Spotted Wilt Evaluation Update

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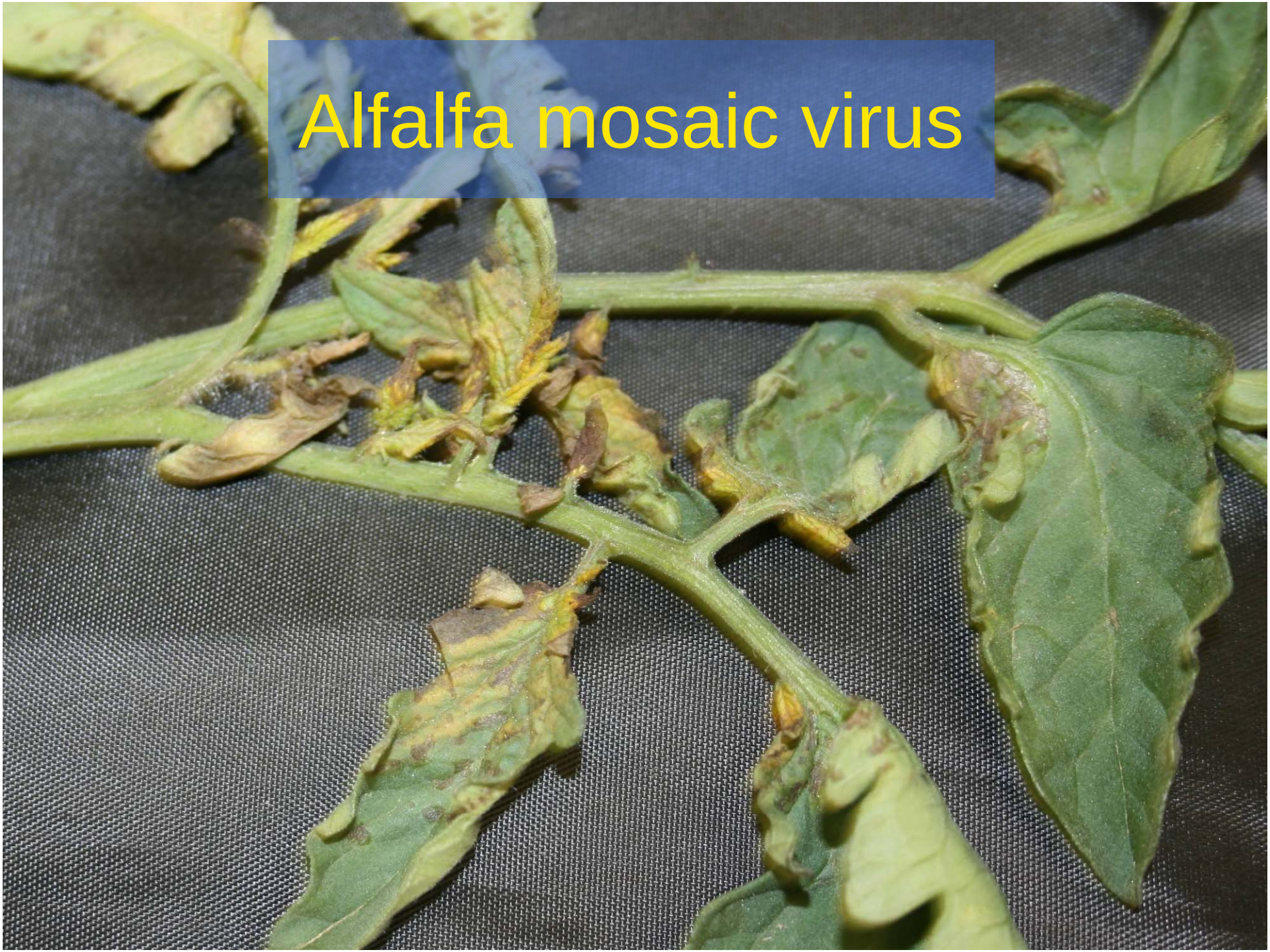
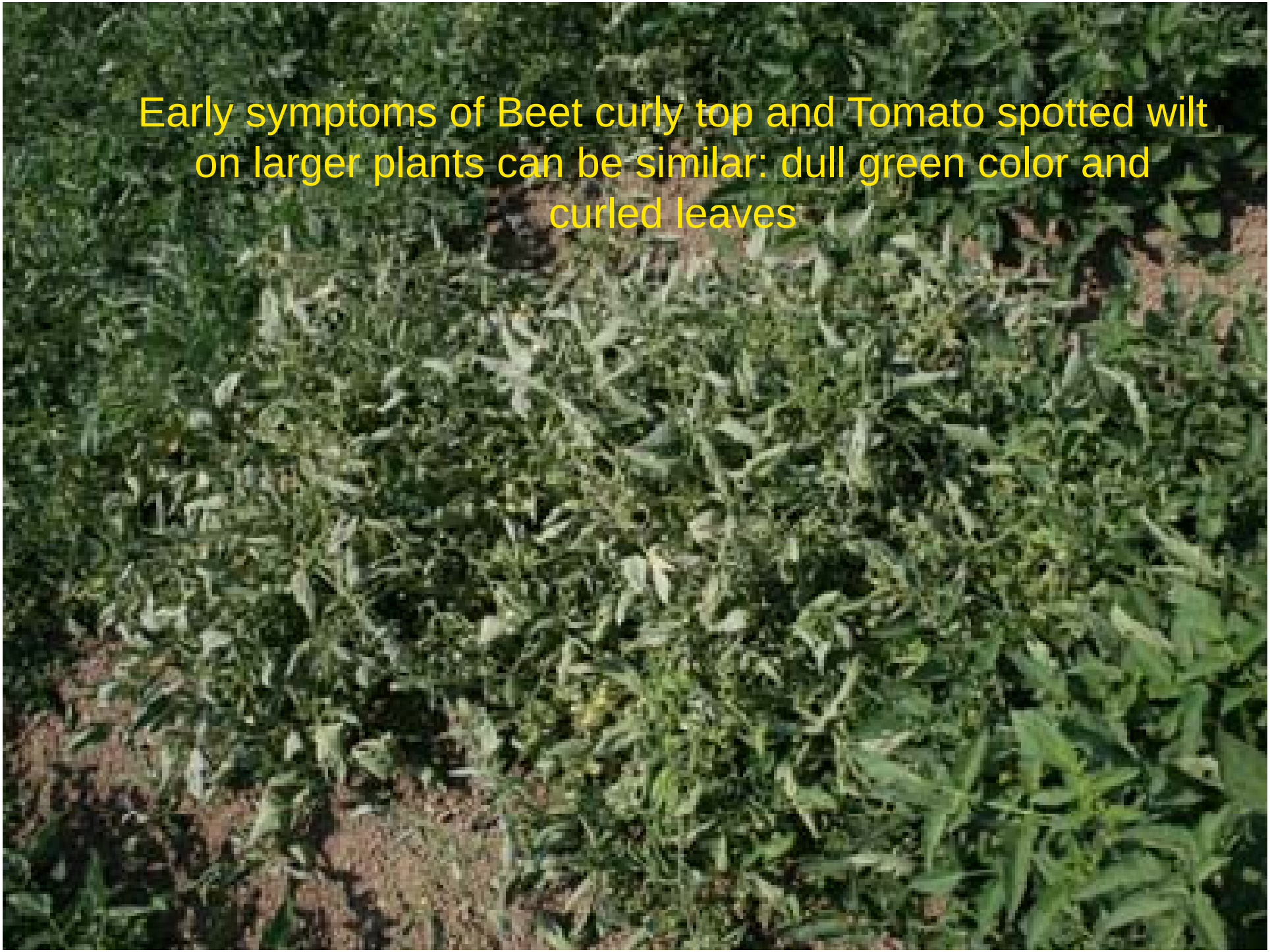
Tomato spotted wilt virus

- Symptoms
- Biology
  - Vector
  - Other plants that can be infected
  - Likely sources of the virus (Fresno Co.)
- Control
  - Tools available
  - Insecticide trial results
  - Relative susceptibility of processing tomato varieties


Alfalfa mosaic virus

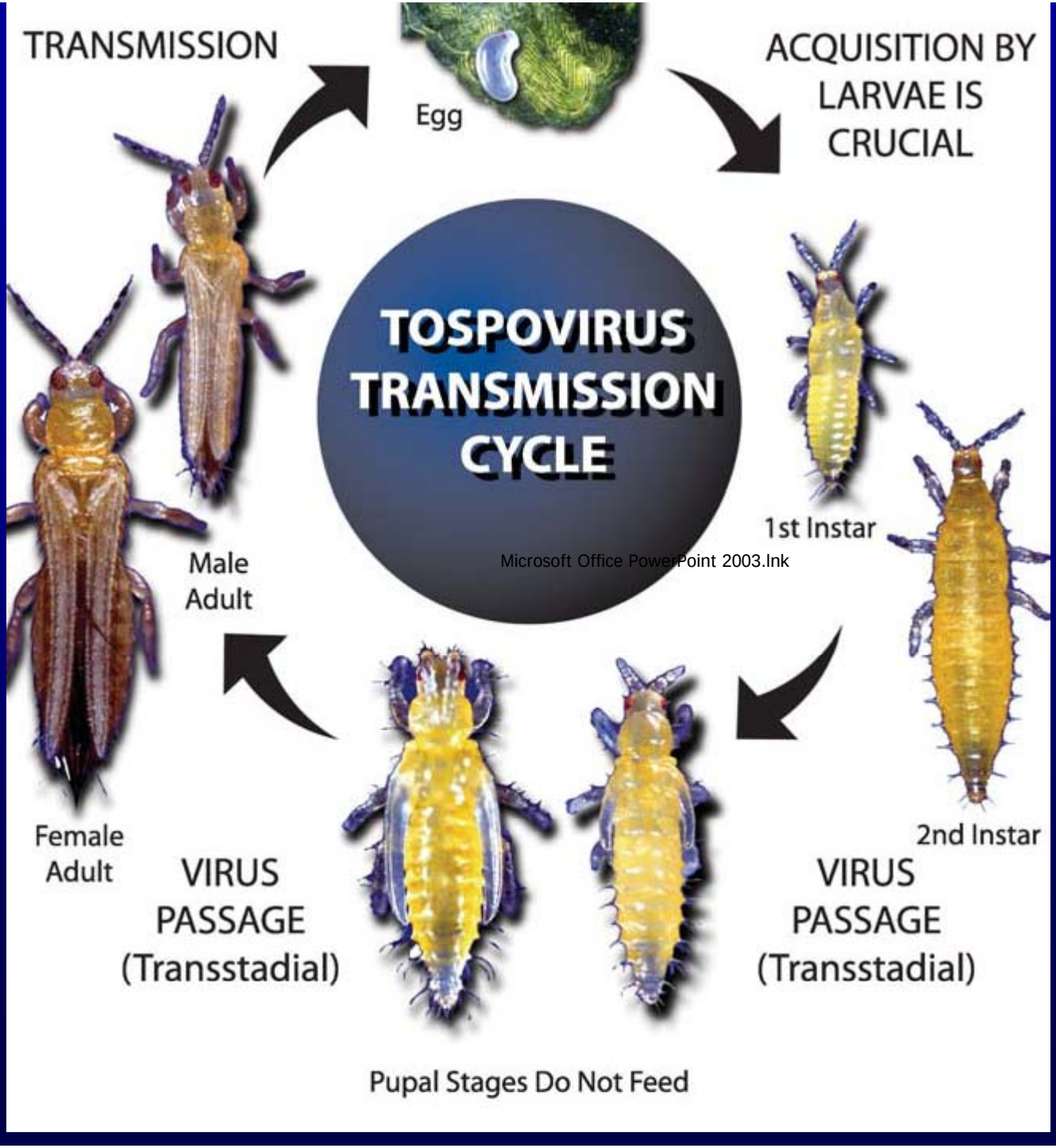

Early symptoms of Beet curly top and Tomato spotted wilt on larger plants can be similar: dull green color and curled leaves

Immunostrips available from AgDia (www.agdia.com) or EnviroLogix (www.envirologix.com)

