

Organic Pest Management

Principles and Practices to Support
Ecological Approaches to Pest Management

Rex Dufour
NCAT Agriculture Specialist
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Photo: Rex Dufour



Overview

- Organic Boilerplate
- Silver bullet vs. many “little hammers”
- Basic Principles of Organic Pest Management
- Practices for managing:
Weeds, Insects, Diseases
- Resources



Definition of Organic Production

“A production system...managed to respond to site-specific conditions by integrating *cultural, biological, & mechanical practices* that

- ✓ foster cycling of resources,
- ✓ promote ecological balance, &
- ✓ conserve biodiversity.”

- NOP definition

Land Requirements §205.202

Land used for organic production must be free from prohibited materials for **3 yrs** before organic harvest

Transition effect –3 years for certification, more years for biological shift and improved economic performance

Principles of Organic Production:

- Manage the farm as an ecological *system*
- *Enhance biodiversity, ecosystem function*
- Use renewable resources
- *Prevention before intervention*
- *Healthy soils and environment*
- Traceability

Pest, Weed & Disease Management

1. **Prevention practices**
 - sanitation, crop health, resistant varieties, crop rotation, monitoring, correct pest ID, etc.
2. Mechanical or physical
 - beneficials, habitat, traps, mulch, mowing, grazing, cultivation, flame
3. Use allowed inputs when other practices are insufficient

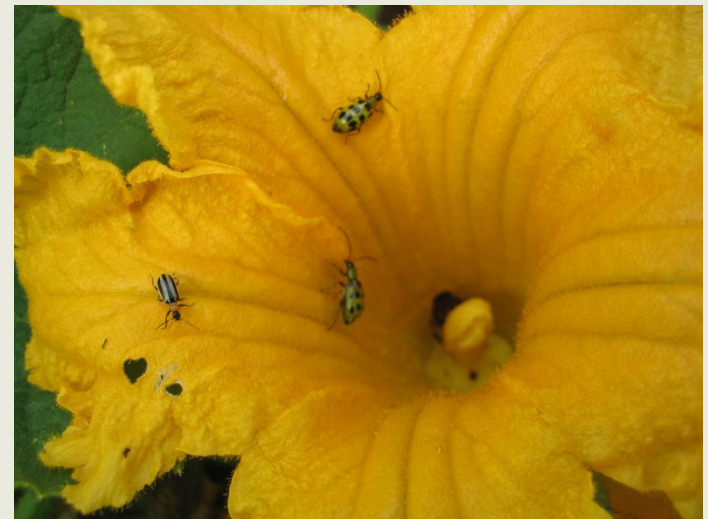
Allowed Pesticides (*last resort*)

- **Naturals (Non Synthetics)**

- Minerals (diatomaceous earth, kaolin clay, sulfur)
- Biologicals (*Bt*, *B. bassiana*)
- Botanicals (neem, pyrethrum)

- **Synthetics (on the National List only)**

- Minerals (copper sulfate)
- Soaps (insecticidal)
- Horticultural oils (narrow range)
- Pheromones



Inputs — Allowed or Prohibited?

Sources of Information

Resources to help farmers interpret the National List:

- Organic Materials Review Institute (www.omri.org/)
 - Maintains generic and brand names materials lists
- WSDA Brand Name Materials List
 - <http://agr.wa.gov/foodanimal/organic/materialslists.htm>

To be sure:

ALWAYS CONSULT THE CERTIFIER before using a product

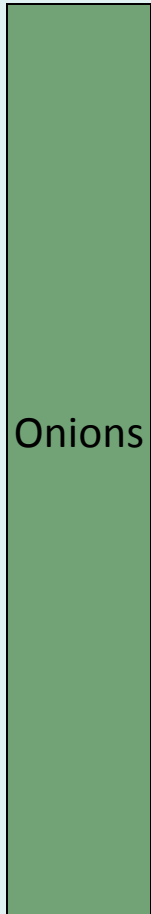
Cow Pasture

Tall Weed Area

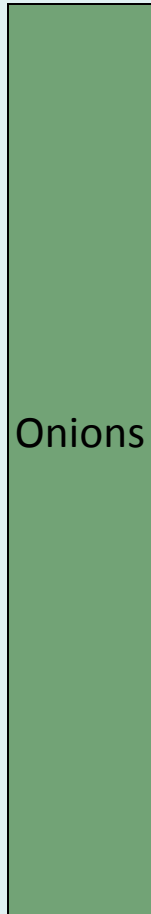


David Orr: Onion maggot in Michigan

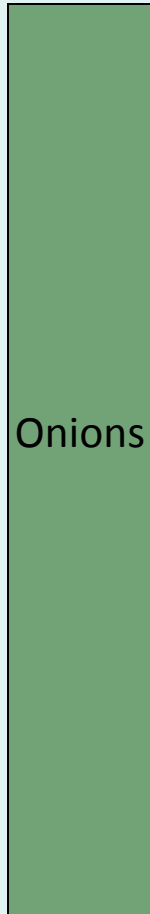
Weedy



Onions



Onions



Onions

Weedy



Radish

Area

Area

Pest Management Ground Rules in Organic Agriculture

- Supporting soil ecology = Supporting soil function = Supporting plant health
- Managing the above-ground ecology—more habitat for mini- and micro-livestock, less for pests

What is one of the most important resource concerns for organic farms?

Soil Quality & Nutrient Management!



Soil Fertility and Crop Nutrient Management §205.203

The producer must conduct practices and manage plant & animal materials in ways that that *maintain or improve* condition of soil, soil organic matter content, minimize erosion, doesn't contaminate soil



Photo: Rex Dufour

Soil organic matter (SOM) can hold 30 times its weight in water. One percent organic matter in the top three inches of soil can hold 1.4" of water...

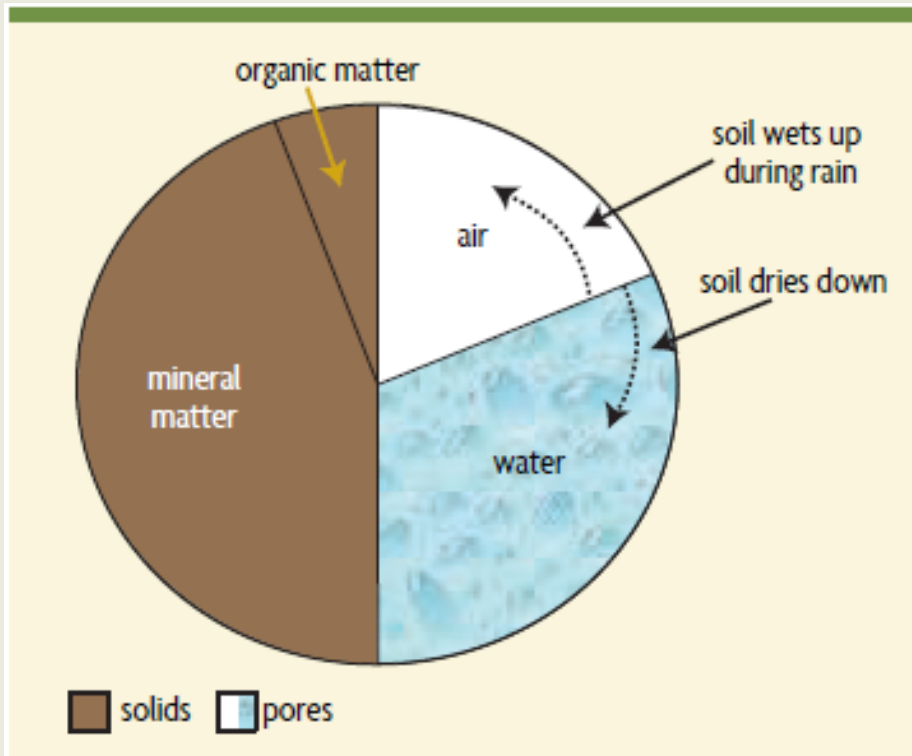
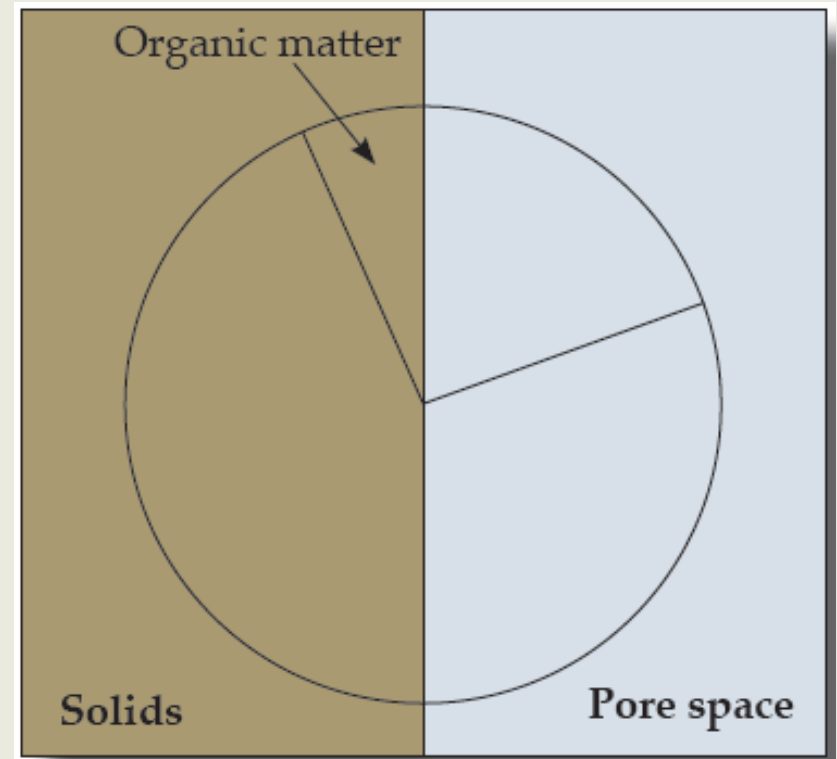


