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Australian plague locust (Chortoicetes terminifera)

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Australian Plague Locust

(*Chortoicetes terminifera*)
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Australian Plague Locust

(Chortoicetes terminifera)
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Locust identification and biology

Locusts are particular species of grasshoppers that occasionally form dense, migratory swarms. The Australian plague locust (*Chortoicetes terminifera*) is a native insect found throughout Australia. It usually inhabits pastoral regions in relatively low numbers, but with favourable weather conditions, numbers increase and locusts can migrate into the heart of agricultural regions.

The Australian plague locust (APL) is the most economically important grasshopper in Australia. The immature hopper stage damages mainly pastures in farming areas, and gardens and lawns in domestic areas. They tend to avoid established green crops, although the edges of crops can be damaged. Adult locusts can form swarms and fly into other areas, damaging pastures, ripening cereal, lupin and pulse crops, grapevines, fruit trees and native tree seedlings. If crops have completely dried off before locusts begin flying, the possibility of damage is considerably less.

Description

Adult Australian plague locusts are between 24 and 40 mm long; the females are larger than the males. They vary in colour from light to dark shades of green to brown. Adult features that identify the species are the dark blotch at the outer edge of the hind wing, and the cadmium red colouration on the inside of the hind legs (Figures 1, 2, and 3).

Figure 1: Adult Australian plague locust (brown form), showing the red inside of the hind leg.

Figure 2: Adult Australian plague locust (green form), showing the red inside of the hind leg.

Figure 3: Adult Australian plague locust: note the dark blotch on the hind wing.
The Egg Stage

Eggs are laid in pods 3 to 8 cm under the ground, usually in bare, compacted soil (Figure 5). During warm conditions, adult locusts are very active and tend to congregate to mate and lay their eggs. Extremely large numbers of egg pods may be deposited over a small area. This area is called an egg bed. Favoured sites are hard, bare ground areas along roadsides, sparse pastures, paddocks that have been uncultivated for a number of years and along fence lines and entrances to paddocks.

The incubation period depends on the time of year, temperature, and soil moisture. During summer, eggs develop very quickly and the incubation period may be only two weeks. If, however, the soil is dry, the eggs enter a state of quiescence when all development stops until the next rainfall.

During winter the incubation period lasts for several months due to low temperatures and the eggs entering a diapause when development stops for a period. Over-wintering eggs do not need spring rains to induce hatching.

Life cycle

The Australian plague locust has three stages in its life-cycle: egg, hopper and adult (Figure 4). In the south-west of Western Australia the locust can complete two generations each year; the first generation occurring through winter, spring and summer and the second generation through summer and autumn.

Figure 4: Life cycle of the Australian plague locust.

Figure 5: Australian plague locust pods of eggs
**The Hopper Stage**

The locusts that emerge from the eggs are 3 mm long and white. Within hours, their colour darkens. It takes between four and eight weeks for these small locusts or nymphs (Figure 6) to develop into adults. During this time they go through five growth stages (Figure 7), shedding their entire external skeleton at the completion of each stage.

The stage of development is indicated by size and wing bud development (Figure 7). Two small buds first appear on either side of the thorax at the third stage when the locust is 10 mm long. By the fourth stage, the buds are as long as the collar behind the head (pronotum) and the locust is 13 mm long. The fifth and final immature stage is characterised by wing buds that are twice the length of the pronotum and the locust is 20 mm long.

The wings are not functional until the adult stage. This restricts the distance the immature stages can move. Newly-hatched locusts may not move for a couple of days, then they disperse into the surrounding fields. If temperatures are high, ground cover sparse and there are few physical barriers, the locusts can begin reforming at the third growth stage and move across the ground in bands with well-defined fronts.

**Figure 6:** Nymphs or hoppers are immature locust without functional wings.

**The Adult Stage**

Adult female locusts need a green food source to become sexually mature. Egg laying will be delayed in hot, dry periods but begins immediately after a significant fall of rain. The delay may last several weeks. During this time the locusts use vital fat reserves to maintain themselves and so fewer eggs are laid.

**Figure 7:** Stages of development of the Australian plague locust, showing the development of wing buds.
The number of pods a female locust can lay depends on the amount of rainfall during the development period and the availability of green food. Given dry conditions, no eggs may be deposited, while three or more pods can be deposited if the development period is wet.

The number of eggs in each pod also depends on rainfall. If conditions are favourable, up to 72 eggs per pod will be laid, but in dry conditions, the developing eggs are reabsorbed. The drier the conditions, the fewer eggs laid.

Adult locusts commonly make daytime flights over short distances, moving a locust population up to several kilometres in a day. Night migrations, which can move a population 100 kilometres or more in one evening, are less frequent. Migrations can be at any angle to the prevailing wind but the swarm is displaced downwind.

Natural enemies

There are several natural enemies of the Australian plague locust, such as birds, spiders, and wasps. Except for scelionid wasps, none of these natural enemies are able to regulate locust numbers during an outbreak. The scelionid wasps, parasitise locust eggs, and levels of parasitism in excess of 90 per cent have been recorded at some egg bed sites. However, in Western Australia these wasps have been found only in the extreme south-western corner of the State.

The Locust Control Program

A coordinated control program will be conducted by the Department of Agriculture and Food, Western Australia, to reduce the formation of large, high density swarms which, if left unchecked, could move large distances and cause widespread damage.

