# Wheat Insect Pest Outlook

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# Wheat Stem Maggot
# *Meromyza americana* Fitch

- Diptera: Chloropidae
- Adult fly
  - 1/5 inch long
  - Three black stripes on thorax
  - Bright green eyes

- Larva
  - Maggot (headless and legless)
  - 1/16 inch long

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# Wheat Stem Maggot – Life Cycle

- Two generations per year
- June - Adult emerges and lays eggs
- July – Maggot (larva) and pupa
- Late July into early August –
  - 2nd generation of adults emerge and lays their eggs on wild grasses or volunteer grain
- Overwinters as maggot in lower parts of grass stems

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# Wheat Stem Maggot

- Hosts: Wheat, rye, barley, grass weeds (quackgrass, wheat grass, bromegrass, green and yellow foxtail, bluestem grass)
- Damage
  - Larva rasps and tears the stem causing 'white heads'
  - White heads do not produce grain
  - Presence of white heads has not been correlated to level of damage/yield loss.

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# Root Rot

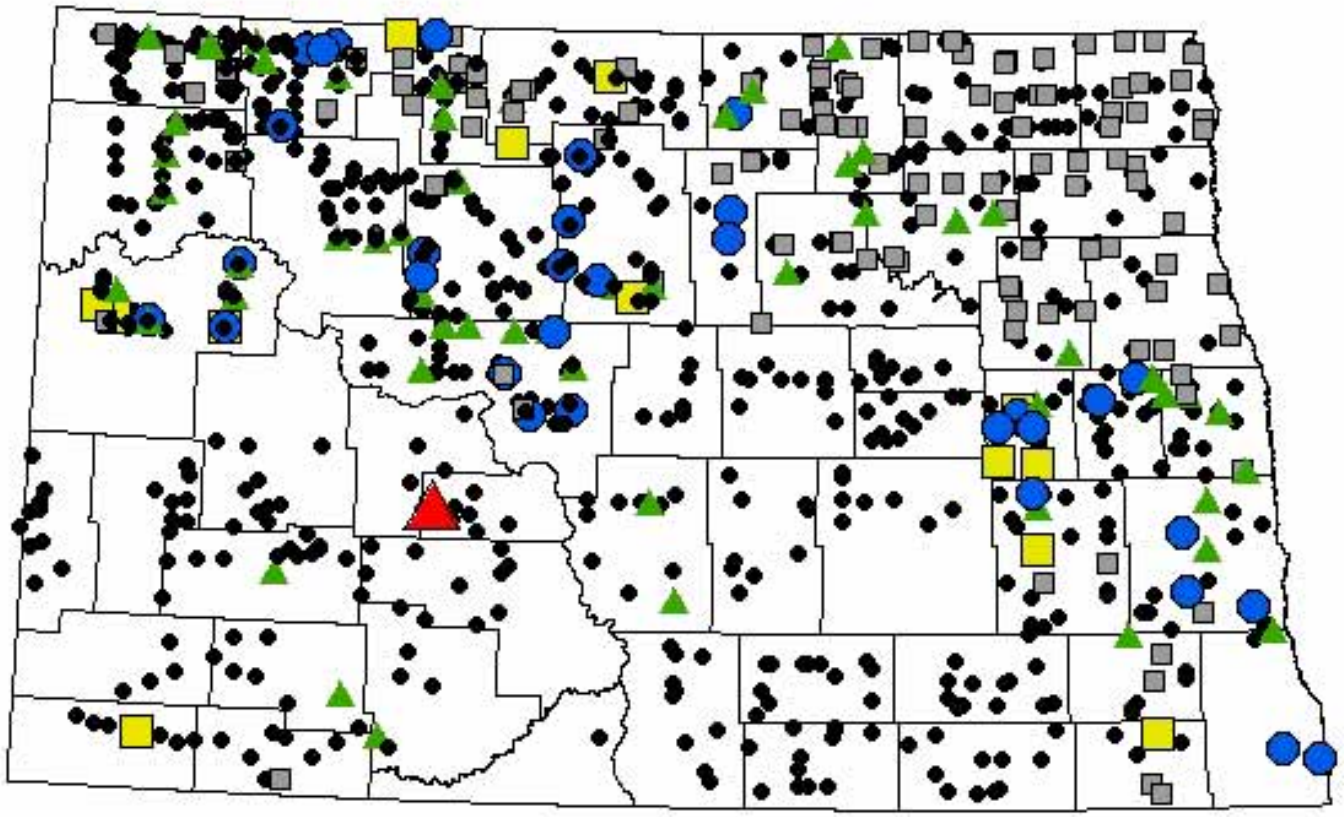
♦ Sub-crown Internode Dark Brown, Dark Lesions; Pythium also causes stunting

♦ White Heads: Plant Died Early

• Favored by wet weather followed by dry and hot conditions

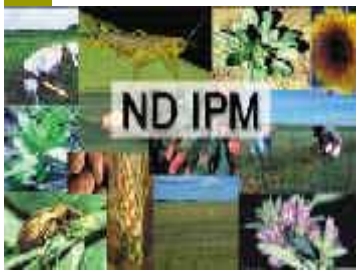
# Wheat Stem Maggot in Wheat

Field Season 2007



Percentage of Infested Plants

● 0 ■ 1-5 ▲ 6-10 ● 11-20 ■ 21-50 ▲ > 50

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# Wheat Stem Maggot - IPM

- Crop rotation with non-susceptible crops
- Delayed planting
- Tillage – Fall or Spring
- Control of grassy weeds and volunteer small grains
- Resistant Varieties – None
- Biological Control – Parasitic wasps
  - *Bracon meromyzae* Gahan
  - *Coelinidea meromyzae* (Forbes)
- Chemical Control - ?

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# Insecticide Timing Trial

- Hettinger REC, Eric Eriksmoen
- HRSW, Variety Reeder, planted on May 1st
- Four spray timings:
  - June 13th (5 leaf & jointing)
  - June 20th (early boot)
  - June 26th (heading)
  - July 5th (flowering)
- Mustang Max insecticide at 3 fl oz/a
- Counted white head on July 20th from 200 heads
- Harvested – July 27th (unreplicated strips of 100 ft per plot)

