

INSECT PESTS WITH PIERCING-SUCKING MOUTHPARTS (APHID COMPLEX, LEAFHOPPERS, MITES)



UC
CE

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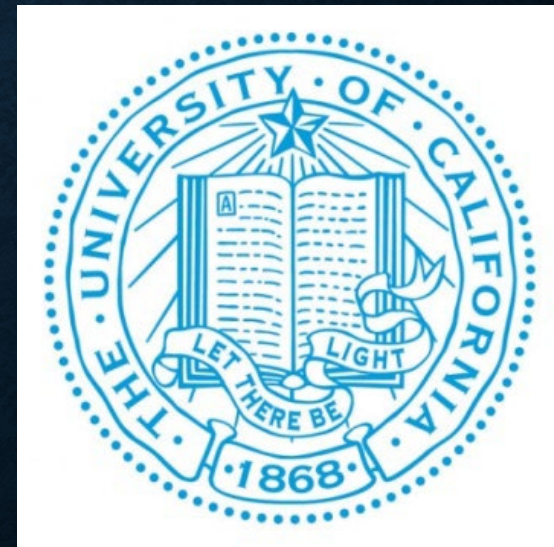
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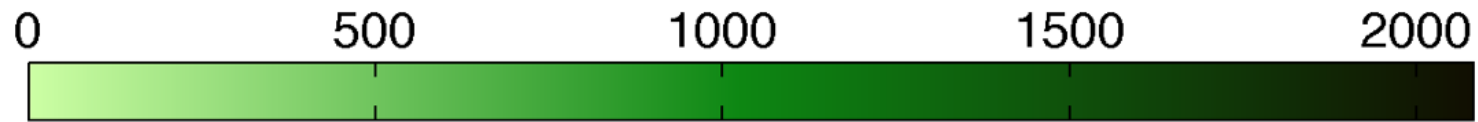
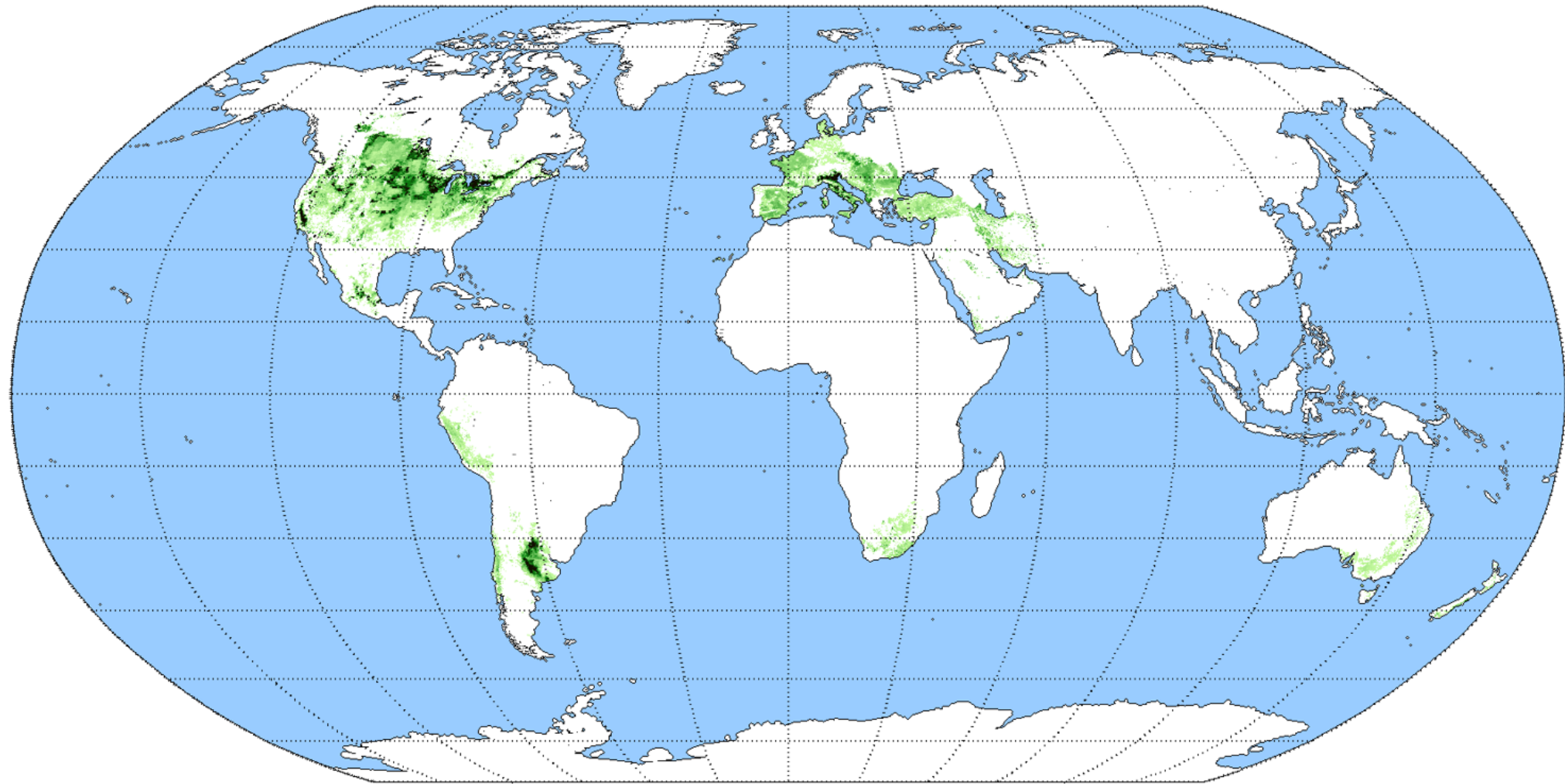
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Average regional alfalfa output (q/ha)

