

Bethel College Mennonite Church Creation Care Committee
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Gardening in an Ecosystem II
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A small cabbage plant recently transplanted to the garden is starting to grow new leaves. Then one morning it lies wilted, clipped off by a cutworm. A beautiful large red tomato is picked to find a hole with a “worm” on the opposite side. These are discouraging events for a gardener. Those pesky insects!! But what is a garden pest? It is an animal or plant that is damaging or detrimental from a human perspective. From an ecosystem perspective, pest is not a very meaningful term. From a dragonfly’s perspective, a mosquito is favorite food. But that is probably not the perspective of most of us.

There are more than a million species of insects that have been described and named. Of these, possibly 10% or 100,000 are potential pests from a human perspective because of what they eat, where they live, etc. Many of the others perform essential services (the insects that pollinate our crops, the predatory insects that keep other populations in check, etc.). Of the 100,000 potential pests, 90% never become damaging because their populations are controlled by various environmental factors – weather conditions, organisms that cause disease in their populations and predators or parasites on the potential pest. There may be 10,000 species world-wide that cause some damage but the species that cause most of the damage probably number in the hundreds.

I welcome insects in my garden. I am willing to share some of my harvest with other species that live in the garden as long as the damage is not too extensive. My management strategy is to try to keep the populations of potential pests low enough that their damage is tolerable. This approach is similar to what is called integrated pest management or IPM. IPM considers the whole ecosystem in determining the best methods for managing pests and then integrates horticultural, physical, mechanical, biological and least-toxic chemical methods in a strategy that is least disruptive to natural pest controls, human health and the general environment.* My strategies have developed over many years and I continue to look for new ways to better manage pest populations:

- 1) **Diversity of species** - I encourage a diversity of species of plants, animals and microorganisms in my garden. I include many different crops and rotate them to different parts of the garden. With diversity, the problems with pests are lessened, compared to the growing of a single crop on the same plot each year. I have a plot of herbs in the middle of my garden because their flowers attract many insect pollinators and the larval stages of many of these insects are predators or parasites that help control other insect populations. Cover crops, mulches and a large amount of organic matter in the soil help maintain habitat for many species.
- 2) **Insecticides** – For many gardeners the method of choice for controlling insect pests is the use of chemical insecticides. Many of these insecticides are actually biocides—that is, they are toxic to many insects and other animals, including humans. Although they may be used with the purpose of controlling a particular insect pest, the molecule does not select but will kill many insects, spiders, etc. living in the crop and may get into food chains in the general environment. Therefore insecticides are a method of last resort for me and I don’t use highly toxic insecticidal poisons that affect many insects and other animals and may get into the human food chain. I use the most specific product and one that breaks down into nontoxic products quickly as I am trying to knock down the pest population to levels that are less damaging, not to eliminate the population. Mostly I use soaps, oils, bacterial products (like Bt), or botanical products (like Neem). However I use these products sparingly for two reasons: a) All of them will affect other populations. The Bt that I use may be only toxic to caterpillars but if I use it often, it will probably reduce the populations of not only the pest species but other species as well and I like to have many butterflies in my yard. b) The selective effect of most of these insecticides may result in populations that are resistant to the insecticide if it is used generally and often.
- 3) **Other methods to protect crops and/or reduce pest populations** – My strategy is to use the most specific and least disruptive method to reduce the pest population or protect the crop. The populations of some insect pests are poorly controlled in my situation and they are troublesome every year. These need long term management strategies. The more I know about the crop life cycle and the pest life cycle the more successful these strategies are likely to be. Other insect pests are only a problem in some years when

weather conditions are especially favorable to them. So I need to observe what is going on in the garden to judge whether I need to take measures to reduce damage from these populations. It is important to include a variety of methods in any strategy since one technique will not necessarily solve the problem.

Cultural methods are very important, particularly in long term strategies – using varieties that have some resistance to the pest and using planting times, irrigation and garden sanitation to minimize damage.

It is important to include measures that enhance the populations of predators or parasites of the pest, such as ladybird beetles (“ladybugs”) and other predatory or parasitic insects, predatory nematodes, spiders, insectivorous birds, etc. And sometimes I order ladybird beetles, parasitic wasps or predatory mites to augment the populations in my garden when they will be effective in preying on or parasitizing particular insect pests.

I often depend on physical barriers to protect the crop when I have not found a good least disruptive method of reducing the pest population. Young cucumber, melon and squash plants can be grown under row covers to protect them from cucumber beetles and squash bugs. Row covers are fine plastic fabric that allows most sunlight and rain to penetrate but keeps out insects. I am much more friendly to rabbits in my yard since I have rabbit-proof fences to keep them out of the garden. But raccoons and opossums can climb over fences and they like to feast on sweet corn the night before I am going to harvest it. I have my own design of electric fence to discourage them and also use live traps to move them away at that time. In the last few years I have been sleeping in the yard near the corn patch when the corn is ripening. Not only does this help protect the corn but it is also enjoyable to sleep under the stars in the middle of the summer. I have also used a product made of clay particles that, when sprayed on plants or fruit, discourages insects from eating them.

If I need to use some insecticide like a bacterial product to reduce the population of a pest, I need to decide how I can best apply it to minimize its effect on other populations. Maybe it can be used in a bait that will only affect those insects that eat the bait. But if there are no obvious ways to prevent extensive crop damage without using a broad spectrum, highly toxic, long lasting insecticide, I will tolerate the damage since I don’t want to damage the ecosystem of many species that I am trying to build up in my garden. That is the advantage of having many crops. A few may fail but there are others that give a good harvest.

- 4) **Weeds** – Weeds are plants that grow very well in association with humans on cultivated ground but for which we have no use. To control weeds, I depend on weed pulling or hoeing or the use of mulches or cover crops to suppress weed growth. I do not use herbicides as a general spray or in a routine way to control weeds because many of the herbicides have more general biological activity. I do sometimes use herbicides to spot spray particularly aggressive weeds, like bindweed, or to paint the stumps of woody weeds.
- 5) **Plant diseases** - Plant diseases are best managed by growing plants under favorable conditions without stress and by using varieties that have some genetic resistance to diseases that are troublesome. I also use some bacterial or fungal preparations or soaps that inhibit the disease-producing organism or stimulate the defensive system of plants.

In the final analysis, my management philosophy is to let nature maintain the ecosystem as much as possible. This can be frustrating because I have expectations and would like to bring “order” out of what sometimes seems like “chaos” in nature. But I can putter around in my garden and try to exert “my control” as long as what I do is relatively benign and does not too drastically disrupt the system. And I not only get a harvest of good food from this effort but other rewards as well – observing a Juniper Hairstreak visiting a mint flower, watching a Wheel Bug feeding on a caterpillar or a Ladybird Beetle eating an aphid, keeping track of a Cicada Killer Wasp digging its nest burrow and provisioning it with food, or the many other “surprises” that I find during a day in the garden.

*The Bio-Integral Resource Center (BIRC) monitors the scientific literature on IPM strategies. You can find information on the BIRC website: www.birc.org. Publications can be ordered from BIRC, PO Box 7414, Berkeley, CA 94707. I have a file of the two journals published by BIRC, the professional **IPM Practitioner** (vol 1, 1979 - to present) and the more popular **Common Sense Pest Control Quarterly** (vol 4, 1988 – to present). These are available for your perusal and can be consulted to find reprinted articles that are listed on the website for sale.