



Lesson: Natural Gardening

Grade: 4-5

Subject: Science, Health, Art (extension)

Students will:

- understand the connection between the use of certain lawn care products and “non-point source” pollution
- learn about natural gardening as an alternative to using fertilizers and pesticides

Teaching Time: 50 minutes

Materials: worksheet, Bugs 101, handout, Common Garden Pest Insects; Beneficial Garden Insects and Plants that Bring Beneficials

(Optional:) Video: “Worm Bin Creatures Alive Through a Microscope”, see Resource section for availability

Vocabulary:

non-point source
point source
pest
beneficial

Lesson concept: *Planning for a Liveable Future* 6-12 curriculum (2000) authored by Shelly Washburn for Metro Regional Services.



Background:

Hazardous waste disposal in Oregon is very costly (about \$1.4 million or more every year). Yard and gardening products such as pesticides and fertilizers comprised 24% of all the hazardous products collected from people’s homes in 1999. These products are often improperly applied which can be dangerous to children, pets and wildlife when they come into contact with these chemicals in the yard. Additionally, the use of yard and gardening products contributes to what is known as “non-point source” pollution. This means that rain and irrigation practices carry the chemicals out of our yards and down into the soil, sometimes into ground wells or other drinking water sources, and into rivers and streams where it damages fish, birds and other wildlife that feed in these watershed areas.

The U.S. Environmental Protection Agency (EPA) estimates nearly 70 million pounds of active pesticide ingredients are applied to urban lawns each year. This figure relates to the 20-30 million acres of lawns that are sprayed in America, resulting in an annual input of between five and seven pounds per acre each year. The Oregon Department of Environmental Quality monitors the health of our rivers and streams, many of which have already been compromised from too much pollution. Thus, it is important to reduce our use of yard and gardening products by using natural gardening practices whenever possible.

Procedures:

- Ask students to name all of the insects they have seen or heard of that live in the area. Write them on the board.
- Now ask students to classify their list of insects as either helpful to humans or harmful. (Some insects will be neither and it is useful to remember that insects play an essential role in the environment whether or not we like them.) Have students explain why they think certain insects are harmful. What does it do?
- Ask students to define what a pesticide, insecticide and herbicide is. Tell them that a pesticide – by definition – is a substance harmful to some living thing. (The morpheme “cide” means to kill.) **Insecticides are harmful to insects. Herbicides are harmful to plants. People use these products to kill insects and weeds that are harming their garden or home. While pesticides are sometimes necessary, overuse of them at home can cause water quality problems miles away. Water from rain or irrigation carries pesticides into street drains and eventually into waterways. This is called “non-point source” pollution. Write the term on the board and present other information described in the Background. Pollution that comes directly from one source like a factory pipe that drains into the river is called “point source” pollution. It is regulated to limit the amounts and types of chemicals that get into the water, but non-point source pollution is very difficult to control. That’s how we can all be a part of the solution to clean up rivers and streams by keeping hazardous products from being released from our homes!**

- Ask students what kinds of problems pesticides might cause. (Students' answers could include pollution that: kills fish, aquatic life, and plants; affects human drinking water; kills or sickens birds and other animals that eat aquatic life, including humans who eat fish from polluted waterways, and can accidentally harm children or pets who come in contact with these chemicals while in our yards.)
- Pass out the handouts and have students individually or in teams answer the questions on the worksheet.

Reflection/Response:

- **What did you learn today about insects and their connection to using less pesticides in our yards or gardens? Does it surprise you to learn that some insects are very useful and that they are “not all bad”?**
- **What are the ways in which having pesticides at our homes is dangerous to ourselves or to the environment?** (Help students make the connection that “left over” chemicals must be properly disposed of as hazardous waste and that chemicals sitting around our homes might be spilled, can create fire hazards, and are dangerous if contacted by children and pets when they have been used in the yard or are left sitting around on shelves. **Lawn care products from homes are the largest contributors to non-point source pollution that contaminates our lakes, rivers and streams.**)

Extensions:

- Have students look up pictures of the beneficial plants and illustrate a garden with some of the plants and insects in the lesson.
- Visit a community garden or invite a landscape specialist to speak about natural gardening and native northwest plants.

