



Top: The picture on the left is an aphid mummy from a released *Aphidius* species. The picture on the right is from a volunteer parasitoid. When growers switch to biocontrol, it is common for other local predators and parasitoids to show up and help out. PHOTO COURTESY OF EVERGREEN GROWERS SUPPLY
 Bottom: Pam Marrone, Ph.D., is the CEO and founder of Marrone Bio Innovations Inc., evaluates a vineyard trial. PHOTO COURTESY OF MARRONE BIO

Green practices and silver bullets

Integrated pest management, or IPM, has continued to improve and deliver benefits for growers

BY ERICA BROWNE GRIVAS

WHILE INTEGRATED PEST MANAGEMENT (IPM) has been an accepted best practice for growers since its introduction in the 1960s, it hasn't always been growers' first choice when looking for a fast, efficient answer to their crop dilemmas.

The field of study has expanded exponentially in recent years, along with the appreciation for its efficacy. In as little as a season or two, growers have seen that IPM practices can be less expensive and safer for their workers and the environment than traditional chemical responses.

IPM offers growers flexible options that are sorely needed as alternatives to some chemicals, experts say.

"Every grower you talk to is trying to work these things in," Chris Hedstrom of Oregon Integrated Pest Management Center said. "They are starting to see problems with resistance, restrictions, and regulation." He cited new and pending restrictions on chlorpyrifos, popular with strawberry growers, and the widely used glyphosate, also known as RoundUp.

"I think, historically, growers have always been a bit more dubious

about biological products," said Tim Johnson of **Marrone Bio Innovations Inc.** "But, there's a lot more science behind them now on how they actually work. They are growing much faster in sales and market share."

While IPM was initially based on reducing chemical inputs, today's version integrates chemicals when needed as a last resort — in the safest form. IPM is a living system.

"Growers want to know, 'What's the IPM way of doing it?'" Hedstrom said. "But it's not that simple." There are many moving parts.

IPM has come a long way. In addition to promoting a healthy environment and hands-on observation, today's IPM includes bioengineering at the most complex level from nematodes to beneficial insects — who might be delivered by drones.¹

The basic principles

If chemical responses are like allopathic medicine, focusing on treating symptoms, then IPM is more like integrative medicine, which acts preventatively to alleviate the causes of disease. It's ➤



Green practices and silver bullets

Marrone provides several options for greenhouse growers. PHOTO COURTESY OF MARRONE BIO INNOVATIONS

more about prevention than reaction.

For example, Steve Bogash of Marrone Bio Innovations said, “If I am running a greenhouse in a place prone to grey mold or *Botrytis*, and I know rain is coming, I’m going to behave as if I have this disease. I’m going to be venting, making the air dry — I don’t need to see a single blooming spore.”

IPM considers the health of the entire ecosystem first and foremost — comprising plants, insects, and humans. It supports health by avoiding disease-prone conditions and cultivars, encouraging beneficial insects, and if an issue develops, responding with the lowest-risk solutions first before ascending the scale.

The four main stages of IPM are known as PAMS: Prevention, Avoidance, Monitoring, and Suppression. It can be tempting to take a shortcut to the Suppression stage — after all, the end goal



is a pest-free crop. If we don’t want aphids or spider mites, wouldn’t it be faster and easier to spray them, or even spray for them preventatively?

There are a few issues with that strategy. For example, depending on your tank mix choices, certain chemistries can require large wait times for reentry, kill beneficial predators if sprayed at the wrong time, and become less effective with developed resistance with repeated use.

PAMS can be used to manage the growing environment address specific issues.²

Prevention includes having clean, pest-free plant stock — ideally bareroot/dormant — that is inspected and quarantined from existing stock, employing protocols to avoid contaminating the nursery with new pests or seeds (employees changing clothes and shoes between areas), and keeping records of plant material and sources. Sanitation of soil and pots ensures a clean base. Sealing windows and maintaining doors and screens will help deter uninvited visitors.

Avoidance means removing infected plants from other healthy materials if a pest or pathogen is discovered. Using less pesticide encourages beneficial predators of undesirable insects and invertebrates. If a pesticide is needed, choosing occasional drenches of chemicals is safer for beneficials than frequent sprays. Using drip tape irrigation rather than overhead watering can help prevent spider mites, who are drawn to parched leaves, and fungal diseases.

Monitoring involves closely inspecting plant material — known as “scouting for disease”, keeping scrupulous annual records about incidents and responses, and communicating protocols to train new and existing staff. Consider using sticky traps to evaluate levels of flying insects or indicator crops for shared pests. For example, some growers cultivate eggplants near poinsettias to test for aphids. Monitoring is based on “threshold levels” which vary based on the crop and situation. A pest may be permissible at certain times of year but not others. Supermarkets can’t tolerate leaf damage in produce, for example.

