

Alfalfa Weevil Resistance Management

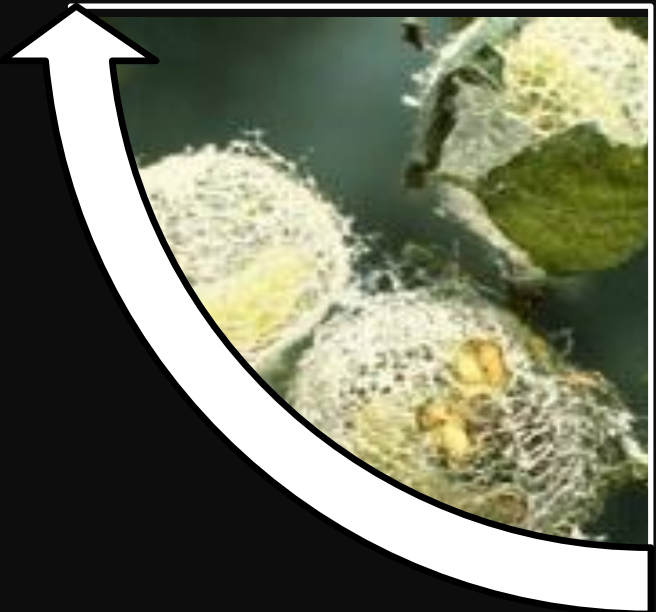
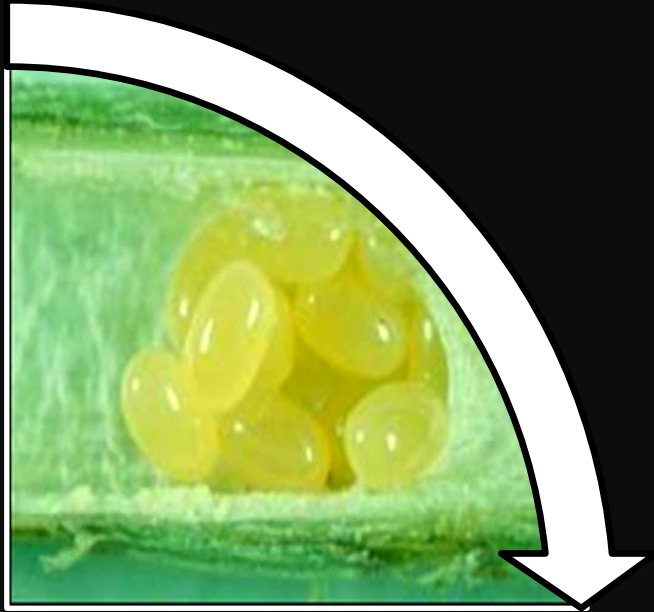
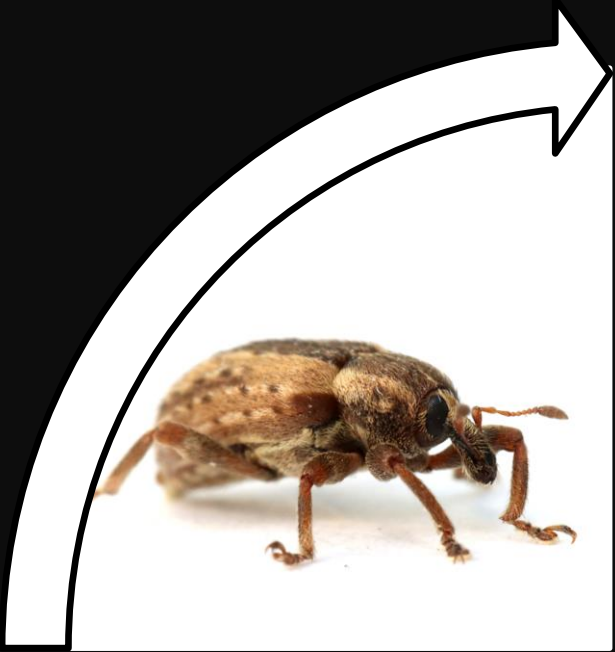
Ian Grettenberger, Madi Hendrick – UC Davis/UCANR

Kevin Wanner, Erika Rodbell – Montana State Univ.

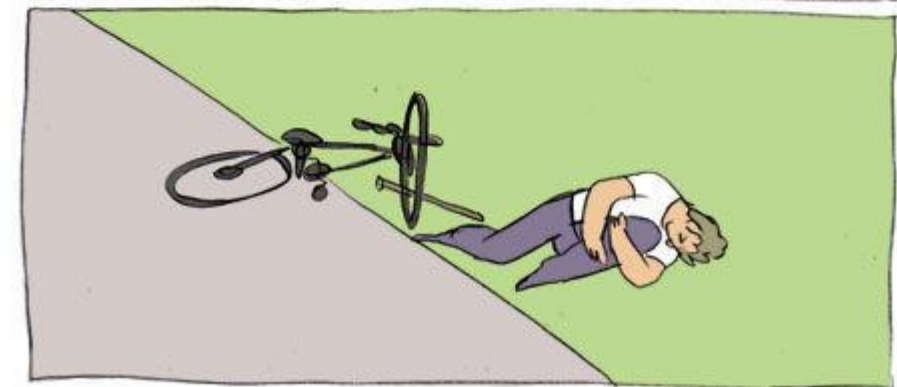
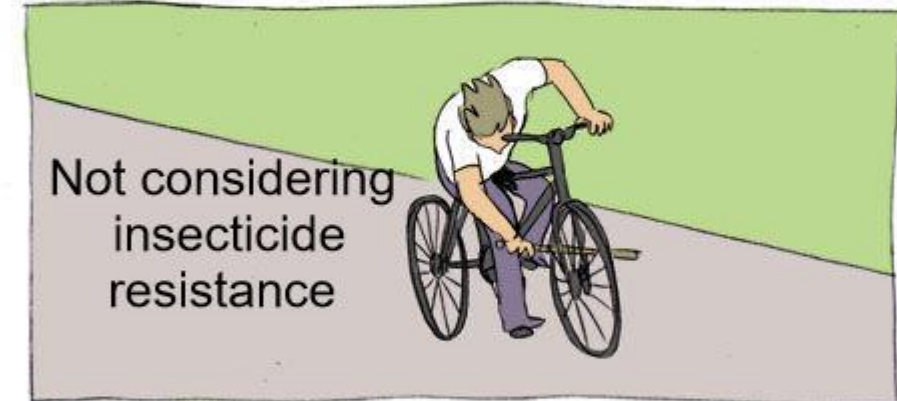






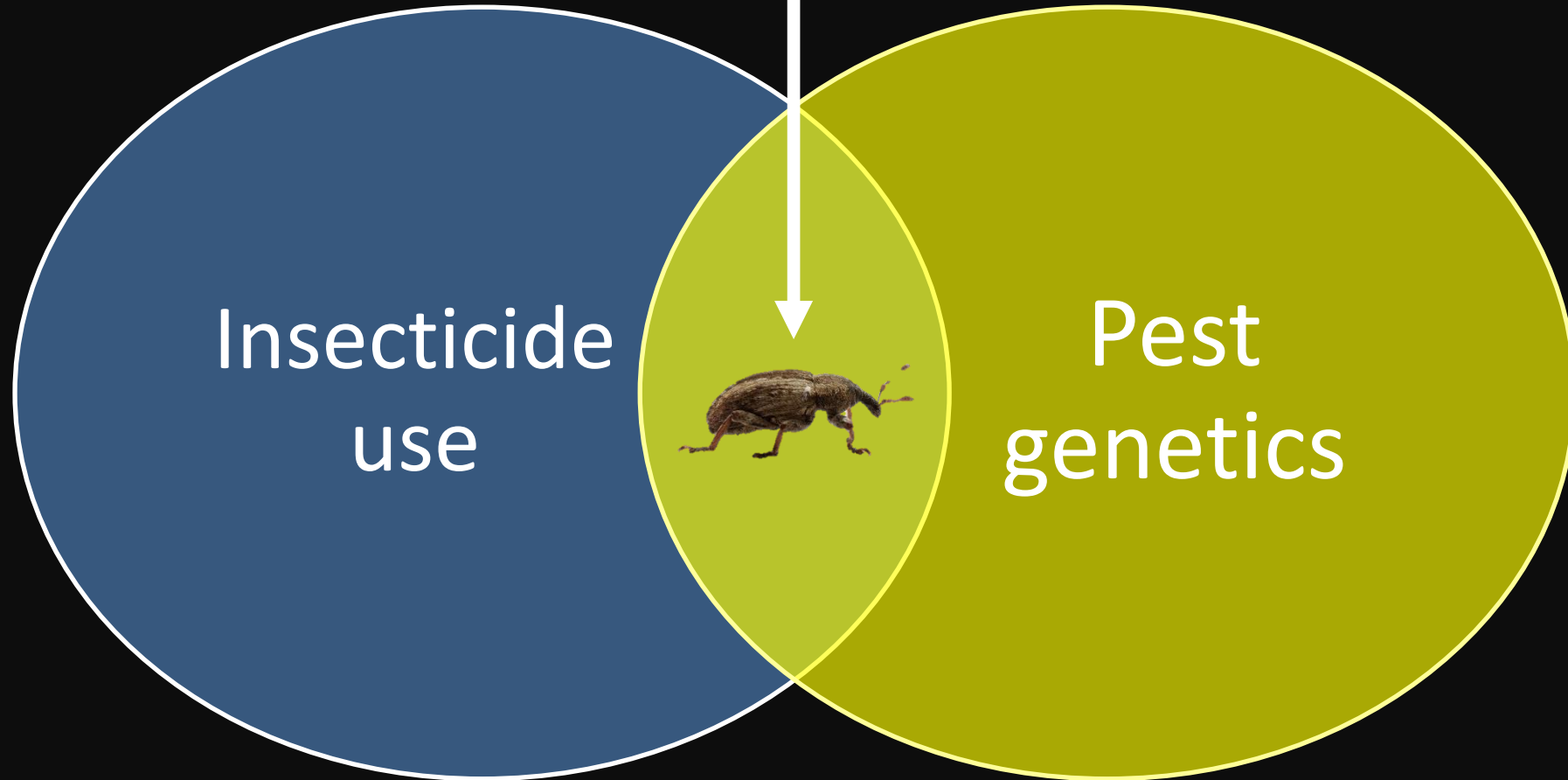


Why care about resistance?



