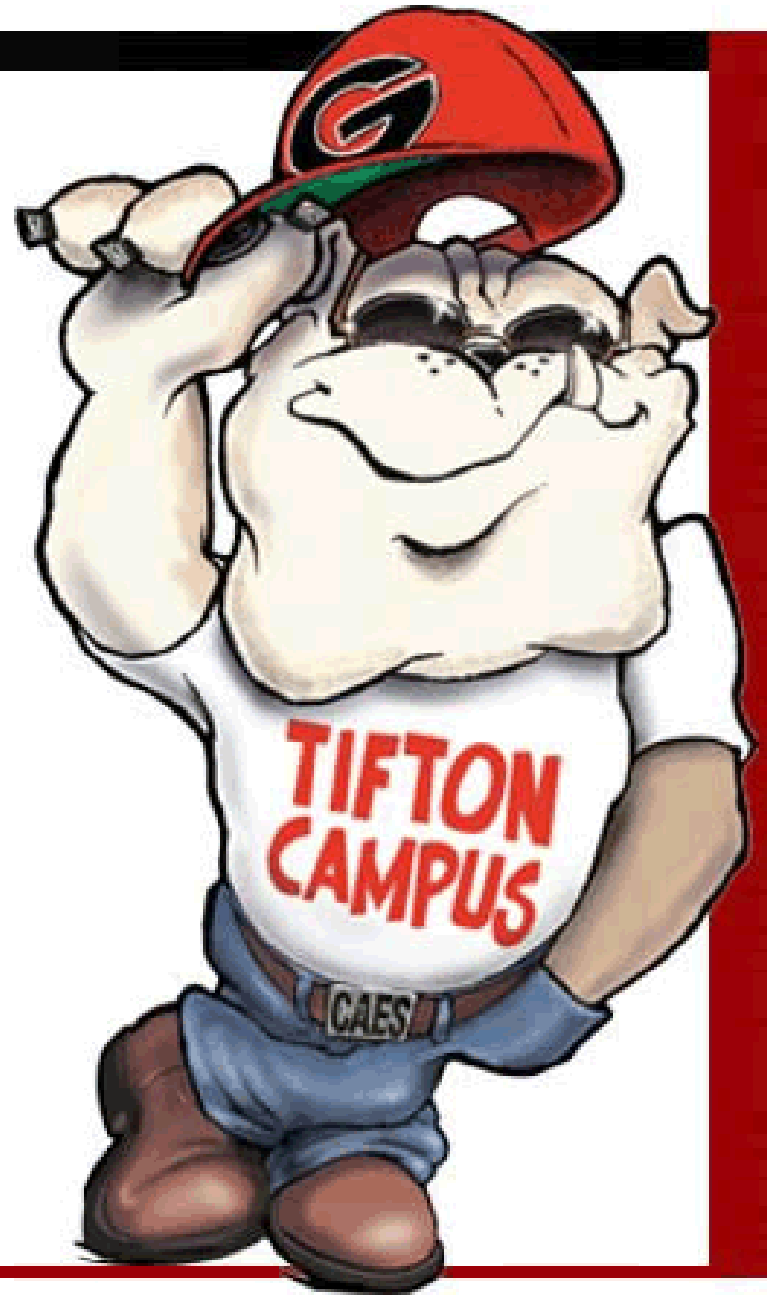


Root Borers in Commercial Pecan Orchards in Georgia

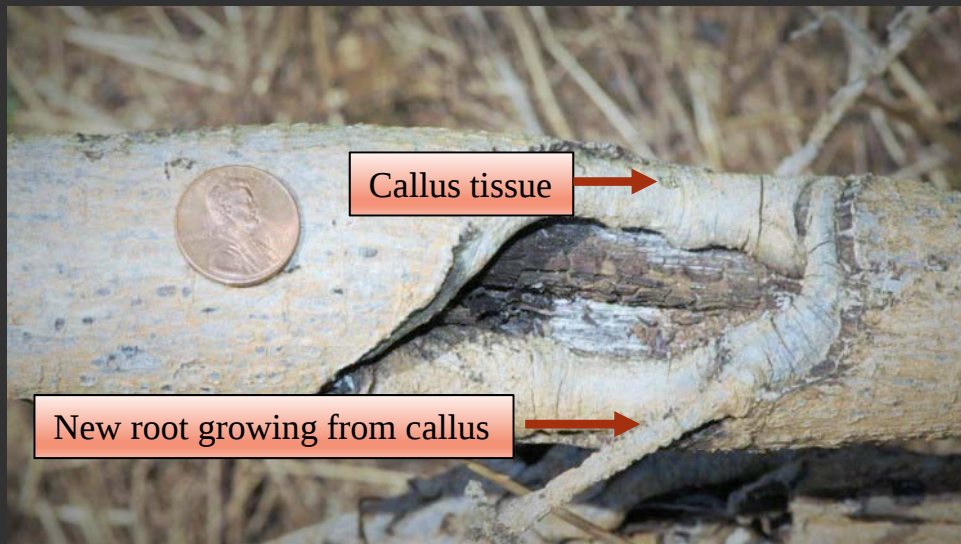
**California Prionus
Pheromone as an
Attractant for Tilehorned
Prionus and Broadnecked
Root Borer**

**Jim Dutcher
Entomology Department
University of Georgia,
Tifton, GA**



KEY QUESTION

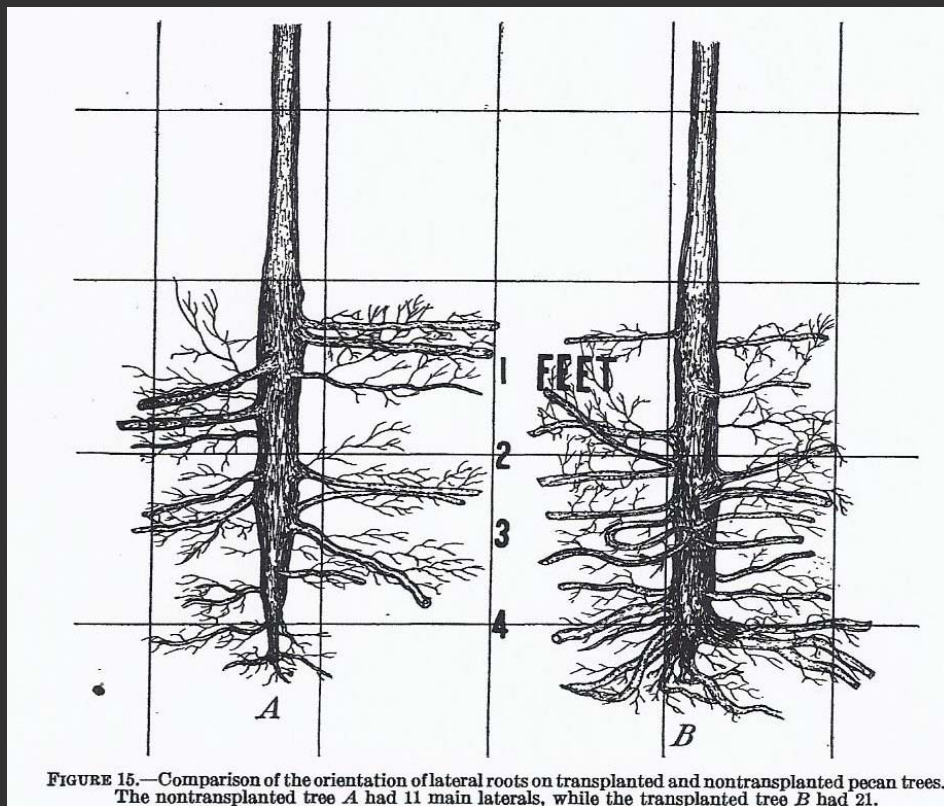
IF THE ROOTS ARE INJURED AND THE LARVAE ARE CONTROLLED,
THEN ARE THE ROOTS REGENERATED?



