

# Wild Bees of Eastern North America

A guide to common pollinators & flowers



Katherine Odanaka, Josh Hall  
Sabine Nooten & Sandra Rehan

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

*The information contained in this field guide is for educational purposes only. Any references to commercial products or trade names do not imply endorsement by the Rehan Lab or bias against those not mentioned.*

*This guide was produced by the Rehan Lab in 2019*

*Any opinions, conclusions or recommendations in this publication are those of the authors and do not reflect the view of the Foundation for Food and Agriculture Research (FFAR)*

(cover image photo credit: Alex Wild)  
*Augochloropsis metallica on Tradescantia ohiensis*

# **Wild Bees of Eastern North America**

## **A guide to common pollinators & flowers**

By Katherine Odanaka, Josh Hall, Sabine Nooten &  
Sandra Rehan

### **Funding provided by:**

Foundation for Food and Agriculture Research  
FFAR Grant #549038

### **Reviewed by**

Sam Droege, USGS  
Joan Milam, U Mass Amherst

Special thanks to Molly Jacobson for photographs

# Contents

1	Introduction	2
2	How to use this guide	5
3	Bee biology	6
4	Bees and flowers	13
5	Bee mimics	16
6	Common bee species	21
7	Flowering plants for bees	62
8	Bee conservation	104
9	Keeping the bees	107
10	Resources	111
11	Index	112

## Introduction

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

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

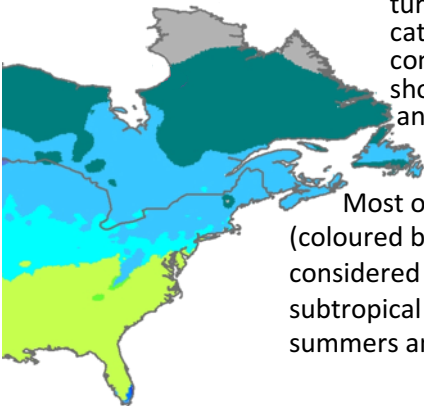
Current pollinator conservation practices encourage the planting of wild flowers to provide both nesting and foraging resources. In this guide, we provide seasonally available wildflowers that are frequently visited by bees.

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.



# Eastern North American Climate


The climate of eastern North America varies greatly with latitude. This book focuses on widespread bees and wild flowers, mostly found in the subtropical and temperate climates. The far northern regions (dark green and grey) have respective subarctic and tundra climates, with extremely cold winters and cold summers. The northern regions (coloured blue and turquoise) are categorized 'humid continental', with shorter summers and colder winters.



Most of southern states (coloured bright green) are considered to have a 'humid subtropical climate' with hot summers and mild winters.

Most of southern states (coloured bright green) are considered to have a 'humid subtropical climate' with hot summers and mild winters.

## Köppen climate type

-  **Cfa:** warm oceanic climate/humid subtropical climate
-  **Dfa:** warm continental climate/humid continental climate
-  **Dfb:** temperate continental climate/humid continental climate
-  **Dfc:** cool continental climate/subarctic climate

## 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.

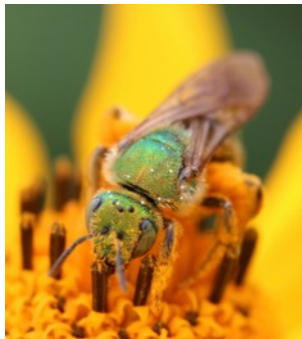


Sabine Nooten

*Megachile* sp. on smooth oxeye

# Bee biology

Patrick Schultheiss



*Agapostemon virescens*

Bicolored striped-sweat bee

There are over 20,000 bees found worldwide and about 4,000 of those species are found in North America. Across eastern North America, there are an estimated 770 bee species. These bees appear in a variety of sizes, shapes, and colours. The largest bee found in North America is the large 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 behaviour

Bees exhibit a wide variety of behaviours 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 behaviour. 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 colouration until they molt to reveal their wings as an adult bee.

Cullen Franchino



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 centimetres to a few metres 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



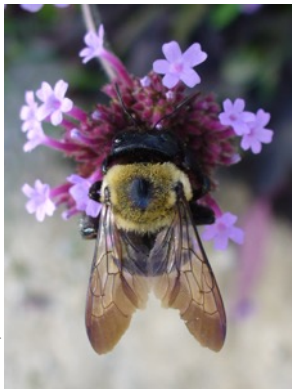
*Osmia cornifrons* (male)  
emerging from stem nest



*Ceratina calcarata*  
small carpenter bee

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 centimetres to a metre 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*  
Eastern carpenter bee

## Bee identification

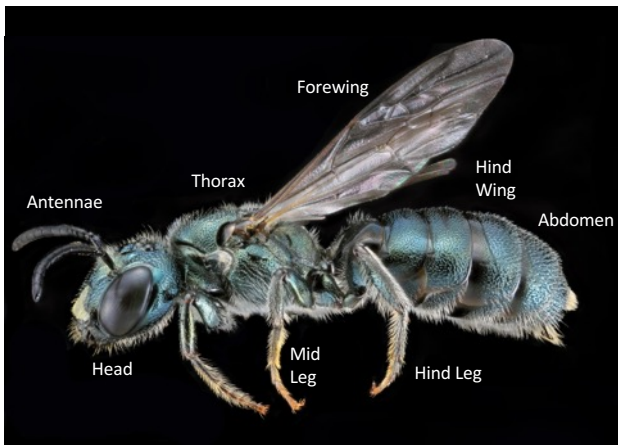
Bees come in many different shapes and sizes. They range from less than 2mm to about 40mm in size. The largest species found in North America are large carpenter bees and queen bumble bees, both reaching 30-40mm long. Many bees are much smaller, like the metallic sweat bees that are about 6mm in length.