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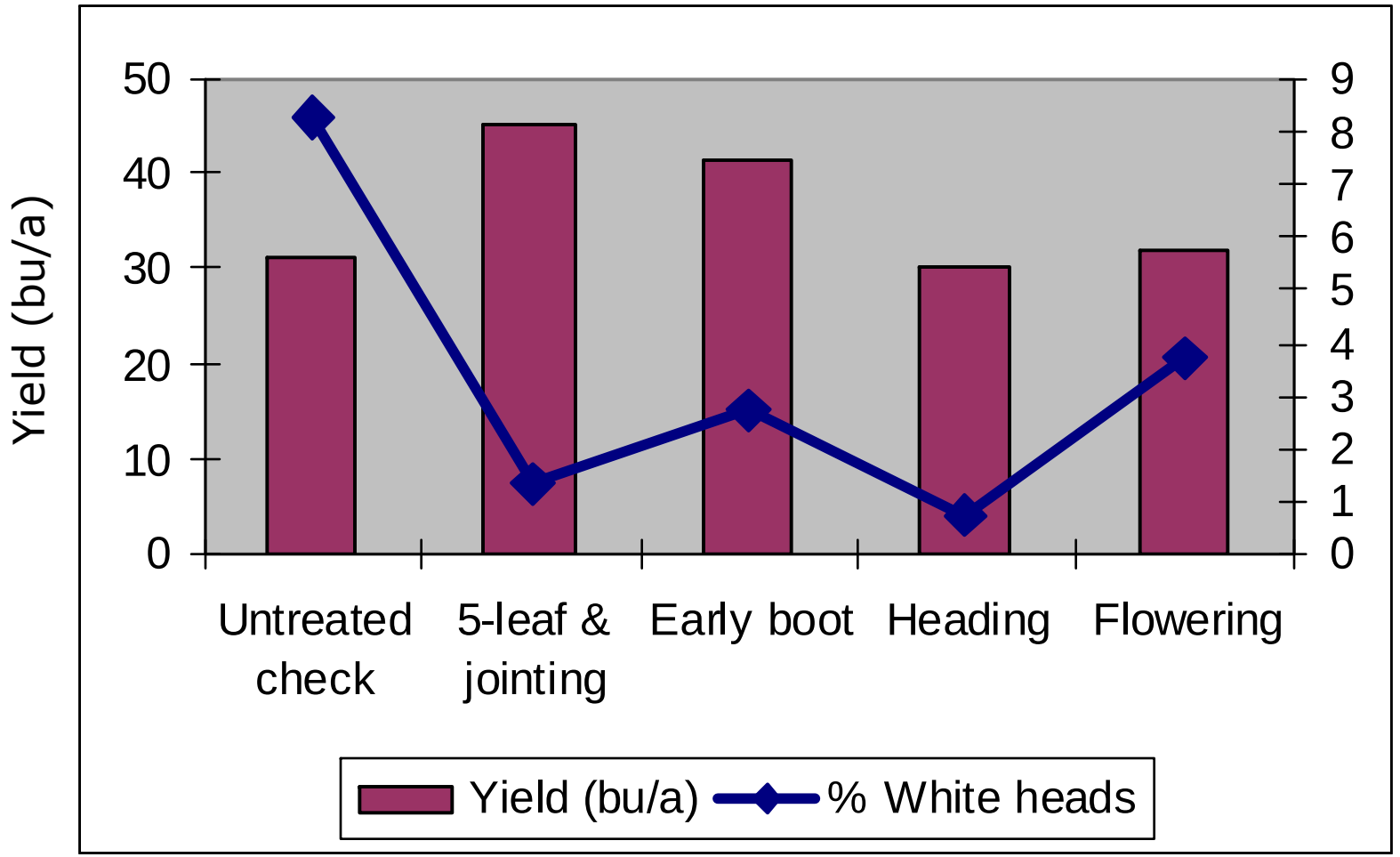
# Wheat Stem Maggot Insecticide Timing Study - Hettinger

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# Wheat Stem Maggot Insecticide Timing Study

- Todd Kautsman, Mott Grain
- Location - NE of Mott, ND
- HRSW, Variety Parshall
- Treatment
  - Warrior (2.56 fl oz/a) + Quilt (12 fl oz/a)
  - June 14th at flag leaf
- Counted white heads on 500 heads

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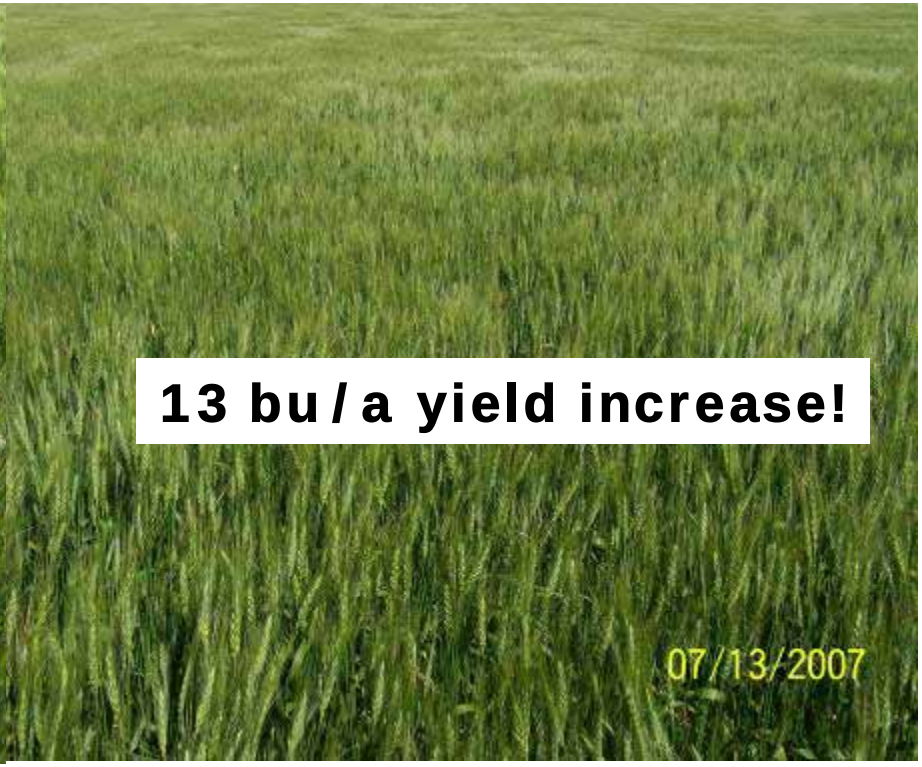
# Wheat Stem Maggot
# Insecticide Timing Study – Mott Grain

