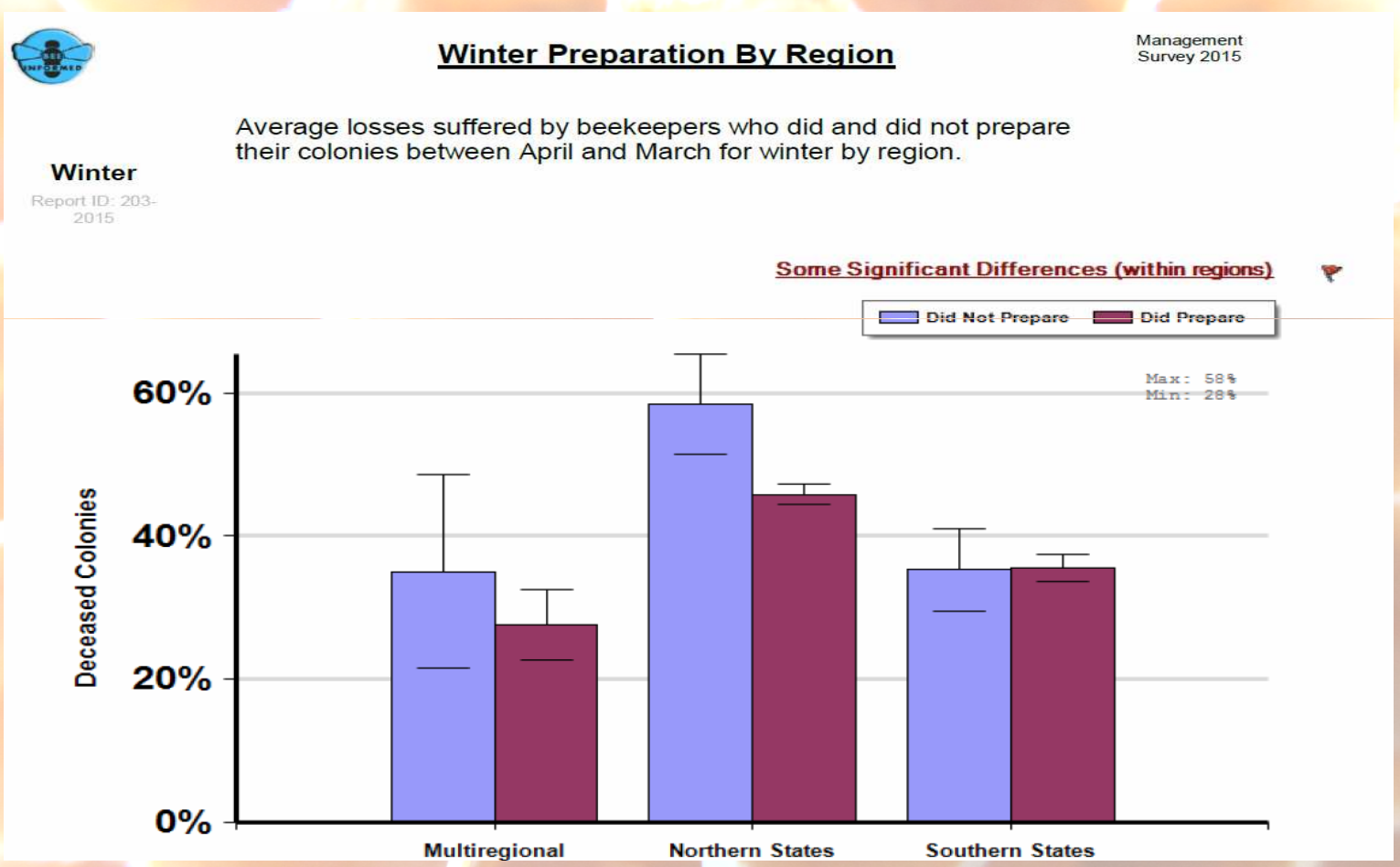
Why Insulate Hives In Northern New Jersey?

John A. Gaut October 13, 2015

BIP Survey
Winter Preparation

The Bee Informed Partnership Management Survey Results (2014-2015)



https://beeinformed.org/results/the-bee-informed-partnership-national-management-survey-2014-2015

BIP Survey
Winter Preparation

"Northern beekeepers who prepared their operations for winter lost 12.6 fewer overwintering colonies per 100 managed colonies (21.6% fewer losses) than beekeepers who did not prepare their colonies for winter."

