

Maine Department of Agriculture,  
Conservation and Forestry

MANAGED POLLINATOR  
PROTECTION PLAN

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## Introduction

Pollinators are vitally important to fruit and vegetable production both in Maine and across the country. In recent years, national concern over the health of managed and wild pollinators has increased. The intensity of management required for beekeeping in the US has increased substantially since the arrival of the *Varroa* mite in 1988, the small hive beetle in 1996, and the much more virulent *Nosema ceranae* in 2007 (*N. ceranae* has now almost entirely replaced the milder *N. apis* in the US.). Loss rates have increased as well, reaching 40% nationally during the 2015-2016 season. Pesticides remain a threat, though historically pesticide-related bee kills have resulted from misuse much more than from proper (label-compliant) applications. Newer pesticides such as the neonicotinoids and phenylpyrazoles are far less acutely toxic to bees, but there is evidence that their sublethal effects on behavior may make them a serious threat, especially to wild pollinators, even when used according to label directions.

Although Colony Collapse Disorder has attracted a great deal of interest in the popular press, cases meeting the accepted definition of CCD are a far lower proportion of colony deaths than are those due to mites and disease. Department of Agriculture, Conservation and Forestry (DACF) experts have not yet observed any evidence of CCD in the state.

The situation is further complicated by the insect neurological viruses that the *Varroa* mites transmit as they feed on the fat bodies and hemolymph of bees. Recent research has so far identified over a dozen of these viruses. At high rates of infection these viruses can be lethal. At lower levels of infection, however, they affect the social and foraging behavior of honey bees, producing symptoms almost identical to those seen from sub-lethal exposure to neonicotinoid insecticides and further complicating the picture. These trends have raised questions about the sustainability of managed colonies and whether pollinator decline will adversely affect agricultural production. It must be noted, however, that many commercial beekeeping operations consistently report low losses, well within the 15-20% range historically considered acceptable. This suggests that there may be a significant management component associated with colony losses.

Overall, Maine's pollinators appear to be in better health than those in many other states. But even with a generally healthy prognosis, Maine honey bee health is clearly being impacted by parasites, diseases, management practices, and, in some cases, the presence of pesticides.

Maine has an effective apiary program with a long history of being proactive and engaged in pollinator health issues. The State Apiarist has been effective in maintaining positive relationships with both hobbyist and contract beekeepers. Out-of-state pollinator service contractors working in Maine must pre-file permit applications which allow DACF to inspect hives and track their movements. In-state beekeepers pay a nominal fee to register their hives which also allows the State Apiarist to keep ahead of disease and pest issues.

The DACF is also known for having a progressive and active pesticide program. The Maine Board of Pesticides Control (BPC) is extremely active in pesticide education, featuring timely topics presented by well-known experts. The BPC prides itself on responding to complaints quickly with thorough and objective investigations, which could include investigations about impacted pollinators.

DACF staff has invested considerable resources in researching pollinator health issues in recent years. Scientific literature is tracked, scrutinized and evaluated for information and recommendations that can be applied in Maine for the benefit of pollinators. Pollinator plans from other states have been reviewed

and analyzed. This research, along with the collective expertise of the DACF staff, forms the basis of this plan.

## **Maine's Pollinator Protection Plan**

The DACF sees great value in taking a proactive, coordinated approach to protecting pollinators in Maine. Consequently, the DACF elected to craft a plan that documents the Department's commitment to pollinator health as well as DACF activities that support that goal. The plan also contains a compilation and synthesis of existing recommendations—in the form of Best Management Practices—intended to protect pollinator health.

This plan is modeled after the North Dakota Department of Agriculture plan. It is also based—in part—on input received at the November 20, 2014 Pollinator Health and Safety Conference co-sponsored by the DACF and the University of Maine Cooperative Extension. Cooperating sponsors included the Maine Beekeepers Association, the Maine Farm Bureau and the Maine Organic Farmers and Gardeners Association. This conference focused on pollinator issues and provided an opportunity for landowners, beekeepers, pesticide users, government officials, and other stakeholders to discuss pollinator health issues. It was also an opportunity for these stakeholders to offer input on reasonable practices that beekeepers, landowners, and pesticide applicators could incorporate to protect pollinators and minimize impacts to crop production.

This plan is designed to reduce risks to pollinators in the state, focusing mainly on managed honey bees. Education, improved communication, and the promotion of pollinator health Best Management Practices (BMPs) form the cornerstones of this plan. The intent is to continuously incorporate the latest scientific consensus covering pollinator issues, and to serve both as an informational document and an action plan for all interested parties.

