Complete Beekeeping Short Course

Part 1:
Introduction to Honey Bees & Beekeeping

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University of Arkansas System

So… you want to keep honey bees?

- you are not alone!
- beekeeping is a popular hobby
- beekeeping is work!
  - expensive to start
  - steep learning curve
  - requires commitment
    - time
    - effort

So… you want to keep honey bees?

- the time is now!
- bees are currently in high demand and short supply
- most producers are selling out of early spring bees
- order early to ensure delivery
- don't forget your bee hives and other equipment

beekeeping

- in nature, honey bees always maintain a certain amount of space between any two honeycombs




beekeeping

- *the bee space* = 1/4" - 3/8"
  - any area larger than bee space
    - bees fill with new comb
  - any area smaller than bee space
    - bees fill in with propolis


"bee space"

the bee space

- the basis for the *moveable frame hive*
  - allows individual combs to be removed and inspected
  - rearrange the combs work the colony with minimal disturbance to bees

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Part 2:

The Bee Hive

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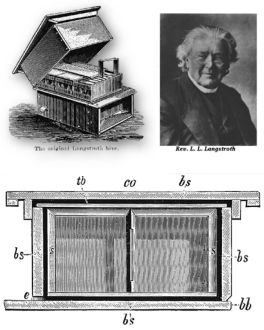
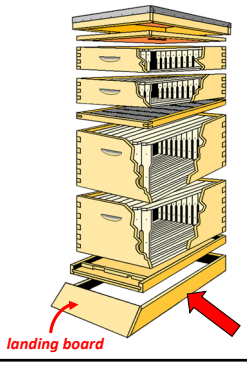
the bee hive

- the Langstroth hive
  - encouraged straight combs
    - preserved the bee space
  - the worldwide standard
  - precise internal dimensions
    - preserves the bee space
  - interchangeable components
    - standardized sizes
    - widely available



the bee hive

- the hive stand
  - keeps the hive up off the ground
    - avoid termites & wood rot
    - improves ventilation
  - easier to work in your hives

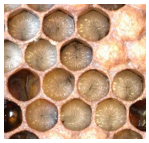


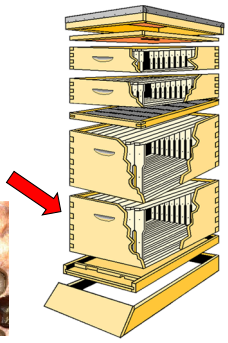
the bee hive

- the bottom board
  - the floor of the bee hive
    - entrance reducer (reversible)
  - screen bottom board
    - improved ventilation
    - pest management tool
      - varroa mites
      - small hive beetles

the bee hive

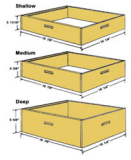
- brood chambers
  - where the queen bee lives
    - lays eggs
    - brood develops
    - pollen stored

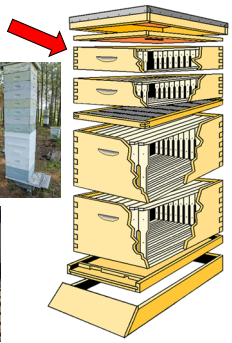




the bee hive

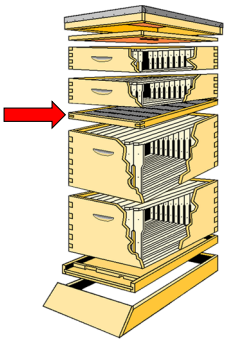
- honey supers
  - surplus honey stored
  - boxes added in as needed
  - removed at honey harvest
  - left off during winter





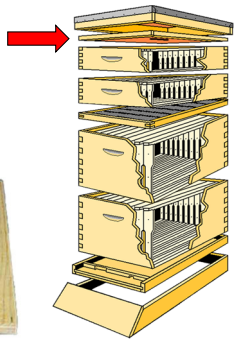
the bee hive

- queen excluder



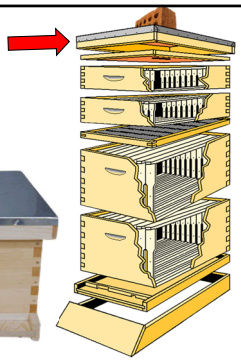
the bee hive

- inner cover
  - provides insulating airspace
  - easier to pry off the outer cover when sealed with propolis



the bee hive

- outer cover
  - telescoping cover
    - keeps out the weather
    - metal & wood
    - plastic
    - polystyrene
  - migratory top
    - used without inner cover

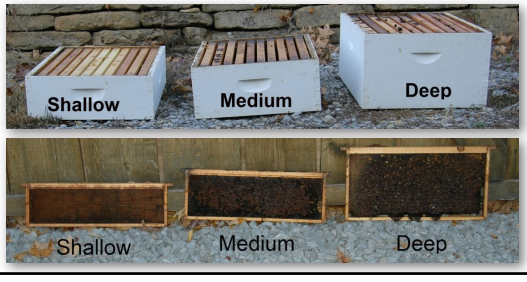


the bee hive

- frames
  - standard = 10 frame boxes
  - 8 frame boxes also available
  - 9 frames in 10 frame supers
  - all medium boxes

the bee hive

- frames & boxes



the bee hive

- so where do you get a bee hive?
  - many mail-order suppliers
    - shop online or request a paper catalog
  - some local merchants
    - arbeekeepers.org/links.html

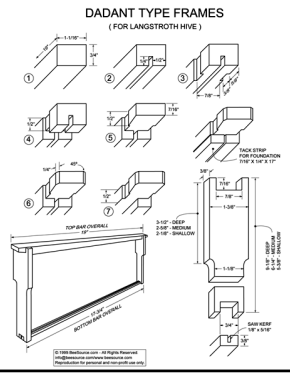
the bee hive

- so where do you get a bee hive?
  - order a hive pre-assembled
    - may come painted & with frames
    - easiest way
    - most expensive
  - order a knock-down kit
    - pre-cut lumber
    - nails together quickly
    - moderate cost
  - build your own woodenware
    - least expensive?
    - *respect the bee space!*
    - use precise plans: www.beesource.com

be wary of buying homemade hives

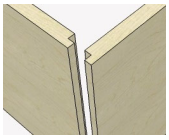
the bee hive

- make your own frames?
  - very time-consuming
  - cheap to purchase



the bee hive

- make strong, tight corners
  - use rabbet or finger joints
  - hives will be exposed to weather for years
    - wood will try to swell and warp
    - simple box corners will pull apart, leaving gaps

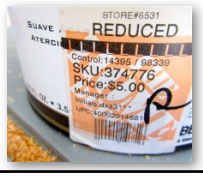


the bee hive

- use glue!
  - strong waterproof glue
  - at every joint
  - stronger than the nails

the bee hive

- paint your hives
  - protect your investment
  - latex or oil-based are both fine
  - don't paint the inside of hives
  - find bargain paints at local stores
    - bees don't care about color
    - don't forget primer!



the bee hive

- assembling frames

the bee hive

- assembling frames

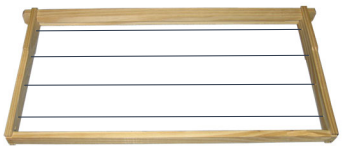
GLUE EVERY JOINT!

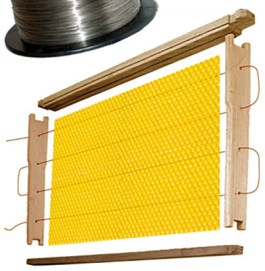
DON'T FORGET THIS NAIL !

If you order pre-assembled frames, check to see if they have these nails! If not, consider adding them!

the bee hive

- wiring frames

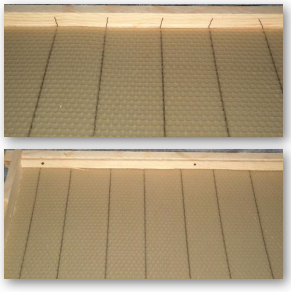




the bee hive

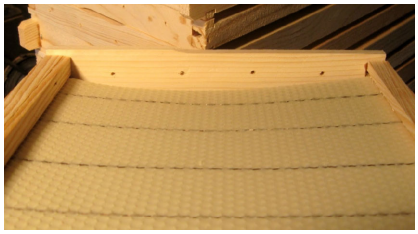
- installing foundation

"wedge-top" frame



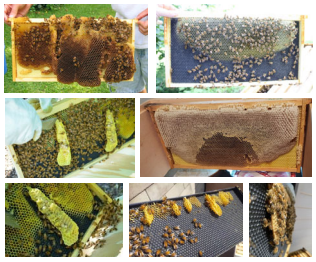
the bee hive

- is wiring necessary?



the bee hive

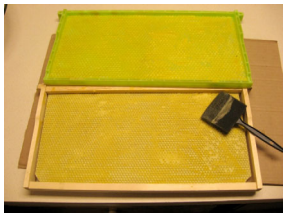
- plastic foundation



- waxed vs. unwaxed?
  - rarely comes with enough wax on it!
- bees will move some wax where they need it more
- bees will accept more readily if you add some more wax

the bee hive

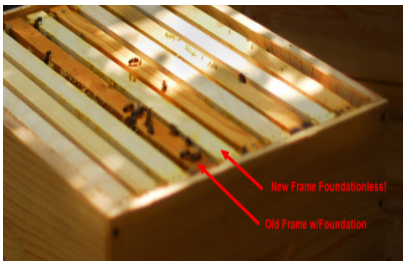
- plastic foundation

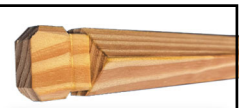


- bees will accept more readily if you add some more wax

the bee hive

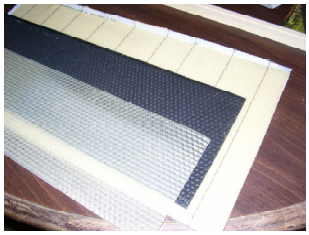
- foundationless frames





the bee hive

- what kind is best?
- just a matter of opinion
  - ask 10 beekeepers, get 12 answers



youtube.com/watch?v=at24aXV5OO0

other types of bee hives

- the "Flow Hive"

other types of bee hives

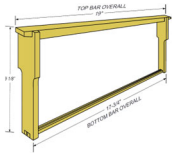
- top bar bee hives
  - Kenyan Top Bar Hive
    - angled sides
  - Tanzanian Top Bar Hive
    - straight sides

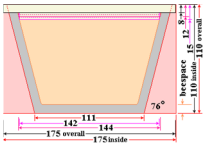
other types of bee hives

- top bar bee hives

other types of bee hives

- top bar bee hives
  - many designs out there
  - only one critical dimension
  - top bars should be 1 3/8" wide (3.5 cm)
  - make the top bars to fit into a Langstroth hive?



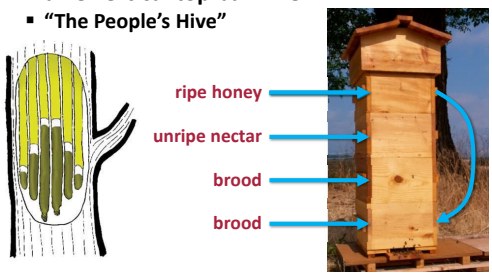


other types of bee hives

- growing body of resources for top bar beekeeping

other types of bee hives

- Warré vertical top bar hive
  - "The People's Hive"



how to choose a bee hive

- many types of bee keepers
- many types of bee hives

- don't be overly dogmatic about your particular style
- honey bees are highly adaptable, and can make themselves at home in just about any suitable cavity
- *bee hives are for beekeepers!*

Complete Beekeeping Short Course

Part 3:

Essential Beekeeping Tools

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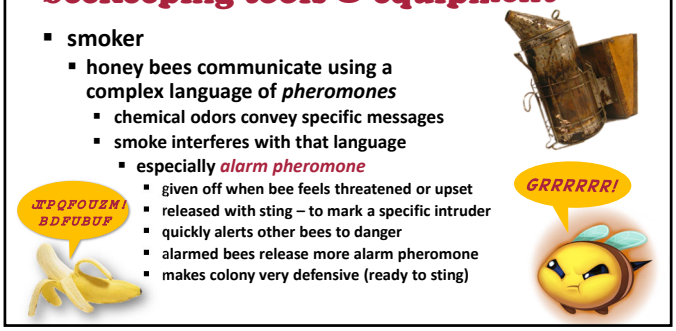
beekeeping tools & equipment

- the essentials…

beekeeping tools & equipment

- smoker
  - honey bees communicate using a complex language of *pheromones*
    - chemical odors convey specific messages
    - smoke interferes with that language
      - especially *alarm pheromone*
        - given off when bee feels threatened or upset
        - released with sting – to mark a specific intruder
        - quickly alerts other bees to danger
        - alarmed bees release more alarm pheromone
        - makes colony very defensive (ready to sting)



beekeeping tools & equipment

- smoker

Learning to correctly light and use your smoker is an important skill!

