

San Jose Scale Management in North Carolina Peaches

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White Peach Scale



White peach scale infests only wood, and leaves a white fluffy appearance,



San Jose Scale



San Jose scale infests both wood and fruit. Infested fruit have a red spot around the scale feeding site



San Jose Scale



Overwinter as immatures on twigs and bark (male oblong).



Winged males emerge and mate with females in early to mid April. Females give birth to live “crawlers.” Females never leave their waxy covering.



When scales feed on fruit, a reddish spot surrounds the feeding site



San Jose scale completes 3 to 4 generations in the NC piedmont.



First generation crawlers appear in May. They quickly settle, begin to feed and secrete a waxy scale covering

Potential Reasons for Abrupt Problems with San Jose Scale

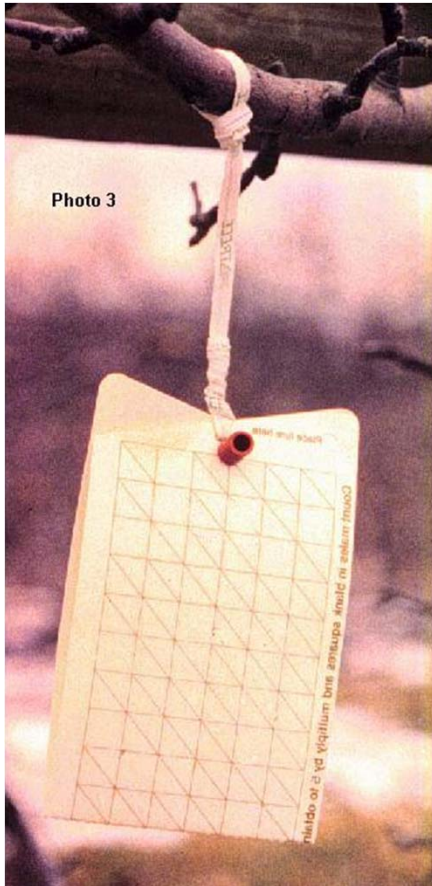
- Pre-bloom oil and/or insecticide with SJS activity not used in multiple years.
 - Coverage can be difficult on older trees (increase gallonage)
- Over-reliance on pyrethroid insecticides for general insect control. Pyrethroids are harmful to SJS parasites and are known to aggravate scale problems.
- Abnormal weather conditions, often mild winters result in low overwintering mortality.
- Nearby source of scales (unsprayed trees) allows for wind-assisted movement of crawlers into orchards.

Ecology of the San Jose Scale and its *Encarsia perniciosi* parasitoid in North Carolina Orchards

(1988, David C. McClain, PhD Thesis, Dept. Entomol., NCSU)

- Phenology data from 1980's on apple and peach at Clayton, Jackson Springs, and Nash County.
- SJC development in relation to temperature
- Key parasites include
 - *Encarsia perniciosi* (Aphelinidae, endoparasitoid)
 - *Coccobius* sp. (Aphelinidae, endoparasitoid)
 - *Aphytis diaspidis* (Aphelinidae, ectoparasitoid)

