

DPI Primefact

Pesticide management on-farm: sensitive areas, buffer zones, chemical storage and disposal

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Macadamia growers have a duty of care when applying crop protection products. There are many things to consider before, during and after applying crop protection products. Growers are required to make detailed records of the spray activity on their farm and keep these records for a minimum of 3 years, wear or provide the spray operator with appropriate personal protective equipment (PPE) and abide by all label instructions. These processes are outlined in the [NSW DPI Macadamia plant protection guide](#).

When considering crop protection, we often reflect on our integrated pest and disease management (IPDM) protocols with an understanding of the cultural, biological and chemical controls. If spray action is required, it is essential to ensure satisfactory coverage, calibration, and timing for best control. A sound crop protection strategy also involves solid foundations for avoiding overspray and drift into sensitive areas (also called risk areas), observing mandatory buffer zones, and ensuring adequate safety for all involved. For example, a storage area must be secure and well bunded to contain any chemical spills.

Points to consider include whether you have a document that describes procedures for identifying risk areas and strategies for spraying near them. Are you aware of mandatory buffer zones that appear on most product labels? Does your chemical shed have bunding in case of pesticide spills?

This article reviews the important elements of a sound crop protection strategy and provides ideas for implementing them.

Start with a farm map

Most growers already have a farm map (Figure 1) to help with planning activities. Google Earth is an excellent resource for providing an up-to-date farm map if you do not already have one. It is a good idea to laminate the map so paddock names and important features can be highlighted.

When planning your crop protection strategy, a farm map will be very useful in helping you identify sensitive areas and to later explain these to others.

Sensitive areas

Sensitive areas are those where spray drift (chemical droplets carried in the air by wind) is likely to have the greatest adverse effects. All growers should identify the following sensitive areas for spraying operations relative to their orchard blocks:

- Human areas such as houses, both on-farm and neighbouring, schools, workplaces, parks, public amenities, public roads, and bus stops.
- Vegetation and riparian zones such as other crops, gardens, native vegetation, animal habitats, non-target vegetation, and wetlands.
- Aquatic areas such as lakes, streams, rivers, and ponds.
- Those designated for trade, including land with food-producing animals, for example, beef cattle or chickens, land that produces feed for food-producing animals or land accessed by food-producing animals such as travelling stock routes and reserves.

Managing crop protection sprays near sensitive areas

The key to managing crop protection sprays around sensitive areas is to:

- Identify sensitive areas and highlight these on a map (Figure 1).
- Identify wind speed and record this in the spray application records. Abide by chemical labels regarding favourable wind speed and droplet size for the products.
- Identify wind direction and check affected areas against your farm map. With these 2 factors in mind, consult the chemical product label for a mandatory buffer zone (refer to Table 1).
- Planting vegetation between the sensitive area and the orchard is also a way of reducing risk of spray drift.
- Nozzle direction and shut-off are also ways of reducing drift. Some growers will shut off sprayers a few trees short of the end of the row to prevent drift. This is not essential and is entirely up to the individual circumstances.

Throughout the spraying operation, the operator should continue to assess conditions to ensure they are acceptable for the spraying operations. This is important as wind speed and/or direction, temperatures and humidity are likely to change throughout the day.

Highlighting sensitive areas

Not only is it essential to highlight sensitive areas on and around your farm, but as part of best practice with documenting, it is also important to describe how you will manage spray operations to protect these sensitive areas. By preparing a physical map identifying sensitive areas on the farm and describing strategies that will be implemented to protect crops near those areas and avoid the risk of drift, growers have evidence to support decision making when it comes to minimising spray drift.

Knowing where the sensitive areas are means that strategies can be put in place to avoid spray drift in those areas. Once highlighted, a plan to manage crop protection activities around these sensitive areas should be established.

Here is an example from the NSW DPI Centre for Tropical Horticulture (CTH), Alstonville. The CTH has been mapped and risk areas have been identified and highlighted in orange (Figure 1). The risk areas are:

- 2 cottages (human areas)
- Bruxner Highway and Teakwood Drive (human areas)
- a creek and dam (aquatic areas)
- residential estate (human areas).

In this example, the shed and office buildings have been identified on the plan but due to them not adjoining production areas, their distance from production zones and the buffers provided, they are considered low risk to be affected by spray drift.

