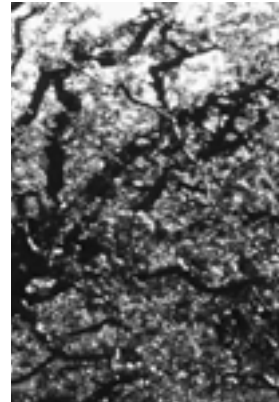
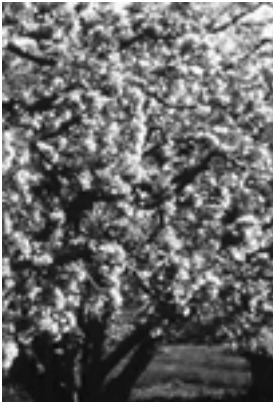


Are You Getting Your Money's Worth?

Hives *for* Hire



PENNSSTATE



College of Agricultural Sciences • Cooperative Extension

Introduction



Honey bees are our most important pollinators. Although many species of bees can be found in and around blooming orchards and vegetable crops, most wild bee species vary in abundance from year to year. Some agricultural practices destroy the natural nesting sites of wild pollinators, and regular pesticide applications may limit the number and variety of these pollinators. However, honey bees can be managed to provide consistent pollinator abundance from year to year.

Honey bee visiting strawberry flower



Problem: the changing pollination scene

With the introduction of parasitic honey bee mites, the pollination picture is changing rapidly. Once-abundant feral colonies (wild colonies nesting in trees or other cavities) provided a measure of pollination security for fruit and vegetable growers. This is no longer the case. Feral honey bee colonies are now nearly nonexistent in many areas. Estimates vary, but the Northeast may have lost 80 percent of its feral honey bees. A 1995-96 survey of 13 wild honey bee colonies in the State College area found that only two colonies survived the winter.



Despite intense efforts to protect their bees, beekeepers are losing large numbers of colonies to these mites and the diseases they transmit. Fewer beekeepers are providing honey bee colonies for growers using honey bees for pollination. The decline in the number of beekeepers is due to increasing winter losses of colonies caused by parasitic mites and diseases. For these reasons, the quality of honey bee colonies, at times, may be marginal for the purpose of pollination. Never before has the pollination situation been so critical. To ensure maximum crop yields, growers must now give careful attention and consideration to crop pollination.

What can you do?

Contact beekeepers early.

Since honey bee colonies may be in short supply some years, it is critical to contact beekeepers as early as possible so they know you are depending on them to supply bees. If you do not have a past relationship with the beekeeper, you should make initial contact with him or her in the fall. Beekeepers assess the survival and strength of their colonies from mid-February to mid-March. Contact your beekeeper during this time to be certain enough bees are available for spring pollination. In addition, you should make every effort to give beekeepers at least 48 hours' notice to move bees onto the crop.

Draw up a pollination contract.

To prevent misunderstandings, it is a good idea to draw up a pollination agreement between grower and beekeeper. This will ensure that enough pollinators are provided and that beekeepers are protected from pest control practices that may injure bees (see sample contract at the end of this publication).

Obtain an adequate number of colonies.

The number of honey bee colonies you will need will vary depending on crop, location, attractiveness of crop, density of flowers, length of blooming period, colony strength, and competitive plants in the area. The rule of thumb is to start with one colony per acre and make adjustments from there. Areas well populated with wild solitary bees and wild honey bee colonies will not need as many rented colonies.

Obtain bees at the appropriate time.

For apples and other tree fruit, move colonies in at 10 to 25 percent bloom. If primary blossoms produce the choice fruit, however, bees should be

present at the start of bloom or when king bloom on the south side of trees starts to open. Competing bloom from other flowers in the orchard, such as dandelions, should be eliminated by mowing, cultivation, or the use of herbicides. For melons, cucumbers, squash, strawberries, blueberries, and cranberries, honey bees should be moved onto the crop when the crop is attractive to bees. This means there should be many blooming flowers (10% to 20%) to attract bees to the crop.

Place colonies for maximum effect.

Place colonies in groups of four to eight in favorable locations throughout the orchard or field to provide even distribution of bees. Pollination is just as effective in large orchards or fields if groups of 10 to 20 hives are strategically distributed in sunny, wind-protected spots. Colonies should be protected from wind and exposed to the sun from early morning until evening. Bales of straw or packing boxes stacked behind colonies offer wind protection. Colony entrances facing east or southeast encourage bee flight. Hives should be up off the ground and front entrances kept free of grass and weeds. Do not place colonies under trees or in shade.

