THE AUSTRALIAN PLAGUE LOCUST

Landholder control strategies for New South Wales

NSW GOVERNMENT

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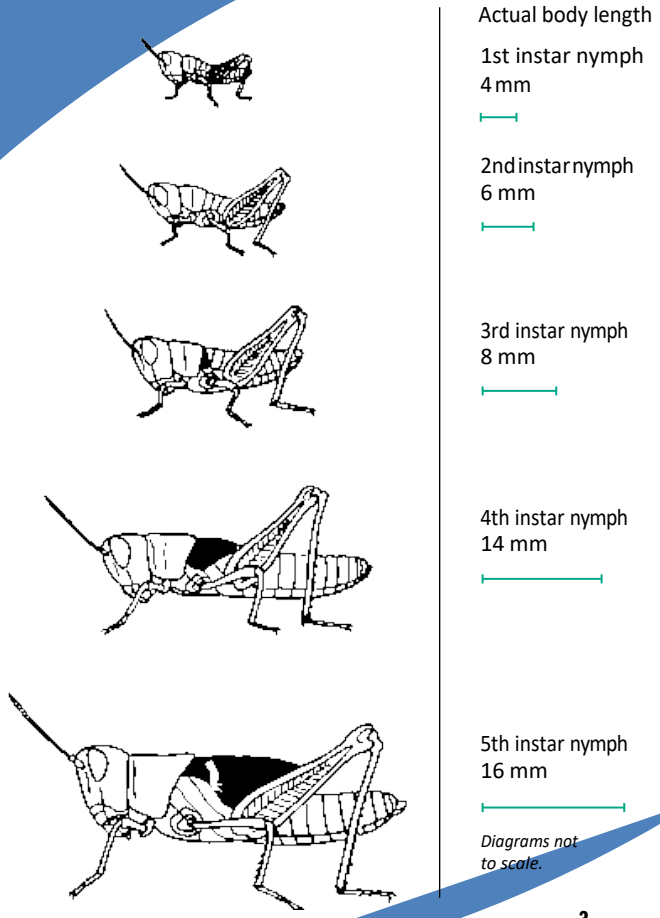
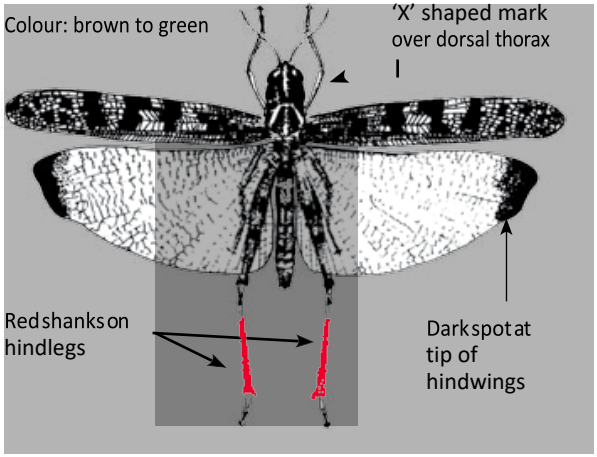
The Australian plague locust

The Australian plague locust (*Chortoicetes terminifera*) is a damaging, recurrent insect pest of pastures and crops throughout Australia. This pest occurs throughout most of the central and western parts of New South Wales with the greatest activity usually from spring to autumn.

Australian plague locust nymphs



Adults are approximately 30–40 mm with the female being slightly larger than the male. Two very distinctive features of the species are the black tipped rear wings and red shanks (tibia) on the hind legs. Additionally, above the shoulders there is a distinctive pale 'X' and this marking often extends towards the wings.



The colour can vary from brown to green and is dependent mainly on population density; as a general rule solitary insects are green and gregarious insects are brown. This is true for the immature stages, the nymphs, as well as the adults. The plague locust is smaller than the migratory and the spur-throated locusts.

The Australian plague locust has a distinctive behavioural habit. When approached, insects will fly 5–10 metres away, land and turn to face the observer. This is not completely unique to the species, but in combination with other traits mentioned above is a good identifying factor. The adult insects are easier to identify than nymphs. Generally the younger the nymphs are the more difficult they are to identify.

The end of the abdomen of the male locust is rounded due to the sub-genital plate which conceals the reproductive organs (in some species of grasshopper this sub-genital plate may be more pointed in shape). The end of the abdomen of the female locust is jagged due to the upper and lower jaws of the ovipositor.

