UNIVERSITY OF MINNESOTA
EXTENSION

A GUIDE TO
BEEKEEPING IN NORTHERN CLIMATES

Third Edition

University of Minnesota | Department of Entomology | Bee Lab | Bee Squad
St. Paul, MN | BeeLab.umn.edu

Acknowledgments

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About the Beekeeping in Northern Climates Guidebook

The Beekeeping in Northern Climates guidebook is intended to accompany hobby beekeepers in the Upper Midwest region's northern climate.

Solid inspection skills paired with note taking are predictors of successful beekeeping. They allow for the tracking of colony health and referring to previous notes to solve problems.

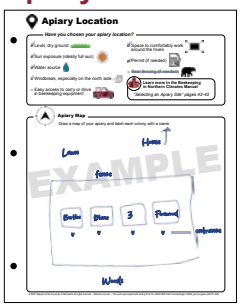
This Guidebook Contains Three Sections:

1. **Training on inspections**. Guides the reader on what to look for to identify healthy colonies, along with activities to increase knowledge and practice observational skills.

2. **Management Guide**. Follows the seasons to help the reader make management decisions based on colony health and growth.

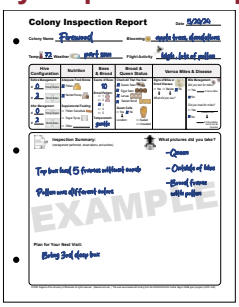
3. **Record Keeping.** Provides in-apiary companions to record actions and observations. Use the prompts in the field sheets to record information that helps the reader observe and track colony health. Keep notes from year to year to gain a “big picture” understanding of honey bee growth and health.

Apiary Location



Colony ID Cards

Colony Inspection Report



Beekeeping in Northern Climates System

This guide is an extension of the **Beekeeping in Northern Climates, Third Edition** manual. This guidebook refers to the manual for in-depth learning. If you do not have a manual, you can download a free PDF or order a hard copy from: beelab.umn.edu/manuals

This system offers field-tested, research-based guidance on management practices. However, there are many ways to keep bees successfully and the methods in this guidebook are not the only way. As the old saying goes, “Ask ten beekeepers and you’ll get (at least) eleven answers.” If you’re curious to try a different approach or you encounter a confusing situation, rely on your understanding of bee biology, apply common sense, and, whenever possible, consult an experienced beekeeper for advice.

Using this guidebook with a Mentor

A predictor of successful beekeeping is having a good mentor. If you are working with a beekeeping mentor or a mentee, use the colony field sheets to share information throughout the season. We recommend that a mentee sends the following to provide their mentor with a better understanding of a colony and help the mentor spot signs of a failing queen, brood disease, varroa issues, or other colony health problems:

- □ A copy or photo of your first colony inspection report each month
- □ A photo of a typical frame of brood each month
- □ A copy or photo of varroa testing results and varroa management plan
- □ A photo of anything unusual that might be a sign of disease, queen issue, or other problem

Icons

Icons are used throughout this guidebook to help you find and remember important information.

Action Plan: the major action steps during the management period.

Checklist: steps to take to accomplish the action plan.

Inspections: seasonal management steps to accomplish the action plan. These steps are in addition to the instructions on the Colony Inspection Report.

Beekeeping Tips: provide guidance on management.

Equipment List: what you will need during the management period. Hive tool, smoker, smoker fuel and lighter, and protective gear are not listed as these should be with you at every colony visit.

Reading List: what to read in your Beekeeping in Northern Climates, Third Edition manual to prepare you for inspections.

Video: links to videos of demonstrations. Understanding beekeeping is frequently aided by watching a beekeeper and the bees.

Record in your Journal: suggestions for Colony Inspection, Colony ID Cards, or Apiary Location notes.

Take Photos and Videos: capture colony health or management photos to use as a reminder or to share with a mentor.

Colony Milestone: signals to progress to the next management section based on the status of the colony, time of year, and your management. Depending on colony health and growth, your colonies may take different amounts of time to reach each milestone even when they started at the same time.

Beekeeper Lingo

Beekeeping contains quite a bit of jargon. Flip to the back of this guidebook to find a glossary of commonly used terms and phrases (page 95).

Evaluation

This guidebook is an updated version of our 2023 pilot edition that incorporates feedback from the beekeepers who used it. Thank you to everyone who contributed!

We are interested in hearing from beekeepers on how to further improve this version. To submit feedback, please use this survey: z.umn.edu/BeeGuidebookSurvey

Updates and Resources

Visit our website beelab.umn.edu/HoneyBeeGuidebook for any updates to this guidebook and for links to additional resources.

Now, let's get started…

Three Ways to Begin Your Beekeeping Year

In this guidebook, we address three common ways to begin your beekeeping year:

Package

A package is a slatted or screened box with a few pounds of worker bees, a feed can, and a queen.

Nuc

A nuc is a small hive with frames of comb, brood, food, worker bees, and a queen.

Overwintered Colony

An overwintered colony survived through winter from the previous year.

We provide options for keeping colonies in three-deep hives or two-deep hives.

Learn more in the Beekeeping in Northern Climates Manual

"Choosing Packages or Nucs" pages 43–45

"Appendix A: The Two-Deep System" pages 111–115

Four Principles of Productive Beekeeping

This guidebook helps beekeepers maintain healthy colonies by providing biology-based beekeeping practices following the four principles of productive beekeeping. These beekeeping principles will help you build a solid foundation for good management decisions. A healthy colony has all four of these factors:

1

Every colony must be protected in a hive and located in a good apiary site.

2

Every colony must have a young, prolific queen.

3

Every colony must have access to ample honey and pollen at all times.

4

Every colony must be monitored and managed for diseases and parasites.

Managing a Colony Started as a Nuc or Package

Most beekeepers start a new colony with a package or nuc. We recommend beekeepers keep two colonies to allow for comparison.

Goals for the Year

- Acquire all the equipment you will need for the year. If you are new to beekeeping, buy new frames and foundation to start fresh, even if colonies are less likely to produce surplus honey. If using drawn comb from past colonies, cull out old comb first.
- Follow the seasonal changes of a honey bee colony.
- Recognize signs of a healthy, queenright colony.
- Practice estimating the size of the adult bee population by counting seams of bees.
- Hone your skill at reading a colony and use signals from the colony to make management decisions.
- Practice rating the brood pattern to flag potential issues like disease, parasite infestation, or a failing queen.
- Learn what ample and diverse food stores look like in the hive. Appreciate how the local landscape affects the health and wellness of your bees. Not enough blooming flowers in your area for bee forage? Plant more! See our website for guidance on planting: beelab.umn.edu/planting-resources
- Monitor and manage varroa. Follow your varroa management plan to keep varroa levels low year round. Monitor varroa levels to check that your plan is working.
- Practice hefting boxes to get a feel for the weight of a full box of honey stores.
- Grow your colony into a two-deep or three-deep colony that is ready to survive the winter.

Managing an Overwintered Colony

Proactively manage your colonies. Your colony will grow quickly in spring. To discourage swarming, be ready to divide about 6 to 8 weeks before the main nectar flow. After the divide, you will have two vigorous colonies: one called the “parent” and the other the “divide.” Both colonies should be ready to produce honey by summer with a strong population of worker bees, a healthy laying queen, and space to expand.

Make sure your colony meets the qualifications for a divide before proceeding. Not all colonies need to be divided, but the vast majority will. Do not divide based on time of year alone.

Populous overwintered colonies can be prone to issues with varroa. Prevent varroa levels from spiking by implementing a proactive management plan, monitoring regularly, and addressing levels.

Goals for the Year

- Encourage colony growth in spring by feeding and performing reversals as needed.
- Prevent swarming by dividing your overwintered colony in spring into two colonies: a parent and divide. Evaluate colony strength and divide your colony when it has at least 8 frames with brood.
- Monitor and manage varroa. Follow your varroa management plan to keep varroa levels low year round. Monitor varroa levels to check that your plan is working.
- Add honey supers to your hives before the main nectar flow to produce honey.
- Prepare your colonies so they enter winter with adequate honey stores.

Equipment for Starting a New Colony

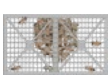
SPRING

Need When Bees Arrive

Personal equipment (bring to every inspection)**:**

- ☐ Personal protective equipment (veil, gloves, etc.)
- ☐ Hive tool
- ☐ Smoker, fuel, and lighter or matches

Equipment needed for each package or nuc:




- ☐ Telescoping cover
- ☐ Inner cover
- ☐ **Package**: deep box with 10 frames of foundation or 9 frames with comb
- ☐ **Nuc**: deep box with 5 or 6 frames of foundation or 4 to 5 frames with comb
- ☐ Bottom board
- ☐ Entrance reducer
- ☐ Hive stand
- ☐ Pollen substitute (as needed)
- ☐ Feeder bucket with 1:1 sugar syrup and empty deep box to protect bucket (as needed)
- ☐ Varroa mite treatment (as needed)

Equipment needed for each overwintered colony:

Spring feeding:

- ☐ Honey frames or another form of sugar (sugar patties, dry sugar, or sugar syrup if over 50°F) (as needed)
- ☐ Pollen substitute (as needed)

Equipment needed for a divide:

- ☐ Telescoping cover
- ☐ Inner cover
- ☐ Deep box with 10 frames of foundation or 9 frames with comb
- ☐ Bottom board
- ☐ Entrance reducer
- ☐ Hive stand
- ☐ Mated queen
- ☐ Feeder bucket with 1:1 sugar syrup and empty deep box to protect bucket (as needed)
- ☐ Varroa mite treatment (as needed)

SUMMER

Colony Growth

- ☐ 2nd deep box with 9 or 10 frames (not needed for parent colony)
- ☐ 3rd deep box with 9 or 10 frames (if using three-deep system)
- ☐ Varroa mite testing kit
- ☐ Varroa mite treatment (as needed)

Honey Production & Harvest

(may not need in first year; not needed if no excess honey)

- ☐ Queen excluder
- ☐ Honey supers each with 9 or 10 frames (as needed); keep the equivalent of 2 empty supers on the colony during a nectar flow
- ☐ Bee brush
- ☐ Equipment for removing honey supers
- ☐ Honey extractor
- ☐ Honey bottling supplies
- ☐ Varroa mite treatment (as needed)

FALL

After Main Nectar Flow

- ☐ Varroa mite treatment (as needed)
- ☐ Varroa mite testing kit
- ☐ Corks
- ☐ Entrance reducer
- ☐ Feeder bucket with 2:1 sugar syrup and empty deep box to protect bucket (as needed)

Prepare for Winter

- ☐ Moisture board
- ☐ Winter cover
- ☐ Varroa mite treatment (as needed)

Learn more in the Beekeeping in Northern Climates Manual

"Personal Equipment" pages 16-18 | "Hive Equipment" pages 20-26

Telescoping Cover

Inner Cover

Honey Supers

Queen Excluder

Deep Hive Bodies (+ 1 if using 3-deep system)

Bottom Board

Hive Stand

Honey Super Frame

Deep Frame

Entrance Reducer

Smoker

Hive Tool

Varroa Mite Testing

Corks

Feeder pail

Pollen Substitute

Bee Brush

Spray bottle with 1:1 syrup

Rock to put on top of the cover

Extra Deep Box

Equipment Not Needed

Equipment that you will see advertised but is not necessary to successfully keep bees:

- Probiotics
- Supplements
- Frame holder
- Pollen trap
- Frame spacing tool
- Frame grip

Equipment for Your Wishlist

List of equipment that is nice to have but not essential:

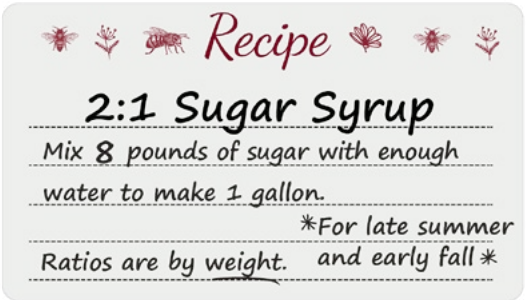
- Queen marking pen
- Extra bottom board
- Extra inner and telescoping cover
- Extra empty deep boxes
- Extra frames with foundation
- Nuc box
- Extra entrance reducer
- Robbing screens
- Extracting equipment
- Drone brood foundation or spare medium frame

Varroa Treatment Materials

- Personal protective equipment based on product label (at minimum will need: socks, closed-toe shoes, long pants, long sleeves, eye protection, chemical resistant gloves)
- Varroa treatment product
- Any extra equipment required for application

Sugar Syrup Recipes

1:1 Sugar Syrup = one part sugar, one part water. Approximate light 1:1 sugar syrup by filling a container (i.e., your feeder pail) half full of sugar. Add warm water to fill the container. Mix until sugar fully dissolves.



2:1 Sugar Syrup = two parts sugar, one part water. Approximate heavy 2:1 sugar syrup by filling a container (i.e., your feeder pail) full of sugar. Add hot water to the same container with the sugar to bring the syrup solution to the top. Mix until sugar fully dissolves.

PART ONE
Training on Inspections

Questions About Sights and Behaviors

Sights and behaviors in honey bee colonies can raise questions about management and what is normal. Use this section to quickly find answers in ***this guidebook*** or the ***Beekeeping in Northern Climates Third Edition manual.***

I See...

Queen or Drone Issues

- A colony with no eggs: pages 118–119 of the manual
- Multiple eggs in cells (could be laying workers or a new queen): page 126 of the manual
- Queen cells or a queen cup: pages 18–19 and 120–123 of the manual
- Drones make up greater than about 20% of the colony population: pages 124–126 of the manual

Food

- Bees storing nectar in the brood nest: page 23 of this guidebook
- A weak colony without enough food for winter: page 84 of this guidebook
- A colony going into winter with frames that lack drawn comb: page 84 of this guidebook

Comb

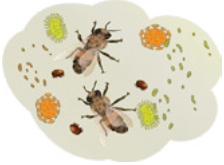
- The bees not drawing out new comb: page 25 of this guidebook and page 67 of the manual
- Comb drawn off the foundation: page 25 of this guidebook

Behaviors

- Robbing: page 74 of the manual
- A highly defensive colony: pages 15–16 of this guidebook
- Bees spilling out of the boxes during inspection or not staying on the frames during inspection: pages 15–16 of this guidebook
- Swarming behavior (loud noise and cloud of bees in yard): page 23 of this guidebook and pages 20–21 of the manual
- Beard of bees on the front of the hive: page 69 in the manual

Unhealthy Looking Bees or Brood

- A dead colony: page 26–27 of this guidebook
- A varroa mite on a bee or bee with deformed wings: page 30–31 of this guidebook
- Discolored brood: pages 32–34 of this guidebook



How to Inspect a Colony

Build colony handling skills that disturb the bees as little as possible, making beekeeping more enjoyable and lessening your chances of getting stung.

Get Ready

- Light your smoker. Take time to ensure it stays lit.
- Put on your protective gear.
- Grab your hive tool. Practice holding it throughout the inspection. A proficient beekeeper can hold both a frame and a hive tool at the same time.
- Grab any other supplies that you will need during the inspection (e.g., additional boxes, varroa testing kit, pen, this guidebook).

Video

SCAN TO WATCH

z.umn.edu/ColonyInspection

Learn more in the Beekeeping in Northern Climates Manual

"5–7 Days Later: First Inspection" pages 56–57

Before You Open a Hive

1. Note the flight patterns of the bees and level of activity at the entrance.
2. Give a few puffs of smoke near the entrance of each hive in the apiary.

Open the Hive

1. Stand to the side of the colony. Standing in front of the entrance can block the bees' flight path.
2. **Puff a little smoke in the hive entrance.**

3. Using your hive tool and keeping the smoker at hand, slowly remove the telescoping cover and place it upside down so the metal top is flush with the ground. Place to the side or back of the hive.
4. If present, remove the feeder bucket and the empty box surrounding it.
5. **Puff a wisp of smoke through the inner cover hole.**

Gently pry off the inner cover with your hive tool and check the underside for the queen. If you see the queen on the inner cover, gently lean the inner cover on the frame tops and herd her into the hive using your hand. **Set the inner cover inside the telescoping cover.**

6. Look down and **note how many spaces between the frames, called "seams," the bees occupy** (page 21).

   Puff a little smoke over the bees and observe how they move down into the box.

7. Start by removing an edge frame or **one frame in from the edge.** Use your hive tool to push the right side of the frame where the wood spacer sticks out, then do the same on the left side. This will loosen the frame and create enough space to remove it without rolling bees. Lifting straight up with both hands, smoothly remove the frame. To keep the bees calm and avoid squashing them, move slowly and deliberately and use smoke as needed. With practice, you will learn to speed up while still using careful movements.

8. Inspect the frame, **holding it over the colony.**

To better see inside the comb, stand with your back to the sun and angle the frame to allow light to shine into the cells. Look for the queen, but if you see normal-looking eggs, you don't need to find her to know she's present.

9. Set the first frame on its short end outside the colony. Place it against the hive box **so that wood touches wood.** This frame will stay outside the colony until the end of the inspection.

10. The frame-sized gap left by the removed frame allows you to remove the next frame without rolling bees. Pull out the next frame and inspect it. Replace it in the hive box in its original orientation against the side of the box. **Maintain the frame-sized gap** as you remove and replace subsequent frames. Use your **hive tool to push inspected and uninspected frames apart as needed.**

11. Remove adjacent frames one by one to check for stored food, eggs, and the queen. After inspecting, replace each frame into the box in its original orientation. When you finish the inspection, return the frame you set outside back inside the colony into the last frame-sized gap. If the gap is too small for the frame to easily glide into the space, use your hive tool to increase the size of the gap by pushing the frames further apart. After you put the last frame in, use your hive tool to evenly space frames containing drawn comb, or to push foundation frames tightly against other frames.

12. Gently reassemble the colony. Use smoke and your hand or a bee brush to herd bees away from the edges of the box and fill out your Colony Inspection sheet (page 93).

Inspecting multiple boxes

- When inspecting more than one box, separate the boxes as needed to inspect the colony. Remove the telescoping cover and place it rim-up at the back of the colony. Then, place the inner cover inside it after checking for the queen.

  Use your hive tool to pry off the top box, lift it off the hive, and place it **staggered on the rim of the telescoping cover**. Avoid putting a box flush on a flat surface, as it can squash bees on the frame bottoms. Cover any boxes of bees you aren't inspecting with a spare cover to keep them calmer.

- If you have honey supers, remove the top one and place it staggered on the telescoping cover. Stack additional honey supers on top, either staggered or flush. Remove the queen excluder and check for the queen. Place the queen excluder upside down and flush on top of the stacked honey supers. Place removed brood boxes on another spare cover to create two stacks. You don't want the queen running into the honey supers.
- Once you pry a box up with your hive tool, avoid lowering the lifted box back down, as this can squish bees between burr comb.
- Before replacing a box back on the colony, puff smoke on the frames of the lower box. This will move bees back down into the frames so they are not crushed. Puff smoke up into the bottom of the box you will be replacing if the bees are hanging out on any burr comb or dripping down. Just tip the box up on edge to expose the bottom of the frames before replacing it.
- Lifting heavy boxes is easier with two beekeepers and helps prevent squishing bees. **Each beekeeper holds two box handles, and together they gently set the box down on the outer cover or back on the hive**.

How long should inspections take?

Once you're comfortable handling the hive, inspections should take less than 15 minutes. It's okay to take longer depending on the colony's temperament, but aim to minimize the time to reduce the chance of causing excessive disruption to the bees.

How to use a smoker

Use small amounts of smoke as needed to keep bees calm. Puffing large bellows of smoke can cause the bees to run off the frames and become agitated. Use a little smoke at the entrances before opening the colony, when removing the inner cover, and when removing or replacing boxes. Otherwise, only use smoke sparingly to herd the bees away from handholds or if they begin showing signs of defensiveness, like looking at you from the frame tops.

Hefting the colony

Estimate a hive's weight **by gently lift the hive using a box handle before prying the boxes apart**. Avoid separating the boxes or detaching the bottom box from the bottom board. During the inspection, note how many frames are full of honey and how this corresponds to the hive's weight. This will help you estimate the amount of stored honey and nectar in the fall, winter, and spring.

What to do if the bees get defensive or won't stay on the frames

If the bees become unmanageable, close up the colony as soon as possible. Different colonies have varying levels of tolerance for the duration of an inspection. If the bees reach their threshold and become agitated, reassemble the hive and note how long the inspection took. For more information on handling defensive colonies, see pages 15–16 of this guidebook.

Tips for Taking Great Photos

View from Above

Hold your camera level above the hive to photograph seams of bees. Take care not to shade the frame tops.

Avoid using too much smoke or the bees will move down.

Queen Location

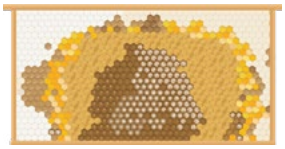
Always check for the queen before taking a photo so she doesn't fall off the frame and you don't accidentally squish her.

Sun From Behind

Ensure the sun is behind you, allowing light to fall on your subject and prevent glare. This is especially important for photographing eggs and larvae in cells.

Visible Frame

For a better image of brood and food resources, shake or brush bees off the frame or move bees with a little puff of smoke.



Multiple Photos

Two or more photos can often tell a more complete story. For example, when documenting a potential brood issue, include both a close-up of the affected brood and a full-frame shot of the entire brood frame.

Be Aware of Shadow

Make sure your shadow does not shade your subject.

Options for Positioning Frames for Photos

A beekeeping friend can keep your frame straight while you take a photo (doing both is challenging!).

Rest the frame on top of your box of frames. Use a hive tool to prop the frame up and avoid squishing bees.

Lean the frame against the side of the box and kneel down to get a good photo.

Smartphone Tips

- Skip the zoom feature. Just get your lens as close to the subject as you can. Crop the image later.
- The standard photo setting is often best. Avoid portrait mode.
- In bright sun, tap the subject on your screen to focus and adjust the exposure.
- Clean your camera lens when needed.
- Before taking a photo, decide whether vertical or horizontal orientation best captures the shot. Horizontal is often better for full frames.

- A phone holder can keep your device steady for you while you position your frame.

How to Work in Defensive Colonies

We use the word “defensive” instead of “aggressive” because honey bees defend their home.

What do defensive bees look like?

Be aware of any signs of defensive behavior in your colonies by looking for these behaviors:

- Bees in a **“heads up” position** on the frames, watching you, lining up before any frames have been moved. This behavior is usually manageable with a puff of smoke.

- Bees are **jittery**, **running,** dripping off the frames, or **leaving the boxes** quickly when opened. Note that even a gentle colony may perform this behavior if the colony is open for a long time.
- Bees flying around open boxes during an inspection is normal, often because foragers are returning to a changed landmark. However, if the bees start **focusing on you** instead of their normal business, take note. Bees **darting at your veil** are trying to sting.
- The most obvious sign of defensive behavior is bees **stinging you or your gear**. While an occasional sting is normal, especially if a bee is accidentally squished, multiple unprovoked stings during an inspection indicates a defensive colony. Stinging bees release alarm pheromones from mandibular glands in the heads of bees and glands associated with their stingers that communicate to other bees about the perceived danger.
- Bees may **“greet” you** as you approach or follow you even after leaving the apiary.

Why a colony may be defensive

Try to identify and address the cause of defensiveness. Colonies may be defensive around the beekeeper for several reasons, including the following:

Genetics

Some lines of bees tend to be more defensive than others.

Time of Year

Bees are generally more defensive during periods of nectar scarcity, such the fall in Minnesota.

Size

Populous colonies can be more defensive. Smaller colonies in spring tend to be the easiest to inspect.

Location of Bees

Disrupting the guard bees at the hive entrance can lead to increased defensive behavior.

Weather

Avoid working a defensive colony in poor weather. Cold, rainy, or windy weather keeps the older, more defensive bees at home.

Queenless or Sick Colony

Colonies with problems or an aging population can be more defensive.

Pests

Skunks or bears can make bees defensive. Animal scat containing bees or scratches on the hive entrance are signs of skunks. Bear damage is obvious.

Management

Crushing bees during inspections or not using smoke can result in defensive bees.

How to inspect and manage defensive colonies

Consider whether you should tolerate keeping a defensive colony in your area. Defensive bees can be dangerous to people and animals. Defensive behavior can worsen over the season and create a nuisance for people nearby.

You'll still need to inspect defensive colonies. Here are tips for working with agitated bees:

- If you have a colony you know to be defensive, inspect it last.
- Avoid opening a colony known to be defensive if you know it may cause issues for anyone in the area. Wait for another day.
- Working bees close to dusk can reduce the amount of time defensive bees can fly.
- Wear protective gear that makes you feel comfortable and confident. If using leather gloves, be careful not to squish bees.

- Perform an inspection on a defensive colony only if you need to and keep inspections short. Have a clear goal in mind and close the colony as soon as it's met. Prepare all the equipment you will use before you open the hive.
- Inspect colonies on good weather days when older bees are out collecting food. Beekeepers can inspect colonies on cool days when the bees are not flying to reduce the number of defensive bees in the air. However, you can take more stings in this scenario as cold bees cling to a warm beekeeper and crawl inside protective gear. Brush off any bees before going inside.
- Remove frames slowly to avoid rolling or crushing bees.
- Use smoke. Smoke the entrance of all hives, defensive and gentle, before starting. Smoke each hive again before removing the cover. Use smoke as needed as you separate boxes and inspect the colony. However, more smoke is not better. Smoke does not calm a colony once riled and oversmoking a colony can lead to the bees running off the frames.