**Untreated: >12% White heads**


**Treated: <1% White heads**

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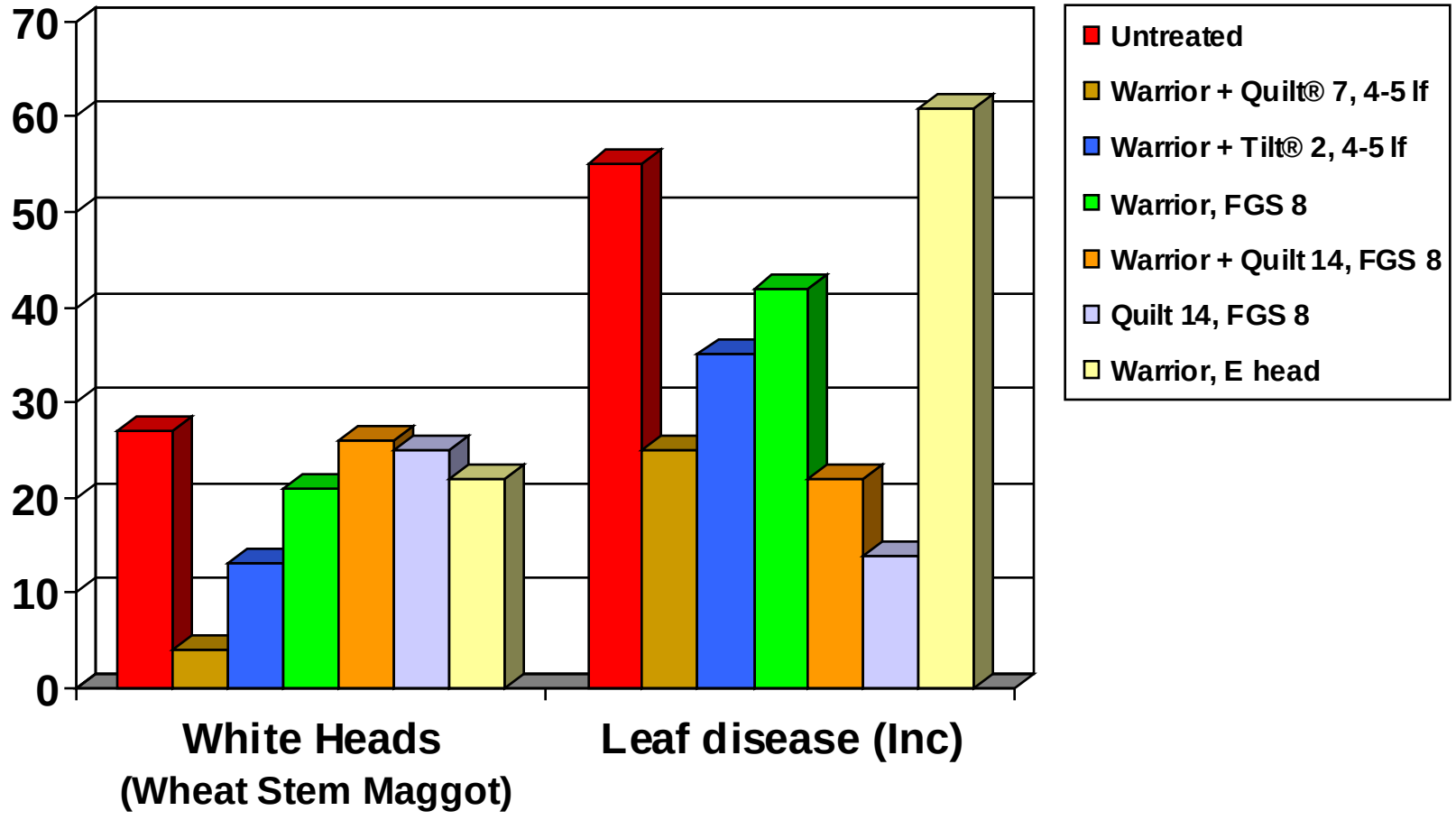
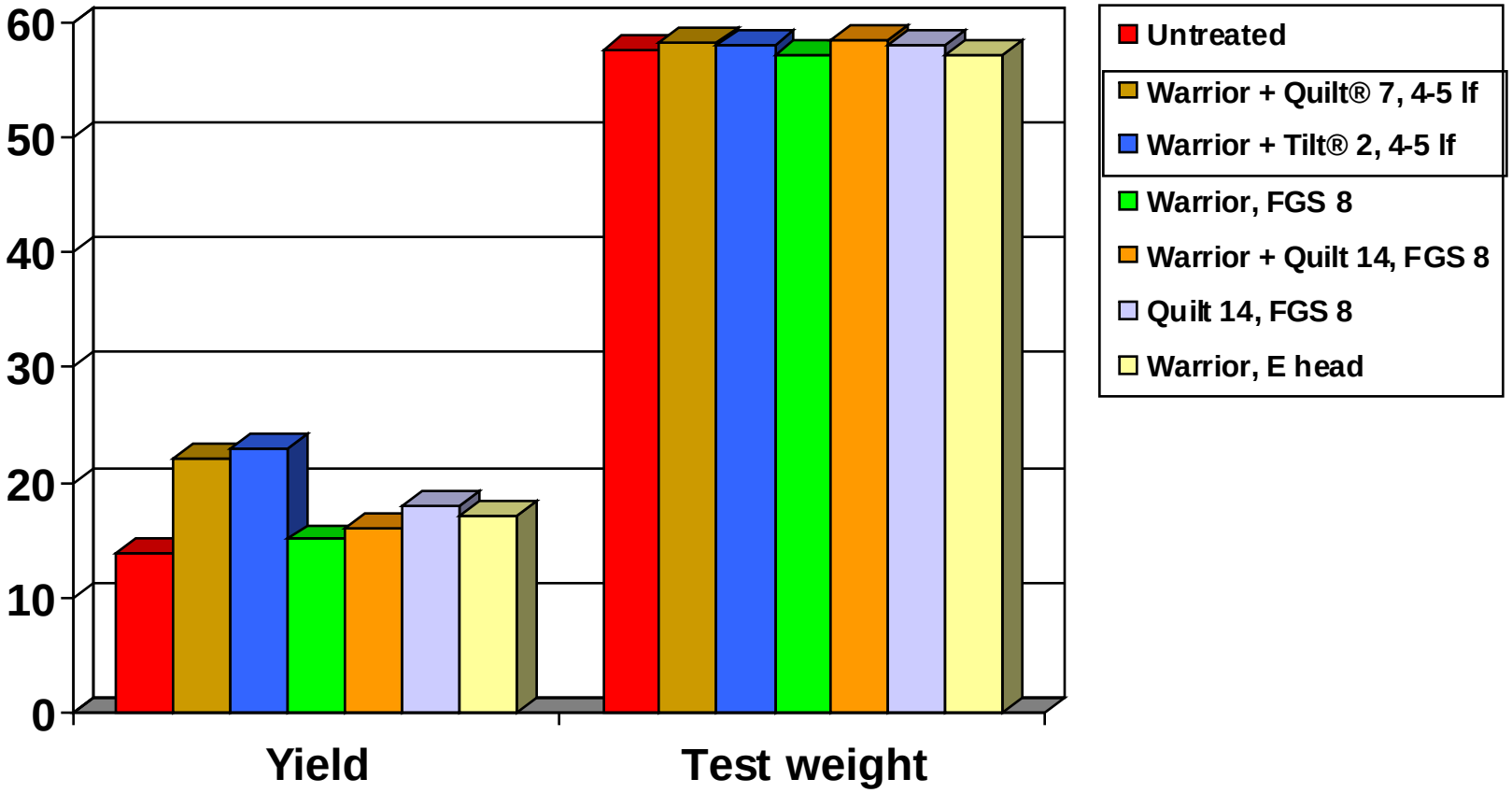
# Warrior® and Fungicide Trial NCREC, Minot, ND 2007




Data source: D. Markle, NDSU, North Central Research Extension Center, Minot, ND. Insecticide fungicide Tank-mix. Minot, ND, 2007. HRSW 'Clearfield' was seeded May 24, 2007. 4-leaf treatments on July 3, flag treatments on July 27, early head July 30. Warrior applied at 2.56 fl oz/A. Leaf rust was primary disease, moderate pressure. $LSD_{0.05}$ = Heads: 13; disease: NS. 

