

**Farmscaping & Bugtusslin’: Integrated Parasite/Predator/Pathogen Management & Strategies for Encouraging Beneficial Insects in the Field** or “if you plant it, they will come”. [www.drmcbug.com](http://www.drmcbug.com).

**Start With:** Pyramid of Soil, plants, insects – all levels need to be healthy first.

**Farmscaping** – Dr. Robert BUGG - *Deliberate use of specific plants and landscaping techniques to attract and conserve “Beneficials”*. **Feed your bugs** – Dr. McBug’s **Applied Farmscaping Principles:** I) Increase plant species diversity, II) Increase plant structural complexity, III) Increase time available for colonization and IV) Decrease distances beneficials must travel. & V) Take advantage of insect behavior.

⇒ **I. Increase plant (and thus insect) species diversity - Farmscaping is part of a Multiple Redundant Systems (MRS) approach** – MRS is a form of disaster preparedness – triple redundancy is desirable for plants and insects. So you want “**guilds**” of food plants *and* natural enemies to protect your plants to achieve **BRACKETING** (having a natural enemy for every life stage of the pest(s)). This is why we list **more** than 10 beneficial food plants per season – and, *more than one natural enemy attacking each life stage is better*, too. Less can lead to breakdowns during times of stress or drought.

Pest	Stage Egg	Larva 1	Larva2	Larva3	Larva4	Larva5	Pupa	Adult
Imported Cabbage-Worm	Ladybugs Syrphids Lacewings Trichogr.	Braconids Ladybugs Syrphids Lacewing	Same As Larva 1	Assassin Bugs, Carabid Stink Bug	Same As Larva 3	Paper Wasps Bugs, Carabid Beetles	Ptero Pupa, Bugs, Carabi ds	Dragonfly Robber Fly Spiders
Japanese Beetle	Carabids Nematodes	Nematodes (Hb), Milky spore	<i>Tiphia vernalis</i> Nemas Milky Spore	Tiphia, Nemas, Milky Spore	No Such Stage	No Such Stage	None	Tachinid- <i>Istocheta aldrichi</i>

[Table 1. Example listing for Imported Cabbageworm and Japanese beetle of more than one natural enemy/life stage, thus achieving **Guilds** of Natural Enemies for each life stage. Japanese beetle needs more natural enemies for each life stage.] Next, you ensure you have the plants for the beneficials @ each stage.

**II. Increase plant structural complexity.** By having plants that have complex leaves and intricate growing patterns, you can create more surface area, and thus more niches for your beneficials in which to hide and live. “Stack and Pack” your farmscaping plants. **However, specific plants can attract specific beneficials** – example: fennel is great for attracting parasitic wasps, syrphid flies, and ladybugs. So one plant can bring in a guild of beneficials. **Overwintering sites for beneficials** - It turns out that many beneficials make cocoons and hibernate in or very near the plants where they find their hosts. Recent research has shown that yarrow and comfrey are also excellent overwintering plants for parasitic wasps.

**III. Increase time available for colonization and reproduction by beneficials – Have something blooming all the time** - by starting with early spring blooming plants like crocus, daffodils, mustards, radishes, etc., and progressing through the season until late fall and then **overwintering** plants, you can get more generations of beneficial insects than normal, and get high population levels of beneficial insects earlier than ecosystems that lack early- and late-season farmscaping plants. Flowers are prime food & mating sites for wasps, flies, and other beneficials. Important to have a well fed, mated female beneficial! Green House – use to Jump-start garden areas.

**IV. Decrease distance beneficials have to travel to protect your crop.** “Lots of clumps of food plants spread out over an area are much better than one big clump.” **Consider Dispersion indices for insects when foraging – “Insect Specs”:**

Low Dispersion- (Stay in field)	Medium Dispersion (forage 1/4 mile)	High Dispersion (forage > 1/4 mile)
Ground Beetles (Carabids) Ladybeetles (when happy) Smaller Parasitic Wasps	Most Parasitic wasps Predatory Wasps – Paper Predatory Bugs	Syrphids – Hover Flies Dragonflies, Tachinid Flies Larger Parasitic Wasps

⇒ **V. Take advantage of insect behavior. Entrainment** – (entomologists– Joe Lewis really opened up this field) have discovered that insects (especially parasitic wasps and flies) can perform associative learning, so if you get insects (especially young ones) happy in their environment, they will “tune in” to a particular pest. A good way to do this for a predator or parasite is to release it on or nearby the intended prey.

