

Myrmica rubra



BEST MANAGEMENT PRACTICES FOR
European Fire Ants
in the Metro Vancouver Region



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SERVICES AND SOLUTIONS FOR A LIVABLE REGION



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Introduction

The impacts of invasive species on ecological, human and economic health are of concern in the Metro Vancouver region. Successful control of invasive species requires concerted and targeted efforts by many players. This document – “Best Management Practices for European Fire Ants in the Metro Vancouver Region” – is one of a series of species-specific guides developed for use by practitioners (e.g., local government staff, crews, project managers, contractors, consultants, developers, stewardship groups and others who have a role in invasive species management) in the region. Together, these best practices provide a compendium of guidance that has been tested locally by researchers and operational experts.

The European fire ant was first recorded in British Columbia in 2010. It has impacted many communities in Metro Vancouver, and several other areas in the province. Its distinctive swarming and stinging behaviour has given it high profile as one of the region’s most alarming invasive species.

Since its discovery in British Columbia, best practices for identifying and managing this species (and other invasive ants) have advanced rapidly. Academic institutions, government and non-government organizations continue to study this species in British Columbia, testing a variety of control methods. As researchers and practitioners learn more about the biology and control of European fire ants in British Columbia, it is anticipated that the recommended best management practices will change over time and this document will be updated. Please check metrovancover.org regularly to obtain the most recent version of these best management practices.

REGULATORY STATUS

The European fire ant is not currently regulated in British Columbia. Hence, land managers are not required to control European fire ants at this time.

IMPACTS

The presence of European fire ants in gardens, yards, parks, golf courses, turf areas and other green spaces renders these areas unusable. European fire ants aggressively defend their territory by swarming and delivering painful, repeated stings to any sort of threat, such as people, pets and wildlife that come in close proximity to their nests. Stings leave venom under the skin, which may swell, become red and painful for 30 to 120 minutes, followed by itchiness that can last for a week (WorkSafe BC 2014). On rare occasions, these stings can cause anaphylactic shock (Saltman 2016).

European fire ants have a number of impacts on native ecosystems. These aggressive ants are able to displace native ant species, which are beneficial for seed dispersal, pollination, and keeping predator-prey relationships in balance (Naumann and Higgins 2015). Although little research has been conducted locally, European fire ant infestations have been found to reduce chick survival in several bird populations elsewhere in North America (Robinson, et al. 2013). Fire ants also have the potential to impact agricultural crops (Inter-Ministry Invasive Species Working Group 2015).

The presence of European fire ants also has economic impacts for governments, businesses, non-profit groups and individuals in Metro Vancouver and across British Columbia. Preliminary damage estimates for British Columbia in 2012 were approximately \$100,000,000/year if this species were to spread throughout its potential habitat range. This estimate includes property damage caused by European fire ants to households, schools, municipalities, golf courses, public parks and green spaces (Sayre 2017). In 2016, agencies represented on Metro Vancouver's Regional Planning Advisory Committee – Invasive Species Subcommittee spent approximately \$26,000 on European fire ant control efforts. This figure does not include control costs for private landowners across the region or costs associated with education and awareness activities. This species' potential to establish in large areas of BC (see Habitat section below) suggests that more widespread impacts are possible.

NESTS

European fire ant nests are typically found in places with high humidity. Favourable nesting areas include soil along roots of trees or shrubs, under rocks, logs or other human or natural debris, lawns, raised garden beds, and in decaying logs (E. Groden, A. Drummond, et al. 2016). Nests can be very difficult to locate as construction does not result in obvious mounds or disturbances of the soil.

The typical European fire ant nest consists of a series of popcorn-sized chambers along a vertical shaft, barely 15 cm wide and typically no more than 20 cm below ground. In very sandy soils they may reach down to almost a metre. Nests may be located at the surface, just beneath a covering of moss, or within the above-ground crown of clumping perennial grasses and ferns, as well as in rock crevices with little to no soil (Sayre 2017).

An ant colony, called a formicary, is the basic unit around which ants organize their lifecycle. European fire ant colonies are 'polygynous' (i.e., many queens) and 'polydomous' (i.e., many nests per individual colony), allowing for high densities of the ants in a given area. In North America, colonies have a density of approximately 4 nests per square metre (Higgins 2015). Lateral tunnels connect adjacent colonies but the extent of underground interconnectedness is unknown and is an on-going research topic in British Columbia (Higgins 2017).