Bee activity is determined by weather and by conditions within the hive. Bees rarely fly when the exterior temperature is below 55° F. Wind speed above 15 mph seriously slows activity, and between 21 and 25 mph, activity stops. The stronger the colony, the lower the temperature at which bees initiate flight. Cold, rainy weather inhibits foraging. Under marginal weather conditions, foraging is limited to trees close to the hives. An extended period of inclement weather may require greater hive distribution to get adequate coverage.

Assess colony strength: be sure you are getting strong colonies.

It is important that the colonies you rent are healthy and contain a large enough population to do the job. For pollination, package bees (bees purchased through the mail and recently installed) and small hives are inferior to strong, overwintered colonies. The field bee population is generally correlated with the amount of brood in the hive. In packages and weak colonies, most of the hive population must remain in the hive to maintain temperatures of 93° to 95° F and rear brood. Two weak colonies are not equal to one strong colony! There are several different ways to assess colony strength.

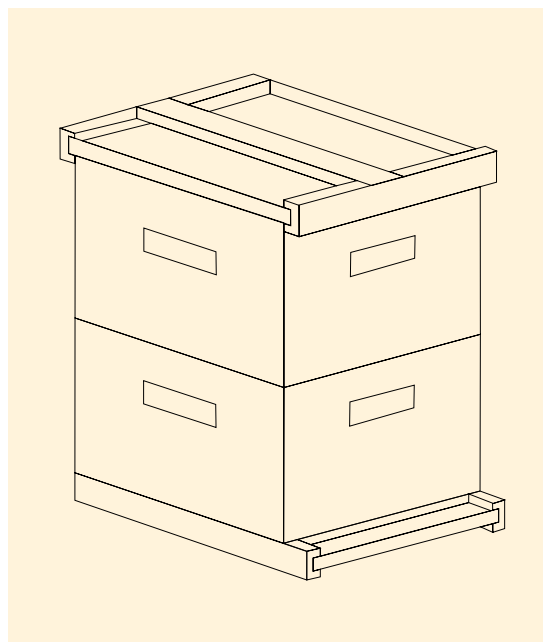
1. Assess colony population by inspecting hives.

This method is the most time-consuming but also the most accurate for assessing the quality of your investment in rented honey bee colonies. Colonies used for springtime pollination should have the following at minimum:

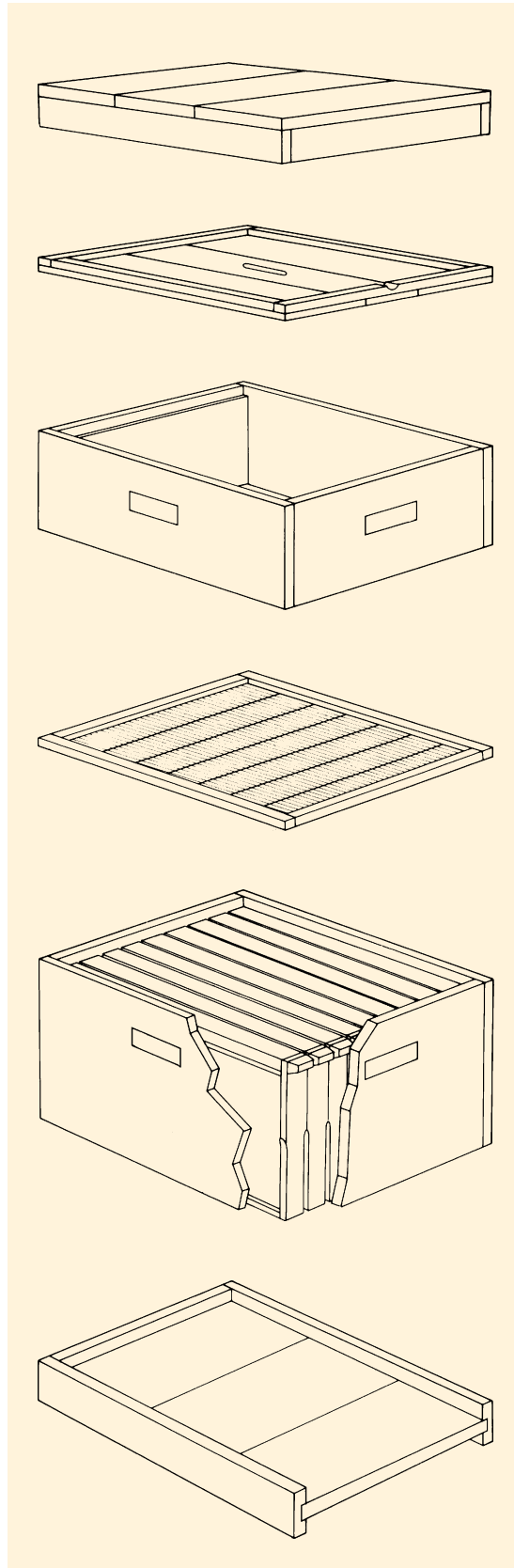
- a laying queen,
- one and a half or two stories (hive bodies or boxes),
- four to six frames of brood, and
- enough adult bees to cover six to eight frames