Female locusts can be checked to determine what stage of the lifecycle they are at. If the abdomen is gently pulled from the main body part and contains lots of yellow fat and eggs (look like little grains of rice) the locust may be about to lay. If empty, they have either laid or have not yet mated. This information can assist in determining the overall locust situation.

OUTBREAKS

Origin

Outbreaks of locusts in NSW can result from migration from pastoral areas of Queensland and western NSW and also from the local build-up of populations within NSW.

Migration

Conditions for an outbreak include high spring and summer rainfall in parts of the locust distribution area. This rainfall enables rapid multiplication and swarm formation by early autumn. Summer breeding may occur in the arid inland of north-western NSW and adjoining areas in Queensland and South Australia. These swarms can then invade arable inner country by mid-autumn. Large populations of nymphs may develop the following spring.

Local build-up

Summer breeding can also occur in the NSW Central West, Northwest Plains or Riverina. Swarms may then spread throughout agricultural districts of western NSW during autumn and lay eggs several times. Large populations of nymphs develop during the following spring. Spring populations fledge and can form swarms during November and December, and the breeding cycle may be repeated.

EXPANSION

Outbreaks expand by:

Long-distance night flights. An outbreak can suddenly relocate after a mass take-off at dusk. Adult locusts may travel several hundred kilometres in a night on high altitude winds; typically, hot, northerly winds ahead of a cold, frontal depression.

Daytime swarm movement. An outbreak can also expand more slowly with daytime flight of adults, which may move up to 100 kilometres over a week and in the direction of prevailing winds.

COLLAPSE

Population numbers can suddenly collapse, and are frequently assisted by:

- Spring droughts that kill hatchlings,
- Summer droughts that restrict food availability, which prevents the sexual maturation of adult females and egg production,
- Parasitism of eggs by *Scelio* wasps or the parasitism of adults by fly maggots or nematodes in the soil, though this will only have a small impact on overall numbers, or
- Migration/dispersion to other districts.

DAMAGE

Autumn swarms. These usually cause minimal damage as summer field crops are either mature or harvested, although newly germinated winter cereal crops and irrigated pastures are vulnerable.

Spring nymph bands, swarms. These can cause severe damage, depending on the stage of maturity of the crop or pasture. Winter cereal crops are particularly susceptible to damage up to the milky ripe stage (three weeks before harvest); emerging summer field crops are also very susceptible. The level of damage to pastures depends on the season and the pasture's ability to regenerate. Short or newly emerging growth is more likely to be damaged than rank or dense growth.

CONTROL CAMPAIGN ORGANISATION

The aim of a control campaign is to reduce the outbreak at the nymph stage, thereby limiting the scale of any subsequent locust breeding and migration.

The organisations below conduct locust control in New South Wales.

Local Land Services

Staff from Local Land Services provide advice to landholders on all aspects of locust control. Local staff also monitor and report outbreaks; organise landholder control of bands and adults; distribute chemicals and control infestations on travelling stock reserves. Local Land Services also assist NSW Department of Primary Industries in organising aerial control activities.

NSW Department of Primary Industries (DPI)

DPI coordinates state-wide locust control programs when control extends beyond the capabilities of local landholders and Local Land Services regions.

Australian Plague Locust Commission (APLC)

The APLC only conducts aerial control campaigns in eastern Australia (generally west of the Newell Highway) against locust infestations which have the potential to significantly threaten rural industries in other States. The APLC also monitors populations, predicts outbreaks, and conducts research into locust biology and control.

Control campaigns

Ground control of bands and aerial control of swarms. The most important part of an effective control campaign involves landholders controlling banding nymphs using ground control techniques. If control becomes beyond the capacity of the landholder, Local Land Services may arrange for ground control contractors to assist. When all ground control options have been exhausted, aerial spraying may be considered.

Aerial control of bands and swarms in remote areas. In the semi-arid inland, it is often impracticable for individual landholders to undertake effective control of locusts. Therefore, the APLC and/or DPI may sometimes organise the aerial application of ultra low volume (ULV) chemicals where target criteria are met. It is therefore essential that landholders report locust activity to Local Land Services. Landholders may always need to undertake control on their own lands regardless of any operations conducted by other parties anywhere in NSW.

The act of reporting locust activity or providing consent to undertake application in no way guarantees intervention by the above-mentioned agencies.

ROLE OF LANDHOLDERS

Outbreaks of Australian plague locusts can potentially affect very large areas and effective control is only possible if individual landholders cooperate.