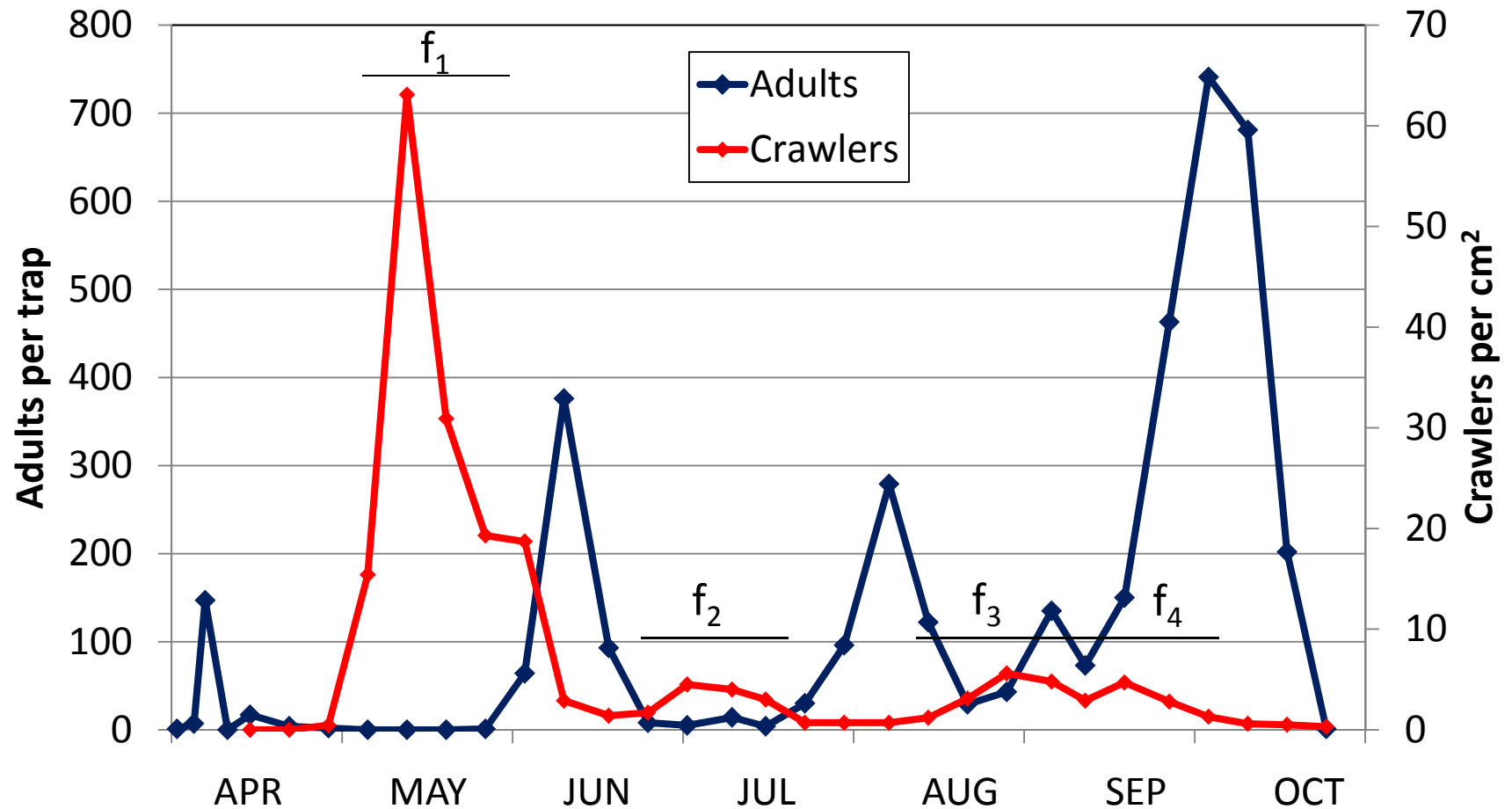
Scale Monitoring Techniques



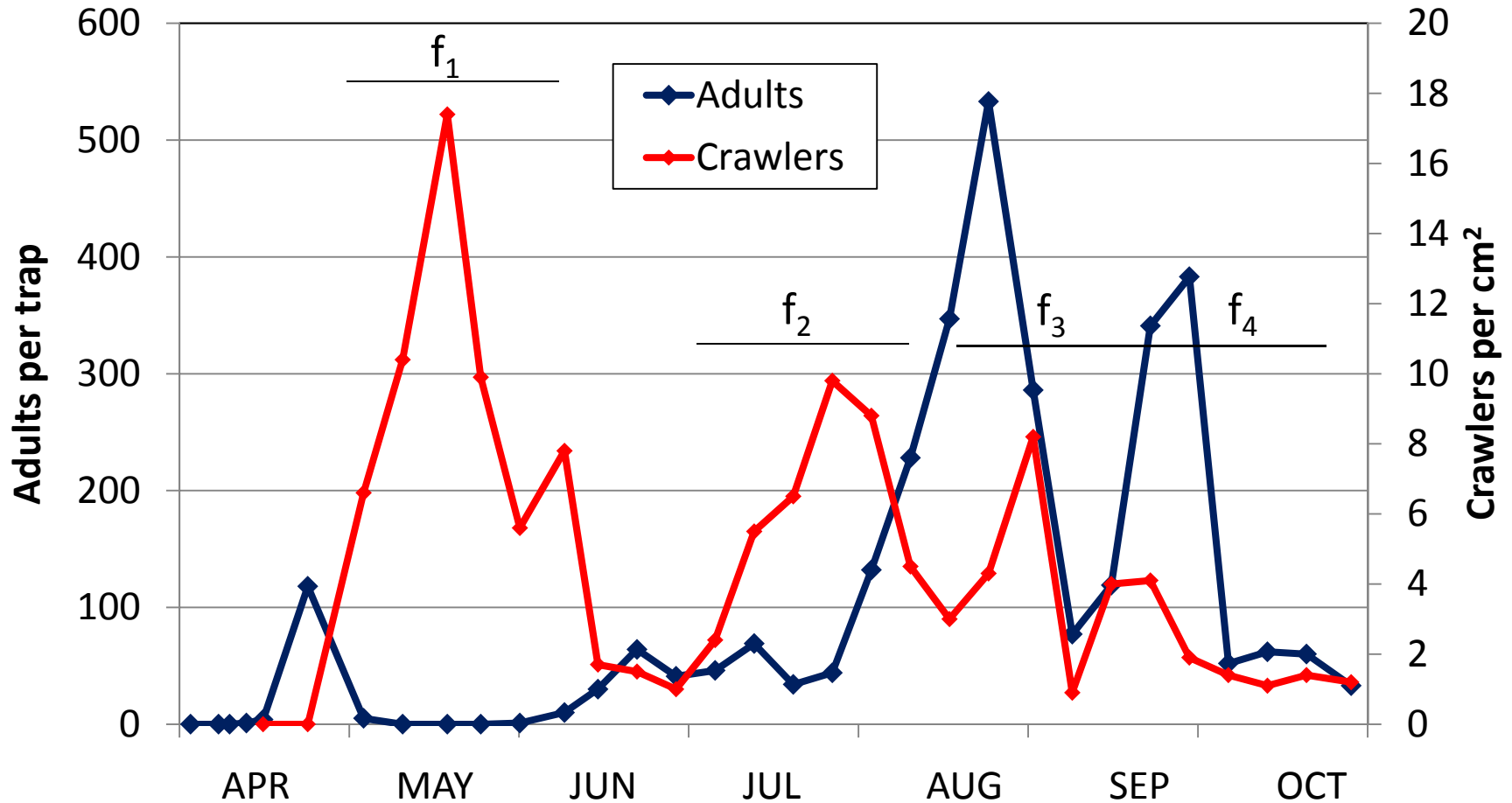
Crawler activity can be monitored by wrapping double-sided sticky tape or electrical tape around twigs of infested trees. A hand lens is often necessary to see crawlers stuck to tape.

Adult male flight periods can be monitored with pheromone traps (above). Due to small size of scale, traps need to be checked under a microscope.

