## CERTIFIED CLASS CURRICULUM—Local Chapter Considerations Need to be Determined.

*Simple abbreviated definitions: curriculum means "content" - An agenda is a schedule.*

The MBP Committee is pleased to offer for the first time, a basic outline of recommended content for a Beginner Beekeeping Class. This has been prepared to aid those who are giving the class, and not as a study-guide for class participants. This contains many areas where words appear without definition or explanation. Those are things that a class presenter would know, and be able to expound upon during class.

This Curriculum is intended as a starting point for a local chapter that is offering a Beginner Beekeeping Class.

We encourage the local chapters to adapt the curriculum to an agenda that works for them, while ensuring that the content offered is sufficient for someone to confidently begin beekeeping. You may have to shorten the time spent on some sections; and conversely, may feel it necessary to expand the time allotted to other sections. One important recommendation is to ensure that all instructors are aware of what the remainder of the curriculum is. Do this to avoid repetition (which isn't too serious), to avoid omission (which is not good, but hopefully the class participants can learn by reading), and the contradiction between presenters on any particular subject. This last makes the material confusing to the students.

When we set about to teach beekeeping to people who think they might be interested in taking up this avocation, we must realize that the majority of them are stepping back into a classroom situation for the first time in many years; with a need to read, study, and memorize things. It is also likely that these potential new beekeepers have not yet become aware of the depth and scope of information that they will need to get started. It behooves all of us to give them as much information as possible, without overwhelming and discouraging them, yet be realistic in our representation of what it takes to be a good beekeeper.

The content of a beginner class has to be balanced so that the material is neither grade school level, nor 3rd year college level entomology. The MBP has no intention of writing a book or setting forth a specific standardized course of study that is mandated for use across the State. Stated many times previously, the MBP is similar to a guild. The content presented herein has been accumulated from numerous resources. A single text, or single power point presentation would be insufficient to accomplish the goal.

There are several "beginner beekeeping" books available. Each chapter has to make decisions concerning how they will be able to present the subject. For this reason, the MBP does not mandate one specific text over another. Cost factors, as well as appropriate content need be considered. Some reference texts cost only $10, while others are in excess of $50. Will your Chapter mandate a specific text? Will the chapter procure the books for distribution to the class, or recommend that participants purchase their own?

Local chapters need to determine when they will offer classes: Spring, Summer, Fall, or Winter. They need to decide if they will have the classes on weekends, or weeknights. Will it be a one-day class? Perhaps the chapter resources dictate that the course be stretched out over a period of weeks. Chapters need to decide if there will be a cost involved in attending the class.

*** remember - there is never a charge to take an MBP test *-**

**However, to receive a certificate, the candidate must be an active member of the NCSBA.**

Who will 'teach'? The best presenters are beekeepers. With effort towards pre-planning, anyone who is interested in teaching can do so. They must be organized and confident. Material outlined must be covered. Even if power points are borrowed or purchased, the presenter must be familiar enough with the content to be able explain all the content presented.

Today an interested person can go online and take any number of online courses. The benefit of a 'live in-person' class is to provide a platform for interaction. In beekeeping, this mentorship is invaluable. An NCSBA Certified Beekeeper Certificate indicates that the successful candidate will have achieved more than completing a class. They will have gained the knowledge and the potential to be a successful beekeeper.

Your Chapter has both the right and responsibility to impact the future of beekeeping in your area, and throughout the state by how you set about instructing the next new beekeepers.

Thank you ALL for all you do to ensure the health and well-being of apiculture in North Carolina going forward.

**NCSBA Master Beekeeper Program**

**CERTIFIED LEVEL - A SUGGESTED CURRICULUM**

**Based on roughly 16 hours— not a mandate**

**Organized in "sections" and in an order that will build upon what has already been presented**

SECTIONS:

ONE: Welcome

TWO: History of Beekeeping

THREE: Products of the Hive

Addendum: Basic Nomenclature / Vocabulary

FOUR: Races (sub-species) of the Honey Bee

Addendum: African Honey Bees

FIVE: Anatomy / Biology

SIX: Colony / Superorganism / Bee Behaviors & Activities

SEVEN: IPM ( Integrated Pest Management)

EIGHT: Diseases of the Honey Bee ( and other maladies)

NINE: Pests of the Honey Bee

TEN: Apiary Site Selection

ELEVEN: Good Neighboring / NC / Rules, Regulations & Recommendations / Local Restrictions

TWELVE: Beekeeper Tools and PPE ( Personal Protection Equipment )

THIRTEEN;: Components of the Hive / various hive types

FOURTEEN: Seasonal Management (except extraction) / PKG Installation / how to inspect hives / Honey Flow - Supering / Winter Prep / Disease & Pest Monitoring

FIFTEEN: Feeding Bees

SIXTEEN—A HONEY - Extraction from the hives

SIXTEEN—B HONEY—Extraction in the honey house / cleaning frames

SIXTEEN—C Bottling, Labels (regulations, laws, recommendations)

SEVENTEEN: Plants for Honey Bees

EIGHTEEN: N.C. RESOURCES : NCSBA / NCDA&CS ( apiary inspection, food & drug protection& pesticide divisions)/NCSU

NINETEEN: Smoker how to light, how and when and why to use (or not)

Other "outside the Classroom" teaching possibilities

Suggestions for printed materials to be distributed, including a sample "homework assignment"

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## SECTION ONE: WELCOME / INTRODUCTIONS / CLASS OVERVIEW & AGENDA / FACILITY (15 minutes)

This is usually handled by the chapter President, or the Course Administrator

Take the first fifteen minutes or so to: introduce the presenters and any additional club members present.

Let the participants know what to expect and when such as Breaks, Lunch, Days of the Course, etc.

Tell the participants about the facility that is hosting the class. Where the restrooms are, any rules or restrictions,

Inform the participants details about the host (especially if it is a Cooperative Extension Facility)

Agenda: Go over any course materials you are distributing, make them aware of any pending bee yard experiences, and any requirements for PPE or other cautionary procedures.

## SECTION TWO: HISTORY of BEEKEEPING ( 30 minutes )

The purpose of this section is to give an overview of what has transpired over the centuries, with a glimpse of what has been invented, and when, in response to when pests or diseases were introduced into the US & the impact that has had. It is a powerful introduction as to why we now must be BEEKEEPERS RATHER THAN BEE-HAVERS.

It also acts as a way to settle the participants into a classroom routine.

It can be easy to make this section overly long. Try to avoid that. While it is also a time where 'interesting facts" such as how fast a bee flies etc., can be mentioned, overuse of these will end up confusing the participants as they think they have to memorize these tidbits. This is not the section to go into detail about bee races, pest or disease mgmt. techniques. The inclusion of topics appearing below in all CAPITAL LETTERS is highly recommended

Topics you might want to include: over 20,000 types of bees worldwide, 4000+ in the US, 500+ in N.C.; Wasps, yellow jackets and hornets are not bees; honey collecting provable since 9000 BC; honey found in King Tut's tomb; bees used in warfare; HONEY BEES ARE NOT NATIVE TO THE AMERICAS; 1621 America, 1670 NC, by the mid 1700's expanded to the Midwest; how bees used to be managed (bee gums and skeps); use of BEE SPACE by Rev. L.L. LANGSTROTH approx. 1852; MOVABLE FRAME HIVES (ability to inspect &/or extract without killing bees or totally destroying their 'nest'); wax foundation 1857 Mehring, INTRODUCTION of ITALIAN HONEY BEE 1859 in response to German bees dying off; 1868 Strange Disappearing Disease noted in Kentucky and Tennessee; 1873 Modern Smoker invented & introduced to beekeeping; early 1900's TRACHEAL MITES wipe out bees in ENGLAND; early 1900's A.I. ROOT (company, still in existence, was involved in formation of NCSBA); 1917 NCSBA FORMED; 1919 First Lessons in Beekeeping—Charles DADANT (company still in existence today); THE 1922 HONEY BEE ACT - ACT OF U.S. CONGRESS RESTRICTS IMPORTATION OF HONEY BEES INTO THE USA; 1957 AFRICAN BEES IMPORTED TO BRAZIL; 1967 BUCKFAST BEES INTRODUCED to the U.S.; 1966-1969 Strange Disappearing Disease of Honey Bees reported in Louisiana, Texas, and somewhat in Florida and California; 1973 HONEY BEE NAMED THE OFFICIAL INSECT OF NORTH CAROLINA; 1977 the NORTH CAROLINA BEE AND HONEY ACT; 1984 TRACHEAL MITES SHOW UP IN THE USA; 1987 VARROA MITES SHOW UP IN THE USA; 1985 & 1990 AFRICANIZED HONEY BEES SHOW UP IN THE USA; 1996 SMALL HIVE BEETLES SHOW UP IN THE USA; 1997 RUSSIAN BEES INTRODUCED TO THE USA; 2004 ISRAELI ACUTE PARALYSIS VIRUS; 2006 DAVE HACKENBERRY AND FIRST REPORTS OF "CCD"; NEW THREATS on the HORIZON—tropilaeps clarcae, zombie flies, etc.

