Bee & Bee

CREATE YOUR OWN BED AND BREAKFAST FOR BUMBLEBEES

Your Bee & Bee should include a nesting space & flowering native plants with nectar and pollen for bees to feast on.

Create your own Bee & Bee

More than two-thirds of food crops we eat need native bees, honey bee and other pollinators to successfully produce a crop. But all around the world, intensified agriculture and its accompanying loss of habitat along with the massive use of pesticides and herbicides has take a toll on the bee population. In Canada, the situation is equally worrisome. Habitat loss, climate change, systemic insecticide use and disease contribute to bee decline.

Scientists say there may be as many as 50 native bee species in the average backyard garden. Canada is home to about 850 confirmed species of bees. There are three areas called "biodiversity hotspots" with the greatest diversity of bee species. These same areas are also those with the most significant habitat loss and intensive agricultural production (see Appendix 1).

As many as one-third of North American bumble bee species are in decline. Eight wild bee species are listed under Canada's species at risk registry. The rusty-patched bumble bee, gypsy cuckoo bumble bee and the macropis cuckoo bee have lost at least 50 per cent of their total population and are classified as endangered, which grants them protection.

The sable island sweat bee and western bumble bee occidentalis subspecies are considered threatened and in need of protection but none is considered for the American bumble bee, yellow-banded bumble bee and western bumble bee mckayi subspecies. They only have a special concern status.

Help bumble bees by creating bed & breakfast accommodation for them. You'll find they, in turn, will help you with better results in your garden. Better still, once you find bumble bees visiting your Bee & Bee, sign up for The Great Canadian Bumble Bee Count to learn more about your bumble bee visitors.

Bumble bees differ from other native bee species in that they are social bees that live in the ground in colonies (unlike solitary bees). There are 40 bumble bee species in Canada. They are long lived compared to other native bees. They fly at low temperatures and light levels. Bumble bees are key pollinators for many native plants and are more effective pollinators than introduced honey bees for certain crops such as tomatoes, blueberries and cranberries.

Bumblebees are extremely important foragers. Unlike honeybees, they are able to forage under cold, rainy and cloudy conditions. This makes them excellent pollinators of native plants and a variety of crops. Some crops which bumblebees can pollinate include tomatoes, peppers, raspberry, blueberry, chives, cucumbers, apples, strawberries, blackberries, soybeans, sunflower, beans, cherries, eggplants, and cranberries.

Here are the three things you need to create your Bee & Bee:

Pesticide-free food Accommodation & habitat Promotion & education

#1 Food that is pesticide-free

Food plants for bumble bees need to provide nectar and pollen throughout the growin season (from spring to early fall). Plant at least 3 bumble bee friendly native plants for each season (spring, summer, early fall) so there will always be nectar-and pollen-rich foraging plants.

Think about clumps of native plants with overlapping bloom periods and different colours, shapes and height. It is best to plant in clumps or swaths of the same native plant species together. It is easier for bumble bees to find clumps of the same plant species than individual plants scatted across the landscape.

Pesticide-free food plants
Check with garden and nursery suppliers to make sure that plants you buy are neonicotinoid-free and have not been treated with pesticides. Check out Friends of the Earth's website for companies that have committed to going neonic-free for their plants.



#2 Accommodation & habitat

Nesting sites can be landscape features that provide dry cavities where new nests can be created such as cavities in trees, abandoned rodent nests in the ground, under tufts of grass, crevices in rock piles or walls, and u der leaf litter, brush and fallen logs. For bumble bees, generally well-drained, level or slightly sloped sites that receive full sun and have good air circulation are best.

Early spring food sources should be planted nearby. The closer nesting and overwintering sites can be to foraging plants, the easier it will be for bumble bees to survive and establish. Patches of bare ground or a layer of leaf litter are good for a newly mated queen to dig down into the ground to hibernate until the spring.

In selecting overwintering and nesting sites, make sure these areas will be free from disturbances to the ground such as recreational activity, movement of equipment, tilling, planting, and mowing. Disturbances to the ground at nesting and overwintering sites can be disastrous for bumble bees.

To reduce the potential of people getting stung, ensure that any nesting areas will be located away from major areas of human activity. Some bumble bees can get defensive of their nests.