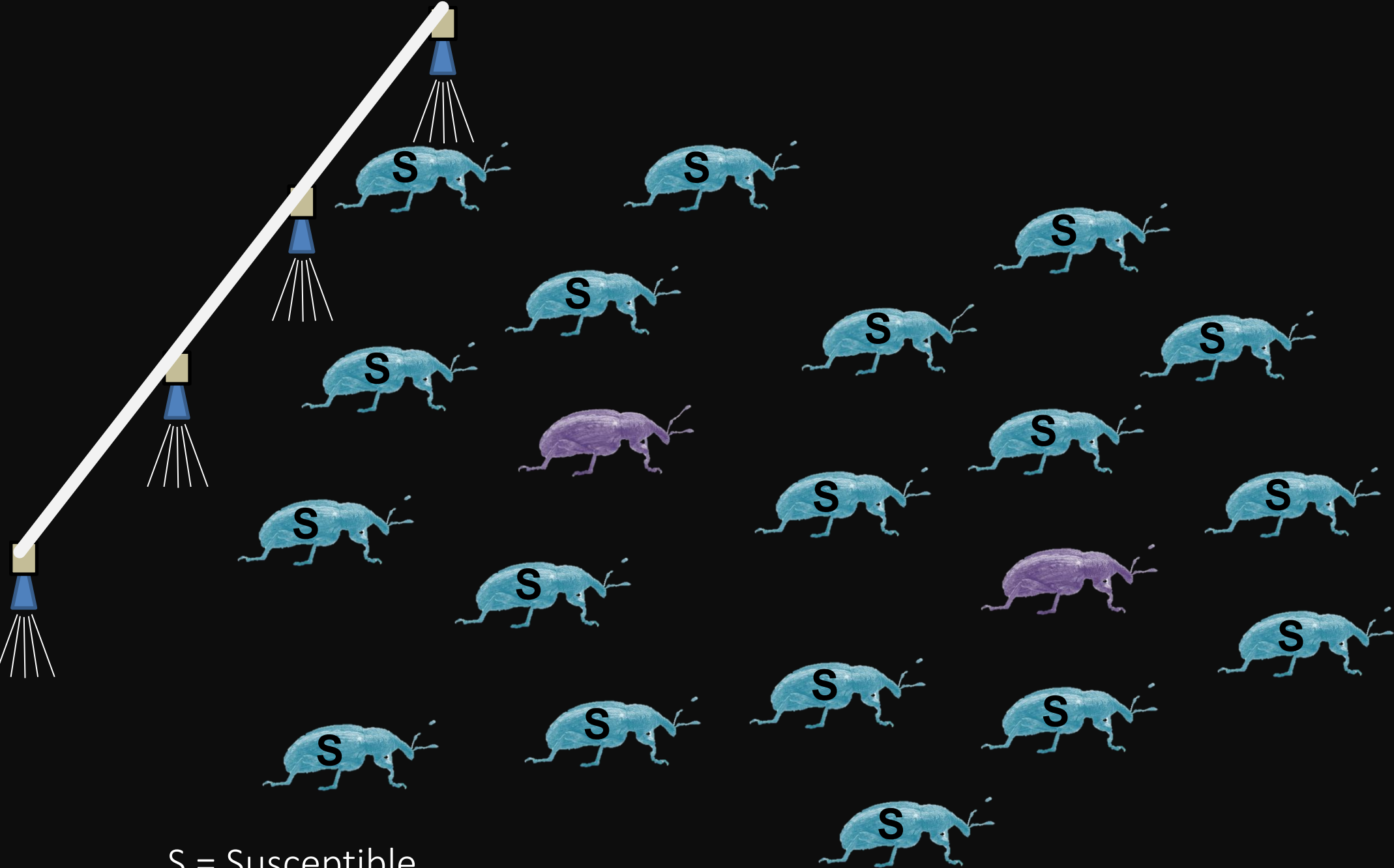
How does insecticide
resistance develop?