- Create or engage an upper entrance
- Wrap colonies with insulation
- Wrap colonies with tar paper or wintering sleeve
- Place extra insulation on top of colony
- Equalize colony strength
- Move colonies to southern location
- Move colonies to inside wintering buildings

"Correlation is not Causation"

As with everything in beekeeping, you should understand the rational for recommendations or suggestions and make your own decision for your colonies

Winter Survival

What are the basic requirements for a colony to survive the New Jersey winters?

Winter Survival

- A queen right colony with plenty of “winter bees”
- Food Reserves
  - Honey 60 pounds
  - Pollen
- Low mite parasitism
  - If the mite count is more than 6%, the colony only has a 50 % chance of surviving the winter (BIP)
  - Less than 1% is ideal
- A dry and wind protected hive

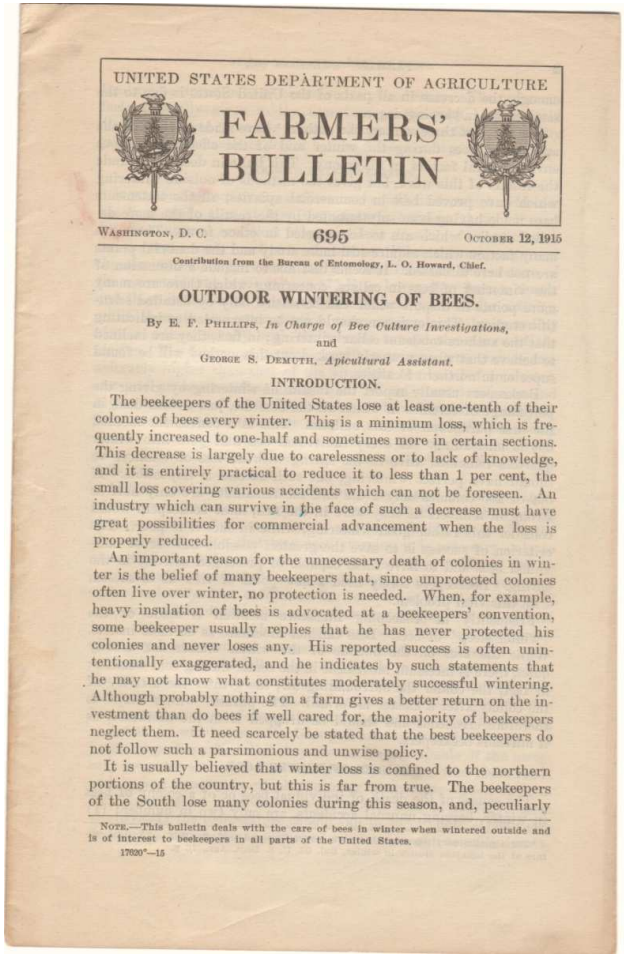
Reasons given for not Insulating

What are some of the reasons you have heard?

Reasons given for not Insulating

- “The bees can survive the winter without insulation.”
- “The bees get too hot”
- “Insulation makes the inside of the hive too moist. Cold does not kill the bees; moisture does.”
- “Insulation keeps the hive too warm; the colony doesn’t cluster, is more active and consumes more honey.”
- “Wrapping the hive with Black Roofing Paper is all that is needed.”
- “Insulation costs too much”
- “Insulation takes too much time”

Farmers' Bulletin 695
1915



UNITED STATES DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN

WASHINGTON, D. C. 695 OCTOBER 12, 1915

Contribution from the Bureau of Entomology, L. O. Howard, Chief.

OUTDOOR WINTERING OF BEES.

By E. F. PHILLIPS, *In Charge of Bee Culture Investigations*, and GEORGE S. DEMUTH, *Apicultural Assistant*.

INTRODUCTION.

The beekeepers of the United States lose at least one-tenth of their colonies of bees every winter. This is a minimum loss, which is frequently increased to one-half and sometimes more in certain sections. This decrease is largely due to carelessness or to lack of knowledge, and it is entirely practical to reduce it to less than 1 per cent, the small loss covering various accidents which can not be foreseen. An industry which can survive in the face of such a decrease must have great possibilities for commercial advancement when the loss is properly reduced.

An important reason for the unnecessary death of colonies in winter is the belief of many beekeepers that, since unprotected colonies often live over winter, no protection is needed. When, for example, heavy insulation of bees is advocated at a beekeepers' convention, some beekeeper usually replies that he has never protected his colonies and never loses any. His reported success is often unintentionally exaggerated, and he indicates by such statements that he may not know what constitutes moderately successful wintering. Although probably nothing on a farm gives a better return on the investment than do bees if well cared for, the majority of beekeepers neglect them. It need scarcely be stated that the best beekeepers do not follow such a parsimonious and unwise policy.