#3 Promotion & education

Creating and maintaining a Bee & Bee means you will have to take care of your bumble bee habitat differently from past gardening practices that clean out all plant matter every season. Put up a sign to tell your neighbours and friends that you've created a Bee & Bee to help bumble bees. This will help them understand why your garden may look different.

You can download a sign from Friends of the Earth and waterproof it with a plastic covering or make your own Bee & Bee sign. Send Friends of the Earth a picture of you and your Bee & Bee! Think about taking your Bee & Bee photo from the same view before, during and after you've planted and then once for each of the seasons.

How to select plants for your Bee & Bee

Select bumble bee friendly native plants adapted to local environments (ecotypes)

Native plants co-evolved with native bumble bees and support specific needs such as scent to find the plants. Non-native plants and specialized cultivars (that are drastically altered) may not contain the same nectar and pollen resources bumble bees need. Native plants are also preferred because they require less water than non-native plants, do not require fertilizers and pesticides, are less likely to become invasive or weedy in natural areas, and support other pollinators. Appendix 2 lists bee-friendly native plants to consider.

Try to purchase seed from local growers who specialize in local ecotype seed and plants; locally sourced plants generally establish and grow well because they are adapted to the area.

If non-native plants are not an option in certain locations, try to ensure the plants you select are bee friendly and non-invasive. Appendix 3 lists some bee friendly non-native plants.

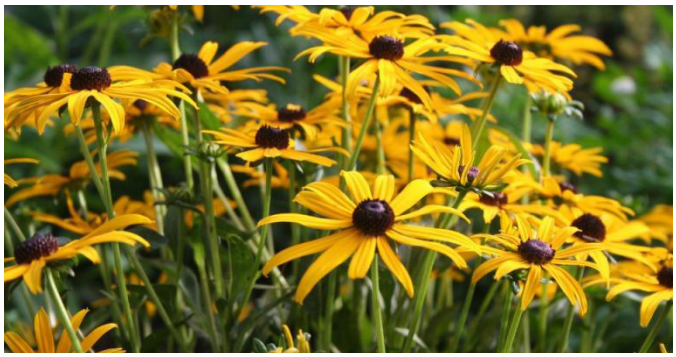
Select a diversity of bumble bee friendly native plants for each of three seasons

Provide a continuous source of pollen and nectar throughout the growing season. With overlapping blooming periods, at least three species to be blooming in each of the blooming periods (early spring/spring, summer, late summer/fall). Bumble bees are active throughout the growing season and require a continuous source of pollen and nectar from spring to late fall.

Match site conditions. Select flowering native plants that will tolerate specific site conditions such as partial shade or sandy soils.

Have different flower colours, shapes and heights. Bumble bees are attracted to white, yellow, blue and purple flowers. Species of bumble bees have preferences for certain plants due to the differences in tongue lengths. Species with long tongues prefer flowers with longer corolla tubes and species with shorter tongues prefer flowers with prefer plants with a shallow and open structure. Different plant heights also attract different species and add texture to the landscape. Bumble bee friendly flowering trees and shrubs are often key flowering plants in the early spring.

Include at least one native bunch grass or sedge. Grasses assist with providing bumble bee nesting and overwinter sites. Short, clump-forming grasses are preferable to sod forming or large, spreading grasses. Grasses also add texture and height to the landscape.



Where to source plants and/or seeds

Depending on the location, transplants or seeds for native plants can be hard to source. In addition, nurseries and garden can run out of inventory quickly. When researching local suppliers ensure they have plants that are neonicotinoid free and have not been treated with pesticides. You also want them to specialize in local ecotype native plants and seeds and provide information on where they sourced their plants from.

Site preparation, planning & maintenance

Preparation

Removing existing vegetation and weeds
The presence of existing vegetation and weeds or invasive species that compete for nutrients, water and sunlight can affect the successful establishment of native plants.

Removal of vegetation and weeds without the use of pesticides can be done in several ways:

- Hand removal
- Solarization using UV stabilized plastic – if you start in the spring the ground could be ready for a fall planting. Solarization, however, can kill beneficial mycorhizzea which some native plants may need.
- Sod removal
- Newspaper / cardboard layering – either in the early spring so that it is ready to plant in late fall / or over the winter so it is ready to plant in the spring.
- A combination of methods.

For locations that are being cleared for overwintering and nesting sites, be sure to remove the dense root mat in the ground to give bumble bees access to the soil below. Leave some clumps of grass or other low-growing plants to reduce erosion. Place various landscape features such as leaf litter, rocks, or logs that will attract bumble bees.

