Wheat Pest Management Strategies

Insects

NDSU Extension Service

Wireworm

Wireworm Bait Station

Best use may be in the fall . . . Check before freeze OR dig up grain in the spring.

- **Recommend 10 to 12 stations per 40 acres,**
- **randomly placed in the field . . .**
- **Time consuming . . . History of wireworm ?**

Wireworm feeding sites

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Small Grain Management Recommendations

registered insecticides - 2000

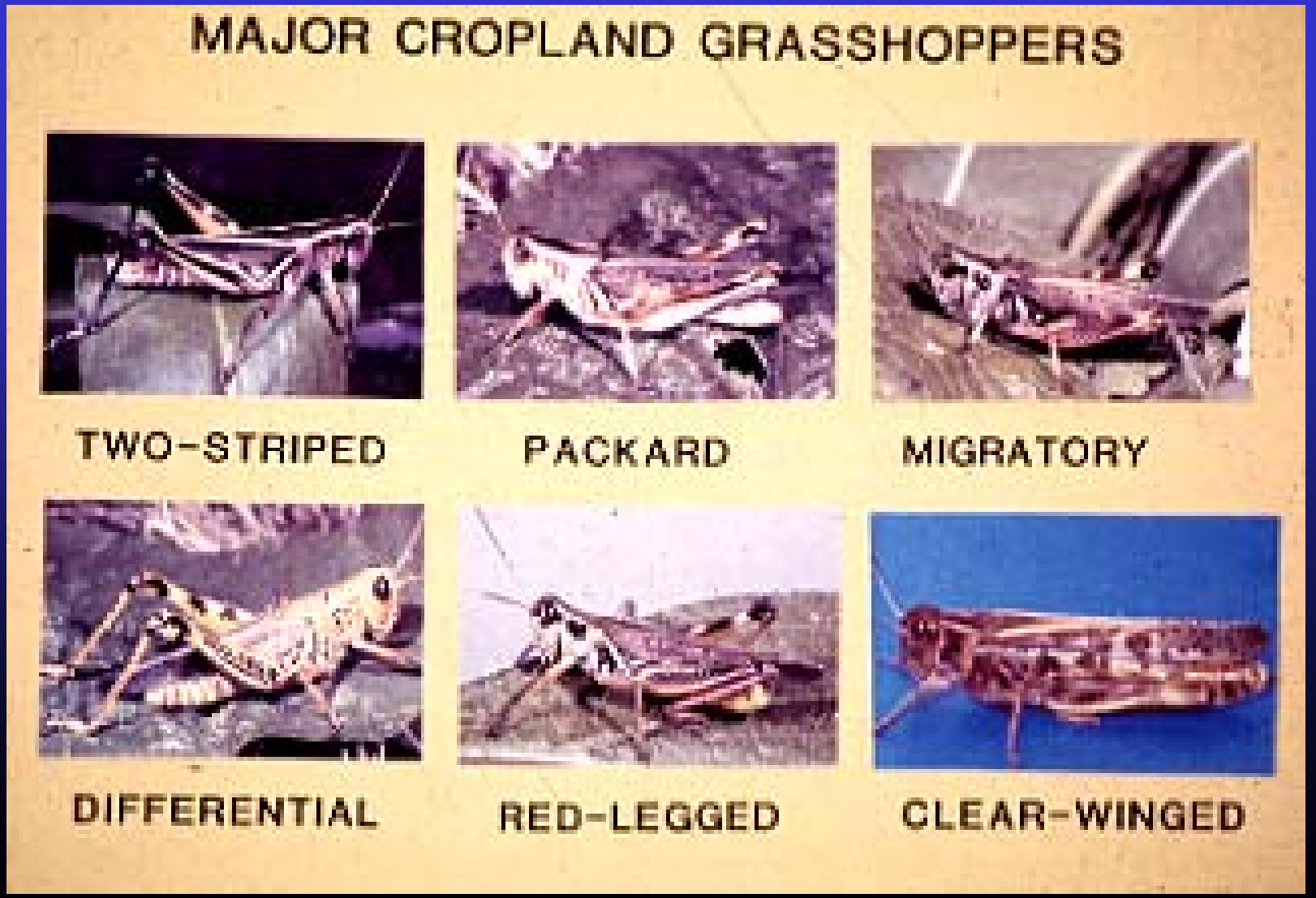
Wireworms

Currently the only insecticide registered for wireworm control that will provide effective suppression is lindane.

This insecticide can be purchased as a dry automatic drill box treatment in combination with fungicides (Maneb or Captan) and is also available in liquid (flowable) formulation to be applied alone or with fungicides such as Vitavax, Captan or Thiram.

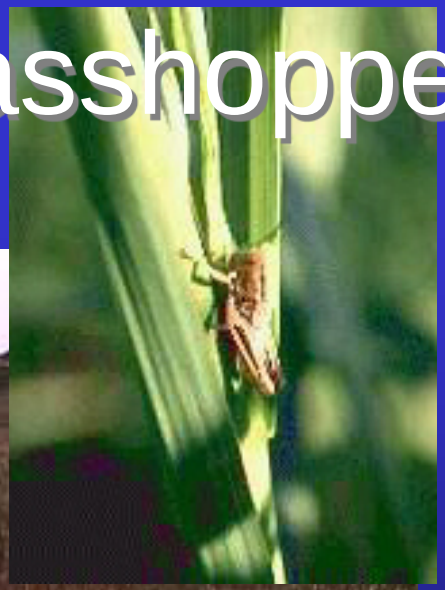
** restricted use insecticide*

Major Cropland Grasshoppers

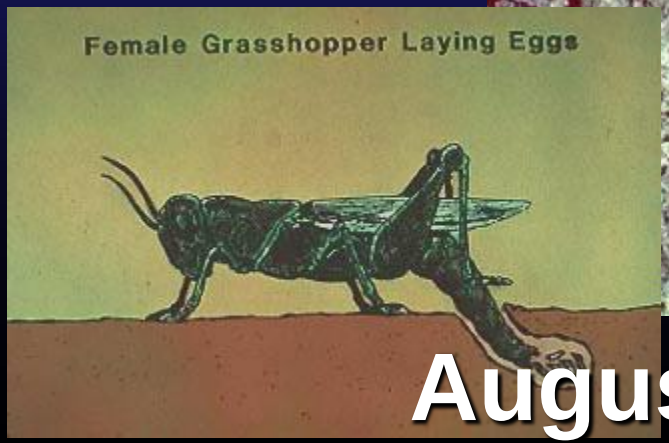


Grasshopper Seasons

May - June



July - August



August - Sept

Grasshoppers Lifecycle

- Eggs are laid in the fall;
- Embryos develop while temperatures are favorable . . . There are wide ranges of development;
- This makes it difficult to predict hatch.

Lilac as an indicator:

10 days after common lilac flowered, 75% of grasshoppers were first stage

Grasshopper Infestation Ratings

	Nymphs / sq. yd.		Adults / sq. yd.
Rating	margin	field	field
Light	25 - 35	15 - 25	3 - 7
Threatening	50 - 75	30 - 45	8 - 14
Severe	100 - 150	60 - 90	15 - 28
Very Severe	200+	120+	28+

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Small Grain Management Recommendations

registered insecticides - 2001

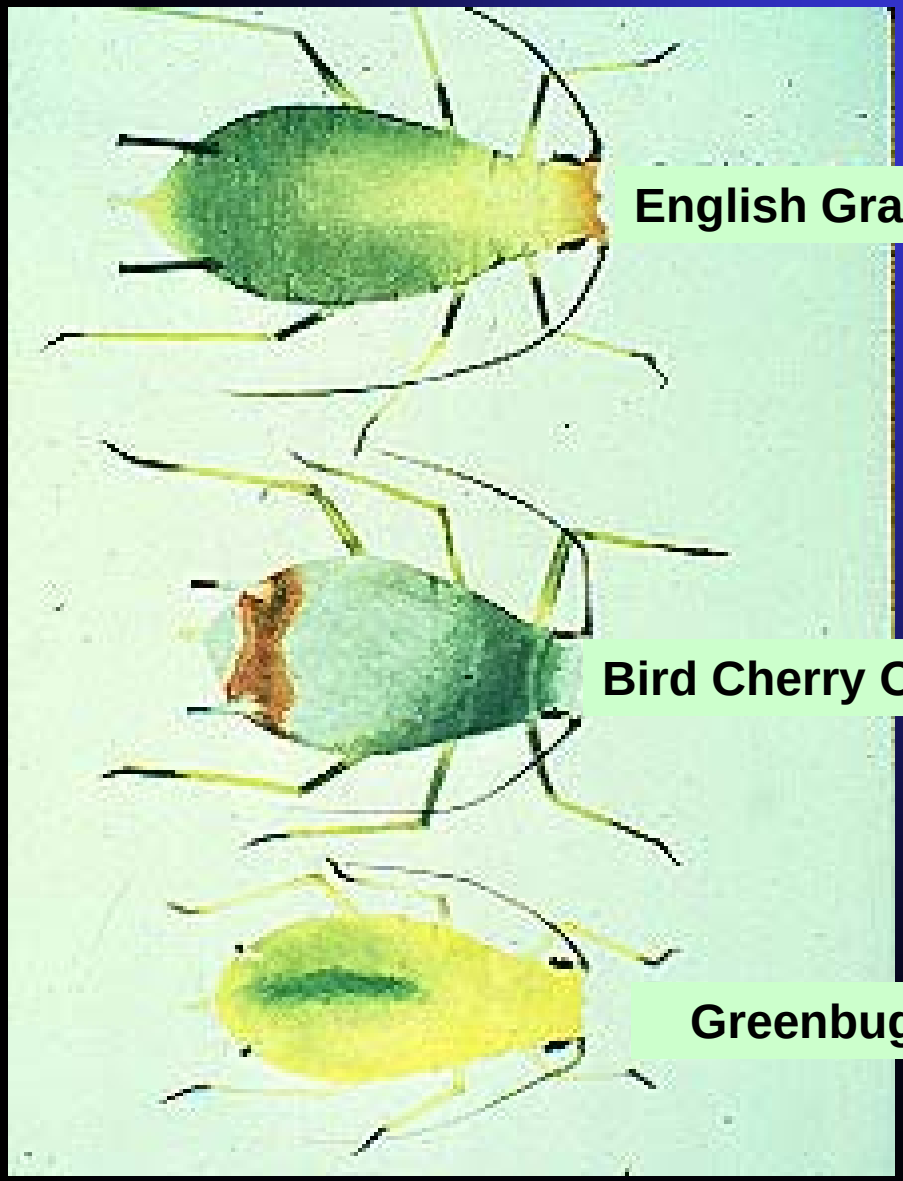
Grasshoppers

Begin scouting hatching sites, usually by mid-May, to assess the need for controlling grasshoppers, either in field margins or within the field.

carbaryl *(Sevin)*
dimethoate
ethyl parathion *
Furadan *
Lorsban 4E-SG *
malathion
methyl parathion *
- *Penncap-M* *
Warrior *

**** restricted use insecticide***

Aphids



English Grain Aphid

- Green with long, black legs, cornicles, and antennae
- Primarily on heads

Bird Cherry Oat Aphid

- Olive green, red spot at base of cornicles
- Found low on plant feeding on leaves

