E1676 (Revised April 2026)

Integrated Pest Management of Alfalfa Weevil in North Dakota

Revised by

Janet J. Knodel
Professor and Extension Entomologist, NDSU

Patrick B. Beauzay
State IPM Coordinator and Research Specialist, NDSU

Miro Herrera Grant
M.S. Graduate Student, NDSU

The alfalfa weevil, *Hypera postica* (Gyllenhal) (Coleoptera:Curculionidae), is found throughout the U.S. and is the major insect pest of alfalfa in North Dakota.

Loss of plant biomass, especially leaf tissue, can be severe. Leaf feeding by alfalfa weevil also reduces the nutritional quality and digestibility of alfalfa. Depending on the year, yield loss due to alfalfa weevil can approach 100%, especially under drought.

NDSU EXTENSION

North Dakota State University
Fargo, North Dakota

Identification

Adults (Figure 1) are about 5 millimeters (mm) long (¼ inch), with elbowed, clubbed antennae and a blunt snout. Adults are brown with short, somewhat thick golden hairs over the body and a distinctive brown stripe longitudinally along the center of the back. Newly deposited eggs (Figure 2) are cream colored, and eggs that are about to hatch are olive brown, with the black head capsule of the developing larva visible. Mature larvae (Figure 3) are about 8 mm long (almost ½ inch) and have a black head capsule and a wrinkled green body with a white stripe running lengthwise along the top. Younger larvae are similar in appearance but smaller.

Figure 3. Mature alfalfa weevil larvae
(Janet Knodel, NDSU)

Figure 1. Adult alfalfa weevil
(Patrick Beauzay, NDSU)

Figure 2. Alfalfa weevil eggs
(Sue Blodgett, Iowa State University, www.Bugwood.org)

Life Cycle (Figure 4)

Alfalfa weevil has one complete generation per year in North Dakota. Adults become active from May through June, and females lay eggs in alfalfa stems. Eggs hatch in one to two weeks. Larvae emerge from the stem and begin feeding on the growing tips of the alfalfa plants. Larvae pass through four growth stages (instars) before reaching maturity.

Larvae continue to feed on tender leaf tissue as they grow (Figure 5). Mature larvae feed for two to three weeks before pupating (Figure 6). Pupation takes place in small, silken cocoons that are spun near the base of the plant. Adults emerge after one to two weeks. Adults feed on the alfalfa for two to three weeks before leaving for sheltered areas and entering a summer dormancy period (aestivation).

Some adults may move back to alfalfa in the fall and lay eggs, but these eggs usually do not overwinter successfully

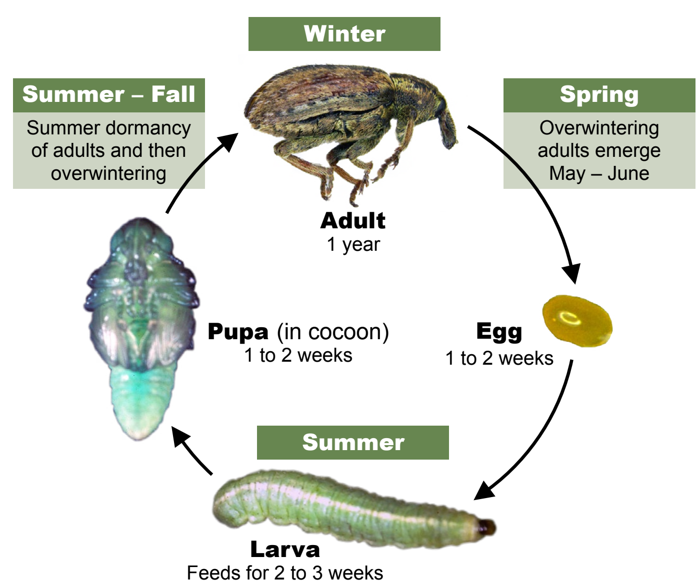

Figure 4. Life cycle of the alfalfa weevil

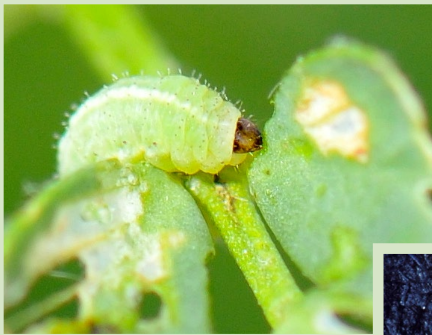

Figure 5. Alfalfa weevil larva feeding on alfalfa leaf

(Patrick Beauzay, NDSU)

