

Introduction to Integrated Pest Management: Insects

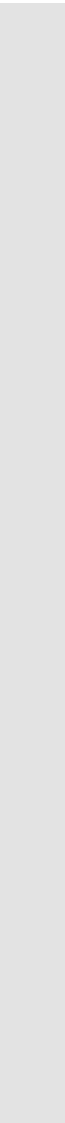
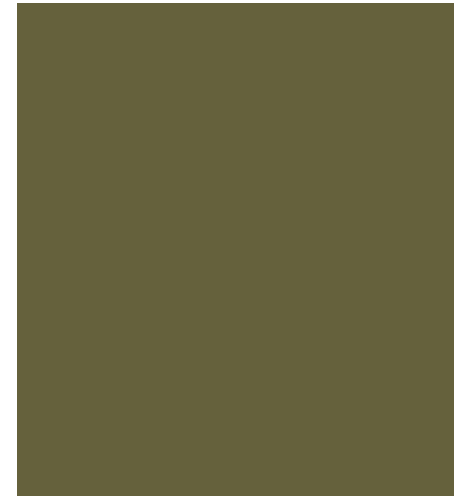
Casey Matney, Ph.D.

UAF CES, Kenai Peninsula



What is an Insect?

- ARTHROPODS
- Insects:
 - 6 legs
 - 3 body regions
 - Antennae
 - Flight – adults
- Insect Relatives
 - Spiders (Arachnids)
 - Mites (Acari)
 - Centipedes
 - Millipedes



What is an
insect?

Most insects are not pests

BENEFICIAL INSECTS

Pollinators

Decomposers

Predators

Parasites

Complete Metamorphosis



Incomplete Metamorphosis



Insect Life Cycles

Insect Life Cycle Examples

Adults	Larvae
Moths and Butterflies	caterpillars, inchworms, loopers, leafminers, cutworms, borers, webworms, leafrollers
Beetles	grubs, wireworms, borers, billbugs
Flies	maggots, grubs, leafminers



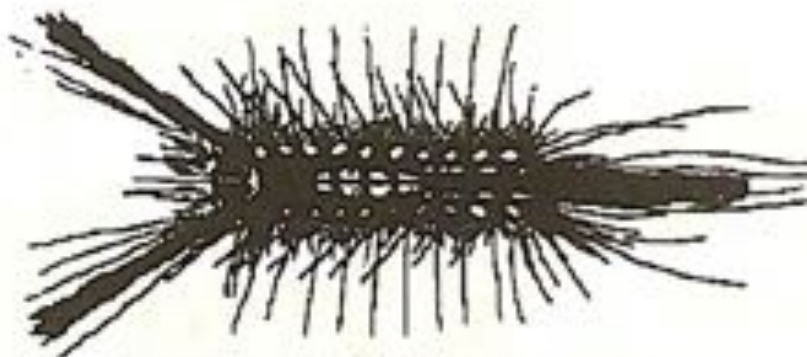
Wireworm



Fireweed Hornworm



Root Maggot



Tussock Moth



Sawfly Larva

Larvae

No army worm in Alaska (2018)

Insect classification

Insects

- Grasshoppers
- Earwigs
- Thrips
- True bugs (Lygus bug)
- Aphids & psyllids
- Leafhoppers
- Spittlebugs



Photo by Sherry Lee Bottoms

- Scales & mealybugs
- Whiteflies
- Moths & butterflies
- Beetles
- Flies, gnats, mosquitoes
- Ants
- Bees
- Sawflies
- Parasitic wasps



