

Pest Management **FAST FACTS**

Nutrient and Pest Management Program (NPM)

Integrated Pest Management Program (IPM)



Avoid Herbicide Resistance in Weeds

Use herbicides only when necessary to prevent economic loss. Base herbicide use on the species present or expected, and their density.

Rotate or tank mix herbicides. Rotate herbicides modes of action from year to year and use tank mixtures with different modes of action.

Rotate crops. Use broad crop rotations; three or four crops in rotation provide more resistance protection than two. Where possible use crops with different life cycles.

Use mechanical weed control methods. Rotary hoe and cultivate to complement herbicide treatments.

Scout fields regularly for weeds. Respond quickly to weeds with suspected herbicide resistance and control escaping weeds as needed.

Practice prevention. Clean tillage and harvest equipment before moving from fields or farms with resistant weeds to other fields.

Signs of Herbicide Resistant Weeds

- Weed species is labeled for control.
- There were no herbicide application errors.
- The environment was favorable for good herbicide performance.
- Only one species has escaped control.
- Weed is healthy while neighboring weeds have died.
- Respraying did not control the weed.
- Weed was not controlled in the same patch in the past and the patch is getting larger.
- Weed was not controlled by different herbicides with the same MOA in the past.
- The same MOA has been used frequently.

Resistant Weeds in Wisconsin 2015

Weed species	Mode of action (year)
Common lambsquarters	PSII (1979)
Smooth pigweed	PSII (1985)
Kochia	PSII (1987), ALS (1995)
Velvetleaf	PSII (1990)
Giant foxtail	ACCCase (1991), ALS (1999)
Large crabgrass	ACCCase (1992)
Eastern black nightshade	ALS (1999)
Green foxtail	ALS (1999)
Giant ragweed	EPSP (2011), ALS (2013)
Horseweed	EPSP (2013)
Tall waterhemp	EPSP (2013)
Palmer Amaranth	EPSP (2013)

* References to pesticide products in this publication are for your convenience and are not an endorsement of one product over other similar products.

Field sprayer calibration equations

$$\text{Speed (MPH)} = \frac{\text{Distance (in feet)} \times 60}{\text{Time (in seconds)} \times 88}$$

$$\text{GPA} = \frac{5,940 \times \text{GPM (per nozzle)}}{\text{MPH} \times W^*}$$

*W = nozzle spacing for broadcast application

*W = spray width for single nozzle or band applications

Adjuvant Rate Conversions

		Spray volume (GPA)		
		20	15	10
Adjuvant rate	Amount/100 gallons	Adjuvant rate per acre		
2%	2 gallons	3.2 pints (51.2 ounces)	2.4 pints (38.4 ounces)	1.6 pints (25.6 ounces)
1%	1 gallon	1.6 pints (25.6 ounces)	1.2 pints (19.2 ounces)	0.8 pint (12.8 ounces)
0.5%	2 quarts	0.8 pint (12.8 ounces)	0.6 pint (9.6 ounces)	0.4 pint (6.4 ounces)
0.25%	1 quart	0.4 pint (6.4 ounces)	0.3 pint (4.8 ounces)	0.2 pint (3.2 ounces)
0.125%	1 pint	0.2 pint (3.2 ounces)	0.15 pint (2.4 ounces)	0.1 pint (1.6 ounces)

Conversions for small liquid volumes

1 tablespoon = 0.5 fluid oz
2 tablespoons = 1.0 fluid oz
32 fluid ounces = 1 quart
128 fluid ounces = 1 gallon

Conversions for general calculations

1 sq mile = 640 acres
1 acre = 43,560 sq ft
1 mile = 5280 feet
1 mile/hour = 88 feet/min
Celsius = (F - 32) x .55

Websites with pest management information:

UW Wisconsin Crop Manager: <http://ipcm.wisc.edu/wcm>

UW Field Crop Disease: <http://fyi.uwex.edu/fieldcroppathology/>

UW Plant Disease Diagnostics: <http://www.plantpath.wisc.edu/pddc>

DATCP Wisconsin Pest Bulletin: <http://pestbulletin.wi.gov>

Crop Data Management Systems: <http://www.cdms.net>

Treatment Thresholds for Pests of Field Corn, Alfalfa, and Small Grains

Field Corn Insects

Insect	Treatment Threshold
Armyworm	1 or more armyworms on 75% of the plants or 2 armyworms on 25% of the plants. Average armyworm length must be less than or equal to ¾" to merit treatment.
Cutworms	2-5% of plants damaged and larvae are sixth instar or less. See Head Capsule Gauge .
Corn leaf aphids	50% or more of the plants have more than 50 aphids per plant. Plants are in the late-whorl to early tassel stages.
Corn rootworm beetles	Pollination Protection: Treat before 70% silking if silks are clipped to within ½" of husk. Root Protection: Following corn, when counts average 0.75 beetles per plant during the egg laying period of mid-August to early September of the previous year. Following soybean, treat corn if yellow sticky trap catches average more than 5 Western corn rootworm beetles/trap/day during the egg laying period of August to early September.
European corn borer (ECB)	ECB has two generations per year in most of Wisconsin. Peak spring moth flights occur at 630 GDD. Peak summer moth flights occur at 1700 GDD. Use the worksheets provided in UWEX publication A3646, <i>Pest Management in Wisconsin Field Crops</i> , to determine if treatment for ECB is justified.
Japanese Beetle	Corn is pollinating and there are ≥3 beetles/ear and silks being clipped within ½ inch of ear tip.
Two-spotted spider mite	Control may be necessary when 15%-20% of the leaf area is covered with TSM colonies, moderate damage is noted, and hot, dry conditions are expected to continue. The greatest benefit of miticides normally occurs prior to the dent stage. Thorough coverage of corn leaves is necessary for control.
Western bean cutworm (WBC)	Scout 20 consecutive corn plants at five locations in a field to obtain a representative field sample. Treatment is justified when 5% of sampled plants have egg masses and/or small larvae.
Seed corn maggot, white grubs, wireworms, hop vine borer and slugs: No acceptable thresholds at this time.	

Alfalfa Insects

(Avoid insecticide applications within 7 days of cutting)

Insect	Treatment Threshold
Alfalfa blotch leafminer	30 - 40% of leaflets showing pinhole feeding.
Alfalfa weevil	1 st Crop: 40% or more of stems showing feeding and prior to one week of harvest. 2 nd Crop: 50% or more of stems showing feeding.
Meadow spittlebug	1 nymph per stem.
Pea aphid	Minimum of 100 aphids per sweep.
Alfalfa & Tarnished plant bug	3 per sweep on 3" or shorter alfalfa; 5 per sweep on alfalfa taller than 5".
Potato leafhopper	0.2/sweep on 3" alfalfa; 0.5/sweep on 6" alfalfa; 1/sweep on 8-11" alfalfa; 2/sweep on alfalfa taller than 12".

Other Small Grain Insects

Insect	Treatment Threshold
Aphids (Bird-cherry Oat, English grain and Corn leaf)	Delay planting until September 15th. Seedlings - 30 aphids per stem; Boot to heading - 50 aphids per stem.
Greenbug	Seedlings - 20 aphids per stem; Boot to heading - 30 aphids per stem.
Armyworm	3 armyworms per square foot.
Cereal leaf beetle & wireworms	No threshold established.
Grasshoppers	Treat if grasshoppers average 20/sq yard on field edges or 8/sq yard for a field average. Apply when grasshoppers are small for most effective control.

Head Capsule Gauge (Black cutworm instar)

To determine the instar stage of larvae, hold the head between thumb and forefinger, and place on the closest corresponding ruler below.