Greenbug

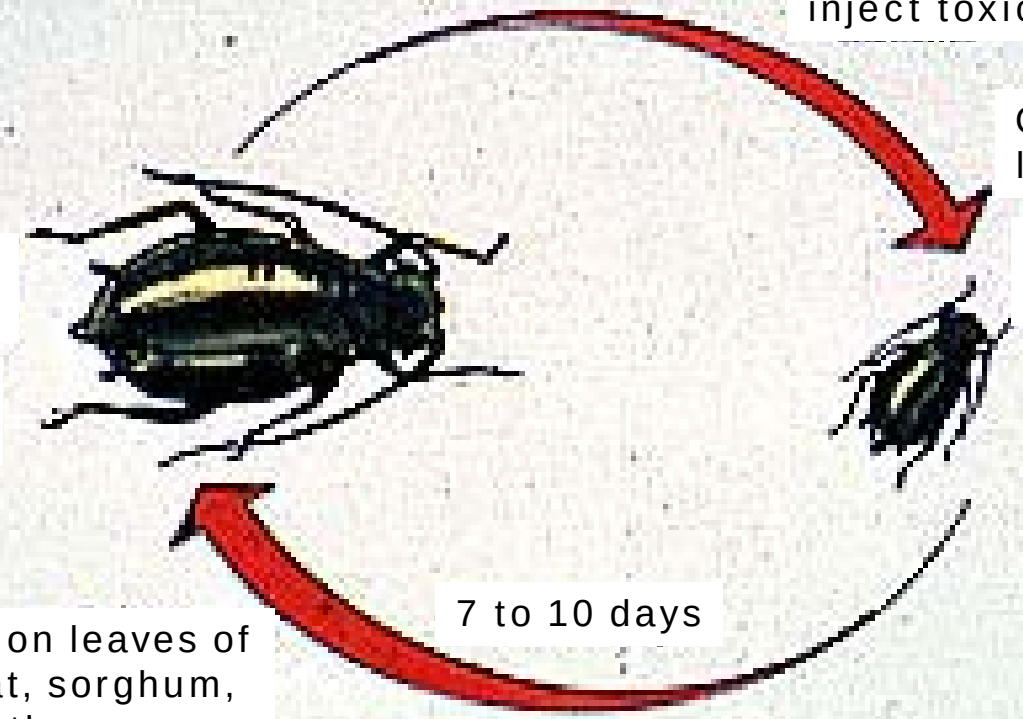
- Green with dark green stripe on back
- Toxin in saliva causes blotching on leaves

Greenbug Life History

All stages suck plant juices and inject toxic saliva

Give birth to live young

NYMPHS (all females)



ADULTS (all females)

winged or wingless

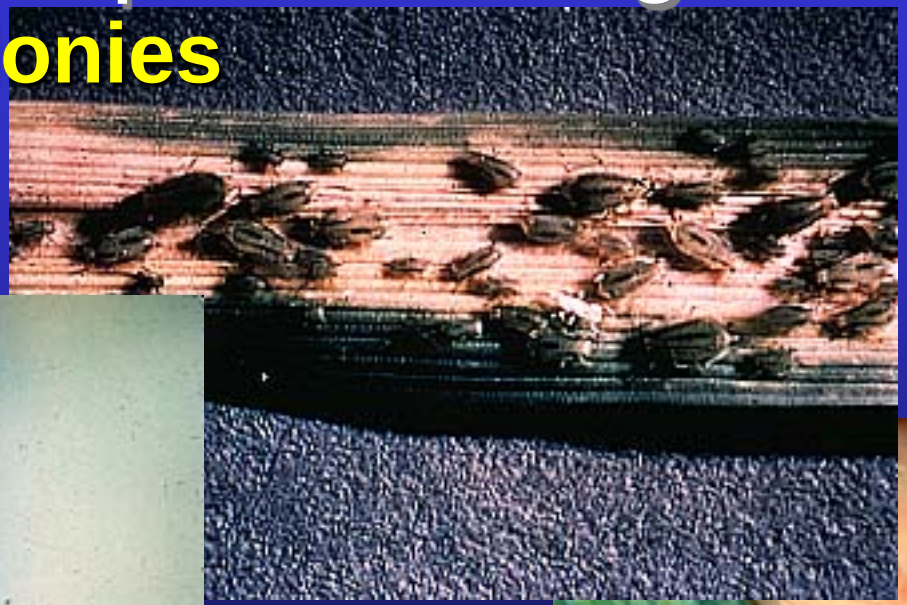
7 to 10 days

Feed on leaves of wheat, sorghum, and other grasses

Do not overwinter this far north, migrate to region in June

Aphid Damage

Greenbug colonies and damage



English grain aphid in wheat heads

Moderate temperatures, good moisture . . .

- Here come the aphids !
- Bird cherry oat and English grain aphids abundant at heading time;
- They hang around all summer, hurting later planted wheat in the north;
- **Barley Yellow Dwarf Virus !** …another Risk Factor for late planting.

Barley Yellow Dwarf Virus

- Aphid Transmitted Virus
- Infects Grass Plants
  - Small Grains
  - Native and Introduced Grasses

Barley Yellow Dwarf Virus

- Transmission occurs all season
- Plants infected in early growth stages are damaged more than later infections
- Infected plants may not show symptoms

Barley Yellow Dwarf Virus

Barley Yellow Dwarf Virus

- Aphids
  - Do not overwinter in North Dakota
  - Arrive from the south from late May - June
  - There are winged and wingless forms of the aphids

Barley Yellow Dwarf Virus

- Aphid Vectors
  - Aphid reproduction favored by 72 - 80 ºF, moderate humidity
  - Aphids acquire virus from feeding 12 to 30 hours on infected plant
  - A latent period of 1 to 4 days necessary for transmission
  - 1 1/2 to 4 hours (most usual) is required for transmission to occur
  - Infected aphids transmit for life

. . . up to 40 days

Barley Yellow Dwarf Virus

- Management
  - When should insecticides be used?
  - Field scouting can help provide the answer

Cereal Grain Aphids

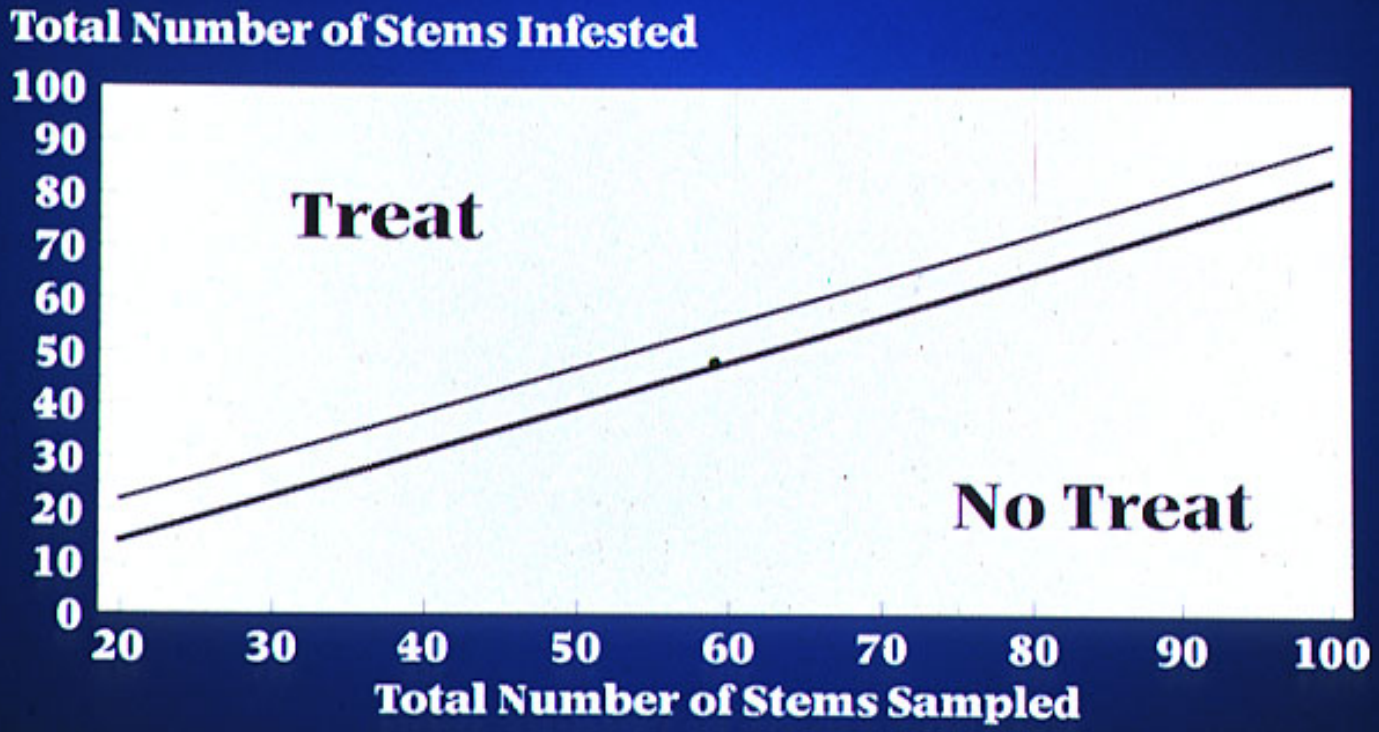
Sequential Sampling Plan

- Threshold may be adjusted to vary with price of wheat
- Count infested stems . . . NOT the number of aphids per stem
- Decisions made in as few as 25 stems, never more than 100
- Time to sample and decide on treatment - - *15 to 20 minutes*

Sequential Sampling Plan for Cereal Grain Aphids in Spring Wheat

(infested stem = 1 or more aphids)

Threshold = 9 aphids / stem, when wheat is greater than $ 5.00 / bu.



Barley Yellow Dwarf Virus

- Treatment Decisions
  - to prevent yield loss due to aphid feeding, treat when 85% of the stems have at least one aphid
  - to reduce the risk of BYDV, use a lower level infestation, perhaps 50 to 75% of stems with at least one aphid.

Barley Yellow Dwarf Virus

- Management
  - Insecticides -- Foliar Insecticides
    - Erratic in effectively reducing BYDV incidence
    - Timing is important
    - Repeat applications may be necessary

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Small Grain Management Recommendations

registered insecticides - 2001

Cereal Aphids

Field scouting should begin no later than stem elongation and continue up to the heading stage. Treatments after heading are not recommended. When BYDV is a concern, scout earlier.

dimethoate
Di-syston *
ethyl parathion *
malathion
Lannate *
Lorsban 4E-SG *
methyl parathion *
- *Penncap-M* *

**** restricted use insecticide***

Barley Yellow Dwarf Virus

- Management
  - Insecticides -- Seed Treatment
    - Gaucho - used in southern and western states where aphids are more likely a problem each year
    - 1.0 - 3.0 oz of Gaucho 75ST / bu expensive ($5.25-$15.75 / acre)
    - 1.0 oz /bu gives about 35 days control
    - 2 oz/bu rate used for extended protection (45 days after planting)
    - No studies in North Dakota

Warrior T *(lambda cyhalothrin)*

- Labeled for aphid control in wheat;
- Pyrethroid insecticides have a history of NOT controlling aphids with *repeated* use . . .

  Risk of resistance developing;
- Recommend using OP insecticides (e.g., dimethoate, Lannate, Lorsban, parathions) for aphid control;
- Save Warrior for grasshoppers, cutworms, armyworms, etc.