These are minimum requirements. Stronger colonies with larger populations make superior pollination units and may command a higher price. As these stronger colonies are opened, bees will “boil out” or cover the tops of frames. When smoked, however, bees move down onto the frames and may not be covering the frame tops. In this case the frames themselves should be covered with bees. Note: there will be some variability in the quality of the colonies you rent. As a general rule, 10 percent below the minimum standard is acceptable if 10 percent are above the minimum standard. Also, for a variety of reasons, some colonies may become queenless for a time; however, if these colonies meet all the other minimum requirements they will still be effective pollination units.

Diagram of a two-story hive with migratory lid



Components of a hive



2. Assess traffic at hive entrance.

This method is less time-consuming but also less accurate. On a warm (65° to 80° F), calm day between 11 AM and 3 PM, bee traffic at hive entrances should be heavy. During a one-minute observation period, strong colonies should have 50 to 100 or more bees arriving and leaving the hive. Bees should also be seen arriving with pollen pellets on their back legs. In weak colonies, perhaps only 10 to 20 bees will be seen arriving and leaving. Colonies that are being used for summer pollination should have even heavier traffic at the hive entrance.

Another crude way to assess colony strength is to observe entrances when temperatures are cool (between 55° and 60° F). The stronger the colony, the lower the temperature at which bees will fly. In general, weaker colonies rarely fly when temperatures are below 60° F. Strong colonies will fly when temperatures are between 55° and 60° F. In general, honey bees rarely fly when temperatures are below 55° F.

Bee with pollen in pollen baskets



3. Assess bee density on the crop.

This method allows you to assess the contribution of wild pollinators (honey bees only) in addition to rented bees. If you are using rented colonies, however, this method tells you little about the quality of bees you have rented. We suggest that if you use this technique and find that the number of bees on the crop is low, you then use options 1 or 2 to assess the strength of the rented bees before renting additional bees.

The honey bee visitation rates in the following table are appropriate only for honey bees and are not accurate for bumblebees or solitary bees. The numbers are only rough guidelines and may change depending on varieties and planting conditions.



Crop	Approximate number of honey bees needed	Time to make observation
Apples	1-2 bees at a glance	Late morning; an average of 2-3 counts during king bloom
Cucumbers including pickles	1 per 100 flowers	Late AM
Cantaloupes	1 per 10 perfect flowers	Late AM
Blueberries	1-4 per bush	Mid-day

Carefully consider the use of bee attractants.

Research on sugar-based attractant sprays for improving pollination indicates that such materials are generally ineffective. The entire tree is sprayed with the attractant and bees collect the sugar off the leaves, usually without visiting the flowers. While this brings more bees into the field or orchard, there is not necessarily more pollination. In addition, the sugar may be detrimental if it serves as a medium for the growth of sooty molds. Other attractants containing bee-derived communication pheromones, such as geraniol, have proved more successful, but further testing is needed before a full recommendation can be made.

One of the newest and most promising attractants, Fruit Boost®, contains honey bee queen mandibular pheromone. Canadian research has shown that when sprayed on flowering crops, queen mandibular pheromone can result in dramatic increases in yields for some crops. This product is sold in both Canada and the United States, and is being marketed mainly for use in pears, high bush blueberries, Gala apples, and vegetable seed production. U.S. distributors are located in the Pacific Northwest. For more information, contact Phero Tech, Inc., 7572 Progress Way, R.R. #5, Delta, British Columbia, Canada V4G 1E9; phone: 604-940-9944; fax: 604-940-9433.

