

Orange County Beekeepers Association (OCBA)

Bee School 2017 Schedule

Date	Lesson	Instructor
Tuesday, January 17, 2017	Introduction to Beekeeping	Randall Austin
Tuesday, January 24, 2017	Honeybee Biology	Todd Walker
Tuesday, January 31, 2017	Bees as Social Insects	Todd Walker
Tuesday, February 07, 2017	Beekeeping Equipment	Randall Austin
Tuesday, February 14, 2017	Getting Started	Will Hicks
Tuesday, February 21, 2017	Varroa Mites	Randall Austin
Tuesday, February 28, 2017	Diseases and Pests	Jennifer Keller
Tuesday, March 07, 2017	Plants for Bees in NC	Geneva Green
Tuesday, March 14, 2017	Products of the Hive	Inge Kautzmann
Tuesday, March 21, 2017	Seasonal Management/Review and Certification Exam	Todd Walker/ Master Beekeepers
Saturday, February 11, 2017	Field Day - Equipment Building	
Saturday, March 25, 2017	Field Day (weather permitting)	

Regular monthly meetings of the OCBA are held on the **2nd Thursday of every month, 7-9 p.m.** at the same location as the bee school (Unitarian Universalist Congregation of Hillsborough, 1710 Old NC 10, Hillsborough, NC 27278). Information on upcoming meeting presentations can be found at <http://theocba.org>.

A Few Resources for New & Prospective Beekeepers

People:

The Orange County Beekeepers Association (OCBA, <http://theoeba.org>) meets at 7:00 p.m. on the 2nd Thursday of each month. Meetings cover all topics related to beekeeping. Attendees include all sorts of people: they've had members who don't have any bees at all, and a few with hundreds, even thousands of hives; they have school-age children, retirees, and everyone in between; attendance is usually an even mix of women and men. The emphasis is on asking questions, learning and supporting each other. **The OCBA has a formal mentoring program, linking beginning beekeepers with an experienced person who can give you practical advice as you get started.**

Other local county associations:

Alamance (<http://alamancebeekeepers.org>)

Chatham (<https://chathambeekeepers.wordpress.com/>)

Wake (<http://www.wakecountybeekeepers.org>)

Person (<http://www.personcountybeekeepers.org>)

Durham (<http://www.durhambeekeepers.org>)

Each county association has its own personality (large/small, structured/casual, rural/suburban/urban, etc.) so if you don't like one, try another one.

NC State Beekeepers Association (NCSBA) holds two conventions every year: one in the late winter/spring (February/March) and one in the summer (July). Workshops, lectures and demonstrations cover basic to advanced topics as well as the latest in academic research. The NCSBA is the largest and one of the most active state beekeeping associations in the United States.

North Carolina Apiary Inspection Service, part of the NC Dept. of Agriculture, has dedicated personnel whose sole job is to help beekeepers maintain healthy hives. If you encounter something odd and would like an expert inspection, do not hesitate to give them a call. **Don Hopkins (919) 218-3310** and **Will Hicks (919) 691-0022** serve our area and often participate in local beekeeping meetings. They are not "the police" and won't criticize you for doing something wrong; they are here to help! And it doesn't matter whether you have one hive or 1,000. Will says that he likes visiting folks with one or two hives, because it is less work for him!

Internet sites:

www.ncbeekeepers.org

North Carolina State Beekeepers Association website. Schedule of beekeeping courses offered throughout the state, links to a wide variety of related websites, meeting announcements & registration forms, links to local county associations and much more.

<http://www.cals.ncsu.edu/entomology/apiculture>

NC State University Apicultural Sciences Extension website. Power Point tutorials on honey bee management, articles on a variety of bee-related topics ("Beekeeping Notes"), FAQs and much more. This is a terrific and extensive resource, paid for with your tax dollars!

<http://www.baileybeesupply.com/articles.htm>

Educational articles written by Master Beekeeper Randall Austin and hosted by a local bee supply store. Articles are specifically targeted to cover the issues faced by Triangle beekeepers.

Note: any nut with a computer can post to an internet site, and lots of nuts keep bees! Don't take everything seriously that you find on the internet related to beekeeping. Especially beware of interesting "alternative" medications and miticides that, although popular, may be both dangerous and illegal. Stick to practices recommended by NCSU and the NC Department of Agriculture.

Reading Material:

It is often said that more has been written about honey bees than any other animal except humans. That may or may not be true, but it certainly is true that there are lots of books about bees and beekeeping. Read several, since each has its own perspective. You'll get conflicting advice from different experts; that's part of the fun of learning! Don't believe everything you read, but use it as a basis for experimentation.

Beginner books:

First Lessons in Beekeeping, Dr. Keith Delaplane, www.dadant.com

First Lessons introduces the prospective beekeeper to the basics of beekeeping through easy-to-understand text and numerous color photos on honey bee biology, beekeeping equipment, management, honey production and processing, as well as disease diagnosis and treatment.

Backyard Beekeeping, Dr. James E. Tew. **Free** PDF Version:

<http://www.aces.edu/pubs/docs/A/ANR-0135/>

Backyard Beekeeping is a colorful, fact-filled introduction to all aspects of beekeeping. In a field where the abundance of information and instructions can be intimidating to the novice, this book puts information in an orderly form and aids the new beekeeper in developing hive management skills. It is also an appropriate review for the experienced beekeeper.

Advanced books:

The Hive and the Honey Bee, Dadant & Sons. This is an all-inclusive reference text, and has been updated every few years for the past 150 years. The latest edition just came out (2015) after a 25 year hiatus. It has extensive, authoritative information on everything related to honey bees and beekeeping. It is arranged by topic in chapters like a textbook.

The ABC and XYZ of Beekeeping, A.I. Root Publishing. Like The Hive and the Honey Bee, this is an exhaustive reference book on every aspect of beekeeping, and has been periodically updated since the late 1800s. The latest version (41st) was published in January 2007. It is arranged alphabetically by topic, encyclopedia-style.

Both of these advanced books are expensive new (around \$50 each) so try to find them used if you can. But make sure you get the latest edition.

Tools for Varroa Management, A Guide to Effective Sampling & Control, Honey Bee Health Coalition. Based on the latest university research, this is an up-to-date (2015), comprehensive guide to managing varroa mite infestation, with comparison of treatment options based on their effectiveness, difficulty and adverse effects. The guide is available for *free* download here: <http://honeybeehealthcoalition.org/Varroa>

Other resources:

There have been several significant events in beekeeping in the past few years, notably the introduction of tracheal and varroa mites in the 1980s and small hive beetles in the late 1990s. The published books cannot keep up with constant changes, but the NCSU “Beekeeping Notes” attempt to. After reading introductory books to learn the basics, browse these extension bulletins for additional information (http://www.cals.ncsu.edu/entomology/apiculture/Beekeeping_notes.html).

