

PENNSSTATE



Improving pollination through bumblebee habitation; Evaluation of nest box types in bumblebee colonization

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Sustainable Agriculture
Research & Education Program

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Honey bees - \$ 15 billion in pollination services

Advantages:

- 1) Domesticated → transportable
- 2) Large colonies → 10,000 to 60,000 workers

Disadvantages:

1) Pests & parasites:

Varro Mites, Tracheal Mites, Nosema, Small Hive Beetle, Wax Moth

2) Bacterial diseases:

American Foulbrood (AFB), European Foulbrood (EFB)

3) Fungal diseases

Chalckbrood, Stonebrood

4) Viral diseases

Acute Bee Paralysis Virus, Israel Acute Paralysis Virus, Kashmir Bee Virus, Black Queen Cell Virus, Chronic Paralysis Virus, Deformed Wing Virus, Cloudy Wing Virus, Sacbrood virus

5) Dysentery

6) Chilled Brood

8) Colony Collapse Disorder

Native bees - \$ 3 billion in pollination services

Disadvantage:

1) **Wild** → **non-transportable** / they don't carry disease

Advantages:

- 1) Free pollination services
- 2) More adapted to pollination in inclement weather
- 3) More diverse, in North America are more than 4000 species

Causes of decline:

- 1) Habitat destruction – monocrop agriculture & suburban sprawl
- 2) Introduced pests and parasites
- 3) Global warming
- 4) Air pollution
- 5) Pesticide misuse
- 6) Scramble competition with managed bees, such as honeybees, bumblebees, leafcutter bees

The migratory honeybee vortex

- a large colony gathering sometimes more than 60 lbs of pollen and 200 lbs of nectar.
- the native habitat, 640 acres (mi²) sustain 3-4 honeybee hives
- monocrop agriculture requires 2 colonies per acre

