

Western Downs Regional Council

**Mosquito Management Plan
2023**



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1. INTRODUCTION

Western Downs Regional Council (WDRC) has developed a Mosquito Management Plan (MMP) that provides an integrated approach for the management of mosquitoes within our region to reduce the risk of mosquito-borne disease. The Mosquito Management Code of Practice, relevant statutory requirements and the environmental amenity of the region were considered in the development of the MMP.

Mosquito management within the region is necessary for two reasons:

- Some species of mosquitoes can be vectors of disease
- Some mosquito species are aggressive biters, causing significant nuisance issues.

The Western Downs Region has a population of around 35,000 and the region covers an area of 37,937 square kilometres with a strong agricultural presence. The WDRC area is in South-West Queensland, about 300 kilometres north-west of Brisbane CBD. Following key environmental events large numbers of mosquitoes can breed and impact on residents in the area.

WDRC includes several remote communities and sparsely populated homes. Due to resource restraints and inaccessibility of some remote locations during the peak mosquito season, this MMP provides different program options across the community with the main treatment areas focused on the larger populated areas within our region.

2. PROGRAM OBJECTIVES

The aim of the MMP is a reduction of mosquitoes which will achieve the following benefits:

- Reduction in mosquito-borne disease
- Low level of disturbance in the evenings
- Being able to spend time outside without being annoyed
- Young children and the elderly are protected from mosquitoes
- Improved sleeping conditions
- Improved living conditions
- Improved outdoor working conditions
- Improved possibilities for sport and leisure
- Reduction in transmission of heartworm in dogs
- Economic advantages for tourism
- Reduction in costs associated with vector borne disease such as medical and vet expenses and time off work.

3. ENVIRONMENTALLY SUITABLE MOSQUITO MANAGEMENT

First and foremost, it is important to remember that mosquitoes are a natural part of the Australian environment. To manage mosquito-borne disease risk, strategies are required that disrupt these natural cycles and influence the activity of the community to minimise their exposure to mosquitoes. Strategies to reduce the risks of mosquito-borne disease and the impacts of nuisance-biting can include:

- Plan urban development to reduce exposure of the community to mosquitoes
- Educating the community on the most effective personal protection strategies
- Reducing the productivity of mosquito habitats through environmental modification and physical methods.
- Treatment of larval and adult mosquitoes through chemical or biological application.

4. STATUTORY REQUIREMENTS

- *Public Health Act 2005*
- *Public Health Regulation 2018*
- *Environmental Protection Act 1994*
- *Environmental Protection Regulation 2019*
- *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*
- *Biosecurity Act 2014*
- *Biosecurity Regulation 2016*
- *Planning Act 2016*
- *Planning Regulation 2017*
- *Fisheries Act 1994*
- *Fisheries (General) Regulation 2019*
- *Agriculture and Veterinary Chemicals (Queensland) Act 1994*
- *Agriculture Chemicals Distribution Control Regulation 2021*
- *Chemical Usage (Agricultural and Veterinary) Control Act 1988*
- *Chemical Usage (Agricultural and Veterinary) Regulation 2017*
- *Biological Control Act 1987*

5. MOSQUITO DISEASE RISK & NUISANCE

Over 220 species of mosquitoes have been identified in Queensland but only a small number are of major concern. Mosquitoes are the deadliest animal in the world. Mosquito-borne diseases such as Malaria, Dengue Fever, Zika, Japanese Encephalitis (JE), West Nile (WNV) and Chikungunya (CHIKV) are causing major public health problems in many countries. The main disease concerns for the Western Downs region include Dengue Fever, Ross River, Barmah Forest and Japanese Encephalitis.

As well as being a disease risk, mosquitoes can also be a considerable nuisance. Some mosquito species in the region are known to be aggressive biters, causing discomfort and pain to affected residents which can impact significantly on lifestyle.

6. BREEDING SITES

Numerous breeding sites within the region contribute to mosquito populations. Some of these areas are monitored and treated by Council; other existing and potential breeding sites are the responsibility of external agencies. WDRC is responsible for management of breeding sites on regional properties. This includes parks, gardens, council facilities, roads and drainage systems.