It is usually believed that winter loss is confined to the northern portions of the country, but this is far from true. The beekeepers of the South lose many colonies during this season, and, peculiarly

NOTE.—This bulletin deals with the care of bees in winter when wintered outside and is of interest to beekeepers in all parts of the United States.

17620°—15

- The beekeepers of the US lose at least 10% of their colonies every winter
- It is entirely practical to reduce losses to less than 1%
- Since unprotected colonies often live over winter, some believe protection is not needed.
- Summary and Conclusions:
  - Bees need protection from cold and wind
  - The beekeeper should give abundant insulation
  - Great care is needed to protect the colonies from the wind
  - A good queen is needed
  - Many colonies die of starvation

    This is easily avoided

Summary of a Study in Wisconsin

- The Thermology of Wintering Honey Bee Colonies, By **CHARLES D. OWENS**, *Agricultural Engineering Research Division, 1971 "Still in force"*
  http://naldc.nal.usda.gov/download/CAT72345678/PDF
  - The 44º F. isotherm establishes the outermost limit of the winter cluster.
  - A colony protected by insulation will have a less compact cluster that will fluctuate more in size with temperature change than a cluster in an unprotected colony.
  - The area of the cluster within the 76º isotherm is the active or heat-generating area, with a relatively low density of bees.
  - In hives heated up to 40º the cluster response is not different from that in insulated hives.
  - Insulated colonies start brood rearing a few days earlier than unprotected colonies, but the latter tend to catch up shortly after warmer weather arrives.
  - Honey bees make no attempt to maintain the temperature in the domicile outside the winter cluster.
  - A cluster held for long periods under freezing conditions declines in strength. The rate of decline is dependent on pollen stores available, but it is slower in insulated than in unprotected colonies.
  - Brood rearing will occur under subzero conditions in insulated colonies with plenty of pollen and honey stores in the cluster.
  - Under normal winter conditions either insulated or non-insulated colonies should survive at Madison, Wis.

The Winter Cluster

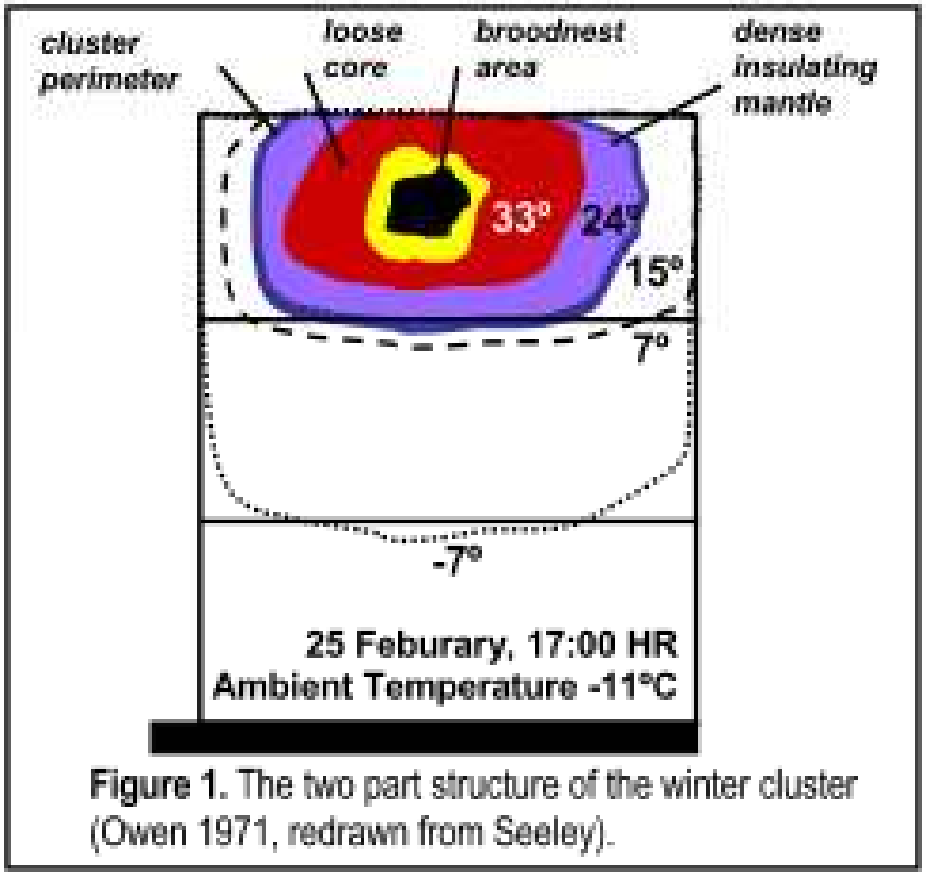


Figure 1. The two part structure of the winter cluster (Owen 1971, redrawn from Seeley).