3 - 4 colonies vs. 1280 colonies per square mile



Almond

615,000 acres

\$2.34 billion, 2nd crop in USA

1,200,000 honeybee colonies - \$150/colony

estimated for 2010, 2,000,000 colonies needed for pollination

krinos foods

Timeless Flavors

TURANO BAKING

Fresh Avocadoes
1.99
each

Sweet Honey
4.99
each

Sweet Lemon
99
each
FARM FRESH

POMELO
99
each
FARM FRESH

EXTRA MANGOES
99
each
FARM FRESH

Kiwi
2.99
each
FARM FRESH

EXTRA MANGOES
3.99
each
FARM FRESH

EXTRA MANGOES
2.99
each
FARM FRESH

EXTRA MANGOES
99
each

EXTRA MANGOES
99
each

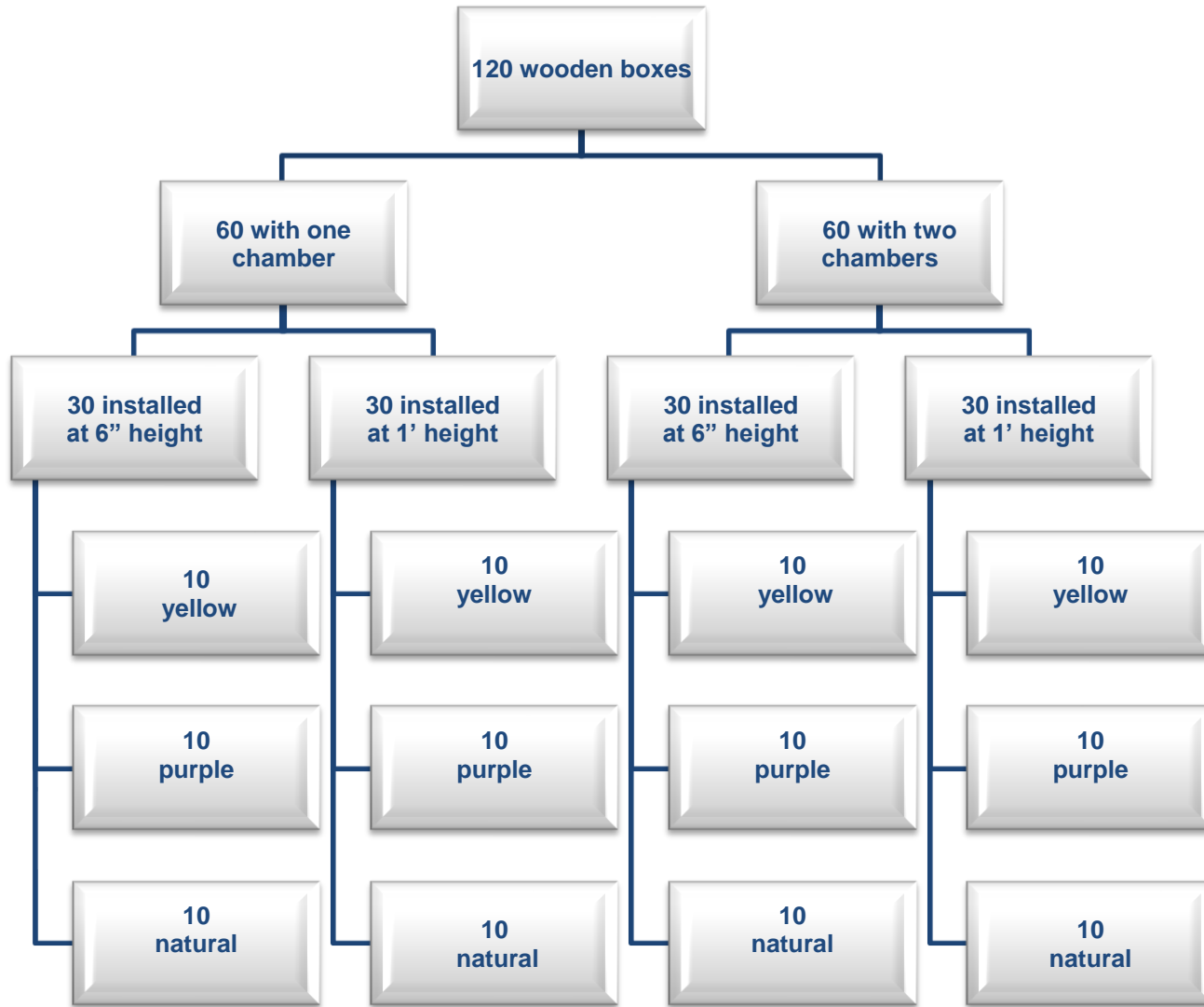
EXTRA MANGOES
4.99
each

EXTRA MANGOES
7.99
each

KOREAN PEARS
1.99
each



120 models of wooden boxes based on variations in design, color, and height:



Mercersburg, Chambersburg, Biglerville, Littlestown, Carlisle, Landisville

Plexiglas panel

5"

