Honeybees-by-the-Sea

Pure Raw Wildflower Honey  Pure Handmade Beeswax Candles
Donna Marie and Thousands of Bees
Organic Terra Preta 'Amazonian Dark Earth' Garden
Donna Marie Lynk, Mandy Farms
Morehead City, N. C.

www.honeybees-by-the-sea.com
Honey Bee Ancestry

• As long as 80 million years ago, honey bees developed from a wasp-like ancestor, forsaking a carnivorous diet for a vegetarian one.

• The only food materials collected and stored by honey bees are nectar and pollen.
Honey Bee Adaptations

- The tongue of the honeybee has become elongated to reach deep seated nectaries.
- Their bodies have developed specialized hairs, combs and bristles to collect pollen.
- The crop of the honeybee has become enlarged as a honey stomach or honey sac, to carry large loads of nectar.
Foraging Statistics

• **Temperature:** Minimum temperature for active foraging is 46 – 50 degrees F. The ideal temperature for foraging is 66 – 86 degrees F.

• **Average flight speeds:** Outgoing 12.5 mph, Returning 15 mph.

• Bees average about 15 flights per day.

• Foraging flights average 30 minutes to 2 hours per flight depending on conditions.

• Honey bees can carry 1/3 to 1/5 of their 80mgs body weight, or 3/1000 oz.

• Bees do not forage after dark because they must see the ground in order to orient their flight.
Forage Territory

- Normal foraging distance is a two to three mile radius from the hive, but bees can go further if necessary.
- Most bees forage within 200-500 yards of the hive.
- Inexperienced bees forage closer to the hive. As they age they fly further.
- Most bees forage on a particular clump of trees, or bushes or a certain part of a field.
- Foraging bees exhibit a preference for certain species of flowers and will fly past other flowers to reach a preferred foraging area.
How Bees Discover Flowers

- Bees use two major senses: sight and smell.
- Flowers show both colors and patterns.
- Many flowers have a nectar ‘bulls-eye’ pattern to guide bees, some only visible to the UV sensitive eye of the bee.
- Floral Scent is a powerful attractant
- Visual clues are important in long range foraging, while scent is more critical for short range orientation.
Scout Bees

- Scout bees are critical to colony survival.
- 5% to 35% of foraging field bees can be involved in scouting at any one time.
- A field bee can find nectar bearing flowers in one of two ways:
  - Scout for them.
  - Be recruited or directed by a dancing bee.
- With information from a dancing bee a field bee can fly toward the nectar source and home in using scent cues from the dancing bee.
Honey Bee Forage

- Worker honey bees, at 22 days old, become field bees for the rest of their lives. Honey bees use their antennae to smell and to taste. Field bees forage for four things:
  - **Nectar**: food 58% of foragers
  - **Pollen**: food 28% of foragers
  - **Water**: cooling hive 17% for all four
  - **Propolis**: sealing
Propolis

- Propolis is gathered by field bees from resinous buds, pine sap and other gummy substances.
- Propolis is collected by the mandibles and placed in the pollen baskets to transport.
- Propolis is used to seal, polish and sanitize the hive.
- Propolis is removed from her baskets by her sisters, while the field bee stands patiently…it can take up to a day to remove the propolis entirely from the basket.
Water

- Water is essential as worker bees must maintain the hive's brood chamber at 94 degrees F to incubate the eggs. If it is too hot, they collect water and deposit it around the hive, and then fan air through with their wings causing cooling by evaporation.
- Water is also used to dilute honey that is fed to larvae.
Nectar

- Worker Field bees collect nectar, their dietary carbohydrate, from the nectaries of flowers, and the extra-floral nectaries of plants such as field beans. Occasionally they also collect honeydew, which is a sugary liquid derived from plant sap and the excretions of aphids.

- Nectar secretion may only last several hours to several days.

- Nectar flow is more pronounced on sunny rather than cloudy days.

The two most important factors in nectar attractiveness are **abundance** and **sugar content**, which varies widely with floral source.
Nectar Flow Factors

- Pear flower nectar is less than 10% sugar while legume nectar measures 40%.

- Wind, rain and damp weather have a negative effect on nectar, wash out.

- Dry weather or drought can limit length and quantity of nectar secretions.

