestrial vegetation and neighbouring crops.'³⁹

CARBENDAZIM is a carbamate-benzimidazole fungicide used on macadamias and stonefruit. It is a possible carcinogen and suspected endocrine disruptor. It causes birth defects in laboratory animals. Women of childbearing age should avoid contact.⁴⁰ It is rated as a poison by the APVMA. It has been under review since 2007 'because of occupational health and safety, residue and public health concerns' after advice that 'exposure to carbendazim and compounds that can form it (namely, benomy) could cause developmental abnormalities in experimental animals and hence might pose a potential public and occupational health and safety risk to people.'⁴¹ Label approvals were suspended and new instructions issued in 2007.

CARBOFURAN is a carbamate insecticide and nematocide used locally on sugarcane to control nematodes. It is a potential water contaminant and suspected endocrine disruptor and is highly toxic to birds. It is rated as a dangerous poison by the APVMA. Its use is under review and registered products containing carbofuran are being withdrawn from the Australian market.⁴²

DIMETHOATE is an organophosphorous insecticide used on avocados, stonefruit, tea tree and vegetables. It is a possible carcinogen, cholinesterase inhibitor, water contaminant, developmental or reproductive toxin and suspected endocrine disruptor. It is rated as a poison by the APVMA. It has been under review since 2004 'because of concerns over toxicology, OH&S, residues and trade' that it first identified in 1995.⁴³

ENDOSULFAN is an organochlorine insecticide used on macadamias, stonefruit and vegetables. It is a suspected endocrine disruptor. It is banned in 62 countries including the EU, New Zealand and the US. It is close to being banned internationally as a persistent organic pollutant (POP) under the Stockholm Convention.⁴⁴ In June 2010 the US EPA took action 'to end all uses of endosulfan in the US' after concluding that it 'poses unacceptable risks to agricultural workers and wildlife, and can persist in the environment.'⁴⁵ It is rated as a dangerous poison by the APVMA and was reviewed from 1995-2005; restrictions were strengthened but there is no current plan to ban it in Australia.

PARAQUAT is a bipyridilium herbicide used on macadamias and tea tree. It is a potential water contaminant and suspected endocrine disruptor. It is rated as a dangerous poison by the APVMA and has been under review since 1995 'because of concerns over the potential risk to occupational health and safety and the environment'.⁴⁶ (**DIQUAT** also belongs to the bipyridilium group of herbicides and is chemically similar, and has been under review since 1997.)⁴⁷

PARATHION (or methyl-parathion) is an organophosphorous insecticide used on cereal crops, fruit trees and vegetables. It is a possible carcinogen, cholinesterase inhibitor, potential groundwater contaminant and suspected endocrine disruptor. It is rated as a dangerous poison by the APVMA and has been under review since 1996 'because of concerns over worker health and safety, and the potential for adverse environmental effects, including its high toxicity to bees'.⁴⁸ It is banned or restricted in 23 countries including the EU (in 2006) and is proposed by WHO for a global ban. It may be replaceable by less toxic organophosphates, carbamates and pyrethroids.



KEY TO TABLES

NAME

The active constituent **only** in the most common formulation/s for the use specified. The active ingredient may not be the only, or even the most, toxic ingredient.⁴⁹

TYPE

Refers to the chemical classes listed on the PAN pesticide database.⁵⁰

USE

Indicates the frequency of use. This column is included for macadamias only due to the additional detail provided by the Macadamia Society of Australia.

Known risks

The terms used⁵¹ and information for each chemical are from the PAN pesticide database.

Carcinogen

Describes whether the chemical can cause cancer or not.

Cholinesterase Inhibitor

Describes whether the chemical can damage the nervous system.⁵²

Water Contaminant

Describes whether the chemical can contaminate drinking water wells.⁵³

Developmental or Reproductive Toxin

Describes whether the chemical is believed to interfere with fetal or child development, or to reduce fertility.

Endocrine Disruptor

Describes whether the chemical interferes with the systems that produce hormones in the body.

? indicates no available weight-of-the-evidence summary assessment for at least 3 of the above 5 risk categories in the PAN pesticide database.

NA indicates that this chemical is not listed on the PAN pesticide database.

Hazard warning

Ratings refer to the APVMA poison schedule rating, which follows the Poison Standard 2010.⁵⁴ Where more than one category is shown, this is because the hazard varies between products using the same active ingredient.