Landholders will need to control hoppers and flying locusts that are causing damage on their own properties.

The Department has enough pesticide to spray approximately 400,000 hectares within areas designated as **Priority Target Zones**.

Other areas needing locust control will have to be sprayed by landholders. It is envisaged that the total area treated for locust control by landholders will be greater than the area treated by the Department.

The main aim of control operations will be to kill locusts in the hopper stage. There is little potential to kill swarms of flying locusts.

Control in Priority Target Zones

Priority Target Zones are areas of 200 square kilometres or less that have the potential to produce large, high-density swarms.

- The Department will apply the insecticide fenitrothion to areas of pasture 100 hectares or greater with the most severe infestations within these Priority Target Zones. Sensitive areas include dwellings and farm buildings, farm dams used for aquaculture, permanent or running water bodies, organic farms, nature reserves and other environmentally sensitive areas.
• Buffer zones of greater than 1.5 km upwind of sensitive areas will be recognised by the Department when aerial spraying. Consideration will also be given for a downwind buffer for high risk sensitive areas, eg aquaculture facilities will have a downwind buffer of 300 metres.

• Buffer zones of greater than 50 metres upwind of sensitive areas when using a boomsprayer. Consideration will also be given for a downwind buffer for high risk sensitive areas, eg aquaculture facilities will have a downwind buffer of 50 metres.

• The Department will not spray within buffer zones.

• No spraying will occur near water bodies if a run-off event is expected within 72 hours.

**Control in areas outside Priority Target Zones**

• All control measures outside designated Priority Target Zones will be the responsibility of landholders.

• Landholders will be responsible for control measures to protect their own farming operations. In this way, it is anticipated that landholders will collectively treat a larger area than the Department, which will contain more dispersed locust populations.

• A number of products are available for use by landholders for locust control (see Insecticides section).

**Communications**

• It is essential to maintain good communication between the Department, landholders and the community throughout the campaign for a successful management program.

• Landholders will be advised by their local Department office of the Local Operations Coordinator who will be their contact person throughout the campaign.

• The Department will provide landholders with a property number that will be required for contacting and reporting in relation to the APL campaign.

• Locust numbers for each property will be entered on a database and the results used to define Priority Target Zones.

• Weekly and daily reports will also be available via all regional and metropolitan mainstream and community media channels (print, radio and TV), industry, community and environmental publications.

**Further Information**

• A statewide freecall 1800 084 881 is available to respond to enquiries.

• The Department’s website is updated daily (www.agric.wa.gov.au).

**Monitoring**

Landholders in the agricultural area will be asked to help define Priority Target Zones by participating in a monitoring program coordinated by the Department in September and October.

The procedure for the monitoring program is as follows:

• Landholders will be asked to contact their Local Operations Coordinator by telephone to report the commencement of locust-hatching on their property.
• Local Operations Coordinators will advise landholders when to begin formal monitoring.
• Details will be supplied on how to conduct formal monitoring by using a Locust Monitoring Sheet obtainable from the Local Operations Coordinators.
• Results of the monitoring should be faxed or phoned to the Local Operations Coordinator on the same day.

Landholders should monitor their properties at least twice a week during September and October and inform their Local Operations Coordinator of any significant increases in locust numbers. The Local Operations Coordinator may carry out follow-up inspections to confirm information provided by landholders.

The information provided by landholders will also be used to determine Priority Target Zones for control activities.

If a landholder’s property is in a Priority Target Zone, the landholder will be asked to identify sensitive areas on his property and give permission for DAFWA to carry out spraying operations. Department staff will then carry out detailed surveys to identify paddocks that have large enough locust infestations to warrant control measures being undertaken. If a landholder’s property is not in a Priority Target Zone, the landholder should continue monitoring on a regular basis and inform their Local Operations Coordinator whenever locust numbers increase significantly. They should also treat locusts on their own property if there is a high risk of economic damage (see Management Options under relevant industry sections).

Landholder Locust Control

The control of infestations of locusts that cause local damage to farming operations are the responsibility of individual landholders, while the Department’s control program aims to reduce the formation of large, high density swarms that could fly and cause major damage at other locations. The earlier a decision to control locusts is made, the greater the financial return.

The application of an insecticide over entire paddocks is necessary to prevent extensive damage from locusts. To achieve effective control, the best time to apply an insecticide is when locusts are at the hopper stage, and the majority are at the third and fourth growth stages (refer to Figure 7 on page 7 Stages of development of the Australian plague locust). Treating small areas of dense masses of nymphs immediately after hatching can also be worthwhile, but will only control a relatively small proportion of the total numbers within a paddock and may involve several sprays as hatching times are staggered. Sprays must be applied directly onto the locusts and the vegetation on which they are feeding. Hoppers can be controlled by applying an insecticide using a boom sprayer, mister or from an aircraft. Adult locusts are difficult to control because of their mobility. The most effective means of controlling flying swarms is with ultra-low volume (ULV) insecticide formulations applied through micronairs from an aircraft.

If locust swarms do form, they should be controlled when they first fly into an area where their feeding will cause damage. It is important that landholders are aware of the likelihood of locusts flying onto their property and for them to stay vigilant.
Barrier spraying to keep locust hoppers out of an area is not effective. Spraying as an anti-feeding deterrent to prevent damage from locusts that may fly into an area is untested.