Insecticide resistance



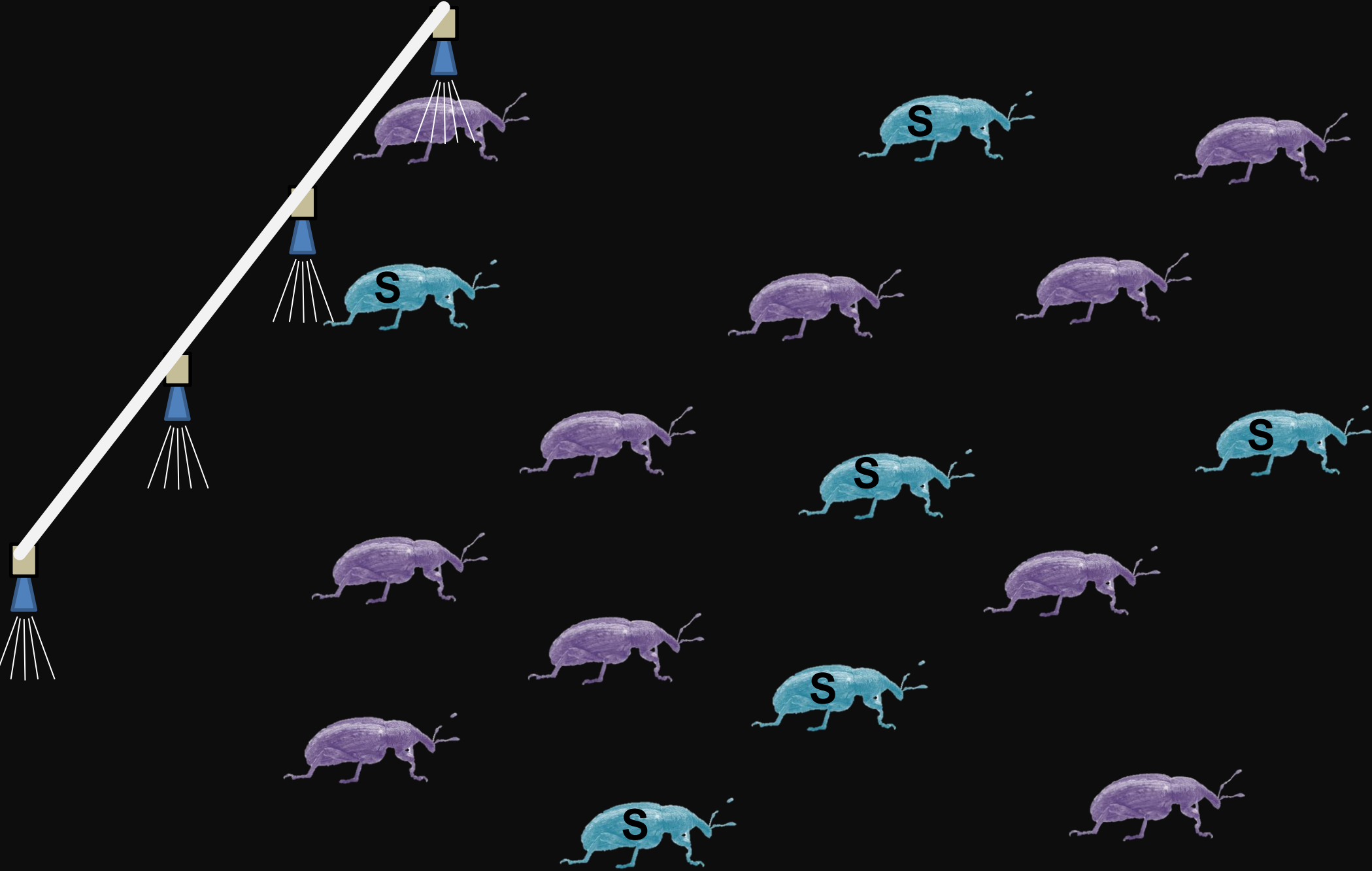
Insecticide
use

Pest
genetics

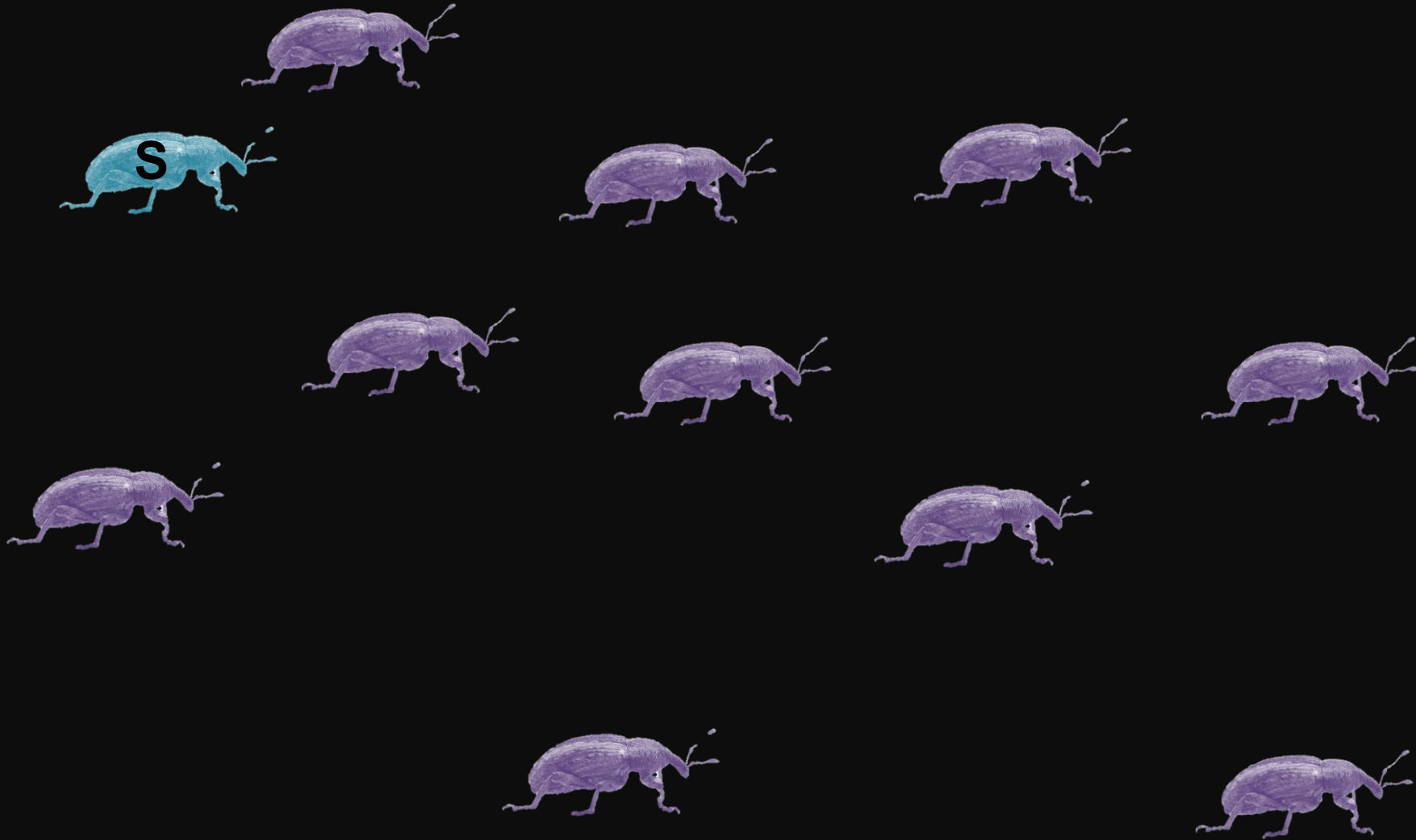


S = Susceptible





Resistant population



Problem: Pyrethroid-resistant alfalfa weevils



"We've had to learn to live with higher levels"

Insecticide resistance is not a new issue

Ab-edi-kin-cal-ter-ear-ift-ne-en-oid-ect-kes-is-oy.
on-ing-m-nia-be-nal-re-his-ity-on
P.-J.-in

TREATS 2000 SQUARE FEET
NET CONTENTS ONE PINT

ORTHO[®] 195

DIELDRIN

SPRAY

KILLS
ANTS, LAWN MOTHS (Sod Webworms), WHITE GRUBS,
GRASSHOPPERS and many other Lawn and Ornamental Soil Insects



ANT LAWN MOTH EARWIG

Active Ingredients By Wt.

Hexachloro-epoxy-octahydro-dimethano
naphthalene (from Dieldrin) 15.8%

Related Compounds (from Dieldrin) 2.8%

Aromatic Petroleum Derivative Solvent 73.4%

Inert Ingredients 8.0%

...cash by the bushel for Orland Manternach!

HEPTACHLOR
soil insecticide
Increases corn yield
35 bushels
per acre!

HEPTACHLOR YIELD CHECK NO. 761

Orland Manternach feeds 700 to 800 hogs a year on his 400 acre farm near Cascade, Iowa. Last season, he planted 110 acres of corn, and gained 35.4 bonus bushels per acre by using Heptachlor soil insecticide.

	STAND COUNT PER ACRE	YIELD BUSHELS/ ACRE CORRECTED TO 15.5% MOISTURE
HEPTACHLOR	14,300	138.0
CHECK	17,800	102.6
INCREASE WITH HEPTACHLOR	1,500	35.4



HEPTACHLOR PAYS—If cash returns were measured as corn yields are, you'd find that Heptachlor soil insecticide would give you bushel after bushel of "money in the bank." Heptachlor protection often makes 4 acres produce as much as 5 untreated acres. And most of the yield increase is profit, because the cost of treatment is often as low as \$1.00 per acre.

SOIL INSECT CONTROL—Soil insect damage causes root injury, reduced stands, poor ear development, and lodging. Heptachlor prevents this damage. Treated corn grows well and stands straight. You can pick it at maximum safe speeds. Heptachlor kills all major soil insect pests of corn. You can apply it broadcast or in the row, in granular or liquid form, or in liquid or dry fertilizer mixtures. To save time and work, application can be combined with other operations.

BUSHELS BETTER—Heptachlor gives corn more protection per pound. It's easier to handle, too, and has no unpleasant odor. For further information, request folder 503-30.

VELSICOL CHEMICAL CORPORATION
330 East Grand Avenue • Chicago 11, Illinois
EXCLUSIVE BASIC MANUFACTURERS OF TECHNICAL HEPTACHLOR

ask for
HEPTACHLOR
SOIL INSECTICIDE

SEED TREATERS . . . for extra protection during germination.
Just mix HEPTACHLOR with seed in planter box!





GROUP 3 INSECTICIDE

Warrior II

with Zeon Technology®

Insecticide

Active Ingredient:

Lambda-cyhalothrin^{1,2} 22.8%

Other Ingredients: 77.2%

Total: 100.0%

Warrior II with Zeon Technology contains 2.08 lbs. of active ingredient per gal. and is a capsule suspension.

¹CAS No. 91465-08-6 ²Synthetic pyrethroid

Contains petroleum distillate.

KEEP OUT OF REACH OF CHILDREN. WARNING / AVISO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

See additional precautionary statements and directions for use in booklet.

EPA Reg. No. 100-1295 EPA Est. 39578-TX-1

Product of the United Kingdom
Formulated in the USA

**SCP 1295A-L2B 0709
304012**

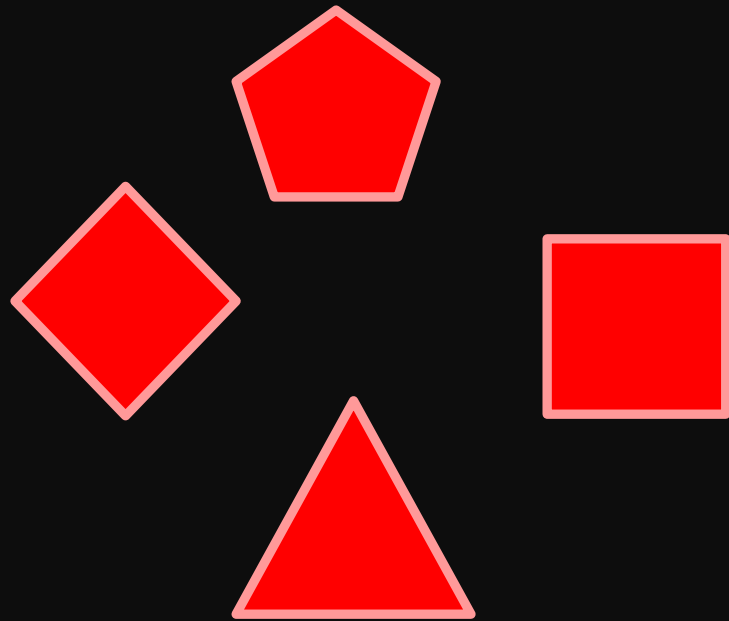
1 gallon

Net Contents

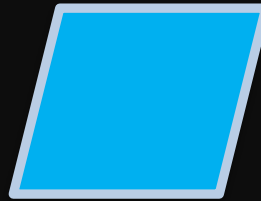
syngenta®

Problem: Limited modes of actions

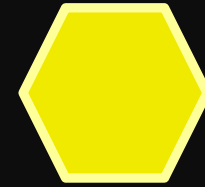
Pyrethroids (3A)



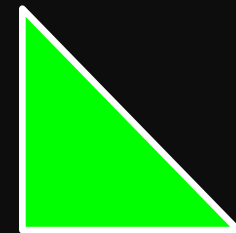
Oxadiazines – Indoxacarb (22A)



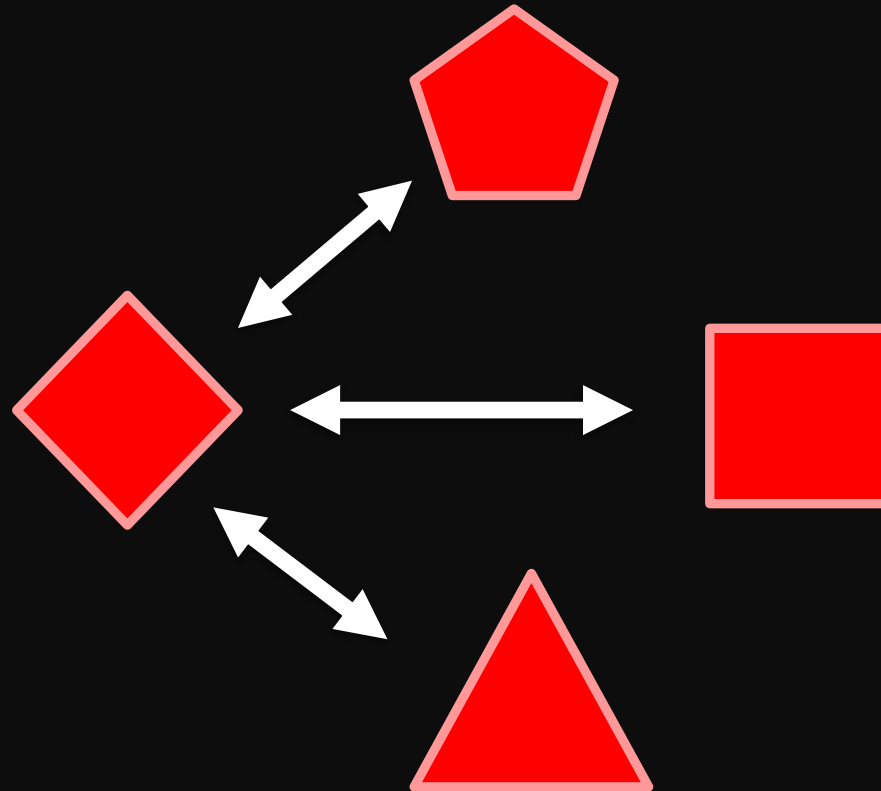
Spinosyns – Spinosad (5)



