



ARIZONA MANAGEMENT PLAN for the PROTECTION of POLLINATORS



*Mark W. Killian
Director*





Citizens of Arizona:

This plan summarizes issues faced by the agriculture community as it relates to bees and crop production. This Management Plan for the Protection of Pollinators (MP3) is not intended to provide all the answers. The MP3 seeks to provide references and guidance so everyone can better understand the issues. The EPA has provided this opportunity to the states as a way to avoid further regulatory measures being enacted through pesticide labels, ultimately affecting a local issue at a national level.

Arizona is a leader in lettuce, cauliflower, broccoli, spinach, and melon production. Our state is in the top 3 for production of most of the winter vegetables. For many fruit and vegetable crops, yields are highly dependent on bees to provide pollination. A loss in bees equals a loss in pollination and revenue. Relations between our growers and beekeepers must remain cordial for agriculture to be successful.

In recent years, tensions grew because some groups blame the unexplained honey bee mortality on pesticide use in crop production. Effective communication among all parties is essential to the success of this plan.

The goal is to help minimize risk to honey bees, at the same time minimizing the impact of that mitigation on crop production. We hope to achieve this balance while continuing to provide access to habitat that supports bee health and the derived benefits to agriculture. Remember bees are only attracted when plants are blooming and nectar and pollen are available to them.

This plan is not meant to be static but dynamic – an evolving strategy. We intend to revisit this document at least annually and update it as frequently as the needs arise. Research has shown that many factors affect honey bee health. Nutrition, parasites, the effects of pesticides, disease, and genetic diversity all play a role. On-going research will help ensure the most effective strategies can be put in place. Arizona has one of the leading research facilities in the country in the USDA Carl Hayden Bee Research Center in Tucson.

By working together Arizona growers, beekeepers, pesticide applicators, the public, researchers and regulators can protect our bees, while maintaining our position as a leading supplier of agriculture products and a great place for people to live.

Thank you for keeping an open mind and encouraging conversations to conserve bees and maintain a prosperous agricultural economy!

Sincerely,

Mark W. Killian
Director

Introduction

Arizona grows a wide variety of fruits and vegetables. Cantaloupe, apples, water melons, onions, grapefruit, oranges and many seed crops are dependent on pollinators for production. It is inevitable that hives will be placed in close proximity to areas where a variety of crops are grown and pesticides are commonly used.

Managed bees and wild pollinators are important to U.S. agriculture as over 90 crops in the U.S. and many crops grown for seed depend on bees. Bee-pollinated crops account for 15 to 30 percent of the food we eat (USDA 2013).

Beekeepers have suffered significant colony losses over the past decade, raising questions about the sustainability of managed colonies in the U.S. This issue has gained national attention with reports of sudden losses of substantial numbers of managed colonies in 2006. In response, Congress identified the U.S. Department of Agriculture (USDA) as the lead Federal agency to determine the causes of and means to mitigate Colony Collapse Disorder (CCD) and in 2007 the CCD Steering Committee was established. The CCD Steering Committee is made up of personnel from USDA's Office of Pest Management Policy, the National Institute of Food and Agriculture, the Agricultural Research Service, the Animal and Plant Health and Inspection Service, and the Natural Resources Conservation Service, as well as staff from the U.S. Environmental Protection Agency (EPA) and public and private partners.

In 2012, the USDA and EPA hosted the National Stakeholder Conference on Honey Bee Health to synthesize what had been learned from research regarding the losses attributed to CCD and overall declines in pollinator health and to identify what additional research is needed to address remaining uncertainties. The proceeding of the conference were published in 2013 (<http://www.usda.gov/documents/ReportHoneyBeeHealth.pdf>) and concluded that there are multiple factors impacting the decline of the honey bee in the United States and that no one factor can be blamed for the declines. These factors include pests, parasites, diseases, low genetic diversity, poor nutrition and pesticides - when applied when plants are flowering and nectar and pollen are available.