- The major nectars are composed of sucrose, glucose and fructose.

- Bees prefer sucrose over other sugars, followed by glucose, maltose and fructose.
Nectar variability, toxicity

- The period of heaviest nectar secretion for an area is referred to as the ‘honey flow’.

- Most regions have one or more plants that are reliable nectar producers, but even the best sources can vary from year to year.

- A few nectars are considered poisonous to bees/ larvae (Carolina Jessamine, swamp cyrilla ‘titi’).

- A few nectars can be toxic to bees and humans (rhododendron, azalea, oleander) in cool wet springs if the honey is consumed before it is fully ripe.
Nectar to Honey

- Conversion of nectar to honey is achieved by both the addition of the honey bee enzyme invertase, secreted by field and house bees in their honey sac, and by evaporation.

- It takes 4 times the amount of nectar to produce the equivalent amount of honey.
Honey Storage

- Honey can be stored in both worker and drone cells, and is capped by worker bees when it is ‘ripe’ i.e. contents evaporated to 25% of volume.
- Frame from brood area, note pattern.
Pollen

- Pollen is the dust-like male reproductive cells of flowers, formed in the anthers. It is an important source of protein and fat for bees and essential for brood rearing.

- Pollen is consumed by young adult bees to produce Royal Jelly, and in the fall to fatten up for over-wintering. As bee bread, it is fed to larvae.

- Pollen is collected on the hairs of bees and stored in special pollen baskets, located on the hindmost legs of the honey bee.
Pollen storage

- Pollen, unlike nectar, is only stored in worker cells, where it is packed into the cells by house bees. A layer of honey is placed over the pollen, and the cell is then capped by a layer of wax. This preserves the pollen nutrients.
Pollen Foraging

- Honey bees are stimulated by brood rearing to collect pollen.
- Bees recognize pollen as a food source because of its odor.
- The act of gathering pollen is called *scabbling*. Bees actively use the mandibles to dislodge pollen from anthers.
- Pollen is often released by flowers both early and late in the day, whereas nectar secretion is mid-morning to mid-afternoon.
Foraging Strategy

- Bees like to maximize the forage return for their efforts.
- In poor forage conditions more scouts go out.
- They will visit the nearest most profitable nectar and pollen sources/plant species.
- If a bee finds a better nectar or pollen source she will decide to dance and communicate its location to unemployed bees.
Honey Bee Dance

- Honey bees are thought to communicate the source and location of nectar and pollen through sharing of nectar and ‘dancing’.

- The Round dance, at left, signals a food source less than 50 meters from the colony.
Honey Bee Dance

• Food sources located at an intermediate distance, between 50 and 150 meters from the colony are communicated by the sickle dance. This dance is crescent shaped.

• Food sources farther than 150 meters from the colony are communicated by the waggle or wag-tail dance. The waggle dance, shown at left, communicates both distance and direction.
Robbing

• Robbing is a special type of foraging.
• It is the honey bee equivalent of ‘get rich quick’.
• It is most likely to occur in a dearth, and when another hive is weak and vulnerable.
• This behavior can be triggered in a bee yard by exposing frames of honey. During inspections ALWAYS cover a super or brood box containing stores to prevent this behavior.
• Bees die fighting over the stores.
• (My honey bees would NEVER do such a thing!)
Pollination Benefits

- Honey bees gather nectar and pollen for food for their own use. In the process they pollinate hundreds of different kinds of plants and crops, many of them commercial.
- Pollination insures fruit set, proper development, more fruit and viable seed.
- Honey bees are the most important insect pollinator of crops grown in NC.
Pollination Defined

- Pollination is the transfer of pollen or sperm cells from the anther, or male part of a flower, to the stigma, or female part of the flower.

- Transfer of pollen to the same flower or another flower on the same plant is called self-pollination.

- Transfer of pollen to other cultivars of the same species is called cross-pollination, as in the apple.
Fruit and Vegetable Crops

- Vegetables and fruit crops that require honey bees include cucumbers, blueberries, watermelons, apples, squash, strawberries, melons, and peaches.
Forage Crops

- Forage crops that benefit from honey bee pollination include alfalfa, cotton, peanuts and soybeans.

