

Overwintering Beehives in the North

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Overview

I have had great success overwintering bee colonies in Upstate New York where honey bees need to endure a 7-month stretch without a floral nectar source. In addition, temperatures in this region regularly drop into the single digits or even below zero degrees Fahrenheit for extended periods. While intended to provide specific guidance for Central New York beekeepers, this guide contains practical information for any extended overwintering region. Naturally, it may be necessary to tailor this advice for your own geographic location.

A key factor to keep in mind while reading this guide is that bees do not heat the hive. They form a tight cluster, keeping themselves warm through body contact and the flexing of their flight muscles which generates heat (like shivering). In fact, the inside of the hive can get cold enough for ice to form on the inside, thus the need for proper ventilation. Of utmost importance is that every effort be made to ensure that the inside of the hive gets as warm as possible during each day from the sun's solar rays so that the winter cluster of bees can move to available honeycomb. That's why flat black hive wrap is so important! It warms the hive more than any other color and those extra few degrees can make the difference in winter survival. The sad reality is that most bees die from starvation, not cold, even when the hive is full of honey. If your dead hive is full of bees with their rear ends sticking out of the comb, then they died of starvation, no matter how much honey remains in the hive! The cause of this starvation amid plenty is the extended cold which forced the cluster to remain so tightly packed that they were unable to move to another part of the comb where honey was stored, even if just inches away!

That's why you should **NEVER overwinter in insulated or polystyrene hive bodies.** Insulated hives reduce the transfer of solar heat from the black wrap thereby keeping the hive colder during the day than it otherwise would. Stay with solid wood! I for one have relegated all of my polystyrene boxes for use as honey supers during the summer months and won't buy any more.

Bee Yard in February



Notice how snow around each hive has been melted by the black panels radiating the sun's warmth.

Also, please keep in mind that my hives are made up entirely of **medium boxes** (traditionally known as Dadant or Illinois 6 5/8" high supers). As a result, any reference in this guide to number of boxes refers to medium supers, unless specified to the contrary (note: 3 medium supers 6 5/8" high = 2 deep brood boxes 9 5/8" high).

Hive Basics

Let's start at the bottom. My **hive stands** are built out of pressure treated lumber and are 16-inches tall, 16 1/4" wide and 19 7/8" long. They are enclosed on all four sides by plywood panels painted "flat black" to increase solar gain during winter. These hive stands do not have tops or bottoms and sit on bricks or flat rocks set almost flush with the ground to keep the hive level and prevent decay due to contact with the soil. As a result there are natural gaps around the bottom due to the unevenness of the ground. These gaps allows for air circulation during the summer when bees are making honey, as well as providing critical ventilation during the winter. The panels on these hive stands are removable, however I prefer to leave them in place year-round as the queen prefers to lay away from the light.



Hive Stands: without panels (left), with panels installed (right)

On top of the hive stand is a **screened bottom board**. Because the hive stand is enclosed, my screened bottom boards are open year-round (in fact, I don't have a way of closing them off and don't have a sticky board or any of that stuff. Just a screened bottom board!). My bottom boards have a 3/8" clearance between the screen and the bottom of the first hive box (most bottom boards have a 3/4" clearance which is OK). I keep a 12" long entrance reducer in place year-round, which means the bottom entrance is 2 3/4" wide and 3/8" high year-round. The screen itself is #7 galvanized hardware cloth (7 openings per inch). This size has openings small enough to keep wasps out, yet large enough that debris and mites easily fall through.



As previously mentioned, I use all **medium boxes**. Ideally the hive is 4 medium boxes high with no openings (holes) in the hive bodies over the winter. If you have boxes with holes drilled in them, stick a cork in to close them off. (note, many of my honey supers have holes 13/16" diameter which is just the right size for a cork from a wine bottle).

My **inner cover** is typically an all screened inner cover with an **entrance** cut into the front edge. It is made from #8 hardware cloth (8 openings per inch). When I wrap the hive in early November, I place a sheet of 1-inch thick Styrofoam over it (16 1/4" x 19 7/8"), but under the outer cover. You can also buy rigid insulating board (basically dense Styrofoam) from home building supply stores like Home Depot and Lowes.