Locusts in NSW are managed under the *Biosecurity Act 2015* where:

- Landholders must report all infestations to Local Land Services
- Landholders must prevent, eliminate or minimise the risk from the locust on their land by treating them with chemical/control agents provided by Local Land Services or with chemical/control agents purchased themselves.
- Land managers also have the responsibility to control locusts on public (Crown) lands.

Ground control involving landholders and Local Land Services remains a **crucial** element in helping to reduce the impact of this pest. This forms a critical component of any joint management approach as many infestations are fragmented and will either consist of only small populations or will be otherwise unsuitable for aerial control methods. Control of previous outbreaks has been most effective when a coordinated ground program was employed.

CONTROL AGENTS

The most common control agents used are the chemical fenitrothion and the biological control agent *Metarhizium* known as Green Guard®.

Fenitrothion

Fenitrothion is a chemical with a short residual action. It is available as an emulsifiable concentrate (EC) and ultra low volume (ULV). Fenitrothion degrades rapidly in the environment, but is extremely toxic to fish and other aquatic life and also to bees. Therefore, buffer zones must be observed (See 'Buffer zones', page 13). Withholding periods for grazing, cutting for stock feed, harvesting and slaughter must also be observed to avoid residues. Before use, check the label for details and directions.

Metarhizium (Green Guard®)

Green Guard® is a biological control agent which may be used in sensitive areas. This includes waterways, and areas of organic farming, where chemical sensitivity issues exist, apiary sites etc. The agent is derived from a naturally-occurring Australian fungus (*Metarhizium anisopliae*) that attacks locusts and grasshoppers and is approved for use by the organic production industry. Unlike chemicals it lacks residual activity and so must make direct contact with nymphs to be effective. Spores germinate on the locusts' outer cuticle and penetrate into their bodies.

As Green Guard® takes 8–18 days to effectively work it should only be used on nymphs and is not suitable for protecting vegetation already being damaged as locusts will continue to feed until delayed mortality is evident. Affected locusts will have substantially reduced reproductive or migration potential.

It is available as a suspension concentrate (SC) and as ULV but has a limited storage life. Withholding periods are not required when this product is used according to the label directions.

Other chemicals

Dependent on the situation, and availability, other chemicals may be used during a control campaign. Fipronil, a chemical used by the APLC during control programs, may be applied through direct application onto locusts or as a barrier treatment where untreated areas can be left between treated areas. Fipronil is not a 'knockdown' chemical.

BAND CONTROL

To achieve good control of locust bands, remember the following principles.

- Consult and coordinate efforts with your neighbours. The larger the area that is systematically surveyed and simultaneously treated, the more effective control will be.
- Accurately assess the extent and density of bands.
- It is more effective and efficient to carry out control early, i.e. when the locusts are banded together (often seen as a black mass moving across the ground) which is generally in the 2nd and 3rd instars stage.
- Obtain the appropriate quantity of chemical/control agent from Local Land Services. Chemicals are also available commercially through most rural suppliers at the landholder's own cost.
- Read all container labels carefully before mixing the chemical/control agent and observe all safety precautions. This is a compulsory requirement under the *Pesticides Act 1999.*
- Calibrate all equipment accurately, and if unsure how to do this, ask someone who does know how.
- Make sure you use the correct chemical/control agent application rates. The correct rate is the most efficient, economic, and environmentally-protective level – using higher rates does not increase effectiveness and is illegal under the *Pesticides Act 1999.* Incorrect use of chemicals increases risk to trade (residues), the environment, yourself and others.

APPLICATION OF FENITROTHION

The best time for application of fenitrothion is when nymphs are banding, such as the 2nd and 3rd instar stage when bands are at their most dense. Follow all label directions. Apply directly onto the 'banded' nymphs and about one swathe-width ahead of the band, or at least five metres in front, and then work back through the nymph band from the dense leading-edge.

APPLICATION OF *METARHIZIUM* (Green Guard®)

The biological control agent, Green Guard® should not be used on adult locusts. Green Guard® takes 8–18 days to kill locusts, so spray when the nymphs are first seen, usually at the 2nd and 3rd instars stage and also ensure that nymphs are banded. Apply directly onto the nymphs, commencing one swathe-width ahead of the band or at least five metres in front. Then spray back through the locust band from the dense leading edge. Remember that Green Guard® may be hazardous to honeybees. Therefore, do not apply to any flowering plants that may be visited by honeybees within reasonable forage range. Read all label directions to ensure correct application. (NB: Remember to clean all spray nozzles and filters after use as blockages can occur with this product.)

