

Ants in our Plants

European fire ants at VanDusen

Treatment Trials & Tribulations



VanDusen
BOTANICAL GARDEN

Bloedel
CONSERVATORY



They're here!

European & Impressive fire ants at VanDusen



Confirmed in 2013, here ~10-15 yrs

- **Highest density:** meadow (adjacent source), increasing exponentially
- **Highest concern:** lawns, high-traffic areas, rental and event locations
- **Limiting factors:** barriers (streams, paths), mode of spread (EFA vs. IFA)

...What's at stake?

- Areas closed to public
- Facilities & Operations impacts: upper service yard, Plant Sale
- Staff injuries, Worksafe BC claim
- Potential spread to adjacent properties
- **Control costs \$\$\$**
- **\$200,000 + in potential lost revenues if we don't take action**
 - Admissions, memberships
 - Education programs, summer camps
 - Rentals, special events, Plant Sale





What are we doing about it?

VanDusen's EFA Management Plan

- Full-time Invasive Species Technician 2015 (reduced to 1 day/week pending funding)
- Monitoring and mapping
- On-the-ground control (EDRR approach)
- Screen all incoming plants and garden materials
- Mitigate infrastructure risk factors (materials storage)
- Control Trials - collaboration with ISCMV, Dr. Rob Higgins, City of Vancouver IPM



...EFA Management Plan

Education and outreach

- EFA Fact sheet
- EFA Open House, 2015
- Staff & volunteer training
- Summer camp fun! EFA sessions for kids
- Public presentations and media

EUROPEAN FIRE ANTS (EFA)

What are European fire ants?

European fire ants (*Mymecocystus rubro*), are small reddish brown ants. The workers are about a 1/4 cm long and queens are a little larger. These ants are only distantly related to the "true" fire ant species (red imported fire ant) found in the Southern U.S.A. and Latin America.

First recorded in BC in 2010, European fire ants are now present throughout Metro Vancouver, including Vancouver, District of North Vancouver, Burnaby, Coquitlam, Delta, Maple Ridge, Richmond and Surrey, as well as Chilliwack and Vancouver Island. Native to Europe and Asia, the species was first introduced to eastern North America in the 1930s.



EFA's prefer moist environments, such as irrigated lawns and gardens on BC's West Coast. Unlike ants with obvious mounded nests, EFA nests can be difficult to spot. Nests vary from a few hundred to a few thousand workers, usually with multiple egg-laying queens (average approx. 20 queens per nest). Each nest consists of a series of popcorn-sized chambers along a vertical shaft, barely 15 cm wide and no more than 20 cm below ground. They are found in soil or mulch, in lawns, along plant roots, under rocks or logs, and in decaying wood or other rotting debris.