beekeeping tools & equipment

- smoker
  - not all smokers are created equal

beekeeping tools & equipment

- smoker fuel
  - use any natural, organic, plant-based materials
  - avoid cardboard, paper, cloth with chemicals or dyes

beekeeping tools & equipment

- the hive tool
  - for scraping & prying
  - bee's stick their hives together from the inside
    - burr comb
    - propolis

beekeeping tools & equipment

- bee brush

beekeeping tools & equipment

- frame grips

beekeeping tools & equipment

- frame perch





beekeeping tools & equipment

- protective clothing
  - hat/veil
  - jackets
  - full coveralls

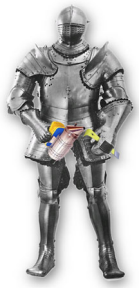



beekeeping tools & equipment

- protective clothing
  - gloves


beekeeping tools & equipment

- protective clothing



beekeeping tools & equipment

- working with your bare hands is effective, and actually easier
- you will gain confidence and comfort as you gain experience



beekeeping tools & equipment

- most suppliers offer a bee-ginner's kit
  - contents and quality vary
    - read the fine print and compare

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Part 4:

Honey Bee Biology & Behavior

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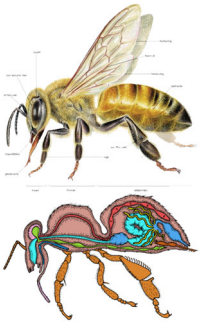
honey bee biology

- bee colony is a "superorganism"
  - collection of individuals that act as one unit
    - collect food/resources
    - self-defense
    - reproduction
  - socially dependent animals – need each other
  - do not behave like domesticated livestock
    - come and go as they please
    - take care of their own needs
      - we can manage them in hives we provide
      - we can take part of their surplus stored honey
  - bees are highly efficient at what they do
  - *successful beekeepers learn to work with the bees to help them accomplish instinctive goals*



honey bee biology

queen

- reproductive female
- one per colony
- the mother of all the workers & drones
- can lay more than 1000 eggs per day
- must eat many time her own body weight
- eats only royal jelly
- longest living bee
  - up to 5 years

worker

- non-reproductive females
- do all tasks in hive:
  - house cleaning
  - tend brood
  - tend queen
  - build combs
  - regulate temperature
  - pollinate
  - gather nectar
  - make honey
  - defend hive

drone

- (potentially) reproductive males
- don't do any work inside the hive:
  - care for brood/queen
  - produce wax
  - forage & pollinate
  - make honey
- can't sting
- one purpose:
  - mate with a queen bee
    - then die
  - unmated drones ejected

honey bee biology

the queen bee

- all bee larvae 0-3 days old are fed *royal jelly*
  - nutritious substance produced by young workers
- after day 3, drones and workers are fed *bee bread*
- if workers continue to feed a female with larva royal jelly, it will develop into a queen
  - queen bees are reared in distinct, elongated vertical queen cells

honey bee biology

raising queen bees

- workers will not raise new queen bees in a colony with a healthy, egg-laying queen
- new queens will only be reared under certain conditions

(1) if the queen is perceived to be poor-quality, the workers will replace her by *supersedure*

(2) if a hive becomes overcrowded, the bees will rear new queens in preparation for *swarming*

(3) if the queen disappears or dies suddenly, workers will immediately begin rearing *emergency queens* from suitable young larvae (0-3 days old)

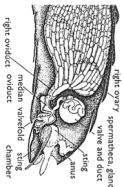
honey bee biology

raising queen bees

- beekeepers can manipulate colony conditions to make workers produce queens
  - create a colony that has…
    - no queen
    - lots of food (pollen and honey)
    - many young nurse bees
    - eggs or young larvae (1-3 days old)
  - bees will rear new queens from the young larvae

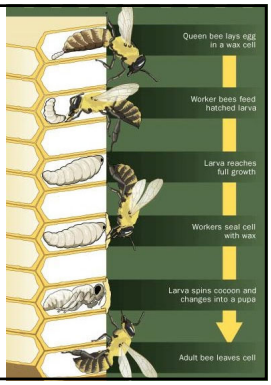
honey bee biology

- mating & reproduction
  - drones spend their afternoons visiting DCAs
  - a new queen bee takes a series of nuptial flights
  - she mates with numerous drones over several days
    - semen from all matings is stored in spermatheca
    - when queen lays an egg, she can choose to release sperm to fertilize it as it is deposited
      - a fertilized egg develops into a female bee
      - an unfertilized egg develops into a male bee
        - drones have no father – but do have a grandfather!
  - after mating, the queen returns to the hive
    - spends the rest of her life producing eggs
    - never leaves the hive (unless the colony swarms)
  - drones die soon after mating
    - most drones are expelled from hive before winter



honey bee biology

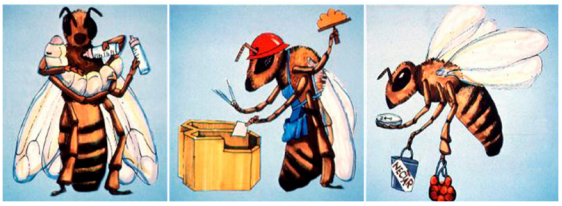
- worker bees
  - egg: 3 days
  - larva: 6 days
  - pupa: 12 days
  - } 21 days to maturity
  - adult
    - lives 4 to 6 weeks (summer)
    - lives 4 to 6 months (winter)
- drones
  - pupa: 15 days; total 24 days
  - lives one season
- queen
  - pupa: 7 days; total 16 days
  - lives up to 5 years



honey bee biology

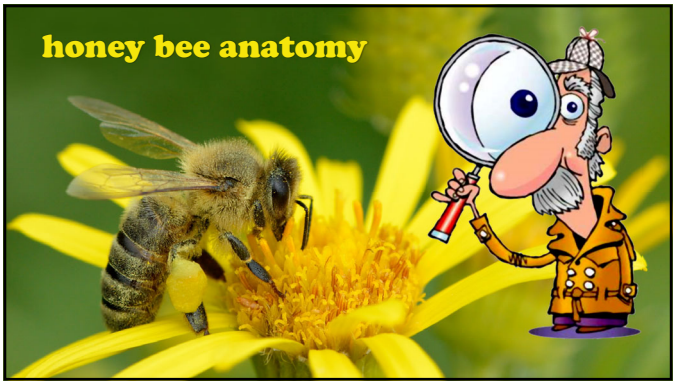
- workers perform different tasks according to age

2-10 days *11-20 days* *21-25 days*



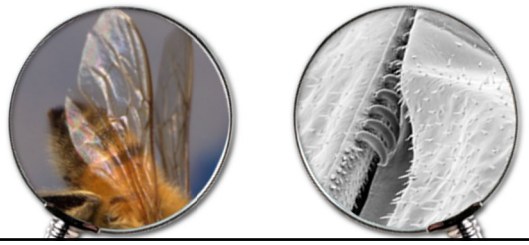
"nurse bees" *"house bees"* *"field bees"*

honey bee anatomy



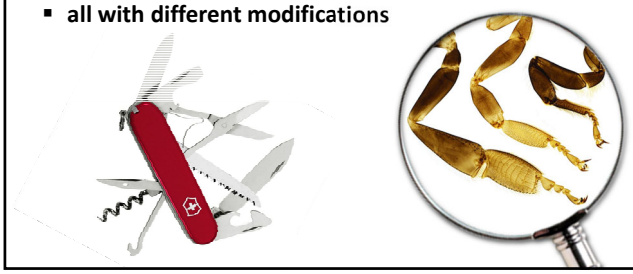
honey bee anatomy

- 2 pairs of wings
- *hamuli* connect forewing to hindwing



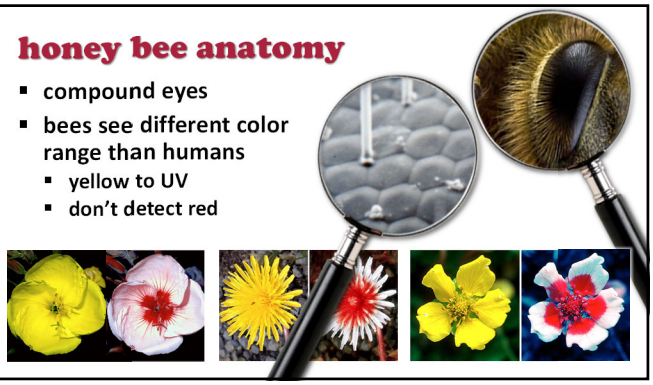
honey bee anatomy

- 3 pairs of legs
- all with different modifications



honey bee anatomy

- compound eyes
- bees see different color range than humans
  - yellow to UV
  - don't detect red

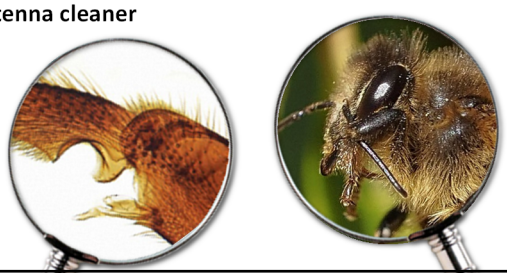


honey bee anatomy

- antennae
- detect odors

honey bee anatomy

- *strigilis*
  - antenna cleaner



honey bee anatomy

- beeswax is produced from wax glands

honey bee anatomy

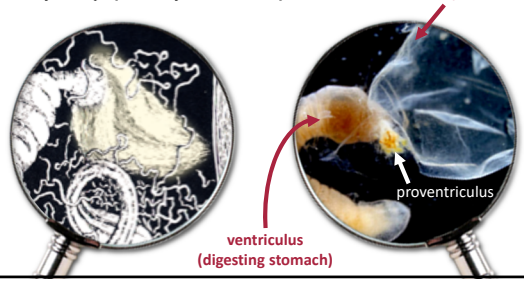
- mandibles (jaws)

honey bee anatomy

- proboscis (tongue)

honey bee anatomy

- honey crop (honey stomach)



honey bee anatomy

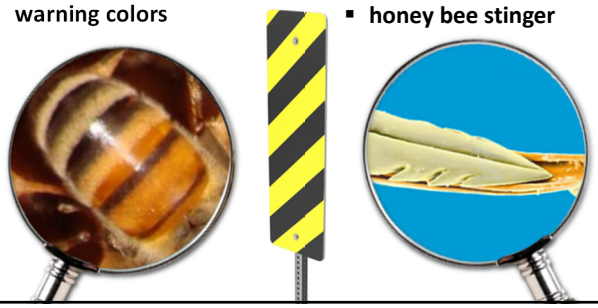
- trophallaxis
  - sharing food
- processing nectar

honey bee anatomy

- ripening honey and capping cells

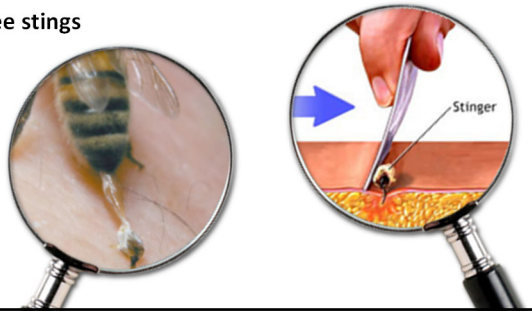
honey bee anatomy

- warning colors
- honey bee stinger



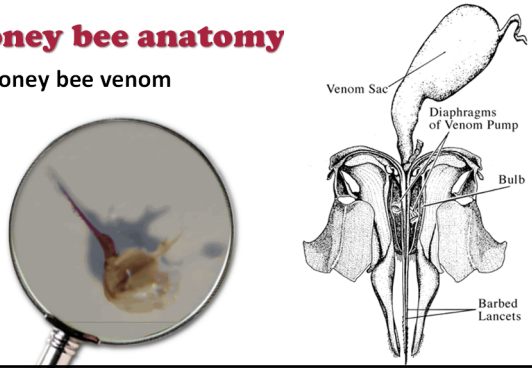
honey bee anatomy

- bee stings



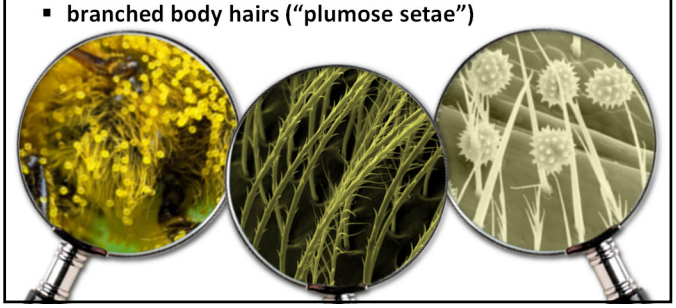
honey bee anatomy

- honey bee venom



honey bee anatomy

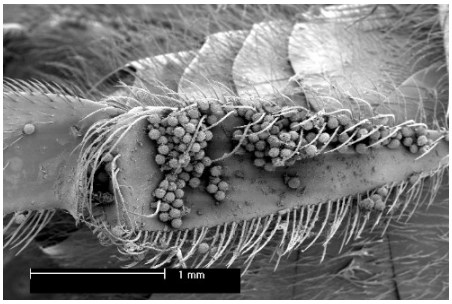
- branched body hairs ("plumose setae")



honey bee anatomy

- pollen combs
- pollen basket

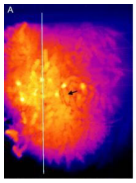
honey bee biology

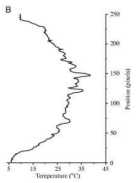


honey bee biology

thermoregulation

- bees maintain a constant temperature in their hive
  - in winter, no brood present, cluster stays around 80˚F
  - brood nest stays about 92˚F
  - bees fan wings to create air currents
    - spread water drops around hive to cool
    - evaporate water from the honey





honey bee communication

- pheromones – chemical language
  - alarm pheromone
    - released when a bee feels threatened
    - excites & alarms other bees to danger
    - released with bite/sting
    - tag intruder as specific threat

honey bee communication

- pheromones – chemical language
  - queen pheromone
    - each queen has a unique scent
      - imparts identity to whole colony
    - passed through trophallaxis
    - absence causes queen rearing
    - sufficient level keeps colony from swarming
    - prevents supersedure
    - inhibits development of workers' ovaries

honey bee communication

- pheromones – chemical language
  - brood pheromone
    - workers can tell the age and caste of each larva
    - attracts parasitic mites to their hosts

honey bee communication

- pheromones – chemical language
  - nasanov pheromone
    - aggregation signal
      - attract lost bees to a hive
      - attract bees to a swarm
      - recruit foragers to water source