Clusters have 2 parts

- A loose inner core
- A dense insulating mantle

Cluster Temperatures

- **Broodnest: 35 C = 95 F**
- **Core: 33 C = 91 F**
- **Heating within 24C = 76F**
- **Insul. Mantle: 15C = 59F**
- **Never below 7C = 44F**

Why Insulate Hives In Northern New Jersey?

- Survival
- Temperature and Moisture
- Honey Consumption
- Roofing Paper Wraps
- Insulation Cost and Time
- Benefits of Insulation

Survival

"The bees can survive the winter without insulation."

- The colony can survive if there is enough bees, honey, pollen **and they can move to the honey and pollen**.
- Colonies with high mite loads collapse due to Parasitic Mite Syndrome
  - The mites infect the bees with viruses and colony suffers a virus epidemic
- Insulation improves the survival rate

Temperature and Moisture

"The bees get too hot"

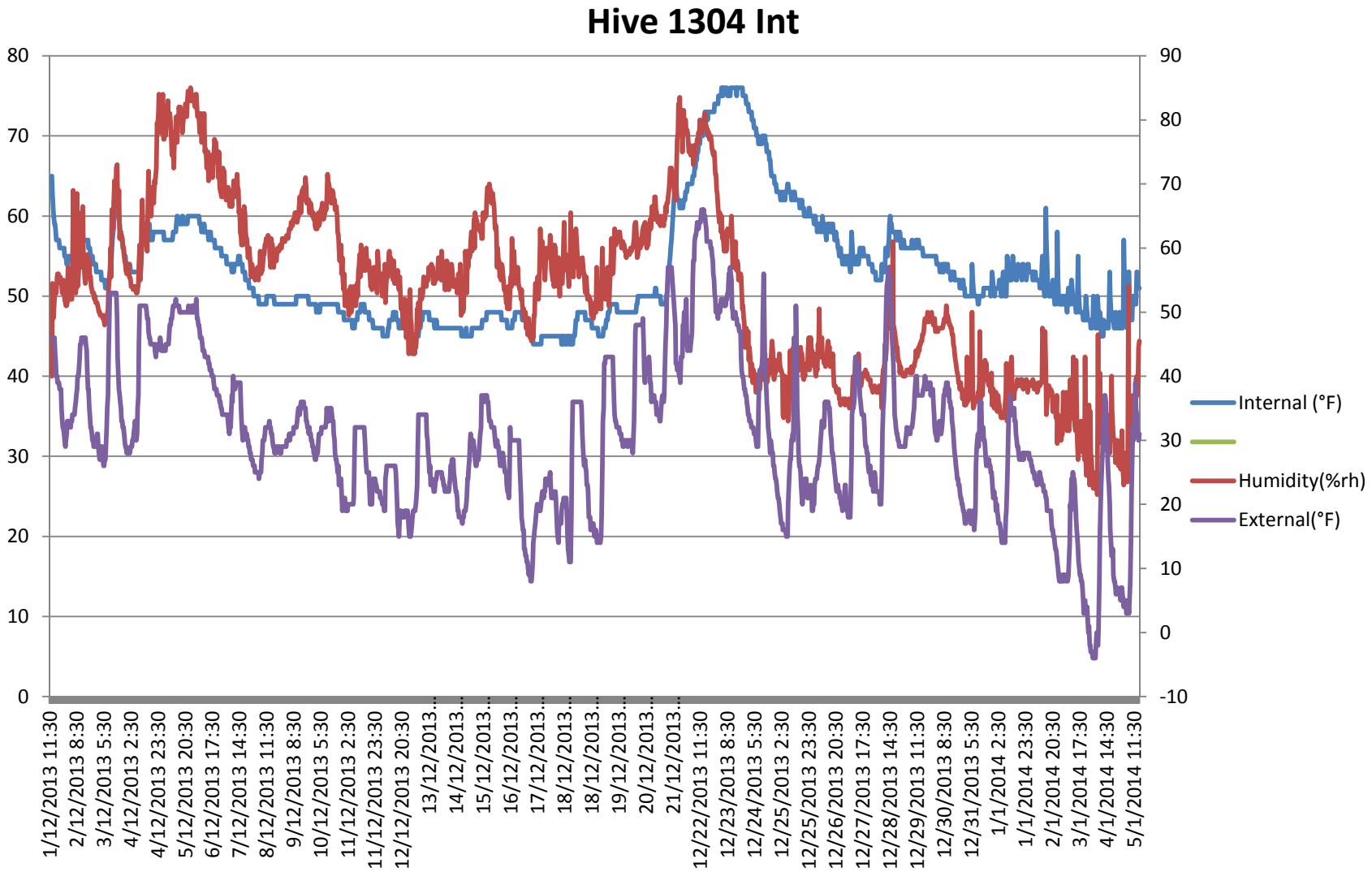
"Insulation makes the inside of the hive too moist. Cold does not kill the bees; moisture does."