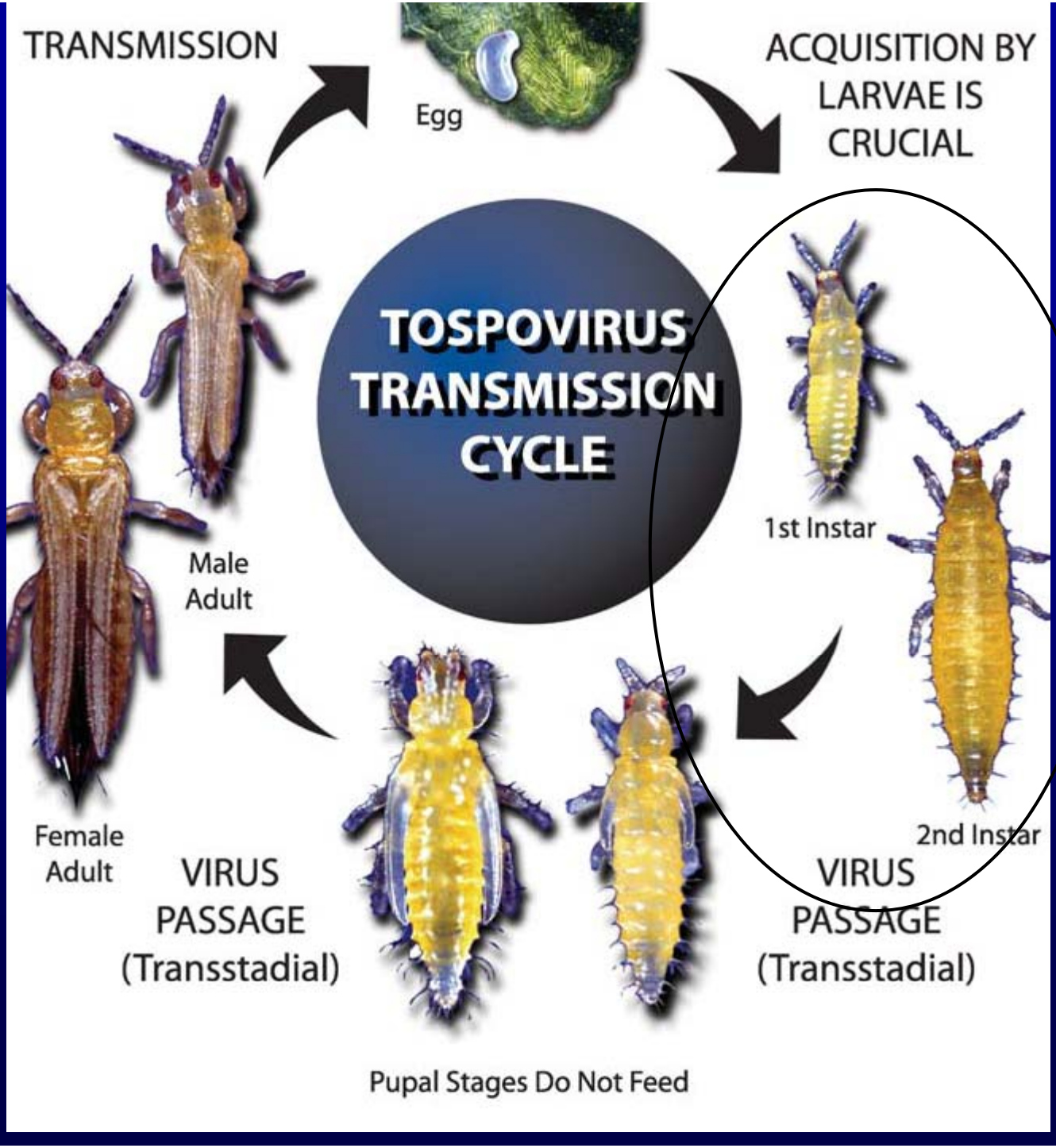
Tomato spotted wilt virus

- Symptoms
- Biology
  - Vector
  - Host range
  - Likely sources of the virus (Fresno Co.)

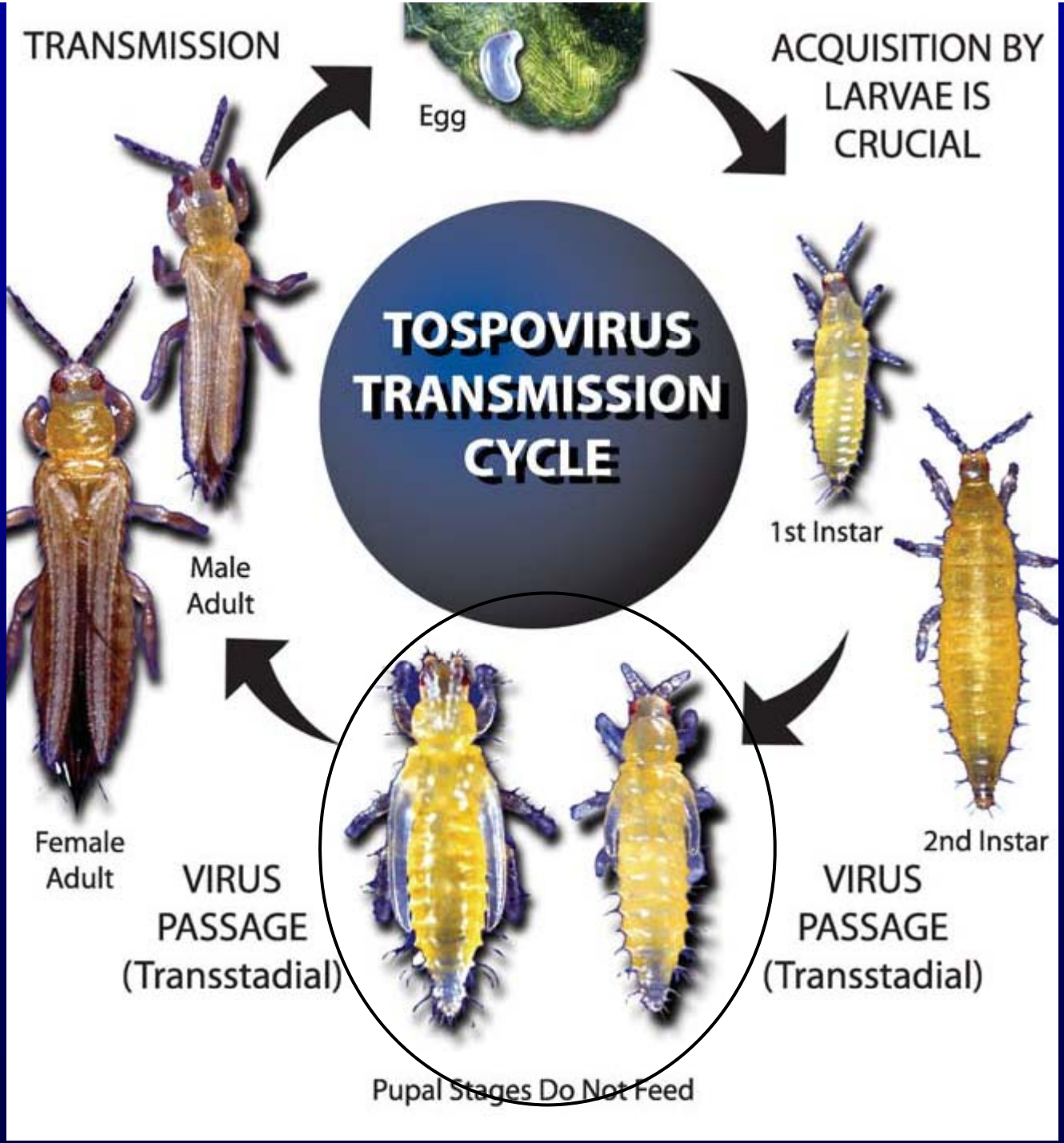
Thrips Control Studies, Fresno County, 2008



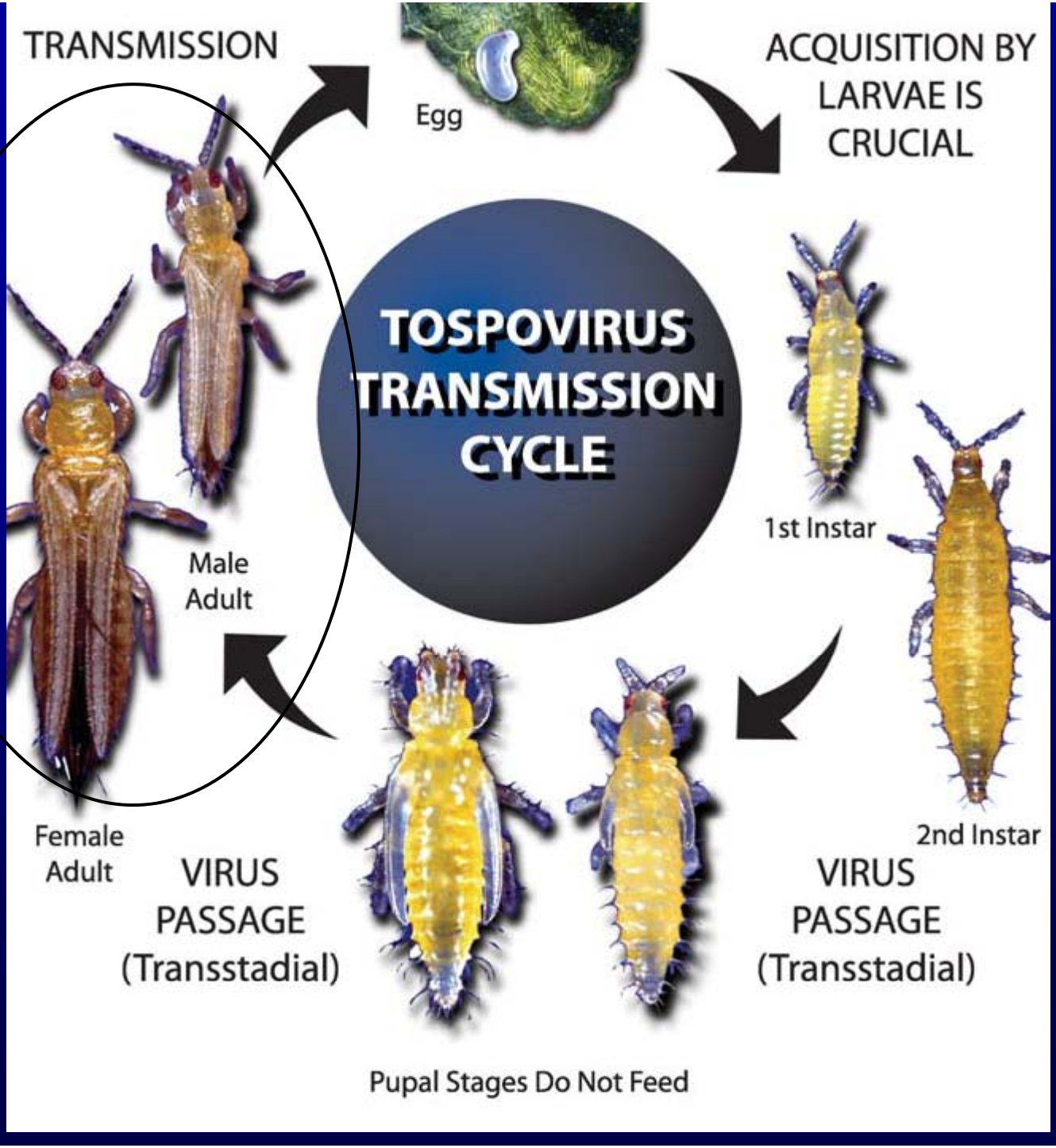
A. E.Whitfield, D. E. Ullman, and T L. German. 2005. **TOSPOVIRUS-THRIPS INTERACTIONS.** Annu. Rev. Phytopathol. 2005. 43:459–89



TSWV must be acquired by the larvae to be transmissible.