Suppression can be cultural, such as using cover crops or groundcovers to out-compete weeds; biological, like employing or supporting natural predators or pheromones; chemical, using pesticides; or mechanical, from hand-picking to mowing or burning.

Quality Bark at Wholesale Prices

**Fir and Hemlock Bark • Sawdust
Compost • Hog Fuel • Fines
Rock, Chips, Bark Rock**

Marr Bros. Bark has been serving the area with quality products and competitive pricing for over 30 years. And we deliver anywhere in the Willamette Valley!

**When you want the best ...
Marr Bros. is your only choice!**

**Call 503-838-1830
to schedule a delivery**

**Conveniently located at:
875 S. Pacific Hwy, Monmouth, Ore.**



Marr Bros. Bark



A collection of petri dishes are full of microbes for study.

PHOTO COURTESY OF MARRONE BIO

Beneficial benefits

One of the biggest growth areas in IPM has been in the development by insectaries of such biological predators, or beneficials, for indoor growing. Margaret Parks, a consultant for Clackamas County-based distributor Evergreen Growers Supply, says they offer several advantages over chemical methods.

“Work isn’t interrupted, you don’t have to clean a sprayer, or mix batches, or use special protective equipment,” Parks said. “Beneficials work as well during the next week or month as the day you release them.

They eat and make babies and many will continue to control pests over time. When growers use them proactively, they can be competitive or cheaper than other approaches.”

Sometimes they establish so well they don’t need replacing. She recently visited a grower who was using aphid prevention *Aphidoletes*. They were about to release the new shipment for this year when they realized the colony had proliferated and was already eating the aphids.

Once you introduce beneficials, you have a new live crop to keep alive and happy. Some chemistries — even “soft” ones made from essential oils — can negatively impact beneficials. Parks recommends checking with your product consultant about resi-

due impacts before using.

A quick tip on *Aphidoletes*: high winds disoriented them, so it’s important to keep the greenhouse fan off a few hours a day so they can mate and find aphids.

“They can’t smell the aphids or the singles club (in the wind),” Parks said.

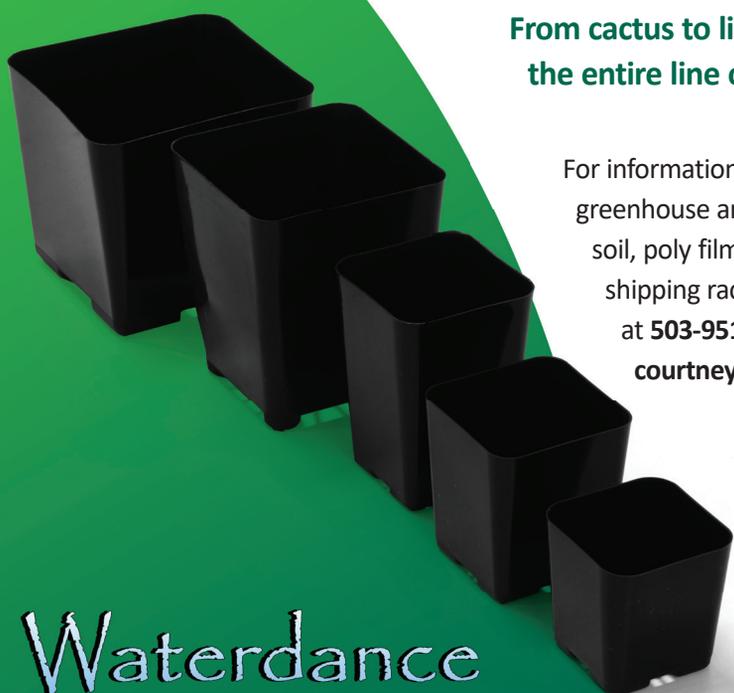
How to get started with beneficials?

“It’s unique to every situation — everyone has the unique environment and pests they are the most concerned about,” Parks said. “Sometimes it’s a combination of beneficials that can add stability the ecosystem.”

In a crisis outdoors, she recommends tackling the worst acre — the most afflicted — first, because it’s the lowest risk.

Ideally, the best time to think about beneficials is before you plant the crop. “Every dollar matters in a nursery situation,” Parks said. “The [indoor]





It /S Hip to Be Square

From cactus to liners to rose pots, T&R Company carries the entire line of Waterdance square containers.