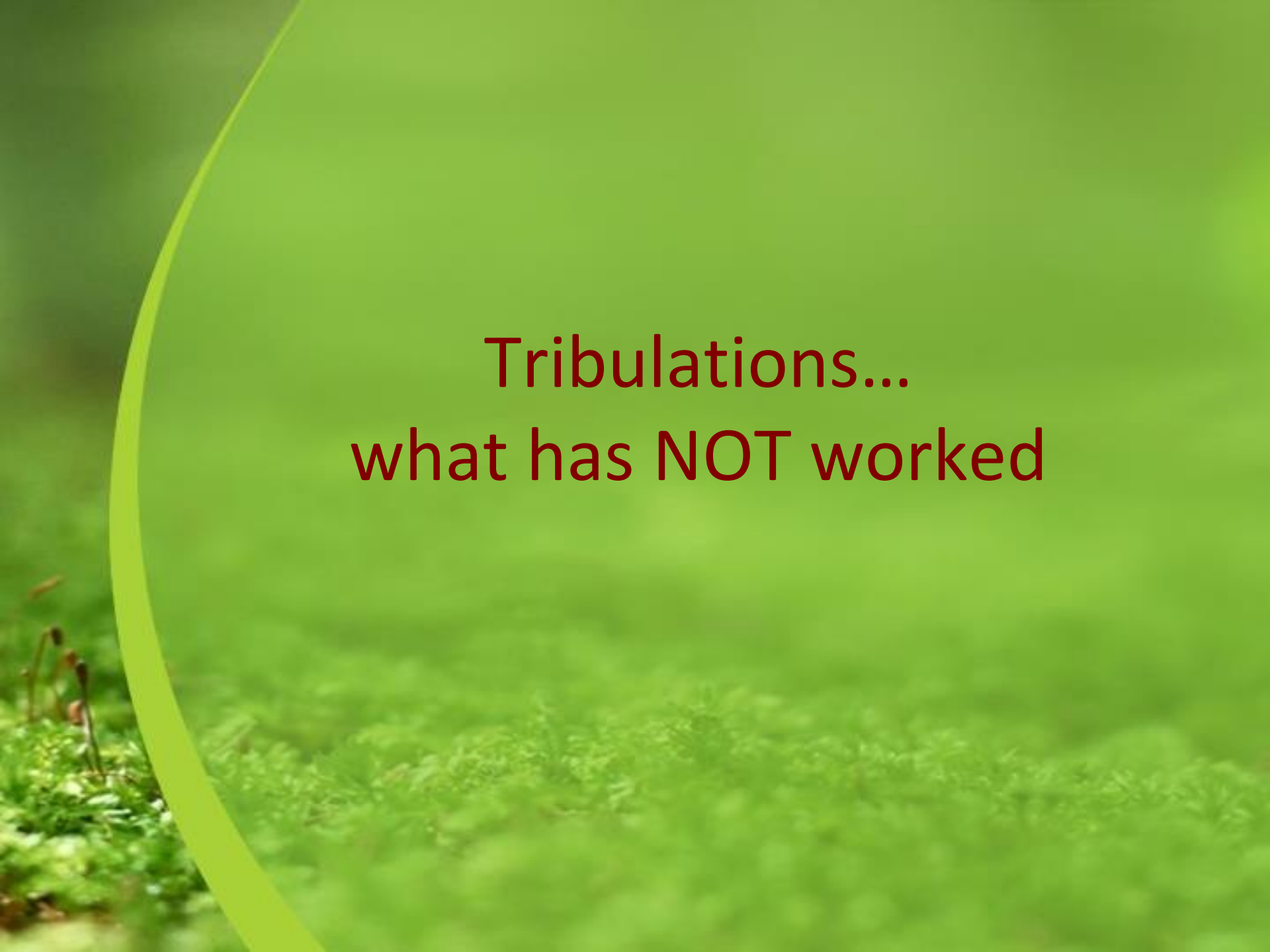
Why are they a problem?

This aggressive, swarming ant can deliver a painful sting when disturbed, rarely leading to an allergic reaction requiring medical treatment. Colonies can reach densities of four nests per square metre, rendering gardens, lawns and parks unusable for normal activities because of repeated stings. European fire ants also displace native ants and may impact agricultural crops.

How do they spread?

The most likely way is through the movement of infested garden material such as soil, mulch and plants. Once established, colonies spread naturally through "colony budding," where one or more queens and a group of workers leave to establish a new nest less than a metre from the original.





Tribulations...
what has NOT worked

Control trials – what doesn't work!

Diatomaceous Earth – ineffective in wet climates

Borax bait stations – only weakens colony

Physical traps – ants don't nest in them

Torching – labour intensive, repeat applications needed

Freezing – labour intensive; can't get entire nest

Nematodes – not effective





What Works!

What works!

Permethrin (AntOut™) Trials

- 0.25% permethrin (no surfactant)
- permethrin is synthetic form of pyrethrin, a plant-based insecticide used in lice treatments

Method

- Identify nest, clear surface of litter and debris
- Working from outside of colony inward, spraying while turning over soil to expose ants
- Repeat as needed
- Pavers may help “lure” colonies in spring & fall



...what Works!

Efficacy

- Single treatment effective 90% of time
- 2014 treated areas remain EFA-free
- Re-opened Meditation Garden
- Highly effective for small- to medium-scale infestations

Pollinator considerations

- Affects pollinators only if applied directly to pollinators or the flowers they visit
- Management plans should minimize potential pollinator impacts

In collaboration with ISCMV and City of Vancouver IPM Coordinator

NOTE: Check active ingredient!