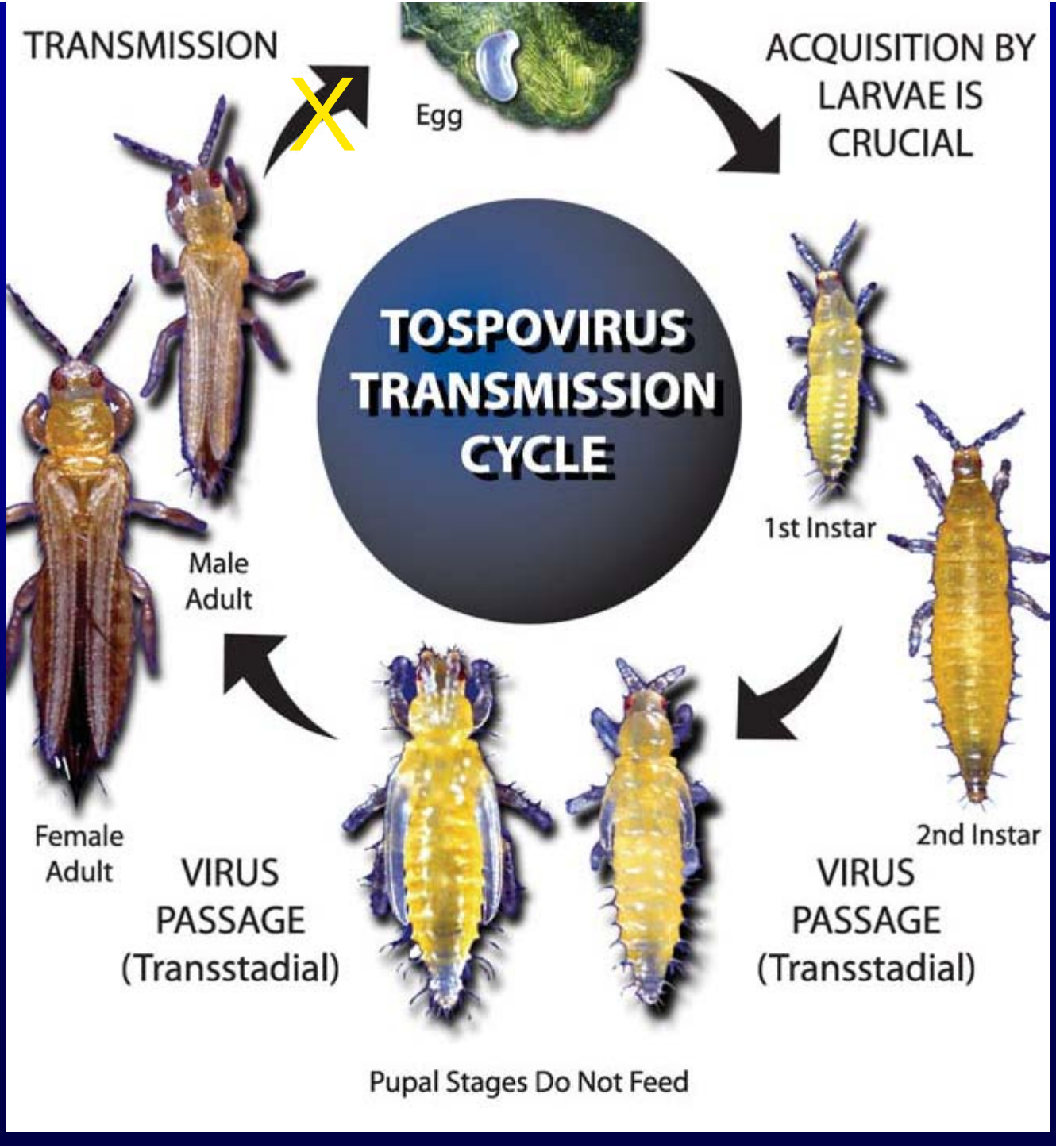


Western flower thrips develop through two quiescent, non-feeding pupal stages in the soil



Adults emerge and resume feeding on flowers, buds, and terminal foliage.

Adults can live 30 to 45 days and transmit the viruses to plants throughout their life.



The virus does NOT pass from female to eggs.

A Few Reported Weed Hosts of TSWV

- Field bindweed
- Common sunflower
- Black nightshade
- Hairy fleabane
- Jimson weed
- Lambsquarters
- London Rocket
- Malva
- Prickly lettuce
- Purslane
- Pigweed
- Russian thistle
- Sowthistle
- Tree tobacco

Reported Crop Hosts of TSWV

- Beans
- Celery
- Cilantro
- Eggplant
- Lettuce
- Pepper
- Potato
- Radicchio
- Spinach

Sources of TSWV in Fresno Co.

- Other crops

  - Tomato transplants? Three transplant houses monitored over 3 years and TSWV was not detected

  - Almond orchards? 4 Almond orchards monitored for thrips and TSWV over 2 years, no TSWV

  - Radicchio? TSWV and high thrips detected one year at one location

  - Lettuce? TSWV is detected in Fall lettuce, rare but present in Spring. Intensive insecticide applications.

Tomato spotted wilt virus detected in lettuce, 2008

Five Points Area

31 Mar: 1 plant/20 min, 0 detected in two fields

16 Apr: 5 plants/100 row ft

Huron Area:

31 Mar: Two fields: 11 and 13 plants/20 min

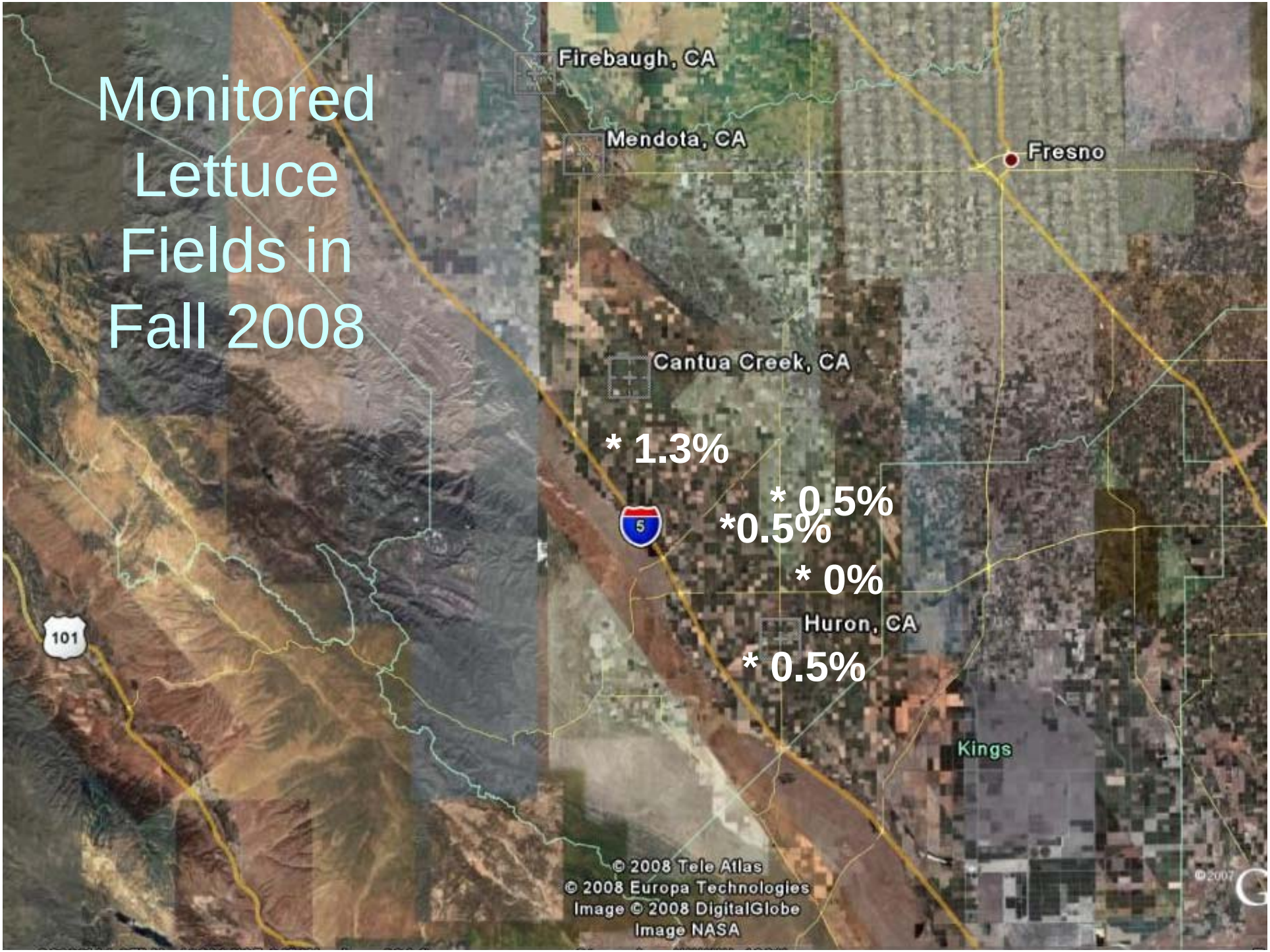

Monitored Lettuce Fields in Fall 2008
Firebaugh, CA
Mendota, CA
Fresno
Cantua Creek, CA
* 1.3%
* 0.5%
*0.5%
* 0%
Huron, CA
* 0.5%
Kings
101
5
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Image © 2008 DigitalGlobe
Image NASA

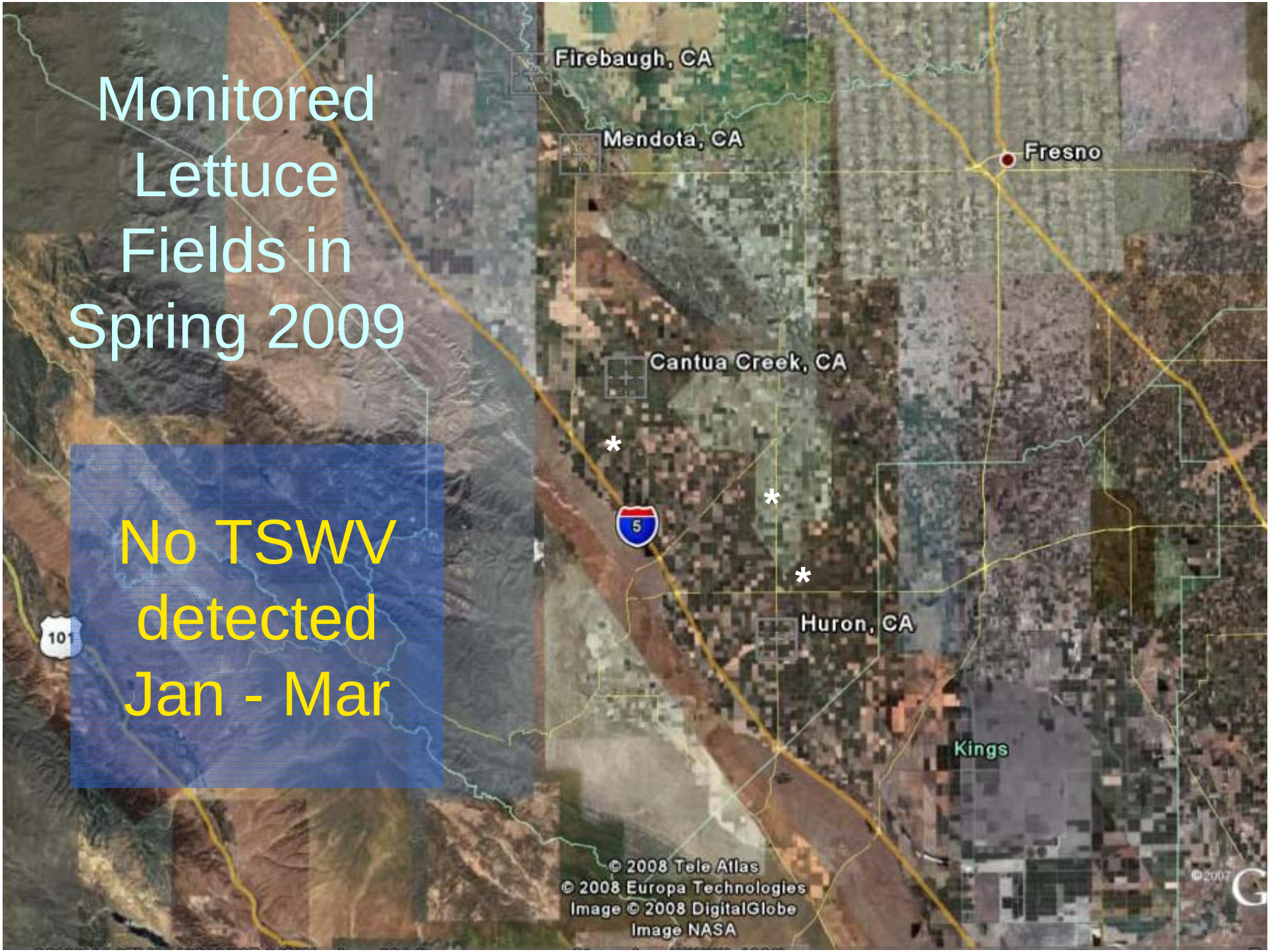
Monitored Lettuce Fields in Spring 2009
No TSWV detected Jan - Mar
Firebaugh, CA
Mendota, CA
Fresno
Cantua Creek, CA
Huron, CA
Kings
5
101
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Image NASA