Oregon Common Curriculum Goal:

Health Education: Safe and Healthy Environment and Controllable Health Risks and Informed Consumer

- Understand the potential influences of environmental factors on personal and public health.
- Understand and apply prevention and risk reduction strategies for health-related interventions.
- Understand and apply strategies to improve and maintain individual, family, school and community health.
- Evaluate the validity and reliability of health-related information, products and services as a consumer or potential consumer.

Science: Life Science: Diversity/Interdependence

- Understand the relationships among living things and between living things and their environments.

Grade 5 Benchmarks:

- Describe the relationship between characteristics of specific habitats and the organisms that live there.

Answers to Bugs 101 Worksheet:

1. Answers will vary depending on the class background discussion.
2. Cutworm
3. Leaf roller
4. Flower fly
5. Lady bug, lacewing or parasitic wasp
6. Dill, fennel, golden margarite, or purple poppy mallow
7. Yellow
8. Fennel
9. List varies according to student



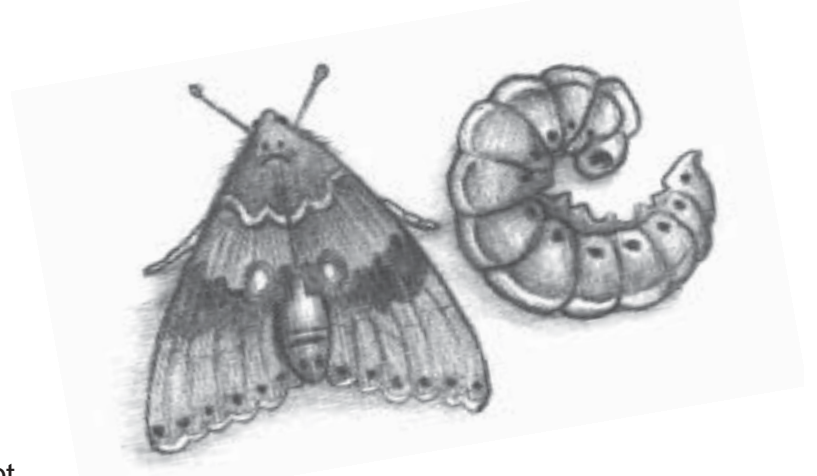
Handout: Common Garden Pest Insects

Illustrations by Antonia Manda



Aphids

Aphids are tiny (about 1/8" long), oval insects that come in an array of colors: green, black, brown, purple, pink, red, and yellow. Some have wings and others do not. They drive gardeners wild when they suck the sap from plants causing them to wilt and curl. Aphids also carry plant diseases. It's hard to keep aphids under control because they reproduce so rapidly. Aphids bear live young and these babies are frequently pregnant when they are born.



Cutworms

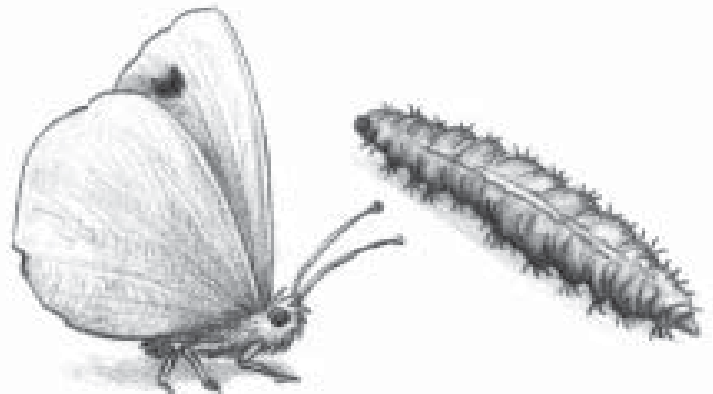
Cutworms are grayish-brown caterpillars that curl up when you touch them. They hide in the soil by day and crawl out at night and nip the stems of seedlings. A visit by a cutworm looks like someone with a pair of scissors attacked your garden.