EQUIPMENT

Always read the product label to ensure that suitable spraying equipment is used with that chemical. Most types of spray equipment can be used to treat nymph bands. Correctly calibrated boom sprays are the most suitable equipment, or boomless jets which can apply 50–200 litres per hectare can also be used.

CORRECT USE OF CHEMICALS

All chemical users must comply with the laws governing the use of chemicals. This includes having a current chemical training certificate recognised by the NSW Environmental Protection Authority (EPA). It is illegal under the *Pesticides Act 1999* to apply chemical unless you are authorised. Prior to using any chemical, check the relevant labels, any permits and the Safety Data Sheet (SDS) for respective precautions and personal protective equipment (PPE) recommendations.

The *Pesticides Act 1999* requires that, each time a chemical is used, the entire label must be read or explained and that all label instructions must be followed. For information on the *Pesticides Act 1999*, contact the EPA.

Clauses of the *Work Health and Safety Regulation 2011* relating to hazardous substances require that all users of hazardous substances, including locust chemicals, conduct, review, and record a risk assessment of the planned spraying.

In the case of fenitrothion (an organophosphorous based chemical), health surveillance and monitoring of cholinesterase levels may also be required if the risk assessment indicates that the exposure of users is sufficiently high. For information on how to carry out a risk assessment and for the guidelines on health surveillance, consult the Code of Practice for the safe use and storage of chemicals in agriculture. This Code is available from SafeWork NSW.

In cases of acute poisoning with fenitrothion, contact the Poisons Information Centre prior to treatment:

POISONS INFORMATION HOTLINE 131 126

The Australian Pesticides and Veterinary Medicines Authority (APVMA) have provided a series of label instructions to help reduce user-exposure of fenitrothion when using ground-based power equipment.

> 'To minimise exposure, a vehicle equipped with a closed cab should be used for ground spraying operations. Enclosed cabs should be equipped with air conditioning and pesticide filters.'

Read the SDS supplied with the chemical and ensure that it is also available to anyone mixing or applying the chemical or who may be exposed to it.

PPE is required when using any chemical so adhere to all chemcial labels and SDS.

RECORDING CHEMICAL USE

The *Pesticides Act 1999*, requires that all chemical applications be recorded, including those chemicals applied for locust control. These records are to be kept for at least three years and are auditable by the EPA.

BUFFER (NO SPRAY) ZONES

To reduce adverse environmental impacts from chemicals, buffer zones may be required for application adjacent to and upwind of environmentally sensitive areas. These sensitive areas include, but are not limited to, natural streams, rivers and watercourses, tanks and dams, waterways, beehives, human dwellings, and neighbouring properties. Ensure that all buffer zones are established according to the label before spraying and also adhere to all other label directions.

AERIAL APPLICATION

When contracting aerial application, ensure that only the EPA licensed aerial applicators are used. Under the *Pesticides Act 1999,* all those involved in decision-making about chemical application share the legal responsibility and may be fined if the chemical is misused. Misuse can include non-adherence to a buffer zone and damage such as from off-target drift.

CLEAN-UP AFTER SPRAYING

Empty all chemical containers and dispose of unused and waste materials in an environmentally responsible manner according to the label instructions of the particular chemical.

When rinsing, the PPE specified on the label for preparing spray and using prepared spray must also be worn. This is because the chemical remaining in a container is the concentrate, the most toxic form of the chemical, even though it may be diluted during the rinsing process.

Rinsing is most effective while the contents are still moist inside. The longer residues have time to dry and cake on the inside of containers, the more difficult they are to remove. If rinsing is carried out during mixing and loading, the rinsate can be emptied into the spray or mixing tank of the application equipment.

DISPOSAL OF RINSATE OR DILUTE CHEMICAL

It is best-practice to use all of the spray that has been mixed to treat locusts. To dispose of unused chemicals, first dilute and then dispose of in an environmentally responsible manner, such as in a disposal pit. Always follow the label instructions when carrying out this procedure.

FURTHER INFORMATION

For more information on controlling plague locusts contact:

- Local Land Services
  www.lls.nsw.gov.au
- NSW Department of Primary Industries
  www.dpi.nsw.gov.au/climate-and-emergencies/emergency/locusts
- Australian Plague Locust Commission
  www.agriculture.gov.au/aplc
- NSW Environment Protection Authority
  www.epa.nsw.gov.au
- SafeWork NSW
  www.safework.nsw.gov.au
- Australian Pesticides & Veterinary Medicines Authority
  www.apvma.gov.au

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