MAP OF ALFALFA PRODUCTION (AVERAGE PERCENTAGE OF LAND USED FOR ITS PRODUCTION TIMES AVERAGE YIELD IN EACH GRID CELL) ACROSS THE WORLD COMPILED BY THE UNIVERSITY OF MINNESOTA INSTITUTE ON THE ENVIRONMENT WITH DATA FROM: MONFREDA, C., N. RAMANKUTTY, AND J.A. FOLEY. 2008. FARMING THE PLANET: 2. GEOGRAPHIC DISTRIBUTION OF CROP AREAS, YIELDS, PHYSIOLOGICAL TYPES, AND NET PRIMARY PRODUCTION IN THE YEAR 2000. GLOBAL BIOGEOCHEMICAL CYCLES 22: GB1022

ALFALFA INSECT PESTS WITH PIERCING-SUCKING MOUTHPARTS

HAY/FORAGE

- APHIDS
- LEAFHOPPERS
- PLANT BUGS
- SPIDER MITES
- WHITEFLIES
- TREEHOPPERS

SEED

- LYGUS BUGS
- SPIDER MITES
- STINKBUGS
- APHIDS

MAJOR INSECT PESTS WITH PIERCING-SUCKING MOUTHPARTS

HAY/FORAGE

APHIDS

LEAFHOPPERS

PLANT BUGS

SPIDER MITES

SEED

• LYGUS BUGS

• SPIDER MITES

MAJOR INSECT PESTS WITH PIERCING-SUCKING MOUTHPARTS

HAY/FORAGE

APHIDS

LEAFHOPPERS

PLANT BUGS

SPIDER MITES

SEED

• LYGUS BUGS

• SPIDER MITES

APHIDS



- Fairly unique among insects in that they give birth to live aphids
- **New aphids in spring/summer are all female**
- Very short period before reproduction begins (<7 days of age)



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APHIDS



- Aphids can give birth to 5-7 aphids per day for about a 2 week period
- These factors can result in very large aphid populations!
- Aphids form wings when stress is detected during development (overcrowding, nutritional stress, etc.)



ALFALFA
WITH NUMEROUS
APHIDS ON
STEM AND
LEAVES/
PETIOLES
WHEN APHIDS
FREELY
REPRODUCE/ LOW
MORTALITY



FOUR (4) ALFALFA APHID SPECIES THAT ARE SIGNIFICANT PESTS AROUND THE WORLD

- *Acyrtosiphon pisum* – Pea Aphid
- *Acyrtosiphon kondoi* – Blue Alfalfa Aphid/Lucerne Aphid
- *Aphis craccivora* – Cowpea Aphid
- *Therioaphis trifolii* – Spotted Alfalfa Aphid

FOUR (4) MOST COMMON ALFALFA APHID SPECIES (LARGEST TO SMALLEST)



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PEA APHID

Acyrtosiphon pisum



BLUE ALFALFA APHID

Acyrtosiphon kondoi



COWPEA APHID

Aphis craccivora



**SPOTTED
ALFALFA
APHID**

*Therioaphis
trifolii*

APHIDS DAMAGE ALFALFA VIA TWO MAJOR MECHANISMS

REMOVAL OF PLANT JUICES (*all aphid species*)

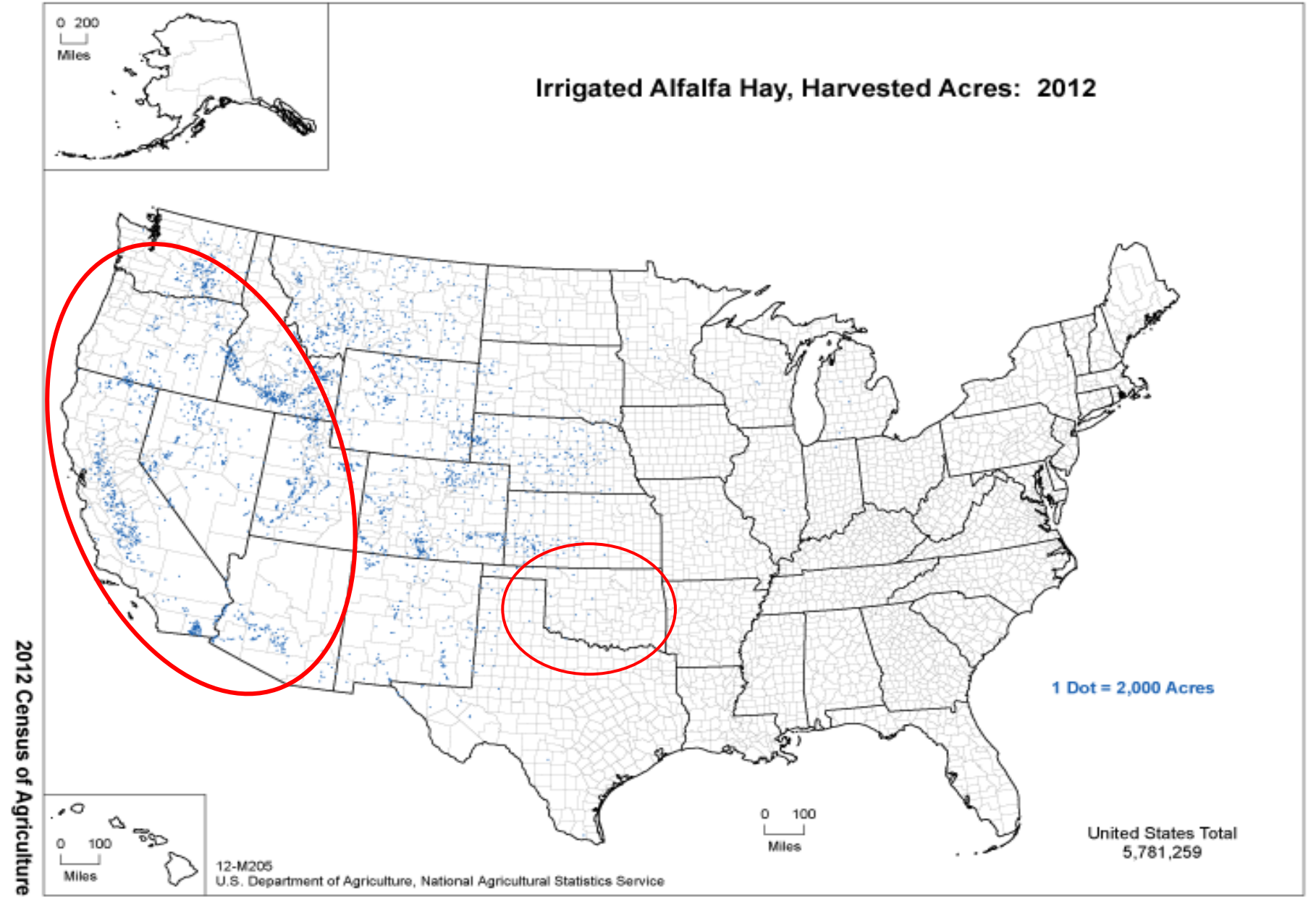
**INJECTION OF TOXINS INTO PLANTS WHILE
FEEDING** (3 of the 4 species (all but *Acyrtosiphon
pisum* – Pea Aphid))