Photo by Julie Riley



Photo by Sherry Lee Bottoms

Insect classification

Insect relatives

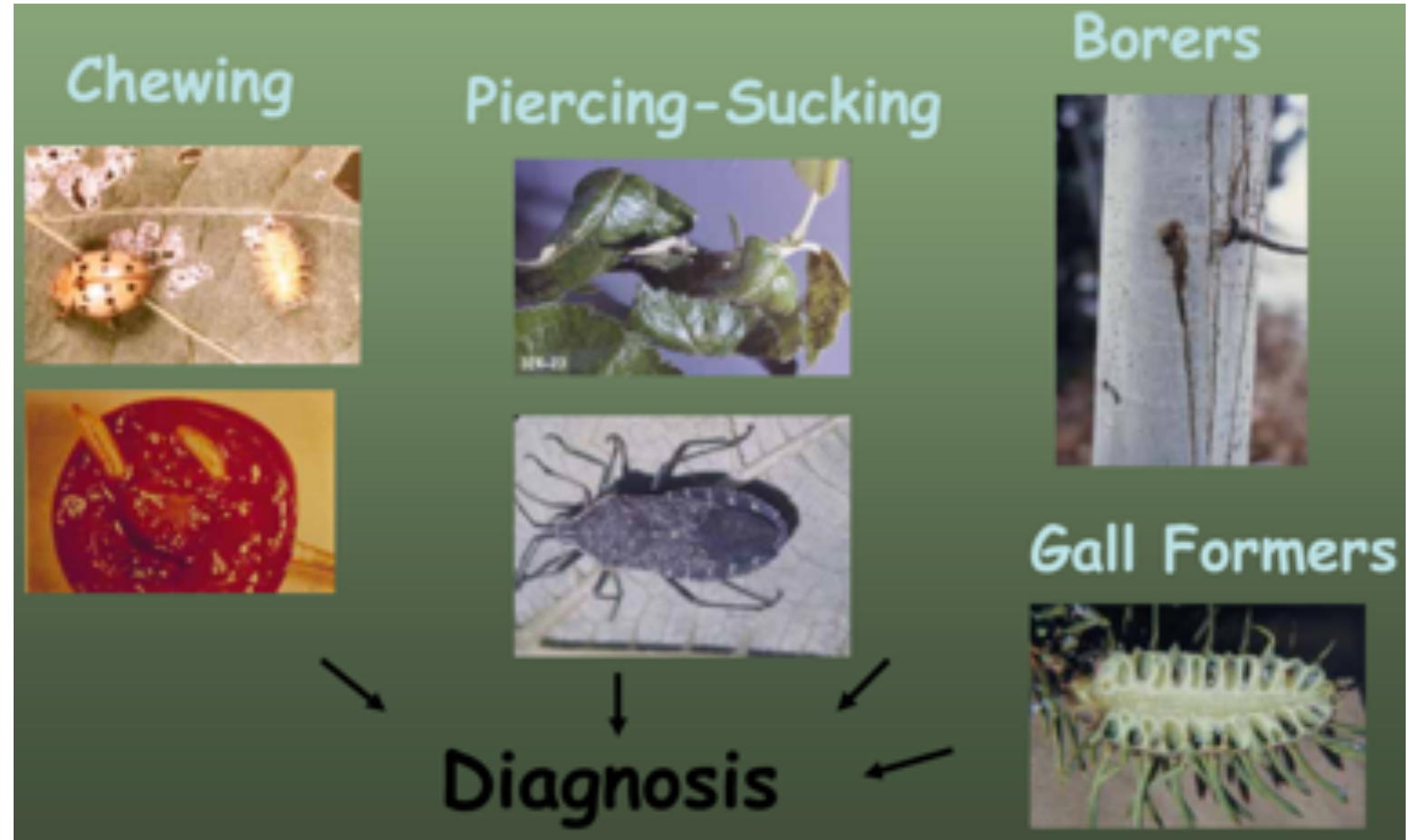
- Spiders
- Spider mites
- Eriophyid mites
- Smyphylans



Photo by Sherry Lee Bottoms

Spiders hatching

Insect Plant Feeding Types



What is IPM?

- Integrated Pest Management
 - Correct Identification of Pest
 - What is your threshold for management?
 - Employ crop rotations, physical barriers, weed management, realistic expectations.
 - Least toxic approaches
 - Use all of the above
 - IPM is NOT relying on a single management design such as one chemical application, but chemicals can be part of a management program

IPM
Integrated
Pest
Management

Use of effective
MULTIPLE strategies to
attain an economically
acceptable yield

- or plant quality while causing the least disruption to the

IPM
Integrated
Pest
Management

Usually means
suppression

- **NOT eradication or elimination**

IPM Integrated Pest Management

PLAN AHEAD (use preventative strategies where possible)

- Use multiple pest management tools
 - Cultural
 - Mechanical
 - Biological
 - Chemical
 - Treat only if needed (thresholds)
 - Environmentally, economically, and socially sound



Identify the Insect



Learn about its life cycle and the life cycle of its host



Important when determining the best time to implement management techniques.

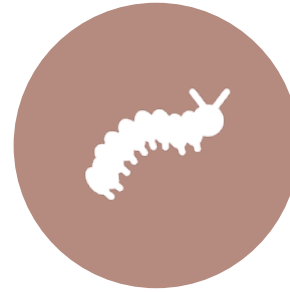


Most pests are susceptible to pesticides only at specific times in their life cycle.

