a voice for the natural landscaping movement

Wild Ones®

Native Plants, Natural Landscapes

Reprinted from the *Wild Ones Journal*, March/April 2007 issue.

For more information, or to join Wild Ones Natural Landscapers, here's how to reach us:

Phone
(920) 730-3986
(877) 394-3954 (Toll-Free)

Mail
P.O. Box 1274
Appleton, Wisconsin 54912-1274

E-Mail
ExecDirector@for-wild.org

Web Site
www.for-wild.org

Humblebee Bumblebee

For all that bumblebees are as familiar to us as are ladybugs, astonishingly little is known about them and their lives. Some of our best sources of information have been the keen observations of amateurs. One of the more recent books published by such an amateur observer is Humblebee Bumblebee, *by Brian L. Griffin.*

By Maryann Whitman

As our northern hemisphere tilts back toward the sun in the spring, the Earth warms, and life begins to stir. In her tiny chamber, inches below the surface of the ground, the queen bumblebee recovers from her winter torpor. The earth in the tunnel she dug last fall is still soft, and she digs like a dog, passing the dirt between her two sets of rear legs.

After a six-month fast she emerges, ravenous, into the light. Blooming plants where she might find nectar at that time of year (mid to late April) may be scarce. In my garden in southeast Michigan she would find the native spicebush *(Lindera benzoin)*, American plum *(Prunus americana)*, Serviceberry *(Amelanchier laevis)*, native crabapple *(Malus coronaria)*, marsh marigold *(Caltha palustris)*, cranesbill geranium *(Geranium maculatum)*, golden Alexander *(Zizia aptera)*, and violets. When she finds them, she drinks her fill, using her long, curled tongue as a straw.

Did You Know?
A rarity, the bumblebee is a warm-blooded insect.

She is one of the huge early bumblebees, alone in the world, the rest of her colony of the previous year having perished. She had mated the previous fall, and carries within her a future bumblebee colony. Her first task is to find the perfect spot to build a proper home in which to start laying her eggs. She might spend as long as three weeks on this chore, feeding on nectar, and spending the still frigid nights clinging to a leaf. This is a dangerous time of year for her, for many other hungry creatures – birds and spiders – relish a high-protein bumblebee snack.

Well situated, abandoned mouse nests are favored by bumblebees. They are sheltered from the weather, and in them are bits of twigs, strands of grass, thistle-down, and hairs from the mother mouse for added warmth and insulation. The queen crawls in, pulls the material around her, and proceeds to dry it with the warmth of her body. A bumblebee, though an insect, is in fact warm-blooded. By "shivering" her massive flight muscles, she can create heat in her thorax. Then, by contracting her muscles, she circulates the warmth into her abdomen. Bumblebee body temperatures can vary between 40 and 104 F, regardless of the ambient temperature.

Fixing the location of her new home in her memory is her next task. Until she is certain she can find it again, she takes slow, orienting flights, rising into the air in gradually widening circles, and then back again to the entrance of her nest. Her navigation, eventually, is flawless.

With her body, she creates a cavity in the center of the nest, continuing to dry the material with her warmth. Thin sheets of wax are extruded from glands between the segments of her abdomen. She collects these shingles with her feet, and brings them up to her mandibles to chew and shape them for her first construction project – a honey pot. This tiny cup is positioned just inside the entrance to her nest and provisioned with nectar and pollen to sustain her while she broods her young.

At the center of the nest, on the floor, she builds a second, smaller cup of wax. Holding the cup in position with her third pair of legs, she inserts her abdomen into the cup and lays her first eight eggs, destined to become workers in the new colony. The cup is *Continued on page 2.*

Continued from page 1.

sealed with a blanket of wax. If all goes well, the young bees will emerge in 21 days.

Bumblebees (like butterflies) undergo complete metamorphosis – from egg, to larva, to cocoon, to adult – continuously tended by the foundress queen. When not foraging, she spends her time brooding her eggs and larvae like a setting hen. She lies "upon the egg cluster with her abdomen greatly distended and her legs grasping the sides of the waxen envelope." Under the warmth of her body, the eggs become larvae within the capsule. Within seven days of hatching, the larvae spin cocoons to form pupae.