Preparation of soil
Generally, native plants grow best in unamended soil (no addition of fertilizers or organic matter). If soil needs to be added, purchase native unamended soil.

Planting, Weeding and Watering

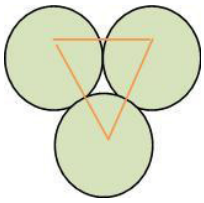
Planting times depend on the native plant species and season (e.g., grasses favour spring planting). Try to buy your pots or plugs so that they can be planted right away.

Planting
Direct seeding after the final frost in your area or transplants pots or plugs that you've started indoors or purchased. The spacing of pots or plugs will be determined by the spread of the plant at maturity.

Plants will also need time to establish and mature:

- plants started from seed (3-5 years)
- plants started from transplants (1-2 years)
- grasses (about 3 years)

To make your planting as attractive as possible for foraging bumble bees, plant in clumps of the same species. For each plant species, determine the distance between the centre of the plant and the next plant; referred to as on-centre spacing (O.C.). Then multiply the areas' square footage by number of plants per square foot with Table 2.


10" O.C

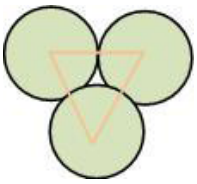

6" O.C

Table 2. Calculating on-centre spacing

On-Centre Spacing	# of Plants per sq. ft.
6"	4
8"	2.25
9"	1.77
10"	1.44
12"	1
18"	.44
24"	.25

For example, **a floral clump area of 5x3=15 sq. ft.** needs:

On 6" O.C. - plants per sq. ft. = 60 plants
On 8" O.C. - plants per sq. ft. = 33 plants
On 9" O.C. - plants per sq. ft = 26 plants
On 10" O.C. - plants per sq. ft = 21 plants
On 12" O.C. - plants per sq. ft = 15 plants
On 18" O.C. - plants per sq. ft = 6 plants
On 24" O.C. - plants per sq. ft = 3 plants

Watering
The newly transplanted sites will need to be watered in the first growing season. Watering is critical for the first 4-6 weeks following the installation of transplants. Water can be provided by trickle or drip irrigation or water storage barrels or bladders and watering cans for smaller sites with no water access. Avoid sprinkler irrigation.

Weeding
Weeding will be required to ensure that native plants properly establish and fill the space. In small areas, this can be done by hand weeding or string trimmers. It may also be useful to keep certain weeds if they're a good bumble bee food source and don't interfere with the newly establishing plants (e.g., dandelions provide nectar in the early spring). Mulching to inhibit weeds and conserve water can also be done, but it makes the ground impenetrable for bees. It will be important to ensure that areas of the site are left without mulch.

Maintenance

Many native plants take at least 3 years to establish or longer if they are started from seed. Some gardens will require more maintenance in the early years, but less overall maintenance in the long-term once the plants are well established.

Planted sites – year 1
The first year is critical. Newly planted areas will need watering and constant weeding. Watering may be needed if there is inadequate rainfall following seed germination. Develop a weeding schedule so weeds don't overtake the slowly growing plants in newly planted areas.

Planted sites years 2, 3 and 5
Depending on the site conditions and weather, certain plant patches may still need some watering. Once established, appropriate native plants will grow without watering. Certain patches may also need supplemental planting.

A weeding schedule will need to be continued (more frequently in the spring months). It is important to keep weeds to a minimum, so they don't compete with native plants for nutrients, water and sunlight. Once native plants are wellestablished and fill in the space after 2 or 3 years (if they are started from transplants) or 5 years (if they are started from seed) there will be less need for frequent weeding.

Ongoing weeding after 5 years
Weeds will need to be constantly monitored.

If mowing of a meadow, lawn or edge of habitat is necessary, try not to treat or disturb the entire site at one time. Try to treat no more than one third of the site per year and create a mosaic of patches with different heights and vegetation. To prevent disturbing established nests and overwintering queens mow at the highest cutting height possible (30.5-40.5 cm or 12-16 inches).

Nest and Overwintering Sites
Encroaching weeds and vegetation should be removed regularly to ensure that bare ground and land features, such as crevices in rock piles and tussucks of grass, are accessible. Be careful of when this is done and to not cause too much disturbance to sites. Refrain from cleaning up leaf litter in certain areas.