- Bee brushes can trigger defensive behavior if used improperly. To use a bee brush, first remove adult bees by shaking the frame: grasp the top bar with both hands and give the frame a quick downward shake. Check that the queen isn't on the frame before you shake it. Then, flick the remaining bees away with the bee brush.
- Avoid disturbing guard bees at the hive entrance. For example, only separate the bottom box from the bottom board if absolutely necessary. If you do need to separate the two, move as quickly and gently as possible.
- If bees become too defensive or won't stay on the frames, end the inspection quickly and close up the hive. Once the bees become defensive, they will stay defensive until they have time to settle down.
- Put up physical barriers around the hive to reduce potential disturbances to the colony from people or animals. "Flyway" barriers, like a tall fence, encourage bees to fly up and over instead of into a walking path.
- Requeen a defensive colony with a queen from gentle stock. Once a new queen is accepted and laying eggs, it may take around 6 weeks to notice a change in behavior: 21 days for new worker bees to emerge, then another 3 weeks for them to mature into guard bees and foragers.
- Keep smaller colonies. Consider breaking down a defensive colony into multiple smaller colonies and requeening them with gentle stock.

How to Read Your Colony

Reading a colony will help you make informed beekeeping decisions based on an understanding of colony organization and inspections that engage your senses.

This section provides you with the skills needed to fill out the Colony Inspection Report on page 93 of this guidebook. Refer back to this section throughout the season to troubleshoot issues.

Reading Frames

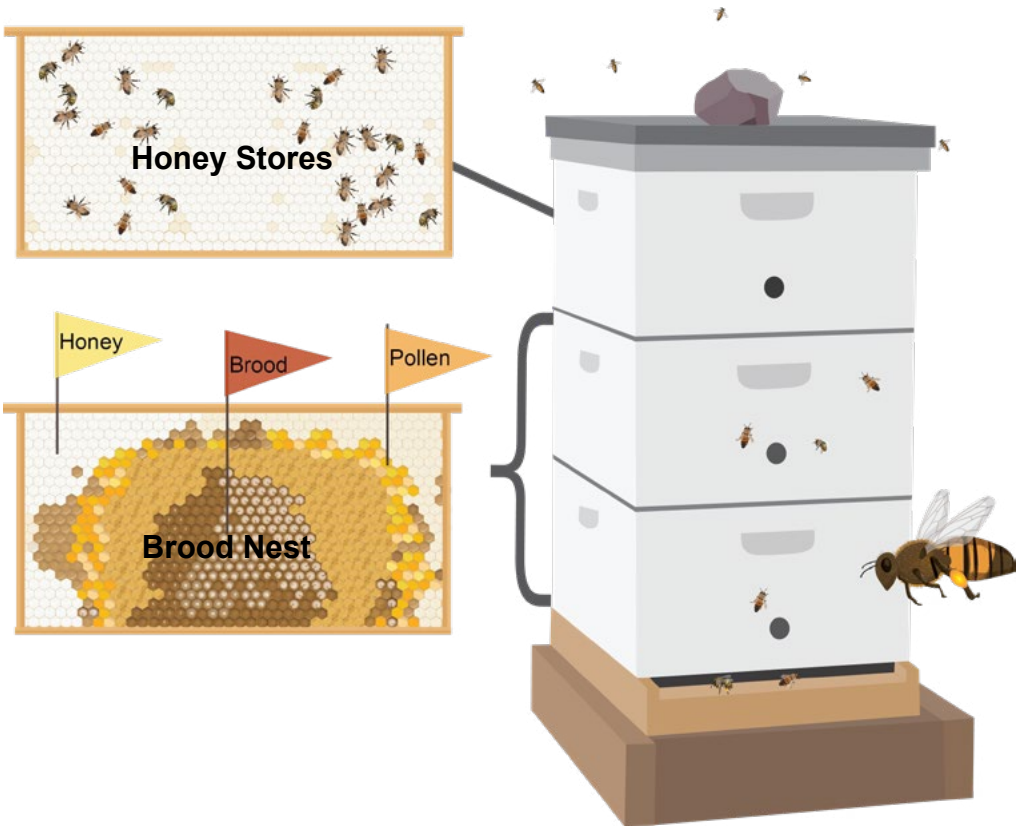
Frame content reveals details about queen presence, food stores, population growth, space needs, and the health of adult and developing bees.

Colony Organization

Typically, a colony raises brood in the center of the colony, surrounded by pollen and then nectar and honey on the outsides. A healthy colony keeps brood in proportion to its adult population, ensuring the brood nest is always covered by worker bees who regulate its temperature. A larger bee population can cover more brood compared to a smaller colony.

As you inspect a colony, ask yourself if the brood, pollen, and nectar/honey are where you expect them to be. If not, note where they are located in the hive.

Colony Organization

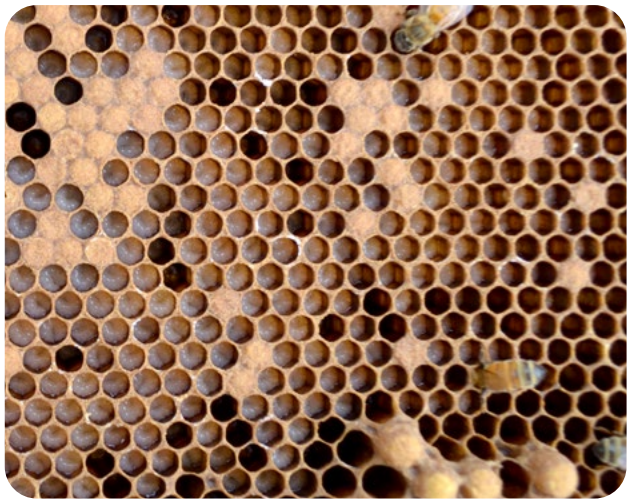


Queen Presence

A colony needs a laying queen to be healthy. To understand the queen status of your colony, look for:

Eggs, Larvae, and Sealed Brood

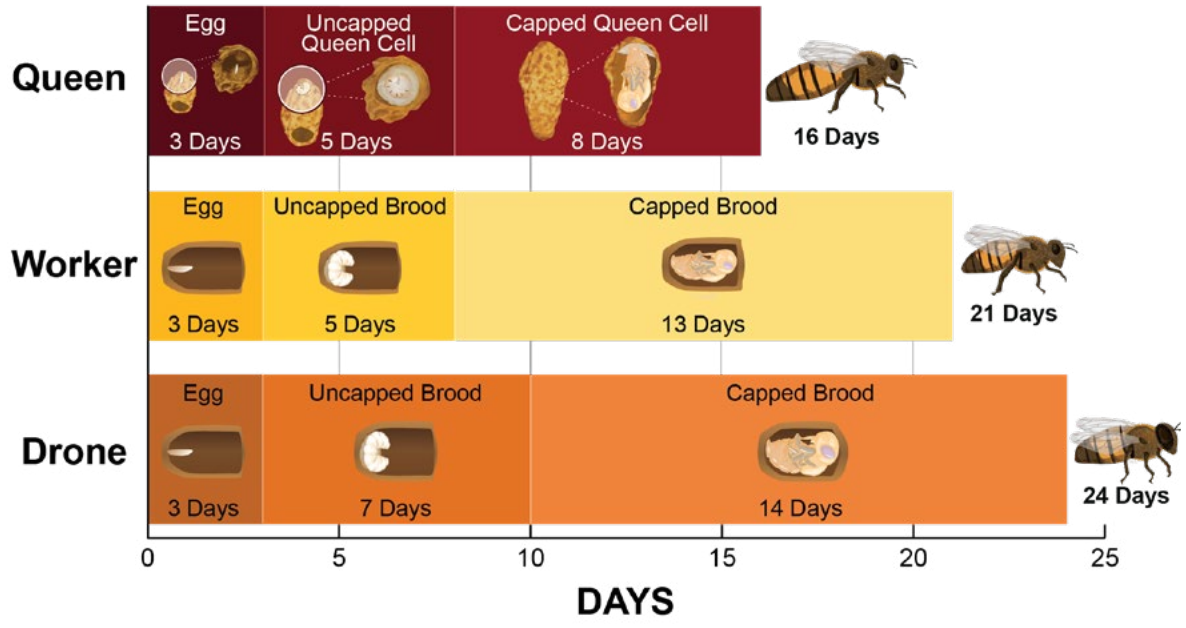
You don't need to see the queen if you find eggs. The presence of all brood stages shows the queen's laying has been consistent. If eggs are absent during the active bee season, there is likely a queen issue. In fall, expect the queen to reduce then stop laying before winter. If you don't see eggs or if you find multiple eggs in many cells, seek guidance from a mentor or in the Beekeeping in Northern Climates manual.



Queen Cells

Finding queen cells in your colony signals something is happening. But what? Resist the urge to destroy queen cells until you understand their purpose. The bees might need them to raise a new queen. If a queen cell is not sealed, check for an egg or larva to indicate the bees are indeed trying to raise a queen. Bees will build empty queen cups that do not signal an issue.

Honey Bee Development Time in Days



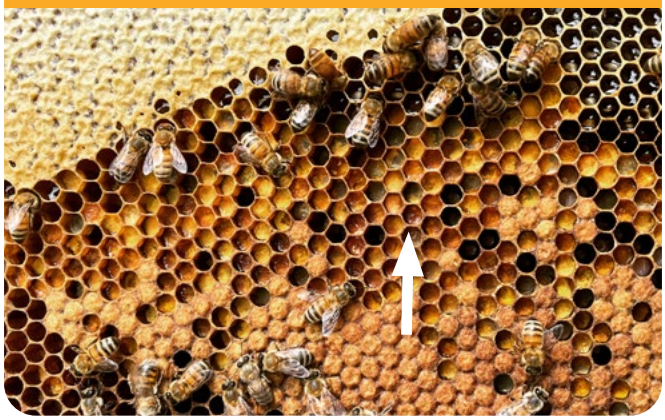
Nutrition

Assessing stored pollen and honey, along with other colony health indicators, can help guide decisions on supplemental feeding and apiary location. A colony with adequate food stores should have pollen near brood and honey/nectar on the edges, though not every brood frame will have this distribution. Depending on its position in the brood nest, a frame may contain mostly brood (center of brood nest) or very little (edge of brood nest).

Pollen

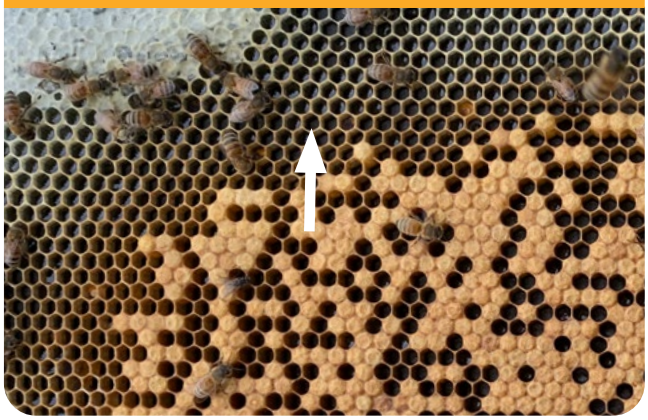
To identify pollen, look for cells plugged by a solid substance that does not reach the top of the cell. Multiple colors indicate a diverse floral diet. Fresh pollen has a matte finish, while older pollen has a shiny sheen. Look for a band of pollen surrounding the brood on a frame. If you don't see a band of pollen, the colony may lack necessary nutrition. Check other frames. If pollen stores are low, feed a pollen patty and consider why your bees lack stored pollen. Consider moving your bees if there is a consistent lack of resources in the area. Natural pollen is critical to colony health.

Stored Pollen



A frame with sealed brood surrounded by a wide band of pollen, followed by an outer boarder of honey.

Little Stored Pollen



A comb with very little stored pollen around the brood indicates that this colony could benefit from a pollen patty or better location.

Honey, Nectar, and Stored Sugar Syrup

These carbohydrates are typically found around the brood nest. Look for honey or nectar toward the edges and tops of brood frames or on end frames.

Nectar and sugar syrup appear shiny and liquid in cells, while honey is capped. Wax cappings over honey are relatively smooth looking, while the wax cappings over brood show cell shapes more distinctly (worker brood) or are puffy (drone brood).

In spring, feed 1:1 sugar syrup if there are fewer than two frames of food. In fall, feed 2:1 syrup to a colony with less than 75 pounds of stored honey. Summer feeding is unnecessary unless there's poor forage or a disaster like a drought or fire. Never feed sugar syrup when honey supers are on a hive.

Stored Honey and Nectar

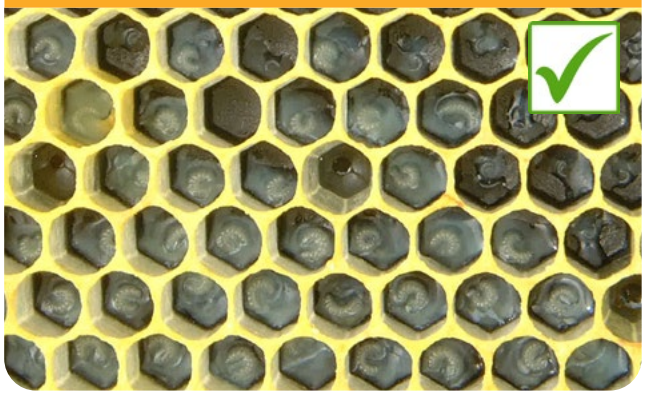
It is often not possible to confidently tell the difference between stored sugar syrup and nectar by sight. Note that wax cappings over honey are often darker than shown.

Larvae in a Visible Pool of Brood Food

Well-fed larvae are a sign that the colony has ample food stores and is healthy. Look closely at young larvae. Do you see a pool of milky white brood food, or do the larvae appear dry? If they look dry and there's little stored nectar or honey, feed sugar syrup. If stored pollen is low, provide a pollen patty.

Poor nutrition is not the only cause of poorly fed larvae. The colony may have a queen problem or disease. Poorly fed larvae can mean that there are too few adult bees to take care of their developing young.

Well Fed Larvae



Well fed larvae in a pool of shiny, white brood food.

Poorly Fed Larvae

Poorly fed larvae that appear dry in their cells.

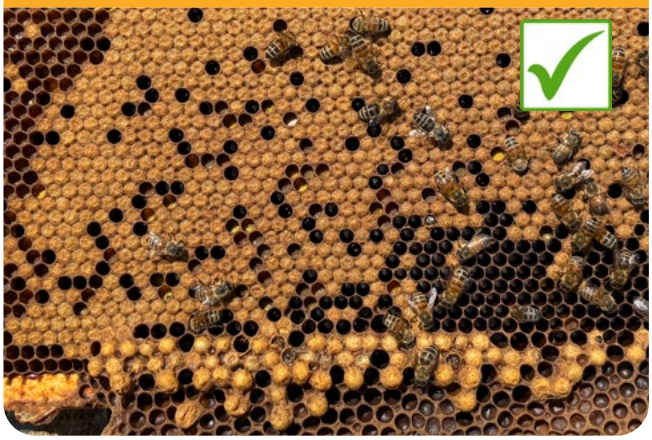
Drone Production in Spring and Summer

The presence of drones indicates the colony has enough resources to support these nutrition- and energy-intensive males. However, watch for an excess of drones. If more than roughly 20% of the population consists of drones, the colony may have a drone-laying queen or laying workers. See pages 124–126 in the Beekeeping in Northern Climates manual for guidance. Expect fewer drones in the fall after the main nectar flow.

Drone Burr Comb

Bees often build drone comb on the tops of frames between two brood boxes. As boxes are cracked apart, it exposes developing drones.

Worker and Drone Brood



Drone brood on the bottom of comb. Sealed worker brood is relatively flat across the cell tops and the sealed drone brood is puffed out.

Estimating Colony Size

Colonies typically grow in spring, peak in summer, and shrink in the fall as the queen reduces egg laying. Track changes in your colony's population to understand how quickly it's expanding or shrinking, allowing you to provide the right amount of space for growth and properly time reversals and divides. Use this skill to determine when a colony is **70 to 80% full of bees** and ready for another deep box. Be proactive by adding space, especially in spring and summer, to help prevent swarming.

Colonies with lots of sealed brood grow quickly! Add extra space to a brood-filled box.

When you first open the hive, quickly estimate the population by looking down at the top deep box before removing any frames. Avoid using too much smoke as it drives the bees into the box, altering your count. Count the number of seams, or spaces between the frames, that are full of bees to give you a rough colony size estimate without inspecting every frame. Compare the number to previous inspections to track growth.

Approximately **6 seams of bee in a 9 frame box**, or just about 70% full. The white wax indicates the bees are building new comb.

Approximately **8 seams of bees in a 9 frame box,** which means the box is beyond 70 to 80% full. Past time to add another box!

Rating Brood Pattern

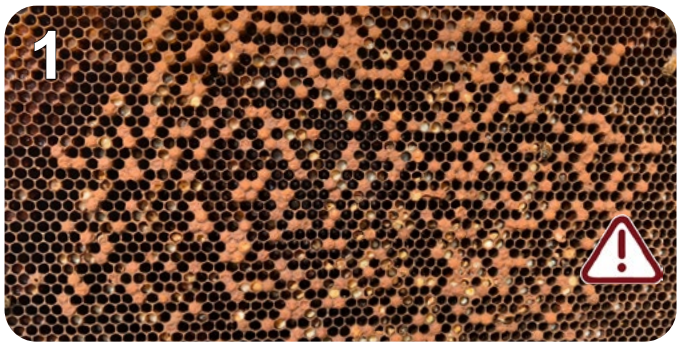
Score your colony's sealed brood pattern on a scale of 1 to 5. Determine this score by averaging the score from two to three frames with sealed brood.

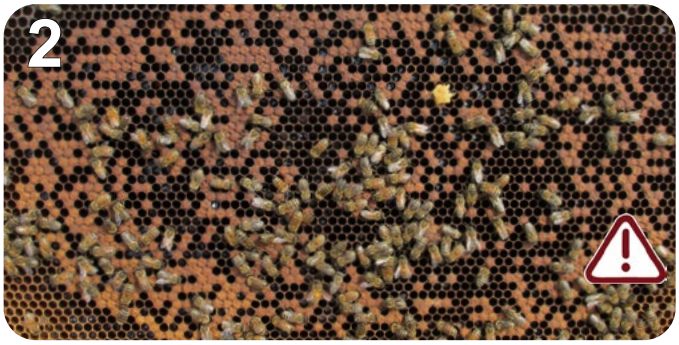
A score of 1 or 2 is a poor brood pattern. It can indicate a serious issue, like a queen problem or brood disease.

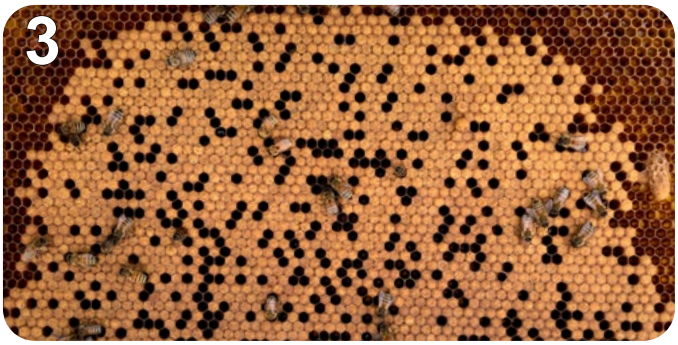
A score of 3 is relatively typical and becomes more common as the queen begins to shut down brood production in the fall. Can be more common in varroa-resistant bees.

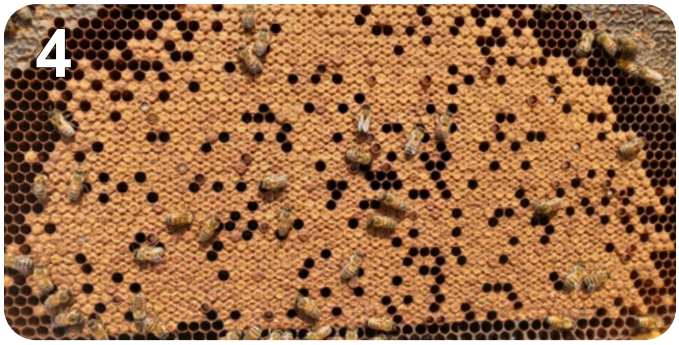
A score of 4 is above average and can mean your queen is a productive layer and the brood is surviving.

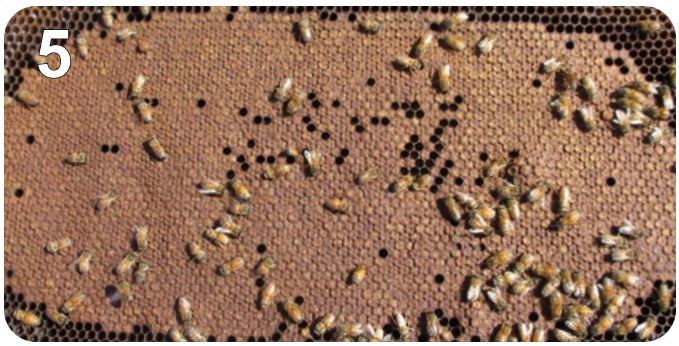
A score of 5 is a rare and magical thing where both the queen and the colony are high performers. However, watch out for varroa mites.











In a colony with a poor brood pattern, look for high varroa levels, pests, disease, queen problems, or old comb that needs to be replaced. Colonies with a past issue may still have a poor pattern due to the location of empty cells that a queen can lay eggs in.

Reasons a healthy colony may have a brood pattern with a few more holes than expected:

- A queen slowing down her egg laying in fall.
- Bees emerging from their cells, or adult bees capping over larvae with wax.
- Stored pollen or nectar in the brood nest. While this stored food is not a problem for colony health, it may mean the colony is preparing to swarm.

If the brood pattern is a 3 or higher, still look closely. For example, note the queen cell in the pattern representing a score of 3 and single cells of uncapped brood in 4 that may signal high varroa levels. A good pattern does not always mean the absence of an issue.

In addition to the sealed brood, look at the sizes (ages) of the larvae. It is okay and common to find a gradient of larval sizes. However, multiple larval sizes grouped together in a non-regular pattern can mean the brood is not surviving.

Swarm Signs

Identifying signs of swarming is one example of how to combine the skills in "Reading Frames" to tell you something important about colony behavior.

From late spring to early summer, colony populations can grow rapidly and prepare to swarm. Much of spring and summer management is about giving the colony room to expand. Be proactive by adding boxes before the colony needs the space and by dividing a strong overwintered colony before it has the impulse to swarm. While package colonies are unlikely to swarm, it can happen. **Look for signs of swarming during inspections:**

Drone Brood Production

Colonies produce drones when food is plentiful, signaling the start of swarm season. This is a low risk sign that provides context for the overall time of year. No need to act; just proactively provide room and watch for other swarming signs.

No Room for the Queen to Lay Eggs

Check the brood nest for empty cells. If space is limited, add frames. Prioritize adding drawn comb, as the bees may not draw out comb on foundation quickly enough to prevent swarming. The bees do not "see" undrawn foundation as room to grow.

Nectar Stored in Brood Nest

If the brood nest is filled with nectar (frequently called "honey-bound" or "backfilling the brood nest"), the colony may swarm. Add a few frames with empty drawn comb or foundation into the brood nest. Prioritize adding drawn comb to provide immediate space for the queen to lay eggs. Add honey supers to provide the bees with space to store nectar outside the brood nest.

Queen Cells Around the Brood Nest

A colony preparing to swarm raises queen cells often found at the edges of the brood nest. Uncapped queen cells indicate swarming is imminent. Capped queen cells indicate the colony has very likely already swarmed. Eggs may be absent because the queen stops laying before swarming in order for her to become lighter for flight.

Avoid letting your colony swarm by providing space as needed and dividing overwintered colonies. Swarms can alarm people and may nest in unwanted places, leading to costly removal. As a beekeeper, it's your responsibility to manage swarming.

Options if your colony does swarm:

1. Catch it and treat it as a new package colony.
2. Catch it and give it away or sell it.
3. Contact your local beekeeping club to catch it.
4. If it's too high up or in a difficult spot, be safe leave it.

In the original colony, let the bees raise a new queen. Leave the capped queen cells and close the hive. Queens cells are delicate; take care moving frames and boxes to prevent damaging them. The future queen needs to mature and take her mating flight. Do not inspect during this time. Return in 21 to 28 days to check for eggs.

Using Your Senses

As you open your hive and inspect frames, pay attention to what you see, hear, and smell. These observations offer insights about your colony's health and activity, which shift throughout the season and with changing weather.

Sight

Before opening the hive, observe the entrance. Are bees flying? Look for pollen on foragers' legs for a clue to the food sources available. Early spring pollen may come in just a few colors. As the season progresses, you should see more variety. During periods of scarcity, you will see less incoming pollen.

Watch the bees' flight paths to see where they're headed. In the afternoon, look for bees hovering near the hive, practicing their orientation flights.

Look at bees near the entrance. Do you see bees fighting: biting each other or spinning like a firecracker? These signs of robbing indicate the nectar flow has stopped. Are any bees raising their abdomens? Raised abdomens with the last segment bent means they're using the Nasonov pheromone to guide nestmates to the entrance. Straight-up abdomens, especially with stingers out, indicate defensiveness.

Once inside the hive, watch the bees' movements. Calm bees wander on the comb, while agitated bees may run, fly, or line up in the "heads up" position at the frame's edge. Notice how your movements affect the colony. Quick, jerky motions can trigger defensive behavior, leading bees to dart at your hands or face.

Bees with bent abdomens releasing the Nasonov pheromone at the colony entrance to signal their nestmates the location of home.

Sound

A honey bee colony has a pleasant hum. A "hopelessly queenless" colony with no eggs or larvae can "roar" when opened. As you inspect a colony, a hive hum that raises in pitch or volume can be a sign that the bees are becoming defensive. Tune into the sounds of bees in flight. You can learn to distinguish between the buzz of workers and drones.