Stalk borer: Economic thresholds for stalk borer in corn, based on leaf stage, market value, and expected yield.

leaf stage	\$3/bu				\$4/bu				\$5/bu				\$6/bu			
	--- Expected yield bu/a ---				--- Expected yield bu/a ---				--- Expected yield bu/a ---				--- Expected yield bu/a ---			
	150	175	200	225	150	175	200	225	150	175	200	225	150	175	200	225
1	5.8	4.9	4.3	3.8	4.3	3.7	3.2	2.9	3.5	3.0	2.6	2.3	3.0	2.5	2.2	1.9
2	7.1	6.0	5.3	4.7	5.3	4.5	4.0	3.5	4.2	3.6	3.2	2.8	3.5	3.0	2.7	2.4
3	9.3	8.0	7.0	6.2	7.0	6.0	5.3	4.7	5.6	4.8	4.2	3.7	4.7	4.0	3.5	3.1
4	9.9	8.5	7.4	6.6	7.4	6.4	5.6	5.0	5.9	5.1	4.5	4.0	5.0	4.3	3.7	3.3
5	11.3	9.7	8.5	7.6	8.5	7.3	6.4	5.7	6.8	5.8	5.1	4.5	5.7	4.9	4.3	3.8
6	19.8	17.0	14.9	13.2	14.9	12.8	11.2	9.9	11.9	10.2	8.9	7.9	9.9	8.5	7.4	6.6
7	54.7	46.9	41.1	36.5	41.1	35.2	30.8	27.4	32.8	28.2	24.6	21.9	27.4	23.5	20.5	18.2

Thresholds based on \$13.00/acre control costs and 80% control with insecticides. (Adapted from Erin Hodgson, Iowa State University.)

Treatment Thresholds and Scouting for Pests of Soybean

Soybean Insects

Soybean Aphid

- Avoid treating soybean aphid when they first appear.
- Scout fields weekly to find rate of population increase.
 - Count number of aphids on 20-30 plants per field.
 - Check upper leaves & stems where aphids congregate.
 - Continue scouting through the R5 pod stage.
- Treat when approximately 80% of the field has reached an average of 250 aphids per plant AND the population is actively increasing.
- This threshold applies at the R1 through the R5 stage soybeans.
- Treating after R6 has not been shown to increase yield.

Insect	Treatment Threshold
Grasshoppers, green clover-worms, wooly bear caterpillars, thistle caterpillars, Japanese beetle	Treat when defoliation reaches 30% in vegetative stage soybean or 20% in reproductive stage soybean. See soybean leaf defoliation guide below.
Green stinkbug	Treat when adults and/or nymphs reach one per foot of row during pod fill. If "narrow rows", threshold is 40/100 sweeps.
Two-spotted spider mite	No economic threshold has been developed for soybean. However treatment may be warranted if: Mites are present between bloom (R1) and pod fill (R5); 15% or more leaf area on plants are discolored and stippled with leavings yellowing; live mites are present; hot, dry weather is expected to continue.
Potato leafhoppers	2 per plant with ≤ 3 trifoliolate leaves; 6 per plant on flowering soybean (R1-R2); 13 per plant on soybean at full pod (R4).
Seed corn maggot	No acceptable thresholds at this time.

Bean leaf beetle early-season treatment thresholds for soybean defoliation.

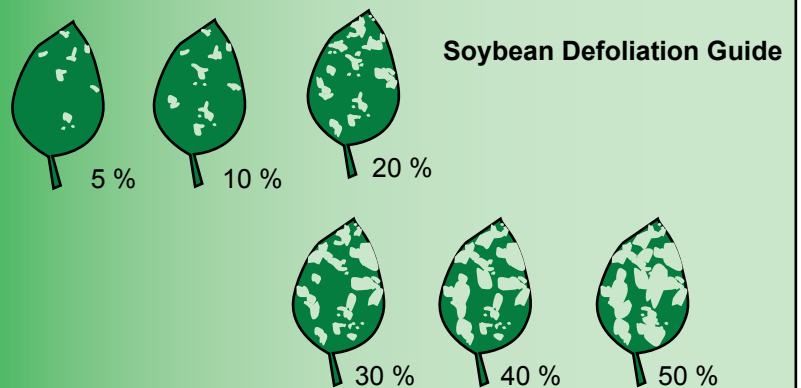
Growth stage	Crop value (\$/bu)	Treatment cost/acre (insecticide + application costs)					
		\$6.00	\$7.00	\$8.00	\$9.00	\$10.00	\$11.00
VC	\$5.00	2.4	2.8	3.2	3.6	4.0	4.4
	\$6.00	2.0	2.3	2.7	3.0	3.4	3.7
V1	\$5.00	3.7	4.4	5.0	5.6	6.2	6.8
	\$6.00	3.1	3.6	4.1	4.7	5.2	5.7
V2	\$5.00	5.9	6.8	7.8	8.8	9.8	10.7
	\$6.00	4.9	5.7	6.5	7.3	8.1	8.9

