

Section E

Hay and Pasture Crops

Alfalfa Hay Pests

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In all cases, follow the instructions on the pesticide label. The PNW Insect Management Handbook has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications. For alfalfa, harvest is defined as when the crop is cut.

Protect pollinators: See How to Reduce Bee Poisoning from Pesticides.

Pesticide resistance: Modes of action are important criteria in selecting insecticides so as to prevent the development of resistance to insecticides. Rotate chemicals with a different mode-of-action group number, and do not use products with the same mode-of-action group number more than twice per season. For example, pyrethroids have a group number of 3A; chemicals with a 3A group number should be alternated with chemicals that have a group number other than 3A. Mode of action groupings are assigned by IRAC (Insecticide Resistance Action Committee). For additional information, see their Web site at <http://www.irac-online.org/>.

Note: Products are listed in alphabetical order and not in order of preference or superiority of pest control. For all insecticides, use appropriate adjuvants and application methods to maximize efficacy.

Alfalfa hay—Alfalfa caterpillar

Colias eurytheme – also known as Orange Sulphur

Colias philodice – also known as Clouded Sulphur

Pest description and crop damage Adult is the common yellow butterfly with a black border on the wings. The caterpillar is green and covered with very short hairs. It is seldom a pest in the Pacific Northwest (<http://bugguide.net/node/view/3248>).

Sampling and thresholds Ten or more nonparasitized larvae per 90° sweep, sometimes called a straight-line sweep.

Management—chemical control

- alpha-cypermethrin (Fastac EC) at 0.014 to 0.025 lb ai/A. PHI 3 days for cutting or grazing. REI 12 hr. Retreatment interval 7 days. Do not exceed 0.025 lb ai/cutting and 0.075 lb ai/A per season.
- azadirachtin (Aza-Direct, Neemix 4.5)—See specific labels for rates. PHI 0 days. REI 4 hr. Aza-direct and Neemix 4.5 are OMRI-listed for organic use.
- *Bacillus thuringiensis aizawai* or *kurstaki* (numerous products) at 0.25 to 1.5 lb ai/A. PHI 0 days. REI 4 hr. Most effective on small caterpillars; use highest recommended rate for more mature caterpillars. Evening applications increase efficacy. A spreader sticker may improve performance. Some formulations are OMRI-listed for organic use.

(Group 11A)

- beta-cyfluthrin (Baythroid XL) at 0.0125 to 0.022 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Do not exceed 0.044 lb ai/A per cutting or a total of 0.175 lb ai/A per season. Retreatment interval 5 days. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- carbaryl (numerous products) at 1 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Do not apply more than once per cutting. Carbaryl may burn or yellow hay under some conditions, and applying to wet foliage or during high humidity may injure tender foliage. Use higher gallonage (up to 40 GPA) when canopy is dense). Carbaryl is extremely hazardous to bees, so do not apply when bees are foraging in the treatment area or nearby. Latex-based formulations, such as Sevin XLR Plus, are less hazardous to bees. (Group 1A)
- chlorantraniliprole (Coragen, Prevathon) at 0.045 to 0.098 lb ai/A. PHI 0 days. REI 4 hr. Do not exceed 0.2 lb ai/A or 4 applications per year or 1 application per cutting. Chlorantraniliprole is considered a low risk to bees. Retreatment interval 3 days. (Group 28)
- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.049 to 0.078 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of products containing lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole-containing foliar products per acre per growing season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. Because of the pyrethroid component (lambda-cyhalothrin), this product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Groups 28 and 3A)
- *Chromobacterium subsugae* (Grandevo) at 0.3 to 0.9 lb ai/A per 100 gal. PHI 0 days. REI 4 hr. OMRI-listed for organic use. (Unidentified Mode of Action group)
- cyfluthrin (Tombstone) at 0.025 to 0.044 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.088 lb ai/A per cutting or a total of 0.35 lb ai/A per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- gamma-cyhalothrin (Declare) at 0.0075 to 0.0125 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Do not exceed 0.015 lb ai/A per cutting or 0.06 lb ai/A per season. Refer to product labels application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- indoxacarb (Steward) at 0.065 to 0.11 lb ai/A. PHI 7 days for cutting. REI 12 hr. Do not exceed one application per cutting or 0.44 lb ai/A per season. May be applied to alfalfa through overhead sprinkler systems. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 22A)
- lambda-cyhalothrin (Warrior II) at 0.015 to 0.025 lb ai/A. PHI 1 day for forage harvest, 7 days for hay harvest. REI 24 hr. Apply only to pure stands of alfalfa. Do not exceed 0.03 lb ai/A per cutting or 0.12 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- malathion (Fyfanon ULV) at 0.61 lb ai/A. PHI 0 days. REI 12 hr. Do not exceed 2 applications per cutting and maintain a minimum 14-day interval between applications. ULV formulations are the only ones labeled for this pest. Not effective below 65°F. This pesticide is highly toxic to bees exposed to direct treatment on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds while bees are actively visiting the treatment area. (Group 1B)
- methomyl (Lannate LV; other products) at 0.45 to 0.9 lb ai/A. PHI 7 days for grazing or cutting. REI 48 hr. Do not apply more than 10 times per season or exceed 3.6 lb ai/A per season. Direct exposure to methomyl is highly toxic to bees. Do not apply or allow drift to blooming crops or weeds while bees are actively visiting the treatment area (Group 1A)
- methoxyfenozide (Intrepid 2F) at 0.06 to 0.12 lb ai/A. PHI 0 days graze/forage, 7 days hay. REI 4 hr. Do not apply more than once per cutting. Do not apply more than 0.5 lb ai/A per year. (Group 18)
- permethrin (numerous products) at 0.05 to 0.2 lb ai/A. PHI 0 days if rate is 0.1 lb ai/A or less, 14 days if more than 0.1 lb ai/A. REI 12 hr. Do not exceed 0.2 lb ai/A per cutting. Retreatment interval 30 days. Permethrin is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply or allow to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- zeta-cypermethrin at 0.028 to 0.05 lb ai/A (Mustang), or at 0.014 to 0.025 lb ai/A (Mustang Maxx). PHI 3 days for cutting or grazing, 7 days for harvesting seed. REI 12 hr. Retreatment interval 7 days. Do not use more than 0.1 lb ai/A per cutting or more than 0.3 lb ai/A per season (Mustang) or 0.05 lb ai/A per cutting or 0.15 lb ai/A per season

(Mustang Maxx). These products are highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)

Alfalfa hay—Alfalfa and/or cabbage looper

Autographa californica and *Trichoplusia ni*

Pest description and crop damage The adult moth is gray to light brown, and the front wing has a white teardrop-shaped mark. Larvae have three pairs of abdominal prolegs, two pairs in the middle of the abdomen and one pair of anal prolegs, are light green, and have a pale head. Fully developed larvae are about 1 inch long and move in a looping, or “inchworm,” fashion. Larvae rarely need chemical control in alfalfa. For additional information, see: <https://horticulture.oregonstate.edu/oregon-vegetables/cabbage-looper-alfalfa-looper>.

Sampling and thresholds 10 or more nonparasitized larvae per 90° sweep, sometimes called a straight-line sweep.

Management—chemical control

- alpha-cypermethrin (Fastac EC) at 0.014 to 0.025 lb ai/A. PHI 3 days of cutting or grazing. REI 12 hr. Retreatment interval 7 days. Do not exceed 0.025 lb ai/cutting and 0.075 lb ai/A per season.
- azadirachtin (Aza-Direct, Neemix 4.5)—See specific labels for rates. PHI 0 days. REI 4 hr. Aza-direct and Neemix 4.5 are OMRI-listed for organic use.
- *Bacillus thuringiensis* (numerous products) at 0.25 to 1.5 lb ai/A. PHI 0 days. REI 4 hr. Most effective on small caterpillars; use highest labeled rate for mature caterpillars. Evening applications increase efficacy. A spreader sticker may improve performance. Some formulations are OMRI-listed for organic use. (Group 11)
- beta-cyfluthrin (Baythroid XL) at 0.0065 to 0.022 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Do not exceed 0.044 lb ai/A per cutting or 0.175 lb ai/A per season. Retreatment interval 5 days. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- chlorantraniliprole (Coragen, Prevathon) at 0.045 to 0.098 lb ai/A. PHI 0 days. REI 4 hr. Do not exceed 0.2 lb ai/A or 4 applications per year or 1 application per cutting. Chlorantraniliprole is considered a low risk to bees. Retreatment interval 3 days. (Group 28)
- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.049 to 0.078 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of products containing lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole-containing foliar products per acre per growing season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. Because of the pyrethroid component (lambda-cyhalothrin), this product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Groups 28 and 3A)
- cyfluthrin (Tombstone) at 0.013 to 0.044 025 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.088 lb ai/A per cutting or 0.35 lb ai/A per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- gamma-cyhalothrin (Declare) at 0.0075 to 0.0125 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Do not exceed 0.015 lb ai/A per cutting or 0.06 lb ai/A per season. Refer to product labels application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. Do not flood irrigate within 24 hr following an application (Group 3A)
- indoxacarb (Steward) at 0.065 to 0.11 lb ai/A. PHI 7 days for cutting. REI 12 hr. Do not exceed one application per cutting or 0.44 lb ai/A per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. May be applied to alfalfa through overhead sprinkler systems. (Group 22A)
- lambda-cyhalothrin (Warrior II) at 0.015 to 0.025 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Apply only to pure stands of alfalfa. Do not exceed 0.03 lb ai/A per cutting or 0.12 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- methomyl (Lannate LV) at 0.45 to 0.9 lb ai/A. PHI 7 days for grazing or cutting. REI 48 hr. Do not apply more than 10 times per season or exceed 3.6 lb ai/A per season. This product is highly toxic to bees exposed to direct treatment or

residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 1A)

- methoxyfenozide (Intrepid 2F) at 0.06 to 0.12 lb ai/A. PHI 0 days graze/forage, 7 days hay. REI 4 hr. Do not apply more than once/cutting. Do not apply more than 0.5 lb ai/A per year. (Group 18)
- permethrin (numerous products) at 0.05 to 0.2 lb ai/A. For use on pure alfalfa stands only. PHI 0 days at 0.1 lb ai/A rate, 14 days if more than 0.1 lb ai/A is used. REI 12 hr. Do not exceed 0.2 lb ai/A per cutting. Retreatment interval 30 days. Permethrin is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- spinosad (Entrust SC) at 0.031 to 0.063 lb ai/A. PHI 0 days forage; 3 days hay or fodder. REI 4 hr. Do not exceed 0.186 lb ai/A per season. Do not exceed 6 applications per season. This product is toxic to bees exposed to treatment for 3 hours following treatment. Do not apply this pesticide to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period. Entrust is OMRI-listed for organic use. (Group 5)
- zeta-cypermethrin at 0.028 to 0.05 lb ai/A (Mustang), or at 0.014 to 0.025 lb ai/A (Mustang Maxx). PHI 3 days for cutting or grazing, 7 days for harvesting seed. REI 12 hr. Retreatment interval 7 days. Do not use more than 0.1 lb ai/A per cutting or more than 0.3 lb ai/A per season (Mustang) or 0.05 lb ai/A per cutting or 0.15 lb ai/A per season (Mustang Maxx). These products are highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)

Alfalfa hay—Alfalfa weevil

Hypera postica

Pest description and crop damage Larvae are about 0.375 inch long, yellow to green, with a white stripe down the back. They feed in and on the buds and leaves of alfalfa. For additional information on their biology and management, see: <http://extension.usu.edu/files/publications/factsheet/Alfalfa-weevils89.pdf>.

Sampling and thresholds

Treat when—

1. Thirty percent of plant terminals show feeding damage. Either cut and then treat stubble or treat the standing crop, depending on how close to cutting it is.
2. Damage is noticeable 1 week or more before estimated cutting time, and larvae exceed 10 per 90° sweep, sometimes called a straight-line sweep).
3. Larvae number 20 or more per sweep (180° sweep, sometimes called a half-circle sweep). Thresholds based on larvae per sweep are a general guideline; weather, plant vigor, irrigation schedules, cutting date, history of weevils in the area, and a complex of other factors should be considered in making treatment decisions.

Management—chemical control

Most of these insecticides are hazardous to bees and should not be applied if bees are actively foraging in the alfalfa.