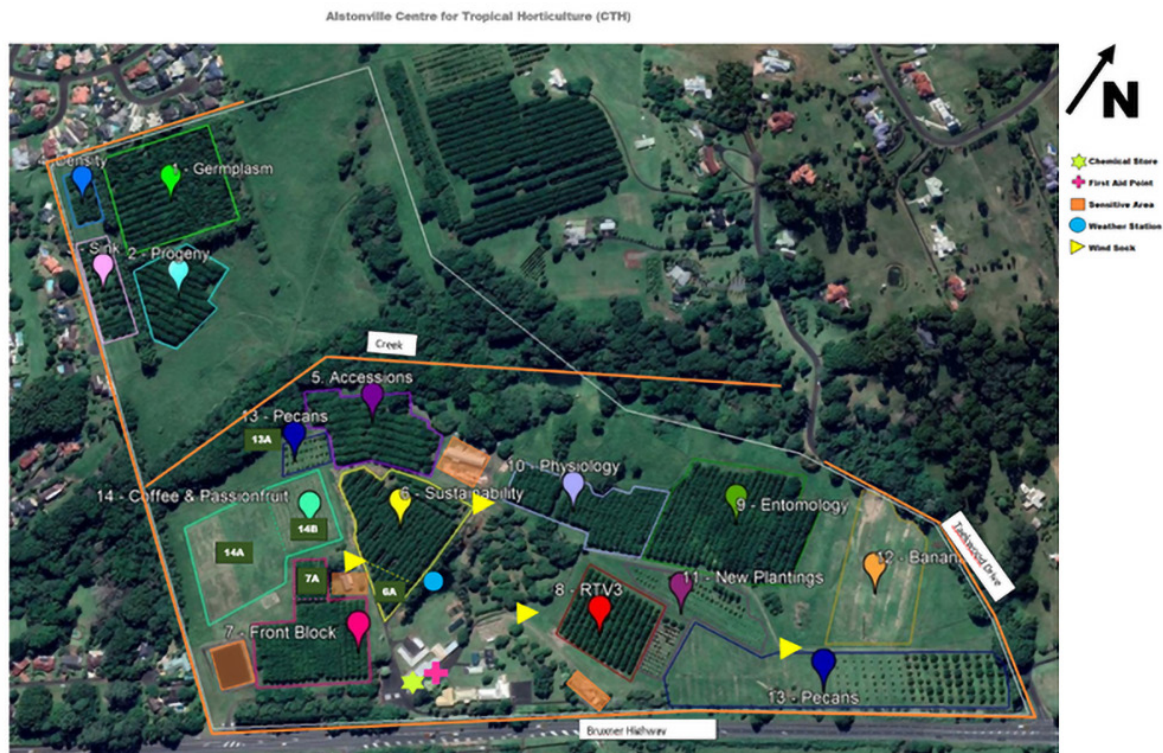


Figure 1. A map of the Centre for Tropical Horticulture at Alstonville showing paddock identification, risk areas (orange), and other spray-related assets (such as chemical storage sheds, a weather station and windsocks).

If we consider the cottage (Figure 2), which is located to the east of Block 7A, to the north of 7 – Front Block and to the west of Block 6A, the strategy is to spray blocks considering the current wind directions. The operator would refer to Table 1 for information on favourable wind directions for the 3 blocks mentioned. In this scenario, if the wind was from the north at 3–15 km/h, the operator could spray 7 – Front Block and 7A without requiring a buffer zone. When the wind is westerly, the operator could spray Block 6A without requiring a buffer zone. Spraying when winds are from other prevailing directions is possible but requires the provision of down-wind buffer zone(s) to the sensitive area.



Figure 2. The cottage (shaded in orange) is in between macadamia blocks. A risk area strategy is required for crop protection depending on block location and wind direction.

The risk of drift will also vary depending on the product used. For example, if we use flupyradifurone (e.g. Sivanto®), the risk areas of most significance are the aquatic zones (the dam) and the creek. The strategies for pest control are highlighted through appropriate wind direction and observed buffer distances in place (Table 1).