# Warrior® and Fungicide Trial NCREC, Minot, ND 2007

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# Wheat Stem Maggot – Research Needs

- IPM
  - Basic Biology - number of generations
  - Plant stage(s) injured
  - Field monitoring/scouting techniques
  - Economic thresholds
  - Impact of planting date
  - Evaluation of hybrids for resistance
    - Solid stem varieties
  - Chemical control and timing
  - Impact on small grain production in the region

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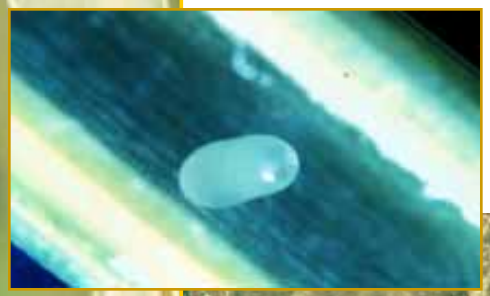
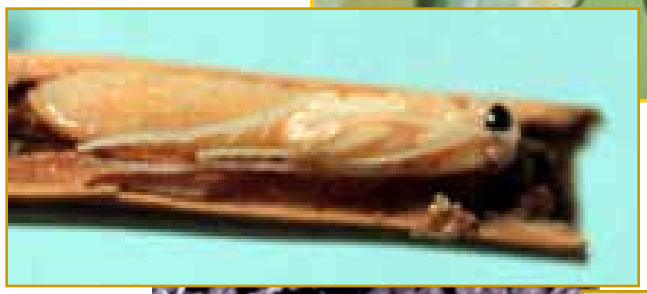
# Wheat Stem Sawfly
# *Cephus cinctus* (Cephidae)

**Adult**

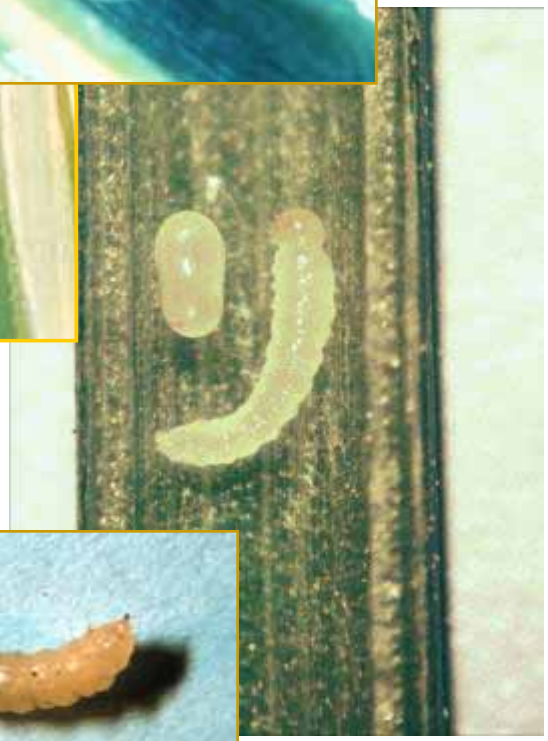
**Egg**



**Pupa**



**Larva**



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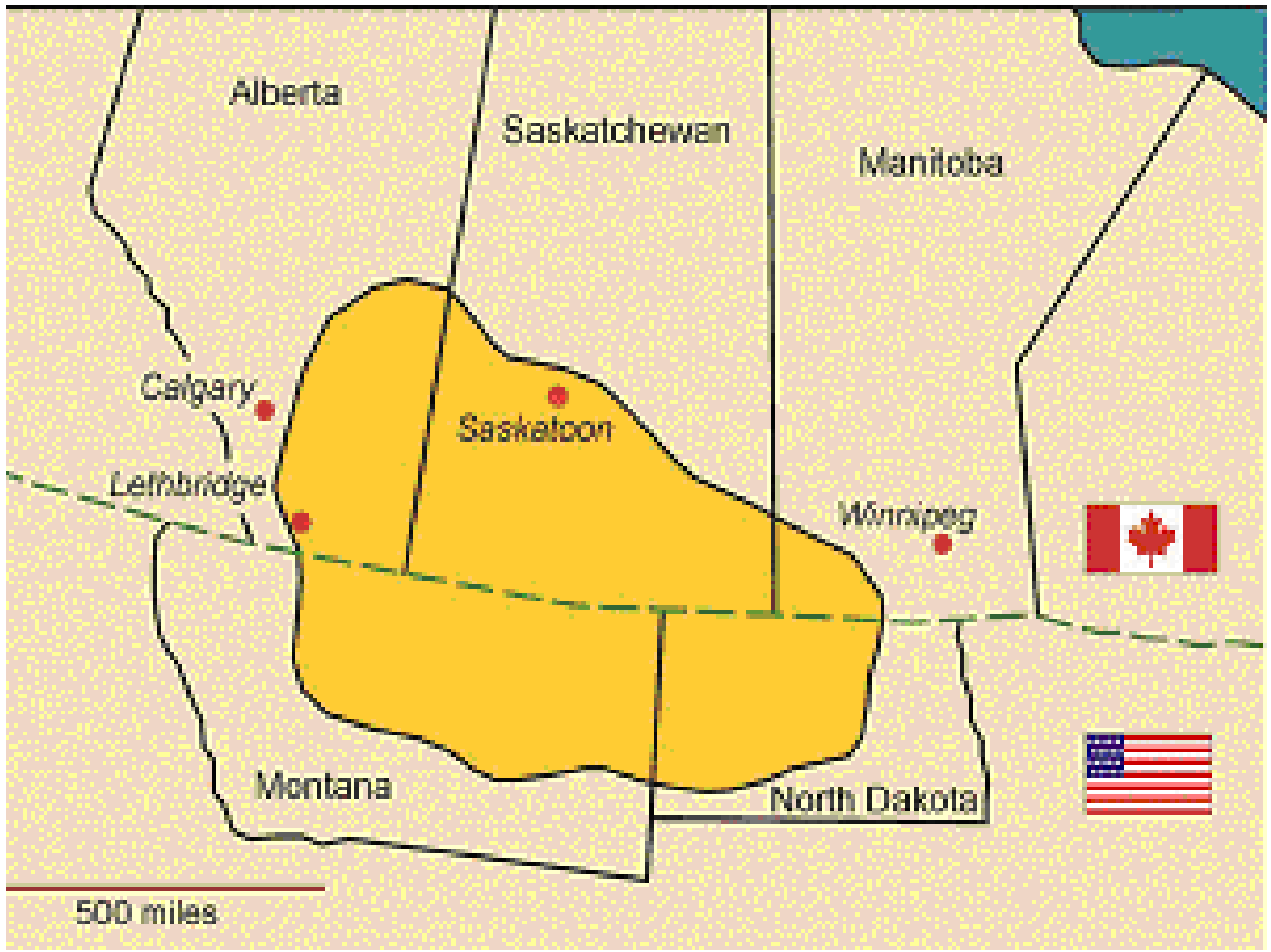
# Distribution of Wheat Stem Sawfly