Care must be exercised when applying insecticide and property owners should use buffer zones around sensitive areas, such as dwellings and dams. There is also a risk with run-off into dams if rain falls within four days after the application of insecticide. All insecticides are toxic to crustaceans.

Only insecticides that are registered or have special permits for use against the Australian plague locust can be used. These are listed in the table on the back page along with the rates at which they must be applied. It is important that directions relating to rates of application, safety issues, and withholding periods for harvest, grazing and slaughter of stock are followed. If stock is unavoidably over-sprayed or is being sent for export markets, contact Safemeat to determine the relevant withholding period.

A naturally occurring fungus, *Metarhizium anisopliae*, known commercially as Green Guard®, has shown potential in the control of the Australian plague locust and would be appropriate for use in sensitive areas and on organic farms. The fungus should be applied when the locust hoppers are in the early instars so there is time for it to kill a large proportion of the locusts. Unlike other pesticides it takes several days to have an effect and it will not protect plants if significant damage is already occurring or is imminent.

It is recommended that landholders observe the buffer zones as per chemical label, around sensitive areas. The Department will be observing the following buffer zones when applying fenitrothion:

- Buffer zones of greater than 1.5 km upwind of sensitive areas will be recognised by the Department when aerial spraying.
- Buffer zones of greater than 50 metres upwind of sensitive areas when using a boomsprayer.
Pastures

Control Issues

Hopper and adult locusts can cause considerable damage to pastures. It is estimated that 20 hoppers per square metre eat the equivalent of three to five sheep per ha each day. Damage to pastures by locusts will affect both the quantity and quality of pasture.

- Locusts will consume green pastures and pastures that have begun drying off.
- Hoppers develop over six to eight weeks, depending on temperature. If green or drying pasture is available over this period, hoppers may complete their development at one locality and consume most of the pasture.

- Adult locusts may fly into a paddock and although their stay may be short, they can still consume a considerable amount of pasture. It may not be possible to effectively protect pasture in these situations.
- Perennial pastures such as lucerne, long-season annual pastures and newly-sown pastures are at greater risk of attack later in the season, since they tend to remain greener longer. Summer-active perennial pastures can remain green over the entire APL incident and will be susceptible to attack for an extended period from November onwards.
- Locust attack has the potential to destroy one to two year old tagasaste and to strip older trees.
- Growers need to identify high value pasture paddocks for special emphasis on control measures. These include newly sown pastures, pastures set aside for specialist seed production and lucerne.
Any degradation to pastures caused by locusts may subsequently result in erosion in prone paddocks. Consideration needs to be given to the increased erosion risk on sandy soils if vegetative cover is removed. This may subsequently limit opportunities for grazing.

Treatment of locust swarms will need to be within hours of them arriving, which means frequent monitoring from mid October onwards, if large infestations are in your area.

Withholding periods for livestock grazing and slaughter should be observed at all times.

Management Options

The following management options should be taken into account for pasture management during the locust incident:

- Hopper control in pastures is economic if hopper densities exceed 20 units per square metre, if pasture is valued at the cost of replacement feed for livestock.
- Adult locust control in pastures is economic if locust densities exceed 10 units per square metre.

Other factors to consider in the decision to spray locust hoppers in pasture include:

- Pasture availability – whether there is a surplus or deficit of pasture on the farm.
- Stage of pasture growth – green pastures and pastures that are drying off are very susceptible to hopper attack, but pastures that have completely dried off are not favoured.
- When the pasture has completely dried off, other green plant material in the paddock or nearby may be damaged, for example, tree seedlings.
- If you consider it necessary to spray for locusts refer to Insecticides, for chemical options and rates.
- Abide by the withholding period in sprayed paddocks.
- Where possible, the over-spraying of stock should be avoided. Otherwise, withholding periods apply.
- Consider spray-topping or hay-freezing additional low-value pasture paddocks. You will need to consider the relative costs of these pasture management treatments versus spraying locusts – which is the cheapest?
• Consider grazing or spraying established lucerne or other perennial pastures prior to locust attack.
• Producers in Priority Target Zones should develop strategies to cope over a summer without any dry pasture. Producers outside these areas should be considering strategies to cope with a 50 per cent reduction in pasture quantity (Note – whilst it is impossible to accurately predict losses, previous experience suggests producers should be planning for the worst case).

Strategies to consider include:
• Reducing carrying capacity by selling livestock and/or agistment.
• Fodder conservation by making silage, hay and sacrificing crops.
• Supplementary feeding in conjunction with estimates of feed reserves, feed budgeting, retaining grain and lot feeding.

Grain Crops

Control Issues

Crops such as wheat, barley and particularly oats are susceptible to damage from locusts. The susceptibility of lupins, canola, chickpeas, field peas and faba beans is uncertain, but all could potentially be attacked while they remain green.
• Established green crops tend to be avoided by hoppers, although the edges of crops can be damaged.
• Crops that are beginning to dry off when locusts begin to fly are susceptible to damage.
 Locusts cause little if any damage to crops that have dried off.

 Even slight damage to grain crops could justify the costs of control.

 As a general rule, hopper and adult numbers should be closely monitored, and if any damage is seen, then spraying should be commenced immediately.

 Cooperative Bulk Handling (CBH) has receival standards for locust body parts and grain damaged by locust feeding.

 Comply with withholding periods for any insecticides sprayed on crops.