To really keep up with the latest news, products and practices, subscribe to one or more beekeeping magazines. The most popular ones are “American Bee Journal” (www.americanbeejournal.com) and “Bee Culture” (<http://beeculture.com>). The content of the two are very similar. Both are published once a month and cost around \$25 per year. If you have a public library card, you can access the electronic version of “Bee Culture” for *free* via NCLive.org.

Equipment/Supplies:

There are a surprising number of beekeeping equipment suppliers. Some are large businesses, others are mom-and-pop operations, and a few are side-lines of commercial beekeeping businesses. It is unusual to find a single supplier who has exactly what you want of everything you want at the right price. So shop around and experiment with suppliers. Be careful to compare the total delivered price of your purchases; differences in shipping charges can often mean that a nearby offer at a higher price is actually a better deal than a far-off offer at a lower price.

Used equipment is often available, although it isn’t often that you’ll find what you want when you want it. Used smokers, bee suits, extractors and other tools can save you a lot of money. But beware of used hive bodies (boxes) and frames. If you hear, “Uncle Joe’s bees all died so we are selling the hives cheap,” consider that the disease that killed Uncle Joe’s bees is probably lingering in the wax and cracks, waiting to kill the next bees that move in. Second-hand equipment is a major means of spreading disease.

A few of the more popular suppliers are:

Bailey Bee Supply: <http://www.baileybeesupply.com> Bailey has two stores: 147 Boone Square Street, Hillsborough (near the old Food Lion, next to “To The Pointe” dance studio), 919-241-4236, and 1724 South Saunders Street, Raleigh (a few thousand feet north of I-40 at exit 298) 919-977-0901.

Betterbee: <http://www.betterbee.com> (1-800-632-2279).

Dadant & Sons: <http://www.dadant.com>. Tip: Dadant is a large company with eleven retail outlets across the country, including one in Chatham, Virginia (20 miles north of Danville). Internet orders are shipped from Hamilton, Illinois. To reduce shipping charges on large (heavy) orders, call the Chatham store directly (1-800-220-8325) rather than placing your order on the internet.

Brushy Mountain Bee Farm: <http://www.brushymountainbeefarm.com> (1-800-233-7929). Bailey Bee Supply (see above) is an authorized distributor for Brushy Mountain Bee Farm.

Miller Bee Supply: <http://millerbeesupply.com> (1-888-848-5184). This is another North Carolina company.

Walter Kelley: <https://www.kelleybees.com> (1-800-233-2899). Tip: Kelley's usually isn't the lowest-cost supplier, but they carry many items that are unusual or old-fashioned. If you cannot find something elsewhere, check Walter Kelley.

Rossman Apiaries: <http://gabees.com> (1-800-333-7677). Located in south Georgia, Rossman specializes in cypress woodenware and package bees.

Where to Get Bees:

First you should know when to get bees. You'll want to establish your new hives as early in the spring as is practical. In our part of the Piedmont, March is a bit early, April is great, May is good, June is possible, July is too late. Bee suppliers take orders on a first-come-first-served basis, so January (or even November/December) is not too early to place an order for delivery the next spring; mid-April may be too late if they sell out quickly. Regardless of when you place your order, you cannot expect delivery of "package" bees earlier than the last of March (in years with great weather) or the first week or two of April.

There are 3 methods of selling bees:

1. In a "package": a screened box, about the size of a big shoe box, designed to be shipped through the mail, usually with 3 pounds of bees (10,000 bees!) and a queen.
2. As a "nuc" (short for "nucleus"): a "baby hive" usually with 5 frames of comb and bees, some brood, and a queen. The frames will often be put in a cardboard box for transporting. Starting with a nuc will give you a little bit of a head start compared to package bees, but may be more expensive. Nucs are usually not available as early in the season as packages are.
3. As an established full-sized hive, complete with all frames, box, cover and bottom. This could conceivably be purchased any time of year.

Which method you go with will depend on availability, price, convenience and your own preference.

I recommend that people not start with an established hive because in the process of getting a hive up to full strength, you will grow in experience at the same time the hive grows. Wouldn't

you rather learn to drive using a Volkswagen Beetle instead of a semi truck? Plus, an established hive should cost more than twice as much as the other two options.

To legally sell bees within the state of North Carolina, vendors must be approved by the NC Dept of Agriculture. This only applies to those selling bees as a business (more than 10 hives per year). The list of registered sellers is at <http://www.ncagr.gov/plantindustry/Plant/apiary/index.htm>.

Honey bees are often listed for sale in the NC Agricultural Review newsletter, on-line at <http://www.ncagr.com/paffairs/agreview/>.

A lot of companies sell bees on-line. Most of the supply houses listed above either sell them or will refer you to a preferred supplier. These are almost always “package bees” that typically originate in south Georgia, regardless of where the retailer is located. Bailey Bee Supply sells packages and nucs in Hillsborough and Raleigh. **Warning:** do not buy bees from sources in areas that are colonized by African bees, such as **Texas, southern California or central/southern Florida**. You may end up with very ill-tempered bees, which is totally unnecessary as well as dangerous to yourself, your family and your neighbors. It is illegal for those suppliers to sell to North Carolina but there isn’t strong enforcement of the law.

Attend a local beekeeping club and ask where you can get bees. Someone there may be able to sell you some. If you establish a relationship with a generous mentor, you may get lucky and get them for free! These will almost always be “nucs.”

In the spring (March/April), it is possible to get “free” bees by collecting a swarm. However there are not nearly as many swarms now as there were in grandpa’s day, so you cannot depend on it. Plus, swarm catching is a lot of work and is unpredictable. For example, I went on four swarm calls one spring: one swarm had left the premises by the time I arrived, one was firmly entrenched inside a cinder-block wall and couldn’t be reached, one turned out to be carpenter bees, and one (just one) was clumped underneath an azalea bush, patiently waiting for me to scoop it up and take it home. So it is possible to get free bees, but not likely. If you want to give it a try, join your local beekeeping association and ask for help. The article “Free Bees?” provides more advice on this topic (http://www.baileybeesupply.com/docs/free_bees.pdf).

