



THE UNIVERSITY OF  
WESTERN AUSTRALIA

M420, 35 Stirling Highway, Crawley, Western Australia, 6009

Telephone +61 8 6488 7286 Fax +61 8 6488 7285

Email: [forensic@uwa.edu.au](mailto:forensic@uwa.edu.au)

Web: [www.forensicscience.uwa.edu.au](http://www.forensicscience.uwa.edu.au)

CRICOS No. 00126G



CENTRE FOR FORENSIC SCIENCE

David Burt  
CEO, Shire of Gingin  
7 Brockman Street  
Gingin 6503

30<sup>th</sup> June, 2010

## SHIRE OF GINGIN

**RE: ENTOMOLOGIST CONSULTANCY, MAY 2010 DR DAVID COOK**

**ATTENTION: DAVID BURT (CEO)**

Please find attached my report on the entomology consultancy that the Shire of Gingin approved for 8 days during the month of May, 2010 in relation to the ongoing stable fly problem.

Yours sincerely,

Dr David Cook

Centre for Forensic Science  
University of Western Australia  
1st Floor, Myers Street Building  
Myers Street, Nedlands WA 6009

30<sup>th</sup> June, 2010

## **SHIRE OF GINGIN**

### **ENTOMOLOGIST CONSULTANCY REPORT**

#### **FEBRUARY TO MARCH 2010**

Over the 8 days of consultancy for the Shire of Gingin during the month of May, 2010, I have been able to visit virtually every market garden along with a range of horse, cattle and goat properties, piggeries, poultry sheds (broiler) and miscellaneous horticultural enterprises (eg turf farms, avocado, olive, fruit orchards).

Most market gardeners still complain about being targeted by the Shire over the stable fly issues, but it has to be pointed out to them, that there is a very good reason for that, and that is because the commercial growing of vegetables produces the vast majority of the stable flies that are affecting livestock and people in this shire. Now that raw poultry manure is not available for use by commercial growers in the Shire of Gingin (from September to May inclusive), then the other major source of stable fly breeding primarily revolves around crop residue remaining after harvest, which comprises i) stalks, leaves and fruit (either left in or on the ground after harvesting) and ii) harvested crop waste (i.e., damaged and rejected produce, processing scraps) dumped into open pits or fed out to livestock. This has been supported by past research and samples collected from commercial vegetable growers' properties (see Table 1 below)

Crops such as broccoli, cabbage, celery, lettuce are the highest risk crops for this waste to produce stable flies, which past research has confirmed can typically produce several hundred stable flies per square metre of trashed crop on the ground. If left untreated (i.e. either broken up into small fragments that dry quickly and do not sustain larval development, or treated with a larvicidal insecticide prior to incorporation into the soil), then this material has been capable of supporting the development of over 1,000 stable flies per square metre of trashed crop. There is also a continuing misconception amongst market gardeners that because of their name, stable flies must come from stables or horse properties and/or that they are also breeding in the wetland areas. Also because there are not many stable flies on the properties of market gardeners, they don't believe that they can be breeding them and they are not truly aware of the continual distress they are causing livestock in the Shire.

Probably the most significant discovery of stable fly breeding was in a lettuce producer near Lennard Brook, where there has been ongoing problems with stable fly to nearby cattle, horse and goat producers for well over a decade. The Loose Leaf Lettuce Company produces, on a daily basis, 3 large bins of reject lettuce leaves, which are fed out to cattle on an adjoining property. However, I found that the lettuce leaves, although considered a lower risk of breeding stable flies when fed out to the cattle, have been put in the same spot on the ground repeatedly over years and years. This has resulted in a deep layer of rotting lettuce leaf residue accumulating in the soil, which when mixed with cattle urine and faeces over time has produced an ideal environment for stable fly larvae to survive and grow in, even at a considerable depth in the soil (10cm). This on-going process would have resulted in adult stable flies emerging continually from this area over years and years. The owner/manager of this enterprise did not realize the problem they were creating and took immediate action on my advice to fix the problem. This involved immediately placing further lettuce residue in a different location, digging up the compacted soil/residue mix and treating the affected area with a larvicidal insecticide to prevent further emergence of adult stable flies from the area. I further explained to the Loose Leaf Lettuce Company that the ongoing solution to this fly problem was very simple: (i) the lettuce leaves need to be spread out in long thin lines so the cattle get better access to the material and there is not a large area they can trample on the lettuce; (ii) the lettuce leaves needs to be placed on different