Caution = Schedule 5: Substances with a low potential for causing harm, the extent of which can be reduced through the use of appropriate packaging with simple warnings and safety directions on the label.

Poison = Schedule 6: Substances with a moderate potential for causing harm, the extent of which can be reduced through the use of distinctive packaging with strong warnings and safety directions on the label.

Dangerous poison = Schedule 7: Substances with a high potential for causing harm at low exposure and which require special precautions during manufacture, handling or use. These poisons should be available only to specialised or authorised users who have the skills necessary to handle them safely. Special regulations restricting their availability, possession, storage or use may apply.

R means restricted in the APVMA rating system.

0 or **NA** means no toxicity information on the APVMA database.

Permit indicates the pesticide is not registered but is used under a limited permit issued by the APVMA.

forestry

active ingredient	type	known risks	hazard warning
Amitrole	Unclassified Herbicide	Carcinogen Potential water contaminant Suspected endocrine disruptor	Caution to dangerous poison
Clethodim	Cyclohexenone derivative Herbicide	Potential water contaminant	Caution or poison
Clopyralid	Pyridinecarboxylic acid Herbicide	Potential water contaminant	Caution
Dimethoate	Organophosphorous Insecticide	Possible carcinogen Can damage nervous system Potential water contaminant Developmental or reproductive toxin Suspected hormone disruptor	Poison
Glyphosate	Phosphonoglycine Herbicide	Potential groundwater contaminant in some formulations	Caution
Haloxypop	Aryloxyphenoxy propionic acid Herbicide	?	Poison
Simazine	Triazine Herbicide	Water contaminant Developmental or reproductive toxin Suspected endocrine disruptor	Caution
Urea	Unclassified Fertiliser	?	NA



macadamias

name	type	use	known risks	hazard warning
Acephate	Organophosphorus Insecticide	Occasional 0-1 X/yr Sept-Nov	Possible carcinogen Can damage nervous system Potential water contaminant Suspected endocrine disruptor	Poison
Bacillus thuringiensis²⁵	Microbial Insecticide	Occasional 1-2 x/yr Sept-Nov	?	0
Beta-cyfluthrin	Pyrethroid Insecticide	Regular 1-3 x/yr Oct-Jan	NA	Caution or poison
Brodifacoum	Coumarin Rodenticide	Used around sheds + silos April-Oct	?	Poison
Carbaryl	Carbamate Insecticide	Occasional 1 x/yr Sept-Jan	Possible carcinogen Can damage nervous system Potential water contaminant Suspected endocrine disruptor	Caution or poison
Carbendazim	Benzimidazole Fungicide	Common 2 x/yr Sept-Oct only	Possible carcinogen Suspected endocrine disruptor	Poison
Copper as ammonium acetate	Inorganic-Copper Fungicide	Common 2-3 x/yr Sept-Nov	?	0
Copper as cupric hydroxide	Inorganic-Copper Fungicide	Common 2-3 x/yr Sept-Nov	NA	Poison
Copper as cuprous oxide	Inorganic-Copper Fungicide	Common 2-3 x/yr Sept-Nov	?	Caution
Copper as oxychloride	Inorganic-Copper Fungicide	Common 2-3 x/yr Sept-Nov	Suspected endocrine disruptor	Poison
Coumatetralyl	Coumarin Rodenticide	Common Dec-Oct	?	Poison
Difenoconazole	Azole Fungicide	Occasional 1-2 x/yr Sept-Oct	Possible carcinogen Suspected endocrine disruptor	Caution
Diquat	Bipyridylum Herbicide	Common 1 x/yr April-May pre-harvest	Potential water contaminant	Poison or dangerous poison
Endosulfan	Organochlorine Insecticide	Regular 1-2 x/yr Sept-Jan Many growers moving away from using	Suspected endocrine disruptor	Dangerous poison
Ethephon	Organophosphorus Growth regulator	Occasional 1 x/yr in April	Can damage nervous system	Poison
Glufosinate-ammonium	Unclassified Herbicide	Common – 1-2 x/yr on young trees - safer than glyphosate. Very good on Fleabane. Generally used Nov-Dec.	Potential water contaminant	Caution

