

Wild Bees of New England

A guide to common pollinators & flowers

A close-up photograph of a green and black striped wild bee on a yellow flower. The bee is positioned in the center of the frame, facing left. Its body is primarily green with distinct black and white stripes on its abdomen. The wings are transparent and delicate. The flower it is on has bright yellow petals and a central disk of numerous small, dark-tipped stamens. The background is a soft, out-of-focus yellow, suggesting other parts of the flower or a similar environment.

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The Rehan Lab at University of New Hampshire (UNH) focuses on wild bee research. We have special interest in pollinator biodiversity, behavior, and evolution. This guide joins other educational books published to explore the regional native bee faunas of California and the Great Lakes region. Our mission is to provide information about wild bees in New England including information on their diversity, nesting biology, ecology, and flower associations to increase our understanding and awareness of pollinators and the services they provide.

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(cover image photo credit: Patrick Schultheiss)
Agapostemon virescens on Heliopsis helianthoides

Wild Bees of New England

A guide to common pollinators & flowers

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Introduction

This book was produced to give a brief introduction to the wild bees of New England. We provide relevant information regarding their biology and pictures of commonly encountered wild bees and native New England wildflowers ideal for bees, as well as information detailing wild bee declines throughout the New England region.

Within this guide we have also included helpful and easy ways to identify commonly encountered bees and some frequent bee mimics.

Current pollinator conservation practices encourage the planting of wild flowers to provide both nesting and foraging resources. In this guide, we provide seasonally available wildflowers that are frequently visited by bees.

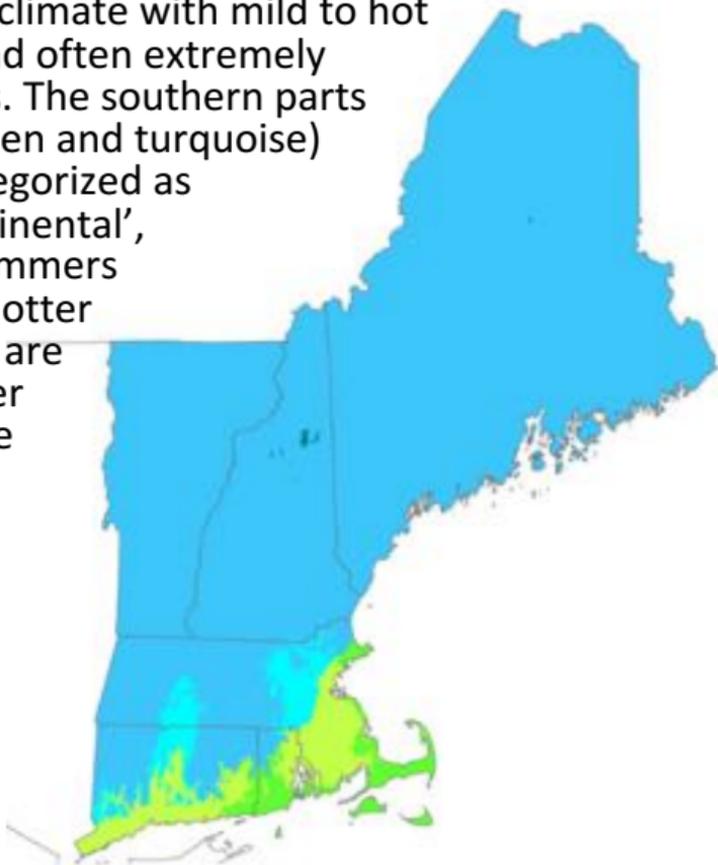
We have included a section detailing the close ties between humans and wild bees, outlining how dependent we are on their ecological services and why it is important to conserve pollinators.



Sabine Nooten

The New England climate

The climate of New England varies greatly depending on the location. Most of New England (colored blue) is considered to have a humid continental climate with mild to hot summers and often extremely cold winters. The southern parts (colored green and turquoise) are also categorized as 'humid continental', although summers tend to be hotter and winters are much shorter than in more northerly regions.



Köppen climate type

Dfc (Subarctic)

Dfb (Warm-summer humid continental)

Dfa (Hot-summer humid continental)

Cfb (Oceanic)

Cfa (Humid subtropical)

How to use this guide

This guide is designed to be an identification tool for anyone interested in bees. There are three main sections: 1. bee mimics, 2. common species of bees, 3. flowering plants that provide bees with pollen and nectar. In addition, we include informative sections about recent bee declines and what we can do to conserve the bees.

The bee species are sorted into families and then listed by genera. This will help to distinguish the species by their oftentimes minute differences. Photographs of each species have also been included to aid in identification.

The plants featured in this guide are a brief summary of many common species found in the wild and in gardens that are attractive to bees. They are sorted initially by bloom season and then alphabetically by their common name.



Sabine Nooten

Megachile sp. on smooth oxeye

Bee biology

Patrick Schultheiss



Agapostemon virescens

There are over 20,000 bees found worldwide and about 4,000 of those species are found in North America. Within New England, there are an estimated 400 bee species. These bees appear in a variety of sizes, shapes, and colors. The largest bee found in New England is the eastern carpenter bee.

Some bee species, such as members of the genus *Augochlorella*, are a brilliant, metallic, race-car green. Others come in striking patterns of red, yellow, and black, such as many of the cuckoo bees.

Bee behavior

Bees exhibit a wide variety of behaviors and nesting strategies due to their vast diversity. One of the most understood of all bees is the non-native honey bee known for their complex social behavior. Honey bees are **eusocial** with one queen and thousands of workers all living in a single hive.

In contrast, the vast majority of wild bees are **solitary**, in which a single female bee constructs and provisions her own nest without the help of other bees. There are some bees that will form large **communal** aggregations, that is, females will come together in one area and build their nests in close proximity together. Other bees form cooperative colonies, much like honey bees, complete with queens and workers. These colonies do not grow nearly as large with only dozens of workers at most. These colonies last just one season beginning in the spring and ending in the fall when the bees die off.

There are a number of **cleptoparasitic** bees. These bees do not collect their own pollen nor do they create their own nest. Instead, they enter the nest of another bee and lay their eggs in nest cells.

Upon hatching, the cleptoparasitic bee larva kills the host larva and feeds upon its pollen ball. These bees are called cuckoo bees because like the cuckoo bird, adults sneak their eggs in the nests of other species.



Molly Jacobson

Nomada luteoloides,
a cuckoo bee

Life cycle

Bees are holometabolous insects, undergoing a complete metamorphosis. They have four life stages: egg, larva, pupa, and adult. Most solitary mother bees build a single cell, provision it with a ball made of pollen and nectar, lay a single egg on it, and seal the cell. This is called mass provisioning. The egg then hatches into a larva, which looks more like a pale caterpillar than a bee. The larva has no eyes or legs and spends its time devouring the pollen ball and growing. Once the the pollen ball is consumed, the larva defecates, molts, and enters the pupal stage. Pupae look like bees having eyes, legs and body segments, gaining coloration until they molt to reveal their wings as an adult bee.



Life cycle of the small carpenter bee (*Ceratina calcarata*)

Nesting

Bees exhibit a range of different nesting types, i.e. they build nests in the ground, rock crevices, snail shells, plant stems, or in hardwoods. Most bees dig a simple burrow into the ground that contains a few individual cells, each stocked with pollen and a single egg. Species may be attracted to certain kinds of soils; some prefer clay soils and others will only be found near dunes and embankments. The depth of nests dug into the ground can reach anywhere from a few inches to a few feet below the surface. Other bees prefer to nest in an existing crevice, e.g. bumble bees nest in abandoned rodent holes, clumps of grass, and even compost piles or old mattresses. Stems, rotting logs, and burrows made by other insects are used by some bee species to build their nests.

Molly Jacobson



Ground nesting bee
Colletes validus

Sandra Rehan



Cross section of bee
nest in the ground



Osmia cornifrons (male)
emerging from stem nest



Ceratina calcarata
small carpenter bees

Small carpenter bees prefer dead, broken stems of sumac and raspberry as nest sites. These bees cannot chew through the exterior bark of a stem and require exposed pith from pruning, mowing, burning, or grazing to make nesting sites available. Females tunnel in the pithy stems from a few inches to a few feet long.

Large carpenter bees form their nests by boring into manmade hardwoods. In pre-colonial times, carpenter bees lived in dead logs and tree trunks. Other stem nesting bees will find and use pre-existing cavities made by beetles and other insects. Mason or leaf-cutter bees, will then line those burrows with bits of leaves, flower petals, mud, or even downy plant fibers in order to partition their nest.



Xylocopa virginica

Bee identification

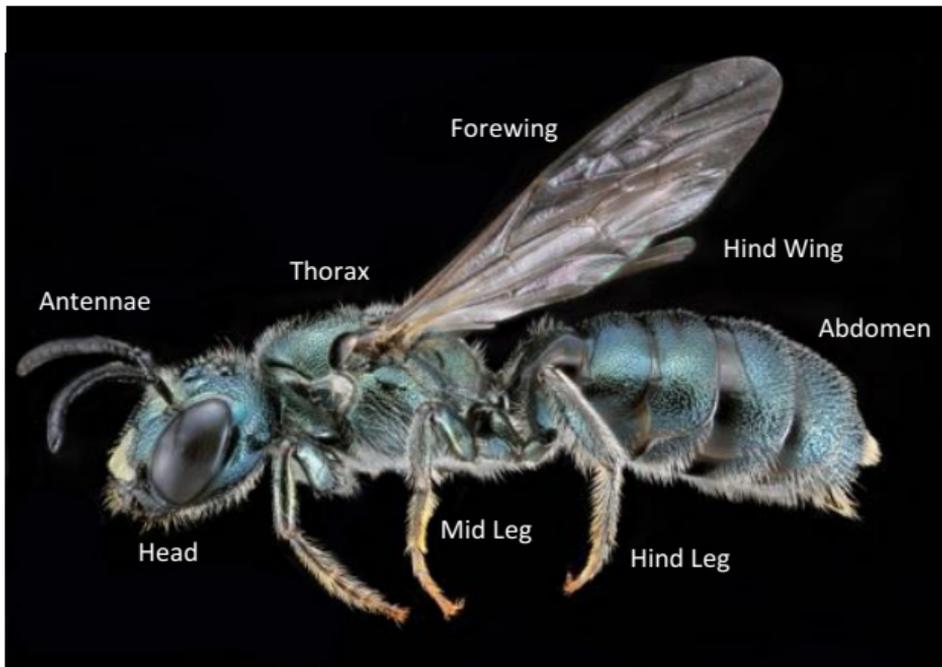
Bees come in many different shapes and sizes. Bees range from less than a quarter to about an inch in size. The largest species found in New England are large carpenter bees and queen bumble bees, both reaching about an inch long. Many bees are much smaller, like the metallic sweat bees that approximately a quarter of an inch in length.