- alpha-cypermethrin (Fastac EC) at 0.014 to 0.025 lb ai/A. PHI 3 days of cutting or grazing. REI 12 hr. Retreatment interval 7 days. Do not exceed 0.025 lb ai/cutting and 0.075 lb ai/A per season.
- beta-cyfluthrin (Baythroid XL) at 0.0125 to 0.022 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.044 lb ai/A per cutting or 0.175 lb ai/A total per season. (Group 3A)
- carbaryl (numerous products) at 1 to 1.5 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. If pretreatment damage is extensive, cut alfalfa and treat the stubble for alfalfa weevil larvae. This product is not effective against adult alfalfa weevils. Do not apply more than once per cutting. Carbaryl may burn or yellow hay under some conditions, and applying to wet foliage or during high humidity may injure tender foliage. Latex-based formulations, such as Sevin XLR Plus, are less hazardous to bees. (Group 1A)
- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.059 to 0.088 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of products containing lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole-containing foliar products per acre per growing season. (Groups 28 and 3A)
- cyfluthrin (Tombstone) at 0.025 to 0.044 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.088 lb ai/A per cutting or 0.35 lb ai/A total per season. (Group 3A)
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Do not exceed 0.015 lb ai/A per cutting or 0.06 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)

- GS-omega/kappa-Hxtx-Hv1a (Spear Biological) at 0.2 to 0.8 lb ai/A. PHI 0 days. REI 4 hr. Do not exceed 2 lb ai/A per year.
- indoxacarb (Steward) at 0.065 to 0.11 lb ai/A. PHI 7 days for cutting. REI 12 hr. Larval control only. Do not exceed one application per cutting or 0.44 lb ai/A total per season. May be applied to alfalfa through overhead sprinkler systems (Group 22A)
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Apply only to pure stands, avoid applications when bees are actively foraging. Do not exceed 0.03 lb ai/A per cutting or 0.12 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. (Group 3A)
- malathion (numerous products) at 1 to 1.25 lb ai/A. PHI 0 days. REI 12 hr. Larvae only. Not effective below 65°F. Do not exceed 2 applications per cutting and maintain a minimum 14-day interval between applications. (Group 1B)
- methomyl (Lannate LV; other products) at 0.9 lb ai/A. PHI 7 days for grazing or cutting. REI 48 hr. Effective on larvae only. Do not exceed 10 applications per season or 3.6 lb ai/A total in one season. (Group 1A)
- permethrin (numerous products) at 0.1 to 0.2 lb ai/A. PHI 0 days at 0.1 lb ai/A or less, 14 days at more than 0.1 lb ai/A. REI 12 hr. Do not exceed 0.2 lb ai/A per cutting. Retreatment interval 30 days. (Group 3A)
- phosmet (Imidan 70-W) at 0.7 to 1 lb ai/A. PHI 7 days for grazing or cutting. REI 5 days. Do not apply more than once per cutting. Do not apply during bloom. Do not use latex- or pineolene-based adjuvants. (Group 1B)
- spinosad (Entrust SC) at 0.031 to 0.063 lb ai/A. PHI 0 days forage; 3 days hay or fodder. REI 4 hr. Only for suppression of alfalfa weevil larvae. Do not exceed 0.186 lb ai/A per season. Do not exceed 6 applications per season. Entrust is OMRI-listed for organic use. (Group 5)
- zeta-cypermethrin at 0.028 to 0.05 lb ai/A (Mustang), or at 0.014 to 0.025 lb ai/A (Mustang Maxx). PHI 3 days for cutting or grazing, 7 days for harvesting seed. REI 12 hr. Retreatment interval 7 days. Do not use more than 0.1 lb ai/A per cutting or more than 0.3 lb ai/A per season (Mustang) or 0.05 lb ai/A per cutting or 0.15 lb ai/A per season (Mustang Maxx). These products are highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)

Alfalfa hay—Aphid

Includes

Alfalfa aphid (*Macrosiphum creelii*)
 Blue alfalfa aphid (*Acyrtosiphon kondoi*)
 Pea aphid (*Acyrtosiphon pisum*)
 Spotted alfalfa aphid (*Therioaphis maculata*)

Pest description and crop damage Aphids are common on legumes. Aphids can frequently cause problems when their natural enemies are eliminated by sprays targeting alfalfa weevil. Border harvesting or strip cutting can help preserve natural enemies for aphids and other pests. Aphids feed by sucking juices from leaves, stems, and pods. Large populations reduce plant vigor. Aphids secrete honeydew that can promote a black sooty mold and decrease photosynthesis. Aphids may also transmit viruses to alfalfa, including Alfalfa mosaic virus and others. The pea aphid is “large” and can be green or red. The spotted alfalfa aphid is small and pale yellow or grayish, with conspicuous dark spots on the abdomen. It often is on the lower plant and can seriously damage some varieties. Correct species identification is critical for optimal control. Blue alfalfa aphid is being found more frequently in recent years in the PNW. Damage thresholds are lower for blue alfalfa aphid than for pea aphid. The following guide provides easy to use diagnostics for key pest aphid species:

<https://Agresearch.montana.edu/wtarc/producerinfo/entomology-insect-ecology/RussianWheatAphid/MontGuide.pdf>.

Contact your local extension office for assistance with identification. For additional information, see:
<http://www.cals.uidaho.edu/edcomm/keys/keys>

Sampling and thresholds

Treat for pea aphid when:

1. The population approaches 100 per sweep and plants are less than 1 ft high. Blue alfalfa aphid may cause damage at levels lower than 100 aphids per sweep.
4. The field is about 2 weeks or more from cutting or is under water stress, as evidenced by wilting plants.
5. Predators and parasites are not controlling the aphids.

Treat for spotted alfalfa aphid when:

1. Aphids average 10 or more per stem, and honeydew is noticeable. Seedling stands are most susceptible and can be damaged seriously even by relatively few aphids.

Management—biological control

Several species of predatory beetles, bugs and flies, and parasitic wasps occur in alfalfa and can maintain aphid populations below damaging levels. Insecticides often destroy such beneficial insects, leading to severe outbreaks of aphids and other pests. A field guide of important natural enemies of aphids and other pests is available at:

http://ipmnet.org/Pocket_Guide_of_Natural_Enemies.pdf. Information on which pesticides are most compatible with natural enemies can be found at: <http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74140.html#TABLE4> or by contacting your local extension office.

Management—cultural control

Certain commercial cultivars have resistance to aphids. Consult seed company representatives or your local extension office for recommendations. Information is also available from the National Alfalfa and Forage Alliance (<http://www.alfalfa.org/>).

Management—chemical control

Most of the following insecticides are hazardous to bees and should not be used if bees are foraging in the alfalfa.

- azadirachtin (Aza-Direct, Neemix 4.5)—See specific labels for rates. PHI 0 days. REI 4 hr. Aza-direct and Neemix 4.5 are OMRI-listed for organic use.
- *Beauveria bassiana* GHA (Mycotrol ESO) at 0.5 to 2 quarts/100 gal. PHI 0 days. REI 4 hr. OMRI-listed for organic use.
- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.059 to 0.088 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of products containing lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole-containing foliar products per acre per growing season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. Can be used on alfalfa grown for seed, but make applications when bees are not foraging by applying during the early morning or during the evening hours. Be aware of bee hazard resulting from a cool evening and/or morning dew. Remove in seed crops, remove bee shelters during and for 2–3 days following application. Do not apply directly to bee shelters. (Groups 28 and 3A)
- *Chromobacterium subsugae* (Grandevo) at 0.6 to 0.9 lb ai/A per 100 gal. PHI 0 days. REI 4 hr. OMRI-listed for organic use. (Unidentified Mode of Action group)
- dimethoate (numerous products) at 0.25 to 0.5 lb ai/A. PHI 10 days for grazing or cutting. REI 48 hrs. Do not apply during bloom. Do not exceed one application per cutting. Do not exceed 0.5 lb ai/A per season. Highly toxic to bees. Restrict application to the period after dark when bees are inside the hive or in the early morning before the bees are foraging in the fields. (Group 1B)
- flupyradifurone (Sivanto 200) at 0.09 to 0.137 lb ai/A. PHI 7 days forage, silage, cutting for hay. REI 4 hr. Retreatment interval 10 days. Do not exceed 0.365 lb ai/A per season.
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Do not exceed 0.015 lb ai/A per cutting or 0.06 lb ai/A per season. Refer to product labels application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. (Group 3A)
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Apply only to pure stands. Do not apply when bees are actively foraging. Do not exceed 0.03 lb ai/A per cutting or 0.12 lb ai/A per season. Refer to product labels application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. (Group 3A)
- malathion (numerous products) at 1 to 1.25 lb ai/A. PHI 0 days. REI 12 hr. Not effective below 65°F. Retreatment interval 14 days. (Group 1B)
- methomyl (Lannate LV; numerous other products) at 0.45 to 0.9 lb ai/A. PHI 7 days for grazing or cutting. REI 48 hr. Do not exceed 2 applications per cutting, or 10 applications or 3.6 lb ai/A per season. (Group 1A)
- permethrin (numerous products) at 0.05 to 0.2 lb ai/A. PHI 0 days at 0.1 lb ai/A or less, 14 days at more than 0.1 lb ai/A. REI 12 hr. Do not exceed 0.2 lb ai/A per cutting. Retreatment interval 30 days. (Group 3A)
- sodium borate (Prev-Am Ultra) at 50 fl oz/100 gal. PHI 1 day. REI 4 hr. Retreatment interval 7 days.
- thiamethoxam (Cruiser 5FS / 5FS Alfalfa – seed treatment) at 0.001 milligrams per seed. Will protect young alfalfa seedlings from damage caused by aphids for the first cut only. (Group 4A)
- zeta-cypermethrin at 0.028 to 0.05 lb ai/A (Mustang), or at 0.014 to 0.025 lb ai/A (Mustang Maxx). PHI 3 days for cutting or grazing, 7 days for harvesting seed. REI 12 hr. Retreatment interval 7 days. Do not use more than 0.1 lb ai/A per cutting or more than 0.3 lb ai/A per season (Mustang) or 0.05 lb ai/A per cutting or 0.15 lb ai/A per season (Mustang Maxx). These products are highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)

Alfalfa hay—Armyworm

Includes

Beet armyworm (*Spodoptera exigua*)

Bertha armyworm (*Mamestra configurata*)

Western yellowstriped armyworm (*Spodoptera praefica*)

Pest description and crop damage Larvae vary in size and color; usually they are 1.5 to 2 inches long at maturity. Armyworms are pests of most legume hay crops.

Management—chemical control

- alpha-cypermethrin (Fastac EC) at 0.0175 to 0.025 lb ai/A. PHI 3 days of cutting or grazing. REI 12 hr. Retreatment interval 7 days. Do not exceed 0.025 lb ai/cutting and 0.075 lb ai/A per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- azadirachtin (Aza-Direct, Neemix 4.5)—See specific labels for rates. PHI 0 days. REI 4 hr. Aza-direct and Neemix 4.5 are OMRI-listed for organic use.
- *Bacillus thuringiensis* (numerous products) at 0.25 to 1.5 lb product/A. PHI 0 days. REI 4 hr. Most effective on small caterpillars; use highest recommended rate for more mature caterpillars. Evening applications increase efficacy. A spreader-sticker may improve performance. Some formulations are OMRI-listed for organic use. (Group 11)
- beta-cyfluthrin (Baythroid XL) at 0.0125 to 0.022 lb ai/A. PHI 7 days for grazing or cutting. Only effective on small larvae. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.044 lb ai/A per cutting or 0.175 lb ai/A total per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- carbaryl (numerous products) at 1 to 1.5 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Do not apply more than once per cutting. Carbaryl may burn or yellow hay under some conditions, and applying to wet foliage or during high humidity may injure tender foliage. Carbaryl is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply carbaryl or allow it to drift to blooming crops if bees are visiting the treatment area. Latex-based formulations, such as Sevin XLR Plus, are less hazardous to bees. (Group 1A)
- chlorantraniliprole (Coragen, Prevathon) at 0.045 to 0.098 lb ai/A. PHI 0 days. REI 4 hr. Do not exceed 0.2 lb ai/A or 4 applications per year or 1 application per cutting. Chlorantraniliprole is considered a low risk to bees. Retreatment interval 3 days. (Group 28)
- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.049 to 0.078 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of products containing lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole-containing foliar products per acre per growing season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. Because of the pyrethroid component (lambda-cyhalothrin), this product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Groups 28 and 3A)
- *Chromobacterium subsugae* (Grandevo) at 0.3 to 0.9 lb ai/A per 100 gal. PHI 0 days. REI 4 hr. OMRI-listed for organic use. (Unidentified Mode of Action group)
- cyfluthrin (Tombstone) at 0.025 to 0.044 lb ai/A. PHI 7 days for grazing or cutting. Only effective on small larvae. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.088 lb ai/A per cutting or 0.35 lb ai/A total per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Do not exceed 0.015 lb ai/A per cutting or 0.06 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- GS-omega/kappa-Hxtx-Hv1a (Spear Biological) at 0.8 lb ai/A. PHI 0 days. REI 4 hr. Do not exceed 2 lb ai/A per year.
- indoxacarb (Steward) at 0.065 to 0.11 lb ai/A for beet armyworm and 0.09 to 0.11 lb ai/A for western yellowstriped armyworm. PHI 7 days for grazing or cutting. REI 12 hr. Do not exceed one application per cutting or 0.44 lb ai/A per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 22A)
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Apply only to pure stands. Do not apply when bees are actively foraging. Do not exceed 0.03 lb ai/A per cutting or 0.12 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming

crops if bees are visiting the treatment area. (Group 3A)