In 2014, President Obama set up a task force requiring many federal agencies to address promote bee health and survival. In response to the President's memo, the USDA and EPA co-chaired a Federal Task Force which developed a *National Strategy to Promote the Health of Pollinators* which was published in 2015 (<https://www.whitehouse.gov/sites/default/files/microsites/ostp/Pollinator%20Health%20Strategy%202015.pdf>). The strategy sets goals of reducing overwintering loss to less than 15%, restoring or enhancing over 7 million acres for pollinators, providing broad based education on pollinators and protecting bees from pesticides. The Arizona plan outlines efforts to protect bees and other pollinators from pesticides as well as helping to mitigate other factors believed to affect pollinator health.

Challenges Faced by Beekeepers

Beekeepers face a challenging task of keeping colonies alive with the threats of Varroa mites, tracheal mites, small hive beetles, bacterial, fungal and viral diseases, declining quality forage and pesticide exposure. Nationally, year to year colony survival is variable with beekeepers reporting average winter losses of roughly 31% over the past six years.

Growers and pesticide users cannot help beekeepers manage threats from mites, beetles and the microbes that weaken their hives. They can, however, help with reducing hive exposure to pesticides and improving the quality of forage available for bees. Even though the USDA summit on Varroa mite (http://www.ree.usda.gov/ree/news/Varroa_Summit-05-19-15_DATED-FINAL.pdf) identified the parasite as the greatest threat to honey bee colonies, a strong colony can handle the pressures of this tiny creature better than one exposed to various pesticides and poor forage that weaken the hive.

Honey bees feed on pollen for their protein source and utilize nectar for carbohydrates. They must obtain these nutrients from a variety of plants in order to obtain all the essential amino acids and nutrients required to build and maintain a strong hive. Bees can become easy targets for pests, predators and pathogens when they do not obtain the proper balance of nutrients. As discussed at the USDA Honey Bee Forage and Nutrition summit (http://www.ree.usda.gov/ree/news/2014_USDA_HB_Forage_Nutrition_Summit_Report-FINAL.pdf), bees provided with high quality forage are better able to handle stressors from all directions including pesticides.

Honey bees are commonly exposed to pesticides either intended for use in agricultural production or in an attempt to rid hives of the Varroa mite. Agriculturally-applied pesticides can impact bees through direct contact or by contaminating forage. Beekeepers worry not only about immediate lethal effects from exposure but also the sub-lethal impacts and their impact on brood (*i.e.*, eggs, larvae, pupae) mortality and reduced adult bee longevity.



Bear deciding which hive is going to be lunch

Challenges Faced by Growers

Growers face many challenges in an attempt to maximize yields. Growers contend with insect pests, diseases, weeds, adverse weather conditions and other factors that impact crop production and quality. They have a variety of pest management tools and strategies from which to choose and integrate. While growers do not have to try to kill a mite on an insect, they often need to eliminate pests and competing plants without impacting plant survival and yields. They also must consider the timing of pesticide applications with respect to harvest, where the crop is going and rotational intervals. Even with integrated pest management (IPM) systems, pests often adapt quickly (*i.e.*, develop resistance) to different methods, rotations, or pesticides, or reproduce so quickly that they seem to multiply within a short amount of time. Because of the nature of such pests, making timely pesticide applications as part of an IPM plan are essential to manage pests effectively.

While it can be difficult for beekeepers to locate land on which their hives will not be exposed to pesticides, growers face difficult decisions when managing pests and minimizing impacts to pollinators. However, this management plan for the protection of pollinators demonstrates how the growers can effectively manage pests while minimizing impact to pollinators. Following the Best Management Practices (BMPs) within this document will help ensure abundant, affordable, safe and nutritious food production which is sustainable over the years to come.



Bees next to field near an urban area.



Bees near alfalfa field.

Challenges Faced by Pesticide Users

Pesticide users face many challenges in Arizona. There are over 12,000 registered pesticide products in Arizona that are used to manage agricultural and non-agricultural pests. In many cases, pesticide applicators have a limited window of time to make an application. Factors such as human safety, pest infestation levels, temperature, precipitation, wind speed, use restriction buffers, plant growth stage and mere presence of pollinators all affect pesticide choices and decisions on when, where, and how to apply them. Applicators also must pay attention to the location of sensitive non-targets adjacent to treatment sites, such as water sources, endangered species, organic fields, farm animals, schools, day care centers, medical facilities, homes, pets, and beehives. The ideal time to apply pesticides may coincide with when the pollinators are

most active, when plants are flowering and nectar and pollen are available, putting pesticide applicators in a difficult position of balancing pest management needs and protecting pollinators.