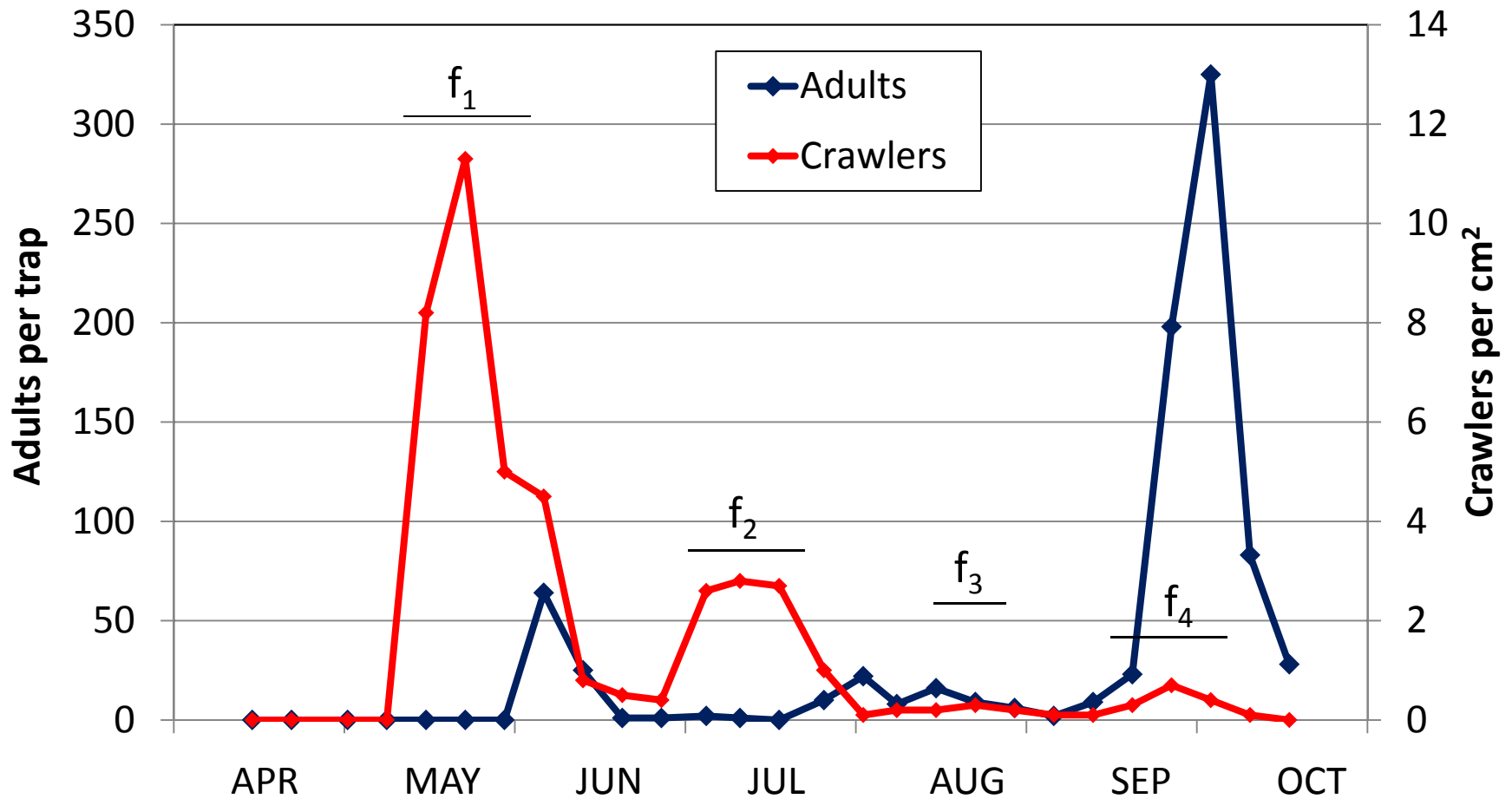
Phenology of San Jose Scale on Non-Sprayed Apples – Clayton, NC 1986