IPM Principles



Resistant varieties
(example – apple scab)



Crop rotation (example –
root maggot)



Cultural control (example
– water and fertilize birch
to help withstand bronze
birch borer)



Mechanical and Physical
Controls (examples –
heat, traps, barriers,
electrical)

IPM Methods



Biological control (example – lady bugs)



Sanitation



Chemical control

IPM Methods
Continued



Traps

**Yellow jacket wasps, slugs,
spiders**



Sticky bands

Trees and shrubs

Traps and Physical Barriers

**How can I make it
work?**

**Outdoor
landscapes -
Conservation of
natural enemies**

**Avoid toxic
chemicals**

**Maintain a diverse
plant environment
(avoid
monocultures)**

**Cultivate plants
that provide
nectar & pollen**

**Tolerate some
herbivorous
insects**

Biological Control

Biological Control

- Beneficial Insects and Mites





Best used in addition to cultural controls



Application based on economic threshold



Appropriate insect life cycle



Alternate or tank-mix products with different modes of action

Chemical Control

Insecticide Resistance Management

- **Rotate chemical classes / modes of action**
 - **Within a generation**
 - **Between generations within a season**

Alaska
Common Farm
and Garden
Pests



Root Maggots



Root Maggots



— Adult root maggot fly in the family Anthomyiidae. Photo by David Cappaert, bugwood.org

Root Maggots



Wire Worm

(affecting root
crops)



Wire Worm



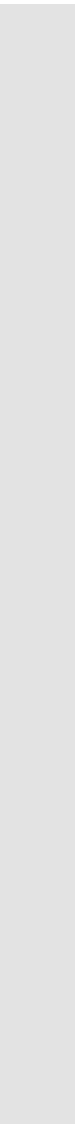
Wire Worm





Wire Worm – Adult Beetle

Spider Mites



Very small; infested plants appear “dirty”; produce webbing, suck sap (remove chlorophyll); leaf speckling

When severe, cause bronzing or silvering of leaves; populations build quickly in hot weather

Suppress mite population before it explodes

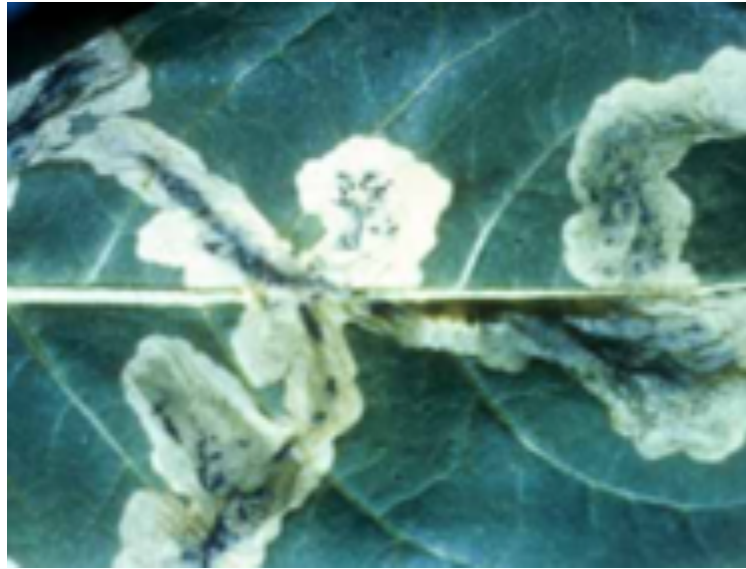
Controls: pressurized stream of water, horticultural oils, insecticidal soap

Don't recommend Vendex or other miticides unless a rescue treatment

Biological control: Predaceous mites

Spider Mites

Leafminers in Leafy Veggies



Adults – Small flies

Larvae – White to cream maggots

Winding trails on leaves, white blotches

Scout regularly, >1 mine/leaf

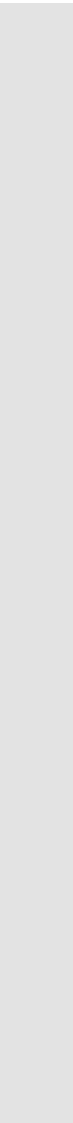
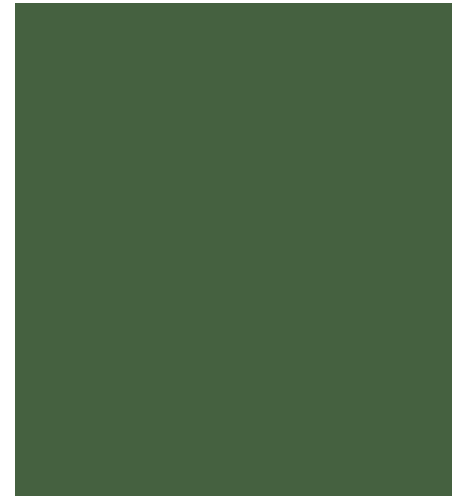
Natural enemies (Paper wasp)

