



# Winterization of European Honey Bees (*Apis mellifera*) in Southeastern Minnesota and Western Wisconsin

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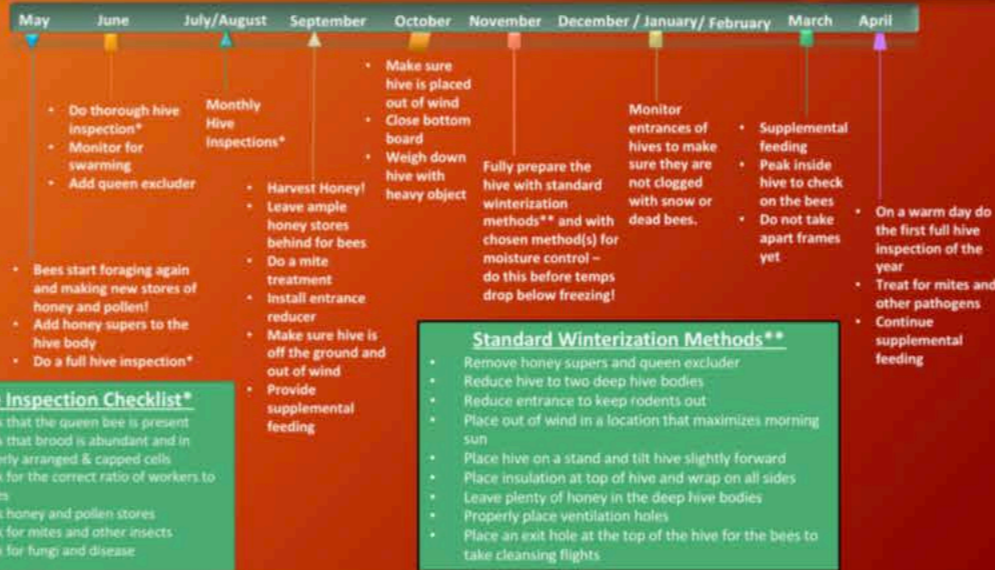


## Abstract & Introduction

Beekeepers face a big obstacle living in the Midwest with subzero winter temperatures. Getting a hive successfully through the winter is possible, but it takes careful planning. Beekeepers most commonly keep a type of hive called a Langstroth hive. Langstroth hives do the job of housing honey bees very well, however, some human intervention is required to prepare them for a cold winter. Bees do a great job of preparing themselves for the winter, seeing as how they are self-sufficient, very organized, and engage in teamwork phenomenally well. However, when housing them outside of their natural habitat, adjustments must be made to help them. The two most important issues that must be addressed are moisture/condensation buildup, and Varroa mites. If a hive goes into the winter affected by mites, it is already compromised and not likely to survive. If moisture builds up and condenses at the top of the hive during the winter, it drips down on the bees and freezes them to death. This project explores different winterization methods in order to discover the best way to get a hive successfully through the winter. We hypothesized that the hives with the highest winter survival rate would have three common moisture control methods implemented within them – dry sugar, moisture board, and moisture quilt. One hive we observed did implement all 3 methods. This allowed us to test how effective it was to use the three methods together, in comparison to using a single method.



## Yearly Beekeeper's Timeline of Events By Emily & Ashley



### Hive Inspection Checklist\*

- Check that the queen bee is present
- Check that brood is abundant and in properly arranged & capped cells
- Check for the correct ratio of workers to drones
- Check honey and pollen stores
- Check for mites and other insects
- Check for fungi and disease

### Standard Winterization Methods\*\*

- Remove honey supers and queen excluder
- Reduce hive to two deep hive bodies
- Reduce entrance to keep rodents out
- Place out of wind in a location that maximizes morning sun
- Place hive on a stand and tilt hive slightly forward
- Place insulation at top of hive and wrap on all sides
- Leave plenty of honey in the deep hive bodies
- Properly place ventilation holes
- Place an exit hole at the top of the hive for the bees to take cleansing flights