Smell

After the smoke from the smoker dissipates, take a moment to breathe in a hive's scent. It should smell sweet, like beeswax and honey. Propolis stored in crevices and around the edges of the box adds a resinous, medicinal note. Lookout for the banana-like smell of defensive bees near your veil. When hiving a package or opening a colony in spring, don't be surprised to find (and smell) little mustard-yellow drops of bee poop on your veil and clothes. Throughout the year, you may notice changes. Some nectars, like goldenrod, can smell funky (think gym socks), while buckwheat has a musky, malty scent. Watch for any unpleasant odors, as these can signal brood disease or dead bees.

Propolis is the sticky substance found on the tops of frames and the box rim, varying in shades of brownish gold, yellow, red, green, or white.

Common Comb Problems

Bees not drawing new comb

Honey bees only build wax comb from spring through the main nectar flow. Do not expect the bees to draw comb in late summer or fall. If they're not drawing comb during the nectar flow, try these strategies:

- In spring, feed 1:1 sugar syrup to simulate a nectar flow and encourage bees to make beeswax.
- Move a frame with some drawn comb (but no brood) to the center of a box with foundation frames to encourage the bees to move into the new space.
- If bees aren't drawing comb on edge frames, move a nectar or honey frame to the outermost position, then move the undrawn frame one position in, pushing them tightly together. For frames where only one side is undrawn, rotate the foundation side to face inward and position it tightly against the adjacent frame.
- Spray foundation with sugar syrup, apply a thin layer of honey, or paint molten beeswax to encourage bees to work on the foundation.

- If bees aren't moving into honey supers, add supers with drawn comb above the foundation. You can also add a couple frames of drawn comb into a super with foundation, keeping the foundation frames pushed tightly together until the frames contain drawn comb.
- Another option if the bees aren't moving into the honey supers is to remove the queen excluder. Replace the excluder once the bees start using the space, but first check to ensure the queen hasn't moved up.

Avoiding burr comb

- Keep foundation frames tightly pushed together to prevent irregular wax structures, which waste resources and create comb that's difficult to inspect and prone to damage. Misaligned comb is easier to scrape off early rather than manage long-term. Maintain proper bee space by keeping gaps under ⅜ inch.
- For extra thick honey frames in a brood box, like in the frame corners, you can trim excess comb with a sharp knife. Return the cut comb to the hive or use it yourself if uncontaminated by treatments. Position the cut side facing a drawn comb frame to help bees maintain normal capping depth.
- To remove comb drawn off the foundation, shake the frame over the hive to dislodge most bees. Carefully lift the comb flaps with your hive tool, scraping gently to separate it from the foundation. Be cautious, as the queen could be behind the wonky comb. After removing the comb, return the frame to the hive, keeping it snug against adjacent frames.

Bring Out Your Dead

Losing your bees can be frustrating, especially when you feel like you did everything right. Understanding why they died can provide peace of mind and help you decide which equipment to keep or discard. For details on determining the cause of colony death, refer to Dr. Meghan Milbrath's article. z.umn.edu/whydidbeesdie

When a Colony Dies

1.

Remove the winter cover and moisture board and store them in a dry, mouse-proof location for next year.

2.

Inspect your equipment, especially the brood frames. Look for signs of American foulbrood (AFB; page 33). If you find AFB, burn or carefully dispose of all frames from that hive. AFB is rare, but checking for scales is worth the time to prevent future issues.

3.

Clean out dead bees by carefully brushing them off frames without damaging the comb. Be extra cautious in cold weather as wax comb will be brittle. Don't try to remove bees stuck inside the cells as you'll do more harm than good and a new colony can remove them. Look for dead bees near honey stores. Little to no honey indicates the colony may have starved.

4.

Check the bottom board for varroa or signs of robbing, then **scrape debris off the bottom board** into a corner of the yard. If the colony was robbed in fall, you may find many wax flakes. Visible varroa are a sign of mite-related death.

5.

Evaluate combs and prioritize **discarding comb from another beekeeper's hives** (e.g., from a purchased nuc).

✗ **Toss frames with:**

- Comb from brood nests of pathogen-infected colonies
- Brood comb older than 5 years
- Comb with a poorer brood pattern every year when compared to other frames
- Large amounts of old pollen
- Entombed pollen (pollen covered with wax)
- Excessive bee poop
- Mouse damage or excretions
- Excessive mold, fermentation smells, slime, or anything that makes you think, "ick."

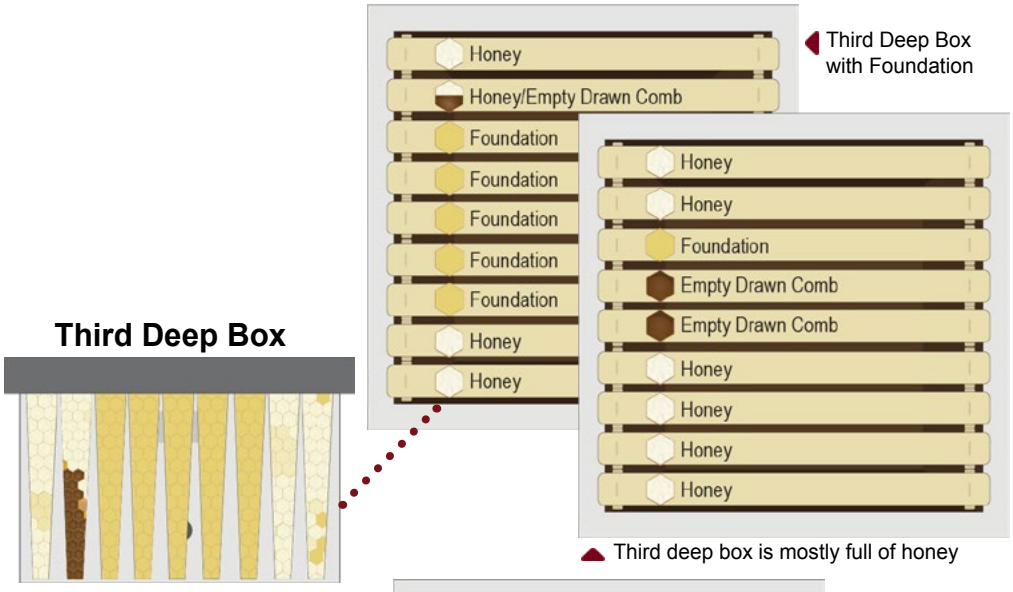
✓ **Keep frames with:**

- Dead adult bees
- A bit of mold
- Honey frames, including wax with bloom (bluish, purplish, or white coating)
- Brood if you know the colony did not have a pathogen
- Drone brood from a laying worker or drone laying queen

✓ **Keep super frames**

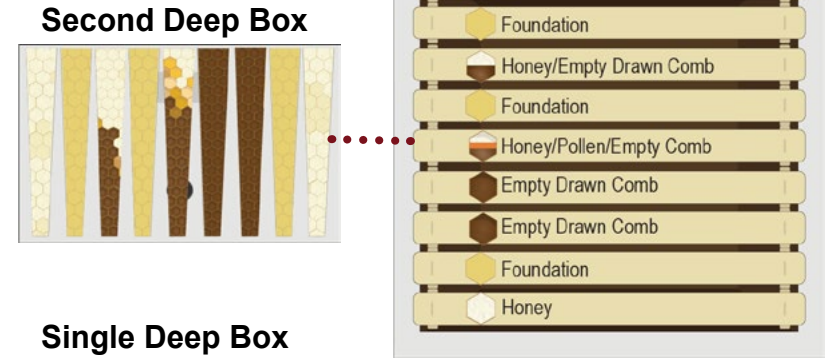
If in doubt, toss it out!

Preparing for a New Colony With Frames From a Deadout

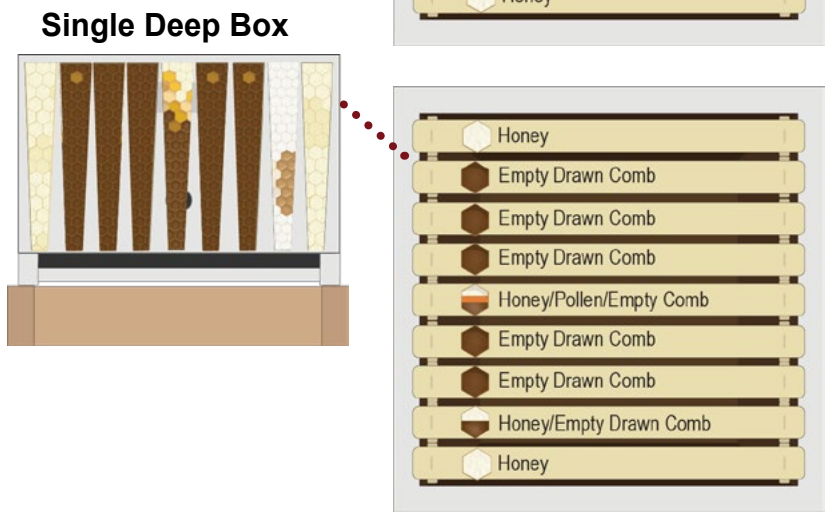


3. If you're using a **three-deep system**, place any remaining frames in the third deep box, with honey on the edges and foundation in the center.

If the third box is mostly full of honey, add a queen excluder and two honey supers at the same time you add the third deep box to the growing colony.

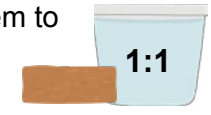


2. Prepare the **second deep box** so it is ready once the first box is about 70% to 80% occupied by the bees. Set it up similarly, with honey on the sides of the box and empty drawn comb in the center. If you're out of drawn comb, use foundation frames, pressing them tightly together.



1. Prepare a **single deep box** for your new package or nuc. Place 1 to 2 frames of honey on each side of an empty deep box, and in the center place empty drawn comb, ideally with a bit of honey around the edges. Aim for 9 frames of drawn comb in total, but use what you have. Use your best-looking frames in this box.

Even with stored food, it is still vital to feed 1:1 sugar syrup and a pollen patty to a package. Feeding promotes growth and helps the colony survive if it gets too cold for them to access honey on the outer frames.



Store the prepared boxes in a **mouse-proof and bee-proof location** until you are ready to use them for your new colony. An unheated shed or similar is best.

How to Recognize Healthy and Sick Bees: Varroa Mites & Diseases

Prevention and identification are your first tools for managing honey bee problems. You may never see disease signs in your colonies, but know what to look for so that you can address any problems if they do arise.

This section will provide you with instructions on how to fill out the varroa and disease sections on the Colony Inspection Report (page 93).

Prevention Tips

For parasitic varroa mites and diseases:

- Learn the signs of parasites and disease to prevent issues from spreading to other colonies
- Use disease and varroa resistant queen stock
- Prevent robbing bees

For diseases:

- Rotate out comb following this guidelines on page 26 of this guidebook
- Avoid buying used comb
- Do not let visiting beekeepers use their tools in your hives
- Sterilize your hive tool and equipment after working a sick colony
- Open any colonies known to be sick last in your inspections

Healthy Adult Bees and Brood

Recognizing healthy adult bees and developing brood is the first step in identifying problems. Once you know what “healthy” looks like, it’s easier to spot issues. If adults or brood look unhealthy, take notes and photos and consult experienced beekeepers.

Healthy Adult Bees

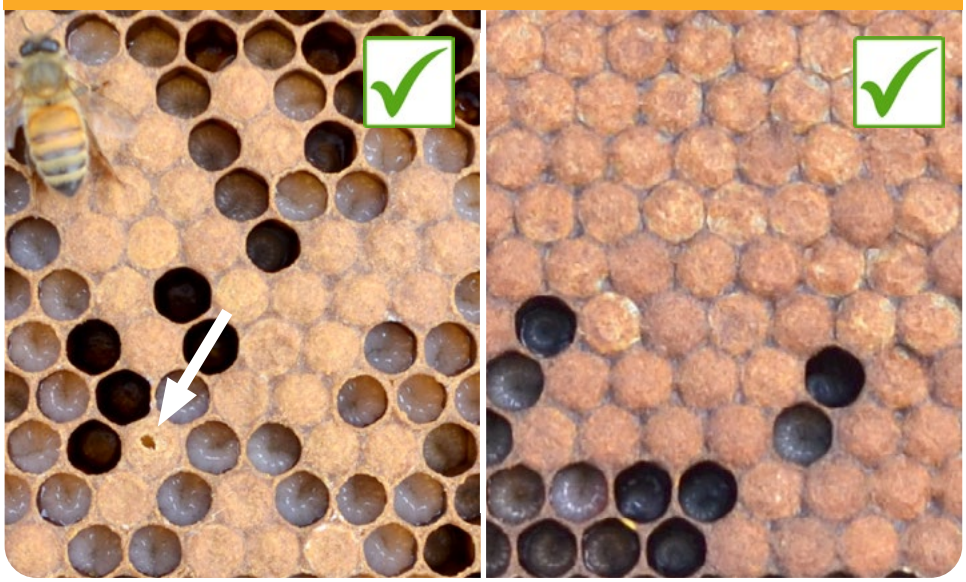
Look for fuzzy adult bees with intact wings. Expect older forager bees to have tattered wings and smoother thoraxes. Healthy bees can be various shades of light to dark.

Healthy adult bees do not twitch. Waggle dancers may appear twitchy, but they move in a regular pattern. Sick bees have less robust movements.

Healthy Larvae

Larvae should be pearly white, glistening, and lying flat in the bottom of their cells. Younger larvae will be nestled in a visible pool of milky-white brood food.

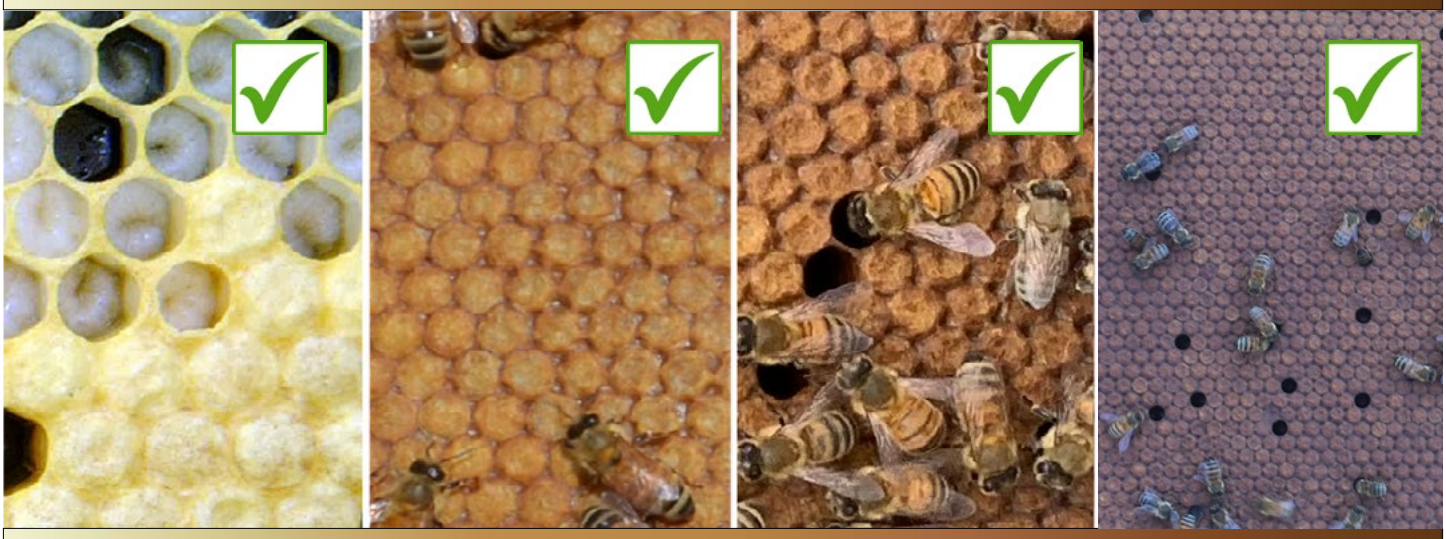
Healthy Worker Pupae (Sealed Brood)



Sealed brood with uniform, dry wax cappings indicates healthy pupae. The wax should fully cover the cell and appear slightly domed, except when it is being capped. The arrow points to a healthy larva being capped over by the bees. The color of wax cappings can range from yellow to dark brown, naturally darkening as it is used by the bees.

Rate brood pattern regularly to flag potential issues (22).

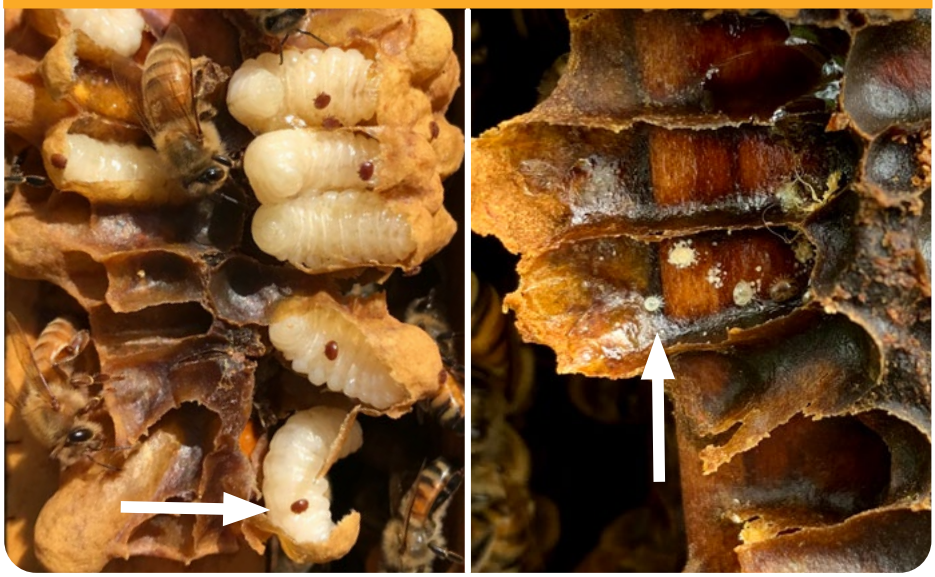
Comb Color Range



Signs of Varroa Mites

Varroa and the viruses they transmit can cause colony sickness and death. Visual inspection alone is not reliable for determining varroa levels. If you see one of the below signs, the colony likely already faces an issue. Test for varroa and consult your varroa management plan for next steps (pages 38–44). These signs are most common in late summer and fall.

Varroa Mites in Drone Brood



Varroa mites prefer to feed and reproduce on drones because drones take longer to develop into adult bees. Bees often build drone comb between brood boxes. When breaking boxes apart, check any exposed drone pupae for varroa.

You may see reddish-brown adult female varroa about the size of a pinhead. In the broken cell where she was living, look for her whitish-clear offspring or a reddish-brown adult daughter.

Varroa Mite Feces

Uncapped pupae are sealed brood cells that were opened by the bees. You may see a pupa head looking out, or the bees may be removing the pupa by chewing it down or hauling it out whole.

Uncapped pupae can indicate issues such as varroa, disease, wax moths, or comb problems. To determine if varroa are the cause, check for varroa feces in the uncapped cells.

Varroa feed on the abdomens of developing pupae and leave their **feces on the top or "ceiling"** of the cell. Look for a white, paint-like spot of feces on the cell ceiling in uncapped pupae cells. You may need to remove a pupa to see the feces.

In dead colonies, look for mite feces inside cells where you think the brood nest was located. This can identify varroa as a possible cause of death.

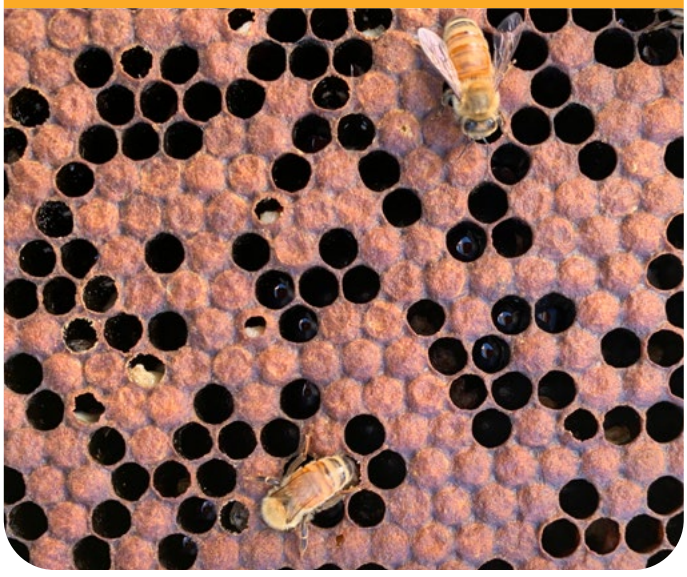
Varroa Mites on Adult Bees

Varroa mites are only readily visible on adult bees when infestation levels are high. Most varroa in a colony are hidden: over 90% of varroa on adult bees are on the underside of bee bodies and over 50% of all varroa in a colony can be under sealed brood cappings.

Deformed Wings

Bee pupae parasitized by varroa mites may emerge as adults with shriveled, non-functional wings, which is a sign of deformed wing virus (DWV). High levels of the virus, transmitted by varroa mites feeding on bee pupae, can cause this visible sign. These bees usually die within a few days after emerging.

Parasitic Mite Brood Syndrome



Signs of a severe varroa mite infestation include all the above signs, along with spotty brood patterns, bees dying on emergence (often with tongues sticking out), and melted white brood that can resemble European Foulbrood.

Identification of Hive Pests

Two common honey bee hive pests are small hive beetles and wax moths. In far northern climates, they are mainly pests of stored comb. Small hive beetles can harm live colonies, especially in warm, humid regions.

Prevention tips: keep comb on live colonies during summer, maintain strong colonies, avoid giving colonies too much space, clean up deadout equipment, store equipment in an unheated building in winter, and limit the size pollen patties to 4 to 8 ounces.

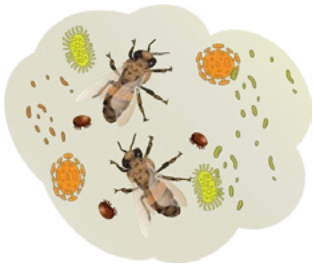
Small Hive Beetle Adult and Larvae

Adults are about 6 mm by 3 mm in size, with clubbed antennae and often hide in dark corners of the hive. Larvae infest pollen patties and comb.

Wax Moth Adult and Webbing

Adults are grayish in color and can infest hive equipment. Larvae make distinctive webbing lines in wax comb.

Identification of Brood Diseases



The ability to look past bees on the comb to observe brood within cells is critical in identifying signs of diseases. If you see any signs of disease, take good pictures and reach out to a trusted beekeeper or mentor.

Definition of terms:

- **Name of disease:** Common name of the honey bee brood disease.
- **Stage of brood affected:** “Open” refers to larvae. “Sealed” refers to pre-pupae and pupae, which is the stage after the developing bee is sealed over with a wax cap. You will see the developing bee for diseases that affect sealed brood when the bees remove the cap or don’t cap the cell.
- **Season most common:** When a disease is typically observed by beekeepers in northern climates. However, these signs can be found any time of year brood is present and scale can be found any time.
- **Description of signs:** Visual signs that help with a correct diagnosis of a disease. All the listed brood issues can eventually lead to a poor brood pattern.

Disease Diagnostic Testing

Use field tests to confirm the presence of American or European foulbrood and differentiate between the two diseases: matchstick test, lateral flow diagnostic kits, and the Holst milk test. Learn more about testing and identifying diseases: z.umn.edu/HoneyBeeDiseases

Laboratories across the U.S. take and process samples from beekeepers. Services include testing for pathogens and parasites, pesticides, queen quality, Africanized bees, and pollen identification: z.umn.edu/HoneyBeeDiagnosticServices

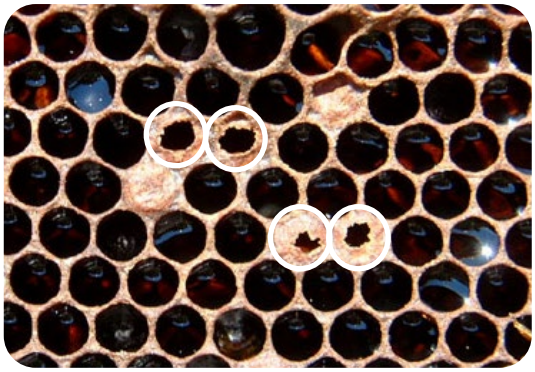
The **USDA ARS Bee Research Laboratory** offers free pathogen testing (shipping costs not included). You can send swabbed brood samples or comb containing brood to test for American or European foulbrood. Upon request, the lab can also test brood or adult bees for other pathogens. For sample submission instructions, visit: z.umn.edu/USDABeeLab

American Foulbrood (AFB)

Stage of brood affected: sealed brood

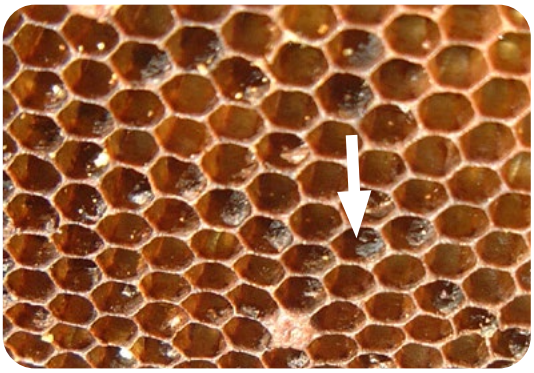
Season most common: Any

Look for sunken or greasy brood cell caps (arrows) and brown, sunken pre-pupae or pupae (circles).



Jagged holes in brood cell caps with brown, dead brood underneath are a classic sign of AFB.