Crane fly

The European crane fly is a fairly recent arrival in Oregon and looks a lot like the variety commonly found here. Adult crane flies look like giant mosquitoes and are sometimes called mosquito hawks. The common variety is harmless and is found around marsh areas.

Crane fly larvae or grubs are the ones that can cause problems. These are tan, worm-like insects up to 1 1/2" long that live in the top layers of soil and destroy the roots of grass and other plants.



Imported cabbageworm

The adult cabbageworm is a white butterfly with black tips and spots on each wing. They flutter about the garden all summer and can be beautiful to watch. But their green larva eat ragged holes in the leaves of plants in the cabbage family and soil the leaves with dark excrement.

Source: Metro Regional Services: *Planning for a Liveable Future* 6-12 curriculum (2000).



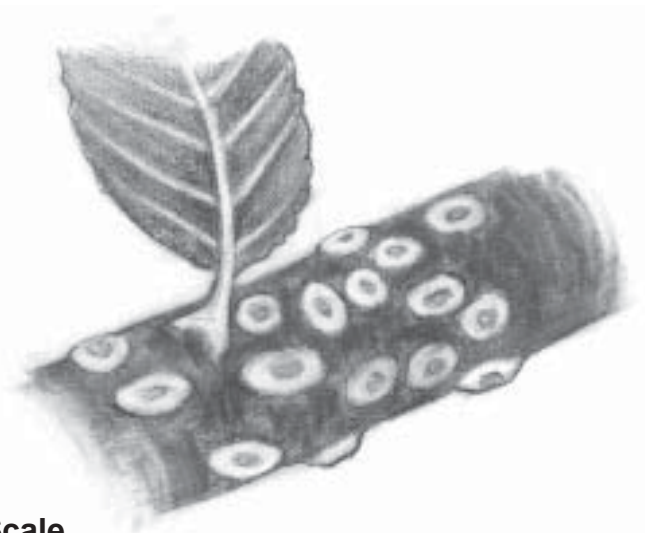
Leaf rollers

The larval stage of the leaf roller is a caterpillar that folds a leaf around it, webs it, and then feeds inside. Different kinds of leaf rollers attack different plants, including apple, willow, and plum trees, blueberries, photinia, and laurel.



Thrips

These are tiny, elongated, fast-moving insects about 1/5" long or less. Adults and nymphs suck sap from plant tissue, leaving silvery spots or streaks on the leaves. Thrips can produce young without mating. This process, like that of aphids, allows thrips to rapidly produce huge populations.



Scale

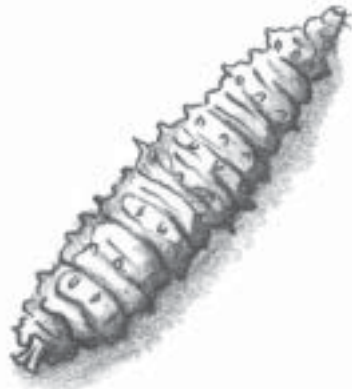
There are many varieties of scale which suck plant sap, weakening the plants and causing leaves to yellow and drop. They have two to four larval stages. The first looks like a mite, and subsequent stages look like smaller versions of the adult females which resemble bumps on stems, leaves, and fruit.



Handout: Beneficial Garden Insects

Illustrations by Antonia Manda

Listed here are only a few of the beneficial insects that help control harmful insects. In addition to insects there are many other animals that feed on pest insects, such as birds, frogs, snakes, ducks, and bats.



Flower flies

Sometimes called hover or syrphid flies, these predators look something like a small yellow jacket wasp, but they will not sting humans or other mammals. They are often found hovering near flowers where they feed on pollen and nectar. Their larvae are legless and feed on aphids and scales.

To attract flower or hover flies, grow pollen-making plants like sweet alyssum and wild mustard. Place fences or grow tall sunflowers in the garden to break the wind. This helps flower flies hover.