Due to the very large geographical area of the Western Downs, it will never be possible to control mosquito breeding or control adult populations, and a focus must always be on community members protecting themselves from mosquito bites.

The management of mosquitoes on private property is the responsibility of owners and residents. Backyard breeding of mosquitoes can contribute significantly to nuisance and disease risk in residential areas. WDRC conducts education campaigns to encourage residents to clean up and help them identify potential backyard breeding sites if necessary. WDRC can undertake enforcement action to require residents or owners to remove backyard breeding sites.

7. MOSQUITO MANAGEMENT METHODS

To manage mosquito-borne disease risk, strategies are required that either disrupt these natural cycles or influence the activity of the community to minimise their exposure to mosquitoes. To be effective, this MMP uses an integrated approach incorporating four management methods: cultural, physical, biological and chemical.

7.1 Cultural Methods - Education

Cultural methods involve influencing people in the community to take measures to protect themselves from mosquito bites and to remove or reduce mosquito activity on their own property. Promotion and education of key personal activities the community can take is the driver to cultural control.

Public education will begin towards the end of the dry season and will be active throughout the wet season. These promotion and education initiatives should first focus on the concept of residents protecting themselves against insect bites.

Activities will be intensified when surveillance indicates that disease risk is high, due to high mosquito numbers detected in adult traps or larval checks. Education materials may include the following:

- Information on how to control mosquitoes around the home
- Mosquito repellents available
- Information displays at local events, particularly outdoor events
- Display information posters on local notice boards
- Dissemination of warnings through local media when surveillance indicates a risk of mosquito-borne disease is likely
- Public notification of planned chemical and physical mosquito control activities; and
- Displaying appropriate signage while in the field conducting monitoring or treatment.

Promotion and education initiatives have been prepared and align to the Intervention levels that are proposed in this Management Plan:

Threat Level	Promotion and Education
Level 1 (Low threat scenario)	Self-Protection messages (use quality repellent, avoid dawn/dusk, wear light coloured loose fitting long clothes, check your insect screens, tip out water from containers and check water tanks). Message of physical controls the community can undertake to reduce breeding (e.g. fix tanks, fill dips in lawn with top soil, etc.) These messages can be delivered via social media, print media and public place signage, such as Coreflute signs.
Level 2 (Medium threat scenario - normal wet season conditions)	Message to install at Larvicide location on Coreflute Sign - 'This area treated by WDRC etc'. QR code
Level 3 (High threat scenarios - extended periods of wet weather leading to high levels of mosquito populations)	Messages for public place adulticide <ul style="list-style-type: none"> • Barrier treatment first option - high mosquito numbers and high facility usage e.g. an event. Can't be used on plants while flowering (check with Beekeepers) • (misting/fogging) - high mosquito numbers and risk of disease. Coreflute sign - this area will be treated on __/__/__ by WDRC. Use repellent. QR code. Facebook messages re self-protection, adult treatments not perfect. Beekeeper notification of treatment.
Level 4 (Extreme threat scenarios - for example, flood conditions)	Messages for residential area adulticide. Coreflutes as per Level 3. Disaster related Facebook messages. Beekeeper notification of treatment. Last resort treatment with extremely high mosquito numbers and risk of disease.

7.2 Physical Methods

Physical methods are measures taken to reduce the potential for mosquito breeding and harborage by modifying the natural or built environment. Examples of physical methods include:

- Maintenance of open stormwater drains to remove silt and weeds to ensure water not held for more than five days (Parks and Infrastructure)
- Remove ponding areas by filling with top soil/gravel etc. (Parks and Infrastructure)
- Reduction of emergent vegetation in known breeding sites (Parks and Infrastructure)
- Slashing of vegetation which provides harborage for adult mosquitoes (Parks and Infrastructure)
- Cleaning up yards to remove containers which will collect water
- Ensuring rainwater tanks are adequately screened
- Ensuring gutting is clear of debris, operating effectively and connected to either a rainwater tank or stormwater system
- Ensuring septic tanks are sealed and vents fitted with mosquito proof screens
- Ensuring that there is suitable and safe access for Mosquito Management to occur.