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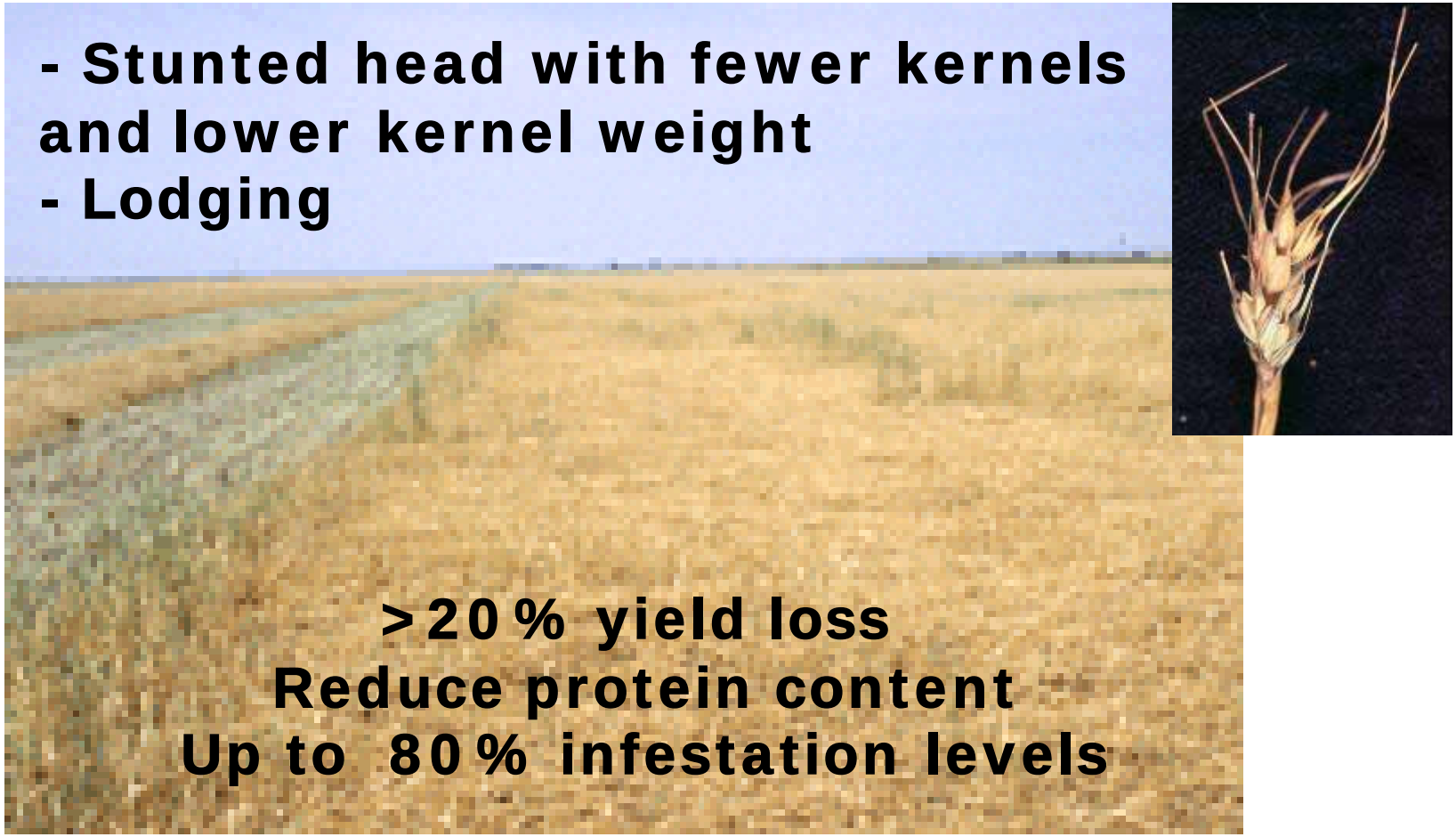
# Damage caused by Wheat Stem Sawfly

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# Wheat Stem Sawfly – IPM

- Field monitoring/Economic Threshold
  - Adult
    - Sweep net
    - Sticky traps?
  - Larvae
    - In split stems
    - % stem with sawfly larvae = infestation level
    - Infestation level ≠ yield loss
  - Cultivars respond differently to sawfly infestations.
  - Not possible to develop Economic injury level
  - More useful for planning next year's crop

# Wheat Stem Sawfly – IPM

- Cultural Control
  - Fall tillage
    - 90% mortality of overwintering larvae
  - Crop rotation
    - Plant non-hosts crops (oats, flax, sunflower, legumes, canola, to a lesser extent barley, rye, durum)
  - Harvesting
    - Heavily infested fields - swath at 30-35% moisture to prevent lodging
    - If >6% of stem infested, swath to reduce lodging losses

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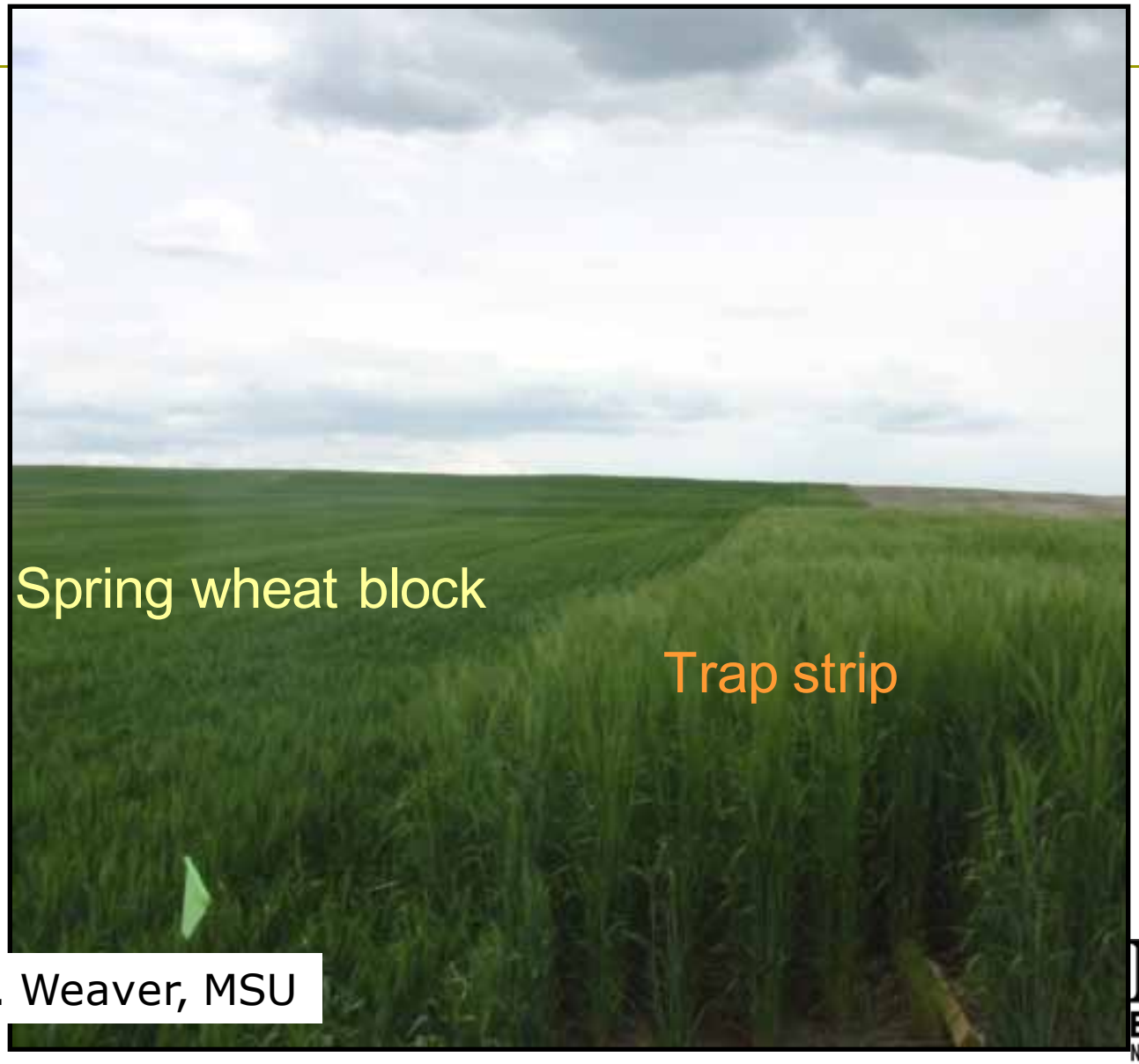
# Trap crop + cultural control