Lady beetles . . . Aphid predators


Armyworm


Armyworm beneath
leaf litter


Armyworm
parasitic
wasp pupae

Armyworm Outbreaks

- Outbreaks when large migrations of moths from southern states arrive with weather fronts;
- Moths lay eggs in shady, grassy areas where humidity is high *(example: lodged wheat);*
- Armyworm may migrate to neighboring fields in search of food.

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Small Grain Management Recommendations

registered insecticides - 2001

Armyworms

Treat when 4 to 5 or more armyworms per square foot are present.

For migrating armyworms, treat a couple of swaths ahead of the infestation in the direction of movement to form a barrier strip.

- carbaryl *(Sevin)*
- ethyl parathion *
- Lannate *
- malathion
- Lorsban 4E-SG *
- methyl parathion *
- *Penncap-M* *
- Warrior *

** restricted use insecticide*

Wheat Midge

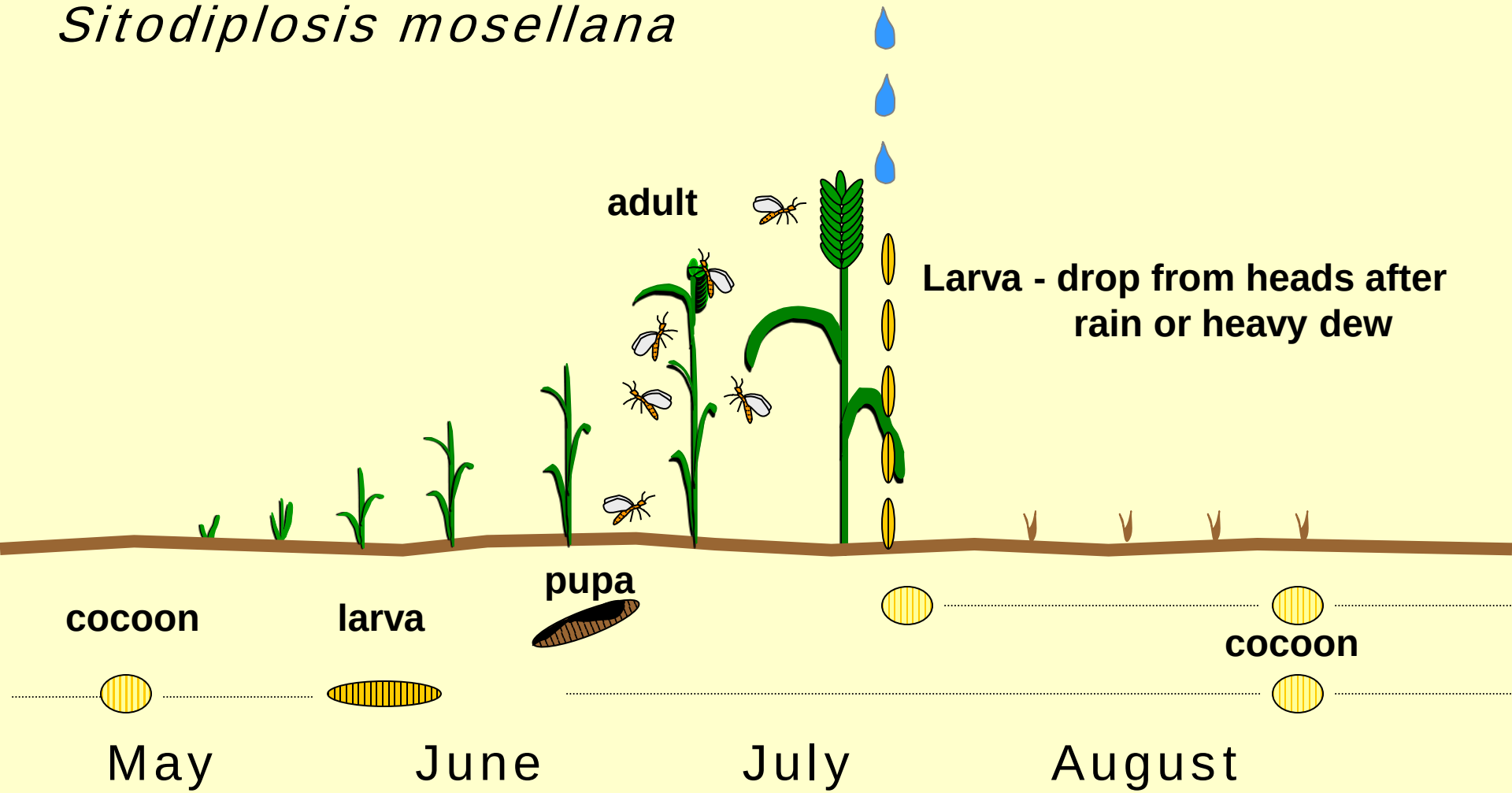
Wheat midge adult

Wheat midge larvae feeding on developing wheat kernel

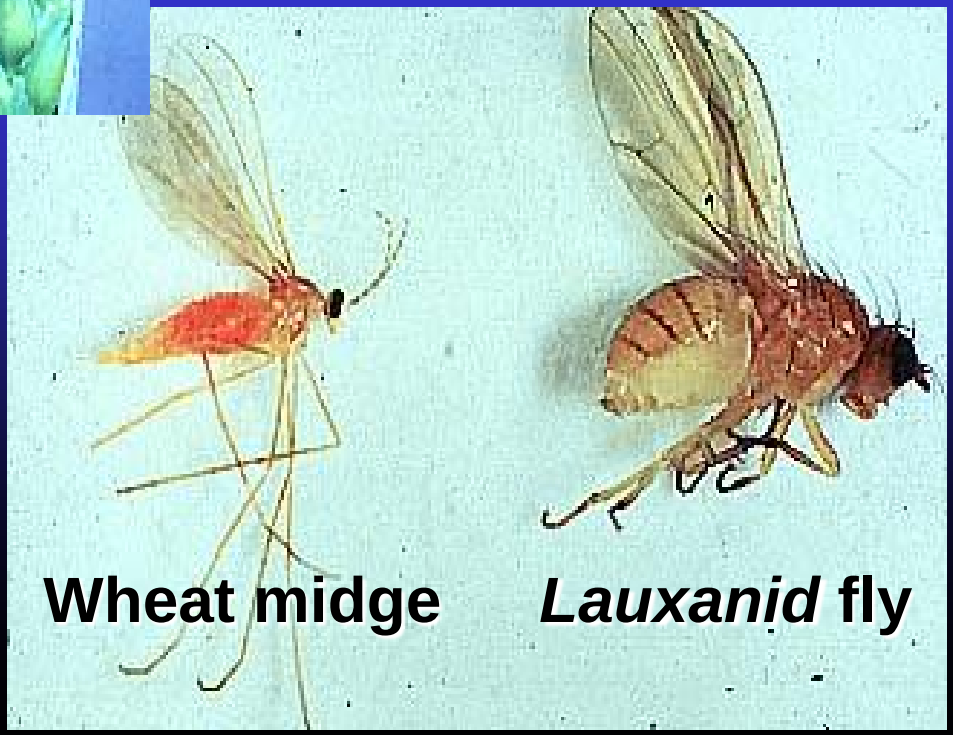
Wheat midge larvae ready to leave wheat head