Figure 6. Alfalfa weevil pupa

(Frank Peairs, Colorado State University, www.Bugwood.org)

in North Dakota. However, during exceptionally mild winters such as we experienced during the winter of 2011-12, winter egg survival may lead to spring larval emergence and damage occurring earlier than normal the following spring. These adults will overwinter in shelterbelts outside the alfalfa field and then continue their life cycle the following year.

Alfalfa weevil development is temperature-dependent, and degree-day models have been used to forecast its life stages. The following degree-day model has been adopted by university Extension specialists in our region (e.g., the University of Wisconsin and the University of Illinois) and was derived from the model developed by Harcourt (1981) for alfalfa weevil in southern Ontario (Table 1).

Table 1. Approximate degree day (DD) requirements for alfalfa weevil development using 48 F as the base developmental temperature.

Life Stage	DD Required to Complete Life Stage	Accumu-lated DD	Typical Feeding Activity
Egg hatch begins	300	300	
1st instar development	71	371	Light
2nd instar development	67	438	Light
3rd instar development	66	504	Heavy
4th instar development	91	595	Heavy
Pupation	219	814	
Adult emergence	—	>814	

The model assumes no overwintering egg survival.

For most years, degree days toward alfalfa weevil development do not begin to accumulate before March 1. Be sure to check the weekly NDSU Extension “Crop & Pest Report” (https://www.ndsu.edu/agriculture/ag-hub/ag-topics/crop-production/crop-pest-report) during the growing season for statewide alfalfa weevil degree day maps. Or you can generate your own by visiting the NDAWN website at https://ndawn.ndsu.nodak.edu/. Go to “Applications,” select “Insect Degree Days” and choose “Maps.” March 1 is used as the start date; select 48 F as the base temperature, then click “Submit” to generate the map. You can also generate accumulated degree day tables for individual weather stations.

Plant Injury

Initial feeding injury by first-instar larvae appears as pinholes in the terminal leaves. As plants and larvae grow, feeding injury will progress across the leaves, with leaves becoming skeletonized as injury becomes more severe (Figs. 7 and 8). Typically, third- and fourth-instar larvae cause the most feeding injury on foliage. Plant growth up to the first cutting is usually most affected by feeding injury. However, crown injury to regrowth can become significant, particularly under windrows where larvae take shelter after the first cutting.

Figure 7. Alfalfa weevil feeding injury; note frosted appearance of crop

(Patrick Beauzay, NDSU)

Figure 8. Close-up of alfalfa weevil defoliation
(Patrick Beauzay, NDSU)

At each sampling site in the field, select a minimum of 30 stems and cut them off at the base. Invert the cut stems into the 5-gallon pail and vigorously beat the plants in the pail to dislodge the larvae. First-instar larvae feeding in rolled leaf tips won't dislodge easily, so be sure to examine leaf tips for larvae.

Count and record 1) the number of stems sampled, 2) the total number of larvae counted, and 3) the height of the alfalfa at the sampling sites. Repeat this procedure for all sampling sites within the field. When finished, total the number of larvae found and divide by the total number of stems sampled to calculate an average number of larvae per stem for the entire field (Figure 9). Also, calculate average plant height for the field.

An alternative, though less accurate, scouting method is to visually estimate defoliation at each field sampling site, using the same field scouting pattern described above. Defoliation estimates should be recorded as percent defoliation, and an average should be calculated for the entire field. Keep in mind that this method, while time-efficient, can lead to overestimation or underestimation of actual damage, and estimates can vary significantly among different observers.