## SECTION THREE: PRODUCTS OF THE HIVE: (30 minutes)

The purpose of this section is to make the class participants aware of all the various hive products that are related to keeping honey bees. Many non-beekeepers are only aware of honey and/or beeswax. They are not aware of all the possible income potential or hobbyist interests involved with beekeeping.

This is not the section to go into detail about how these products are made (either by the bee or the beekeeper), seasonal management techniques, how to market items, or where to purchase items.

In actuality, this section could easily be used as a talk given to the general public.

You should include:

POLLINATION

HONEY

WAX

POLLEN

ROYAL JELLY

PROPOLIS

MEAD

APITHERAPY (BEE VENOM THERAPY)

FOOD (in some cultures)

RAISING AND BREEDING BEES (as livestock)

MENTORING or KEEPING BEES for others for a fee

HONEY TASTING (similar to wine tasting)

* as an additional source of 'business—income' BEEKEEPING EQUIPMENT and SUPPLIES

* additional interests : encaustic painting, cooking with honey

A short vocabulary of nomenclature common to beekeeping.

Since the honey bee is a member of the genus APIS, many of the words associated with bee-keeping have origin in this word.

APICULTURE

APICULTURIST

APIARY

APITHERAPY

Later on, you will see that many products and supplies also utilize the root API in their names.

COLONY

HIVE

TYPES OF BEEKEEPERS:

- Hobbyist
- Sideliner
- Commercial

## SECTION FOUR: RACES (sub-species) of HONEY BEES (15 minutes)

In this section, we endeavor to explain that honey bees are similar to livestock; that different sub-species (breeds/races) of bees have different characteristics.

We will explain to the participants that genetics has, and will continue to play a major role in combatting perils that the bees face from pests and diseases. (Past : Italians replaced German bees in the US due to resistance to foulbrood, Introduction of Buckfast to combat Tracheal Mites, Introduction of Russian to combat Varroa Mites )

A TAXONOMIC CLASSIFICATION CHART can be used to explain how wasps, hornets, and other insects are not honey bees. This is where we introduce the class participants to the term "apis mellifera".

Suggested: Show a slide picture of other insects (various wasps, moths, bumble bees, orchard bees, etc.) to reinforce the concept of the taxonomic classifications.

We then must show them the actual "words" that define the bee sub-species prevalent in the USA.

At this point, your participants are likely becoming aware for the first time that there are actually different types of honey bees in the USA, and that they might have to make a decision about 'what type of honey bees' to get. It can be overwhelming, and in large part is why many experienced beekeepers dislike having to teach this section.

Remember, this is an introductory course and is not intended to be an in-depth study of genetics. Keep it Simple. While interesting, it is not necessary to delve into the color or sizes of sub-species at this level.

List the sub-species, and their taxonomic names. It really isn't necessary to cover "past" hybrids like Starlight/Midnight etc.

| | |
|---|---|
| German | Apis mellifera mellifera |
| Italian | Apis mellifera ligustica |
| Carniolan | Apis mellifera carnica |
| Caucasian | Apis mellifera caucasia |
| African | Apis mellifera scutellata |
| HYBRIDS | Strains of sub-species. A strain may contain only a fraction of genetic diversity which might effect hygienic behavior, honey production, etc.; and is generally a mix between sub-species. |

Certainly mention:

Russian, Buckfast, VSH (Varroa Sensitive Hygiene), Minnesota Hygienic, SMR (Suppression of Mite Reproduction), "ankle biters", etc.

Suggested: While showing a picture of these various sub-species, you can state some basic characteristic differences. State once again that the genetic breeding of honey bees to emphasize specific characteristics is an ongoing process. You can mention how various government agencies (USDA BEE LAB—Louisiana involved with the introduction of Russian bees) and various Universities (Perdue—'ankle biters') are involved with honey bee genetics.

It IS IMPORTANT to note that the ITALIAN honey bee is the most widely kept honey bee by beekeepers within the USA. Being in the Southeast, you will perhaps want to discuss the predominance of the use of Italian bees over other common honey bees in the US; advising about swarm tendencies, honey production, over-wintering populations etc.

It is VERY IMPORTANT that you advise them about the PERMIT TO SELL BEES in NORTH CAROLINA list that is prepared by the NC Apiary Inspection Agency. Give them a copy of the actual list, or give them the website address.

It is also important that you reassure these potential beekeepers, that you and other chapter members will be available to discuss their concerns and advise them on the type of bee best suited to their location as well as where to obtain bees.

**Refer to texts that outline the varying characteristics of the sub-species.**

## Addendum to SECTION FOUR : AFRICAN ( AFRICANIZED ) HONEY BEES aka "AHB"

Back in 1956, the South American bee researchers endeavored to develop a bee that was more suitable to the warmer climates than the European Honey Bees that they were working with. They imported queens from Africa, (apis mellifera scutellata) and felt that if they could cross-breed the two sub-species, that they would have the 'perfect' bee sub-species for their area.

The queens escaped from their confines, and little by little, over the years, the African bee genes have dominated and the AHB has replaced the European throughout many regions. (How this happens is a matter of development time and other factors)

The latest 'documented' advance into the USA places them in the very Southwest tip of Georgia, towards the boarder with Alabama. Our N.C. Apiary inspectors monitor the progress. (You will learn more about the inspectors later in this course). Have they ever been in N.C.? Yes, one time a colony was found living on a ship that entered the port of Morehead. It was destroyed. For this reason, there is a 'quarantine' area surrounding the seaports of N.C. in which no one is to keep honey bees. Honey bee colonies discovered within these areas are destroyed. You should know that NC has a "PLAN" concerning AHB. You can locate it on the internet, but be advised that it has not been updated in many years; and the word is that it is scheduled to be updated soon.

So.. What is the "fear"? There is a wide division between fact and fiction. There are a lot of myths. Facts have been misrepresented by horror films such as "Killer Bees". Note.. We do not ever call them "killer bees".

The sub-species "apis mellifera scutellata" has characteristics that warrant attention from beekeepers.

These bees, in general, are highly defensive of their colony. They possess a heightened level of alarm and guarding behaviors. The Africanized honey bee have the same sting apparatus as the European; therefore, they sting only once and die. * It isn't that a single bee stings more often, it is that many more Africanized bees will react to the sting and alarm pheromones and more will pour out of the nest to attack what they perceive is an intruder. More stings because more bees are stinging. Moreover, the AHB will pursue the intruder for a farther distance. Where the European bee may 'chase' an intruder for 100 feet, the AHB may chase that intruder for 1000 feet.

Do they make honey? Yes. Can a beekeeper 'keep' AHB and work them for hive products? Yes.

The issue here is that due to their inherit characteristics, based on their warmer climate origins, they have a much greater tendency to swarm, and abscond. ( You will learn the details of these behaviors a little later on in this course).

Because of this tendency two things occur:

1.) The beekeeper has difficulty keeping the population high enough so that excess honey will be stored.

2.) The AHB creates broodless periods throughout the year. Thus, they have a resistance to some of the pests and diseases that afflict the European Honey Bee ( EHB).

Florida ( and other states, predominantly in the Southwest USA) have these bees. Those areas have developed some interesting methods of dealing with them. A good resource for learning knowledge about AHB comes from Jamie Ellis, …. University of Florida. Just be aware that the guidelines are those mandated by the State of Florida, not N.C.

We caution new beekeepers to avoid discussing this topic with the general public until such time as the beekeeper can accumulate the knowledge of facts; most of which are not so-alarming as the media would like to use for ratings.

## SECTION FIVE: BEE ANATOMY / BIOLOGY (60 minutes—1 hour )

This section truly needs to be presented before sections concerning bee behaviors, colony life, site selection, equipment, or others. In this section potential beekeepers are being introduced to aspects of a honey bee that are the basis for all other topics concerning honey bees.

While it is necessary to be thorough, the experienced beekeeper presenting this section must also keep in mind that the goal of a beginner beekeeping class is to provide that basic understanding, without the expectation that the target audience is going to be capable of memorizing all details, or equating the anatomy to all functions.

Queen: longer abdomen

Drone: barrel shaped body / very large eyes

Worker: smaller than either queen or drone, compare eyes to drone

PLUMOSE HAIRS: a major reason honey bees make such excellent pollinators / Branched and numerous

The Honey Bee as an Insect: Body Segments ( Head, Thorax, Abdomen) / 2 antennae 4 wings / 6 legs

Describe the primary functions of each body segment

Head: Contains major sensory organs: Compound Eyes / ocelli / mouth parts /

Describe eyes and vision :

Compound : trichromatic / does not see red / detects motion and broken patterns / facets and hairs /

Ocelli : three sensory organs / located on top of head / thought to respond to UV and light

Antennae: sense of smell, touch, taste, and motion ( helps them 'hear" to perceive 'dances' in dark hive

Mouth Parts:

Mandibles: chewing, can manipulate solids

GLANDS in the HEAD:

Mandibular: Worker: mandibular (along with another ) secretes jelly to feed the brood (larvae)

Queen: mandibular ( produces pheromones) "queen substance" and more

Drone: has one, but it is extremely small and of no use

Hypopharyngeal: Worker: secretes jelly for brood rearing ( Royal and other)

Queen: vestigial, of low use

Drone: does not have one

Salivary Glands : (one of two salivary glands is located in the head)

Workers secrete enzymes that convert the sugars in nectar into others to make honey

**SECTION FIVE : ANATOMY / BIOLOGY continued:**

Honey Bee THORAX: The Middle Body Segment: The "LOCOMOTION " portion of the bee

WINGS: two pair = four wings

Forward pair are the "fore wings", they are larger, than the aft pair

Aft pair are called the "hind wings"

Wings have numerous veins through which "bee blood" circulates

HAMULII connect the wings : Velcro-like hooks

LEGS: three pair of legs

Legs contain sensory organs that correspond to touch, taste, and smell

Forelegs have an antenna cleaner

Middle legs have spines for spearing wax scales from the abdomen, and for passing to the mandibles

Hind Legs: contain the CORBICULA , commonly called the pollen basket

It is used for storing and transporting pollen grains and sometimes resins

Only female workers have this "corbicula". Drones and queens do not have one.