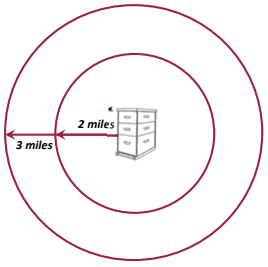
honey bee communication

- bees also communicate by dancing
  - conveys specific, precise directions to resources
    - direction
    - distance
    - quality

  - also dance the location of potential home sites

foraging bee-havior

- a ¾-inch honey bee forages several miles from home!
- a bee colony covers an enormous territory
- remember: $\pi \times r^2$
- 2 mile radius = 12.6 mi²
  - > 8000 acres
- 3 mile radius = 28.3 mi²
  - > 18,000 acres
- this is why there is very little certified organic honey produced in the U.S.



a proportional comparison…

Honey Bee vs. Superman

- ¾" long
- forages 3 miles away
- can fly 15 mph
  - 3 miles in 12 minutes
- territory of 28.3 mi²

- 6' 3" tall (75")
- patrols 300 mile radius
- must fly 1,500 mph
  - mach 2 = 1,540 mph
- territory of 282,743 mi²
  - Texas = 266,874 mi²

Complete Beekeeping Short Course

Part 5:

Considerations for Placing Bee Colonies

Dr. Jon Zawislak
uaex.uada.edu/bees

DIVISION OF AGRICULTURE
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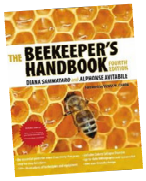
University of Arkansas System

getting ready for your bees

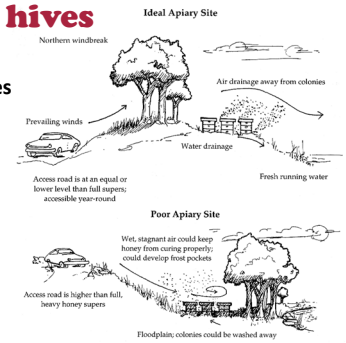
- read up on honey bees
- assemble hives & equipment
- pre-order spring bees early
- plan your apiary site






placing your bee hives

- consider your bees
  - dependable nectar sources
  - fresh water source
  - avoid floodplains
  - windbreak
  - face morning sun
  - bright afternoon sun
    - helps to deter hive beetles



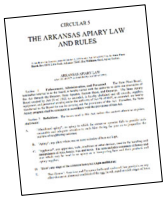
placing your bee hives

- consider yourself
  - convenient location
  - easy access when carrying heavy items
  - permission to place bees on another's property



placing your bee hives

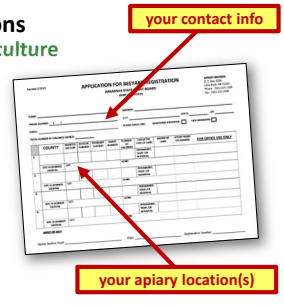
- consider your neighbors
  - fence or vegetation forces bees to fly higher
  - don't disturb your bees when your neighbors are out
- follow the rules




placing your bee hives

- register your bee yard locations
  - Arkansas Department of Agriculture
  - State Plant Board
  - Apiary Section
- simple 1-page form
  - *it's free*
  - *it's the law*
- consult local regulations
  - municipal codes
  - property owners' association



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Part 6:

Starting New Bee Colonies

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getting your first bees

- purchase an established hive
  - easiest way to become a beekeeper
    - used equipment can be a bargain
    - can also come with problems
  - bee colonies can not be legally moved without a health inspection certificate
- established hives can be moved
  - less than 3 feet OR more than 3 miles
  - close the hive securely after sunset
  - open the hive entrance after placing the hive

getting your first bees

- nucleus hive ("nuc")
  - miniature hive (usually 5 deep frames)
- place it exactly where you want your hive
- let the bees establish their foraging patterns
- transfer the frames and bees into a standard sized hive before they get too crowded

- laying queen
- frames of brood
- frames of food



getting your first bees

- package bees
  - 1 queen
  - 3 pounds of workers



getting your first bees

- bees begin shipping around mid-April
  - supplier will tell you when to expect delivery
    - provide them with a phone number
    - post office may call you to pick them up
- keep them out of the sun
- give them water or sugar syrup



installing package bees





candy plug goes up!



feeding your bees



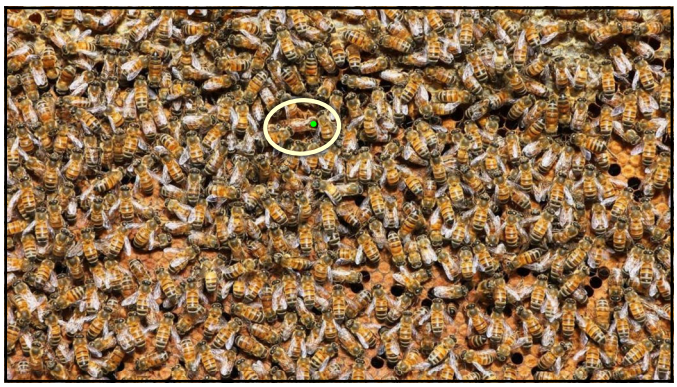




the new bee hive

- feed them well
- leave them alone for 3 days
- remove the empty queen cage
- inspect comb building & continue feeding



the new bee hive

- continue feeding while combs are being built
- check on their progress about once a week


the new bee hive

- watch hive entrance for bees with pollen
- a healthy, mated queen should begin laying eggs within 24 hours of release from shipping cage
- capped brood cells should be present by 10 days after the queen was released
- about 3 weeks after the queen was released, fully developed workers should be emerging

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Part 7:

First Year Bee Colony Management

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examining your hive

- get organized
- light your smoker
  - learn to do it right
  - don't over-use it
- suit up





examining your hive






examining your hive

- stand out of the flight path
- stand with the sunlight over your shoulder
- hold brood frames over the hive to examine
- keep frames in a vertical orientation
- stagger boxes that have been removed

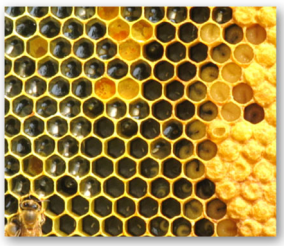
examining your hive

examining your hive

- so what are we looking for?

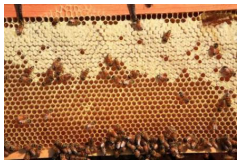

examining your hive

- is the queen present?
  - does she look healthy?
- does the brood look healthy?
  - how is the brood pattern?
  - eggs?
  - young brood?
  - older brood?
  - capped brood?
  - how much drone brood?
  - are there queen cells?
- does the queen have sufficient room to lay?
- do the workers look healthy?



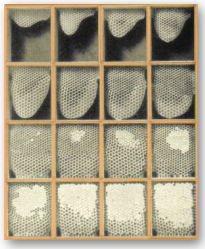
examining your hive

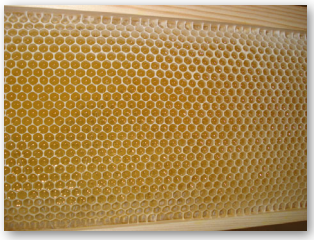
- assess the food supplies
  - pollen
    - bees returning with pollen?
    - stored around the brood area?
  - honey
    - capped?
    - uncapped?
    - empty space?
    - if ¾ of frames are full, add another super
      - then another
        - and another
          - and another
            - as needed…



the honey flow

- usually mid-April to mid-June





the honey flow

- "ripe" honey has less than 18.6% moisture
  - the bees draw air through the hive to dry it out
  - they seal each ripe cell with a wax capping
  - bottling unripe honey can cause fermentation

perfect frame of ripe honey

half-ripened frame of honey

summer dearth

fall with the bees

fall with the bees

- watch out for "bitter weeds"
- *Helenium amarum* (Asteraceae)

- goldenrod is great*!*
- *Solidago* spp. (Asteraceae)

fall with the bees

- drones ejected when flowers get scarce


fall with the bees

- determine if pest control is necessary
- consolidate hives to minimum space
- ensure minimum 45 lbs of honey for Arkansas winter

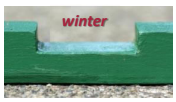
that's a little more than a medium super full of honey, but a little less than a deep

fall with the bees

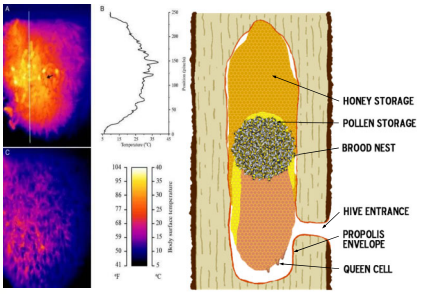
- install mouse guards
  - before night temperatures get below 57oF (14 C)







winter in the bee yard




ideal fall situation:
- food in the top
- brood down below

winter in the bee yard

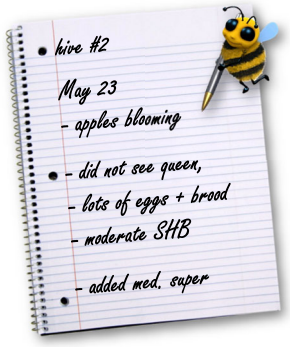
- leave them alone
- occasionally check food stores
- remove snow/ice blocking entrance


winter for the beekeeper

- consider your first year with honey bees
  - what have you learned?
  - what would you change?
  - plan to expand?
    - order early!

record keeping

- useful habit
  - inspection details
  - hive manipulations
  - honey flows & harvests
  - queen origin
  - expenses
  - profits
  - floral blooms
- record on paper
- digital record software



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Part 8:

Second Year Bee Colony Management

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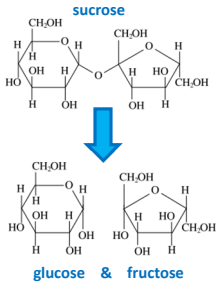
late winter & early spring

- ***a critical time for bee colonies!***
- the queen has begun to lay eggs
- temperatures often allow flying
- increased activity & brood requires food
- no flowers yet!
- cold snap may chill the brood
- colony may need emergency food

emergency feeding

- feed syrup <u>inside</u> the hive during winter
- candy boards
- dry sugar

feed your bees plain white sugar



- bees add an enzyme that converts nectar (sucrose) into honey (glucose & fructose)

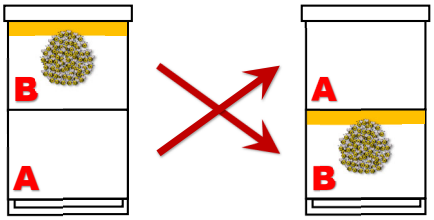
not what to feed your bees !!!

a new year with the bees

- overwintered colonies have a big advantage over hives started new in the spring
  - by the time your nucs or packages arrive, overwintered colonies may be twice as strong because they have had over a month of spring pollen to eat and produce brood

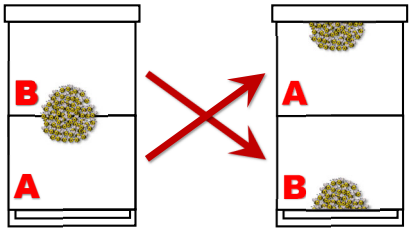
a new year with the bees

- spring reversal:
  - restores the bee brood to bottom
  - empty space above the brood encourages honey storage



a new year with the bees

- do not reverse colonies if the cluster or brood nest in partly in both boxes



X SPOH!