Screened inner cover

If your inner cover **does not** have an entrance on the edge, then you will need to place the Styrofoam sheet **under** the inner cover or even in place of the inner cover. The Styrofoam sheet **must** have an entrance cut into the edge to provide the bees a way out when snow and dead bees block the lower entrance. If you use a traditional inner cover (with the hole in the center) then the Styrofoam sheet can be placed either above or below it. I find the easiest way to make an entrance is by melting a slot in the Styrofoam. I heat a thin metal bar about 1" wide over an open flame (stove or propane torch), while holding it with a pair of pliers or vice-grips. Once hot, I melt a slot from the front edge of the sheet about 4-inches toward the center. I do not melt the slot all the way through. [Caution: do not heat the metal bar to the point that it glows. Test the bar frequently until it easily melts the foam. It doesn't need to be hotter than that].

For **outer covers** I only use the plastic covers from the Walter T. Kelley Co. They are virtually indestructible and I have been using them for 40+ years (and never replaced one yet!). In addition to its durability, it doesn't have a metal flashing where ants and other insects can hide. It also has ribs on the underside to allow for ventilation.



Plastic Outer Cover (Walter T. Kelley Co)

I have found success in overwintering to be based on three fundamentals: "bees", "food" and "hive preparation".

Bees

In order to survive the long, cold, 7-month winter period in Upstate New York, the hive has to have enough bees to keep the cluster warm while raising replacement bees in late winter (Jan-Feb). Hopefully by early fall your hive has several medium boxes full of bees as there is not much a beekeeper can do at this point to increase their numbers

other than combining weak hives. Unless the hive has only a few frames of bees (extremely weak), I give every hive the chance to make it through the winter on their own and have been surprised with how well some weak hives (less than 2 medium boxes) have successfully made it through the winter. I also know of local individuals who have successfully overwintered using single 5-frame nucs (with deep frames).

Food

To feed or not to feed... That is the question:

Here in Upstate New York I overwinter hives in 4 medium boxes (equivalent to 2 deeps plus 1 medium). By early September your hive should have built up to at least 3 boxes (mediums). At this time of year I generally limit hive inspections to looking down from the top and occasionally removing a frame or two from the top box, rather than doing a more thorough inspection (separating lower boxes) as they are usually jammed with bees and I don't want to disturb them going into winter. My experience is that some of the boxes (usually the lowest one) is only partially filled with honey, so don't expect 4 boxes packed solid with full frames of honey. I check the hive's condition by slightly tipping the entire hive to the side to get a sense of it's weight (only lift the side about 1-inch. You don't want it to fall over!). It should feel like the hive is filled with bricks or rocks and be somewhat difficult to start tipping. In my experience heavy mean 80 pounds or more. If the hive tilts easily it is probably too light and you may want to check the lower boxes to confirm the lack of honey. Don't be alarmed if there is a lack of brood / larvae as the bees should be shutting down brood rearing at this point.



If the hive is not very heavy you will need to feed. The goal of feeding in the fall is to supplement honey stores using a 2:1 sugar-to-water syrup, not to stimulate brood rearing which is a spring technique (using a less sugary 1:1 sugar-to-water syrup). I make 2:1 syrup using pure cane sugar rather than feeding corn syrup. The 2:1 syrup is a sugar-to-water ratio by weight, not volume (see recipes below). I feed until the bees won't take any more, which happens when the cold weather sets in around late October to early November in my area. (Just a note about the weather in Upstate New York: we usually get a frost by mid to late September followed by an "Indian Summer" warm spell that lasts until mid to late October).



Recipe (2:1 syrup)

I make syrup using three ingredients: Pure cane sugar, water & lemon juice (like RealLemon brand). If sugar is on sale, I may buy it from a grocery store in 4 or 5-pound bags, otherwise I have found the best prices at warehouse stores like BJ's, Sam's Club or Costco. I found the most convenient size for my use is the 25-pound Domino brand from BJ's for less than \$10 (with an attached carrying handle). The process is as follows:

- Select the ingredient quantities from the table below.
- Bring the water to a rolling boil in a pot big enough to hold everything.
- Pour in the sugar and stir until dissolved (or as dissolved as possible). Don't stop stirring for long or the syrup will burn which can make the bees sick.
- Add the lemon juice and stir it in.
- Turn off heat
- Leave covered overnight. In the morning any remaining sugar crystals should have dissolved and the syrup should be clear.
- Depending on batch size, you can pour directly into the jars or a honey bottling tank with honey gate/valve. I take 5-gallon food grade pails (with bottling gates on each) to the bee yard and fill the jars there, including refilling any empty jars from the hives.