2nd generation bean leaf beetle thresholds in reproductive stage soybean.*

Crop value (\$/bu)	Treatment cost/acre (insecticide + applications costs)								
	\$7	\$8	\$9	\$10	\$11	\$12	\$13	\$14	\$15
	----- Number of beetles per foot of row -----								
\$5.00	5.5	6.3	7.1	7.9	8.7	9.5	10.3	11.0	11.8
\$6.00	4.6	5.2	5.9	6.5	7.2	7.8	8.5	9.2	9.9
\$7.00	3.9	4.4	5.0	5.6	6.1	6.7	7.3	7.8	8.4
\$8.00	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5
	----- Number of beetles per sweep -----								
\$5.00	3.5	4.0	4.5	5.0	6.5	7.2	7.7	8.3	8.7
\$6.00	2.9	3.3	3.7	4.1	5.4	6.0	6.4	6.9	7.3
\$7.00	2.4	2.8	3.1	3.5	3.8	4.2	4.5	4.9	5.2
\$8.00	2.2	2.5	2.8	3.2	4.1	4.5	4.8	5.2	5.5

Source: Marlin Rice, Iowa State University, 2000

* Economic thresholds are based on a row spacing of 30 inches and a plant population of eight plants per foot of row. For narrow-row soybean (8-inch rows) and a plant population of three plants per foot of row multiply the above economic threshold by 0.70