Honey bees in the US belong to several different races or strains. Most package bees are Italians (*Apis mellifera ligustica*). These are known for rapid population build-up, industrious comb-building and a gentle disposition, three very desirable qualities for a brand new hive. There are other races that tend to have a different mix of characteristics, e.g. Carniolans (*Apis mellifera carnica*) are very thrifty with food stores in summer and winter but don’t build comb quickly or grow their population as readily as Italians, while Russians (a substrain of debatable genetic origin, perhaps from *Apis mellifera anatoliaca*) are reported to be slightly better at handling pests but tend to be more irritable. Note that if you start out with one type of honey bee (e.g. Italian, Russian or Carniolan), it only takes a couple of months to completely switch to another type simply by replacing the queen. And the bees in the starter hive (from either a package or a nuc) don’t have to be the same type as the queen. So don’t worry too much about what bees you start with. The important thing is to buy healthy bees from a reputable source.



Note 3.02
(Previously Note #1A)

THE IMPORTANCE OF HONEY BEES IN NORTH CAROLINA

Honey bees are not native to the New World. They are immigrants, but they are an essential part of both our agricultural economy and the overall ecosystem including homeowners, wildlife, and anyone with an interest in nature.

Honey bees are important throughout the Americas and, in fact, throughout the world, but a brief description of their importance here in North Carolina may be more meaningful to the residents of this state.

The Various Ways That Honey Bees Are Important in North Carolina

1. Honey -- Each year honey bees kept by beekeepers in North Carolina produce over \$6 million worth of that delicious food. Some of the most popular honeys in the eastern United States are produced here, such as sourwood, black locust, tulip poplar and many others. Even though honey is a very popular food product, it is not the real reason for the importance of the honey bee.
2. Beeswax, Royal Jelly, Bee Pollen and Other Products of the Hive -- North Carolina beekeepers also produce a wide variety of bee products from the beehive with the aid of their honey bees. These products have a variety of uses such as beeswax for candles and cosmetics, royal jelly for cosmetics, bee pollen as a protein source, and more. These products are very popular as health foods and cosmetics, but they are not the main importance of honey bees in the state.
3. Pollination -- Pollination is defined as the transfer of pollen (the male portion of a flower) to the female portion which is then followed by fertilization and the production of fruit and/or seeds. Honey bees are undoubtedly the most important pollinators of food crops for humans and probably of food for wildlife in North Carolina and the entire nation. This is the main importance of honey bees.

Without adequate insect pollination, many of the crops grown in North Carolina could not be produced on a commercial basis, and honey bees are the most important insect in the process of pollination.

In North Carolina there are many crops that require some insect pollination and the following crops could not be produced if we did not have honey bees available for this task: apples, cucumbers, squash, watermelons, many of the berry crops, and more.

Why Are Honey Bees So Important For Pollination? It is reasonable to ask, “Why can’t other insects do the pollination work?” It is true that many other bees (non-honey bees), flies, and other insects also do some pollination when they visit flowers; but those insects cannot take the place of honey bees. Those other insects do not have the special features that honey bees possess:

Reasons Honey Bees Are So Effective in Pollination of Commercial Crops:

- * A honey bee colony may consist of up to 60,000 individuals while most other insects are solitary or only have colonies of a few hundred individuals.
- * Honey bee colonies have adult insects throughout the entire year while other insects exist for only a portion of the year as adults. Adults do most of the pollination.
- * Honey bee colonies can be moved by beekeepers to any location in the state where bees are needed for pollination and this is not usually an option with other insects. (Bumble bees are an exception, but those colonies number only a few hundred individuals.)
- * Honey bees are managed by beekeepers who have developed successful management practices based on thousands of years of mankind’s experience with honey bees.

An Example of the Importance of Honey Bees -- Cucumbers:

North Carolina is one of the leading producers of cucumbers. Cucumbers require insect pollination to produce marketable fruit and the honey bee is the only insect that is a realistic pollinator for this commercial crop. Note the following:

Based on studies at North Carolina State University:

- * Cucumber flowers that do not receive insect visitation do not set any fruit. They do not even set fruit that is culled or thrown away. NO BEES = NO FRUIT (Cucumbers)
- * Cucumber flowers not only require insect visitation but each flower requires a large number of insect visits -- the average requirement is 12 insect visits to each flower (blossom) during a one day period. Only honey bees are available in adequate numbers to ensure good cucumber fruit set. A reduced number of bee visits will result in fruit that aborts or in fruit that is small and misshapen.

The importance of honey bees is not limited to just the commercial production of crops such as cucumbers. Honey bees are also important in the pollination of many fruits, vegetables and seeds in the home garden. If your vine crops have flowers but are not producing any fruit (vegetables), then the reason is probably that they are not being pollinated by insects such as honey bees.

Food for Wildlife -- In addition to being important in the pollination of commercial and backyard crops, honey bees are also important in the pollination and production of foodstuffs for wildlife. For example, up to 20 or 25% of a black bear’s diet may come from berries, seeds, etc. that are insect pollinated. In addition, many birds feed on insect (honey bee) pollinated seeds, nuts, and berries. Of course, other insects also pollinate many of the foodstuffs for wildlife, but honey bees definitely play a major role.

A Recent Problem -- Honey bees have been important in the pollination of many plants grown in N.C., but recently there has been a serious problem. The accidental introduction of two mite pests into the Americas in recent years has drastically reduced the number of honey bee colonies throughout the Americas, in the U.S. and in North Carolina. We have lost over 1/3 of our managed bee colonies (bees kept by beekeepers) in the state within the last five years and the problem is ongoing. In addition, over 90% of the feral honey bee colonies (honey bees living in the wild) have also been destroyed by the mite pests. This reduction in honey bee numbers means fewer bees for pollination. Beekeepers, researchers and state regulators are all working to reduce the impact of the mite pests on honey bees, but in the meantime it is in everyone’s interest to protect all of the remaining honey bee colonies that we have in both managed beehives and in the wild.

Prepared by: J.T. Ambrose, Extension Apiculturist - May 1997



Note 3.01
(Previously Note #1)

BEES AND BEEKEEPING IN NORTH CAROLINA

Who Keeps Bees? Anybody can keep honey bees. In North Carolina, farmers, businessmen, homemakers, carpenters, children, doctors, university professors, and just about anyone else you can imagine keeps bees.

Where Can Bees Be Kept? Bees can be kept almost anywhere. There are beekeepers in deserts, small towns, in rural areas, in suburban areas, in large cities, and on beach front property. There is even at least one beekeeper in New York City who keeps several hives of bees on the roof of his penthouse apartment.

What is a Bee Colony? A bee colony is merely a large family of bees. It consists of one queen who is the mother of all of the other bees in the hive, between 15,000 - 50,000 worker bees and several hundred drones (male bees).