Other precautions and requirements

Beekeepers should be given at least 48 hours' notice to move bees onto the crop. Likewise they should be provided 48 hours' notice to move bees off the crop. Insecticides applied in or near the crop before or during bloom are a serious threat to bees. Give the beekeeper 48-hour's advance notice so that the bees can be removed from the field or orchard.

Honey bees need water for temperature regulation and brood production. Provide a clean water supply near the hives.

Keep orchard wheel ruts and areas around the pesticide sprayer fillpoint drained to eliminate a possible insecticide-laden water source.

Additional information

The publications listed below are available at your county extension office or by contacting Maryann Frazier, Penn State Department of Entomology (814-865-4621).

- Fundamentals of Beekeeping (available for \$5)
- Beekeeping Topics: "Sources of Bees for Pollination in Pennsylvania," "Bees and Insecticides," "Pollination Contracts"

Summary: pollination rules

1. Contact beekeepers early.
2. Draw up a pollination contract.
3. Get an adequate number of colonies.
4. Obtain bees at the appropriate time.
5. Place colonies for the maximum effect.
6. Assess colony strength: be sure you are getting strong colonies.
7. Carefully consider the use of bee attractants.
8. Other precautions and requirements:
 - Give beekeepers at least 48 hours' notice to move bees onto and off the crop.
 - Provide a water supply near the hives.
 - Keep orchard wheel ruts and area around pesticide sprayer fillpoint drained to eliminate a possible insecticide-laden water source.



Pollination Agreement

This agreement is made _____, 19_____, between _____,
(date)
and _____.
(beekeeper's name)

1. Term of Agreement

The term of this agreement shall be for the 19 _____ growing season.

2. Responsibilities of the Beekeeper

a. The beekeeper shall supply the grower with _____ hives (colonies) of honey bees to be delivered to the _____ as follows:
(orchard, field, etc.)

(Fill in the appropriate line or lines and cross out those that do not apply)

Approximate date of introduction: _____ . Number of days after written notice from the grower: _____ .

Time in relation to the following amount of bloom:

Description of location(s):

(For additional space attach a separate sheet dated and signed by both parties)

The beekeeper shall locate said bees in accordance with directions of the grower, or, if none are given, according to his/her judgment in providing the maximum pollination coverage.

b. The beekeeper agrees to provide colonies of the following minimum standards:

Disease-free colonies with a laying queen as evidenced by brood.

_____ frames with brood, with adult bees to cover.

_____ pounds of honey stores or other food.

_____ story hives.

The beekeeper agrees to open and demonstrate the strength of colonies randomly as selected by the grower.

c. The beekeeper agrees to maintain the bees in proper pollinating condition by judicious inspection and supering or honey removal as needed.

d. The beekeeper agrees to leave the bees on the crop until:

(Fill in the appropriate line or lines and cross out those that do not apply)

Approximate date of removal: _____ . Number of days of written notice from grower: _____ .

Time in relation to amount of crop bloom:

Other:





3. Responsibilities of the Grower

a. The grower agrees to provide a suitable place to locate the hives. The site must be accessible to a truck and other vehicles used in handling and servicing the colonies. The grower shall allow the beekeeper entry on the premises whenever necessary to service the bees, and the grower assumes full responsibility for all loss and damage to his fields or crops resulting from the use of trucks or other vehicles in handling and servicing such colonies of honey bees.

b. The grower agrees not to apply pesticides toxic to bees to the crop while the bees are being used as pollinators nor immediately prior to their movement if the residue would endanger the colonies. See Beekeeping Topics No. 4 "Honey Bees and Pesticides" for determining which pesticides are hazardous to bees.

c. The following pesticides, other agricultural chemicals, and methods of application are mutually agreed to be suitable while the bees are on the crop.

d. The grower also agrees to properly dispose of all pesticide solutions in such a manner that bees will not be able to contact the material while searching for a water source.

e. The grower agrees to give the beekeeper 48-hours' notice if hazardous materials not listed need to be applied. The cost of moving the bees away from and back to the crop to prevent damage from highly toxic materials shall be borne by the grower.

f. The grower agrees to pay for _____ colonies of bees at the rate of \$ _____ per colony. Payment shall be made to the beekeeper as follows: \$ _____ per colony on delivery and the balance on or before _____ (date) of said year.

Additional moves or settings shall require \$ _____ per hive per move.

g. The grower agrees to provide adequate watering facilities for the bees if none are available within one-half mile of each colony used in pollinating the crop.

Signed: _____
Grower

Beekeeper

Address: _____

Phone: _____

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