### **Challenges Faced by Beekeepers**

Beekeepers face a challenging task of keeping colonies alive with the threat of CCD, *Varroa* mites, small hive beetles, bacterial, fungal and viral diseases, declining forage quality, and pesticide exposure. Nationally, year-to-year colony survival is variable. In a 2015-2016 Winter Loss Survey by the Bee Informed Partnership winter hive losses were down in Maine to 18.16%. Though high, this loss level is far lower than the 30 – 50% losses suffered by most Northeastern states.

Growers and other pesticide users cannot help beekeepers manage threats from mites, beetles, and the microbes that weaken their hives. They can, however, help with reducing their exposure to pesticides. Honey bees may be exposed to pesticides applied directly to hives to rid them of pests such as the *Varroa* mite or applied to plants on which they forage. Growers can also help improve the quality of forage available. Even though *Varroa* mites are considered the greatest threat to honey bee colonies, a strong colony can handle the pressures of this tiny creature better than one weakened by other stressors.

Honey bees feed on pollen for their protein source, and utilize nectar for carbohydrates. Few pollen sources provide all the essential amino acids and micronutrients that bees require to build and maintain a strong hive. Like most other organisms, they benefit from a varied and balanced diet. Bees provided with high-quality forage are substantially better able to resist and recover from the stresses of parasites, disease, weather, and pesticide exposure than bees weakened by an inadequate diet.

## **Challenges Faced by Growers and Pesticide Users**

Growers face many challenges in attempting to obtain acceptable yields. Growers contend with insect pests, diseases, weeds, drought, overland flooding, and other factors that impact crop production and quality. They often need to manage pests and competing plants without impacting yields. They also must consider the timing of pesticide applications with respect to harvest and rotational intervals. Even with Integrated Pest Management (IPM) systems, pests can adapt quickly to different methods, rotations, pesticides, or reproduce so quickly that their populations rise exponentially in a short time. Because of the nature of such pests, making timely pesticide applications as part of an IPM plan can be essential to manage pests effectively.

There are over 12,000 registered pesticides in Maine that are used to manage agricultural and non-agricultural pests. Pesticide application decisions are exceptionally complex, and involve a host of environmental, logistic, and economic factors. In most cases, the life cycle of the pest and the potential for economic damage to the crop combine to produce a limited window of time in which an application will be effective. Most products also have a prohibition against applying when blooms are present, or when residues may persist on blooming crops. Factors such as pest infestation levels, temperature, precipitation, wind speed, water levels, buffer zones, and the presence of pollinators all affect pesticide choices and decisions on when, where, and how to apply pesticides. Applicators also must pay attention to the location of sensitive sites adjacent to treatment areas. These can include surface water, endangered species, incompatible crop fields, and beehives. The ideal time to apply many of these products is likely to coincide with when the pollinators are most active, putting pesticide applicators in a difficult position of balancing pest management needs and protecting pollinators. Fortunately, pesticide labels help guide them to make the right decision.

Homeowners also need to take special precaution when applying pesticides. The pesticide user BMPs apply to anyone using pesticides. The pesticide label is the law and it contains instructions intended to minimize risks to human health, pollinators, and every other component of our environment. Failure to comply with label directions may decrease the effectiveness of pesticides, increase the risk of adverse effects, can lead to pesticide resistance and most importantly is illegal.

## **DACF Activities Committed to Pollinator Health**

The DACF devotes resources to the following activities in support of pollinators:

- All Maine licensed pesticide applicators must pass the core exam which covers the basics of legal and appropriate pesticide application. The study manual provided for this exam contains multiple sections on the importance and protection of pollinators.
- The Board of Pesticides Control (BPC) participates annually in numerous pesticide applicator recertification training courses. Appropriate use of pesticides and pollinator protection are emphasized in these trainings.
- New pesticide applicators can, prior to testing for the core exam, attend an optional core exam training at which appropriate use of pesticides and pollinator protection are emphasized. The DACF offers this training many times annually.

- The BPC website contains extension information and numerous pertinent links about pollinator protection and appropriate use of pesticides. The Board supported website *GotPests?* provides IPM information to homeowners.
- The BPC, in cooperation with the State Apiarist, investigates all credible pesticide complaints regarding pollinators and, in the event of a bee kill, references the EPA's bee kill protocol for these complaints.
- The DACF works with Maine fruit commodity groups using contracted pollinator services to improve communication and coordination, and to investigate tactics that reduce risks to pollinators.
- Hive registrations and inspections are conducted by the State Apiarist. This service is vital for maintaining pollinator health and provides an opportunity for outreach and stakeholder feedback.
- The State Apiarist provides educational presentations to a wide variety of audiences about pollinator health and safety.
- The DACF works with the University of Maine system to develop guidance on product choices to reduce risks to bees.