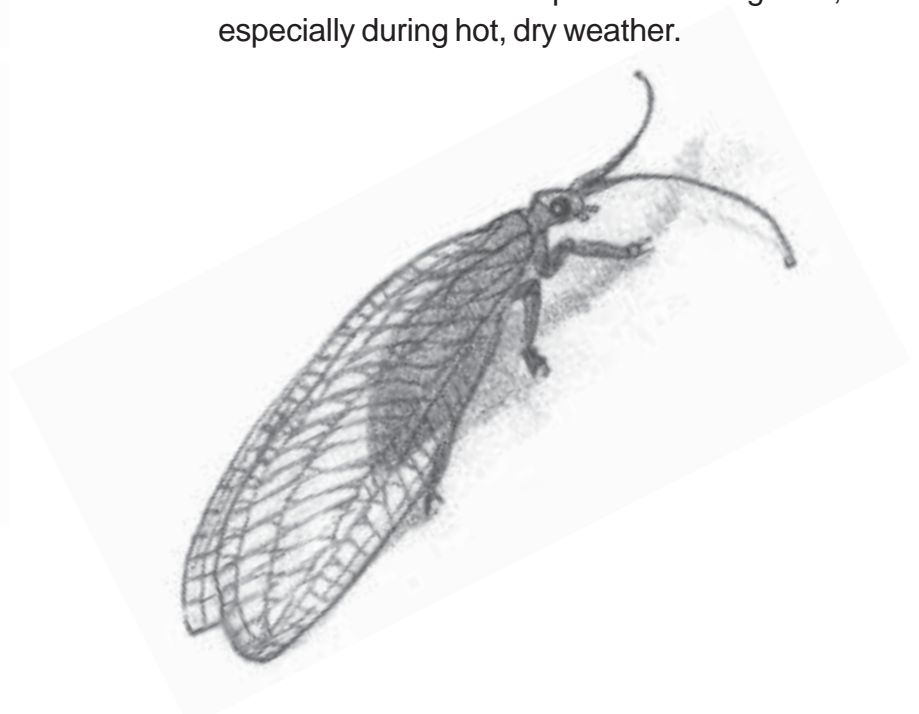


Lacewings

The most common lacewings are bright green insects with large golden eyes and delicate wings. They are about 3/4" long and eat pollen, honeydew and nectar. The tan larvae look something like tiny alligators and eat aphids and other soft-bodied insects. A similar-looking insect is the brown lacewing. It is also an effective aphid predator.



To attract lacewings, plant flowers such as dill, caraway, sunflowers, cosmos, and goldenrod. Provide water in a small pan filled with gravel, especially during hot, dry weather.





Ladybird beetle

Better known as ladybugs, these black and red beetles are found throughout the world. The most common species in Oregon eat aphids and other small, soft-bodied insects. The larva of this beetle are usually black, 1/8" to 1/2" long and somewhat spiny. They look like tiny alligators and feed on aphids.

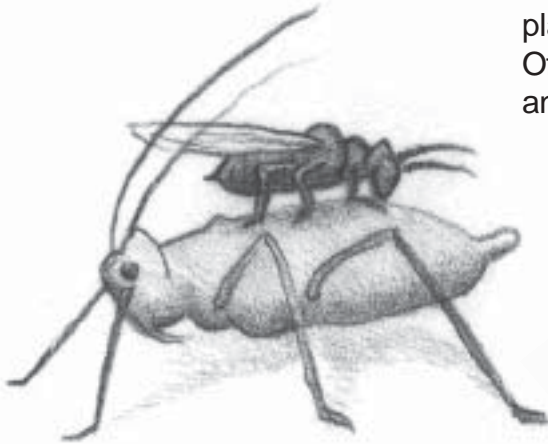
To attract ladybugs, plant dill, goldenrod, yarrow, sunflowers, and corn for pollen. Ladybugs like weedy areas in the yard where they can overwinter. Plant native grasses for these areas.

To attract parasitic wasps, plant mints and herbs. Grow tall plants for shelter.