### Management Options

- Assess how much of the cropping program and individual crops are at risk.
  - Canola after leaf drop – low risk.
  - Lupins Pod bronzing – low risk.
  - Pulses Pod yellowing – low risk.
  - Cereal completely dried off – low risk.
- Conduct a cost/benefit analysis of locust control.
- Take into consideration the cost of running over the crop (crop damage) with a boomsprayer versus application by a mister or aircraft.
- Consider how long it will take to spray using a boomsprayer versus application by a mister or aircraft.
- Limit swath width of misters to 50 metres.
- Consider crop desiccation in mid-October in an effort to make crops unattractive to swarming adults.

### Control Issues

Horticultural enterprises most susceptible to hopper attack include cultivated turf, including playing fields, parklands and golf courses, and vegetable crops.

- Other horticultural enterprises are mainly susceptible to adult locusts rather than hoppers. However, horticultural enterprises such as cut flowers, nurseries, grape vines and fruit trees should be monitored for damage.
- Comply with withholding periods for any insecticides sprayed on crops.
Viticulture

Control Issues

This spring and summer large numbers of locusts will be produced in the eastern, south-central and south-coastal agricultural areas of the South-West agricultural region. Locusts will begin flying in October.

- Although grapevines do not appear to be a favoured host plant, when large numbers of insects are present extensive damage may occur, particularly on boundary rows.
- Damage to vineyards is erratic in that locusts will fly over some vineyards and then land and feed on others.
- Damage to vineyards can be extensive with adult locusts stripping vines off leaves in hours.
- Vines planted this year are more likely to be killed than mature vines. They have little carbohydrate reserves in their stem and root systems. If a significant proportion of the leaves are eaten, particularly if the locust attack occurs in early spring, the young vines are likely to die.
- If the leaves of mature vines are eaten the vine will usually recover. If damage occurs early in the season, yields will be decreased and fruit quality may suffer. These vines should however produce normally the following year.
- Where insecticide treatment is considered necessary, it is likely that treatment will not be 100 per cent effective and that repeat treatments may be required.
- Over a period of two to three weeks, locusts can fly up to 200 kilometres.

Management Options

- Control in horticultural crops should be initiated as soon as any hopper damage becomes evident. The cost of control is almost certain to be less than the cost of even minor locust damage.
- Due to the high value of horticultural crops, landowners will have to act immediately if a swarm of locusts arrives.
Management Options

- Monitoring for locusts should be undertaken from early September onwards.
- Control in vineyards should be initiated as soon as any hopper damage becomes evident. The cost of control is almost certain to be less than the cost of even minor locust damage.
- Due to the high value of vineyards, landowners should act immediately if a swarm of locusts arrives.
- In areas containing high locust egg numbers, consideration should be given to postponing any new vine plantings until the following year.
- Locust hatchings are not likely to be in vineyards more than one year old. Treating areas of high locust concentration in adjoining pasture paddocks before they attack.

- Vines is likely to be more effective. Where immature hoppers are invading vineyards from adjacent pastures, an insecticide barrier should be applied across the line of advance.
- Where damage to vines is likely to result from nymphs originating near the vineyard, spraying with insecticides registered for locust control in vines (see back page - Insecticides) should be effective.
- Chemicals:
  - Read the label carefully.
  - Do not spray chemicals which have no registration to control locusts on vines;
  - Observe withholding periods.
  - Grape growers and winemakers who are exporting wine should refer their enquiries to the Australian Wine Research Institute.
  - Grape growers should seek advice from their chosen winemaker regarding the suitability of insecticides to use on their vines.
- During the 1990 APL incident, some vineyards were frequently treated with insecticides which were not registered for use in vines. In the following years these vineyards had severe rust mite infestations.
- Where locusts fly into an area, damage can be very swift and severe and it may not be possible to effectively protect the vines. Any decision to treat in these circumstances must be made on commercial grounds. Treatment of locusts will need to be within hours of them arriving, which means frequent monitoring from September onwards.
Trees

Control Issues

Locusts eat green plant material – their preferred foods are green grass and green cereals. The immature hoppers will initially emerge from and develop in pasture paddocks. When the pastures are either eaten out or dry-off, any other green plant material is susceptible.

- Most tree species are susceptible to attack from locusts, including native (eucalypts, she-oaks and wattles) and introduced (pines, olives, pistachio, etc.) species.
- Some species appear to be more susceptible to damage and death from attack than others, e.g. Allocasuarina huegeliana and some provenances of Eucalyptus camaldulensis.
- Damage to trees during the APL outbreak may result from immature locusts (hoppers) which have developed on site or nearby (hoppers cannot fly but can travel hundreds of metres) or from adult locusts which fly into a site.
- Locusts are less likely to do significant damage in plantations with closed canopies.
- Damage to trees can be unpredictable from both immature hoppers and adult locusts that fly in.
- Trees remain green over the entire period the locusts are active and could be susceptible to attack over an extended period from November through to next autumn (if summer rainfall allows the locusts to produce another generation over summer).
- Where insecticide treatment is considered necessary, it is likely that treatment will not be 100 per cent effective and that repeated treatments may be required. This is especially the case with trees given that they are susceptible over a long period.
- In recent years, large numbers of Landcare, nature conservation and commercial tree species have been planted. All of these trees are also at risk of damage by locusts.
- Younger trees (less than three years-old) are at greatest risk of attack and are more likely to be killed than mature trees.
- Plantation trees are at reduced risk of attack from immature locust hoppers once the trees have developed a closed canopy.
Trees planted individually or in narrow bands are at increased risk of damage from immature hoppers.