- malathion (numerous products) at 1 to 1.25 lb ai/A. PHI 0 days. REI 12 hr. Not effective below 65°F. Not effective after worms reach lengths over 0.375 inch. Retreatment interval 14 days. Limit to 2 applications per cutting. Malathion is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply malathion or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 1B)
- methomyl (Lannate LV; other products) at 0.45 to 0.9 lb ai/A. PHI 7 days for grazing or cutting. REI 48 hr. Do not exceed 10 applications or 3.6 lb ai/A per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 1A)
- methoxyfenozide (Intrepid 2F) at 0.06 to 0.12 lb ai/A. PHI 0 days graze/forage, 7 days hay. REI 4 hr. Do not apply more than once per cutting. Do not apply more than 0.5 lb ai/A per year. (Group 18)
- permethrin (numerous products) at 0.05 to 0.2 lb ai/A. PHI 0 days at 0.1 lb ai/A or less, 14 days at more than 0.1 lb ai/A. REI 12 hr. Do not exceed 0.2 lb ai/A per cutting. Retreatment interval 30 days. Permethrin is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply permethrin or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- spinosad (Entrust SC) at 0.031 to 0.063 lb ai/A. PHI 0 days forage; 3 days hay or fodder. REI 4 hr. Do not exceed 0.186 lb ai/A per season. Do not exceed 6 applications per season. Entrust is OMRI-listed for organic use. This product is toxic to bees exposed to treatment for 3 hours following treatment. Do not apply this pesticide to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period. (Group 5)
- zeta-cypermethrin Mustang at 0.035 to 0.05 lb ai/A, or Mustang Maxx at 0.0175 to 0.025 lb ai/A. PHI 3 days for cutting or grazing, 7 days for harvesting seed. REI 12 hr. Retreatment interval 7 days. Do not use more than 0.1 lb ai/A per cutting or more than 0.3 lb ai/A per season (Mustang) or 0.05 lb ai/A per cutting or 0.15 lb ai/A per season (Mustang Maxx). These products are highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)

Alfalfa hay—Blister beetle

Epicauta spp.

Meloe spp.

Pest description and crop damage Large, gray to black elongate beetles feed on foliage in late spring and summer. Feeding on hay causes little, if any, crop injury. However, blister beetles are a serious concern for hay producers and livestock owners because the cantharidin in the blister beetle causes cantharidiasis or blister-beetle poisoning when livestock eat hay that contains it. Cantharidin irritates animals' gastrointestinal and urinary tracts, may irritate the mucous lining of the mouth, may affect behavior, and sometimes kills horses, cattle, and sheep. Symptoms include blisters on the tongue and mouth, colic, diarrhea, blood or intestinal lining discharge in stools, and problems with urination or bloody discharge in urine. If you suspect blister-beetle poisoning, contact a veterinarian immediately. For additional information, see: Blister beetles; Pests or Beneficial Predators? <http://cru.cahe.wsu.edu/CEPublications/FS113E/FS113E.pdf>.

Management—chemical control

- carbaryl (numerous products) at 0.5 to 1 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Do not apply more than once per cutting. Carbaryl may burn or yellow hay under some conditions (wet foliage, high humidity). Carbaryl is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply carbaryl or allow it to drift to blooming crops if bees are visiting the treatment area. Latex-based formulations, such as Sevin XLR Plus, are less hazardous to bees. (Group 1A)
- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.049 to 0.078 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of products containing lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole-containing foliar products per acre per growing season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. Because of the pyrethroid component (lambda-cyhalothrin), this product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Groups 28 and 3A)
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Do not exceed 0.015 lb ai/A per cutting or 0.06 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Apply only to pure stands. Do not apply when bees are actively foraging. Do not exceed 0.03 lb ai/A per cutting or

0.12 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)

Alfalfa hay—Clover leaf weevil

Hypera punctata

Pest description and crop damage This is the largest weevil found in legume fields. Fully developed larvae are about 0.5 inch long, green to yellow, and have a brown head and a white or pink line down the center of the back. Larvae feed on buds and leaves. Larvae rarely need chemical control in alfalfa.

For additional information, see: <https://www.uidaho.edu/-/media/UIdaho-Responsive/Files/Extension/county/Elmore/Forages/Forage-Pests-Identification.pdf?la=en&hash=08F5EFB9EA3AB3E14F2CEDE0A928F27082A857AF>

Management—biological controls

During cool, moist spring weather, a fungal disease usually attacks the larvae, naturally suppressing populations.

Management—chemical control

- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.059 to 0.088 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of products containing lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole-containing foliar products per acre per growing season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Groups 28 and 3A)
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Do not exceed 0.015 lb ai/A per cutting or 0.06 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Apply only to pure stands. Do not apply when bees are actively foraging. Do not exceed 0.03 lb ai/A per cutting or 0.12 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- malathion (numerous products) at 1 to 1.25 lb ai/A. PHI 0 days. REI 12 hr. Not effective below 65°F. Retreatment interval 14 days. Do not make more than 2 applications per cutting. Malathion is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 1B)

Alfalfa hay—Clover root curculio

Sitona hispidulus

Pest description and crop damage Adults are grayish weevils about 0.16 inch long. Larvae feed on fibrous roots and chew cavities in main roots but usually do not significantly reduce yield.

Management—chemical control (Adult weevils only)

- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.059 to 0.088 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of products containing lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole-containing foliar products per acre per growing season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Groups 28 and 3A)
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Do not exceed 0.015 lb ai/A per cutting or 0.06 lb ai/A per season. Adults only. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be

used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)

- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. For adult suppression only. Apply only to pure stands. Do not apply when bees are actively foraging. Do not exceed 0.03 lb ai/A per cutting or 0.12 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)

Alfalfa hay—Cutworm

Includes

Army cutworm (*Euxoa auxiliaris*)—adults are called “miller moths”

Clover cutworm (*Scotogramma trifolii*)

Dingy cutworm (*Feltia jaculifera*)

Granulate cutworm (*Feltia subterranea*)

Redbacked cutworm (*Euxoa ochrogaster*)

Variegated cutworm (*Peridroma saucia*)

Pest description and crop damage Cutworms usually are dull gray, brown, or black and may be striped or spotted. They often curl up when disturbed. They usually feed at night and by day are found under leaves or in the soil at moisture level. Cutworms can kill seedlings and reduce stands. If alfalfa fields do not “green up” in the spring, or are slow to regrow after cutting in the fall, look for cutworms. Small populations (less than one larva/sq yd) can damage new seedlings. Cutworms are primarily a pest of alfalfa and clovers, but they attack other legumes also. Army cutworms, redbacked and variegated cutworms begin feeding in the fall and overwinter as half-grown larvae in grain and hay fields. Most damage occurs as caterpillars complete their development in spring. In mild winter years, be aware of large populations that can cause significant damage in late winter and early spring. In mild winter years, be aware of large populations that can cause significant damage in late winter and early spring. Variegated cutworm has an overwinter generation similar to the army cutworm and a midsummer generation. Redbacked cutworms overwinter as eggs and caterpillars commence feeding in late winter to early spring.

For additional information, see: <https://www.uidaho.edu/-/media/UIIdaho-Responsive/Files/Extension/county/Elmore/Forages/Forage-Pests-Identification.pdf?la=en&hash=08F5EFB9EA3AB3E14F2CEDE0A928F27082A857AF>

Management—chemical control

When convenient, irrigate the field before treating for redbacked or army cutworms. This brings larvae to the surface, making control easier. Applications in late evening, when larvae usually feed above ground, are most effective.

- alpha-cypermethrin (Fastac EC) at 0.014 to 0.025 lb ai/A. PHI 3 days of cutting or grazing. REI 12 hr. Retreatment interval 7 days. Do not exceed 0.025 lb ai/cutting and 0.075 lb ai/A per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- azadirachtin (Aza-Direct, Neemix 4.5)—See specific labels for rates. PHI 0 days. REI 4 hr. Aza-direct and Neemix 4.5 are OMRI-listed for organic use.
- *Bacillus thuringiensis* (numerous products) at 0.25 to 1.5 lb product/A. PHI 0 days. REI 4 hr. Most effective on small caterpillars; use highest recommended rate for more mature caterpillars. Evening applications increase efficacy.. A spreader-sticker may improve performance. Some formulations are OMRI-listed for organic use. (Group 11)
- beta-cyfluthrin (Baythroid XL) at 0.0065 to 0.0125 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Do not exceed 0.044 lb ai/A per cutting or 0.175 lb ai/A total per season. Retreatment interval 5 days. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- carbaryl (numerous products) at 1 to 1.5 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Do not apply more than once per cutting. Carbaryl may burn or yellow hay under some conditions (wet foliage, high humidity). Latex-based formulations, such as Sevin XLR Plus, are less hazardous to bees. (Group 1A)
- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.049 to 0.078 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole-containing foliar products per acre per growing season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Groups 28 and

3A)

- *Chromobacterium subsugae* (Grandevo) at 0.3 to 0.9 lb ai/A per 100 gal. PHI 0 days. REI 4 hr. OMRI-listed for organic use. (Unidentified Mode of Action group)
- cyfluthrin (Tombstone) at 0.013 to 0.025 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.088 lb ai/A per cutting or 0.35 lb ai/A total per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- gamma-cyhalothrin (Declare) at 0.0075 to 0.0125 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Do not exceed 0.015 lb ai/A per cutting or 0.06 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- indoxacarb (Steward) at 0.065 to 0.11 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Do not exceed one application per cutting or 0.44 lb ai/A per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 22A)
- lambda-cyhalothrin (Warrior II) at 0.015 to 0.025 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Apply only to pure stands. Do not apply when bees are actively foraging. Do not exceed 0.03 lb ai/A per cutting or 0.12 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- methomyl (Lannate LV; other products) at 0.23 to 0.9 lb ai/A. PHI 7 days for grazing or cutting. REI 48 hr. Do not exceed 10 applications or more than 3.6 lb ai/A per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 1A)
- permethrin (numerous products) at 0.05 to 0.2 lb ai/A. PHI 0 days at 0.1 lb ai/A or less, 14 days at more than 0.1 lb ai/A. REI 12 hr. Do not exceed 0.2 lb ai/A per cutting. Retreatment interval 30 days. Permethrin is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)
- spinosad (Entrust SC) at 0.031 to 0.063 lb ai/A. PHI 0 days forage; 3 days hay or fodder. REI 4 hr. Only for suppression of alfalfa weevil larvae. Do not exceed 0.186 lb ai/A per season. Do not exceed 6 applications per season. This product is toxic to bees exposed to treatment for 3 hours following treatment. Do not apply this pesticide to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period. Some formulations are OMRI-listed for organic use. (Group 5)
- zeta-cypermethrin at 0.028 to 0.05 lb ai/A (Mustang), or at 0.014 to 0.025 lb ai/A (Mustang Maxx). PHI 3 days for cutting or grazing, 7 days for harvesting seed. REI 12 hr. Retreatment interval 7 days. Do not use more than 0.1 lb ai/A per cutting or more than 0.3 lb ai/A per season (Mustang) or 0.05 lb ai/A per cutting or 0.15 lb ai/A per season (Mustang Maxx). These products are highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Group 3A)

Alfalfa hay—Grasshopper

Includes several species, especially *Melanoplus* spp.

Pest description and crop damage Both nymphs and adult grasshoppers feed on foliage. Early management of grasshopper populations is critical. Consider treatment when populations exceed 8 adults or large nymphs or 12 small nymphs per yard. For additional information, see: <https://www.agronomy.org/files/publications/Alfalfa-management-guide.pdf>.