Like size, shape is also variable ranging from slender masked and mining bees to robust bumble, carpenter and wool carder bees. Bees come in many different colors, from reds and browns, metallic greens and blues, to black and yellow.

An easy way to distinguish a wasp from a bee is by the amount of hair on the insect's body. Bees are generally quite hairy, however some bees that lack the dense hair, but all bees have branched hairs on their bodies. Wasps are generally predators feeding their offspring other insects or spiders while bees typically feed on pollen and nectar.

Bee anatomy

Like all insects, bees have six legs and their bodies are divided into three main sections: head, thorax, and abdomen. Female bees have branched hairs that are typically dense on hind legs and abdomen. Bees have four wings and long slender antennae. Flies only have two wings and shorter, stubby antennae. Wasps also have four wings and long antenna, but are typically less hairy than bees.

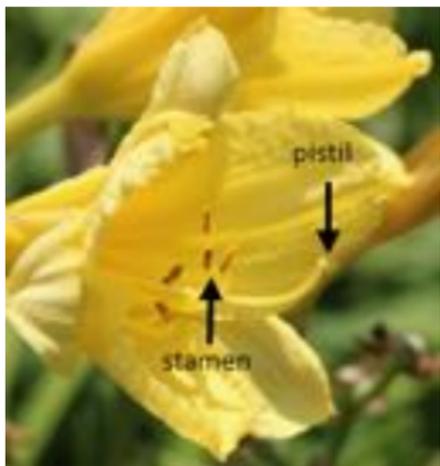


Ceratina calcarata

Bees and Flowers

Flowering plants

Bees are generally thought to have appeared on earth millions of years ago during the Cretaceous period. At the same time, flowering plants, known as Angiosperms, expanded widely in shape, form and size. This group of plants were the first to use flowers for reproduction. Stamens produce pollen that when deposited on the pistil, fertilize reproductive cells that develop into seeds that produce the next generation of plants. This system relies on spreading pollen by wind, water or mobile animals-pollinators, the latter being more efficient.



Lilium sp.

Attracting pollinators is costly for plants. Flowers produce pollen, oils, and nectar as a reward for pollination services. Animals feed on the nectar and simultaneously distribute the pollen collected from other plants. Insects, bees especially, are the most efficient and effective pollinators.

Bees and plants

Sabine Nooten



Sabine Nooten

Bombus sp. & *Hoplitis sp.* on wild bergamot (*Monarda fistulosa*)

Adult bees feed on nectar, while their offspring eat a mixture of nectar and pollen. Many bees have developed specialized mechanisms on their legs or abdomens called scopae or corbicula to collect and store pollen. Scopae are composed of long, stiff hairs that have many miniscule branches to hold large quantities of pollen. For most species, the scopae are on the legs, but some species have scopae located at the sides and underside of the abdomen (right).

Bumble bees and honey bees do not have scopae. Instead they have pollen baskets called corbicula that are flat areas on their hind legs (left). Bumble bees pack a mixture of pollen and nectar onto their corbicula to take back to their nest.

Through the process of co-evolution, bees became the most specialized and effective animal pollinators. Bees developed a wide array of nectar feeding and pollen carrying features, while flowers developed many different shapes and sizes to attract pollinators. Most bees are generalists, meaning that they visit any type of flower they can get nectar from. Whereas other bees have become so specialized that they only visit one or a few types of flowers. These bees are fittingly called specialists. One example is the squash bee, *Eucera pruinosa*. This bee is so specialized that it is only found on plants in the cucurbit family, e.g. squashes and melons. Squash blossoms open in the early morning hours. Male squash bees often spend the night inside the closed squash flower waiting to mate with females arriving early in the morning to pollinate squash flowers.

Patrick Schultheiss



Lasioglossum pilosum
(male) - generalist



Eucera pruinosa
specialist squash bee

Molly Jacobson

Bee mimics & other pollinators

There are many other insects that are frequent floral visitors that, like bees, feed on nectar and transport pollen. These include flies, wasps, ants, beetles and butterflies. Some of them look remarkably like bees and they are described in the following pages.

Flower flies Syrphidae

The Syrphidae, or flower flies, are frequent visitors to flowers to collect nectar. Syrphids are often mistaken for bees. Many of them mimic bees with their dark banding and yellow coloration. Their two wings, short antennae, and large eyes distinguish them from other bees and wasps.



Toxomerus germinatus

Hummingbird Moth Sphingidae

Molly Jacobson

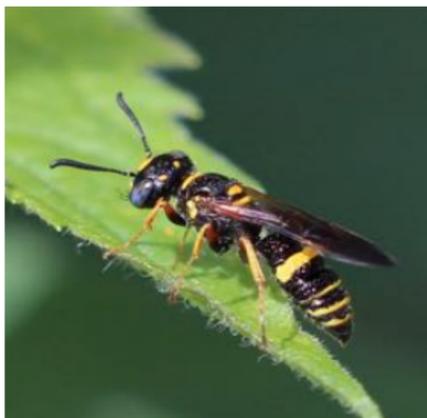


Hemaris diffinis

These moths are sometimes mistaken as bumble bee mimics due to their size and coloration. They are attracted to many flowers, including blueberry, and are often seen hovering in flight.

Sand wasps, bee wolves & others

Digger wasps (Crabronidae) are closely related to bees. Mostly nesting in the ground, these wasps provision their larvae with other insects, unlike bees that provision with pollen. Prey items will vary amongst the different species, and some of these wasps even hunt bees.



Sabine Nooten

Philanthus gibbosus

This group includes the paper wasps, yellow jackets and hornets. These members of the Vespidae are eusocial and have a queen, like the honey bee. These eusocial species can be aggressive when the colony is disturbed and wasps are much more likely to sting than bees.

Paper wasps can be seen scavenging or hunting where food is present and are widely misidentified as bees. They are especially attracted to picnics and outdoor gatherings, in order to find meat provisions for their larvae. Adult wasps are omnivores and can also commonly be seen taking nectar from flowers.



Dolichovespula sp.



A wasp nest

Bee Flies Bombyliidae

Bob Webster; Bugguide.net



Systoechus vulgaris

Bee flies can be found in spring, hovering over the ground and nectaring at flowers. Their hairy bodies pick up pollen. As bee flies move among flowers, they pollinate the plants. Bee flies fire their eggs into bee nests and their larvae are parasites of bees.

Soldier beetles Cantharidae

Commonly found on goldenrods during the summer, these black and orange beetles feed on pollen and nectar as adults. Due to their frequent presence, they are avid pollinators of flowers



Tom Murray; Bugguide.net

Chauliognathus pensylvanicus

Locust Borer Cerambycidae

Megacyllene robiniae



MJ Hatfield; stevenanz.com

Megacyllene robiniae

Adults of these long-horned beetles are commonly found on goldenrod in late summer taking nectar and pollen from the flowers. Due to their coloration, sometimes they are mistaken for bees. Their larvae nest in the bark of Black Locust deciduous trees.

Robber flies

Robber flies are predatory, large bodied flies and a few genera contain species that are exceptional bumble bee mimics. The presence of only two wings, short antenna, large eyes, and long mouthparts sets these flies apart from the bees they imitate.

Asilidae



Molly Jacobson

Laphria sp.

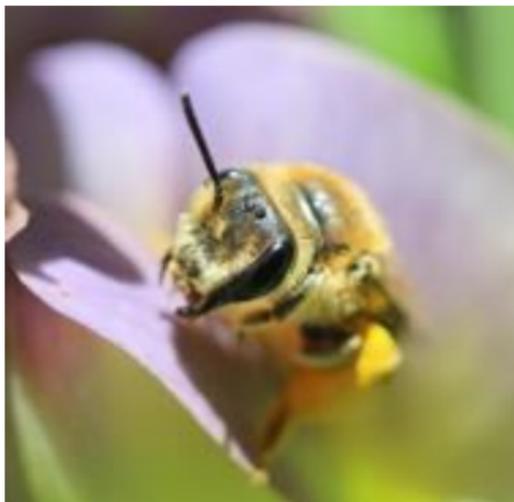
Common bee species

There are an estimated 400 wild bee species in New England, an exhaustive list would go beyond the scope of this field guide. In the following we focus on a selection of the most commonly encountered species. Bees are grouped by family and then by genus. A particularly curious group of bees – the cuckoo bees are described at the end of this section.

Mining bees Andrenidae

Andrena

All members of the family Andrenidae line their underground nests in a waterproof substance to reduce moisture and mold. Females mass provision their offspring with a ball of pollen and nectar on which they lay a single egg. Upon hatching, larvae feed on the pollen ball, pupate and emerge that fall or next spring.



Cullen Franchino

Andrena sp.

Mining bees *continued*

The genus *Andrena*, commonly referred to as mining bees, is one of the most diverse, with over 1400 species world wide, 550 in the US, and 90 species in New England. Mining bees are solitary and nest in simple burrows they dig in the ground. The depth of the burrows range between a few inches to several feet deep. There is one generation of *Andrena* per year. The emerging adults of most species fly only for six weeks. Some species come out in summer or fall while other *Andrena* species are among the first bees to emerge in the early spring, sometimes occurring even when snow is still present and flowers are just starting to bloom.

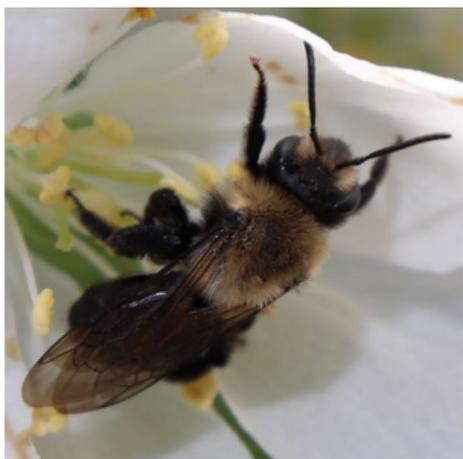
Mining bees can be either floral generalists or specialists. Many fruit crops are pollinated by generalist spring flying *Andrena* species, such as the apple blossom on the right.