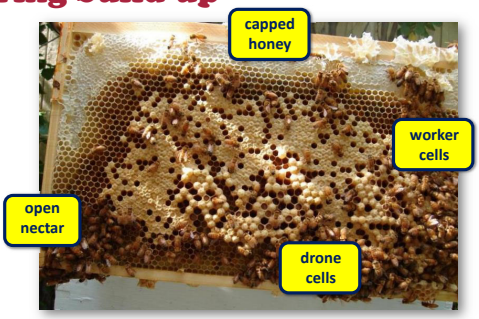
spring build-up

spring build-up

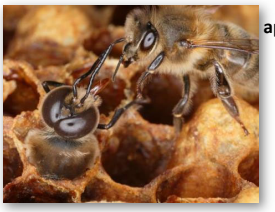
spring build-up

spring build-up

spring build-up



spring build-up



appearance of drones indicates swarm season is approaching

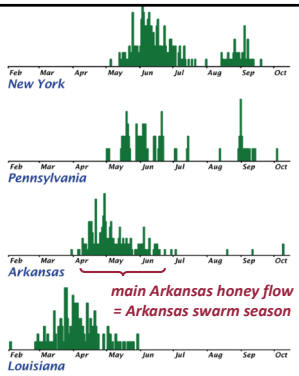
swarm cells are usually found on the bottom or edges of combs

spring build-up

- some beekeepers feed protein supplements early in the season to jump-start brood production
  - small hive beetles also like protein
  - early spring build-up promotes early swarming



swarm season

swarm season

- swarming is a natural and normal thing for bees
  - how the colony reproduces
  - ensures the survival of the species


a hive with a good queen can get crowded quickly


the old queen leaves with about 2/3 of the workers


old queen establishes a new colony nearby


workers will rear new queens in a queen cells


the new queen emerges and takes nuptial flights


the new queen inherits an established hive

swarm season



swarm season







swarm season



swarm season

- swarm prevention tips
  - ensure plenty of extra space during build-up
    - spring reversal of hive bodies
    - add another super on top
    - break up the brood area by placing empty comb between each frame with brood
  - remove queen cells
    - they may be rebuilt quickly
    - be sure there is a healthy laying queen first
    - use them to re-queen another hive, or make a split
      - cut out the cell carefully
      - use the whole frame

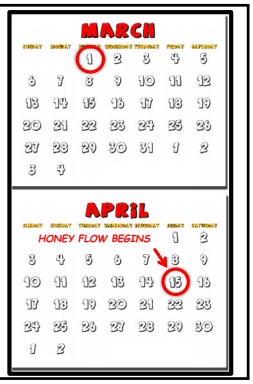
swarm season

- swarm prevention tips
  - split the hive – an artificial swarm
    - move frame with queen to center of new hive
    - give her 2 frames of food (honey & pollen)
    - move another frame of open brood & bees
    - move a frame or two of capped brood
    - fill in spaces with frames of comb or foundation
    - brush/shake in extra bees from open brood combs
      - many will fly home
      - old hive will raise a new queen
        - be sure to leave them some young brood/eggs
        - capped brood will emerge soon to repopulate
  - create splits early in the season (after adult drones seen)
    - can prevent swarming

split

the honey flow

- a short time when most of the colony's surplus honey will be gathered for next winter
  - takes 21 days for a worker bee to become an adult
  - takes 24 days for an adult worker to begin foraging
- to ensure a strong foraging force: brood production should be strong 45 days before the major honey flow begins in your area



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Part 9:

Harvesting Your Honey

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University of Arkansas System

harvesting honey

harvesting honey

harvesting honey

harvesting honey

- honey was traditionally harvested in the comb
  - consumed just as the bees produced it

harvesting honey

- crush & strain method
  - harvests both honey and wax

harvesting honey

- honey extracting
  - remove honey from combs
  - harvest some wax (cappings)
  - let bees reuse combs next season

worker bees must consume 1 pound of honey to create just 2 ounces of beeswax

- extracting honey requires additional equipment

harvesting honey

- basic honey extracting equipment
  - extractor
  - uncapping tank
  - uncapping knife
  - uncapping fork
  - strainer
  - settling tank

Many beekeeping clubs have an extractor for local members to use!

harvesting honey

- uncapping tools

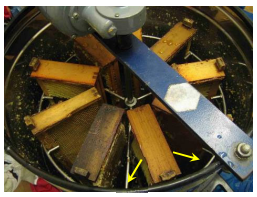
harvesting honey

- uncapping tools

harvesting honey

- honey extracting

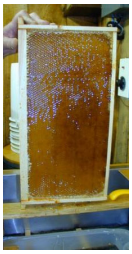
tangential extractor

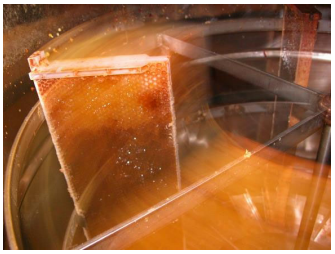


radial extractor

harvesting honey

- honey extracting





harvesting honey

- honey extracting

harvesting honey

- straining honey

harvesting honey

- extracting honey introduces lots of air bubbles
- use a settling tank
  - sit for 72+ hours
- bottle off the bottom
- results in clean, pure honey free of impurities

harvesting honey

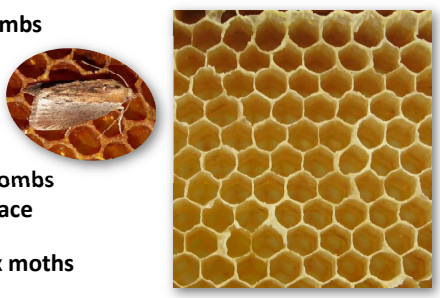
- your final product sells itself!

cleaning up

- let your bees help you clean sticky equipment

storing your combs

- wax honey combs
  - strong
  - delicate
  - valuable
- store drawn combs in cool, dry place
- safe from wax moths



Complete Beekeeping Short Course

Part 10:

Keeping Your Hives Healthy

Dr. Jon Zawislak
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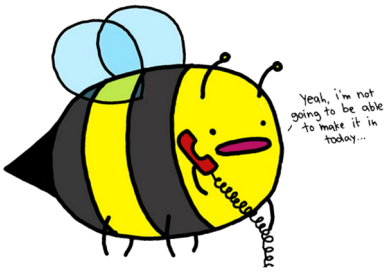
DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

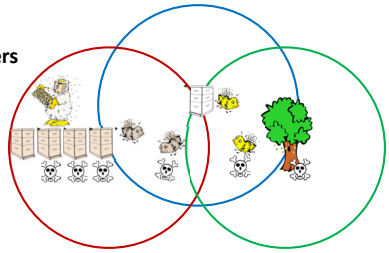
keeping hives healthy

- honey bees can get sick just like anyone else



keeping hives healthy

- bees can forage up to 3 miles from their hive
  - bee diseases and parasites can spread
    - robbing
    - drifting
    - beekeepers



apiary inspectors

Arkansas Department of Agriculture
State Plant Board Apiary Section

- *It's free!*
- *It's the law!*

Honey bee colonies must have a current health inspection certificate to be legally transported!

apiary inspectors

- YOU are your first bee inspector!
- learn what a healthy bee colony should look like, and you will be better able to recognize problems

Complete Beekeeping Short Course

Part 11:

Managing Parasitic Mites

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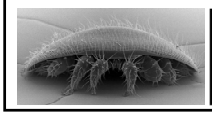
varroa mites

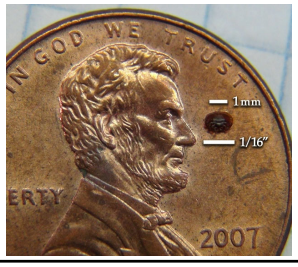
- *Varroa destructor*
  - accidently imported in 1980's
    - from *Apis ceranae*
    - spread rapidly
      - package bees
      - mobile pollinators
      - robbing bees
  - decimated feral bee populations
  - increased costs of managing bees
  - resulted in fewer beekeepers
  - increased need for mobile pollinators

varroa mites

varroa mites

- the worldwide #1 enemy of honey bees!
  - external parasite
  - feeds on body fluids
    - damage developing pupae
    - steals proteins
    - weakens bee
    - transmits viruses
  - *little mite = a big deal*





varroa mites

- reproduction depends on the development of honey bee larvae
- understanding the mite life cycle is key to controlling them

varroa mite treatments

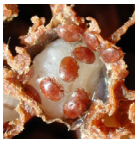
"hard" chemicals

- miticides
  - lipophilic
  - mites developed resistance
  - chronic exposure to a low dose over time affects bee health
  - cannot be used during honey flow

varroa mite treatments

"soft" chemicals

- organic acids
- HopGuard
  - safe to use during the honey flow
  - food-grade ingredients
  - only works well when there is no brood present



varroa mite treatments

"soft" chemicals

- organic acids
- formic acid
  - vaporizes in the hive
  - temperature dependent
    - daily high: 50-85°F
  - vapors penetrate caps
  - safe to use during honey flow
- *dangerous caustic acid!*
  - wear a respirator, eyewear and acid-resistant gloves!

varroa mite treatments

"soft" chemicals

- organic acids
- oxalic acid
  - trickle in sugar syrup
  - vaporize with heat

varroa mite treatments

"soft" chemicals

- organic acids
- oxalic acid
  - trickle in sugar syrup
    - apply 5 ml (1 tsp) onto bees in each occupied bee space between brood combs
    - do not apply to same colony more than once per year
    - only effective when the bee colony is broodless

- *35 g oxalic acid crystals*
- *1 L warm 1:1 sugar syrup*

- *treats up to 15 colonies*
- *difficult to mix smaller batches accurately*
- *unstable as liquid, do not store for long periods.*

varroa mite treatments

"soft" chemicals

- organic acids
- oxalic acid
  - vaporize with heat
  - seal screen floor
  - smoke bees up from bottom
  - use ¼ teaspoon (2 grams) oxalic acid per hive body
  - connect power and vaporize
  - always follow the directions from vaporizer manufacturer
  - most effective when broodless

varroa mite treatments

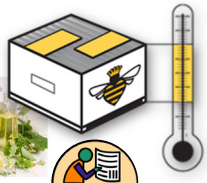
"soft" chemicals

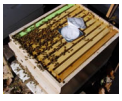
- organic acids
- use caution*!*
  - always use chemical resistant gloves & eye protection when handling acids
    - skin burns
    - eye damage
  - use a respirator to avoid severe respiratory burns
    - lung damage

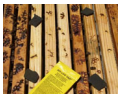
varroa mite treatments

"soft" chemicals

- essential oils
  - must volatilize
    - temperature dependent
  - follow label instructions
  - don't use during honey flow
    - affects quality of honey







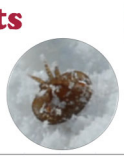
Apiguard *Thymovar* *ApilifeVar*

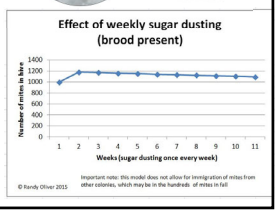
- *thymol*
- *eucalyptus*
- *camphor*
- *menthol*

varroa mite treatments

non-chemical

- powdered sugar dusting
  - knocks down some phoretic mites
  - labor intensive
    - must repeat often
    - use with a screen bottom board
    - not effective if brood is present
- it's important to count mites before and after any treatment to evaluate its effectiveness

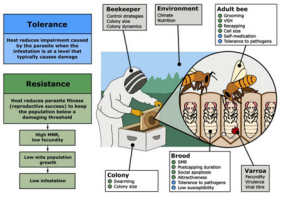




varroa mite treatments

non-chemical

- cultural control
  - screen bottom board
  - mite-resistant queen stock
    - Varroa Sensitive Hygienic
    - Russian stock
    - "Ankle Biters"
  - there is no 100% mite resistant bee



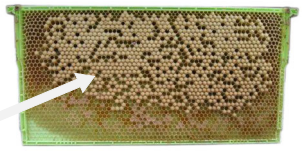
varroa mite treatments

non-chemical

- cultural control
  - screen bottom board
  - mite-resistant stock
  - drone brood trapping

I can produce an average of 2.2 female offspring in each infested drone cell!

3.2 X 843 = 2698 mites released just from the cells this side!

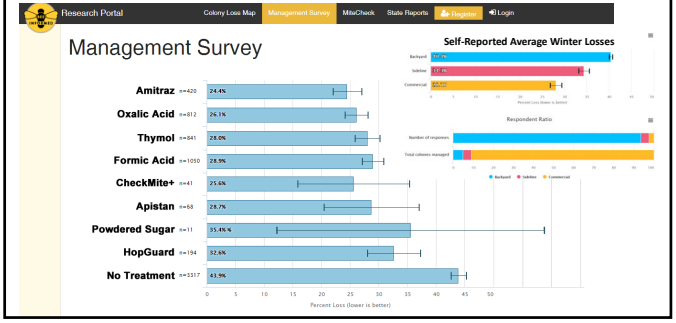


varroa mite treatments

what works best?

varroa mite treatments

www.beeinformed.org

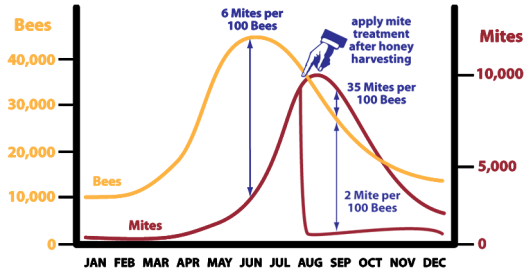


are mite treatments necessary?