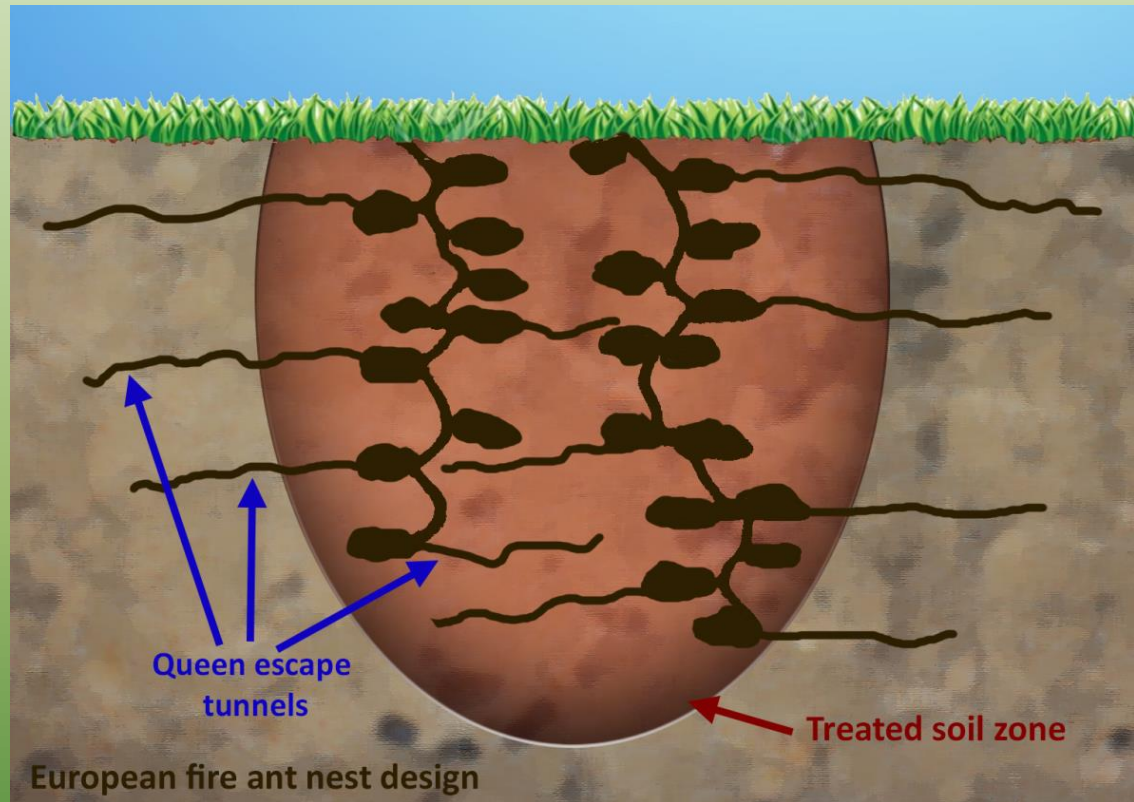


Gardener Dean
McIntosh and EFA
Technician Lisa Wong



why does Permethrin work?

It's all in the nest design!



- Queens and some workers hide in **escape tunnels** during disturbance (boiling water, torching, digging, etc.)
- **Residual effect of permethrin (to 40 days) kills queen when it re-emerges!**
- Treatments with no residual effect nearly always miss some queens



Large scale control trial....

Poly Sheeting Control Trial 2015

Theory: clear poly laid over infested soil heats up soil to high enough temperatures to kill or exclude EFA colonies

Methods:

- Treatment period: July 20 - Oct 15 (12 weeks)
- Applied 6 ml clear poly sheeting over 8.8 x 10.4 m area
- In collaboration with Dr. Rob Higgins, Thompson Rivers University

Treatment site



Alma VanDusen Meadow - 0.5 acre
Favourite picnic spot, closed due to EFA



Pre-treatment:

- 2 perennial beds surrounded by turf
- Bordered by a stream (natural barrier) and forest
- EFA nest in roots of clumping grasses and turf
- Nests from 0-18" deep
- Density: ~ 1 nest per 4 m²