Ice on Inner Cover

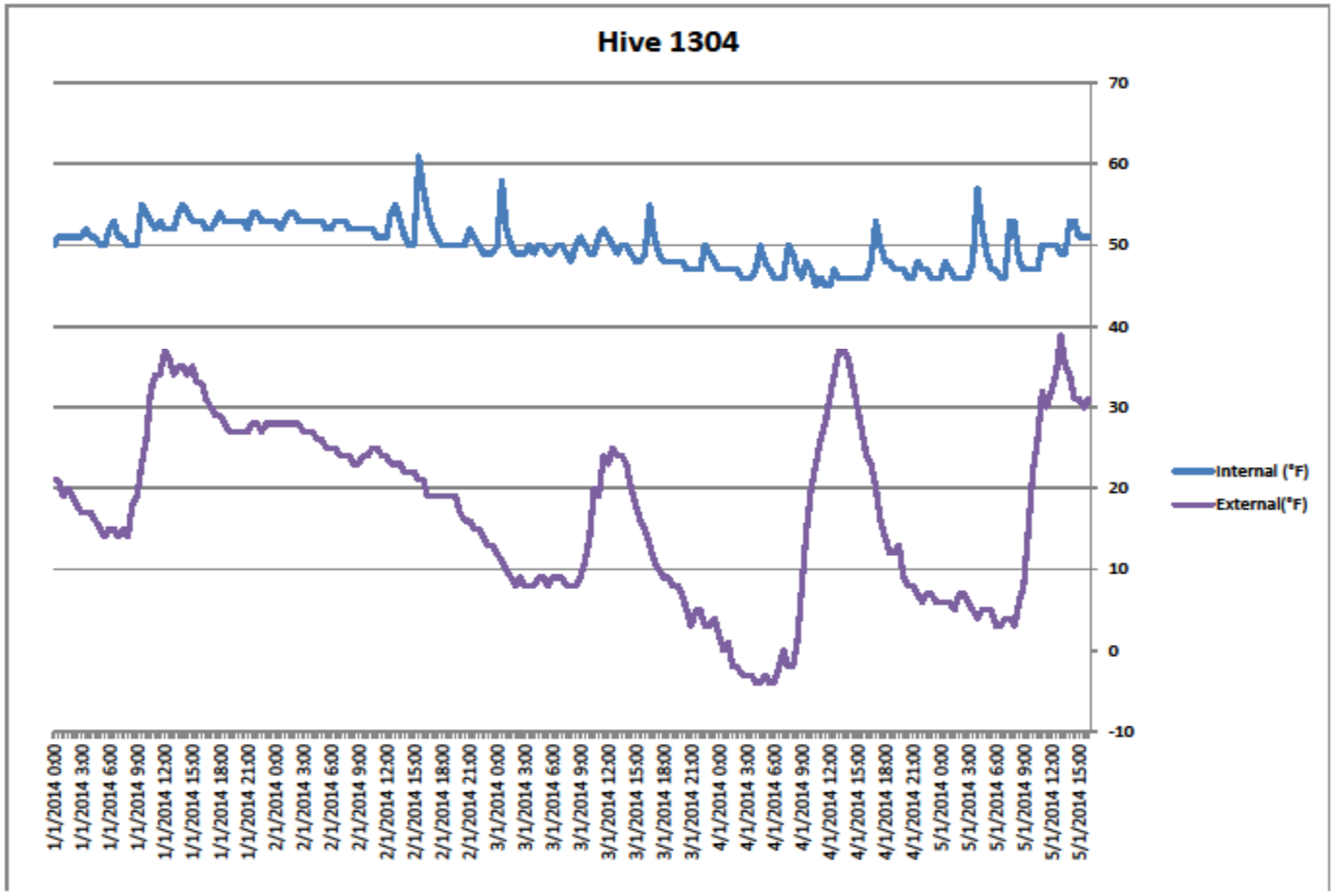
It is hard to see in the picture, but what you are looking at is the inside of a top cover upside down. All of the white substance is tiny stalactites, like frost standing up about 1/4 of an inch above the brood.

http://basicbeekeeping.blogspot.com

December 1, 2013 to January 5, 2014



The coldest days of 2014
January 1 to January 5



Brood Nest Temperatures

Temperature and Moisture

"The bees get too hot"