Phenology of San Jose Scale on Non-Sprayed Apples – Clayton, NC 1987



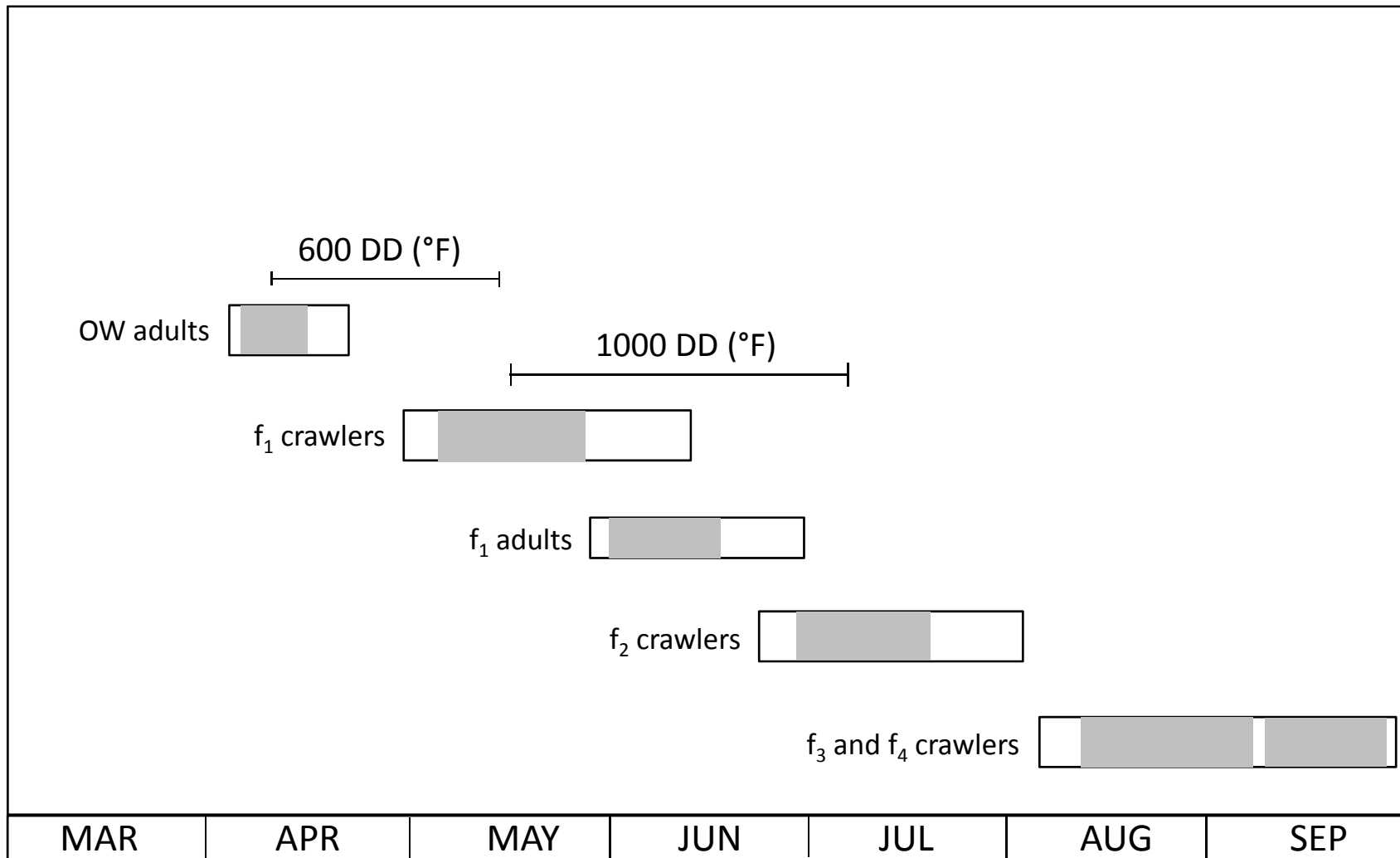
Phenology of San Jose Scale on Non-Sprayed Apples – Jackson Springs, NC 1986



San Jose Scale Development

- Developmental threshold temperatures
 - Lower 10°C (50°F)
 - Upper 32°C (89.6F)
- 300-400 DD °C (540-720 °F) from peak male captured on traps to peak f_1 crawlers.
- 555 DD °C (1000 °F) required from peak f_1 crawlers to peak f_2 crawlers.

Phenology of San Jose Scale in the Piedmont of North Carolina



San Jose Scale Insecticide Control Strategy

- Target early season populations, when generations are distinct (not overlapping), and numbers are at their lowest.
- Most vulnerable life stage is crawlers.
- Optimum timing
 - Delayed Dormant (overwintering immatures)
 - Early May (f_1 crawlers)

Recommendations for San Jose Scale

*** Delayed Dormant ***

- Horticultural oil as a delayed dormant application is a standard application for scales in tree fruit production. Oil becomes more toxic to scales as their rate of respiration increases, which occurs as they age. Hence, delay applications to at least bud swell.
- Thorough coverage is critical for an oil application. Because good coverage can be difficult to obtain on older trees, increase gallonage for the oil spray – 150-200 GPA.
- Most oils sold today are highly refined and lighter than older “dormant” oils. Potential for phytotoxic effects are low, when applied before bloom
- Do Not apply a sulfur-containing fungicide within two weeks of an oil application.

Recommendations for San Jose Scale

* Delayed Dormant *

- With low scale populations, a 2% oil spray alone often provides the necessary level of control.
- For moderate or higher populations, an insecticide should be included with the DD oil spray. Most effective options include:
 - Lorsban 4E (or Advanced) at 2 pt/acre (4-day REI)
 - Diazinon 4E at 1 pt/100 gal (4-day REI)
 - Esteem 35WP at 4-5 oz/acre
 - Centuar 30WDG at 2.15 lbs/acre
- Among these insecticides, Lorsban has the longest residual activity and is preferred at the DD spray.