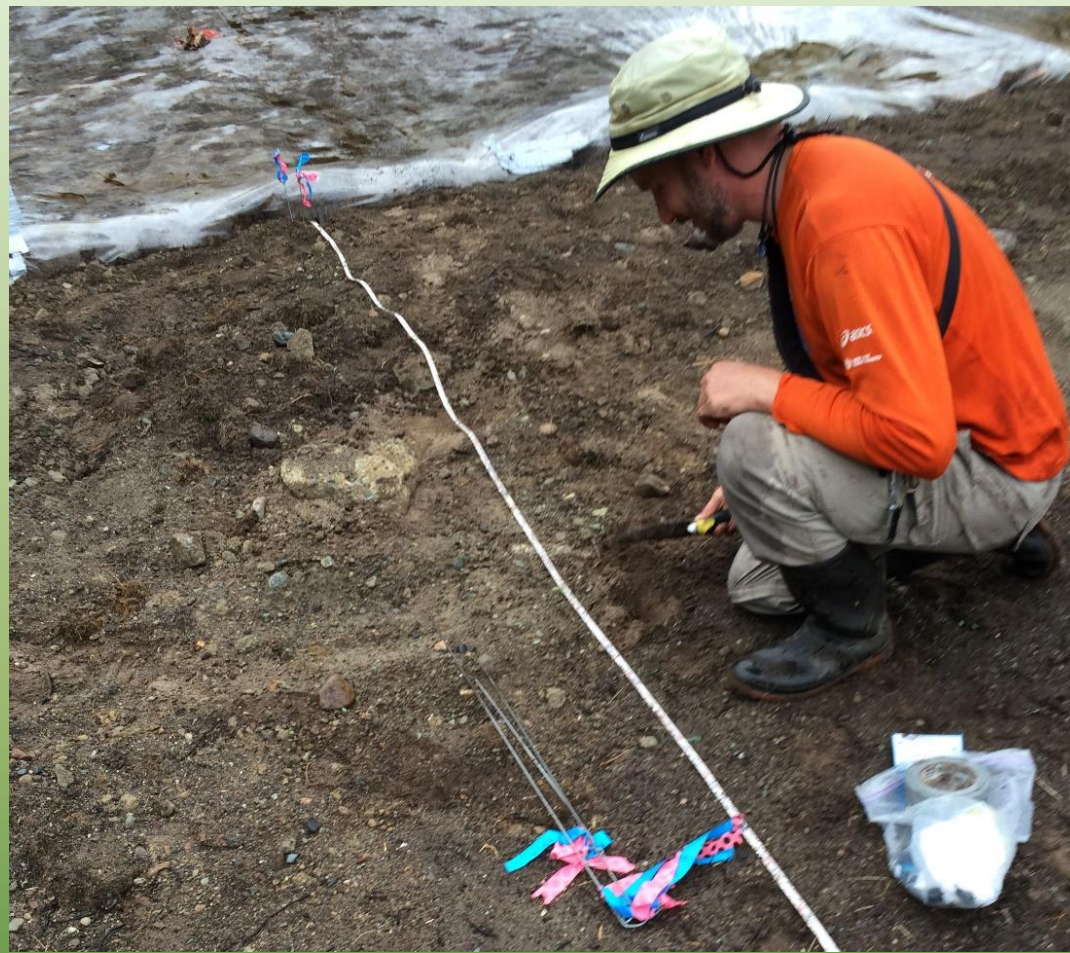
July 20, 2015 - preparing the site: scraping surface vegetation



- 29' x 34' (9 x 10m) sheet of 6 mm poly (seams sealed)
- Buried edges 1 foot deep
- Sprayed edges with 0.25% permethrin



Filled in trench



12 temperature sensors buried along transect

Sheeted: 3 just below soil surface
3 at 10 cm below surface

Unsheeted: 3 just below soil surface
3 at 10 cm below surface



Observation: in days following installation, EFA depositing **hundreds of dead ants** on and around the poly. WHY? A few theories...