We do not recommend using sweep nets for sampling because results are often highly variable and inaccurate. Sweep nets can be used to determine the presence/absence of alfalfa weevil adults and larvae in a field at or before typical egg hatch (300 DD). After alfalfa weevil has been detected, the stem sampling method should be used.

When and How to Scout

Integrating the degree-day model into your alfalfa weevil management program is essential. Accumulated degree days will give you a time to begin scouting, when larval feeding damage might occur and when control action might be necessary.

Scouting should begin immediately after egg hatch, and fields should be scouted weekly up through the first cutting. Fields should be scouted in a "W" pattern or by selecting random sites in the field, with a minimum of five sampling sites per field. Larger fields should have more sampling sites. Be sure your sampling pattern is representative of the entire field. Don't scout only along the edges or in small areas.

Using a system of aerial imagery of your field, global positioning system (GPS) coordinates (available in Google Earth), and a handheld GPS unit will allow you to set up your scouting routes and locate sampling sites before you scout.

For sampling before the first cutting, you will need sharp pruning shears; a clean, white 5-gallon bucket; a hand lens; a yardstick for measuring plant height; and a pencil, paper and a calculator.

Figure 9. Alfalfa weevil larvae collected during 30-stem sampling method using a white bucket
(Patrick Beauzay, NDSU)

Economic Threshold and Management Decisions

Several factors must be considered when making alfalfa weevil management decisions. Plant height, estimated yield, crop market value, management costs and plant injury based on the number of larvae per stem must be considered. Studies conducted in Kentucky, Nebraska, New York and Utah have demonstrated that the level of plant damage per insect varies by geographic area.

The following economic threshold table is based on simulated third- and fourth-instar larvae damage levels observed in a two-year study conducted in Nebraska in 1990 and 1991 (Peterson et al. 1993) and has been adapted for North Dakota. Threshold numbers in Table 2 are the average number of larvae per stem sampled in the field using the 30-stem sampling method described above. These economic thresholds apply prior to the first cutting only.

After the first cutting has been harvested, be sure to scout for larvae under the windrows. Larvae that escaped the first cutting tend to move under the windrows for shelter and feed there (Figure 10).

Table 2. Recommended economic thresholds for third- and fourth-instar alfalfa weevil larvae in North Dakota prior to the first cutting.