Predaceous ground beetles

These large, glossy, dark brown or black beetles with grooves down its back will eat many insects. It likes to hide in compost or under plant cover.

To attract ground beetles, grow pollen making plants such as goldenrod and wild amaranth. Offer moist shelter and dense cover with perennials and stone walkways.



Parasitic wasps

Most insects and many insect eggs are host to one or more species of parasitic wasps. Often tiny and delicate, parasitic wasps sting their host insect and lay eggs inside them. The eggs hatch inside the host and feed on it, eventually killing it. In our region, aphids are commonly parasitized by these wasps as well as some caterpillars. Parasitic wasps are extremely effective at controlling insects but are susceptible to most sprays. Parasitic wasps do not sting humans.





Handout: Plants That Bring Beneficials

PLANT	DESCRIPTION	BENEFICIAL INSECT
Dill (<i>Anethum graveolens</i>)	3' tall, yellow flowers, fern-like foliage, annual herb	Lacewings Ladybugs Hover flies Parasitic wasps
Fennel (<i>Foeniculum vulgare</i>)	5' stalks, ferny bronze or green foliage, yellow flowers, perennial herb	Lacewings Ladybugs Hover flies Parasitic wasps
English lavender (<i>Lavendula augustifolia</i>)	1 – 4' tall mounds of gray foliage, spikey lavender flowers, perennial	Hover flies
Fern-leaf yarrow (<i>Achillea filipendulina</i>)	3 – 4' tall, flat yellow flower clusters, perennial	Hover flies Parasitic wasps
Golden margarite (<i>Anthemis tinctoria</i>)	Small yellow daisies, perennial	Lacewings Ladybugs Hover flies Parasitic wasps
Purple poppy mallow (<i>Callirhoe inyolucrata</i>)	Trailing plant with cup-shaped flowers, perennial	Lacewings Hover flies Parasitic wasps



Artwork by Jamie Speirs, Grade 8, Hosford Middle School, Portland SD 1J. Submitted for Metro Regional Services Earth Day Bill Board Contest, 2001.





Worksheet: Bugs 101- Student Pages

What is an insect?

Insects have inhabited the earth for over 200 million years and are found everywhere on the planet – even at the poles. While insects are not always popular, they are necessary. Insects provide food for other animals; they pollinate plants, produce honey, and spin silk. They eat carrion and break down plant refuse. They offer beauty and interest to our lives.

Insects are relatives of the crab and lobster. Like them, they have a hard outer skeleton or shell. The body of an insect is divided into three sections: the head, thorax, and abdomen. Insects normally have three pairs of legs attached to the thorax.

KINDS OF INSECTS

The Class of Insecta is the largest group of animals in the world. The class is divided into 26 orders which describe over a million species. The order of Coleoptera (beetles) alone contains approximately 300,000 listed species. Some authorities believe that we have discovered less than five percent of the insects that live on the earth.

For our purposes here, we will lump many different kinds of insects into these two categories: pest and beneficial. We will call an insect a pest when it becomes destructive in the garden. We'll call an insect beneficial when it pollinates plants or causes no harm. Especially prized by gardeners are those beneficial insects that eat or otherwise destroy pest insects. These are predators.

A very general rule for identifying a predator is this: if the jaws of the insect point OUT, parallel to the surface it is walking on, it is a predator. If the jaws of the insect are pointing DOWN toward the surface it is walking on, the insect is a plant eater.

1. Usually, people think of bugs as unpleasant and something that they want to stay away from. Describe a situation in which bugs are useful to have around. _____

2. Which insect makes your garden look like it was attacked by scissors? _____

3. Which pest would you likely find on your fruit tree or bush? _____

4. Which bug resembles a wasp, but does not sting? _____

5. If you have an aphid problem, which bug would you like to invite to your garden? _____

6. Name two plants that you could put in your garden to attract lacewings. _____

7. Name the flower color to which beneficial insects are commonly attracted. _____

8. Which plant would grow to the tallest in your garden? _____



9. Make a list of all the bad things that can result when certain lawn care products get into the environment.