

Raising Bumble Bees at Home:

A Guide to Getting Started

By James P. Strange PhD

USDA-ARS, Pollinating Insect Research Unit

Logan, UT



Introduction

Why raise bumble bees? Bumble bees (genus *Bombus*) are important pollinators of crops and wild land plants and are the primary pollinators for crops in greenhouses. Bumble bees are especially effective at pollinating plants in the nightshade family (Solanaceae) which includes peppers, tomatoes and eggplant. While these plants are self fertile, they benefit from bumble bee visits which

help release pollen from the flower. In addition many berry (blueberry, cranberry, currants, raspberries), fruit (apricot, apples, melons and squashes) and seed crops

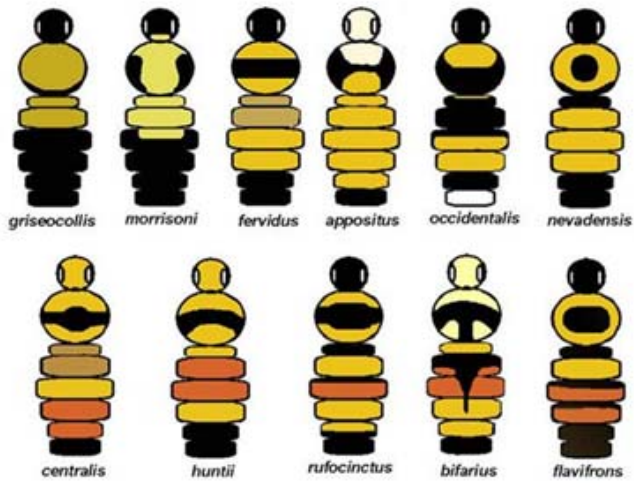


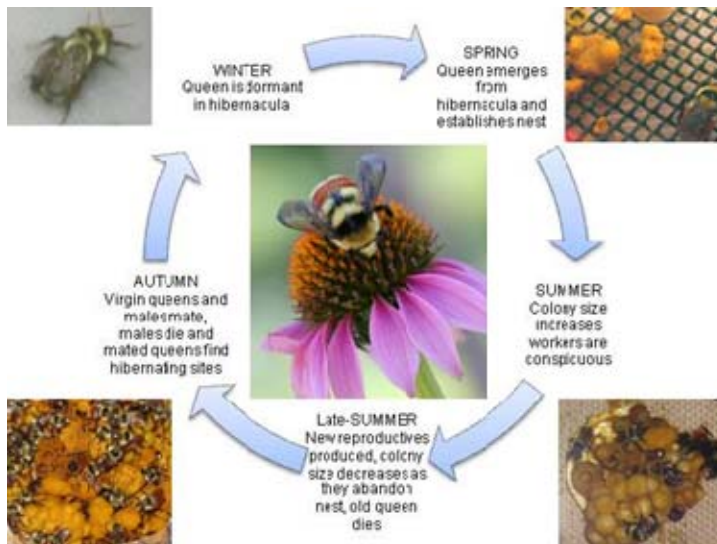
Figure 1. ID guide to bumble bees of northern Utah

and seed crops (alfalfa, clover, onions) are visited by bumble bees. Bumble bees also provide vivid color and sound to a garden and watching the bees that you raise forage in your garden brings a sense of pride.

About bumble bees. There are about 40 species of bumble bees in the United States and many of them have been raised by scientists in laboratories or by interested naturalists curious about these creatures. Some species are more difficult to rear than others and it is best to focus on your efforts on easy to rear species

when beginning. Most species of bumble bees are relatively easy to tell apart with a little training. In Utah there are 6 species that are relatively easy to rear in captivity. They are: *Bombus appositus*, *B. bifarius*, *B. centralis*, *B. huntii*, *B. occidentalis* and *B. rufocinctus*. Some other species that have been reared elsewhere, and might be worth trying, are *B. griseocollis*, *B. morrisoni* and *B. nevadensis*.