Life Cycle of Orange Wheat Blossom Midge

Sitodiplosis mosellana

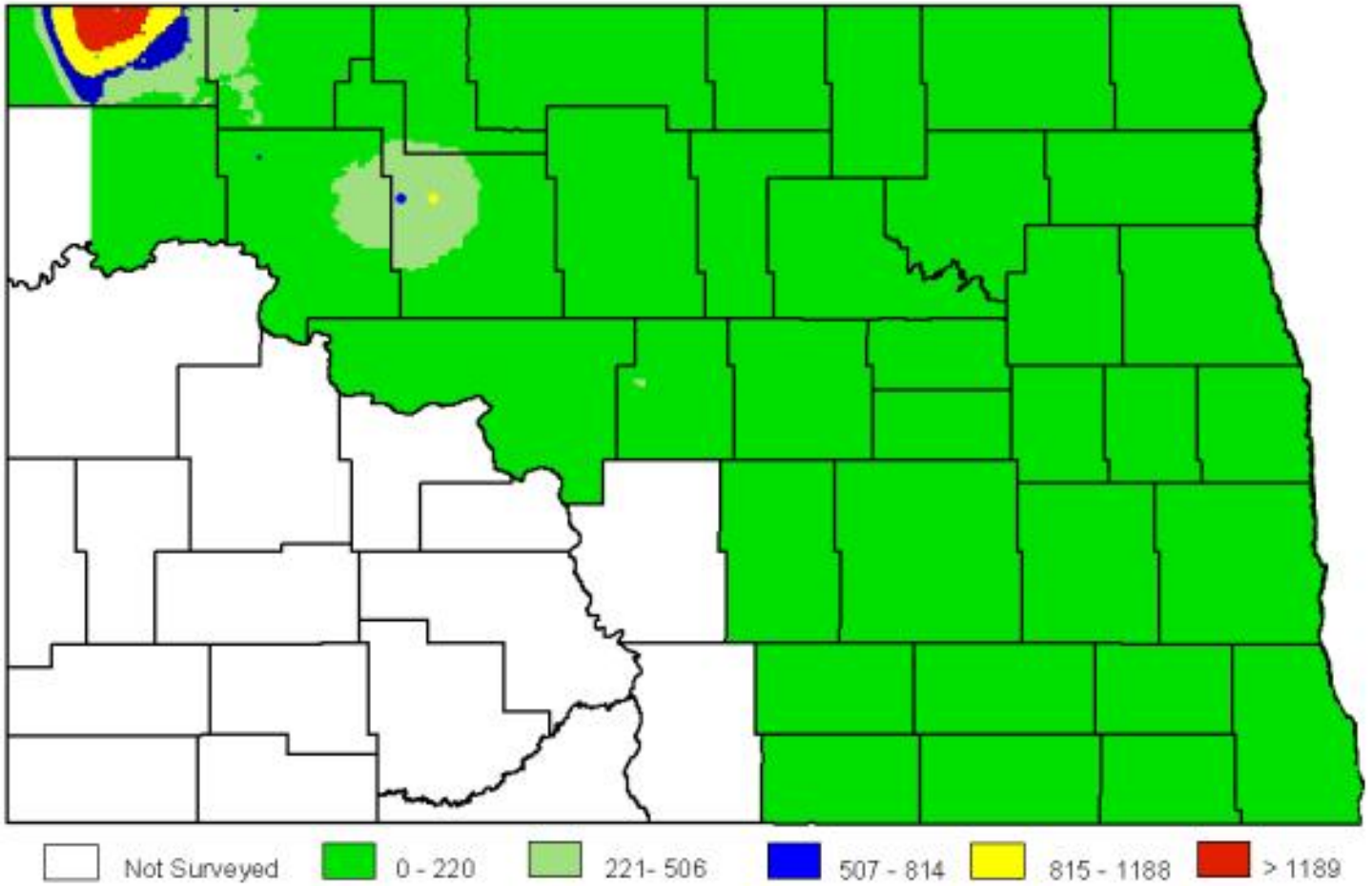


Wheat midge adults on wheat heads



Midge Distribution

1999 WHEAT MIDGE SURVEY



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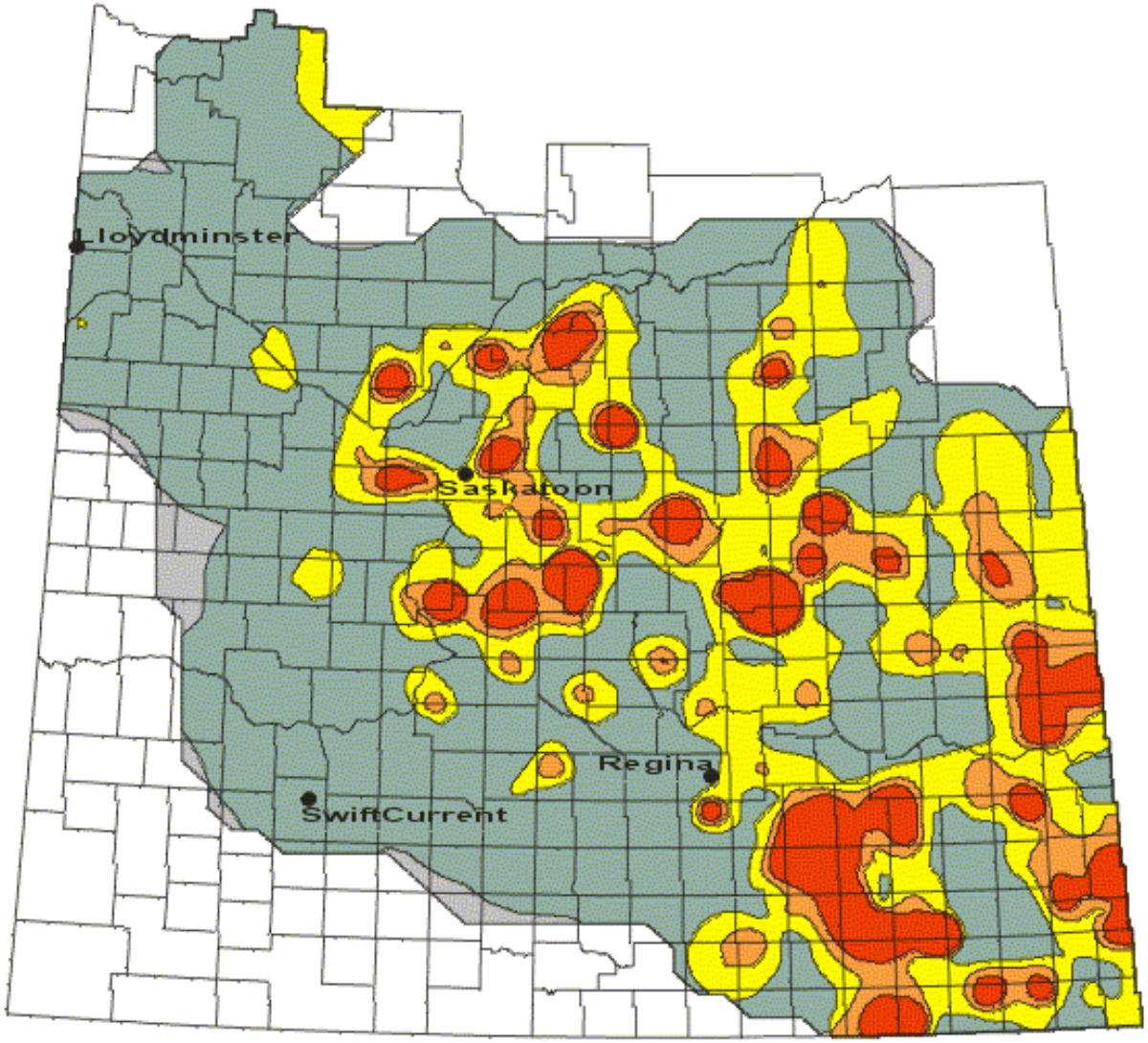
Department of Entomology
North Dakota Extension Service
North Dakota Agricultural Experiment Station

Wheat Midge Forecast 1999

Midge / m²

- No infestation
- < 600
- 600 <= 1200
- 1200 <= 1800
- > 1800



Agriculture and Agri-Food Canada
Research Branch

Agriculture et Agroalimentaire Canada
Direction générale de la recherche

CANADA - SASKATCHEWAN Crop Insurance

SAF
SASKATCHEWAN AGRICULTURE AND FOOD

Growing Degree Day Units: A tool for Crop Monitoring

Insect Degree Days

www.ext.nodak.edu

Calculating Insect Degree Days

$$\frac{\text{Max} + \text{Min}}{2} - \text{Threshold Temperature} = \text{DD}$$

If average temperature is less than the threshold temperature . . . NO degree days are accumulated that day.

Using Insect Degree Days

- Time Scouting Activities
- Predict biological events

  . . . Eliminate unnecessary scouting, avoid missing injurious pest populations, improve management decisions.

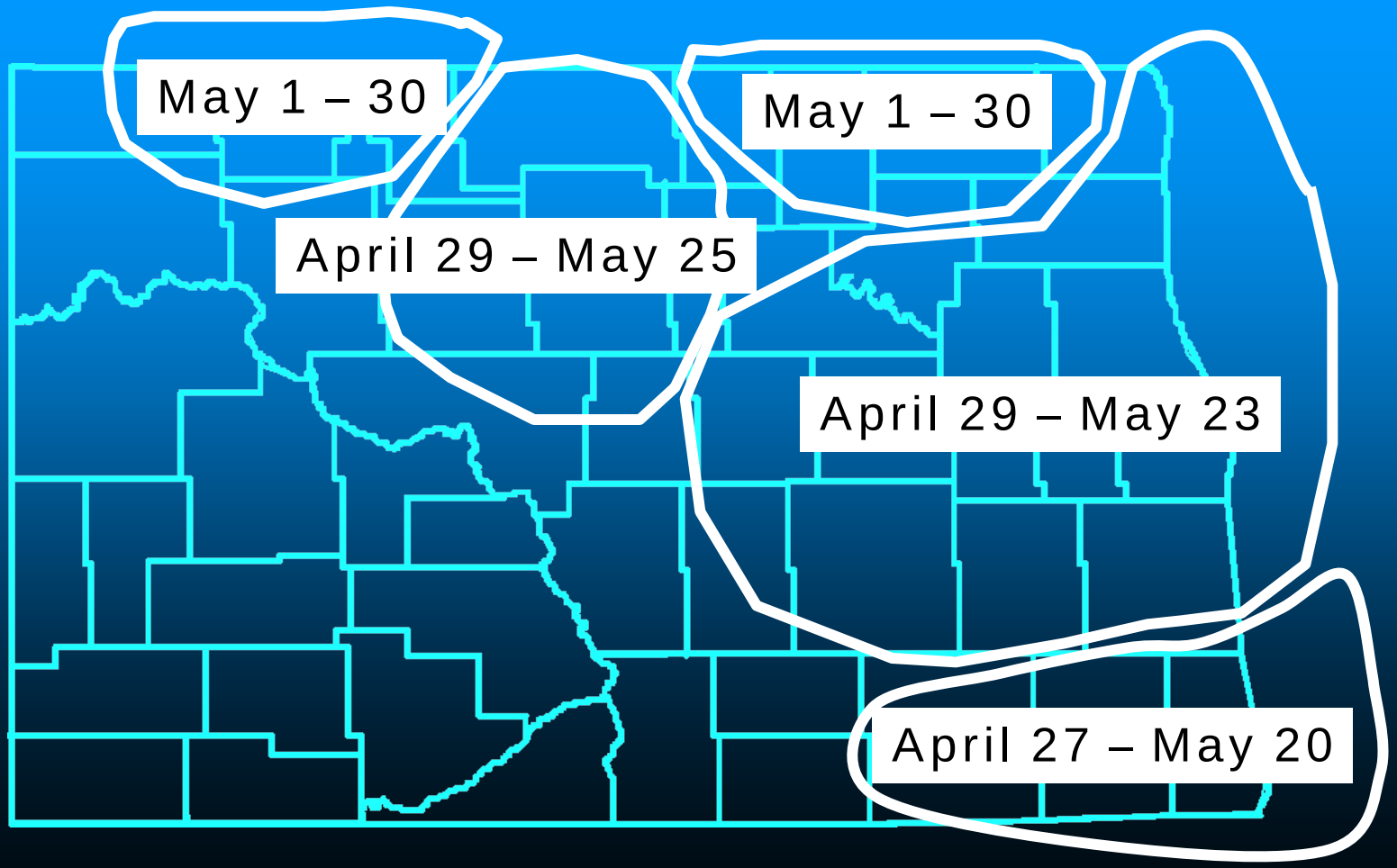
Limitations of Insect Degree Days

- Predictions are only estimates
- Local temperatures can result in variation
- Accuracy is +/- 3 or 4 days

Wheat Midge Degree Days Used as a Guideline for Risk Asessment

- HRSW planted prior to 200 DD will head before wheat midge emerge;
- HRSW planted from 200 to 600 DD will be heading at the time wheat midge are emerging;
- HRSW planted after 600 DD will head after peak emergence and should be at low risk to infestation, higher risk of other factors.

2000 High Risk Planting Dates for Wheat to be Heading When Wheat Midge Emergence Begins



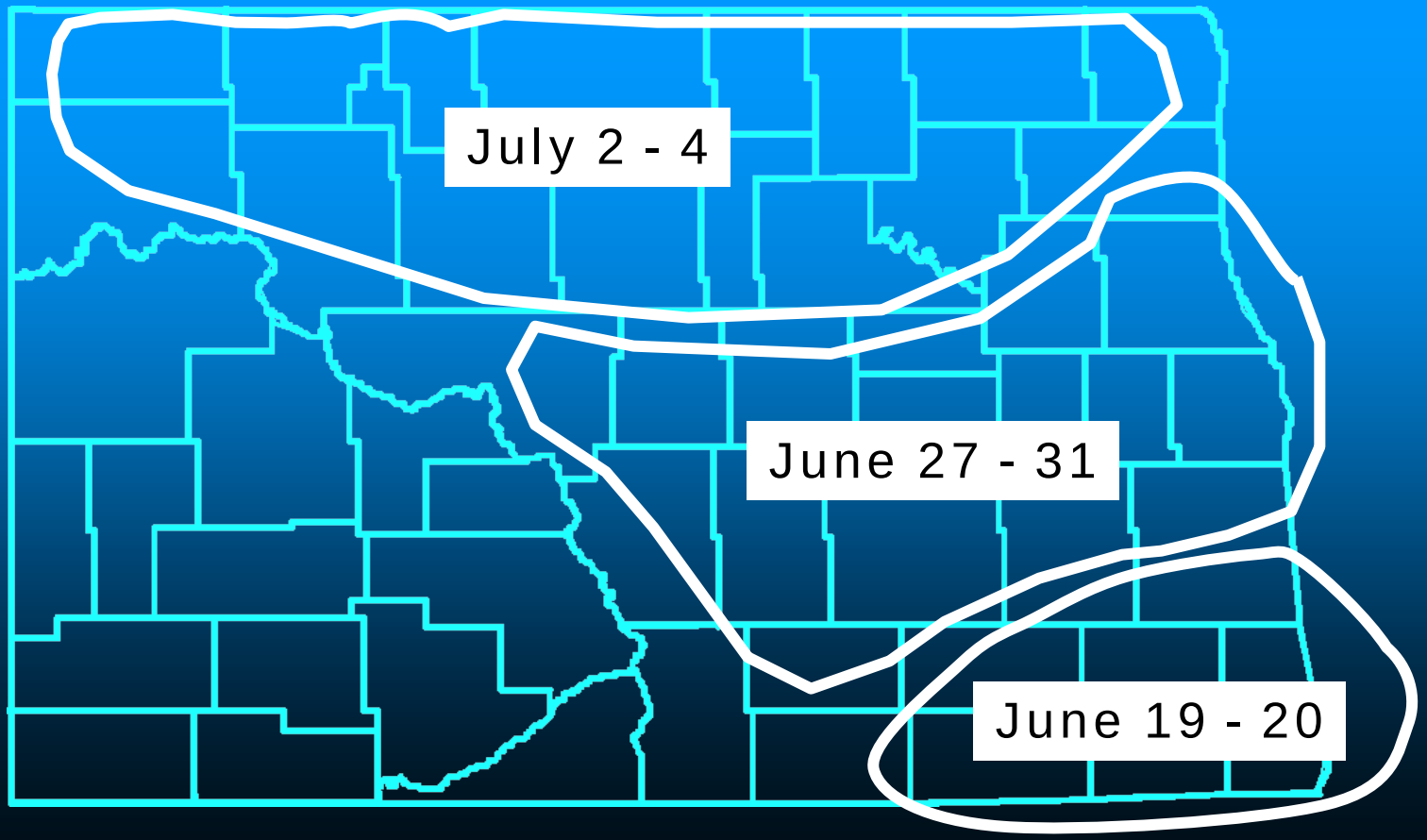
Wheat Midge Degree Days * (40° F Base Temperature)