Row covers

Spinosad (Success, Entrust) insecticide

Leafminers in
Leafy Veggies

Aphids on Vegetables and Herbs



Suck fluids from leaves & stems; curl leaves; produce sticky honeydew; black sooty mold growth

Insecticidal soap, neem oil, chemical controls such as Azamax

Biological control: lady beetles, lacewings, syrphid flies, parasitic wasps

Aphids on
Vegetables
and Herbs

Aphids bio controls



Syrphid fly larva



Lacewing larva



Aphid mummies



Flea Beetles



Cutworms in Alaska

- An IPM Example
- 

Moth, Larvae, Pupal Cases, these are your small subjects that can do a lot of damage to your fields and gardens.



While we have many native Noctuidae Moths we also have a new species that has been moving into Alaska for the last few years. Such as the strong flying Introduced Pest, The European Yellow Underwing.

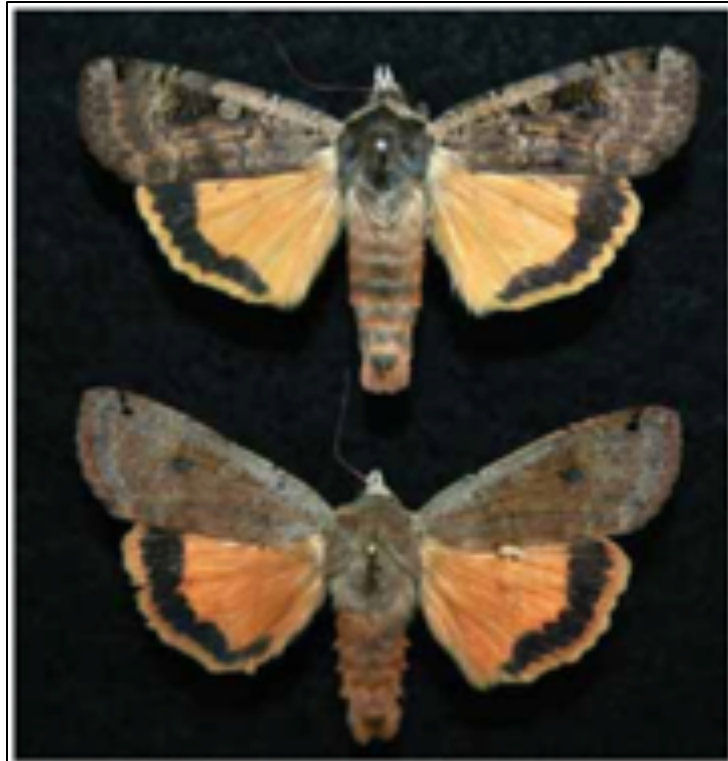


Figure 6. Pinned specimens of male (upper) and female (lower) moths. The round spot in the center of the body behind the head is the reflection from the pin rather than an actual mark on the insect.

CAUTION: Pesticides can be injurious to humans, domestic animals, desirable plants and fish, or other wildlife—if they are not handled or applied properly. Use all pesticides selectively and carefully. Since approved uses of a pesticide may change frequently, it is important to check the label for current approved and legal use. Follow recommended practices for the disposal of surplus pesticides and pesticide containers. Mention of a pesticide in this publication does not constitute a recommendation for use by the USDA, nor does it imply registration of a product under Federal Insecticide, Fungicide, and Rodenticide Act, as amended. Mention of a proprietary product does not constitute an endorsement by the USDA.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6182 (TDD). USDA is an equal opportunity provider and employer.

European Yellow Underwing

James Kruse, Forest Entomologist; Angie Ambourn, Biological Science Technician; and Gerard Sprankle, Biological Science Technician; USDA Forest Service, Alaska Region, State and Private Forestry.

