



Texas Apiary Inspection Service

Integrated Pest Management for Honey Bee Health

What is Integrated Pest Management?

Integrated Pest Management (IPM) is an innovative approach to controlling pests and diseases of a host species. IPM stresses the idea of prevention when possible, monitoring for pests, and when deemed necessary, controlling for pests using judicious methods that take into account both effectiveness and risk.

IPM strategies exist for each pest or disease and take into account pest biology, pest-host interactions, and the safety of the environment, people, and the commodity. Unlike traditional methods of managing for pests and diseases (i.e. calendar-based applications of pesticides), IPM uses a system of monitoring to determine if and when to intervene. IPM stresses the idea that a certain level of pests is acceptable (Figure 1). Only when that pest level exceeds the set action threshold is intervention necessary. An action threshold is the highest population that a pest can reach before damages to the host are likely to occur.

By treating only when necessary, the amount of pesticide in the environment is limited, resistance to chemicals is decreased (particularly if chemicals are used in a rotation), and farmers often save money by not buying unnecessary pesticides.

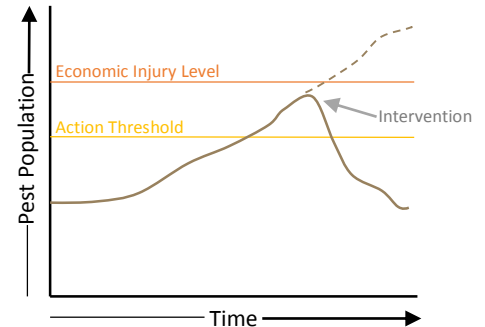


Figure 1. Action threshold –the highest population that a pest can reach before losses are likely to occur

What are the steps of IPM?

There are five steps used in an IPM strategy as demonstrated in Figure 2: prevention, monitoring, identification, action, and evaluation.

- **Prevention** –prevention is used before a pest develops, as well as to stall the inevitable buildup of pests. Using preventative methods is a great strategy to minimize the amount of pesticides needed later. The best form of prevention for honey bees is maintaining strong, healthy colonies through [best management practices](#).
- **Monitoring** –a critical step of any IPM routine. The results of monitoring, and sampling are what determine what action to take. If the set action threshold has been crossed, action is indicated. Monitoring for honey bee pests should be part of any hive inspection. Using a combination of visual inspection and sampling, depending on the pest or disease, will determine if action is needed.
- **Identification** –the positive identification of pests is necessary to make an accurate assessment. Without proper identification, any techniques or pesticides used will likely have no effect on the target species of pest, allowing it to continue to spread.
- **Action** –once the action threshold has been crossed, intervention is required to prevent further damage. For a beekeeper, this is a critical point which may determine whether a failing colony will survive or not.
- **Evaluation** –after action is taken, evaluate the pest levels post-treatment. If the pest level is still above the action threshold, consider using a different control strategy or combine approaches.