Figure 5.1. Distribution of solids and pores in soil.

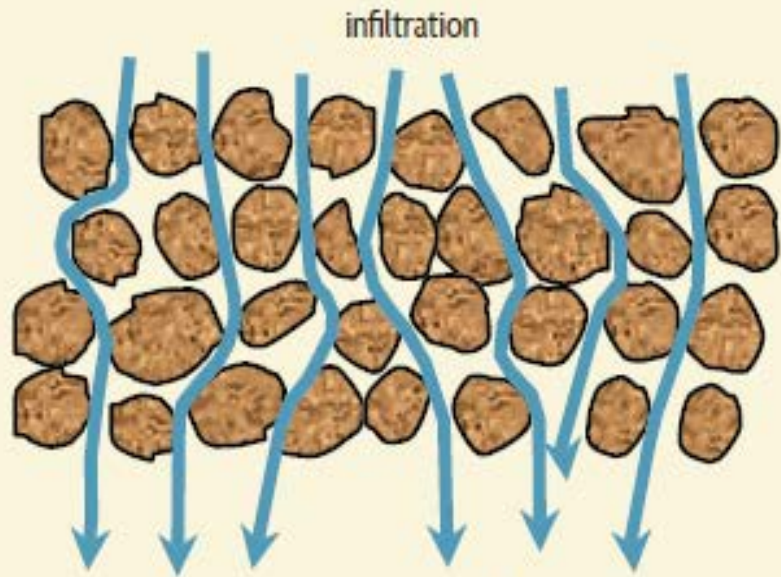


Soil Organic Matter: Glomalin, Fungi and Soil Aggregates

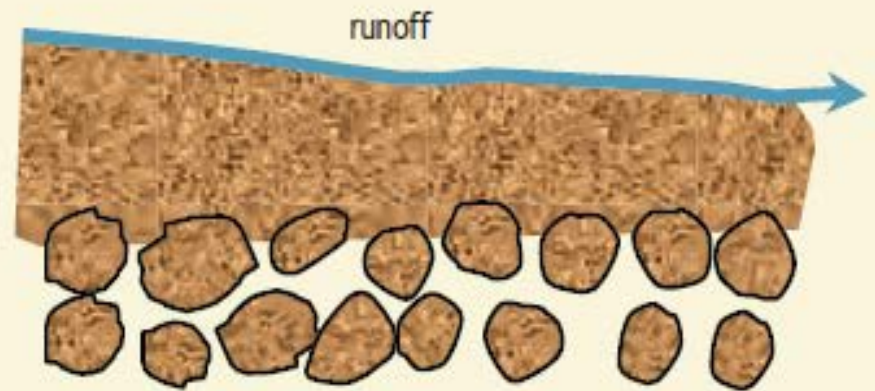


Figure 3. Roots, fungi hyphae, and polysaccharides stabilize soil macroaggregates and promote good soil structure.

Soil Aggregates and Water Infiltration



a) aggregated soil



b) soil seals and crusts after aggregates break down



Left: Note the surface crust on this soil. The field was in tall fescue sod for 11 years. It was cleared and plowed using conventional tillage methods. Photo courtesy Bobby Brock, USDA NRCS (retired). Right: Collected from a no-till field in Georgia's Southern Piedmont, good structure and aggregation are evident in the soil on the right. The same soil formed a structural crust under conventional tillage. Note the sunlight reflectance of the crusted soil. Photo courtesy James E. Dean, USDA NRCS (retired).

A large-scale agricultural site, possibly a composting or soil processing facility. The foreground and middle ground are dominated by dark brown, rich soil mounds. A green tractor is visible in the center, and another smaller tractor is in the background. The background shows a line of trees and a clear sky.