How Popular is Beekeeping in North Carolina? Beekeeping is a very popular hobby and interest seems to be on the increase. There are over 10,000 beekeepers in the state and about 1,200 of them belong to the N. C. State Beekeepers Association. In addition, the NCSBA has beekeeping chapters in most of the N. C. counties.

Are There Beekeeping Education Programs in N.C.? Yes, there are many programs such as regular courses on honey bees at N.C. State University, short courses offered at the annual NCBA conventions (twice a year) and at local NCSBA chapter (county) meetings, and of course the N.C. Master Beekeeper Program. The N.C. Master Beekeeper Program is the largest and most long-lived state master beekeeping educational program in the United States. The program is completely free of charge to N.C. residents and is sponsored by the N.C. State Beekeepers Association, N.C. State University (Extension Service), and the N.C. Dept. of Agriculture.

What is the North Carolina State Insect? The honey bee!

Is North Carolina an Important Beekeeping State? Definitely! North Carolina ranks in the top ten states based on its number of beehives. In addition, there are more beekeepers in North Carolina than any other state. The great majority of the state's beekeepers are hobby beekeepers with less than 10 hives of bees per beekeeper.

Why Is Beekeeping Important in North Carolina? In a typical year, North Carolina's beekeepers (with a little help from their bees) produce between 5 and 6 million pounds of honey with a value of approximately \$10 million dollars. In addition, they also produce over 120,000 pounds of beeswax. But that is only part of the story. Honey bees also contribute another \$70 million plus to the state's agricultural economy through the pollination of such crops as apples, blueberries, cucumbers and other vine crops.

Does a Bee Sting Hurt? Yes, but few things in life are free, not even honey. It is also important to note that a good beekeeper learns how to reduce the chances of being stung.

What North Carolina Crops Really Benefit from Honey Bee Pollination? Many of our fruit and vegetable crops such as apples, blueberries, cucumber, melons, pumpkins, squash, strawberries, and watermelons show increases in yield and quality from honey bee pollination. In addition, a sizeable portion of the diet of North Carolina's wildlife (birds, squirrels, bears, etc.) feed on bee pollinated plants.

How Much Does it Cost to Get Started in Beekeeping? The first hive of bees and the equipment to work the bees should cost about \$175.00. Additional hives cost less because some of the equipment is interchangeable and reusable.

What Are Some of the Ways to Earn Money from Honey Bees?

- ! sale of honey
- ! sale of beeswax and beeswax products such as candles
- ! renting bee colonies for pollination
- ! sale of queen and package bees
- ! sale of specialty bee products such as pollen, bee venom and royal jelly

How Much Money Can a Hobby Beekeeper Earn Per Colony of Bees? In N. C. the average hobby beekeeper can expect to earn approximately \$60-\$80/colony from honey sales. This amount may fluctuate from year to year and the beekeeper may also earn income from other sources such as the sale of beeswax, pollination, etc.

Where Can I Obtain Additional Information on Beekeeper?

1. Office of your local (county) Cooperative Extension Agent
2. North Carolina State Beekeepers Association - (information on membership including dues, benefits, and annual meetings):

Mr. Paul Madren, Treasurer
104 Woodland Drive
Cary, N.C. 27513
Phone: (919) 467-7065

Visit the NCSBA web site:
www.ncbeekeepers.org

3. Extension Apiculturist at N. C. State University (general information on beekeeping and beekeeping education programs):

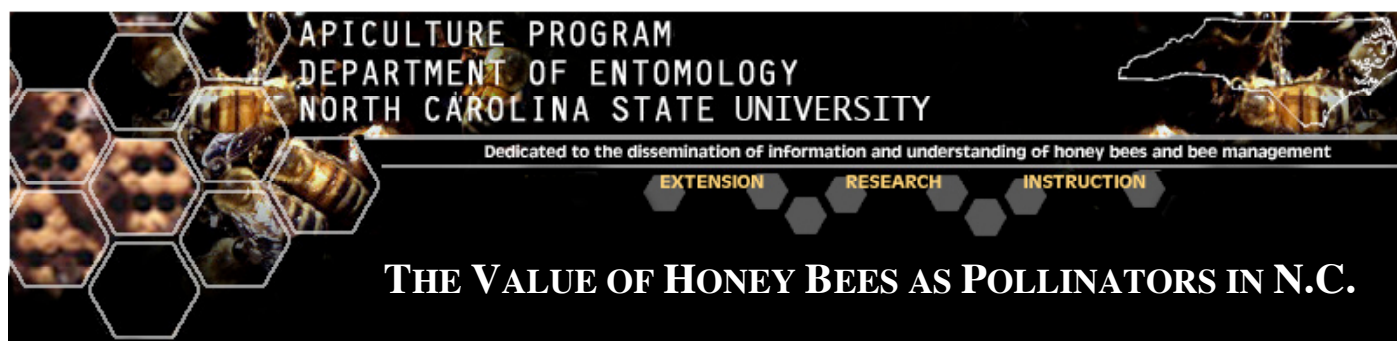
Dr. David R. Tarpy, Extension Apiculturist
Campus Box 7613
N. C. State University
Raleigh, NC 27695-7613
Phone: (919) 515-1660

Visit the NCSU web site:
<http://entomology.ncsu.edu/apiculture>

4. NC Dept. of Agriculture (information on bee disease inspection services and state regulations on beekeeping):

Mr. Don Hopkins, Apiary Inspector Supervisor
N. C. Dept. of Agriculture
PO Box 27647
Raleigh, NC 27611
Phone: (919) 233-8214

Visit the NCDA web site:
www.agr.state.nc.us/plantind/plant/apiary/apairy



Many crops require insects to move pollen from one flower to another. Pollination ensures fruit set, proper development, more fruit, and viable seed. **Honey bees** are the **most important insect pollinator** for crops grown in North Carolina.

- Vegetable and fruit crops that require honey bees include cucumbers, blueberries, watermelons, apples, squash, strawberries, melons, and peaches.
- Forage crops that benefit from honey bee pollination include alfalfa, cotton, peanuts, and soybeans.
- Averaged over the last five years, honey bees have directly accounted for approximately **\$96 million** in annual fruit and vegetable production (67.9%) and approximately **\$186 million** in total annual crop productivity (24.5%) (*Table 1*).

Since the mid-1980s, honey bees have been plagued by two exotic parasitic mites that can kill entire colonies if left untreated. The result has been a **dramatic drop** in the state's **honey bee population**

- The estimated number of **managed** hives in the state has declined from a high of 180,000 hives before the mite introduction to **only 100,000 hives** currently.
- Most **wild honey bee colonies**, which also served as pollinators, **have been wiped out** by these mites.