REPRODUCTION AND SPREAD

European fire ants predominantly spread by budding - as new colonies grow, some queens will leave the parent colony, accompanied by a group of workers, and establish new nests in the vicinity of the original nest (E. Groden, F. Drummond, et al. 2005) (Higgins 2015).

Mature colonies can contain a few thousand workers with a new reproductive total (queens or males) of a few to several hundred individuals per year (Higgins 2015). A single colony may have 15-20 queens present (Higgins 2015).

European fire ants are often spread through human activities. They nest in garden and landscaping materials, including potted plants, soil, compost, tree balls and mulch. Entire nests can be inadvertently transplanted along with these materials (Higgins 2015). Some species of fire ants have also been known to cross water bodies by linking together as a colony to form a waterproof raft (Mlot, Tovey and Hu 2011).

HABITAT AND DISTRIBUTION

European fire ants prefer moist habitats with a mean annual temperature greater than 6° Celsius. Precipitation in affected areas usually exceeds 1000 mm/year (E. Groden, F. Drummond, et al. 2005). Under these conditions, European fire ants have the potential to establish along the coast from Vancouver to Prince Rupert, as far inland as Hope, and through all of Vancouver Island, the Gulf Islands and Haida Gwaii. In the interior, conditions are appropriate for establishment in a small area in Nelson and from Prince Rupert inland to Terrace (Higgins 2015). Moist riparian areas may be at risk throughout British Columbia.

The European fire ant is native to the Palearctic regions of Europe and Asia and from Ireland to western Siberia (E. Groden, F. Drummond, et al. 2005). In Canada, it has established in Quebec, Ontario, New Brunswick, Nova Scotia, Prince Edward Island and British Columbia (Hicks 2012).

This species of ant was first recorded in British Columbia in 2010 and has been detected in many communities in Metro Vancouver and on Vancouver Island: Burnaby, Chilliwack, Coquitlam, Courtenay, Delta, District of North Vancouver, Maple Ridge, Richmond, Surrey, Pitt Meadows, Vancouver, West Vancouver, Courtenay, Oak Bay, and Victoria. There is one known population in British Columbia's interior in Naramata (Higgins 2015).

CLIMATE ADAPTATION

Climate modellers predict that the Metro Vancouver region will experience warmer temperatures; a decrease in snowpack; longer dry spells in summer months; more precipitation in autumn, winter and spring; more intense extreme events; and an extended growing season. In the past, our region had an average of 252 days in the growing season. In lower elevations 45 days will be added to the growing season by the 2050s, and 56 days by the 2080s, resulting in nearly a year-round growing season of 357 days on average. In higher elevation ecosystems the growing season length will increase by 50% to 325 days by the 2080s (Metro Vancouver 2016). These changes will stress many sensitive ecosystems, increasing their vulnerability to invasive species.

Although there is no known connection between the European fire ant and global warming (Inter-Ministry Invasive Species Working Group 2021), they may be able to adapt to our future climate in several ways:

- **Increased precipitation:** In BC, European fire ants currently occupy areas with greater than 1000 mm of rain annually where mean annual temperatures are above 6° C, which suggests they could potentially spread up the coast as far north as Prince Rupert, East to Hope and into higher precipitation areas of the Kootenays (Inter-Ministry Invasive Species Working Group 2021).
- **Warmer temperatures:** Other genera of fire ants around the world are expected to expand in range due to predicted warming trends (Needleman, Neylan & Erickson 2018).

With these kinds of competitive advantages, this species is more adaptable than native insects and suggest that it will be able to withstand, and possibly thrive, with changing climate conditions.