parts of the paddock in a continual rotation to prevent further accumulation of residue; and (iii) areas where lettuce has been fed to the cattle should be regularly checked for any build up of organic material in the soil and the presence of fly larvae (maggots) – if any maggots are found then the affected area was to be sprayed with a fly larvicide to prevent any further emergence of stable flies.

Significant numbers of fly larvae were collected from a number of rotting organic materials including eggplants, cabbage, rockmelons, watermelons, zucchinis, watermelon, lettuce, carrots, lawn clippings, paddy melons, corn crop trash, pumpkin, pig manure and straw compost mix, pig manure sludge, pig manure and sand mix, spilled cattle dung & grain and cattle dung. The adult flies that subsequently emerged from all these samples when reared in the laboratory are shown in the Table 1 on the following page below.

Stable flies were the ONLY fly species developing from rotting eggplant, pig manure and sand mix and rotting lawn clippings, and were by far the most prevalent fly species developing from rotting rockmelons, lettuce, cabbage and capsicums. Only rotting roma tomatoes and continental cucumbers did not support the development of any stable flies. This is consistent with previous research that I conducted at Agriculture WA, where stable flies represented >90% of flies developing from rotting crop residues of either cauliflower, celery, broccoli, carrots, onions, potatoes and corn. Many other less pestiferous flies develop from rotting vegetable matter including the false stable fly, lesser house fly, blowflies, black carrion fly and flesh flies.

**Table 1. Numbers of nuisance flies, specifically stable flies (SF), house flies (HF) and flesh flies (SAR) developing from samples collected in the Shire of Gingin in February to March 2010 inclusive.**

<b>2010</b>	<b>SF</b>	<b>HF</b>	<b>SAR</b>
10/03 CM GROUP PIGGERY - MANURE SAND MIX	<b>67</b>		
10/03 CM GROUP PIGGERY - MANURE SLUDGE		176	
10/03 ODEUM MELONS - ROTTING WATERMELONS	<b>6</b>		39
10/03 ODEUM MELONS - ROTTING WATERMELONS	<b>2</b>		1
10/03 ODEUM MELONS - ROTTING WATERMELONS		No Flies	
10/03 ODEUM MELONS - ROTTING WATERMELONS			25
10/03 ODEUM MELONS - ROTTING WATERMELONS			10
10/03 GINGIN MEATWORKS – MANURE & GRAIN	<b>9</b>	13	
10/03 T & C DO - ROTTING LETTUCE (A)	<b>13</b>		7
10/03 T & C DO - ROTTING LETTUCE (B)	<b>13</b>		11
10/03 T & C DO - ROTTING CABBAGE			47
11/03 TONY COSENTINO, ROTTING ROCKMELON	<b>19</b>		
11/03 TONY COSENTINO, ROTTING ROCKMELONS	<b>15</b>		
10/03 DOBRA, GINGIN - ROTTING LETTUCE STUMPS		No Flies	
24/03 MANLEE, GINGIN - ROTTING EGGPLANTS	<b>26</b>	1	34
24/03 MANLEE, GINGIN - ROTTING ZUCCHINIS			66
31/03 LOVEGROVE TURF, ROTTING LAWNCLIPPINGS	<b>301</b>		
31/03 EGG LAYER PM + MAGGOTS - LOVEGROVE		27	
4/5 MANLEE, ROTTING ZUCCHINIS	<b>8</b>		<b>9</b>
4/5 ANDERSON, ROTTING PADDY MELONS			<b>1</b>
5/5 DEWAR, CATTLE DUNG			
5/5 KBM HOLDINGS LETTUCE FED TO CATTLE	<b>47</b>		
11/5 HYBRID OLIVE FARM, ROTTING CAPSICUMS		<b>43</b>	<b>2</b>
11/5 HUMPHRIES, ROTTING PUMPKINS	<b>41</b>		
18/5 GUILDERTON FARMS, TRASHED CORN CROP	<b>22</b>		
19/5 SUPERIOR LAWN TURF, PIG MANURE + STRAW	<b>14</b>		
26/5 MONTE & SONS, ROTTING CABBAGE	<b>154</b>		<b>1</b>