Recommendations for San Jose Scale

* 1st Generation Crawlers *

- An insecticide targeting first generation crawlers is recommended in any orchard with a recent history of scale problems – e.g., infested fruit the previous year.
- Based on historical data, first generation crawler emergence starts in early May, but emergence can extend for up to 6 wks. Insecticide timing should target the peak emergence period (2nd or 3rd wk of May).
- If using pheromone traps to monitor SJS males, peak abundance of first crawlers occurs about 600 DD (°F) after peak trap capture.

Recommendations for San Jose Scale

* 1st Generation Crawlers *

- When specifically targeting 1st generation SJS crawlers, use a different insecticide than used before bloom
- Recommendations during the May treatment period include:
 - Esteem 35WP @ 4-5 oz/acre 14-d PHI, 12-h REI
 - Centaur 30WDG @ 2.15 lbs/acre 14-d PHI, 12-h REI
 - Diazinon 50WP @ 1 lb/100 gal 21-d PHI, 4-d REI
 - *Movento 2SC @ 9 oz/acre 7-d PHI, 24-h REI

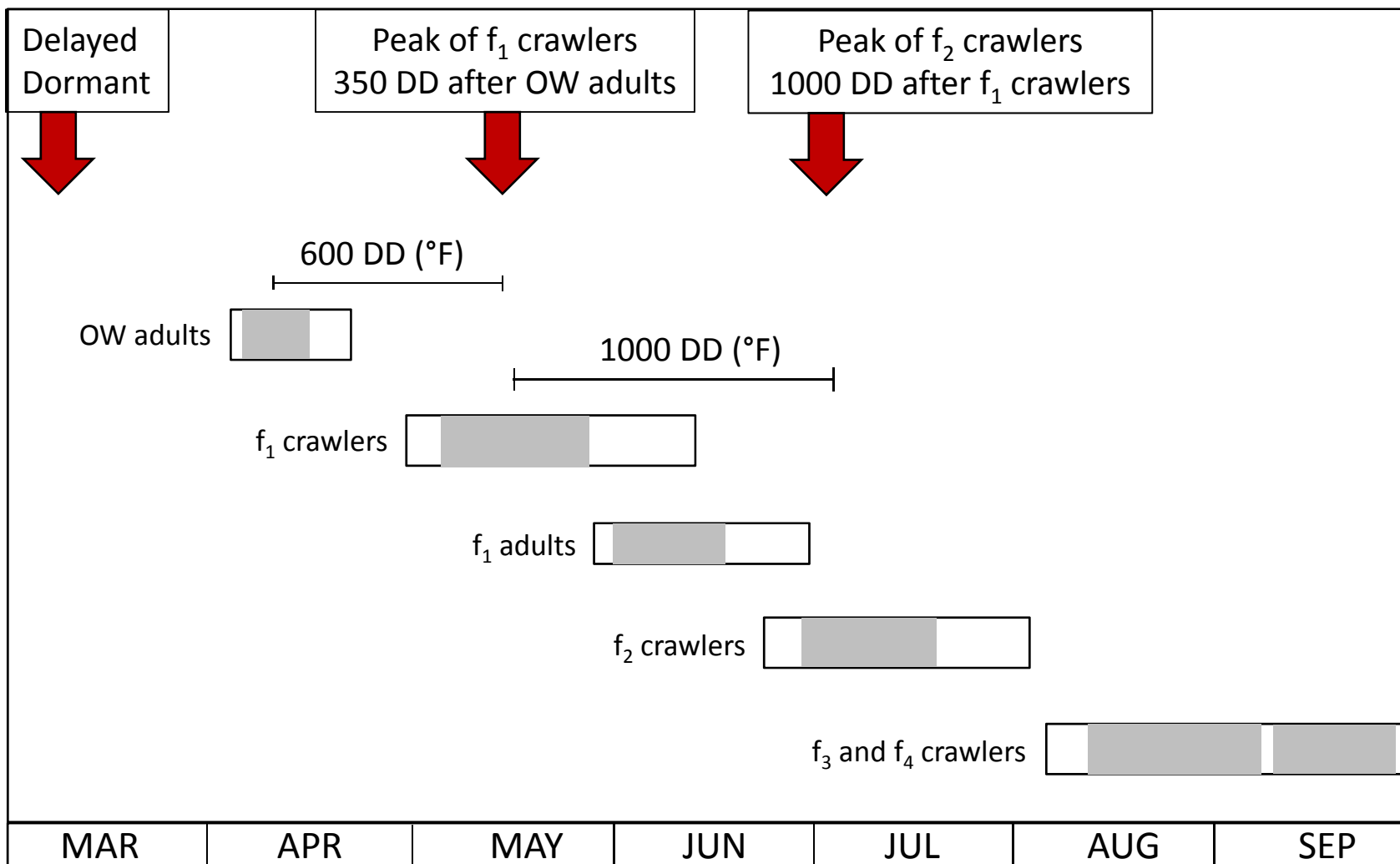
*There is less information on the efficacy of Movento compared to other products. Also, Movento must be applied at petal fall to allow for uptake by the time first crawlers are present.