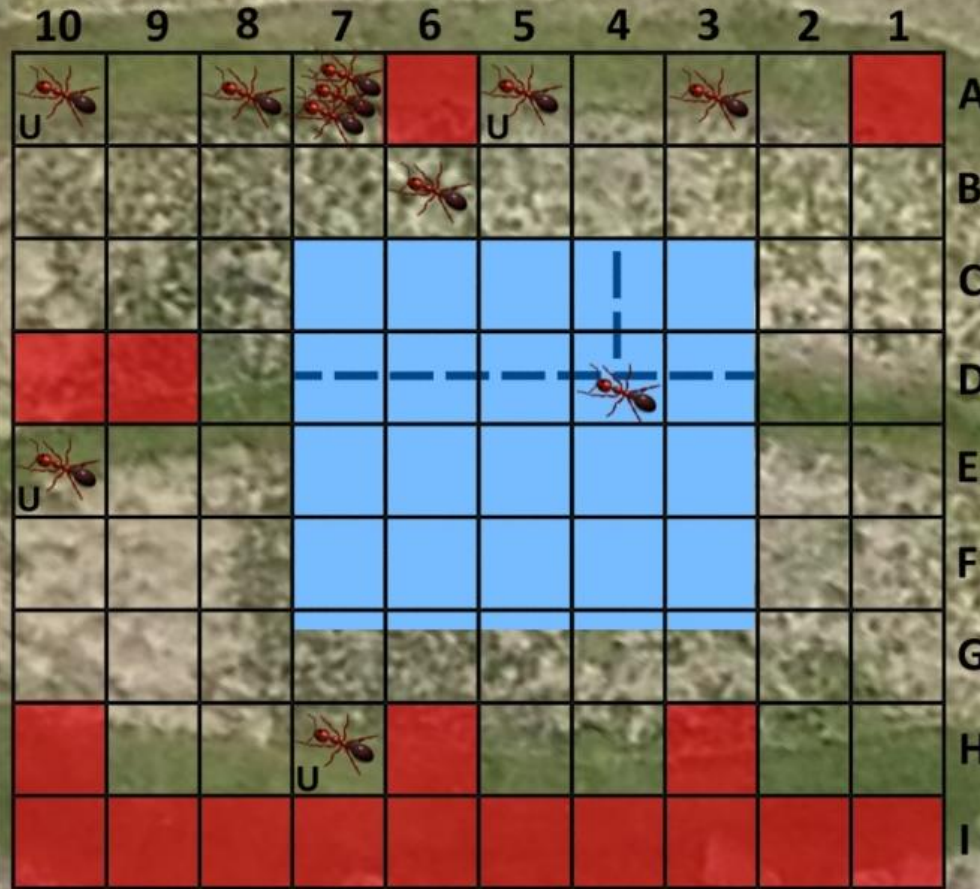


Oct 15 (12 weeks later): Sampling grid laid out (2x2m² plots)
Surveyed for EFA presence, marked nests



Results....

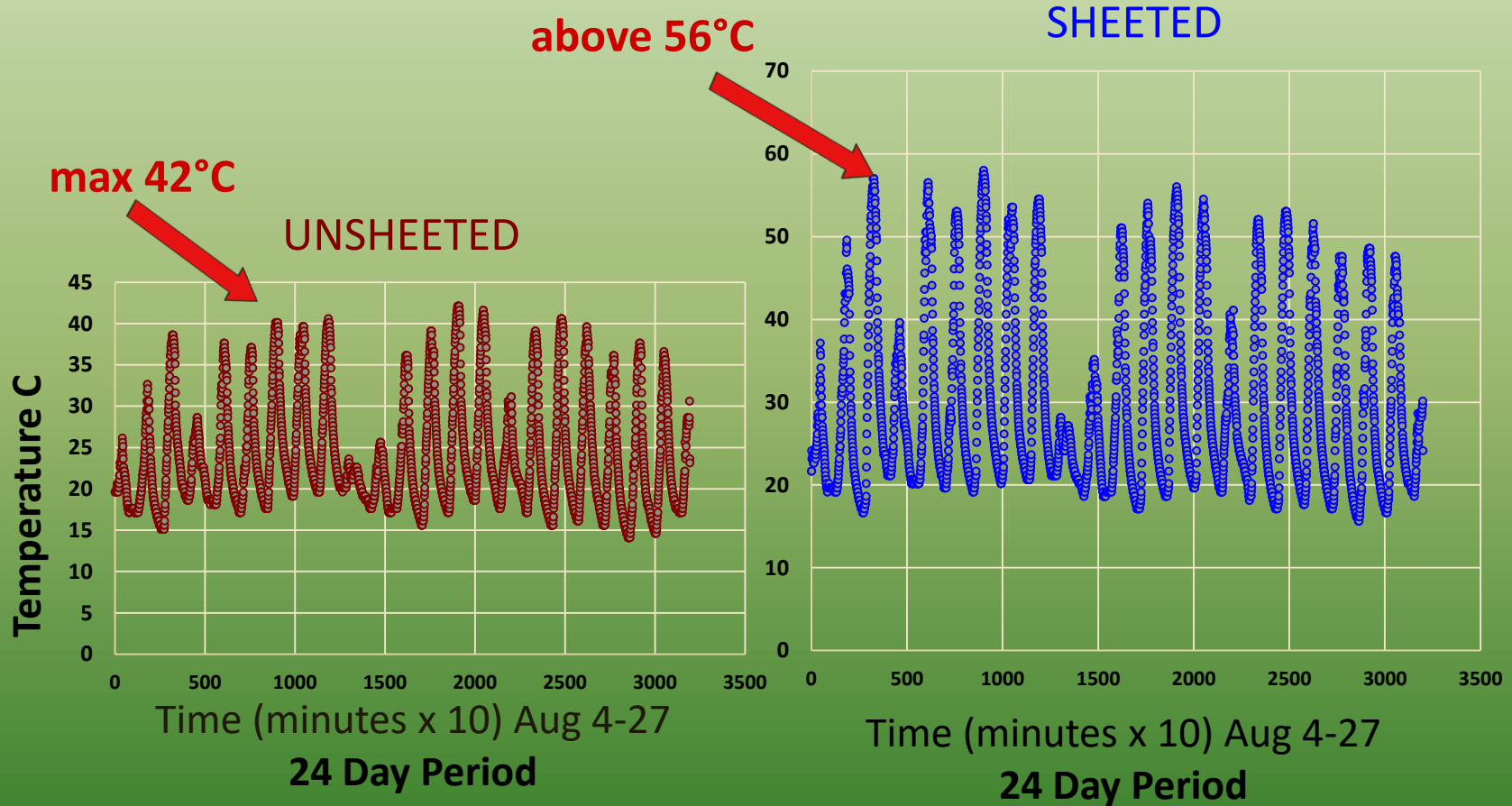
**European fire ant
Poly Sheeting Control Trial**
VanDusen Botanical Garden
July 20 - Oct 15, 2015