macadamias

name	type	use	known risks	hazard warning
Glyphosate	Phosphonoglycine Herbicide	Common up to 6 x/yr except winter	Potential groundwater in some formulations	Caution
Haloxypop	Aryloxyphenoxy propionic acid Herbicide	Common 0-6 x/yr	?	Poison
Isoxaben	Amide Herbicide	Occasional 1 x/yr around young trees	Potential water contaminant	Caution
Metalaxyl	Xylylalanine Fungicide	Occasional – 1 x/yr by some orchards with stem canker problems	Potential water contaminant	Caution
Methidathion/xylene	Organophosphorus Insecticide	Occasional use in spring on young trees	Possible carcinogen Can damage nervous system Potential water contaminant	Dangerous poison
Methoxyfenozone	Diacylhydrazine Insecticide	Common 1 x/yr Jan-Feb	Potential water contaminant	NA
Metsulfuron-methyl	Sulfonylurea Herbicide	Occasional use on headlands + revegetation areas	Potential water contaminant	Caution
Paraquat	Bipyridylum Herbicide	Common 1 x/yr April-May pre-harvest	Potential water contaminant Suspected endocrine disruptor	Dangerous poison
Petroleum oil	Petroleum derivative Insecticide	Occasional	?	Caution
Phosphoric acid⁶	Inorganic Fungicide	Common 3-8 x/yr on trees infected with canker	?	Caution or poison
Spinosad	Microbial Insecticide	Rare – Aug-Sept	?	Caution
Trichlorfon	Organophosphorus Insecticide	Occasional 1-2 x/yr Sept-Nov as alternative to endosulfan	Suspected endocrine disruptor	Poison



sugar cane

active ingredient	type	known risks	hazard warning
2,4-D	Chlorophenoxy or phenoxy Herbicide	Possible carcinogen Potential water contaminant	Caution or poison
Ametryn/EthyleneGlycol	Triazine Herbicide	Potential water contaminant	Caution or poison
Atrazine	Triazine Herbicide	Carcinogen ⁵⁷ Water contaminant Suspected endocrine disruptor	Caution
Bifenthrin	Pyrethroid Miticide and insecticide	Possible carcinogen Developmental or reproductive disruptor Suspected endocrine disruptor	Poison
Carbendazim	Benzimidazole Fungicide	Possible carcinogen Suspected endocrine disruptor	Poison
Carbofuran	N-Methyl Carbamate Nematicide	Potential water contaminant Suspected endocrine disruptor	Dangerous poison
Chlorpyrifos (Dust/granular formation)	Organophosphorus Insecticide	Suspected endocrine disruptor	Caution
Chlorpyrifos (emulsifiable concentrate, wettable powder)	Organophosphorus Insecticide	Suspected endocrine disruptor	Poison
Coumetetrallyl	Coumarin Vertebrate poison	?	Poison
Dicamba	Benzoic acid Herbicide	Potential water contaminant Developmental or reproductive disruptor	Caution or poison
Diquat	Bipyridylum Herbicide	Potential water contaminant	Poison or dangerous poison
Diuron	Urea Herbicide	Carcinogen Water contaminant Developmental or reproductive disruptor Suspected endocrine disruptor	Caution
Fenamiphos	Organophosphorus Nematicide	Can damage the nervous system Potential water contaminant	Dangerous poison
Fipronil	Pyrazole Insecticide	Possible carcinogen Potential water contaminant Suspected endocrine disruptor	Caution or poison
Fluroxypyr	Pyridinecarboxylic acid Herbicide	?	Caution
Glyphosate	Phosphonoglycine Herbicide	Potential water contaminant in some formulations	Caution
Hydrocarbon liquid (Pendimethalin)	2,6-Dinitroaniline Herbicide	Possible carcinogen Suspected endocrine disruptor	Caution or NA
Imidacoprid	Neonicotinoid Insecticide	Potential water contaminant	Caution or poison