Large lateral roots and the tap root with injury develop undifferentiated callus tissue in the cambium tissue and this generates a live covering over the wound and a new root.

Woodroof and Woodroof found that transplanted pecan trees recover from severe root pruning by doubling the number of lateral roots generated from the tap root.

PECAN TREES HAVE FOUR TYPES OF ROOTS
PRIONUS ROOT BORERS FEED ON TAP AND LATERAL ROOTS



1. Tap Root
2. Lateral Roots
3. Fibrous Roots
4. Mycorhizzal Roots

Fig. from: Woodroof, J.G. & N. C.
Woodroof. 1934. Pecan root growth and
development. J. Agr. Res. 49(6):511-530.

LOOKS LIKE THE INJURED TREES MAY BE WORTH SAVING., WHAT DO WE KNOW ABOUT THE ROOT BORERS?

- Life Cycle –
 - The woods are full of alternate tree hosts – Oaks, pines, grapes, poplars, apples, chestnuts
 - The beetles are commonly found all across the eastern U.S.
 - The females lay eggs in the soil near roots
 - The larvae are in the roots and soil until they pupate.
 - Insecticides cannot reach the larvae deep in the soil and adult emergence pattern is not well known the adults peak measured by light traps in June.
 - Life cycle is 5 – 7 years
- Trapping
 - Light traps the first effective method for trapping
 - Males are attracted to prionic acid baited pheromone traps
 - Females attracted to alpha pinene baited pitfall traps
- Control
 - Culling infested trees and then letting a new tree grow back eventually restores nut production but the beetles are still in the orchard.

TRAPPING METHODS

Light Trap



Pheromone Baited Panel Trap

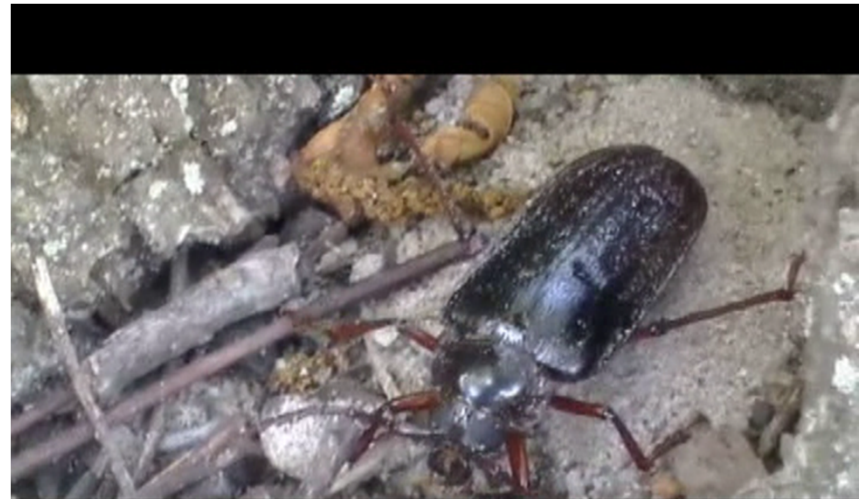




Objectives

1. What is the emergence pattern in pecan orchards?
2. How long are the pheromone lures effective in the pecan orchard?
3. How effective is soil application of chlorpyrifos on the adult male beetles?
4. Can the beetles be trapped out with the pheromone traps?

Prionus oviposition



Normal Pecan Orchard - July



Are the trees infested?