Ingredients (by batch size)				
<u>Batch Size:</u>	<u>½ Quart</u>	<u>2 Quarts</u>	<u>2 ½ Quarts</u>	<u>3 Gallons</u>
Sugar (weight in pounds) (or by volume)	1 lb 2 cups	4 lbs 7 cups	5 lbs 9 cups	25 lbs 11 quarts
Water (volume)	1 cup	3 ½ cups	4 ½ cups	5 ½ quarts
Lemon Juice	1 teaspoon	4 teaspoons	5 teaspoons	½ cup (25 tsp)

Reference (approximate)				
	<u>Pint</u>	<u>Quart</u>	<u>Gallon</u>	<u>Liter</u>
Water (weight in pounds) (metric)	1 lb 0.5 kg	2.1 lbs 0.9 kg	8.3 lbs 3.8 kg	2.2 lbs 1 kg
Sugar (weight in pounds) (metric)	1.1 lb 0.5 kg	2.2 lbs 1 kg	8.8 lbs 4 kg	1 lbs 1 kg

Feeders

I use hive-top jar feeders which I find work best for me. While I have tried using traditional hive-top feeders and Boardman entrance feeders, I have better luck with hive-top jar feeders. They are available from some supply companies like Walter T. Kelley Co., but I make my own 4-jar feeders designed to fit four half-gallon wide-mouth canning jars. As a result I can put as much as 2 gallons of syrup on each hive at one time. The feeders sit on top of traditional inner covers (with the oblong hole in the center) and have a 3/8" gap under them for the bees to move around and access the feeder. The lid is perforated with small holes so the bees can get at the syrup. A natural vacuum keep the syrup from pouring out (same principle as a water cooler). Alternately, you can place Boardman entrance feeders around the hole of the inner cover.

The feeders fit neatly into single deep supers, or, lacking those, two medium supers. I use a screened inner cover over the top box to keep yellow jackets and other pests out. Even though they would not be able to get to the syrup, any spilled or leaked syrup can encourage robbing of the hive itself, thereby defeating the whole purpose of feeding the hive.

End of Feeding

Once the cold weather sets in for good, I remove the syrup, feeders and traditional inner cover. I then wrap the hives (see below). Finally, as an extra precaution, I top off the hive with granulated cane sugar. I do this by placing



Extra Insurance: Table sugar on newspaper

newspaper or other thin paper on top of the frames, just under the screened inner cover. Onto this paper I pour granulated cane sugar like Domino brand. Pour as much as it will hold while still allowing the inner cover to go back on. Be sure to leave a way for the bees to go in and out of the top of the hive (entrance in the edge of the screened inner cover or if using a traditional inner cover, a small gap between the inner and outer cover). If you use a traditional solid inner cover, keep a small piece of wood covering most of the hole in the center so the bees can more effectively guard the hive. Additionally, restricting this opening will reduce drafts during the winter while still providing critical air circulation. Don't add the granulated sugar before cold weather permanently sets in to make certain small hive beetles and other pests are under control and not stimulated by all the sugar.

Hive-top Jar Feeders



With full jars in place (left) Without jars (right)



Enclosed by two medium supers (left)
Feeders on right hive will fit in a single deep super



Feeders once enclosed in hives

Robbing

Fall is a critical time of year due to the ever present threat of robbing by neighboring honey bees and other insects, notably Yellow Jackets and like-minded social wasps. Unlike spring, when you can leave frames of honeycomb laying around and the bees won't touch them, fall is quite the opposite... especially once the natural nectar supply dwindles after the first hard frost kills most flowering



Yellow Jackets robbing a hive

plants. At this point honey bees get aggressive, requiring you to keep everything closed: doors and windows, vehicles, containers, etc. Also, fall is when Yellow Jackets and their cousins, the Bald-faced hornets, become a real threat to hives due to their unique life-cycle which starts with a single reproductive female in the spring and builds to a population of between 1,500 and 15,000 individuals in the fall. While strong honey bee colonies will generally be able to fend off the attackers, it can still take a toll on hive strength as bees are killed off defending their home. In some years it may be necessary to limit the hive to a single entrance of 1-inch or less in width by 3/8" high or take other preventative measures. If you limit the hive to a single entrance, then additional ventilation is critical in the form of screened inner covers and screened bottom boards. Stapling window screen or #8 hardware cloth over the hole in a traditional inner cover is a perfectly adequate alternative to using a screened inner cover.