Identification

PHYSICAL CHARACTERISTICS

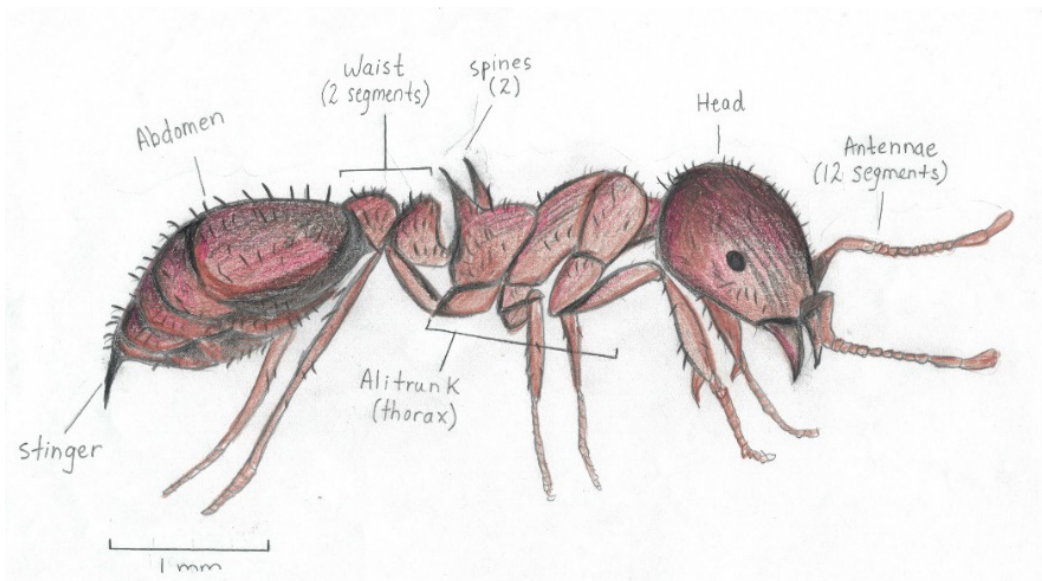
European fire ants are typically reddish-brown in colour, however their colour varies between colonies. The workers are about 4mm to 5mm in length. Queens can be distinguished from the workers mainly by their size, growing to 9mm in length. The waist has 2 segments, the last segment of the alitrunk (the thorax) sporting two spines that point backwards. The workers' bodies are covered with fine hairs and they have antennae with 12 segments (Arevalo and Groden 2016). Some body parts may only be visible using a hand lens or magnifying glass. It is important to note that there are many species of ants in British Columbia, including other species that are red or that sting. While the swarming and stinging behavior can be characteristic of European fire ants, it is important to confirm the ant's identity before considering treatment options.

Fire ant eggs are small, oval-shaped and white or translucent. Larval stages look similar but larger. Worker ants will attempt to gather and protect eggs and larvae if nests are disturbed (Arevalo and Groden 2016).

CONFIRMING IDENTITY

Proper identification of ants can be challenging. Several agencies and specialists within British Columbia can assist with ant identification (Inter-Ministry Invasive Species Working Group 2015). Below are the current methods and procedures to collect and submit ant samples for identification (Higgins 2015):

1. Collect a sample on a cool morning, when the ants are less likely to sting. This can be done by:
 - a. Laying out apple slices in areas where nests are suspected and checking on the slices within an hour. If the apple is covered in ants, quickly pick it up and place it and the ants into a container and freeze overnight.
 - b. Scooping a portion of the nest into a bucket of soapy water and letting it sit for a few minutes until the ants have died.



Anatomy of a worker ant

CREDIT: ISCMV

2. Gently remove 10-20 dead ants and place them in a waterproof container and add alcohol (rubbing or clear consumable alcohol) to preserve the ants.
3. Place the container in a sealed bag and ship.
4. Send samples to one of the following locations for identification. Please include your name and the date and location where the samples were collected.

Preferred location: Plant Health Laboratory, Ministry of Agriculture. Download and complete the necessary form at <http://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/animals-and-crops/plant-health/plant-health-laboratory>. Please note that any positive samples will NOT be reported to the Canadian Food Inspection Agency (CFIA) as this species is not a plant pest and is therefore not regulated under the federal *Plant Protection Act*. Shipping instructions can be found on the back of the form.

Alternate location 1: Dr. Rob Higgins, Department of Biological Sciences, Thompson Rivers University, 805 TRU Way, Kamloops, British Columbia, V2C 0C8.

Alternate location 2: Natural History Section, Entomology Dept, Royal British Columbia Museum, Attn: Claudia Copley, 675 Belleville St, Victoria, British Columbia, V8X 9W2.

The [British Columbia Inter-Ministry Invasive Species Working Group](#) periodically updates identification procedures based on current research.