Look for symptoms and signs of an infestation



Crown gall and root borer infestations



Fitzgerald Monitoring Site



Pheromone traps and root sampling can be used to find the relative abundance



Trees topple in high winds



Clearing trees for a new orchard



Larvae chew through the irrigation



Prionus infestation near Fitzgerald



Source of map: Google Earth 2013 Digital Globe

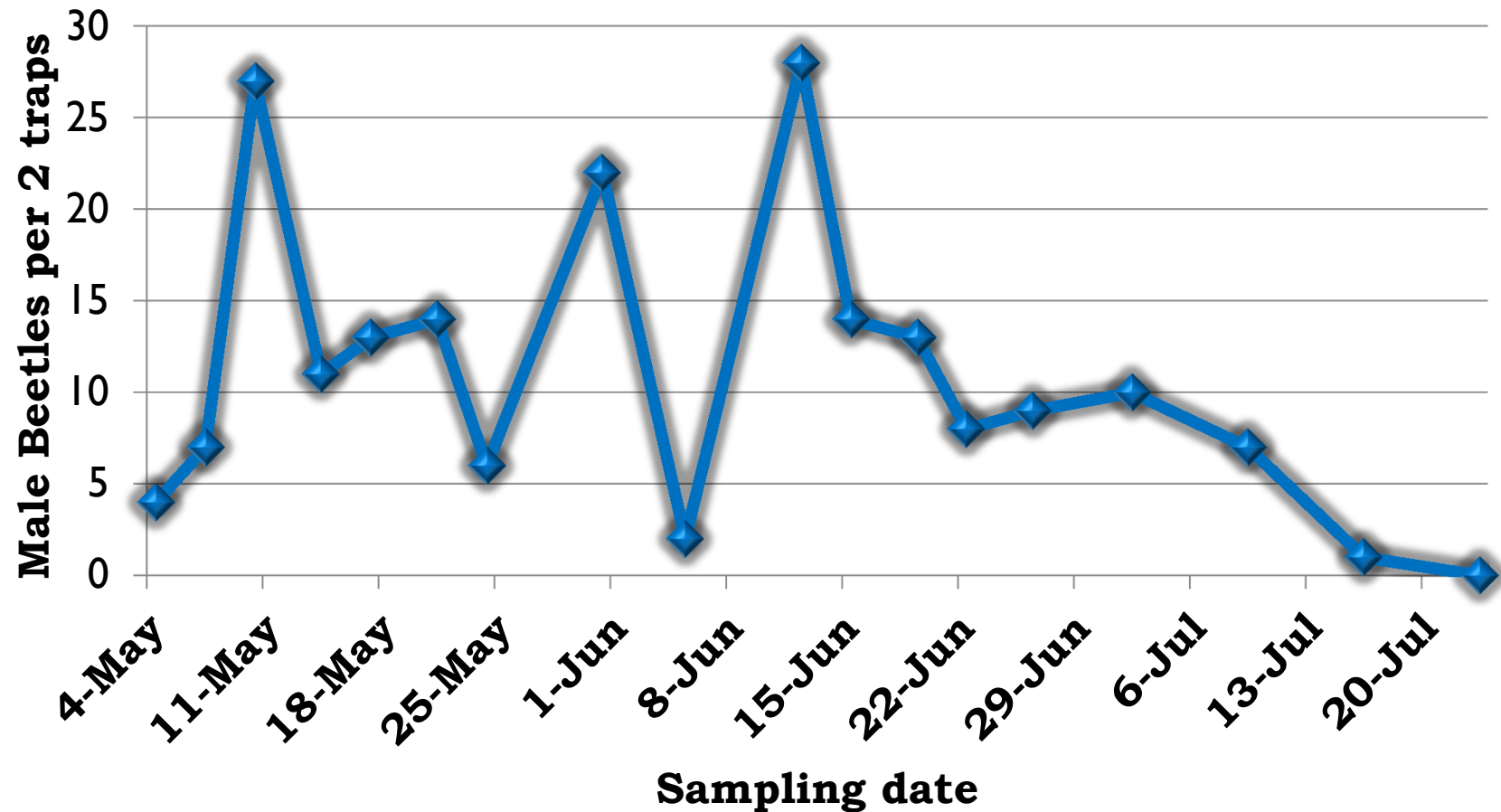
Prionus infestations in Mendes, GA



Source of map: Google Earth 2013 Digital Globe

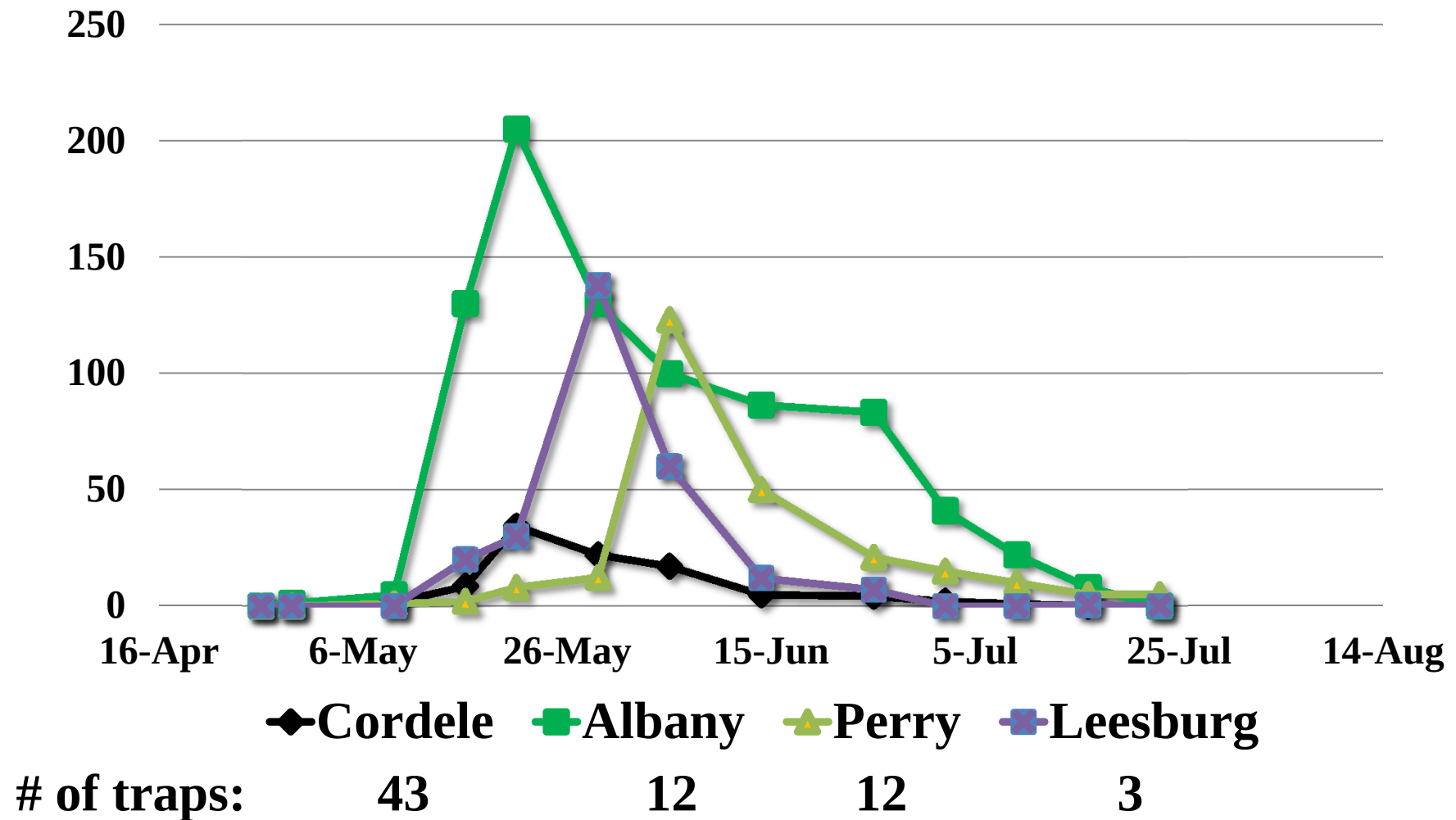
Fitzgerald, GA *Prionus* Trap Catch 2012

Trap Catch (2 traps)