Apple blossom - *Malus pumila*

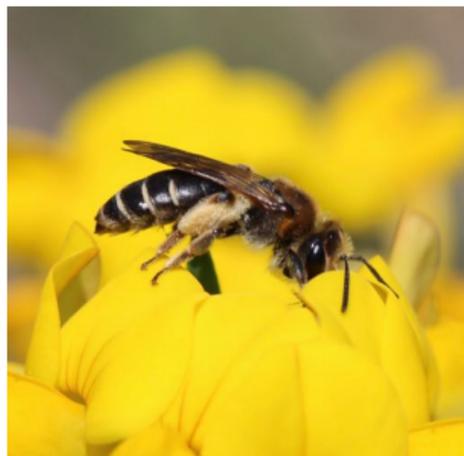
Mining bees *continued*

Andrena carlini is a large, dark species that is most active in the late spring and early summer and is a broad generalist. It has a black body and pale yellow hairs on its thorax. This bee is similar to *A. vicina*, but can be distinguished by the solid black hair on its hind legs.



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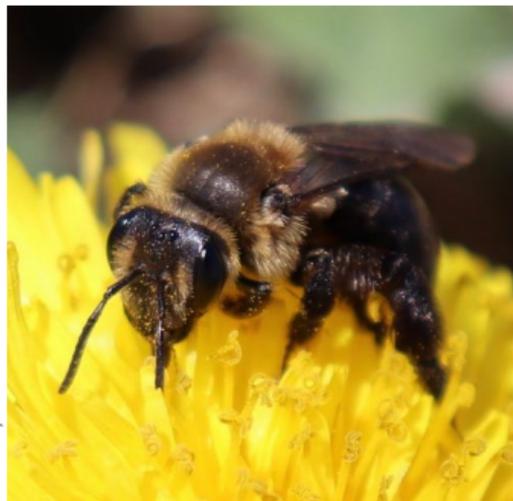
Andrena carlini



Andrena wilkella

Andrena wilkella is an introduced large, common bee found in north eastern America. It has a black body and thick yellow hair covering the back of its head, thorax, and legs which it uses to gather large amounts of pollen. Its most commonly found on introduced crown vetch.

Mining bees *continued*



Molly Jacobson



Katherine Odanaka

Andrena vicina

Andrena vicina is a medium sized bee, common throughout southern Canada and northern US.

It is most commonly mistaken for *A. carlini*, but is distinguished by having longer, denser and lighter thoracic hair.

A. vicina acts as a broad generalist throughout the spring and summer and can be found pollinating crops like apple and blueberry.

Honey bees Apidae

Apis

Apis mellifera, commonly known as the European honey bee, was introduced to the US in the late 1600's. It is eusocial in nature, creating large colonies in cavities and man made hives with a single reproductive queen and many workers and drones. This bee has a unique color pattern: multiple bands of dark brown and amber across its abdomen, while its head and thorax are black.

Honey bees are active throughout the year in areas where it is warm enough to support them. The entire colony persists through the winter unlike native bee species. Honey bee workers have a uniquely barbed stinger and can only sting once dying shortly thereafter. This species is also the only one known to cause human allergic reactions.

Honey bees are generalist pollinators feeding on many different flowers. To date they are the most mass produced commercial crop pollinator world wide and the only bee species in America north of Mexico that makes honey.



Apis mellifera

Bumble bees Apidae

Bombus

The genus *Bombus* is the group commonly referred to as the bumble bees. They are large bees that are densely covered in black, yellow and occasionally orange hairs. Bumble bees can generate heat by vibrating the muscles that control their wings which enables them to fly in cold temperatures. Because of this ability, bumble bees are found farther north and in higher elevations than other bees. They are also important pollinators of early spring crops because they will fly in colder and wetter weather than managed honey bees. Colonies are established by queens in the early spring, usually in abandoned rodent burrows and crevices. Smaller workers are produced in spring - summer while males are present later in the season. They are observed foraging on late season plants. Some bumble bee species are commercially used to pollinate crops, such as tomatoes and blue-berries, due to their ability to buzz their flight muscles at the frequency needed for pollen to be released by the flower.



Bombus sp.

Bumble bees *continued*

The two-spotted bumble bee, *Bombus bimaculatus*, is very common throughout the eastern US. It is active from March to September, it is the first bumble bee out in spring and acts as a generalist pollinator for a large variety of plants.

The two-spotted bumble bee is often mistaken for its close relatives, the common eastern bumble bee (*B. impatiens*) and the brown-belted bumble bee (*B. griseocollis*). Females can be differentiated by their longer face and the presence of two yellow patches on the abdomen; males are highly variable in patterning, often with extensive yellow coloration.



Sabine Nooten

Bombus bimaculatus

Bumble bees *continued*



Bombus griseocollis (male)

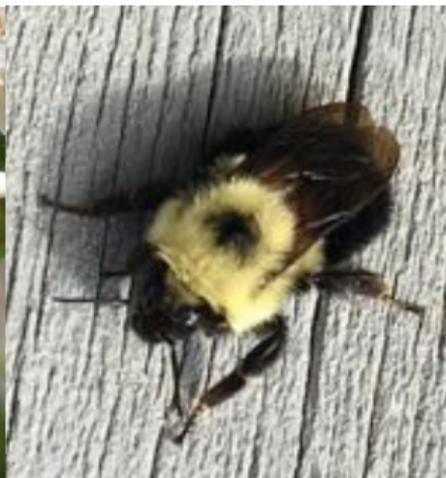
The brown-belted bumble bee *B. griseocollis* received this name from a brown stripe across the abdomen below the first yellow stripe. This distinguishes it from other similar species. This bumble bee is common in gardens.

The brown-belted bumble bee is common across North America and is active from February to August. Like its relatives, it acts as a very broad generalist pollinator, feeding on a multitude of flowers.

Bumble bees *continued*

The common eastern bumble bee, *B. impatiens*, can be identified by the single yellow band across its abdomen. As the name suggests, it is the most populous bumble bee in the eastern half of North America. This bumble bee is very adaptable, allowing it to act as a pollinator for many plants. As such, it is frequently used commercially for tomatoes and other buzz pollinated crops. Colonies can be purchased for farmers to supplement pollination for their crops. *B. impatiens* is a species increasing in numbers over recent years and is not compromised by the many diseases thought to have contributed to the local extinction of the rusty patch bumble bee, *B. affinis*.

Sabine Nooten



Katherine Odanaka

Bombus impatiens

Bumble bees *continued*

The perplexing bumble bee, *B. perplexus*, can be found throughout northern North America but is absent in the southern states. The three yellow stripes across the abdomen of the male makes them appear much more yellow than other commonly encountered *Bombus* species.

Active from April to September, this bee can be found around forests, orchards, and even some bogs. The perplexing bumble bee is a generalist pollinator and will visit many different kinds of plants including blueberry and raspberry.

Katherine Odanaka



Blueberry
(*Vaccinium corymbosum*)



Molly Jacobson

Bombus perplexus
(male)

Large carpenter bee *Apidae*

Xylocopa

The large carpenter bee, *Xylocopa virginica*, is the largest New England bee species (~1 inch long). It burrows into manmade wooden structures, but it does not dig deep and only causes structural damage if aggregations are immense.

This bee is a generalist pollinator, feeding on many flowers during summer. It is black with thick, yellow hairs on the thorax, and can be mistaken as a bumble bee. The large carpenter bee can be identified by its shiny black and broad abdomen.

Males, which have a ivory square on their face, exhibit aggressive and territorial behavior towards each other. They will confront presumed threats by approaching and flying around the intruder in an attempt to chase them away. Male carpenter bees will not bite and all male bees are incapable of stinging. Females have solid black faces and are capable of stinging, but are not aggressive or territorial.



Molly Jacobson

Xylocopa virginica

Small carpenter bee Apidae

Ceratina

The bees in the genus *Ceratina* are known as the small carpenter bees. They dig out the soft center - the pith - of old sticks and stems to create their nests. Raspberry and sumac are their preferred plants to build nests. Small carpenter bees build cells along the length of the stick, laying one egg in each cell with a wall of wood shavings, held together with mandibular secretions to make a paste, in-between them. They are dark colored with a metallic sheen and water bottle ridge shaped abdomen. The small carpenter bee, *C. calcarata*, is common throughout the eastern US. It is blue to blue-green with a very reflective surface and is active from early spring to late fall. Males and females of this species can be easily distinguished; the males have a small white patch on their face in the shape of an upside down T and females have a small line or spot. As a generalist, this bee is valued for its ability to pollinate a wide variety of flowering plants and crops, such as raspberry.



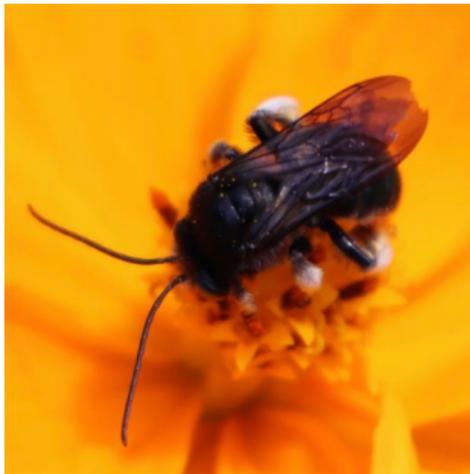
Ceratina calcarata

Long-horned bees Apidae

Melissodes

Bees in the genus *Melissodes* are commonly referred to as the “long-horned bees” because of the lengthy antennae of the males. Many of the bees in this group are specialist pollinators that focus only on one type of flower. Long-horned bees are solitarily, ground nesting bees, and they are active throughout the summer. Thick hairs on the legs, thorax and head are common to *Melissodes*.

The two-spotted long-horn bee *M. bimaculata* has a completely black body and very hairy hind legs. The legs are hairy with mostly pale or white coloration.



Molly Jacobson

Melissodes bimaculata

This bee is active throughout the summer and is a generalist pollinator. The pollination done by two-spotted long-horn bee complements that of the squash bee, *Eucera pruinosa*, both essential to summer blooming crops like melons and squash.

Long horned bees *continued*

Molly Jacobson



Melissodes trinodis

The orange sunflower bee, *Melissodes trinodis*, is a medium sized bee with vibrant yellow-orange colored hairs on a black body. The dense hairs thickly covering the legs, head, and thorax are consistent with other members of the genus. The sparse lateral lines across the abdomen, gives this bee a striped appearance.