Table 1. Block identification and favourable wind directions for spraying with and without a buffer zone. The buffer zone is specified on the product label.

| Block | Wind direction | |
|-------|---------------------|------------------------------|
| | Favourable | Favourable with buffer zones |
| 1 | NW | N, NE, E, SE, S, SW, W |
| 2 | S, SW, W, NW | N, NE, E, SE |
| 3 | S, SW, W, NW | N, NE, E, SE |
| 4 | W, NW | N, NE, E, SE, S, SW |
| 5 | – | N, NE, E, SE, S, SW, W, NW |
| 6 | W | NW, N, NE, E, SE, S, SW |
| 6A | S, SW, W | NW, N, NE, E, SE |
| 7 | W, NW, N, NE | E, SE, S, SW |
| 7A | N, NE, E, SE | S, SW, W, NW |
| 8 | SE, S, SW, W | NW, N, NE, E |
| 9 | W, NW, N, NE, E | SE, S, SW |
| 10 | S, SW, W, NW, N | NE, E, SE |
| 11 | E, SE, S, SW, W, NW | N, NE |
| 12 | NW, N, NE, E | SE, S, SW, W |
| 13 | – | N, NE, E, SE, S, SW, W, NW |
| 13A | SW, W, NW, N | NE, E, SE, S |
| 14A | SW | W, NW, N, NE, E, SE, E |
| 14B | S, SW | W, NW, N, NE, E, SE |

Buffer zones

Buffer zones protect sensitive areas from spray drift by imposing a separation between the area at risk and the spray activity.

Labels will specify a buffer zone distance downwind (the direction of the prevailing wind at the time of spraying) from a sensitive area that cannot be sprayed while the wind continues to blow in that direction. The distance is established according to the potential effect a product might have on one or more of the sensitive areas identified by the [Australian Pesticides and Veterinary Medicines Authority](#) (APVMA).

A buffer zone often forms a strip of **unsprayed paddock** but might also contain a vegetative barrier within. Having a buffer zone allows spray drift to settle out of the air stream as it travels across the buffer zone before reaching the sensitive area.



Figure 3. A buffer of trees can reduce the effects of spray drift, noise and dust on a neighbouring property.

Not all products require a buffer zone, and buffer zone distances will vary. They will only be incorporated on a label when a sensitive area has been identified to be at risk (e.g. aquatic area). Some products will have several identified sensitive areas, while others might only have one or none.

A **mandatory buffer zone** will be different for different products, sensitive areas, and application methods. Mandatory buffer zones are applicable **only** when the sensitive area is downwind of the area being sprayed, and they only apply to the sensitive areas and application methods listed on the label.

If the distance for the buffer zone is not stated on the label, it is then **not** a mandatory buffer zone.

Using the CTH example above, we are applying flupyradifurone (e.g. Sivanto®) as a crop protectant. The Sivanto® label stipulates that aquatic zones have a mandatory buffer zone of 15 m for trees taller than 2 m (fully-foliated). There is a creek running through CTH and a few dams. These are mandatory buffer zone risk areas designated on the Sivanto® label and they require a 15 m mandatory buffer zone. The creek is further than the required 15 m from any of the blocks. All other areas are not considered risk zones on the label and, therefore, do not have a mandatory buffer zone. However, they are all given a minimum buffer zone of at least 10 m.

Example labels

The Sivanto® label (Figure 4) has the following directions for use:

- DO NOT apply unless the wind speed is between 3 and 20 km/h at the application site during the time of application.
- DO NOT apply if hazardous surface temperature inversion conditions are present at the application site during the time of application. Surface temperature inversion conditions exist most evenings one to two hours before sunset and persist until one to two hours after sunrise.

Refer to the [Macadamia plant protection guide](#) for further information regarding inversion layers.

Other conditions are included and also apply.

Note: there is a mandatory buffer zone for natural aquatic areas **but** not for other risk areas.

SPRAY DRIFT RESTRAINTS

Specific definitions for terms used in this section of the label can be found at apvma.gov.au/spraydrift.

DO NOT allow bystanders to come into contact with the spray cloud.

DO NOT apply in a manner that may cause an unacceptable impact to native vegetation, agricultural crops, landscaped gardens and aquaculture production, or cause contamination of plant or livestock commodities, outside the application site from spray drift. The buffer zones in the relevant buffer zone table/s below provide guidance but may not be sufficient in all situations. Wherever possible, correctly use application equipment designed to reduce spray drift and apply when the wind direction is away from these sensitive areas.

DO NOT apply unless the wind speed is between 3 and 20 kilometres per hour at the application site during the time of application.

DO NOT apply if there are hazardous surface temperature inversion conditions present at the application site during the time of application. Surface temperature inversion conditions exist most evenings one to two hours before sunset and persist until one to two hours after sunrise.