- 1300 DD - 10% adult female emergence
- 1450 DD - 50% adult female emergence
- 1600 DD - 90% adult female emergence

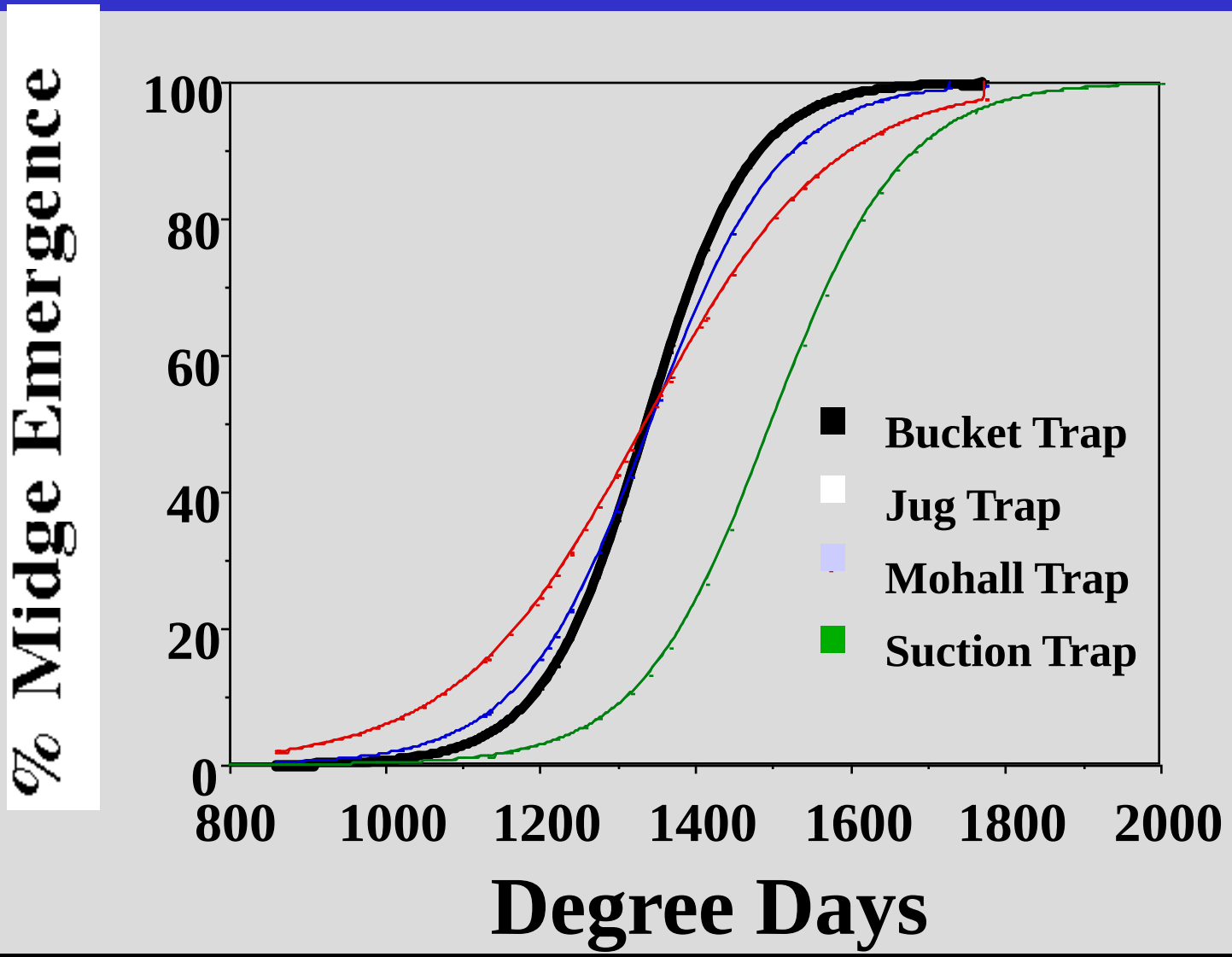
Spring wheat is expected to head at 1,000 to 1,100 DD on the wheat midge DD scale.

*(*source: R. H. Elliott and O. O. Olfert, unpublished)*

2000 Estimated Female Wheat Midge Emergence Dates



Midge Captures



Midge Emergence

- **In 1998, Midge emergence began as expected based on degree day accumulations;**
  - **Normal Life span of adult midge = *5 to 7 days***
  . . . It can be longer, though;
  - **Emergence is nearly over at 1600 DD . . . Adult midge are still around for several days after.**

Midge Survival

- **Conditions for survival of adult midge were very favorable in 1998;**

- **Adult activity occurred over a period of 17 days;**

- **Past observations indicate that significant flight activity lasts about 2 weeks.**

Dates when Wheat Midge Degree Day Benchmarks were Reached at Several ND Locations, 1998.

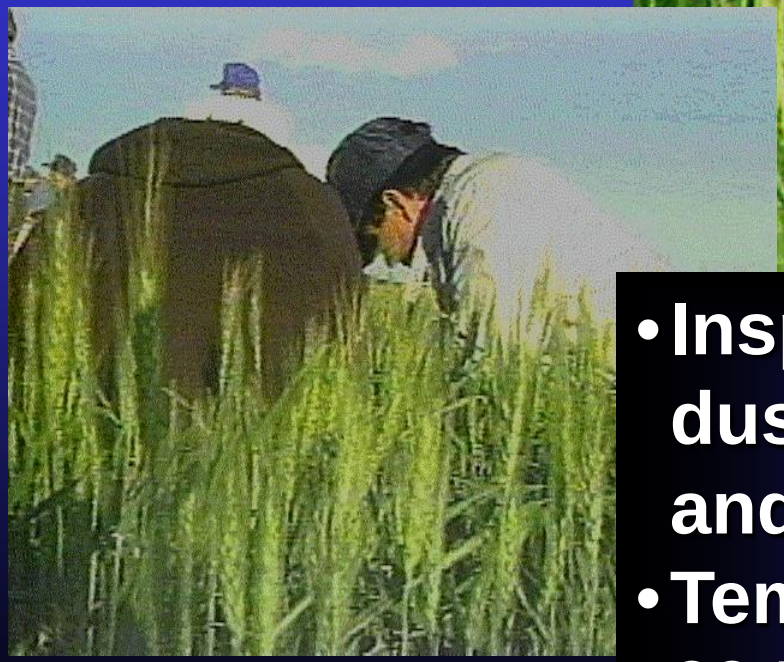
	Female Midge Emergence				
	Start	*Peak*	*End*		
Location	**1300 DD**	**1450 DD**	**1600 DD**	**1800 DD**	**1900 DD**
Mohall	**July 1**	**July 6**	**July 11**	**July 18**	**July 22**
Bottineau	**June 30**	**July 5**	**July 10**	**July 17**	**July 21**
Baker	**June 27**	**July 2**	**July 8**	**July 13**	**July 17**
Cando	**June 26**	**July 1**	**July 7**	**July 12**	**July 16**
Langdon	**July 1**	**July 7**	**July 11**	**July 18**	**July 23**

Avg = 10.5 days

Avg = 11.5 days

Avg = 16.8 days

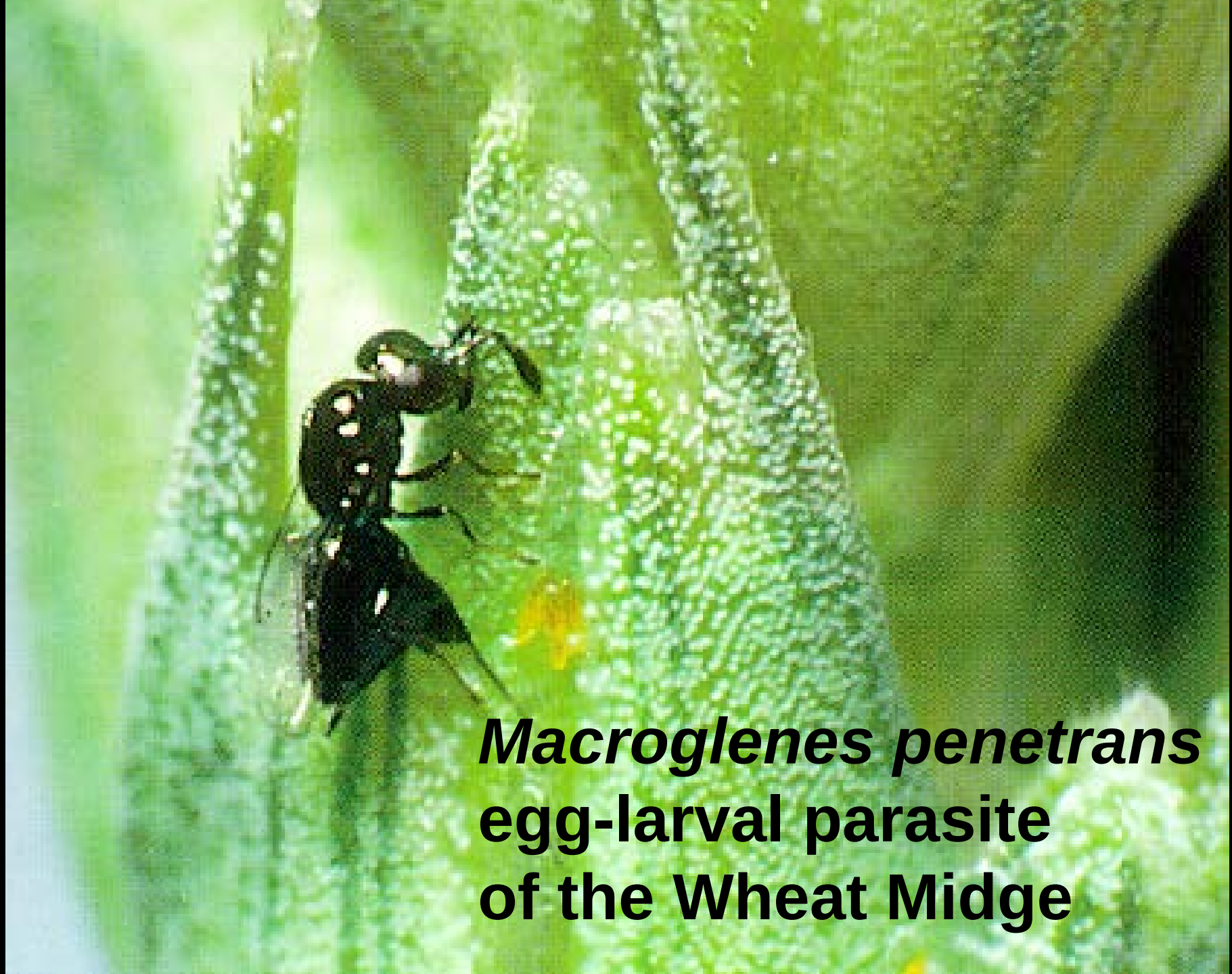
Scouting for wheat midge



- Inspect wheat heads after dusk . . . Usually from 9 pm and later;
- Temperatures must be above 60 F for midge to be active;
- Wind speeds greater than 5 mph limit activity of midge.