SIMILAR SPECIES

A few morphological differences can help to differentiate the European fire ant from the other ants within the same genus. When viewed from above, the frontal lobes of the European fire ant look thin and lamellar (with thin layers of overlapping tissue), laterally developed and do not cover the antennal base. One characteristic that differentiates the genus *Myrmica* from some other ants is the propodeum (the first abdominal segment fused anteriorly to the thorax) has two spines pointing backwards (Arevalo and Groden 2016).

Some ant species found in the coastal region of British Columbia that may be confused with the European fire ant include (Higgins 2015):

- Impressive fire ant (*Myrmica specioides*)
- Rough fire ant (*Myrmica scabrinodis*)
- *Manica invidia* (no common name)
- Thatching ant (*Formica oreas*)
- Tropical stinging ant (*Hypoponera punctatissima*)

DNA analysis is currently helping experts to distinguish these species from the European fire ant. Ongoing research will help determine whether the management practices in this document are valid for the other invasive ants in the region.

Tracking

The [British Columbia Inter-Ministry Invasive Species Working Group](#) is working in collaboration with various experts, governments and non-government organizations to determine the full extent of the European fire ant invasion in British Columbia.

Reporting

Please report all European fire ant occurrences within Metro Vancouver to:

- The [Provincial Report Invasive Species program](#) (via smart phone app).
- The Invasive Species Council of Metro Vancouver: 1-604-880-8358 or iscmv.ca.
- The municipality where the European fire ant infestation was found.
- The landowner directly – If the infestation is on private property, the municipality should also be notified with as many details as possible about the location and description of the suspected infestation. Most land managers are keen to be made aware of European fire ant sites immediately so control can be arranged as soon as possible. If the landowner is unknown, the [Invasive Species Council of Metro Vancouver](#) can provide support in identifying the appropriate authority.

Reports submitted through these channels are reviewed by invasive species specialists who coordinate follow-up activities when necessary with the appropriate local authorities. However, some people may be hesitant to report European fire ant infestations as their presence may affect property values.



Worker ants moving eggs and larvae after nest disturbance
CREDIT ISCMV

Prevention and Control Strategies

Effective management may include a variety of control techniques ranging from prevention, chemical, cultural, manual, biological, and/or mechanical methods. Each method is described below in order of effectiveness.

Coordinated management efforts across jurisdictional boundaries are critical. If infestations are shared, it is ideal for the entire infestation to be treated with the same method at the same time. Management efforts will be less successful if only a portion of the infestation is targeted.

CAUTION: When treating European fire ant infestations, ensure that the appropriate **personal protective gear** is worn, including closed-toed shoes or rubber boots, pants tucked in, and sealing any other gaps between items of clothing so that no skin is exposed. Gloves are also recommended. Ants that come in contact with skin can be brushed away. Crushing them will only provoke them to sting. WorkSafe BC (2014) provides additional guidelines to prevent stings and recommendations for medical treatment if stings occur.

Eradication of European fire ants in infested areas greater than 200m² is nearly impossible due to challenges around complex nest locations (e.g., under trees roots, edges of parking lots, retaining walls, wood fence posts, valued plantings, etc.) and difficulty finding all of the nests. For large infestations, the management goal should be controlling and containing the infestation, as opposed to eradicating it (Higgins 2017). Prior to commencing any control activities, the location and extent of the infestation must be understood (see 'Finding the Nests' box).

The treatment methods listed below can be carried out any time of year except winter. During the cold winter months, European fire ants tend to ball up in a way that suggests they might be easily targeted and removed; however, within each nest, there are multiple balls at different depths making it difficult to locate and treat all of the balls (Higgins 2017).

FINDING THE NESTS

European fire ants forage within a metre or so of their nests and will cluster heavily upon apple slices when they are close to a nest. Hence, one of the best practices for finding nests is to:

1. Lay out apple slices one metre apart, in a rough grid.
2. Check the apple slices within an hour to see if there are any ants on them. If European fire ants are detected on the apple slice, then there is a nest nearby, most likely within a few metres.
3. Put on personal protective gear.
4. To localize the nest, stomp on the ground around the apple; this will disturb the ants and cause them to swarm around a nest entrance (Sayre, 2017) (Wong, 2017).
5. When mapping European fire ant infestations, the outer boundary of the infested area can be defined if ants are not observed within 10m of an apple slice (Higgins, 2017).