Boom sprayers

DO NOT apply by a boom sprayer unless the following requirements are met:

- spray droplets not smaller than a medium spray droplet size category
- minimum distances between the application site and downwind sensitive areas (see 'Mandatory buffer zones' section of the following table titled 'Buffer zones for boom sprayers') are observed.

Buffer zones for boom sprayers

| Boom height above the target canopy | Mandatory downwind buffer zones | | | | |
|-------------------------------------|---------------------------------|-----------------------|------------------|------------------|-----------------|
| | Bystander areas | Natural aquatic areas | Pollinator areas | Vegetation areas | Livestock areas |
| 0.5 m or lower | 0 m | 0 m | 0 m | 0 m | 0 m |
| 1.0 m or lower | 0 m | 20 m | 0 m | 0 m | 0 m |

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Sivanto

Vertical sprayers

DO NOT apply by a vertical sprayer unless the following requirements are met:

- spray is not directed above the target canopy
- the outside of the sprayer is turned off when turning at the end of rows and when spraying the outer row on each side of the application site
- for dilute water rates up to the maximum listed for each type of canopy specified, minimum distances between the application site and downwind sensitive areas (see 'Mandatory buffer zones' section of the following table titled 'Buffer zones for vertical sprayers') are observed.

Buffer zones for vertical sprayers

| Type of target canopy and dilute water rate | Mandatory downwind buffer zones | | | | |
|--|---------------------------------|-----------------------|------------------|------------------|-----------------|
| | Bystander areas | Natural aquatic areas | Pollinator areas | Vegetation areas | Livestock areas |
| 2 metres tall and shorter (maximum application rate of 2 L/ha) | 0 m | 10 m | 0 m | 0 m | 0 m |
| Taller than 2 metres (not fully-foliated) (maximum application rate of 2 L/ha) | 0 m | 20 m | 0 m | 0 m | 0 m |
| Taller than 2 metres (fully-foliated) (maximum application rate of 2 L/ha) | 0 m | 15 m | 0 m | 0 m | 0 m |

Figure 4. The Sivanto® insecticide chemical label. Note that the aquatic buffer zone for vertical sprayers on target canopies taller than 2 m is 15 m.

The Trivor[®] label (Figure 5) has similar messages for managing spray drift:

- DO NOT apply unless the wind speed is between 3 and 20 km/h at the application site during the time of application.

Inversion warnings

Spray operation: the spray is not to be directed above the target canopy, and the sprayer should be turned off when turning at the end of the row.

There are 3 mandatory buffer zones (distance between the application site and downwind sensitive areas) for Trivor[®]:

1. 40 m for natural aquatic areas
2. 50 m for vegetation areas
3. 80 m for livestock areas.

SPRAY DRIFT RESTRAINTS

Specific definitions for terms used in this section of the label can be found at www.apvma.gov.au/spraydrift

DO NOT allow bystanders to come into contact with the spray cloud.

DO NOT apply in a manner that may cause an unacceptable impact to native vegetation, agricultural crops, landscaped gardens and aquaculture production, or cause contamination of plant or livestock commodities, outside the application site from spray drift. The buffer zones in the relevant buffer zone table/s below provide guidance but may not be sufficient in all situations. Wherever possible, correctly use application equipment designed to reduce spray drift and apply when the wind direction is away from these sensitive areas.

DO NOT apply unless the wind speed is between 3 and 20 kilometres per hour at the application site during the time of application.

DO NOT apply if there are hazardous surface temperature inversion conditions present at the application site during the time of application. Surface temperature inversion conditions exist most evenings one to two hours before sunset and persist until one to two hours after sunrise.

DO NOT apply by a vertical sprayer unless the following requirements are met:

- Spray is not directed above the target canopy.
- The outside of the sprayer is turned off when turning at the end of rows and when spraying the outer row on each side of the application site.
- For dilute water rates up to the maximum listed for each type of canopy specified, minimum distances between the application site and downwind sensitive areas (see 'Mandatory downwind buffer zones' of the following table titled 'Buffer zones for vertical sprayers') are observed.

Buffer zones for vertical sprayers

| Application rate | Mandatory downwind buffer zones | | |
|---|---------------------------------|------------------|-----------------|
| | Natural aquatic areas | Vegetation areas | Livestock areas |
| Up to 40 mL/100 L and maximum dilute water rate of 4000 L/ha (up to 1.6 L/ha) | 40 metres | 50 metres | 80 metres |

Figure 5. The Trivor[®] insecticide chemical label showing the mandatory buffer zones.