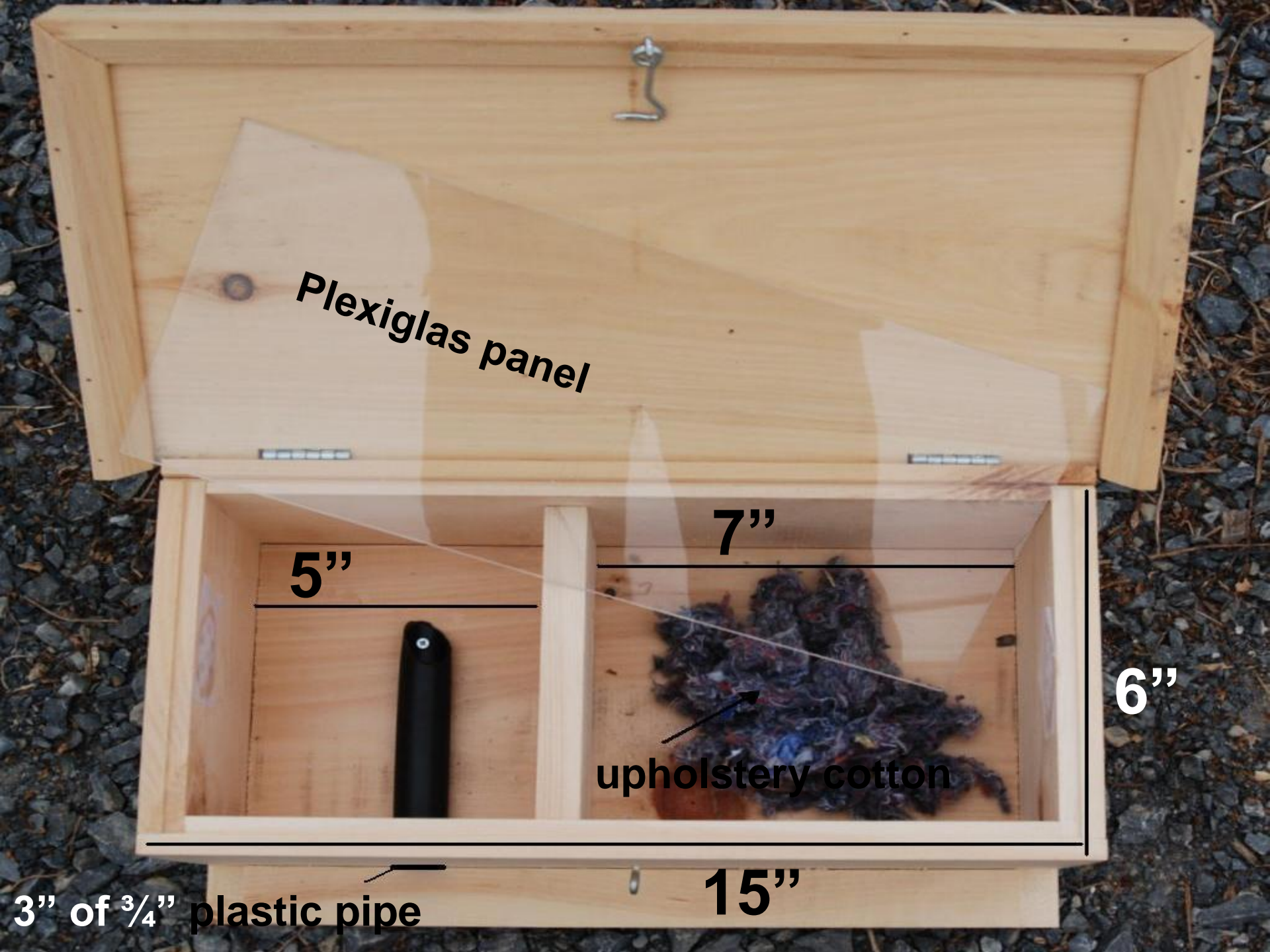
7"