Assessments should be carried out when it is warm (< 20 °Celsius), dry and when ants are actively foraging (morning or afternoon).

Wire mesh or small inverted baskets (e.g., mesh fruit baskets) can be secured over the apple slices if removal of the bait by other animals (e.g., squirrels) is a concern.



Use apple slices to locate the nest

CREDIT ISCMV

STRATEGY COLOUR LEGEND

GREEN: RECOMMENDED

ORANGE: CAUTION

RED: NOT RECOMMENDED OR NOT AVAILABLE

PREVENTION: IMPERATIVE

Prevention is the most economical and effective way to reduce the spread of European fire ants over the long term. Practitioners and the public should be made aware that transporting materials from infested areas increases the risk of spread. Potted plants, soil, mulches, and similar materials should be inspected on site and again before transplanting or use. If ants are found, the materials should not be used until they can be identified by a reliable source (see 'Confirming Identity' above) and/or destroyed.

CHEMICAL: RECOMMENDED

With the exception of substances listed on Schedule 2 of the [Integrated Pest Management Regulation](#), the use of pesticides is highly regulated in British Columbia. Site characteristics must be considered with pesticide prescribed, based on site goals and objectives and in accordance with legal requirements. [This summary of BC's Integrated Pest Management Act](#) provides an overview of the provincial legislation.

PESTICIDE LICENCE AND CERTIFICATION

A valid pesticide licence is required to:

- offer a service to apply most pesticides;
- apply most pesticides on public land including local government lands¹; and
- apply pesticides to landscaped areas on private land, including outside office buildings and other facilities.

A pesticide applicator certificate in the appropriate category is required to apply pesticides under a licence holder in BC. Refer to the 'Pesticides & Pest Management' documents listed in the Additional Resources Section or contact Integrated Pest Management program staff at the BC Ministry of Environment and Climate Change Strategy to determine which certificate category is required for the intended pesticide uses. Assistant applicator training is also available and the [online course and exam are free](#).

Pesticides (e.g., insecticides, herbicides, fungicides) are regulated by the federal and provincial government, and municipal governments often have pesticide bylaws.

- Health Canada evaluates and approves chemical pest control products as per the [Pest Control Products Act](#).
- The [BC Integrated Pest Management Act](#) sets out the requirements for the use and sale of pesticides in British Columbia. This Act is administered by the Ministry of Environment and Climate Change Strategy.
- Several municipalities have adopted bylaws which prohibit the use of certain pesticides.

Everyone who uses pesticides must be familiar with all relevant laws.

¹ on up to 50 ha/year by a single organization. Organizations looking to treat over 50 hectares of land per year are also required to submit a Pest Management Plan and obtain a Pesticide Use Notice confirmation.

ONLY companies or practitioners with a valid *Pesticide Licence* and staff who are certified applicators (or trained assistant applicators working under a certified applicator) may apply pesticide on invasive species located on public lands in British Columbia. Applicators must be either the land manager/owner or have permission from the land manager/owner prior to pesticide application.

On private property the owner may obtain a *Residential Applicator Certificate* (for Domestic class products only) or use a qualified company. Refer to the 'Pesticides & Pest Management' and 'Home Pesticide Use' documents listed in the Additional Resources Section for more information.

Questions? Contact the BC Integrated Pest Management Program:

Telephone: (250) 387-9537

Email: bc.ipm@gov.bc.ca

It is best practice for personnel supervising or monitoring pesticide contracts to also maintain a pesticide applicator licence so they are familiar with certification requirements. For more information on how to obtain a licence and the requirements when working under the provincial *Integrated Pest Management Act* and Regulation, please visit: www.gov.bc.ca/PestManagement.

INSECTICIDE LABELS

Individual insecticide labels must always be reviewed thoroughly prior to use to ensure precautions, application rates, and all use directions, specific site and application directions are strictly followed. Under the federal *Pest Control Products Act* and the BC Integrated Pest Management Regulation, persons are legally required to use pesticides (including insecticides) only for the use described on the label and in accordance with the instructions on that label. Failure to follow label directions could cause damage to the environment, poor control results, or danger to health. Contravention of laws and regulations may lead to cancellation or suspension of a licence or certification, requirement to obtain a qualified monitor to assess work, additional reporting requirements, a stop work order, or prohibition from acquiring authorization in the future. A conviction of an offence under legislation may also carry a fine or imprisonment.