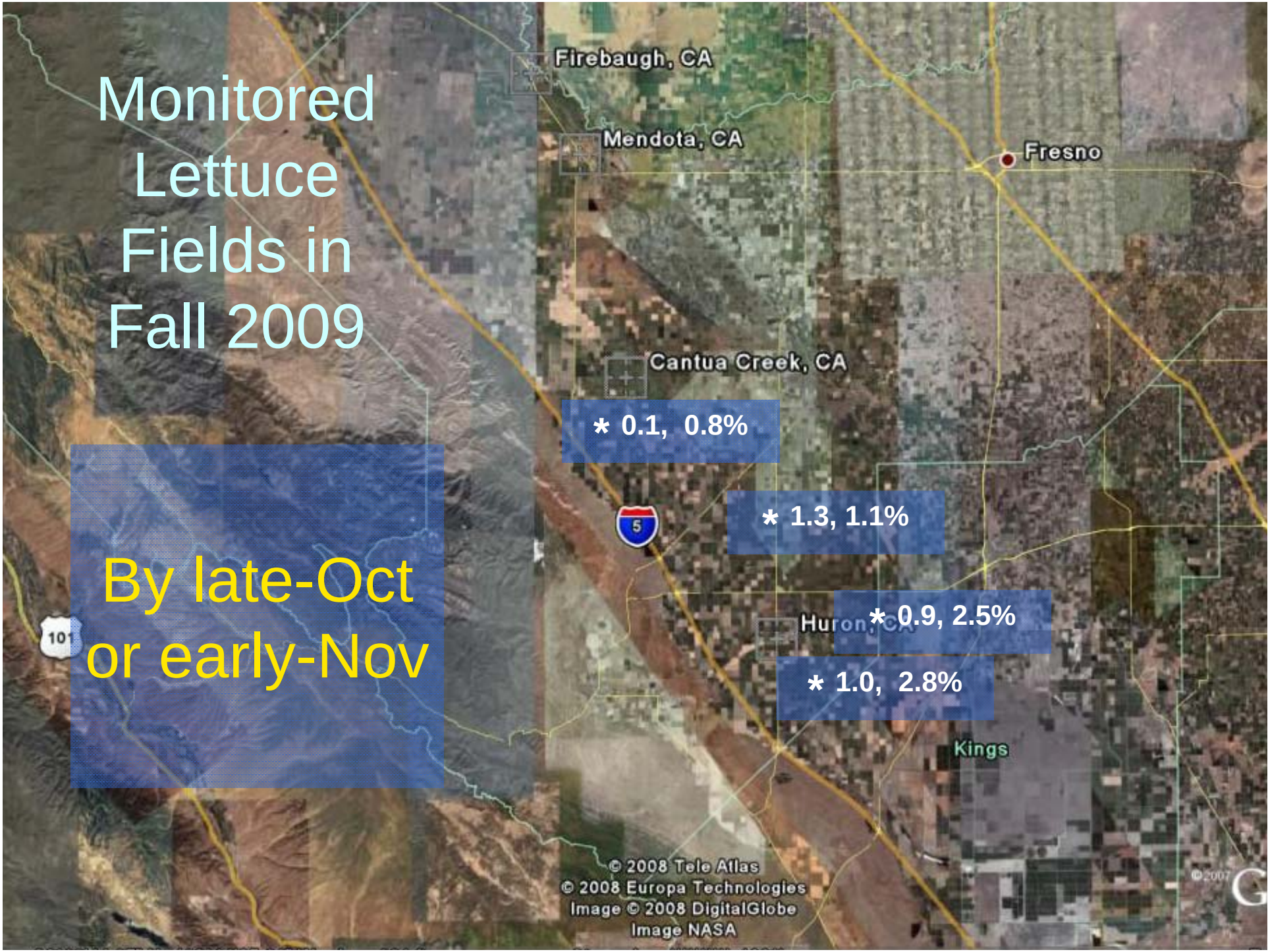
Monitored Lettuce Fields in Fall 2009
By late-Oct or early-Nov
Firebaugh, CA
Mendota, CA
Fresno
Cantua Creek, CA
* 0.1, 0.8%
* 1.3, 1.1%
* 0.9, 2.5%
* 1.0, 2.8%
Kings
5
101
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Image NASA

Sources of TSWV in Fresno Co.

- Weeds
  - **Surveys conducted from 2005 to 2008 – very few weeds with TSWV were detected**

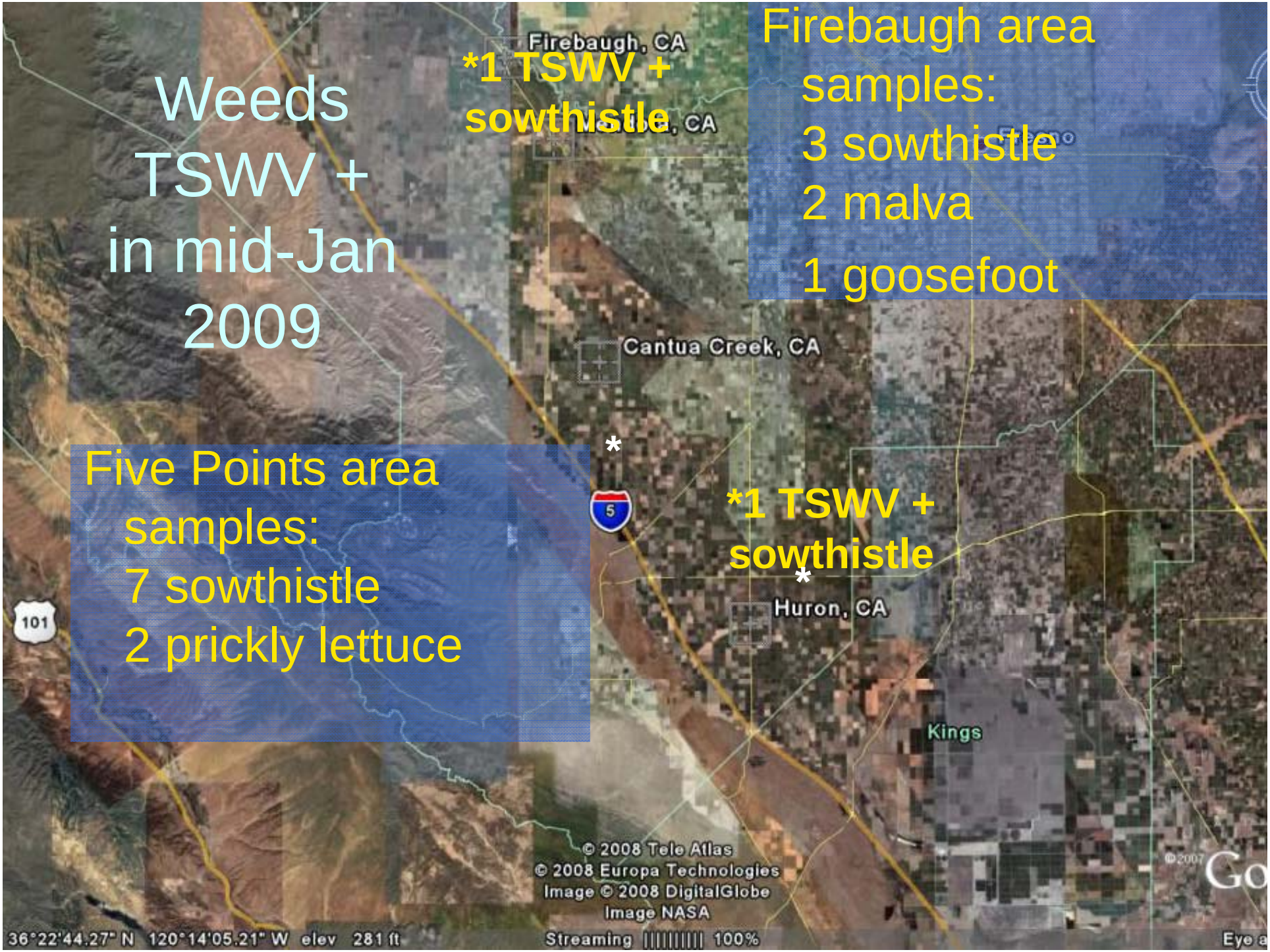
Weeds TSWV + in mid-Jan 2009
Firebaugh, CA
*1 TSWV + sowthistle
Firebaugh area samples:
3 sowthistle
2 malva
1 goosefoot
Cantua Creek, CA
Five Points area samples:
7 sowthistle
2 prickly lettuce
*1 TSWV + sowthistle
Huron, CA
Kings
101
5
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Image © 2008 DigitalGlobe
Image NASA
Streaming 100%
36°22'44.27" N 120°14'05.21" W elev 281 ft