These hives are not being hidden – they are placed under trees for shade.

The Plan

The goal of this plan is not to eliminate pesticide use or to ban pesticide use in hives or in close proximity to hives. Instead, the goal is to bring awareness to the issues faced by all parties and find a way for everyone to be part of a solution. The following Best Management Practices (BMPs) were developed with this in mind and for incorporation into grower's IPM plans that simultaneously reduce economic, environmental and human health risks. Protecting pollinator resources, managed or otherwise, should be an important goal of any IPM plan.

The Arizona Department of Agriculture (ADA) anticipates several multi-stakeholder discussions focused on pollinator issues. These will provide opportunity for landowners, growers, beekeepers, pesticide users, government officials and other stakeholders to discuss pollinator/pesticide issues. It allows all the opportunity to provide input on reasonable practices that beekeepers, landowners, growers and pesticide applicators could implement to protect pollinators and minimize impacts to crop producers, during times when plants are flowering and nectar and pollen are available.

The Pollinator Plan contains voluntary BMPs for pesticide users, landowners/growers, and beekeepers in hopes of creating the following positive outcomes:

- Maintained positive relationships and peaceful co-existence among beekeepers, landowners/growers, and pesticide applicators;
- Reduced pesticide exposure leading to decreased risk of pesticides to pollinators;
- Increased bee friendly habitat;
- Ensuring both a robust apiary industry and sustainable agriculture economy; and,
- Continued high compliance with state pesticide use requirements.

Arizona's Law for Bee Protection in Agriculture

Arizona’s law was developed as an aid in communication between landowners/growers, pesticide applicators and beekeepers. In addition, two forms have been developed to assist with clear communication between involved parties. These forms, included in the Appendix, can be customized for each interaction. They are also available on our webpage:

https://agriculture.az.gov/forms-library?field_category_term_tid=42&=Apply

A.R.S. § 3-367.02. Notification by beekeepers of bees located in a commercial agricultural area

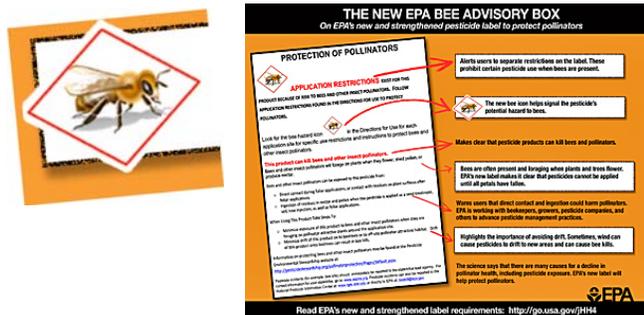
A. Before locating bees on an apiary site, the owner of the bees shall obtain the landowner's or lessee's permission and notify in writing persons engaged in commercial agriculture on whose land the bees may forage. The notice shall include the beekeeper's address and telephone number, the location of the hives within a quarter section and the exact dates that the bees will be in the area.

B. After receiving the notice required by subsection A, the person who engages in commercial agriculture shall inform the beekeeper, before application, when a bee sensitive pesticide will be applied to the area in which the bees are foraging.

C. A failure by the beekeeper or the owner of the bees to notify the person or persons who engage in commercial agriculture as provided by subsection A constitutes prima facie evidence that no loss occurred due to a pesticide application and no pesticide violation related to bees has occurred.

Follow label directions

As it is in every state, label directions must be read and followed. Specific precautionary statements designed to protect bees are usually found in the Environmental Hazards section of the pesticide label. As an example the EPA developed a bee logo to help identify which insecticides are of greatest concern for bee safety. Unfortunately the use of the box is only be found on some of the neonicotinoids and has not been implemented on a broad scale. Labels need to be read carefully to determine how to minimize or eliminate risks to bees. Review the entire label for precautionary and advisory statements. Key words to look for include “highly toxic to bees,” “toxic to bees,” and “residues.” The absence of this does not mean the product is safe for bees, it is just another tool to help users. So read labels carefully for other ways the EPA helps identify pesticides of concern.