EFA nests in: 0/20 POLY (sheeted) plots – 1 crawler near gaping seam
2/40 SCRAPED (unsheeted) plots – adjacent nests in turf at border
15/30 TURF (undisturbed) plots – few near diatomaceous earth

Crawlers in: 9 plots with crawlers – all but 2 found within 4 m of a nest

Soil Temperature – at surface



~15°C temperature increase in treatment plot

Soil Temperature – 10 cm depth

> 35°C

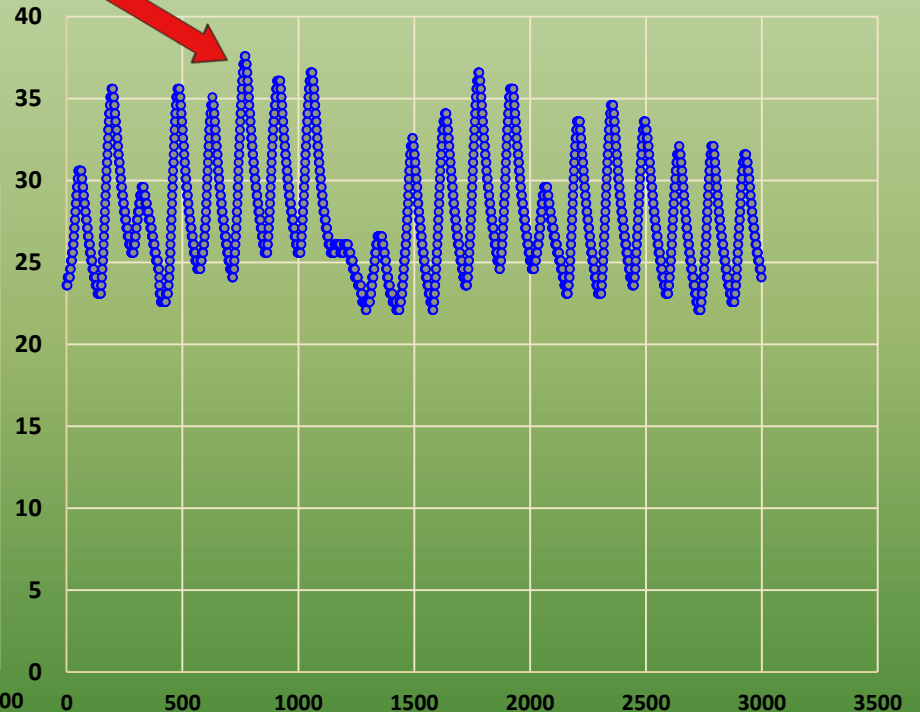
SHEETED

max 27°C

UNSHEETED



Time (minutes x 10) Aug 4-27th
24 Day Period



Time (minutes x 10) August 4-27th
24 Day Period

Temperature Sensor Data

Sine modeled - courtesy of Dr. Robert Higgins, TRU

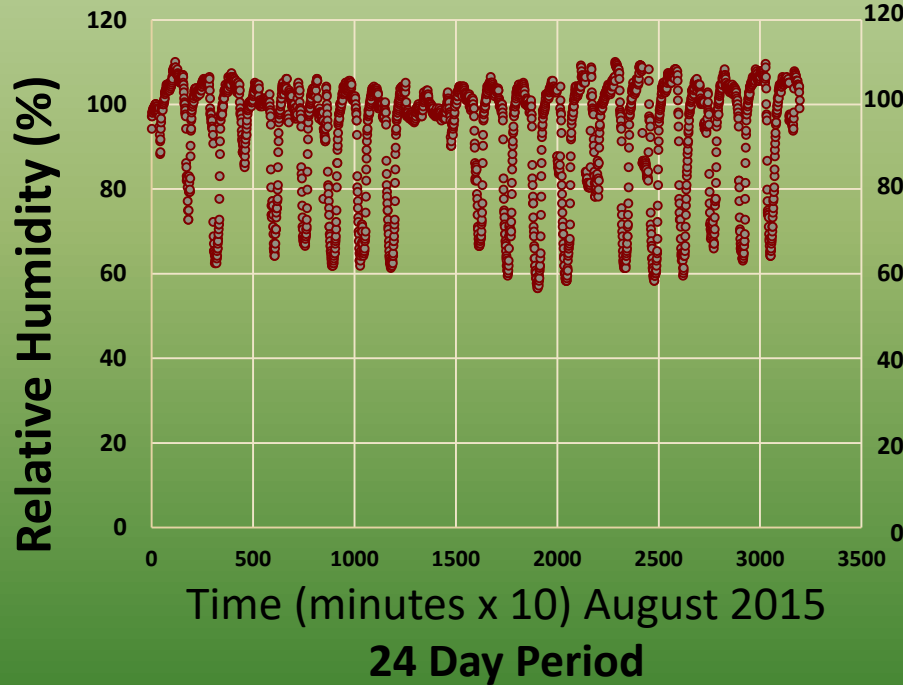
Sensor	Daily Amplitude x 2 (°C)	Mean Temp °C	Average Daily Amplitude x2 (°C)	Average Temp °C
Sheeted – 10 cm depth				
1	7.94	28.05	7.2	27.9
3	6.7	27.87		
5	6.86	27.89		3.1 °C
Unsheeted – 10 cm depth				
7	4.44	24.7	4.1	25.2
9	4.5	25.16		
11	3.4	25.77		
Sheeted – at surface				
2	26.36	28.67	25.7	27.6
4	25.54	25.56		
6	25.34	28.7		10.9 °C
Unsheeted – at surface				
8	16.76	22.4	14.8	23.5
10	17.3	25.7		
12	10.24	22.3		