Organophosphates –
malathion (1B)



Pyrethroids (3A)





RESISTANT ALFALFA WEEVIL

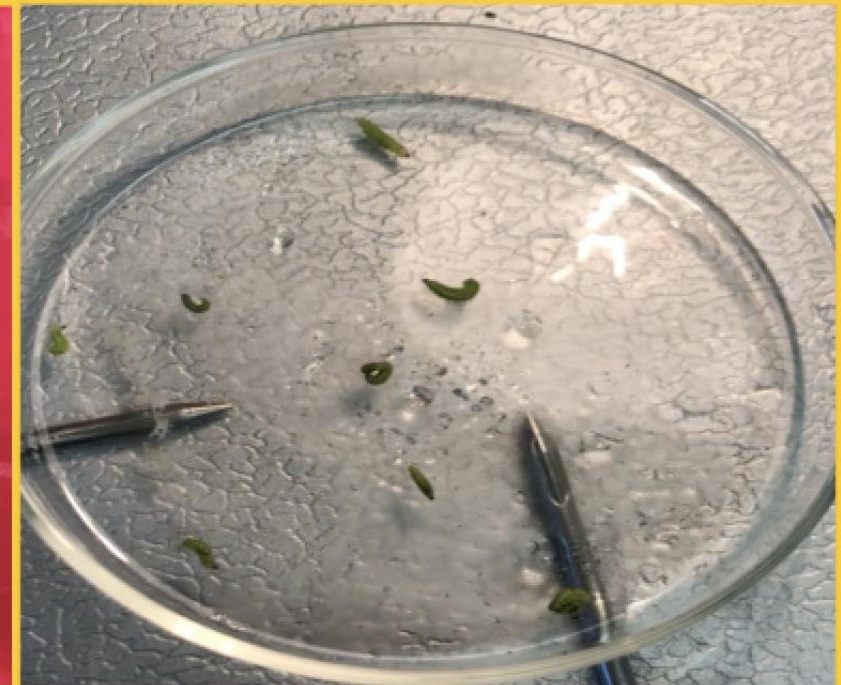
Ten 3rd to 4th instar larvae placed in treated glass vials



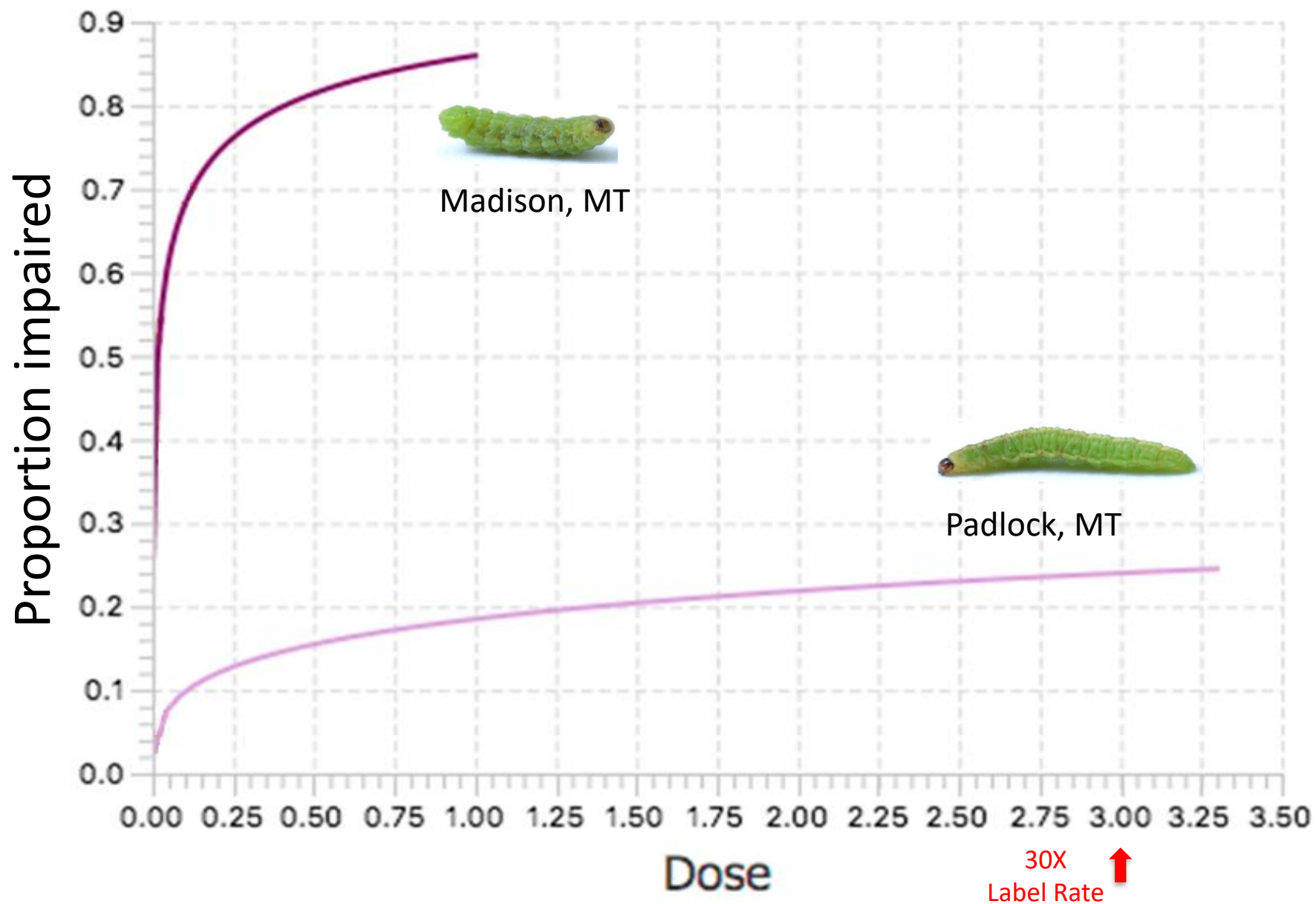
Five vials per dose maintained at 21°C for 24 hours