## Best Management Practices

These voluntary BMPs for pesticide users, landowners/growers, and beekeepers are shared with the intent of:

- Encouraging positive relationships, communication, and amicable co-existence among beekeepers, landowners, and pesticide applicators;
- Reducing pesticide exposure and subsequent risk of pesticides to pollinators;
- Supporting both a robust apiary industry and a robust agricultural economy; and
- Continued compliance with state pesticide and apiary regulations.

## Beekeeper Best Management Practices

- **Work with landowners to choose hive locations.** Ideal hive locations will have minimal impact on agricultural activities but will still have adequate access to forage and water. Avoid placing hives in low spots to minimize impacts from pesticide drift or temperature inversions (when cold air traps warm air below). Temperature inversions can cause additional problems with off-target pesticide movement. Beekeepers should consider road conditions after rainfall events to minimize their impact on farm roads, and discuss with landowners which roads or trails should be used. Beekeepers should also request contact information for other nearby applicators, renters, and neighbors.

- **Be cognizant of neighboring landowners when placing and moving hives.** Neighboring landowners often use the same roads, trails, and section lines. Do not block these rights-of-way or place hives so close they may cause problems for other land-users. Take appropriate steps to ensure that bees do not negatively affect operations of neighboring landowners, such as considering the proximity of hives to neighboring yards, homes, swimming pools, equipment, or storage sites.
- **Work constructively with applicators when notified of upcoming pesticide applications.** When informed of a planned application, beekeepers should block, move, or net hives, or find other strategies to allow for pesticide applicators to manage pests while minimizing pesticide exposure to their bees.
- **Notify landowners and applicators when arriving and when moving hives.** If possible, notify nearby pesticide applicators and landowners when you place or move beehives. This will ensure they are aware of current hive locations and can notify you before making pesticide applications. Contact information for nearby pesticide applicators can usually be obtained from landowners.
- **Obtain landowner permission for hive placement every year and maintain positive contact.** Land ownership changes, and what may be acceptable to one owner may be a nuisance to another. Beekeepers should maintain up to date contact with the property owner or manager to make sure that bees are placed on land with the permission of all parties concerned. This step is imperative to ensure hives to do not become a nuisance.
- **Immediately report all suspected pesticide-related bee kills to the DACF pesticide program.** Inspect the condition of your apiary regularly. The DACF is the lead pesticide regulatory agency in the state, and will respond to credible complaints as quickly as possible. Each investigation is unique, and cases may be made from a variety of physical or documentary evidence. Particularly where physical samples may be important, DACF should be notified as soon as possible so that samples may be collected while any residues present are still detectable. Because of legal and chain-of-custody concerns, it is almost always best to let the DACF inspector collect samples. Beekeepers can report suspected pesticide incidents by calling 207-287-2731 and speaking to a representative from the BPC.
- **Use registered pesticides according to label directions.** When pesticide use is necessary to manage pests within hives, use registered pesticides and comply with all restrictions, precautions and directions found on the pesticide label. Failure to comply with label directions may decrease the effectiveness of pesticides, increase the risk of adverse effects to bees, cause unsafe pesticide residues in honey and other products, and potentially lead to pesticide resistance. Contact the DACF pesticide program with any questions on pesticide labeling or to determine whether a pesticide is registered in the state.
- **Comply with all requirements of the Maine beekeeping law.**
  - For all beekeepers:
    - i. Maintain hives free of diseases and parasites.
    - ii. Make sure hives have adequate reserves of honey and pollen for the winter.
    - iii. Make sure hives do not go queenless.
    - iv. Provide the ACF Commissioner with all apiary (hive) locations.

- v. Report the total number of colonies to the ACF Commissioner.
- In state beekeepers only:
  - i. Pay beekeeper's licensing fee each year.
- If importing honeybees to Maine:
  - i. Pay beekeeper's registration fee each year.
  - ii. Obtain an import permit.
  - iii. Provide certificate of hive inspection prior to importing honeybees or used equipment.
  - iv. Continue to provide up to date hive locations throughout the season. This ensures that all locations are accurate when applicators attempt to locate them.
- **Ensure hives are easily visible to applicators.** Hives should be visible and marked with beekeeper contact information so applicators can see the hives and contact beekeepers, if necessary, before spraying.