Key messages:

- Not all products will have mandatory buffer zones.
- Mandatory buffer zones will be different for different products, sensitive areas, and application methods.
- Mandatory buffer zones are applicable only when the sensitive area is downwind of the area being sprayed.
- Mandatory buffer zones only apply to the sensitive areas and application methods listed on the label.

For full details of these points, please refer to the [APVMA website](http://www.apvma.gov.au).

Applying label buffer zones to on-farm spray examples

Below are 4 examples of a buffer zone direction being applied to scenarios with different spray conditions. Source: Jane Collin, Agriculture Victoria.

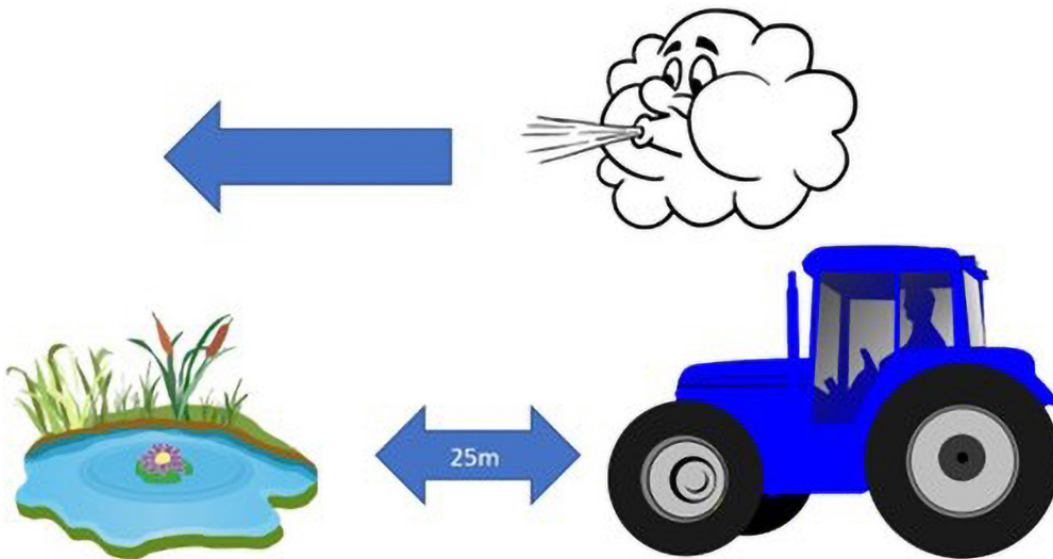
A pesticide product label has a mandatory downwind buffer zone of 20 m from sensitive aquatic areas when used with a coarse droplet in a 3–20 km/h wind.

In which of the following situations can I spray?

Example 1: spraying 25 m away from a sensitive aquatic area

Spraying is planned for 25 m away from a sensitive aquatic area. The wind is blowing towards the sensitive area. Can I spray?

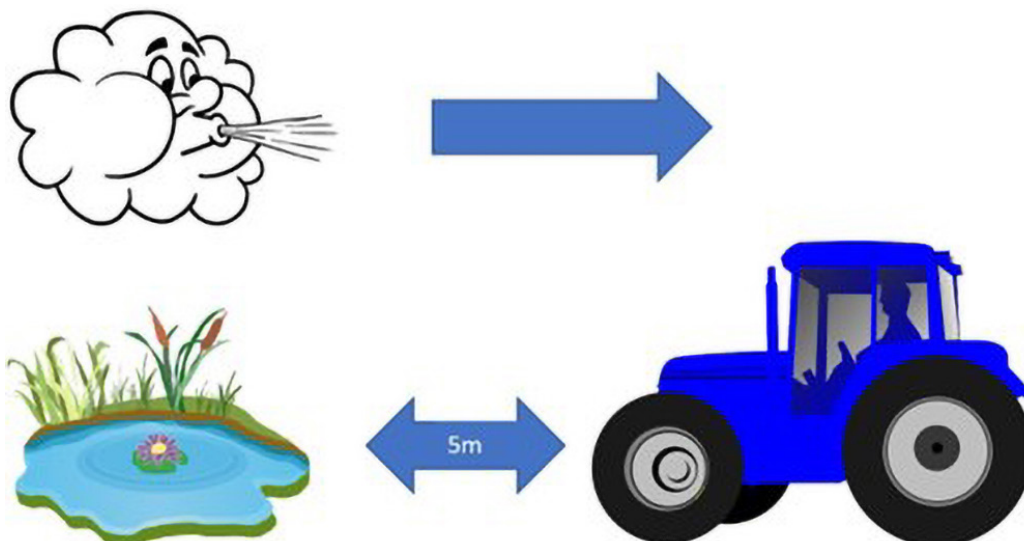
Yes. The buffer zone on this product is only 20 m from the sensitive aquatic area.



