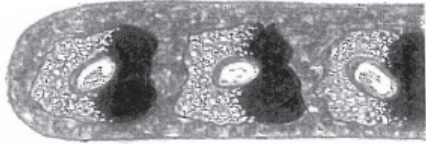

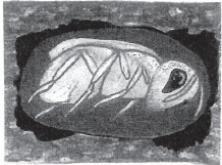
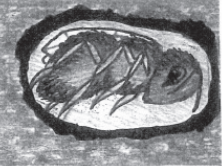






Mason Bee Life Cycle

APPROXIMATE TIMELINE	ACTIVITY	ILLUSTRATION
Week 1	An egg is laid on a pollen pile. A female can lay up to 30 eggs during her nesting season.	
Week 2 - 5	The egg hatches to become a larva. The larva goes through five growth stages, or instars. The fifth stage is when the larva spins its cocoon.	
Week 6 - 9	The pupa in the cocoon develops into a white pupa which resembles a fully formed bee, but is white in color.	
Week 10 - 13	The white pupa in the cocoon sheds its pupal skin, darkens and becomes a fully developed bee.	
Week 14 - 44	In the cocoon the fully formed bee goes through diapause; a condition similar to hibernation.	
Week 45	Bees begin to emerge from their cocoons. This is generally early to mid-March and may continue for a number of weeks.	
Week 46	Mating begins. Males can mate with several females. Mated females become progressively less attractive to males. Males die soon after mating.	
Week 47 - 52	Nesting activity is carried out by the females and is usually completed by early to mid-June.	

Mason Bees

Osmia Lignaria (Blue Orchard Bees)



Female Mason Bee on Apple Blossom

Characteristics

Mason bees are native to southern Canada and the United States at elevations below 7,000 feet. These bees are active in early spring. In the Pacific Northwest mason bees emerge from their cocoons around mid to late March. Locally mason bees become flight active when the temperature reaches approximately 55 degrees.

They are most commonly referred to as mason bees, due to their use of mud for nest building, but are also referred to as blue orchard bees due to their metallic dark blue color. Mason bees prefer pollinating fruit orchard trees because they begin blooming at approximately the same time the bees begin emerging from their cocoons.

Males have distinctive white colored hairs on their heads and longer antennae than the females. Female mason bees are about the same size as a honey bee. The males are slightly smaller. Mason bees are very docile. As with most bees, the male mason bee doesn't have a stinger mechanism. The female mason bee does have a stinger but she is very non-aggressive.

Pollination

Bee pollination is responsible for over 33 percent of the food produced in the United States. Mason bees are excellent pollinators. Bumble bees and honey bees collect pollen which they carry in basket-like structures on their hind legs. Female mason bees collect and carry dry pollen using stiff hairs under their abdomens called scopa. As the female mason bee forages from flower to flower she readily spreads the pollen she has collected. The United States Department of Agriculture (USDA) research indicates that honey bees tend to fly in a straight line as they forage down rows of crops. Bumble bees and mason bees tend to fly in zig zag patterns as they forage. This means the foraging female mason bee cross-pollinates more effectively than a honey bee.

The USDA recommends using one hive of honey bees (approximately 30,000 bees) to pollinate one acre of apple trees. By comparison it takes 250 female mason bees to pollinate one acre of apple trees. Mason bees also become flight active at approximately 55 degrees. Honey bees do not become flight active until the temperature is closer to 60 degrees. This means that mason bees begin pollinating earlier in the spring and work longer days than honey bees. Mason bees also forage in inclement weather and honey bees generally do not.

Brochure Information

All photos taken and brochure information compiled by Ron Spental, OSU Master Gardener. Illustrations by Hayley de Sully.



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Nesting

Mason bees are one of the 4,000 species of bees native to North America. 70 percent of native bees nest in the ground. The remaining 30 percent nest in cavities in the wood and these are almost exclusively solitary bees. Mason bees are considered solitary bees because they do not live in hives and they do not have a social order such as queens and worker bees. The female mason bee builds and provisions her nest without the assistance of other bees. They can however be gregarious. Mason bees may nest near one another in large numbers. Each nest consists of a number of individual cells separated by mud walls. In each cell the female has deposited a small pile of pollen and nectar upon which she has laid a single egg.

The male mason bee does not assist in constructing or provisioning the nest. The males do visit flowers for pollen and nectar but only for their own consumption. The function of the male is to mate with the females. The male mason bee life span is about two to three weeks. By comparison the females visit many more flowers because they must feed themselves as well as provide pollen and nectar for their nests. Female mason bees live six to eight weeks.

In the wild, mason bees nest in abandoned insect burrows in dead logs and stumps. Frequently they nest in exterior crevices of trees, houses and other structures. They will also nest in man-made nesting structures. Mason bee nesting devices vary a great deal in their construction materials and their efficiency. It is consistently recommended that whatever holes or channels are drilled or routed, the holes should be five-sixteenths inch in diameter (8mm). If straws are used, they should be made of unwaxed paper and not plastic.