Crop-specific precautions and mandatory restrictions may also be listed on the label directions for use (DFU). Although these precautions/restrictions are based on toxicity to honey bees, they are also relevant to other species of bees. Residual toxicity to bees of pesticide residues on plants varies greatly between pesticides and can range from hours to a week or more. When using insecticides with extended residual toxicity (residues expected to cause at least 25 percent bee mortality 8 or more hours after application), it is imperative that applicators and

landowners/growers carefully consider potentially prolonged exposures to both wild and managed bees, and avoid applying pesticides to blooming plants (crops or weeds).

Beekeeper BMPs

- **Work with landowners/growers to choose hive locations.** Ideal hive locations will have minimal impact on agricultural activities but will still have adequate access for bees to forage and water. Avoid low spots to minimize impacts from drift or temperature inversions on hives. Give consideration to which roads to travel when transporting colonies to/from agricultural areas by discussing with landowners/growers their preferred access as some roads may not be built for heavy loads. Beekeepers should also request contact information for applicators, lessees and surrounding landowners/growers. (See AZ Laws for Bee Protection on pages 5 and 6.)
- **Be cognizant of neighboring landowners/growers when placing and moving hives.** Neighboring landowners/growers often use the same roads and trails. Do not block right-of-ways 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/growers, such as considering the proximity of hives to neighbor's, equipment and property.
- **Work constructively with pest control advisors and applicators.** One of the recommended BMPs for pesticide applicators is to contact nearby beekeepers prior to making pesticide applications. Block, move or net hives when applicators inform you they are going to apply pesticides, or find other strategies to allow pesticide applicators to manage pests while minimizing pesticide exposure to bees. Weather, limited alternative forage and time greatly influence if this is even an option. When this is impracticable, work with the pest control advisor, applicator and grower to find an alternative product less toxic to the hives or timing of the application, such as applying after dark. Everyone needs to remember this is highly critical when plants are flowering and nectar and pollen are available (See AZ Laws for Bee Protection on pages 5 and 6.)
- **Notify landowners/growers, pest control advisors and applicators** when moving hives. If possible, notify nearby landowners/growers, their pest control advisors and pesticide applicators 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/growers. (See AZ Laws for Bee Protection on pages 5 and 6.)
- **Obtain annual landowner permission** for hive placement and keep in contact. As landowner/grower information changes, it is important to ensure everybody is aware and bees are not placed without permission. This step is imperative to ensure hives are not seen as a nuisance and are afforded the necessary precautions. (See AZ Laws for Bee Protection on pages 5 and 6.)
- **Report all suspected pesticide-related bee kills** to the ADA Environmental Services Division immediately. Inspect bee behavior regularly. The ADA is the lead pesticide regulatory agency in the state. The ADA will respond to complaints, including collecting

and analyzing locations for pesticide residues. Some pesticides degrade rapidly so timely reporting will aid the pesticide investigation. Beekeepers can report suspected pesticide incidents by calling **1-800-423-8876** or **602-542-0986** and asking to speak to an ADA representative about a pesticide complaint.

- **Use registered pesticides according to the label.** 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 or the use of a product not labeled for use in colonies may decrease the effectiveness of pesticides, increase the risk of adverse effects to bees, cause unsafe pesticide residues in bee related products and potentially lead to pesticide resistance. Contact the ADA Environmental Services Division with any questions on pesticide labeling. You cannot purchase a product in another state and/or through the internet and use it in Arizona unless it is also registered for use in Arizona. You can research this on our web page: Look for it under Licenses and Credentials <http://searchagriculture.az.gov/mastercontent/licsearch.aspx>
- **Clearly post contact information** at all hive locations and continue to communicate hive locations throughout the year. Communication is necessary with both the landowner/grower and their pest control advisor and applicator to help avoid problems.
- **Make hives as visible as possible to pest control advisors and applicators.** Shade is a necessity in AZ, but hives must be visible so pest control advisors and applicators can locate them before spraying. It is strongly suggested that hives are painted white or a color that stands out from the surrounding area. Work out a mechanism with other ag operations as to how hives can be marked...maybe bright flags could be used as in Mississippi, provided applicators and growers are aware of the meaning of the flags.
- **Contact local experts in IPM education and deployment.** The University of Arizona Cooperative Extension maintains county offices in each county in Arizona staffed by County Agents and other Extension professionals who can help provide information, education, and advice to beekeepers wishing to learn more about how to implement these BMPs in their area. These Agents are connected to a large network of Extension and IPM Specialists at the Arizona Pest Management Center (APMC) who have expertise in the development of IPM plans that also protect the environmental interests including bee health and safety. The APMC can help connect you to the resources needed confidentially at any time, <http://cals.arizona.edu/apmc/contact.html>.