Additional information on this insect can be obtained from your local Alaska Cooperative Extension office, Alaska State Forestry office, or from:

USDA Forest Service
State and Private Forestry
Forest Health Protection
2770 Sherwood Lane, Suite 2A
Juneau, Alaska 99801-8545
Phone: (907) 586-8883

3301 "C" Street, Suite 202
Anchorage, Alaska 99503
Phone: (907) 743-9455

3700 Airport Way
Fairbanks, Alaska 99709
Phone: (907) 451-2701

www.fs.fed.us/r10/ipl/thp

European Yellow Underwing



Cover photo. Adult European yellow underwing, showing the distinguishing yellow hindwing. Photo by Kenneth Philp, University of Alaska-Fairbanks.

Large Yellow Underwing

A New Cutworm in Idaho

by Edward John Bechinski, Larry J. Smith, and Frank W. Merickel

KEY FACTS

- Potential threat to winter wheat and barley, Austrian winter peas, alfalfa, grass forages, winter vegetables, and home flower and vegetable gardens planted into weedy patches
- European species first reported in North America during 1979

BACKGROUND

Noctua pronuba (pronounced knock-TOO-ah pro-NEW-bah) is an accidentally introduced cutworm known as the large or greater yellow underwing for its distinctively colored adult moth stage. Native to western Europe, the insect was first detected in North America during 1979, when several moths were collected around a porch light in Nova Scotia, Canada.



No one knows how it arrived in North America from Europe. *Noctua pronuba* moths are unusually strong fliers, so it is conceivable they arrived by flight. However, they were probably carried here via human-aided transport.

Typical damage from cutworms



Cutworm control is difficult at best. Early field inspection when pest pressures are low will be more effective.

While it is labor intensive you can hand remove when numbers are low or use physical barriers such as collars or sticks when planting crops.

Consider if crop rotation can be used in your fields. Don't plant next to grassy pastures or grain fields as they are a common host.

Remove weeds, these are hosts and areas for egg laying next season's cutworm crop.

Birds enjoy cutworms but can also enjoy your crops, other local predators include ground beetles and parasitic wasps.

If populations are still too high you might consider some of the least toxic choices.





Hungry Larvae exposed after an inspection, when they are this size they eat a lot, they stop feeding when about 2 inches in length, can be hand picked, and are susceptible to other controls.

Example of a physical barrier. Discourages moths from laying eggs and larvae in soil from climbing up plant but will not stop below ground activity.





Insect-Parasitic Nematodes for the Management of Soil-Dwelling Insect Pests

Organic Agriculture - March 15, 2010

Organic author: Mary E. Barbercheck, Penn State University

Source: Barbercheck, M. E. 2004. Entomopathogenic nematodes in biological control. PSU Extension Fact Sheet. Available at: <http://www.ento.psu.edu/extension/factsheets/nematode.htm> (verified 15 March 2010).

Introduction

Insects have many types of natural enemies. As with other organisms, insects can become infected with disease-causing organisms, called pathogens. Soil serves as a natural home and reservoir for many kinds of insect pathogens, including viruses, bacteria, protozoa, fungi, and nematodes. We can take advantage of these natural enemies of insects to help manage insect pests. The use of natural enemies to manage pests is called biological control.

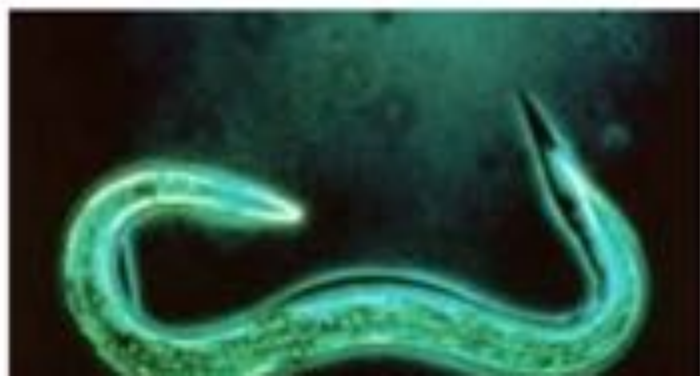
Description: What Is a Nematode?

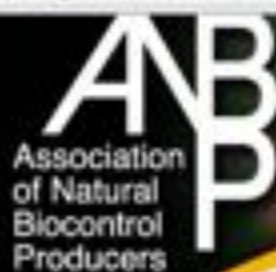
Nematodes are microscopic, whitish to transparent, unsegmented worms. They occupy almost every habitat on earth, both aquatic and terrestrial, and are among the most common multi-celled organisms. Nematodes are generally wormlike and cylindrical in shape, often tapering at the head and tail ends; they are sometimes called roundworms or eelworms. There are thousands of kinds of nematodes, each with their particular feeding behavior; for example, bacterial feeders, plant feeders, animal parasites, and insect parasites, to name a few.