## KEY POINTS

- Rotting crop residue remains as a consistent and significant source of stable fly breeding in the Shire of Gingin. This material comprises either i) stalks, leaves and fruit (either left in or on the ground after harvesting) and ii) harvested crop waste (i.e., damaged and rejected produce, processing scraps) dumped into open pits or fed out to livestock. This has been supported by past research and samples collected during the time of this consultancy, where stable flies are invariably the only species of fly to develop on such rotting material. Given the vast expanses of some horticultural enterprises where vegetable crops are grown within the shire, there needs to be constant vigilance by shire EHO's in identifying fly breeding in these situations and where appropriate pursue the avenue of prosecution if the grower does not initiate remedial action within a specified and agreed timeframe.
- There is a continuing misconception amongst commercial vegetable producers that because there are not many stable flies on their properties, they don't believe that they can be breeding them. The reality is that they may be responsible for breeding huge numbers of this livestock pest, which after emerging from the soil in the hour before sunrise, will then travel long distances (well over 10-20km) in search of livestock for blood. Furthermore, stable flies much prefer to feed on cattle and horses compared with humans, so they will preferentially not hang around on a horticultural enterprise where there are no livestock to bite.
- The majority of horticultural producers are not truly aware of the continual distress that this fly is causing to livestock in the Shire and they still continue to point the finger at horse and cattle owner's properties as being the main source of this fly, indicating that the fly breeds in horse or cattle dung. This is simply not the case and has been proven by previous research that stable flies rarely if ever breed in pure horse, cattle or poultry manure.
- There is an urgent and very strong case for the Shire of Gingin to appoint a full time officer onto dealing with the ongoing stable fly issue within the Shire over a critical 8 month period this coming summer (October to May inclusive)(see overleaf). The stable fly has been present in such large numbers for well over a decade in the Shire, which is resulting in many livestock producers either selling up, moving out of the Shire all together, or seriously considering ceasing their operations. This does not include the negative impact this fly has had on many people's lifestyle and on tourism within the Shire, especially the coastal towns.

Signed:

Dr David Cook  
Forensic Entomologist  
Centre for Forensic Science  
University of Western Australia  
1st Floor, Myers Street Building  
Myers Street, Nedlands WA 6009  
6488 7290 (Phone)            6488 7285 (Fax)  
0416 181 162 (Mobile)  
[dfcook@faculty.uwa.edu.au](mailto:dfcook@faculty.uwa.edu.au)

## CASE FOR FULL-TIME FLY OFFICER (8 MONTHS)

Over the last 20 years the stable fly problem on the Swan Coastal Plain has reached epidemic proportions. This fly pest continues to have a significant and detrimental effect on livestock production, livestock health and welfare and the health and well-being of rural residents in the Shire of Gingin. The enormous infusion of horticultural industries into what is a traditionally livestock-based region has produced an unfortunate combination that favours the continual production of stable flies throughout most of the year.

The severity of this fly problem is recognised internationally as being on the extreme end of the scale. The stable fly problem has been ongoing and escalating since the mid 1990's with no relief in sight for livestock producers, owners and rural residents alike. As few as 20 stable flies per animal can reduce daily weight gain and disrupt marketing plans. As many as several hundred stable flies have been regularly recorded on affected animals in and around the Shire of Gingin, so the distress and economic loss caused by this fly are quite staggering.