BLUE ALFALFA APHID



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IN THE UNITED STATES, THE BLUE ALFALFA APHID IS PRIMARILY A PEST OF ALFALFA IN THE SOUTHERN/WESTERN REGIONS



BLUE ALFALFA APHID VS. PEA APHID

Blue Alfalfa Aphid

Acyrtosiphon kondoi



Pea Aphid

Acyrtosiphon pisum



WHY DOES THE BLUE ALFALFA APHID POSE A THREAT TO ALFALFA PRODUCTION?



- Unlike the pea aphid, the blue alfalfa aphid injects a toxin while it feeds. Crop loss can occur with larger plants and/or severe injury/death of small plants with small numbers of aphids

DAMAGE FROM APHID FEEDING, 2019



MIS-SHAPEN STEMS, YELLOWED/DESICATED LEAVES, CAST APHID SKINS, AND BLACK MOLD ON LEAVES ASSOCIATED WITH 'HONEYDEW'



**SINCE 1978 A MAJOR EFFECTIVE
INTEGRATED PEST MANAGEMENT TOOL
FOR BLUE ALFALFA APHIDS
HAS BEEN THE USAGE OF
HIGHLY RESISTANT (OVER 50% RESISTANCE)
ALFALFA VARIETIES**

ALFALFA VARIETY RESISTANCE LEVELS

| Resistance Level | | % Resistant Plants | % Susceptible Plants |
|-------------------------|----------------------------|---------------------------|-----------------------------|
| S | Susceptible | 0-5 | 95-100 |
| LS | Low Resistance | 6-14 | 84-96 |
| MR | Moderate Resistance | 15-30 | 70-85 |
| R | Resistance | 31-50 | 50-69 |
| HR | High Resistance | 51+ | 0-49 |

BLUE ALFALFA APHID

TIME LINE OF IMPORTANT EVENTS

- **1991** - First report of a new blue alfalfa biotype in US, noted as BAOK90 (Oklahoma).
- **1998** – Three to seven (3-7) phenotypes identified in Australia. Clones differed in life history traits that included survival, fecundity, growth rates and percentage of winged aphids.

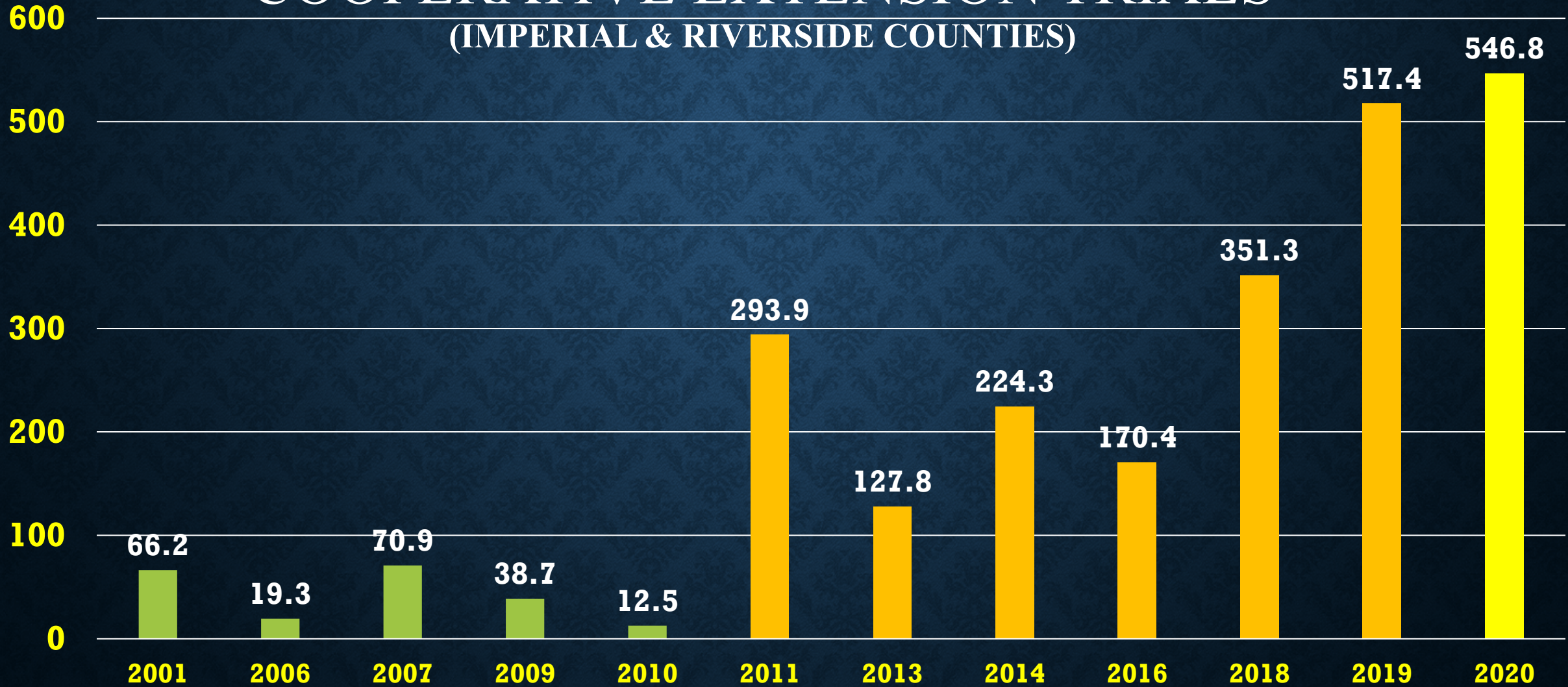
BLUE ALFALFA APHID

TIME LINE OF IMPORTANT EVENTS

- **2001** – Variation in growth rates of various BAA aphids (Australia)
- **2009** – South Australia – Blue alfalfa aphids collected from certain locations had much greater virulence on all previously resistant alfalfa varieties, producing high rates of plant mortality.