Insecticide labels include information on both the front and back. The front typically includes trade or product name, formulation, class, purpose, registration number, and precautionary symbols. Instructions on how to use the pesticide and what to do in order to protect the health and safety of both the applicator and public are provided on the back (BC Ministry of Environment and Climate Change Strategy 2011).

Labels are also available from the Pest Management Regulatory Agency's [online pesticide label search](#) or [mobile application](#) as a separate document. These label documents may include booklets or material safety data sheets (MSDS) that provide additional information about a pesticide product. Restrictions on site conditions, soil types, and proximity to water may be listed. If the insecticide label is more restrictive than provincial legislation, the label must be followed.

INSECTICIDE OPTIONS

The following insecticide can be used on European fire ants in British Columbia:

Permethrin (Ant Out® and other brands)²

This is the most successful insecticide to date; however, for large infestations, the cost will be high and this method may not be effective. Permethrin has low toxicity overall, however it is toxic to fish, pollinating insects, wildlife and domestic animals. Below are the recommended procedures to apply permethrin in different environments (Higgins 2015) (Sayre 2017) (Wong 2017). A 0.25% permethrin solution is recommended for the following permethrin applications:

In turf, flower beds, or open areas:

1. Put on personal protective gear (see 'Prevention and Control Strategies' above).
2. If the exact location of the nest is known, disturb the area and watch where the ants start to swarm or use the advice in the 'Finding the Nests' box above to locate the nests for treatment.
3. Clear any coarse debris from the surface, but work quickly to ensure no ants are escaping as work is being carried out.
4. Beginning from about 1-2 feet from the nest, start digging and turning over the soil (a hand spade works well), while simultaneously spraying the soil. Work from the outside of the nest inward, honing in on the center. Keep digging down and around the nest until ants or tunnels are no longer observed.
5. Place the treated soil in a mound over the area after treatment.
6. Cover the mound to prevent birds and cats from coming in contact with the treated soil. Permethrin on the surface (exposed to light) will break down in a day or two but beneath the surface it will remain active for up to 40 days.
7. Continue this process until all of the nests have been treated.

In moss:

1. Put on personal protective gear (see 'Prevention and Control Strategies' above).
2. European fire ant nests in moss tend to be very shallow, just beneath the moss layer, and they can be quite extensive, covering a wide area. When the moss cover is gently pulled back, the ants, including queens and eggs will most likely be visible on the surface.
3. To treat, gently pull away the moss to reveal nests and then treat according to the above method. Be sure to spray the moss as well as treat the infested soil. After treatment, replace the moss back over the soil to keep the permethrin active in the soil.
4. The moss will likely die. However, after successful eradication, the moss can be restored by combining living moss and buttermilk or yogurt, mixing it in a blender and spreading it out to re-establish a mature moss layer over the span of 1-2 years.

² The mention of a specific product or brand name of pesticide in this document is not and should not be construed as an endorsement of that product.

In the crown of a plant or rock crevice:

1. Put on personal protective gear (see 'Prevention and Control Strategies' above).
2. If nests are located in rock crevice, use a digging tool or stick to try to get as many of the ants/eggs out of the crevice for treatment. There may or may not be soil in the crevice; European fire ants are known to nest in rock crevices with little to no soil, or even in the openings of pipes or concrete blocks lying on the ground.
3. Using the stream setting on the nozzle on your sprayer, spray a stream of permethrin into the crevice to get as far into the nest as possible and spray the opening of the crevice. Follow up is required to monitor for activity and ensure that the treatment reached all the ants.

In the crown of a fern or perennial grass crevice:

1. Put on personal protective gear (see 'Prevention and Control Strategies' above).
2. If you find a nest in the crown of a fern or perennial grass, the ants are likely nesting in both the crown and in the roots.
3. Spray the crown first, then dig out the plant and treat the roots. It may be necessary to cut up the plant or the root mass to access the entire colony for treatment. Spray as much of the infested plant surface as possible, being sure to get into the entire root mass and the crown. The treated plant can be left to decompose in place or can be disposed of according to local bylaws. Infested plants cannot be saved and will have to be replaced.