Stable flies principally develop in rotting organic material or a combination of rotting organic material and animal manure. Principally there are 2 major sources of stable fly breeding that have been clearly and unequivocally identified.

**The first is poultry litter** from broiler sheds that is used as a fertiliser and soil conditioner in horticulture. This material can sustain the development of over 1.5 million house flies and 0.2 million stable flies from each hectare when applied as a pre-plant fertilizer for vegetable production. Post-planting or top/side dressings of poultry litter to vegetable crops also contribute to stable fly and other nuisance flies development. The total ban on the use of raw poultry manure in horticulture is to come into effect in Sept 2011, which when enacted should reduce a major source of stable fly and other fly breeding.

**The second is rotting crop residues** from horticultural production. In this instance over 90% of flies developing from rotting crop residues of either cauliflower, celery, broccoli, carrots, onions, potatoes, egg plants, lettuce, turf lawn clippings, cabbage and corn. This residue comprises: i) stalks, leaves and fruit (either left in or on the ground after harvesting) and ii) harvested crop waste (i.e., damaged and rejected produce, processing scraps) dumped into open pits or fed out to livestock. This material continues to provide an ideal medium for stable fly breeding as evidenced by samples from numerous different vegetable crops that all allow for stable fly development.

Stable flies are a biting fly and their main hosts are cattle and horses, with lesser hosts including humans, dogs, pigs, sheep (especially newborn lambs) and camels. Stable flies are persistent biters, feeding several times a day, typically in early morning and late afternoon; the fly punctures the skin several times before drawing blood and their bite causes a sharp pain as it quickly draws blood and engorges itself in a few minutes. Female stable flies must feed on blood before being able to lay eggs, which they do in either rotting vegetable matter either alone or in combination with animal manures and urine.

Complaints concerning flies from the general public include being harassed, attacked and bitten by flies. As a consequence people have had to adjust their lifestyles and are unable to conduct social activities in their backyards. Furthermore, stable flies can potentially transmit a number of diseases to livestock and to a lesser extent humans as well as being the intermediate hosts of several species of nematode worms, which affect cattle and horses. Bites to livestock occur mainly on the limbs and belly and because animals react to their annoying bite, their feeding is often interrupted, hence there is an increased chance that the flies will move and feed on another animal, and hence have the opportunity to transmit pathogens.

## ECONOMIC IMPACT OF STABLE FLIES

The economic impact of stable flies on livestock production in the Shire of Gingin is very significant. Cattle irritated by the blood feeding flies consume less feed, grow more slowly and convert feed into milk or body mass less efficiently. A secondary problem is that the animals crowd or bunch together to avoid the flies biting them and then become heat stressed. Animals spend much of their time stomping, tail switching and throwing their heads to try to rid themselves of this biting fly.

Research shows that 72 percent of the production loss from stable flies is caused by animal behaviour (bunching) and 28 percent is attributed to the stable fly feeding. Research from the University of Nebraska (2007) found that stable flies depressed calf weight gains by 0.22kg/day and yearlings by 0.20kg/day. These same populations also significantly reduced milk production. When there are 100 stable flies per animal, weight gain is reduced by a minimum of 20%.

Estimates on the economic impact of stable flies on livestock production (in the USA) calculated that based upon a nationwide average of 10 stable flies per animal for 3 months per year, the model estimates stable flies cost the dairy industry \$543 million, \$1.34 billion to pasture cattle and \$1.44 billion to feedlot cattle.

As a consequence of stable flies continued negative impact in the Shire of Gingin, livestock producers are either shutting down their business, relocating or having their animals agisted elsewhere to avoid being attacked by this fly pest. Just looking at loss of production to cattle owners in the Shire of Gingin, it is estimated that the stable fly causes nearly \$600,000 loss each year in meat production and an estimated \$200,000 to control the stable fly (mostly insecticidal) in addition to the impact on horse owners (protective clothing, insecticides, fly repellents, veterinary fees, traps, agistment fees) this fly easily costs livestock producers in the Shire of Gingin over \$1.1m per year. The additional cost to rural residents in fly control costs (fly baits, traps, repellents, protective clothing, dog and pet fly control, veterinary fees, flyscreen mesh, purpose built enclosures etc), reduced value of real estate and loss of tourism in warmer months in the coastal towns of Guilderton, Seabird, Ledge Point, and Lancelin put this figure substantially higher and well over \$1.6m/annum. For an annual outlay in this proposal of \$78,000 by the Shire of Gingin even a modest 20% reduction in the impact of stable flies on the entire community sees the benefit to the community far outweighing the cost by a factor of 4 to 1.