Anne Ewert



Helianthus annuus

The main source of pollen for this species is the genus *Helianthus*, more commonly known as sunflowers. Although they are generalists pollinators, if there are sunflowers in the area they are strongly attracted to them.

Squash bees Apidae

Eucera (formerly *Peponapis*)

The eastern cucurbit (or squash) bee, *Eucera pruinosa*, is common throughout the summer and early fall throughout the United States and south to Mexico. This medium sized, black bee has thick yellow hairs and white stripes on the abdomen. It is a specialist pollinator for plants in the gourd family (Cucurbitaceae) which includes many popular vegetables like squash, pumpkins, zucchini and some melons.

Female squash bees dig burrows to nest near these plants. Males are commonly found sleeping in the flowers in groups.



Molly Jacobson

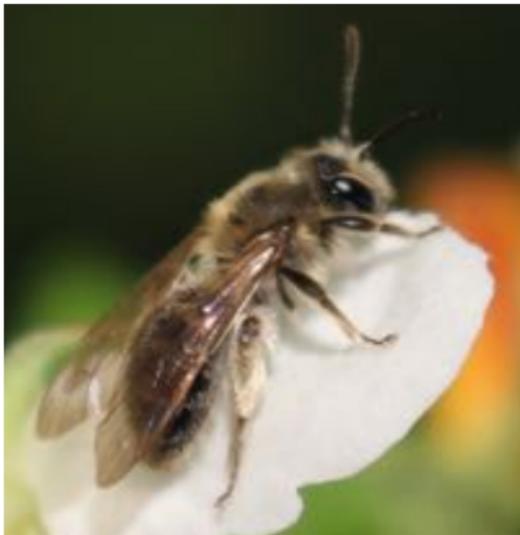
Eucera pruinosa

Cellophane bees Colletidae

Colletes

The common name of cellophane bees comes from a waterproof liquid secretion that members of this genus use to line the walls of their burrows. When dried this liquid resembles the crinkly, waxy look of cellophane. The cellophane bees are medium to large sized ground-nesting bees and are one of the first bees to emerge in early spring.

Cellophane bees of the genus *Colletes* are hairy, much like *Andrena* species. By contrast, *Hylaeus* cellophane bees are almost hairless and have a wasp-like appearance.



Sabine Nooten

Colletes sp.

Cellophane bees are solitary nesters, but some *Colletes* species have a preference to nest in sandy soils which often results in large aggregations.

Most species are found in a variety of soil types and do not form aggregations.

Cellophane bees *continued*

The cellophane bee *Colletes inaequalis* is a common ground-dwelling bee that emerges early in spring. Because this bee is a floral generalist and appears very early in the season, it visits early spring blooming flowers and trees. *C. inaequalis* are common in apple and blueberry orchards.



Molly Jacobson

Colletes inaequalis



Katherine Odanaka

Apple orchard

Cellophane bees *continued*

Molly Jacobson



Colletes validus

The blueberry cellophane bee, *Colletes validus*, is a medium-sized bee with a face that is characteristically longer than wide.

It has a black body with lateral stripes of white hairs running across the abdomen and pale yellow hairs covering its thorax.

It is thought to be a specialist on the commercially grown northern high bush blueberry *Vaccinium corymbosum*.

Katherine Odanaka



Vaccinium corymbosum

Masked bees Colletidae

Hylaeus

Masked bees also produce cellophane to line their nests, but are much smaller and mostly hairless. They live in pre-existing holes and are solitary.

Instead of carrying pollen on branched hairs like most bees, *Hylaeus* bees store pollen internally in their crop, a similar structure to our stomach. They eat the pollen and then regurgitate it when needed. Because of their small size and hairless bodies, they can be mistaken for wasps.

The commonly found yellow faced masked bee *Hylaeus modestus* is a small black bee with vibrant yellow patches on the head, thorax, and legs.



Molly Jacobson

Hylaeus modestus

The yellow faced masked bee is a broad floral generalist, active from May to September and can be found throughout eastern North America.

Banded sweat bees Halictidae

Halictus

The banded sweat bees are named due to the white bands on their abdomens and their attraction to human perspiration. It is thought that they use the salt for nutrition. Members of the genus *Halictus* are wide-spread across the Northern Hemisphere. They are some of the most common bees in any given area, making them important pollinators of flowering plants.

Most *Halictus* species are eusocial, with queens and workers, forming colonies in underground burrows, similar to bumble bees. Colonies have a vary in size, commonly 10-20 bees and up to 200 individuals.

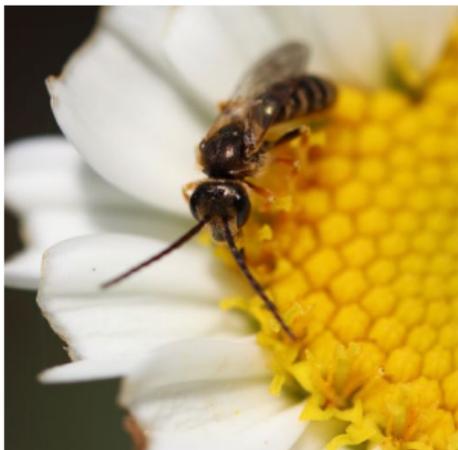


Molly Jacobson

Halictus ligatus on oxeye daisy (*Leucanthemum vulgare*)

Banded sweat bees *continued*

The southern bronze furrow bee, *Halictus confusus*, is small and dull green with bold white bands on its abdomen. This bee is a broad generalist pollinator that forms social colonies in ground burrows. It can be found in New England during spring and summer months.



Molly Jacobson

Halictus confusus



Halictus ligatus

The sweat bee *Halictus ligatus* is medium sized (0.3 inches) and black with light colored hairs on the thorax. White bands stretch across the abdomen. This bee has a large head. This eusocial, generalist bee prefers composite flowers and is widespread across North America including Mexico.

Banded sweat bees *continued*

The sweat bee *Halictus rubicundus* is a medium-sized bee with a black body with bands of hair on their abdomen that appear as white stripes. It can be distinguished from *H. ligatus* by the lack of the triangular shaped pointed, spine-like project at the base of its cheek and much narrower head.

This sweat bee has a worldwide distribution and can be found on multiple continents, including North America, Europe, and Asia. It is active from early spring to late summer and acts as a generalist pollinator. Like others in this group, it is eusocial and lives in small colonies in nests beneath the soil.



Molly Jacobson

Halictus rubicundus

Green sweat bees Halictidae

Agapostemon & similar

The genera *Agapostemon*, *Augochloropsis*, *Augochlorella*, and *Augochlora* are commonly grouped together and called the green sweat bees. These vibrantly colored, race-car green species can look very similar. The females of all genera are entirely green, except for the bicolored striped sweat bee, *Agapostemon virescens*.

Agapostemon virescens is a medium sized, metallic, green bee that is common across southern Canada and the northern US. This species nests communally with up to two dozen females sharing a nest entrance, but each individual builds and provisions it's own brood cells.



Sandra Rehan

Agapostemon virescens

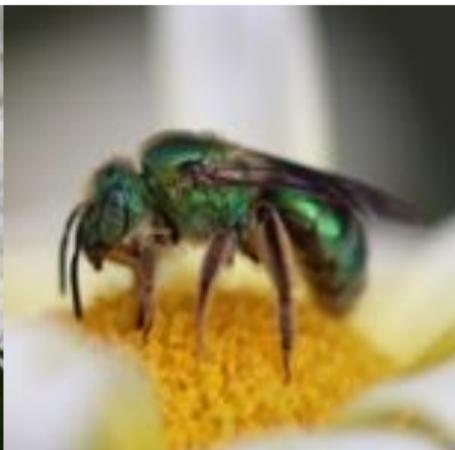
Different from other *Agapostemon* species, male bicolored striped sweat bees have been found to nest with females. Green sweat bees are broad generalist pollinators active throughout the warm season from May to October.

Green sweat bees *continued*



Steve Nanz; stevenanz.com

Agapostemon sericeus



Molly Jacobson

Agapostemon texanus

Both *A. sericeus* and *A. texanus* are medium sized bees with all green females and males with green heads and thoraces and striped abdomens that have the appearance of female *A. virescens*. The hues of green can be more yellow or more blue depending on the location of the individual. *A. sericeus* is less common in New England than *A. texanus*.

A. sericeus is known to nest in the ground where multiple females share a single entrance. Inside the nest, each female has their own cell where they stock food and take care of their young.

Green sweat bees *continued*

Célia Bordier



Augochlora pura

The green sweat bee *Augochlora pura* is a small, shiny bee often found in wooded areas where it nests in pre-existing cavities in rotting wood. Interestingly, while normally green, there have been individuals found with deep blue and bright yellow overtones. These bees nest solitarily, but depending on nesting resource availability, females may nest in close proximity. Some nests have even been found to wind between each other. As a generalist, this green sweat bee pollinates a wide variety of flowers during spring and summer season. It is a common visitor to gardens.

Green sweat bees *continued*

Molly Jacobson



Augochloropsis metallica

The medium sized brilliant green bee *Augochloropsis metallica* is found across North America. This generalist pollinator nests in the ground and is active during summer. It can be distinguished from other green sweat bees by its 'D' shaped tegula (wing attachment cover).

Célia Bordier



Augochlorella aurata

Augochlorella aurata is a small metallic green bee, sometimes with blue, yellow, or copper hues. This generalist pollinator is found from the Rocky Mountains to the eastern coast between May to October. They primarily nest socially, but occasionally solitarily in cooler climates.

Small dark sweat bees Halictidae

Lasioglossum

Lasioglossum is one of the most widespread and numerous genera in North America and can be found from spring through late fall. There are roughly 300 species in North America and 100 species in New England.

They range from a tenth to half an inch in size. Members in this genus range in color from black and dull to green and metallic species. Many appear similar in color and shape and are challenging to tell apart - even for experts. While many species of *Lasioglossum* are solitary, some are social and form eusocial colonies.



Molly Jacobson



Célia Bordier

Lasioglossum tegulare

Small dark sweat bees *continued*



Tom Murray; Bugguide.net

Lasioglossum pilosum

The small, dark sweat bee *Lasioglossum pilosum* is a very common bee. This golden green bee is small in size and has dense woolly hairs covering most of its body. It is found throughout eastern North America between March and October. As a broad generalist pollinator, it has been recorded visiting over 80 different flowering plant species. It nests in the soil.