Affected brood “ropes out” over 2 mm after being stirred with a stick, then slowly withdrawn from the cell.

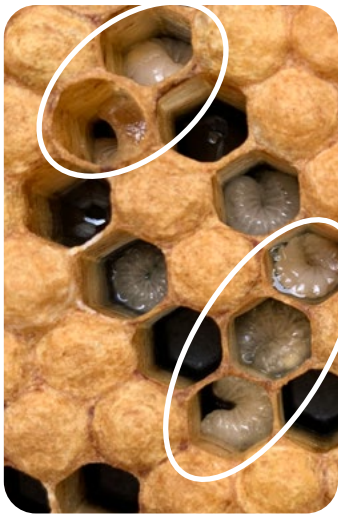


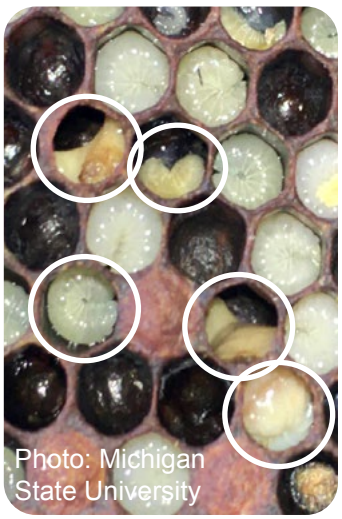
Can progress into a hard, dark scale at the bottom of a cell that is very difficult to remove and fluoresces with a blacklight.

European Foulbrood (EFB)

Stage of brood affected: open or sealed brood

Season most common: Spring





- More likely to affect larvae, but can also affect recently sealed brood
- Larvae often twisted in their cells
- Discolored brood that can be shades of off-white, yellow, or brown
- Larvae may have white lines that highlight their breathing tubes
- May have a sour smell
- Can progress into a dried scale that is easy to remove

Chalkbrood

Stage of brood affected: sealed brood

Season most common: Spring

- Hard pellets of chalk-like white, gray, or black mummies.
- Found in brood cells, on the bottom board, and/or at the colony entrance.
- Signs in the early stages of disease can include a pointy head or look melted before the clearer chalk-like signs develop.

Hard pellets of chalkbrood in cells. Can be white, gray, or black.

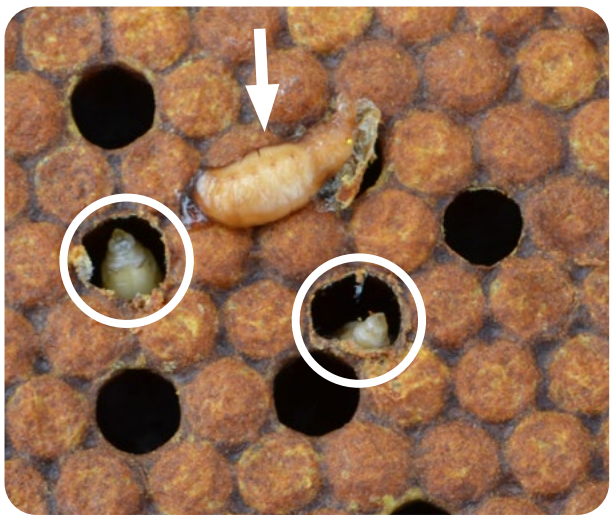
Initial stages of chalkbrood can have a pointy head or look melted.

Grey and white chalkbrood mummies on the bottom board at the entrance of a colony.

Sacbrood

Stage of brood affected: sealed brood

Season most common: Spring into summer



- Holes in cell cappings.
- Pre-pupa has a rubbery, sac-like skin filled with fluid. This is noticeable when a pre-pupa is pulled out of its cell with a forceps.
- Affected brood has a pointy head and is off-white, yellow, brown, or black.
- Can progress into a dried scale that is easy to remove.
- Can look like early stage chalkbrood.

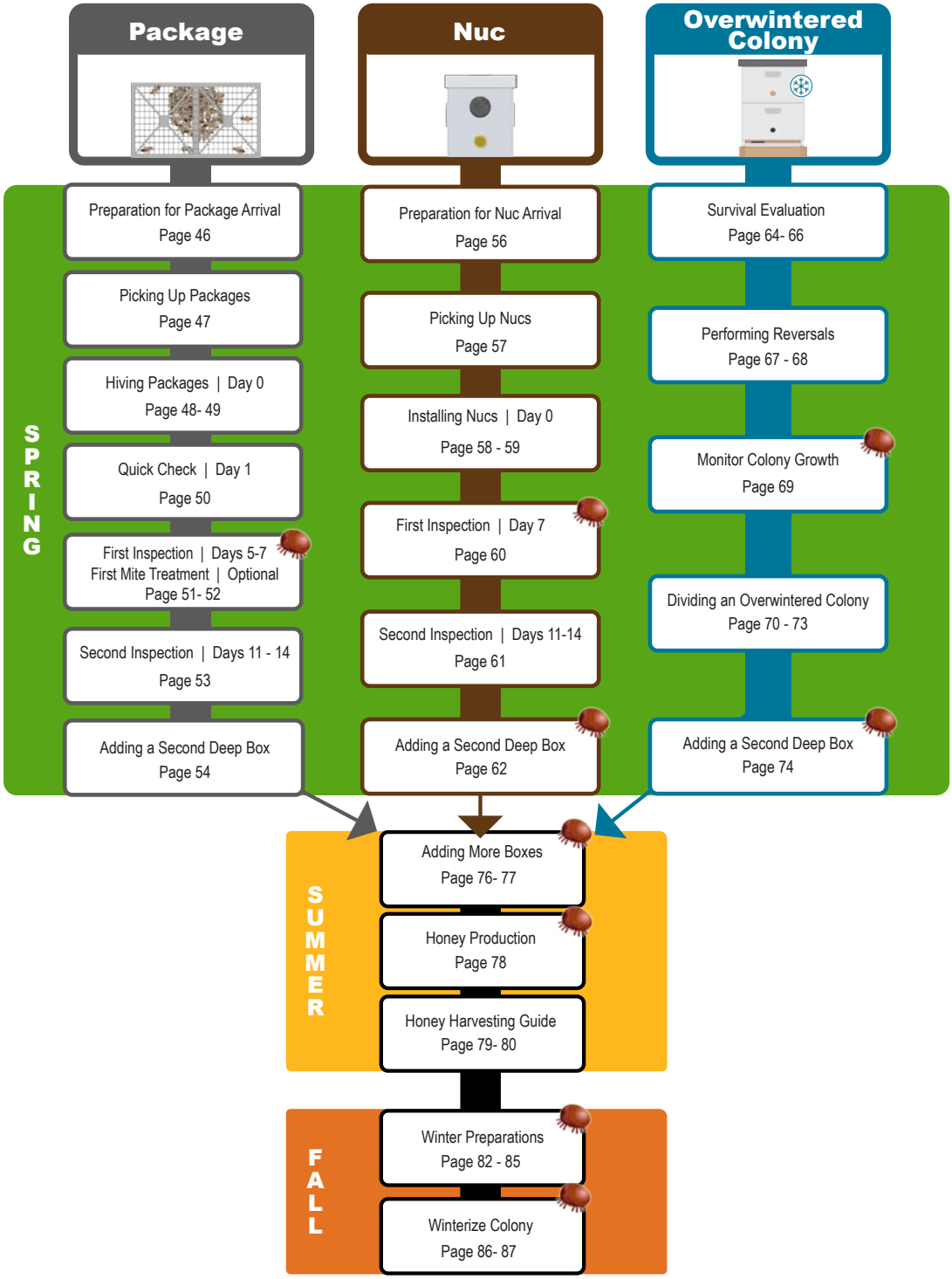
PART TWO
Management Guide

Varroa Mite Management

Keeping honey bee colonies means you also keep varroa mites. Make a plan to keep varroa levels low over the full year and test your colonies to check that your plan is working.

Beekeeping Management Paths

Follow your colony throughout the seasons. Choose a path based on how you are starting your year: with a package, nuc, or overwintered colony. The beginnings for each path start a little different and merge once the colony grows.



Varroa Mite Management

Varroa Mite Management Plan

Keep varroa levels lower than 1% (3 mites in a 300 bee sample) year-round to give your bees the best chance of survival. Varroa management practices change over time with new research on pathogen transmission and efficacy of varroa controls. See our website for updated recommendations on how to monitor and manage varroa: z.umn.edu/VarroaMonitoring

Varroa Population Dynamics

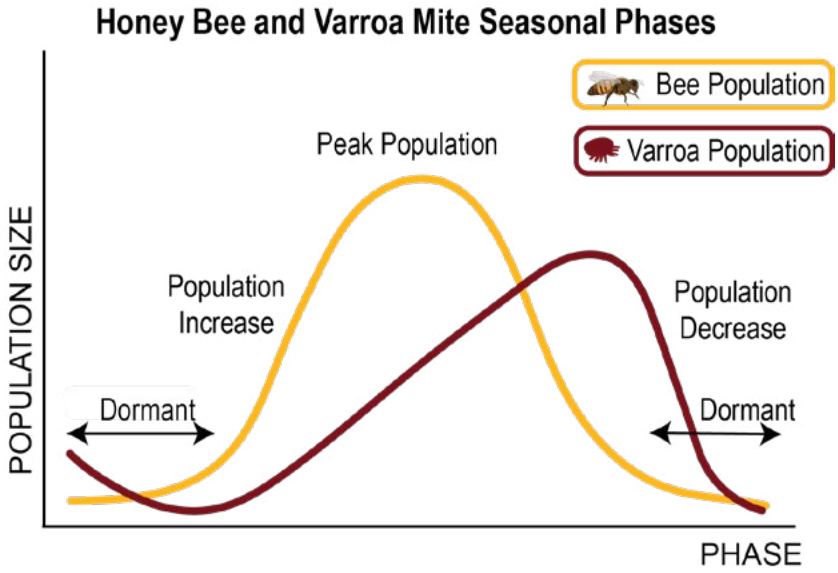
Varroa feed on honey bee worker and drone adults and developing brood. They travel on adult bees within and outside the colony and reproduce on brood. As honey bee colony populations grow, so do varroa populations.

Expect higher varroa levels in:

- Colonies with large brood nests, especially with many drones.
- A warm year with a long period of brood production.
- Locations with high varroa migration (i.e., areas with colonies not managed for varroa).

Use different varroa management strategies based on the seasonal phase of your honey bee colony (graph and terms adapted from the Honey Bee Health Coalition's TOOLS FOR VARROA MANAGEMENT guide, version 2022; z.umn.edu/HBHCVarroaGuide):

- **Population increase:** in spring as the queen lays more eggs and the colony grows.
- **Population peak**: in summer during the height of honey production and bee population.
- **Population decrease**: in late summer and into fall as there is less brood and the colony decreases in size.
- **Dormant**: in winter or an extreme lack of forage when there is little or no brood in the colony.



Testing for Varroa

Test to confirm your management plan is working, not to decide whether or not to manage. Use testing to monitor mite level changes over time.

When to test?

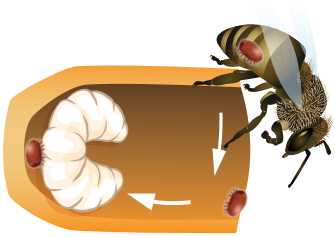
- Begin testing in the spring when populations increase and your colony has at least 8 seams of bees. Test monthly through peak population and population decrease. Do not test when the bees are in the dormant period.
- Test before and after varroa management to check that your strategy worked.

What does the varroa number mean?

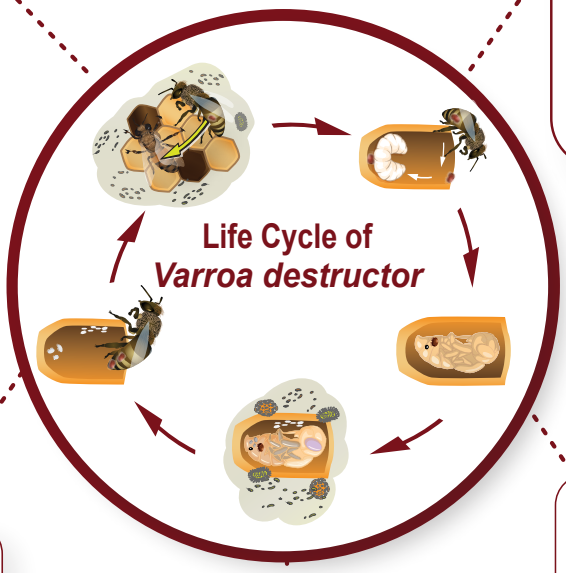
Aim to keep varroa levels below 1% year round (fewer than 3 varroa in a 300 bee sample). Manage varroa promptly with a treatment if levels are above 2%.

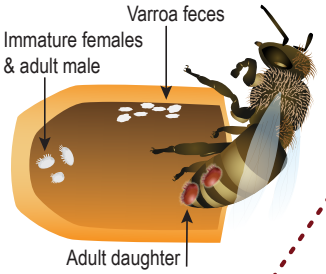
Varroa destructor Reproduction

Transmission
Adult female varroa mites move among adult bees, feeding on them and transmitting viruses.

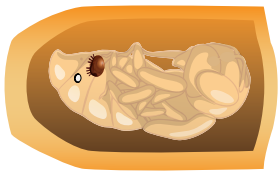


Cell Invasion
A female mite enters a cell with a larva just before its cell is capped over with wax. Varroa can reproduce as long as there is sealed brood in the colony.





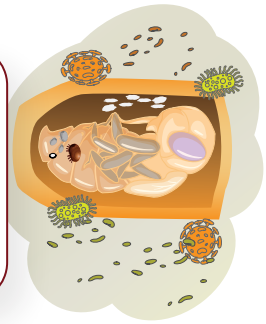
Emerges
When the bee emerges, the original mite can emerge along with one or two adult daughters.



Lays Eggs
Sixty hours after capping, the female mite lays a male egg. Every 30 hours after the male, she lays a female egg.

♂ In drone cells, two to three adult daughters can emerge with the original female.

Feeds on Pupa
When a mite feeds on a pupa, she can transmit viruses. This feeding leads to a bee with a compromised immune system, reduced longevity, and greater susceptibility to other stressors.



How to Test for Varroa Mites

Link to this brochure: z.umn.edu/VarroaMonitoring
Supplies needed: plastic tub, 1/2 cup, 1-pint canning jar, canning jar band for lid. caning jar solid lid, canning jar lid made with #8 hardware mesh, alcohol, timer, and a towel.

STEP BY STEP INSTRUCTIONS

How to test a colony for varroa mites using the alcohol wash method.

1

Fill pint jar 3/4 full of 70% or 91% rubbing alcohol.

2

Find a frame of bees with **open and sealed brood.**

If **queen** is present, **move** her off the frame or select different brood frame.

3

Place tub on top of frames.

Remove bees from the frame into the tub with a hard shake.

Alt method: Gently run flat edge of scoop down backs of the bees. Bees will tumble into scoop.

4

Pour or scoop 1/2 cup of bees from tub into measuring cup.

1/2 cup ≈ 300 bees

Tip: Tap measuring cup on hard surface after scooping to knock bees down and ensure a full 1/2 cup bees.

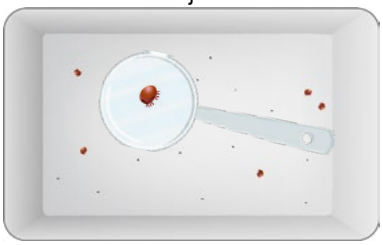
5

Pour bees into jar containing alcohol and secure with **solid lid**.

Shake and swirl bees strongly for **one minute**.

6

- Switch to **mesh lid**. Swirl alcohol and bees, then invert jar over tub to pour out the alcohol. Shake jar to release additional mites.
- Wash bees again. Pour the alcohol from tub back into jar with bees, keeping out any varroa already found.
- Repeat washing bees until no additional mites fall out when you invert and shake jar.



Count varroa in tub.

Tip: You can use water instead of alcohol for additional washes.

7

$$\frac{\text{TOTAL \# MITES}}{3} = \text{\% MITES ON ADULT BEES}$$

E.g., 6 mites divided by 3 estimates a 2% mite infestation on adult bees

Tip: For best estimate, count number of bees and use this formula:

$$\text{\% MITES ON ADULT BEES} = \frac{\text{\#MITES}}{\text{\# BEES}} \times 100$$

8

Manage varroa with a treatment if levels are above the threshold.

Varroa Action Thresholds

Colony Phase	IMMEDIATE CONTROL NOT NEEDED	CONTROL PROMPTLY
Spring Population Increase	<1%	>1%
Summer Peak Population	<1%	>2%
Late Summer Population Decrease	<1%	>2%

Modified from: The Honey Bee Health Coalition, honeybeehealthcoalition.org
Thresholds as of July 2025

9

Remove any mites and dry out tub before performing another test or storage.

Tip: Strain alcohol of debris and mites, then store in a spare jar and reuse for the next test.

Varroa Management Strategies

Non-Chemical Controls

Employ non-chemical controls to lower your colony's varroa growth. These require a solid understanding of honey bee biology and management. Varroa testing using an alcohol wash is recommended for beekeepers using non-chemical controls for close monitoring of varroa populations. Most beekeepers will still need to integrate treatments to control varroa effectively.

Varroa Resistant Bee Stocks

Use varroa resistant stock. Bee breeders can select for stocks of bees with varroa-resistant behaviors, including varroa sensitive hygiene (VSH), non-reproductive varroa, grooming, or just low overall varroa growth. Use queens that are selected and bred from resistant stock.

Drone Brood Trapping

Use drone brood as a lure for varroa.

To a brood box, add a frame with many drone-sized cells, a drone foundation frame, or a medium frame where the bees can draw drone comb on the frame bottom. Mark the frame. Return once the drone brood is capped, but before the drones emerge. Remove and freeze it for 48 hours, or feed to the birds. Put another drone frame back in. Can reuse a frozen frame and let the bees clean out the drones. Repeat process multiple times for better efficacy.

Considerations:
- Must stick to a hard calendar.
- Colony food and labor resources used to produce drones.
- Only works when the colony is rearing drone brood (spring and summer).

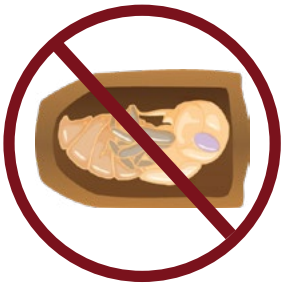
Brood Breaks

A brood break is when there is an interruption in the queen laying eggs. A period with no sealed brood can slow varroa reproduction.

Brood breaks occur when:
- Queen is caged or removed
- Colony requeens itself
- A beekeeper requeens a colony with either a queen cell or virgin queen
- Queen naturally stops laying (e.g., in late fall)

Pair a brood break with a varroa treatment to increase efficacy. This works because all the varroa are exposed on adult bees and not protected under the sealed brood.

Considerations:
- Can slow colony growth and reduce honey production.

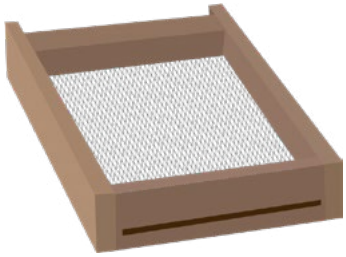


Screened Bottom Board

Bottom board made with #8 hardware mesh/cloth. Varroa that fall off bees drop below the screen.

Not effective for control of varroa. Can be used to monitor mite levels. Not accurate as an alcohol wash, but better than not monitoring. Place a sticky board under the screen for 5 to 7 days, then count fallen mites. Use to track mite population changes over time and to compare the mite drop before and after a treatment to check efficacy.

Considerations:
- Some varroa treatment products require a closed screened bottom board.
- Replace before winter.
- Hard to see mites among hive debris.
- Whole colony test, so not comparable to mite wash.



Treatments

Treatments are currently the fastest way to reduce varroa populations. To prevent varroa from developing resistance to product, use synthetic chemicals only as a last option, rotate active ingredients, and always follow label instructions. Use the fewest treatments necessary to maintain effective varroa control.

When to treat for varroa?

Monitor varroa levels and adjust your plan as needed to minimize treatment frequency while maintaining control. Keep varroa levels low year-round for the best chances of colony survival. (Terms adapted from the Honey Bee Health Coalition's TOOLS FOR VARROA MANAGEMENT guide, version 2022).

- **Population increase (spring)**: Early varroa levels influence summer growth. Give colonies a strong start by treating before the population reaches its peak. Even if tests (e.g., alcohol wash) show low levels, treat proactively as spring tests can underestimate the population, especially when a large percentage of mites are hidden under the brood cell cappings.
- **Population peak (summer):** Management can be harder now due to large bee populations, temperature, and honey supers. If spring treatment was highly effective and there is low mite transmission from other colonies, summer treatment may not be needed but otherwise, it's critical.
- **Population decrease (late summer or early fall)**: Ensure low varroa levels *before* winter bee production. Manage varroa before the end of the main nectar flow. In the case of a late nectar flow, use treatments safe for honey supers or delay if varroa are well under control. Allow time to check treatment success and re-treat if needed.
- **Dormant (winter)**: Treat when no sealed brood is present to "clean up" varroa in the winter cluster and reduce the levels the bees start with in spring.

Choosing a treatment product

Use the **table** on the following page to select a treatment. The table summarizes important information from the product label, but is not a replacement for the label. **Always read and follow the label.**

The table is based on the "Integrated Pest Management (IPM) for Varroa mites" (Version 7, May 2024) publication by the Massachusetts Department of Agricultural Resources, University of Massachusetts, and Maine Department of Agriculture, Conservation, and Forestry. Find the PDF at z.umn.edu/IPMforVarroa

Important instructions to look for on the label:

Personal Protective Equipment (PPE)

- All require protective gloves, close-toed shoes, socks, long pants, and long sleeves. Some products require goggles or a face shield. Others require a respirator. Confirm you have all required PPE.

Directions for Use

The label explains how much product and how to apply it. Check for:

- Application method: number of applications, treatment duration, and directions for application.
- Seasonal guidance: temperature limits, brood presence, and honey super compatibility.
- Usage restrictions: bee activity level, max yearly applications, and minimum colony size.

Where do I find a copy of the label before I buy a product? Are there new products?

For the most up-to-date list of approved varroa treatments and their labels, visit: z.umn.edu/EPAvarroa

Varroa Treatment Table

Use this table to identify a treatment, then read the product label. For best practices, prioritize using essential oil-based or organic acid-based treatments over synthetic chemicals. Products current as of summer 2025. Visit visit z.umn.edu/EPAvarroa for a current list of registered products and their labels.

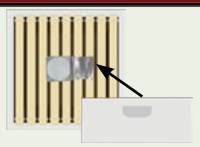
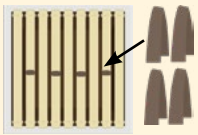
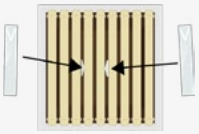
	Product name Active ingredient Mode of action	Temp restrictions Other restrictions	Kills mites in sealed brood? (due to treatment duration or fumigation)	Safe with honey supers? Treatment duration?	Application Type	Personal Protective Equipment
Essential Oils	Apiguard Thymol Fumigant	60–105°F Use when bees are active	Yes	No 4–6 weeks	 Place an empty super or >1/4" rim on top.	
Essential Oils	ApiLife VAR Thymol Fumigant	64–95°F	Yes	No 26–32 days + wait 4 weeks to add supers		
Organic Acids	Formic Pro Formic Acid Fumigant	50–85°F on first day, avoid >92°F during first 3 days Minimum colony size of 6 frames of bees.	Yes	Yes		 Respirator suggested
Organic Acids	VarroxSan Oxalic acid Contact	More effective when bees are active	Yes	Yes, separate treatment from honey supers by at least one chamber (box)	 1 strip per 2.5 frames of bees.	
Organic Acids	API-Bioxal or EZ-OX Oxalic acid Contact, fumigant	Avoid opening colony if below 40°F	No	Yes		
Organic Acids	HopGuard 3 Hop beta acids Contact	52–92°F	Some	Yes	 1 strip per 5 frames of bees.	
Synthetic	Apivar or Apivar 2.0 Amitraz Contact	No	Yes, but evidence of varroa resistant to amitraz in U.S.	No Apivar: 42-56 days + wait 2 weeks to add supers. Apivar 2.0: 42-70 days	 1 strip per 5 frames of bees (image of Apivar).	

Table is based on the "Integrated Pest Management (IPM) for Varroa mites" (Version 7, May 2024) by Massachusetts Department of Agricultural Resources, University of Massachusetts, and Maine Department of Agriculture, Conservation, and Forestry

Varroa Mite Treatment Plan

Action Plan

- Begin testing in the spring when populations increase and a colony has at least 8 seams of bees. Continue testing monthly through peak population and population decrease. Cease monitoring during the dormant season.
- Aim to keep varroa levels below 1% (fewer than 3 mites in a 300 bee sample). Manage promptly with a chemical treatment if 2% (6 mites in a 300 bee sample) or over.
- Use non-chemical control methods to reduce varroa population growth.
- Test for varroa before a treatment and after a treatment is complete to check the efficacy.

Varroa Treatment Checklist

□ Consult the table and select a product based on:

- If brood is present or not.
- Any temperature restrictions.
- If honey supers are present or will be before the treatment ends.
- Size of colony population.

□ Read the selected product label before use.

Beekeeping Tips

- For temperature dependent treatments, check the forecast to ensure it stays within the label's specified range.
- Add a calendar event to remind you to remove a treatment or apply a second treatment.
- Varroa mites prefer drone brood. As you separate brood boxes, check drone pupae for varroa in burr comb or use a capping scratcher to inspect sealed drone cells. While not precise enough to gauge infestation levels, finding no mites in drone brood is a positive sign.