Most damage to trees will be from adult locusts.

Greatest risk of damage will be in areas where the highest numbers of locust eggs were known to occur over winter.

Any setback of growth could have an adverse economic impact on commercial tree plantings.

Seed collection may be affected.

**Management Options**

The following actions and management of trees should be taken into account during the APL campaign:

- Monitoring for locusts should be undertaken from early September onwards.

- In areas of high risk of locust attack, consideration should be given to postponing any new tree plantings.

- Locust hatchings are not likely to be in revegetation areas more than one-year-old, and therefore most control will not be on revegetation areas. Treating areas of high locust concentration in adjoining pasture paddocks before they attack trees is likely to be more effective.

- Consideration should be given to grazing tagasaste to capture the grazing value prior to locust damage.

- Consideration should be given to netting high-value trees such as pistachio where it is economically viable. However, there have been reports of locusts ‘eating’ shade cloth and netting.

- Where there is a market, oil mallee trees could be harvested prior to a predicted attack.

- Where damage to trees is likely to result from nymphs originating near the trees, spraying with approved insecticides may be effective (see Insecticides section).

- Where locusts fly into an area, damage can be very swift and severe and it may not be possible to effectively protect the trees. Any decision to treat in these circumstances must be made on commercial grounds. Treatment of locusts will need to be within hours of them arriving, which means frequent monitoring is a necessity, from November onwards.

- Tree plantings may be protected from locusts in the hopper stage invading from adjoining pasture areas by treating a band of pasture around the edge of the planting. Several treatments may be required.
Aquaculture

Control Issues

- Spraying locusts will commence in early October.
- The chemical being used for the bulk of the Departmental spraying is fenitrothion, which is toxic to crustaceans such as yabbies and marron and may possibly affect the health of other fish.
- Aquaculturists need to ensure they take appropriate action to safeguard their animals.
- Any dam or tank containing crustaceans or fin fish may be at risk from chemical spraying to combat locusts.
- Early liaison and communication with your Local Operations Coordinator and neighbours is essential.

Management Options

- In Priority Target Zones located in Shires with an extreme locust risk, the Department will be distributing maps of individual properties to landholders prior to the commencement of spraying. It is important that you clearly mark on this map any areas that are “sensitive” and should not be sprayed.
- The areas identified should include all dams or ponds containing aquaculture stock and any sensitive catchment areas.
- A Department surveyor will mark on the map the location of locust infestations to be sprayed. The pilot will use the map to spray the locusts while avoiding the sensitive areas marked in it.
- A buffer zone of 1.5 km upwind and 300 metres downwind and to the side will be maintained around these sensitive areas to minimize the risk of spray drift. Consideration will also be given for a downwind buffer for high risk sensitive areas, eg aquaculture facilities will have a downwind buffer of 300 meters.
- Buffer zones of greater than 50 meters will be maintained upwind of sensitive areas when using a boomsprayer. Consideration will also be given for a downwind buffer for high risk sensitive areas, eg aquaculture will have a downwind buffer of 50 meters.
- Where landholders are conducting their own spraying, aquaculturalists should liaise with neighbours and discuss sensitive areas and buffer zones and how they affect intended spraying programmes, well before spraying commences.
- A small risk has been identified associated with run-off into dams and tanks. If rain falls within four
days of application and sediments from areas that have been sprayed washes into dams, it is important not to harvest from these dams immediately. Fenitrothion breaks down rapidly in water and is unlikely to result in residues in stock, however recommended withholding periods should be observed.

Other management options aquaculturists may wish to consider include:

- Transferring aquaculture stock to several main dams that are to be quarantined from spraying to minimise the number of dams that need to be excluded from spraying; and
- Harvesting stock from dams that may be threatened and transferring them to alternative holding facilities before replacing back into dams at least four days after spraying.
- Should you have any concerns regarding the spraying procedures for your property, please contact your Local Operations Coordinator in the first instance.
- For advice on aquaculture please contact the Aquaculture Council of WA on (08) 9492 8888 or the Department of Fisheries on (08) 9482 7333.

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**Apiculture**

**Control Issues**

This spring and summer, insecticides will be used over a large area of the South-West agricultural region to control locust infestations. These chemical sprays will also kill bees.

- Beekeepers need to keep informed about the Department’s and landholders’ spray programs if bee losses are to be avoided.
- Horticulturists are likely to spray their crops even though many are netted. Locusts have been reported as ‘eating’ shade cloth and netting.
- The Department and farmers may only be able to provide a 24 to 48 hour warning to beekeepers
of their intention to spray insecticides and therefore it may not be possible for beekeepers to move all their apiaries out of an affected area in time.

- Beekeepers may need to avoid some honey flows this season due to spraying for locusts.
- Beekeepers contracting pollination services to growers in locust-affected areas will need to take into consideration the possibility of having to move their bees during the pollination period, due to the application of insecticides, which may affect the conditions of their pollination contract.