## BENEFITS OF A FULL TIME FLY OFFICER (8 MONTHS)

**The Full time Fly Officer (Oct 2010 to May 2011 inclusive) will be responsible for:**

1. Continual monitoring for breeding sites of stable flies and other nuisance flies of humans and livestock (collect samples for rearing flies, liaise with Shire EHO's on prosecutions under the Fly Regulations)
2. Ongoing education and liaison with commercial vegetable growers, livestock owners and rural residents in the Shire of Gingin on how to reduce the stable fly problem through a series of practical field days, workshops, personal visits and school education packages.
3. Make recommendations to growers, livestock owners and residents on methods to control stable flies.

**4. Surveying the effects of stable flies on rural residents and livestock in the Shire of Gingin and tourists in the four coastal towns of Guilderton, Seabird, Ledge Point, and Lancelin**

The most common short term solution for fly control is to reduce their numbers by using insecticides, either registered or unregistered for stable flies. Due to the high numbers of stable flies in the Shire of Gingin, chemical applications are continually over-challenged and pesticide resistance has rapidly developed, rendering repeated applications of the pesticide useless. At best, chemicals can only give short term relief to the fly problem and over use is deleterious to the environment, humans and livestock.

The real focus of this appointment is to inform and educate people on stable fly breeding and feeding sites and how using an integrated pest management approach will control stable fly populations. Large scale commercial vegetable production has been clearly identified as one of the greatest sources of stable flies and working with the vegetable growers in the Shire on how they can best manage their crop residues after harvesting will be pivotal to the role of the Fly Officer.

Stable fly numbers can be dramatically reduced with the correct handling, timely disposal and judicious use of insecticides on crop residues, eg stalks, leaves and fruit left on the ground after harvesting and harvested crop waste. Without sustainable fly control measures the possible consequences are an increased prevalence of disease, increased nuisance effects on human activities and long term detrimental effects to human health and the environment from the overuse of chemicals.

**TIMELINE:**                      Start                      4<sup>th</sup> October 2010                      Finish                      31<sup>st</sup> May 2011

**EVALUATION:**                      Specific Key Performance Indicators and Expected Outcomes will be developed with the Shire of Gingin.

**PUBLICITY:**                      Features on TV and news items or as documentaries including This Day Tonight, Catalyst and in the Advocate local newspaper and other local newspapers in the 13 shires nominated in the PM regulations.

**TOTAL FUNDS REQUESTED:    \$78,000**

Salary - \$60,000 (Livestock Entomologist)

Travel - \$10,000 (vehicle provided by Shire of Gingin)

Equipment - \$8,000 (Field days, promotional and educational materials)

**RESOURCES:**

The Centre for Forensic Science (CFS) at the University of WA is already actively engaged in research on many species of flies and is prepared to commit most of the support services associated with a Fly Officer being appointed by the Shire of Gingin. This includes telephone, library, office and laboratory space, fly cages, rearing containers, mechanical and experimental workshops, computers, accounting and postage.

**The appointment of a full-time Fly Officer for 8 months in the Shire of Gingin has the potential to dramatically reduce the impact of stable flies by continually monitoring the extent of the fly problem both in terms of areas where flies breed and where adult flies are located along the Swan Coastal Plain. Continual education of commercial vegetable growers, livestock owners and rural residents on ways of reducing stable fly breeding will a key feature of this position using both local media, TV exposure and field days to promote cultural practices that can significantly reduce stable fly breeding.**