Bumble bees are social insects that live in colonies headed by a single queen (Figure 2). A solitary queen overwinters in the ground



in a small cavity she excavated termed a *hibernacula*.

When the soil warms in the spring, the queen emerges and begins flying around looking for a nest site and stopping to feed on nectar

producing flowers. Most bumble bees nest in the ground in cavities such as abandoned rodent burrows, holes in building foundations or stacks of firewood. Once the queen finds a suitable site, she will begin preparing the nest space by building a small wax cup, called a honey pot, and collecting pollen which she will use to feed her developing brood. Once the nest is provisioned, she will lay eggs on the pollen lump and begin incubating the eggs by laying her abdomen over the brood to keep the eggs or larvae warm.

At this point, the queen remains in the nest unless she needs to collect more food. Nearly 4 weeks after egg laying, her first workers will emerge as adults and begin the jobs of foraging, nest cleaning and brood care. The colony will grow throughout the summer and the workers will help the queen produce a clutch of male offspring, followed soon by new queen bees. These reproductive bees will leave the nest and find mates. After mating, the males die and the females feed briefly before digging a hibernacula and becoming dormant for the winter. Each species is a little different in the optimal colony conditions, the size of the colony and the number of new queens they produce, so when you try to raise them you may note differences if you have several species.

This guide briefly outlines how to raise bumble bees from spring caught queens. Be aware that success rates in getting full sized nests can be pretty low when you first start, so don't give up if you don't succeed the first year.

Bees and allergies. Less than 1% of people are truly allergic to bee stings. For most of these people, a sting will result in hives, itching and swelling (not just at the sting but everywhere) and, rarely, anaphylactic shock. It is a good idea to keep an EpiPen® on hand if you have bees at your house.

Getting ready. Before you can begin, you should have the following items ready to use:

- A nest box (see below).
- Fresh (or frozen) pollen.
- Sugar syrup.
- A warm dark place to keep your bees.

Building your nest box.

At the Logan Bee Lab, we use a two step system for rearing bumble bees. We place newly caught queens in 4in x 6in x 4in plastic boxes until the queen has workers, then the nest

is transferred to a two-chambered 6in x 16in x 4in wooden nest box. The smaller boxes take less space when starting colonies and the larger box will allow your colony to grow to its full size. All of our boxes have removable Plexiglas or wire mesh lids so that we can observe the bees when we want to. The lids are taped or stapled onto the box in a hinge fashion so that we can get into the boxes to feed the bees when needed. The starter box can be easily constructed off the shelf from your local grocery or hardware store (Figure 3). The starter box is easily made by inverting the plastic storage container and cutting a hole for the feeder and another for access to the nest (Figure 4). Metal screen is stapled



Figure 3. Items needed to make a starter box

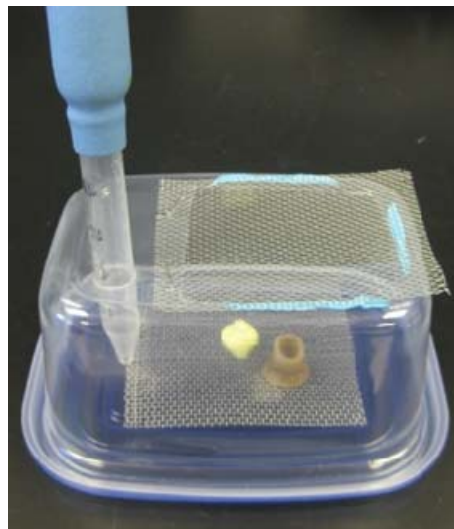


Figure 4. A queen starter box.