## **Landowner/Grower Best Management Practices**

- **Work with beekeepers to choose hive locations.** The most common problems resulting from honey bees revolve around their need for water. On hot days, most honey bee foragers may be collecting water to cool the hive. They typically use the nearest water source, regardless of whether it is the "best" from our perspective. They can be nuisances in stock water, hot tubs, pet dishes, and swimming pools. It is usually prudent to locate hives near an acceptable water source to encourage them not to be a nuisance on hot days. Similarly, honey bees tend to exploit the nearest good forage sources first, including sugary runoff from farm-stand or food service operations. Locating hives away from these areas will help to prevent conflicts. Landowners should communicate with beekeepers about which roads/trails can be problematic when wet, preferred traffic routes, and should provide contact information for applicators, renters, and neighbors.
- **Communicate with renters about bee issues.** Renting land for agricultural production is a common practice. Landowners and renters should discuss bee issues, such as who has authority to allow bees, how long they will be allowed and hive placement. These issues should be addressed and included when rental agreements are negotiated.
- **Communicate with pesticide applicators about who has the responsibility to look for hives, notify neighbors, etc.** When contracting with commercial pesticide applicators, make sure that there is a clear understanding of who has the responsibility to identify hive locations and communicate with beekeepers. Applicators may do this as part of their standard procedures, but some landowners may prefer to make beekeeper contacts themselves.
- **Agronomists should consider pollinator impacts when making pesticide recommendations.** Agronomists and crop consultants are in a unique position to protect both managed and wild pollinators by the recommendations they make regarding pesticide products, application methods and timing, and all the other related factors that go into wise crop-protection decisions.

- **Plant bee forage.** Plant flowering plants, trees and shrubs to improve bee forage, especially in non-farmable or non-crop areas. Doing so provides forage and it may also concentrate bees away from fields to be treated with pesticides, thereby minimizing impacts to pollinators.
  - Many pesticide labels require untreated **vegetative buffer strips** around sensitive sites. Plant flowering plants in those buffer strips to provide additional bee forage, but be sure to consider whether pest management in the area is compatible with the presence of pollinators (i.e. don't plant areas attractive to bees that are likely to receive spray drift from treated fields).
  - If planting **cover crops**, add flowering plants into the mix or delay tilling until after the cover crop has bloomed. Even a small percentage of flowering plants can provide a considerable amount of forage for pollinators.

## Pesticide User Best Management Practices

- **Use Integrated Pest Management.** Utilize economic thresholds and IPM to determine if pesticides are required to manage pests.
- **Choose pesticides carefully.**
  - When insecticides are required, try to choose insecticides with low toxicity to bees, lower residual toxicity or repellent properties towards bees; pay attention to pollinator toxicity and product persistence.
  - Be aware that even products without specific bee-protection language may be harmful to honey bees. Fungicides, for example, have recently been shown to have a synergistic effect on pesticide toxicity to bees, and some herbicides can affect queen or drone fertility, even though they do not harm adult worker bees (the life stage commonly used in pesticide testing). The best practice is to avoid exposing bees to any pesticides, even those without specific bee-protection language. “Low-risk” does not mean “no risk,” and the effects of stress are cumulative on bee health just as they are for us.
  - Choose formulations that present a lower risk to bees.
    - Avoid dusts, micro-encapsulated, and wettable-powder insecticide formulations; these can leave a powdery residue which sticks to hairs on bees. In addition to their acute effects, these formulations can also be incorporated into pollen, leading to delayed or long-term effects on the whole colony.
    - Granular and liquid formulations are safer for pollinators since granules are not typically picked up by bees and liquids dry onto plant surfaces.
      - Ultra-low volume formulations are usually more hazardous than other liquid formulations because of their typically higher concentrations and small particle size.
    - Microencapsulated formulations are highly toxic to pollinators because they can become incorporated into pollen and affect the long-term health of the hive.



- Avoid tank mixing of insecticides and fungicides as specific mixtures may cause synergistic toxic effects on bees and most combinations have not been researched. If you must tank-mix, follow the most restrictive label language for all situations, including pollinator protection.
- **Use caution around flowering plants.** Pesticide applicators should pay special attention when making applications on or near plants that are flowering or will soon flower. All bee protection language specifically forbids application to flowering plants.
  - Many pesticides, especially insecticides, have use restrictions prohibiting applications when bees are foraging in the treatment area. Some labels prohibit applications when crops are blooming and require that the applicator notify beekeepers in the area prior to application. Read and follow label directions carefully. If the label is not clear, contact the BPC.
  - Limit applications of any pesticides, including fungicides, during bloom.
  - Identify weeds which are attractive to bees; note when they bloom.
  - Check fields for bee activity prior to making applications.
  - Mow flowering weeds prior to application so that bees will not be foraging on them.
- **Use registered pesticides according to label directions.** Pesticide label language is developed to ensure that pesticides will not pose a risk of unreasonable adverse effects to human health or the environment. The label instructions also tell you how to get the maximum benefit out of the product for the least risk and expense. Failure to comply with the label not only puts humans and the environment at risk, it is also illegal. Applicators are bound by all directions, precautions and restrictions on pesticide labeling, even when following other BMPs. Contact the DACF with any questions on pesticide label language.
- **When possible, apply pesticides early morning, evening, or at night.** Pollinators are most active during daylight hours and when the temperature is over 45 degrees Fahrenheit. Apply pesticides early in the morning or preferably in the evening when bees are less active to reduce the chances that bees will be foraging in or near the treatment site while residues are still active and biologically available to bees.
  - Be cognizant of temperature restrictions on pesticides. The efficacy of some pesticides is reduced at certain temperatures.
  - Be aware of temperature inversions (when cold air traps warm air below) when choosing the best time for applications.
  - Applying pesticides in the early evening allows them to decompose during the night, but unusually low temperatures can increase the time that toxic residue remains on the crop.