Suggested: show clear photos of the antennae cleaner . the corbicula, the hairs on the legs

Honey Bee ABDOMEN: The major internal body systems of the bee are located in the abdomen

Contains a narrow segment ( wasp-waist)

Lacks external attachments

Contains SPIRACLES that are respiratory openings * here is where you would note that some spiracles are also on the thorax*

Constantly Moving:

Pumping aids breathing / digestion / excretion / circulation

Contains Wax Glands (that produce bees wax ) 4 sets of 2 - for a total of EIGHT WAX GLANDS

Contains Reproductive Organs

EXOSKELETON: no bones / a hard outer body covering /

All internal body parts, muscles, connective tissue, and all body parts are connected to the exoskeleton

It consists of hardened plates and flexible membranes

**SECTION FIVE: ANATOMY / BIOLOGY continued (Systems)**

**RESPIRATORY SYSTEM:**

The respiratory system of the honey bee, like the circulatory system, is considerably different from the human system. There are **three thoracic and seven abdominal pairs of air openings, called spiracles,** and internally many air sacs that lead to branching tubes or tracheae. Oxygen moves through tracheal tubes and sacs and into and out of tracheae with wing and abdomen muscle activity. * the last one is so tiny, near the sting apparatus, that it is sometimes not even counted. . The locations of the nine visible spiracles on each side. The tenth, the second largest, is hidden within the sting chamber.

**CIRCULATORY SYSTEM:**

The circulatory system is simple, consisting of a 4 chambered heart located in the abdomen. It pumps **hemolymph (blood),** through an open system bathing internal organs with nutrients and carrying away waste. It does not contain oxygen carrying cells. *(therefore it is not red in color)*

**ALIMENTARY SYTESM: (DIGESTION AND EXCRETION )**

The digestive and excretory systems take up most of the space in the abdomen. The first section in the abdomen is the **crop** (honey stomach), honey or nectar stored here can be passed on through the digestive tract or regurgitated to the mouth and given to another bee. The honey stomach and the **ventriculus** (stomach) are separated by the **proventriculus**. Digestion occurs in the ventriculus (stomach). The ventriculus is coiled and averages about twice the length of the bees body. Connected to the digestive tract, located between ventriculus and intestine, are numerous **Malpighian tubules**. These are long tube-like structures that are suspended in the hemolymph to take waste matter from the blood. The digestive tract extends through the intestine and ends at the **rectum**.

**REPRODUCTIVE SYSTEMS:**

DRONE: In an established colony, during the height of the season, the percentage of drones in a colony is roughly 2. The primary function of the drone is to mate. After mating, they die. Their reproductive system consists of testes, semen and an endophallus that is barbed/hooked and causes them to not be able to detach from the queen after mating. They fall off and drop to the ground. They die after mating.

QUEEN: She will mate with multiple drones. Therefore, she has an organ (the SPERMATHECA) in which the semen collected is stored for her entire life. Her reproductive system includes an ovary, oviaroles, valve ducts.

WORKERS: have the same reproductive system,. However, it is extremely small and seldom used.

**WAX GLANDS:**

Only female workers have wax glands. Queens and drones do not have wax glands. The worker is capable of producing wax when she reaches about 12 to 16 days of age. There are four on each side for a total of eight glands.

**NASANOV SCENT GLAND:**

The abdomen contains several glands. A scent gland on the dorsal side releases a pheromone that is very attractive to bees and is released to help bees locate food and water and to help lost or disorientated bees to locate home or a swarm site. Only the female worker has this Nasanov gland; queens and drones do not have this 'homing' scent gland.

**STING GLAND & VENOM GLAND:**

The sting glands release a pheromone when a bee stings that causes alarm; "sting here" response from other bees. The stinger stays in your skin because of barbs on the stinger and unless removed tells other bees just exactly where to come sting you as well. The venom glands produce a mixture of enzymes and proteins that produce a release of histamine in the victim.
Stinger is made up of three parts. DRONES DO NOT HAVE A STINGER or these glands = they do not sting.

The stinger on a queen is less barbed so she can sting rival queens and still live.

The worker stinger is barbed. She usually stings only once and dies.

## SECTION SIX: The "superorganism" of a bee colony / Bee Behaviors and Sociology of the Colony

There are three types of individuals in a honey bee colony; the female queen, the female workers, and the male drones. The fact that there are different types of females is what is called a *caste.* There is generally only one queen, who lays the eggs in the colony and controls many colony activities by her production of pheromones. The workers do almost all of the colony's work, including comb building, brood tending, defense, foraging and many other tasks.

The drones do no work in the nest, and die in the fall after the workers drive them from the nest as colonies prepare for winter; or die after mating.

**TWO CASTES / THREE TYPES OF BEES.** YES, it is true.. There are only two castes (castes refers to social differences within one sex) So, there are two castes : the queen and the worker. This is often stated incorrectly, even in otherwise reliable references as three castes. Knowing the castes is no where near as important in knowing the three types, so don't over-stress this point.

**HAPLOIDITY ( HAPLOID / DIPLOID )**

Haplodiploidy is a sex-determination system for all insects in the order Hymenoptera ( bees, ants, wasps)
**MALES** develop from **UNFERTILIZED EGGS** Males have **half the number of chromosomes** that females have and are **HAPLOID**

**FEMALES** develop from **FERTILIZED EGGS** Females have **twice the number of chromosomes** that males have and are **DIPLOID**

The haploid/diploid sex determination system has a number of peculiarities. For example – a male has NO FATHER, and CANNOT have SONS – but has a grandfather and can have grandsons.

## DEVELOPMENT / COMPLETE METAMORPHOSIS:

There are four stages to the life of a honey bee, the egg, larvae, pupae and the adult stage

**Egg Stage:** The queen sticks her head into an empty cell, that has been prepared by the workers. Using her antenna and front legs she sizes the cell. Based on the size she will lay either a **fertilized egg to become a worker bee, or an unfertilized egg that will become a drone.**

**ALL TYPES OF BEES ( queens, female workers, and male drones—spend THREE DAYS AS AN EGG )**

**Larva Stage:** The length of time spent at this stage depends on what type of bee the larva will become.

This is a legless, featureless white grub. The immature larval stage has virtually no external and few internal features. The body of the larva is a series of folds. The digestive tract has only the single mouth opening, and does not complete development until just before the larva changes to the pupa. Thus there is no waste discharge in the larva. They excrete one time just prior to the pre-pupal stage as the cell is capped. Eyes, antenna, and other features are lacking. This stage is specialized to eat and grow rapidly, increasing in size by 1500 times before the next stage.

They have virtually no external features. They have an opening (mouth), and do not excrete waste till JUST prior to the next stage.

Nurse bees place food in the cell. The type of food the larvae is fed depends on what type of bee they are to become (queen, worker, or drone.) Nurse bees visit each developing larva about 10,000 times during the approximately SIX DAYS of this stage; feeding, cleaning, and inspecting the cell.

***SECTION SIX: The "superorganism" of a bee colony / Bee Behaviors and Sociology of the Colony " CONTINUED:***

DEVELOPMENTAL STAGES CONTINUED:

**PUPA STAGE:**

Another name is "capped brood stage" The grub changes, (transforms) into an adult bee during this stage. During a "complete metamorphosis" the young do not look at all like the adult.

The pupa of the bee gradually assumes the features of the adult through cell division and differentiation. The early pupa does not resemble the adult while the late pupa clearly has all of the adult features. The transformation from simple egg to complex adult requires 21 days for a worker, 24 days for a drone and only 16 days for a queen.

THIS INFORMATION IS CRITICAL—STUDENTS SHOULD BE ENCOURAGED TO MEMORIZE THE INFORMATION IN THIS CHART

**The Developmental Stages of the European Honey Bee ( in days)**

| | Time spent as an EGG | The combined time as a larva and as a pupa | Total development time: from egg laid till emergence as adult | Total Life Span of adult (during summer) |
|---|---|---|---|---|
| **Worker** | 3 | 5 larva + 13 capped = 18 days | 21 days | 28 - 42 days 4 to 6 weeks |
| **Queen** | 3 | 5 larva + 8 capped = 13 to 14 days | 16—17 days | 1—3 up to 5 yrs. |
| **Drone** | 3 | 7 larva + 14capped = 21 days | 24 days | 21 to 35 days 3 to 5 weeks |

References: Beekeeping for Dummies 2015 version : page 41

The Hive & The Honey Bee 2010 version pages: 82 and 83

The Hive and The Honey Bee 2015 version starting at page 80

**LIFE EXPECTANCY:**

QUEENS – can live up to 5 years / generally about 2 years
frequently replaced yearly by beekeepers

DRONES – about 35 days
in the late fall, they are kicked out to die or are killed off

WORKERS – live about 42 days "in season"
due to their changing duties, the last duty they perform during the summer months is foraging and it wears them out
over-winter worker bees have a slightly different physiology and they can live for several months
( they aren't foraging much if at all )

Bees are not like chickens. At no point during their development do they "hatch". Rather, they transform into the next stage, including when they emerge from their cell as an adult. This is called ECLOSE.

