1 Integrated Crop and Pest Management

1.1 Introduction

The purpose of this publication is to help growers make informed choices best adapted to their individual orchards. The best way to use this guide is to become familiar with it as a whole before using it to answer specific questions during the busy growing season. Integrated Pest Management (IPM) is the guiding philosophy behind this publication. It is a multifaceted approach to maintain pest damage below economically damaging levels.

The word "Integrated" refers to the fact that individual management decisions are not isolated, but take into account, to the greatest extent possible, all aspects of the existing and potential pest situation in relation to the overall farm operation. Integration also applies to combining multiple tactics in a way that reinforces their efficacy. The word "Pest" refers to insects, mites, weeds, pathogens that cause disease, and animals such as deer and voles.

Instead of focusing on how to eradicate pests, IPM considers pest biology and all feasible preventive and curative options, and brings them together into an overall "Management" plan. The goal of IPM is to make informed decisions leading to results that meet economic, environmental, and social objectives.

1.2 Practicing IPM

Using IPM requires integrating management tools in a complementary way to create an overall management plan that is efficient, effective, and sustainable. By using multiple tactics, the chance of successful results is increased, and the chance that a pest population will adapt to a specific tactic is decreased. Horticultural practices, such as sanitation and habitat management, are a first line of defense in preventing many types of pest problems.

Using an IPM approach requires accurate identification and risk assessment of pest threats. Services in New England that provide insect and disease diagnosis and soil and tissue analysis are listed at the end of this publication. An understanding of pest biology and ecology and the influence of factors such as weather and natural enemies on pest abundance will aid in choosing management tactics.

Instead of total eradication, IPM programs stress suppression of pest populations to levels that do not cause economic damage. Use of pesticide and other pest control options reaches a point of diminishing returns at which additional suppression is exceeded by the additional cost and negative impacts. In the case of insect pests, it may be important to have at least some pests present to ensure that natural enemies will remain in the orchard to suppress subsequent pest infestations.

1.3 Components of IPM

1.3.1 Monitoring (Scouting)

Scouting is making observations to identify and measure pest populations. For some insect pests, traps can be used to indicate population density to compare against treatment thresholds and to identify optimum timing for control measures. For diseases, weeds and some insect pests, inspecting foliage, fruit, or groundcover is required. Monitoring individual orchard blocks throughout the season is the most effective way to assess the insect, disease, and weed situation and, therefore, the need and timing for chemical treatment. Scientifically based, accurate, and efficient monitoring methods are available for many tree-fruit pests. Brief descriptions of recommended monitoring methods are included in the "General Pest Management Consideration" notes for each crop in this publication.

1.3.2 Pest Models and Forecasting

Weather-based pest development models for some pests can be used to estimate the best timing for monitoring, prevention, or control. A record of daily maximum and minimum temperatures and rainfall can provide useful input for pest models and to estimate depletion of protective residue from a previous pesticide application. Alternatively, site-specific weather data are available from private companies (see IPM Resources). An on-line tool called Orchard Radar processes weather data through IPM models, and is available through the PRONewEngland.org website. Information on the potential for pest outbreaks can also be obtained from Cooperative Extension newsletters and regional crop advisors.

1.3.3 Action Thresholds

A pest threshold is an estimate of the population density at which treatment is justified because the cost of economic damage is likely to outweigh the cost of prevention/control. Thresholds have been scientifically determined for some pests. For other pests, generally accepted "best guess" thresholds are used. By comparing pest monitoring observations with thresholds, tree fruit growers have been able to reduce pesticide use by as much as 50% without jeopardizing crop quality or yield. In fact, the risk of damage can be decreased by early detection and evaluation of pest threats. The term ***suggested action threshold*** in this publication denotes situations in which the decision to apply a pesticide or not can be made primarily on the basis of a properly timed visual inspection of the orchard. Grower judgment is needed to apply general recommendations to individual orchard situations. Your knowledge and records of block history are very important to make decisions appropriate for your orchard.