Plant Growth Stage (Height)	Treatment Cost	Crop Value ($/ton)									Management Decision
		$50	$75	$100	$125	$150	$175	$200	$225	$250	
		Number of Alfalfa Weevil Larvae per Stem									
50% bud or greater											Cut early
Early bud (>20 inches)	$7/acre	4.0	2.7	2.0	1.6	1.3	1.2	1.0	0.9	0.8	Cut early, or use a short PHI/PGI product
	$8/acre	4.6	3.1	2.3	1.8	1.5	1.3	1.2	1.0	0.9	
	$9/acre	5.2	3.5	2.6	2.1	1.7	1.5	1.3	1.2	1.0	
	$10/acre	5.8	3.8	2.9	2.3	1.9	1.6	1.4	1.3	1.2	
	$11/acre	6.3	4.2	3.2	2.5	2.1	1.8	1.6	1.4	1.3	
	$12/acre	6.9	4.6	3.5	2.8	2.3	2.0	1.7	1.5	1.4	
	$13/acre	7.5	5.0	3.7	3.0	2.5	2.1	1.9	1.7	1.5	
	$14/acre	8.1	5.4	4.0	3.2	2.7	2.3	2.0	1.8	1.6	
	$15/acre	8.6	5.8	4.3	3.5	2.9	2.5	2.2	1.9	1.7	
	$16/acre	9.2	6.1	4.6	3.7	3.1	2.6	2.3	2.0	1.8	
Late vegetative (16 to 20 inches)	$7/acre	3.8	2.4	1.8	1.4	1.1	0.9	0.8	0.7	0.6	Use a short to mid-PHI/PGI product
	$8/acre	4.4	2.8	2.1	1.6	1.3	1.1	0.9	0.8	0.7	
	$9/acre	4.9	3.2	2.4	1.8	1.5	1.2	1.1	0.9	0.8	
	$10/acre	5.5	3.6	2.6	2.1	1.7	1.4	1.2	1.0	0.9	
	$11/acre	6.1	4.0	2.9	2.3	1.9	1.6	1.3	1.2	1.0	
	$12/acre	6.7	4.4	3.2	2.5	2.1	1.7	1.5	1.3	1.1	
	$13/acre	7.2	4.8	3.5	2.8	2.3	1.9	1.6	1.4	1.3	
	$14/acre	7.8	5.1	3.8	3.0	2.4	2.1	1.8	1.6	1.4	
	$15/acre	8.4	5.5	4.1	3.2	2.6	2.2	1.9	1.7	1.5	
	$16/acre	9.0	5.9	4.4	3.4	2.8	2.4	2.1	1.8	1.6	
Midvegetative (10 to 15 inches)	$7/acre	3.6	2.2	1.5	1.1	0.9	0.7	0.5	0.4	0.3	Use a long-residual product
	$8/acre	4.1	2.6	1.8	1.4	1.1	0.8	0.7	0.5	0.4	
	$9/acre	4.7	3.0	2.1	1.6	1.2	1.0	0.8	0.7	0.6	
	$10/acre	5.3	3.4	2.4	1.8	1.4	1.2	1.0	0.8	0.7	
	$11/acre	5.9	3.7	2.7	2.1	1.6	1.3	1.1	0.9	0.8	
	$12/acre	6.4	4.1	3.0	2.3	1.8	1.5	1.2	1.1	0.9	
	$13/acre	7.0	4.5	3.3	2.5	2.0	1.7	1.4	1.2	1.0	
	$14/acre	7.6	4.9	3.6	2.7	2.2	1.8	1.5	1.3	1.1	
	$15/acre	8.2	5.3	3.8	3.0	2.4	2.0	1.7	1.4	1.2	
	$16/acre	8.7	5.7	4.1	3.2	2.6	2.2	1.8	1.6	1.4	

Figure 10. Alfalfa weevil larval feeding injury underneath the windrows (brown defoliated strips)
(NDSU Extension)

Check regrowth for larval feeding. If eight or more larvae per square foot are found or regrowth is delayed due to feeding, treatment is recommended.

If using the visual percent defoliation method, treatment is recommended when the average percent defoliation across the entire field reaches 30%. Keep in mind that this threshold is less accurate than the threshold based on larval counts and does not take into account forage value or insecticide application costs.

Integrated Pest Management Strategies

Biological Control

A few parasitic wasp species, including *Anaphes luna*, *Bathyplectes anurus*, *B. curculionis* and *Oomyzus incertus*, have been introduced in the U.S. to control alfalfa weevil. Limited surveys of the natural enemies of alfalfa weevil have been conducted in North Dakota.

A fungal pathogen, *Zoophthora phytonomi*, also provides natural control of larvae, but it is most effective only in warm and moist environments and, as such, likely is not an important biological control agent of alfalfa weevil in North Dakota.

A study by Tatyana Rand of the U.S. Department of Agriculture-Agricultural Research Service Laboratory in Sidney, Montana, found an average parasitism rate by *B. curculionis* at 37.2% in the North Dakota/Montana border region.

Natural enemies have the potential to keep alfalfa weevil from reaching economic levels. Therefore, insecticides should be used only when necessary.

Cultural Control

Cutting typically occurs soon after alfalfa reaches the early bud stage. At this time, continued larval feeding may not be sufficient to warrant the cost of insecticide application. Early cutting is recommended when alfalfa has reached 50% budding and alfalfa weevil larvae have reached the economic threshold.

If economic alfalfa weevil infestations are observed, early cutting (hay) is one of the best strategies for reducing alfalfa weevil damage.

Bale windrowed alfalfa as soon as possible to expose larvae that are sheltering under the windrows.