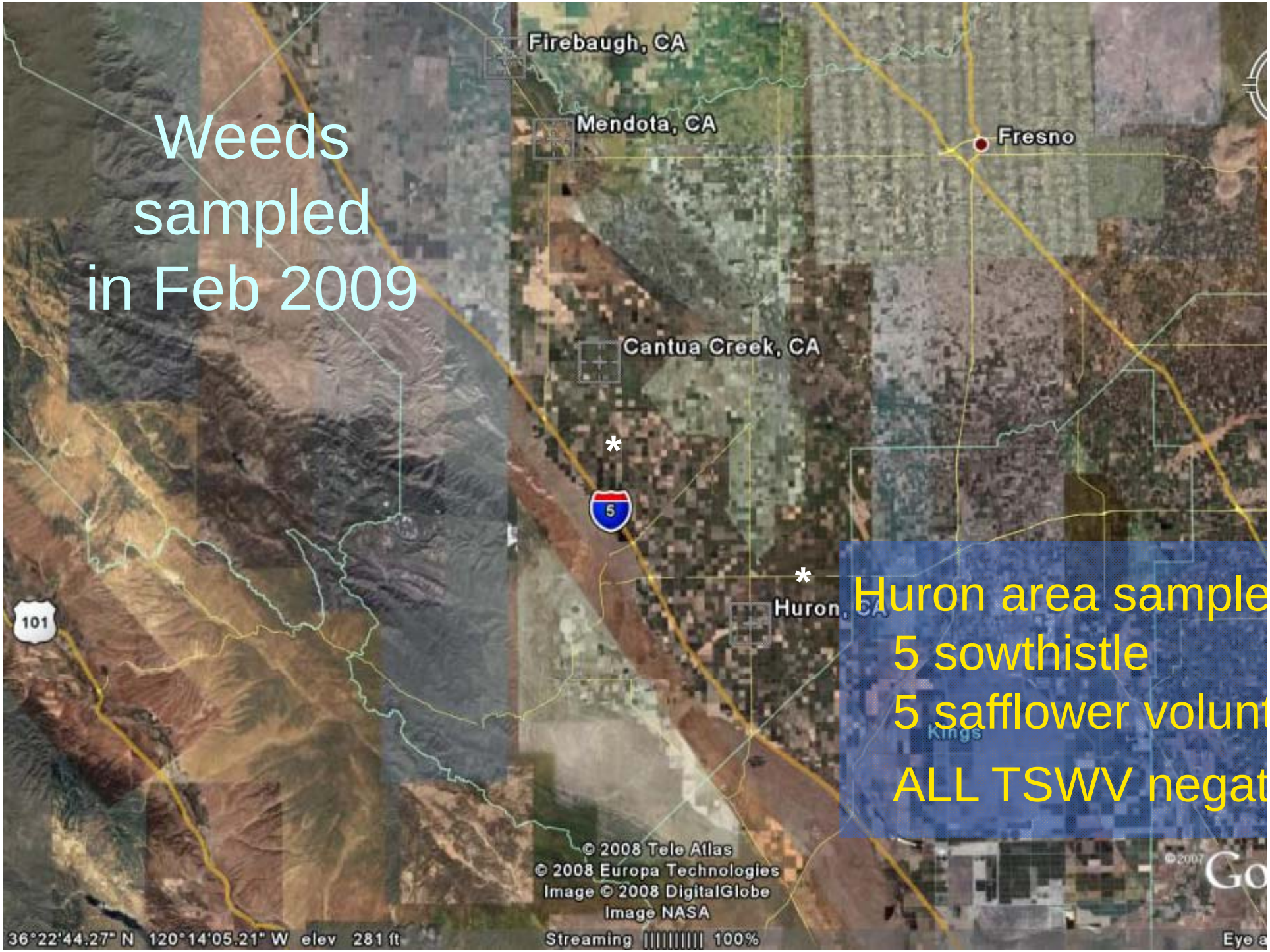
Weeds sampled in Feb 2009
Firebaugh, CA
Mendota, CA
Fresno
Cantua Creek, CA
Huron, CA
5
101
Huron area sample
5 sowthistle
5 safflower volunt
ALL TSWV negat
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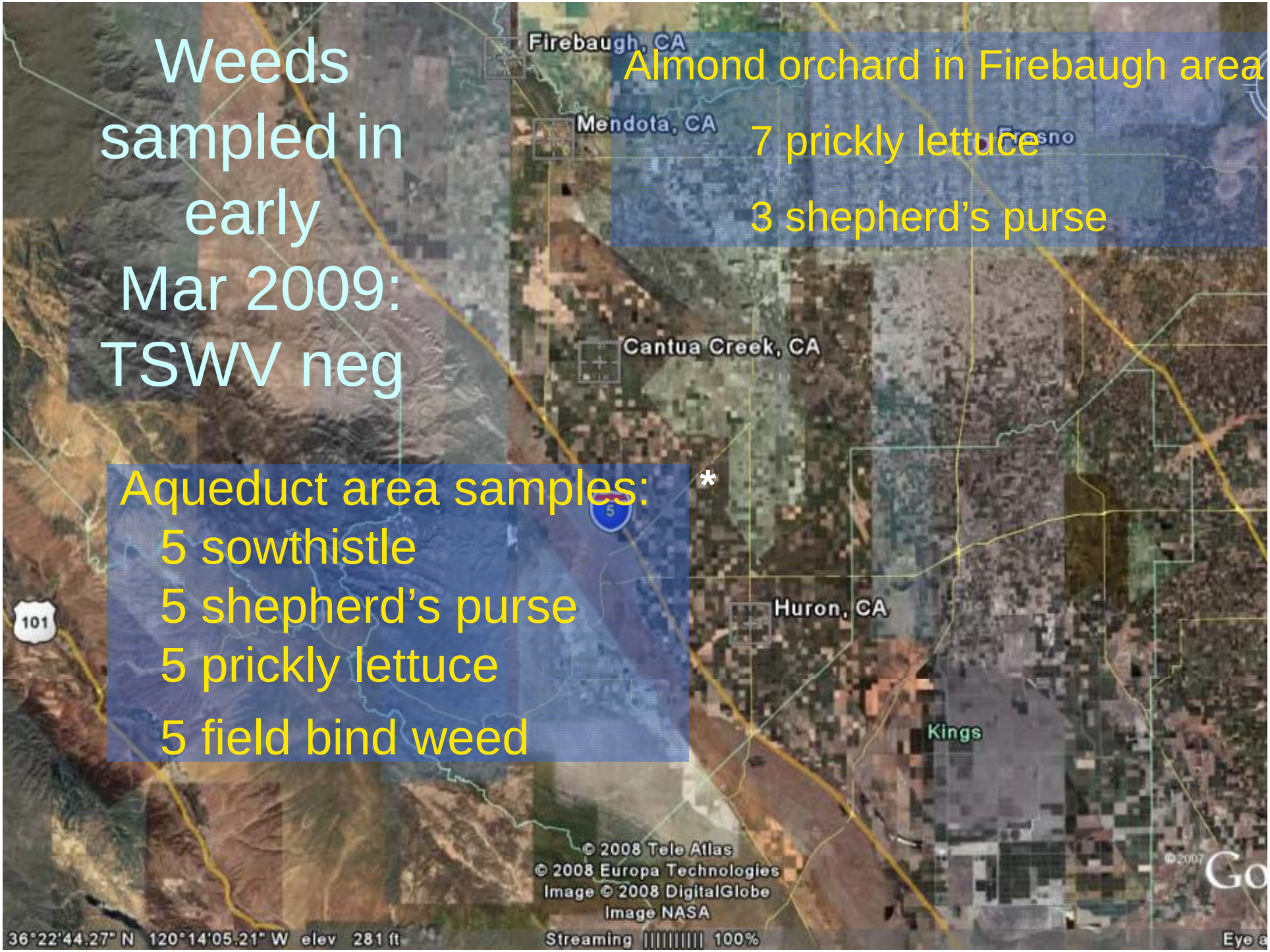
Image NASA
Streaming 100%
36°22'44.27" N 120°14'05.21" W elev 281 ft


Weeds sampled in early Mar 2009: TSWV neg
Almond orchard in Firebaugh area
7 prickly lettuce
3 shepherd's purse
Aqueduct area samples:
5 sowthistle
5 shepherd's purse
5 prickly lettuce
5 field bind weed
*
Firebaugh, CA
Mendota, CA
Fresno
Cantua Creek, CA
Huron, CA
Kings
101
5
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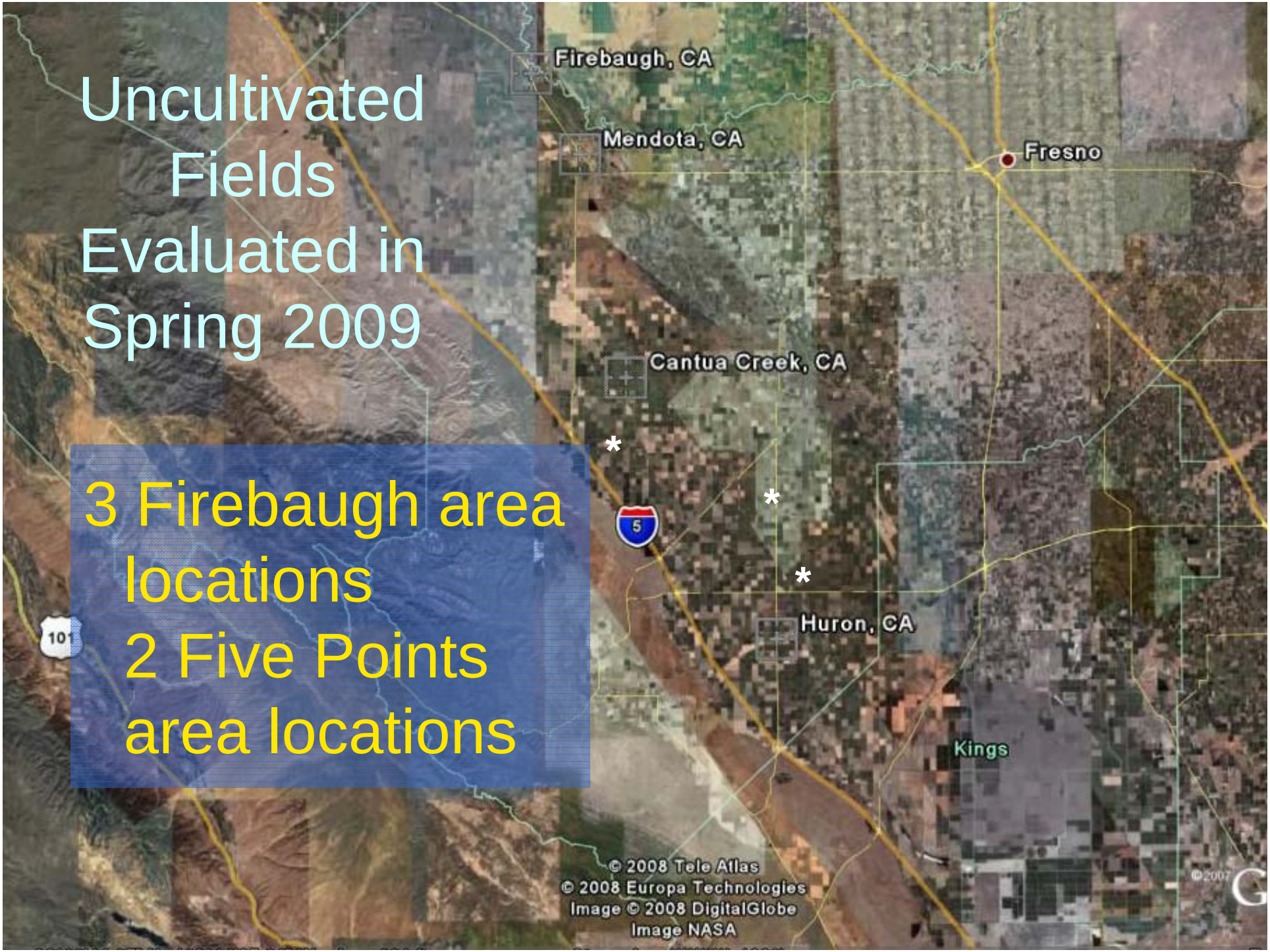
Uncultivated Fields Evaluated in Spring 2009
3 Firebaugh area locations
2 Five Points area locations
Firebaugh, CA
Mendota, CA
Fresno
Cantua Creek, CA
Huron, CA
Kings
5
101
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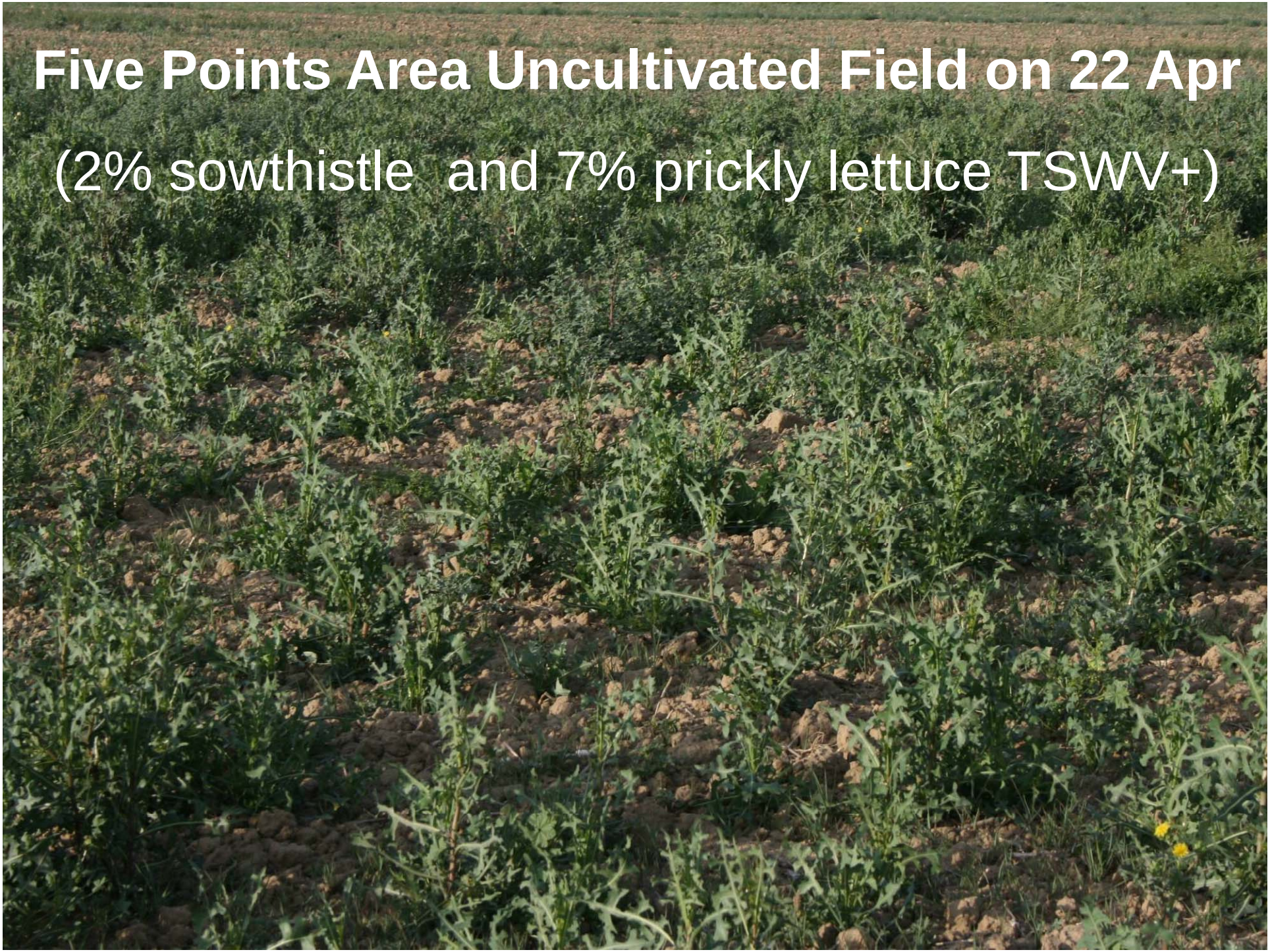
Five Points Area Uncultivated Field on 25 Mar
(6% sowthistle TSWV+)