Management Options

- Keep yourself informed on APL issues and planned spraying programs.
- Consider moving hives to honey flows in the Goldfields, if nectar resources are available, to avoid the risk of pesticide sprays that kill bees.
- In susceptible areas, liaise with the Department’s Local Operations Coordinators and local farmers within a 7 km radius of apiaries (15 km if attractive crops such as canola are flowering) of intended spraying programs. Move bees away from affected areas before they are likely to be sprayed.
- If more than one apiary is located in a susceptible area, arrange for another beekeeper to assist with moving the apiaries at short notice to an alternative safe area.
- Beekeepers involved in pollination services may need to consider changing the condition of their pollination contract to permit the movement of hives, if their bees are threatened by the application of insecticides to control locusts during the pollination period.

Organic Farms

Control Issues

Organic farms are considered sensitive areas by the Department and no insecticide will be sprayed in these areas by the Department.

- It is the responsibility of the landholder to identify the organic farm for the Department.
- Spraying locusts will commence in early October.
- Early liaison and communication with your Local Operations Coordinator and neighbours is essential.
Organic farming management options

- In Priority Target Zones located in Shires with an extreme locust risk, the Department will be distributing maps of individual properties to landholders prior to the commencement of spraying. Organic farming operations either on or neighbouring the property should be clearly marked.

- A Department surveyor will mark on the map the location of locust infestations to be sprayed. The pilot will use the map to spray the locusts while avoiding the sensitive areas marked in it.

- A buffer zone of greater than 1.5 km upwind will be maintained around homesteads when aerial or mister spraying. Consideration will also be given for a downwind buffer for high risk sensitive areas, e.g. aquaculture facilities will have a downwind buffer of 300 meters.

- Buffer zones of greater than 50 meters upwind when using boomsprayers for fenitrothion applications will be maintained around the sensitive areas. Consideration will also be given for a downwind buffer for high risk sensitive areas, e.g. aquaculture facilities will have a downwind buffer of 50 meters.

- Where landholders are conducting their own spraying, organic farmers should liaise with neighbours and discuss sensitive areas and buffer zones and how they affect intended spraying programs, well before spraying commences.

- It is not possible to spray a protective buffer zone around organic farming operations because registered insecticides do not have any residual properties beyond two or three days and it will be very difficult to predict when locusts will arrive on a particular property and from which direction.

- A naturally occurring fungus, *Metarhizium anisopliae*, known commercially as Green Guard®, has shown potential in the control of the Australian plague locust and would be appropriate for use on organic farms. The fungus should be applied when the locust hoppers are in the early instars so there is time for it to kill a large proportion of the locusts. Unlike other pesticides it takes several days to have an affect and it will not protect plants if significant damage is already occurring or is imminent.
Home Gardens

Control Issues

- This spring and summer large numbers of locusts will be produced over a large area of the South-West agricultural region.
- Initially locusts will be distributed in paddocks on farms but hoppers and adult locusts in particular are very mobile and will move to homesteads and rural towns. Because of the concentration of irrigated plants in gardens relative to surrounding areas, locusts can quickly build up to high numbers in gardens causing damage. Locust hoppers and adult locusts may enter gardens over a number of weeks.
- Homesteads and rural towns have been designated sensitive areas and will not be sprayed by the Department.
- A buffer zone of greater than 1.5 km upwind will be maintained around homesteads when aerial or mister spraying, and greater than 50 metres upwind when using boomsprayers for fenitrothion applications. Consideration will also be given for high risk sensitive areas.
- Buffer zones of 1.5 km will be maintained around townships for fenitrothion applications.

Management Options

- The damage that large numbers of locusts can do to gardens can only be stopped by the use of insecticides.
- Because gardens can be damaged quickly, landowners would have to act immediately if a swarm of locusts arrives.
- Nurseries and hardware retailers can supply the small quantities of insecticides for individual home gardens and advise on their safe use.
- It is important that label directions relating to rates of application of insecticides in gardens are followed.
Health and Safety

Several control options have been explored, including bio-control, but the only effective way to reduce the locust population is through the use of insecticides.

The Department has decided to use fenitrothion, which is recommended for use by the Australian Plague Locust Commission and is used throughout Australia.

The Department’s application of fenitrothion is governed by strict control regimes including buffer zones around residences and sensitive areas such as waterways and public water supply dams.

Professional contract sprayers, who are licensed by the Department of Health, will combine with farmers to undertake the control program, which includes both aerial and ground spraying.

A training program is underway to ensure fenitrothion is used safely and responsibly. The training covers safe preparation and use, disposal of containers, chemical rates, buffer zones and other label requirements.

Farmers will also use other common insecticides to help control locusts on their properties.

What is fenitrothion?

Fenitrothion is an organophosphate insecticide that is regularly used to protect stored grain from insect damage and to control insects in crops and pastures.

It is registered by the Australian Pesticides and Veterinary Medicines Authority (APVMA) for the control of locusts and has recently been reviewed by the Authority as part of its regular chemical review program.

Is it toxic?

The acute toxicity of chemicals, where there is a one-off high dose exposure, is categorised according to a scale of low, moderate and high.

In this regard, fenitrothion as a concentrated product is regarded as having moderate acute toxicity (one-off high dose exposure).

However, when the product is diluted for application in the field, the toxicity decreases markedly.

While people preparing and applying the spray have to wear protective clothing according to label requirements, the chemical can be used safely without risk to the health of the operator or the nearby public.

Chemicals are also categorised according to chronic toxicity, where there is low dose exposure over an extended period of time.