- 1/3 of all food we eat is impacted by honeybee pollination.
Wind pollinated Crops

- Crops that do not require honey bee pollination are wind pollinated. These crops include corn, oats and wheat.
Honey Bees and Pollination

- Honey bees are *Polytropic*: visiting many different species of plants. But, honey bees exhibit a ‘fidelity’ or ‘constancy’ by working a single source of nectar or pollen on a single collecting trip, making them invaluable as pollinators.
Honey Bee Importance to Agriculture

• 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 Importance to Agriculture $$$

- Averaged over five years, honey bees in NC have directly accounted for @ $96 million in annual fruit and vegetable production, and @ $186 million in total annual NC crop productivity.

- One Cornell University study estimated that honeybees annually pollinate $14 billion worth of seeds and crops in the US.
Honey Bee Value to Agriculture

- 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.
Honey Bee Depopulation

• Since the 1980’s honey bees have been plagued by two parasitic mites that can kill whole colonies. CCD has pushed losses even higher.
• Most wild, or feral, honey bee colonies have been wiped out by these mites.
• The number of managed colonies in the state has dropped from 180,000 to only 100,000.
• There are an estimated 2.4 million colonies in the U.S.
### NC Honey Bee Hives

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

<table>
<thead>
<tr>
<th>CROP</th>
<th>Recommended Hives/acre</th>
<th>Estimated Values for 2007</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Acreage</td>
</tr>
<tr>
<td>Apples</td>
<td>1.5</td>
<td>6,740</td>
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<tr>
<td>Blueberries</td>
<td>3.0</td>
<td>5,240</td>
</tr>
<tr>
<td>Brambles</td>
<td>0.8</td>
<td>245</td>
</tr>
<tr>
<td>Cucumbers (fresh)</td>
<td>2.2</td>
<td>5,510</td>
</tr>
<tr>
<td>Cucumbers (pickled)</td>
<td>2.2</td>
<td>78,360</td>
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<tr>
<td>Melons</td>
<td>1.5</td>
<td>4,000</td>
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<tr>
<td>Peaches</td>
<td>0.2</td>
<td>1,200</td>
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<tr>
<td>Pumpkins</td>
<td>1.5</td>
<td>1,500</td>
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<tr>
<td>Squash</td>
<td>1.5</td>
<td>3,730</td>
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<tr>
<td>Strawberries</td>
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</tr>
<tr>
<td>Watermelons</td>
<td>1.8</td>
<td>6,090</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>114,075</td>
</tr>
</tbody>
</table>

- It is now necessary that growers of bee dependent crops rent hives to ensure proper pollination.
- **It was estimated over 240,000 hives were required in NC for pollination in the year 2007.** This is over twice the 100,000 total managed colonies in the state. Growers must contract pollinators well ahead of the date they are needed.
Importance of Keeping Bees

- With feral or wild colonies on the brink of extinction, the importance of the beekeeper and his managed colonies cannot be overestimated.

- North Carolina boasts more beekeepers than any other state, with an estimated 10,000 beekeepers.
Native Honey Plants of Coastal NC

- The coastal plain is the leading honey producing region of the state.
- [http://www.ncbeekeepers.org/coast.php](http://www.ncbeekeepers.org/coast.php) Honey Plants of NC Website shows the native honey plant bloom year begins January 20, with Red Maple, and ends with Aster, November 9, in coastal NC.
- Knowledge of the plants honey bees use is important to every beekeeper.
- The type and availability of nectar sources in an area determines not only the potential honey production for that locality, but also the flavor, color and quality of the honey crop.
- Coastal NC is a spectacular location for beekeeping.
Red Maple

- A beekeeper who knows his/her local flora will be better able to develop a management system which fully utilizes those potential honey and pollen plants.
- **Red Maple** (*Acer rubrum*) is typically the first nectar and pollen source in North Carolina. Average blooming period for the Coastal Plains is 45 days (Jan 20th - Mar 5th).
- The pollen bees collect from red maple is actually greenish-gray. Trees are in bloom for 30-50 days, depending on the weather.
Sugar Maple

- Sugar Maple (*Acer saccharum*) is also an early flowering plant. Though present only in the upland areas of the Coastal Plain, sugar maple trees will bloom late February through most of March in the Piedmont and Mountain regions.
Blackberry