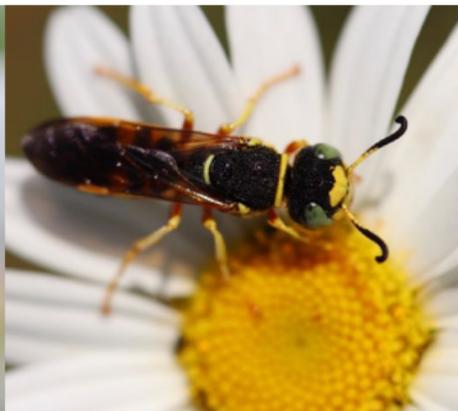
Wool carder bees Megachilidae

Anthidium

Bees in the genus *Anthidium* are also known as wool carder bees. The name derived from the female's ability to use their large, sharp jaws to gather soft plant fibers to insulate their nests. All species in New England and non-native. A particularly striking behavior that sets *Anthidium* apart from other bees is that males territorially defend a patch of flowers. Because of their aggressive nature, males are known to kill other bees that happen to wander into their territory. Most wool carder bee species can be recognised by their distinct yellow and black colorations and brightly colored eyes. Despite this coloration they should no be confused with wasps – see photo below for comparison.



Anthidium manicatum
(bee)



Philanthus ventilabris
(wasp)

Wool carder bees *continued*

Molly Jacobson



Anthidium manicatum

The oblong wool carder bee, *Anthidium oblongatum*, is black with yellow bands along its head and abdomen. They are generally smaller than *A. manicatum*. Originally from Europe, it is found throughout the eastern US during summer and autumn. This bee is attracted to bird's foot trefoil, *Lotus corniculatus*.

The European wool carder bee, *Anthidium manicatum*, is a medium sized bee with black and yellow coloration. It was introduced to the US from Europe in the 1960's and quickly colonized the continent. This bee re-uses old nesting sites and cavities, making it easy to spread.



Anthidium oblongatum

Molly Jacobson

Leaf-cutter bees Megachilidae

Megachile

The genus *Megachile* are commonly known as leaf-cutter bees. Female bees chew off pieces of leaves and petals to incorporate into their nests. Unlike many bees, females will often make multiple nests. These bees nest readily in pre-existing cavities and can be attracted to gardens by installing bee hotels.

They emerge early in spring and are active through September. Usually generalist pollinators some are extreme specialists, such as *M. pugnata* that uses sunflowers and related species.

The alfalfa leaf-cutter bee *Megachile rotundata*, an important crop pollinator for e.g. alfalfa and carrots. This bee is the smallest member of its group. Originally from Europe and not native to North America, it is now quite common and naturalized in many parts of the world.



Leaf-cutter bees *continued*

Megachile mendica is a medium-sized, black bee with white hairs on its head, thorax, and abdomen, forming lateral bands on the latter. It is perhaps to most common native *Megachile* species. It nests in the soil and can be found during summer and autumn. This species uses leaf or flower clippings to line its nests.



Molly Jacobson

Megachile mendica

Megachile inimica sayi is a subspecies of the more widespread 'hostile leaf-cutter bee', *M. inimica*. Native to north eastern US, this bee is a strong specialist on plants from the family Asteraceae, including sunflowers. It differs in leg color (black) from its southern relative that extends its range into South America.



Molly Jacobson

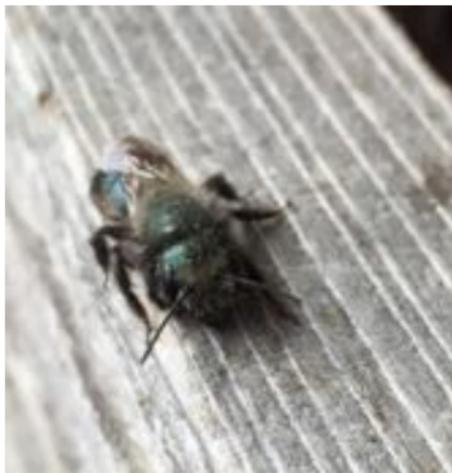
Megachile inimica sayi

Mason bees Megachilidae

Osmia

Bees in the genus *Osmia* are known as mason bees because they use mud and other similar substances in nest construction. They are small to medium sized with a robust build. Usually emerging in the early spring, they build solitary nests in pre-existing underground burrows, crevasses in wood, stone, concrete, and known to occupy old snail shells.

Some mason bees, like the blue orchard bee (*Osmia lignaria*) and the horn-faced bee (*O. cornifrons*), are used commercially in the agricultural sector as pollinators to enhance production of fruits and nuts.



Osmia lignaria



Osmia cornifrons

Mason bees *continued*

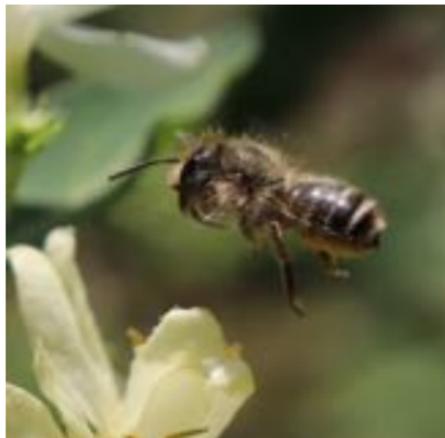
Molly Jacobson



Osmia lignaria

The blue orchard bee *Osmia lignaria* is a native species of *Osmia*. This medium sized bee is recognized by its metallic blue color and a mix of black and white hairs on the body. It is a generalist throughout North America that occurs in spring and usually dies off by the end of June.

The horn-faced bee, *O. cornifrons*, originally came from Japan and was introduced in the late 1970's as to enhance crop pollination. This bee has a dark body loosely covered with long red brown to pale hair. Females can be recognized by horn like protrusions on the lower end of their face.



Osmia cornifrons

Molly Jacobson

Mason bees Megachilidae

Hoplitis

Cullen Franchino



Hoplitis producta



Hoplitis sp.

Molly Jacobson

The mason bee genus *Hoplitis* is a small to medium sized bee varying in size from a quarter to half an inch. They are smaller and darker in coloration than *Osmia*. Like other mason bees they also use a mix of substrates to make mud partitions for nest construction or to wrap their eggs in a protective envelope. Interestingly *Hoplitis* have been observed in nests built in stems by small carpenter bees, genus *Ceratina*. To date, one can only speculate if they co-inhabit or usurped the nest. *Hoplitis* bees are known to return to the same nest they were born in to make their own nests.

Cuckoo bees parasitic bees

Although most bees visit flowers to collect pollen to provision nest cells, there are a few genera who do not. Instead, these thieves rely on the pollen collecting labor of other bees. Called cleptoparasites, or cuckoo bees, these bees behave similarly to cuckoo birds, which lay eggs in the nests of other birds and force the other bird to care for the cuckoo bird offspring.

Cleptoparasitism in bees has evolved at least 27 times, each in a different lineage and this lifestyle is found across the different bee families.

Many of the cuckoo bees come in striking patterns of reds and yellows giving them a very waspish look. Cuckoo bees are most frequently encountered hovering near the ground or nectaring at flowers.



Nomada sp.

Cuckoo bees Apidae

Nomada

The *Nomada* are among the most commonly encountered of the cuckoo bees. These bees are generally hairless and come in a vast array of reds and yellows. In the US, they are the only bee observed to be entirely red in color.



Nomada sp.

Molly Jacobson

There are an estimated 300 species of *Nomada* in the US. Most of them parasitize the nests of *Andrena*, although there are records of them using other genera including *Agapostemon* as well.



Nomada sp.

Large aggregations of *Andrena* will attract female and male *Nomada*. They can be seen hovering in and near host nest sites.

©Charley Eiseman; www.charleyeiseman.com

Cuckoo bees Apidae

Nomada and *Holcopasites*

Like most *Nomada*, *N. luteoloides* is dark brown and yellow in color. It is found in the eastern half of the United States up to the Hudson Bay. Throughout the spring females can be seen hovering along the ground searching for host nests while males are commonly seen nectaring at flowers.



Molly Jacobson

Nomada luteoloides



Molly Jacobson

Holcopasites calliopsidis

Holcopasites is a striking genus of parasitic bee from the family Apidae. They have red abdomens and a black thorax with a rough texture. Only about a quarter inch in length, they are often overlooked. There is only one species in New England and it parasitises the nests of the *Calliopsis*, andrenid bees.

Cuckoo bees Apidae

Triepeolus

Triepeolus is another genus of parasitic bee. They have bodies with distinctive white hair patterns, black or bright red legs and large bodies that makes them easy to identify. They are strikingly similar in coloration and appearance to fellow cleptoparasitic genus *Epeolus*.

Triepeolus is a nest parasite of sweat bees, *Nomia* and *Dieunomia*, and eucerine bees, including members of the genus *Melissodes*. These bees are found during the summer and fall months nectaring at a variety of different flowers.



Molly Jacobson

Triepeolus nr. donatus

Cuckoo bees Halictidae

Sphecodes

The genus *Sphecodes* is another type of cuckoo bee. The members of this genus parasitize other sweat bee species, such as the small dark *Lasioglossum* sweat bees. They have been observed parasitizing species of other genera including the mining bees *Andrena* and *Calliopsis*, and *Colletes* cellophane bees.

Some species of *Sphecodes* are social parasites. The parasitic females remain in the nest with the host. Little research has been done on these bees, and much of their biology is still a mystery.



Sabine Nooten

Sphecodes sp.

Cuckoo bees Megachilidae

Coelioxys

Coelioxys is a genus of parasitic bees that can be identified by their extremely pointed abdomen. These bees are usually black with white stripes on the abdomen and some species have red legs and colorful eyes. They are found throughout North America. The most common hosts of this genus are the *Megachile* leaf-cutter bees, but they have also been known to parasitize *Anthophora* nests. Their parasitic hatchlings use powerful jaws to attack a host egg or larva and cut it in half.



Coelioxys octodentatus

Flowering plants for bees



Sabine Nooten

Flowers provide all of the food bees need to survive. Bees obtain protein from pollen and sugar from floral nectar. Having a diversity and abundance of flowers in bloom from early spring through autumn is necessary to provide adequate nutrition for bees to feed themselves and their offspring, in addition to providing nesting substrate for some bee species. In the following pages we highlight some native and non-native herbaceous flowers that support bees locally. Planting native species is recommended, but we include common flowers and many non-natives that are well established in New England. These are sorted by seasonal bloom time and then listed alphabetically based on the common name.