BLUE ALFALFA APHIDS – MEAN PEAK NUMBER/ SWEEP IN UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION TRIALS

(IMPERIAL & RIVERSIDE COUNTIES)



WINGED APHIDS OCCUR WHEN THERE IS OVER-
CROWDING AND/OR PLANTS ARE UNDER STRESS



HIGH NUMBERS OF BLUE ALFALFA APHIDS MIGRATE INTO PALO VERDE VALLEY OF CALIFORNIA IN FEBRUARY-MARCH

Numbers of blue alfalfa aphids in collected in a water trap indicated about 275 aphids/ square foot in a 2 day period March 13-15, 2020





DIFFERENCE AND
DAMAGE DUE TO
HEAVY MIGRATING
POPULATION OF
BLUE ALFALFA
APHID FEEDING ON
ALFALFA IN 7 DAYS.

DO WINGED
APHIDS CAUSE
GREATER YIELD
LOSS DUE TO
LARGER SIZE OF
APHIDS AND
INCREASED
TOXINS FROM
FROM FEEDING BY
LARGER APHIDS?

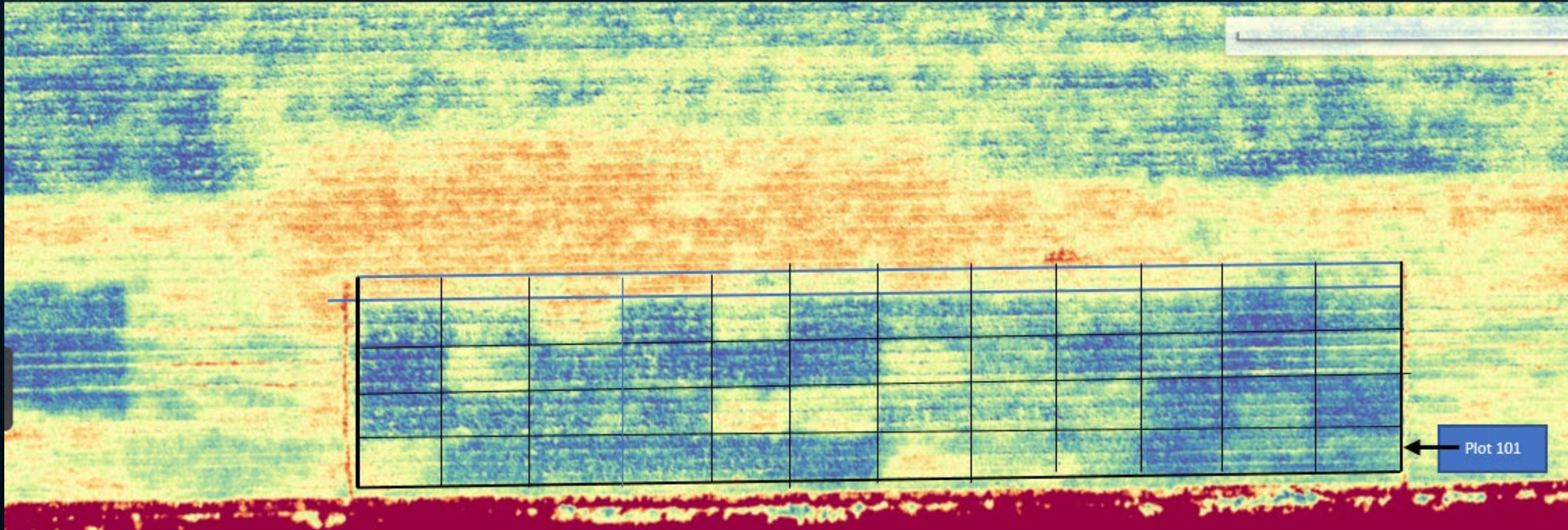
BLUE ALFALFA APHIDS ON ALFALFA



DRONE IMAGERY OF PLOTS AT 23 DAYS POST MARCH 29, 2021, TREATMENT
SHOWING DIFFERENCES IN STRESS OF ALFALFA.

DARK BLUE = LESS STRESS/BETTER BLUE ALFALFA APHID CONTROL
(*LADYBEETLES PRESENT IN THIS STUDY*)

MicaSense



Plot 101

SEVEN SPOTTED LADY BEETLE



- Feeds on alfalfa weevil larvae as well as aphids
- Much larger in size than the convergent lady beetle, or other lady beetles encountered in local alfalfa. Larger = eats more aphids!

**BELEAF 2.8 oz. + DANADIM
PROGRESS 16 oz.**

**WARRIOR
II 1.92 oz.**

BELEAF 2.8 oz.

PQZ 2.4 oz.

TORAC 14 oz.

SEFINA 6 oz.

ENDIGO ZCX 4.5 oz.