sugar cane

active ingredient	type	known risks	hazard warning
Imidacloprid liquid concentrate	Neonicotinoid Insecticide	Potential water contaminant	Caution or poison
MCPA	Chlorophenoxy acid or ester Herbicide	Possible carcinogen	Caution or poison
Metolachlor	Chloroacetanilide Herbicide	Possible carcinogen Water contaminant Suspected endocrine disruptor	Caution
Paraquat	Bipyridylium Herbicide	Potential water contaminant Suspected endocrine disruptor	Dangerous poison
Tebuconazole	Azole Fungicide	Possible carcinogen Potential water contaminant Suspected endocrine disruptor	Caution
Triadimefon (permit)	Azole Fungicide	Possible carcinogen Potential water contaminant Developmental or reproductive disruptor Suspected endocrine disruptor	Caution
Trichlorfon	Organophosphorus Insecticide and Parasiticide	Suspected endocrine disruptor	Poison
Trifluralin	2,6-Dinitroaniline Herbicide	Possible carcinogen Suspected endocrine disruptor	Caution



tea tree⁵⁸

active ingredient	type	known risks	hazard warning
2,2-DPA	Acid-alkanoic Herbicide	NA	Caution
Dimethoate	Organophosphorous Insecticide	Possible carcinogen Cholinesterate inhibitor Potential water contaminant Developmental or reproductive toxin Suspected hormone disruptor	Poison
Diquat	Bipyridylum Herbicide	Potential water contaminant in some formulations	Poison
Fluazifop-P (present as Butyl ester/hydrocarbon solvent)	Aryloxyphenoxy propionic acid Herbicide	Potential water contaminant Developmental or reproductive toxin Suspected hormone disruptor	Poison
Glyphosate	Phosphonoglycine Herbicide	Potential water contaminant in some formulations	Caution
Hydrocarbon solvent (Pendimethalin)	Pyrazole Insecticide	?	Caution or NA
Methanol/methomyl	Alcohol/ether Insecticide	?	Dangerous poison
Oryzalin/Oxyfluorfen	2,6-Dinitroaniline Herbicide	Carcinogen Potential water contaminant Suspected endocrine disruptor	Caution
Paraquat	Bipyridylum Herbicide	Potential water contaminant Suspected endocrine disruptor	Dangerous poison
Propamocarb (present as monohydrochloride)	Carbamate Fungicide	?	Caution
Spinosad	Microbial Insecticide	?	Caution

public land

active ingredient	type	known risks	hazard warning
Fluroxypyr	Pyridinecarboxylic acid Herbicide	?	Caution or poison
Glyphosate	Phosphonoglycine Herbicide	Potential groundwater contaminant in some formulations	Caution
Metsulfuron-methyl	Sulfonylurea Herbicide	Potential water contaminant	Caution
Tridopyr (present as Butoxyethyl Ester)	Chloropyridinyl Herbicide	?	Poison