Source: D. Weaver, MSU

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# Wheat Stem Sawfly – IPM

- Evaluation of hybrids for resistance
  - Solid-stem varieties
  - Degree of solidity necessary for resistance?
  - First resistant wheat cultivar 'Rescue' in 1946
  - Wheat lines with resistance to sawfly:
    - Hard red winter
    - Hard white spring
    - Hard red spring
  - Sawfly suffer higher mortality in solid stem varieties.

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# Resistant Varieties Released after 1990

| Variety | Wheat Type | Height | Origin | Year Released | Straw Strength | Yield |
|---|---|---|---|---|---|---|
| Ernest | HRS | standard | NDAES | 1995 | med | High |
| AC Eatonia | HRS | standard | AC | 1996 | med | High |
| AC Abbey | HRS | standard | AC | 1998 | med | High |
| Choteau | HRS | semidwarf | MAES | 2003 | strong | High |
| AC Lilian | HRS | standard | AC | 2006 | med | High |
| NDSW 0449 | HRS | standard | NDAES | 2009? | strong | Very High |
| Vanguard | HRW | standard | MAES | 1995 | med | High |
| Rampart | HRW | standard | MAES | 1996 | med | High |
| Genou | HRW | standard | MAES | 2004 | strong | High |
| Explorer* | HWS | semidwarf | MAES | 2002 | strong | High |
| Agawam | HWS | semidwarf | WPB | | strong | Very High |

# Wheat Stem Sawfly – IPM

- Biological Control
  - Parasitoids
    - *Bracon cephi*, native Braconid wasp
    - *Bracon lissogaster*, Braconid wasp
    - ND: <5% of sawfly larvae attacked
    - Infestation level ranged from 0-82%, averaging 7.8% in eastern MT and western ND survey during 1999-2001 (Shanower, USDA)
    - Current solid-stemmed varieties do not negatively impact parasitoids.
    - Current solid-stemmed varieties and parasitoids do not provide effective or sustainable control of sawfly.

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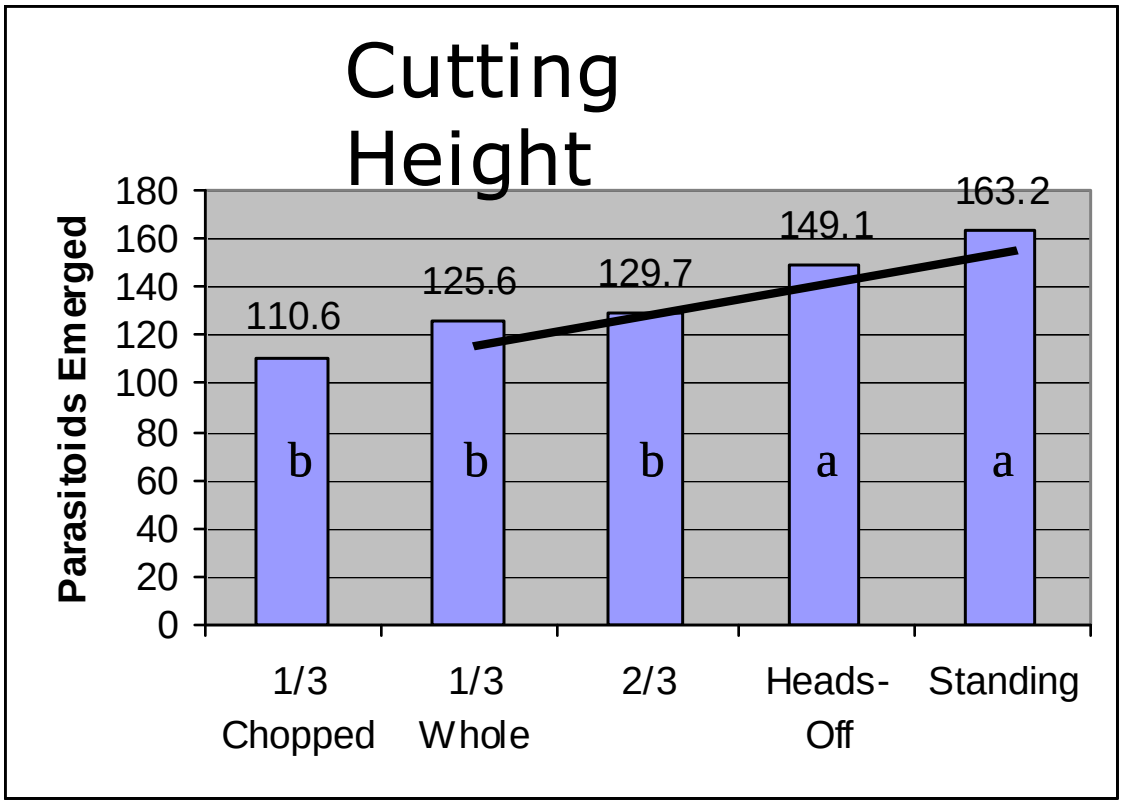
# Parasitoid conservation