7.3 Biological Methods

Biological methods refers to the natural predation of mosquito larvae, for example by fish. Biological methods occur naturally in many water bodies and when present will reduce the need for other management techniques. The introduction of fish can also be an effective, long-term control for mosquito breeding in man-made situations such as backyard ponds.

This may have limited effect in public places in the local area.

7.4 Chemical Methods

Chemical methods of adult and larval mosquitoes involves the application of minimal amountsof chemical substances that are toxic, physically damaging or hormonally disruptive to mosquitoes to kill them or slow or disrupt their development. Routine applications of these chemicals with the same mode of action or over application of these chemicals can create insecticide resistance within the target mosquito population.

Some of these chemicals can also have undesired impacts on non-target populations. It is important to understand that although insecticides have a place in mosquito management, these chemicals should be used sensibly to maximise their benefits while minimising any disadvantages.

7.4.1 Larvicides

Larvicides kill mosquito larvae and/or prevent the emergence of adult mosquitoes. This is beneficial to prevent the emergence of mosquitoes, but it is not possible to treat all areas.

Materials known as larvicide are placed in known mosquito breeding water sources in the region.

These Larvicides stop the breeding cycle of mosquitoes at the larval stage, so they are not able to transition into an adult mosquito and therefore are not able to bite and cause the spread of disease. Larvicides are in liquid, pellet and briquette forms and can last up to 3

months, meaning they can be used for areas in which water is held for longer periods of time. Larvicides are used to treat known breeding sites in close proximity to residential areas.

Advantages:

- Mosquitoes are killed before they pose any health risk
- Products can be very target specific making it easier to manage any environmental impact
- Controlled release formulations allow for residual control
- Reducing populations at the larval stage limits ongoing breeding, making ongoing control easier.

Disadvantages:

- Treatment can be limited by site access and the size of the area requiring treatment
- Pupae and late 4th instar larvae are not affected, making the timing of treatment crucial
- In small breeding sites, larvicides can be applied by hand without any specialist equipment. Council has backpack sprayers that can be used to apply liquid to larger breeding sites.

7.4.2 Adulticides

Adulticides are those chemicals that kill mosquitoes at the adult stage. Pesticides kill or alter an organism by disrupting some vital physiological function. The method by which this occurs is called the pesticide's mode of action. The most typical mode of action involves disruption of the insect's nervous system. They are the only chemical control option once flying adults have emerged. The chemical application is usually by Ultra-low-volume (ULV) misting and Barrier Spraying.

Advantages:

- Fast knockdown of biting adults in times of high disease risk
- Some residual surface sprays are available which can be used as barrier sprays with longer lasting effects.

Disadvantages:

- Only temporary control is achieved by misting - mosquitoes are highly likely to re-enter treated areas from adjacent untreated areas, meaning treatments must be repeated regularly
- No target specific formulations are available. Adulticides work like a large-scale insect spray, killing all flying insects, including natural predators of mosquitoes and beneficial insects such as bees
- Mosquitoes can develop insecticide resistance through the overuse of adulticides
- Highly toxic to fish and other aquatic organisms and cannot be used near wetlands
- Labor and chemical costs associated with ongoing misting treatments can be very high
- Misting cannot be undertaken in windy or rainy conditions
- Works can only be undertaken by an accredited Pest Management Technician.

8. MOSQUITO MANAGEMENT PROCESS

Our mosquito management process begins with scheduled inspections and routine monitoring of known mosquito breeding sites checking trapping numbers and identifying species.

The management process will escalate dependent upon the threat level due to trigger conditions resulting in action. Table 1 below outlines the management process to be undertake.
monitoring to determine success levels.