Let It Bee

Re-think Landscaping Practices To Care For Your Bee & Bee

Use of pesticides
Pesticides are toxic to bumble bees and other pollinators. Alternatives approaches for pest problems in strategic areas should be explored (e.g., fatty acid soaps; biological oils and herbal repellents).

Sprinkler irrigation
Bees are able to perceive imminent rain and will seek protection in their nests. Sprinkler irrigation offers no such warning cues and can alter visual landmarks and entrances to nests. For large areas, use trickle or drip irrigation or avoid irrigation during daylight hours by irrigating at night (when bees are in their nests).

Buried or surface weed barrier fabric
Impervious surfaces inhibit overwintering and ground-nesting sites not just for bees but other beneficial insects and compact soils.

Mulching
Mulching to conserve water and inhibit weeds can also make the ground impenetrable to bumble bees. Leave areas of your garden without mulch.

Thick turf
Generally, bumble bees will not nest in thick turf, possible due to the density of shallow roots.

Fertilizing
Native plants don't need it and it encourages weeds and invasive species.

Excessive site clean-up
If leaf litter, deadwood and brush are cleaned up and bottoms of hedges excessively pruned, nesting and overwintering sites could be impacted. Due to prevailing cultural expectations of tidiness, consider putting up a Bee & Bee sign that explains to your neighbours that you are protecting bumble bees.

Mow lawns with high blade setting so that native violets and clover can flourish

Appendices

Appendix 1 – EcoZones & Biodiversity

Within Canada there are a number of large-scale ecozones (see Appendix 1). Provinces also have their own classification system that assist with delineating natural regions. For example, BC has the Biogeoclimatic Ecosystem Classification System and Ontario has the Ecological Land Classification (ELC) system. Within the ELC system, Ontario's ecozones can be broken down into ecoregions and ecodistricts. These breakdowns are useful for developing native plant lists. Native plants that grow in one ecozone, ecoregion or ecodistrict might not necessary grow well or survive in another due to changes in local soils, climate, insect and plant diseases.

Appendix 1. Canada's ecozones and sites of bee biodiversity

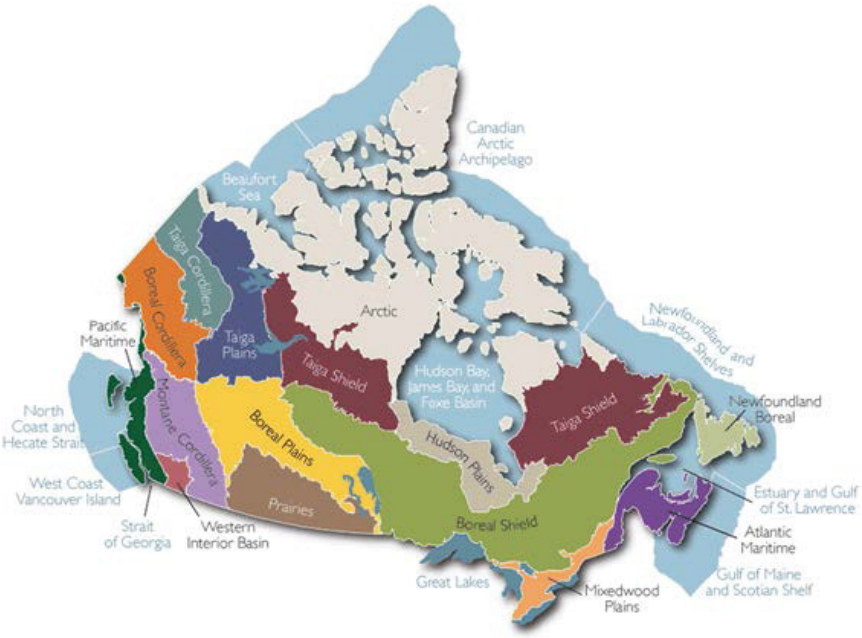


Fig. 1. Canada's revised ecozones.