Taller residue is better

Source: D. Weaver, MSU

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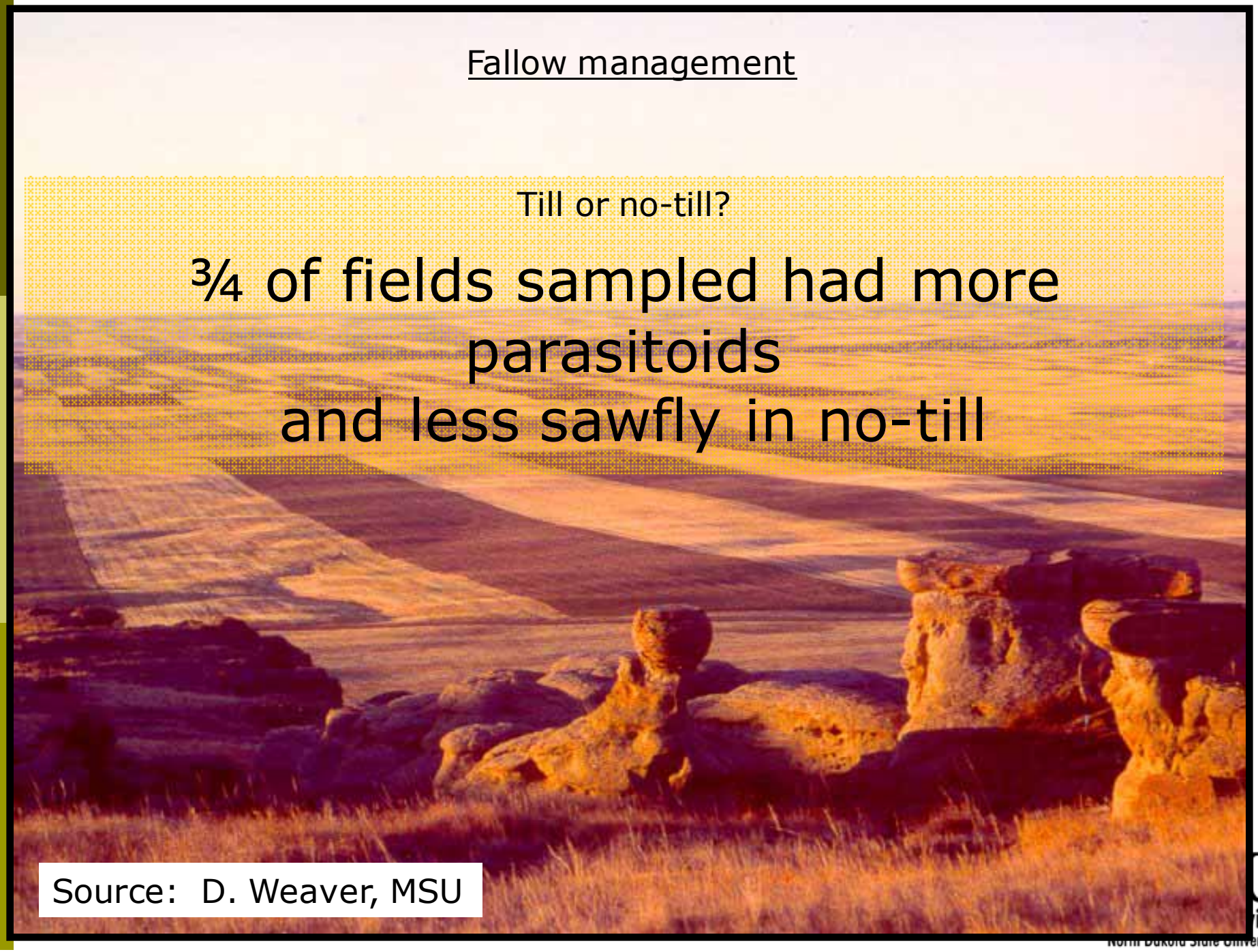

Fallow management

Till or no-till?

¾ of fields sampled had more parasitoids
and less sawfly in no-till

Source: D. Weaver, MSU

# Wheat Stem Sawfly Insecticide Timing Study - Hettinger

| Treatment | % Stem Infested Larvae* | Yield* (bu/a) | TW* (lbs/bu) |
|---|---|---|---|
| Untreated check | 12 | 31.3 | 49.1 |
| June 13 – 5-leaf & Jointing | 0 | 45.1 | 50.2 |
| June 20 – E. boot | 0 | 41.6 | 53.9 |
| June 26 - heading | 0 | 30.3 | 50.0 |
| July 5 - flowering | 2 | 32.0 | 51.4 |

***Unreplicated data.***

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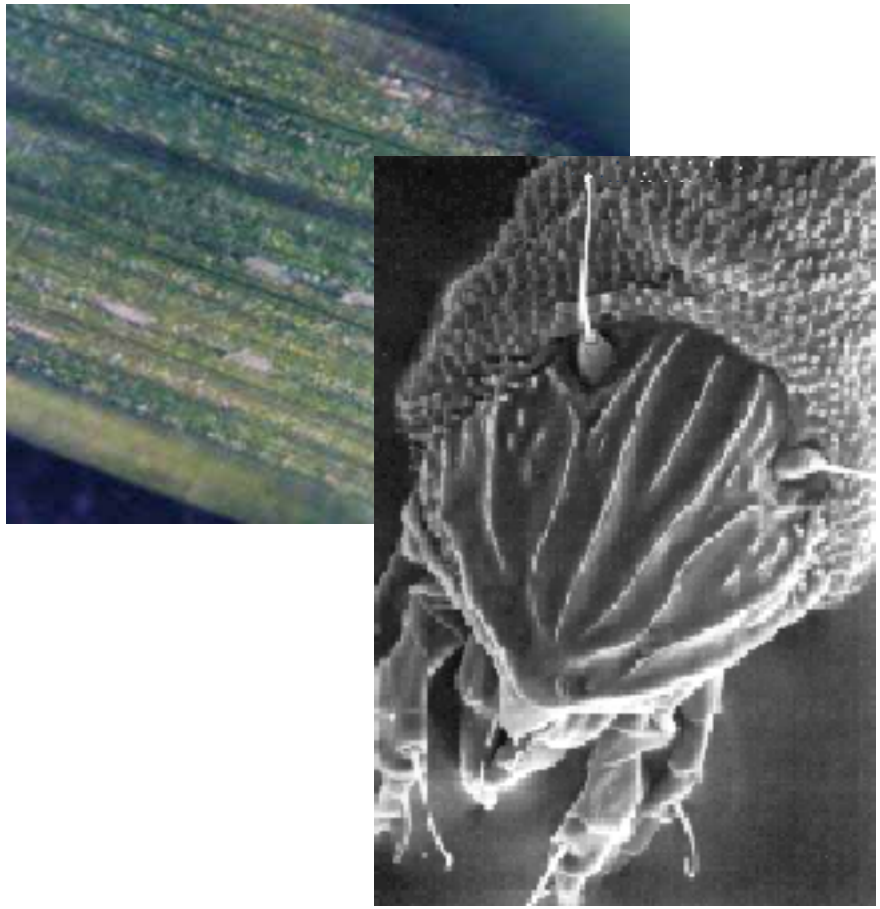
# Wheat Curl Mite

- **Eriophyidae mites**
- **1/100th inch long**
- **Feed in protected areas of plant**
- **Life cycle completed in 8-10 days**
- **Several alternate grass hosts**
  - **Corn, wheat, grassy weeds**
- **Disperse via wind**