Figure 5. A full size nest box with a sugar syrup feeder.

on to close the hole and putty is used to seal the screen so that bees do not escape, but you can still access the nest. The bottom of the nest is made of metal screen with a small (pea sized) lump of hardened spray foam and a small wax cup. The wax cup serves as a honey pot and can be filled with syrup, and the foam gives the queen a place to begin laying her eggs. The second stage nest box can be built from $\frac{3}{4}$ inch plywood and hardware cloth or similar material (Figure 5). All ventilation holes and the bottom of the boxes should be screened to prevent the bees from escaping. The feeder hole should be drilled at an angle and sized so that the feeder is snug, but not tight. A piece of plywood can be cut to fit the bottom and top so that you can cover and move your boxes if needed.

A few notes on pollen. Bumble bees need pollen as the protein source to grow larvae. One of the best ways to insure high rates of nesting success is to obtain high quality pollen. Pollen from the health food store is typically dried and is not high in nutritive value. At the Bee Lab we use pollen collected in pollen traps placed on honey bee colonies. The pollen is never dried, but stored in airtight bags and is frozen until use. A good beekeeper should be able to collect enough pollen from one or two hives to supply you with enough pollen for dozens of bumble bee colonies. We mark the bags of pollen with the date it was removed from the honey bee colony and feed spring-collected pollen to colonies in the spring to nesting queens to best replicate their natural diet.

Sugar syrup. Bumble bee adults need sugar as their carbohydrate source to survive and to produce wax to build their nest. A medicine dropper makes a great feeder for the small colony or queen starter box. As the colony grows, the demand for sugar will too

and you will have to either open the nest to forage on flowers, or feed them more sugar syrup. The syrup is made by dissolving sugar into water in a ration of 1:2 or (e.g. 1 cup sugar into 2 cups water). Syrup should be refrigerated until use to prevent spoilage. If the sugar crystallizes and clogs the feeder, invert sugar can be purchased or made and fed safely to your bees.

Space for your bees. The starter boxes are relatively small and can easily be kept on a shelf in a closet basement or garage. The space should be warm (about 78°F) and you want to try to keep the humidity around 60% so you might need a humidifier and a space heater. An electric blanket or heating pad could also be used under your nest boxes. Queens nest underground and only come out in the light to feed, so try to keep them stored in the dark. Exposing them to too much light will disturb them, but you can use a little light when you feed them. We find that a red light (or red headlamp) allows for plenty of light to work by, but as bees can't see red, causes minimal disturbance and reduces their attempts to fly. A final consideration is that you want the space to be safe for the bees so choose a place free of ants, cats, dogs and kids. My kids love to see the bees and even help with feeding, but only with adult supervision.

Catching queens. Once you have your boxes made, you can think about putting queens in them. There are no real secrets to catching queens, because every location is a little different. Here in Logan queens begin flying at the end of March, but in warmer places it can be much earlier. Certain species will emerge from winter earlier than others. For example, in northern UT one of the first bumble bees to emerge is *B. huntii* and queens can be found foraging on apricot blossoms. About two to three weeks later the first *B. apposi-*

tus queens can be found on golden current blossoms. Generally, the first *B. griseocollis* queens are not seen until mid-June.

Queens are generally caught while foraging for nectar on a plant. Only take queens that do not have any pollen on their hind legs, because that indicates that they are provisioning a nest already and are unlikely to start a new nest in captivity. Queens can be collected with a standard insect net and transferred to a small jar or vial. Store the vials in a warm dark place, out of sunlight. Once you have caught a few queens, transfer them into one of your large nest boxes provisioned with syrup feeder and a pea-sized lump of pollen. Let the queens rest in a warm (~70°F) dark place overnight. The next day, the queens can be removed from the box and placed into prepared starter boxes.

Initiating the nest. For transferring bees from the holding box to the starter box, we anesthetize the bees by inundating the box with CO₂ for 30 seconds or until the bees stop moving, but this is not necessary. Canisters of CO₂ can be purchased at most office supply or sporting goods stores. When the bees are put into the starter box, it should be provisioned with a pea sized lump of pollen. To form the pollen ball, mix the pollen with a tiny amount of sugar syrup to moisten it. Mix it until it resembles very dry dough. It can then be rolled in your hands to form a ball. In order to keep the pollen fresh, you can coat the ball in wax. To do this we stick a toothpick into the ball and quickly dip it in hot beeswax, then set it out to cool. The toothpick is removed before feeding to the queen. Also, fill the wax cup with syrup and make sure the medicine dropper has 2ml syrup in it.