Table 1. Biggest Challenges Of Winter Beekeeping	Remedies & Tips
Not enough stored honey	<ol style="list-style-type: none"> <li>1. Leave approximately 10lbs of honey per frame for winter feeding</li> <li>2. Supplemental/emergency feeding</li> </ol>
Intruders/disease	<ol style="list-style-type: none"> <li>1. Routine hive inspections</li> <li>2. Entrance reducer (put on hive in early fall)</li> </ol>
Varroa Mites	<ol style="list-style-type: none"> <li>1. Routine hive inspections</li> <li>2. Perform 3 annual preventative mite treatments &amp; additional treatments as needed</li> </ol>
Condensation Build-up	<ol style="list-style-type: none"> <li>1. Tilt the hive slightly forward</li> <li>2. Moisture board</li> <li>3. Moisture quilt</li> <li>4. Dry sugar</li> <li>5. Properly positioned ventilation holes</li> </ol>
Not Enough Ventilation	<ol style="list-style-type: none"> <li>1. Holes for appropriate air flow</li> <li>2. Moisture board</li> <li>3. Top exit hole</li> </ol>

### Moisture Board Method

A moisture board is placed on top of the inner cover and creates a channel for air to circulate out of the hive. It also helps to minimize the temperature difference between the inner and outer covers, making it less likely for moisture to condense. The moisture board can also serve to absorb excess moisture and wick it away from the hive.



An infrared photo of an overwintering cluster of Honey Bees. Photo credit to Bee Culture Magazine.



### Moisture Quilt Method

A shallow rim or a simple frame, similar in size to a honey super, is placed on top of the uppermost hive body. The frame is equipped with a screened in bottom and screened ventilation holes on the sides. There should be one to three ventilation holes on each side to allow for adequate air flow. Wood shavings are added to the frame until the side ventilation holes are covered half way. The wood shavings wick excess moisture through the screened bottom and absorb it. The shavings continually dry out due to the ventilation holes.



### Dry Sugar Method (Mountain Camp Method)

This method of moisture control involves pouring several pounds of dry sugar on top of newspaper laid out across the frames of the top deep hive body. The sugar has two purposes for overwintering bees, one is to absorb excess moisture from the hive, and the other is to provide a supplemental food source for the bees. As the sugar absorbs moisture, it will turn into a block and provide moisture and carbohydrates to the bees if they need supplemental food throughout the winter.



Table 2. Beekeeper	Method	Successful Hives (#)	Failed Hives (#)	Percent Success (%)
Fred Krause	Dry Sugar Method	0	1	0%
Dr. Barrett Klein	1 hive with dry sugar method & 1 hive with dry sugar and moisture board	0	2	0%
Laura Appleman and Roger Carlson	All 3 methods: dry sugar, moisture board & moisture quilt	1	9	10%

## CONCLUSION

The only surviving Langstroth hive had all 3 winterization methods implemented within it by Roger and Laura. The first thing to point out is that the 2018-2019 winter had record low temperatures and lots of precipitation. Unfortunately, Roger and Laura only had 1 out of 10 hives survive; this may have been different if this area hadn't experienced a polar vortex. The other methods observed had success rates of 0%. When keeping a backyard beehive, plenty of research needs to be done first, and then the following calendar year should be planned out accordingly to prepare for the important beekeeping events and weather fluctuations. The key points are placement of the hive, insulation, ventilation, supplemental feeding, and most importantly, moisture control with a general hands-on approach. We found that a hands-on approach for backyard beekeeping is the best method to aid in winter survival. Laura and Roger used the hands-on approach and had the only successful hive. Fred and Dr. Klein used a hands-off approach and had no success. The overall success rate of the observed hives was 7.7%. We can see that keeping a hive alive through a midwestern winter is challenging, but it is possible. This validated the hypothesis that a combination of methods would work the best, but more research should be done to make a fully supported conclusion since the success rate was low and the sample size was small.

## Participants



- Emily Hoffman, Ashley Olichwier
- Winona State University- Dr. Robin DeVinney
- Winona East Rec Center (ERC)- Lydia Boysen & Megan Graf
- Local Beekeeper in Winona, Minnesota- Fred Krause
- B & B Honey Farms Houston, MN- Ted Sennes
- University of La Crosse, Wisconsin (UWL)- Dr. Barrett Klein
- Genoa, Wisconsin- Laura Appleman and Roger Carlson
- 3D hive model design- Jon Devine