To Maintain Soil Food Web:

Maintain or increase organic matter in the soil

- Compost, cover crops, green manures
- Keep tillage to a minimum

Crop rotation!!—breaks pest cycles

Keep chemical fertilizers and pesticides to a minimum

Organic Production Basics: Good Soil Management

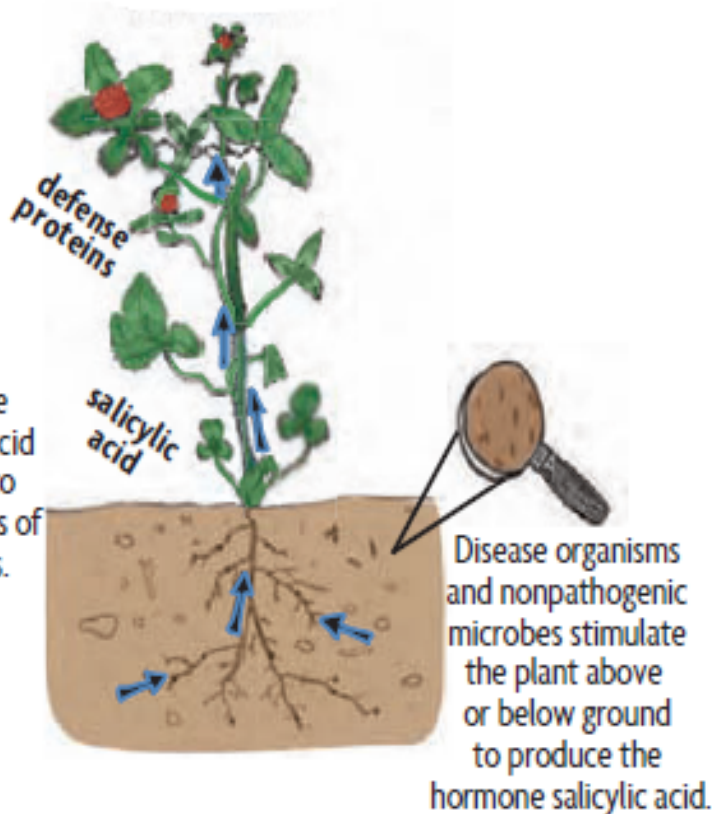


Up to 20% of carbon fixed by photosynthesis in plants is transferred to the soil as root exudates.



Good Soil Management = Good Pest Management !?!?

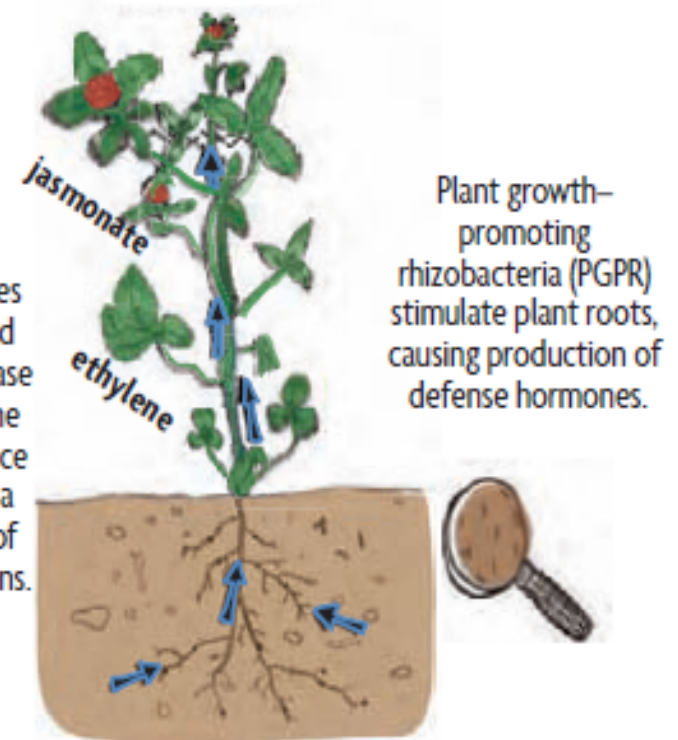
The plant defense proteins provide resistance to a variety of plant pathogens.



a) systemic acquired resistance (SAR)

An increase in the hormone salicylic acid causes the plant to produce many types of defense proteins.

Plant hormones jasmonate and ethylene increase throughout the plant and induce resistance to a wide variety of plant pathogens.



b) induced systemic resistance (ISR)

Plant growth-promoting rhizobacteria (PGPR) stimulate plant roots, causing production of defense hormones.