Baiting

Baits have been shown to offer limited to poor control in European fire ant infestations and will not eradicate an infestation but may temporarily reduce the population density and prevent further spread. Baits tend to only kill the workers and not the queens, who determine the colony (Yong 2017).

Baits that contain 2% boric acid in a sugar solution are recommended where other options are not practical. These are commercially available from retailers carrying household pesticides. Ant baits that have a boric acid content of 4-5% should be avoided as these higher concentrations are not effective (Inter-Ministry Invasive Species Working Group 2015). Baits should be replaced each week as they tend to dry out in hot weather or become saturated with water when it rains.

Baits should be used during early to mid-summer, the period during which the queens and ant brood are consuming the most food. Bait should not be placed directly within vegetable gardens and raised beds, rather around the perimeter of these structures (E. Groden, F. Drummond, et al. 2005).

CULTURAL: PARTIALLY RECOMMENDED

Cultural control methods include **landscape alteration** to reduce the quality of their preferred habitat (e.g., removing debris such as rocks and logs and any vegetation that serves as nesting habitat or a food source). Cultural control methods will not lead to eradication of European fire ant infestations; however, they will help reduce population density and may help prevent infestations in new areas.

Infestations can be contained by installing a barrier of crushed rock (course gravel) that is at least 2 feet deep by 6 feet wide along the periphery of the infestation. In theory, the conditions (long distance to travel, hot conditions and minimal food resources) along the rock barrier will deter the ants from crossing it (Higgins 2017) (Sayre 2017). European fire ants cannot establish nests in coarse gravel, though they have been known to nest in pathways composed of compacted fine crushed rock or gravel.

MANUAL/MECHANICAL: NOT RECOMMENDED

Digging and torching (using a propane torch to apply fire to infested soil) infested soil may reduce the number of ants within a colony, but it is unlikely to eliminate the colony. Colonies are likely to return because the heat from the torch may not travel far enough to reach all of the queens in the nest (Higgins 2015). This method is labour intensive, requiring repeated applications and close monitoring. Digging and torching is only recommended if the use of permethrin is not an option. To effectively dig and torch, one person can turn over the infested soil with a shovel to expose the ants, while a second person torches the soil with a propane torch. Repeated monitoring and treatment will likely be required (Sayre 2017).

BIOLOGICAL: NOT AVAILABLE

There is currently no known biological control agent available for the European fire ant in British Columbia. The European fire ant appears to be a poor candidate for biological controls. As social animals living in microbe rich soil they have evolved extensive mechanisms to detect infections in colony members and limit their spread. Research has shown that European fire ants are able to identify colony members that have been infected with fungal biological control. Infected members are killed, dismembered and the body parts taken to the hottest location available to sterilize the parts (Higgins 2017).

CONTROL SUMMARY

The following table provides a summary and comparison of control methods for European fire ants.

CONTROL STRATEGY	TECHNIQUES	APPLICABLE SITE TYPE	PROS	CONS
Chemical	Dig or expose the nests and apply the insecticide Permethrin	Small to medium sized infestations	Most successful treatment in BC to date	Unintended environmental /health impacts, high public concern, requires trained staff
	Place baits (2% boric acid in sugar solution) around the nests	Any sites except not directly in vegetable gardens or raised beds	Effective to temporarily reduce the population and prevent spread	Must be replaced weekly, will not eradicate colonies, unintended environmental/health impacts, high public concern, requires trained staff
Cultural	Landscape alteration to reduce preferred habitat	Any sites	May reduce population density and prevent spread to new areas	Will not eradicate colonies
Manual/ Mechanical	Digging, torching	Sites where use of insecticide is not an option	Non-chemical	Labour intensive, will not eradicate colonies, unintended environmental impacts, may require multiple trained staff, may increase staff exposure to ant stings
Biological	No bioagents are currently available for distribution in British Columbia			

CONTROL SUMMARY COLOUR LEGEND

GREEN: RECOMMENDED

ORANGE: CAUTION

RED: NOT RECOMMENDED OR NOT AVAILABLE

Disposal

Best practice is to avoid off site disposal of European fire ant-infested soil due to the high risk of spread during and after transport. However, if it must be removed, any applicable local area bylaws (e.g., soil removal and deposition bylaws) and protocols must be adhered to.