Example 2: spraying 5 m away from a sensitive aquatic area

Spraying is planned to be 5 m away from a sensitive aquatic area. The wind is blowing away from the sensitive area. Can I spray?

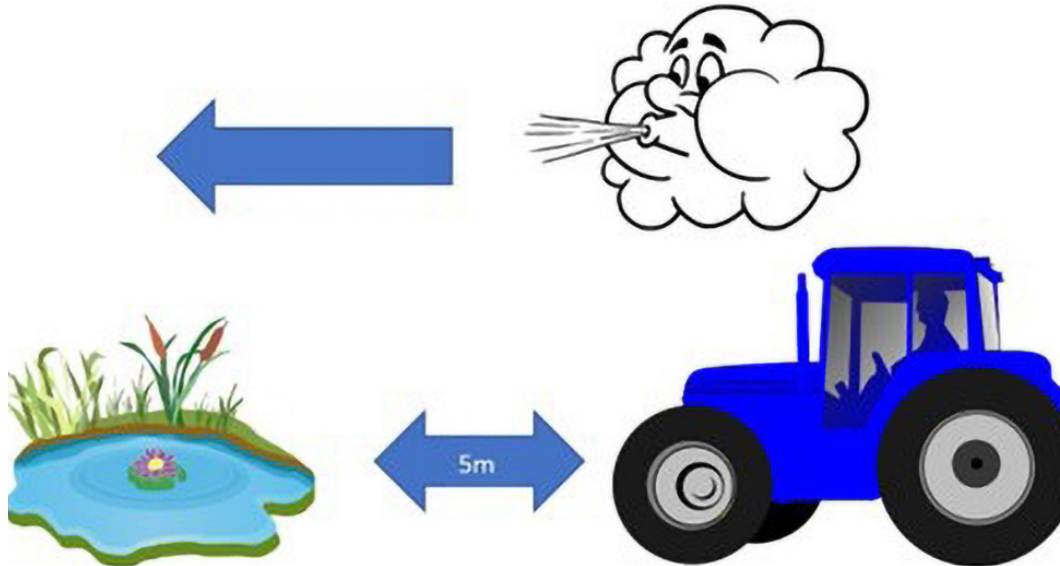
Yes. The 20 m buffer zone only applies when the wind is blowing towards the sensitive aquatic area.



Example 3: spraying planned 5 m away from a sensitive aquatic area

Spraying is planned to be 5 m away from a sensitive aquatic area. The wind is blowing towards the sensitive area. Can I spray?

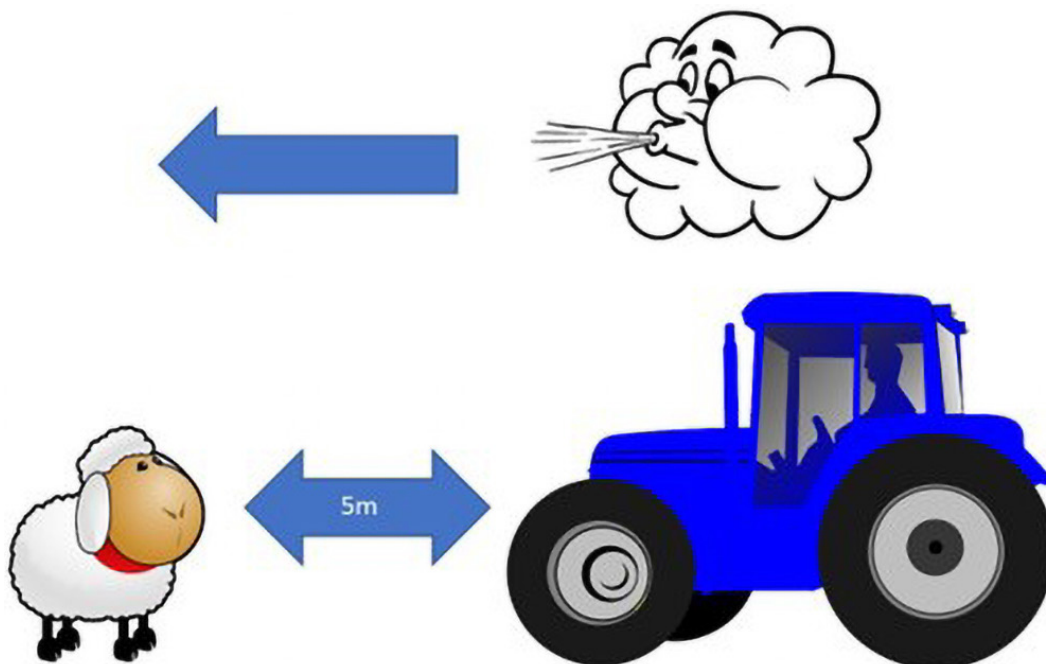
No. The closest you can get to the sensitive aquatic area when the wind is blowing towards it when using this product is 20 m.