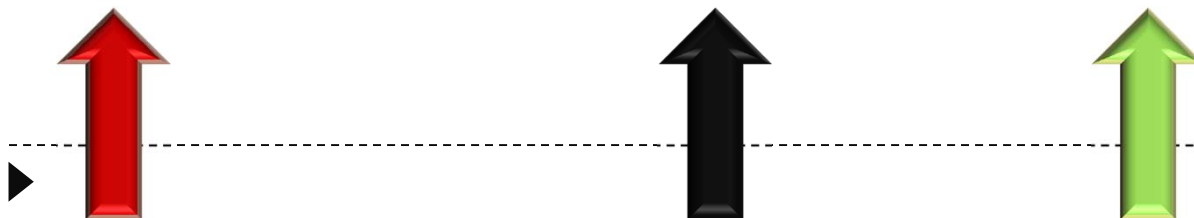
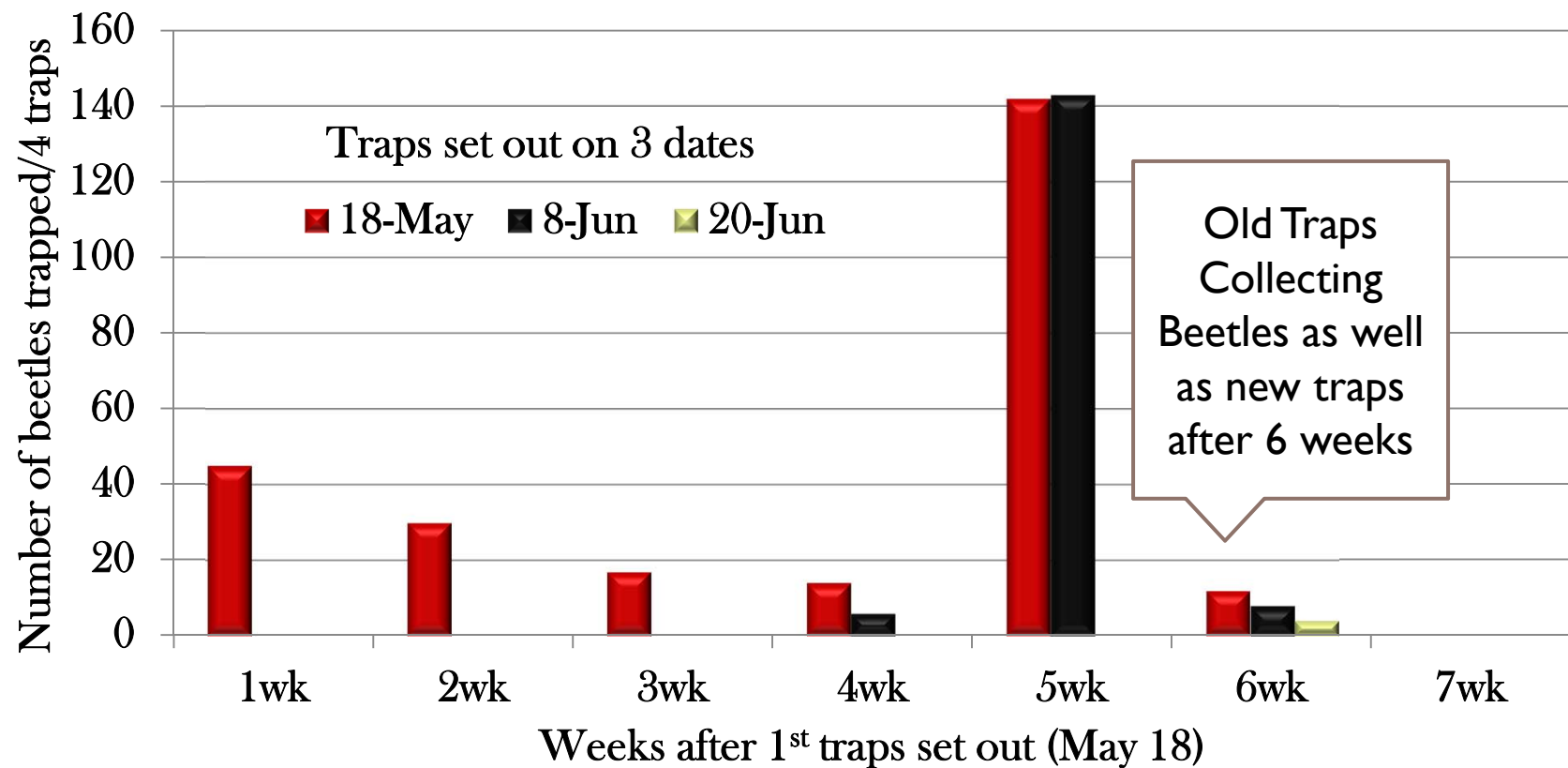


Prionus Trap Catch 2013

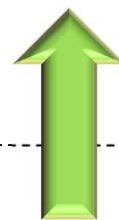
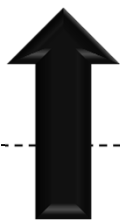
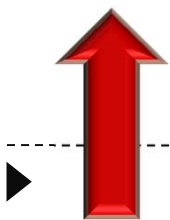
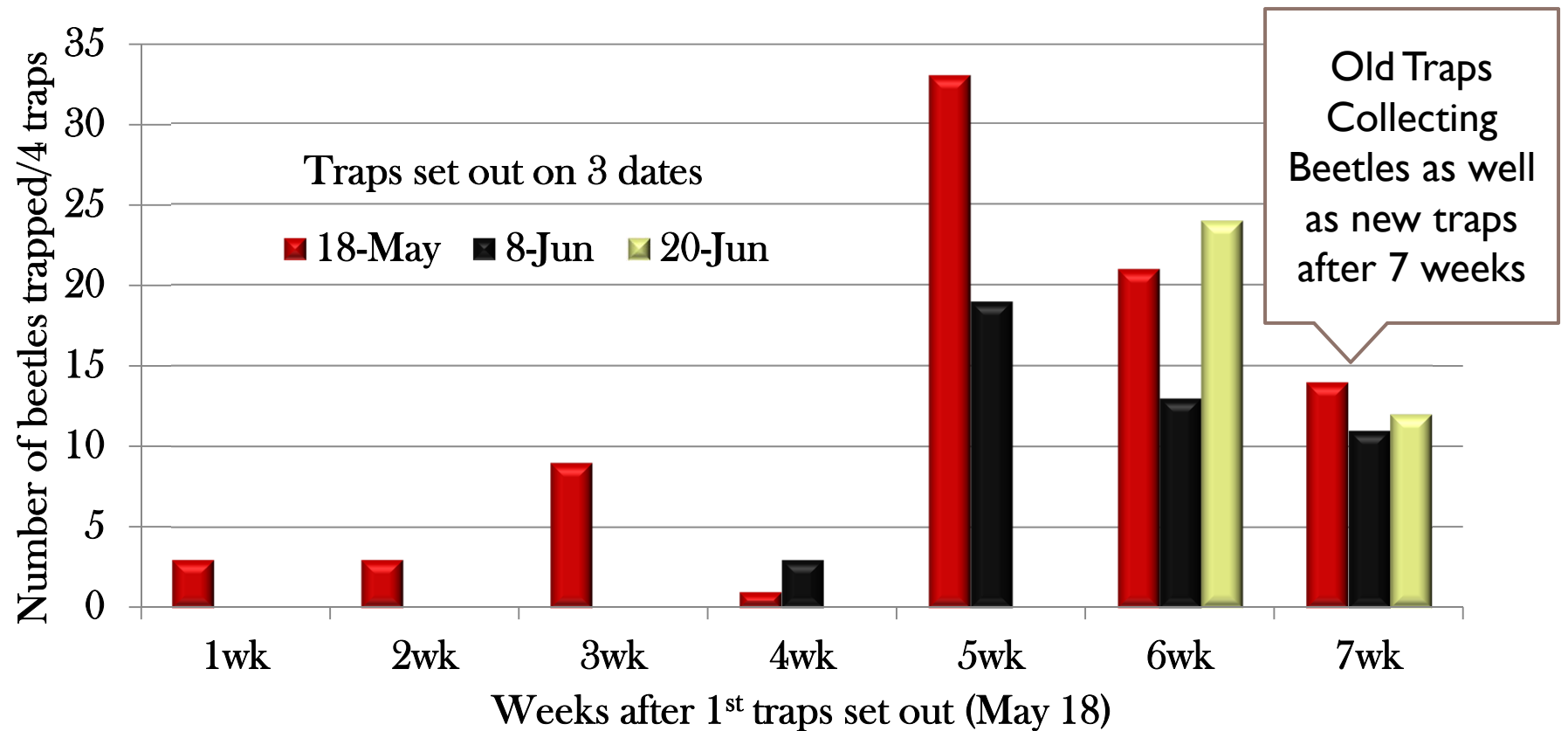
Number *P. imbricornis* males/trap



How long do the pheromone lures last for *P. imbricornis*?