The following protocol is recommended for disposing of European fire ant-infested soil that has undergone treatment:

1. Roll out a sheet of thick plastic and spread the infested soil onto the sheet.
2. If the soil has not yet been treated with permethrin, apply 0.25% solution of permethrin to the infested soil on the sheet.
3. Roll the infested material up in the plastic and seal the ends.
4. Tape all seams along the plastic roll to ensure it is sealed.
5. Leave the sealed package in the sun during high temperatures (not in winter) for 2 days to ensure the majority of the ants are dead.
6. Open the package and inspect it for ants and/or eggs.
7. If no ants and/or eggs remain, transfer the soil back into the formerly infested area.
8. Although generally not recommended, if the soil must be transferred offsite, reseal the package with tape and transfer it to a vehicle. Ensure the cover is tightly fastened to prevent detachment due to wind turbulence.
9. Carefully transport and dispose of the package at a local landfill (e.g., Vancouver landfill).
10. Thoroughly wash the transport vehicle.

In the Metro Vancouver region, a limited number of facilities accept European fire ant-infested soil for disposal, provided they have sufficient capacity. This list provides addresses and website links for the disposal facilities.

[This list](#) is updated periodically.

PLEASE CONTACT ALL FACILITIES BEFOREHAND TO CONFIRM THEY CAN PROPERLY HANDLE THE MATERIAL.

CLEANING AND DISINFECTION³

Before leaving a site, remove all visible ants and soil from vehicles, equipment and gear, and if possible, rinse these items. When back at a works yard or wash station, vehicles should be cleaned and disinfected using the following steps:

- Wash with 180 °F water at 6 gpm, 2000 psi*, with a contact time of ≥ 10 seconds on all surfaces to remove dirt. Pay special attention to undercarriages, chassis, wheel-wells, radiators, grills, tracks, buckets, chip-boxes, blades, and flail-mowing chains;
- Use compressed air to remove vegetation from grills and radiators;
- Sweep/vacuum interior of vehicles paying special attention to floor mats, pedals, and seats;
- Steam clean poor access areas (e.g., inside trailer tubes) – 200 psi @ 300 °F; and
- Fully rinse detergent residue from equipment prior to leaving facility.

* Appropriate self-serve and mobile hot power-wash companies in the Metro Vancouver region include: Omega Power Washing, Eco Klean Truck Wash, RG Truck Wash, Ravens Mobile Pressure Washing, Hydrotech Powerwashing, Platinum Pressure Washing Inc., and Alblaster Pressure Washing. Wash stations should be monitored regularly for European fire ants.

³ Adapted from Metro Vancouver (2017) Water Services Equipment Cleaning Procedures and Inspection Protocols.

Follow-up Monitoring

Whatever control method is used, follow-up monitoring and maintenance treatments are part of an integrated management plan or approach. Monitoring European fire ant treatments will reveal short- and long-term trends that can lead to new knowledge and understanding and subsequently improve site-specific management effectiveness and efficiencies. Regular inspection and monitoring should be part of the site management plan as re-invasion in treated areas is likely.

Treated area(s) should be monitored annually by laying out apple slices in the spring and early summer to identify active colonies and enable quick control.

Restoration

Recommended control strategies (digging and application of permethrin) involve the disturbance and possibly the removal of small patches of turf, plants and/or soil. If turf, plants or soil are removed, the soil should be replaced with clean (invasive-free) top soil, and the area re-seeded or re-planted with native (or at least non-invasive) vegetation and watered thoroughly (Higgins 2017).



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Additional Resources

For more information please refer to the following resources.

- British Columbia Inter-Ministry Invasive Species Working Group. https://testwww.for.gov.bc.ca/hra/invasive-species/fire_ants.htm
- Controlling European Fire Ants (*Myrmica rubra*) on Residential Properties - Best Approach to Date (with video). http://faculty.tru.ca/rhiggins/control_of_myrmica_rubra_2.htm
- European fire ant in BC – The Ants of British Columbia: Abundance, Significance And Ecological Diversity. <http://ibis.geog.ubc.ca/biodiversity/efauna/TheAntsofBritishColumbia.html>
- Pesticides and Pest Management. Province of British Columbia <https://www2.gov.bc.ca/gov/content/environment/pesticides-pest-management>

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