Equipment

□ Varroa treatment product

□ Personal protective equipment as specified on the treatment label

□ Any additional equipment required for the application of the product (e.g., a syringe for oxalic acid dribble, a vaporizer for oxalic acid vaporization, or a rim at least 1/4" deep for Apiguard)

Record in your Journal

- What were your varroa levels before and after the treatment?
- What product did you use and why?

Spring | Package Management

Winter and Early Spring | Preparation for Package Arrival

For a smooth start, get ready before the bees arrive.

Action Plan

- Prepare your apiary and equipment to receive the packages.
- Plan for the year by making a varroa mite management plan.

Checklist

- ☐ Select an ideal apiary site and fill out your Apiary Location sheet (page 91).
- ☐ Learn about nectar and pollen producing plants in your area and when they tend to bloom.
- ☐ Order packages in winter. Packages normally arrive in April or early May.
- ☐ Acquire and prepare equipment you will need throughout the bee year (pages 7–8).
- ☐ Make a varroa management plan (pages 38–44).
- ☐ Decide if you are going to keep bees using the two-deep or three-deep system.

Beekeeping Tips

- Think about what your apiary will be like at different times of the year. *Muddy in the spring? In your dog's favorite napping spot during the summer?* Evaluate your potential apiary site during each season to identify moisture, activity levels, and access issues.
- Acquire and prepare all of the equipment you will need per colony prior to getting your bees. Colonies grow at different rates and you may need additional boxes, frames or other equipment sooner than you think.

Learn more in the Beekeeping in Northern Climates Manual

"Colony Life Cycle" pages 14–17 | "Personal Equipment" page 27 | "Equipment" pages 28–41
"Selecting an Apiary Site" pages 42–43 | "Appendix A: The Two-Deep System" pages 111–115

Record in your Journal

In your Apiary Location sheet, note:

- What does your apiary site look like? Do you plan to make any improvements?
- What do you think your biggest challenge with the apiary site will be, if any?
- Do you have any equipment left to acquire?

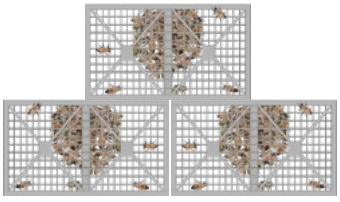
In your Colony ID Cards, note:

- What type of queens did you order in each package?
- Where did you purchase your packages from?
- How many pounds of bees were in your packages?

Your apiary site

Colony Milestone

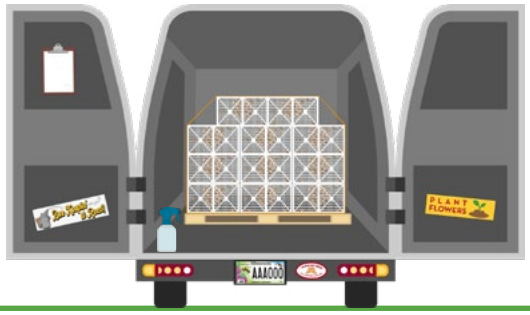
Packages arrive.



NEXT
Early Spring | Picking up Packages

Early Spring | Picking Up Packages

The package bees arrive. Package pick-up day is exciting for new and seasoned beekeepers alike!



Action Plan

- Collect hive equipment.
- Pick up the packages.

Checklist

- □ Collect all hive equipment for each colony. Set it up beforehand to make sure all the equipment is ready to go and to familiarize yourself with how it fits together.
- □ Transport packages inside a vehicle or in a truck bed if temperatures are above 60°F.
- □ ***Hive packages as soon as conditions allow. IF you can't hive packages the same day as pick-up, reduce stress to the bees by:***
  - Spraying 1:1 sugar syrup through the package screen or mesh at least twice a day to feed the bees. Do not soak the bees. Do not rely on the syrup can.
  - Keeping packages in a well-ventilated, cool, dark place (55°F to 70°F).

Beekeeping Tips

For Transporting packages:

- Use a tarp under the packages as they are often sticky and syrup can spill.
- Gently brush bees from the outside of each package with a bee brush or a bouquet of grass.

- Do not panic if a few bees escape; they generally fly to the windows.
- Secure the packages during the drive home to prevent them from tipping over.

Learn more in the Beekeeping in Northern Climates Manual

"Preparing and Setting-Up a Hive" page 47 | "Transporting the Package" and "Taking Care of the Package After Arrival" page 48

Equipment

- □ Prepare full set of hive equipment for each package:
  - □ deep brood box
  - □ 10 frames with foundation or 9 frames with drawn comb
  - □ bottom board
  - □ entrance reducer
  - □ inner cover
  - □ empty deep box
  - □ telescoping cover

- □ Drill a 7/16- to 1-inch ventilation hole in the deep box.

- □ Spray bottle filled with 1:1 sugar syrup if not able to hive the packages right away

Record in your Journal

In your Colony ID Cards, note:

- How did the pick up go?
- Anything you would do differently next year?

Colony Milestone

You picked up your packages.

NEXT
Early Spring | Hiving Packages

Early Spring | Hiving Packages

Day 0

Action Plan

- Set up the hive equipment for each package at your apiary.

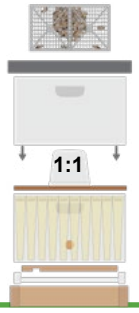
Beekeeping Tips

- Wear a veil. No need for a smoker.
- Lightly coat, never soak, the bees with sugar syrup, especially when cold. If chilly, use warm 1:1 sugar syrup. If cold, spray the frames instead of the bees. Adjust the nozzle and pressure of the spray bottle to mist evenly and gently. Test to be sure the spray is a gentle mist and not a squirt gun before using it on the bees.
- Ensure that the queen is alive in the cage before "dumping" the bees. Put the live queen in a safe location, like your pocket. If she is dead, replace the sugar can in the package and contact your package supplier immediately.
- If the feeder bucket is leaking, first make certain that the lid is securely sealed. If it is still leaking, use a level and small stick or shim to level the bucket.
- Tilt the hive slightly forward so water doesn't pool on the bottom board when it rains.

Learn more in the Beekeeping in Northern Climates Manual
"Hiving packages" pages 47-51 | "Releasing the Queen in the Package" page 50

Equipment

- ☐ Standard gear to bring each time: hive tool, veil, gloves if desired
- ☐ Hive set up for each colony
- ☐ Spray bottle filled with warm 1:1 sugar syrup
- ☐ Feeder bucket filled with 1:1 sugar syrup
- ☐ Empty deep box to protect feeder bucket
- ☐ Pollen patty, 4 to 8 ounces
- ☐ Rock, brick, or ratchet strap to secure telescoping cover



Video

Hiving a package in the snow and sleet:
z.umn.edu/HivingAPackage

SCAN TO WATCH

Record in your Journal

In your Colony ID Cards, note:
- What day did you hive packages (date you started the colonies)?
- Names of your new colonies.

In your Colony Inspection sheets, note:
- What was the weather like?
- How did you release the queen?
- Is there anything you would do differently next time?

Package of bees | Bees inside the hive

Colony Milestone

You hived your packages.

NEXT
Early Spring | Quick Check After Hiving Packages

How to Hive a Package

1. Assemble Hive Equipment

Set up hive stand, bottom board, box with frames. Remove 4 frames from the center of the box. Place entrance reducer to its smallest opening and plug loosely with grass.

Set aside:

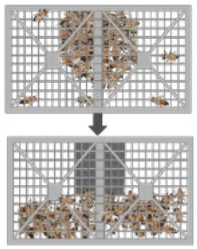
- 1:1 sugar syrup feeder pail
- empty deep box
- inner cover
- telescoping cover
- pollen patty

2. Spray Bees

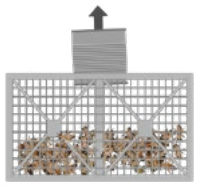
Spray bees with light 1:1 sugar syrup through the cage. If cool temperatures, mist the frames instead of the bees.

3. Remove Feeder Can

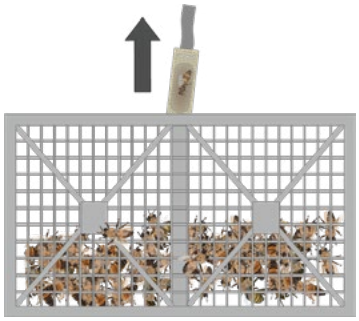
Tap the package on the ground to dislodge the bees to the bottom of the package.



Remove feeder can of syrup. If bees fly out of the opening, spray mass of bees in the package with more sugar syrup.



4. Remove Queen Cage



Remove queen cage and put queen in a safe place. If hiving in cool weather, a warm pocket is a good option.

5. Shake Bees Into Hive

Shake bees into hive either through syrup can opening or the door on the side of the package. Tip the package from side to side as you shake to get the bees out.

6. Spread Bees Out

Carefully spread bees out on the bottom board with your hive tool.

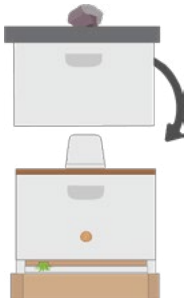
7. Introduce the Queen

Place queen in colony using your preferred release method.

8. Replace Frames and Feed Pollen Patty

Put a pollen substitute patty on top of the frames. Do not block access to the syrup feeder. Replace the inner cover.

9. Feed Sugar Syrup and Close Up Hive



✓ Feed light 1:1 sugar syrup. Turn the feeder pail upside down away from the hive to allow the syrup flow to slow. Place over part of the inner cover. *Make sure the pail is not leaking.*

✓ Close up your hive and keep the cover in place using a rock.

✓ The following day, check that the bees are underneath the feeder pail, the bees are accessing the sugar syrup, and the pail is not leaking.

Early Spring | Quick Check After Hiving Packages

Do a quick check of each colony to make sure the bees are okay.

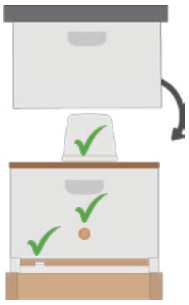
Day 1

Action Plan

- Check the feeder bucket, bee cluster, and grass plug.

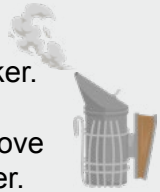
Checklist

- □ Remove any grass still in the hive entrance. Leave the cork in the deep box.



- □ Ensure the feeder bucket isn't leaking by checking for pooled syrup on the inner cover. Level the bucket with a small stick if necessary.
- □ Check that the colony can access the sugar syrup. Look for bees centered beneath the feeder bucket under the inner cover opening. *No need to remove the inner cover if you see bees through the hole*.

_IF_ you can't see the bees under the feeder bucket:



1. Put on your veil and light a smoker. Puff a little smoke through the opening of the inner cover. Remove the feeder bucket and inner cover.
2. Gently center the bees by shifting frames. Remove the outermost frame on the side opposite where the bees are clustered, then place that frame in the outermost position on the opposite side of the box. Continue shifting empty outer frames, one at a time, to the other side of the box until the frames with bees are in the center. Avoid disturbing frames where the bees are clustered.

3. Replace the inner cover, feeder bucket, empty box protecting the feeder bucket, and cover.

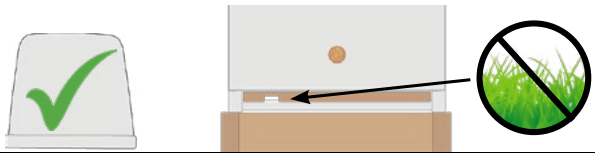
Record in your Journal

- Did you remove grass from the entrance?
- Were the bees centered under the feeder bucket?
- Did the feeder bucket leak?
- Were the bees flying?

Top of inner cover with feeder bucket

Colony Milestone

Confirmation that the bees are accessing sugar syrup, the feeder bucket isn't leaking, and the entrance is clear of grass.



NEXT
Early Spring | First Inspection After Hiving Packages

Learn more in the Beekeeping in Northern Climates Manual

"One Day After Hiving a Package or Nuc" page 55 | "Orientation Flights" page 63

Early Spring | First Inspection After Hiving Packages

Action Plan

- Ensure the colony is consuming the food you provided.
- Find eggs to check for a laying queen.

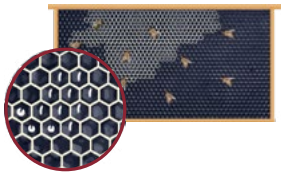
VARROA MANAGEMENT

Days 5 - 7

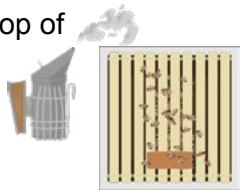
Inspection

- □ For details on how to inspect a colony, see pages 11–13.
- □ Light your smoker and put on your veil each time you open a hive.
- □ Remove the telescoping cover. Check the syrup. Ensure the feeder bucket isn't leaking. If the syrup level remains unchanged, the bees may not be accessing it. Verify that the feeder holes are clear and over the inner cover hole.
- □ Remove the empty deep hive body, feeder bucket, and inner cover. Gently puff smoke over the bees.
- □ Remove a frame from the outer edge of the box. Set that frame on its end outside of the colony, leaning it against the hive so that the wood of the frame touches the wood of the box.

- □ Progress inward one frame at a time. Inspect, then replace each frame back in the box in its original orientation. Push inspected frames towards the wall of the box, leaving a frame-size gap between inspected and uninspected frames. This gap allows for room to gently pull out frames without rolling bees.
- □ If starting with foundation, find a frame with newly drawn comb.
- □ Find eggs to indicate the queen is present.



- □ At the end of your inspection, return all frames with bees and drawn comb to their original position and orientation in the hive.
- □ Replace the pollen patty on top of the frames, guiding the bees out of the way with smoke. Replenish patty if mostly consumed. Avoid blocking the inner cover opening.



- □ Refill feeder bucket with 1:1 sugar syrup as needed. Place the inner cover on the box, then the feeder bucket upside down over part of the hole in the inner cover. A small opening allows bees to move back into the hive if they are above the inner cover. Watch for leaks and level the bucket with a small stick if needed. Close up the hive.

- □ Fill out your Colony Inspection Report each time you inspect a colony.

Beekeeping Tips

- Wait until a day when the temperature is above 55°F to pull out frames for an inspection.
- Treat new packages with oxalic acid 5 to 7 days after hiving to reduce varroa levels.

Learn more in the Beekeeping in Northern Climates Manual

"5–7 Days Later: First Inspection" page 56–57 | "How to Light a Smoker" page 29

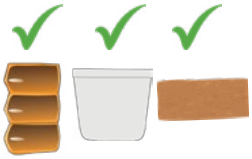
Record in your Journal

- If using foundation, how many frames had newly drawn comb?
- Were you able to see eggs?
- Did you spot the queen?
- Did you observe bees bringing back pollen?

Frame with eggs

Colony Milestone

Confirmation that the queen is laying eggs and the bees are accessing food.



NEXT

Spring | Second Inspection After Hiving Packages

Early Spring | Varroa Treatment After Hiving Packages OPTIONAL

Days 5-7

Action Plan

- Reduce the number of varroa by treating with oxalic acid. This can be done immediately after your first inspection or as a quick additional visit.
- This is an *optional* first varroa treatment after hiving **packages**.

Varroa Treatment Checklist

Apply the treatment 5 to 7 days after hiving to let the bees settle in, but before there is sealed brood.

Read and follow the instructions on the label. See pages 38–44 for information on treatments.

Oxalic acid dribble method

□ Mix the oxalic acid with 1:1 sugar syrup according to the label.

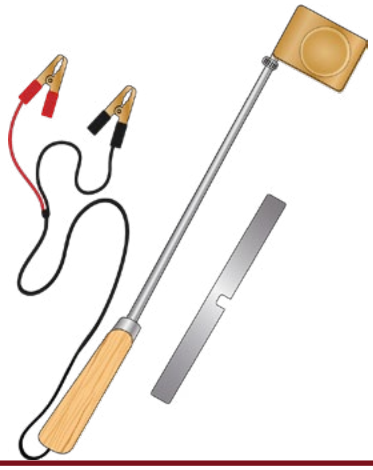
□ Practice using the syringe with only sugar syrup away from the hive until you have good control and can administer a consistent "dribble" of syrup.

□ Apply approximately **5 milliliters of oxalic acid solution per seam of bees**. Most packages will only need approximately 20 milliliters which is less than half of the maximum colony dose of 50 milliliters.

□ **Do not over treat.**

Vaporizer method

□ Follow the directions for your specific vaporizer.



Beekeeping Tips

- No brood in the colony is an opportune time to clean up varroa that arrived on the bees. Apply the oxalic acid *before* the bees seal over first of the queen's brood with wax, which protects varroa in the cells from the treatment. Reduce varroa levels in spring to help ensure the bees have a good start to the year.

Equipment

□ Oxalic acid varroa treatment product

□ Personal protective equipment as specified on the varroa treatment label

□ Equipment for dribble (1:1 sugar syrup, mixing container, mixing spoon, scale, and 50–60 milliliter syringe) or the vaporizer method (vaporizer and energy source)

Record in your Journal

- How many days after hiving did you treat?
- Did you see any sealed brood?
- How did you treat?

Spring | Second Inspection After Hiving Packages

Days 11-14

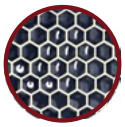
Action Plan

- Confirm that the bees are accessing the sugar syrup and pollen patty, building new comb if starting with foundation, and that the queen is laying eggs.

Inspection

- □ Ensure the feeder bucket isn't leaking by checking for pooled syrup on the inner cover. Level the bucket with a small stick if necessary.
- □ Count the number of frames with new comb if starting with foundation.

- □ Find comb with eggs and larvae.



- □ When starting with a package, you may not see sealed brood just yet.
- □ Replenish the pollen patty if mostly consumed.

- □ Refill feeder bucket with 1:1 sugar syrup as needed.

Beekeeping Tips

- To improve dexterity, progress to gloveless beekeeping. Bare hands squish fewer bees, and allow you to notice nuances in colony behavior.

- A package colony's population initially decreases but starts growing as new adult worker bees emerge 21 days after the queen starts laying eggs.
- Don't worry if you see a couple of eggs in a few cells. New queens occasionally lay more than one egg in a cell.

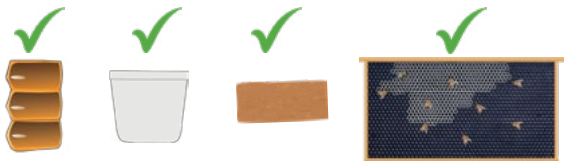
Record in your Journal

- Describe the size, shape, and color of the larvae.
- How long did the inspection take you? Were you able to keep your smoker lit for the duration of the inspection?
- Describe anything else that you saw, heard, or smelled.

Comb with eggs and larvae

Colony Milestone

Confirmation that the queen is laying eggs, the bees are accessing food, and there is newly drawn comb if you started with foundation.



NEXT
Spring | Adding a Second Box

Spring | Adding a Second Deep Box

Inspect Every 7-10 Days

Action Plan

- Inspect the colony every 7 to 10 days to ensure it is growing, queenright, and free of disease.
- Add a second deep box when the first deep box is 70 to 80% occupied by bees.
- Monitor for varroa.

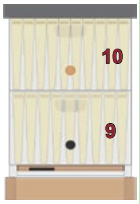
Inspection

□ As you open the hive, listen to the bees to familiarize yourself with the sounds of a colony.

□ Check the sugar syrup for mold or fermentation. Refill the feeder bucket with 1:1 sugar syrup as needed.

□ Replenish the pollen patty as needed.

□ Count the number of frame seams occupied by bees.



□ When 70 to 80% of frames are occupied by bees, add a second deep box. Adjust the entrance reducer to the larger opening. Uncork the bottom box and cork the second box. If the second box contains all foundation frames, move 1 brood-less comb frame from the bottom box to the second box, leaving **9 frames in the bottom** box and **10 in the second**.

□ Take your first varroa sample once the first deep box is at least **80%** occupied by bees. Monitor for varroa at least once per month through fall. See your varroa management plan for how to use the test results (pages 38–44).

Beekeeping Tips

- The number of inspections you perform prior to adding the second deep box will vary based on the available floral resources and how quickly your bees are growing.
- Provide space before the hive is 70% full if you won't return soon, if the bees are on drawn comb rather than foundation, or during a nectar flow. However, wait to add a box if the forecast includes many cool nights below 45°F. Space above the cluster in cold weather can hinder colony growth.
- Feed pollen patty until you see pollen stored around the brood nest and pollen is reliably coming in from the landscape.
- Stop feeding 1:1 sugar syrup when all of these are true:
  - ✓ A continuous supply of nectar is available from flowers in the environment.
  - ✓ The colony has at least two full frames of stored sugar syrup, nectar, and/or honey.
  - ✓ There is wax comb throughout the first deep brood box if starting with foundation.

Learn more in the Beekeeping in Northern Climates Manual

"Inspections from Spring to Summer " pages 59–67 | "Do the bees need room to grow?" page 64

Equipment

□ Second deep box with 9 frames

□ 1:1 sugar syrup as needed

□ Pollen patty as needed

□ Varroa testing kit

Record in your Journal

- Is the colony's population increasing?
- What colors of pollen did you see?
- Describe anything else that you saw, heard, or smelled.

Frames from above (inner cover removed)
Eggs, larvae, and sealed brood

Colony Milestone

The queen is laying eggs and you added the second deep box.

NEXT
Spring & Summer Management | Adding more Boxes
on page 76

Spring | Nuc Management

Winter and Early Spring | Preparation for Nuc Arrival

For a smooth start, get ready before the bees arrive.

Action Plan

- Prepare your apiary and equipment to receive the nucs.
- Plan for the year by making a varroa mite management plan.

Checklist

- □ Select an ideal apiary site and fill out your Apiary Location sheet (page 91).
- □ Learn about nectar and pollen-producing plants in your area and when they tend to bloom.
- □ Order nucs during the winter months. Nucs are normally available in Minnesota from May through June.
- □ Acquire and prepare equipment you will need throughout the bee year (pages 7-8).
- □ Make a varroa management plan (pages 38-44).
- □ Decide if you are going to keep bees using the two-deep or three-deep system.

Beekeeping Tips

- Think about what your apiary will be like at different times of the year. *Muddy in the spring? In your dog's favorite napping spot during the summer?* Evaluate your potential apiary site during each season to identify moisture, activity levels, and access issues.
- Acquire and prepare all the equipment you will need per colony before getting your bees. Colonies can grow at different rates and you may need additional boxes, frames or other equipment sooner than you think.
- Base your expectations for colony growth on the time of year you will receive the nuc:
  - If you start with all drawn comb and receive your nuc in early spring, expect that colony to grow into two or three deeps and maybe make some honey.
  - If you start with all new foundation and receive your nuc in later spring or in summer, expect that colony to grow into one or two deeps and make honey the following year. Feed sugar syrup to any colony starting on foundation.

Learn more in the Beekeeping in Northern Climates Manual

"Colony Life Cycle" pages 14–17 | "Personal Equipment" page 27 | "Equipment" pages 28–41
"Selecting an Apiary Site" pages 42–43 | "Appendix A: The Two-Deep System" pages 111–115

Record in your Journal

In your Apiary Location sheet, note:

- What does your apiary site look like? Do you plan to make any improvements?
- What do you think your biggest challenge with the apiary site will be, if any?
- Do you have any equipment left to acquire?

In your Colony ID Cards, note:

- What type of queen did you get in each nuc?
- Where did you purchase your nucs from?

Your apiary site

Colony Milestone

Nucs arrive.

NEXT
Spring | Picking up nucs

Spring | Picking Up Nucs

Nuc pick-up day is exciting for new and seasoned beekeepers alike!

Action Plan

- Collect the hive equipment.
- Pick up the nucs.

Checklist

- ☐ Collect all hive equipment for each nuc. Set it up beforehand to make sure all the equipment is ready to go and to familiarize yourself with how it fits together.
- ☐ Transport nucs in a truck bed or inside a vehicle. Secure to prevent tipping and position the box lengthwise to prevent the frames inside from swinging into each other. Use a ratchet strap or similar to keep the lid on if necessary. Secure the nuc entrance with a vent or mesh screen that allows airflow. If inside a vehicle, point the AC at the nucs to prevent bees from overheating.
- ☐ Move your nucs to their permanent locations and place them next to or on top of your hive equipment. Open the entrances to let the bees fly for 1 to 2 hours before installation. You can return the next day if needed. Bees will orient to their hive location once they begin flying.
- ☐ If nucs can't immediately be placed in their permanent location, put them at least three miles away to prevent foragers from returning to the temporary spot. Open the nuc entrance for free flight. When ready to relocate, close the entrances during non-flying hours (dark, cold, or rainy weather), then move the nucs.

Beekeeping Tips

- Enclose the nuc in a large, mesh laundry bag to keep any escapees from getting loose inside your vehicle on the drive home. Be sure to close the nuc's entrance before placing it in the mesh bag.
- Do not panic if a few bees escape; they generally fly to the windows.

Learn more in the Beekeeping in Northern Climates Manual

"Preparing and Setting-Up a Hive" page 47

Equipment

- ☐ Full set of hive equipment for each nuc
  - ☐ deep brood box
  - ☐ 4 to 6 frames with foundation or drawn comb, depending on number of nuc frames
  - ☐ bottom board
  - ☐ entrance reducer
  - ☐ inner cover
  - ☐ telescoping cover
- ☐ Drill a 7/16- to 1-inch ventilation hole in the deep box.

- ☐ Optional: mesh laundry bag, ratchet strap, or similar.

Record in your Journal

In your Colony ID Cards, note:

How did the pick up go? Anything that you would do the same or differently next year?

Nucs in your vehicle

Colony Milestone

You picked up your nucs.