It is now necessary that growers of bee-dependent crops **rent hives** to ensure proper and successful pollination.

- Pollination rentals often require **pollination contracts** between growers and beekeepers to ensure an adequate number of honey bees in the crop during the bloom period.
- An estimated **240,000 hives will be required for pollination in 2007** (*Table 2*), which exceeds the number of managed hives in the state. Thus it is vital to **contract pollinators well ahead of the date they are needed**.

Distributed in furtherance of the acts of Congress of May 8 and June 30, 1914. North Carolina State University and North Carolina A&T State University commit themselves to positive action to secure equal opportunity regardless of race, color, creed, national origin, religion, sex, age, or disability. In addition, the two Universities welcome all persons without regard to sexual orientation. North Carolina State University, North Carolina A&T State University, U.S. Department of Agriculture, and local governments cooperating.

To **locate beekeepers in your area**, contact your local Cooperative Extension Office, the North Carolina Department of Agriculture and Consumer Services, or visit the **"BeeLinked"** web site at:

<http://www.ncagr.com/beelinked>

Table 1. The value of NC agriculture directly attributable to honey bee pollination.

FRUITS AND VEGETABLES	Total Value of Production (\$1000s of dollars)							Value attributable to honey bees (\$1000s of dollars)					
	2002	2003	2004	2005	2006	D	P	2002	2003	2004	2005	2006	5 Year Avg.
Apples	22,205.000	17,103.000	16,630.000	13,859.000	19,799.000	100%	90%	19,984.500	15,392.700	14,967.000	12,473.100	17,819.100	16,127.280
Blueberries	22,534.000	34,777.000	32,235.000	36,702.000	48,745.000	100%	90%	20,280.600	31,299.300	29,011.500	33,031.800	43,870.500	31,498.740
Brambles	583.440	938.250	1,003.920	1,003.920	1,025.280	80%	90%	420.077	675.540	722.822	722.822	738.202	655.893
Cucumbers (fresh)	12,075.000	13,260.000	11,340.000	8,400.000	13,299.000	90%	90%	9,780.750	10,740.600	9,185.400	6,804.000	10,772.190	9,456.588
Cucumbers (pickled)	23,490.000	23,612.000	19,404.000	19,952.000	10,260.000	90%	90%	19,026.900	19,125.720	15,717.240	16,161.120	8,310.600	15,668.316
Grapes	2,934.000	2,989.000	3,366.000	3,653.000	4,624.000	10%	10%	29.340	29.890	33.660	36.530	46.240	35.132
Melons	20,000.000	20,000.000	20,000.000	20,000.000	20,000.000	80%	90%	14,400.000	14,400.000	14,400.000	14,400.000	14,400.000	14,400.000
Peaches	3,500.000	2,400.000	2,940.000	5,100.000	5,115.000	60%	80%	1,680.000	1,152.000	1,411.200	2,448.000	2,455.200	1,829.280
Pumpkins	2,000.000	2,000.000	2,000.000	2,000.000	2,000.000	90%	10%	180.000	180.000	180.000	180.000	180.000	180.000
Squash	10,260.000	8,430.000	9,000.000	9,860.000	11,480.000	90%	10%	923.400	758.700	810.000	887.400	1,033.200	882.540
Strawberries	19,125.000	15,300.000	15,840.000	18,525.000	19,440.000	20%	10%	382.500	306.000	316.800	370.500	388.800	352.920
Watermelons	9,503.000	6,825.000	6,300.000	7,259.000	12,960.000	70%	90%	5,986.890	4,299.750	3,969.000	4,573.170	8,164.800	5,398.722
Subtotal	148,209.440	147,634.250	140,058.920	146,313.920	168,747.280			93,074.957	98,360.200	90,724.622	92,088.442	108,178.832	96,485.411
(% of total value)								62.8%	66.6%	64.8%	62.9%	64.1%	64.2%
FORAGE CROPS													
Alfalfa (hay)	5,000.000	5,940.000	3,120.000	106,080.000	115,872.000	100%	60%	3,000.000	3,564.000	1,872.000	63,648.000	69,523.200	28,321.440
Cotton (lint)	163,263.000	322,051.000	253,286.000	315,910.000	281,424.000	20%	80%	26,122.080	51,528.160	40,525.760	50,545.600	45,027.840	42,749.888
Cotton (seed)	25,704.000	37,692.000	41,795.000	38,548.000	3,945.000	20%	80%	4,112.640	6,030.720	6,687.200	6,167.680	631.200	4,725.888
Peanuts	45,990.000	73,280.000	77,112.000	56,448.000	49,459.000	10%	20%	919.800	1,465.600	1,542.240	1,128.960	989.180	1,209.156
Soybeans	174,305.000	306,180.000	257,550.000	222,329.000	274,176.000	10%	50%	8,715.250	15,309.000	12,877.500	11,116.450	13,708.800	12,345.400
Subtotal	414,262.000	745,143.000	632,863.000	739,315.000	724,876.000			42,869.770	77,897.480	63,504.700	132,606.690	129,880.220	89,351.772
(% of total value)								10.3%	10.5%	10.0%	17.9%	17.9%	13.7%
TOTAL	562,471.440	892,777.250	772,921.920	885,628.920	893,623.280			135,944.727	176,257.680	154,229.322	224,695.132	238,059.052	185,837.183
(% of total value)								24.2%	19.7%	20.0%	25.4%	26.6%	23.2%

D = Dependency of crop on insect pollination for fruit set
P = Proportion of insect pollinators that are honey bees

Resources: Delaplane, K. S. and D. F. Mayer. (2000). *Crop Pollination by Bees*. CAB International, Cambridge.