Figure 1. An insect-parasitic nematode. Figure credit: Penn State Entomology Department Image Gallery (<http://www.ento.psu.edu/ImageGallery/default.html>)

Description: Insect-Parasitic Nematodes

In conventional production systems, soil-inhabiting insect pests are managed by applying systemic pesticides to the soil or foliage. Instead, soil insect pests can be managed by using cultural practices, for example, tillage and crop rotation. Biological control is another important way to manage soil-inhabiting insect pests, especially in organic systems. A group of organisms that can be used as biological control agents for soil pests in organic systems are insect-parasitic nematodes. These





Association
of Natural
Biocontrol
Producers



Home

News and Views

Join/Renew ANBP

Member Benefits

ANBP Newsletter

Members & Products

Biocontrol

Events

Research

ANBP Board Members

ANBP Committees

Quality Assurance

Contact

Our Members

Looking to buy beneficial insects, mites, or nematodes for biological control (biocontrol)? Listed below are current Members and product lists for those who have submitted them. If you are a member and would like to submit your product list, please send an e-mail to the [Executive Director](#).

[Statement on Member Products](#)

PRODUCERS

Anatis Bioprotection

Silvia Todorova
278 rang Saint-Andre
St-Jacques-le-Mineur, Quebec J0J1Z0
CANADA
PH 514.577.0817
FX 514.485.0323
Email: info@anatisbioprotection.com
Web: <http://anatisbioprotection.com>
[Product List](#)

Bio-Nomics Ltd.

Brian Spencer
11074 W. Saanich Rd.
Sidney, BC V8L 5P5



Natural Resources Canada

Search the Insect
Producer Database

Looking for beneficial insects, mites, or nematodes? Use this searchable database for products available in North America.

[CLICK HERE](#)

CONTRIBUTING MEMBERS

INCOTEC

Mac Keely
1293 Harkins Rd.
Salinas, CA 93901
USA
PH
Email: mac.keely@incotec.com

The Morning Star Packing Company

Renee Rianda
724 Main Street
Woodland, CA 95695



Find out, Is It REGISTERED FOR USE IN ALASKA?



There are 547 products on the DEC website for cutworms, remember that the CROP/SITE MUST BE ON THE LABEL.



Some of these products are used for Organic Production such as Spinosad or Azadirachtin but label reading will inform you of toxicity of bees or aquatic insects.



Other products have rapid knock down such as Pyrethrins, or longer activity in the soil such as Carbaryl, while others require a license to purchase them as they are Restricted Use products.



ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PESTICIDE CONTROL PROGRAM

This website (<http://www.kellysolutions.com>) is created, maintained, and provided by Kelly Registration Systems, Inc. (KRS), Corvallis, OR, as a free service to the public through the Alaska Department of Environmental Conservation (Division of Environmental Health). KRS is a private company that maintains this search program and controlled or managed by the Alaska Department of Environmental Conservation (Division of Environmental Health).

The following selections will search the Alaska Department of Environmental Conservation (Division of Environmental Health) databases of pesticides. This information is compiled solely from pesticide registration data submitted by companies who wish their products to be sold in the state of Alaska, combined with data from the EPA with regard to ingredients, pests and sites.

Please select from the following options

[Search by Company Name](#)

[Search by Company ID](#)

[Search By Product Name](#)

[Search By Product EPA ID](#)

[Search By Pest](#)

[Search By Site](#)

[Search By Pesticide Type](#)

[Search By Formulation Type](#)

[Search By Active Ingredient](#)

[Search By Multiple Criteria](#)

[Search State Restricted Use \(RUP\)](#)

[Show All State RUP's](#)

[Search Federally Restricted Use \(RUP\)](#)

[Show All Fed RUP's](#)

[Show all Special Local Needs \(SLN\)](#)

[Show All 25B products](#)

[Show all Products with a Worker Protection Statement](#)

[Show All Products with a Water Quality Advisory](#)

[Show all Products with Endangered Species Bulletin](#)

[Show All Products](#)

Consider costs of controls, weather conditions needed for application, what your realistic expectations are and have your IPM plan in place before the start of the season. Happy Hunting!



Snails and Slugs

- **Eat large irregular holes in leaves & fruit**
- **Susceptible to dry conditions**
- **Cultural controls: do not over irrigate, avoid excessive mulch & debris which provide moist habitats**
- **Chemicals: baits (iron phosphate), commercial & home-made traps (low sided dishes with water + yeast)**