Fenitrothion when sprayed in the field is not a threat to human health in relation to chronic toxicity (low dose exposure over an extended period of time).

Although fenitrothion can be absorbed into the body, it is rapidly broken down and quickly excreted.

Scientific data from the APVMA shows that fenitrothion does not cause cancer.

Like all organophosphates, fenitrothion can affect the nervous system – but in the case of fenitrothion this is only seen at high doses. An antidote is available.
to treat organophosphate poisoning effectively and medical attention should be sought immediately if this occurs.

**Chemicals registered in WA for use against the Australian Plague Locust**

The following chemical information table is provided as a guide for control of Australian plague locust, but product labels should be carefully read in conjunction with this information. Rates of application must not exceed the label rate for each crop.

Observe ‘buffer zones’ around sensitive areas such as farm buildings, dams, aquaculture dams, wetlands etc. The buffers for aerial application of fenitrothion are greater than 1.5 km upwind of sensitive areas. For boomspraying applications of fenitrothion, the buffer zone is to be greater than 50 metres upwind. Consideration will also be given for a downwind buffer for high risk sensitive areas. eg aquaculture facilities will have a downwind buffer of 300 metres for aerial spraying, and 50 metres for boomspraying. For information on buffer zones for other chemicals please refer to the label of the chemical that is being used.

Avoid overspraying stock. If overspraying does occur, observe the ‘Withhold from slaughter’ periods.

Producers of export livestock should seek advice on grazing export animals on treated pastures.

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**If you need more information and advice you can contact:**

- Australian Pesticides and Veterinary Medicines Authority website
  www.apvma.gov.au

- Department of Agriculture and Food:
  - local offices throughout the State
  - website: www.agric.wa.gov.au
  - Pest and Disease Information Service
    - Phone: 1800 084 881

- Department of Health:
  - Pesticide Safety Unit
    - Phone: 9383 4244

- Poisons Information Centre
  - Phone: 131 126

- Rural Financial and Family Counselling
  - Phone: 1800 198 231

- Safemeat - information on Export Slaughter Intervals and Export Grazing Intervals and Export Animal Feed Intervals
  www.safemeat.org

- Your family doctor
Grazing withholding periods

1. **Export Animal Feed Interval (EAFI)**
   The minimum period that must elapse between the application of a chemical and grazing or harvesting the crop/pasture for animal feed.

2. **Export Slaughter Interval (ESI)**
   The minimum period that must elapse between removal of grazing livestock to clean pasture or feed and slaughter, where the livestock have been grazing the crop/pasture prior to expiry of the export animal feed interval.

3. **Export Grazing Interval (EGI)**
   The minimum period that must elapse between the application of a chemical and slaughter of the stock, where grazing has continued on the crop/pasture from the time the chemical was applied.

For further information see the SAFEMEAT brochures that can be obtained from their website at www.mla.com.au

Key Points

- ESIs & EGIS do not appear on the product label – see the above table.
- On the National Vendor Declaration form, answer Yes to Q5 (sheep) and/or Q6 (cattle) if the stock may have been exposed to locust sprays and are still within the ESI or EGI.
  Warning! For the synthetic pyrethroid group of chemicals used on drying pasture the EGI does not commence until the next break of the season unless no feed is left. Synthetic pyrethroids include: alpha-cypermethrin, beta-cyfluthrin, lambda-cyhalothrin and gamma cyhalothrin.
- If feed is drying or dried off – these intervals are insufficient. If stock remain on sprayed areas, then need to comply with the ESI (ie 42 days on clean feed before slaughter). If cattle are expected to be turned off before the break of the next season and alternative feed is unlikely to be available, then it best not to use synthetic pyrethroids.
- Farmers should refer to chemical label withholding periods (WHP), which only apply to domestic markets. Animals destined for domestic markets need not comply with export standards.
Insecticides

CHEMICALS REGISTERED FOR THE CONTROL OF THE AUSTRALIAN PLAGUE LOCUST IN WESTERN AUSTRALIA

Read chemical label before application

- There are many products with different trade names that contain the same active ingredient. This list is not exhaustive and does not imply any specific recommendations of brand names.
- EC - Emulsifiable concentrate, ULV – Ultra low volume.
- Withholding period (WHP) - number of days are given for: (H) - Harvest withholding period. For grazing WHP’s refer to chemical label and export withholding periods (ESI, EGI, EAFI) intervals are listed below in days.
- Avoid overspraying stock. Refer to labels for withholding grazing periods for domestic markets. For animals destined for export: if overspraying does occur, withhold stock for slaughter until the export slaughter interval (ESI) on clean feed is met. Or the export grazing interval (EGI) on treated crops/pasture.
- Many products are dangerous to fish and crustaceans. Do not contaminate ponds, rivers or waterways and do not spray flowering crops when bees are foraging.