Example 4: spraying planned 5 m away from a livestock area

Spraying is planned to be 5 m away from a livestock area. The wind is blowing towards the livestock area. Can I spray?

Yes. The 20 m buffer zone only applies when the wind is blowing towards a sensitive aquatic area (food-producing animals are not identified as being sensitive to this product in terms of trade risk).



Pesticide storage and bunding

Chemical bunding or secondary containment is the practice of creating a physical barrier or containment system around storage areas, equipment or processes where hazardous substances such as pesticides are handled.

Most macadamia farms might need to have 2 types of bunding: containment berms (Figure 6) and banded pallets (Figure 7). Berms are raised structures usually made of concrete that surround the whole storage area. These are required where a chemical container or tank has to be kept outside. Berms must be able to contain 110% of the total liquid stored.

Bunding is required for chemical storage. Bunding must be able to contain spills of chemicals in storage and can be constructed around the perimeter of the chemical store (Figure 8), provided to a subgroup of chemical drums stored (Figure 7) or to individual chemical drums (Figure 9). The bunding used should be able to contain greater than 25% of the total volume of the stored product or a minimum of 100% of the largest tank or container stored within the banded area.

Once bunding is installed, it will need to be checked regularly for signs of damage, wear or deterioration over time. Cracks and corrosion will become the main issues and, if not fixed early, will compromise the integrity of the bunding.



Figure 6. Containment berms are raised structures usually made of concrete that surround the whole storage area.



Figure 7. Bunded pallets underneath individual smaller containers, drums or barrels to capture leaks or spills.



Figure 8. Bunding around a chemical storage shed.



Figure 9. Individual chemical drum bunding can be as simple as a plastic tray.

Remember, bunding is not only a legal requirement but also a responsible practice to safeguard the environment and protect workers from potential hazards. Proper bunding ensures that any accidental spills or leaks are contained and managed effectively.

Further information on storing pesticides safely on the farm is on the [NSW DPI website](https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/186394/storing-pesticides.pdf) (https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/186394/storing-pesticides.pdf).

Pesticide rinsate

Empty pesticide containers are classified as hazardous waste, meaning they are a danger to public health and the environment. Before disposing of or recycling pesticide containers, you must triple-rinse them. A triple rinsing procedure is outlined on the [EPA website](https://www.epa.nsw.gov.au/your-environment/pesticides/preventing-pesticide-misuse/safe-disposal-pesticides) (<https://www.epa.nsw.gov.au/your-environment/pesticides/preventing-pesticide-misuse/safe-disposal-pesticides>). Rinsing should be carried out **immediately after emptying** the chemical container, as residues are more difficult to remove when dry.

Rinsate is produced from cleaning equipment used for pesticide application or in pesticide containers. Rinsate from spray operations must be disposed of appropriately to minimise harm to people and the environment. The EPA has provided [Guidelines for managing the disposal of pesticide rinsate](https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/pesticides/120100pestrinsate.pdf), which is available on the EPA website (<https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/pesticides/120100pestrinsate.pdf>).

See also 'Disposing of farm chemicals and their containers' in the [Macadamia plant protection guide](#).

Reference

Collin J (2023) [Spray drift restraints and buffer zones](#), Agriculture Victoria, <https://agriculture.vic.gov.au/farm-management/chemicals/spraying-agricultural-chemicals/managing-spray-drift/spray-drift-restraints-and-buffer-zones>

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