Another cultural control strategy is to maintain stand health through recommended agronomic practices. Refer to NDSU Extension publication R571 (revised), "Alfalfa Management in North Dakota," for information.

Chemical Control

When insecticidal control is necessary, pay particular attention to the preharvest intervals (PHI) and pregrazing intervals (PGI) on the product label. The decision on which product to use should be based on when you intend to cut or graze the crop.

Also, note that products with a long PHI do not necessarily have long-lasting residual for insect control. For example, chlorpyrifos (an organophosphate) applied at more than 1 pint per acre has a PHI/PGI of 21 days. Still, its residual activity can realistically be expected to last only seven days. Zeta-cypermethrin (a pyrethroid) applied at the low or high rate has a PHI/PGI of three days, yet should provide seven to 10 days of residual control.

The development of insecticide resistance is a growing concern for alfalfa weevil management in the northern Great Plains, including North Dakota, Minnesota and South Dakota. Alfalfa weevil resistance to pyrethroids, including lambda-cyhalothrin and zeta-cypermethrin, has recently been identified in six western U.S. states, including Montana (Rodbell et al. 2024). Farmers are encouraged to practice Insecticide Resistance Management (IRM) tactics to mitigate insecticide resistance in alfalfa weevil populations. Key methods of IRM include the following:

- Monitor fields to track alfalfa weevil population growth.
- Use the established Economic Thresholds to make insecticide treatment decisions, only when necessary to preserve natural biological control.
- Use other Integrated Pest Management strategies, such as cultural control (early cutting or harvesting), to reduce pest populations.
- Limit the use of insecticide products or groups with known alfalfa weevil resistance, such as lambda-cyhalothrin, a pyrethroid, to once every three years.
- Although insecticide groups (or modes of action) are limited in alfalfa, use different modes of action to break the overreliance on one product or group.

Another critical consideration is pollinator safety. Most insecticide labels now carry "bee language" such as "do not apply when crop is in bloom" or "do not apply when bees are actively foraging." When spraying any insecticide in alfalfa, be sure to observe pollinator safety. Only apply insecticides early in the morning or late in the evening when bees are not present.

The following table lists insecticides registered for use in alfalfa in North Dakota for control of alfalfa weevil (Table 3). Trade names are given as examples only and do not imply endorsement of one product over another nor discrimination against any product by NDSU Extension.

Table 3. Insecticides registered for control of alfalfa weevil in alfalfa in North Dakota (by active ingredient).

Active Ingredient	Example Trade Name(s)	Chemical Class	IRAC Group	Product Rate per Acre	Preharvest Interval (days)	Pre-grazing Interval (days)
alpha-cypermethrin	Fastac CS	P	3A	2.2-3.8 fl oz	3	3
beta-cyfluthrin[1]	Baythroid XL	P	3A	1.6-2.8 fl oz	7	7
carbaryl[2,3]	Sevin 4F, Sevin XLR Plus	C	1A	1.5 quarts	7	7
chlorantraniliprole + lambda-cyhalothrin	Besiege	D + P	28 + 3A	6.0-9.0 fl oz	7	1
chlorpyrifos	Pilot 4E, Warhawk Clearform	OP	1B	1-2 pints	1 pint = 14	1 pint = 14
chlorpyrifos + lambda-cyhalothrin	Lambdafos	OP + P	1B + 3A	16-38 fl oz	13-26 fl oz = 14 >26 fl oz = 21	13-26 fl oz = 14 >26 fl oz = 21
cyfluthrin	Tombstone Helios	P	3A	1.6-2.8 fl oz	7	7
dimethoate[3,4]	Dimethoate 4E	OP	1B	0.5-1 pint	10	10
indoxacarb	Steward EC	none	22A	6.7-11.3 fl oz	7	Not listed
lambda-cyhalothrin	Warrior II	P	3A	1.28-1.92 fl oz	7	1
lambda-cyhalothrin	Grizzly Z, Silencer	P	3A	2.56-3.84 fl oz	7	1
malathion[2]	Malathion 57EC	OP	1B	1.5-2 pints	0	Not listed
malathion[2]	Fyfanon ULV	OP	1B	8 fl oz	0	Not listed
methomyl	Lannate LV	C	1A	3 pints	7	7
permethrin	Arctic 3.2EC	P	3A	4.0-8.0 fl oz	14	Not listed
phosmet	Imidan 70W	OP	1B	1-1.33 pounds	7	7
zeta-cypermethrin	Mustang Max	P	3A	2.24-4.0 fl oz	3	3

[1] Due to potential bee injury, do not apply to alfalfa grown for seed.