NOTES

- 1 The ChemClear program aims to reduce the quantity of obsolete chemicals stored on properties and in businesses across Australia: see www.chemclear.com.au.
- 2 For the regulation of contaminated land in NSW, see the *Contaminated Land Management Act 1997*.
- 3 See APVMA, APVMA operating principles in relation to spray drift risk, July 2008, p 4.
- 4 The APVMA operates under the *Agriculture and Veterinary Chemicals (Administration) Act 1992* and the *Agriculture and Veterinary Chemicals Code Act 1994*.
- 5 See http://www.apvma.gov.au/use_safely/spray_drift/index.php
- 6 See http://www.austlii.edu.au/au/legis/cth/consol_reg/aavccr1995491/sch4.html.
- 7 See http://www.austlii.edu.au/au/legis/cth/consol_reg/aavccr1995491/sch4.html.
- 8 See <http://www.apvma.gov.au/products/review/index.php>.
- 8 For instance, in April 2010 the APVMA suspended approval for quintozone to be used in Australia following a risk assessment that showed it could contain unacceptable levels of dioxin: see www.apvma.gov.au/news_media/chemicals/quintozone.php
- 9 For more information about the Act, go to www.environment.nsw.gov.au/legislation/DECCActssummaries.htm#pa.
- 10 For more information about the Regulation, go to www.environment.nsw.gov.au/legislation/DECCRegulationsummaries.htm#PestReg09.
11. *Pesticides Act 1999* (NSW) ss. 10, 10, 11, 13, 14, 16.
- 12 See the annual reports since 2000 from DEC/DECC/DECCW. DECCW does sometimes use other environmental statutes to regulate serious incidents involving pesticides including the *Protection of the Environment Operations Act* and the *Threatened Species Conservation Act* (personal communication, DECCW officer).
13. *Pesticide Regulation 2009* (NSW) c. 19; See http://www.environment.nsw.gov.au/pesticides/pesticide_notification.htm.
14. *Pesticide Regulation 2009* (NSW) c. 27.
- 15 Pesticide Control Order 1987 Air-1: see <http://www.environment.nsw.gov.au/pesticides/pco.htm>.
- 16 The publication of certain statements about chemical products is prohibited under Section 89 of the Agvet Codes: see www.apvma.gov.au/about/legislation. The NSW Agvet Code is a Schedule to the *Agricultural and Veterinary Chemicals Code Act 1994*.
- 17 From APVMA, How the APVMA Determines the Size of Protective No-Spray Zones (5 September 2008); http://www.apvma.gov.au/users/spray_drift.shtml.
- 18 See, eg, Barnett Rattner (2009), History of wildlife toxicology, *Ecotoxicology* 18, pp 773-783.
- 19 See, eg, Daniel Oros and Inge Werner (2005), Pyrethroid Insecticides: An Analysis of Use Patterns, Distributions, Potential Toxicity and Fate in the Sacramento-San Joaquin Delta and Central Valley. White Paper for the Interagency Ecological Program. SFEI Contribution 415. San Francisco Estuary Institute, Oakland, CA; Caroline Geeraerts and Claude Belpaire (2010), The effects of contaminants in European eel: a review, *Ecotoxicology* 19, pp 239-266; and DW Kelly et al (2010), Synergistic effects of glyphosate formulation and parasite infection on fish malformations and survival, *Journal of Applied Ecology* 47 (2), pp 1-7.
- 20 The information in this section is adapted from the Glyphosate page on the Safer Solutions website: <http://safersolutions.org.au/a/95-glyphosate>.
- 21 According to Glyphosate Monograph, Pesticide Action Network Asia Pacific (2009): <http://www.panap.net/en/p/post/pesticides-info-database/115>.
- 22 Glyphosate Monograph, Pesticide Action Network Asia Pacific (2009): <http://www.panap.net/en/p/post/pesticides-info-database/115>.
- 23 However, In 2009 France's Supreme Court upheld earlier decisions by two courts that Monsanto had falsely advertised its herbicide as 'biodegradable' and 'left the soil clean': see Monsanto guilty in 'false ad' row, BBC News, 15 October 2009: <http://news.bbc.co.uk/2/hi/8308903.stm>.
- 24 Surfactants (surface active agents) are detergents or other agents which reduce the surface tension of the active ingredient so it is more easily absorbed by plants or animals: see, eg, Toshiyuki Katagi, Surfactant Effects on Environmental Behavior of Pesticides, (2008) *Reviews of Environmental Contamination and Toxicology*, 71-177.
- 25 From the Toxipedia article on Glyphosate, referring to papers by Richard, et al, 2005 and Watts and McFarlane, 1999: see <http://www.toxipedia.org/display/toxipedia/Glyphosate>.
- 26 See Nora Benachlour et al (2009), Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic and Placental Cells, *Chemical Research in Toxicology* 22 (1), pp 97-105: <http://pubs.acs.org/doi/abs/10.1021/bx800218n>; also R.S Moslemi et al (2005), Differential effects of glyphosate and roundup on human placental cells and aromatase, *Environmental Health Perspectives*, 113 (10).
- 27 Glyphosate Monograph, Pesticide Action Network Asia Pacific, 2009, p 2 (see also p 24): <http://www.panap.net/en/p/post/pesticides-info-database/115>.
- 28 See Matt Landos (2010), Veterinary Report for the Scientific Sub-Committee of the Noosa Fish Health Investigation Taskforce:

http://www.dpi.qld.gov.au/28_14238.htm.

29 Marissa Calligeros, Fungicide maker in birth defect storm, *Sydney Morning Herald*, 2 February 2009: <http://www.smh.com.au/news/environment/fungicide-maker-in-birth-defect-storm/2009/02/02/1233423096718.html>. See also, Lionel Elmore, Noosa's two-headed fish: farm spraying goes nuts, *Crikey*, 20 January 2009: <http://www.crikey.com.au/2009/01/20/noosas-two-headed-fish-farm-spraying-goes-nuts>.

30 Queensland Department of Employment, Economic Development and Innovation, Noosa Fish Health Investigation Taskforce: Interim Report #2 March 2010, p. 1: http://www.dpi.qld.gov.au/28_16814.htm.