Cover Crops



Cover Crops



Photo: Rex Dufour



Photo: Rex Dufour

Making Organic Mulches...



Paper mulch is an option..



Remay cloth or plastic mulch is an option..



Spider Habitat...



Spiders are often the first critters on the agricultural scene



Photo: Rex Dufour

Photo: Rex Dufour

Carol O'Meara of Colorado State University showed that more complex landscapes (higher percent woody or herbaceous plants) supported greater numbers and diversity of spiders.



Photo: Rex Dufour



Photo: Rex Dufour

Weed Management: Grazing Options



Weed Management: Grazing Options



Photo: Rex Dufour



Photo: Rex Dufour

Weed Management: Grazing Options



Photo: Rex Dufour



Photo: Rex Dufour

Weed Management: Conservation Tillage & Strip Tillage



Weed Management: Conservation Tillage & Strip Tillage



Weed Management: Mechanical



Photo: Rex Dufour



Photo: Rex Dufour

Insect Management: Habitat 101



Photo: Rex Dufour



Photo: Rex Dufour

Insect Management: Nectar & Pollen



Photo: Rex Dufour

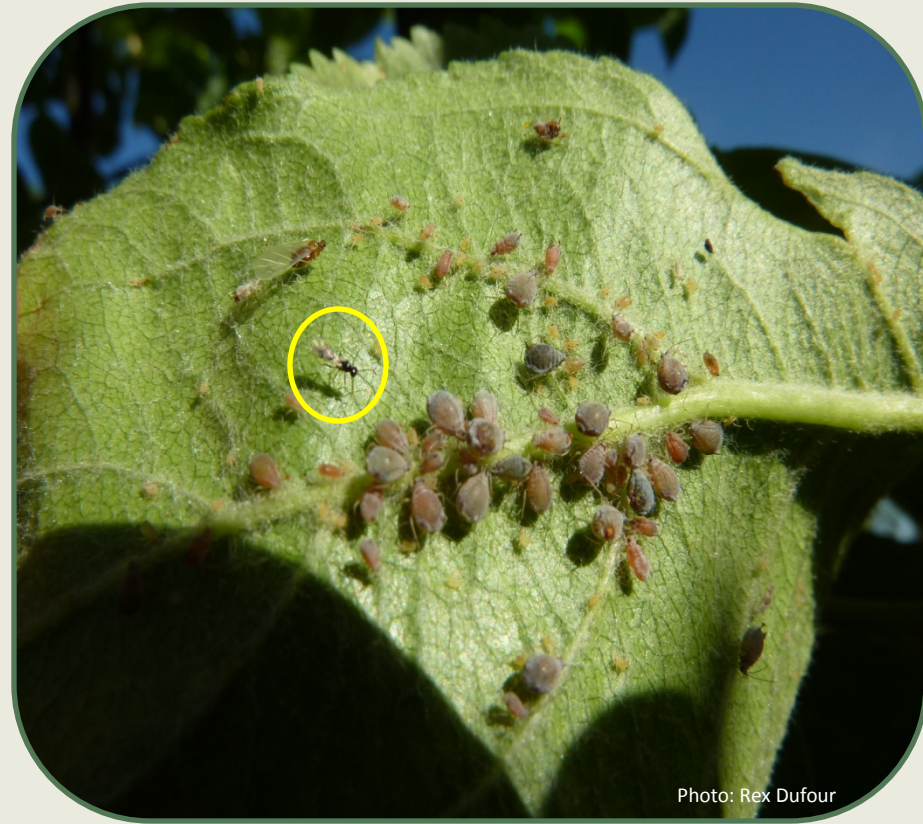


Photo: Rex Dufour

Insect Management: Nectar & Pollen



Alyssum to attract syrphid flies for lettuce aphid control



Syrphid
adult (right)
and larva



Photo: Rex Dufour



Insect Management: Nectar & Pollen Resources

Flowering Periods of California Native Insectary Plants

Common Name	Genus/ sp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Willow	<i>Salix spp.</i>												
California lilac	<i>Ceanothus spp.</i>												
Mule fat	<i>Baccharis viminea</i>												
Coffeeberry	<i>Rhanmus californica</i>												
Hollyleaf cherry	<i>Prunus ilicifolia</i>												
Yarrow*	<i>Achillea millefolium</i>												
Silverlace vine	<i>Polygonum aubertii</i>												
Toyon	<i>Heteromeles arbutifolia</i>												
Golden sticky monkeyflower	<i>Mimulus guttatus</i>												
Elderberry	<i>Sambucus mexicana</i>												
California buckwheat**	<i>Eriogonum fasciculatum</i>												
Deergrass	<i>Muhlenbergia rigens</i>												
Creeping boobiolla	<i>Myoporum parvifolium</i>												
California fuchsia	<i>Zauschneria californica</i>												
Narrowleaf Milkweed	<i>Asclepias fascicularis</i>												
St. Catherine's lace	<i>Eriogonum giganteum</i>												
Coyote bush	<i>Baccharis pilularis</i>												