You wouldn't treat a dog like this!

How would you like it?

are mite treatments necessary?



are mite treatments necessary?

- the mite-virus complex is worse than either mites or viruses on their own
  - mite parasites weaken bees and reduce their immune system response to fight pathogens
  - mites potentially vector many viruses

tracheal mites

- *Acarapis woodi*
  - internal parasite
  - lives in tracheal tubes
  - feeds on bee's blood
  - breeds in trachea
    - diminishes oxygen supply
  - spreads pathogens
  - symptom: K-wing
    - need microscopic diagnosis for positive identification

tracheal mites

- *Acarapis woodi*
- treatments?
  - menthol crystals
  - thymol treatments
  - genetic resistance

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Part 12:

Managing Small Hive Beetles

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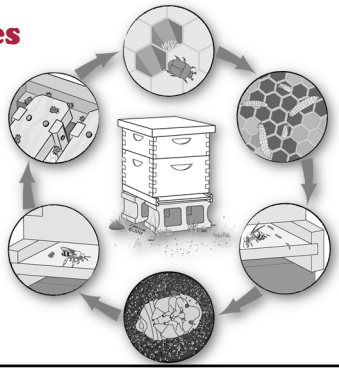
UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

small hive beetles

- *Aethina tumida*
  - opportunistic hive pest
  - from South Africa
  - found in U.S. in 1996
    - spread in packages
    - migratory beekeepers
    - can fly several miles

small hive beetles

- life cycle
  - adults invade hive
  - hide from bees
  - lay eggs
  - larvae feed
  - ruin honey
  - exit hive
  - pupate in soil
  - emerge as adults



small hive beetles

- scavengers that feed on whatever they find
  - protein patties
  - grease patties
  - hive debris



small hive beetles

- treatments?
- strong colonies
  - don't over-super
  - stay queen-right
  - keep things clean





small hive beetles

- treatments?
- in-hive chemicals
  - of limited use


small hive beetles

- treatments?
- soil drench
  - Gardstar 40% EC (permethrin)
- wont' stop adults from flying in from other locations


small hive beetles

- treatments?
- nematodes
  - *Heterorhabditis indica*
  - *Steinernema riobrave*

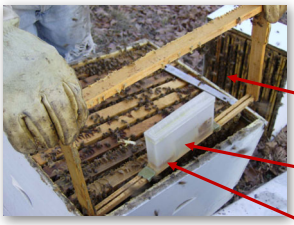


small hive beetles

- treatments?
- strong colonies
- *control the adult beetle population*
  - in-hive traps

small hive beetles

- in-hive traps



Hood trap

Beetle Jail Frame

lots of empty space

vegetable oil

apple cider vinegar

small hive beetles

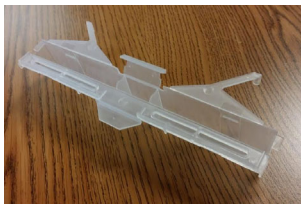
- in-hive traps

West Trap

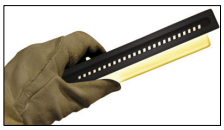
Freeman Beetle Trap

small hive beetles

- in-hive traps



Baitable Beetle Jail Jr.



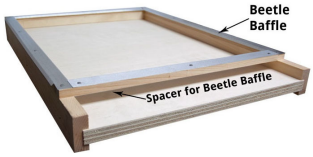
Beetle Blasters

AJ's Beetle Eater

small hive beetles

- in-hive traps

Beetle Jail Entrance Trap



Beetle Baffles

small hive beetles

- small hive beetle traps

small hive beetles

- small hive beetle traps

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Part 13:

Managing Wax Moths

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U of A DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

greater wax moth

- *Galleria mellonella*

lesser wax moth

- *Achroia grisella*

greater wax moth

- *Galleria mellonella*
  - "wax worms"
  - opportunistic pests
    - found in weak colonies and stored combs
    - can rapidly consume/destroy drawn combs

greater wax moth

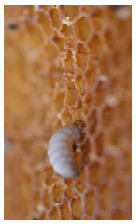
- don't confuse with SHB larvae
  - both found in weak colonies

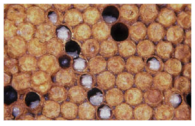
GWM
~ 1"

SHB
~ ½"

greater wax moth

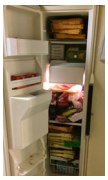
- tunnels through combs
- consumes pollen, cocoons & beeswax
- spin webbing as they move
- leaves frass
- chews up wood





greater wax moth

- what to do?
  - mild infestation
    - stack on strong hive
  - severe infestation
    - scrape it all clean

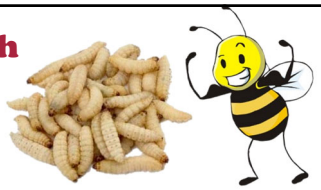


freeze for at least 72+ hours



greater wax moth

- what to do?
  - strong colonies
  - don't over-super
  - stay queen-right




greater wax moth

- what to do?
  - store combs in safe place
    - keep frozen
    - lots of light & air circulation
  - *Bacillus thuringiensis* (Bt)
  - fumigate
    - moth crystals
      - para-dichlorobenzene
      - *not naphthalene*
    - 80% (glacial) acetic acid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Part 14:

Minor Bee Hive Pests

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UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

minor pests

- ants
  - ant moats



minor pests

- predatory insects & spiders
  - rarely a problem




minor pests

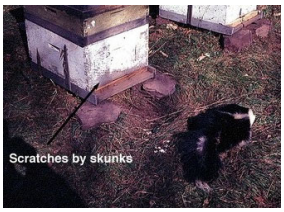
- mice
  - install mouse guards before it get cool (57ºF)




minor pests

- skunks

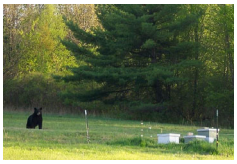


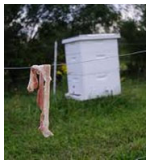



minor pests

- bears



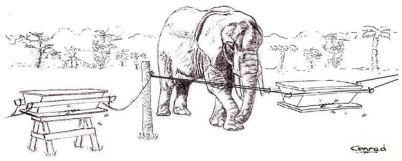


minor pests

- elephants





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Part 15:

Integrated Pest Management & Sampling Bee Hives

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UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

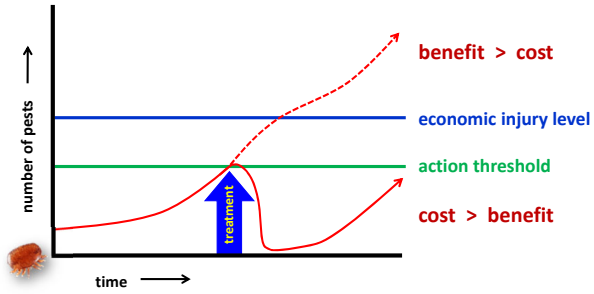
integrated pest management

- IPM is an approach to pest control that is sensitive to the environment and the economics of each pest situation
- IPM is not necessarily the same as organic pest control, although organic solutions can be part of an IPM approach
- we manage pests because eradication is rarely a viable option

integrated pest management

- IPM integrates all the tools have, for the most effective, and least intrusive solution
  - cultural & mechanical controls
    - prevention is the best control
    - good beekeeping practices
    - screen bottom boards
    - mechanical traps
  - genetic controls
    - MN Hygeinic, VSH, Russian, Buckfast…
  - chemical controls
    - begin with highly targeted, less toxic compounds
    - move up the scale only as needed

integrated pest management



integrated pest management

- how many pests can a colony handle?
- influenced by many factors
  - colony population
  - colony health
  - time of year
  - weather
  - fecundity of queen
  - genetics

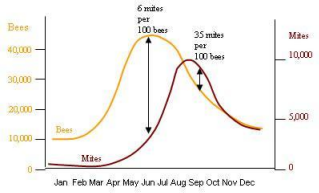
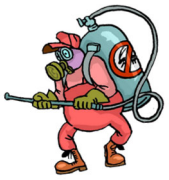


Figure 1. Simplified bee and mite population growth curves for a temperate climate. The mite growth curve lags behind the bee curve. Note how the number of mites per hundred bees greatly increases in fall. A colony is unlikely to survive a fall infestation rate this high.

integrated pest management

- sampling pest populations is the key
  - does this hive have a pest problem?
  - how many pests does it have?
  - how many pests can this colony handle?
- what is the most effective method to manage this problem?



integrated pest management

- sampling for varroa mites

integrated pest management

- sampling for varroa mites

1/8" wire mesh & wide-mouth jar

integrated pest management

- sampling for varroa mites

white container
(or other light color)

integrated pest management

- sampling for varroa mites

1/4 cup =
about 100 bees

you need minimum
of 300 bees for an accurate
sample

integrated pest management

- sampling for varroa mites

find a comb with nurse bees (open brood cells) and gently move jar down the backs of bees and they will backflip right into the sampling container

integrated pest management

- sampling for varroa mites

add 2 tablespoons
powdered sugar

integrated pest management

- sampling for varroa mites

gently roll bees
for 30 seconds

integrated pest management

- sampling for varroa mites

tip jar over white container and gently shake for 1 minute

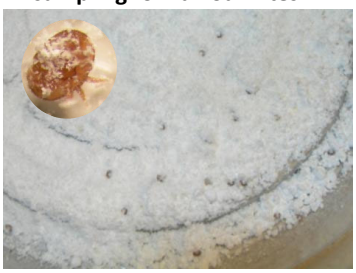
integrated pest management

- sampling for varroa mites

return the bees to their hive

integrated pest management

- sampling for varroa mites



count the total number of varroa mites

integrated pest management

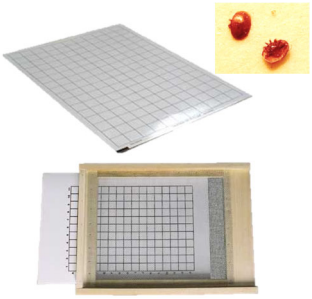
- sampling for varroa mites
  - CO_2 knocks out bees and mites

integrated pest management

- sampling for varroa mites
  - alcohol wash is most accurate
  - fatal to bees and mites

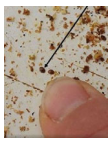
integrated pest management

- sampling for varroa mites



integrated pest management

- sampling for varroa mites



- leave in place for 3 days
- calculate average mite-fall per day
- not an estimate of infestation
- compare hive to itself over time

integrated pest management

- what is the threshold for varroa?
  - there is no absolute rule!
  - consider mite treatment if…
  - sugar sample (300 bees)
    - spring: 1-3
    - summer/fall: 9+ (3% infestation)
  - sticky board count:
    - spring: 3-10 mites/day
    - fall: 40+ mites/day
- what's *your* comfort level?

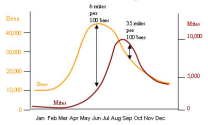


Figure 1. Simplified bee and mite population growth curves for a temperate climate. The mite growth curve lags behind the bee curve. Note how the number of mites per hundred bees greatly increases in fall. A colony is unlikely to survive a fall infestation rate this high.

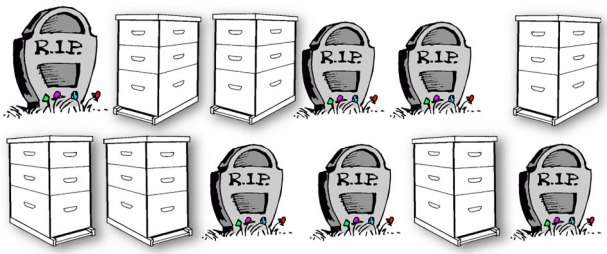
integrated pest management

- what is the threshold for varroa?
  - based on what you know about your hive…
    - time of year
    - bee population
    - resistant genetics
    - overall colony health
  - err on the side of caution
    - applying an unnecessary treatment is cheaper than replacing a colony that you didn't treat but should have

integrated pest management

- *the most popular method of pest control…*
- "live and let die"

integrated pest management



- breeding from "survivor stock"

healthier honey bees

- breeding from "survivor stock"
  - the only sustainable future for beekeeping
- as long as we continue to put pesticides into our bee hives, we do two things:
  - breed stronger pests
  - breed weaker bees
- chemical treatments have their place
  - last resort – not first choice

Complete Beekeeping Short Course

Part 16:

Honey Bees Diseases

Dr. Jon Zawislak
uaex.uada.edu/bees

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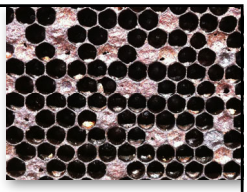
honey bee diseases

- what does a healthy colony look like?



honey bee diseases

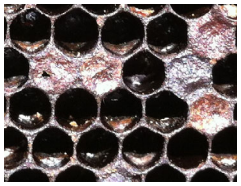


- American foulbrood
  - *Paenibacillus larvae*
  - caused by a bacterial spore
    - highly resistant – difficult to kill
    - can remain on combs & woodenware
  - bee larva ingest spores in contaminated food
  - larva dies soon after cell is capped
  - extremely lethal and contagious!!!
    - only dangerous to honey bees
    - spores are found in lots of store-bought honeys

honey bee diseases

- American foulbrood
  - detection
    - sunken, perforated caps
    - pupal "tongues"
    - sulphurous decay odor
    - ropiness test
    - dead larvae form a tough scale, which is difficult to remove
    - dying colonies robbed out by other bees





honey bee diseases

- American foulbrood
  - treatment

honey bee diseases

- American foulbrood
  - treatment
  - hygienic genetics

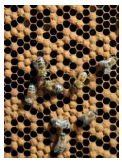

antibiotics do not cure AFB!