Furthermore, bees do not move eggs around in their cells. They do not turn them over or adjust their positions.

***SECTION SIX: The "superorganism" of a bee colony / Bee Behaviors and Sociology of the Colony " CONTINUED:***

**DUTIES: of the types of bees:**

**WORKERS:** Worker bees pass through a sequence of duties, or behaviors, as they age. It is important to realize that all bees do not necessarily engage in all types of activities. Additionally, depending on colony needs, workers can regress to an earlier stage and take on tasks they did previously.

Typically, during the first 3 days after emergence, young worker bees clean cells from which they just emerged. After a day or so after emergence they begin to feed nectar, diluted honey and pollen to larvae more than 3 days old. At approximately six to 12 days old, after their hypopharyngeal glands are mature enough to secrete royal jelly, they begin to feed young larva less than 3 days old.

*Some bees "age prematurely" and initiate field foraging, without having been a guard bee or engaging in some other kind of activity such as housecleaning.*

| **DAYS of Age** | **DUTIES** |
|---|---|
| **1 to 3** | **Cell Cleaning** |
| **3 to16** | **Undertakers** |
| **4 to 12** | **Feeding Larva ( & queen retinue)** |
| **7 to 12** | **Receive nectar from foragers** |
| **12 to 18** | **Temperature Control ( fanning )** |
| **12 to 35** | **Wax Secretion and Comb Building** |
| **18 to 21** | **Guard Bees** |
| **21 – death abt. 42** | **Foragers** |

**QUEENS:**

**Capable of laying more than 1500 eggs a day** – at 30 second intervals

Emit PHEROMONES that control colony cohesion and reproduction ( queen substance)

She is surrounded by a group of attendants referred to as the **queen retinue**

Queens do not feed themselves (although they CAN)
Queens defecate in the hive, and her attendants carry it away and out of the hive

**DRONES:** The drone honey bees have but one purpose in life, to mate with a virgin queen. Newly emerged drones are tended by workers and appear relatively inactive, usually gathering at the edges of the brood rearing areas, often where bee bread is stored in the colony. Pollen protein is essential for sperm production. Once they start mating flights, they require rest after chasing virgin queens, or each other, high in the Drone Congregation Area (DCA). They may fly more than once in an afternoon, and feed on honey after each flight.

Drones do not forage ( for themselves or others)
Drones do feed themselves as adults, but frequently beg food off workers
Drones do not perform other duties (guarding, feeding larvae, house cleaning)
Drones have MUCH LARGER EYES and LONGER ANTENNAE

Drones do NOT have pollen baskets, stingers, nasanov glands, hypopharyngeal glands.

At the height of 'the season' the population of drones in a colony is roughly only 2 %

***SECTION SIX: The "superorganism" of a bee colony / Bee Behaviors and Sociology of the Colony " CONTINUED***

***SOCIOLOGY of the COLONY:***

***FORAGING / COMMUNICATION (sound, pheromones, hormones, Dances) / Orientation Flights / Cleansing Flights / Mating / Supercedure / Absconding / Swarming / Laying Workers / Robbing / Drifting / Festooning / Clustering / Heating & Cooling /***

***Fanning & Bearding / Wax Production & Cell Building / Nectar to Honey /***

## FORAGING: ( workers )

**When bees are about 21 days old they begin to forage** for Nectar, Pollen, Water and Resins to make Propolis. They will continue to forage until they wear out their wings and cannot return to the colony.
Based on the needs of the colony, and foraging conditions outside of the hive body influence the number of bees foraging.

Also, they communicate where and how much food is available.

They are influenced by forage conditions, the availability of the food source, the number of bees

The female foraging worker performs this task for about 2 weeks of her life.

The foraging area is roughly between 300 feet up to 1 –1/2 miles. Although they can fly farther for forager (up to 5 miles), they usually do not. They will walk away from the hive to die, or not return from foraging.

## COMMUNICATIONS:

Antennae

Pheromones

Hormones

Dances ( round and waggle tail for this level)

**ORIENTATION FLIGHTS**

**CLEANSING FLIGHTS**

**FORAGING Flights—temperature at which the bees will forage heavily**

## MATING:

Age at which a virgin queen will begin to mate

Queen's Pheromones + Drones BIG EYES

The queen mates with multiple drones

Sperm received during mating is stored in the spermatheca; for the life of the queen> If she did not mate with enough drones, and the sperm collected runs out that queen would still lay eggs, but they would be unfertilized, therefore they would all become drones. This type of queen is called a "drone layer".

Time of day: afternoon

They do not mate with their brothers (NORMALLY), although it Can happen.

DCA— Drone Congregating Area

## LAYING WORKERS:

This tricky situation seems to happen to every beekeeper sooner or later.

If the queen's pheromones are not capable of reaching a large population; or if the queen has died, the reproductive organs of the female workers can become functional. However, they will never have mated, and therefore, any eggs they lay would be unfertilized, and all adult bees they produce would become drones. This would make the colony unsustainable.

Sadly, once there is a laying worker ( or as is commonly the case, multiple laying workers), the colony will NOT ACCEPT the introduction of a queen. They would kill her. There are a couple methods/techniques for ridding a colony of the laying worker(s). Presenters should familiarize themselves with these techniques and explain them briefly.

The important factor to get across to the class is that SOMETHING MUST BE DONE TO REMEDY THE SITUATION OR THE COLONY IS DOOMED.

SIGNS of a LAYING WORKER (or laying workers)

Two eggs, or more, in a single cell. *( SOMETIMES eggs laid on top of cells filled with pollen)*

Eggs are often stuck to the side of the cell, and are not centered in the bottom of the cell as would have been done by a queen.

Often the colony displays aggressive behavior.

An exceptionally high amount of drone brood, or all drone brood, with little or no 'regular worker' brood present. At a later stage, you may also see an overabundance of adult drones.

**Supercedure, Swarming & Absconding:**

It is very important that the class participants are able to differentiate between these three activities. Volumes have been written about each, and for this presentation, there are generally minutes to give an overview.

**SUPERCEDURE:**

We will now be introducing our participants to the fact that honey bees can raise their own queens.

This is the natural occurrence of a colony replacing and old, ailing, or deceased queen with a new queen. They do this by constructing "supercedure/queen cells". The larva in the cell is fed a special rich "royal jelly". She will be fed this her entire life, where as other bees (workers and drones) are only fed royal jelly for the first few days as a larva.

A Supercedure Cell looks similar to a "peanut" and can generally be found on the upper portion of a frame, or more towards the center. ( as opposed to Swarm Cells, which are found more often on the bottom of the frames)

**SWARMING:** This is a colony's natural way of reproducing itself. It is an activity that beekeepers try to thwart because it will most often reduce the amount of surplus honey that this colony will be able to produce for the season. Most often occurring in the Spring, the bees will realize that the amount of space within the hive is running out; especially in the brood area. If they have no place to spread out to, they will most likely swarm.

They begin by constructing queen cells to raise potential new queens. As previously stated, swarm cells, resembling downward hanging peanut shells, are usually found on the bottom edge of the frames. Once the majority of the developing new queen cells are capped, the bees will begin preparing the queen to depart. They will run her around, keeping her from laying eggs and getting exercise so that her abdomen decreases in size and she can fly with them when they leave. The old queen will leave the colony with the swarm, which will contain as much as 60% of the adult bees. They leave behind nurse bees, brood, and of course, the developing queen cells. ONE of which is destined to be the new queen for the colony that remains behind.

For Swarming and for Supercedure, the FIRST QUEEN that emerges from her pupal cell will go around and sting the other developing queen cells to kill them. IF more than one queen has emerged, those queens will seek each other out and fight to the death so that only one will remain.

**ABSCONDING:** * since this activity is associated with an unhealthy condition within the hive, this topic is often covered during the section that addresses Diseases, and Maladies of the honey bee. However, as it is similar to swarming, it can be mentioned here as well to differentiate the two behavioral actions

The greatest reasons for this activity is usually infestation by varroa mites or SHB.

The bees will perceive that the conditions within the hive are not favorable. They will ALL leave, leaving behind whatever undeveloped brood and food stores there are.

Often mistaken for either a pesticide incident, OR claimed to be CCD it is neither: With CCD—95% of the time, the queen remains present, and only a handful of bees remain—about less than 200 are on hand. The colony is "collapsing" in that it doesn't have workers to do all the necessary tasks.

Pesticide incidence: Dead bees in front of the hive would most likely be present.