- The colony can thermo-regulate the hive very effectively and the hive does not over heat

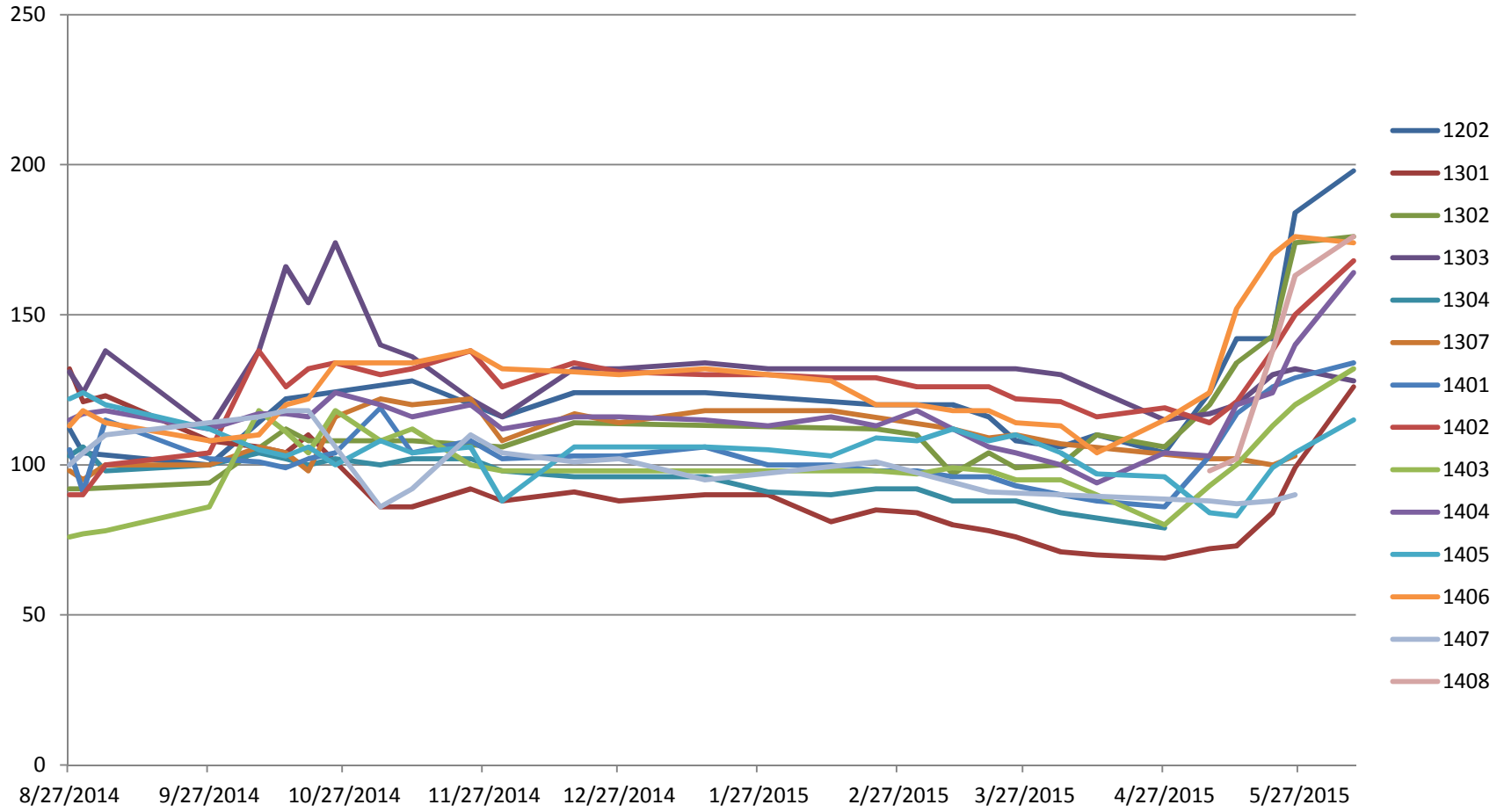
"Insulation makes the inside of the hive too moist. Cold does not kill the bees; moisture does."

- Condensation (Liquid Moisture) does kill bees. Adequate ventilation is needed to remove moisture while it is a vapor.
- Insulation can help reduce condensation in the hive so the moisture can be removed by ventilation, **especially on top**. Also the sides.
- The colony can regulate the humidity in the brood nest very effectively (MB Ellis, 2008)
  - Actively by fanning
  - Passively by having moisture sinks - honey and cocoons

Honey Consumption

“Insulation keeps the hive too warm; the colony doesn’t cluster, is more active and consumes more honey.”