Table 1 Mosquito Management Response Hierarchy

Threat Level	Trigger Conditions	Management Actions
Level 1 - Low	Customer requests and data determine there is no indication of a high-risk season No additional surveillance or control measures are necessary to reduce the risk of human cases of infection	Information displays, public notices, and communication to the community. Review and update website information Review previous management actions and mosquito season and update management actions. Maintain standard monitoring of larvae and adults
Level 2 - Medium	Number of larval or adult mosquitoes increasing New sites identified Customer requests increasing	Information displays, public notices, and communication to the community. Mosquito breeding areas to be identified and coordinated larviciding to commence at known breeding locations on Council controlled land. Public notifications on larviciding areas to be posted and signage incorporated at areas.
Level 3 - High	Level 3 will be triggered where one of the following items is met: <ul style="list-style-type: none"> there is more than 8 CRM/ month for Dalby there is more than 5 CRM/ month for Chinchilla there is more than 4 CRM/ month for other regions number of mosquitoes caught at a single location in a single carbon dioxide baited trap exceeds 300 of a specific species over a normal sampling period (i.e. 12 – 18 hours) Disease risk 	Information displays, public notices, and communication to the community. Mosquito breeding areas to be identified and coordinated larviciding to commence at known breeding locations on Council controlled land. Public notifications on larviciding areas to be posted and signage incorporated at areas. Barrier treatment first option - high mosquito numbers and high facility usage e.g. an event. Can't be used on plants while flowering (check with Beekeepers) Adulticiding (misting/fogging) - high mosquito numbers and risk of disease, last resort. Public notification and signage at areas to be incorporated.
Level 4 - Natural Disaster Event	Level 4 will be triggered where one of the following items is met: <ul style="list-style-type: none"> Natural Disaster Event Public Health Emergency Biosecurity Emergency Incursion of an Exotic Vector of Public Health and Agricultural Significance Notifiable Disease Outbreak (vector and disease must be present) 	Information displays, public notices, and communication to the community. Mosquito breeding areas to be identified and coordinated larviciding to commence at known breeding locations on Council controlled land. Public notifications on larviciding areas to be posted and signage incorporated at areas. Adulticide misting commencement at public spaces, known problem drain locations and parklands by licensed pest management technicians. Adulticide misting commencement in residential streets in all major urban

		centres. Adulticide residual spraying of public and residential infrastructure where deemed appropriate. Public notification and signage at areas to be incorporated. Engage possible assistance from the Darling Downs Public Health Unit and other Local Government Mosquito Management teams.
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8.1 Priority Areas for Level 1

No priority areas identified

8.2 Priority Areas for Level 2 – Larvicide

Dalby Town	Chinchilla Town
Aerodrome area	Apex shed
Black Toyota area	Botanic parklands
Bunnings area drains	Charlies Creek Park
Cemetery area and ponds	Chinchilla Pound and Waste Facility
Dog Park area	Chinchilla - Tara road opposite dog park
Drain near PCYC and railway bridge	Recreation grounds
Mountain view estate	Warrego Highway drains and culvert
Pound and Depot area	
Sale yards area	
Showgrounds	
Warrego Highway drains and culvert	
Miles Town	Tara Town
Chinaman's Lagoon	Showgrounds
Warrego Highway drains and culvert	Sewage treatment pond area (old golf course)
	Surat Development Road drains in town
	Tara Lagoon

8.3 Priority Areas for Level 3 – Public Place Adulticide

Council acknowledges that there are a number of areas and events that are considered to be high risk e.g. daycare facilities, aged care facilities, and events where a significant number of the public will be in attendance. Instances such as these will be subject to the above process then reviewed as per the risk to determine if adulticide or additional treatments are an option. Ideally, larvicide and barrier treatments are to be undertaken first to provide long term protection, where this is not possible adulticide may be considered.