**ROBBING: "The removal of honey from a weak colony's stores by other bees or other insects"**

**DRIFTING: "The movement of bees to another hive rather than the hive from which they originated. Some drifting is expected."**

**HEATING (Dynamics of the "CLUSTER" )**

**CLUSTER:** During the winter cold period, the bees cling together in a mass for warmth.

They also cluster during swarming to sustain the colony social structure, passing of food, and the transmission of chemicals.

**COOLING: (include BEARDING, and FANNING and water used for evaporation)**

**Concerning all of the above colony behavior activities, you will learn more later in this course in the Section " Seasonal Management"**

"what bees go outside of the hive to forage for".

1. Water
2. Nectar = CARBOHYDRATES
3. Pollen = PROTEINS (along with amino acids, lipids, and minerals)
4. Resins and Saps
5. Honeydew ( brief explanation)

**HOW BEES COLLECT WATER:**

Bees will find resources of water that they will carry back to the hive in their 'honey stomach'. This water is then deposited in areas of the colony and serves a couple of purposes. One is so that it can be added to 'bee bread', that is a mixture of pollen, nectar, saliva, and water, which is then packed into cells and later it is fed to developing larva. This sticky substance is referred to as "bee bread".

More often the use of water in the hive is to place droplets around inside the hive for the purpose of cooling by means of evaporation. (See also "fanning" behavior in this section.)

You will learn more about how to ensure water resources for honey bees later in this course in the Section on Seasonal Management.

**How NECTAR is gathered, and then 'made' into honey**

Nectar is approximately 80% water and 20% sugars. Honey, once ready, is roughly the opposite; being less than 20% water and over 80% sugars. {Honey is between 15.5 & 18.6% moisture.}

Remembering the "communications" mentioned earlier in this Section, foraging bees 'tell' other bees where the 'best' nectar is located. Once the bee arrives at the flower, they will insert their proboscis into the flower, attempting to reach the nectar. They 'suck' the nectar up, it goes through their esophagus and into their honey stomach. The bees carry the nectar back to the hive in their "honey stomach".

Honey is NOT truly "bee barf". But the wording given to the anatomical parts has leant to this misconception. Remember, there is a one-way valve, called the Proventriculus that separates the 'honey crop/stomach' from the bees' digestive stomach (Ventriculus).

The nectar is transferred to a 'house bee', who in turn, takes it into her crop then begins to blow bubbles which acts to begin dehydration. During this bubble making time, **the bee also adds enzymes.** One is "invertase" (aka sucrase) which **converts the sucrose of the nectar, into fructose and glucose which is the honey. Another enzyme** added is "glucose oxidase" that **has molecules of hydrogen peroxide** and is in part why honey is used for wound treatment and in burn units, as this is what gives honey anti-microbial and anti-bacterial properties.

The bees 1.) consume the nectar/honey as a source of carbohydrate energy for themselves. This is important to know because much energy is necessary for the production of wax; to be able to flex thoracic muscles etc.

2.) the nectar, and subsequently honey, is mixed with pollen to make "bee bread" that is fed to developing larvae.

## How POLLEN is Gathered:

The honey bee is particularly well adapted to pollinate plants due to several factors. The most obvious physical characteristic is that the honey bee is covered in "PLUMOSE HAIRS". (wasps and many other bees are not)

There are even hairs between the facets on their eyes. So, when a honey bee forages for pollen, they become covered with pollen. As they go from plant to plant, some pollen drops off, thereby plant fertilization occurs.

The honeybees need the pollen as a source of protein ( and amino acids, lipids, and minerals). They will need to carry this back to the hive. They do this by putting pollen into 'pollen baskets' ( REAL NAME IS CORBICULA). These are stiff hairs on the hind legs.

Honey bees have a characteristic known as "flower fidelity". Once a forager, or group of foragers, begin to collect pollen from a specific species, they will stay with that cultivar or variety. This is one of the primary reasons that the honey bee is such an important pollinator.

Once back at the colony, the pollen-laden forager will find an empty cell, place her back legs into the cell (with her abdomen balanced on the top opposite side of the cell). Using her other legs, she will then scrape the pollen 'ball' into the cell. Other house bees will take pieces of it, rework it, add nectar, water, saliva and convert it into bee bread to feed the developing larvae.

## How Resins and Saps are gathered for PROPOLIS.

Foraging bees will "specialize' in gathering resins and saps. Those that gather these materials, do not change over to pollen on a subsequent trip. The bee will scrape at the tree with their mandibles and feet. They will then manipulate the sap/resin to their corbiculas to carry back to the hive. Once at the hive, workers assist the foragers in unloading their corbiculas. Workers will then chew the resins, combine it with beeswax and stomach content depending on how or where they want to use it. This combined product is PROPOLIS.

Propolis is often called "bee glue" as the colony uses it to seal cracks and fill crevices. Propolis is anti-bacterial, anti -fungal, anti-viral; is possibly anti-oxidant and anti-inflammatory.

## BEESWAX:

How the bees make the wax; and when. At roughly 14 days of age, their wax glands are developed enough to begin this task.

There are 8 wax glands located on a worker bee's abdomen. (Drones and Queens do not have these glands.)

The substance that will become bees wax is excreted from these glands, it is soft and clear, then hardens and turns whiter as it mixes with air. Using specialized features of their mid-leg, they will remove the flakes of wax as it is excreted and move it to their front feet and mandibles where they manipulate it and place it wherever it is needed

within the hive. For cell building, a single flake (called scales) can take up to 4 min**.** HUNDREDS of bees work on a single cell; often chewing loose a newly affixed piece and moving it merely a millimeter – frequent during brood capping.

**Section 7 : IPM—Integrated Pest Management: ( 15 minutes )**

This section is important in that we often hear that IPM is incorrectly defined.

Integrated Pest Management ( IPM ) is the coordinated use of appropriate pest control tactics to reduce pests and their damage to an acceptable level.
To determine if and when action against a pest is needed …
the IPM approach makes use of

- current pest information
- regular monitoring
- recordkeeping

"Integrated" means that all types of control strategies are considered, and combined as appropriate to solve a pest problem
A critical concept of IPM is that small populations of pests can often be tolerated

COMPONENTS of IPM:

**IDENTIFY** the pest, and understand its biology
**MONITOR** the pest to be managed
Determine if **THRESHOLD** levels of pest population have been reached
Consider **VARIOUS MANAGEMENT CHOICES**
( non-chemical and chemical as appropriate )
**IMPLEMENT** the control
* ( **control the pest, with the least harm to everything else**)
* **the LABEL is the LAW**
**RECORD and evaluate** the results

Identify the pest / disease
- By looking at it
- By recognizing the damages/symptoms
- Understand its life cycle; and it's 'needs'
- This will help you to understand What CAN be done, and what is worthless activities.
- Understanding how to determine the level of infestation
- Understanding the implications of the population/infestation = THRESHOLD
- Manage (treat)
- MONITOR – to determine if what you are doing, is having any effect

Treatment / Management

- 1. Identification / Threshold Determination
- 2. Physical / Mechanical Methods
- 3. Biological Methods
- 4. Chemical ( sometimes referred to as "soft chemicals")
- 5. Pesticides

Know the legitimate resources for research.

**NOTE** concerning recommended content for Bee Diseases, Maladies, and Pests:

For the person, or presenters of these sections: The MBP would like to see the emphasis put on recognizing the symptoms of diseases and maladies, *( and for pests—next section)* rather than the specifics of management techniques. For many years, the certified written tests included both the trade and chemical names of treatments (especially for varroa). The current MBP recognizes that the list of possible treatments continues to change. While it is not an error to go over the vast array of possibilities that can be used; it is not something that will be tested upon, at least not in great detail.

The MBP feels that a new beekeeper would likely seek out a mentor once a disease or pest has been identified. If that new beekeeper can at least be aware that there is a problem; and be able to describe the symptoms to a mentor or apiary inspector, that would be good.

Additionally, individual chapters may have adopted 'chemical-free' practices. Please note that the goal of the MBP is not to promote the use of chemical treatments; rather, the MBP requires that candidates for various levels are aware of all the management techniques. Individuals must know what they are in order to have the foundation to make a decision concerning what is right for them.

## SECTION 8: BEE DISEASES (and Maladies) ( 75 minutes / 1-1/4 hour )

### For each: go over the identification (symptoms) / cause / management methods

**List of Diseases to cover:**

AFB American Foulbrood

EFB European Foulbrood

Nosema Apis

Nosema Ceranea

Chalkbrood

Sacbrood

Stone Brood

Paralysis Virus ( Acute, Chronic, Israeli)

DWV Deformed Wing Virus

PMS Parasitic Mite Syndrome

"Snotty Brood"

**List of Maladies to cover:**

Chilled Brood

Starvation

Pesticide Kill / Exposure

CCD Colony Collapse Disorder

**KNOW WHAT NORMAL IS:**

There is no substitute for hands-on experience. In a classroom environment, showing photographs of healthy developmental stages is necessary ( eggs, larva, capped brood with good pattern, honey & pollen stores).