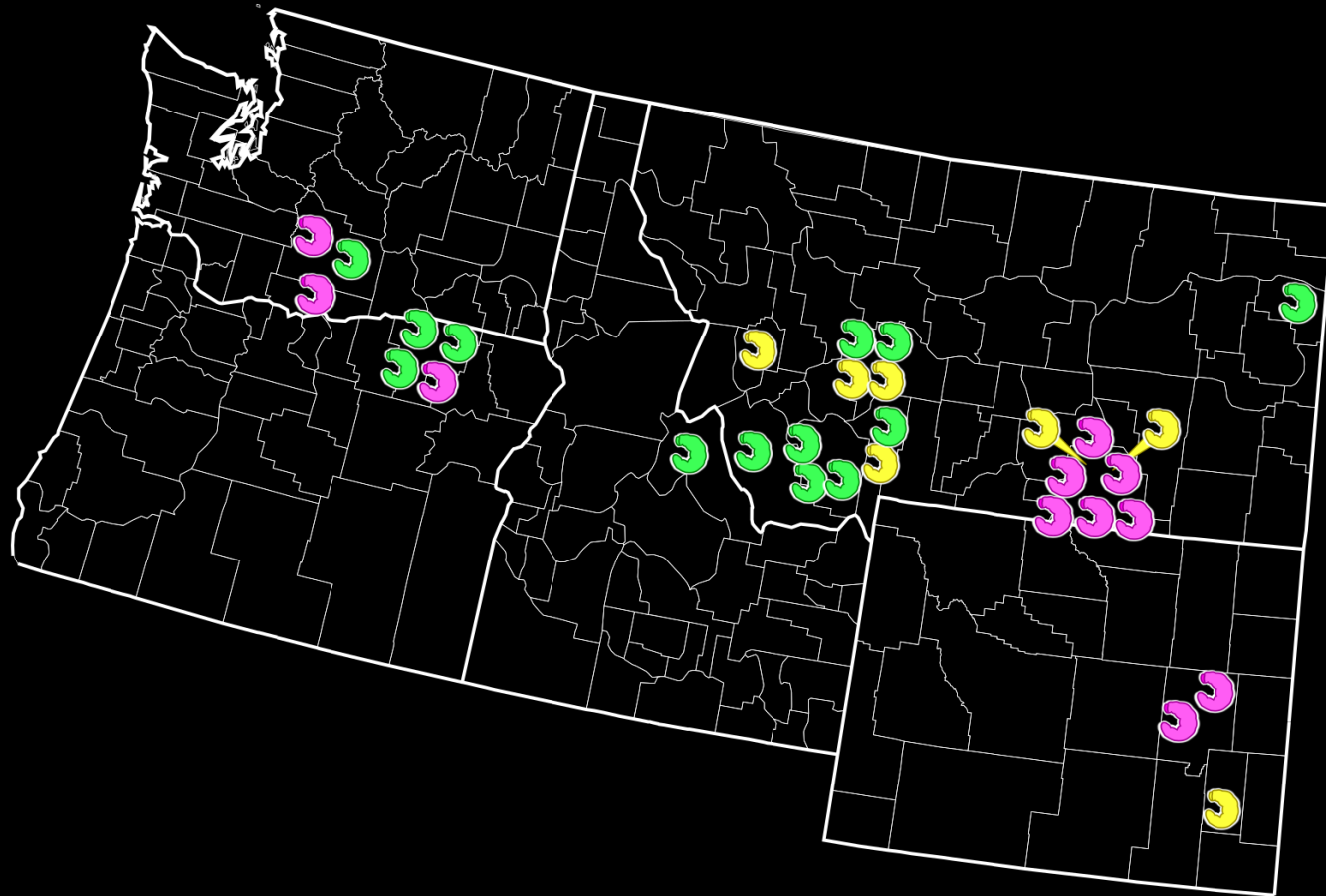
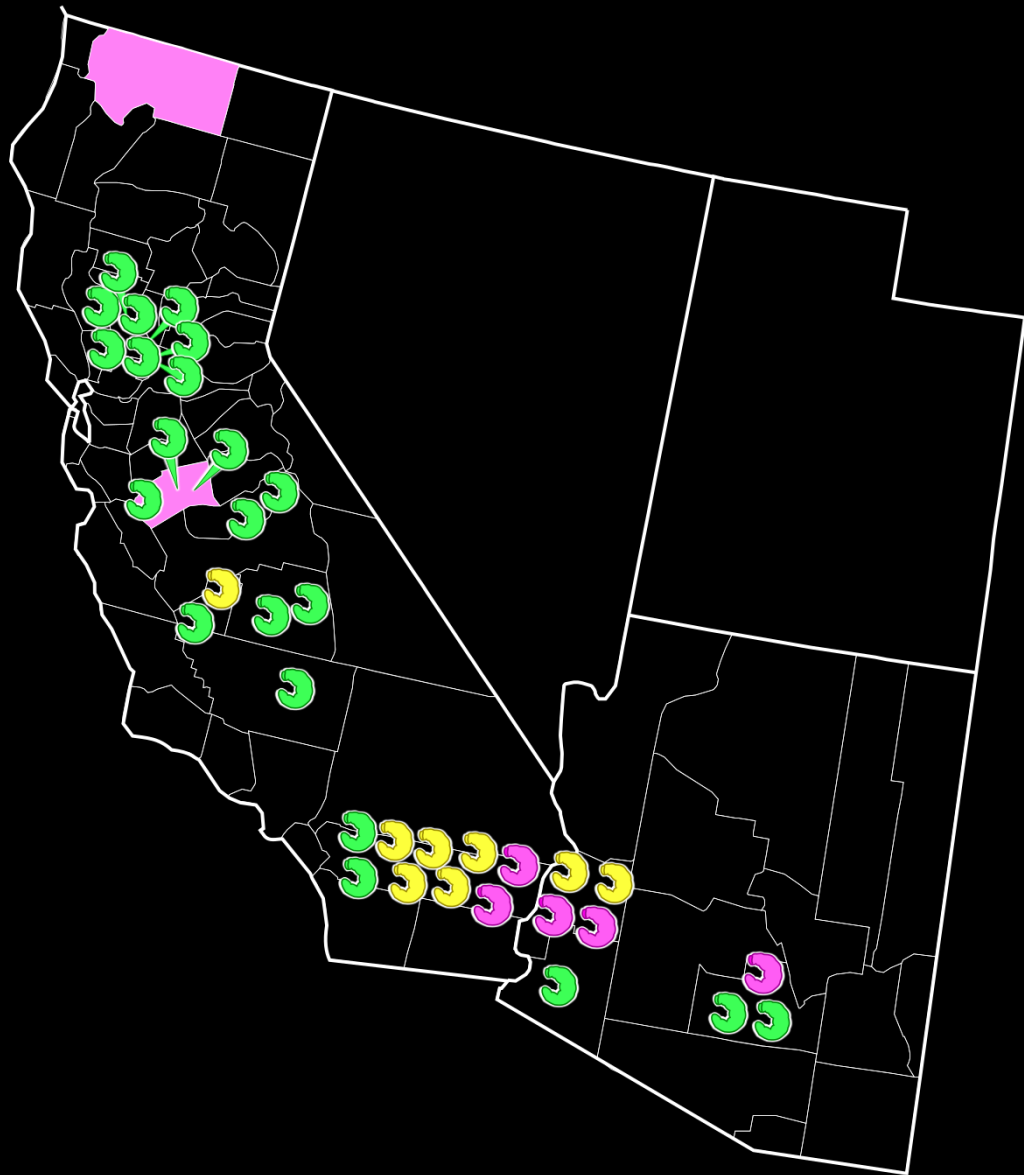


Exposed treated larvae to 43-50°C to determine # dead



Susceptible vs. resistant populations





	Resistance category	LC ₅₀ (μg/cm ²)
	Susceptible	0 - 0.3
	Moderate	0.3 - 1
	High	> 1

Frequency of sites

1.00
0.75
0.50
0.25
0.00

0.0

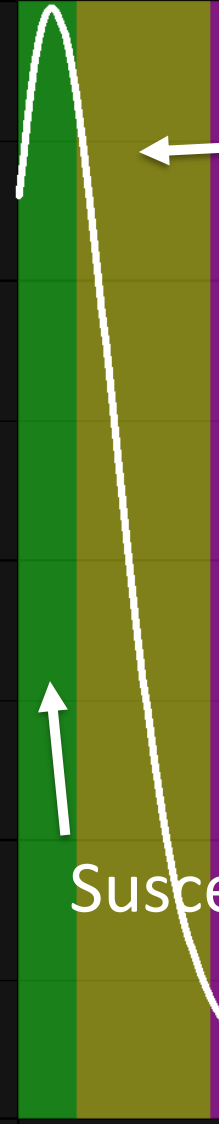
2.5

5.0

7.5

10.0

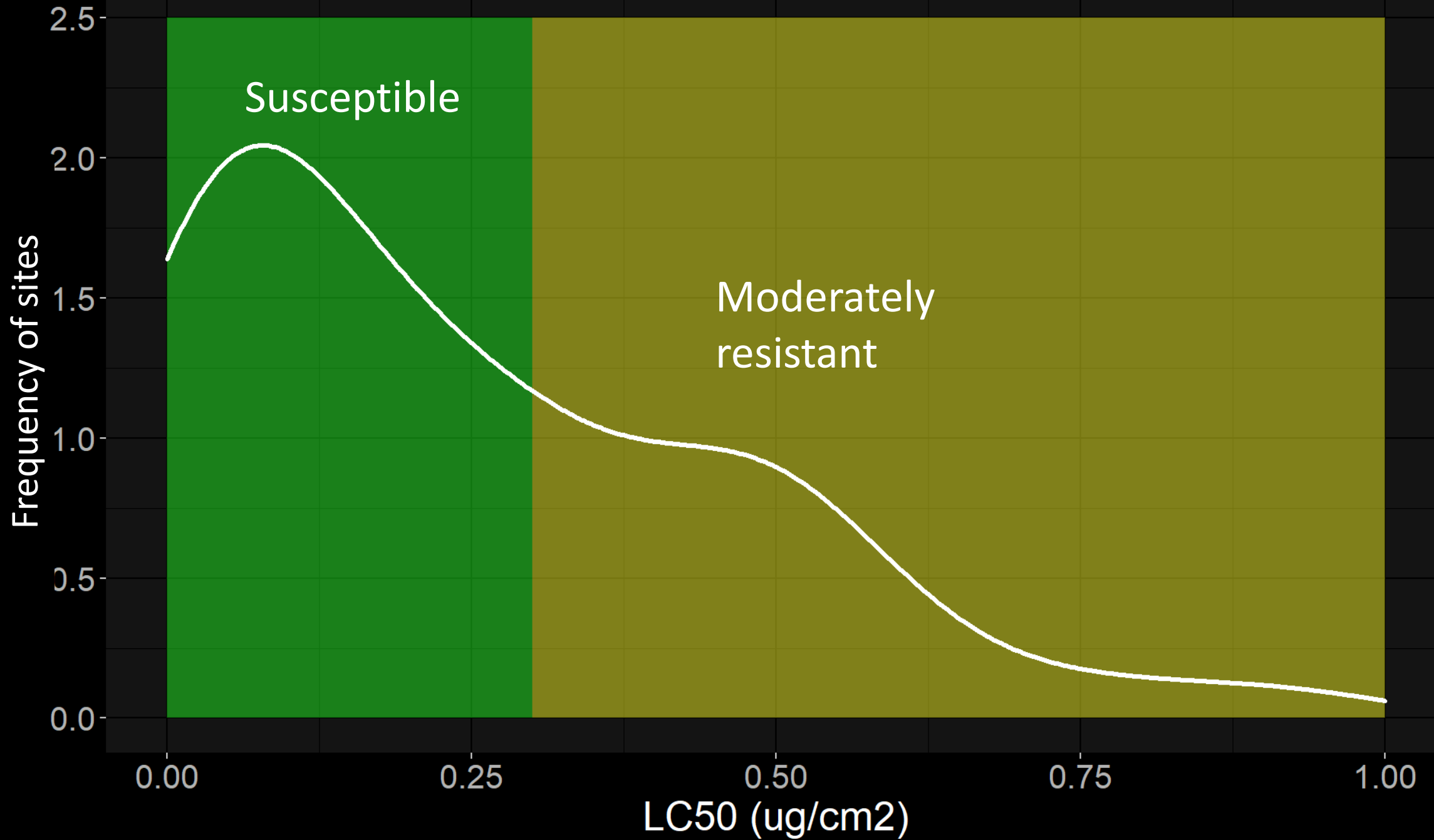
LC50 (ug/cm2)