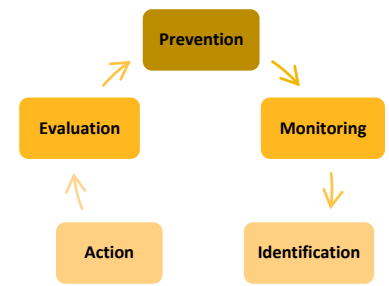


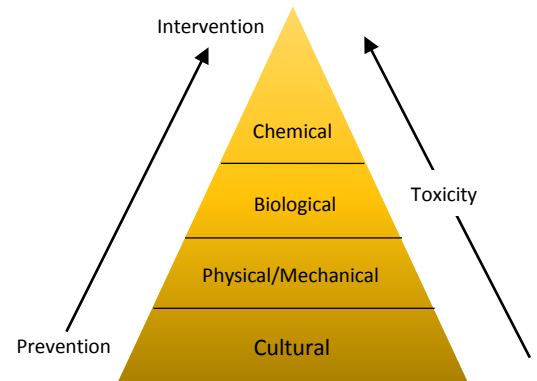
Figure 2. Steps of an IPM approach

1. "Best Management Practices for Honey Bee Health." *Texas Apiary Inspection Service*. <http://txbeeinspection.tamu.edu/best-management-practices/>
2. Hood, Michael. "What Integrated Pest Management Mean's For Today's Beekeeper." *Clemson Cooperative Extension*. <http://www.clemson.edu/extension/beekeepers/fact-sheets-publications/pest-management-publication.html>
3. "Integrated Pest Management." *eXtension.org*, April 23, 2012. <http://articles.extension.org/pages/17849/integrated-pest-management>
4. "Introduction to Integrated Pest Management." *United States Environmental Protection Agency*. <https://www.epa.gov/managing-pests-schools/introduction-integrated-pest-management#action>
5. "Tools for Varroa Management, A Guide to Effective Varroa Sampling & Control." *Honey Bee Health Coalition*. April 7, 2017. <http://honeybeehealthcoalition.org/Varroa/>

What types of controls are available?

IPM utilizes many different methods of control and encourages the rotation of methods to decrease the likelihood of resistance. The IPM pyramid (Figure 3) represents the types of controls that are used, beginning at the bottom of the triangle with the least invasive options, then moving up the triangle as necessary.

- **Cultural Controls** –includes anything that would disrupt the environment of the pest and is often employed as a preventative strategy. Examples of cultural controls in beekeeping could include:
 - For small hive beetle (SHB): placing hives in full sun.
 - For Varroa mites: using resistant stock.
- **Physical Controls** –exploits the physical limitations of the pest. Examples of physical controls in beekeeping could include:
 - For SHB and wax moths: freezing drawn comb to eliminate any larvae.
 - For wax moths: using ventilation and light when storing unused equipment.
- **Mechanical Control** –using mechanical techniques to decrease pest populations. Examples of mechanical controls in beekeeping could include:
 - For SHB: smashing any visible adults on boxes or frames, or using traps.
 - For Varroa mites: using screened bottom boards or utilizing drone brood removal.
- **Biological Control** –utilizes natural biological processes and natural enemies. Examples of biological controls in beekeeping could include:
 - For SHB: nematodes used as a soil treatment to kill pupating beetles.
- **Chemical Controls** –utilizes both organic and synthetic chemicals. **Always read, understand, and follow the label of any pesticide. Remember, the label is the law.** Examples of chemical controls in beekeeping could include:
 - For Varroa mites: check out the [Honey Bee Health Coalition's Tools for Varroa Management Guide](#) for a details regarding monitoring for and controlling Varroa mites.



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Figure 3. the IPM pyramid of strategies

As a beekeeper, why should I use an IPM strategy?

The beekeeping world has experienced many changes and challenges during the last 40 years. The introduction of tracheal mites, Varroa mites, and small hive beetles has shaped how beekeeping has evolved and influenced how pest control has developed in the beekeeping world. While tracheal mites have decreased in prevalence, Varroa mites and small hive beetles are still present, despite efforts to eradicate them. Varroa mites in particular are pervasive throughout managed and feral honey bees and cause extensive damage.

Due to these new pests, the use of chemicals in and around hives is sometimes necessary and commonplace. However, use of traditional methods of pest control (calendar-based systems; dependence on a single chemical) has led to widespread Varroa mite resistance to fluvalinate and coumaphos, terramycin-resistant strains of American Foulbrood, and pesticide persistence in both wax and honey. In order to rectify these issues and sustain healthy colonies, beekeepers must be innovative in their approach.

As a responsible beekeeper, it is imperative to remain a step ahead of pests and disease. While it does require more time, energy, and a greater knowledge of pest biology, using an IPM strategy offers many solutions to the problems beekeepers face. IPM often saves beekeepers money by reducing colony loss, it decreases the chance of pests becoming resistant to pesticides, and it releases less pesticides into the environment, the hive, and the hive products by not relying on a single pest control plan. Most importantly, however, using an IPM strategy will drastically increase the likelihood that colonies survive and thrive, which is the ultimate goal of any beekeeper.