Spring Blooming Plants

Bloodroot *Sanguinaria canadensis*

Flower type:

A radial white flower with 8-12 petals and yellow center

Flower diameter:

~ 1.25"

Foliage:

A single leaf and flower on each stem, leaves basal simple or lobed

Height: 12-14"

Location:

Woodlands

Growth conditions:

- Sun - shade to part shade
- Soil - loam
- Moisture - moist



Molly Jacobson

Bee foragers:

Cuckoo bees
Mining bees
Sweat bees

Native to New England

Spring Blooming Plants

Butterflyweed *Asclepias tuberosa*



Sabine Nooten

Bee foragers:

Bumble bees
Carpenter bees
Cuckoo bees
Green bees
Leaf-cutter bees
Mining bees
Resin bees
Sweat bees

Flower type:

Large, flat clusters of vibrant orange flowers with five upright petals and five downward facing petals

Flower diameter: ~ 0.5"

Foliage:

Lance-shaped leaves that grow from 2-5" along slender, hairy stems

Height: 1-3'

Location: Fields

Growth conditions:

- Sun - full sun
- Soil - sandy
- Moisture – dry

Native to New England

Spring Blooming Plants

Carolina spring-beauty *Claytonia caroliniana*



SamuelFrelj; Wikipedia.org

Native to New England

Flower type: Five pale pink or white petals

Flower diameter: ~ 0.50"

Foliage: single pair of opposite, simple leaves

Height: 4-12"

Location: Floodplain, forest edges, forests

Growth conditions:

- Sun – part shade
- Soil - any
- Moisture - medium

Bee foragers:

Cuckoo bees
Ground bees
Mining bees
Small carpenter bees
Sweat bees

Spring Blooming Plants

Common dandelion *Taraxacum officinale*



Célia Bordier

Flower type:

Composite flower head, bright yellow

Flower diameter: ~ 1.5"

Foliage: Leaves grow basally, longer than wide, toothed or lobed

Height: 4-12"

Location: disturbed areas, fields and meadows, abundant weed

Bee foragers:

Bumble bees
Carpenter bees
Honey bees
Mining bees
Sweat bees

Growth conditions:

- Sun - shade to full sun
- Soil - sand, loam, clay
- Moisture - medium

Non-native

Spring Blooming Plants

Common strawberry *Fragaria virginiana*

Flower type:

White, five-petaled flowers surrounding a dense group of yellow stamens

Flower diameter:

~ 0.75"

Foliage:

Leaves divided in 3 leaflets, coarsely toothed, plants grow from stems rising from runners along the ground

Height: 4-8"

Location: Dry, open spaces, forest edges

Growth conditions:

- Sun - part shade to full sun
- Soil - any
- Moisture - dry



Célia Bordier

Bee foragers:

Carpenter bees
Cuckoo bees
Mason bees
Mining bees
Sweat bees

Native to New England

Spring Blooming Plants

Creeping phlox *Phlox stolonifera*

Molly Jacobson



Bee foragers:

Bees with long tongues including

- Bumble bees
- Leaf cutters
- Mason bees

Growth conditions:

- Sun - shade to part sun
- Soil - any
- Moisture - medium to moist

Flower type: Light purple, five petaled flowers that grow in small clusters from a single stem

Flower diameter:
~ 0.75"

Foliage: Slender but sturdy stems lined with 3" long, oval-shaped leaves and forming in large groups on the forest floor

Height: 6-10"

Location: Woodlands

Native to New England

Spring Blooming Plants

Garden yellow rocket *Barbarea vulgaris*

Flower type:

Dense clusters of bright yellow flowers

Flower diameter:

~ 0.5"

Foliage:

Coarsely toothed basal leaves with a large lobe at the end, upper leaves egg-shaped

Height: 1-2'

Location:

Roadsides and meadows, common

Growth conditions:

- Sun - shade to full sun
- Soil - any
- Moisture - medium



Sabine Nooten

Non-native

Bee foragers:

Cellophane bees
Cuckoo bees
Honey bees
Mining bees
Sweat bees

Spring Blooming Plants

Lanceleaf coreopsis *Coreopsis lanceolata*



Fan Wen; Wikipedia.org

Bee foragers:

Bumble bees

Honey bees

Long-horned bees

Flower type:

Ray and disk flowers; ray flowers have four lobes at tips

Flower diameter: ~ 1-2"

Foliage: Multiple erect stems; opposite, sessile, linear oblong leaves

Height: 1-2'

Location: Prairie, meadow, open woodlands, pastures

Growth conditions:

- Sun - full sun
- Soil - sand, loam
- Moisture - any level

Native to New England

Spring Blooming Plants

Large-leaved lupine *Lupinus polyphyllus*



Dusty Durant

Flower type:

Blue-purple pea flowers in dense 6-18" cone-shaped terminal clusters

Flower diameter: ~ 1"

Foliage: Long, sturdy stem with long-stalked compound leaves with 12-18 oblong leaflets radiating from a central point

Height: 2-4'

Bee foragers:

Bumble bees
Carpenter bees
Sweat bees
Mason bees
Leaf-cutter bees

Location: Fields and roadsides

Growth conditions:

- Sun - part shade to full sun
- Soil - any
- Moisture - any level

Native to New England

Spring Blooming Plants

Purple Coneflower *Echinacea purpurea*

Flower type:

Large composite flower with reddish purple rays and an orange-red disk

Flower diameter:

~ 2-4"

Foliage: Erect stem, lower leaves toothed and egg-shaped on long stalks

Height: 1-4'

Location: Open forests and prairies

Growth conditions:

- Sun - part to full sun
- Soil - sand
- Moisture - dry



Sabine Nooten

Bee foragers:

Bumble bees
Carpenter bees
Digger bees
Leaf-cutter bees
Long-horned bees
Mining bees
Sweat bees

Native to New England

Spring Blooming Plants

Quaker lady *Houstonia caerulea*

Flower type:

White to pale blue flowers with four fused petals surrounding a yellow center

Flower diameter: ~ 0.5"

Foliage: slender stem, leaves at base oblong in tufts, at stem tiny and opposite

Height: 2-8"

Location: Grassy meadows, fields, and open woods

Growth conditions:

- Sun - full sun
- Soil - any
- Moisture – moist



Célia Bordier

Bee Foragers:

Sweat bees

Native to New England

Spring Blooming Plants

Red-osier dogwood *Cornus sericea*



Sabine Nooten

Flower type:

Dense, flat clusters of white flowers

Flower diameter: ~ 0.5"

Foliage: Leaves entire, large shrub with red-colored young branches

Height: 6-12'

Location: Wet places, marshes and shorelines

Growth conditions:

- Sun - part shade
- Soil - any
- Moisture - moist

Bee foragers:

Mining bees (specialists)
Andrena fragilis
Andrena integra
Andrena perisimulata
Andrena platyparia

Native to New England

Spring Blooming Plants

Spotted geranium *Geranium maculatum*



Molly Jacobson

Flower type:

Sparse clusters of five-petaled, purple flowers on the apices of stems

Flower diameter: ~ 1.25"

Foliage: Leaves deeply divided into toothed lobes on slender stems

Height: 1-3'

Bee foragers:

Bumble bees
Carpenter bees
Cuckoo bees
Mason bees
Mining bees
Sweat bees
& a specialist bee =
Andrena distans

Location:

Woodland edges and moist meadows

Growth conditions:

- Sun - shade to part shade
- Soil - any
- Moisture - moist

Native to New England

Spring Blooming Plants

Yellow woodsorrel *Oxalis stricta*

Flower type:

Small, long-stalked clusters of yellow flowers with five petals

Flower diameter: ~ 0.5"

Foliage:

Leaves divided in 3s, similar to clover, long slender stems, branching variably and mostly upright

Height: 3-15"

Location: Fields, meadows, and open woodlands

Growth conditions:

- Sun - full sun
- Soil - any
- Moisture - dry



Sabine Nooten

Bee foragers:
Carpenter bees
Sweat bees

Native to New England

Summer Blooming Plants

Bird's foot trefoil *Lotus corniculatus*

Bee foragers:

Bumble bees

Leaf-cutter bees

Mason bees

Mining bees

Sweat bees

Anthidium oblongatum
(specialist)

Flower type:

Bright yellow pea flowers in terminal umbels

Flower diameter:

~ 0.5"

Foliage:

Slender stems with compound leaves, 3 pointy leaflets at the top and 2 at the base

Height: 2-20"

Location:

Fields and roadsides

Growth conditions:

- Sun - full sun
- Soil - any
- Moisture - any level

Non-native



Summer Blooming Plants

Blue vervain *Verbana hastata*

Flower type:

Narrow spikes with small tubular purple flowers

Flower diameter: ~ 0.25"

Foliage: Square stems with opposite, simple leaves

Height: 2-5'

Location: Meadows, woods, prairies, ditches, and pastures

Growth conditions:

- Sun – full or partial sun
- Soil - sand
- Moisture - moist

Native to New England



Cody Hough; Wikipedia.org

Bee foragers:

Bumble bees
Carpenter bees
Cuckoo bees
Masked bees
Mining bees
Sweat bees

Summer Blooming Plants

Canadian St. John's wort *Hypericum canadense*

Robert H. Mohlenbrock; Wikipedia.org



Flower type:

Clusters of five-petaled, bright yellow flowers with spots on the margins

Flower diameter:

~ 0.25"

Foliage: simple, opposite leaves; 0.75-1.5' long

Growth conditions:

- Sun - sun
- Soil - wet
- Moisture - moist

Height: 6-20'

Location: river and lake shores, swamps, wetland margins

Bee foragers:

Bumble bees
Sweat bees

Native to New England

Summer Blooming Plants

Common milkweed *Asclepias syriaca*

Flower type:

Dense, spherical clusters of pink to purple flowers with five upward and five downward facing petals

Flower diameter: ~ 0.25"

Foliage: Thick, hairy stems with large, short-stalked leaves that release a thick white substance when broken

Height: 2-6'

Location: Fields and roadsides

Growth conditions:

- Sun - full sun
- Soil - any
- Moisture - moist

Bee foragers:

Bumble bees
Mining bees
Sweat bees



Sabine Nooten

Native to New England

Summer Blooming Plants

Crimson clover *Trifolium incarnatum*

Flower type:

Terminal heads of small, dense, bright red-pink florets, more elongate than other clover

Flower diameter: ~ 0.5"
~ 2" height

Foliage: Leaves trifoliate, leaflets hairy with bilobed apex along upright slender stems

Height: 10-20"

Location: Forest edges, fields, and roadsides

Growth conditions:

- Sun - full sun
- Soil - any
- Moisture - moist



Dusty Durant

Bee foragers:

Bumble bees
Carpenter bees
Honey bees
Mason bees
Mining bees
Sweat bees

Non-native

Summer Blooming Plants

Field thistle *Cirsium discolor*



George F Mayfield; Wikipedia.org

Flower type:

Tight group of pink to purple florets at the apex

Flower diameter: 1-2"

Foliage: An erect, hairy stem with many spined wings, leaves long, alternate, deeply lobed; leaves green on top and white underneath

Height: 2-7'

Bee foragers:

Bumble bees
Carpenter bees
Leaf-cutter bees
Masked bees
Mining bees
Sweat bees

Location: Colonizes moist to dry soils; pastures, old fields, roadsides, forest edge

Growth conditions:

- Sun - full sun
- Soil - any
- Moisture - any level

Native to New England

Summer Blooming Plants

Foxglove beardtongue *Penstemon digitalis*



Flower type:

Deep, tubular, white flowers made of two lips

Flower diameter: ~ 0.5" ~ 1.25" length

Foliage: Slender stems with long tapering leaves, elliptic leaves at base

Height: 3-5'

Location: Meadows, fields, and forest edges

Bee foragers:

Bumble bees
Carpenter bees
Digger bees
Leaf-cutter bees
Mason bees
Sweat bees
Wool-carder bees

Growth conditions:

- Sun - part to full sun
- Soil - sand and loam
- Moisture - any level

Native to New England

Summer Blooming Plants

Mountain mint *Pycnanthemum virginianum*

Flower type:

Dense, small, white flowers; two-lipped petals

Flower diameter: ~.75"

Foliage: Narrow, opposite, simple leaves; Leaves 2.5" long

Height: 3'

Location: Meadows, forest edges, and disturbed habitats

Growth conditions:

- Sun - partial to full sun
- Soil - any
- Moisture - all

Native to New England



Wikipedia.org

Bee foragers:

Bumble bees
Cuckoo bees
Mason bees
Mining bees
Sweat bees

Summer Blooming Plants

Rough cinquefoil *Potentilla norvegica*



Jason Hollinger, Wikipedia.org

Flower type:

Flat yellow flower with five oval to heart-shaped petals

Flower diameter: ~ 0.5"

Foliage: Alternate and compound leaves; leaflets ~3" long

Height: 1-3'

Location: fields, roadsides, waste areas, disturbed soil

Bee foragers:

Bumble bees
Masked bees
Sweat bees

Growth conditions:

- Sun - part to full sun
- Soil - loam
- Moisture - medium

Native to New England

Summer Blooming Plants

Sensitive partridge pea *Chamaecrista nictitans*

Flower type: Yellow flowers with five irregular petals

Flower diameter: ~ 0.6" length

Foliage: Hairless, multiple stems; alternate, oblong leaves; leaves 1.2-2.4" long

Height: 1-2'

Location: Rivers, ponds, woods, prairies, thickets, roadsides

Growth conditions:

- Sun - sun
- Soil - sandy
- Moisture - moist



Forest and Kim Starr; Wikepeida.org

Bee foragers:

Bumble bees
Mason bees
Mining bees
Sweat bees

Native to New England

Summer Blooming Plants

Smooth rose *Rosa blanda*



A. Barra; Wikipedia.org

Flower type: Five broad rounded petals with wavy edges; pink to deep rose; numerous yellow stamens

Flower diameter: ~ 2-3"

Foliage: Shrub without prickles along its stems; leaves are alternate and compound; leaflets are 1-1.5" long

Height: 4-7'

Location: Woodland edges, prairie, lakeshores

Bee foragers:

Bumble bees
Carpenter bees
Masked bees
Mason bees
Sweat bees

Growth conditions:

- Sun – sun; part shade
- Soil - clay
- Moisture - medium to dry

Native to New England

Summer Blooming Plants

Spotted jewelweed *Impatiens capensis*



D. Gordon E. Robertson; Wikipedia.org

Flower type: Orange flowers with three lobed corolla

Flower length: ~ 1"

Foliage: Ovate, alternate leaves, ~5" long

Height: 2-5'

Location: Woodlands, along rivers, and roadside ditches

Growth conditions:

- Sun - part to full sun
- Soil - any
- Moisture - moist

Bee foragers:

Bumble bees

Long tongued bees

Native to New England



Fritz Geller-Grimm; Wikipedia.org

Summer Blooming Plants

Steeplebush *Spiraea tomentosa*

Flower type:

Pyramid shaped clusters;
dense pink to rose
purple flowers

Flower diameter:

~ 0.06"

Foliage: Reddish
brown, hairy stems
lined with toothed,
ovate leaves

Height: 2-4'

Location: wetlands;
sandy marshes;
shorelines

Growth conditions:

- Sun – Sun
- Soil - loam
- Moisture - moist

Native to New England



Steven G. Johnson; Wikipedia.org

Bee foragers:

Bumble bees
Carpenter bees
Masked bees
Mining bees
Sweat bees

Summer Blooming Plants

White clover *Trifolium repens*



Sabine Nooten

Bee foragers:

Bumble bees
Honey bees
Mason bees
Mining bees
Sweat bees

Flower type:

Composite flower with many slender, white florets in a round head

Flower diameter: ~ 0.5"

Foliage: Leaves in leaflets of 3s with distinct light-colored markings

Height: 6-24"

Location: Fields, roadsides and meadows

Growth conditions:

- Sun - full sun
- Soil - clay
- Moisture - moist

Non-native

Summer Blooming Plants

White meadowsweet *Spiraea alba*

Flower type:

Small elongate clusters of white to pale-pink flowers with 5 petals

Flower diameter: ~ 0.25"

Foliage: Finely toothed, lance-shaped leaves alternating along the stem

Height: 2-6'

Location: Wetlands and freshwater shorelines

Growth conditions:

- Sun - shade to full sun
- Soil - any
- Moisture - medium to wet

Bee foragers:

Bumble bees
Carpenter bees
Mining bees



Molly Jacobson

Native to New England

Autumn Blooming Plants

Wild bergamot *Monarda fistulosa*



Sabine Nooten

Flower type: Dense rounded cluster of purplish-pink tubular flowers around a green central disk

Flower diameter: ~ 1.5"

Foliage: Toothed, lance-shaped leaves; opposite along unbranched square stems

Height: 2-3'

Bee foragers:

Bumble bees

Carpenter bees

Leaf-cutter bees

Long-horned bees

Resin bees

Sweat bees

Wool-carder bees

Location: Hillsides and forest edges

Growth conditions:

- Sun - part to full sun
- Soil - any
- Moisture - medium to dry

Native to New England

Autumn Blooming Plants

Black-eyed Susan *Rudbeckia hirta*

Flower type:

Large composite flower with a cone-shaped, black central disk surrounded by thin, yellow ray florets

Flower diameter: 2-4"

Foliage: Thinly toothed leaves along a coarse bristly stem

Height: 1-3'

Location: Open spaces

Growth conditions:

- Sun - full sun
- Soil - sand
- Moisture - any level

Native to New England



Wyatt Shell

Bee foragers:

Bumble bees
Carpenter bees
Cuckoo bees
Leaf-cutter bees
Long-horned bees
Sweat bees
Andrena rudbeckia
(specialist)

Autumn Blooming Plants

Canada goldenrod *Solidago canadensis*

Flower type:

Curved one-sided clusters of small yellow flowers at branch tips

Flower diameter: <0.25" length

Foliage: Leaves lance shaped, sharply toothed, uniform in size, smooth stem near the base, downy above

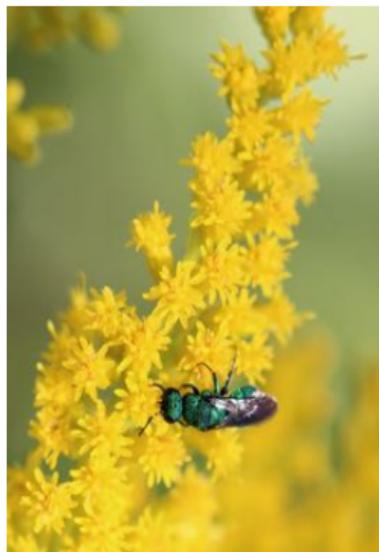
Height: 1-5'

Location: Fields and roadsides

Growth conditions:

- Sun - part to full sun
- Soil - any
- Moisture - medium to dry

Native to New England



Molly Jacobson

Bee foragers:

Bumble bees
Carpenter bees
Cellophane bees
Cuckoo bees
Digger bees
Masked bees
Mining bees
Sweat bees

Autumn Blooming Plants

Canada hawkweed *Hieracium canadense*

Flower type: Composite flowers made from many bright yellow florets, on long stalks, often more than one crown per stalk

Flower diameter: ~ 1"

Foliage: Simple and alternate leaves; leaves are 0.75-6' in length

Height: 1-3'

Location: Fields, beaches, woods and woodland edges

Growth conditions:

- Sun - shade to full sun
- Soil - loam
- Moisture - moist



D. Gordon, E. Robertson; Wikipedia.org

Bee foragers:

Bumble bees
Leaf-cutter bees
Sweat bees

Native to New England

Autumn Blooming Plants

Common boneset *Eupatorium perfoliatum*

Flower type: Dense clusters of small, white flowers at the apex of the highest branches

Flower diameter:
0.1 – 0.25"

Foliage: Bristly stem with large, toothed lower leaves on opposite sides and connected around the stem

Height: 4-6'

Location: Open woods and prairies

Bee foragers:
Bumble bees
Masked bees
Mining bees
Sweat bees



Molly Jacobson

Growth conditions:

- Sun - part shade to full sun
- Soil - sand and clay
- Moisture - medium to moist

Native to New England

Autumn Blooming Plants

Common sneezeweed *Helenium autumnale*

Flower type: solitary crowns with many wedge-shaped, three-toothed, yellow petals around a central, knob-shaped disk