Source: http://www.biodivcanada.ca/default.asp?lang=En&n=64217E8D-1#_fig02

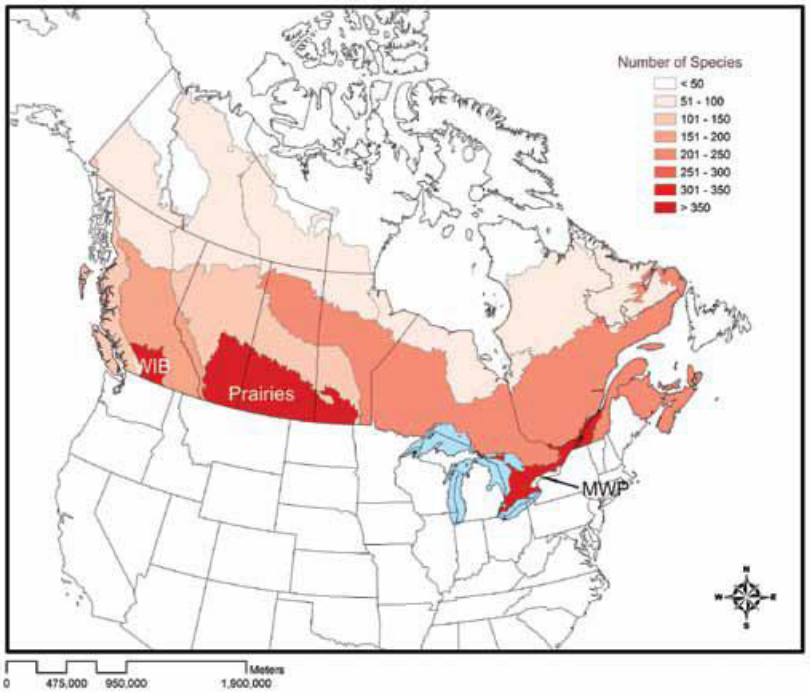
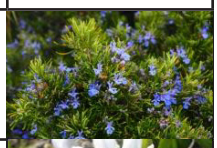
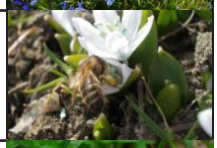
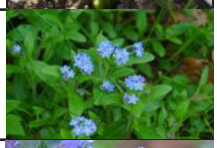
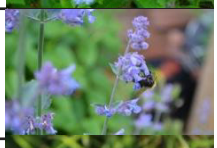
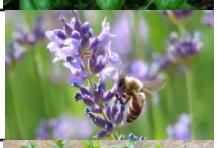
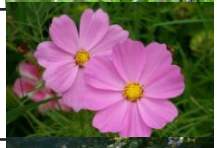
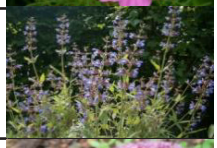


Fig. 2. Biodiversity Hotspot Map

The number of bee species (in increments of 50) recorded for Canada's ecozones with darker shades represent higher species richness.

Source: Sheffield et al. (2014).