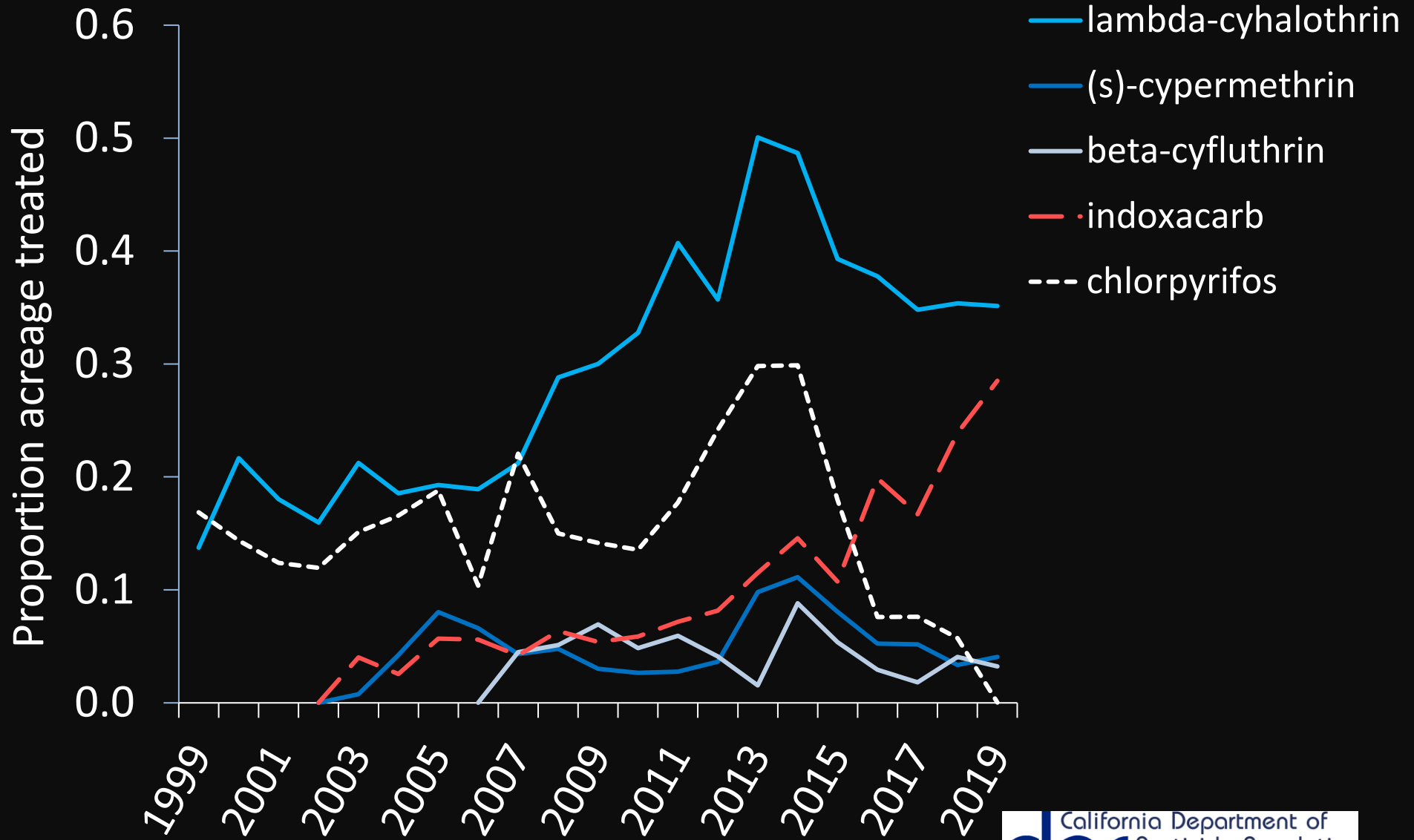
Moderately resistant

Highly resistant

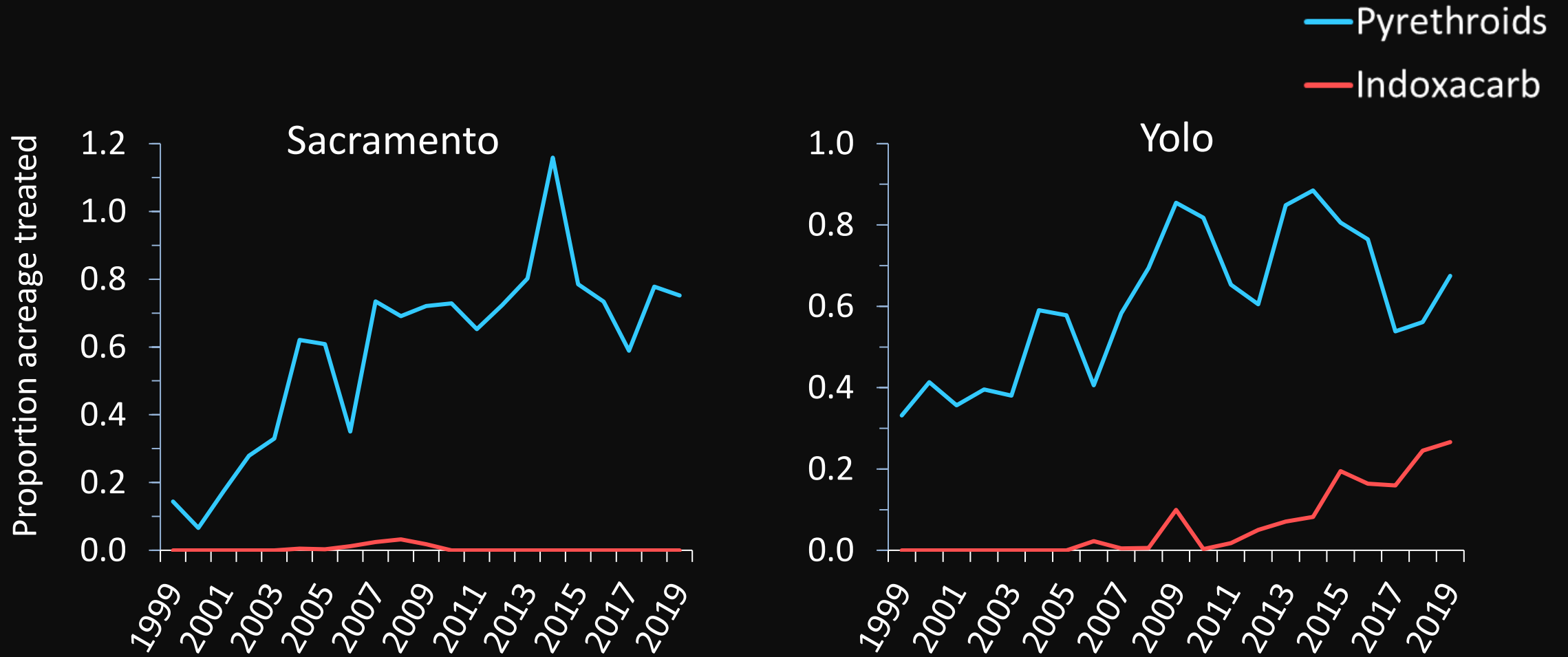
Susceptible



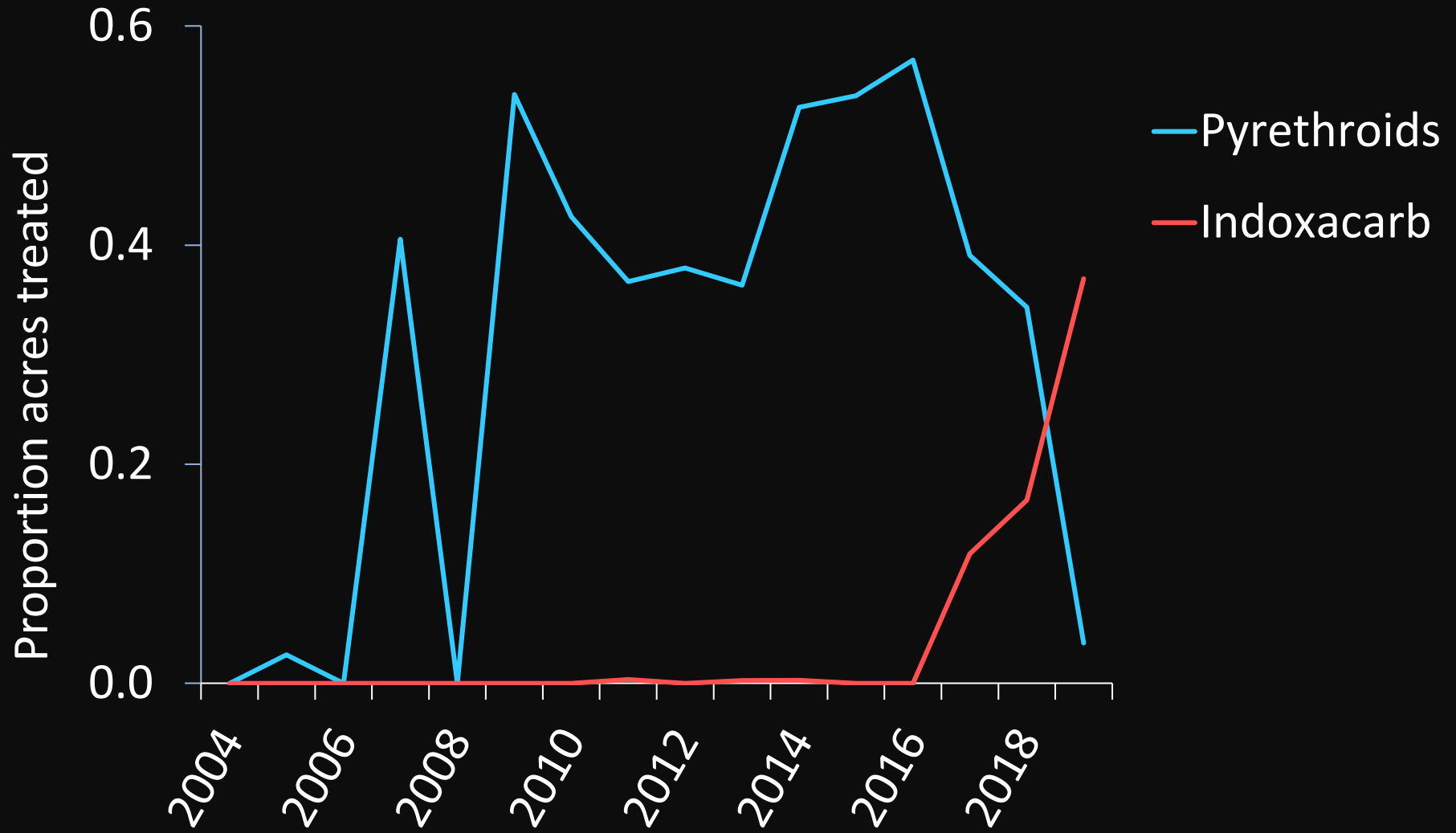
What have we seen in CA for insecticide use?