For information on Waterdance products, greenhouse and nursery containers, soil, poly film, stakes, or our line of shipping racks, call Courtney Lewis-Borts at 503-951-3929 or email courtney.lewis@trlcompany.com





T&R Company
Trust & Reliability for Over 50 Years

www.trlcompany.com

Waterdance

Green practices and silver bullets

Plants treated with biopesticides, such as those on the right, are healthier and can result in higher yields. PHOTO COURTESY OF MARRONE BIO INNOVATIONS



propagation area is a good place to start usually, because it's smaller, confined, typically with fewer bugs. Growers are often watching propagation more carefully, and it's a situation where you know there is not usually much pesticide residue."

Biopesticides working from the inside

Scientists are also developing new biopesticides that work with the plants internal biology to combat disease. For instance, Bogash points out that Regalia™, an extract of giant knotweed (*Reynoutria sachalinensis*) doesn't work directly on powdery mildew.

"Instead, the pathway you turn on in the plants make the plant secrete fungitoxic and bacteritoxic compounds and thickens up the outside epidermal cells," Bogash said. "You've made the plant a substantially tougher organism. It's very difficult for a disease to get entrenched."

Bogash recommends using Regalia

through the season to keep the biological pathway active. Then, if there is an outbreak, combine Regalia with a synthetic like copper. He often recommends a mixture of Regalia plus Mancozeb/Dithane and copper as a "tonic" for vegetables and ornamentals. Like many of Maronne Bio's products, Regalia has a minimal reentry interval (REI) of four hours.

Also at MBI, Tim Johnson pointed out that Grandevo™ is a broad-spectrum insecticide for sucking mites that is safe for beneficial mites. It is especially useful for indoor growers who have widely adopted biocontrol agents. Outdoors, it's proven effective on spotted wing *Drosophila* on berries.

Steve Carlson sees growers' issues first-hand as a horticulturist for Marion Ag Service in St. Paul, Oregon. He might recommend Botector™, which colonizes plant tissue to edge out *Botrytis*, or Tricoderma™, a fungus which attacks or blocks other fungi

like *fusarium* in the roots.

Marion Ag Service offers Crop Watch to help with monitoring, using trained interns to check select areas for busy growers. His wish is for improved information on identifying lifecycles of insects and guidelines on threshold levels.

"Can we tolerate two aphids per leaf if natural enemies are around, or do we spray wherever we see them?" Carlson asks. Hedsrom agrees. "Extension agents will say '30 cabbage aphids per leaf,' but a restaurant or CSA customer may be able to tolerate some leaf damage, while a supermarket will tolerate none."

Carlson considers the main expense for transitioning to IPM to be the purchase and distribution of beneficials — especially considering the cost per acre on a large scale. For high-value crops, growers may be able to defer some labor cost and gain efficiency with drones. A California-based company called Unmanned Aerial Vehicle Intelligence will send drones to target crops in the field more precisely than by hand at an additional \$20 per acre. A big X factor for IPM is how to handle some of the novel invasive pests that are proliferating too fast for scientists and horticulturists to deliver solutions, like Spotted Wing *Drosophila*, Azalea lace bug (*Stephanitis pyroides*), and stink bug (*Halyomorpha halys*).

The attention needed for IPM offers a payoff of being closely attuned to the ecosystem you are managing, and an ability to make smaller, safer changes as needed to benefit your plants, your workers, and your consumers.

"There is an economic investment in getting an IPM program started from scratch," Hedstrom said. "But, I certainly think it's worth it. ☺"

Erica Browne Grivas is an award-winning journalist and gardener pushing zone boundaries in Seattle, Washington. She can be reached at ebgrivas@gmail.com.

1. <https://fruitgrowersnews.com/article/california-drone-company-releases-beneficial-insects/>
2. *Integrated Pest Management Strategic Plan for Oregon Nurseries* Chris Hedstrom, Isaac Sandlin et. al – not yet published – used with permission from Chris H.]



F&L LUMBER, INC

WHOLESALE LUMBER BROKERAGE



Specializing in Nursery Lumber Needs!

- **Tilt Sticks**
1X1-8' or cut to your length
2X2-8' or cut to your length
1X2-8' or cut to your length
- **Container/B&B Pallets**
- **Gates/Gate Boards**
1X4-8' or cut to your length
- **Tree Stakes**
- **Shipping Racks & Gates**

Call Michelle at **503.803.1175** or fax: **503.212.0160**
FLLUMBER@AOL.COM • **WWW.FLLUMBER.COM**

Where Great Customer Service is a Given! We accept Visa and MasterCard