How long do the pheromone lures last for *P. laticollis*?

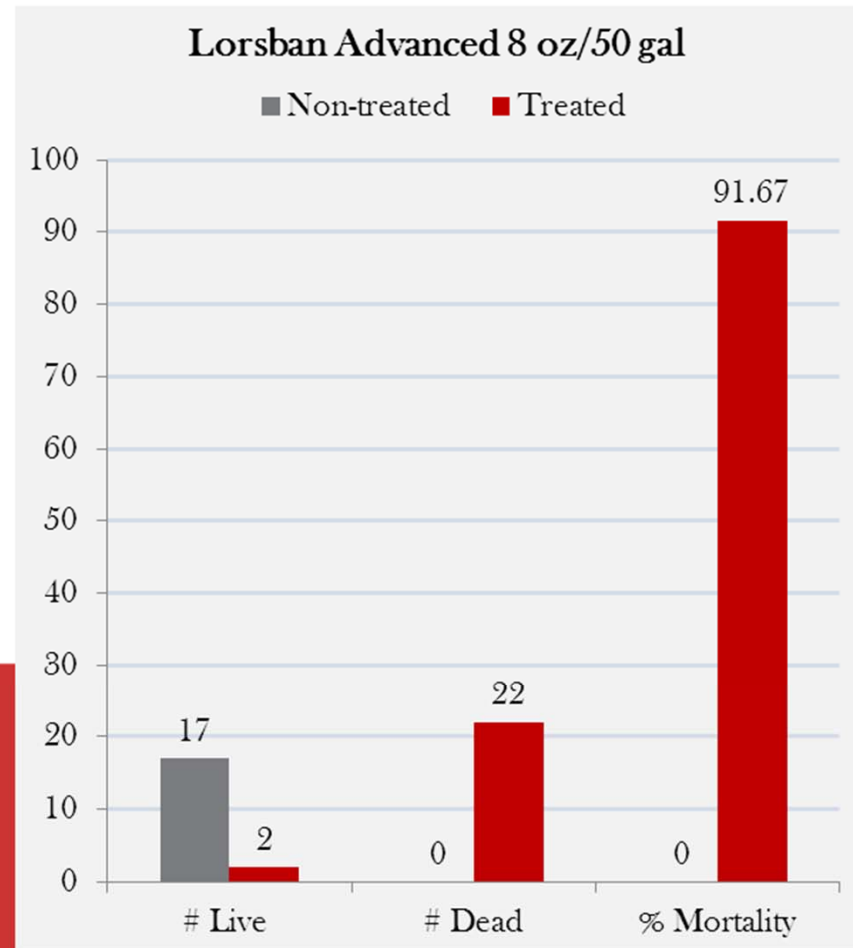
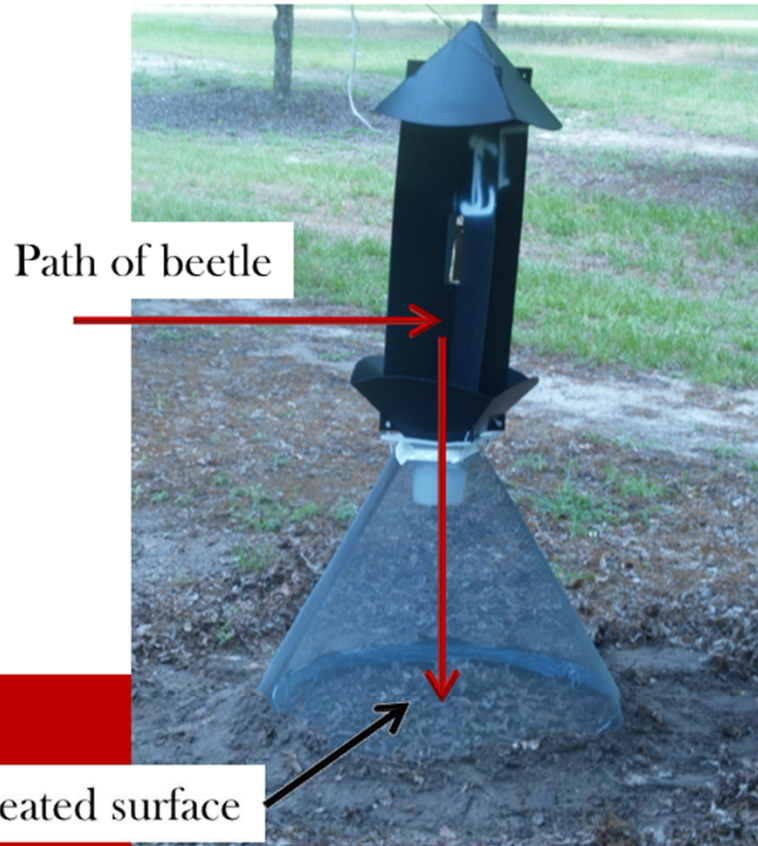


Lorsban Efficacy Trial



CHEMICAL CONTROL BIOASSAY

Since the adult beetles spend a long period digging through the soil chemical control may be possible to treat the soil with a long residual contact poison during adult emergence. Lorsban Advance (Dow) proved to be an effective control (92% mortality) in the field bioassays.