Landowner/Grower BMPs

- **Work with beekeepers to choose hive locations.** Ideal locations for hives will have minimal impact on farming/ranching operations, but will still provide bees access to forage and water. Communicate with beekeepers about any roads which can be problematic for heavy loads or if there are any preferred traffic routes for transporting colonies. Landowners/growers may also want to provide contact information for applicators, lessees and neighbors (if applicable).
- **Communicate with lessees about bee issues.** Leasing land for agricultural production is a common practice. Landowners/growers and lessees 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 lease agreements are negotiated.

- **Communicate with pesticide applicators whose responsibility it is 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/growers may prefer to make beekeeper contacts themselves. Remember this is most critical when plants are flowering and nectar and pollen are available.
- **Ask Pest Control Advisors to consider pollinator impacts when making pesticide recommendations,** Make sure pest control advisor know hives may be present. Consider pollinator impacts when making recommendations including product choices and pesticide application timing decisions. Remember this is most critical when plants are flowering and nectar and pollen are available.
- **Plant bee forage** near crops not dependent on bee pollination. 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 attract bees away from fields to be treated with pesticides, reducing their dependence on the treated crop while at the same time providing nutrient diversity increasing their ability to resist the effects of pesticides. For crops dependent on bee pollination, a variety of flowering plants will help improve bee health.
 - Many pesticide labels require untreated **vegetative buffer strips** around sensitive sites. Plant flowering plants in those buffer strips to provide additional bee forage.
 - If planting **cover crops**, add flowering plants into the mix. Even a small percentage of flowering plants can provide a considerable amount of forage for pollinators.
- **Ensure that pest pressure warrants seed treatment.**
 - Utilize alternatives to talc/graphite in pneumatic seed planters. When planting seeds treated with insecticides, utilize alternatives to talc/graphite (fluency agents) as they become available. To the extent possible ensure that appropriate sticking agents are in the seed coat. Talc and graphite may be less effective at reducing the likelihood that treated seed coatings abrade creating insecticide-containing dust that can drift onto hives and flowering plants where bees may be foraging.
- **Stagger plantings of crops.** To provide an extended or diverse flowering time, stagger plantings of a single variety of a crop or chose multiple varieties.
- **Contact local experts in IPM education and deployment.** The University of Arizona Cooperative Extension maintains county offices in each county in Arizona staffed by County Agents and other Extension professionals who can help provide information, education, and advice to growers / land owners wishing to learn more about how to implement these BMPs in their area. These Agents are connected to a large network of Extension and IPM Specialists at the Arizona Pest Management Center (APMC) who have expertise in the development of IPM plans that also protect both your economic and environmental interests including bee health and safety. The APMC can help connect you to the resources needed confidentially at any time,

<http://cals.arizona.edu/apmc/contact.html>.

Pest Control Advisors (PCAs)

- **Consider pollinator impacts** when making pesticide recommendations. Include product choices and pesticide timing decisions to have the least impact on pollinators. Use science-based tools for making these decisions (see next). Remember this is most critical when plants are flowering and nectar and pollen are available.
- **Consider using ipmPRiME, a risk assessment tool for understanding potential impacts of pesticides used in agriculture.** Signing up at <http://ipmprime.org> is quick, easy, confidential, and free. Most of all, ipmPRiME provides a new tool for understanding pollinator risks of thousands of pesticidal products. The Arizona Pest Management Center (APMC) is available to provide assistance in using or understanding this tool and how it can guide your pesticide choices (see last bullet).
- **Communicate with landowners/growers and applicators** known bee locations. Act as a check-and-balance to remind growers and applicators to take necessary precautions to protect bees.
- **Communicate with the landowner/grower about good hive locations.** Good hive placement can help minimize adverse impacts on both bees and the landowner/grower.
- **Help in the communication process**, as part of your service, keeping communication open between beekeepers, landowner/growers and pesticide applicators.
- **Contact local experts in IPM education and deployment.** The University of Arizona Cooperative Extension maintains county offices in each county in Arizona staffed by County Agents and other Extension professionals who can help provide information, education, and advice to PCAs wishing to learn more about how to implement these BMPs in their area. These Agents are connected to a large network of Extension and IPM Specialists at the Arizona Pest Management Center (APMC) who have expertise in the development of IPM plans that also protect both economic, environmental, and human health interests of your growers. The APMC can help connect you to the resources needed confidentially at any time, <http://cals.arizona.edu/apmc/contact.html>.