Management—chemical control

Most of the following insecticides are hazardous to bees and should not be used if bees are foraging in the alfalfa.

- alpha-cypermethrin (Fastac EC) at 0.0175 to 0.025 lb ai/A. PHI 3 days of cutting or grazing. REI 12 hr. Retreatment interval 7 days. Do not exceed 0.025 lb ai/cutting and 0.075 lb ai/A per season.
- beta-cyfluthrin (Baythroid XL) at 0.0155 to 0.022 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.044 lb ai/A per cutting or 0.175 lb ai/A total per season. (Group 3A)
- chlorantraniliprole (Coragen, Prevathon) at 0.026 to 0.065 lb ai/A. PHI 0 days. REI 4 hr. Do not exceed 0.2 lb ai/A or 4 applications per year or 1 application per cutting. Retreatment interval 3 days. (Group 28). Apply when the majority of population is in the nymphal stage. Performance is improved with the addition of a Methylated Seed Oil (MSO)

- adjuvant at 1 gallon per 100 gallons of spray volume (1% v/v).
- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.049 to 0.078 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of products containing lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole-containing foliar products per acre per growing season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. Because of the pyrethroid component (lambda-cyhalothrin), this product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area. (Groups 28 and 3A)
- cyfluthrin (Tombstone) at 0.031 to 0.044 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.088 lb ai/A per cutting or 0.35 lb ai/A total per season. (Group 3A)
- diflubenzuron (Dimilin 2L) at 0.016 to 0.031 lb ai/A. PHI 1 day for forage or hay. REI 12 hr. Do not exceed 1.5 oz ai/A per season. Limit 3 treatments. Addition of a crop oil or methylated seed oil improves efficacy.
- dimethoate (numerous products) at 0.25 to 0.5 lb ai/A. PHI 10 days for grazing or cutting. REI 48 hr. Suppression only. Do not apply during bloom. Apply only once per cutting. Effective only on the cutting to which it is applied. PHI 10 days for harvest or grazing. Do not exceed 0.5 lb ai/A per season. (Group 1B)
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Do not exceed 0.015 lb ai/A per cutting or 0.06 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. (Group 3A)
- indoxacarb (Steward) at 0.039 to 0.059 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Do not exceed one application per cutting or 0.44 lb ai/A per season. (Group 22A)
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Apply only to pure stands. Do not apply when bees are actively foraging. Do not exceed 0.03 lb ai/A per cutting or 0.12 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. (Group 3A)
- malathion (numerous products) at 1 to 1.25 lb ai/A. PHI 0 days. REI 12 hr. Not effective below 65°F. Retreatment interval 14 days. Limit to 2 applications per cutting. (Group 1B)
- *Nosema locusta* (pathogenic protozoan) (Nolo Bait)—Apply as manufacturer directs. OMRI-listed for organic use.
- phosmet (Imidan 70-W) at 0.7 to 1 lb ai/A. PHI 7 days for grazing or cutting. REI 5 days. Do not apply more than once per cutting. Do not apply during bloom. Do not use latex- or pineolene-based adjuvants. (Group 1B)
- zeta-cypermethrin Mustang at 0.035 to 0.05 lb ai/A, or Mustang Maxx at 0.0175 to 0.025 lb ai/A. PHI 3 days for cutting or grazing, 7 days for harvesting seed. REI 12 hr. Retreatment interval 7 days. Do not use more than 0.1 lb ai/A per cutting or more than 0.3 lb ai/A per season (Mustang) or 0.05 lb ai/A per cutting or 0.15 lb ai/A per season (Mustang Maxx). (Group 3A)

Alfalfa hay—Meadow spittlebug

Philaenus spumarius

Pest description and crop damage Nymphs are recognized by the frothy spittle mass that they excrete over their bodies. Meadow spittlebug can stunt plant growth and kill young plants. Chemical control usually is not warranted. For additional information, see: http://extension.cropsci.illinois.edu/fieldcrops/Alfalfa/meadow_spittlebug/

Management—chemical control

These insects are very difficult to control because most insecticides cannot penetrate their spittle mass. The following insecticides are hazardous to bees and should not be used if bees are foraging in the alfalfa.

- alpha-cypermethrin (Fastac EC) at 0.014 to 0.025 lb ai/A. PHI 3 days of cutting or grazing. REI 12 hr. Retreatment interval 7 days. Do not exceed 0.025 lb ai/cutting and 0.075 lb ai/A per season.
- beta-cyfluthrin (Baythroid XL) at 0.0065 to 0.0125 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.044 lb ai/A per cutting or 0.175 lb ai/A total per season. (Group 3A)
- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.059 to 0.088 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of products containing lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole-containing foliar products per acre per growing season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. (Group 28 and 3A)
- cyfluthrin (Tombstone) at 0.013 to 0.025 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Do not exceed 0.088 lb ai/A per cutting or 0.35 lb ai/A total per season. (Group 3A)
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24

hr. Do not exceed 0.015 lb ai/A per cutting or 0.06 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. (Group 3A)

- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Apply only to pure stands. Do not apply when bees are actively foraging. Do not exceed 0.03 lb ai/A per cutting or 0.12 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. (Group 3A)
- malathion (numerous products) at 1 to 1.25 lb ai/A. PHI 0 days. REI 12 hr. Not effective below 65°F. Retreatment interval 14 days. Limit to 2 applications per cutting. (Group 1B)
- permethrin (numerous products) at 0.1 to 0.2 lb ai/A. PHI 0 days at 0.1 lb ai/A or less, 14 days at more than 0.1 lb ai/A. REI 12 hr. Do not exceed 0.2 lb ai/A per cutting. Retreatment interval 30 days. (Group 3A)
- phosmet (Imidan 70-W) at 0.7 to 1 lb ai/A. PHI 7 days for grazing or cutting. REI 5 days. Do not apply more than once per cutting. Do not apply during bloom. Do not use latex- or pineolene-based adjuvants. (Group 1B)
- zeta-cypermethrin (Group 3A) Mustang at 0.028 to 0.05 lb ai/A, or Mustang Maxx at 0.014 to 0.025 lb ai/A. PHI 3 days for cutting or grazing, 7 days for harvesting seed. REI 12 hr. Retreatment interval 7 days. Do not use more than 0.05 lb ai/A per cutting or more than 0.15 lb ai/A per season (Mustang) or 0.025 lb ai/A per cutting or 0.075 lb ai/A per season (Mustang Max, Mustang Maxx). (Group 3A)

Alfalfa hay—Pea leaf weevil

Sitona lineata

Pest description and crop damage Adults are grayish brown weevils about 0.16 inch long with three faint stripes on the thorax. They appear in large numbers in spring and sometimes late summer.

Adult feeding occasionally can cause substantial defoliation, which is of most concern on seedling stands. Pea leaf weevil adults migrate in large numbers when other crops they are infesting are harvested. Their presence in fields is usually spotty, and targeted treatments at field margins can be very effective.

The following insecticides are hazardous to bees and should not be used if bees are foraging in the alfalfa.

Management—chemical control

- alpha-cypermethrin (Fastac EC) at 0.014 to 0.025 lb ai/A. PHI 3 days of cutting or grazing. REI 12 hr. Retreatment interval 7 days. Do not exceed 0.025 lb ai/cutting and 0.075 lb ai/A per season. (Group 3A)
- beta-cyfluthrin (Baythroid XL) at 0.0065 to 0.0125 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.044 lb ai/A per cutting or 0.175 lb ai/A total per season. (Group 3A)
- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.059 to 0.088 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of products containing lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole-containing foliar products per acre per growing season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. (Group 28 and 3A)

Alfalfa hay—Slug

Pest description and crop damage Snails and slugs are nocturnal and generally feed during the night damaging many varieties of plants and plant seedlings. They inhabit damp, moist areas around decaying refuse, organic matter, and hide at the base of growing plants. Their presence can be detected by the shiny trails left on the soil surface. Damage is to new seedlings and primarily to hay grown west of the Cascades. For additional information, see: http://ohioline.osu.edu/ent-fact/pdf/ENT_20_14.pdf. <http://ohioline.osu.edu/ent-fact/pdf/0020.pdf>

Management—chemical control

- metaldehyde baits (such as Deadline M-Ps mini pellets or Trail's End LG large granules)—PHI 0 days. REI 12 hr. Broadcast bait should be applied to the soil over hot spots in the field. Do not apply to edible plant parts or allow contamination. Do not apply to dry soil. For best results, apply soon after rain or irrigation, and apply in the evenings when slugs are most active. Rain and irrigation water following application will deactivate baits. See specific product label for rates.

See also:

Slug Control

Alfalfa hay—Western spotted cucumber beetle

Diabrotica undecimpunctata

Pest description and crop damage Adults are green to yellow with 12 black spots on wing covers. They feed on seedlings and retard growth or reduce stands. Occasionally require control on new stands west of the Cascades.

Management—chemical control

The following insecticides are hazardous to bees and should NOT be used if bees are foraging in the alfalfa.

- beta-cyfluthrin (Baythroid XL) at 0.0125 to 0.022 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.044 lb ai/A per cutting or 0.175 lb ai/A total per season. (Group 3A)
- carbaryl (numerous products) at 1 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Do not apply more than once per cutting. Carbaryl may burn or yellow hay under some conditions (wet foliage, high humidity). Latex-based formulations, such as Sevin XLR Plus, are less hazardous to bees. (Group 1A)
- chlorantraniliprole/lambda-cyhalothrin (Besiege) at 0.059 to 0.088 lb ai/A. PHI 1 day for forage and 7 days for hay. REI 24 hr. Minimum of 5 days between applications. Do not exceed 0.12 lb ai of lambda-cyhalothrin or 0.2 lb ai of chlorantraniliprole per acre per growing season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. (Group 28 and 3A)
- cyfluthrin (Tombstone) at 0.025 to 0.044 lb ai/A. PHI 7 days for grazing or cutting. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.088 lb ai/A per cutting or 0.35 lb ai/A total per season. (Group 3A)
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. Do not exceed 0.015 lb ai/A per cutting or 0.06 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. (Group 3A)
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 1 day for forage harvest or 7 days for hay harvest. REI 24 hr. For adult beetle suppression only. Apply only to pure stands. Do not apply when bees are actively foraging. Do not exceed 0.03 lb ai/A per cutting or 0.12 lb ai/A per season. Refer to product labels for application limits if products containing gamma-cyhalothrin and products containing lambda-cyhalothrin are to be used in the same season. (Group 3A)
- permethrin (numerous products) at 0.1 to 0.2 lb ai/A. PHI 0 days at 0.1 lb ai/A or less, 14 days above 0.1 lb ai/A. REI 12 hr. Do not exceed 0.2 lb ai/A per cutting. Retreatment interval 30 days. (Group 3A)
- phosmet (Imidan 70-W) at 0.7 to 1 lb ai/A. PHI 7 days for grazing or cutting. REI 5 days. Do not apply more than once per cutting. Do not apply during bloom. Do not use latex- or pineolene-based adjuvants. (Group 1B)

Clover Hay Pests

Elizabeth Verhoeven

Latest revision—March 2022

In all cases, follow the instructions on the pesticide label. The *PNW Insect Management Handbook* has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Protect pollinators: See How to Reduce Bee Poisoning from Pesticides.

Important notice Several pesticides with 24c SLN (Special Local Need) registrations for use on seed crops lack legal tolerances established for pesticide residues that may be on the seed, screenings, or hay at harvest. Therefore, certain seed grower associations in Washington, Oregon, and Idaho have declared, through their respective state departments of agriculture, that the crop produced for seed in those states is a *nonfood crop*. This declaration means that none of the seed, screenings, hay, or sprouts produced from

harvested seed will be available for human or animal consumption when these pesticides have been applied. The grower must notify the seed processing plant in writing of any seed treated with these pesticides. Processed seed must be labeled: “This seed was produced using one or more products for which the United States Environmental Protection Agency has not established pesticide residue tolerances. This seed, in whole, as sprouts, or in any form, may violate requirements of the Federal Food and Drug Administration, the Oregon Department of Agriculture and other regulatory agencies.”

Note: Products are listed in alphabetical order and *not* in order of preference or superiority of pest control.

Clover hay—Aphid

Includes

Clover aphid (*Nearctaphis bakeri*)

Pea aphid (*Acyrtosiphon pisum*)

Pest description and crop damage Clover aphid can be serious on red clover in the PNW. The clover aphid is much smaller than the pea aphid, is yellow, and builds up in spring from a few overwintered aphids that are under stipules. Large numbers secrete copious honeydew. They usually infest red, alsike, and Ladino clover. Winged forms disperse in May and June.