Each Square is 4x4 trees

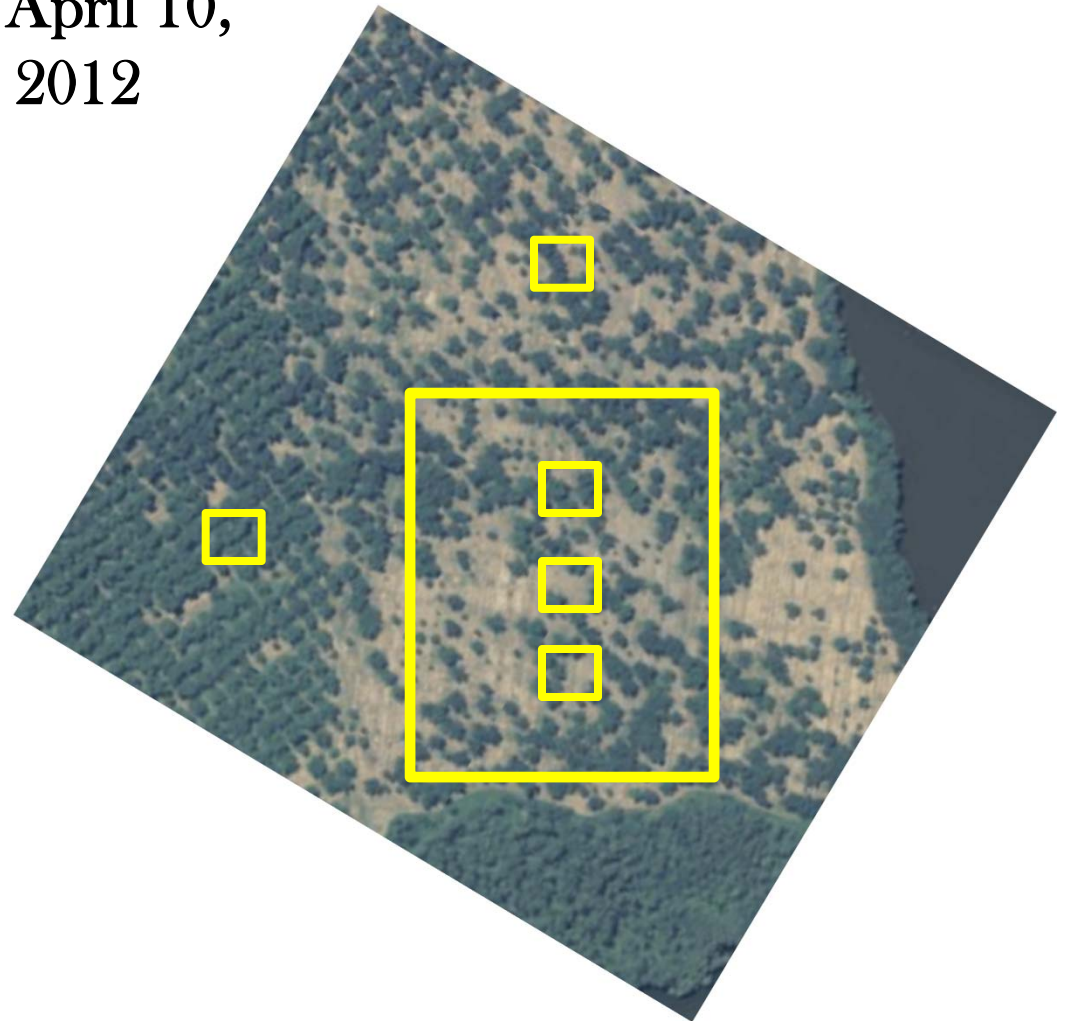
April 24

nt

Traps out
on April 10,
2012

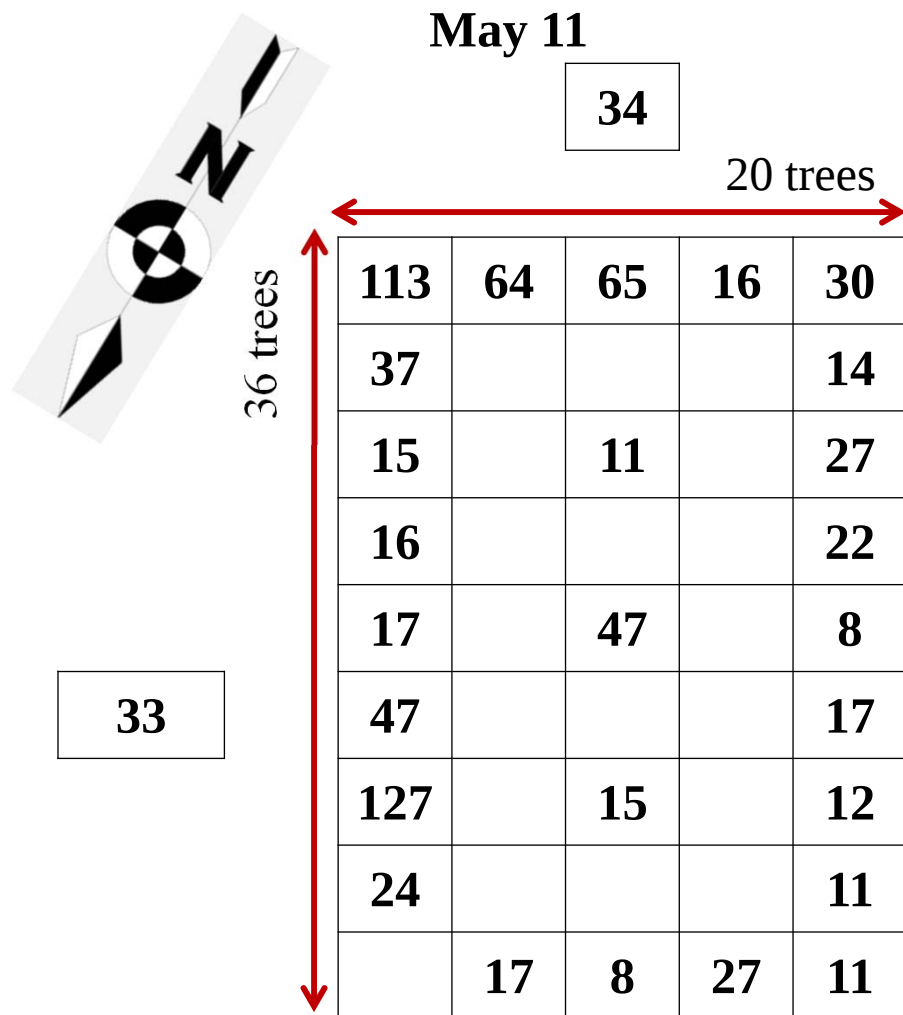
34	11	14	13	6
34				9
11		0		14
0				9
16		8		8
0				7
19		13		10
11				14
	13	4	1	3

nt



Mann-Whitney U-test statistics
Z = 0.8857 P = 0.3758

P. imbricornis trap catch at Crisp Co.



Mann-Whitney U-test statistics
 $Z = -0.3618$ $P = 0.7175$

May 25

4				
20	4	14	18	6
15				0
14		6		6
11				9
0		2		8
3				5
8		7		12
0				3
	5	1	9	14

Mann-Whitney U-test statistics
 $Z = -1.5307$ $P = 0.1259$

P. imbricornis trap catch at Crisp Co.

June 2

8

25	22	21	14	18
23				42
12		1		35
43				23
13		0		16
21				5
19		2		32
22				6
	16	12	11	32

5

June 15

32

13	23	6	0	33
37				14
15		5		6
16				4
17		0		0
12				2
10		0		5
4				16
	18	12	1	2

20

Mann-Whitney U-test statistics
Z = -2.7717 P = 0.0056

Mann-Whitney U-test statistics
Z = -1.9723 P = 0.0485

P. imbricornis trap catch Crisp Co.

July 24

0

1	0	6	2	0
2				0
0		0		0
0				0
1		0		0
3				0
3		0		0
1				0
	2	1	1	0

3

September 18

0

4	0	0	0	3
0				0
8		0		0
0				0
0		0		0
0				0
0		0		4
0				0
	10	2	0	3

0

Mann-Whitney U-test statistics
Z = -1.3969 P = 0.1625

Mann-Whitney U-test statistics
Z = -1.8841 P = 0.0596

Total trap catch by beetle species

All Season

Prionus imbricornis 78

210	124	126	63	96
148				79
75		25		88
86				67
64		57		40
86				36
186		30		72
62				50
	81	39	50	65