Pest Management Professionals

- **Utilize bee-smart management processes.** When called in to control bees as a pest, first assess the situation to see what can be done (*e.g.*, salvaging/relocating bees). Do the bees pose a threat to health? If so, control the bees as allowed on pesticide labels. If not, **consider bee removal versus killing of bees.**
- **Provide bee-smart advice.** To help homeowners avoid having bee problems, provide advice on bees and even ways they can help bees.



Bees have taken up residence near a home.

Pesticide User BMPs

- **Use Integrated Pest Management (IPM).** Utilize economic thresholds and integrated pest management (IPM) to determine if insecticides and miticides are required to manage pests in flowering fields and in bee hives. When they are required, try to choose products with low toxicity to bees. For flowering fields use short residual toxicity or repellent properties towards bees. Remember this is most critical when plants are flowering and nectar and pollen are available.
- **Consider using ipmPRiME, a risk assessment tool for understanding potential impacts of pesticides used in agriculture.** Signing up at <http://ipmprime.org> is quick, easy, confidential, and free. Most of all, ipmPRiME provides a new tool for understanding pollinator risks of thousands of pesticidal products. The Arizona Pest Management Center (APMC) is available to provide assistance in using or understanding this tool and how it can guide your pesticide choices. The APMC can help connect you to the resources needed confidentially at any time, <http://cals.arizona.edu/apmc/contact.html>.
- **Avoid application of insecticides toxic to bees when crops are in bloom and/or when bees are actively foraging.**
- **Use registered pesticides according to the label.** Pesticide label language is developed to ensure that pesticides will not pose a risk of unreasonable adverse effects to human health or the environment. Failure to comply with the label not only puts humans and the environment at risk, it is also illegal. 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.

Check miticide labels to ensure proper use as many prohibit hive treatment during honey flow. Ensure the miticide is registered for use in hives and what the allowed label rate is. Using less than the label rate can lead to quicker mite resistance. Always comply with

these and other label restrictions to reduce risks. Applicators are bound by all directions, precautions and restrictions on pesticide labeling, even when following other BMPs. Contact the ADA with any questions on pesticide label language.

- **When pesticides are needed, when possible apply pesticides at night or in the evening.** Pollinators are most active during daylight hours and when the temperature is over 55 degrees Fahrenheit. To the extent possible, apply pesticides at night when bees are less active to reduce the chances that bees will be foraging in or near the treatment site.
 - Be cognizant of temperature restrictions on pesticides. The efficacy of some pesticides is reduced at certain temperatures.
 - Be aware of temperature inversions when choosing the best time for applications.
 - Pay attention to label warnings as some pesticides have residuals that are toxic to bees. Application timing allow the label required times to lapse before bee foraging begins.
- **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 pesticide applied since only part of the applied amount reaches the target. Drifting pesticide also can pose a risk to non-target organisms that come in contact with the off-target residues. Pesticides (particularly insecticides) can adversely affect bees and other beneficial insects through direct contact or by contaminating their forage and habitat. **Most labels have a requirement prohibiting drift, which if ignored, could result in a citation and penalty.*
 - Although most herbicides, fungicides, spray oils and adjuvants do not result in direct acute toxicity to bees, direct contact with these can impact bees - death due to suffocation, longer-term impact on hive development or a reduction of quality forage available to pollinators. Communication with the beekeepers can help minimize such effects as they may have had experience with this in the past. Talk with your PCA, dealer or nozzle supplier for information on minimizing pesticide drift.
- **Identify and notify beekeepers in the area prior to pesticide applications.** Bees will fly several miles to find quality forage. Therefore, pesticide applicators should identify and notify beekeepers within an agreed upon distance of a site to be treated at an agreed upon time prior to application. Timely notification will help ensure ample time for the beekeeper and applicator to develop a mutually acceptable strategy to manage pests while mitigating risk to honey bees. This may include covering hives, moving hives, choosing an alternate time of day to apply, or selecting an alternative product that is less toxic to bees. **Notifying beekeepers does not exempt applicators from complying with pesticide label restrictions. Many insecticide labels prohibit use on blooming plants if pollinators are present in the treatment area.*
- **Choose products with lower risk to bees.** Avoid use of dusts and wettable powder insecticide formulations. Dust and wettable powder pesticide formulations can leave a powdery residue which sticks to surface hairs on bees. Bees then bring the pesticide back to