NEXT
Early Spring | Installing Nucs

Spring | Installing Nucs

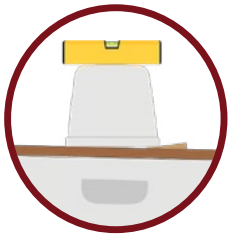
Day 0

Action Plan

- Install each nuc into a deep hive box.

Beekeeping Tips

- Feed a 4 to 8 ounce pollen patty.
- If the feeder bucket is leaking, check that the bucket lid is securely sealed. If still leaking, use a small stick or shim to level the bucket. If you're unsure about leaks or whether bees are accessing the syrup, wait as long as possible to check the bucket before leaving the apiary or return the next day to inspect for leaks.

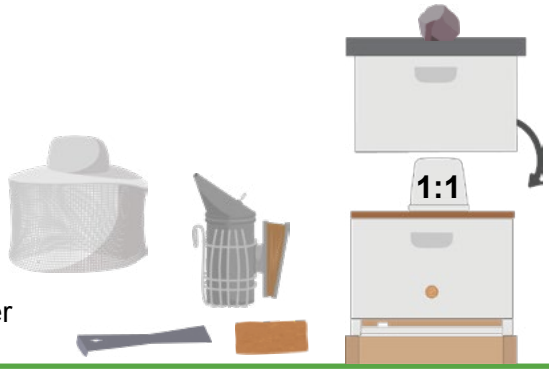


- When setting up the equipment, tilt the hive slightly forward so water doesn't pool on the bottom board when it rains.

Learn more in the Beekeeping in Northern Climates Manual
'Hiving or "Installing" Nucs' pages 52-53

Equipment

- ☐ Hive tool
- ☐ Beekeeping veil, gloves if desired
- ☐ Smoker, fuel, lighter
- ☐ Hive set up for each colony
- ☐ Pollen patty
- ☐ Feeder bucket filled with 1:1 sugar syrup
- ☐ Empty deep box to protect feeder bucket
- ☐ Rock, brick, or ratchet strap to secure telescoping cover



Video

Video on installing a nuc:
z.umn.edu/InstallingANuc

SCAN TO WATCH

Record in your Journal

In your Colony ID Cards, note:

- What day did you install nucs (date you started the colonies)?
- The names of your new colonies?

In your Colony Inspection sheets, note:

- What was the weather like when you installed the nucs?
- Is there anything you would do differently next time?

The tops of the nuc frames inside the deep box

Colony Milestone

You installed your nucs into their new hive.

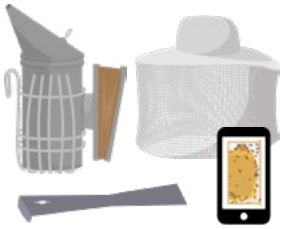
NEXT
Spring | First Inspection After Installing Nucs

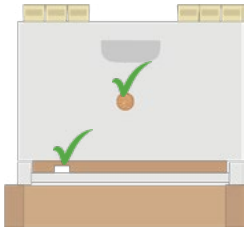
How to Install a Nuc

1. Prepare Yourself and the Hive

Set up your hive equipment. Light your smoker and put on your veil. Grab a camera to document the experience.

Move slowly and take your time to keep the bees calm.





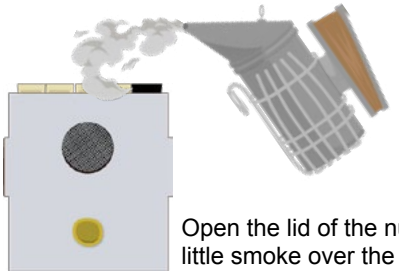
Place the nuc to the front or side of the deep box. Let the bees fly for 1 to 2 hours.

Place an entrance reducer in the hive entrance on the smallest-sized opening. Cork the ventilation hole in the deep box. If starting with comb, place any honey frames in the outermost positions on each side of the deep box.

4-frame nuc needs:
6 frames of foundation ***or***
5 frames of drawn comb

5-frame nuc needs:
5 frames of foundation ***or***
4 frames of drawn comb

2. Open the Nuc



Open the lid of the nuc box, puffing a little smoke over the tops of the frames.

Carefully check the underside of the lid for the queen and set aside once you are certain she is not there.

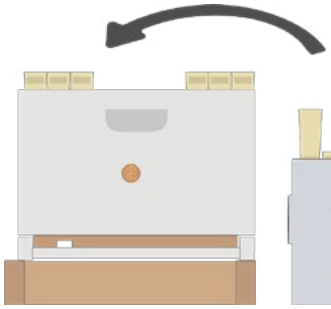
If she is present, gently herd her into the deep box with your hand.

Use your hive tool to carefully push the frames apart.

Mark the top of each nuc frame with the date using a permanent marker. Prioritize replacing these frames with new ones next spring.

3. Transfer Nuc Frames and Bees to the Deep Box

Starting with the frame closest to the outside of the nuc box, transfer each frame into the center of your deep box.



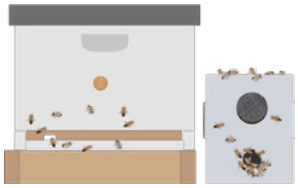
Inspect both sides of the frame for the queen.

Keep the frames in the same order they came in.

If you did not see the queen, check inside the nuc box. If you find her inside, rest the edge of the nuc box along the top of the frames and gently herd her into the deep box with your hand.

Thump the base of the nuc box on the ground, then dump the remaining bees into the deep box.

Leave the opened nuc box beside the hive to allow stragglers to find their way into their new home. If there are still bees inside the nuc when you are done in the apiary, pick it up on your next visit.

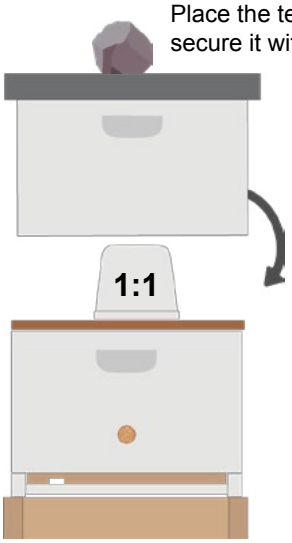


4. Provide Food and Protection

Place a **4 to 8-ounce pollen patty** on top of the frames.

Do not block the inner cover hole to allow bees access to the feeder bucket.

Place the telescoping cover on top and secure it with a rock, brick, or ratchet strap.



Add a feeder bucket filled with **1:1 sugar syrup** over part of the inner cover hole.

Leave a gap so bees left on the inner cover can find their way into the hive. *Level the feeder bucket to prevent leaks.*

Place an empty deep box over the inner cover to protect the feeder bucket.

Spring | First Inspection After Installing Nucs

VARROA MANAGEMENT

Day 7

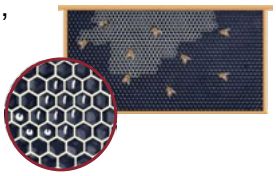
Action Plan

- Confirm that the bees are accessing the sugar syrup and pollen patty, building new comb if starting with foundation, and that the queen is laying eggs.

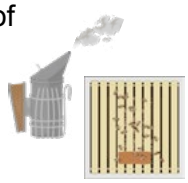
Inspection

- □ For details on how to inspect a colony, see pages 11-13.
- □ Light your smoker and put on your veil each time you open a hive.
- □ Remove the telescoping cover. Check the syrup. Ensure the feeder bucket isn't leaking. If the syrup level remains unchanged, the bees may not be accessing it. Verify that the feeder holes are clear and over the inner cover hole.
- □ Remove the empty deep hive body, feeder bucket, and inner cover. Gently puff smoke over the bees.
- □ Remove a frame from the outer edge of the box. Set that frame on its end outside of the colony, leaning it against the hive so that the wood of the frame touches the wood of the box.

- □ Progress inward one frame at a time. Inspect, then replace each frame back in the box in its original orientation. Push inspected frames towards the wall of the box, leaving a frame-size gap between inspected and uninspected frames. This gap allows for room to gently pull out frames without rolling bees
- □ If starting with foundation, find a frame with newly drawn comb.
- □ Find eggs to indicate the queen is present.



- □ At the end of your inspection, return all frames with bees and drawn comb to their original position and orientation in the hive.
- □ Replace the pollen patty on top of the frames, guiding the bees out of the way with smoke. Replenish the patty if it is mostly consumed. Avoid blocking the inner cover opening.

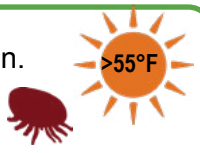


- □ Refill feeder bucket with 1:1 sugar syrup as needed. Place the inner cover on the box, then the feeder bucket upside down over part of the hole in the inner cover. The small opening allows bees to move back into the hive if they are above the inner cover. Watch for leaks and level the bucket with a small stick if needed. Close up the hive.

- □ Fill out your Colony Inspection Report each time you inspect a colony.

Beekeeping Tips

- Wait until a day when the temperature is above 55°F to pull out frames for an inspection.
- Beekeepers can treat nucs for varroa mites shortly after acquiring them.



Learn more in the Beekeeping in Northern Climates Manual

"5–7 Days Later: First Inspection" page 56–57 | "How to Light a Smoker" page 29

Record in your Journal

- If using foundation, how many frames had newly drawn comb?
- Were you able to see eggs? Spot the queen?
- Did you observe bees bringing back pollen?

Frame with eggs

Colony Milestone

Confirmation that the queen is laying eggs and the bees are accessing food.

NEXT

Spring | First Inspection After Installing Nucs

Spring | Second Inspection After Installing Nucs

Days 11-14

Action Plan

- Confirm that the bees are accessing the sugar syrup and pollen patty, building new comb if starting with foundation, and that the queen is laying eggs.

Inspection

- ☐ Ensure the feeder bucket isn't leaking.

- ☐ Count the number of frames with new comb if starting with foundation.

- ☐ Look for all stages of brood.

- ☐ Replenish the pollen patty if mostly consumed.

- ☐ Refill feeder bucket with 1:1 sugar syrup if needed.

- ☐ Optional treatment for varroa.

Beekeeping Tips

- To improve dexterity, progress to gloveless beekeeping. Bare hands squish fewer bees, and allow you to notice nuances in colony behavior.

- Do not worry if you see a couple of eggs in a few cells. New queens occasionally lay more than one egg in a cell.

- If a nuc struggles to draw comb on new frames, place an undrawn foundation frame between the outermost honey frame of the nuc and the brood nest, keeping the brood frames together in the center.

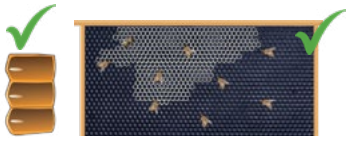
Record in your Journal

- Describe the size, shape, and color of the larvae.
- How long did the inspection take you? Were you able to keep your smoker lit for the duration of the inspection?
- Describe anything else that you saw, heard, or smelled.

Frame with eggs and larvae

Colony Milestone

Confirmation that the queen is laying eggs, the bees are accessing food, and there is newly drawn comb if you started with foundation.



NEXT
Early Spring | Mid to Late Spring | Adding a Second Box

Spring | Adding a Second Deep Box

VARROA MANAGEMENT

Inspect Every 7-10 Days

Action Plan

- Inspect the colony every 7 to 10 days to ensure it is growing, queenright, and free of disease.
- Add a second deep box when the first deep box is 70 to 80% occupied by bees.
- Optional treatment for varroa.

Inspection

- □ As you open the hive, listen to the bees to familiarize yourself with the sounds of a colony.
- □ Check the sugar syrup for mold or fermentation. Refill the feeder bucket with 1:1 sugar syrup as needed. Replenish the pollen patty as needed.
- □ Count the number of frames occupied by bees.
- □ Take your first varroa sample once the first deep box is at least **80%** occupied by bees. Manage varroa as needed.
- □ When 70 to 80% of frames are occupied by bees, add a second deep box. Adjust the entrance reducer to the larger opening. Uncork the bottom box and cork the second box. If the second box contains all foundation frames, move 1 brood-less comb frame from the bottom box to the second box, leaving **9 frames in the bottom box and 10 in the second.**

Beekeeping Tips

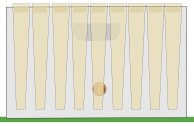
- The number of inspections you perform prior to adding the second deep box will vary based on the available floral resources and how your bees are growing.
- Provide space before the hive is 70% full if you won't return soon, if the bees are on drawn comb rather than foundation, or during a nectar flow. However, wait to add a box if the forecast includes many cool nights below 45°F. Space above the cluster in cold weather can hinder colony growth.
- Feed pollen patty until you see pollen stored around the brood and pollen is reliably coming in.
- Stop feeding 1:1 sugar syrup when: a continuous supply of nectar is available from flowers; the colony has at least two full frames of stored sugar syrup, nectar, and/or honey; AND there is wax comb throughout the first deep brood box if starting with foundation.
- Nucs can come with enough varroa to cause problems later. Reduce varroa levels in spring to help the bees have a good start.

Learn more in the Beekeeping in Northern Climates Manual

"Inspections from Spring to Summer " pages 59–67 | "Do the bees need room to grow?" page 64

Equipment

- □ Second deep box with 9 frames
- □ 1:1 sugar syrup as needed
- □ Pollen patty as needed
- □ Varroa testing kit and optional treatment



Record in your Journal

- Is the colony's population increasing?
- What colors of pollen did you see?

Frames from above (inner cover removed)
Eggs, larvae, and sealed brood

Colony Milestone

The queen is present and laying eggs and you added the second deep box.

NEXT
Spring & Summer Management | Adding More Boxes on page 76.

Spring | Overwintered Colony Management

Winter & Early Spring | Survival Evaluation | Colony Died

IF your colony died

Action Plan

- Secure the hive to prevent bees and pests from entering.
- Try to determine why the colony died.
- Decide if you would like to order bees again as a package or a nuc.

Checklist

□ Sort out the hive equipment to prepare it for future use (page 26–27). If chilly, scrape the bottom board, loosen frames to clear dead bees, then seal the equipment to prevent pests from entering and return on a warmer day to sort out the comb.

□ Try to determine why the colony died. Take notes and photos of what you see in the hive.

□ If ordering packages or nucs, use that section in this guidebook for instructions to follow the colony through the bee year (page 46 for packages or page 56 for nucs).

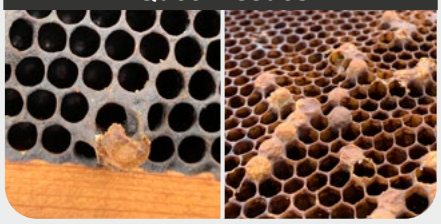
Learn more in the Beekeeping in Northern Climates Manual

"Colony Death" page 82 | "Rotating Out Old Comb" page 83 | "Entombed Pollen" page 85 | "Appendix B: Queen Problems" pages 117-126

Common Causes of Colony Death with Visible Signs

Inspect your colony for signs that may indicate cause of death. Note that the cause can be elusive, as damage can occur earlier in the year and leave no obvious clues. Some factors, like nutrition quality or sublethal pesticide exposure, leave no visual signs.

Queen Issues



Check notes for past queen issues. Inspect comb for signs of past problems. The presence of queen cells can mean the bees failed to raise a new queen. Drone brood in worker cells suggests a drone-laying queen or egg-laying worker bees.

Varroa Mites

Check your notes for past varroa levels and management. Look for varroa poop in the comb. This appears as white, paint-like marks on the ceiling of the cell where the brood nest was located (page 30).

Starvation

Look at the location of the dead bees. Is any honey or nectar within reach of the cluster? No food means the bees starved. You may see honey in the hive, but the bees may have starved if it was out of reach of the cluster during very cold weather.

Record in your Journal

- Describe where you found the dead bees.
- Was there any honey left in the colony?
- What was your varroa management plan last year?
- Why do you think the bees died?
- Is there anything you would do differently next season?

Comb from the center of the hive

Colony Milestone

You sorted and stored hive equipment, and ordered new bees if desired.

NEXT

Go back to Package Management on page 46 or Nuc Management on page 56.

Winter & Early Spring | Survival Evaluation | Colony Survived

IF your colony survived

Action Plan

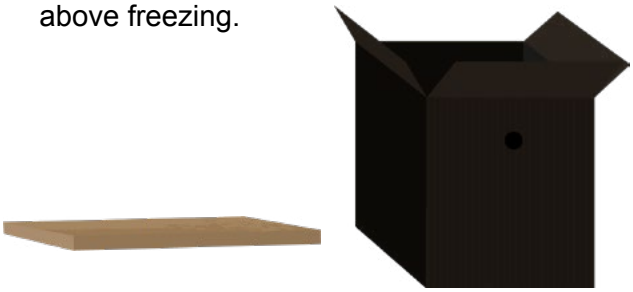
- Feed a pollen patty and honey or another form of sugar as needed.
- Take a peek at your colonies on a day above 50°F.
- Unwrap the colonies when night-time temperatures are consistently above freezing.
- Prepare the equipment needed for dividing a colony.
- Plan to acquire a queen that you will need for dividing the colony.

Checklist

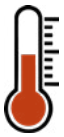
□ Place a pollen patty above the cluster to provide protein for feeding developing brood, ensuring bees have access to nutrition if stored pollen is inaccessible or depleted. Avoid feeding a pollen patty if the bees have not yet taken cleansing flights.

□ Check honey stores without disturbing the cluster by looking between the top box frames for stored honey and hefting the hive to gauge its weight. Feed if the bees have fewer than two full frames of honey or if their honey is far from the cluster. To feed honey frames, remove an empty frame near the cluster and replace it with a honey frame. Take care not to disrupt the cluster. Alternatively, place a box of honey frames from a deadout colony on top of the hive if temperatures are consistently above 45°F. If you don't have spare honey frames, use sugar patties, dry sugar on newspaper, or a candy board.

□ Remove the winter cover and moisture board once nighttime temperatures are consistently above freezing.



□ On a day above 50°F, set the deep boxes off to the side and scrape debris from the bottom board.



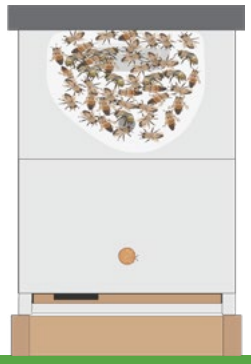
>50°F

□ Prepare a full set of hive equipment for the divide colony (pages 7–8). Decide if you want to keep your parent or divide colony in two or three deep boxes. If you have not tried it before, keeping the parent in two deep boxes is a good place to start.

□ Make a plan to acquire a queen from a queen producer for the divide. Plan to pick up or receive the queen right before making the divide or the day of the divide. You will not know the day you will divide until later, but it is helpful to know when a queen will be available and have a queen source picked out.

Beekeeping Tips

- Do not panic if the bees are in the top box as the colony may still have ample honey.



- Secure the hive equipment needed for dividing an overwintered colony earlier rather than later. Colonies can grow quicker than you may expect in spring. Divide before your colony shows signs it is planning to swarm.

Learn more in the Beekeeping in Northern Climates Manual
"Spring Feeding" page 81 | "The Great Divide" and "Divide preparation" page 87–89 | "Two Deep or Three Deep Brood Boxes?" page 90 |
"Feeding Bees Sugar in the Winter" z.umn.edu/FeedBeesSugar

Equipment

- ☐ Pollen patty 
- ☐ Only feed sugar if the colony is starving or close to starving. Choose one of these:
  - ☐ honey frames (best option)
  - ☐ sugar patty (i.e., winter patty)
  - ☐ dry sugar, wooden rim, newspaper
  - ☐ candy board

Record in your Journal

- Were the bees noticeably clustered? How many seams of bees did your cluster have?
- Did you need to feed the colony sugar?
- When were you able to take the winter cover off?
- Where do you plan to place the new divide colony?
- Describe anything else that you saw, heard, or smelled.

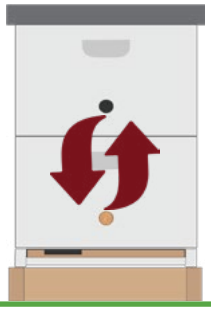
Cluster of bees to show the size of the colony

Colony Milestone

The colony survived winter, you scraped the bottom board, and removed the winter wrap.

NEXT
Spring | Performing Reversals

Spring | Performing Reversals



Action Plan

- Evaluate stored syrup/nectar/honey and pollen. Feed sugar syrup and pollen supplement as needed.
- Support colony growth by reversing hive boxes if needed. Reversals encourage the bees to expand upward into an empty box.

Inspection

- ☐ For details on how to inspect a colony, see pages 11–13.
- ☐ Fill out your Colony Inspection Report each time you inspect a colony.
- ☐ Feed 1:1 sugar syrup until there is a continuous supply of nectar from flowers, AND the colony has at least two full frames of stored sugar syrup/nectar/honey.
- ☐ Replenish the pollen patty until you see bands of stored pollen around the brood nest and pollen is reliably coming in from the landscape.
- ☐ Count the number of frames of brood in each deep box. Consider reversing when there are at least 4 frames full of brood and 6 seams full of bees.

Determine if the Colony Can Be Reversed

Skip reversals *if the colony already has brood in each box. Instead, move to the next section.*

Perform a reversal if all of the following are true:

- ✓ Nights are constantly above 45°F.
- ✓ The colony has more than 6 seams full of bees.
- ✓ There are at least 4 frames with brood and at least 1 box does not have brood.

OR

Do not reverse if the colony has brood in all boxes or if the colony is too small to reverse. If a colony is small, keep checking until conditions are met. Keep a small colony in one deep until it occupies 70 to 80% of the space and requires a second deep.

Anytime a colony isn't growing in spring or summer, check for signs of brood disease and queen issues (queen cells, no eggs, gap in brood stages, drone brood in worker-sized cells).

How to Perform a Reversal

Choose a day above 55°F. Locate the position of the brood in the colony.

Two-deep system

- If all the brood is in the top box only, reverse the positions of the two boxes by placing the box with brood on the bottom board and the box without brood on top.

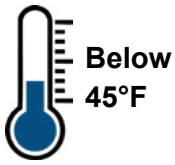
Three-deep system:

- If all four or more of the frames with brood are in the top box, perform a "partial reversal" by switching the position of the top and middle hive body. You can remove the bottom box if you like.
- If all the frames with brood are in the top two boxes, perform a "modified reversal" by moving the empty bottom box to the top position above the brood.

Beekeeping Tips

- Do not split the brood nest during a reversal. If the temperature drops, the bees need to cluster around the brood to keep it warm. Separating the brood can lead to cold exposure that results in the death of developing bees.

- Consider the weather forecast. Refrain from reversing colonies if nighttime temperatures are expected to drop below 45°F. Reversing in cold conditions can stress the bees and hinder colony growth. *If in doubt, do not reverse.*



- Colonies in three-deep hives are more likely to benefit from reversing than those kept in two-deep setups.

Learn more in the Beekeeping in Northern Climates Manual

"Early Spring Management" page 84–85 | "Colony Reversals" page 86

Equipment

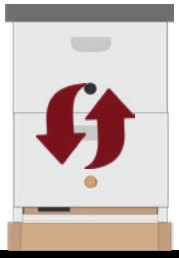
- ☐ Feeder bucket with 1:1 sugar syrup if needed
- ☐ Pollen patty if needed

Record in your Journal

- How many frames of brood did you find in each box?
- Did you perform a reversal? If so, how?
- Describe anything else that you saw, heard, or smelled.

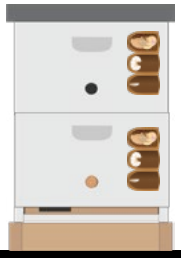
Colony Milestone

You've reversed your hive.



OR

The colony has brood in all boxes and does not need to be reversed.



NEXT
Spring | Monitor Colony Growth

Spring | Monitor Colony Growth

Action Plan

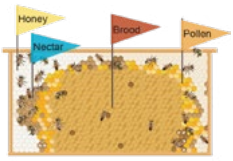
- Monitor your colony's growth every 7 to 10 days.
- Divide (or "split") the colony when it reaches 8 or more frames with brood.
- Monitor the colony's level of varroa.

Inspection

- □ Assess the amount of food in the colony. Feed 1:1 sugar syrup and a pollen patty as needed.
- □ When temperatures are consistently above 55°F, perform a varroa test and follow your varroa management plan. **Check varroa treatment labels for temperature and honey super restrictions** (pages 40-44). Depending on weather, it is often more practical to treat colonies after dividing.

- □ A colony is strong enough to divide when there are **8 or more frames of brood**. Skip dividing if the colony is not strong enough by the main nectar flow. This is not common for overwintered colonies; expect to divide your colony.

Beekeeping Tips



- As more flowers begin to bloom in your area, watch for incoming and stored nectar and pollen. Look for different colors of pollen.
- Feed pollen patty until you see pollen stored around the brood nest and pollen is reliably coming in from the landscape.

- Feed 1:1 sugar syrup until the colony has at least two full frames of stored nectar, honey, or sugar syrup and nectar is reliably coming in from the landscape.

- Be on the lookout for signs of swarming (page 23).

Record in your Journal

- How many frames with brood do you count?
- Can you see the colony grow based on the number of frames of brood at each inspection?
- Describe anything else that you saw, heard, or smelled.

Colony Milestone

Colony has 8 or more frames of brood and is ready to be divided.

NEXT
Late Spring | Dividing an Overwintered Colony

OR

The colony is not strong enough to divide by the start of the main nectar flow.

NEXT
Spring | Adding a Second Deep Box on page 74

Late Spring | Dividing an Overwintered Colony

Action Plan

- Prepare your apiary and equipment for the divide. Chose a spot for the new divide colony. Placing it near the parent is just fine.
- Be sure you can get a queen when you will need her: right before you make the divide, the day you make the divide, or the day after the divide. Choose how you want to release the queen.
- Divide the colony.