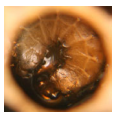
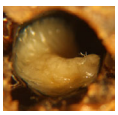
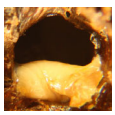
honey bee diseases

- European foulbrood
- *Melissococcus plutonius*
  - larvae consumes spores in contaminated food
  - larva dies *before* its cell is capped
  - bacteria does *not* form long lived spores
  - a colony *can* recover from mild infection

honey bee diseases

- European foulbrood
  - detection
    - spotty brood pattern
    - discolored, melting larvae
    - larvae die before capping
    - light-colored, rubbery scale
    - no ropiness



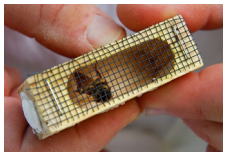





honey bee diseases

- European foulbrood
  - antibiotic treatment
    - cage or replace the queen bee
    - feed antibiotic mixed with powdered sugar
    - release queen in 2 weeks

honey bee diseases

- European foulbrood
  - treatment without antibiotics *usually* works
    - cage or remove the queen bee
    - shake all adult bees onto new foundation
      - discard old combs
    - feed heavily with 1:1 sugar syrup
    - release queen in 2 weeks

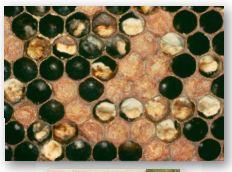
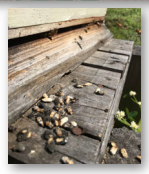



honey bee diseases

- Chalkbrood
- *Ascosphaera apis*
  - fungal infection
    - contact or ingestion
  - when the larva dies, fungus invades entire host
    - forms sporulating bodies
    - larva becomes a "chalky" mummy


honey bee diseases

- Chalkbrood
- detection

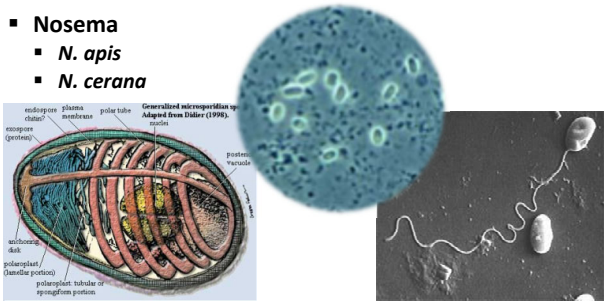




honey bee diseases

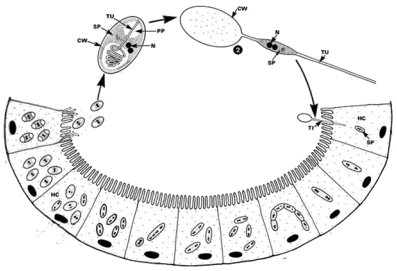
- Chalkbrood
- treatment
  - elevate hives
  - ventilate hives


honey bee diseases

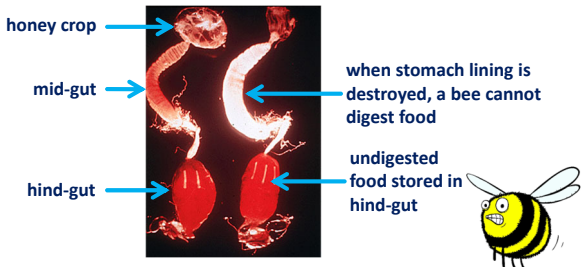
- Nosema
  - *N. apis*
  - *N. cerana*



honey bee diseases



honey bee diseases



honey bee diseases

Nosema
detection





honey bee diseases

Nosema
treatment

- mix into syrup
- feed to colony in fall
- bees consume during winter months
  - less effective against *N. ceranae* in winter
  - can be used as early spring treatment
- don't use during the honey flow!
  - bees must consume all syrup 4 weeks before honey flow
- *diet & exercise!*

honey bee diseases

- Viruses
  - Sacbrood Virus
    - replace the queen
  - Deformed Wing Virus
  - Black Queen Cell Virus
  - many others
    - more than 25
    - no medical cure
    - most often spread by parasitic mites
    - hygienic stocks can help


Complete Beekeeping Short Course

Part 17:

Final Thoughts on Keeping Honey Bees

Dr. Jon Zawislak
uaex.uada.edu/bees

DIVISION OF AGRICULTURE
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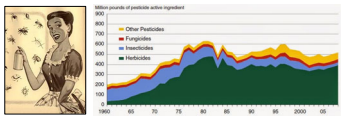
University of Arkansas System

what's causing pollinator declines?

- multiple factors
- habitat loss
  - changes in land use
    - intensive agriculture
    - urbanization
  - loss of diverse natural forage
- pathogens
- parasites
- pesticides & pollution



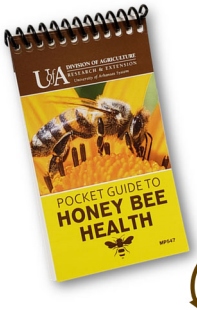
final thoughts...

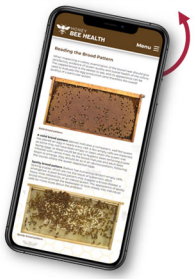
- most people don't know much about bees
- as a beekeeper, educate them
  - bees are not dangerous if they are respected
  - bees are vital to our ecosystem & food supply
- you represent the industry
  - your bees
  - your honey

final thoughts...

- don't be overly dogmatic about your beekeeping

- honey bees are very adaptable
  - they often survive in spite of us, not because of us
- be a pragmatic beekeeper
  - find the methods that work best for you
- keep learning
  - our bees are happy to remind us that we don't know it all yet





beehealth.uada.edu

uaex.uada.edu/publications/pdf/MP547.pdf

Any questions?

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DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Beekeeping in Arkansas

Your Cooperative Extension Service is a part of the University of Arkansas System Division of Agriculture. With offices in all 75 counties, our faculty and staff provide educational programs and research-based information to the people of Arkansas. If you have questions or would like some information about honey bees or beekeeping, contact your apiculture specialist:

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Beekeeping in Arkansas is regulated by the Arkansas Department of Agriculture. All beekeepers arerequired by state law to register the locations of their apiaries. There is no fee for hive registration, and registered beekeepers are entitled to free apiary inspection services. For more information, or to register your bee hives, contact the Arkansas State Plant Board:

Arkansas Department of Agriculture
Apiary Section
1 Natural Resource Drive
Little Rock, AR 72205
501-225-1598
www.agriculture.arkansas.gov/plant-industries/regulatory-section/apiary/

Good Books on Beekeeping

- **The Beekeeper's Handbook (4th ed.)** *by* Diana Sammataro & Alphonse Avitabile
- **Honey Bee Biology and Beekeeping (3rd ed.)** *by* Dewey Caron & Lawrence Connon
- **Honey Bees and Beekeeping: A Year in the Life of An Apiary** *by* Keith Delaplane
- **First Lessons in Beekeeping** *by* Keith Delaplane
- **Bee-sentials: A Field Guide** *by* Lawrence Connor
- **Beekeeping for Dummies** *by* Howland Blackiston
- **The Backyard Beekeeper** *by* Kim Flottum
- **The Complete Idiot's Guide to Beekeeping** *by* Dean Stiglitz & Laurie Herboldsheimer
- **Natural Beekeeping** *by* Ross Conrad

Beekeeping Clubs

Arkansas has numerous local beekeeping associations. These groups can be a great way to learn more about honey bees, and get to know others in your area who share your fascination with them. The Arkansas Beekeepers Association is a statewide organization open to all those with an interest in bees. The ABA sponsors two great conferences each year to promote and support beekeeping in the Natural State. For more information, or to find a local club near you, visit their website at ***arbeekeepers.org***.

Amazing Honey Bees

A honey bee colony is composed of one giant family. The queen bee is the mother of all the other bees in her hive! One hive may contain 20,000 to 60,000 bees, all working together.

A queen bee can lay up to 2000 eggs per day. She must eat many times her own body weight each day to continually produce eggs.

A honey bee can fly up to 15 mile per hour. Its wings beat about 180 times per second, producing the familiar buzzing sound.

A honey bee may travel up to 3 miles from its hive to collect food. One colony of bees can forage across more than 18,000 acres.

An individual honey bee will take an average of 10 trips from her hive each day, visiting 50-100 flowers on each trip from home.

A honey bee will only visit a single species of flower on each trip, ensuring that pollen is transferred to the correct type of flower.

A worker bee who finds a good source of nectar will communicate its location to the other bees by performing a unique dance.

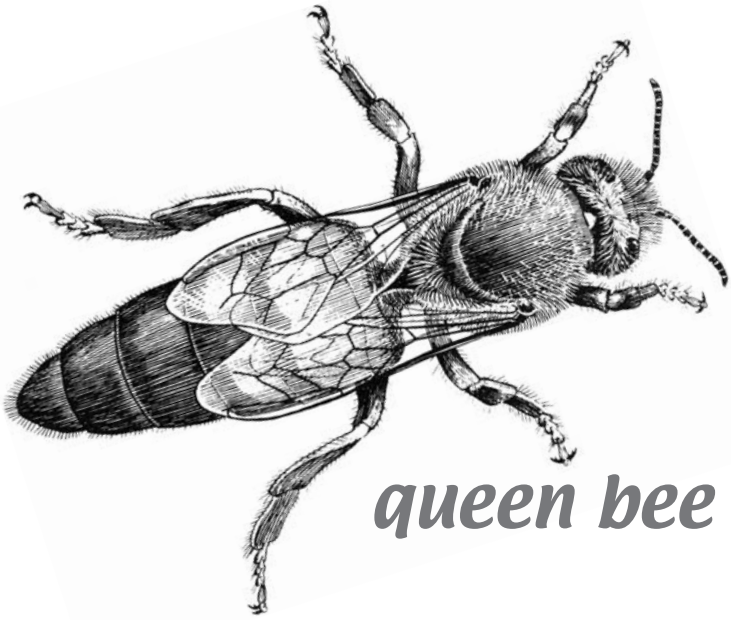
A pound of honey equals about 1 1/3 cups. Bees must gather nectar from around 2 million flowers to make a single pound of honey.

Together, the bees in a hive must fly about 55,000 miles to collect all of the nectar for just 1 pound of honey. By comparison, the earth is about 25,000 miles around at the equator.

By working together, a colony of bees can produce between 50 and 200 pounds of honey each year. One individual bee will make only 1/12 teaspoon of honey in her entire life.

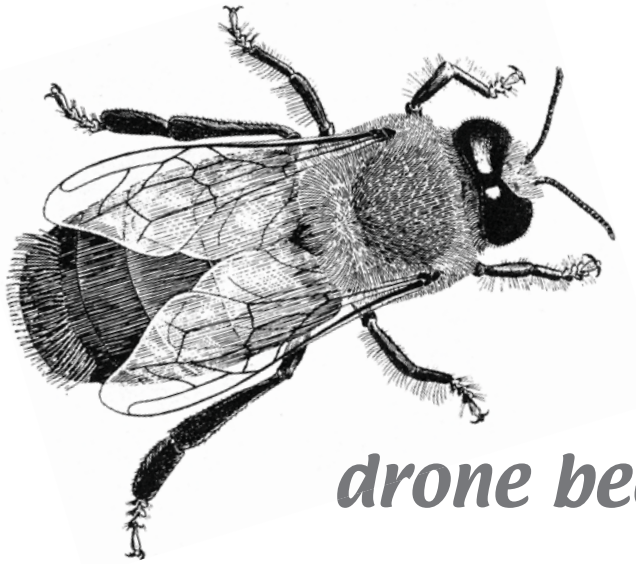
Honey bee will die soon after they sting, and are therefore not naturally aggressive animals. They sting only to defend themselves or when they feel their colony is threatened.

During their busy spring and summer, a worker honey bee will only live for about 6 weeks. But workers may live up to 6 months in the winter, during which time the bees cluster together to stay warm.



queen bee

worker bee



drone bee

learn more:
uaex.edu/bees

Keeping Bees in Arkansas

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

If you can garden, you can keep bees!

Honey bee hives can be managed safely and productively, even in urban areas. Keeping bees can be a relaxing and enjoyable persuit, immersing you directly in the natural world. As a hobby, or a sideline business, keeping honey bees can be a perfect activity for your family to enjoy together!