Insect Management: Annual Habitat



Photo: Rex Dufour



Photo: Rex Dufour

Insect Management: Annual Habitat



Photo: Rex Dufour



Photo: Rex Dufour

Insect Management: Annual Habitat



Photo: Rex Dufour



Photo: Rex Dufour

Insect Management: “Biodiversity Islands”



Insect Management: Plant Structural Diversity



Photo: Rex Dufour



Photo: Rex Dufour

Insect Management: Overwintering Habitat



Insect Management: Perennial Approaches



Photo: Rex Dufour

Perennial Habitat as Buffer Zones

Common size: 25-30 feet

Common buffers: roads, grass, hay, trees (windbreaks), hedgerows



Size of the buffer is directly related to the risk posed by use of prohibited substances on neighboring lands

Biodiversity: An Art & a Science

A monarch caterpillar with its characteristic yellow and black stripes is crawling on a green milkweed stem. In the background, a large, white, elongated milkweed pod is visible against a clear blue sky. The scene is set in a natural, outdoor environment with other green plants and stems in the foreground and background.

Implementing Biodiversity is as much an art as it is a science

Conserve biodiversity on the farm

Get the soils in good shape

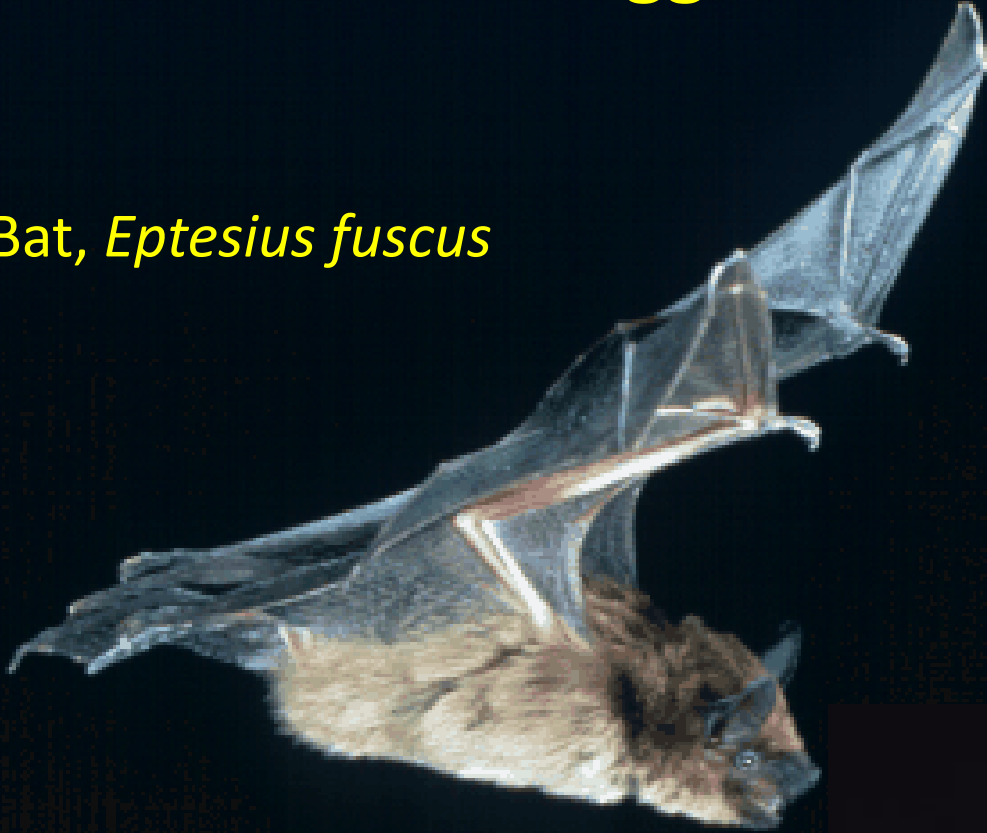
Look for opportunities (unused land) to enhance biodiversity on the farm keeping in mind:

- Plant structure diversity

- Flower diversity (in bloom time & flower structure)

Other “Little Hammer” Suggestions..