the hive and potentially expose the entire hive to the pesticide for an unknown amount of time. Granular and liquid formulations are safer for pollinators since granules are not typically picked up by bees, and liquids dry on plant surfaces. Also choose products with lower toxicity of residues on foliage to bees.

Supporting Pollinator Forage & Habitat

- **Bee Forage.** 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. Flowers 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 when choosing plants to ensure adequate forage for the entire growing season. Diversity will also ensure pollinators have access to all of the nutrients they require to be healthy. Here are some easy, efficient ways to improve pollinator forage. . **Avoid plants or crops that might serve to increase pest populations locally that will require control with pesticides.**
 - **Municipalities** can plant trees, shrubs and flowers that provide good forage for all types of pollinators. Diversity is important; the pollen and nectar of each species carries a different nutrient load for the pollinators. This can be worked into new and replacement plantings, by choosing varieties that will contribute to pollinator forage. Foraging honey bees are typically not aggressive.
 - **Counties** can create bee forage along secondary roads. Secondary road ditches often contain several species of plants that provide forage for pollinators. It is a common practice to mow ditches for the safety of motorists. Consider spot spraying unwanted weeds and mowing at times when bee forage is least desirable.
 - **Homeowners** can put out flower pots, create flowerbeds, plant trees or shrubs or establish gardens to provide forage. Homeowners should also take special precaution when applying pesticides. The pesticide user BMPs apply to anyone using pesticides. Remember, the pesticide label is the law and it is in place to minimize risk to the environment and human health.

Interested in bee friendly plants and crops? Please go to: WWW.POLLINATOR.ORG.

- **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 houses in snags or in soft centered, hollow twigs and plant stems. Bees will 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 unwanted pests.
- **Public land access.** 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. Permission must be obtained through a permitting process with the appropriate state or federal land management agency.

Hobbyists

- Inspect hives regularly. Knowing how your honeybees look normally can help you identify problems faster.
- Keep bees healthy and vigorous. Ensure a clean source of water, proper pollen nutrition and minimize hive disturbances.
- Communication is key. Pollinators can travel to many different backyards and that can mean a lot of potential pesticide exposures.
- Are you in a cold part of the state? Consider your options to keep honeybees protected from the cold in the winter.
- Before controlling backyard pests, do some homework. For example, aphids secrete honeydew, a sugary liquid that attracts honeybees.
- Consider non-pesticide or least-toxic alternatives when controlling pests.

Honeybees typically live only 5-6 weeks although overwintering bees live for several months. It is normal to see a few dead bees in or around the hive. Honeybees remove the dead bees and carry them away from the entrance. However, pesticide poisonings can cause large numbers of bee deaths, resulting in piles near the hive entrance and survivors may exhibit marked behavior changes (*e.g.*, hyperactivity, shaking, and intensive grooming).

Other Considerations:

Alfalfa leafcutting bees remain in the field for 3 or more weeks. Studies have shown in these situations they have increased sensitivity to insecticides. Applications should be timed to occur after the peak nesting and pollination period (*i.e.*, 6 to 7 weeks after the start of foraging activity.)

Tank mixing may cause greater than additive (*e.g.*, synergistic) effects, resulting in increased hazards for bees. Be sure to follow the most restrictive label precautions and talk with the beekeepers as they may have had past experiences dealing with tank mixes and their effects on the bees.

Bees may collect pollen or nectar from treated crops that don't require pollination, such as corn, alfalfa, sorghum or cotton. Bees may also collect nectar from other parts of a plant than flowers, *e.g.*, extra-floral nectaries of cotton.