Flower diameter: 1-2"

Foliage: Slender stems with toothed, lance-shaped leaves coming off in wings

Height: 2-6'

Location: Moist meadows and shorelines

Growth conditions:

- Sun - full sun
- Soil - clay
- Moisture - moist



Fritz Flohr Reynolds; CC BY-SA 3.0

Bee foragers:

Bumble bees
Carpenter bees
Leaf-cutter bees
Long-horned bees
Masked bees
Sweat bees

Native to New England

Autumn Blooming Plants

Eastern daisy fleabane *Erigeron annuus*

Flower type:

Composite flower with 50-100 white ray florets and a yellow central disk

Flower diameter: ~ 0.75"

Foliage: Hairy stem with lance shaped, toothed hairy leaves throughout its length

Height: 1-5'

Location:

Fields, roadsides and disturbed areas

Growth conditions:

- Sun - part to full sun
- Soil - any
- Moisture - moist



Sabine Nooten

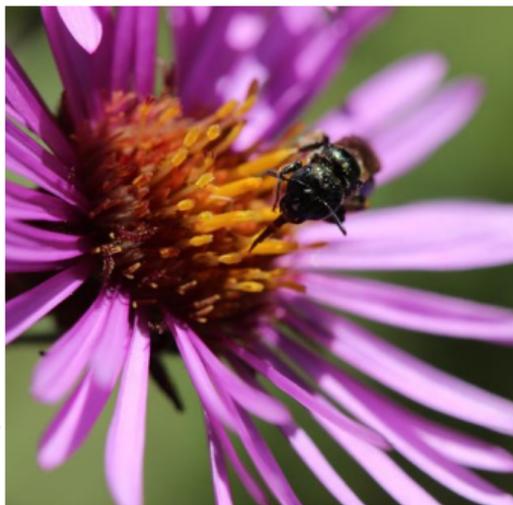
Bee foragers:

Bumble bees
Carpenter bees
Cuckoo bees
Long-horned bees
Masked bees
Sweat bees

Native to New England

Autumn Blooming Plants

New England Aster *Aster novae-angliae*



Molly Jacobson

Flower type: 40-50 purple rays surrounding a yellow-red central disk

Flower diameter: 1-2"

Foliage: Lance-shaped, clasped leaves surrounding a stem covered in bristly hairs

Height: 2-8'

Growth conditions:

- Sun – part shade to full sun
- Soil - sand, loam, clay
- Moisture - moist

Location: Fields and damp meadows

Bee foragers:

Bumble bees
Carpenter bees
Sweat bees

Native to New England

Autumn Blooming Plants

Red clover *Trifolium pratense*

Flower type:

Composite flower in round heads with slender, purple to dark pink florets

Flower diameter: ~ 0.5"

Foliage: Leaves in leaflets of 3s with a white, crescent shape

Height: 6-24"

Location: Fields and meadows

Growth conditions:

- Sun - full sun
- Soil - loam
- Moisture - moist

Non-native



Rebecca Dew

Bee foragers:

Bumble bees
Honey bees
Mason bees
Mining bees
Sweat bees

Autumn Blooming Plants

Smooth oxeye *Heliopsis helianthoides*

Flower type:

Composite flower with long, yellow ray florets and a cone-shaped, brown central disk

Flower diameter: ~ 2"

Foliage: Large, egg-shaped leaves with long stalks and coarse teeth opposite at smooth stem

Height: 2-5'

Location: Open woods and thickets

Growth conditions:

- Sun - full sun
- Soil - sand
- Moisture - moist



Sabine Nooten

Bee foragers:

Bumble bees
Cuckoo bees
Leaf-cutter bees
Long-horned bees
Mining bees
Sweat bees

Native to New England

Autumn Blooming Plants

Tall goldenrod *Solidago altissima*



Kenpei; www.Wikipedia.com

Flower type:

Yellow flowers in curved one-sided clusters at central stem and branches

Flower diameter: ~ 0.25" length

Foliage: Lance-shaped, lightly-toothed leaves along a grey and downy stem

Height: 2-7'

Location: Dry, open spaces

Growth conditions:

- Sun - part to full sun
- Soil - sand, loam, clay
- Moisture - moist

Bee foragers:

Bumble bees
Carpenter bees
Digger bees
Masked bees
Mining bees
Sweat bees

Native to New England

Autumn Blooming Plants

Purple giant hyssop *Agastache scrophulariifolia*



USDA NRCS

Flower type:

Flower spikes with long, irregular, tubular flowers; color can be purple, pink, and occasionally white

Flower diameter: ~ 0.24"

Foliage: Leaves are opposite and simple with toothed edges and a pointed tip; stems are square and covered in short hairs

Height: 2-4'

Location: Woods; along streams and rivers

Growth conditions:

- Sun - part to full sun
- Soil - any
- Moisture - moist

Bee foragers:

Bumble bees
Carpenter bees
Leaf-cutter bees
Long-horned bees
Resin bees
Sweat bees
Wool-carder bees

Native to New England

Bee conservation

Globally, we have seen dramatic declines of wild bees. In the US alone, there are eight native bees that have been placed on the endangered species list, seven are masked bees from Hawaii. The most notable, and only bee to be found in the continental US, is the rusty patched bumble bee. For most bees there are no status assessments and we have much to learn. There is not one specific cause for wild bee decline, rather the declines we are witnessing are a complex interaction between many different factors. These factors include:

1. Habitat loss
2. Climate change
3. Invasive species and disease

Habitat loss

The largest threat facing bees is habitat loss due to the destruction of natural landscapes. In protected and restored environments, bees have access to a variety of different flowering plants that they can forage on, and different substrates that they can use to construct nests.



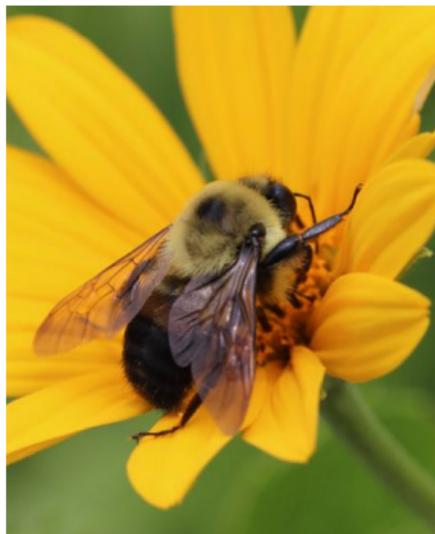
Bombus terrestris

Human activities such as substantial monocultures and expansive agriculture and urbanization that impact the natural environment making it difficult for bees to find enough resources to survive. One of the easiest ways to reduce the loss of wild bees is to provide native flowering plants for them to forage on. For other ways we can help native bees flourish can be found in the “Keeping the Bees” section of this booklet.

Global climate change

Changes in temperature and rainfall can cause problems for bees. For example, bees forage and their preferred flowers bloom at the same time of

year. If the timing is off, bees may emerge too early or too late and the flowers they feed on will have already finished their blooming cycle. Changes in emergence of both flowers and bees is most detrimental to pollen and nectar specialists.



Sabine Nooten

Bombus griseocollis

Introduced species and disease

Katherine Odanaka



Sabine Nooten

The oblong wool carder bee (*Anthidium oblongatum*) and the bird's foot trefoil (*Lotus corniculatus*) are both introduced species.

Introduced bee and plant species can cause many problems. Non-native plants and pollinators may out-compete native species and drive wild species away from their natural environments. Additionally, introduced species of plants and animals may bring diseases that can decimate native populations who lack resistance to these foreign pathogens. Exotic bee and plant species can spread rapidly out competing native populations.

Keeping the Bees



Sabine Nooten

Bees and other pollinators are essential for the survival of almost every terrestrial ecosystem. It is estimated that these small workers contribute billions of dollars worth of work to the agricultural sector in the US alone. There are many threats to these species, and making sure we do everything we can to conserve them is vital for their persistence. Helping our six-legged neighbors is not just a job for scientists and researchers; everyone can and should get involved. Here we provide information on a few ways that you can support the native bees of New England!



An example of a soft edge

Mowing

Changing lawn care habits is one of the easiest ways to support local bee species. Expansive, well-kempt lawns might look appealing to some landscapers, but this hurts the bee community in multiple ways. Large tracts of mowed

grass provide no food for pollinators and also make the distances between nesting and foraging areas too large to support some species of bees. One way to help solve this problem is to leave a “soft edge,” a few feet of un-mowed lawn along the outskirts to allow flowers to bloom and provide bees with a food source.

Pesticide and herbicide control

Herbicides can kill plants that bees can forage on. Pesticides are chemicals used to kill insects that cause problems for humans, but these chemicals also affect the native bees. The use of pesticides and herbicides on lawns, gardens, and crops is unhealthy for every member of the community:

pollinators, plants, and other animals (including humans). Please do not use unless absolutely necessary because they kill insects, including bees.

Bee hotels

As shown in this field guide, many of the native bee species in New England construct their nests in pre-existing cavities or burrow into the soft centers of dead wood materials. A bee hotel is simply a collection of suitable sticks for these bees to create their nests. Drilled holes in untreated wood, sticks with pithy centers, and hollowed sticks of bamboo can create a great place for a variety of bees to thrive. Bee hotels thrive when placed in full sun and protected with a roof to keep the nests dry.



Sandra Rehan

A bee hotel on UNH campus

Wildflower gardens



Sabine Nooten

Not only are wildflower gardens attractive to the human eye, they help to create buffets for bees. Especially in urban areas where flowering plants can be few and far between, patches of flowers can help to maintain bee populations.

Some ornamental flowers are unable to be pollinated by the native bee populations, so it is important and much more beneficial to use wildflowers that bloom naturally in the surrounding area. These gardens not only provide sustenance, but can make an empty space much more beautiful.

Resources

- Go Botany*. New England Wildflower Society, 2018.
gobotany.newenglandwild.org
- Holm H. 2014. *Pollinators of Native Plants*.
Pollination Press.
- Lady Bird Johnson Wildflower Center*. The University
of Texas at Austin, 2018.
www.wildflower.org/plants/
- Newcom L. 1977. *Newcomb's Wildflower Guide*.
Little, Brown and Company.
- Plants For A Future*. Plants For A Future, 2012.
pfaf.org/user/Default.aspx
- Wilson JS & Carril OM. 2016. *The Bees In Your
Backyard*. Princeton University Press.

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