Five Points Area Uncultivated Field on 22 Apr
(2% sowthistle and 7% prickly lettuce TSWV+)


INSV
TSWV
SAMPLE
SAMPLE

Tomato spotted wilt virus

- Symptoms
- Biology
  - Vector
  - Other plants that can be infected
  - Likely sources of the virus (Fresno Co.)
- Control
  - Tools available
  - Insecticide trial results
  - Relative susceptibility of processing tomato varieties

Tools

- Resistant Varieties: single dominant resistance gene – *Sw-5* are available in both fresh market and processing tomatoes (*Tsw in peppers*)
- Insecticides

Limitations of Thrips Control with Insecticides

- Thrips adults and immature stages generally prefer areas of the plant where they are sheltered (flower or bud tissues)
- Thrips populations can increase very rapidly, 200-300 eggs/female
- Under Fresno Co. Conditions, there is a short period of activity
- Insecticide resistance is a concern

Insecticide Comparisons 2007-2009

- Varieties and plant dates
  - H 9997 direct seeded on 9 Mar 07
  - H 9665 direct seeded on 9 Apr 2008
  - H 8004 transplant on 14 May 2009
- Materials were applied in the equivalent of 25 gallons of water with Induce 0.25%
- Experimental design: four-replication randomized complete block

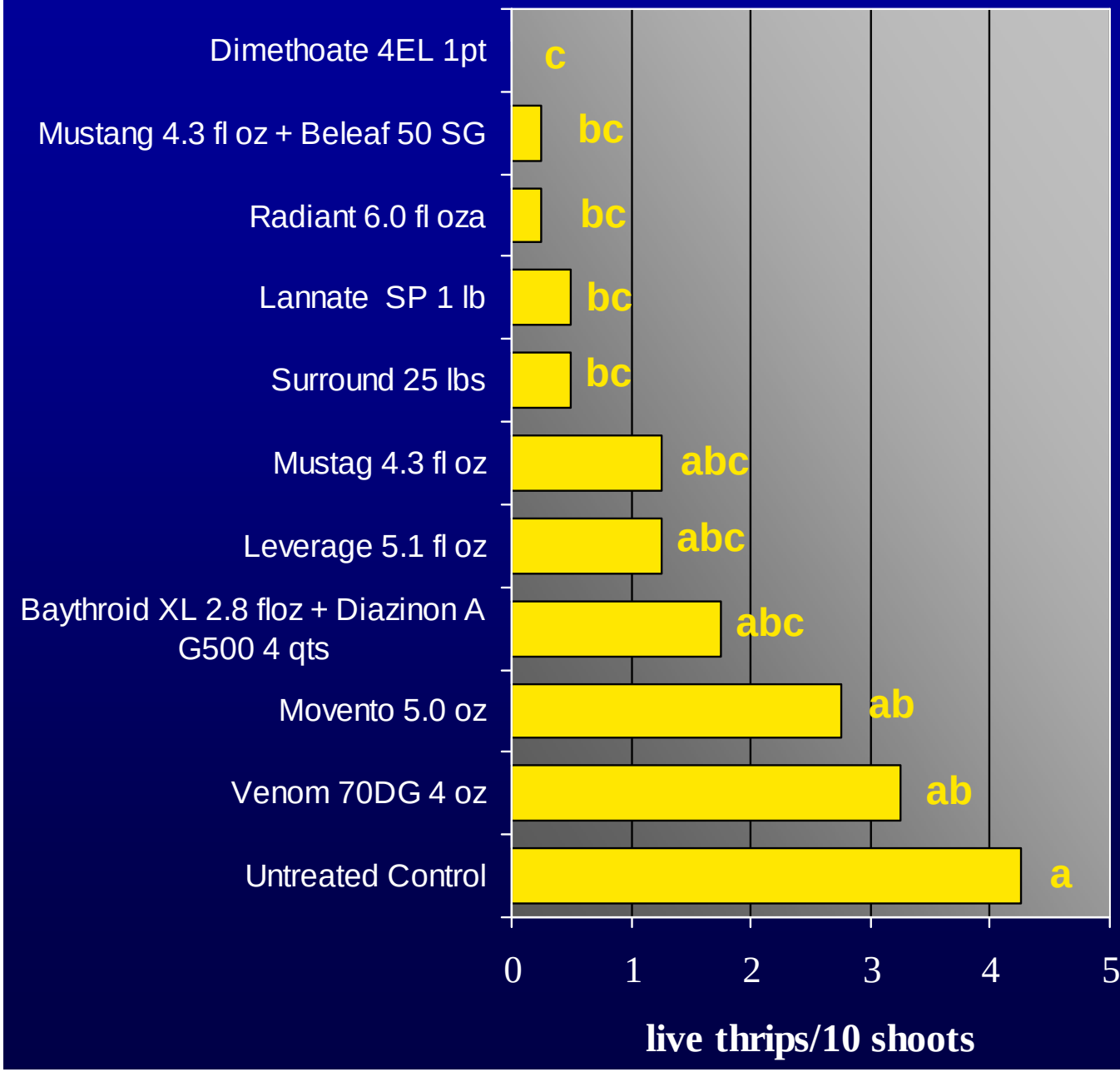
Some materials tested may not be registered on tomatoes. All applicable labels should be read before writing a pesticide recommendation.

Thrips Counts (4 days after treatment)

2007

All materials were applied on 1 Jun with Induce 0.25% v/v

2008

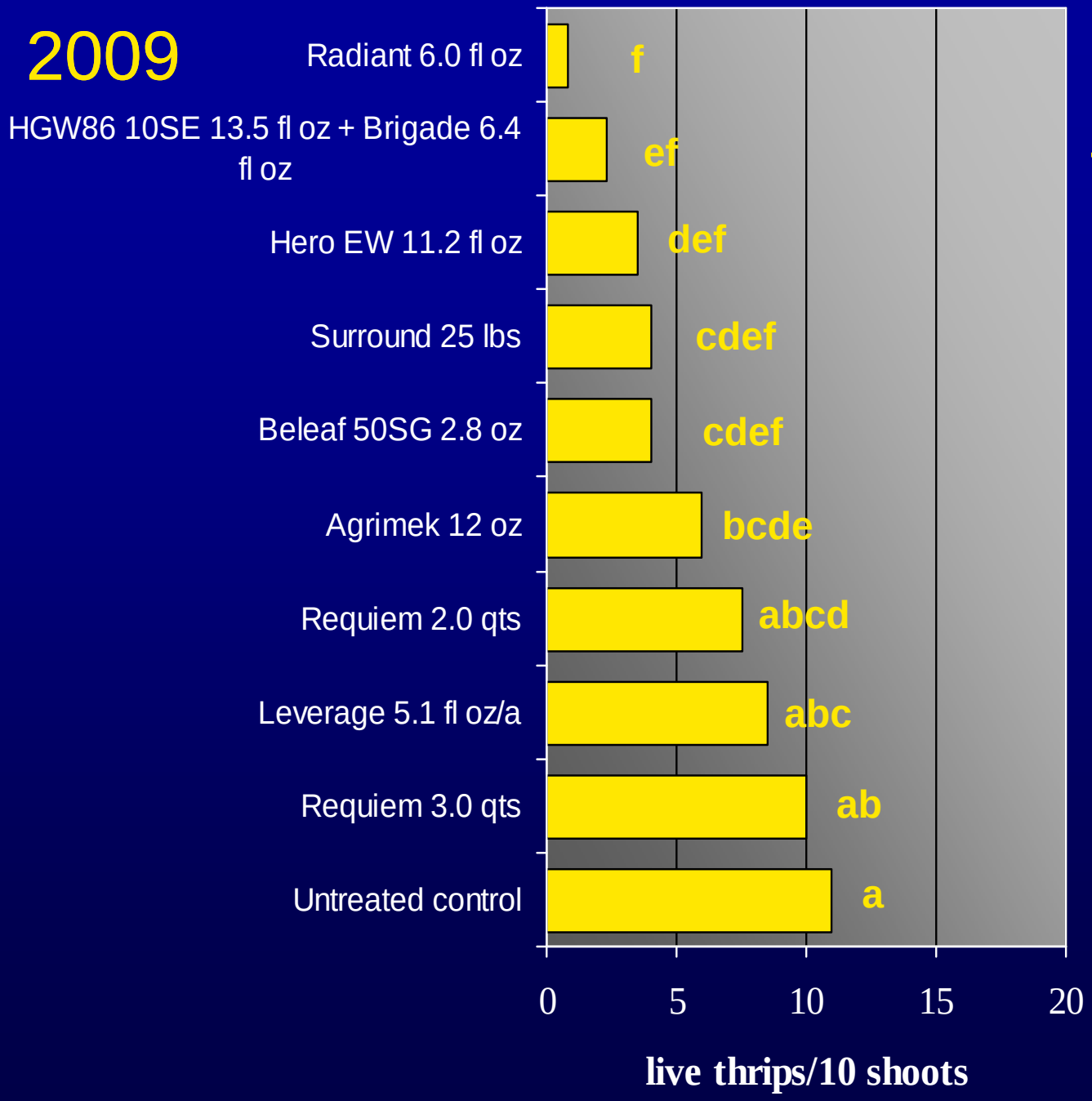


Live Thrips (4 days after treatment)

All materials were applied on with Induce 0.25% on 24 Jul

Thrips Counts (4 days after treatment)

2009



All materials were applied on 17 Jun with Induce 0.25% v/v

Insecticide Comparisons 2007-2009

- Materials that consistently provided control included Dimethoate (2/2), Lannate (2/2), Radiant (3/3), Surround (2/2), Beleaf + Mustang (2/2)

Insecticide Programs

8004 transplanted on 14 May 2009

Main Plot Treatments (drip injected into three 66 in bed, 315 ft long

- Platinum 11 fl oz (3 Jun)
- Platinum 11 fl oz (3 Jun) and Venom 3.0 fl oz (7 Jul)
- Untreated

Sub-plot treatments (applied in 20 gal water/acre @ 30psi)

# apps.	17 Jun	1 Jul	16 Jul	21 Jul
4	Radiant 6 fl oz	Dimethoate 4EL 1pt	Lannate WP 1lb	Radiant 6 fl oz
3 early	Radiant 6 fl oz	Dimethoate 4EL 1pt	Lannate WP 1lb	
3 late		Dimethoate 4EL 1pt	Lannate WP 1lb	Radiant 6 fl oz
Untreated				

Experimental details

- Four replications , 4 Main plot treatments, 5 sub plot treatments;
- 3 beds per main plot treatments
- 75 ft sub plots