**MUSTANG
MAXX 4 oz.**

UNTREATED

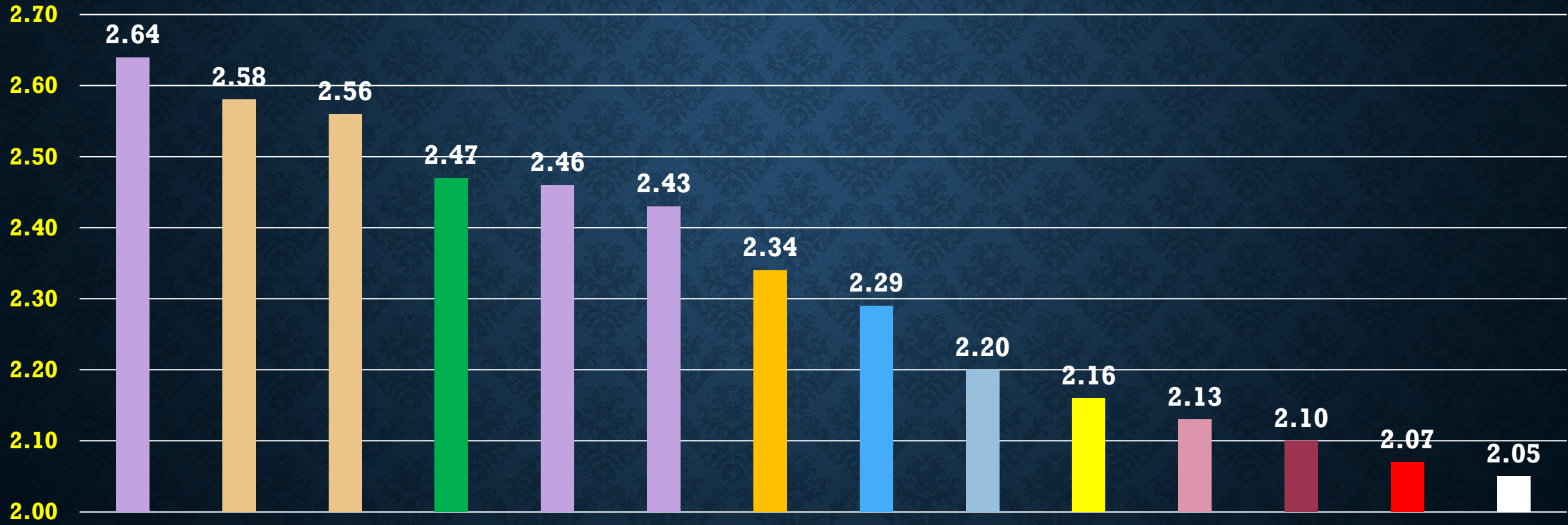
1 oz. TRANSFORM 2 oz.

7 oz. SIVANTO 10 oz. PRIME 14 oz.

ALFALFA YIELDS



MEAN YIELD (TONS/ACRE) OF NEWLY ESTABLISHED ALFALFA AS AFFECTED BY INTERACTIONS OF BLUE ALFALFA APHIDS, INSECTICIDES & LADYBEETLES, FOLLOWING APPLICATION ON MARCH 29 (12.25" TALL) & APRIL 27 HARVEST

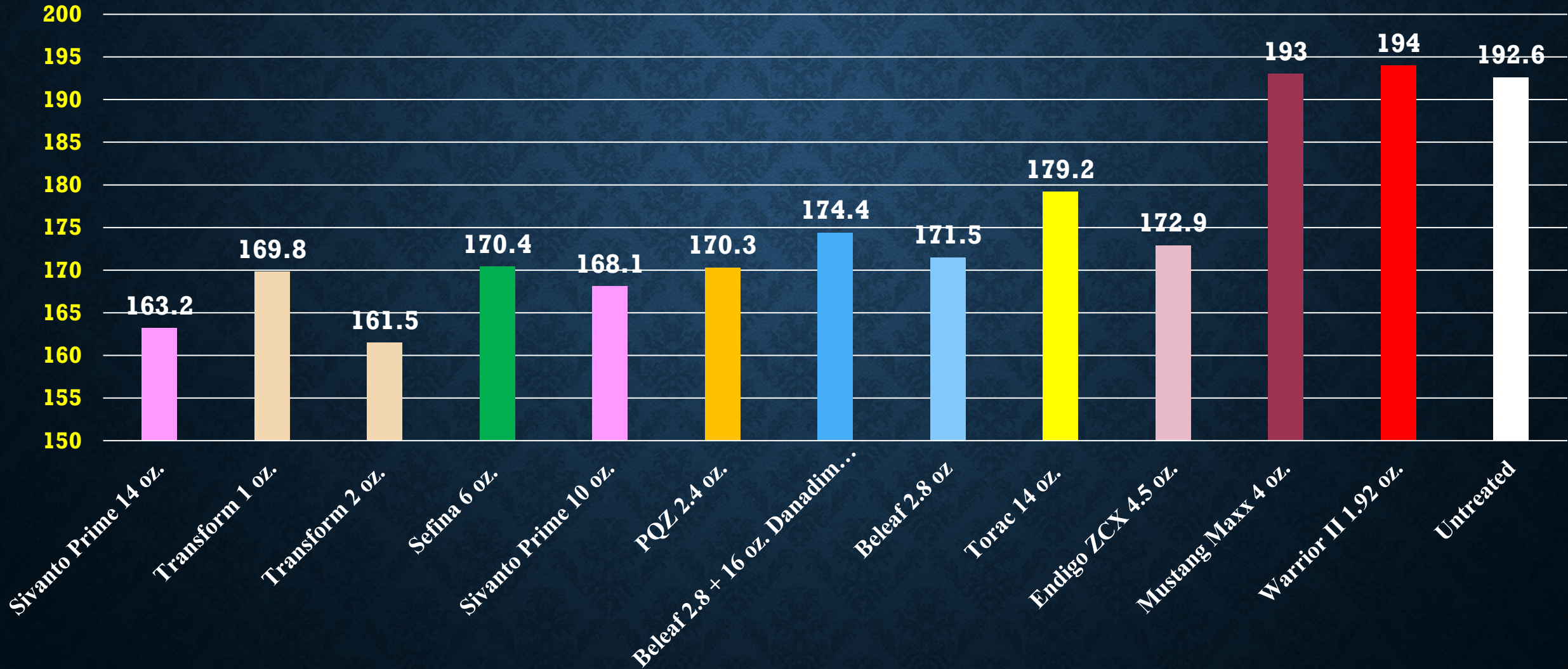


- Sivanto Prime 14 oz.
- Sefina 6 oz.
- PQZ 2.4 oz.
- Torac 14 oz.
- Warrior II 1.92 oz.

- Transform 1 oz.
- Sivanto Prime 10 oz.
- Beleaf 2.8 + 16 oz. Danadim Progress
- Endigo ZCX 4.5 oz.
- Untreated

- Transform 2 oz.
- *Sivanto Prime 7 oz.
- Beleaf 2.8 oz
- Mustang Maxx 4 oz.