Nest can be initiated in various ways. Queens can be put into nesting boxes alone, as pairs, or in other configurations. Putting two

queens into a nesting box together seems to stimulate them to lay eggs. Another method is to put the queen into a box with three or four newly emerged honey bee workers. If you have access to honey bees, this can be easily done. Whichever method you choose, you will need to put the box in the dark room and wait.

Maintaining the nest. For the first several weeks you will not have any workers, so the queen will not need much food. When queens are put into nests, we leave them alone in the dark for 3 days to minimize disturbances. After 3 days, refill the feeders with fresh syrup and give the queen another small pinch (about $\frac{1}{4}$ the original lump) of pollen. After that, check the sugar supply and feed a small pinch of pollen every other day. Cross your fingers. At this point what you want to look for is a queen that begins laying her abdomen over the lump of foam and pumping her muscles to keep it warm. The queen may also add wax to the wax cup you gave her. She will lay eggs in little wax cups on the pollen and keep them warm until they hatch (about 3 days). Once this happens, you will need to be sure she has enough pollen to feed the developing larvae.

After about a month the first workers will emerge. If there is still no brood in a nest, it is probably best to let the queen go. Those starter boxes that have workers will need to be transferred to the bigger box. This is best done under red light so that the bees cannot fly. First, loosen the bottom of the starter box and then carefully set the whole starter inside of the wooden nest box. Then lift the top off the starter box and quickly place the lid on the wooden box. Be sure the feeder is full of syrup. Once you have workers, you will need to feed daily with nectar and every other day or so with pollen. A general rule is that the bees should always have a

little more pollen than they can eat. You don't want to waste it, but don't starve your bees either. Once the nest has about 10 workers you can place them somewhere where they can forage outside and you can stop feeding them. We run a flexible clear plastic tube out of the nest and into the garden to let the bees forage. Put a wooden lid on the nest, but if you leave the Plexiglas lid under that, you can observe the bees all summer long.

Watch as the nest grows and keep an eye out for the first male bees to emerge. Soon after that the next generation of queens will begin to appear.

Sanitation. Bumble bees are messy. There are bee diseases such as *Nosema bombi* and *Crithidia bombi*. There are pests such as cuckoo bees and wax moths. There is wax, sugar syrup and pollen. There are dead bees and mold to contend with. You will need to clean up after your bees at the end of the year. Nests will die off naturally in the fall and this is the perfect time to deconstruct the nest and wash it. All the plastic and wooden wear can be soaked in a 10% bleach solution and then dried before storage. If you think you had a disease outbreak in your hive, then it is best to throw that box away.

A few other things to remember. Take lots of good notes and pictures. You will want to mark your successful queen collection spots so you can go back the next year. Every nest is different and it is fascinating to see how they grow and develop. We have recorded the growth of nests by taking pictures of them every week. When we look back at them, we can get a sort of time lapsed view of the nest.

Enjoy your bumble bees.

Additional Reading

Evans E., Burns I. and M. Spivak (2007) *Befriending Bumble Bees: A practical Guide to raising local bumble bees*. University of Minnesota Extension, Minneapolis, MN

Heinrich B. (2004) *Bumblebee Economics*. Harvard University Press, Cambridge, MA

Kearns C.A. and J.D. Thompson (2001) *The Natural History of Bumble Bees: A sourcebook for investigations*. University Press of Colorado, Boulder, CO

Plowright R.C. and S.C. Jay (1966) Rearing bumble bee colonies in captivity. *Journal of Apicultural Research* 5:155-165.

For plans on building boxes:

<http://www.befriendingbumblebees.com/links.html>