Twenty-Five flowers/plot collected and thrips counted

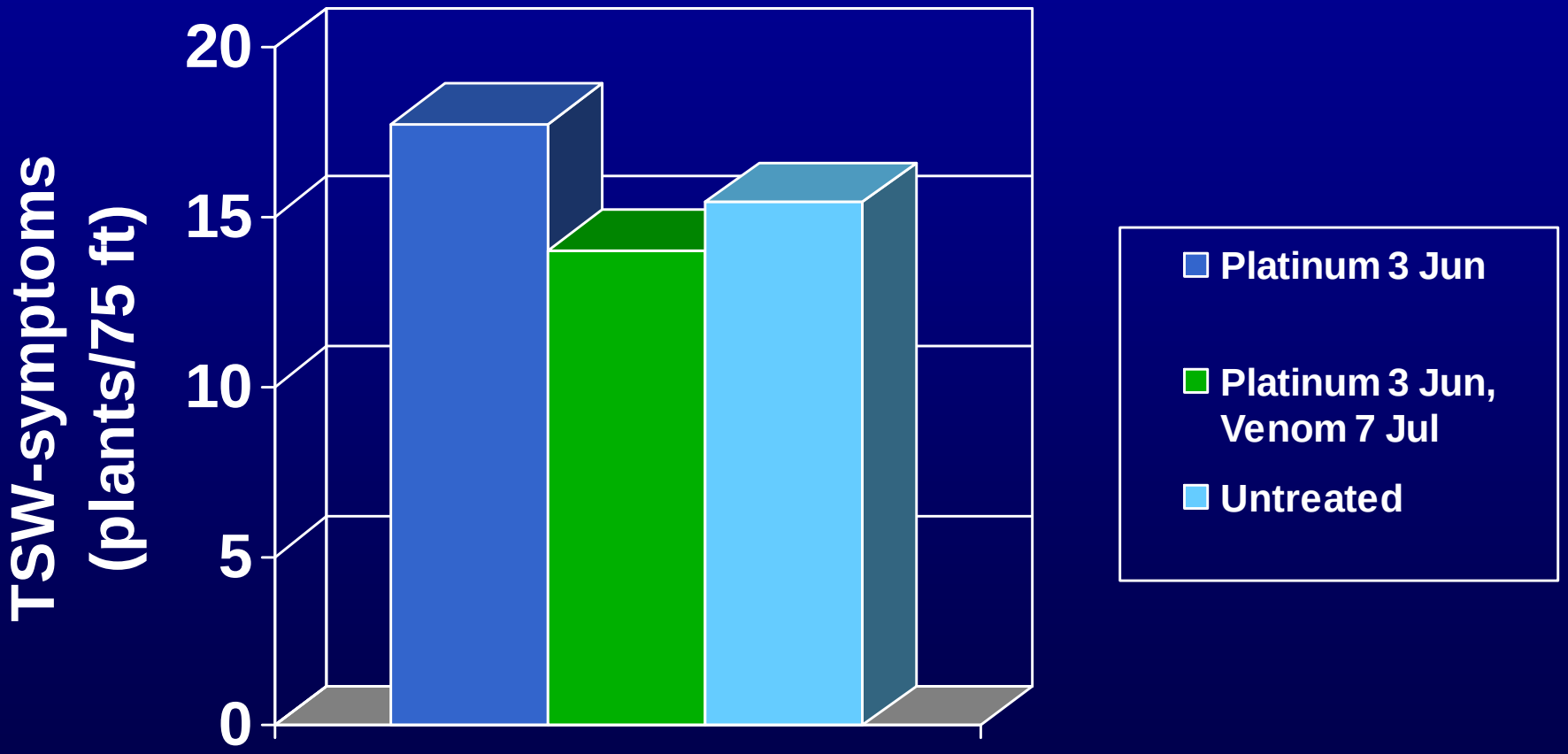
Number of plants expressing symptoms on 14 Sep

Affect of Subsurface drip applications on thrips densities

16 Jun (13 days after treatment)

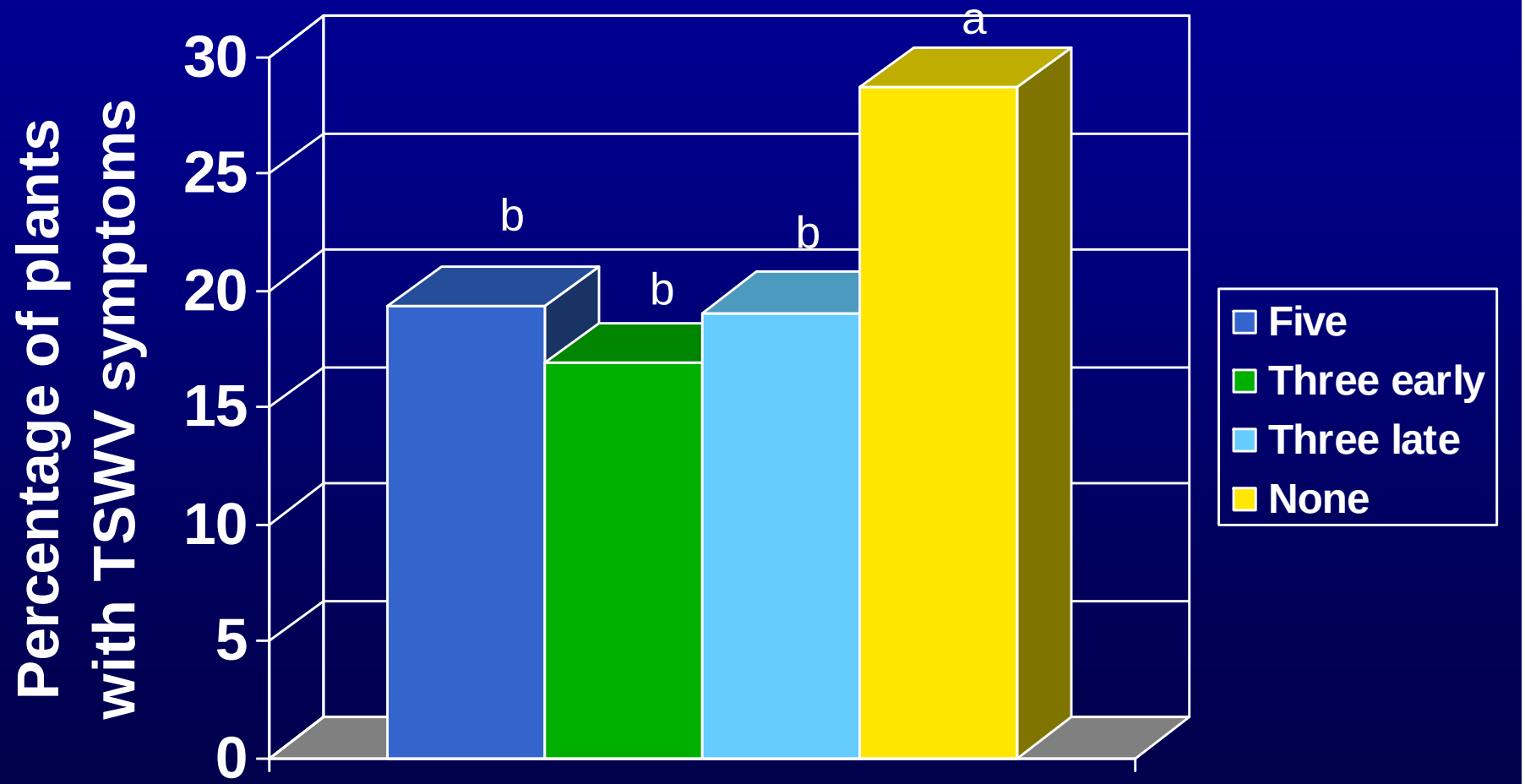
Treatment	Thrips/25 flowers
Platinum 11 fl oz on 3 Jun	82.37
Untreated	110.25
P (group comparison)	0.052

TSW-Symptom Incidence Soil-Applied Insecticide



NO SIGNIFICANT DIFFERENCE P=0.05

TSW-Symptom Incidence
Foliar-Applied Insecticide Programs

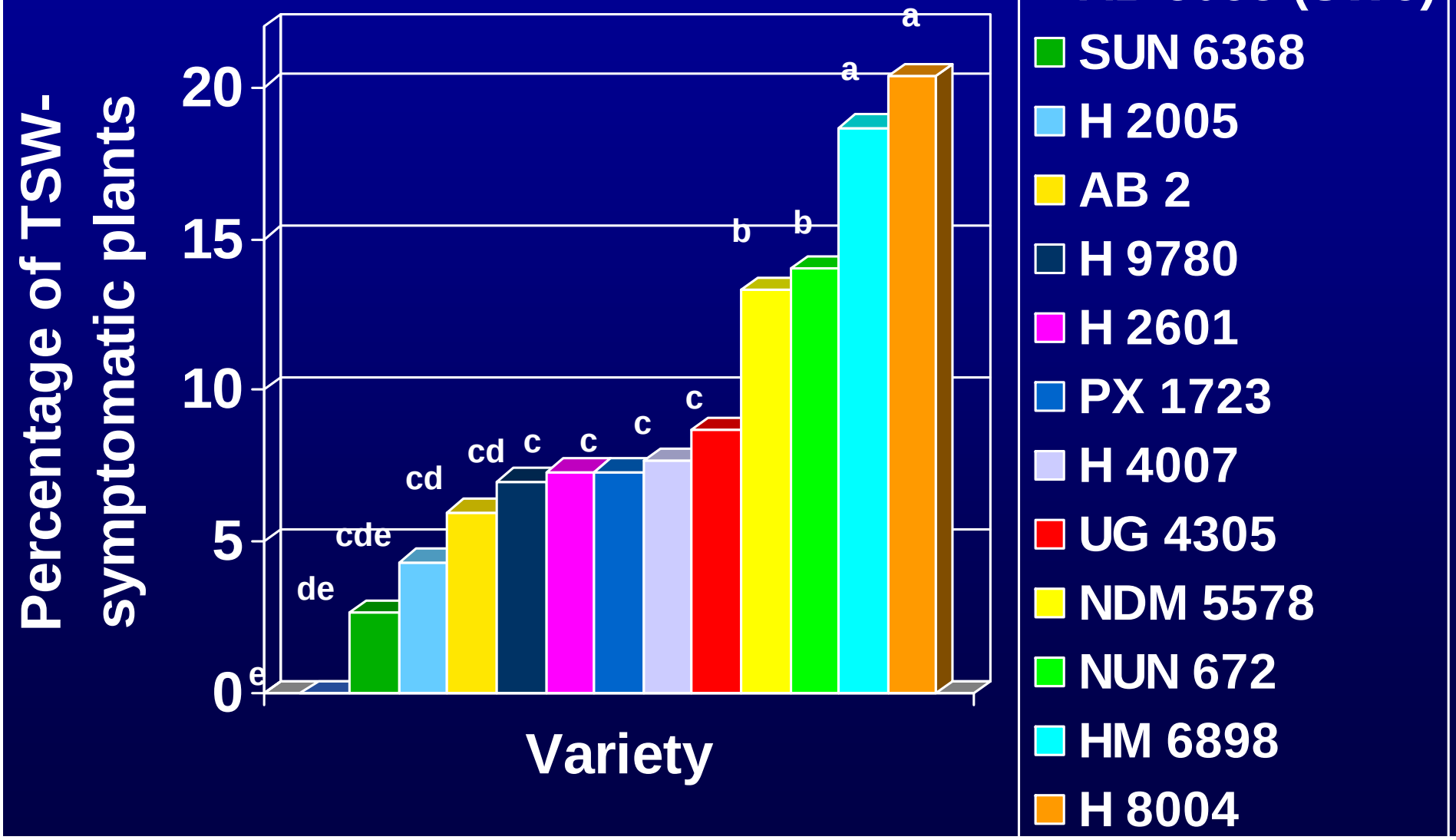


Processing Tomato Variety Response to TSWV

- Incidence of TSWV symptoms evaluated in replicated variety trials in 2008 and 2009.