[2] Not effective against adult alfalfa weevils.

[3] Do not apply when alfalfa is in bloom.

[4] Suppresion only.

Chemical Class Abbreviations:C = carbamates; D = diamides; OP = organophosphates; P = pyrethroids.

IRAC Group Modes of Action: 1A, 1B = acetyl cholinesterase inhibitors; 3A = sodium channel modulators; 22A = voltage-dependent sodium channel blockers; 28 = ryanodine receptor modulators.

Be sure to read, understand and follow all label directions and precautions.

Selected References

Bryan, M.D., R.J. Dysart and T.L. Burger. 1993. Releases of introduced parasites of the alfalfa weevil in the United States, pp. 1-203. USDA-APHIS Series, Miscellaneous Publications No. 1504.

Cook, K.A., S.T. Ratcliffe, M.E. Grey and K.L. Steffey. 2004. Alfalfa Weevil. http://ipm.illinois.edu/fieldcrops/insects/alfalfa_weevil/ University of Illinois Extension.

Danielson, S., T. Hunt and K. Jarvi. Managing the Alfalfa Weevil. 2006. University of Nebraska-Lincoln Extension, Institute of Natural Resources publication G1208 (revised).

Giles, K., J.J. Obrycki, M. Rice, L. Pedigo and S. Barnhart. 1999. Integrated Pest Management of Alfalfa Insects in the Upper Midwest. Leopold Center for Sustainable Agriculture, Publication IPM-58. Iowa State University, Ames.

Harcourt, D.G. 1981. A thermal summation model for predicting seasonal occurrence of the alfalfa weevil, *Hypera postica* (Coleoptera: Curculionidae), in southern Ontario. The Canadian Entomologist 113: 601-605.

Peterson, R.K.D., S.D. Danielson and L.G. Higley. 1993. Yield responses of alfalfa to simulated alfalfa weevil injury and development of economic injury levels. Agronomy Journal 85: 595-601.

Peterson, R.K.D., and S.J. Meyer. 1995. Relating degree-day accumulations to calendar dates: alfalfa weevil (Coleoptera: Curculionidae) egg hatch in the north central United States. Environmental Entomology 24: 1404-1407.

Radcliffe, E.B., and K.L. Flanders. 1998. Biological control of alfalfa weevil in North America. Integrated Pest Management Reviews 3: 225-242.

Rand, T. 2013. Host density drives spatial variation in parasitism of the alfalfa weevil, *Hypera postica*, across dryland and irrigated alfalfa cropping systems. Environmental Entomology 42: 116-122.

Rodbell, E.A., C.G. Caron, S.I. Rondon, M.U. Masood and K.W. Wanner. 2024. Alfalfa weevils (Coleoptera: Curculionidae) in the western United States are resistant to multiple type II pyrethroid insecticides. Journal of Economic Entomology 117: 208-292.

Cover photo: adult alfalfa weevil
(Joseph Berger, www.Bugwood.org)

USDA National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE

Printing is being supported by the USDA-NIFA, Crop Protection and Pest Management - Extension Implementation Program (2024-70006-43752).

This publication was authored by Patrick B. Beauzay, State IPM Coordinator and Research Specialist, NDSU; Janet J. Knodel, Extension Entomologist, NDSU; and G.A.S.M. Ganehiarachchi, Senior Lecturer, Department of Zoology, University of Kelaniya, Sri Lanka

For more information on this and other topics, see www.ndsu.edu/extension

3M-7-13; 1830-6-18; 800-4-26