Lorsban 4E-SG

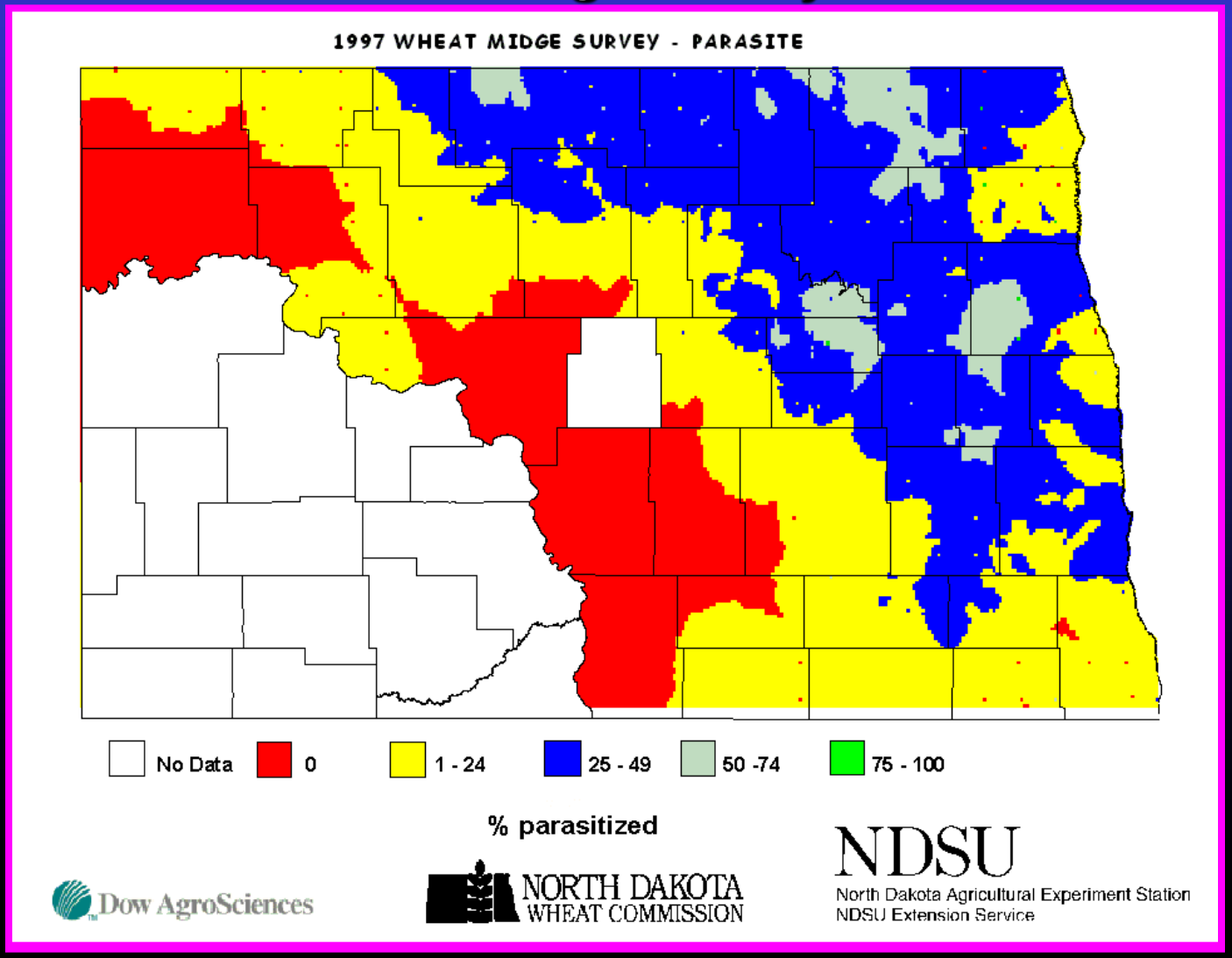
- Threshold =
  - HRSW = 1 midge / 5 wheat heads
  - Durum = 1 midge / 7 wheat heads
- Apply within 4 to 6 days after midge appear on the primary heads
- Application at 75% head emergence is recommended
- Controls adult midge for several days after treatment
- Activity by chlorpyrifos impacts eggs/larvae laid prior to treatment