Generally sustained pyrethroid use

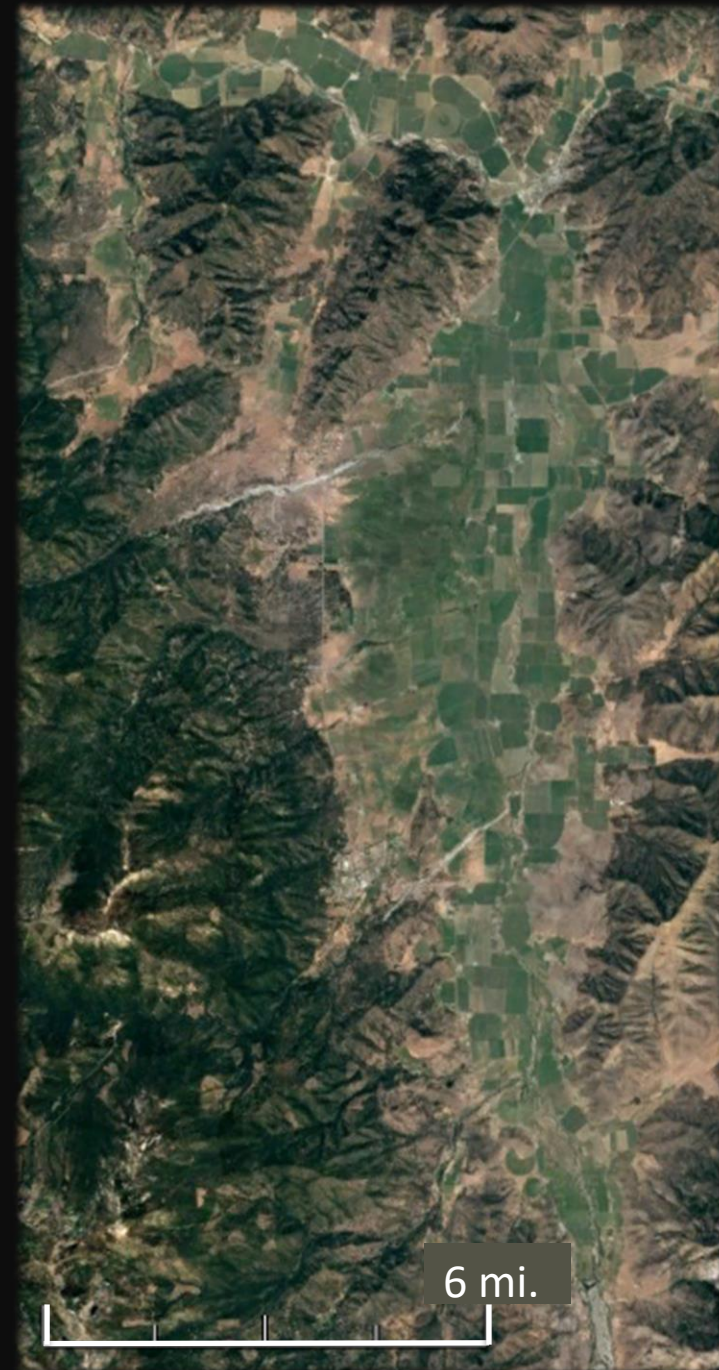


Siskiyou



How does resistance spread...
how far, how quickly?

- Plenty of uncertainty
- In intensive alfalfa areas + smaller scales: rapidly
- Otherwise, appear to be strong local effects...initially

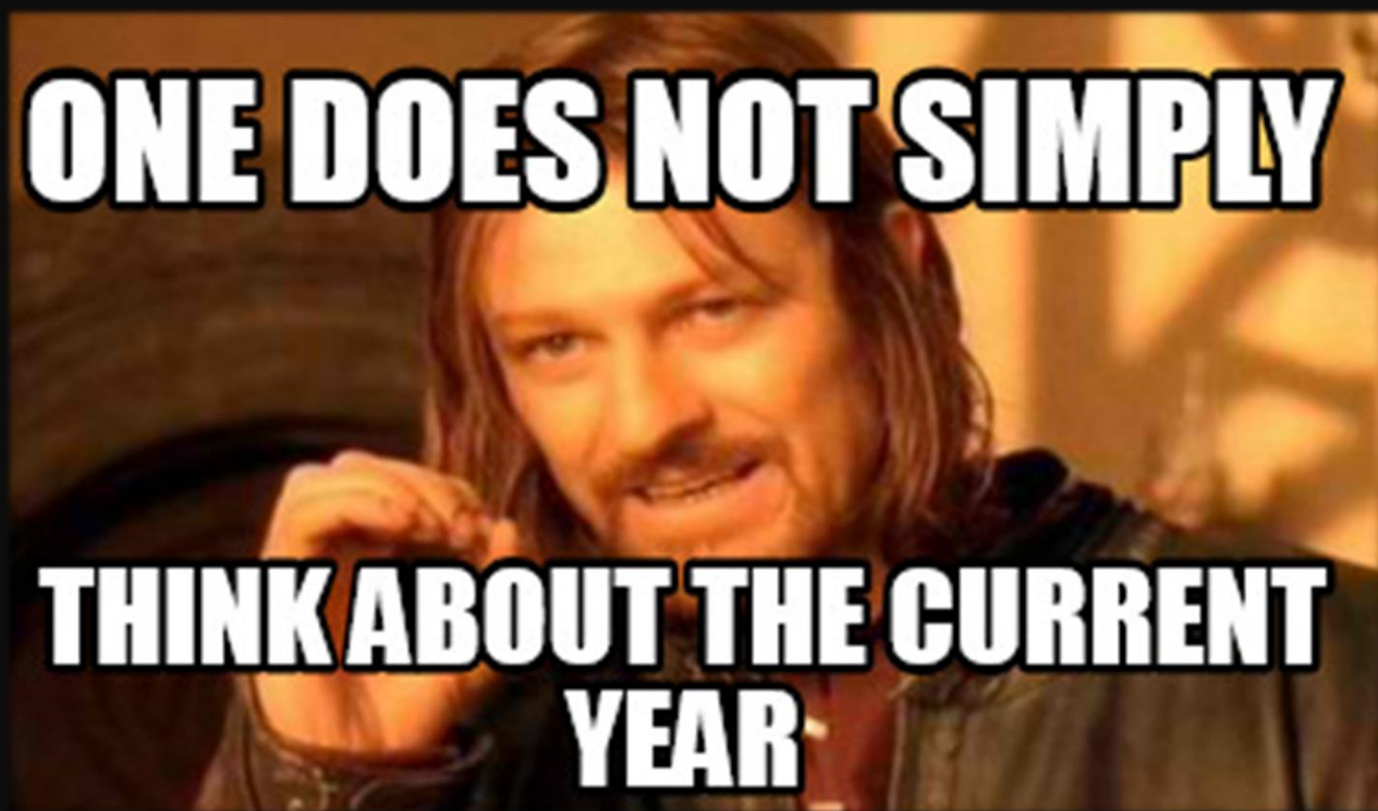


What do we have to look forward to?

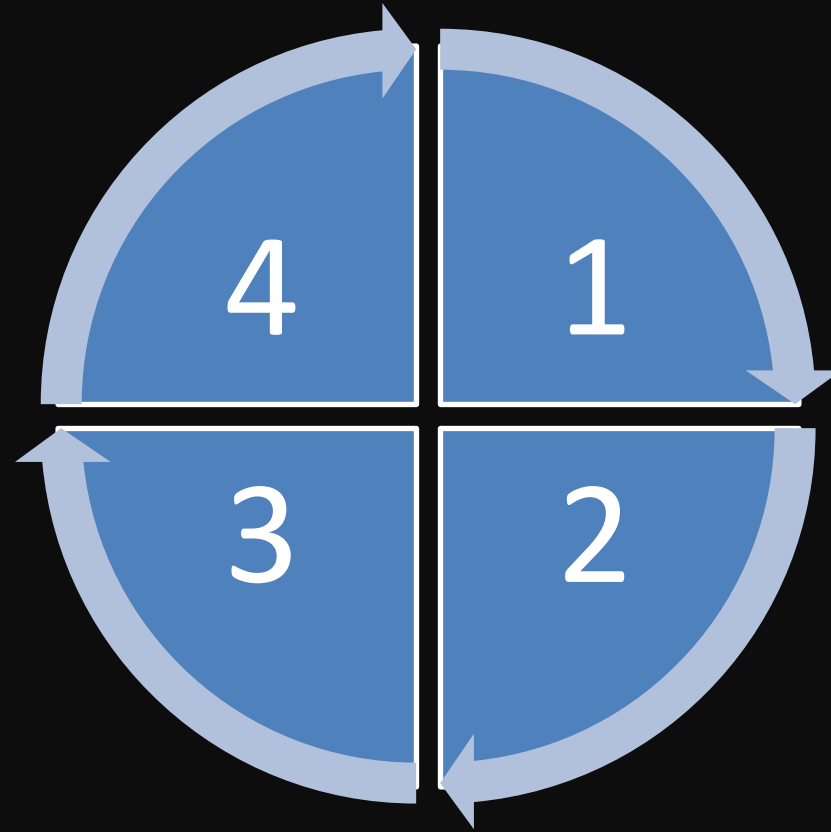
- Resistance across the landscape
- Likely not a lot of future chemicals
- DO have susceptibility in the landscape
- Need to make BEST use of current tools