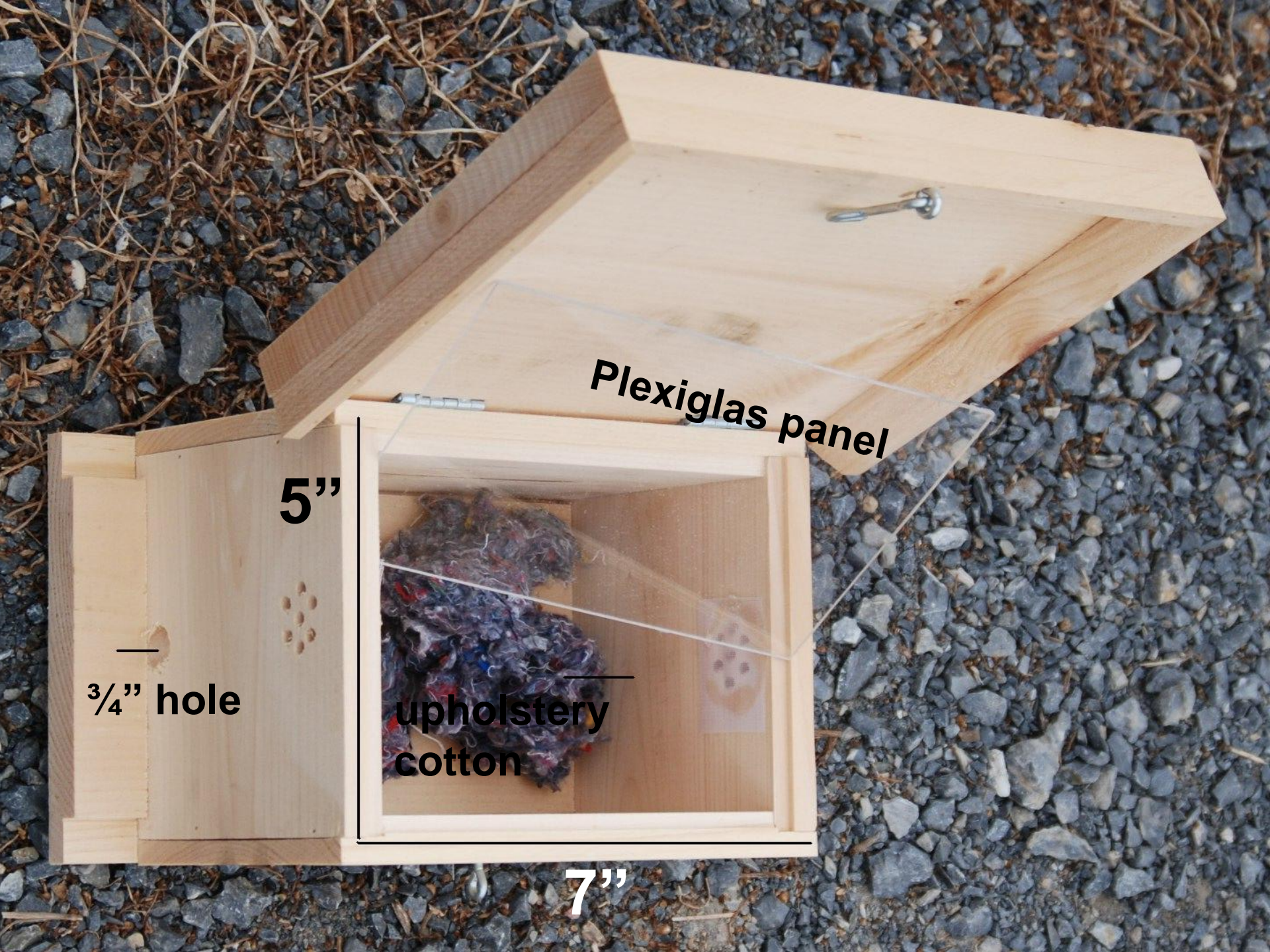
upholstery cotton

6"

15"

3" of $\frac{3}{4}$ " plastic pipe





Plexiglas panel

5"

3/4" hole

upholstery
cotton

7"









26 boxes: 15 two chambered + 11 one chambered



8 boxes: 5 two chambered + 3 one chambered



6 boxes: 4 two chambered + 2 one chambered



1 two chambered box



9 boxes: 4 two chambered + 5 one chambered



16 boxes: 5 two chambered + 11 one chambered





2 two chambered boxes







Conclusions:

- 1) the boxes were constructed and installed a little too late in the season
- 2) the fumes of the freshly painted boxes might have discouraged the queens
- 3) the colonized domiciles were two-chambered boxes and have attracted only *Bombus griseocollis*











Native bee conservation:

Step 1 – Recognize habitat



- Natural or unmanaged areas
- Hedgerows, road edges and field margins
- Fallow fields, grassy borders, excavated soil
- Cover crops
- Old snags
- Farm ponds or Riparian habitat
- Gardens

Supplement forage

Choose diversity of native or naturalized plants that:

- Provide abundant forage
- Bloom throughout the year, especially early and late
- Can serve as “bridge” between crops
- Avoid hybrids chosen for showy petals at the expense of pollen or nectar



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Native bee conservation: Step 3 – Enhance habitat: forage

Supplement forage: From willows in the early spring to goldenrod in the fall.



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