Beekeeping Tips

- Divides typically occur around the start of fruit tree and dandelion bloom. But read your bees and do not divide based on the calendar alone. If your overwintered colony lacks sufficient bees and brood, neither the parent nor the resulting divide is likely to thrive or produce honey.
- Keep an eye on the weather and avoid splitting colonies right before a cold snap.
- An egg hatches into a larva after 3 days. Use a queen excluder between deep boxes to confine the queen. Four days later, check for eggs to find the queen's location, enabling you to divide the colony without locating her directly. If you spot the queen while preparing the divide, you can divide immediately. Just ensure you can obtain a new queen for the divide within 24 hours.

- Order a queen to arrive before you need to put her in the divide colony. If dividing is delayed, store the queen and attendants in a place that is 60 to 72°F, dark, and quiet. Provide a drop of water a few times a day. A caged queen can stay in these conditions for several days.
- Younger bees more readily accept a new queen. Foragers from the divide hive will return to the parent in the original location, while the younger bees will stay in the divide with the new queen. Expect the divide's population to decrease as foragers return to the parent colony.

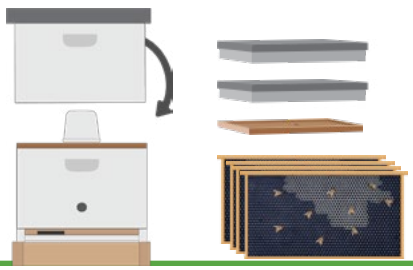
- Feeding the divide colony 1:1 sugar syrup increases the likelihood of queen acceptance.

Learn more in the Beekeeping in Northern Climates Manual

"Purchasing Mated, Virgin, Or Cell Queen Bees" page 89 | "The Great Divide" pages 87–96 | "Slow Release Method" for Introducing a Queen into a Divide" page 92 | "Important notes on releasing the queen from the cage" page 93

Equipment

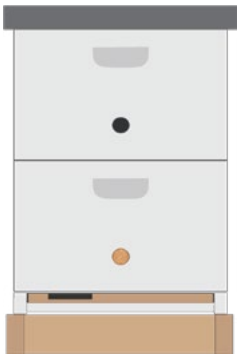
- □ Full set of hive equipment for each new divide colony: deep brood box, 10 frames with foundation or 9 frames with comb, bottom board, entrance reducer, inner cover, telescoping cover, hive stand
- □ Feeder bucket with light 1:1 sugar syrup
- □ Empty deep box to protect the feeder bucket
- □ 1 or 2 extra covers
- □ A new queen (for the divide)



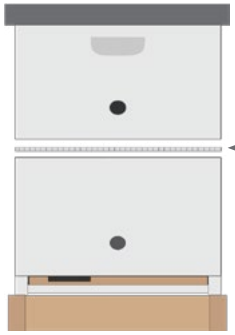
How to Divide a Two-Deep Wintered Colony

1. Watch Colony Growth

✓ Get ready to divide when a colony has 8 or more frames of brood.



2. Distribute Brood and Add Queen Excluder

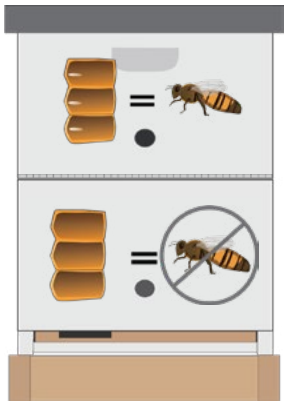


✓ Place 4 or more brood frames in the center of both boxes with frames of food on each side.

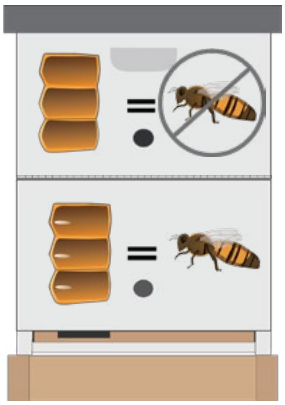
✓ Add a queen excluder to isolate the queen.

3. Look for Eggs to Identify the Parent and Divide Boxes

✓ Wait 4 days, then look for eggs to determine if the queen is below or above the queen excluder.



OR

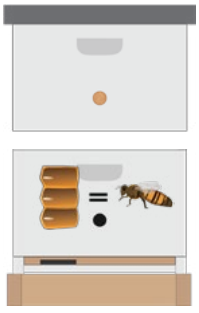


✓ Divide the wintered colony to create the parent and divide colonies.

4. Set Up Your Two Colonies

Parent Colony

The parent stays in the original location and keeps the original queen.



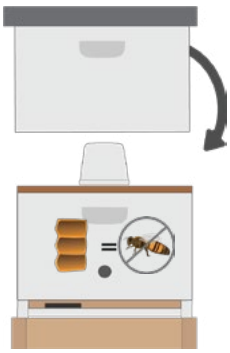
✓ Add a 2nd deep box with frames

✓ Use the deep box *with* eggs (and thus the queen) as the 1st deep in the original colony location.

Divide Colony

Place the divide in a new location.

✓ Feed light 1:1 sugar syrup.



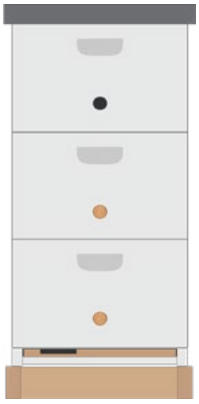
✓ Introduce a new queen after 30 minutes to 24 hours of queenlessness.

✓ Use the deep box *without* eggs (and thus no queen) as the 1st deep in a new location.

How to Divide a Three-Deep Wintered Colony

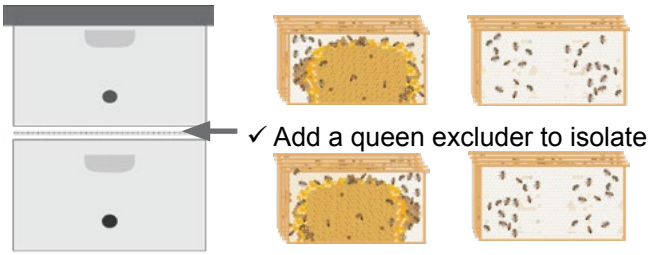
1. Watch Colony Growth

✓ Get ready to divide when a colony has 8 or more frames of brood.



2. Distribute Brood and Add a Queen Excluder

✓ Place 4 or more brood frames in the center of both boxes with frames of food on each side.

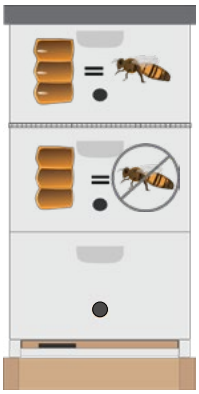


✓ Add a queen excluder to isolate the queen.

✓ Place the remaining 9 frames in the bottom box with any brood in the center. This box becomes the **parent colony's** 2nd deep box.

3. Look for Eggs to Identify the Parent and Divide Boxes

✓ Wait 4 days, then look for eggs to determine if the queen is below or above the queen excluder.



OR

✓ Divide the wintered colony to create the parent and divide colonies.

4. Set Up Your Two Colonies

Parent Colony

The parent stays in the original location with the original queen.

✓ Add a 3rd deep box with frames if the colony is strong.

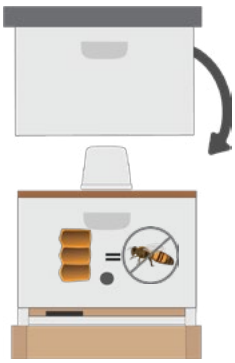
✓ Use the box that received the remaining 9 frames as the 2nd deep box.

✓ Use the deep box *with* eggs (and thus the queen) as the 1st deep in the original colony location.

Divide Colony

Place the divide in a new location.

✓ Feed light 1:1 sugar syrup.



✓ Introduce a new queen after 30 minutes to 24 hours of queenlessness.

✓ Use the deep box *without* eggs (and thus no queen) as the 1st deep in a new location.

Checklist

Queen Introduction

Introduce the new queen 30 minutes to 24 hours after the divide:

- □ Make sure the feeder bucket is not leaking by looking for pooled syrup on the inner cover.
- □ Either expose the queen cage candy or not based on how you choose to release the queen.
- □ Securely place the caged queen between two brood frames. Face the screen downward. Do not place the queen cage directly under the feeder bucket.

Choose a Queen Release Method

The bees release the queen

- □ Remove the cage cork or plug to expose the queen candy. Worker bees will eat the candy within 2 to 3 days, releasing the queen.
- □ To slow the queen's release, cover the candy with masking or painter's tape, poking a small hole in the tape above the candy.
- □ Leave any worker attendants in the cage. Angle the candy hole upward by at least 20 degrees to prevent dead attendant bees from blocking the queen's escape.
- □ Place the queen cage in the colony as described above. Leave the colony undisturbed for 7 to 10 days, then check for eggs.

You manually release the queen.

- □ Keep the cage corked to block colony access to the candy. Place the queen cage in the colony as described above.
- □ After 3 days, return to check that the queen is alive. To release her, lay or hold a frame horizontally, then gently open the cage to allow her to walk out on the comb.
- □ Observe worker behavior. If they attack, return the queen to the cage and check for queen cells or signs of another queen. If the workers accept her, close up the hive.

- □ Leave the colony undisturbed for 7 to 10 days, then check for eggs.

Record in your Journal

- How many frames of brood did your colony have when you divided it?
- Did you see any indicators of swarming (e.g., nectar in the brood nest)?
- Describe anything else that you saw, heard, or smelled.

In your Colony ID Cards, note:

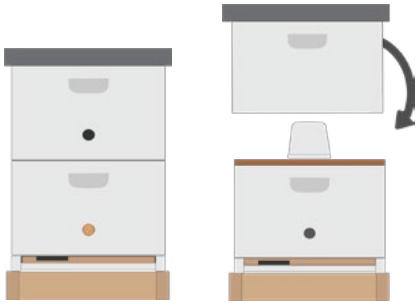
- The type of queen you introduced.
- The queen release method you used to introduce the queen.

In your Apiary Location sheet, note:

- Location of your divide hive.
- Any equipment left to acquire.

Colony Milestone

The overwintered colony has been split into two colonies: a parent and a divide.



NEXT
Divide colony: Spring | Adding a Second Deep Box

Parent hive: Spring & Summer | Adding More Boxes on page 76

Spring | Adding a Second Deep Box

VARROA MANAGEMENT

Inspect Every 7-10 Days

Action Plan

- Inspect the colony every 7 to 10 days to ensure it is growing, queenright, and free of disease.
- Add a second deep box when the first deep box is 70 to 80% occupied by bees.
- Optional treatment for varroa.

Inspection

- □ As you open the hive, listen to the bees to familiarize yourself with the sounds of a colony.
- □ Check the sugar syrup for mold or fermentation. Refill the feeder bucket with 1:1 sugar syrup as needed. Replenish the pollen patty as needed.
- □ Count the number of frames occupied by bees.
- □ Take a varroa sample once the first deep box is at least **80%** occupied by bees. Manage varroa as needed.
- □ When 70 to 80% of frames are occupied by bees, add a second deep box. Adjust the entrance reducer to the larger opening. Uncork the bottom box and cork the second box. If the second box contains all foundation frames, move 1 brood-less comb frame from the bottom box to the second box, leaving **9 frames in the bottom** box and **10 in the second**.

Beekeeping Tips

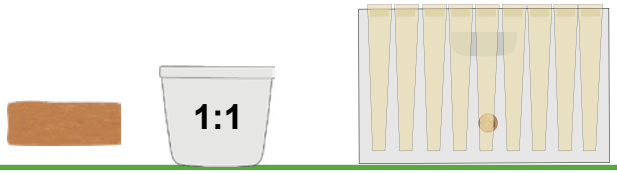
- The number of inspections needed before adding the second deep box will depend on the available floral resources and the growth of your bees.
- Provide space before the hive is 70% full if you won't return soon, if the bees are on drawn comb rather than foundation, or during a nectar flow. However, wait to add a box if the forecast includes many cool nights below 45°F. Space above the cluster in cold weather can hinder colony growth.
- It is unlikely you will need to feed the divide colony, but if you do:
  - Feed pollen substitute until you see a pollen band around the brood nest and pollen is reliably coming in.
  - Feed sugar syrup until a continuous supply of nectar is available from flowers AND the colony has at least two full frames of stored sugar.
- Reduce varroa levels in spring to help the bees have a good start.

Learn more in the Beekeeping in Northern Climates Manual

"Inspections from Spring to Summer " pages 59–67 | "Do the bees need room to grow?" page 64

Equipment

- □ Second deep box with 9 frames
- □ 1:1 sugar syrup as needed
- □ Pollen patty as needed
- □ Varroa testing kit and optional treatment



Record in your Journal

- Is the colony's population increasing?
- What colors of pollen did you see?
- Describe anything else that you saw, heard, or smelled.

Frames from above (inner cover removed)
Eggs, larvae, and sealed brood

Colony Milestone

The queen is present and laying eggs and you added the second deep box.

NEXT
Spring & Summer Management | Adding More Boxes on page 76.

Summer Management

Spring & Summer Management | Adding More Boxes

Started as Packages, Nucs, and Overwintered Colonies

Action Plan

- Inspect the colony every 7 to 10 days to ensure it is growing, queenright, and free of disease.
- Manage varroa in summer before winter bees emerge in fall.
- Proactively provide space for the colony to grow and store food by adding another deep box or honey supers before the bees need it. Colonies with lots of sealed brood grow quickly!

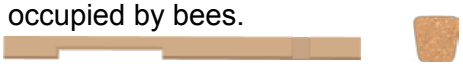
Checklist

- ☐ Before separating brood boxes, gently lift the whole hive using the top box handle to gauge its weight. As you inspect, assess the stored nectar and honey to practice correlating the hive's weight with the amount of food stored.

- ☐ Look for drone brood and adult drones.
- ☐ Look for signs of swarming. Check for empty cells that the queen can lay eggs in. Make sure the colony is not filling the brood nest with nectar.

- ☐ If you haven't already, manage varroa. High varroa numbers now can cause issues when honey supers are on and mites are harder to control. Check treatment labels for temperature and honey super restrictions.

- ☐ Remove the entrance reducer. Uncork any deep brood boxes that are 70 to 80% occupied by bees.



Add more boxes. Add boxes before 70% of the frames are occupied if adding drawn comb and there is a nectar flow.

Two-Deep System

Add a queen excluder and two honey supers when the second deep box is 70 to 80% occupied by bees.

Three-Deep System

Add a third deep box when the second deep box is 70 to 80% occupied by bees. Move a brood-less frame with comb into the new deep box if it has foundation.

Once the third deep box is 70 to 80% occupied by bees, add a queen excluder and two honey supers.

Equipment

Varroa Mite Testing Kit

Two-Deep System

- ☐ Queen excluder
- ☐ Two honey supers

Three-Deep System

- ☐ Third deep box with
- ☐ 9 frames
- ☐ Queen excluder
- ☐ Two honey supers

Beekeeping Tips

- Separate the boxes to inspect the bottom box. See "*How to Inspect a Colony*" on pages 11–13.
- How can you tell if the bees are on a nectar flow? Look for new white wax, burr comb filled with nectar, cells filled with stored nectar, and high foraging activity at the hive entrance on a nice day. If you hold a comb horizontally and give it a good shake, you may see nectar "shake out."

- Drone production indicates the bees are getting enough nutrition to raise males. But more than about 20% drones, or only drone brood, are signs the colony has a queen problem.

- **To prevent swarming** add space before the frames are 70% occupied by bees if you started with drawn comb instead of foundation and there is a nectar flow.

- **Watch for swarm signs:**
  - limited space for the queen to lay eggs
  - nectar in the brood nest
  - queen cells in the periphery
- **You see swarm signs?** Add frames with comb or rearrange the hive to provide space as needed. If queen cells are capped or nearly capped, it's likely too late to prevent swarming.

Learn more in the Beekeeping in Northern Climates Manual

"Queen Cells" and "Swarms" pages 18–20 | "Swarm Management" page 62 | "What are your varroa mite levels?" page 65 | "Does the colony need honey supers?" page 67 | "Hefting and Peeking" page 69 | "Appendix A: The Two-Deep System" pages 111–115 | "Appendix B: Troubleshooting Queen Bee Problems" pages 117–131

Record in your Journal

- How many frames with stored honey and pollen did you see? How many frames with brood?
- Did you see any signs the colony is on a nectar flow?
- Did you see drone brood or adult drones? If you saw drone brood, where did you see it?
- Describe anything else that you saw, heard, or smelled.

Frames from above (inner cover removed) | Eggs and larvae | Sealed brood | Your sample of 300 bees | Any varroa found

Colony Milestone

- **Two-deep system**: You've added honey supers and the colony is queenright.
- **Three-deep system**: You've added a third deep box and honey supers, and the colony is queenright.
- **OR** it is after the main nectar flow and you did not add honey supers. If so, skip to "*Winter Preparations*" on page 82.

NEXT
Summer | Honey Production on pages 78 *OR* Fall | Winter Preparations on page 82

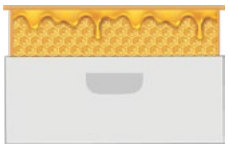
Summer | Honey Production

Action Plan

- Check the colony every 10 to 14 days when honey supers are on.
- Monitor for varroa mites at least once per month.
- Add honey supers as needed until the end of the nectar flow.
- Remove supers and harvest honey.

Checklist

- ☐ Keep summer inspections brief.
- ☐ Check honey supers for stored honey. Add more space if needed. Ensure the colony always has the equivalent of two empty honey supers to accommodate a heavy nectar flow.



- ☐ Test for varroa. Manage varroa before the nectar flow is over for healthy winter bees.

- ☐ Near the end of the nectar flow, remove the honey supers and harvest the honey. Harvest earlier if the nectar flow ends sooner or if you are using the two-deep system and the second deep isn't full of honey.

Beekeeping Tips

- As you become more skilled at reading the colony, you can increase the time between brood nest inspections to longer than 14 days. Aside from adding space for the bees and managing varroa, little is required at this time of year. Queen issues are a risk, but it is often best to let the colony handle them.
- The colony is at its peak population now. Be mentally prepared to work with many bees.
- Work with a partner to lift heavy boxes.

Learn more in the Beekeeping in Northern Climates Manual
" Chapter Nine: Harvesting, Extracting, & Bottling Honey" pages 101–109

Equipment

- ☐ Additional honey supers as needed
- ☐ Varroa mite testing kit and treatment if needed.
- ☐ Honey harvesting and extracting equipment

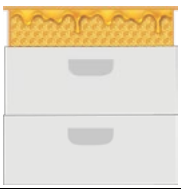
Record in your Journal

- How full are the honey supers with stored honey/ nectar? What percentage is capped with wax?
- How much honey did you harvest? Describe how you removed (pulled) your honey supers.
- Describe anything else that you saw, heard, or smelled.

Hive with honey supers

Colony Milestone

You harvested honey.

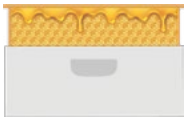


NEXT
Fall | Winter Preparations on page 82

Honey Harvesting Guide

Starting with drawn comb increases the chances of a harvesting honey. Keeping bees in new equipment often means no honey harvest in the first year, as bees need a lot of nectar to build comb. However, some colonies may still produce surplus honey in nectar-rich areas.

If the top brood box is light on honey, remove supers before the nectar flow is over to allow the bees to store nectar for winter. Some areas have an intense late nectar flow. If varroa are controlled and the top box is heavy, keep a super on to collect the late season bounty.



Action Plan

Removing honey supers:

- Check if honey is mostly capped and ready for extraction.
- Remove honey supers and clear out the bees before bringing the boxes indoors for extraction.

Extracting honey:

- Extract honey from frames and bottle honey.
- Store supers.

Checklist

Removing honey supers:

- ☐ Ensure most honey is capped.
- ☐ Remove bees from supers using your preferred method.
- ☐ Store supers in a bee-proof location for no more than three days to prevent hive beetles from damaging the honey. If storing, stack supers in a staggered arrangement for maximum airflow and keep them in a warm location (above 80°F). Continuously run a fan and dehumidifier to maintain humidity below 50% until extraction.

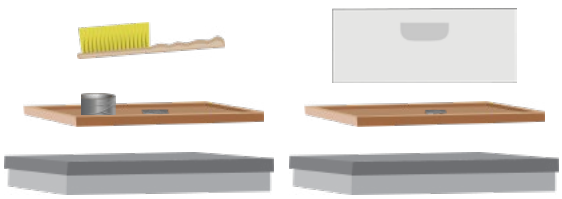
Extracting honey:

- ☐ Extract honey using your preferred method.
- ☐ Bottle and store honey in sealed containers.
- ☐ Place extracted supers back on the hive between the inner and telescoping covers for the bees to clean the remaining honey for a few days before removing for storage. Or store extracted honey supers (often called “wet” or “stickies”) in a bee-proof place.

Equipment

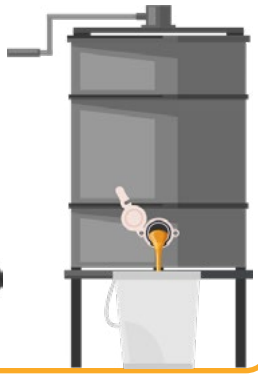
Removing honey supers:

- ☐ Bee brush
- ☐ Optional: fume board, bee repellent, bee escape, or bee blower
- ☐ Extra telescoping covers, inner covers with the hole taped over or similar to cover honey supers
- ☐ Empty super box



Extracting honey:

- ☐ Tool for removing wax caps (e.g., hot knife or uncapping scratcher)
- ☐ Uncapping bin
- ☐ Honey extractor
- ☐ Strainer for wax and debris.
- ☐ Food-safe containers for honey
- ☐ *(Optional) Refractometer to measure honey moisture*



Honey Harvesting Tips

Removing honey supers:

- Uncapped nectar can have high moisture levels, leading to fermentation of extracted honey. Leave supers on the hive longer to allow the bees to dry the nectar, or stack supers in a staggered formation in a room with a dehumidifier and fan running continuously to lower moisture content. Use a refractometer to check if the moisture is **under 18%**. Testing moisture levels before extracting can save you a headache later.
- Select your bee removal method based on available equipment, weather, and the number of supers with honey.

- Always carry a bee brush. Use the brush as your primary method to remove bees, or as final cleanup of bees on the frames after the primary method.

- When removing supers, prevent bees from returning to the supers by placing the stack of supers on a spare cover, and covering the stack with another spare cover. Moving quickly also helps avoid robbing.

Extracting honey:

- Extract honey in a bee-proof space. Never extract outdoors, as it will attract foraging bees.

- Do not leave extracted supers exposed in the apiary, as this can encourage robbing.

Learn more in the Beekeeping in Northern Climates Manual

"Beware of Robbers" page 74 | "Harvesting, Extracting, and Bottling Honey" page 101–109

Video

For a video on honey extraction:
z.umn.edu/extractinghoney

SCAN TO WATCH

Record in your Journal

Removing honey supers & extracting honey:

- How many honey supers did you remove?
- What method did you use to remove your honey supers?
- How much honey did you harvest?
- What color and flavor does your honey have?

Fall Management

Fall | Winter Preparations

VARROA MANAGEMENT

Action Plan

- After controlling for varroa, test for mites to check if the management was effective.
- Prevent robbing.
- Make sure the colony has at least 75 pounds of stores and the top box is full of honey. If needed, feed 2:1 sugar syrup before it gets too cold for the bees to store and dry the syrup.
- Watch for the colony to stop raising brood.

Checklist

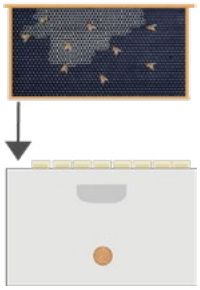
- ☐ Control varroa as needed. Test for varroa to check that your management was effective. Look for any signs of varroa (pages 30–31).

- ☐ To help prevent robbing, put the entrance reducer back in the hive and adjust it to the larger of the two openings. Cork all ventilation holes drilled in boxes.

- ☐ Heft the top deep box.
  - **Feed** 2:1 sugar syrup if the top box has fewer than 8 frames of honey, or if the hive lacks 10 full deep frames of stored honey. If needed, you can rearrange frames (page 84).

  - **Stop feeding** once the colony has 75 to 100 pounds of honey stores to avoid reducing spring egg-laying space.

- ☐ **Stop feeding** before daytime temperatures **drop below 50°F**. Cooler weather slows syrup consumption and hinders the bees' ability to condense or "cure" the syrup.
- ☐ If you have frames of foundation in the top deep box, move those frames to the edges of the bottom box or consider consolidating the colony into fewer brood boxes (page 84).



- ☐ Once daytime temperatures consistently drop below 50°F, management is minimal until the colony is broodless. The queen gradually slows and then stops laying. On warm days above 55°F, when bees are flying, check for brood about every 14 days.