Hive Weights



Honey Consumption

"Insulation keeps the hive too warm; the colony doesn't cluster, is more active and consumes more honey."

- The bees begin clustering at 55 to 57 F. The cluster gets more compact as the temperature decreases.
- The hive weights are nearly steady until January and then start decreasing in February and March as the brood rearing ramps up.
- The hives have plenty of honey left in April

Roofing Paper Wraps

"Wrapping the hive with Black Roofing Paper is all that is needed."

- The paper does help reduce air infiltration. Lack of wind protection is a major cause of winter losses.
- The black paper does passively heat one side of the hive on sunny days for a few hours.
- **BUT** on clear cold nights, the black roofing paper radiates heat back out on all four sides for 12 hours or more

Insulation Cost and Time

"Insulation costs too much"

- The cost is about $25 per hive

"Insulation takes too much time"

- The hive can be insulated in a few minutes
- Cutting the insulation takes about 10 minutes per hive.
- The cut pieces are reusable every year.

Benefits of Insulated Hives

- Reduces heat loss and air infiltration
  - Especially on cold and windy nights
  - Allows bees to move to honey
    - Bees can't move if less than 42 F
      - 41 F is the minimum temperature that "shivering" is possible*
    - Bees will not walk on surfaces less than 45 F
- Reduces Condensation on the top cover and sides of the hive bodies
  - Condensation will kill the bees
  - Moisture (High Humidity) can result in Chalk Brood and other bacterial and fungal diseases
- Reduces the consumption of Honey
    - For every 11F degrees reduction in temperature, the bees must work twice as hard to keep warm and function. *
    - More honey and pollen for brood building and less used for thermo-regulation
- Enables colony to survive the winter along with:
  - Adequate Ventilation for the moisture removal. An upper entrance lets the moist air escape.
    - The colony must remove 3 to 4 quarts of water for every 10 pounds of honey consumed
  - Plenty of healthy young "Winter Bees" raised in August, September and October.
  - Mite Control so bees are not weakened from the parasites and the viruses they transmit
  - Low Nosema Levels
  - Adequate Nutrition including pollen and honey

- Enables more brood rearing in Jan, Feb and March when the outside temp is still cold
  - Reduces Chilled Brood
  - Cluster size and brood area can be larger, building "first class populations of young bees."
  - More foragers for the early nectar flow in May and June

- **Enables a colony to survive the cold windy nights in the winter and thrive in the early spring**

*The BEE, A Natural History, Noah Wilson-Rich, p76

Hive Insulation

- Materials
- Costs
- Details for installing

Hive Insulation

- **Extruded** Polystyrene - EPS (Not Expanded Polystyrene)
  - 2 Inch Thick is **R10** (13 times more insulating value than just the hive body)
  - **2 inches between Inner Cover and Outer Cover**
  - 2 inches on all four sides
  - 2 – 48 inch bungee straps
  - About $25 per hive, reusable every year

Materials and Cost

One sheet will insulate 2 hives

Pactiv R 10 Unfaced Polystyrene Foam Board Insulation (Common: 2-in x 4-ft x 8-ft; Actual: 2-in x 4-ft x 8-ft)

Item #: 304090 | Model #: 304090.0

★★★★★ 25 reviews | Write a review

$35.48

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Description | Specifications | Reviews | Community Q&A

Got an update or addition to this product's details? Share it here.

R 10 Unfaced Polystyrene Foam Board Insulation (Common: 2-in x 4-ft x 8-ft; Actual: 2-in x 4-ft x 8-ft)

- Does not absorb moisture
- Lightweight, durable, easy to use
- Meets and exceeds all type IV and type X specifications
- Retains insulating properties over time
- Maintains integrity

2- 4ft Bungee Cords

Secure Tite 4-ft Rubber Core Steel Hook Bungee Cord

Item #: 548691 | Model #: 61488

★★★★★ Be the first to write a review!

$2.98

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Description | Specifications | Reviews | Community Q&A

Got an update or addition to this product's details? Share it here.