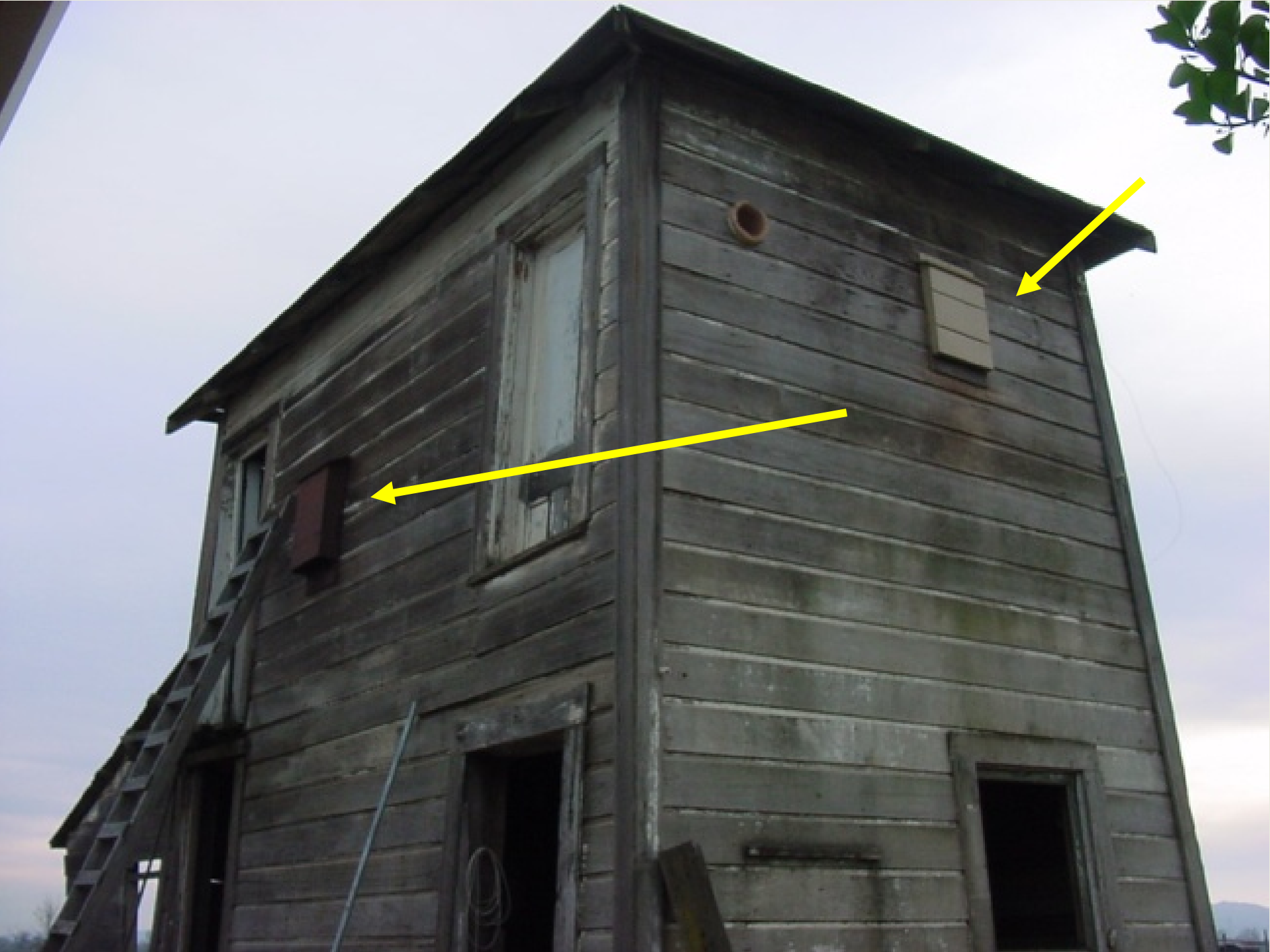
Big Brown Bat, *Eptesicus fuscus*



13 inch wingspan, 5 inch body, weighs up to 1 oz.







NCAT Sustainable Agriculture Project



Biorationals: Ecological Pest Management Database

by Rex Dufour
NCAT Agriculture Specialist

What Is Sustainable Agriculture?

Master Publication List

Education

Energy Alternatives

Beginning Farmer

Field Crops

Horticultural Crops

Livestock & Pasture

Local Food Systems

Refer to the **instructions** below for search usage.