2.7 °C
difference

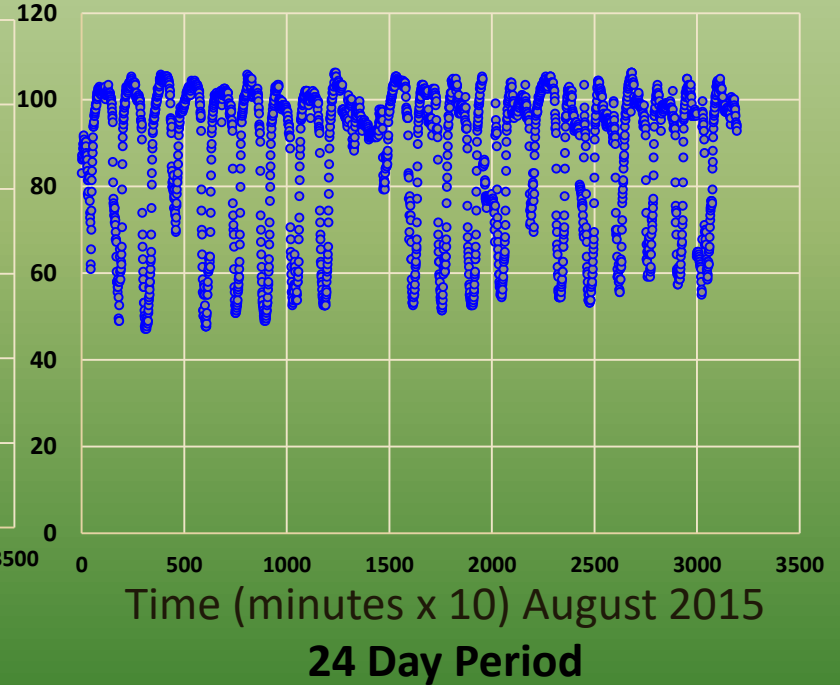
4.1 °C
difference

Soil Relative Humidity (%) – Soil surface

UNSHEETED

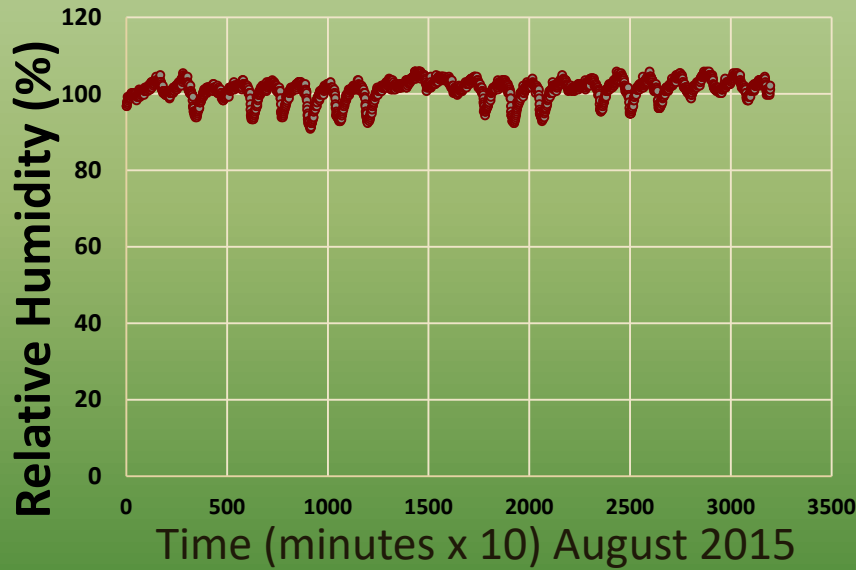


SHEETED



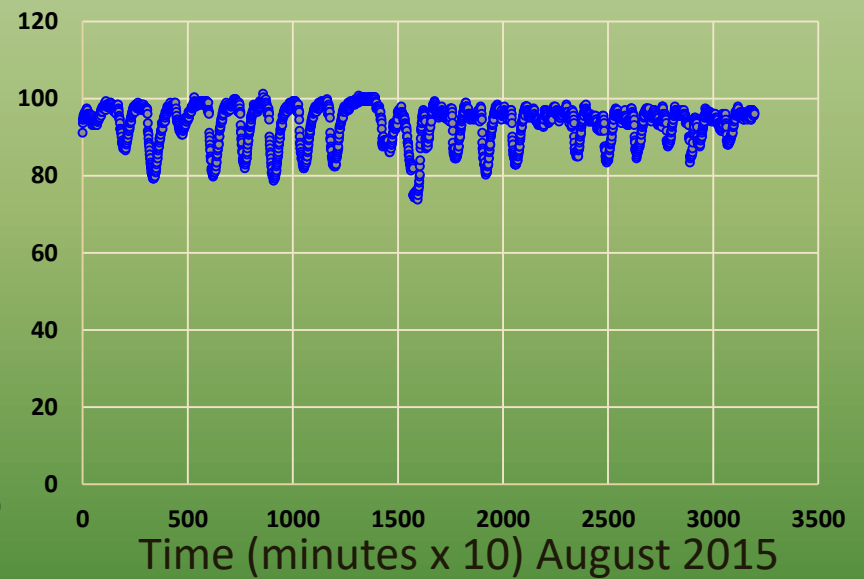
Soil Relative Humidity (%) – 10 cm depth

UNSHEETED



24 Day Period

SHEETED



24 Day Period

Poly trial - conclusions

EFA excluded from **both** poly treatment (sheeted) and scraped soil (unsheeted) relative to untreated vegetation

- Cannot conclude poly sheeting alone excluded EFA
- Repeat experiment with replicates and controls to tease out cause and effect
- mark nests to track ant movement

Temperatures within the poly treatment (sheeted), at and below surface were likely hot enough to exclude EFA according to Dr. Rob Higgins' recent lab studies on EFA temperature tolerances

“Temperatures are regularly going above 55°C in the sheeted experiment... **Can't be good!**” – Dr. Rob Higgins

...conclusions

EFA management progress

- Meditation Garden re-opened after successful eradication!
- Alma VanDusen Meadow infestation (“ground zero”)
 - Re-opening this spring!
 - Renovated the stream borders: vegetation removal, rock work
 - Will rotate seasonal crops (sunflowers, ornamental grains, corn maze) with winter cover crop; rototill spring and fall
 - More large-scale control trials (funding dependent)
- Implemented EFA screening protocols
- Service yard - reconfigured storage bays and screening to mitigate risks
- Ongoing education and outreach

Lessons learned

Permethrin method

- Best tool for small- to medium-scale infestations
- Complete eradication 90% of the time
- CAN reduce densities to safe levels with monitoring and maintenance where eradication impossible due to limiting factors (aggressive behaviour increase with density).

Poly sheeting promising as large-scale control option

Through observation...

- Nest morphology, habitat highly adaptable: metal pipe, rock crevices, crown of tree fern,
- Successful control depends on size of area, nest density, limiting factors such as large rocks, woody roots, proximity to EFA sources

Where do we go from here?

- Exploring funding models to pursue further control trials and secure funding for full-time EFA technician

Thanks to our partners



Don't let it come to this... (1954 film *Them!*)

Cynthia Sayre - cynthia.sayre@vancouver.ca