Be aware that soil fumigants will kill ground nesting bees, even when they are dormant.

Bees are most vulnerable when plants are flowering and nectar and pollen are available. At other times plants are not attractive to bees and they will not actively be in the area.

Appendix

Helpful Bee Related Links:

Arizona Sites

Beekeepers Association of Central Arizona <http://www.azbaca.org/index.html>

Carl Hayden Bee Research Center

http://www.ars.usda.gov/main/site_main.htm?modecode=20-22-05-00

UofA Bees <http://ag.arizona.edu/urbanipm/buglist/bees.pdf>

General Bee Sites

Bee Hive Journal <http://beehivejournal.blogspot.com/>

Bee Source <http://www.beesource.com/>

ScientificBeeKeeping.com <http://scientificbeekeeping.com/>

The Bee Journal <http://thebeejournal.blogspot.com/>

Government Sites

EPA Pollinator Protection <http://www2.epa.gov/pollinator-protection>

Extension - Bee Health http://www.extension.org/bee_health

Pesticide Environmental Stewardship

<http://pesticidestewardship.org/PollinatorProtection/Pages/Resources-and-Suggested-Reading.aspx>

USDA ARS http://www.ars.usda.gov/main/site_main.htm?modecode=80-42-05-40

USDA NRCS <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/pollinate/>

Industry Sites

American Beekeeping Federation <http://www.abfnet.org/>

Bee Care <http://becare.bayer.com/home>

CropLife America – Pollinators

<http://www.croplifeamerica.org/pesticide-issues/protecting-our-pollinators>

Varroa Mite Spread

<http://www-personal.umich.edu/~copyrgh/image/solstice/win06/Sammataro/varroa2006.html>

Scholarly Sites

Bee Informed Research Portal <https://bip2.beeinformed.org/>

Honey Bee Health Coalition <http://honeybeehealthcoalition.org/>

Pollinator Partnership <http://pollinator.org/>

Project Apism <http://projectapism.org/>

Reduce Bee Poisoning <http://extension.oregonstate.edu/crook/sites/default/files/bee2.pdf>

Scholarly Articles – Bees and Varroa Mites

http://scholar.google.com/scholar?q=bees+and+varroa+mites&hl=en&as_sdt=0&as_vis=1&oi=scholart&sa=X&ved=0CCYQgQMwAGoVChMI-ef32OvoxwIVhS6ICh3mwQII

Xerces Society <http://www.xerces.org/>



LANDOWNER PERMISSION FORM

A.R.S. § 3-367.02 requires that I, _____, get permission to place my bees on your lands and notify ag operators in the area where my bees will forage. This establishes an open line of communication so that you can notify me and I can take appropriate actions to protect my bees - avoiding pesticide label violations. By working together we can avoid problems.

I seek permission to place my bees in the following locations: *(List them, attach maps and then state how many maps are attached - whatever works to clearly show where the hives will be and the anticipated dates you would like to place them there.)*

This agreement is good from _____, 20__ through _____, 20__.

Landowner/Lessee Signature

Date

Contact Phone Number

Beekeeper Signature

Date

Contact Phone Number



BEEKEEPER NOTIFICATION FORM

A.R.S. § 3-367.02 requires that I, _____, get permission to place my bees on lands and notify ag operators in the area where my bees will forage. This establishes an open line of communication so that you can notify me and I can take appropriate actions to protect my bees - avoiding pesticide label violations. By working together we can avoid problems.

I have obtained permission to place my bees in the following locations: *(List them - attach maps and then state how many maps are attached, whatever works to clearly show where the hives will be and the anticipated length of time you will place them there.)*

This is to let you know of my bee locations so that you can notify me prior to making pesticide applications that may be harmful to my bees. I can be reached at the following numbers: _____. We have discussed and agreed upon the procedure, realizing there may be times when alternate methods of communication will be needed. _____ *(Insert here how you both agree the procedure should work – realizing that neither party wants to be taken advantage of – not moving bees in a timely manner or notification of applications without allowing time to take protective measures for the bees)*

This agreement is good from _____, 20__ through _____, 20__.

Grower Signature

Date

Beekeeper Signature

Date

Thank you to the ND Dept. of Ag for allowing the use of their plan as a model