79

----- Mann-Whitney U-test statistics
 Z = -2.3684 P = 0.0179

All Season

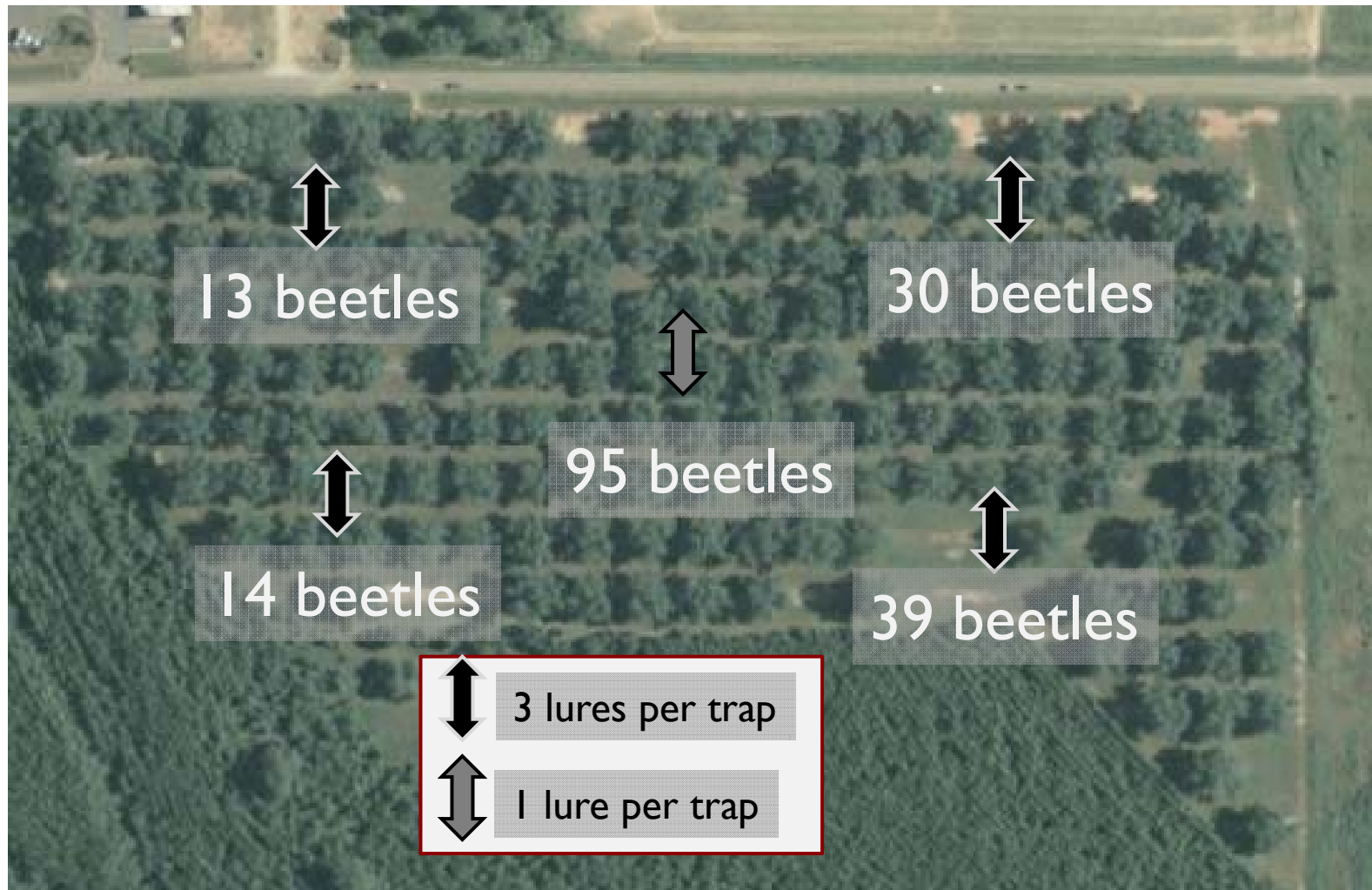
Prionus laticollis 8

5	0	3	4	2
0				14
4		0		2
11				1
1		0		0
2				17
5		0		1
0				0
	0	1	3	4

5

----- Mann-Whitney U-test statistics
 Z = -2.0974 P = -.0360

24-acre Peach Co. Orchard - 2012 Season



► Source of map: Google Earth 2013 Digital Globe

Alpha-pinene baited pitfall traps with Insect-o-Slip® treated inner walls

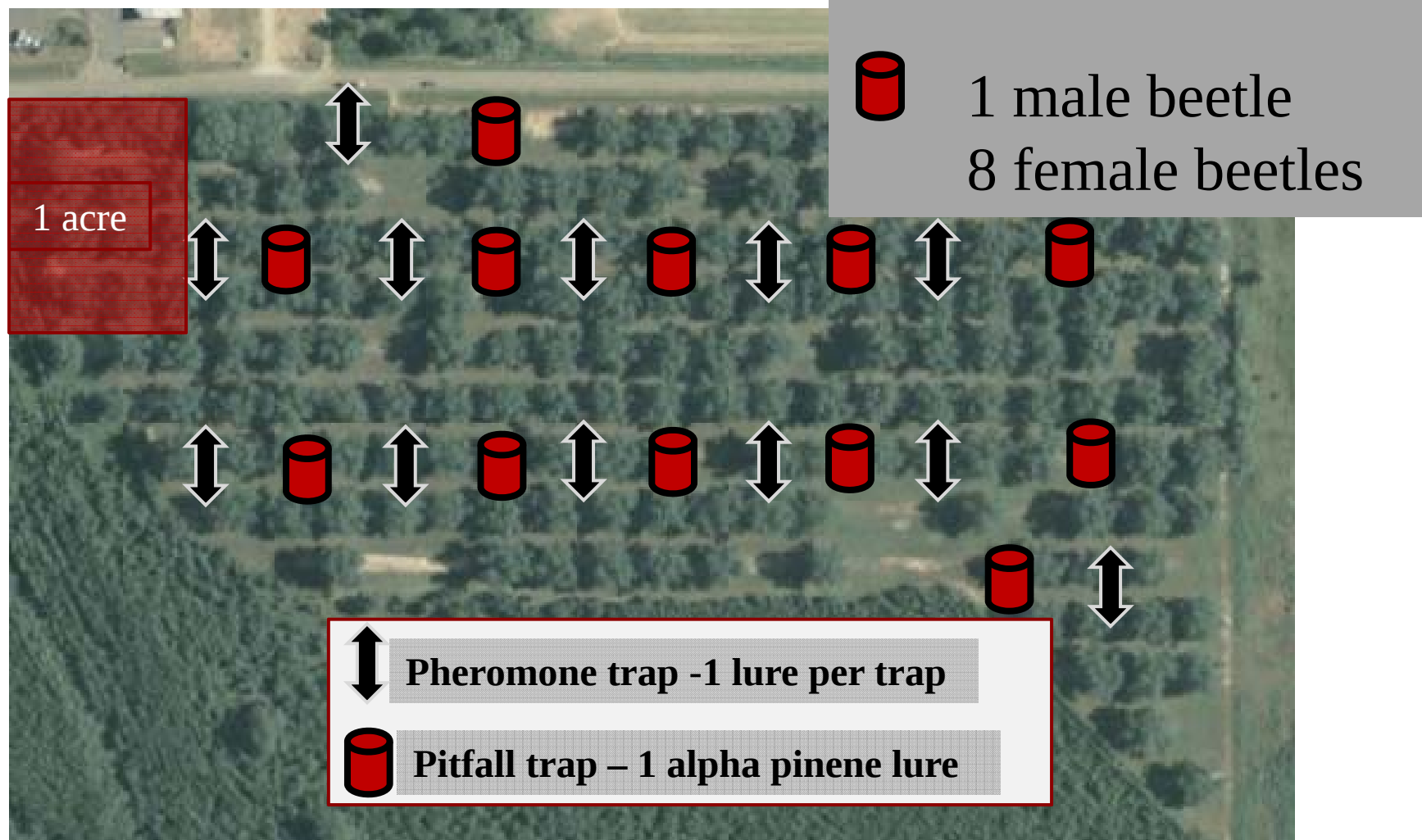


Alpha-pinene attracts
female *Prionus* beetle.

Live female remains in trap
one week and the number
of males is recorded.

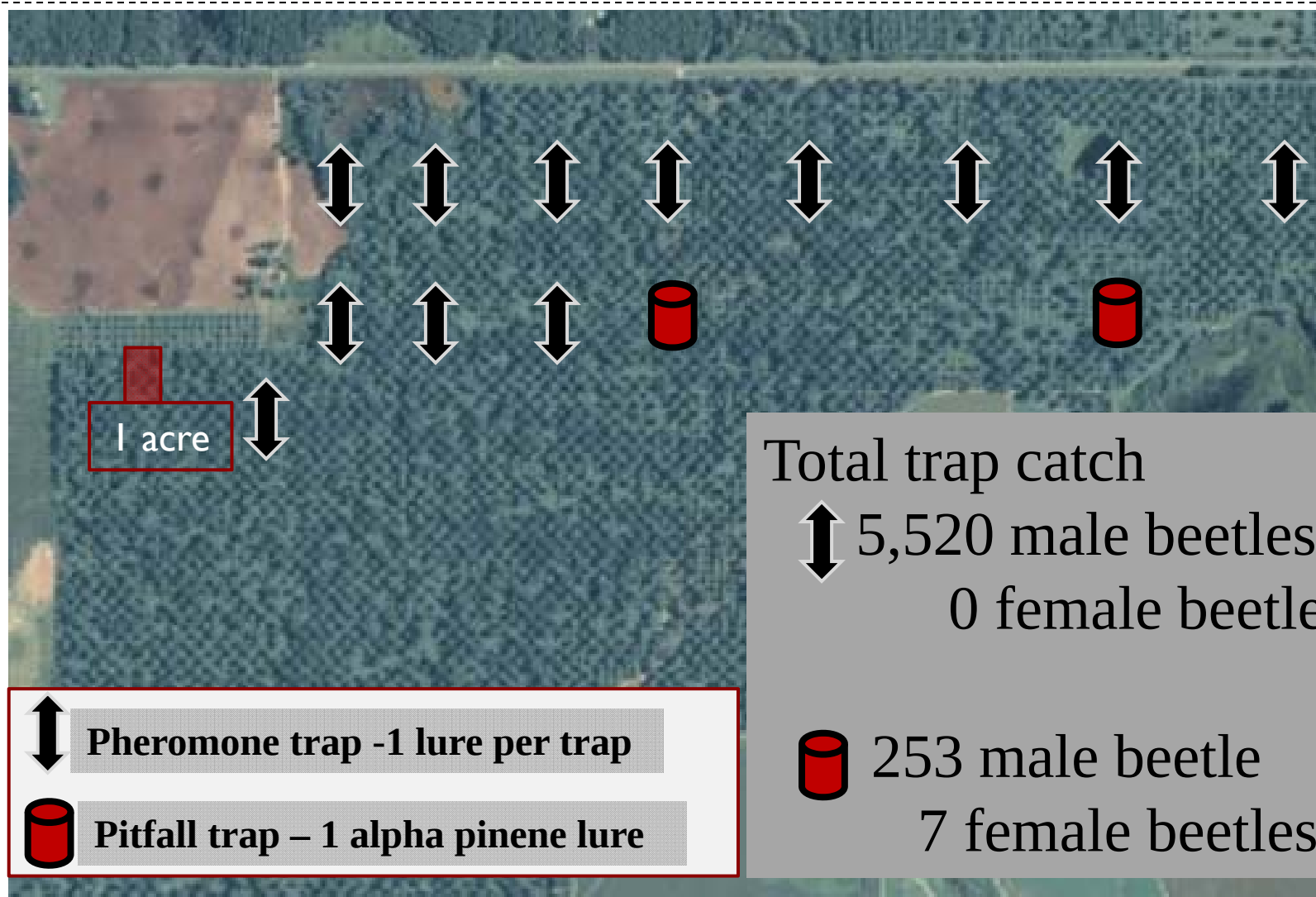


Peach Co. Orchard – 2013



► Source of map: Google Earth 2013 Digital Globe

Nilo Plantation, Albany, GA -2013



► Source of map: Google Earth 2013 Digital Globe

Summary and Conclusions

1. Tilehorned prionus (98% of beetles sample) and broadnecked root borer adult males were attracted to the California prionus pheromone lures in Georgia pecans from late April thru July.
2. One pheromone lure will last for at least 6-7 weeks.
3. Chlorpyrifos at the ant-control rates as a soil application has a 93% efficacy against the adult male beetles.
4. Peripheral traps collected more adult males than traps in the center of 60 acre orchard encircled by pheromone-baited traps.
5. No males were attracted to live females in pitfall traps among pheromone-baited traps at a density of 1 trap per 2 acres. Males were attracted to live females in pitfall traps among pheromone-baited traps at a density of 1 trap per 24 acres.

Acknowledgement

- Cooperating Pecan Growers and Agent:
 - Nilo Plantation (Mitchell Co.)
 - Cannon Farms (Crisp Co.)
 - Lane Packing Co. (Peach Co.)
 - Wade Farms (Fitzgerald, GA)
 - UGA Coop. Extension - Scott Carlson (Ben Hill Co.)
- Student Workers: Jamie Wilson, Paul Tyson
- Funding: USDA/NIFA; Georgia Agricultural Commodity Commission for Pecans, Cannon Farms
- Discount on lures: Contech Inc., manufactures the lures
- Spray Materials donated by Dow AgroSciences

QUESTIONS?