Appendix 2 – Bumble bee friendly non-native plant list

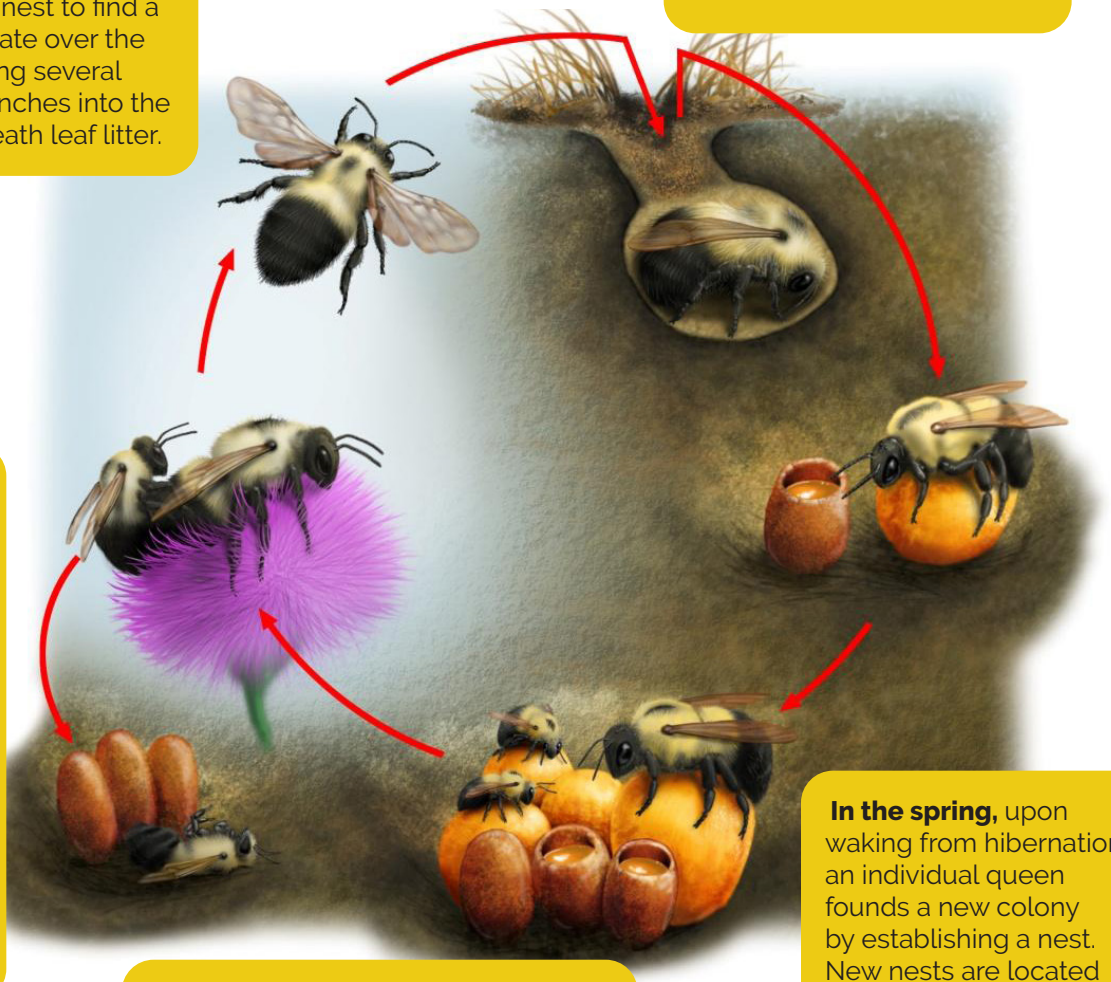
Type	Family	Common Name(s)	Scientific Name	Season	Floral Colour	Photo
Forb	Mint	Rosemary	*Rosmarinus officinalis*	Spring	Blue	
Forb	Mint	Squill	*Scilla siberica*	Spring / summer	Blue	
Forb	Borage / forget-me-not	Borage	*Borago officinalis*	Spring / summer	Blue	
Forb	Mint	Catnip	*Nepeta spp.*	Spring / summer	White, blue	
Forb	Pea	Clover	*Trifolium spp.*	Summer	White, pink, red	
Forb	Mint	Basil	*Ocimum spp.*	Summer	White	
Forb	Mint	Lavender	*Lavandula spp.*	Summer	Purple	
Forb	Mint	Mint	*Mentha spp.*	Summer	White, lavender	
Forb	Mint	Oregano	*Origanum spp.*	Summer	White, pink	
Forb	Mint	Thyme	*Thymus spp.*	Summer	White, purple, blue	
Forb	Aster	Cosmos	*Cosmos bipinnatus*	Summer / fall	White, pink, red	
Forb	Mint	Russian sage	*Perovskia atriplicifolia*	Summer / fall	Blue	
Forb	Stonecrop	Stonecrop	*Sedum spp.*	Summer / fall	Yellow, white, purple, pink	

Appendix 3 – Life Cycle of a Bumble Bee Colony

Here's a description of the life cycle of a bumble bee colony. Read this to better understand what bumble bees need and why to make changes in your gardening practices when you create a Bee & Bee.

In the fall, the old queen and worker bumble bees die. The newly mated queens leave the natal nest to find a place to hibernate over the winter by digging several centimeters / inches into the ground or beneath leaf litter.

Over the winter, the mated new queens hibernate.



In the late summer, the males and a small number of new queens will be produced. After the males pupate and emerge, they leave the nest to mate and never return. The new queens stay in the nest and only leave to mate and then return to the natal nest.

In late spring and summer, the larvae pupate and emerge as worker bees. The mainly female worker bees take over the role of expanding the nest and foraging while the queen lays more eggs. The colony grows with overlapping generations.

In the spring, upon waking from hibernation, an individual queen founds a new colony by establishing a nest. New nests are located within dry cavities such as a cavity in a tree, abandoned rodent nests, under a tussocks of grass, and old rock walls. The queen produces wax from her glands to make a cluster of pots in which she lays her eggs. The queen will forage for nectar and pollen to feed her first brood of larvae.