31 This is the principle of environmental law that holds that 'Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation': Principle 15 of the 1992 *Rio Declaration*.

32 This approach has been adopted by the European Commission and has resulted in two-thirds of the pesticides that had been on the market since 1993 being removed from sale: see Fact Sheet, EU Action on Pesticides, Directorate-General for Health & Consumers, European Commission, March 2009.

33 For more information about cattle tick control in NSW, go to <http://www.dpi.nsw.gov.au/agriculture/livestock/health/specific/cattle/ticks/cattle-tick-control-nsw>.

34 Personal correspondence to Dr Mariann Lloyd-Smith from NSW Agriculture, North Coast Correspondence (ref. No. PJMcG:RAH) F.O.I. Application 'Cattle Tick Dip Sites (18 January 1991) Appendix 1 Pesticide Residues in Dip Yard Soils of the Tick Quarantine Area' (Spring 1980). See also Cattle Tick Dip Site Management Committee, DIPMAC Report on the Management of Contaminated Waste at Cattle Tick Dip Sites in North Eastern NSW, Wollongbar Agricultural Institute NSW (March 1992).

35 Source: personal communication with Dr Mariann Lloyd-Smith, CoChair, International POPs Elimination Network and Senior Advisor, National Toxics Network, who served on the Cattle Tick Dip Site Management Committee from 1991-1994.

36 See, eg, the 2 May 2009 media release from WWF: <http://www.wwf.org.au/news/apvma-wrong-to-defend-atrazine-wwf>.

37 <http://www.apvma.gov.au/products/review/completed/atrazine.php>.

38 http://www.apvma.gov.au/products/review/nominated/simazine_update.php.

39 APVMA media release, 17 May 2010: http://www.apvma.gov.au/news_media/media_releases/2010/mr2010-08.php.

40 APVMA Infopest labels <http://www2.dpi.qld.gov.au/extra/asp/infopest/nra/labels.asp?prodcode=53061>

41 See <http://www.apvma.gov.au/products/review/current/carbendazim.php>.

42 See http://www.apvma.gov.au/products/review/nominated/carbofuran_update.php.

43 See <http://www.apvma.gov.au/products/review/current/dimethoate.php>.

44 See http://ntn.org.au/index.php?option=com_content&task=view&id=113&Itemid=1.

45 US EPA news release, June 9, 2010: <http://www.epa.gov/pesticides/reregistration/endsulfan/endsulfan-canc-fs.html>.

46 See <http://www.apvma.gov.au/products/review/current/paraquat.php>.

47 See <http://www.apvma.gov.au/products/review/current/diquat.php>.

48 See http://www.apvma.gov.au/products/review/current/parathion_methyl.php.

49 More information on the various formulations may be found on the APVMA website (www.apvma.gov.au) by clicking on the 'Registered Products and Chemical Reviews' link on the left hand side of the homepage, then the 'PubCRIS database' link, then entering the relevant crop in the field marked 'Host animal/crop'.

50 See http://www.pesticideinfo.org/Docs/ref_general3.html.

51 See www.pesticideinfo.org/Docs/ref_help11.html.

52 The term 'Can damage the nervous system' is used instead of 'cholinesterase inhibitor' as it is more widely understood.

53 Does not include rainwater tanks, contamination of which is a risk in the Northern Rivers.

54 See Poison Standard 2010, Schedule 1 - Standard for the Uniform Scheduling of Medicines and Poisons No. 1, Commonwealth Department of Health and Ageing, Therapeutic Goods Administration, 1 September 2010, p. vi: see <http://www.frlf.gov.au/ComLaw/Legislation/LegislativeInstrument1.nsf/0/D41CD6A80FAF293ECA25778800280D92?OpenDocument>.

55 *Bacillus thuringiensis* has numerous subspecies registered on the APVMA database. The information given is therefore general only.

56 APVMA permit 10263 expires on 30/09/12.

57 The PAN pesticide database lists Atrazine as a carcinogen on the basis of its listing in the US EPA's Toxics Release Inventory. However, this listing is disputed by CropLife Australia, the industry body which 'represents the developers, registrants, manufacturers and formulators of plant science solutions for use in agriculture and the management of pests in other settings': see www.croplifeaustralia.org.au.

58 *Melaleuca alternifolia*.

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