Macroglenes penetrans
egg-larval parasite
of the Wheat Midge

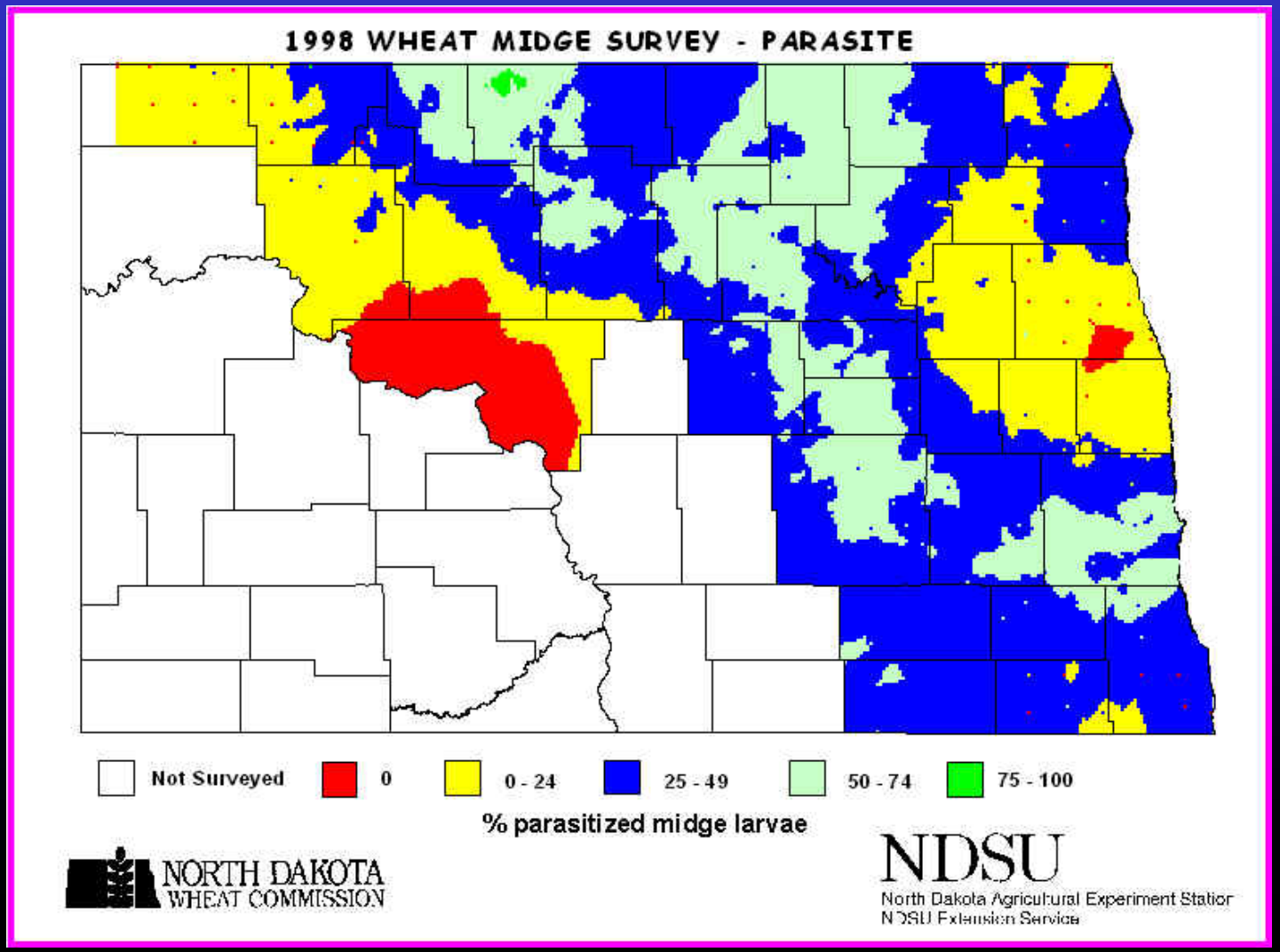
Macroglenes penetrans

Percent parasitism recorded from the 1997 midge survey



Macroglenes penetrans

Percent parasitism recorded from the 1998 midge survey



Wheat Stem Maggot

Wheat Stem Sawfly

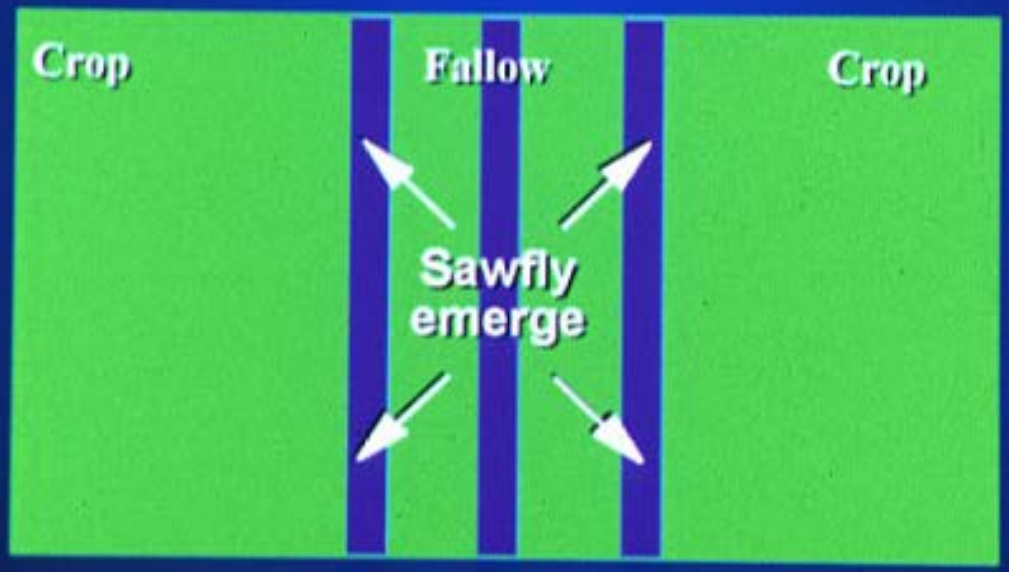
Wasp-like adult

S-shaped larva in stem

Cut wheat stems

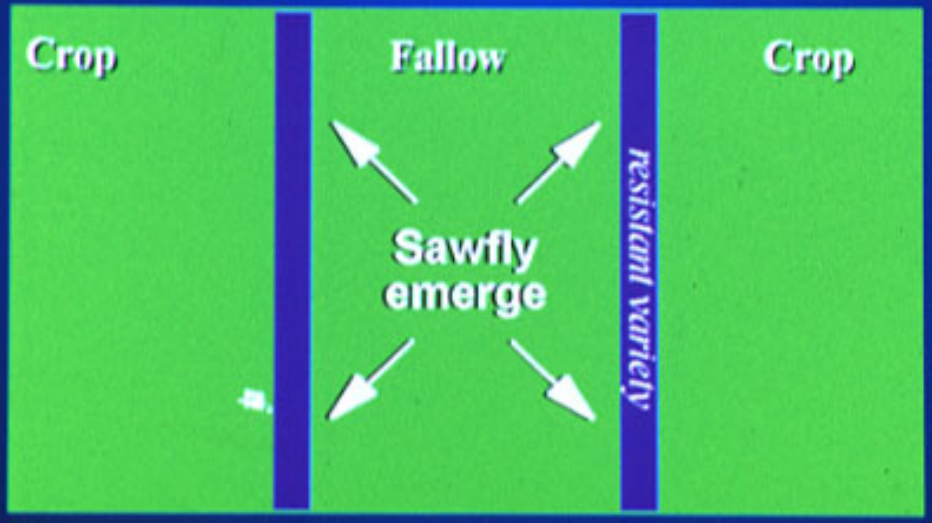
Wheat Stem Sawfly Management

Objective: **Using susceptible varieties as a trap strip in crop-fallow systems**



Wheat Stem Sawfly Management

Objective: **Using resistant varieties as a trap strip in crop-fallow systems**



Wheat Stem Sawfly Resistant Hard Red Spring Wheat Variety Descriptions

Solid stem varieties are unsuitable for sawfly development

Variety	Height	Test Wt.	Protein	Yield *
Ernest	standard	high	high	high
Lew	standard	high	low	high
Leader	standard	high	high	med
Tioga	standard	high	avg	low
AC Eatonia	standard	high	high	high
Cutless	semidwarf	high	avg	med
Rambo	semidwarf	high	avg	high
Glenman	semidwarf	avg	low	high

** yields relative to sawfly resistant varieties*

Barley thrips

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Small Grain Management Recommendations

registered insecticides - 2000

Barley thrips

Field scouting should begin when the flag leaf is first visible and continue until the head is fully emerged. Insecticide treatments are only effective when applied before heading is complete.

$$\text{Thrips / stem} = \frac{\text{cost of control} \div \$ \text{ value / bu}}{0.4}$$

ethyl parathion *

methyl parathion *

** restricted use insecticide*


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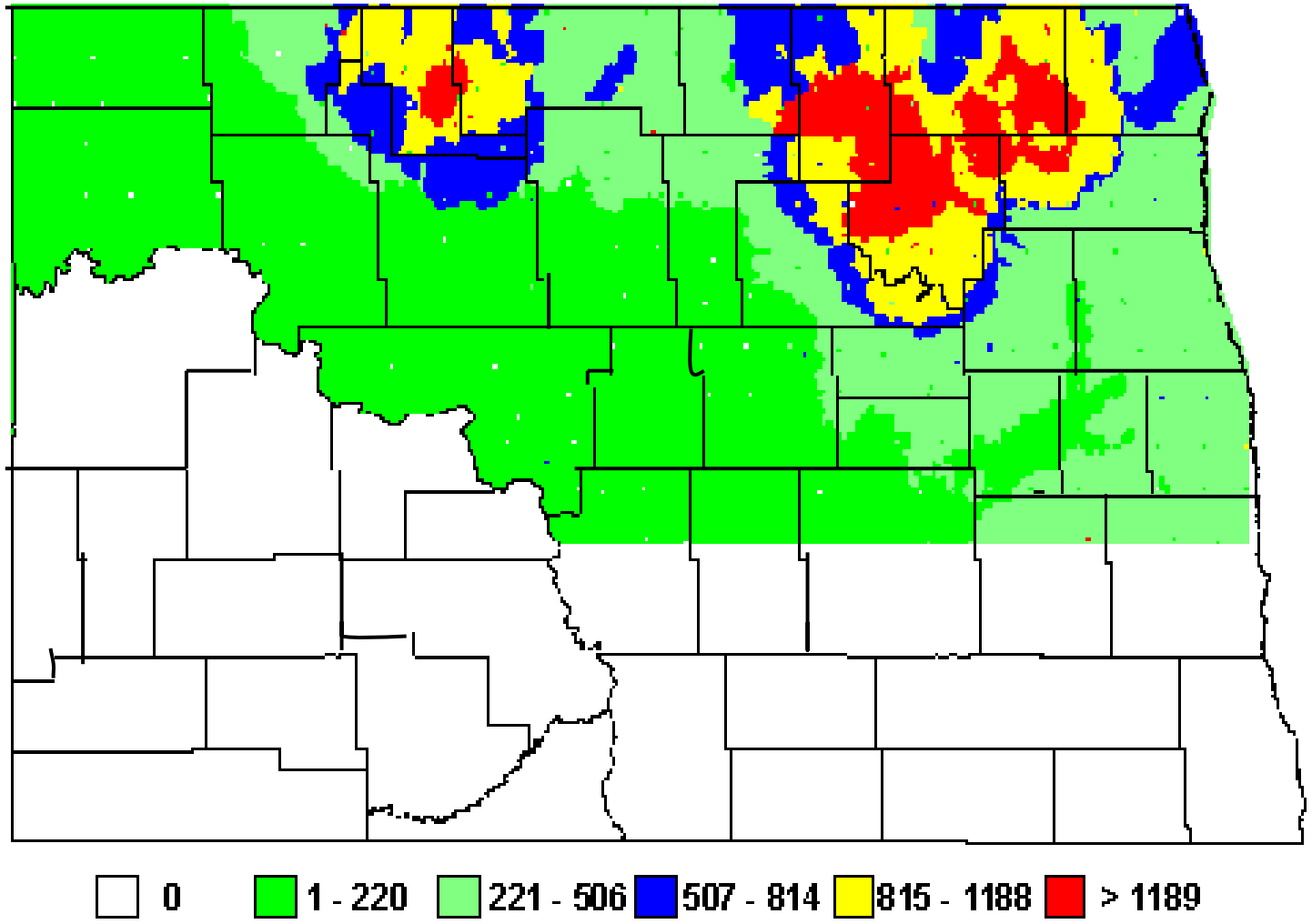
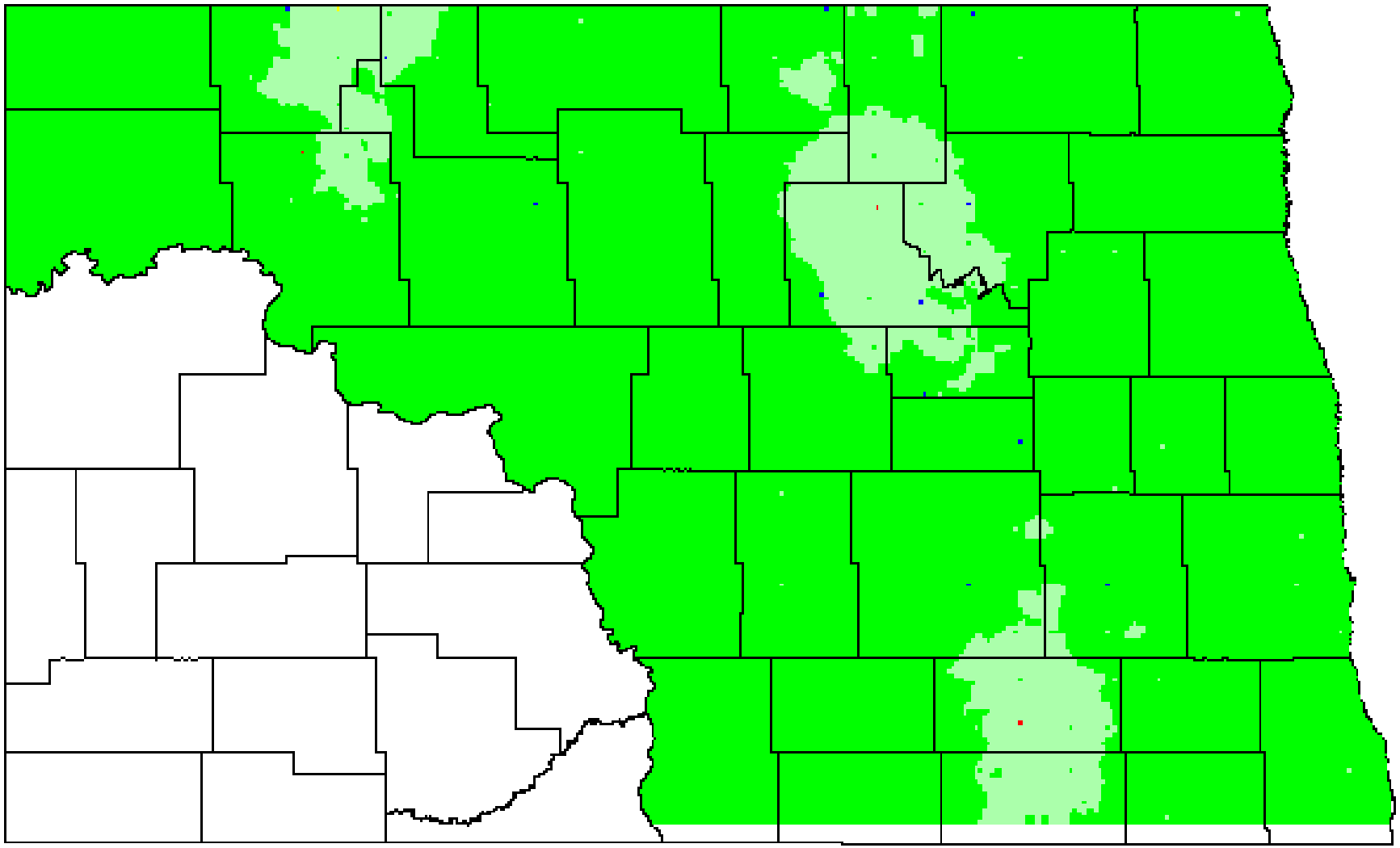
1995 Wheat Midge Survey