- **Avoid drift.** Pesticide drift is the off-site movement of pesticides through the air from the treatment site to adjacent areas, either in the form of mist, particles or vapor. Drift reduces the effectiveness of the chemical applied since only part of the applied amount reaches the target. Drifting chemicals also pose a risk to non-target organisms that come into contact with the off-target residues. Pesticides can negatively affect bees and other beneficial insects by direct contact or by contaminating their forage and habitat. Drifting herbicides have the potential to further reduce quality forage available to pollinators. Contact the BPC for more information on how to reduce pesticide drift.
- **Incorporate pollinator considerations when planning wide-area spray programs.** Currently, there are no wide-area spray programs routinely occurring in Maine. However, populations of the browntail moth are on the upswing and there is a rising threat of tick and mosquito-borne diseases. Strict label compliance (as is required by law) will mitigate many of these risks. Land managers and project coordinators can further reduce the dangers to pollinators by careful product selection, communication with beekeepers and/or the State Apiarist, and scheduling applications when pollinators are not active even if not specifically required by the label.
- **Communicate with your neighbors about pesticide applications and hive locations.** The normal foraging range for honey bee colonies is two to three miles. In poor conditions, bees may forage up to 7 or 8 miles from the hive. The BPC has rules that allow nearby landowners to request advance notification. Beekeepers are encouraged to communicate with their neighbors about pesticide use.

## Supporting Pollinator Forage and Habitat

- **Plant trees, shrubs and flowers that provide good forage for all types of pollinators.** Everyone can plant forage for bees. Plants that support pollinators are also beneficial for other wildlife, are often visually attractive and can help improve soil health. Annuals and perennials often come to mind when thinking about bees, but bees also utilize trees, shrubs and other less-noticeable plants for pollen and nectar sources. It is important to consider diversity and season-long blossoming when choosing plants to ensure adequate forage for the entire growing season. Diversity will also ensure pollinators have access to the nutrients they require to be healthy. Easy, efficient ways to improve pollinator forage include.
  - Diversity and season-long blooming are important. The pollen and nectar of each species carries a different nutrient load. Diversity can be worked into existing plantings. Every time a plant is added and/or replaced, choose a variety that will contribute to pollinator forage. Foraging honey bees are typically not aggressive.
  - Create bee forage along secondary roads. Ditches along secondary roads often contain several species of plants that provide forage for pollinators. It is a common practice to mow ditches for the safety of motorists and to prevent drifting snow. Consider spot spraying noxious weeds and mowing ditches later in the year after most of the plants have flowered to ensure that bee forage is available. Incorporate short forbs into secondary road ditches to minimize attracting large wildlife.
  - Put out flower pots, create flowerbeds, plant trees or shrubs, or establish gardens to provide forage. Create **habitat for beneficial, wild pollinators**. Roughly 70 percent of native bees nest in the ground. They burrow into areas of well-drained, bare or partially vegetated soil. Other bees nest in abandoned beetle tunnels in snags or in soft centered,

hollow twigs and plant stems. Cavity-nesting bees may also utilize dead trees and branches. Habitats can be created by leaving deadfalls and brush piles as nesting habitat. Consider the type of habitat you wish to create and pollinators you want to attract. Be cognizant that certain structures might attract other animals such as rodents, rabbits, foxes, coyotes, skunks, and porcupines.

- **Increase public land access for managed hives.** Public land typically does not incorporate crop production and large scale insecticide use. There are some agencies that allow beekeepers to place honey bees on state and federal lands. Contact DACF for more information. Permission must be obtained from the agency in charge of the property before placing bees, and hives placed on state or federal lands must also be registered with the DACF.