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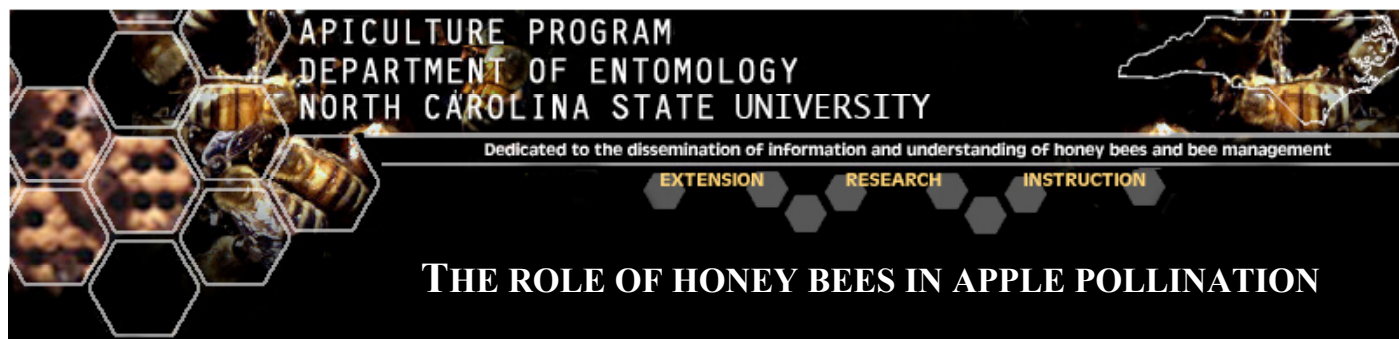
Morse, R. A. & N. W. Calderone. (2000). The value of honey bees as pollinators of U.S. crops in 2000. *Bee Culture* 128: 1-15.

National Agricultural Statistics Service

Table 2. Estimated number of hives required for NC pollination in 2007.

CROP	Recommended Hives/acre	Estimated Values for 2007	
		Acreage	No. hives needed
Apples	1.5	6,740	10,110
Blueberries	3.0	5,240	15,720
Brambles	0.8	245	196
Cucumbers (fresh)	2.2	5,510	12,122
Cucumbers (pickled)	2.2	78,360	172,392
Melons	1.5	4,000	6,000
Peaches	0.2	1,200	240
Pumpkins	1.5	1,500	2,250
Squash	1.5	3,730	5,595
Strawberries	3.5	1,460	5,110
Watermelons	1.8	6,090	10,962
TOTAL		114,075	240,697

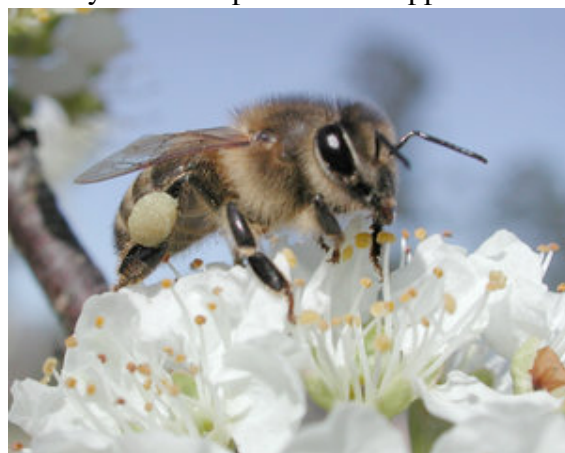




Honey bees, like other common agricultural plants and animals in the United States, are not native to North America but were imported from Europe in the early 17th century. Because of the ease by which honey bees are transported, they have become the primary insect pollinator used in agriculture. Honey bees are responsible for one-third of food people eat. In these days of agribusiness and corporate farms, our diet and the U.S. economic livelihood are dependent upon the pollination services provided by honey bees.

The apple tree is one of the most cultivated plants in the entire world with more than 7,500 known cultivars. The wild ancestral apple, *Malus sieversii*, is indigenous to the Tien Shan Mountains that border China and Kazakhstan, which is also part of the native range of the western honey bee, *Apis mellifera*. Around the same time colonists imported bees to the “new world”, they also brought apple trees. The value of apples in the U.S. has been estimated at over \$2.10 billion every year (Table 1.).

Pollination is the transfer of a plant’s male reproductive cells (pollen) to the female reproductive structures of a flower (stigma). Because honey bees collect nectar and pollen from many flowering plants they are very effective pollinators. Apple flowers cannot self pollinate and therefore require cross pollination. This means they not only require a pollinator like the honey bee, but they also require a pollenizer (which could be either an apple or crabapple variety that produces viable and compatible pollen). Honey bees are the most important pollinators of apples in North America. In 2006, over 500,000 honey bee hives were needed to pollinate apple orchards.



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Pollination obstacles

There are many different factors that can result in poor pollination of apple trees. If the pollinator (bee) population is too small, the 'pollination threshold' will not be reached and there will be a lack of viable pollen transferred to receptive flowers. Good weather during flower bloom is also critical for optimal pollination. Honey bees tend to visit flowers in the morning. Any disturbance of early visitation times due to weather, spray schedules, mowing, or other management practices may significantly affect the pollination efforts of honey bees and other pollinators. The presence of pollen sources or compatible pollenizer varieties is crucial for the successful pollination of apple flowers. Below is a chart that lists apple varieties from earliest to latest bloom times, and the compatibility of varieties as pollinizers.



extension.missouri.edu

	Lodi	Pristine	Gala	Jonathan	Jonafree	Honeycrisp	Liberty	Empire	Red Delicious	Jonagold	Golden Delicious	Braeburn	Enterprise	Mutsu (Crispin)	GoldRush	Winesap	Fuji	Granny Smith	Arkansas Black	Red York	Rome Beauty
Lodi																					
Pristine																					
Gala																					
Jonathan																					
Jonafree																					
Honeycrisp																					
Liberty																					
Empire																					
Red Delicious																					
Jonagold																					
Golden Delicious																					
Braeburn																					
Enterprise																					
Mutsu (Crispin)																					
GoldRush																					
Winesap																					
Fuji																					
Granny Smith																					
Arkansas Black																					
Red York																					
Rome Beauty																					

Should be pollinated by another variety for best results
 Not a satisfactory pollinizer

Fertilization threshold

In order for complete fertilization to occur after pollination, 6-7 ovules must be fertilized by a sufficient number of pollen grains. If this threshold is not met, the results can be morphological and physical deformities in the fruit, a decrease in yield, smaller fruit size, and a reduction in the calcium content of the fruit (which can subsequently lead to storage problems). Moreover, if adequate fertilization is not achieved, the fruit may not remain on the tree until harvest.



Colony strength

There are steps a grower can take when renting hives for pollination in order to ensure adequate pollination by honey bees. Colony strength is very important to ensure sufficient pollination. When the lid is removed from a beehive housing a strong colony, the bees should spill out—due to the large number of adult bees within the hive. Bees should cover 6 to 8 frames in a 10-frame hive, known as a ‘cluster count’. Moreover, each frame should have sufficient amounts of brood and young larvae to guarantee an adequate future foraging population. As part of their duties, NCDA&CS Apiary Inspectors will perform this service upon request.