Management—chemical control

- acetamiprid (Assail 30SG, Assail 70WP) at 0.047 to 0.075 lb ai/A. PHI 30 to 56 days, depending on product; check label. REI 12 hr. One application per season. Do not exceed 0.75 lb ai/A per year.
- azadirachtin (Aza-Direct, Neemix 4.5) at 0.015 to 0.021 lb ai/A. REI 4 hr. PHI 0 days. OMRI-listed for organic use.
- *Beauveria bassiana* GHA (Mycotrol ESO, BoteGHA ES) at 0.25 to 1 quart in 5 to 100 gal water/A. Adjust water volume to ensure good coverage but avoid runoff. PHI 0 days. REI 4 hr. OMRI-listed for organic use.
- *Chromobacterium subsugae* (Grandevo) at 2 to 3 lb product per 100 gal/A. PHI 0 days. REI 4 hr. OMRI-listed for organic use.
- flupyradifurone (Sivanto 200SL) at 0.091 to 0.137 lb ai/A. PHI 14 days. Retreatment interval 10 days. Do not exceed 0.365 lb ai/A per season.
- malathion (Drexel Malathion 5EC) at 0.94 to 1.25 lb ai/A. PHI 0 days. Limit 2 treatments per cutting. Retreatment interval 14 days. REI 12 hr.
- zeta-cypermethrin (Mustang, Mustang Maxx) Mustang at 0.035 to 0.05 lb ai/A; Mustang Maxx at 0.0175-0.025 lb ai/A. PHI 3 days for cutting and grazing; 7 days for seed. REI 12 hr. Do not apply more than 0.05 lb ai per cutting or 0.15 lb ai per season of Mustang or 0.025 lb ai per cutting and 0.075 lb ai per season of Mustang Maxx. Retreatment interval 7 days.

Clover hay—Clover leaf weevil

Hypera punctata

Pest description and crop damage This is the largest weevil found in legume fields. The full-grown larva is about 0.5 inch long and has a brown head. The body is green or yellowish green shading to pink at the tip of the abdomen, with a white or pinkish line down the center of the back. Larvae feed on buds and leaves.

Management—biological control

During cool, moist spring weather, a fungal disease usually attacks larvae, naturally controlling them.

Management—chemical control

- malathion (Malathion 5EC) at 0.94 to 1.25 lb ai/A. PHI 0 days. Limit 2 treatments per cutting. Retreatment interval 14 days. REI 12 hr. Do not apply more than 2.5 lb ai /A per calendar year.

Clover hay—Clover root borer

Hylastinus obscurus

Pest description and crop damage Adults are bark beetles, 0.1 inch long and dark brown. They begin activity as early as March and may disperse from March through August. Larvae are creamy white and burrow within the roots of red clover, causing extensive damage and reducing stand density and life.

Management—chemical control

No insecticides, registered or otherwise, are effective for controlling this pest.

Clover hay—Clover root curculio

Sitona hispidulus

Pest description and crop damage Adults are small grayish weevils 0.2 inch long.

Larvae feed on fibrous roots and chew cavities in main roots. This insect usually is at low levels on many of the clovers but control usually is not necessary.

Management—chemical control

No products are registered or recommended.

Clover hay—Cutworm and armyworm

Bertha armyworm (*Mamestra configurata*) Variegated cutworm (*Peridroma saucia*)

Pest description and crop damage These larvae vary a lot in color. By day, the larger larvae are in soil cracks or under duff or leaves. They commonly feed at night. Small larvae are on foliage during the day and can be sampled with a sweep net. They cut off young plants and feed on the foliage of older plants.

Management—chemical control

- azadirachtin (Aza-Direct, Neemix 4.5) at 0.015 to 0.021 lb ai/A. REI 4 hr. PHI 0 days. OMRI-listed for organic use.
- *Bacillus thuringiensis* (Javelin) at 0.25 to 1.5 lb/A. PHI 0 days. REI 4 hr. Armyworms only. Add an appropriate spreader-sticker to enhance control. Most effective on small, actively feeding larvae. OMRI-listed for organic use.
- carbaryl (Carbaryl 4L, Sevin 4F) at 1 to 1.5 lb ai/A. PHI 7 days before harvest or grazing. Use only once per cutting. REI 12 hr. Do not use carbaryl when clover is blooming or when bees are foraging actively.
- chlorantraniliprole (Coragen, Prevathon) at 0.045 to 0.098 lb ai/A. Max rate for Prevathon ins 0.067 lb ai/A. PHI 0 days. REI 4 hr. Do not exceed 0.2 lb ai or 4 applications per calendar year
- *Chromobacterium subsugae* (Grandevo) at 1 to 3 lb product per 100 gal/Acre. PHI 0 days. REI 4 hr. OMRI-listed for organic use.
- malathion (Malathion 5EC) at 1.25 lb ai/A. PHI 0 days. Retreatment interval 14 days. REI 12 hr. Limit 2 treatments per cutting. Armyworm only.
- methoxyfenozide (Intrepid 2F) at 0.06 to 0.16 lb ai/A. PHI 7 days for hay; 0 days for forage; livestock can enter and graze on treated area immediately after application. REI 4 hr. Do not exceed 0.5 lb ai/A per year. Do not make more than one application per cutting.
- spinosad (Entrust SC) at 0.031 to 0.062 lb ai/A PHI 0 days forage; 3 days hay and fodder. REI 4 hr. Limit 6 treatments per year. Do not exceed 0.186 lb ai/A per season. Do not apply more than three times in a 21-day period. Do not graze cattle until spray has dried. Some formulations are OMRI-listed for organic use.
- zeta-cypermethrin (Mustang, Mustang Maxx) Mustang at 0.035 to 0.05 lb ai/A; Mustang Maxx at 0.0175-0.025 lb ai/A. PHI 3 days for cutting or grazing; 7 days for seed. REI 12 hr. Do not apply more than 0.05 lb ai per cutting or 0.15 lb ai per season of Mustang or 0.025 lb ai per cutting and 0.075 lb ai per season of Mustang Maxx. Retreatment interval 7 days.

Clover hay—Grasshopper

Includes several species, especially *Melanoplus* spp.

Pest description and crop damage Both young and adult grasshoppers damage by feeding on leaves.

Management—chemical control

- azadirachtin (Neemix 4.5) at 0.015 to 0.021 lb ai/A. REI 4 hr. PHI 0 days. OMRI-listed for organic use.
- *Beauveria bassiana* GHA (Mycotrol ESO, BoteGHA ES) at 0.25 to 1 quart in 5 to 100 gal water/Acre. Adjust water volume to ensure good coverage but avoid runoff. PHI 0 days. REI 4 hr. OMRI-listed for organic use.
- chlorantraniliprole (Coragen, Prevathon) at 0.027 to 0.067 lb ai/A. PHI 0 days. REI 4 hr. Do not exceed 0.2 lb ai or 4 applications per season.
- malathion ULV (Fyfanon ULV) at 0.61 lb ai/A. PHI 0 days. REI 12 hr. Limit 2 treatments per cutting. Retreatment interval 14 days.
- malathion (Drexel Malathion 5EC) at 1 to 1.25 lb ai/A. PHI 0 days. Limit 2 treatments per cutting. Retreatment interval 14 days. REI 12 hr.

Clover hay—Lesser clover leaf weevil

Hypera nigrirostris

Pest description and crop damage Green or brown weevils about 0.125 inch long. Larvae feed under the basal leaf sheath, tunnel in the stem, and feed on florets in developing flowers. This is seldom a pest. When it is in an area, it seems to prefer red and alsike clover.

Management—chemical control

- malathion (Drexel Malathion 5EC) at 0.94 to 1.25 lb ai/A. PHI 0 days. Limit 2 treatments per cutting. Retreatment interval 14 days. REI 12 hr. Do not apply more than 2.5 lb ai per acre per calendar year.

Clover hay—Looper

Includes alfalfa looper (*Autographa californica*)

Pest description and crop damage The adult moth is grayish to light brown. Front wings have a characteristic teardrop mark. Mature larvae are about 1 inch long, light green, with pale heads. They move in a looping fashion.

Management—chemical control

- azadirachtin (Neemix 4.5) at 0.015 to 0.021 lb ai/A. REI 4 hr. PHI 0 days. OMRI-listed for organic use.
- *Bacillus thuringiensis* (*Bt*)—See product labels for rates. PHI 0 days. REI 4 hr. Add an appropriate spreader-sticker to enhance control. Most effective on small, actively feeding larvae. OMRI-listed for organic use.
- *Beauveria bassiana* GHA (Mycotrol ESO, BoteGHA ES) at 0.25 to 1 quart in 5 to 100 gal water/A. Adjust water volume to ensure good coverage but avoid runoff. PHI 0 days. REI 4 hr. OMRI-listed for organic use.
- chlorantraniliprole (Coragen, Prevathon) at 0.045 to 0.098 lb ai/A. Max rate for Prevathon is 0.067 lb ai/A. PHI 0 days. REI 4 hr. Do not exceed 0.2 lb ai or 4 applications per calendar year
- methoxyfenozide (Intrepid 2F) at 0.06 to 0.16 lb ai/A. PHI 7 days for hay; 0 days for forage; livestock can enter and graze on treated area immediately after application. REI 4 hr. Do not exceed 0.5 lb ai/A/yr. Do not make more than one application per cutting.
- zeta-cypermethrin (Mustang, Mustang Maxx) Mustang at 0.035 to 0.05 lb ai/A; Mustang Maxx at 0.0175-0.025 lb ai/A. PHI 3 days for cutting and grazing; 7 days for seed. REI 12 hr. Do not apply more than 0.05 lb ai per cutting or 0.15 lb ai per season of Mustang or 0.025 lb ai per cutting and 0.075 lb ai per season of Mustang Maxx. Retreatment interval 7 days.

Clover hay—Meadow spittlebug

Philaenus spumarius

Pest description and crop damage Nymphs are recognized easily by spittle mass. Moderate populations can stunt plants.

Management—chemical control

- malathion (Malathion 5EC) at 0.94 to 1.25 lb ai/A. PHI 0 days. Limit 2 treatments per cutting. Retreatment interval 14 days. REI 12 hr.
- zeta-cypermethrin (Mustang, Mustang Maxx) Mustang at 0.035 to 0.05 lb ai/A; Mustang Maxx at 0.0175 to 0.025 lb ai/A. PHI 3 days cutting and grazing; 7 days for seed. REI 12 hr. Do not apply more than 0.05 lb ai per cutting or 0.15 lb ai per season of Mustang or 0.025 lb ai per cutting and 0.075 lb ai per season of Mustang Maxx. Retreatment interval 7 days.

Clover hay—Pea leaf weevil

Sitona lineata

Pest description and crop damage Adults are small, grayish brown, faintly striped weevils about 0.2 inch long. They appear in large numbers in spring and sometimes in late summer. Adult feeding may kill seedling plants and seriously defoliate older stands. These insects migrate into fields from border areas.

Management—chemical control

Currently no materials are registered to control this pest. However, carbaryl (Sevin 80WSP) or Mustang MAX applied to control other weevils will also control this pest.

Clover hay—Slug

Pest description and crop damage Primarily a western Oregon and Washington problem. Damage is most critical when establishing a seedling stand.

Management—chemical control

- iron phosphate (Sluggo Maxx) at 0.12 to 0.45 lb ai/A. PHI 0 days.
- iron phosphate/spinosad (Bug-N-Sluggo) at 0.1 to 0.45 lb ai/A. PHI hay or fodder 3 days; forage 0 days. REI 4 hr. Do not exceed 3 applications in 21 days. OMRI-listed for organic use.
- metaldehyde bait at 0.4 to 1.6 lb ai/A (Deadline, Durham).

See also:

Slug Control

Clover hay—Webworm

Includes beet webworm (*Loxostege sticticalis*)

Pest description and crop damage Caterpillars vary from light to dark with three white longitudinal stripes and many black and white tubercles.