Photos courtesy S. Blodgett, Montana State University

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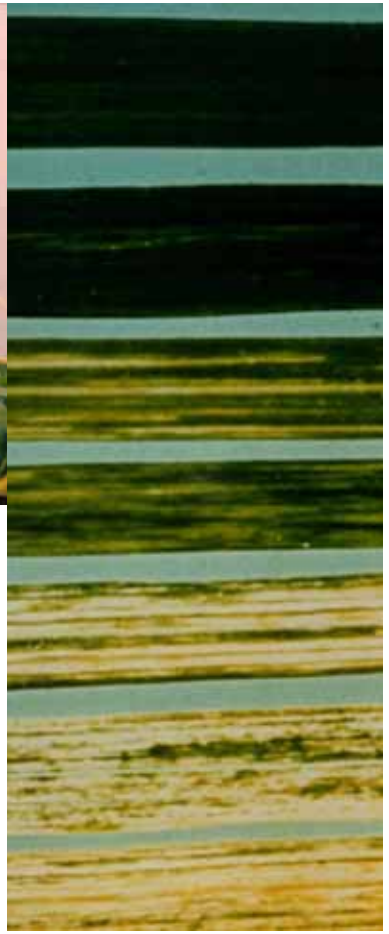
# Wheat Curl Mite Damage

- **Transmit Wheat streak mosaic virus**
- **Feeding damage causes leaves to curl**
- **Young plants may be stunted**
- **Tolerant corn hybrid may be source of infestation**



Photos courtesy S. Blodgett, Montana State University

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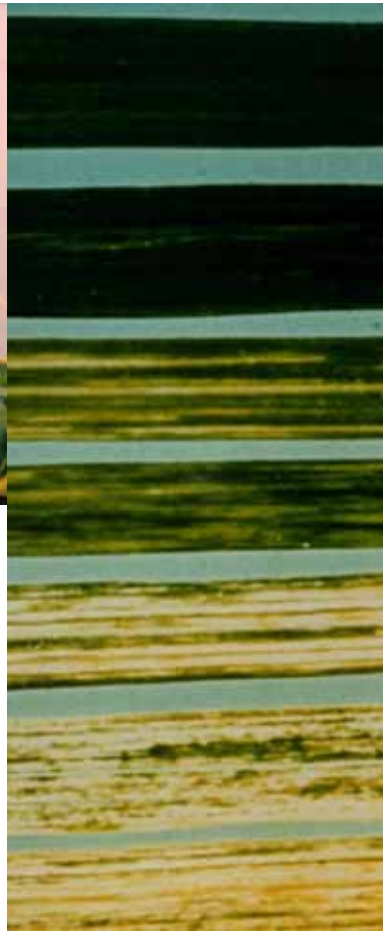
# Wheat Curl Mite Control

- **Break the “green bridge”**
- **At least two weeks with no green living material**
- **Control volunteer wheat**
- **Avoid early planting of winter wheat**
- **No insecticides work**



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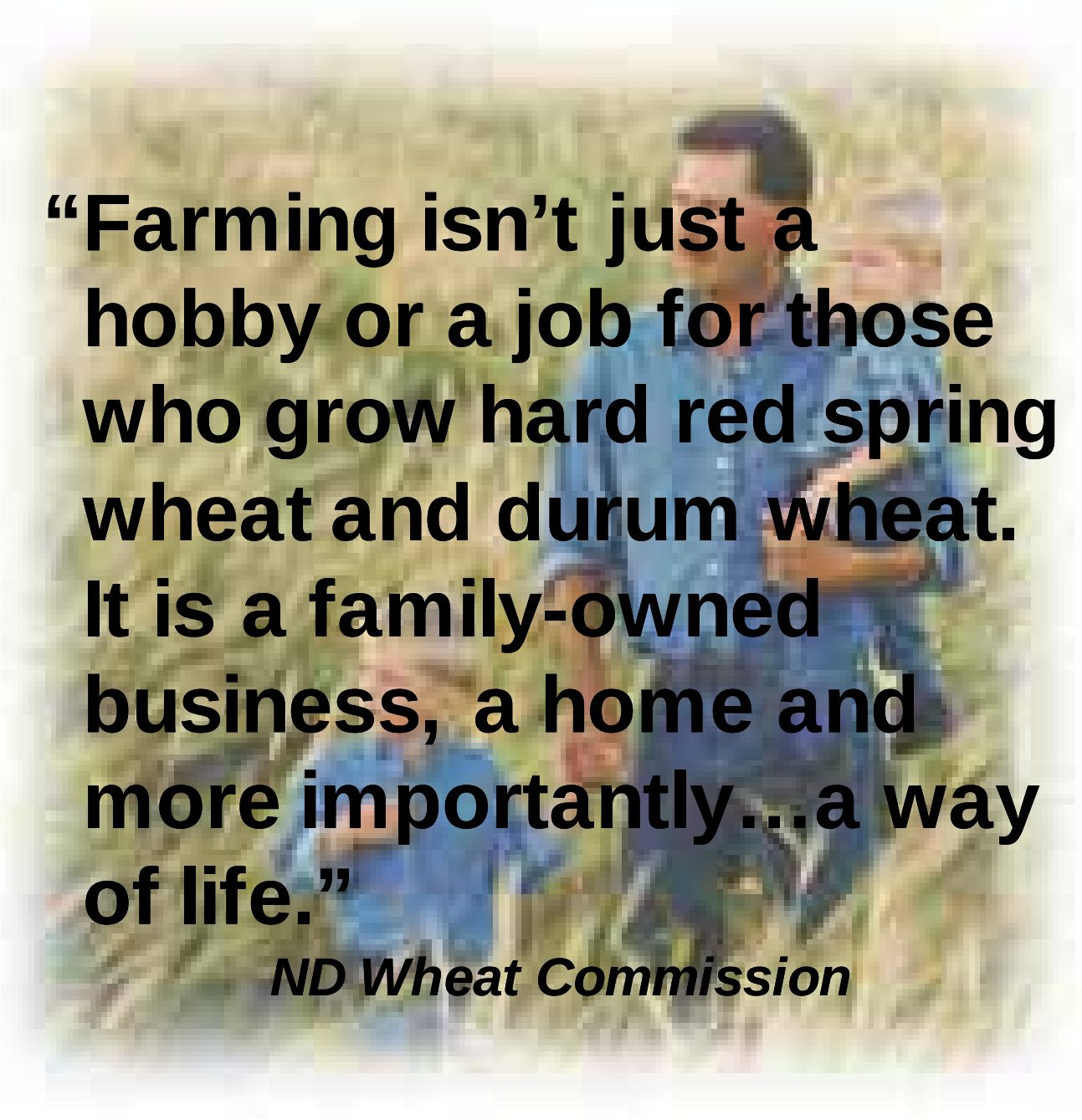

**"Farming isn't just a hobby or a job for those who grow hard red spring wheat and durum wheat. It is a family-owned business, a home and more importantly…a way of life."**

***ND Wheat Commission***

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