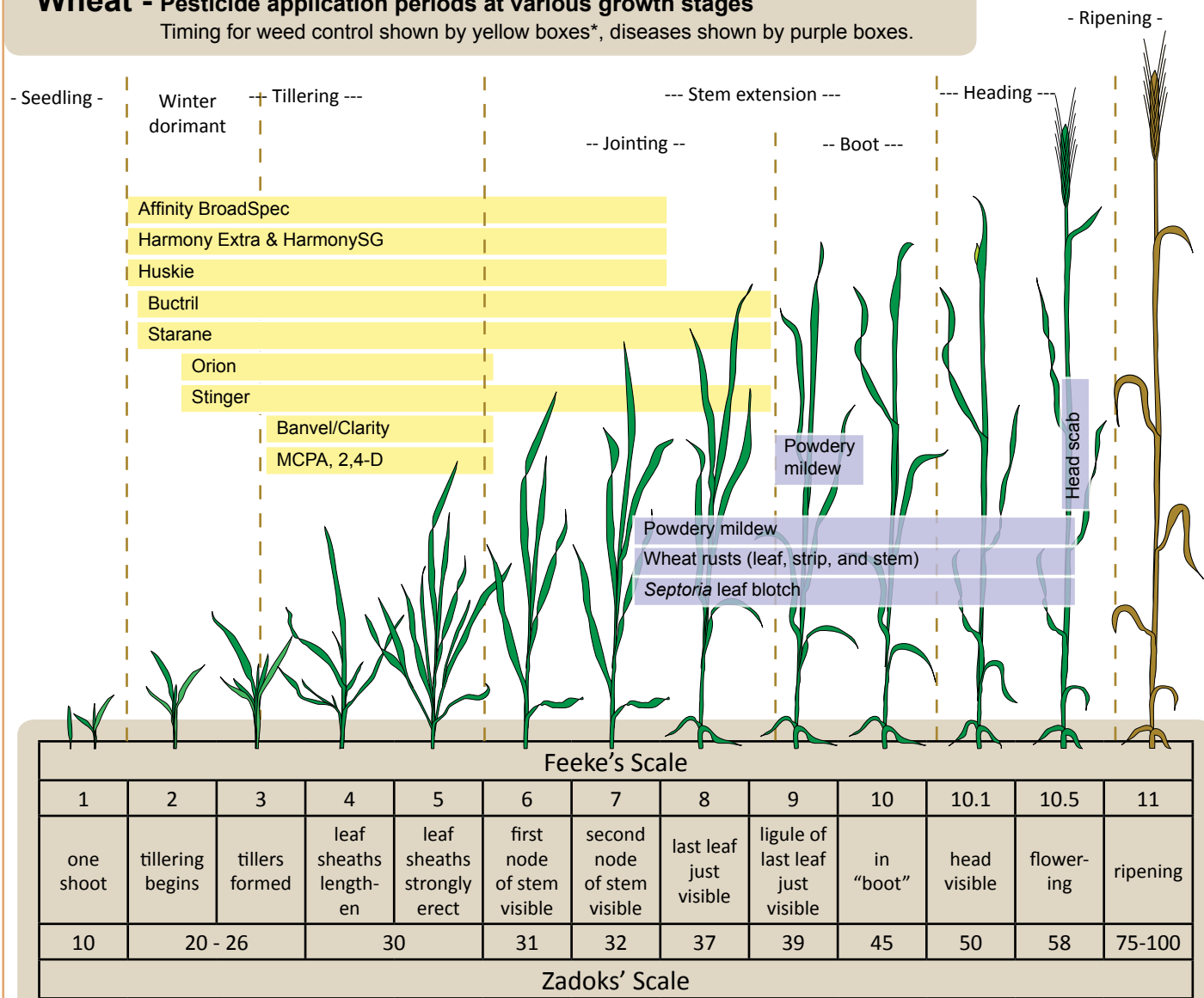


Collecting a soil sample for Soybean Cyst Nematode (SCN)

1. Use a soil probe or narrow-bladed trowel or shovel. Take cores close to plants at a depth of 8 to 10 inches. Discard the upper 2 inches of soil, especially if it is dry. Be sure to include plant roots.
2. Submit one sample for a 10-acre field, or for a suspected area within the field. Sample from plants in the margins of suspected areas, and not from their centers. Collect in a zigzag pattern across the field. Collect from areas of similar soil texture and cropping history. If different crops were grown, or there is markedly different soils within a field, sample separately.
3. Take soil and roots from 12 to 20 plants and mix into one sample (1 to 2 pints of soil). Place in a sturdy plastic bag (or soil sample bag), fasten the open end securely, and label accurately with an indelible marker. Keep the samples out of the sun and don't let them dry out.
4. Mail as soon as possible, and early in the week to avoid delays in transit. Mail to the Plant Disease Diagnostic Clinic, 1630 Linden Drive, University of Wisconsin-Madison, Madison, WI 53706. Consult with your county extension agent about private laboratories that conduct SCN analyses.

Wheat - Pesticide application periods at various growth stages

Timing for weed control shown by yellow boxes*, diseases shown by purple boxes.



* References to pesticide products in this publication are for your convenience and are not an endorsement of one product over other similar products.

General guidelines for fungicide management

- Plant disease-resistant hybrids/varieties whenever possible.
- Maintain proper soil fertility.
- Scout fields on a regular basis, noting incidence and severity of diseases. Use this information to develop a field history for future disease management decisions.
- Avoid sites with a history of high disease pressure.
- Utilize a crop rotation that fits your area and field history.
- Tank mix high-risk fungicides with fungicides that have different modes of action, are active against the targeted disease(s), and have similar lengths of residual activity.
- Do not use reduced rates of fungicides.
- Alternate or tank mix fungicides with different modes of action when multiple applications are required.
- Apply fungicides preventively or early in the disease cycle and when a disease threat is warranted.
- Avoid curative fungicide applications, especially with high-risk fungicides.

Always read and follow the pesticide label:

- for maximum number of sprays per season.
- for recommended application rates.
- for application timing for both target disease and plant growth stage.

For more information see UWEX publication: A3878, *Fungicide resistance management in corn, soybean, and wheat in Wisconsin*