Management—chemical control

- azadirachtin (Neemix 4.5) at 0.015 to 0.021 lb ai/A. REI 4 hr. PHI 0 days. OMRI-listed for organic use.
- carbaryl (Sevin 4F) at 1 to 1.5 lb ai/A. PHI 7 days before harvest or grazing. Use only once per cutting. REI 12 hr. Do not use carbaryl when clover is blooming or when bees are foraging actively. Carbaryl may burn foliage under wet or hot conditions.
- methoxyfenozide (Intrepid 2F) at 0.06 to 0.16 lb ai/A. PHI 7 days for hay; 0 days for forage; livestock can enter and graze on treated area immediately after application. REI 4 hr. Do not exceed 0.5 lb.
- zeta-cypermethrin (Mustang, Mustang Maxx) Mustang at 0.035 to 0.05 lb ai/A; Mustang Maxx at 0.0175 to 0.025 lb ai/A. PHI 3 days cutting and grazing; 7 days for seed. REI 12 hr. Do not apply more than 0.05 lb ai per cutting or 0.15 lb ai per season of Mustang or 0.025 lb ai per cutting and 0.075 lb ai per season of Mustang Maxx. Retreatment interval 7 days.

Clover hay—Western spotted cucumber beetle

Diabrotica undecimpunctata

Pest description and crop damage Yellowish green, black-spotted beetle, common in western Oregon and Washington. Adults feed on seedlings and can kill plants and reduce stands.

Management—chemical control

- carbaryl (Sevin 4F) at 1 lb ai/A. One application per cutting. PHI 7 days before harvest or grazing. Limit 1 treatment per cutting. REI 12 hr.

Pasture and Grass Hay Pests

Elizabeth Verhoeven and Seth Dorman

Latest revision—March 2022

In all cases, follow the instructions on the pesticide label. The *PNW Insect Management Handbook* has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Protect pollinators: See How to Reduce Bee Poisoning from Pesticides.

Note: Products are listed in alphabetical order and not in order of preference or superiority of pest control.

Pasture and grass hay—Armyworm and cutworm

Many species, including

Armyworm (*Pseudaletia unipuncta*)

Army cutworm (*Chorizagrotis auxillaris*)

Black cutworm (*Agrotis ipsilon*)

Glassy cutworm (*Apamea devastator*)

[No common name] (*Protagrotis obscura*)

Pest description and crop damage Larvae are 1 to 2 inches long at maturity. All, except glassy cutworm and *Protagrotis obscura* usually feed above ground on foliage after dark or during conditions of low light intensity. Larvae cause most damage to new seedlings, particularly if the previous crop was heavily infested and the larvae were not controlled.

Management—chemical control

- azadirachtin (Aza-Direct, Neemix 4.5) at 0.015 to 0.021 lb ai/A. REI 4 hr. PHI 0 days. OMRI-listed for organic use.
- *Bacillus thuringiensis* (XenTari, DiPel DF) at 0.5 to 2 lb product/A. PHI 0 days. REI 4 hr. Armyworms only. Most effective on small caterpillars, but use highest recommended rate for fully developed ones. Multiple applications may be necessary for effective control. A spreader sticker may improve performance. Some formulations are OMRI-listed for organic use.
- beta-cyfluthrin (Baythroid XL) at 0.013 to 0.015 lb ai/A. PHI 0 days for grazing or hay. REI 12 hr. Do not exceed 0.089 lb ai/A per season. Retreatment interval 5 days.
- bifenthrin (Brigade WSB) at 0.05 to 0.1 lb ai/A. PHI 30 days for forage and hay. REI 12 hr. Retreatment interval 14 days. Do not exceed 0.2 lb ai/A per season.
- carbaryl (Sevin 4F) at 1 to 1.5 lb ai/A. PHI 14 days. REI 12 hr. Limit 2 treatments per year. Retreatment interval 14 days. Do not exceed 3 lb ai/A per year. Armyworms only.
- carbaryl (Sevin 5 Bait) at 1.5 lb ai/A. PHI 7 days for harvest or grazing. Limit 2 treatments per year. REI 12 hr. Retreatment interval 14 days.
- chlorantraniliprole (Coragen, Prevathon) at 0.045 to 0.098 lb ai/A for armyworms, and 0.065 to 0.098 lb ai/A for cutworms. Max rate of Prevathon is 0.067 lb ai/A for armyworms and 0.097 lb ai/A for cutworms. PHI 0 days. REI 4 hr. Retreatment interval 7 days. Do not exceed 0.2 lb ai/A or 4 applications per season.
- chlorantraniliprole/lambda-cyhalothrin (Besiege, Voliam Xpress) at 0.049 to 0.078 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested for hay. Retreatment interval 7 days. REI 12 hr. Do not exceed 0.09 lb ai/A lambda- cyhalothrin or 0.2 lb ai/A chlorantraniliprole.
- cyfluthrin (Tombstone) at 0.025 to 0.03 lb ai/A. PHI 0 days. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.176 lb ai/A per season.
- diflubenzuron (Dimilin 2L) at 0.03 lb ai/A. PHI 1 day for cutting. REI 12 hr. Must be applied at first sign of hatch and before larvae reach 0.25 inch. Do not exceed 0.03 lb ai/A (0.5 oz ai/A) per cutting or 0.09 lb ai/A (1.5 oz ai/A) per year.
- gamma-cyhalothrin (Declare) at 0.0075 to 0.0125 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested. REI 24 hr. Do not exceed 0.045 lb ai/A per season.
- lambda-cyhalothrin (Warrior II) at 0.015 to 0.03 lb ai/A. PHI 0 days for grazing and forage; 7 days to be dried for hay. REI 24 hr. Do not exceed 0.03 lb ai/A per cutting or 0.09 lb ai/A per season.
- malathion (Malathion 5EC) at 1.25 lb ai/A. PHI 0 days. REI 12 hr. Armyworms only. One application limit per cutting.
- methoxyfenozide (Intrepid 2F) at 0.06 to 0.12 lb ai/A. PHI 0 days for grazing, forage; 7 days hay. REI 4 hr. Do not apply more than 0.5 lb ai/A per year. Armyworms only.
- sodium borate (Prev-Am Ultra) at 50 fl oz/100 gal. PHI 1 day. REI 12 hr. Retreatment interval 7 days.
- spinosad (Entrust SC) at 0.031 to 0.0625 lb ai/A. PHI 3 days hay or fodder; 0 days pasture/forage. REI 4 hr. Armyworms only. Do not apply more than 3 times in any 21-day period or more than 6 times/ season. Hazardous to honeybees for up to 3 hours post application. Limit 0.186 lb ai/A per season. OMRI-listed for organic use.
- zeta-cypermethrin (Mustang, Mustang Maxx) —Mustang at 0.035 to 0.05 lb ai/A; Mustang Maxx at 0.0175 to 0.025 lb ai/A. PHI 3 days for cutting or grazing; 7 days for seed. REI 12 hr. Do not apply more than 0.05 lb ai per cutting or 0.15 lb ai per season of Mustang or 0.025 lb ai per cutting and 0.075 lb ai per season of Mustang Maxx. Retreatment interval 7 days.

Pasture and grass hay—Black grass bug

Labops hesperius and other *Labops* spp.
Irbisia pacifica and other *Irbisia* spp.

Pest description and crop damage Insect is grayish black with silvery scales, about 0.25 inch long, and somewhat pear-shaped. Adults have prominent compound eyes and can have shortened or absent wings. Black grass bugs will feed on a variety of range grasses (e.g., wheatgrass, brome grass, orchardgrass, bluegrass) and field crops (e.g., barley, wheat, rye, oats). Great Basin wildrye and wheatgrasses are preferred if available, especially blue bunch wheatgrass, crested wheatgrass, and intermediate wheatgrass. Feeding causes pale spots on the leaves of cereals and, when severe, a general yellowish, stippled appearance.

Management—chemical control

- bifenthrin (Brigade WSB) at 0.1 ai/A. PHI 30 days for forage and grass. Do not apply more than 0.2 lb ai/A per year. REI 12 hr. Retreatment interval 14 days.
- carbaryl (Sevin 4F) at 0.5 to 1 lb ai/A. PHI 14 days. REI 12 hr. Limit two treatments per year. Retreatment interval 14 days. Do not exceed 3 lb ai/A per year. (See various labels under “Rangeland”).
- chlorantraniliprole/lambda-cyhalothrin (Besiege, Voliam Xpress) at 0.059 to 0.098 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested for hay. Retreatment interval 7 days. REI 12 hr. Do not exceed 0.09 lb ai/A lambda-cyhalothrin or 0.2 lb ai/A chlorantraniliprole.
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested. REI 24 hr. Do not exceed 0.045 lb ai/A per season.
- lambda cyhalothrin (Warrior II) at 0.015 to 0.03 lb ai/A. PHI 0 days for grazing and forage; 7 days to be dried for hay. REI 24 hr. Do not exceed 0.03 lb ai/A per cutting or 0.09 lb ai/A per season.
- zeta-cypermethrin (Mustang, Mustang Maxx)—Mustang at 0.035 to 0.05 lb ai/A; Mustang Maxx at 0.0175 to 0.025 lb ai/A. PHI 3 days for cutting and grazing; 7 days for seed. REI 12 hr. Do not apply more than 0.05 lb ai per cutting or 0.15 lb ai per season of Mustang or 0.025 lb ai per cutting and 0.075 lb ai per season of Mustang Maxx. Retreatment interval 7 days.

Pasture and grass hay—Cereal leaf beetle

Oulema melanopus

Pest description and crop damage Adults are 0.25 inch long with a brightly colored, orange-red thorax, yellow legs, and metallic-blue head and elytra (forewings). This is a quarantine pest, and although damage is seldom seen in pasture grasses, California has strict import laws governing interstate movement of pasture hay from counties in other states known to be infested with CLB. Only grass hay from cereal leaf beetle-free PNW counties or fumigated hay from infested counties is allowed into California.

Management—chemical control

- beta-cyfluthrin (Baythroid XL) at 0.013 to 0.015 lb ai/A. PHI 0 days for grazing or hay. REI 12 hr. Do not exceed 0.089 lb ai/A per season. Retreatment interval 5 days.
- bifenthrin (Brigade WSB) at 0.05 to 0.1 lb ai/A. PHI 30 days for forage and hay. REI 12 hr. Retreatment interval 14 days. Do not exceed 0.2 lb ai/A per season.
- carbaryl at 1 lb ai/A. PHI 14 days. REI 12 hr. Do not exceed two applications. Retreatment interval 14 days. This pest does not occur on the carbaryl labels but when this general use insecticide is applied to control other pests when CLB is present, control is good.
- chlorantraniliprole/lambda-cyhalothrin (Besiege, Voliam Xpress) at 0.059 to 0.098 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested for hay. Retreatment interval 7 days. REI 12 hr. Do not exceed 0.09 lb ai/A lambda-cyhalothrin or 0.2 lb ai/A chlorantraniliprole.
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested. REI 24 hr. Do not exceed 0.045 lb ai/A per season.
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 0 days for grazing and forage; 7 days to be dried for hay. REI 24 hr. Do not exceed 0.03 lb ai/A per cutting or 0.09 lb ai/A per season.
- malathion (Malathion 5EC) at 1.25 lb ai/A. PHI 0 days. REI 12 hr. One application limit per cutting.
- zeta-cypermethrin (Mustang, Mustang Maxx) Mustang at 0.035 to 0.05 lb ai/A; Mustang Maxx at 0.0175 to 0.025 lb ai/A. PHI 3 days for cutting and grazing; 7 days for seed. REI 12 hr. Do not apply more than 0.05 lb ai per cutting or 0.15 lb ai per season of Mustang or 0.025 lb ai per cutting and 0.075 lb ai per season of Mustang Maxx. Retreatment interval 7 days.

Pasture and grass hay—Clover and winter grain mite

Clover mite (*Bryobia praetiosa*)

Winter grain mite (*Penthaleus major*)

Pest description and crop damage Clover mite is light brown; winter grain mite is blue with red legs. These cool-season mites have caused serious damage in central Oregon pastures since 1999. Populations build in October; most damage to grass pastures is from late February through May. Grass pastures do not green up in the spring. Large populations have killed orchardgrass pastures.

Management—chemical control

Effective insecticides that control clover mite have not been identified. The two synthetic pyrethroids listed below are not labeled for winter grain mite control, but research in OR has shown them to be effective on this particular pest when used at mid-range label rates for other pests. These are recommended in Washington and Oregon only.

- beta-cyfluthrin (Baythroid XL) at 0.013 to 0.015 lb ai/A. PHI 0 days for grazing or hay. REI 12 hr. Do not exceed 0.089 lb ai/A per season. Retreatment interval 5 days.
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 0 days for grazing and forage; 7 days to be dried for hay. REI 24 hr. Do not exceed 0.03 lb ai/A per cutting or 0.09 lb ai/A per season. Minimum re-treatment window is 30 days. For suppression only.