1.3.4 Management Tactics

Appropriate management tactics to prevent or control pests include cultural, biological, and physical methods, as well as chemical control (i.e.pesticide) when needed. Chemical control is deferred unless other tactics are not sufficient in order to minimize the social, environmental, economic, and safety concerns associatedi wth pesticide use. Implementing some of the simple and relatively inexpensive non-chemical pest management methods described in this manual can yield significant savings in pesticide use and crop loss. Preventive measures taken before pest damage occurs can be much less expensive than the cost of rescue treatment later.

1.3.5 Recordkeeping

A yearly record of pest monitoring observations, treatment actions, and an end of season damage assessment provides a valuable reference for future decisions. Written records are likely to be more complete and accurate, and are more easily shared than memory. Having a pest management records to refer to can not only improve results and decrease costs, they also serve as documentation to justify actions and verify compliance with regulatory or customer requirements, and be used in business planning. Post harvest evaluation of the season's pest management supports learming from mistakes and building on successes.

1.4 IPM Tactics

Actions taken at planting and before and during each growing season can affect the degree of pest risk and need for pesticide use. Here is an outline of methods that can be integrated into an overall management plan.

1.4.1 Cultural and Physical Controls

There are commercially viable scion cultivars available that are resistant to apple scab and other major apple diseases. Among susceptible cultivars, the degree of susceptibility to different diseases and even some insect pests varies.

Rootstock selection should account for desired horticultural traits, soil conditions and low temperature hardiness, but can also include consideration of the degree of management needed to prevent fire blight and Phytophthora diseases.

Consider pest pressure in selecting sites to plant trees. For example, low spots that hold fog and dew have increased risk of fungal diseases.

Orient orchards to provide maximum air drainage and circulation. If possible, remove hedgerows of wild shrubs and trees immediately adjacent to the orchard. Dense vegetation close to the orchard block sunlight and wind, keeping the orchard trees wet longer which encourages growth of some disease organisms.

Use deer fencing and open mesh vole guards, especially for young orchards that are particularly vulnerable to vertebrate pest damage.

Remove materials that provide overwintering sites for pests: dead or dying wood, branch cankers, prunings, mummified fruit, root suckers, and alternate host trees near the orchard.

Support tree health and regulate vegetative vigor through careful management of fertilizer, water, and groundcover.

Avoid stresses such as overwatering, drought, mechanical trunk damage, overcropping or other conditions that may predispose trees or fruit to damage by insects, diseases, physiological disorders or environmental stresses such as rapid temperature changes and low winter temperatures.

Manage irrigation schedules to avoid long periods of leaf wetness or high relative humidity that favor growth of fungal diseases.

1.4.2 Biological Control

Conserve natural enemies of insect and mite pests by only using insecticides, miticides, and fungicides when needed. Select pesticides that are effective against the targeted pest(s) with minimal negative impact on predators, parasites, pollinators and other beneficial organisms. Consider the impact of groundcover management decisions on beneficial organisms.

Consider "seeding" releases of predator mites if practical.

1.4.3 Chemical Control

Only use pesticides if monitoring and economic thresholds, model forecasts, block history or other information indicates a need.

Choose pesticides according to applicator and worker safety; required protective equipment, reentry and preharvest intervals; pest efficacy; resistance management; impact on the environment and natural enemies; tankmix compatibility and suitability for the application equipment that will be used

Ensure complete and uniform spray coverage by using recommended pesticide dosage, accurately calibrated equipment, optimum spray pattern, travel speed, droplet size, and sufficient water per acre to insure good coverage for protective surface residue or absorption for locally systemic materials.

Try to time spray applications for maximum impact on pests and minimum off-target impacts, and for weather conditions that allow for optimum coverage and drying.

Do not apply pesticide when wind velocity is more than five miles per hour to avoid drift to nontarget sites. Avoid making foliar sprays when high temperatures and high humidity can increase the risk of phytotoxicity. Test new tankmix combinations with a jar test or trial application to a few trees.