Recommendations for San Jose Scale

* 2nd Generation Crawlers *

- Under most conditions, insecticides are not necessary against 2nd gen. crawlers. This application is only necessary when problems persist into July.
- If needed, insecticide timing is early July, or about 1000 DD (°F) after peak 1st gen. crawlers.
- Insecticides recommended are the same as against 1st gen. crawlers, but for resistance management, use a different product than used against the 1st generation.

Optimum Timing of Insecticides in Relation to San Jose Scale Phenology in the Piedmont of North Carolina



Alternatives to Pyrethroids

- There are numerous insecticide options to pyrethroids for controlling peach insects, but none have the wide spectrum of activity as pyrethroids.
- Knowledge of the pest complex in the orchard is important to match the proper insecticide with the pest.
- Mating disruption of OFM is an option. It is easy, provides season-long control, and virtually eliminates that pest as a concern.

Key Insect Pests of NC Peaches

	DD	PF - SF	MAY	JUN	JUL	AUG
W. peach scale	X					
S. Jose scale	X		X			
Plant bugs		X				
Plum Curculio		X		X	X	
OFM		X	X	X	X	X
Jap. Beetles				X	X	
June bugs				X	X	
Stink bugs					X	X

Non-Pyrethroid Options for Peach Insect Control

E = Excellent G = Good F = Fair — no activity

	PHI	REI	Scales	Plant bug	Plum Curc.	OFM	Jap. beetle	Stink bug
Actara	14 d	12 h	G	E	E	F	E	G
Assail	12 d	12 h	G	G	G	G	E	G
Belay	21 d	12 h	G	E	E	F	E	G
Provado	0	12 h	F	—	—	—	E	—
Avaunt	14 d	12 h	—	—	E	E	F	—
Imidan	14 d	3 d	F	F	E	E	E	F
Altacor	10 d	4 h	—	—	F	E	—	—
Delegate	7 d	4 h	—	—	F	E	—	—
Esteem	14 d	12 h	E	—	—	G	—	—
Centaur	14 d	12 h	E	—	—	—	—	—
Diazinon	21 d	4 d	G	G	G	G	F	F
Lorsban	—	24 h	E	—	—	—	—	—
Movento	7 d	24 h	E	—	—	—	—	—

OFM Mating Disruption Options



**Isomate OFM TT
(100 per acre)**



**CheckMate OFM F
(1-1.3 oz/A)**



**CheckMate OFM
(100-150 per acre)**



**CideTrak OFM
(100 per acre)**



**CheckMate Puffer OFM
(1 puffer/acre)**

OFM Mating Disruption Options

- Dispensers should be hung before flight of OFM, which begins about when peaches bloom.
- Hand applied pheromone dispensers (180+ days activity)
 - Isomate OFM TT (50 to 75 dispensers/A)
 - CheckMate OFM (100 dispensers/A)
 - Trece CideTrak OFM (100 dispensers/A)
- Puffers (180+ days)
 - CheckMate Puffer OFM (1 puffer/acre)
- Sprayable pheromone (3-4 wks residual activity)
 - CheckMate OFM-F (1 oz/A @ 3-4wk intervals)

Summary

- To control Jose Scale:
 - Apply a delayed dormant oil (2%) + Lorsban 4E (1 qt/A) or Diazinon 4E (1 pt/100 gal).
 - Apply Esteem (4-5 oz/A) or Centaur (2.15 lbs/A) during mid May against 1st gen crawlers.
 - If still concerned about SJS, make another application of Esteem or Centaur in early June against 2nd gen crawlers. An application of a “good” rated product such as Assail should also suffice.
- Reduce pyrethroid use, especially during April and May when SJS control is critical.
- This program will also control white peach scale.