**AMERICAN FOULBROOD / AFB: (probably a beekeepers "worst nightmare")**

**Identify the problem:**

An EXTREMELY FOUL ODOR is present

Usually shows up in CAPPED BROOD

Sunken / Perforated / Noticeably Darkened Capping and Comb

Larva or Pupa with TONGUE sticking out

"scales" are difficult to remove from cells

ROPY—larva have a ropy appearance when probed with a twig or toothpick

(this is a difference from EFB which follows in the next section of this outline )

**CAUSE: Bacteria**

A BACTERIUM that FORMS SPORES - Bacillus Larva

Larva are susceptible for the first 53 hours following emergence from the egg stage

Effects all types of bees ( queens, workers, drones)

Colony dies slowly—can take up to a year

A single "scale" can contain up to 2.5 BILLION spores

Spores can live up to 60 years (or more) - infecting other bees /

Old Used Equipment , Disease spread by beekeepers going from hive to hive, robbing, drifting

**TREATMENT / MANAGEMENT:**

In most states AFB discovery requires burning the hive and bees, then burying the ashes to prevent spreading

In North Carolina the Bee Inspectors can take the hives to the fumigation chamber in Raleigh for a small fee. There is a lengthy wait time until the equipment can be returned to the beekeeper.

The use of antibiotics is PROHIBITED for the treatment of this disease.

Do not use old equipment that has not been fumigated or is thought to be spore free as spores can last virtually for ever. Purchase bees & equipment from those who have a "Permit to Sell Bees".

You MUST report any AFB incident to the NCDA &CS apiary inspection service

**EUROPEAN FOULBROOD / EFB**

**IDENTIFY THE SYMPTOMS:**

An UNPLEASANT SOUR ODOR is present

Generally appears in UNCAPPED BROOD

( although capped brood can exhibit SOME characteristics similar to that of AFB )

The BROOD PATTERN is scattered and spotty

In unsealed cells, the larva are twisted

The dead larva are discolored: Yellowish, Tan, or Brown and generally darkened

Unlike AFB - the larva is not Ropy

Unlike AFB - the larva do not have their tongues sticking out

Effects the larva of all types of bees ( queens, workers, drones)

Frequently occurs in the Spring. Somewhat thought to be a seasonal disease.

**CAUSE:** Bacteria

Bacterium : Melissococcus pluton

Does not form spores

**TREATMENT / MANAGEMENT**

It is worthwhile to note that up until 2017, the use of antibiotics was commonly used to treat EFB.

Those antibiotics were Oxytetracyclin, Terramycin, Lyncomax, and/or Tylosin. At that time the EPA initiated a requirement that if an antibiotic was to be used, a veterinarian would first have to be consulted, and a prescription written. One reason for this is due to the fact that the use of antibiotics in AFB might treat the symptoms, but not have any effect on the spores. This resulted in masking the disease and the transfer / sale of bees caused further spread of AFB.

The use of antibiotics can still be used to treat EFB, however, the beekeeper must find a veterinarian who can exam the “patient”, make a proper diagnosis, issue a prescription for which the beekeeper would have to go to a ‘farm supplies’ purveyor to purchase.

EFB is something that the colony CAN recover from on its own.

To aid in recovery , re-queening is often recommended. ( break in brood rearing)

AVOID the disease by:

Discouraging drifting and robbing

Do not share equipment or buy used equipment or bees from those who do not have a “permit”

Clean / Sterilize tools used in the hives

**SECTION NINE: PESTS ( 120 minutes / 2 hours )**

For each:

go over the Identification / Symptoms / Cause / Effects on Individual &/or Colony / Management Methods

It is wise to mention WHEN each pest became apparent in the US. The reason for this is so that the student can understand how long something has been being researched, and why some management methods are no longer effective.

**Pests to Cover:**

Varroa Destructor

Tracheal Mites

Small Hive Beetle (SHB)

Greater Wax Moth (GWM)

**"Other" Pests:**

Ants

Marauding Yellow Jackets

Bee Louse

Mice

Raccoons, Opossum, Skunk

Black Bear

Spider (mention black widow - beekeeper awareness)

**"On the Horizon" mention:**

New Mite: Tropilaeps Clarcae

New Beetle—West Coast USA

Zombie Flies

**SECTIONS TEN & ELEVEN: often combined:**

**SECTION TEN: APIARY SITE SELECTION ( 45 minutes)**

**SECTION ELEVEN: Good Neighboring Practices, Rules and Regulations ( 15 minutes)**

Apiary = Bee Yard

Choose what is right for the bees AND what is right for the beekeeper

Check with your county, home-owner association, and municipality concerning regulations

> While it is legal to keep bees in NC without a permit or licensing, some municipalities and/or home-owner associations place regulations that are prohibitive, or that control the placement of hives &/or limit the amount of hives. (start with animal control or the county or city manager)

To avoid bee and human contact, consider a privacy hedge or fence of abt. 15 feet

Talk with your neighbors. Let them know you are planning on keeping bees. If any of them is truly allergic to bee stings, you may want to reconsider having your apiary at this location.

Whenever possible—remember that a gift of honey or other hive products goes a long way to tolerance.

Know how a honeybee sting is different than a wasp. Know how to remove the sting to reduce the amount of venom exposure.

Place hives in the SUN if at all possible (reduces SHB incidence)

Face the opening of the hive(s) to the South or Southeast

Place hives to avoid harsh winds

Make certain that there is a water resource for the bees

Place hives 10 feet apart if possible to reduce drifting, robbing, and the spread of pests and diseases

Do you have room? To work. To expand.

Do you need fencing? (limit human, pet or bear or others)

Remember ease of access. Can you drive a vehicle to the apiary? Remember, hive components can be heavy, and extraction requires removal of equipment. Also, a safety factor for the beekeeper..

Will you need to mow or do weed control?

You should not place the hives directly on the ground. What height will work for you? For the Bees?

What will you put the hives “on”. (table, cement blocks etc.)

SLIGHT incline towards the front to reduce accumulation of water on a solid bottom board.

**SECTION TWELVE: Beekeeper PPE ( Personal Protection Equipment) and Beekeeper TOOLS (**15 minutes)

Here is where having catalogues on hand can be a help.

Also, having other chapter members display their suits, jackets, veils, gloves, hive tools, etc., so that the class participant can realize they have choices is a significant benefit.

Beekeeper PPE & Tools differs from Hive Components and seasonal management items such as reducers, excluders etc.

This section generally immediately precedes the section on “how to inspect hives / seasonal management”.

(NOTE: Bee Yard Safety is covered in the next section)

Start by mentioning what to avoid:

Dark clothing

Perfume (body odors)

Fast Movements

Loud Noises &/or Vibrations

VEIL

SUIT / Jacket / Closure of clothing

GLOVES

HIVE TOOL

BEE BRUSH

SMOKER

FRAME REST / HOLDERS

SPACING TOOL

FRAME GRIPPER

**SECTION THIRTEEN: HIVE COMPONENTS:** ( 120 minutes / 2 hours )

Briefly, remind the class of the importance of the Langstroth use of the "moveable frame hive" for inspection and for disease/pest management. It is the law in North Carolina that hives are constructed in a manner that makes them accessible for inspection. (bee gums and skeps are not legal in North Carolina)

Advise the participants of the various types of hive construction:

Langstroth 8 or 10 frame / Top Bar / Warre etc.

The successful candidate for the Certified Beekeeper Certificate will be able to distinguish the various parts of the hive (woodenware) and internal/external accessories. These are mandatory on the practical exam.

Telescoping Outer Cover

Inner Cover ( solid or screened)

Shallow Super ( 8 or 10 frame)

Medium Super ( 8 or 10 frame)

Deep "Brood" Box ( 8 or 10 frame)

The bottom board ( screened or solid)

The hive stand

What a "landing board" is

The Table/Structure upon which the entire hive sits

The placement & styles of the frames ( grooved / wedged tops and bottoms)

The use of wire in foundation –when, where, and why

The use of foundation

The use of "ross rounds" or other to produce "CUT comb honey"

Queen Excluder

Entrance Reducer

Fume Board

And others….

**SECTION FOURTEEN:** ( 45 minutes )

**Bee Yard Safety:**

Dress and behave appropriately.

What to do if you get a bee inside your veil.

What to do if you get stung while in the bee yard.

Going it alone? Let someone know you are going to be in the apiary: when you intend to start & finish

Take a cell phone with you and have it at least in the vicinity of the work area.

**Hive Inspection :**

There are better times of the day to do inspections than others.

There are weather conditions that need to be considered prior to doing inspections.

Determine what your goal is before going to the apiary. What are you looking for, or need to do?

Note taking is important.

Have the equipment or gear with you to achieve your intended goal.

Where to stand ( behind or to the side of the hive)

Use of smoker

How to open a hive, use of a hive tool

How to move frames, lift frames, hold frames and inspect frames.

The importance of keeping frames in the order from that which they were removed for inspection. * not always*

Duration of exposure to air, sunlight, and wind to frames (brood vs honey or pollen)

Replacing frames: care not to 'roll' bees, especially the queen!

What do you observe? (again, either take notes, or write this information down after you leave the apiary)

What is the condition of the apiary overall?

Fences in good condition or need repair?

Do weeds need removing?

As you open the hive, do you see SHB? (running around on the outer or inner cover)

Do you smell a foul odor? (an inclination to suspecting foulbrood)

As you inspect, what development stages to do you see? Eggs, new larva, fat plump larva, capped brood?)

As you inspect, do you see bees bringing in pollen? ( fun to note, but not critical—what color?)