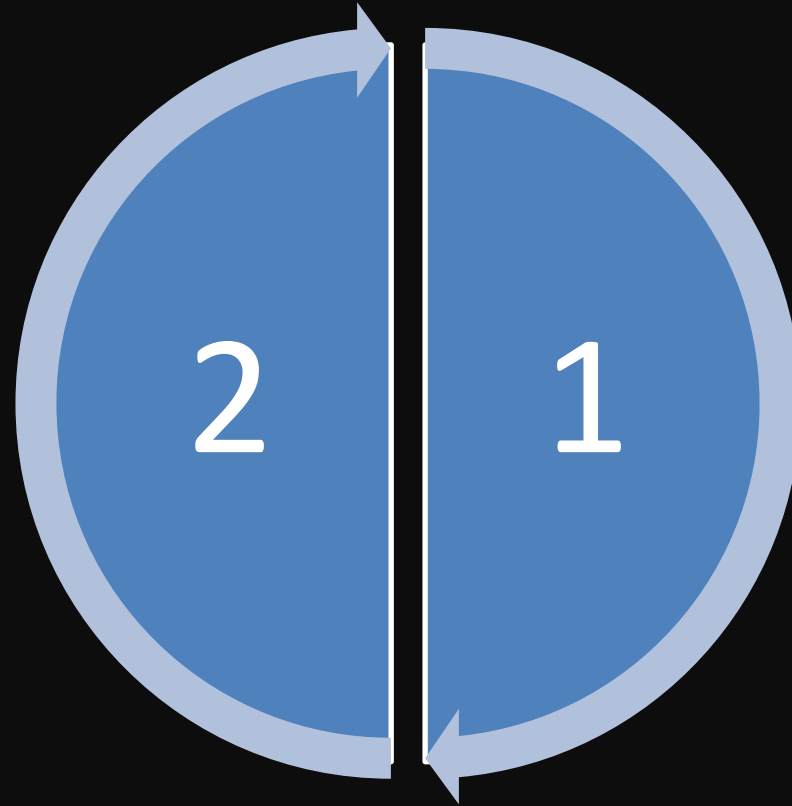
What can we do?



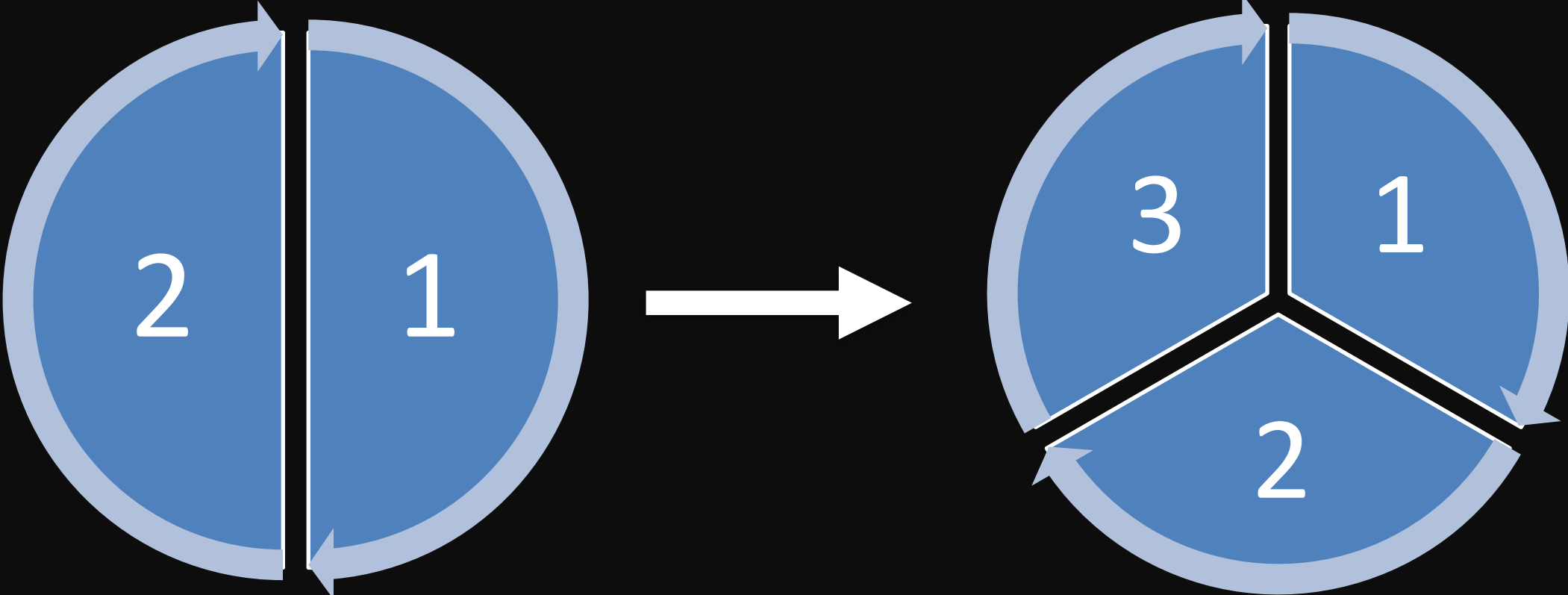
Rotation is necessary



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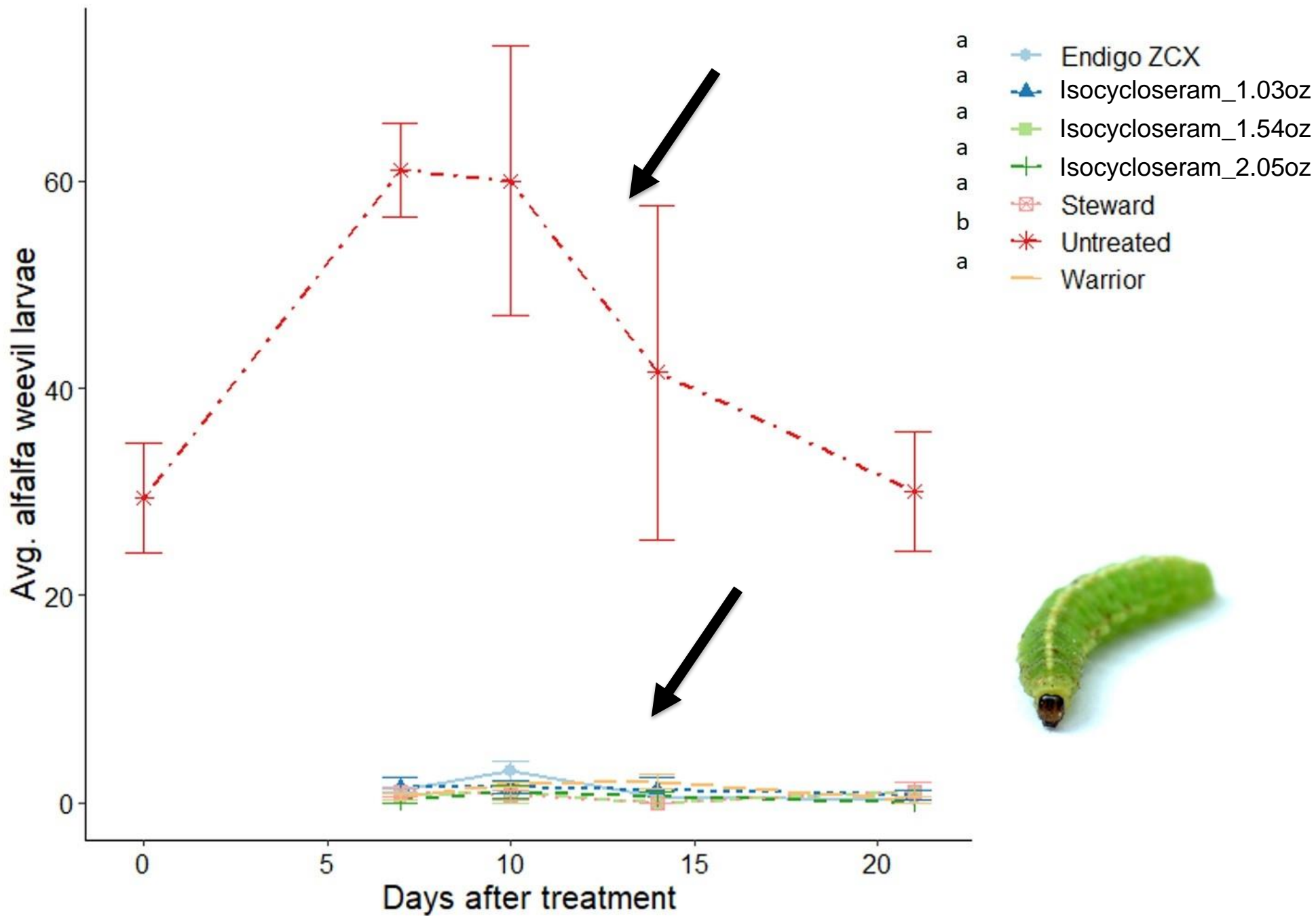
Rotation is necessary







Syngenta:
PLINAZOLIN®
Group 30



~~Reactive~~
Proactive



Acknowledgements



- Madi Hendrick (UCD)
- Kevin Wanner (Montana State)
- Erika Rodbell (Montana State)
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- Michelle Leinfelder-Miles (Delta)
- Michael Rethwisch (Imperial)
- Kevin Goding (UCD)
- Treanna Pierce (UCD)
- Omir Livneh (UCD)
- Growers/PCAs
- Rob Wilson + IREC crew



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