To get started keeping bees, you will need a little space, some special tools, some honey bees, and a hive for them to live in. Everything you need is available from mail order suppliers who specialize in beekeepers' needs. An internet search can instantly connect you with many of the leading manufacturers. A great resource is the website ***www.beesource.com***, which lists many suppliers of equipment and honey bees, and provides plans for building your own hives as well.

Setting up your bee yard. In Arkansas, we must register our apiary locations with the Arkansas State Plant Board. There is no fee for registration, just a simple form to fill out. For more information contact the Apiary Section of the Plant Board at (501) 225-1598. Honey bee hives don't require much space, but should not be placed near areas of excessive activity by your family, pets or neighbors. Use your common sense and be considerate. A barrier of thick vegetation or a 6-foot privacy fence will encourage your bees to fly higher as they come and go from the hive, avoiding most people.

The Bee Hive. The bee hive is the bees' house. It is where they live and raise their young, and where they store their delicious golden honey. A bee hive is full of wooden frames, each of which hold a single wax comb. By encouraging the bees to build their combs in these wooden frames, beekeepers can remove the combs to examine them without disturbing or destroying all of the bees' hard work. This modern style of bee hive helps us to keep bees healthy and aids in harvesting their surplus honey. The dimesions of a modern hive are standardized and should be very precise.

Honey bees are not naturally aggressive creatures, but they may react defensively (by stinging) when they feel that their hive is threatened. Honey bees communicate their alarm to each other by emitting a chemical odor, which the other bees detect, and which may cause them to become defensive as well.

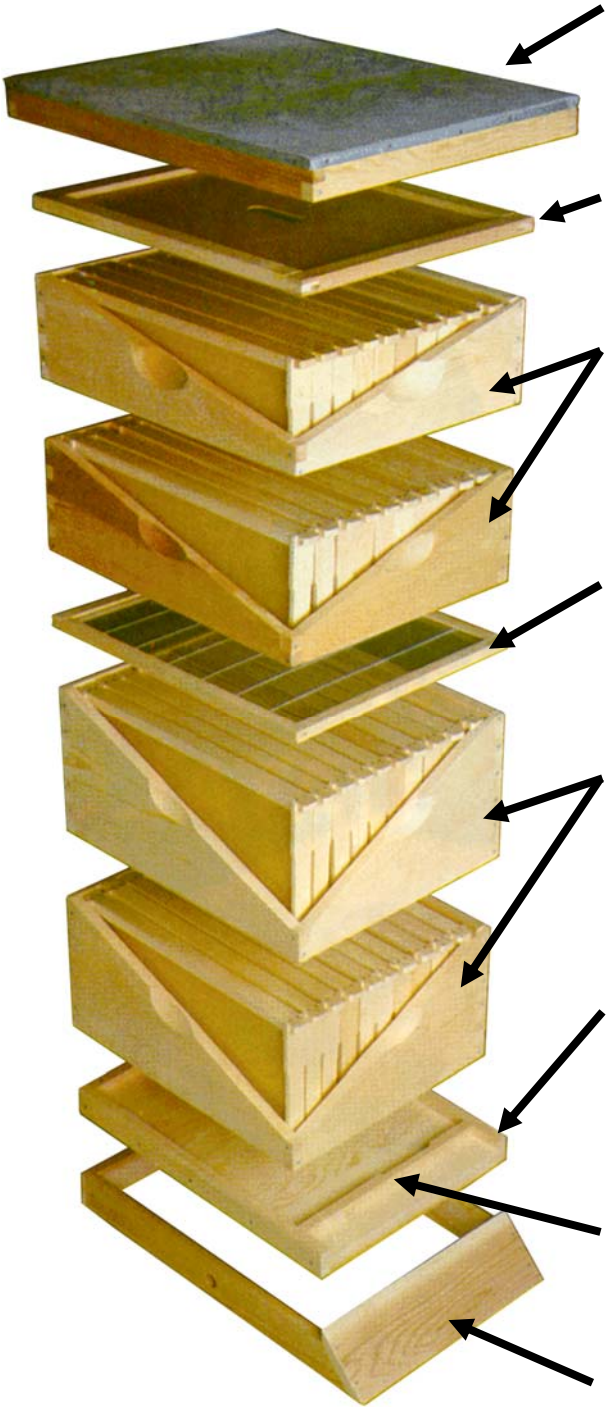
Beekeepers use a **smoker** to temporarily mask the bees' communication. By applying a little bit of gentle smoke, your honey bees will remain calm and docile, and working with them will be much easier.

You will also want to invest in some protective clothing to wear while working with your bees. A **bee veil** keeps the bees away from your face and head, while **bee gloves** protect your hands and arms. Protective clothing is available in many styles, ranging from a minimal hat to full length coveralls with an attached zip-on veil.

Bee hives can get a bit sticky. A **hive tool** is designed to help you open the boxes and more easily remove the frames for inspection. Another item, called a bee brush ,can be used to gently move the bees around on the combs and hive without upsetting them. It is also useful to brush a stray bee from your clothing when you are finished examing your hives.

Components of the Modern Bee Hive

The modern "Langstroth" bee hive is like a highly efficient multi-storied factory with each "story" having a specific function. These "stories" work together to provide a home for the bees and a honey factory for the beekeeper. This modern hive design allows for easy manipulation of the frames of brood and honey to manage the bee population and encourage a surplus of honey beyond that needed by the bees to live on and rear their replacements. It is this surplus honey that the beekeeper removes and markets.



HIVE COVER – the telescoping cover "telescopes" over the sides of the top super to protect the hive. The aluminum or galvanized covering sheds water and helps to reflect some summer heat.

INNER COVER – creates a dead air space for insulation from the heat and cold, and makes the telescoping cover much easier to remove; an optional but useful item.

HONEY SUPERS – boxes added on top of the hive as required to give the bees room to store their surplus honey. These boxes are removed by the beekeeper when the honey is harvested. Various depth boxes are available from beekeeping suppliers.

QUEEN EXCLUDER – a device to keep the queen bee in the brood chamber, as she is too large to pass through the excluder and begin laying eggs in the honey combs above; another optional item.

HIVE BODIES – the "brood chambers" are the bee's living quarters. The queen bee lays eggs in the combs here, and the developing brood is raised. Pollen is also stored here, to feed the young bee larvae. Some honey is also stored here for the bees' use.

BOTTOM BOARD – merely the floor of the hive. A solid bottom board is traditional, but many beekeepers now use a floor of 1/8" mesh. The screened bottom board allows for better ventilation and helps to passively eliminate some varroa mites (a bee hive pest).

ENTRANCE REDUCER – can be placed across the entrance to help a small colony of bees better guard their hive. It is also placed on the hive during winter to keep out mice.

HIVE STAND – supports the hive off of the ground, keeping the hive dry, and allowing ventillation beneath the hive.

Beekeeping Woodenware

The term **woodenware** refers to the individual components of a bee hive. While these have traditionally been made from wood, today a variety of bee hives are available from plastics and even polystyrene foam. Treated lumber should never be used to make bee hives. Paint your hives with an exterior grade paint to protect your equipment from the elements, unless hives are constructed from cypress, cedar or some other weather-resistant material.

A **bee hive** is the structure that houses the honey bee colony. It could be a hollow tree or other cavity, or one or more stacked wooden boxes provided by a beekeeper, with a lid and bottom board.

A **hive body** is an individual box that makes up a part of a bee hive.

A **colony** refers of the group of living bees that occupy a bee hive. A colony is composed of many thousands of worker bees, a few hundred drone bees, and a single queen bee.

"Deep" Hive Bodies

Until recently, most beekeepers kept their bees in standardized stacked hives with **deep frames** (9 5/8") for both brood and honey. The deep frames provide a large, uninterrupted area for the queen to produce her brood nest. However, because a deep honey super can weigh more than 80 pounds, many beekeepers have begun to use shorter boxes for harvesting surplus honey.

"Medium" hive bodies

A full **medium frame** (6 5/8") honey super weighs about two-thirds of a comparable deep super. Using all medium hive bodies is increasing popular with hobbyist beekeepers. One advantage of using all medium frames is that the beekeeper only needs to have a single size frame and box on hand, rather than a combination of deeps and mediums. Beekeepers can use 3 medium boxes for the brood chamber, roughly equaling the volume of two deep boxes. However, when using all mediums, a beekeeper must handle more frames to do a complete inspection. Also, most nucleus colonies are sold with deep frames, making the establishment of nucs more difficult. When starting new colonies with all medium frames, a beekeeper should consider beginning with package bees, or seek nucs that were made with medium frames.

New VS. Used Equipment

It is not advisable for a new beekeeper purchase used equipment. The spore of some highly contagious honey bee diseases could be present, but not be obvious, in old equipment. If the history of the equipment is unknown, it should be avoided.

Beekeeping Woodenware

10 Frame Equipment

The 10 frame “Langstroth” bee hive has been the industry standard for nearly 150 years, and is still the most commonly used hive in the US. Because they are the most common, it is often easier to resell equipment to another beekeeper, or to find additional equipment for yourself. Another advantage in large hives is that each 10 frame box has more space for bees, honey and brood. A comparable 8 frame hive will be taller and use more boxes than a 10 frame hive.

8 Frame Equipment

An 8 frame hive is lighter by approximately 20 percent. When full of honey, a full 8 frame medium super will weigh 40 to 48 pounds while a full 10 frame medium may weigh 50 to 60 pounds. There is some thought that the smaller size and cross-section of an 8 frame hive is closer to the typical hollow tree cavity seen in nature. Some feel that overwintering is better in taller 8 frame hives than the comparable amount of stores in 10 frame boxes because the cluster can move up more readily in a smaller 8 frame hive as stores are consumed.

9 Frames in a 10 Frame Box?

Some beekeepers evenly space 9 frames in a 10-frame honey super. If done correctly, the bees will draw out the cells of these combs deeper, leaving the standard “bee space” between all finished combs. Thicker combs are easier to harvest, because the surface of the honeycomb that is removed when uncapping is not blocked by the edge of the wooden frame. Also, because there would be one fewer empty “bee spaces” between combs, there should be slightly more honey stored in a 9-frame setup. Do not use 9 frames in a 10 frame brood box, however, as this will only result in fewer cells in which the queen can lay eggs. When giving the bees new foundation to draw in any hive body, place all 10 frames (not 9), pressed tightly together, in the middle of the hive body. Once the combs have been drawn, a beekeeper can remove one frame and then evenly re-space the remaining combs. Starting bees with 9 frames of foundation to draw will often results in poor quality combs, because the bee space between foundations is too large, and comb may be built parallel to the foundation, or even perpendicular to it.

Other types of bee hives

Because of concerns about honey bee health, all managed colonies must be kept in hives with **moveable combs** that allow the brood nest to be inspected. The Langstroth style bee hive is the most common, and is therefore the easiest to purchase. It will also be easier to find advice and information on colony management when using these hives. However, there are other types of bee hives in use, including Warré hives and Kenyan or Tanzanian Top Bar hives.

Alternative Bee Hive Types

There is a growing body of knowledge and resources (both online and in print) available for those interested in Top Bar Beekeeping:

- **beeculture.com/experiences-top-bar-hive**
- **tbhsbywam.com**
- **biobees.com**
- **beekeepinglikeagirl.com/langstroth-vs-top-bar-hive**
- **en.wikibooks.org/wiki/Beekeeping/Top_Bar_Hive**
- **bushfarms.com/beestopbarhives.htm**
- **outdoorplace.org/beekeeping/kenya.htm**

The above websites provide numerous photos and plans for variations on TBH design, but most lack good explanations on how to work bees in a TBH. While these hives are inexpensive to construct, they may require more frequent inspections and manipulations to ensure that the bees have adequate space for brood and honey storage. Also, TBHs typically do not produce as much honey as Langstroth hives, but they do produce more beeswax, since combs are not reused by the bees after harvesting honey. Top bar honey combs are also very fragile, since they are not built inside of a rigid frame, and are easy to damage when you are inspecting a colony.

Resources for Warré Hive construction and management:

- **thebeespace.net/warre-hive**
- **warre.biobees.com/**
- **thewarrestore.com/warre-hives/**

Download a free e-book copy of *Beekeeping for All* by Abbé Warré (in English):

- **www.users.callnetuk.com/~heaf/beekeeping_for_all.pdf**

Another type of hive is the Layens Hive or Horizontal Hive.

This European design features taller frames and a wider hive body than the standard Langstroth design. The entire hive fits in a single box, with no supers, heavy lifting, or other seasonal manipulation.

- **www.beeculture.com/the-layens-hive**
- **horizontalhive.com**
- **www.beekeepingfornewbies.com/horizontal-hives**

There are many choices for styles of bee hives, and none of them are perfect, despite strong opinions on just about every topic. What's important to remember that bee hives are mostly for the convenience of beekeepers, and not bees. Choose a style that fits your personality, your budget, and your goals as a beekeeper. And don't be afraid to continue learning and try new things in the future!