Pasture and grass hay—European crane fly

Tipula paludosa

Pest description and crop damage Larvae are gray grubs that feed underground, on roots and crowns, from October through May. Older larvae may feed above ground on stems and leaves during the night. Large numbers can thin stands in old pastures and kill seedlings in new stands.

Management—chemical control

- beta-cyfluthrin (Baythroid XL, Warrior and Mustang) has given effective control of these pests when applied to control other labeled pests that occur at the same timing as for these products. Research in Oregon has shown it to be effective on this particular pest when used at higher-range label rates for other pests. Oregon and Washington only.
- chlorantraniliprole/lambda-cyhalothrin (Besiege, Voliam Xpress) at 0.059 to 0.098 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested for hay. Retreatment interval 7 days. REI 12 hr. Do not exceed 0.09 lb ai/A lambda-cyhalothrin or 0.2 lb ai/A chlorantraniliprole.
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested. REI 24 hr. Do not exceed 0.45 lb ai/A per season.
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 0 days for grazing and forage; 7 days to be dried for hay. REI 24 hr. Do not exceed 0.03 lb ai/A per cutting or 0.09 lb ai/A per season.
- malathion (Fyfanon ULV) at 0.48 to 0.62 lb ai/A. PHI 0 days. REI 12 hr. Adults only. Limit 1 treatment per cutting.

Pasture and grass hay—Fly

Face fly (*Musca autumnalis*)

Horn fly (*Haematobia irritans*)

Pest description and damage Flies annoy livestock and compromise weight gain.

Management—chemical control

- diflubenzuron (Dimilin 2L, 25W) at 0.03 lb ai/A. PHI 1 day for cutting. REI 12 hr. Apply Dimilin to control fly emergence from cattle manure. Do not exceed 0.03 lb ai/A (0.5 oz ai/A) per cutting or 0.09 lb ai/A (1.5 oz ai/A) per year.
- malathion (Fyfanon ULV) at 0.48 to 0.62 lb ai/A. PHI 0 days. REI 12 hr. Limit 1 treatment per cutting.
- permethrin (Pursuit 4-4 ULV)—Consult label for ground or aerial ULV application.

See also:

Fly Control

Beef Cattle Pests

Pasture and grass hay—Grasshopper

Many species, including

Clearwinged grasshopper (*Camnula pellucida*)
Lesser migratory grasshopper (*Melanopus sanguinipes*)
Redlegged grasshopper (*Melanoplus femurrubrum*)
Two-striped grasshopper (*Melanoplus bivittatus*)

Pest description and crop damage Both nymphs and adults can damage plants by feeding on the foliage, stems and heads. May attack any cereal crop.

Management—chemical and biological control

- beta-cyfluthrin (Baythroid XL) at 0.02 to 0.022 lb ai/A. PHI 0 days for grazing or hay. REI 12 hr. Do not exceed 0.089 lb ai/A per season. Retreatment interval 5 days.
- bifenthrin (Brigade WSB) at 0.05 to 0.1 lb ai/A. PHI 30 days for forage and hay. REI 12 hr. Retreatment interval 14 days. Do not exceed 0.2 lb ai/A per season.
- carbaryl (Sevin 4F) at 0.5 lb ai/A. PHI 14 days. REI 12 hr. Limit 2 treatments per year. Retreatment interval 14 days. Do not exceed 3 lb ai/A per year.
- carbaryl (Sevin 5 Bait) at 1.5 lb ai/A. PHI 7 days for harvest or grazing. REI 12 hr. Retreatment interval 14 days.
- chlorantraniliprole (Coragen) at 0.026 to 0.065 lb ai/A. PHI 0 days. REI 4 hr. Do not exceed 0.2 lb ai/A or 2 sequential applications per season.
- chlorantraniliprole/lambda-cyhalothrin (Besiege, Voliam Xpress) at 0.059 to 0.098 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested for hay. Retreatment interval 7 days. REI 12 hr. Do not exceed 0.09 lb ai/A lambda- cyhalothrin or 0.2 lb ai/A chlorantraniliprole.
- cyfluthrin (Tombstone) at 0.04 to 0.044 lb ai/A. PHI 0 day. REI 12hr. Retreatment interval 5 days. Do not exceed 0.176 lb ai/A per season.
- diflubenzuron (Dimilin 2L, 25W) at 0.015 to 0.03 lb ai/A. PHI 1 day for cutting. REI 12 hr. Apply when the majority are in the 2nd through 4th instar. Do not exceed 0.03 lb ai/A (0.5 oz ai/A) per cutting or 0.09 lb ai/A (1.5 oz ai/A) per year.
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested. REI 24 hr. Do not exceed 0.045 lb ai/A per season.
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 0 days for grazing and forage; 7 days to be dried for hay. REI 24 hr. Do not exceed 0.03 lb ai/A per cutting or 0.09 lb ai/A per season.
- malathion (Malathion 5EC) at 1.25 lb ai/A. PHI 0 days. REI 12 hr. One application limit per cutting.
- malathion (Fyfanon ULV) at 0.62 to 0.93 lb ai/A. PHI 0 days. REI 12 hr. Apply by air when hatch is complete. Do not apply if rain is imminent. Most effective when air is above 70°F. Limit 1 treatment per cutting.
- zeta-cypermethrin (Mustang, Mustang Maxx) Mustang at 0.035 to 0.05 lb ai/A; Mustang Maxx at 0.0175 to 0.025 lb ai/A. PHI 3 days for cutting and grazing; 7 days for seed. REI 12 hr. Do not apply more than 0.05 lb ai per cutting or 0.15 lb ai per season of Mustang or 0.025 lb ai per cutting and 0.075 lb ai per season of Mustang Maxx. Retreatment interval 7 days.

Pasture and grass hay—Grass scale (mealybug)

Eriococcus insignis

Pest description and crop damage On timothy hay or timothy– alfalfa mixed-stand hay crops only. This scale weakens stands.

It can be a serious pest in western regions where it has become established. A serious pest in all of western Washington.

Management—chemical control

- bifenthrin (Brigade WSB) at 0.05 to 0.1 lb ai/A. PHI 30 days for forage and hay. REI 12 hr. Retreatment interval 14 days. Do not exceed 0.2 lb ai/A per season.
- chlorantraniliprole/lambda-cyhalothrin (Besiege, Voliam Xpress) at 0.059 to 0.098 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested for hay. Retreatment interval 7 days. REI 12 hr. Do not exceed 0.09 lb ai/A lambda- cyhalothrin or 0.2 lb ai/A chlorantraniliprole.
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested. REI 24 hr. Do not exceed 0.045 lb ai/A per season.
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 0 days for grazing and forage; 7 days to be dried for hay. REI 24 hr. Do not exceed 0.03 lb ai/A per cutting or 0.09 lb ai/A per season.
- zeta-cypermethrin (Mustang, Mustang Maxx) Mustang at 0.035 to 0.05 lb ai/A; Mustang Maxx at 0.0175 to 0.025 lb ai/A. PHI 3 days for cutting and grazing; 7 days for seed. REI 12 hr. Do not apply more than 0.05 lb ai per cutting or 0.15 lb ai per season of Mustang or 0.025 lb ai per cutting and 0.075 lb ai per season of Mustang Maxx. Retreatment interval 7 days.

Pasture and grass hay—Harvester ant

Pogonomyrmex spp.

Pest description and crop damage Large reddish ants found east of the Cascades. They build soil and pebble mounds and destroy vegetation around the mounds. May sting viciously when disturbed.

Management—chemical control

No effective insecticides currently are registered for ant control in pastures in the Pacific Northwest.

Pasture and grass hay—Mosquito

Management—chemical control

- *Bacillus thuringiensis* var. *israelensis* (VectoBac WDG)—PHI 0 days. See label for rates. *Bt* products are used to control mosquito larvae in ponds, pools, catch basins, etc., and do not kill adults. Some formulations are OMRI-listed for organic use.
- *Bacillus sphaericus* (VectoLex WDG) at 0.5 to 1.5 lb product/A. Reapply as needed after 1 to 4 weeks. OMRI-listed for organic use.
- carbaryl (Drexel Carbaryl 4L) at 0.25 to 1 lb ai/A. For adult control. PHI 0 days. REI 12 hr.
- deltamethrin (DeltaGard) at 0.00134 lb ai/A. Do not exceed 0.0134 lb ai/A per year.
- etofenprox (Zenivex E20) at 0.00175 to 0.007 lb ai/A. Do not exceed 0.18 lb ai/A per year.
- malathion ULV (Fyfanon ULV Mosquito) at 0.08 to 0.23 lb ai/A. For adult control. PHI 0 days. REI 12 hr. Limit 1 treatment per cutting.
- naled (Dibrom 8E) at 0.1 lb ai/A. REI 48 hr. Retreatment interval 10 days where lactating dairy animals are being held. Adult mosquitoes.
- permethrin (Pursuit 4-4 ULV)—Consult label for ground or aerial ULV application.
- prallethrin/phenothrin (Duet Dual-Action Adulticide)—Consult label for ground or aerial ULV application.
- s-methoprene (Altosid SBG II)—Consult label for species controlled. Apply at 2nd to 4th larval instars. Irrigated pastures may be treated after each flooding without the removal of grazing livestock.

Pasture and grass hay—Spider mite

Banks grass mite (*Oligonychus pratensis*) *Tetranychus* spp.

Pest description and crop damage On timothy hay or timothy– alfalfa mixed-stand hay crops only. Spider mites silver and stunt hay crop. Can reduce yield of timothy hay crop.

Management—chemical control

- chlorantraniliprole/lambda-cyhalothrin (Besiege, Voliam Xpress) at 0.059 to 0.098 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested for hay. Retreatment interval 7 days. REI 12 hr. Do not exceed 0.09 lb ai/A lambda-cyhalothrin or 0.2 lb ai/A chlorantraniliprole. Suppression only.
- cyfluthrin (Tombstone) at 0.04 to 0.044 lb ai/A. PHI 0 days. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.176 lb ai/A per season.
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested. REI 24 hr. Do not exceed 0.045 lb ai/A per season. Suppression only.
- hexythiazox (Ruger EC) at 0.078 to 0.186 lb ai/A. PHI 14 days. REI 12 hr. Limit 1 treatment per year. Timothy only.
- malathion (Malathion 5EC) at 1.25 lb ai/A. PHI 0 days. REI 12 hr. One application limit per cutting.

Pasture and grass hay—Thrips

Frankliniella spp. and other species

Pest description and crop damage On timothy hay or timothy– alfalfa mixed-stand hay crops only. Thrips scar and silver timothy and can reduce hay crop yield.

Management—chemical control

- beta-cyfluthrin (Baythroid XL) at 0.02 to 0.022 lb ai/A. PHI 0 days for grazing or hay. REI 12 hr. Do not exceed 0.089 lb ai/A per season. Retreatment interval 5 days.
- carbaryl (Sevin 4F) at 1 to 1.5 lb ai/A. PHI 14 days. Limit 2 treatments per year. Retreatment interval 14 days. Do not exceed 3 lb ai/A per year. REI 12 hr.

- chlorantraniliprole/lambda-cyhalothrin (Besiege, Voliam Xpress) at 0.059 to 0.098 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested for hay. Retreatment interval 7 days. REI 12 hr. Do not exceed 0.09 lb ai/A lambda-cyhalothrin or 0.2 lb ai/A chlorantraniliprole.
- cyfluthrin (Tombstone) at 0.041 to 0.044 lb ai/A. PHI 0 day. PHI 7 days in stands where grass is mixed with alfalfa. REI 12 hr. Retreatment interval 5 days. Do not exceed 0.176 lb ai/A per season.
- gamma-cyhalothrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 0 days for grazing or cut for forage; 7 days for cut grass to be dried and harvested. REI 24 hr. Do not exceed 0.045 lb ai/A per season.
- lambda-cyhalothrin (Warrior II) at 0.02 to 0.03 lb ai/A. PHI 0 days for grazing and forage; 7 days to be dried for hay. REI 24 hr. Do not exceed 0.03 lb ai/A per cutting or 0.09 lb ai/A per season.

Rangeland Pests

Sergio Arispe

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In all cases, follow the instructions on the pesticide label. The *PNW Insect Management Handbook* has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Protect pollinators: See How to Reduce Bee Poisoning from Pesticides.

Note: Products are listed in alphabetical order and *not* in order of preference or superiority of pest control.