MEAN RELATIVE FEED VALUE OF NEWLY ESTABLISHED ALFALFA AS AFFECTED BY INTERACTIONS OF BLUE ALFALFA APHIDS, INSECTICIDES & LADYBEETLES



WHAT ABOUT OTHER APHIDS?
CHALLENGES WITH CONTROL?



COWPEA APHIDS AND DAMAGE



DAMAGE AND DEATH OF ALFALFA DUE TO APHID FEEDING

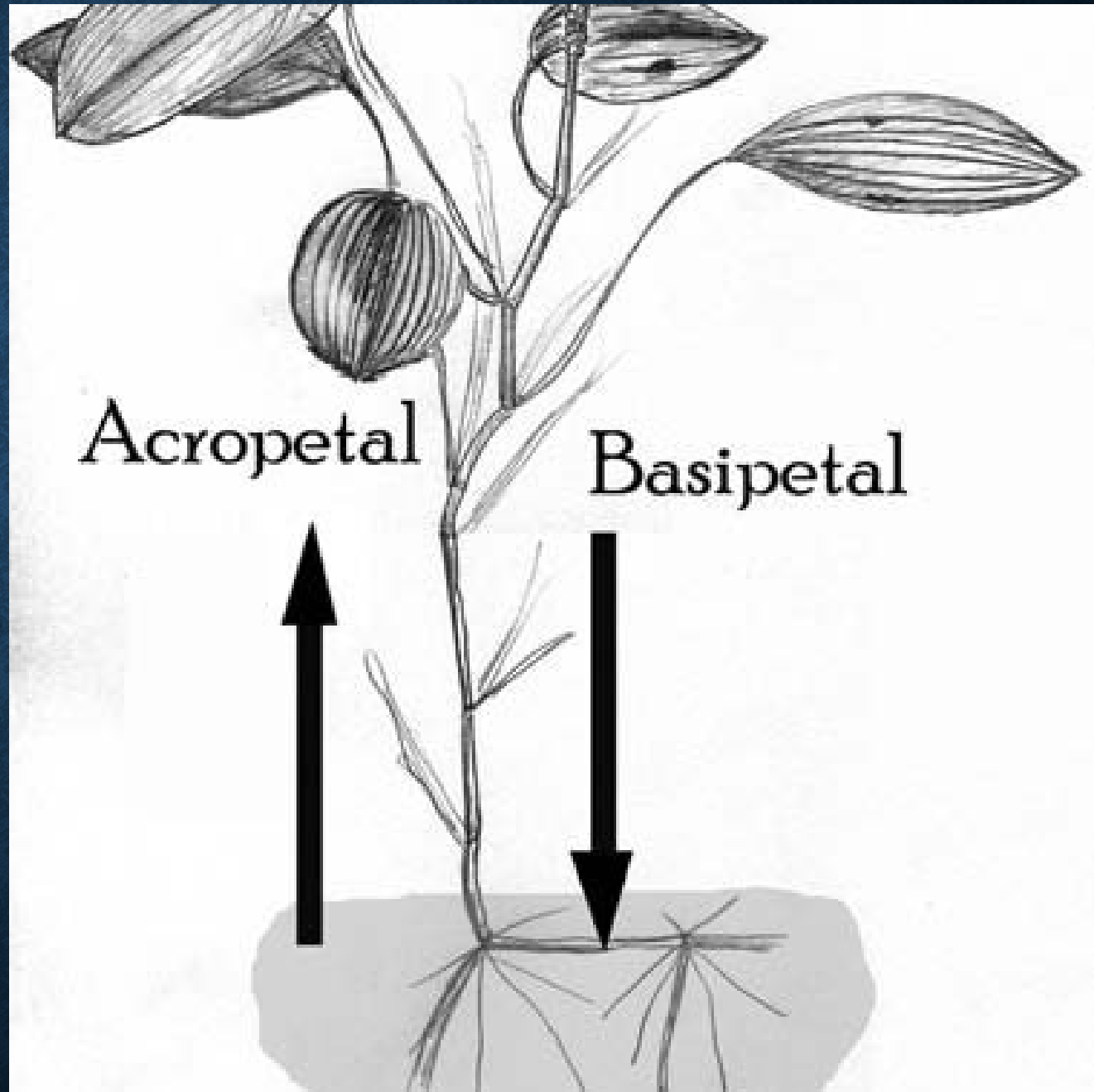


MANY OF THE SYSTEMIC INSECTICIDES USED IN ALFALFA TODAY ARE NOT FULLY SYSTEMIC, BUT ARE ACROPETALLY SYSTEMIC

THIS MEANS THAT THEY ONLY PROTECT THE INTERCEPTED FOLIAGE WHEN SPRAYED, AND THE NEW GROWTH AFTER THAT.

FOLIAGE UNDERNEATH THE DIRECT CONTACT AREA WILL NOT BE PROTECTED AND APHIDS WILL CONTINUE TO FEED.

BETTER INSECT CONTROL USUALLY NOTED AT 10 DAYS THAN AT 3 DAYS POST TREATMENT



WHAT IS EFFECT ON APHIDS AND RESULTING ALFLAFA GROWTH WHEN APHID INFESTED ALFALFA IS TREATED AT DIFFERENT HEIGHTS?