- **Blackberry** (*Rubus* spp.) will bloom from early March through mid-April in the Coastal Plains, and during April in the Piedmont. Some blackberries also grow in the Mountains where blooming periods are several weeks later than for plants at lower elevations. Blackberry honey tastes slightly similar to the fruit which these plants bear.
• Dandelion (Taraxacum officinale) has a long blooming period beginning early-mid Spring through early Summer in most areas, lasting between 50-60 days (Mar 5th – Apr 29th). These low-growing annuals can be very abundant in some places and can be an important source of nectar and pollen for your bees.
There are many species of **Sumac** (*Rhus* spp.), and most are shrub-like plants that produce flowers in formations such as shown here, or in similar looking masses and clusters. Sumac has a very long blooming period, from April to September in all three regions in North Carolina. Not all sumacs are good nectar plants.
Huckleberry

• **Huckleberry** *(Gaylussacia spp.)* are plants typically only found in the Coastal Plains. They will bloom from early April to mid-May where present, the bloom lasting approximately 32 days (Apr 5<sup>th</sup> – May 7<sup>th</sup>)
Tulip Poplar ***

- According to A. I. Root, one of the most handsome native American trees.

- **Tulip Poplar** (*Liriodendron tulipifera*) is the main honey source in the Piedmont region. Also called Yellow Poplar, the green, yellow, orange and white flowers are loaded with a rich and voluminous nectar. The honey bees make from tulip popular is rather dark and robust tasting. In the Piedmont, this tree blooms from late-April to late-May, and is considered the primary honey source. Tulip poplar also grows on the Coastal Plain and in the Mountains. In each region, tree will bloom for 20-35 days.
Tupelo Gum

- **Tupelo Gum** (*Nyssa aquatica*) and **Black Gum** (*Nyssa sylvatica*) are related trees that are very important nectar sources in some areas. While some tupelo honey is made in North Carolina, other, more southern states such as Georgia and Florida make more of this particular honey. Tupelo Gum thrives in areas in the Coastal Plain and blooms from mid-April to mid-May.
Holly

- There are many species of Holly (*Ilex* spp.); some are shrubs while others are more tree-like in growth habit. Most of them are great sources of nectar. Holly plants will grow in all three regions and typically bloom from late-April through May for about 13-20 days (Apr 24th – May 10th).
Black Gum

- **Black Gum** (*Nyssa sylvatica*) grows in all three regions and blooms April to May. Coastal plain dates are approximately 24 days (Apr 27<sup>th</sup> – May 21<sup>st</sup>)
Clovers

- There are many species of clover, and **Alsike Clover** (*Trifolium hybridum*) is one that does pretty well in the Piedmont region of the State. It can bloom for over 100 days, typically from early April to mid-July. Like most clovers, honey from Alsike clover is amber-colored and mild tasting.

**Crimson Clover** (*Trifolium incarnatum*) is an attractive clover species. These flowers, which are actually made up of many little flowers, would look gray to honey bees. Crimson clover will bloom from mid-April to mid-May in the Piedmont.
Gallberry  ****

- Gallberry, *Ilex glabra & coriacea*, is one of, if not the, most important sources of nectar in Coastal NC.
- Also known as Inkberry the honey produced is excellent in flavor, light colored and must be well ripened.
- Blooms in the Coastal Plain for about 28 days (May 10th – June 9th).
Sourwood ***

- **Sourwood** (*Oxydendrum arboretum*) trees produce many small, bell-shaped flowers in racemes. Sourwood does grow in the Coastal Plains and Piedmont regions, and blooms during June in these areas. However, the sourwood honey flow is usually strongest in the Mountains, and is considered the prime nectar source for this region. Sourwood honey is sought after by many, as the watery-white color and pleasingly mild taste of sourwood honey is unique. The market demand for sourwood honey is large. The standing joke in North Carolina is that beekeepers produce about 10,000 pounds of this honey a year, but sell 30,000 pounds to tourists.
Pepperbush

- **Pepperbush** (*Clethra* spp.) is common in the Coastal Plain. These shrubs can be quite populous in some areas and bloom mostly in August, but may start in July and go until September.