Moving hives into the crop

To maximize their effectiveness as pollinators, it is important to consider when bees should be moved into the orchard. Moving hives into a crop during the night is less stressful on the bees, because they are not flying and the temperatures are generally cooler. To maximize the likelihood that the bees will forage on the apple flowers, and thus transfer pollen, it is a good idea to move hives into the apple orchard after roughly 5-10% of the apple flowers have blossomed. Removing all weeds and non-target plants is also imperative; avoid the competition for your target crop.

Hive placement

Hive placement within the orchard is a very important factor to consider. It has been shown that bees prefer to forage within 300 ft of hive. Many different placement scenarios have been proposed depending upon the layout of the orchard, but it has been generally recommended that groups of 4-8 hives be placed at intervals of 500 ft. In order to allow the bees to take advantage



of the early morning bloom time, it is also important to place hives in sunlight—preferably with the front of the hive receiving morning sun to promote early foraging. Avoid cool, damp, and heavily littered or trafficked sites and places where a vehicle may become stuck.

Number of hives per acre

The optimal number of hives per acre for apples has been researched since the mid-1970's, and recommendations have ranged from 0.25 to 5 hives per acre. The scientific literature average is **1.5 hives per acre**, and this is the recommended number for apple growers. However, different factors can affect the number of hives needed to ensure optimal pollination. The attractiveness of the crop has a large effect on the foraging activity of the pollinators. If the crop is not appealing to the pollinator, or if there is a more rewarding crop in bloom nearby, it may be necessary to increase the number hives per acre. Therefore, it is important to remove (if possible and legal) any non-target forage that may entice the bees from the apple blossoms, including flowering weed on the orchard floor. If it is not possible to remove these plants, then more hives may be needed to ensure that the apple blossoms are visited. The local population density of wild bees can also affect the number of hives necessary for pollination services. If there are few wild bees in the area, it may be important to increase the recommended number of hives per acre. On the other hand, if there is a thriving wild bee population, sufficient pollination may be achieved with fewer hives per acre, which can save the grower money.

Chemical attractants and pesticides

There are several chemical attractants available, most of which are composed of synthetic honey bee pheromones. These chemicals can stimulate increased bee visitation and recruitment, and in some cases they can promote the earlier onset of daily foraging activities. These compounds are particularly helpful to use when there are suboptimal pollination conditions. However, while these attractants may increase bee visitation, they may not necessarily increase pollination.

In agriculture, it is often necessary to use chemical insecticides and herbicides to remove unwanted pests and plants. Unfortunately, these chemicals can have adverse effects on the pollinator community, especially if they are applied while the target crop is in bloom. If chemical control is needed during the pollination period, there are a few things to consider so that the pollinator community is minimally impacted. First, do not spray during the flowering period if at all possible. This will help minimize the exposure of the pollinator to the potentially





harmful chemicals. Second, use chemicals with low bee toxicity, particularly those with short residual times and moderate to low LD₅₀ ratings as outlined on the chemical label. In general, granule and liquid formulations are safer than powder and dust applications. The granule and liquid formulations minimize drift onto non-target flowering plants. Finally, late-afternoon or evening application of chemicals is recommended to minimize the exposure of foraging bees to potentially harmful chemicals. The best approach is to anticipate and manage pest problems before bees are placed in the orchard. More information

about pesticides and their effects on honey bees can be found in the North Carolina Agricultural Chemicals Manual (<http://ipm.ncsu.edu/agchem/agchem.html>) .

Renting a pollinator hive and setting up a pollination contract

A 'pollination fee' is the cost to rent a hive of bees during the bloom of a particular crop. Pollination contracts are made between the grower and the beekeeper to help ensure that a sufficient number of bees are present in the crop during bloom. The national average pollination fee per hive for apples has been increasing in recent years. In 2004, the price per hive was \$31, on average; in 2005, the average price jumped 7% to \$37; and in 2006, the price was \$40, up 17% in just two years. More recent data are not available at this time, but this upward trend is expected to continue. These increases were most likely caused by the shortage of beehives available, increased demand for almond pollination in California (where pollination fees can reach \$150 per hive or more), and a declining population of managed honey bees. Here is a link to a sample contract (http://maarec.cas.psu.edu/PDFs/Pollination_Contract.pdf).

Conclusions

The efficient use of honey bees for apple pollination can result in an increase in both fruit quantity and quality. In fact, one major complaint of some growers is that honey bees can set too much fruit and the crop must be thinned. While a heavy crop can be thinned, a light crop cannot be increased after the pollination period has ended. In the end, proper bee pollination will ensure adequate seed formation and reduce the incidence of deformed apples, which in turn results in better success for the grower.



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- National Agricultural Statistics Service (<http://www.nass.usda.gov/>)

Table 1. Acres, yield, production, value and value attributable to honey bees for Apples, 2005-2006 in the entire U.S. (A) and North Carolina only (B). Data consolidated from the NASS and Morse & Calderone (2000).

A	Apples (nation)	Acres harvested	Yield/acre	Production	Price/unit	Value	Value attributable to honey bees
	2005	379,560 thousand	25,600 lbs.	9,719,900 thousand lbs.	0.18 / lb.	\$ 1,680,747	\$ 1,512,672
	2006	377,490 thousand	26,700 lbs.	10,072,100 thousand lbs.	0.21 / lb.	\$ 2,099,129	\$ 1,889,216

B	Apples (NC)	Acres harvested	Yield/acre	Production	Price/unit	Value	Value attributable to honey bees
	2005	6,800 thousand	19,100 lbs.	130,000 thousand lbs.	0.12 / lb.	\$ 13,859	\$ 12, 473
	2006	6,800 thousand	25,900 lbs.	176,000 thousand lbs.	0.12 / lb.	\$ 19,799	\$ 17,819

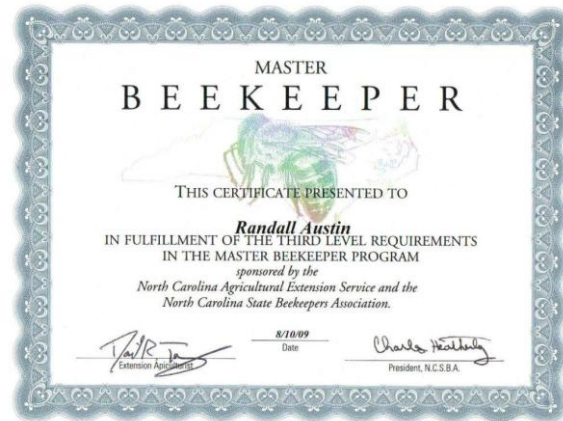
Prepared by:

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NC State Apiculture Program

I had a great time conducting the field day for Bailey's Bee Supply's introductory beekeeping class last month. As part of the activities, we administered the NC Master Beekeeper Program's "Certified Beekeeper" written test to anyone who was a paid-up member of the NC Beekeepers Association. Someone asked what they get if they pass both the written and hands-on practical tests at the Certified level. The short answer is, "The admiration of your friends and a nice certificate suitable for framing." The long answer is... longer.