Nesting Station at Jackson Bottom

Historically the recommended length of the hole or channel was thought to be approximately six inches, however recent research recommends longer channels. Mason bee nesting devices need to have their holes or channels level to the ground for the mason bees to effectively lay their eggs on the pollen piles in the nest cells. Most mason bee nesting devices are made from wood. Wood is preferable because it breathes and absorbs moisture. There are some commercially available mason bee nesting devices made from plastic, but these can have problems with moisture retention which can result in the cocoons developing mold and bees dying.

To build a nest the female selects a nest cavity, memorizes its location, then seeks out a source of mud. The mud she selects needs to have adequate clay content. She uses her large jaws and front legs to collect the mud and transport it back to the nest to build a partition at the end of the cavity. After the end wall is completed the female will take an average of 25 pollen/nectar trips to collect enough provisions to make a pile in the cavity to lay a single egg. On each trip the female visits up to 75 flowers. This means the nesting female can make approximately 1,875 flower visits to collect enough pollen/nectar to provide for a single egg. The nesting female then constructs another mud partition and begins collecting pollen/nectar to provision the next egg cell. Once the cavity is nearly full of nest cells the female will often construct a vacant nest cell called a vestibule cell. The vestibule cell is probably a defensive structure against predators. She will then construct an end plug of mud to seal off the cavity. The female will then select another cavity to begin constructing more nest cells, if she is able.

Mason bees use visual landmarks as navigational aids to orient themselves to their nesting sites. Once a female selects a nesting site she will fly in a zig zag pattern nearby to memorize the site location and surrounding landmarks. Nesting materials should not be moved or tampered with during the active nesting period. Moving a nest even slightly can cause the female to become disoriented and abandon her nest. Movement of the nest can also dislodge the eggs and young larvae from their pollen provisions resulting in death.



Mason Bee Nesting Activity

Development

While honey bees develop from egg to adult in only 21 to 24 days, mason bees take ten months to develop. Mason bees laid as eggs in the spring do not emerge from their cocoons, mate and nest until the spring of the following year. On average a nesting female mason bee lives approximately six to eight weeks. A female can lay up to 30 eggs in her life time.

In late March to early April male mason bees emerge from their cocoons a week or so ahead of the females. The males quickly mate with the females as the females emerge. The males die soon after mating. Mated females store the sperm in an internal sac called the spermatheca that they use to selectively fertilize their eggs. Fertilized eggs develop into females and non-fertilized eggs develop into males. When a mated female lays her eggs in a nesting channel, the innermost cells typically contain female eggs and the outermost cells contain male eggs. There are two probable explanations for this. First, the males need to emerge before the females so this is facilitated if the male egg cells are the outermost cells. Second, the male egg cells are more expendable (in terms of survival of the species) if a predator like a bird tries to attack the nesting channel. Females prefer to nest near where they emerged from their cocoons and generally forage within 300 feet of where they nest. Once the female seals off an egg cell she has no further contact with her egg. She never sees her offspring. Mason bees produce only one generation per year.



Mason Bee Larvae

Larvae Stages

A mason bee egg hatches in approximately one week and then there are five different larval stages that occur during the next few weeks. In the fifth larval stage the larva spins a cocoon. The mason bee pupa in the cocoon is initially a white pupa, then after about four weeks, develops into a fully formed adult mason bee. Still in the cocoon the adult mason bee goes into diapause for approximately eight months. Female cocoons are approximately one-half inch long and the male cocoons are slightly smaller. While still in their cocoons, mason bees need to be exposed to the warm temperatures of the summer months and the cold temperatures of the winter months to properly develop and emerge in the following spring.

Cleaning

In a managed environment mason bee cocoons are usually removed from their nests sometime between mid-November to mid-January and carefully cleaned. This is done to remove any parasites clinging to the cocoons. Nesting devices that allow for safe and easy extraction of the cocoons are highly recommended. The nesting devices should also be cleaned or replaced each year.

Mason bees are preyed upon by a number of parasites and predators. The most common problems are Krombein mites (also known as pollen mites or hairy fingered mites) and parasitic wasps. Some people recommend washing the cocoons in a bleach dilution. Recent research however shows that a bleach dilution may have a limited effect on parasites and can contribute to a damp environment which may cause cocoons to mold. An alternative approach is to use dry sand to scour the parasites off the cocoons. The mason bee nesting devices are also cleaned at this time in preparation for their use in the spring.

Emergence Box

Once they are cleaned, the cocoons are placed in an emergence box which generally has one or two holes drilled in one side. The emergence box is then kept in a cool dark environment until late February to mid-March or when blossoms begin to appear that can provide a pollen source for the mason bees. The emergence box is then placed near the prepared nesting devices. When the temperature rises, the mason bees chew their way out of their cocoons, see daylight coming in through the hole(s), then emerge. If orchard or plant blossoms are late for some reason and there are no foraging resources for the bees, the cocoons can be refrigerated to postpone the mason bee emergence.

Once the mason bees emerge, the annual life cycle begins again. Please refer to the bee life cycle chart on the last page.



Mason Bees Emerging