Select a Pest Type

Select a Pest Name

Active Ingredient or Beneficial Organism

OR

Pesticide Trade Name

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al Pest Manage...

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Biorationals: Ecological Pest Management Database

by Rex Dufour
NCAT Agriculture Specialist

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- Master Publication List
- Education
- Energy Alternatives
- Beginning Farmer
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- Horticultural Crops
- Livestock & Pasture
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- Marketing, Business & Risk Management
- Organic Farming

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Reset Search

The database notes which materials are listed by OMRI (**Organic Materials Review Institute**). Because OMRI listings



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Active Ingredient or Beneficial Organism

Pesticide Trade Name



The database notes which materials are listed. Because OMRI listings are frequently updated, organic growers should check their crops or livestock.

- Anisota rubicunda
- Anisota senatoria
- Annual Bluegrass Weevil
- Anoplophora glabripennis
- Ant
- Anthonomus eugenii
- Anthonomus grandis
- Anthonomus grandis grandis
- Anthonomus quadrigibbus
- Anthonomus signatus
- Anthrenus scrophulariae
- Anticarsia gemmatalis
- Aonidiella aurantii
- Aphid
- Aphis craccivora
- Aphis fabae
- Aphis gossypii

Search

Because OMRI listings are frequently updated, organic growers should check their crops or livestock.

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[Pest Prevention Information ->](#)

Your search for: **"Aphid"** has produced 36 results.

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Trade Name	Active Ingredient	Supplier (mouse over for details)	Labels	OMRI Listed
Agroneem	Azadirachtin	Agro Logistic Systems	Label 1	Yes
AgroneemPlus	Azadirachtin	Agro Logistic Systems	Label 1 Label 2	Yes
Allityn Insect Repellent	Garlic Extract	Helena Chemical Co.	Label 1	No
Anti-pesto-o	Azadirachtin	Holy Terra Products, Ltd.		No
Aphid-pruf	Garlic Extract	Kittenmoseley Fertilizer & Supply Inc.		No
Aza-Direct	Azadirachtin	Gowan Company	Label 1 Label 2	Yes
Azatin XL Plus	Azadirachtin	Certis USA, LLC	Label 1	No
Azatrol	Azadirachtin	PBI/Gordon Corp.	Label 1	Yes
Bio-Catch	Verticillium lecanii	T. Stanes & Company Ltd.	Not Registered in the U.S.	No
BioRepel	Garlic Extract	JH Biotech, Inc.	Label 1	Yes
Bioline	Verticillium lecanii	Biotech International	Not Registered in the U.S.	No



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Aphid Prevention

Crop Scouting and Trapping

Plants should be visually inspected for signs of an aphid infestation. Look especially carefully at plants prone to aphid problems, and at plant parts like the undersides of leaves, stems, and new growth. Choose plants randomly throughout the greenhouse and inspect undersides of leaves, buds or tip growth and watch for honeydew and cast skins. Since aphids are difficult to see on plants with fine foliage, hold such plants over a white piece of paper and gently tap to dislodge any aphids. Avoid moving infested plants to new areas where susceptible plants are growing. Locations where aphids are found should be flagged, so that population development and control efforts can be evaluated.

Different aphid species tend to populate different parts of their host plants. Green peach aphids tend to cluster on the succulent young growth, whereas melon aphids are usually evenly distributed along the plant stems. Melon aphid populations also have fewer winged adults than do green peach aphids. Knowing which species is infesting the crop is very important in successful detection and monitoring of aphid populations. The Cooperative Extension Service is a good resource for identification of specific aphid pests.

Yellow sticky cards placed horizontally at the top of the pot or container (if you are growing containerized plants) can be used for monitoring winged aphids. However, since winged aphids caught during the summer months may have blown in from the outdoors, sticky cards are not as reliable as visual inspections. Sticky cards are more useful in the winter months when aphids caught on the cards are not likely to have come in from the outside. It is better to rely primarily on visual inspections for aphid detection, and use sticky cards as a backup method.

Signs of an aphid infestation include honeydew or sooty mold on leaves, yellow spots on upper leaf surfaces, cast skins on leaves, curling of leaves, and distortion of new growth.

Biological Control

There are several biological control options for greenhouse aphid pests. Some common biological control agents (BCAs) include green lacewings (*Chrysoperla carnea*, *C. rufilabris*, *Chrysopa* spp.), aphid midges (*Aphidoletes aphidimyza*), parasitic wasps (*Aphidius colemani* and *Anhidius matricariae*) and lady beetles (*Hippodamia convergens*).

Questions?

Rex Dufour

rexd@ncat.org

530-792-7338



Biodiversity is beautiful