Hive Preparation

Wrapping the hive

In late-October or early November I put the hives to bed for the winter. First, be sure any queen excluders are removed as they will doom the hive by preventing the queen from moving with the cluster. Second, wrap the hive as follows:

Hive wrapping instructions:

1. Remove any queen excluders.
2. Place a sheet of Styrofoam (16 1/4" x 19 7/8") over screened inner cover or in place of inner cover (see earlier section on inner covers).
3. Purchase a roll of roofing felt (tar paper) from your local building supply store (Home Depot / Lowes). Rolls are typically 36" wide x 72-feet long and sell for about \$25.



Roofing Felt (tar paper)

4. Cut a length long enough to go all the way around the hive and overlap by about 6-inches (about 80-inches). Depending on the hive's height you will need to trim the width so that it stays below the outer cover.
5. Get a bunch of furring strips to use in stapling the roofing felt to the hive. You will need about 10 strips per hive. A furring strip is a long piece of thin wood (1/8" thick and roughly 1/2" wide) or a stick about 1/4" in diameter. They need to be as long as your hive is tall. Around here I use dead goldenrod stems as they are the right diameter, long enough to reach from the bottom to the top of the hive and, best of all, they grow right next to my hives for free!
6. Get a **staple gun** with staples 5/8" long if you are using round sticks (like goldenrod stems) or 1/2" long if you are using wood strips. They need to be long enough to go through the furring strip, roofing felt, and into the wood hive body far enough to hold through the winter.
7. Staple the roofing felt to the hive body using the furring strips. It is critical to use the furring strips to prevent the staples from tearing through the roofing felt. If you are doing this without a helper, it is OK to use one staple to hold the felt in place. I find it easiest to start on one of the long sides of the hive, but the back is OK if you prefer. Avoid starting in front of the hive since it is always a good practice to minimize standing in the bees' flight path! Next, wrap the felt paper around the hive until it overlaps the starting edge (with the staple). It is OK to use another staple to hold the end in place. Next, place a furring strip vertically onto the side of the hive and shoot 4 or 5 staples to hold the furring strip in place. If you are using sticks like goldenrod stems, then each leg of the staple should go on either side of the stick (staple straddles the stick). If using a wood furring strip, then you can also staple through the strip. Place 2 or 3 furring strips on each long side of the hive, and 1 or 2 on the front and back. **Be sure the wrap does not block the entrance.** If necessary, you can tear a small piece of felt paper away from the entrance. Same goes for an upper entrance. There likely will be gaps between the roofing felt and the hive body, especially near the corners. This is normal as the roofing felt is somewhat stiff.



Hive wrapped with Roofing Felt

A note about using staples: It is natural to want to avoid stapling into the hive boxes, especially for beginners with brand new "pretty" hives. Do it anyway! Let me assure you that your hive won't be so pretty in the spring when the colony is dead and the hive is full of stinking, rotting bees and blue/green mold all over your frames. If you use staples, they will be easy to remove in spring with a pair of pliers since the staples are easy to grab due to use of furring strips. If you are using a good exterior latex paint, it should remain somewhat plastic and seal the tiny staple holes. Furthermore, you will find that any remaining holes will be filled in the next time you paint.

Summary

As discussed in this guide, successful overwintering is dependent on three fundamentals: "**bees**", "**food**" and "**hive preparation**". There must be a population of **bees** large enough to generate heat within the cluster and sustain the population over the winter. There must be enough **food** to last until forage is available again in the spring, especially the month of March when brood is being reared and honey consumption increases. Finally, the hive can be **prepared** in many ways to increase the likelihood of survival.

Remember, what we have discussed are techniques for increasing the odds that a colony of honey bees survives the winter. It is not an absolute that everything be done exactly as outlined in this guide. I have had colonies survive with relatively few bees; stores which are less than optimal; hives with solid bottom board; hives with traditional inner covers; hives left unwrapped and hives made out of insulated, polystyrene (Styrofoam). I have also had hives perfectly prepared which did not survive. While beekeepers can do much to assist the bees, the quality and age of the queen and genetic makeup of the bees themselves, along with the severity and length of the winter are major factors in survivability. Bottom line... do as much as you can and keep your fingers crossed.



Rows of cozy beehives in winter

-Eric