All the while the queen tends her developing brood, keeping them warm, and periodically opening the capsule to deposit pollen and nectar on which the larvae feed. When the weather is cold or rainy the queen does not leave the nest, but sips from the honey pot that she provided for herself. She can reach it without leaving the egg capsule, and it is positioned so that she is facing the entrance, ready to deal with intruders.

The first young workers are helped out of their cocoons by their mother. They are much smaller than she. As the season progresses and the growing colony of sisters assists their mother in foraging and feeding the young, the later generations receive the food necessary to grow quite large. This first brood needs about three days for their wings to become straight and hard, and for their coats to go from a wet, silvery, white pile to rich velvet in their ancestral colors. During this time they sip from the communal honey pot.

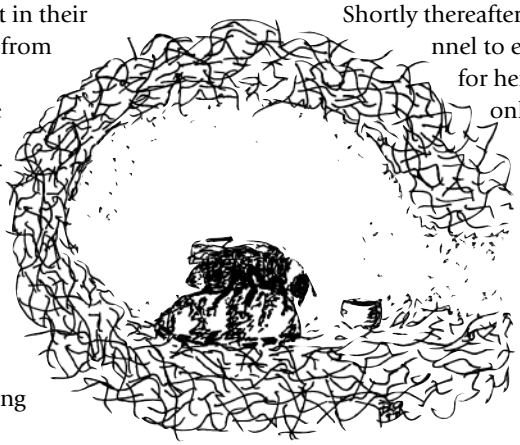
When the larvae of her first brood have spun their cocoons, the queen builds another egg cup, attaching it to the side of the original egg cup. In a few days she repeats the process. By the time the first young workers are ready to leave the nest, the queen has three more broods in varying stages of development – and she has eight new helpers.

They also assist their mother by brooding the young, freeing the queen to lay ever more eggs – the colony has started. The four-week life of the worker bee is a busy one. Her work day starts as soon as she has warmed her flight muscles to at least 50 F, and doesn't end until long after sunset.

The workers may rightly be called "sisters," for they hatch from fertilized eggs of the same mother. Late in the season, the foundress queen will lay some unfertilized eggs that will hatch into drones. The drone's sole function in life is reproductive. She will also lay some fertilized eggs that will develop into queens.

As soon as the drones are strong enough to fly they leave the nest, never to return. Instead they go a short distance away from the nest, and set up overlapping, pheromonal "trap-lines" on blooming flowers. Their goal is to entice the newly hatched young queens to linger a moment on these scent-marked flowers, and to mate. To an onlooker the drones don't look much different from the worker bees – they just don't seem to be working – but rather "sleeping in the noon-day sun," waiting for something.

The young queens stay in the nest for a few days after emerging from the cocoon, feeding at the communal honey pot and doing some housekeeping chores. After their wings have hardened and their tribal colors have come in, the new queens emerge in their resplendent glory. Soon they are enticed into the pheromone traps, and they mate.



Shortly thereafter each queen finds a vole or squirrel tunnel to enter into and create a hibernation chamber for herself for the winter. These new queens are the only survivors of the old colony, but each carries within her the genetic material to establish a new colony the following spring. How the social and functional aspects of the colony are maintained is still largely a mystery. It is surmised that the queen controls allaspects of the colony's structure and function through pheromones. It is likely that her pheromones even determine which fertilized eggs will become queens rather than workers.

Don't Miss "Why Humblebee" on the next page.

Wild Ones Natural Landscapers
P.O. Box 1274 • Appleton, Wisconsin 54912-1274 • www.for-wild.org
Reprinted from the *Wild Ones Journal,* March/April 2007 issue.

Why Humblebee?

By Maryann Whitman

You may be wondering why we have chosen to feature the life cycle of a bumblebee in the *Wild Ones Journal*. Just as it is good to know one's enemy, it is also good to know one's friends. It's been calculated that every third spoonful of our food comes courtesy of pollinators like bumblebees. Further, the importance of native pollinators is being reconsidered as the European honeybee population is plummeting as a result of diseases and parasites that have become immune to traditional treatment methods.

Bumblebees are among the most important pollinators of temperate-zone plants – in the wild, in the garden, in the field – and now in the greenhouse. In rough terms, it can be said that there are 54 species of the genus *Bombus* native to North America – with *Bombus impatiens* predominating in the east, and *B. occidentalis* predominating in the west. These native pollinators present a diversity of body and proboscis sizes (which determine which flowers each species can pollinate), methods of pollinating plants, density of pile, and adaptation to temperature and climate types (one species lives in Alaska). The length of their season of activity varies, but for our purposes a *Bombus* likely pollinates our earliest and our latest blooming native plants.