- WINTER 2022 TRIAL

- ESTABLISHED

ALFALFA INFESTED

- 3.55'' (9.0 cm) (Stubble treatment)

WITH COWPEA

- 5.75'' (14.6 cm)

APHIDS AND BLUE

- 9.0'' (22.9 cm)

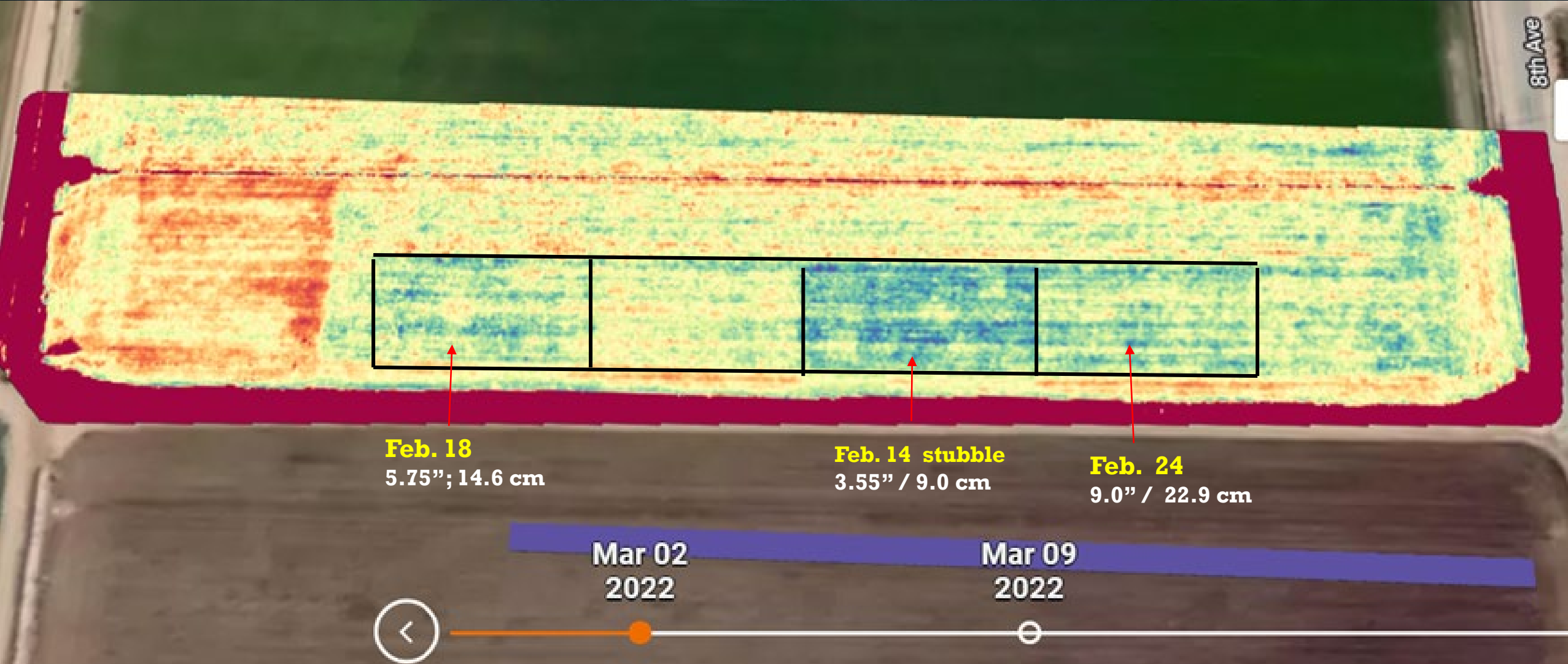
ALFALFA APHIDS

- 12.0'' (30.5 cm)