But first... what is the North Carolina Master Beekeeper Program? You may have heard of Master Gardeners: well-informed folks who can tell you what to put on your hydrangeas to make them change colors. They take classes, read a lot, plant a lot of flowers and then go to garden clubs and elementary schools to share their knowledge with other people. Master Beekeepers are very similar, for similar reasons. They have a passion for honey bees, a thirst for knowledge and a compelling desire to share their passion with others.

According to the MBP description on the NC State Beekeepers Association website, the purpose of the program is to "provide an infrastructure whereby beekeepers can improve their beekeeping skills and knowledge on a continuous basis within a system that objectively and formally acknowledges those accomplishments. It also serves as a means of providing valuable information to beekeepers and the public through various outreach services." It was started in 1982 by the State Apiculturist at that time, NCSU's Dr. John Ambrose. Dr. Ambrose based the concept on a similar program run by his alma mater, Cornell University. Dr. David Tarpy took over the administration of the program when he was named State Apiculturist. In 2011, state budget cuts required that the administration shift from NCSU to the NC State Beekeepers Association. We are fortunate that Dr. Ambrose has recently stepped in to once again oversee the program in this new environment.



There are four steps in the MBP. To progress, the candidate must demonstrate knowledge of honey bees in three areas: 1) honey bee biology, 2) honey bee management and 3) honey bee industry. Each step has its own requirements:

Certified Beekeeper

Entry level for the program

1. Candidates must pass a written test. Questions deal with common honey bee topics such as, "why might you need to requeen a hive?" and "what country is the largest supplier of honey on the world market?"
2. Candidates must pass a practical test involving manipulation of a hive of bees. Can you tell the difference between the different castes of bees? Can you judge whether a hive is well-provisioned for winter? Can you make valid recommendations for dealing with issues found during a hive inspection?

Journeyman Beekeeper

A beekeeper who has demonstrated good beekeeping skills and knowledge

1. Candidates must pass a written test.
2. Candidates must pass a practical test. This is a one-on-one Q&A with an interviewer. You must identify and explain various tools, objects, and pictures relating to honey bee biology and beekeeping.

3. Candidates must have two years of beekeeping experience.
4. Candidates must have accumulated five units of public service credit.

Master Beekeeper

A beekeeper who has demonstrated extensive expertise in beekeeping and a number of specialized areas in beekeeping. There are roughly 75 NC Master Beekeepers.

1. Candidates must pass a written test
2. Candidates must pass a practical test. This is a “virtual” test – you must provide documentation that you have achieved mastery/excellence in selected beekeeping specialties.
3. Candidates must have 3 years of beekeeping experience.
4. Candidates must have accumulated 10 units of public service credits.

Master Craftsman Beekeeper

The highest level of the program composed of Master Beekeepers who have demonstrated excellence in teaching, public and media interactions, a substantial commitment to beekeepers and beekeeping, and who have passed an oral examination. The Master Craftsman designation is awarded for five-year active appointments. Then the individual is moved into an emeritus status unless he/she is recertified by earning an additional 15 units of public service credit and demonstrating that he/she has kept current on matters affecting bees and beekeeping. There are about a dozen NC Master Craftsman Beekeepers.

1. Candidates must pass an oral examination, comparable to the oral exam for a student in a Master of Science program at a university.
2. Candidates must have two years as a Master Beekeeper.
3. Candidates must present a program at a state bee meeting.
4. Candidates must demonstrate communication skills.
5. Candidates must pass a practical test, as for the Master level, documenting

mastery/excellence in a minimum of seven required beekeeping specialty areas.

6. Candidates must participate in a NCSU sponsored research project.
7. Candidates must earn 15 units of public service credits

The required service credits aren’t just about giving presentations to school children, although those do count! Examples of service credits I submitted for consideration include:

1. A friend asked me to remove a colony of bees from the crawl space of a church. When I went to check them out, I found a very active colony of yellow jackets. I advised my friend to either ignore them until winter, when the problem would take care of itself, or exterminate them if they were a safety risk to the congregation. This counted as a teaching and service interaction with the public, even though the “bees” turned out to not be bees at all.
2. The Advanced Latin class at Orange High School was translating Virgil’s “Aeneid”, which has a section about bee society and life in the hive. The students were having trouble understanding the poetic bits about the drones. So their teacher brought the class on a field trip to my bee yard, where I opened a hive and showed them the colony dynamics that Virgil was describing.
3. I always volunteer to do at least one shift at the NC State Fair bee exhibit in October. Don’t be intimidated thinking that you must be an expert to work at the bee booth. If you know the difference between a queen, a worker and a drone, then you know more than 99% of the general public!

The MBP is designed to get people in, not keep people out. If you are serious about advancing, the program administrators will be serious about helping you. The goal isn’t to be a “know-it-all”; it’s to be a “serve-’em-all”. We want to prepare and encourage people so they will share their knowledge and experience with others, including being a “bee ambassador” to

the general public. This is an important distinction between the NC program and several of the others around the country (e.g. Eastern Apicultural Society MBP). Knowledge is very important as a gauge of credibility, but knowledge alone won't get you anywhere in the NC MBP. Service credits are the focus of the program, combined with a demonstrated seriousness about advancing your skill set. If you are interested in participating, check out the information available on the [NCSBA website](#). Another great resource on the web is [South Carolina's MBP program description](#), which provides some details that North Carolina's doesn't. The South Carolina program was copied from North Carolina, so the overall requirements are the same. Find Master Beekeepers in your [local county association](#) and ask them for advice. And attend the [Annual Summer Meeting](#) of the NCSBA July 10-12 in Wilkesboro; written and practical testing at every level will be available there. So to answer our original question, what do you get as you advance through the MBP steps other than a nice certificate? Hopefully you'll get the knowledge and experience you need to intelligently and effectively share your passion with others. You'll have official verification that you are a credible ambassador for beekeeping issues, not just another wild-eyed self-appointed nut case. And you'll have the satisfaction of being a member of the select few who are recognized for their dedication to serving fellow beekeepers and the public. How's that?

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A beekeeper (Aristotle) shares his wisdom, earning a service credit.