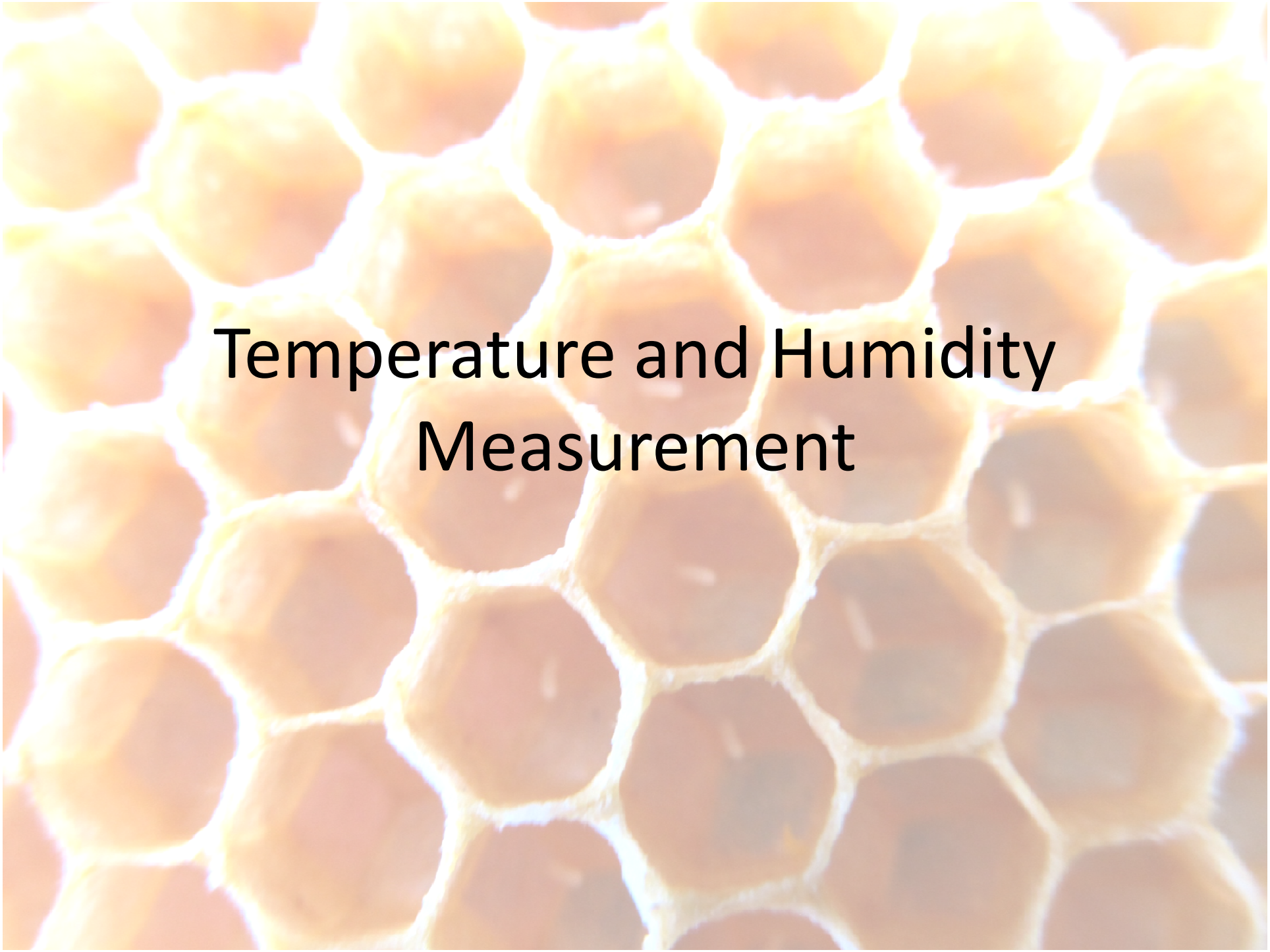
4-ft Rubber Core Steel Hook Bungee Cord

- This flat bungee is 48-in long
- Flat design of the bungee spreads the load and won't dig into cargo
- This flat bungee is 3 times stronger than conventional hooks
- The protective coating on hooks won't mar paint and prevents rust

Insulation Details

Top
Entrance

Top Insulation – 2 inches
In a 3 inch shim


Temperature and Humidity
Measurement

Temperature and Humidity Measurement

EL-USB-2-LCD+

High Accuracy Humidity and Temperature Data Logger with LCD

- Higher accuracy sensor when compared to the EL-USB-2-LCD
- 0 to 100%RH measurement range
- -35 to +80°C (-31 to +176°F) measurement range
- High contrast LCD
- Immediate, delayed and push-to-start logging
- Calibration certificate available

Temperatures on February 14, 2015

Temperatures on February 16, 2015

Checklist for Winter Survival

- ❑ Adequate Honey Stores
- ❑ Good pollen reserves
- ❑ Large population of young healthy bees
- ❑ Low Mite levels
- ❑ Low Nosema levels
- ❑ Upper entrance and reduced/guarded bottom entrance
- ❑ Minimize Air Infiltration
  - ❑ Close Bottom Board on Screened Bottoms
- ❑ Insulate the top of the hive between the inner cover and the outer cover
- ❑ Insulate the hive sides

Insulating Hives
In Northern New Jersey