Rangeland—Armyworm and cutworm

Many species, including

Army cutworm (*Chorizagrotis auxillaris*)

Armyworm (*Pseudaletia unipuncta*)

Black cutworm (*Agrotis ipsilon*)

Glassy cutworm (*Apamea devastator*)

Pest description and crop damage Larvae are 1 to 2 inches long at maturity. All, except glassy cutworm and *Protogrotis obscura* usually feed above ground on foliage after dark or during conditions of low light intensity.

Management—organic control

- *Bacillus thuringiensis kurstaki* (many commercial products, e.g., Dipel) at 0.5 to 2 lb product/A. PHI 0 days. REI 4 hr. Armyworms only. Most effective on small caterpillars, but use highest recommended rate for fully developed ones. Multiple applications may be necessary for effective control. A spreader sticker may improve performance.
- spinosad (Entrust) at 0.63 to 1.25 oz/A. PHI 0 days for forage; 3 days for hay or fodder. Do not apply more than 3.75 oz of Entrust (0.186 lb ai spinosad) per acre per season or make more than 6 applications per year or 3 applications within 21 days. Follow resistance management guidelines. Armyworms only. OMRI-listed for organic use.

Management—chemical control

- beta-cyfluthrin (Baythroid XL) at 0.013 to 0.015 lb ai/A. PHI 0 days for grazing or 7 days for hay. REI 12 hr. Do not exceed 0.089 lb ai/A per season. Armyworms only.
- bifenthrin (Brigade 2EC) at 0.1 lb ai/A. Do not exceed 0.2 lb ai/A per season. Retreatment interval: 30 days. REI 12 hr.
- chlorantraniliprole (Coragen) at 0.045 to 0.098 lb ai/A. REI 4 hr. Do not exceed 0.2 lb ai/A or 4 applications per season. Armyworms only.
- gamma-cyfluthrin (Declare) at 0.01 to 0.015 lb ai/A. PHI 0 days for grazing. REI 12 hr. Do not exceed 0.045 lb ai/A

- per season.
- lambda-cyhalothrin (Warrior II with Zeon Technology) at 0.015 to 0.03 lb ai/A. PHI 0 days for grazing and forage; 7 days for hay. REI 12 hr.
- zeta-cypermethrin (Mustang Maxx) at 0.014 to 0.025 lb ai/A. PHI 0 days graze and hay; 7 days straw. REI 12 hr.

Rangeland—Black grass bug

Labops hesperius and other *Labops* spp.

Pest description and crop damage Insect is grayish black with silvery scales, about 0.25 inch long, and somewhat pear-shaped. Adults have prominent compound eyes and can have shortened or absent wings. Black grass bugs will feed on a variety of range grasses (e.g., wheatgrass, brome grass, orchardgrass, bluegrass) and field crops (e.g., barley, wheat, rye, oats). Great Basin wild rye and wheatgrasses are preferred if available, especially blue bunch wheatgrass, crested wheatgrass, and intermediate wheatgrass. Feeding causes pale spots and, when severe, a general yellowish stipple on cereal leaves.

Management—chemical control

- bifenthrin (Brigade 2EC) at 0.1 lb ai/A. Do not exceed 0.2 lb ai/A per season. Retreatment interval: 30 days. REI 12 hr.
- carbaryl (Carbaryl 4L) at 0.5 to 1 quart ai/A. PHI 0 days. Do not make more than 1 application per year. REI 12 hr.
- lambda-cyhalothrin (Warrior II with Zeon Technology, Lambda-Cy) at 0.02 to 0.03 lb ai/A. PHI 0 days for grazing or forage harvest, 7 days if cut for hay. REI 24 hr. Max 0.03 lb ai/A per cutting, 0.09 lb ai/A per season. Do not re-apply sooner than 30 days after last application if a hay crop is not taken.
- malathion (Malathion ULV) at 8 to 12 oz product/A. PHI 0 days. REI 12 hr.

Rangeland—Grasshopper

Many species, including:

Clearwinged grasshopper (*Camula pellucida*)

Lesser migratory grasshopper (*Melanopus sanguinipes*)

Redlegged grasshopper (*Melanoplus femurrubrum*)

Twostriped grasshopper (*Melanoplus bivittatus*)

Pest description and crop damage More than 400 grasshopper species live in the western states, but only 10 to 12 typically cause economic damage. Eggs may be deposited in pastures, field margins, undisturbed areas, or in field stubble, and densities may exceed 1,000/sq ft. Immature and adult insects feed in rangeland, pastures, and crop fields. Damage is severe during outbreaks, with the potential for migratory swarms that may invade nearby crops.

Management—biological control

- *Nosema locustae* (NOLO Bait Biological Insecticide)—Apply early in the season, as the over-wintering grasshoppers emerge. Two to three weeks may be required for initial effect. Broadcast 1 to 2 lb/A around the entire infested area, as well as outlying areas such as drying grasses and fields. Heavy infestations may require repeated applications. OMRI-listed for organic use.

Management—chemical control

University of Wyoming website highlighting Ground-Applied Reduced Agent Area Treatment (RAAT) Strategies may help in developing a strategy for grasshopper control. URL <http://www.uwyo.edu/entomology/grasshoppers/atvraats.htm> or contact Alexandre Latchininsky at 307-766-2298.

- beta-cyfluthrin (Baythroid XL) at 0.02 to 0.022 lb ai/A. PHI 0 days for grazing or 7 days for hay. REI 12 hr. Do not exceed 0.089 lb ai/A per cutting.
- bifenthrin (Brigade 2EC) at 0.1 lb ai/A. Do not exceed 0.2 lb ai/A per season. Retreatment interval: 30 days. REI 12 hr.
- carbaryl (Carbaryl 4L) at 0.5 lb ai/A. PHI 0 days. Reduced Agent and Area Treatment (RAAT) is required. Do not exceed 1 lb ai/A per crop. REI 12 hr.
- lambda-cyhalothrin (Warrior with Zeon Technology, Lambda-Cy) at 0.02 to 0.03 lb ai/A. PHI 0 days for grazing or forage harvest, 7 days if cut for hay. REI 24 hr. Max 0.03 lb ai/A per cutting, 0.09 lb ai/A per season. Do not re-apply sooner than 30 days after last application if a hay crop is not taken.
- malathion ULV at 0.62 lb to 0.9 lb ai/A. PHI 0 days. REI 12 hr. Apply by air when hatch is complete. Do not apply if rain is imminent. Most effective when air is above 70°F.
- malathion (Malathion 8 EC) at 1 to 1.25 pints ai/A. PHI 1 day. REI 12 hr.

- zeta-cypermethrin (Mustang Max) at 0.0175 to 0.025 lb ai/A. PHI 0 days forage or graze. 7 days for straw. Max 0.025 lb ai/A per cutting. Retreatment interval 7 days for forage or graze, 17 days for straw. Do not apply more than 0.01 lb ai/A per season for hay crops, nor more than 0.0125 lb ai/A per season for forage or straw.

Rangeland—Mormon cricket

Anabrus simplex

Pest description and crop damage Flightless, heavy katydids that feed on many range plants as well as on small grains and alfalfa. They migrate from pastures into crop fields during outbreak years.

Management—biological control

- *Nosema locustae* (NOLO Bait Biological Insecticide)—Apply early in the season, as the over-wintering grasshoppers emerge. Two to three weeks may be required for initial effect. Broadcast 1 to 2 lb/Acre around the entire infested area, as well as outlying areas such as drying grasses and fields. Heavy infestations may require repeated applications.

Management—chemical control

- carbaryl (Carbaryl 4L) at 0.5 quart ai/A. PHI 0 days. Reduced Agent and Area Treatment (RAAT) is required. Do not exceed 1 quart ai/A per year. REI 12 hr.
- carbaryl (Sevin 5 Bait) at 20 lb per acre with no more than one application per year—ground application only.

Vetch Hay Pests

Elizabeth Verhoeven

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In all cases, follow the instructions on the pesticide label. The *PNW Insect Management Handbook* has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Protect pollinators: See How to Reduce Bee Poisoning from Pesticides.

Note: Products are listed in alphabetical order and *not* in order of preference or superiority of pest control.

Vetch hay—Armyworm and cutworm

Many species

Pest description and crop damage Caterpillars vary in color when full grown: 1 to 2 inches long. They feed on foliage of older plants or cut off young plants at ground level. Larvae of both commonly feed on plants at night, hiding in or on the soil surface under leaf litter by day.

Management—chemical control

- azadirachtin (Neemix 4.5 IGR) at 4 to 10 fl oz product per acre. Consult label. OMRI-listed for organic use.
- *Bacillus thuringiensis* (Biobit HP) at 0.5 to 1.5 lb/A. PHI 0 days. Armyworms only. Add an appropriate spreader-sticker to enhance control. Most effective on small, actively feeding larvae. Some formulations are OMRI-listed for organic use.
- *Beauveria bassiana* GHA (Botanigard Maxx) at 0.5 to 2 qt/100 gal. PHI 0 days. REI 4 hr.
- *Chromobacterium subtsugae* (Grandevo WDG) at 0.3 to 0.9 lb ai/A per 100 gal. PHI 0 days. REI 4 hr. OMRI-listed for

- organic use.
- chlorantraniliprole (Coragen, Prevathon) at 0.045 to 0.098 lb ai/A. Prevathon max rate is 0.067 lb ai/A. PHI 0 days. REI 4 hr. Do not exceed 0.2 lb ai/A or 4 applications per season. Make one application per cutting.
- malathion (Drexel Malathion 5EC) at 0.625 to 1.25 lb ai/A. PHI 0 days. REI 12 hr. Armyworms only. Limit 2 treatments per cutting. Retreatment interval 14 days.
- methoxyfenozide (Intrepid 2F) at 0.06 to 0.16 lb ai/A. PHI 0 days graze, 7 days hay. REI 4 hr. Do not exceed 0.5 lbs ai/A/yr. Limit one treatment per cutting.
- spinosad (Entrust SC) at 0.031 to 0.062 lb ai/A. PHI 0 days for forage; 3 days for hay or fodder. REI 4 hr. Do not exceed 0.186 lb ai/A per season. Do not graze cattle until spray has dried. Some formulations are OMRI-listed for organic use.
- zeta-cypermethrin (Mustang, Mustang Maxx) Mustang at 0.035 to 0.05 lb ai/A; Mustang Maxx at 0.0175-0.025 lb ai/A. PHI 3 days cutting and grazing; 7 days for seed. REI 12 hr. Do not apply more than 0.05 lb ai per cutting or 0.15 lb ai per season of Mustang or 0.025 lb ai per cutting and 0.075 lb ai per season of Mustang Maxx. Retreatment interval 7 days.

Vetch hay—Omnivorous leaftier

Cnephasia longana

Pest description and crop damage Yellow spindle-shaped larvae with brown heads and light stripes on each side of the back. They web and feed within terminal leaves.

Management—chemical control

- *Bacillus thuringiensis* (Javelin WG) at 0.5 to 1.5 lb/A. PHI 0 days. REI 4 hr. Addition of a spreader sticker may improve performance. Some formulations are OMRI-listed for organic use.
- malathion (Malathion 5EC) at 0.625 to 1.25 lb ai/A. PHI 0 days. Retreatment interval 14 days. REI 12 hr. Limit 2 treatments per cutting.
- methoxyfenozide (Intrepid 2F) at 0.06 to 0.16 lb ai/A. PHI 0 days graze, 7 days hay. REI 4 hr. Do not exceed 0.5 lbs ai/A/yr. Limit 1 treatment per cutting.

Vetch hay—Pea leaf weevil

Sitona lineata

Pest description and crop damage This is the common, large light-green aphid found on most legumes. Large populations weaken plants, secrete honeydew, and can reduce hay yield.

Management—chemical control

- zeta-cypermethrin (Mustang, Mustang Maxx) Mustang at 0.035 to 0.05 lb ai/A; Mustang Maxx at 0.0175 to 0.025 lb ai/A. PHI 3 days cutting and grazing; 7 days for seed. REI 12 hr. Do not apply more than 0.05 lb ai per cutting or 0.15 lb ai per season of Mustang or 0.025 lb ai per cutting and 0.075 lb ai per season of Mustang Maxx. Retreatment interval 7 days.

Vetch hay—Slug

Pest description and crop damage Primarily a pest in western Oregon and Washington. Damage is most critical when establishing a seedling stand.

Management—chemical control

- iron phosphate/spinosad (Bug-N-Sluggo) at 0.1 to 0.45 lb ai/A. PHI 3 days for hay and fodder. Do not exceed 3 treatments in 21 days. OMRI-listed for organic use.
- metaldehyde bait (Deadline) at 0.4 to 1.6 lb ai/A. REI 12 hr.

See also:

Slug Control