1996 WHEAT MIDGE SURVEY



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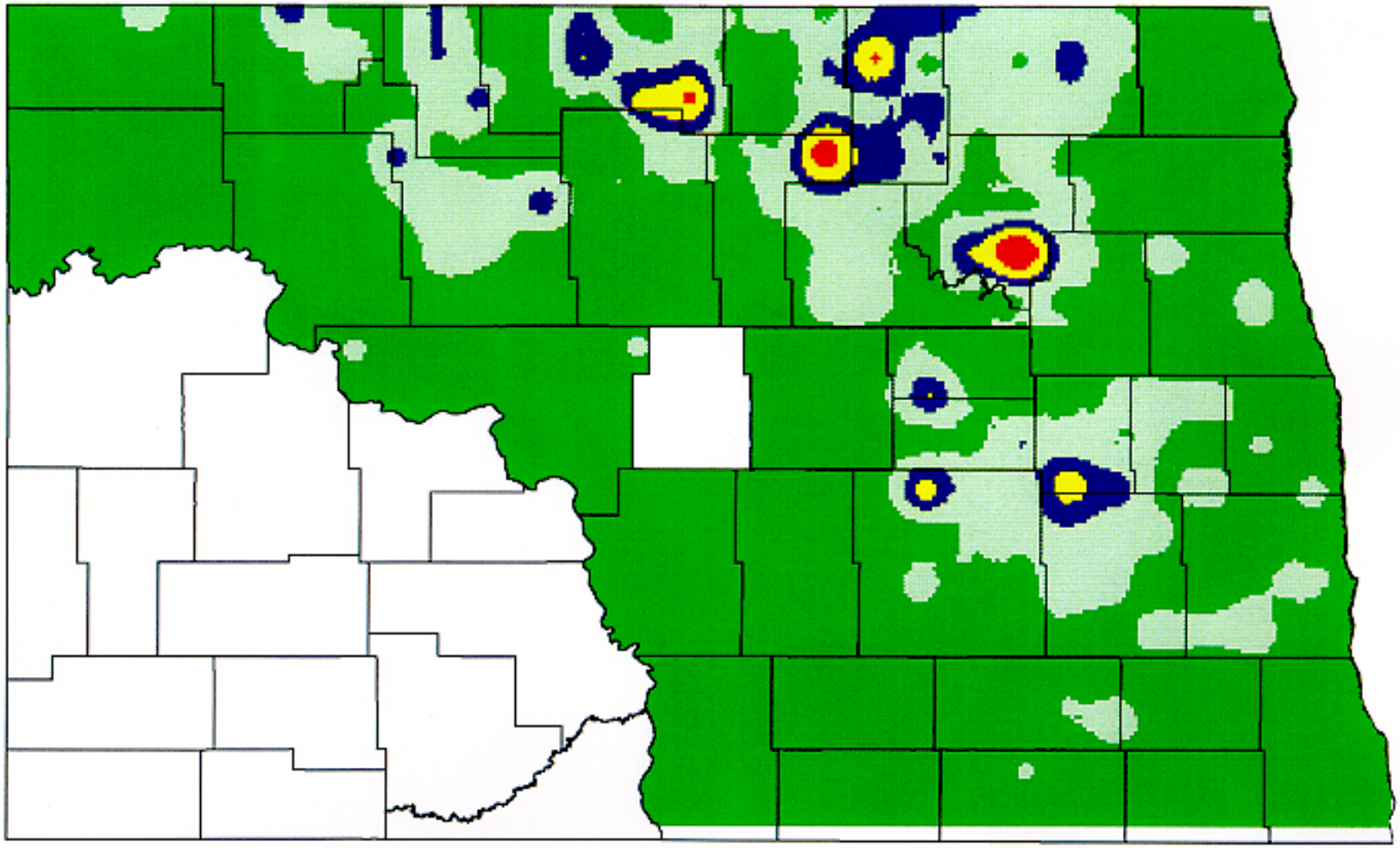
1997 WHEAT MIDGE SURVEY - CORRECTED



Dow AgroSciences

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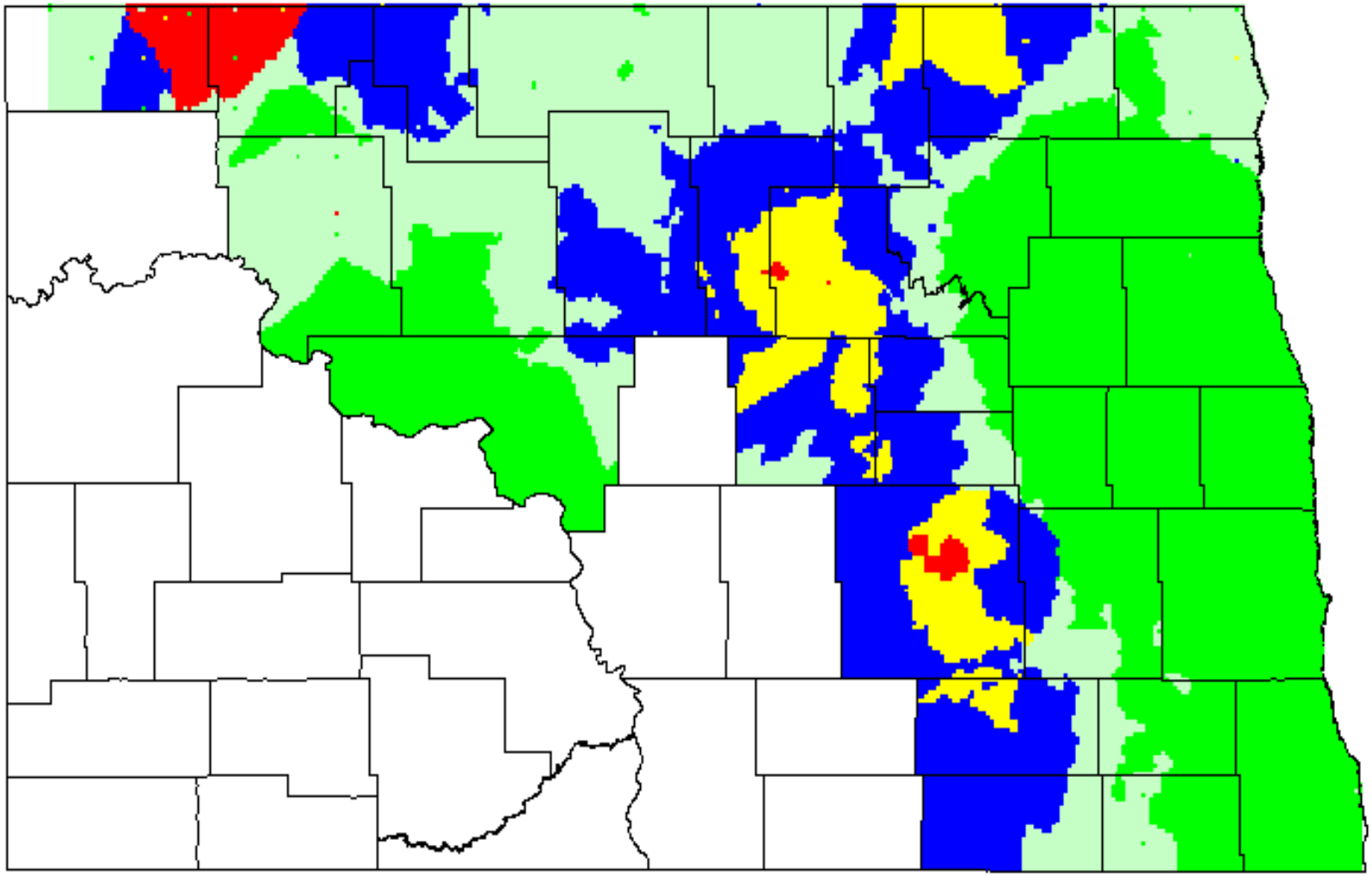
1998 WHEAT MIDGE SURVEY



Not Surveyed | 0 - 220 | 221 - 506 | 507 - 814 | 815 - 1188 | > 1189

midge larvae / sq. m

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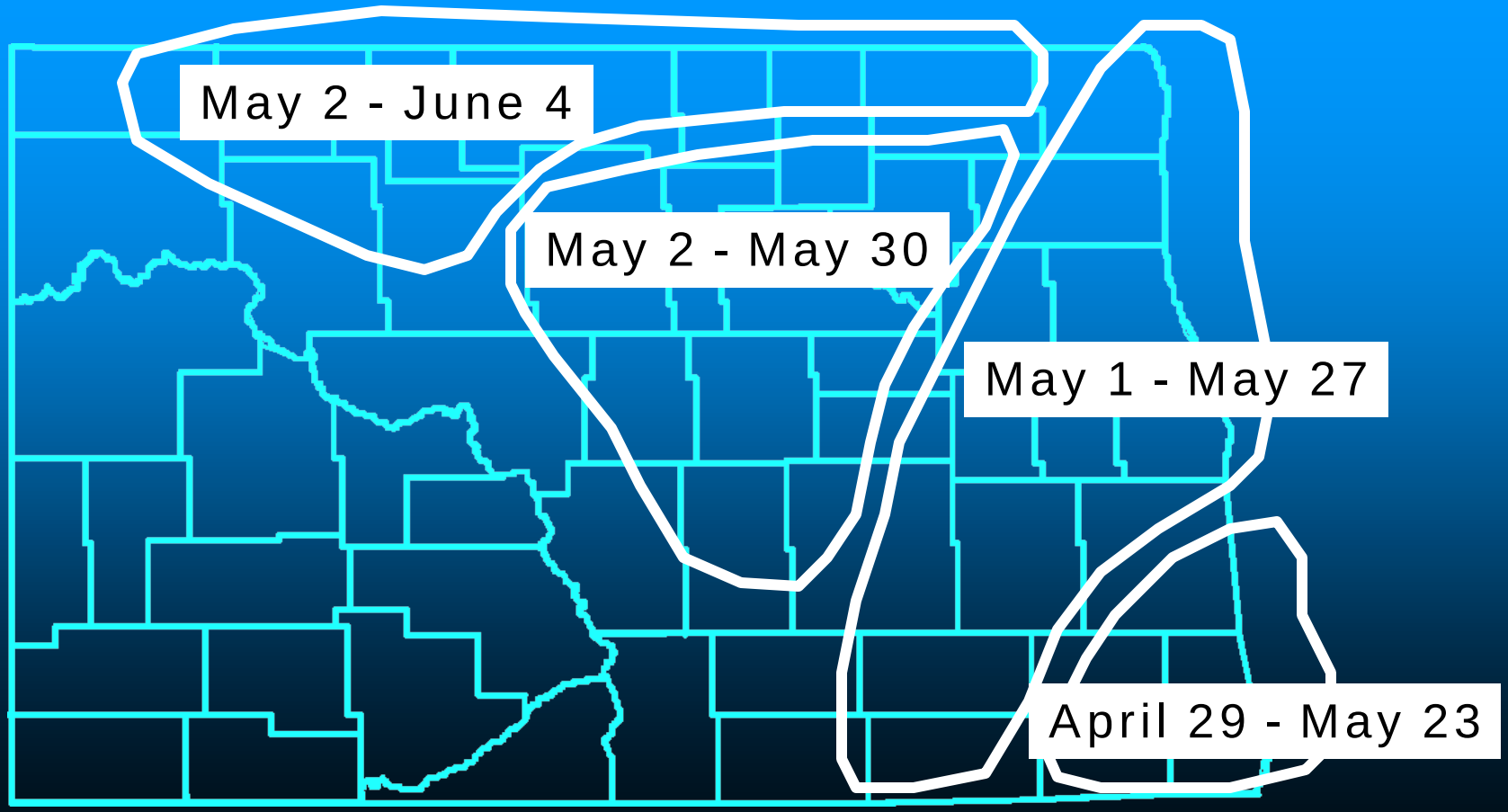
1999 High Risk Planting Dates for Wheat to be Heading When Wheat Midge Emergence Begins



1999 Estimated Female Wheat Midge Emergence Dates