Equipment

- ☐ Varroa mite testing kit
- ☐ Varroa mite treatment and personal protective equipment if needed
- ☐ Entrance reducer and corks
- ☐ 2:1 sugar syrup, feeder bucket, and empty deep to protect the bucket if needed

Winter Resource Organization

Top Box

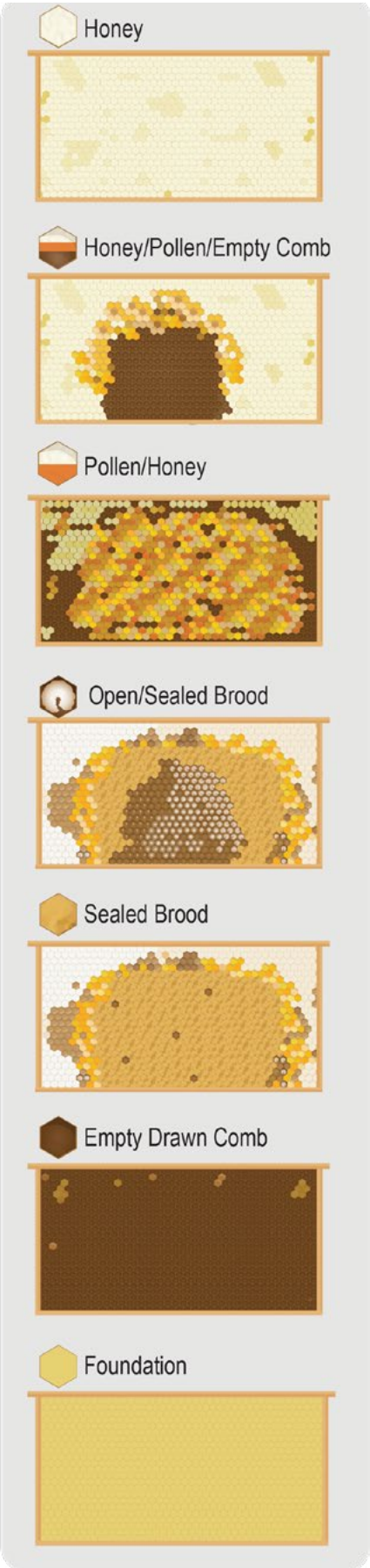
- Honey
- Honey
- Honey
- Honey/Pollen/Empty Comb
- Honey/Pollen/Empty Comb
- Honey
- Honey
- Honey
- Honey

Middle Box

- Honey
- Honey/Pollen/Empty Comb
- Pollen/Honey
- Sealed Brood
- Open Brood
- Sealed Brood
- Empty Drawn Comb
- Honey
- Honey

Bottom Box

- Foundation
- Honey/Empty Drawn Comb
- Honey/Pollen/Empty Comb
- Empty Drawn Comb
- Honey/Pollen/Empty Comb
- Empty Drawn Comb
- Empty Drawn Comb
- Empty Drawn Comb
- Honey/Empty Drawn Comb



An example of a colony ready for winter with at least 10 frames full of honey and 3 to 5 frames with pollen. Different frame content configurations are fine so long as the bees can move up into honey stores. Move any frames with foundation to the bottom box if you can't replace them with drawn comb. No honey is needed in the bottom box of a three-deep hive. For a two-deep colony, aim for a set-up similar to the top two boxes.

Rearranging Frames for Winter

- **Goal: ensure that the honey bee cluster can access both carbohydrates and pollen over the entire winter and into spring.** Keep in mind that the bees will move up into stores.
- Check that a few combs with pollen are in the top box for late-winter brood rearing. If needed, move frames with some pollen into the top deep box during the nectar flow or when feeding 2:1 sugar syrup in fall.
- Avoid leaving foundation frames that lack drawn comb where bees will cluster. Honey bees will not draw comb out in fall, even with sugar syrup feeding. Whenever possible, remove frames without comb from the hive and replace them with frames containing drawn comb. If no drawn comb is available, position undrawn frames at the edges of the bottom box.
- Consolidate a hive into fewer boxes if a colony is small or has many undrawn frames in early fall. Remove foundation frames, then shake or brush bees into the remaining brood boxes. Ensure the queen is not on any removed equipment.
  - *Reduce two boxes to one*: place brood in the center and honey on the edges. Store extra honey frames in a freezer or unheated shed for spring feeding. Feed 2:1 syrup starting in late summer until the hive reaches 75 pounds.
  - *Reduce three boxes to two*: place brood in the center of the bottom box, surround it with honey, and fill the top box with honey. Feed 2:1 syrup auntil the hive reaches at least 75 pounds of stores.

Combine two colonies if one is either:

- Queenless, has a drone-laying queen, or had queen issues earlier in the season and has a small population in fall.
- Low on honey stores and it is too late in the year to feed sugar syrup to get the colony up to wintering weight.

How to combine two colonies

1. Remove all queen cells from the queenless colony or remove the drone-laying queen. Ensure both colonies are disease-free. Never combine a healthy colony with a sick one.
2. Consolidate the queenless colony into one deep box by placing brood frames in the center and resource frames on the outside. Shake or brush bees from the other hive equipment into this box. Store empty equipment elsewhere to prevent foragers from returning to it.
3. For the queenright colony, remove the covers and lay a sheet of newspaper over the frame tops. Cut a few small slits in the paper, ensuring they are too small for bees to pass through. The newspaper allows the colonies to adjust to each other's scent, reducing defensiveness. Place the queenless box on top of the paper and replace the covers. Provide an open entrance (e.g., hole in the box or inner cover hole) in the queenless hive to prevent suffocation.

4. The bees will slowly chew through the paper, merging the colonies. Inspect after 5 days.

Beekeeping Tips

- Manage varroa again if any summer management was not effective.

- Robbing is more common in late summer and early fall when less forage is available. Keep inspections brief and avoid leaving frames out where bees can rob them. Robbing can destroy a colony.

- In late summer to fall, colonies tend to be more defensive. Use calm movements and keep your smoker lit.

- Look for drones being kicked out of the colony. This is normal in the fall.

- If you have two weak colonies, combining them may make sense. Avoid combining a strong, healthy colony with a sick colony.
- Bees tend to move upward during winter, so it's essential to ensure honey is primarily stored in the top box.

Learn more in the Beekeeping in Northern Climates Manual

"Hefting and Peeking" page 69 | "Beware of Robbers" page 74 | "Chapter Seven: Year One: Fall and Winter Management" pages 71–79 | "How to Use Newspaper to Combine a Queenless and Queenright Colony" page 127 | "Moving Frames" page 132

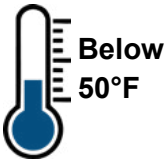
Record in your Journal

- How many frames full of honey are there in the brood boxes? Will you need to feed sugar syrup for the bees to build winter stores?
- Did you find any foundation frames? What did you do with them?
- How many frames had brood?
- Describe anything else that you saw, heard, or smelled.

Tops of the frames of the top box and a sealed brood frame

Colony Milestone

The colony has at least 75 pounds of stored honey or sugar syrup, daytime temperatures are consistently below 50°F, and there is little to no brood left in the colony.



NEXT
Mid to Late Fall | Winterize Colony

Mid to Late Fall | Winterize Colony

Daytime temperatures are chilly and there is no brood left in the colony.

Action Plan

- Apply a fall “clean-up” varroa treatment when the colony is broodless.
- Winterize your colony.

Inspection

- □ Check the position of the entrance reducer. It should be on the larger of the two openings and facing up.

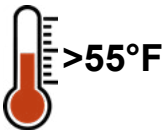
- □ Apply a “clean-up” varroa treatment. See your varroa management plan. Do not test for varroa after this treatment to avoid disrupting the colony and potentially sampling the queen when she is smaller and hard to spot. Before you wrap the hive, remove any varroa treatment products (like cardboard strips or formic acid pads) as they may interfere with clustering.
- □ Once the “clean-up” varroa treatment is complete, wrap the colony to protect it from winter weather. If using a ventilation-based wrapping system:
  - Remove the cork in the ventilation hole of the top box. Leave the bottom box(es) corked.
  - Put the moisture board on top of the inner cover.
  - Place any additional insulation (like a 1 or 2-inch 16 x 20-inch foam board) on top of the moisture board.
  - Cover the hive with a wintering cover. Ensure at least one edge of the moisture board is exposed to the air.
  - Put the telescoping cover over the wintering wrap and secure it with a ratchet strap or heavy rock.

- □ If using another wrapping system (like the condensing system or a specialized wrap), follow those directions.
- □ Give the hive three pats and tell the colony you will be back in spring.

Equipment

- □ Varroa mite treatment and personal protective equipment as specified on the varroa treatment label
- □ Moisture board
- □ Wintering wrap or cover

Beekeeping Tips



- No need to perform inspections. Remove frames with bees only when air temperature is **above 55°F**.
- Prepare the colony for winter before the snow flies.
- Feeding in winter is problematic. The bees need to break cluster to access the sugar, you may not be able to feed them enough, and you need to open the hive to feed. Prepare your colony with **at least 75 pounds of honey** so you do not need to feed it over winter.

However, if you heft the colony over winter and it is light, feed spare honey frames, sugar patties, a candy board, or dry sugar. For options see:

z.umn.edu/FeedBeesSugar

- For any deadout colonies, leave the equipment in the apiary or store in an unheated shed. Seal the entrances to protect it from pests. Sort through the equipment when the weather is warmer (page 26–27).

Learn more in the Beekeeping in Northern Climates Manual

"Protecting colonies from winter weather" page 78 | "Winter Cluster and Inspections" page 79

Record in your Journal

- Were the bees noticeably clustered?
- How many seams of bees was the cluster?
- Describe anything else that you saw, heard, or smelled.

Fill out your Future Plans sheet

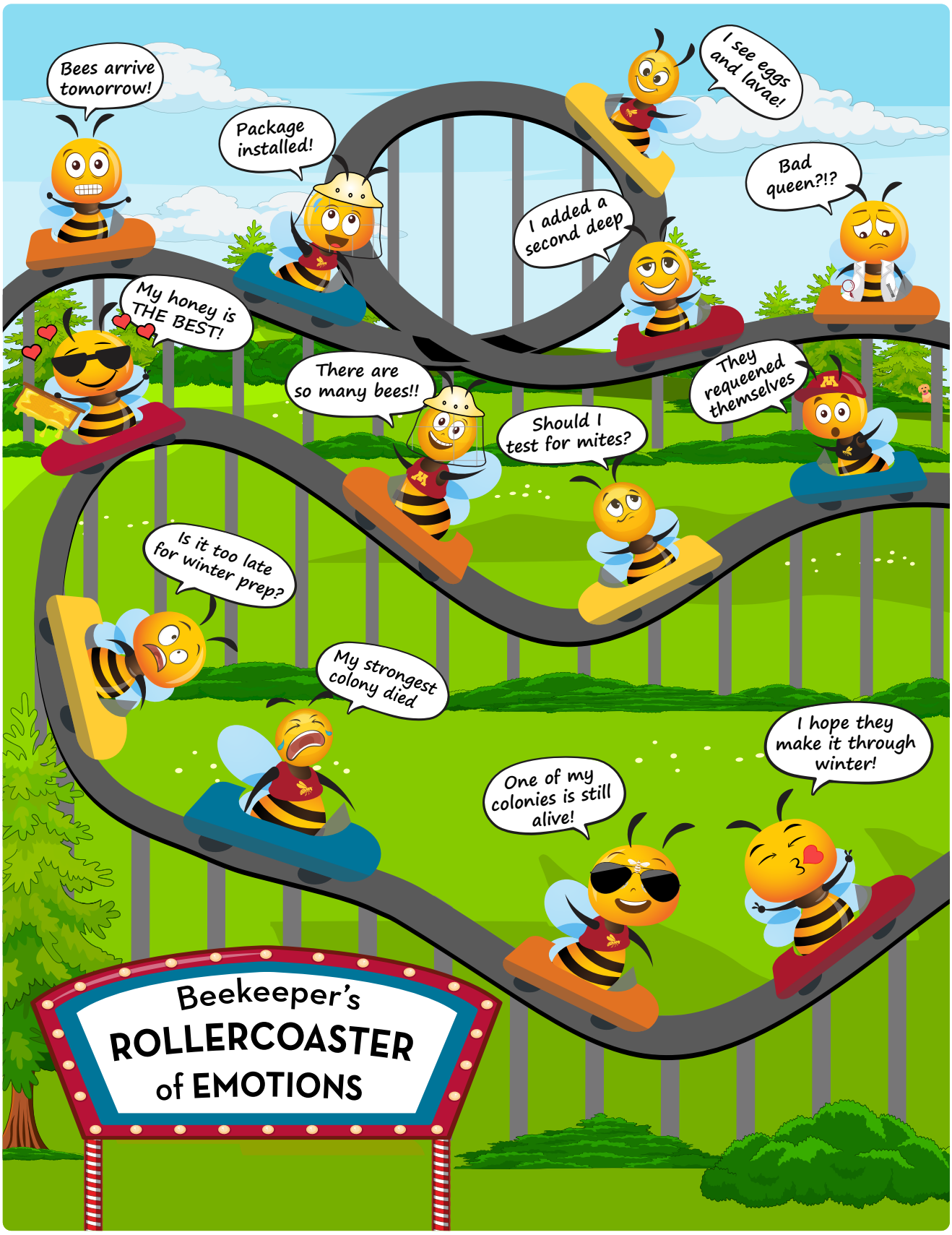
- What was your favorite part of the beekeeping season?
- What did you find difficult?
- Would you like to do anything differently next year?

Front of the winterized colony

Colony Milestone

You prepared the colony for winter. Congratulations!
For what to do in spring, see pages 64–66.

Emotional Roller Coaster of Beekeeping



Inspired by Chris Schad's *Emotional Journey of Beekeeping*.

PART THREE
Record Keeping

Beekeeping Record Keeping

The following pages will help you keep track of your management and the health and growth of your colonies. We provide examples of filled out sheets below, then blank sheets for you to copy or fill out.

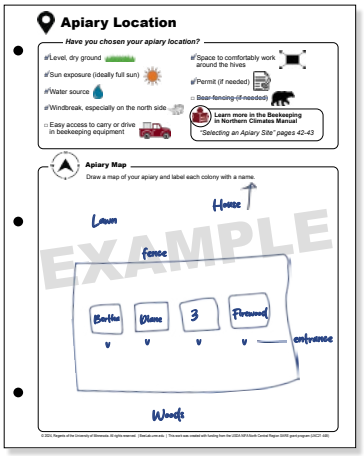
Suggestions on how to use the data sheets

- Pair the template with a notebook where you write down your notes.
- Keep a PDF on your phone to refer to during an inspection.
- Print out the sheets and store in a three-ring binder. Keep sheets from individual colonies together in the binder for easier recollection of that colony's past.

Find PDF copies of the datasheets: beelab.umn.edu/honeybeeguidebook

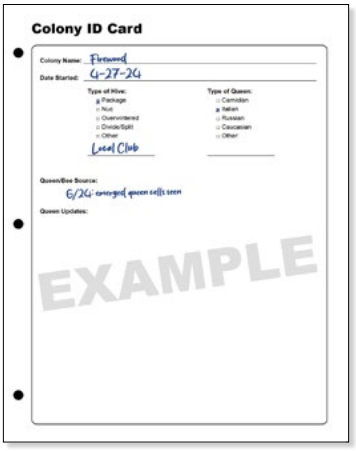
Apiary Location

Use to plan and track your apiary.



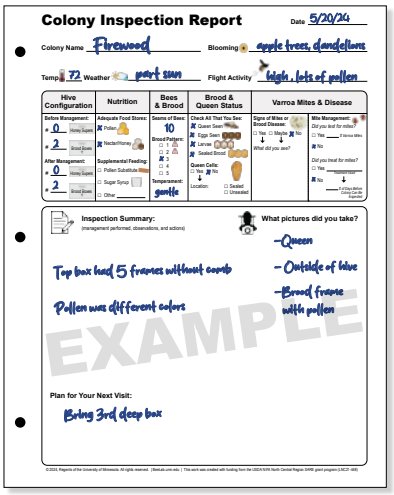
Colony ID Cards

Keep records of the queen types and sources in your colonies.



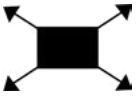
Colony Inspection Report

Fill out a sheet each time you perform an inspection to write down indicators of colony health. Share current and past sheets with a mentor to help diagnose issues. Keep for your own records to track colony progress.



Apiary Location

Have you chosen your apiary location?

- □ Level, dry ground 
- □ Sun exposure (ideally full sun) 
- □ Water source 
- □ Windbreak, especially on the north side 
- □ Easy access to carry or drive in beekeeping equipment 
- □ Space to comfortably work around the hives 
- □ Permit (if needed) 
- □ Bear fencing (if needed) 

Learn more in the Beekeeping in Northern Climates Manual

"Selecting an Apiary Site" pages 42-43

Apiary Map

Draw a map of your apiary and label each colony with a name.

Colony ID Card

Colony Name: _____

Date Started: _____

Type of Hive:

- □ Package
- □ Nuc
- □ Overwintered
- □ Divide/Split
- □ Other:

_____

Type of Queen:

- □ Carniolan
- □ Italian
- □ Russian
- □ Caucasian
- □ Other:

_____

Queen/Bee Source:

Queen Updates:

Colony Inspection Report

Date _____

Colony Name _____ **Blooming** _____

Temp _____ **Weather** _____ **Flight Activity** _____

Hive Configuration

Before Management:

_____ Honey Supers

_____ Brood Boxes

After Management:

_____ Honey Supers

_____ Brood Boxes

Nutrition

Adequate Food Stores:

☐ Pollen

☐ Nectar/Honey

Supplemental Feeding:

☐ Pollen Substitute

☐ Sugar Syrup

☐ Other _____

Bees & Brood

Seams of Bees:

Brood Pattern:

☐ 1 ⚠

☐ 2 ⚠

☐ 3

☐ 4

☐ 5

Temperament:

Brood & Queen Status

Check All That You See:

☐ Queen Seen

☐ Eggs Seen

☐ Larvae

☐ Sealed Brood

Queen Cells:

☐ Yes ☐ No

↓

Location: ☐ Sealed ☐ Unsealed

Varroa Mites & Disease

Signs of Varroa or Disease:

☐ Yes ☐ Maybe ☐ No

↓ ↓

What did you see?

Varroa Managment:

Did you test for varroa?

☐ Yes _____ *# Varroa Mites*

☐ No

Did you manage varroa?

☐ Yes _____ *Treatment Used*

☐ No ↓

_____ *# of Days Before Colony Can Be Inspected*

Inspection Summary:

(management performed, observations, and actions)

What pictures did you take?

Plan for Your Next Visit:

Future Plans

Keep track of the things you want to remember to do next year and the things you want to do differently in the future. Knowing what you know now, what would you change? Jot down your thoughts throughout the year.

Beekeeping Glossary

Find additional explanations of beekeeper lingo and definitions of equipment on pages 37 and 27–40 in the Beekeeping in Northern Climates manual, Third Edition.

Apiary: place where honey bee colonies are kept. Also called a "**bee yard**" or simply "**yard**."

Apiculture: beekeeping.

Bee Space: ⅜ of an inch, or the size of a gap that bees do not build comb in.

Bearding: when honey bees hang out on the front of the colony. Most common in populous colonies during hot, humid weather.

Beeswax: wax secreted from glands on the underside of a bee's abdomen that is used to construct comb.

Box: Langstroth-style box that comes in different sizes. Often referred to based on their size (deep, medium, or shallow) or use (brood box or honey super). May be called a "hive box" or "hive body." Primary use of a box is to provide a home for a colony of honey bees. Langstroth-style boxes come in two widths: one can fit 10 up to 10 frames and the other can fit up to 8 frames. These hive boxes also come in different depths:

- **Deep box**: hive box that holds frames and is 9 5/8" deep. Deep boxes are used for the brood nest in the Beekeeping in Northern Climates system and called in the two-deep and three-deep systems for keeping honey bee colonies. Deeps can weigh over 80 pounds when full of honey.
- **Medium box**: box that holds frames and is 6 5/8" deep. Mediums can be used as either brood boxes or honey supers, depending on the management system.
- **Shallow box**: box that holds frames and is typically 5 11/16" deep. Typically used as cut comb honey supers (a section of honey cut out from the larger comb and not extracted).

Brood: developing bees, including eggs and larvae (**open brood**) and pupae (**sealed or capped brood**).

Brood chamber: the part of the hive in which young bees are reared.

Brood nest: the area where brood is found. This is where the queen bee lays eggs, nurse bees raise new bees, and the colony stores pollen and honey for their own consumption. Also called a "brood chamber." Beekeepers may use deep or medium boxes for the brood nest.

Burr comb: comb built along the edges of frames and other parts of the hive, comb built between combs, and/or between combs and walls of hive bodies. Comb built between combs is sometimes called "brace comb."

Castes: the different forms of adult female bees in a colony: workers and queens.

Cell: a single hexagon-shaped compartment in a honeycomb.

Cleansing flight: bee flight after a period of confinement to dispose of feces and body wastes.

Cluster: when a colony of honey bees forms into a spherical shape as they gather together. Bees cluster typically in cooler weather, including over the winter.

Colony: the honey bees living together in their hive.

Comb: the hexagon-shaped beeswax structure built by the bees. In the hive system we use, the comb is built on sheets of foundation placed in a frame. Beekeepers often use "**comb**" and "**frame**" interchangeably.

Deadout: a colony that has died. Often used by beekeepers to refer to a set of hive equipment that needs to be cleaned out after the bees have died.

Divide colony: the part of a divided colony that receives or raises a new queen.

Dividing a colony: the process by which the beekeeper splits a colony into two or more colonies. Often performed by the beekeeper on overwintered colonies in the spring to prevent swarming and increase the number of hives. The resulting colonies are often referred to as "**splits**" or "**divides**."

Drawing comb: a term used by beekeepers to describe honey bees building beeswax onto frames. "**Drawn comb**" is another term for frames with beeswax comb built onto them.

Drifting: the return of field bees to colonies other than their own, most commonly to close, neighboring hives.

Drone brood frame or foundation: a frame with primarily drone brood-sized cells, often used for trapping varroa as a form of controlling growth in a colony. Can be purchased. Encourage bees to build their own by replacing a deep frame with a medium frame in a deep box. The bees often build drone brood in the space at the bottom of the frame.

Drone layer: a queen that lays only unfertilized eggs which develop into drones.

Forage: blooming plants that bees collect pollen and/or nectar from for food.

Foundation: a sheet embossed on each side with a cell pattern, used in frames as a starting point for bees to build beeswax combs. Foundation can have a plastic base coated with beeswax or be made from a thin sheet of beeswax.

Frames: the rectangular structures that beekeepers give the bees to build their comb in the boxes and make it possible to remove each comb for inspection.

Hive: the structure a honey bee colony lives in.

Hive tool: small, metal hand–held crowbar used to pry apart boxes, lift out frames, and scrape equipment.

Hiving or installing a package or nuc: the process of moving bees from a package or nuc into a set of beekeeping equipment in the apiary. This is how many beekeepers start new colonies in the spring.

Honey stores: frames containing nectar and honey that the bees have stored to consume later.

Honey supers or supers: boxes used for the bees to store honey that will be harvested for human consumption. Supers should *only* be used honey that will be harvested and not as a brood box. Many beekeepers use medium boxes, but supers can be any box size.

Larva, larvae (plural): the grub-like immature form of an insect and the second stage in metamorphosis.

Miticide: chemical pesticide used to control mites like varroa.

Nectar dearth: a period of time when there is little to no nectar available for the bees to collect.

Nectar flow: the period when abundant nectar is available for bees to collect and later produce honey for storage in the combs of the hive. Also called a "**honey flow**."

Nuc: a small colony with approximately 10,000 worker bees and a mated queen. Usually consists of 4 to 5 frames of drawn comb containing brood and stored nectar and pollen. Short for "**nucleus**" colony and pronounced as "nūk."

Package: a screened or slatted box containing 7,000 to 15,000 worker bees, a feed can, and a mated queen in a cage.

Parent colony: the part of a divided, or "split," colony that keeps the old queen.

Pheromones: chemicals that animals produce to communicate with members of their own species. Beekeepers may notice the effects of queen, alarm, and orientation pheromones in their colony.

Pollen basket: an area on a bee's hind legs where pollen is packed.

Pollen flow: the period when abundant pollen is available for bees to collect.

Pollen substitute: a mixture containing protein alternatives fed to the bees when real pollen is not readily available. Often given in the form of a "**pollen patty**" which does not generally contain real pollen.

Propolis: plant resins collected from plants by bees to use in sealing cracks and crevices in hives. Cottonwood and poplar trees are common sources in the northern climates.

Pulling honey supers: the process of removing bees from honey supers and taking the supers off a colony, in preparation for harvesting honey.

Pupa, pupae (plural): the inactive third stage of an insect that goes through complete metamorphosis.

Queen cell: a vertical-hanging cell in which a queen bee develops.

Queen cup: open cup that looks like the start of a queen cell, but does not contain an egg or larva. Often referred to as a "play" or "practice" cup.

Queen excluder: a wire or plastic grid with space large enough for workers to pass through but too small for the queen to pass through. Often used by beekeepers to keep the queen in the brood chamber and prevent her from laying eggs in the honey supers.

Queen status: the state of the queen bee in the colony. A **queenright** colony has a queen who is mated and able to lay female worker eggs. A **queenless** colony means no queen at all. A **drone-layer** queen is only able to lay male drone eggs. A **virgin queen** has not mated or begun to lay eggs yet.

Refractometer: tool used to measure the moisture content of honey.

Robbing: when foraging worker bees "steal" honey from another colony, often during a nectar dearth. Fighting between robbers and defending workers, as well as the loss of winter honey stores, can result in colony loss.

Rolling bees: rubbing the bees on one frame against the adjacent frame as you pull it out or place it back in the colony. This can squash bees, causing them to release alarm pheromone and become defensive.

Smoking the hive: using a smoker to gently puff smoke into the hive entrance and between the frames of an active honey bee colony.

Swarming: when a group of worker bees and a queen leave their hive to establish a new colony.

Sugar syrup: a mix of granulated sugar and water fed to the bees. Light sugar syrup or 1:1 is often used in spring. Heavy or 2:1 sugar syrup is used in the fall. See recipes on page 8 of this guidebook.

Supering: placing honey super boxes, often called "**supers**," on a hive for the purpose of collecting honey for human consumption.

Supers: see "Honey supers."

Supersedure: process where the worker bees replace their queen by raising a new queen without swarming.

Varroa mites (*Varroa destructor* mites, or just **"varroa")**: parasitic mites that feed on adult bees and developing pupae.

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