Several of our native *Bombus* species use "sonication" to pollinate flowers. The bee grasps the flower in question, wraps its body under the anthers (pollen-bearing structures), and vibrates its strong flight muscles – not for purposes of flight, but only to vibrate the flower, causing it to spill its pollen. With this method our bumblebee can do something that the honeybee cannot – they can pollinate tomato blossoms in greenhouses. They are 400 times more efficient than honeybees at *any* pollination chore, capable of visiting 30 to 50 flowers per minute.

Before bumblebees' special talent with tomato blossoms was discovered, pollinating in the greenhouse was done by hand or with "table shakers." It is this unique capability that is quickly becoming the undoing of our native bumblebees. In the mid-1980s three firms in Europe started breeding, for commercial greenhouse purposes, *B. terrestris*, (native to Europe), and *B. impatiens* (imported from North America). *B. impatiens* is also being bred in North America. Commercial breeding practices concentrate massive numbers of bees, and any diseases spread rapidly. Further, our bumblebee scientists hypothesize that a European strain of *Nosema bombi* (and perhaps other diseases) entered North America during a three-year period (1992-1994), when USDA/APHIS allowed queens of our western *B. occidentalis* and our eastern *B. impatiens* to be shipped to Belgium (where *B. terrestris* was being reared), and colonies reared from them were returned to the U.S. for distribution throughout North America. Since *B. occidentalis* is very closely related to the European *B. terrestris* (they are members of the same subgenus), it and other species of this subgenus of *Bombus* in North America, were the most susceptible to the European bumblebee diseases.

Though *B. impatiens* seemed to show no ill effects, it is likely to be a carrier (like "Typhoid Mary"). Thus, the European disease(s) entered into and caused population declines in both western (*B. occidentalis* and *B. franklini*) and eastern (*B. affinis* and *B. terricola*) populations of the subgenus of *Bombus*. We do not yet know if parallel declines in some other subgenera of North American bumblebees may also be related to this invasion. So, although *B. terrestris* itself was not imported into North America, the route by which its disease(s) could have entered the continent in the early 1990s is well documented.

Because it is very difficult to detect infections early in the life of a colony, the infected bees are sent out to greenhouses across the country and around the globe. Greenhouses are not airtight structures – bees escape and come in contact with wild colonies. It's been observed that the diseased wild bees are found primarily around greenhouses. Another aspect of this contact is genetic mixing between commercial bumblebees and native wild species.

Both the spread of diseases and genetic interbreeding have serious potential to threaten co-evolved plant-pollinator relationships and habitats. This is inferred from evidence collected in Japan, Australia, and Tasmania, where large numbers of foreign bumblebees have been introduced. Importation of *Bombus terrestris* into North America (Mexico, Canada, and United States), has been prohibited.

The numbers of several subspecies of *Bombus* in the Pacific Northwest have been seen to plummet in recent years. One, at least, is feared extinct.

What can we do? We can continue doing exactly what we have been doing – natural landscaping with native plants, while advocating this practice to anyone who will listen.

A great proportion of our native pollinators are solitary bees that are ground-dwelling. They prosper in turfless "scruffy" areas and in minimally disturbed soils. We can continue to provide them with both. If you find a colony of ground bees, mow around them – fence in the area to keep animals and children out. The bees won't be there for long.

Others of our solitary bees build nests of mud and dig tunnels in rotting snags. Don't panic and haul out insecticide if you find them under the eaves of your garage or tool shed. Prize them. Recall that, unlike honeybees, our solitary bees don't have a store of honey to protect, so they are much more docile and much less likely to sting.

Plant such a variety of natives that something is blooming in every season, from snow-melt to snow-fall. The nectar and pollen in these blossoms may be saving someone's life.

More information

www.nappc.org

www.xerces.org/Pollinator_Insect_Conservationnativebeenests.htm

www.pollinator.org/resources.htm

A list of what blooms when

www.arboretum.harvard.edu/plants/bloom.html#bottom

Wild Ones Natural Landscapers
P.O. Box 1274 • Appleton, Wisconsin 54912-1274 • www.for-wild.org
Reprinted from the *Wild Ones Journal*, March/April 2007 issue.