Do you see evidence of wax moths?

Do you see bees on the ground in front of the hive? Are they dead or dying? Do they have DWV or K wing? Each of those is an indication of different problems, so you need to be able to know the difference between them.

**SECTION FOURTEEN (continued) Seasonal Management / Hive Inspection**

- obtaining bees ( packages, marked queens, nucs, swarms, hives)
- Installing package bees
- Feeding bees
- Adding space / Supering
- 2nd year—swarm prevention, splits, pest management
- Monitoring for pests and diseases
- Removing honey from the hive
    - * moisture of honey / "70 % rule"
    - * fumigants, bee blowers, brush-n-run, bee escapes / little if any smoke
- Monitor for 'queen-right', pests, diseases
- Winter—Prep—a lot gets done in early fall
    - * queen-right
    - * adequate stores
    - * not too much space
    - * entrance reducers / mouse guards
    - * VENTILLATION
    - * wind protection
    - * to wrap or not
    - * take 'winter losses' in the fall by combining weak hives with stronger hives
- Monitor over-winter stores, feeding syrup / fondant / emergency
- Don't break the cluster, or introduce cold air

**SECTION FIFTEEN: FEEDING BEES** (15 minutes)

While it is likely you will have covered some of this in the previous section "seasonal management", a small section of time should be set aside to advise of the various types of feeders, their pros and cons.

Specifically: Hive Top feeders , both the box / float type and the "pickle jar" or pail feeders , Boardman Entrance Feeders, In-Hive 'frame' feeders with floats, and describe the need to protect bees from drowning in syrup.

You should also discuss syrup ratio / fondant vs syrup / pollen substitute feeding (why, when or when not to)

You should mention the use of High Fructose Corn Syrup, primarily used by "commercial" beekeepers.

**SECTION 16a and 16 b**

**16 a—extracting honey from the bee hives ( 30 minutes)**

The 70% Rule

Moisture Content—use of a refractometer IN THE APIARY

To be HONEY the product must be between 15.5 and 18.6 % to be Grade A or B honey. PERIOD.

Sealed / Capped Honey

Methods of removal of bees from frames/boxes of honey

Escape Board / fumigant (fume board) / blower / brush-n-run

*smoke is not advised during extraction from hives other than to mask pheromones in the area*

**16 b—extraction of honey from frames / the 'honey house" (35 minutes)**

CLEANLINESS is paramount. There are rules and regulations put forth from the NCDA&CS Food and Drug Protection Division that dictate where you can safely extract honey to avoid contamination. Refer to their website.

EXTRACTION EQUIPMENT: Decapping Knife / Decapping Tank / Extractor / Filtering "systems" / Pails / Honey Gates / Jars or containers to 'package' honey in for marketing.

What to do with the empty frames ( in the area of the apiary for the bees to finish cleaning. How to store frames that are "cleaned"; how to store frames that have honey in cells.

**16 c—Label Laws ( and recommendations ) (10 minutes)**

As previously stated, the NCDA&CS Food and Drug Protection Division has laws that impact what you can put on a label for a jar of honey.

#1 Honey is sold BY THE POUND ( solid weight) (a pint jar is approximately 1.33 lbs. as an example)

#2. The USDA requires that that weight statement is also printed in GRAMS

#3. The Weight statement must appear in the lower 1/3 of the label

#4. The word "RAW" is against NCSBA recommendations. The use of Local or Pure is all right

#5. North Carolina requires the source (address, including ZIPCODE) to be on the label

#6. The word HONEY can be in large letters if it is the ONLY thing in the container. Any flavorings added, ANYTHING added and then the word honey cannot be larger than other words/letters. It is no longer honey—it is "blueberry flavored honey syrup" for example

**SECTION SEVENTEEN: Plants for HONEY bees** ( 30 minutes)

Most people are interested in knowing EXACTLY what they should plant to "help the honey bees".

Most beekeepers spend their beekeeping lives improving upon the forage for their bees. It is an endeavor and topic that takes more than the 30 minutes suggested for this initial introduction to the topic.

How in-depth you go into this subject would be based on the time you have to cover it.

Start by reminding them "what bees go outside of the hive to forage for".

1. Water
2. Nectar = CARBOHYDRATES
3. Pollen = PROTEINS (along with amino acids, lipids, and minerals)
4. Resins and Saps (combined in the hive with varying amounts of wax = propolis)
5. Honeydew ( brief explanation)

**FLOWER FIDELITY / FLOWER CONSTANCY**:
In this section you would want to touch on bee nutrition; and what attracts honey bees to certain plants as opposed to others. Duplication of some previously taught topics is a way of reinforcing color vision; communication by dance language and pheromones; and the duties of the bees at different ages. Now, some of what you taught earlier will start falling into place for the aspiring beekeepers in your class.

You might like to arrange your presentation on this subject by what is blooming in YOUR AREA by MONTH.

You could arrange the presentation based on what your chapter feels are good honey-producing plants for your area.

You could arrange the presentation based on plant types: agricultural, fruits and vegetables, ornamentals

Some plants that seem to always be mentioned:
Red Maple, Henbit and Dead Nettle, Dandelion, Clovers, Hollies, Crepe Myrtles, Mimosa, Tulip Poplar, Vitex, and there are many more

For Sourwood, you would want to bring in the topic of label honesty.

Cotton, Soy Beans, Corn, Alfalfa

Cucumbers, Pumpkins, Gourds, Cantaloupe, Pepper Plants, Blueberry, Apple,

And then there are those plants that are TOXIC to HONEY BEES. Carolina Jessamine, SUMMER Titi (leatherwood), Rhododendron, Bougainvillea, Azaleas to name a few.

A little later on in their experiences, the beekeeper will most likely endeavor to learn what plants not only provide nectar and make "good honey", but which are more nutritional for honey bees than others.

**SECTION EIGHTEEN: N.C. RESOURCES : (45 minutes)**

Benefits of Participation in Local Chapter / NCSBA / MBP Program ( 15 minutes)

Mentorship, and fellowship

Opportunities to attend educational programs

Support for Beekeeping Research

Participate in educating the general public concerning matters relative to honey bees and beekeeping.

Be sure to explain when and where your chapter meets; what are the annual dues

If you have an annual agenda available, distribute it to them.

If you have a chapter brochure, distribute it to them.

Remind the class participants that with beekeeping, a mentor is more than convenient, it is extremely helpful. For the first three years, generally a new beekeepers needs the club. After that, honestly, the club needs them to continue on the succession of paying it forward, and paying it back in regards to mentoring new beekeepers on matters of apiculture.

**NCSBA:** Advise the cost and encourage membership to the NCSBA.

Note the activities and programs of the NCSBA:

2 state meetings a year that host major national speakers, and a large representation of beekeeping suppliers along with workshops and other activities / The MBP = Master Beekeeper Program / participation in the NC State Fair / Assistance in the construction and establishment and volunteer opportunities at the NC Zoological Park's "honey bee garden" / GAP / Certified Honey Producer Program / McIver-Hass Award / Beekeeper of the Year Award / Annual Contests (honey judging, wax, cooking and more ) / A Video Library / Born-N-Bred Queen Rearing educational program / Regional Directors / an active Facebook page / an up-to-date website / Support for the NCSU Science Lab / The Yellow Book / The quarterly BEE BUZZ /

PLEASE DISPLAY / DISTRIBUTE THE URL WEBSITE ADDRESS FOR NCSBA www.ncbeekeepers.org

**The Master Beekeeper Program** encourages the expansion of the beekeepers knowledge, thereby making the efforts more enjoyable (and hopefully successful).

Please give the class participants an MBP brochure if you have them available.

Explain to them that most likely, at the culmination of this course, IF THEY HAVE BECOME MEMBERS OF THE NCSBA would have the opportunity to take the written portion of the Certified Beekeeper exam. After 4 months of beekeeping, they would then be eligible to take their Practical Exam for Certified Beekeeper. Once the candidate has successfully passed both of those, they would receive, from the NCSBA, a "CERTIFIED BEEKEEPER CERTIFICATE".

There is not a fee for this. They only need to put forth the effort to achieve it. * Note, at this time, the "Bee Hive Grant" offered by the NC Legislature requires that applicants for that grant have achieved the level of Certified Beekeeper. This requirement was set forth by the state legislature, not the NCSBA.

**SECTION EIGHTEEN: N.C. RESOURCES : continued:**

**NCDA&CS = North Carolina Department of Agriculture and Consumer Services**

The Dept. of Agriculture has many divisions, agencies, and programs that directly impact beekeeping within the state. Remember, according to the USDA ( and the NC. Dept. of Agriculture) honey bees are considered livestock. Additionally, the pollinator health within the state directly impacts farming concerns, food production, and the financial impacts of them.

Regardless of club or association membership, EVERY BEEKEEPER IN NC should be aware of the Department of Agriculture and the many ways in which it influences, assists, and regulates beekeeping in North Carolina.

There are three areas within the Dept. of Agriculture that beekeepers should be aware of.

Please cover these sections in your class:

**NCDA&CS - apiary inspection** (10 minutes)

The apiary inspectors work for the state of North Carolina; the Department of Agriculture and Consumer Services. They operate under the Plant Industries Division. They do not work for NCSBA or NCSU. At it's inception, the agency was initiated in an effort to quarantine and contain tracheal mites.