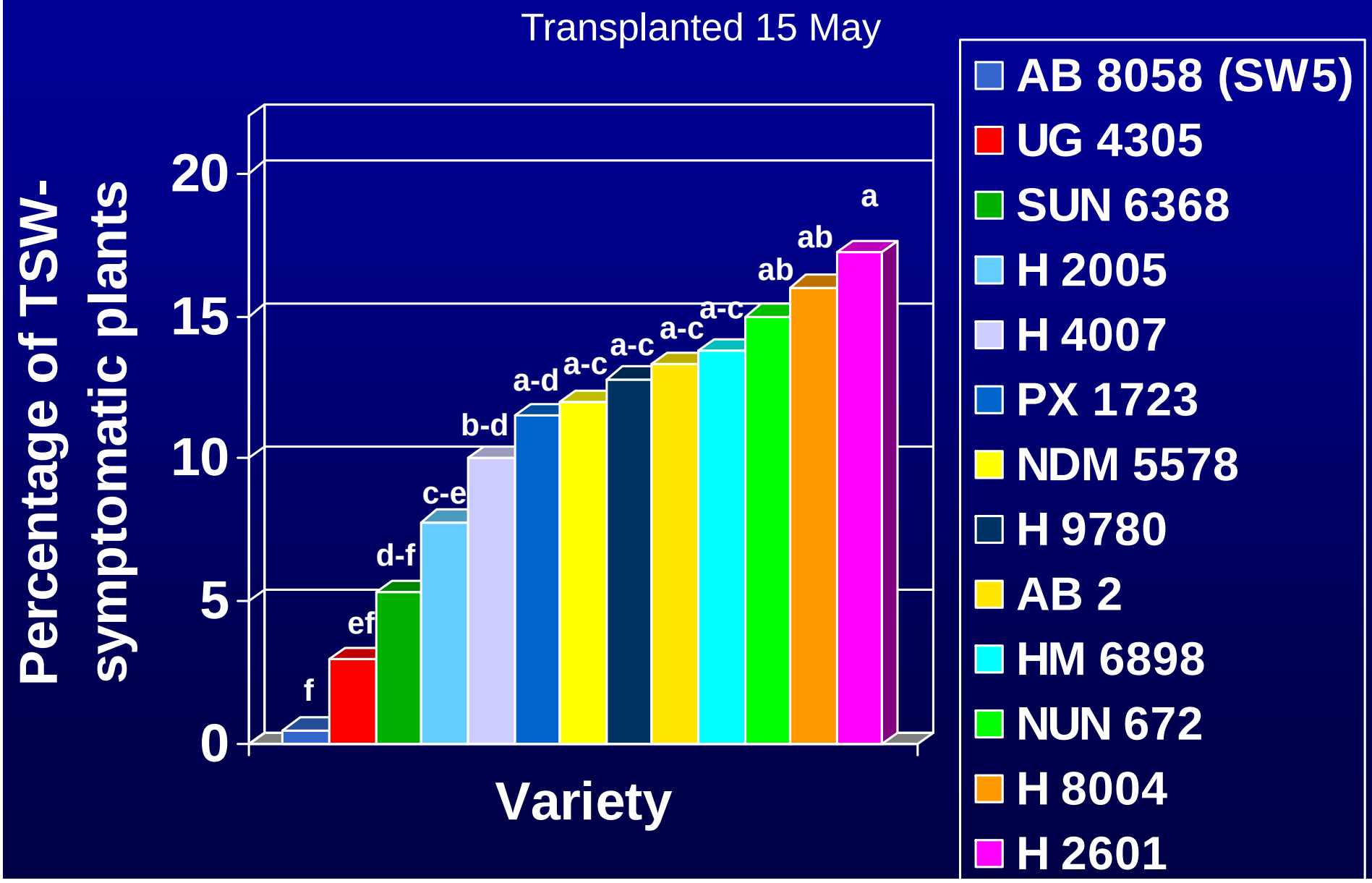
TSWV-Incidence in Mid-Season Processing Tomato Varieties at WSREC, 2008

Transplanted 16 Apr



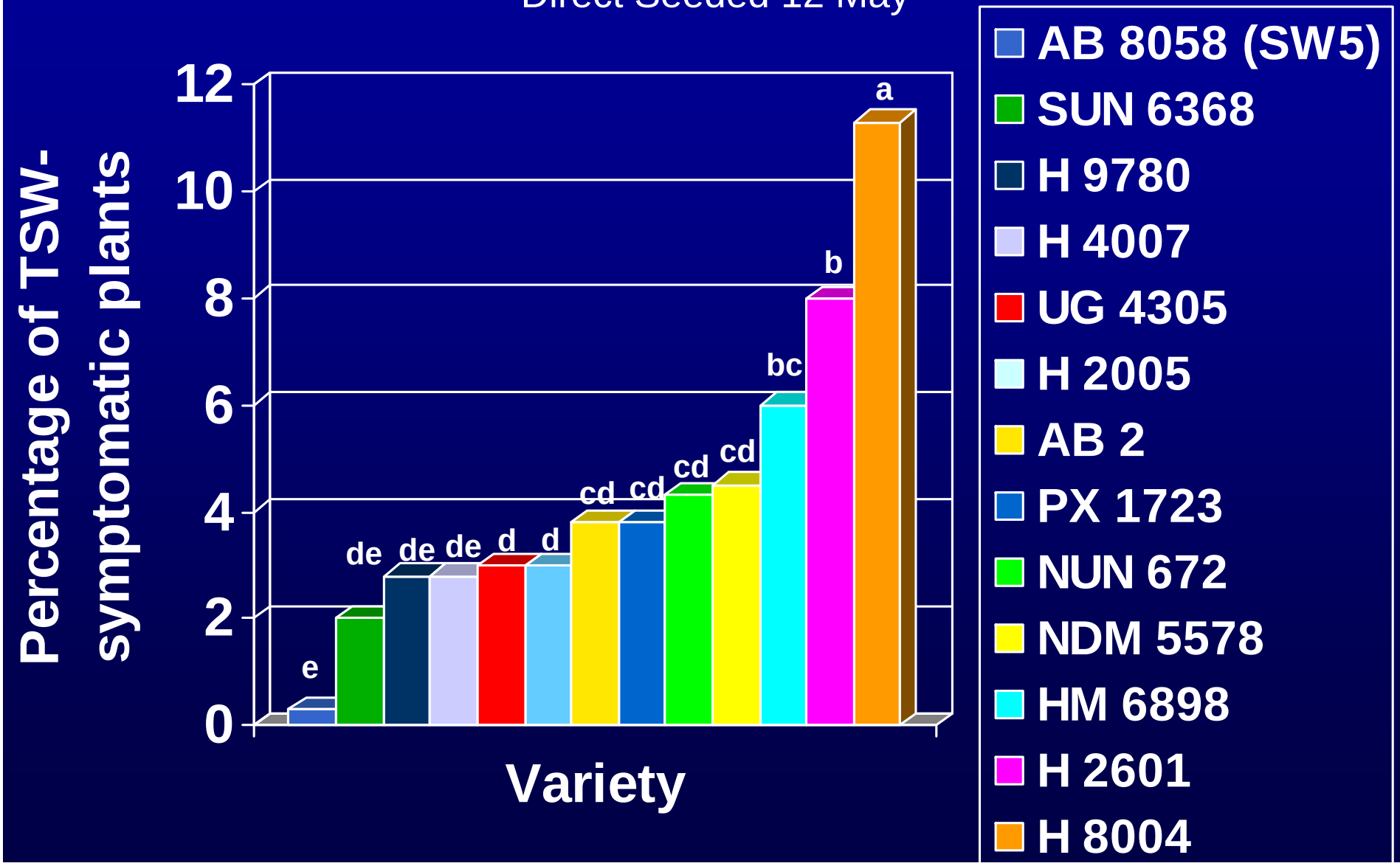
TSWV-Incidence in Mid-Season Processing Tomato Varieties at WSREC, 2008

Transplanted 15 May



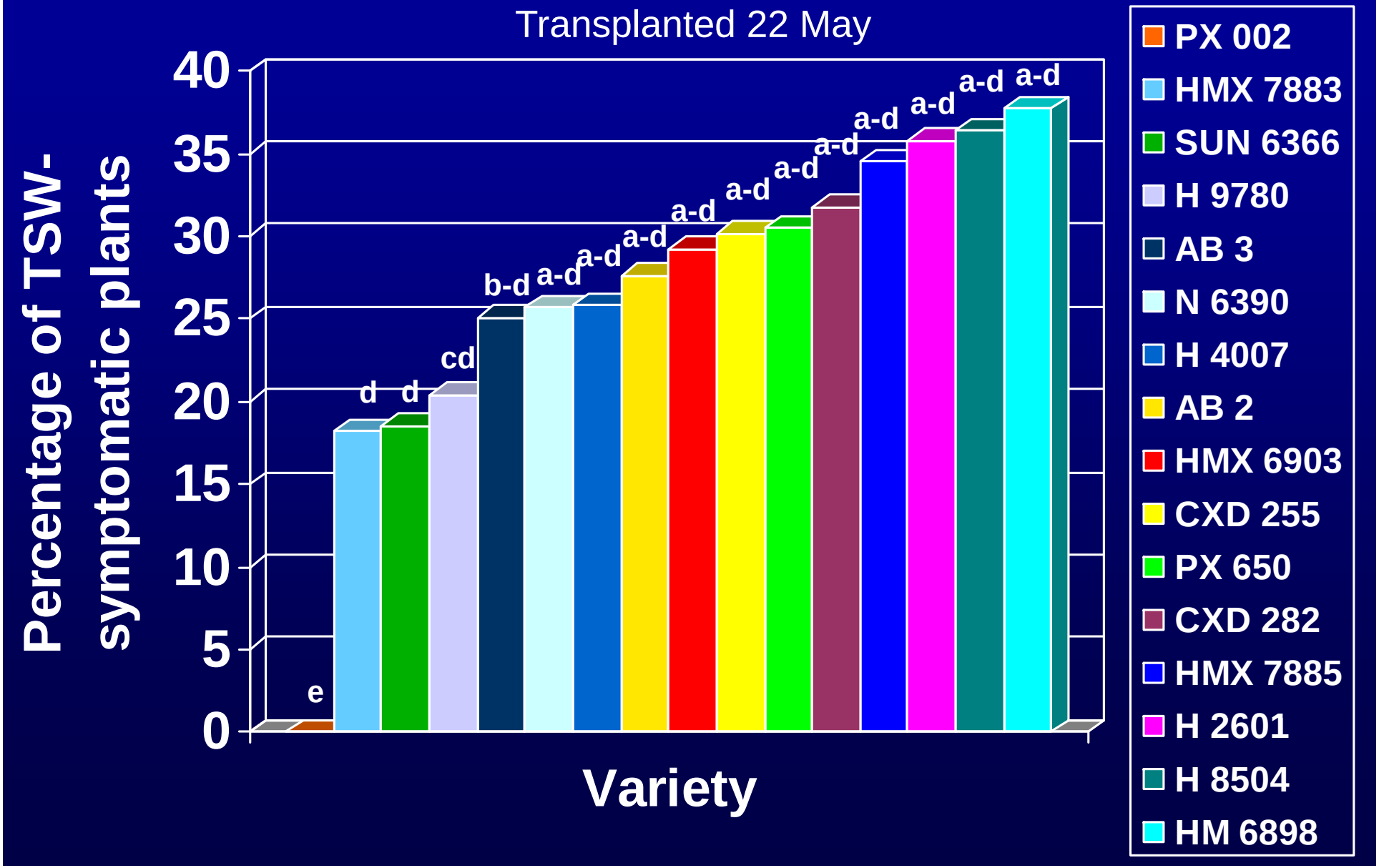
TSWV-Incidence in Mid-Season Processing Tomato Varieties at WSREC, 2008

Direct Seeded 12 May



TSWV-Incidence in Mid-Season Processing Tomato Varieties at WSREC, 2009

Transplanted 22 May



Processing Tomato Varietal Response

- Dramatic differences in incidence of TSWV symptoms exist among varieties.
- These differences have been relatively consistent in Fresno Co. trials.
  - SUN 6368 had lower incidence.
  - AB 2 tended to have lower to medium incidence.
  - H 8004 and H 2601 tended to have higher incidence.

Summary

- Infected crops or weeds near tomatoes can serve as a source of TSWV. Be aware of potential hazards when you plant.
- If planting in a high risk situation, consider using a SW5 variety.
- Control spread within the field with the use of rotations of effective insecticides.
- Consider relative susceptibility of processing tomato varieties (Under Fresno Co. trial conditions, SUN 6368 - lower incidence: H 8004 & H 2601 - higher incidence)

Acknowledgements

- California Tomato Research Institute (CTRI)
- Growers and PCAs in Fresno and Kings Co.
- West Side Research and Extension Center
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