- Blooms on the Coastal Plain for about 21 days (Aug 1\textsuperscript{st} - Aug 21\textsuperscript{st}).
There are many species of Goldenrod (*Solidago* spp.), and in some areas such as the mid-Atlantic states, goldenrod is a very important nectar source. In North Carolina, goldenrod is also important as a fall honey flow crop. The odor of honey made from goldenrod is similar in some ways to that of foulbrood, which confuses more than the just novice beekeepers. Goldenrod and aster make up the “final honey flow” plants that bees and beekeepers may rely on to support the colonies over winter. In the Coastal Plains and Piedmont, goldenrod flowers from August through mid-October.
Aster and Groundsel

- **Aster** (*Aster* spp.) is another important fall honey plant. There are many species of aster and their flowers come in several different colors. Purple aster is a common species that thrives in all three regions of the state. Asters typically bloom from September through October.

- **White Aster** is more common in North Carolina than the purple form. Most asters can be found in fields, open woods, and along roadsides. One thing to remember about aster honey is that it granulates rapidly. Beekeepers should not let their bees go into winter with too much aster honey because, when solid, it becomes unusable to the bees and they can starve. They will need access to water to dissolve the sugar crystals.

- The Groundsel, Silverling or Sea Myrtle, **Baccharis halimifolia** Native in Coastal Plain and Piedmont.
Landscape Honey Plants for Coastal NC

- Chaste tree *Vitex negundo* or *agnus castus* summer
- Crape Myrtle (white flower) summer
- Elaeagnus (fall or spring blooming)
- Golden Raintree summer
- Grape Hyacinth
- Ligustrum spring
- Locust tree (thorns, invasive)
- Magnolia less important source
- Orchard trees, Apple, Peach, Persimmon, Plum, Pear
- Wisteria summer
Herb Honey Plants for Coastal NC

- Bee Balm
- Catnip
- Crimson Clover
- Lavender
- Mint
- Parsley (biennial)
- Sage
- Salvia
- Thyme
- Basil
Honey Harvest

- Harvest when frames of honey are fully capped, or no less than 80% capped.
- Harvest Techniques;
  - Escape boards
  - Fume boards
  - Blow out
  - Shake and Brush

- At right harvest 2007 demonstrates the variety of floral nectar sources throughout the year.
- L to R fall, summer, spring 2007
Harvest Statistics

• 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.

• It is estimated that honeybees visit 2 million flowers for every pound of honey produced.

• In addition, they also produce over 120,000 pounds of beeswax.

• To produce one pound of beeswax, honey bees consume 8 pounds of honey. Be gentle with drawn comb!
Extraction, Filter, Bottle

- Most common Honey product is extracted honey. Also Chunk honey and Cut Comb.
  - Crush and drain
  - Spin in extractor

- Filter, stainless steel double sieve.

- Settle, bottle, wash and re-wash containers.
Honey Marketing and Competition

- Density
- Absence of granulation or crystallization
- Cleanliness
- Flavor
- Color and Brightness
- Container Appearance

*Note: blatant use of ones own honey in this slide*
Honey Labels

- Name of Business
- Address
- Contact info
- Contents: Honey
- Varietal: Wildflower, Pure Raw, etc.
- Weight, specifically Honey weight, a pint is not a pound, it is 1.5 pounds!
Selling Honey

• No NC sales tax on honey sold by the owner of the bees, considered ‘produce’, like vegetables
• Health food stores
• Fairs
• Farmers markets
• Church Bazaars
• On-line, website
• Advertise
• Give some away to friends and neighbors!
Hive Products

- Honey
- Beeswax
- Royal Jelly
- Pollen
- Propolis
- Bee Venom
Sources

- Apiculture at NCSU Beekeeping Notes
- *The Hive and the Honey Bee*, Dadant & Sons
- *The ABC and XYZ of Bee Culture*, A.I. Root
- Beekeeper’s Handbook,
- Sammataro & Avitabile
- *Honey Plants of North America*, John H. Lovell
- *Starting Right with Bees*, A.I. Root
- *Beekeeping for Dummies*, H. Blackston

This presentation created by Donna M. Lynk, *Honeybees-by-the-Sea*, 2006. revised 2009