Dalby Town	Chinchilla Town
Dog Park	Botanic Parklands
Football fields	Camping area Chinchilla Weir
Myall Creek Corridor	Charleys Creek Walking Track
PCYC drains and harbourage vegetation	Dog Park
Showgrounds	
Thomas Jack Park	
Warrego Highway and Black Street drain	

Miles	Wandoan
Dogwood Creek Corridor	Apex Park
	Council land Royd Street (areas close to housing)
	Soldiers Settlement Walk
	Waterloo Plains Environmental Park (areas close to housing)
Tara	Jandowae
Football fields	Creek corridor
Lagoon	Lions Park
Nursing Home	Showgrounds loop
Sewage treatment pond & golf course area	
Showgrounds	

8.4 Preferred Contractors

Prior to each summer season, Council will obtain quotations for the engagement of Pest Management Technicians to undertake the Adulticide programs (barrier spraying and misting). Council Officers are unable to undertake this work without PMT accreditations.

These PMTs will be engaged to enable a rapid response in the event of a Level 3 or 4 trigger being met. The Preferred Contractor list will be stored in Appendix 1 which is updated every year or as required.

9. EMERGENCY RESPONSE

Mosquitoes can be a major problem during or following a major event such as flooding caused by rainfall, major runoff or storm surge. Should a Disaster be declared for such an event under the *Disaster Management Act 2003* (DMA 2003), then the matters being addressed by the Disaster Declaration may no longer be subject to the provisions of the EP Act.

The *Disaster Management Act 2003* prevails when there is an inconsistency with the provisions of any other Act. Environmental protection may be compromised when there is inconsistency between the provisions of these two Acts. There is a trend for emergency events to be handled at the local level without the need for declaring a Disaster. This will place increasing importance on planning procedures to mitigate against the effects of particular events and to allow effective remedial and recovery responses.

There is also potential for an emergency situation to arise if there is a major accidental or natural introduction of exotic mosquitoes of public health or biosecurity significance or there is an outbreak of mosquito borne disease of public health or biosecurity significance in Queensland.

The *Public Health Act 2005* makes provision to address public health emergencies (chapter 8) and when a public health emergency is declared under the *Public Health Act 2005* allows for the exercise of considerable powers to meet the emergency, the provisions of the EP Act still apply.

Council is prepared to respond to emergencies such as flooding and other disasters that can increase community exposure to mosquitoes. All emergency response to mosquitoes is undertaken in alignment with State emergency plans and the Western Downs Regional Council Disaster Management Plan.

10. CUSTOMER REQUESTS

Occasionally Western Downs Regional Council receives customer requests from residents regarding mosquito nuisance. These requests may provide information on areas where mosquito impacts are greatest. The tolerance of individuals to mosquitoes varies greatly and the number of requests may not be directly related to actual mosquito populations.

Request numbers can be used to initiate level 2 or 3 mosquito management responses.

11. PROACTIVE PROGRAMS

Larval Survey

All identified breeding sites are monitored regularly during mosquito season or after floods to determine larval activity. Freshwater sites are surveyed 6 days after rain events. Larval surveys are conducted at least monthly during the wet season. More extensive surveys are conducted twice per year, just after the first appreciable rains of the wet season and mid-way through the wet season in February. Larvae may be identified under a microscope or reared in emergence cages and identified as adults.

The findings of larval surveys will determine the location and need for the application of larvicide to prevent the emergence of adult mosquitoes. The threshold for larvicide treatment in freshwater sites is an average of 2nd, 3rd or 4th instar larvae per dip.

Mosquito larvicides are not effective at the late fourth or pupal stage, therefore it is critical that if a mix of 3rd and 4th instars are observed that the larvicide is applied immediately. If 4th instars and pupae are observed, then it is too late to apply larvicide and the only chemical option available at that point is to wait for the adults to emerge, educate the community and conduct adulticiding only if necessary and appropriate.

In sites where, natural predators of larvae are evident dips resulting in early instars, but very few or no 3rd and 4th instars, may indicate that the biological method is sufficient. If practical, the site should be reinspected 1 or 2 days later to determine if the biological method is effective or if the cohort has progressed through to 3rd /4th instar and requires larvicide to be applied.