Bee Hive Inspection Record

hive name:			***date:***
bee yard location:			***time:***
# brood chambers:		***# supers:***	***queen excluder:*** ☐ no ☐ yes
hive temperament:	☐ calm	☐ nervous	☐ defensive
entrance traffic:	☐ high	☐ medium	☐ low ☐ with pollen
saw queen:	☐ no ☐ yes	marked?	☐ no ☐ yes - color:
laying pattern:	☐ excellent	☐ mediocre	☐ poor
eggs seen:	☐ no ☐ yes		
bee population:	☐ heavy	☐ moderate	☐ low
queen cells:	☐ no ☐ yes		***excessive drone cells:*** ☐ no ☐ yes
honey stores:	☐ high	☐ medium	☐ low
pollen stores:	☐ high	☐ medium	☐ low
diseases:	☐ chalkbrood	☐ nosema	☐ EFB ☐ AFB ☐ DWV
pests:	☐ varroa mite	☐ tracheal mite	☐ SHB ☐ wax moth
hive conditions:	☐ normal/healthy	☐ brace comb	☐ excessive propolis
	☐ normal odor	☐ foul odor	☐ equipment damage
	☐ other:		
actions taken:	☐ added feeder	☐ fed hive	☐ added super(s) #:
	☐ swapped brood chambers		☐ requeened
	☐ split hive - new hive name/#:		
	☐ other:		
medications:	☐ added	☐ removed	
recommendations:	☐ add supers	☐ split	☐ replace queen ☐ needs SHB trap
	☐ swarming imminent - needs monitoring		☐ test varroa level
	☐ replace equipment:		
	☐ other:		

UofA
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University of Arkansas System

interesting observations:

Feeding Honey Bee Colonies

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There is no better food for honey bees than their own honey. However, sometimes it becomes necessary for beekeepers to supplement their colonies' food supplies.

Establishing new colonies: When we establish a new colony, those bees have the tremendous job of drawing out new combs from foundation. Honey bees must consume the equivalent sugar in about 1 pound of honey in order to produce just 2 ounces of beeswax. Each colony must construct some comb before their queen can begin to lay eggs, and before they can begin to store pollen and nectar. In the spring we feed bees 1:1 syrup (1 part sugar to 1 part water). This thinner mixture is considered a *stimulating syrup*. It simulates a nectar flow, and because it has more water than the thicker *fall syrup*, it encourages the bees to draw out more comb in order to have room to store all the food coming into the hive.

Summer dearth: In heavily agricultural parts of the state, irrigated cotton and soybeans may provide a continuous nectar supply all summer. Urban colonies may be surrounded by plenty of well-watered gardens and landscape plants. Colonies in other rural areas may need a little help. When hot dry conditions prevail for extended periods, a colony can consume more honey than it produces. Particularly with new or weak colonies, the beekeeper may need to feed them to ensure that they can make it through the summer. Colonies also need a consistent supply of fresh water during this time.

Fall prep: The fall honey flow is extremely variable in Arkansas, and should not be relied upon to fully replenish the bees' stores for winter, especially if the summer was extremely hot and dry. Some years bring a fall with moderate temperatures and sufficient rains to keep plants in bloom for a while. Different regions of the state vary greatly. As soon as the last of a beekeeper's surplus honey has been harvested, hives should be consolidated to the overwintering volume. Place the queen and all brood frames, plus any frames containing large quantities of pollen, into the lowest hive body. All frames containing honey should be placed above. Put capped frames of honey in the outside positions of the upper box, with empty frames in the center. Feed as needed to encourage bees to fill in all upper frames, and allow bees to back-fill empty cells in the lower box as the brood nest shrinks for winter. Fall syrup is mixed 2:1 (2 parts sugar to 1 part water). This syrup is made thicker so that the bees will be able to store it more efficiently without having to remove excessive moisture before capping it.

Emergency winter feeding: Gently tilt the hive back on its bottom board periodically during the winter. The relative weight and center of gravity of the hive should give the beekeeper a fair idea of how much honey remains. If a hive seems light, emergency feeding is probably in order. Emergency syrup can be fed using any type of feeder, but internal feeders are recommended if daily high temperatures remain below 55^{o}F. Honey bees will not be able to efficiently take syrup from an entrance feeder during cold conditions. Granulated sugar can be fed to bees if syrup is not available. Place sugar directly on top of inner cover, or on a sheet of newspaper placed on the top bars, with an empty super around to provide space. Sugar can be fed in division board feeders or hive top feeders. *Candy boards* can also be used.

Medicating hives: If hives require treatment for Nosema disease or other conditions, mix the medication with syrup according to the product label and feed it to the bees as appropriate. Fall medications are stored in the combs and consumed by the bees throughout winter. Spring treatments can also be fed to bees if symptoms of disease are seen. Feed treatments to colonies early, so all medications will be consumed at least 4 weeks prior to placing the first honey super.

Never feed your bees honey purchased from any unknown sources. Many commercial brands of honey (particularly from overseas sources) contain spores of American Foulbrood. These spores are harmless to humans, but can induce lethal and contagious infections if fed to honey bee colonies.

Never feed brown sugar, molasses or artificial sweeteners (aspartame, saccharine, etc.) to honey bee colonies. Unrefined sugar contains excess plant material that cannot be digested by honey bees. Bees that are confined in the hive for extended periods (due to excess cold or wet weather) must store bodily wastes until conditions are right for cleansing flights. Bees that are fed brown sugar, for instance, will have substantially more waste, and exhibit symptoms of dysentery in the hive, which may be confused with Nosema disease. If you must feed your bees sugar syrup, *use only refined sugar*.

Should you feed them? If you aren't sure if you need to feed your bees or not, err on the side of caution. If the bees don't need it, they won't take it. Especially with granulated sugar, they may even toss it out of the hive if they don't want it. But a little wasted sugar is preferable to a starving colony. ***Do not feed anything to bees while honey supers are on the hive.***

How To Mix Sugar Syrup:

To make sugar syrup, first bring the water to a gentle boil. Reduce heat to a simmer, and then add the sugar. Stir until all sugar is completely dissolved, otherwise it may granulate in the feeder or in the combs. If any additives or medications will be mixed with syrup, wait until it has cooled to room temperature before mixing. Never feed hot syrup to bees.

Additives: Beekeepers often add a teaspoon of white vinegar, apple cider vinegar, or lemon juice per gallon of syrup to reduce the incidence of mold if the bees don't consume it all quickly. Thoroughly washing feeders between uses also cuts down on mold. Mixtures of emulsified essential oils (Honey B Healthy®, Essential Bee®, HiveAlive®, etc.) are "feeding stimulants" and may be added to syrup to encourage bees to consume it more quickly, but are not labeled as medications. Fumagillin (Fumidil-B®) is an antibiotic used to treat Nosema disease in honey bees. Mix it according to label instructions.

Note: Mixing sugar syrup is often directed to be done by weight, rather than volume. However, if you don't have an accurate kitchen scale, measuring by volume will generally be close enough for this purpose. You can add a little more water if you want to be precise (but for the purpose of feeding bees, it's not that important):

1 cup of white sugar = 8.82 oz.
1 cup of water = 8 oz, 1 tsp water = 0.167 oz.
1 cup + 5 tsp. water = 8.835 lb water

Candy Boards: A candy board is a block of hard sugar candy that is given to the bees to supplement their winter feed. The humidity that builds up inside an overwintering hive will usually soften the surface of the sugar enough for honey bees to eat. Candy boards were traditionally made by pouring the melted sugar into a wooden tray about the size of an inner cover, which fits on top of a Langstroth hive. If the bees run short of honey during the winter, they are usually at the top of the hive, and so will be in contact with the candy.

Some beekeepers will add pollen (or pollen substitute) to the mixture. Others will place a protein patty in the mold before the sugar solution is poured over it. This way, after the bees have consumed most of the candy, they expose the protein and begin to feed on it just as the brood cycle begins in the spring. Essential oil mixtures may be added to the candy to attract bees to feed on it. Additives should be thoroughly stirred into the candy mixture as it begins to cool down.

Candy can be made in smaller molds, such as pie pans, and stored in large discs or blocks. These individual blocks of candy can be placed onto the top bars of hives that need a little extra food. A spacer or shim may be needed to provide a little extra space in the hive for the candy. Even though this may violate the bee space, bees will not build burr comb in this empty space during the winter.

Cooking Candy: Boil 1 pint of water in a large pot. Add 5 pounds sugar (11 ¼ cups). *Using a candy thermometer*, heat the mixture to 240°F. At this point the candy mixture will foam up and nearly double in volume. Use a long spoon and a deep pot to allow for the sugar to expand! Stir the solution continuously to prevent caramelization. The candy mixture will become cloudy, but then clear as it reaches 240°F. Immediately remove the candy from heat and allow to cool to around 180-200°F, stirring continuously. At this temperature, the mixture is still runny, but *it will set up quickly!* Pour the mixture into the candy mold before it solidifies. This recipe will make enough candy for one mold that is 16 1/4" x 19 7/8" x 3/4" deep (a size that fits neatly on top of a Langstroth hive).

Be extremely careful when cooking candy! Boiling sugar is more dangerous than boiling water, as it will not run off of your skin if you spill or splash it — it sticks to you and continues to burn!

No-cook Candy Method:

- 5 pounds sugar
- 5 ounces cold water
- 1 tablespoon white vinegar or apple cider vinegar

Measure sugar into a very large pot. Add water and vinegar a little at a time, mixing well. When thoroughly mixed, it should have the consistency of wet sand. Other feeding stimulants (essential oils) can be added to this mixture in place of vinegar. Pack sugar tightly into candy board mold and allow to dry until firm (1-3 days, depending on the temperature). Candy should not fall out of mold when inverted. Place the candy board in the top of the hive, sugar side down.

Instructions for Arkansas Bee Yard Registration

In accordance with Arkansas Apiary Laws and Regulations, and all apiaries (locations of kept bees) must be registered with the Apiary Section of the Arkansas State Plant Board. To accomplish this, beekeepers are required to complete and have in the Apiary office an Application for Registration at least 20 days prior to setting up a new bee yard.

At the office the applications will be reviewed for consideration as per the apiary laws and regulations in a timely fashion. The applicant will be notified if the Registration is complete or if it is being detained due to some conflict.

Apiaries may not be set up prior to the completion of the registration process.

Most of the application is self-explanatory. You may provide the location of the bee yard as the legal description of the land (found on your property deed or property tax receipts) ***or*** as GPS coordinates. You do not need to provide both.

Where it asks if the location is "permanent, temporary or seasonal" the applicant should mark accordingly. ***Permanent*** hives remain in one location all year. ***Temporary*** is for hives that will only be in place for a short time, such as for pollination. ***Seasonal*** apiaries are used when a beekeeper moves hives between two or more locations in order to make different honey crops.

In the column for "owner of land" write "self" if it's your land. Otherwise, provide the name of the property owner.

The apiary needs to have a name that you can remember. This is a way to communicate with you about a specific location. Give it any name you wish (*Number 1*, *Home*, *Big Field*, *Smith Pasture*, *Red Barn*, etc.)

For more information, questions about this process, or help in filling out the application, contact the **Apiary Section** Office at the **Arkansas State Plant Board** at **501-225-1598** or visit **www.agriculture.arkansas.gov/plant-industries/regulatory-section/apiary**.

Return the completed form by mail or fax:

Apiary Section
P.O. Box 1069
Little Rock, AR 72203

Fax:
501-225-3590

Revised 1/2015

APPLICATION FOR BEEYARD REGISTRATION

ARKANSAS STATE PLANT BOARD

(PRINT ONLY PLEASE)

APIARY SECTION
P. O. Box 1069
Little Rock, AR 72203
Phone: (501) 225-1598
Fax: (501) 225-3590

NAME: _____ **ADDRESS:** _____

PHONE NUMBER: [ ] _____ **CITY:** _____ **STATE:** _____ **ZIP:** _____

EMAIL: _____ **PLEASE CHECK ONE:** **REGISTERED BEEKEEPER:** ☐ **NEW BEEKEEPER:** ☐

	COUNTY	QUARTER SECTION	SECTION NUMBER	TOWNSHIP NUMBER	RANGE NUMBER	NUMBER OF COLONIES	CIRCLE THE TYPE OF YARD	OWNER OF LAND	APIARY NAME OR NUMBER	FOR OFFICE USE ONLY
1.							PERMANENT, TEMP, OR SEASONAL			
	GPS: IN DEGREES DECIMAL	LAT:				LONG:				
2.							PERMANENT, TEMP, OR SEASONAL			
	GPS: IN DEGREES DECIMAL	LAT:				LONG:				
3.							PERMANENT, TEMP, OR SEASONAL			
	GPS: IN DEGREES DECIMAL	LAT:				LONG:				
4.							PERMANENT, TEMP, OR SEASONAL			
	GPS: IN DEGREES DECIMAL	LAT:				LONG:				
5.							PERMANENT, TEMP, OR SEASONAL			
	GPS: IN DEGREES DECIMAL	LAT:				LONG:				

OFFICE USE ONLY BELOW:

Apiary Section Head _____ Date _____ **Registration Number**: _____