*** Subject to APVMA application for temporary permit 1/9/2004 - 31/12/2006
- Use of chemicals will be restricted to crops for which there are current registrations for other pests.
- Rates of application must not exceed the label rate for each crop.
- Rates of application in the table are given in mL/ha

<table>
<thead>
<tr>
<th>Chemical formulation and concentration</th>
<th>Trade name</th>
<th>Pastures</th>
<th>Cereals</th>
<th>Canola or Lupin or Pulse crops</th>
<th>Forest trees or Agricultural Non-crop</th>
<th>Harvest and Grazing Withholding period</th>
</tr>
</thead>
<tbody>
<tr>
<td>**Alpha-cypermethrin *****</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>EC</td>
<td>100 g/L</td>
<td>Alpha-cypermethrin, Alpha Duop, Alphamax100, Alpha100, Alphasip Duo, Alpha-Cyp100 Duo, Alpha-Scud Elite, Astound Duo, Buzzard, Centaur, Dictate Duo, Dominex 100, Dominex Duo, Fastac Duo, Ken-Tac 100, Unialphacyper.</td>
<td>160</td>
<td>160</td>
<td>160 - 200</td>
<td>300</td>
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<tr>
<td>ULV</td>
<td>16 g/L</td>
<td>1000</td>
<td>1000</td>
<td>1000 - 1250 &amp; 1250 - 2500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>**Beta-cyfluthrin *****</td>
<td></td>
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<tr>
<td>DUO</td>
<td>25 g/L</td>
<td>Bulldock Duo</td>
<td>200</td>
<td>400</td>
<td>400</td>
<td>7-14(H) ESI 42 EGI 56</td>
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<tr>
<td>ULV</td>
<td>8 g/L</td>
<td>Bulldock 8UL</td>
<td>-</td>
<td>625 - 1250 &amp; 625 - 1250</td>
<td>7-14(H) ESI 42 EGI 56</td>
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<tr>
<td><strong>Carbaryl</strong></td>
<td></td>
<td></td>
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<tr>
<td>Flow</td>
<td>500 g/L</td>
<td>Bugmaster, Carbaryl</td>
<td>1200 -1400</td>
<td>1200 -1400</td>
<td>3(H) EAFI 7 ESI 7 EGI 7</td>
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### Insecticides (table cont.)

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<thead>
<tr>
<th>Chemical formulation and concentration</th>
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<th>Pastures</th>
<th>Cereals</th>
<th>Canola or Lupin or Pulse crops</th>
<th>Forest trees or Agricultural Non-crop</th>
<th>Harvest and Grazing Withholding period</th>
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<tbody>
<tr>
<td>Chlorpyrifos</td>
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<tr>
<td>EC</td>
<td>300 g/L</td>
<td>Lorsban 300</td>
<td>600</td>
<td>600 or 950</td>
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<td>10(H) EAFI 10 ESI 21 EGI 28</td>
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<tr>
<td>EC</td>
<td>500 g/L</td>
<td>Agricultural Insecticide, Bar, Chlorpyrifos, Chlorpyrimax, Fortune, Generifos, Kensban, Lorsban, Pest Controller, Profos, Strike Out.</td>
<td>350</td>
<td>350</td>
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<td>10(H) EAFI 10 ESI 21 EGI 28</td>
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<tr>
<td>Diazinon</td>
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<tr>
<td>EC</td>
<td>800 g/L</td>
<td>Diazinon, Diazol</td>
<td>700</td>
<td>700</td>
<td>700</td>
<td>14(H) EAFI 14 ESI 14 EGI 28</td>
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<tr>
<td>Fenitrothion</td>
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<tr>
<td>EC / ULV</td>
<td>1000 g/L</td>
<td>Fenitrothion</td>
<td>270 – 325</td>
<td>270 – 325</td>
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<td>14(H) EAFI 14 ESI 14 EGI 28</td>
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<tr>
<td>Fipronil</td>
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<tr>
<td>SC</td>
<td>200 g/L</td>
<td>Regent 200SC</td>
<td>6.25</td>
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<td>14(H) EAFI 14 ESI 14 EGI 21</td>
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<tr>
<td>UL</td>
<td>3.0 g/L</td>
<td>Adonis 3UL (Restricted use)</td>
<td>420</td>
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<tr>
<td>Lamda-cyhalothrin ***</td>
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<tr>
<td>CS</td>
<td>250 g/L</td>
<td>Karate with Zeon Matador with Zeon</td>
<td>20</td>
<td>20</td>
<td>24 -36</td>
<td>7-14(H) ESI 42 EGI 56</td>
</tr>
<tr>
<td>Gamma cyhalothrin ***</td>
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<tr>
<td>CS</td>
<td>150 g/L</td>
<td>Trojan</td>
<td>20</td>
<td>20</td>
<td>24 -36</td>
<td>7-14(H) ESI 42 EGI 56</td>
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<tr>
<td>Maldison</td>
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</tr>
<tr>
<td>EC</td>
<td>500 g/L</td>
<td>Maldison</td>
<td>1200 - 1700</td>
<td>1200 - 1700</td>
<td>1200 - 1700</td>
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<tr>
<td>EC</td>
<td>1150 g/L</td>
<td>Hy-Mal</td>
<td>750</td>
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<tr>
<td>Biological control – naturally occurring Australian fungus Metarhizium anisopliae var. acridum</td>
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<tr>
<td>SC</td>
<td>150 g / 1.8kg</td>
<td>Green Guard SC</td>
<td>75 g of spores / 150-450 L water</td>
<td>75 g of spores / 150-450 L water</td>
<td>75 g of spores / 150-450 L water</td>
<td>75 g of spores / 150-450 L water</td>
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<tr>
<td>ULV</td>
<td>300 g/L</td>
<td>Green Guard ULV</td>
<td>40 - 250</td>
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Notes