Adult Trapping

Adult mosquito traps are used to monitor populations of adult mosquitoes. The mosquitoes caught in the traps are counted and identified to species. Trapping is important to monitor mosquito abundance, as well as to identify problem species and allow targeted larval investigations and management actions.

Routine adult trapping will be undertaken monthly during the dry season and weekly during the wet season. Trap sites are positioned close to known breeding sites to capture the highest possible number of mosquitoes. Additional trapping may be undertaken in response to customer requests and to evaluate the effectiveness of control activities.

Adult mosquito trapping includes the use of CO₂ Traps and Gravid Aedes Trap (GAT). The CO₂ Traps are used to collect certain species of mosquitoes usually associated with flooding and ponding of rainwater. These mosquito species are capable of carrying most of the at risk disease viruses for the region.

GATs are used to trap mosquitoes found breeding in containers and rainwater tanks around homes. The GAT program is vital to determining if the *Aedes aegypti* or *Aedes albopictus* mosquitoes that carry Dengue Fever have entered our region. The GAT program is run in conjunction with the DDSW PHU.

BioGent (BG) traps will be used where the site is relevant.

12. CLIMATE CHANGE & FUTURE RISKS

Mosquitoes and mosquito-borne disease are often discussed, as a major concern should climate change result in global warming and/or sea level rise. The greatest concern is that, with increased temperatures, the geographic range of pest and vector species will increase and with it the risk of human and agricultural diseases.

The risks of mosquito-borne diseases such as dengue likely to change with predicted climate change, and there may be local increases in the risk of RRV and BFV. With overall warmer temperatures, there may be a decrease in the incubation period (the time between when a mosquito ingests a virus and when it is capable of transmitting the virus to humans or agricultural animals) of the viruses in local vector species. This will mean that a potentially greater proportion of mosquitoes can transmit RRV or BFV in the local area. In addition, the warmer weather may not increase the magnitude of population increases but it may extend the period of mosquito activity, increasing nuisance-biting and potential public health risks into the spring and late autumn.

Climate change increases the potential for more severe and prolonged weather events such as flooding and rainfall which increases the potential for mosquito breeding. Drought conditions can increase container breeding mosquito numbers when the community tries to store water.

13. RESOURCE REQUIREMENTS

Operating and implementing an effective mosquito management program is dependent on ongoing human and operational resources. Resource requirements will fluctuate significantly depending on the severity of the mosquito-breeding season, which is largely dependent on environmental variables. Environmental health staff are primarily responsible for implementing this Plan, however, mosquito management is only a small part of Councils environmental health responsibilities and assistance is required from other staff.

Purchase and delivery of chemicals is dependent upon Western Downs Regional Council's own budget allocation. This money can be utilised in years when mosquito-borne disease risk/nuisance is greater than normal.

Monitoring programs may require increased budget funding for the purchase of new or replacement traps, CO₂ and attractants.

14. STRATEGY

1. Plan Principles and Management
2. Mapping and Identification of Mosquito Breeding Areas
3. Public Education/Promotion/Collaboration
4. Treatment Strategies

15. ANNUAL REVIEW & REPORT

Good record keeping practices are crucial for the continuation of this Plan and retention of knowledge within the organization. The following list includes the minimum required records to be kept on the Council's record management system:

- Records of customer requests
- Communicable disease notifications and follow-up documentation
- Adult trapping results
- Larval survey results
- Chemical treatments
- Vector Control maps
- Chemical product labels and MSDS
- Media releases.

This plan will be reviewed annually (during wet years) and every two years during drought years by 31 April with information included in the Western Downs Regional Council's annual report. It is important to assess effectiveness of the surveillance program and the overall control program to allow for continuous improvement.

An ongoing surveillance program will assess whether the mosquito populations are being reduced and if the control program is achieving reductions in pest problems or mosquito borne disease.

The Environmental Health Section will also continue to liaise with relevant stakeholders and research the most up to date treatment and prevention methods for mosquito management within the Western Downs Region.

16. REFERENCE SOURCES

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