The inspectors are knowledgeable, accommodating, and friendly. If they don't happen to keep bees themselves right now, they have all kept bees at one time or another.

They monitor the health of honey bees within the state. In addition to watching over the bees kept with N.C., they are tasked with monitoring bees that are transported through, and sometimes "parked" within the state.

They are watchful for things such as AFB, AHB, and trends occurring within N.C.

The annual "Permit to Sell Bees in North Carolina" is issued by this agency.

Every beekeeper in North Carolina should know the name of their regional apiary inspector, and how to reach them. If ever you have a concern, you should feel at ease in contacting them. Part of the mission statement for the agency is educational outreach. You will not insult them, nor will they think ill of you if you contact them with a question. CHAPTER: Please display the website for this agency:

http://www.ncagr.gov/plantindustry/Plant/apiary/apiarymp.html

**NCDA&CS— food & drug protection** (10 minutes)

This is another division of the N.C. Department of Agriculture and Consumer Services. This division is where you will find laws, rules, and recommendations concerning the safe extraction, handling, and marketing of honey.

CHAPTER: Please display the website for this division: http://www.ncagr.gov/fooddrug/

*(Dept. of Ag. Continued next page )*

**Section 18 continued—NC Resources:**

**NCDA&CS - Structural Pest Control & Pesticides Division** (10 minutes)

Yet another division with the NCDA&CS that promotes healthy pollinators, with special efforts towards honey bees. This division is tasked with educating consumers and farmers in proper pesticide usage.

CHAPTER: Please display the website for this division: http://www.ncagr.gov/SPCAP/pesticides/index.htm

This division handles registration of apiaries so that notification to the beekeeper can be made prior to a pesticide application that might impact the colonies. See AERIAL REGISTRATION and DRIFTWATCH / beecheck

CHAPTER: Please display the website for this program: http://www.ncagr.gov/pollinators/Driftwatch.htm

**NCDA&CS —Pollinator Awareness ( under the Structural Pest Control & Pesticides Division )**

CHAPTER: Please display the website for this program: http://www.ncagr.gov/pollinators/index.htm

**NCSU:**

While not directly associated with the NCSBA at this time, NCSU has a long standing relationship with both the N.C. State Beekeepers Association, and beekeeping in general within N.C. It was, after all, at this University that the Master Beekeeper Program for N.C. was begun back in 1982 by Dr. Ambrose.

The Entomology Department at NCSU is renowned for its achievements in honey bee research.

The Apiculture Program at NC State has three core missions: ***Extension***—providing information, advice, and other outreach services to help beekeepers at all levels; ***Research***—using the scientific method to test hypotheses about honey bee biology and ways to help improve bee management; and ***Instruction***—teaching and disseminating knowledge about honey bees and apiculture through formal classes and academic training

Along with ATT, the University is the "land grant college" that is associated with the NC Cooperative Extension service. Class attendees are frequently unaware of the services available to them through the NC Cooperative Extension. There are many articles, research papers, and publications which the beekeeper can avail themselves of information.

RESOURCES:

Apiculture at NCSU: https://entomology.ces.ncsu.edu/apiculture/

NCSU : "BEES" : ( an online course of study ) **https://entomology.ces.ncsu.edu/apiculture/bees**

CALS ( College of Agriculture and Life Sciences) : **https://cals.ncsu.edu/**

NC Cooperative Extension: **https://www.ces.ncsu.edu**

**SECTION NINETEEN: SMOKER:** * an outside the classroom extra activity (30 minutes)

Smoker how to light: emphasis should be placed on having the fire source at the bottom

(not stuffing the smoker then lighting it)

Emphasis should be placed on making "cool smoke" - acceptable types of fuel

how and when and why to use (or not)

THIS Is a MAJOR FAILING of beginning beekeepers. Most attempt to light a stuffed smoker from the top.

**ADDITIONAL EXTRACURRICULAR** - Outside the classroom experiences possible

**Bee Yard Visit:** (90 minutes / 1-1/2 HOUR)

PPE / TOOLS and how to use them

Techniques of Hive Inspection

Identifying Hive Body Parts

**Workshops:**

Frame Construction

Foundation Placement

Hive Body Construction

If at the 'right' time—extraction and bottling

**Suggestions for additional printed materials for distribution:**

Print out of Class Agenda (showing times, topic, presenter information)

Membership Forms for Local Chapter and NCSBA

Local Club Info such as a brochure; information sheet containing website and/or Facebook information

NCSBA Master Beekeeper Program brochure

Information about installing an electric fence for bear deterrent

Plans for making wax moth bait traps

Printed sheet listing references: (websites, magazines, books)

Printed sheet of the NC list of those with Permits to Sell Bees for the current year

Printed list of beekeeping suppliers

Catalogues from beekeeping supply companies—usually available upon request with months notice

Advertisements or announcements concerning upcoming events (local chapter / NCSBA)

** "Homework Assignment" one example follows here and is a worksheet for the class participant to use in making up a list of items they will need to buy (or make) and what those costs might be. ***

**"Homework Assignment"**

Over the many years that the chapter has been teaching 'beginner classes', we have found that the subject of what someone needs to get started becomes confusing – and that seems to 'hit' them after the class is over. So, we felt that if we started out with this project right from the beginning, the participants in this class could discuss their needs more completely during the review period on the third Saturday.

So, whether you do this assignment or not, is entirely up to you. But if you do complete it, then on the third Saturday as part of the review, you will have an opportunity to have the instructors and other beekeepers take a look at your plan and point out any 'obvious' omissions or inconsistencies that might cause you problems going forward.

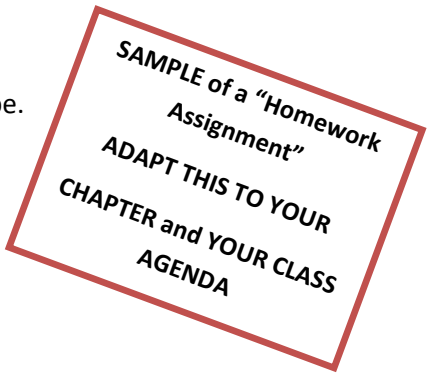
**Over the next three weeks, try to work on the planning for your apiary.**

Although we don't discuss this till the Second Class, feel free to get started. Then, while we are discussing apiary needs, hive equipment needs etc., some of what we say may make more sense to you.

**APIARY: Start with your apiary.**

**Draw a simple picture/diagram of where ( at your location ) you think you will place your bee yard.**

You can use the back of this piece of paper if you wish.




For this, only draw rectangles to suggest where in the apiary your hives will be.
At the next step, you will list the hive parts needed.

Be sure to include:
Your overall property ( house, pool, etc.)
directional aspects ( North/South/East/West )
shrubs, trees, fences that exist
neighbors properties ( and any physical concerns that may exist there )
ground preparation needs
security needs for your apiary
consider how you will access your apiary – considering having to move some heavy items from time to time

**SECOND PART of "Homework Assignment"**
**Make a list of every single item that you feel you will need as Beekeeper Equipment.**

That being PPE ( Personal Protection Equipment) such as veils, gloves, hive tools, etc.

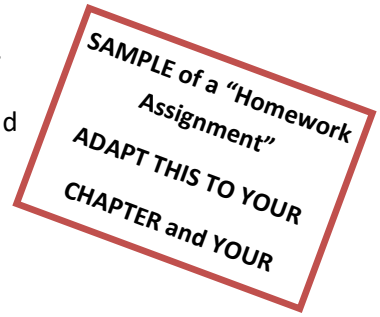
Make your list as if you were about to place an order.

List the item name ( and if you wish the size )

List the cost ( from a catalogue or other supplier source)

**THIRD PART of "Homework Assignment" - page 2 of 2**
**"Build a Hive"**

Do the first two steps before you start on this third part.
You may even want to wait till after the second Saturday class –when we show and tell about the various needs of a physical hive.
You can draw a picture if it will help you. ( it really does help most folks)
List every single piece of equipment that you will need to assemble a hive.
That being boxes, stands, frames, foundation, etc.
List them by NAME (perhaps use sizes and/or a catalogue number too ) and PRICE
Name and Price




**FOURTH PART of "Homework Assignment"**
**HIVE Accessories, and Other 'tools'**
Consider going forward once you have your bees. We've put a couple items below to get you started, but it is not at all a complete list. Make up YOUR OWN list of what you think you will be needing.
Remember to list them by NAME and PRICE

Do you need additional boxes?
Will you need a feeder? What type? And that choice may lead you to needing additional items.
Spray bottles?
Queen Excluder?
Small Hive Beetle traps? What kinds? ( It makes a difference – you need to know this as you order or things purchased may not fit on your hive)
Moth Traps
Feeding Supplements
The list can get lengthy – let's see what you come up with.

- If next spring will be your first year keeping bees… you may choose NOT to include extraction equipment. This is generally not something you will have an immediate need for a couple years, especially if you are a club member. Generally others in the club will allow you to join with them when they do extraction. This will eliminate a costly investment for a couple of years.

QUESTIONS I WANT TO ASK AT THE NEXT SESSION:
_____

_____

_____

_____