TREATED AT 4

DIFFERENT HEIGHTS

NDRE IMAGE OF ALFALFA ON MARCH 2, 2022

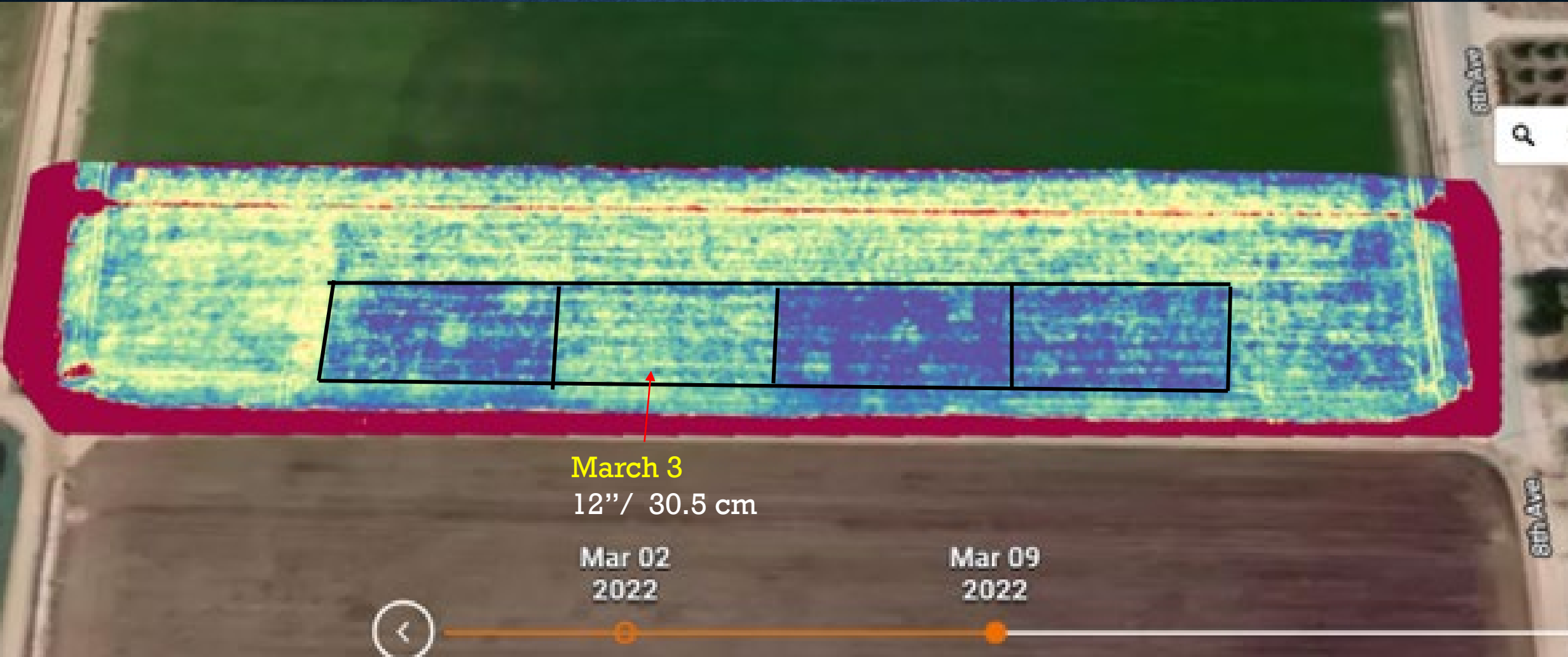


Imagery provided by Agtegrity, Inc., Yuma, AZ

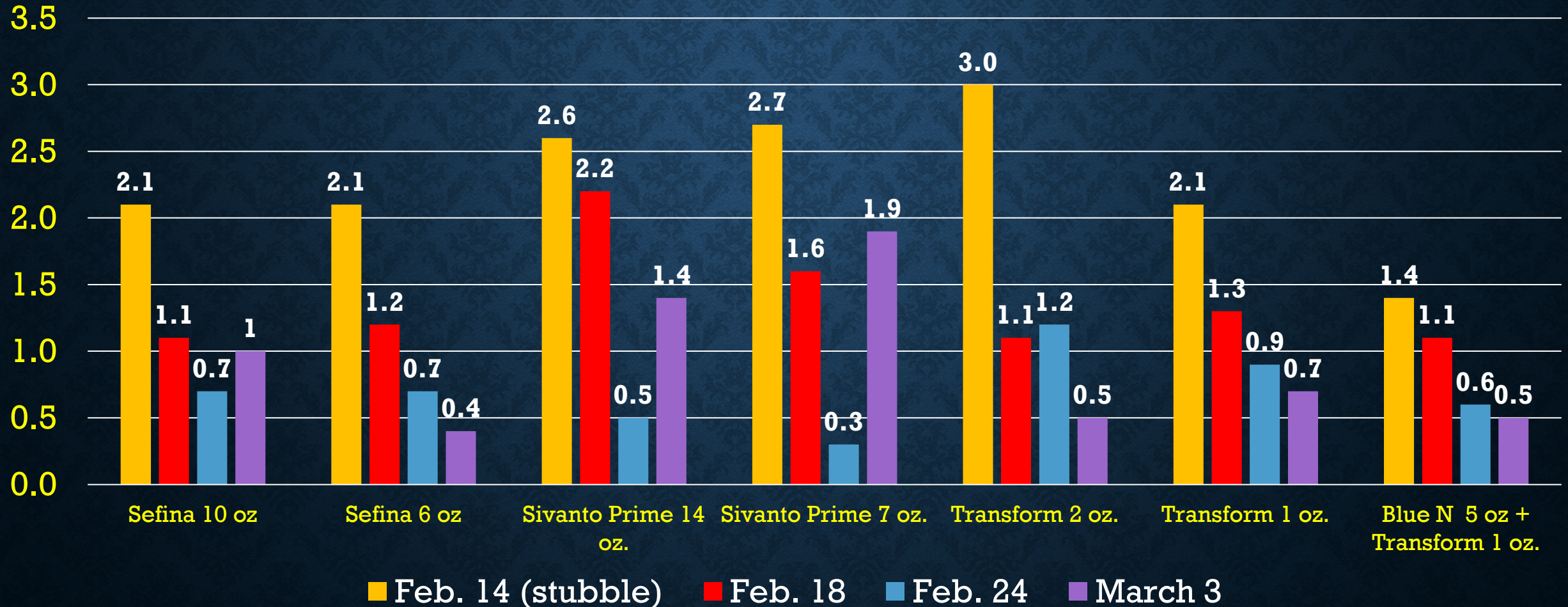
8th Ave

© Mapbox © Open

NDRE IMAGE OF ALFALFA ON MARCH 9, 2022



MEAN ALFALFA STEM HEIGHT DIFFERENCES (*INCHES*) FROM INSECTICIDE TREATMENTS - NEW STAND ALFALFA - MARCH 12, 2022, BLYTHE, CA



EMPOASCA SPP. LEAFHOPPERS



EMPOASCA spp. LEAFHOPPERS

- Adults and nymphs have a bright green, almost fluorescent color, and run sideways very fast.
- Both adults and nymphs feed on plants, their feeding disrupts nutritional movement in leaves.
- Biology of some species, but not all, has been well studied



DAMAGING *EMPOASCA* SPECIES NOTED FROM VARIOUS ALFALFA AREAS

- *E. fabae* (eastern United States)
- *E. pteridis* (Europe)
- *E. mexara* (northern Mexico, southwest United States)
- *E.* 3 species in Argentina (*kraemeri*).

POTATO LEAFHOPPER COMPLEX

- Species are essentially identical in appearance, currently must dissect the leafhoppers and examine internal appendages and sometimes reproductive structures.
- There are differences in their biology and behavior

IN EUROPE, THE MOST SIGNIFICANT EXPRESSION OF THE NEGATIVE IMPACT OF *EMPOASCA PTERIDIS* IS THE REDUCTION OF THE YIELD BY 20-30% AND REDUCING THE FORAGE QUALITY AND IN PARTICULAR THE CRUDE PROTEIN CONTENT AND THE RESERVE OF CARBOHYDRATES IN THE ROOT, AS WELL AS SUPPRESSION OF THE DEVELOPMENT OF THE FOLLOWING REGROWTH.

- Damage reports very similar to *E. fabae* in the eastern United States



“HOPPERBURN” ASSOCIATED WITH LEAFHOPPER FEEDING
– BEGINS AS DIAMOND SHAPED YELLOWING AREA AT
END OF LEAFLET



SEVERE DAMAGE RESULTS IN FIELDS WITH CONDITIONS CALLED “HOPPER YELLOWS”



FEEDING DAMAGE IN THE FALL FROM
MEXICAN POTATO LEAFHOPPER (*E. MEXARA*)
IN SOUTHWEST UNITED STATES



DAMAGE TO FALL ALFALFA
IN THE LOW DESERT DUE
TO LEAFHOPPER FEEDING
CAN OFTEN RESULT IN
MORE PURPLISH/BROWN
COLORATION, THOUGHT
PARTIALLY DUE TO
COOLER TEMPERATURES.

THIS COLORATION IS
NOT ASSOCIATED WITH *E.*
FABAE IN THE EASTERN
UNITED STATES



THANK YOU FOR YOUR ATTENTION!