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 colours, 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. Some bees are quite hairy while others have sparse patches, 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.

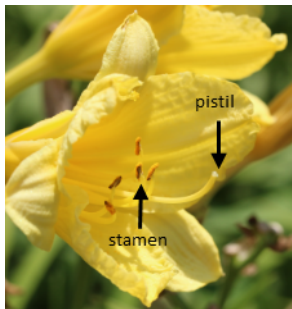


*Ceratina calcarata*

# 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 which 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.



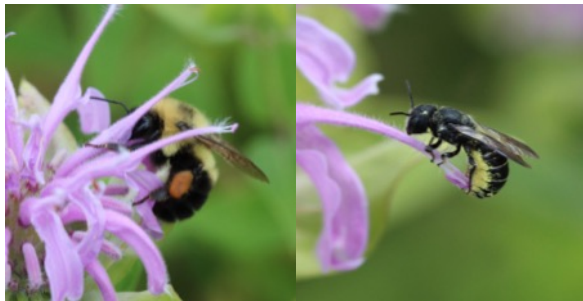
Josh Hall

*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*)

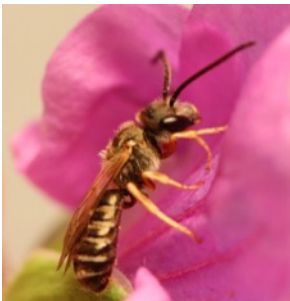
Adult bees feed on nectar, while their offspring eat a mixture of nectar and pollen. Many bees have developed specialized mechanisms on their legs or abdomens called scopae or corbiculae to collect and store pollen. Scopae are composed of long, stiff hairs that have many miniscule branches to hold large 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 corbiculae that are flat areas on their hind legs (left). Bumble bees pack a mixture of pollen and nectar onto their corbiculae 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

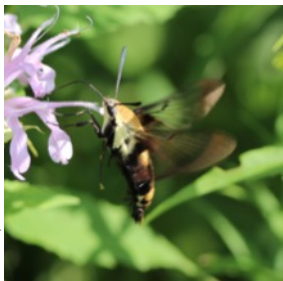
The Syrphidae, or flower flies, frequently visit flowers to collect nectar. Syrphids are often mistaken for bees. Many of them mimic bees with their dark banding and yellow colouration. Their two wings, short antennae, and large eyes distinguish them from bees and wasps.



*Toxomerus germinatus*

## Hummingbird Moth Sphingidae

Molly Jacobson



*Hemaris diffinis*

These moths are sometimes mistaken as bumble bee mimics due to their size and colouration. 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*

# Vespid wasps

# Vespidae

This group includes the paper wasps, yellow jackets and hornets. As members of the Vespidae, these wasps are eusocial and have a queen, like the honey bee. These eusocial species can be aggressive when the colony is disturbed and 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.

Molly Jacobson



*Dolichovespula sp.*



Wikipedia.org

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 colouration, sometimes they are sometimes 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.*

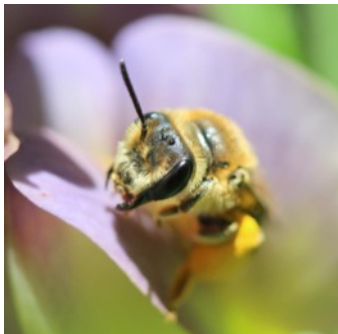
## Common bee species

There are an estimated 770 wild bee species in eastern North America, an exhaustive list would go beyond the scope of this guide. Here 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 mould. 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 and about 130 species in eastern North America. Mining bees are solitary and nest in simple burrows they dig in the ground. The depth of the burrows range between a few centimetres to over a metre. There is one generation of *Andrena* per year. The 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.

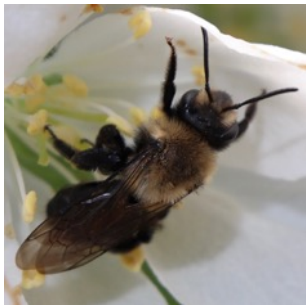


Apple blossom - *Malus pumila*



## Mining bees *continued*

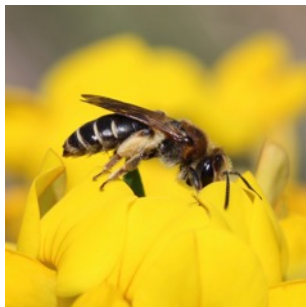
*Andrena carlini* is a large, dark species that is most active in the late spring and early summer and is a broad generalist. It has a black body and pale yellow hairs on its thorax. This bee is similar to *A. vicina*, but can be distinguished by the solid black hair on its hind legs.



Molly Jacobson

*Andrena carlini*

*Andrena wilkella* is an introduced large, common bee found across eastern North 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.



Rebecca Dew

*Andrena wilkella*

## 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 manmade hives with a single reproductive queen and many workers and drones. This bee has a unique colour 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.

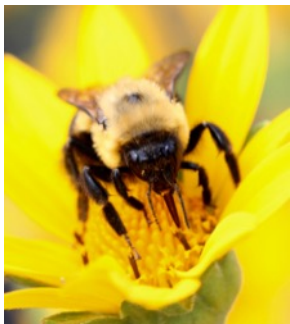


*Apis mellifera*

# 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 often observed foraging on late season plants. Some bumble bee species are commercially used to pollinate crops, such as tomatoes and blueberries, due to their ability to buzz their flight muscles at the frequency needed for pollen to be released by the flower.



Sabine Nooten

*Bombus* sp.

## Bumble bees *continued*

The two-spotted bumble bee, *Bombus bimaculatus*, is very common throughout eastern North America. 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.

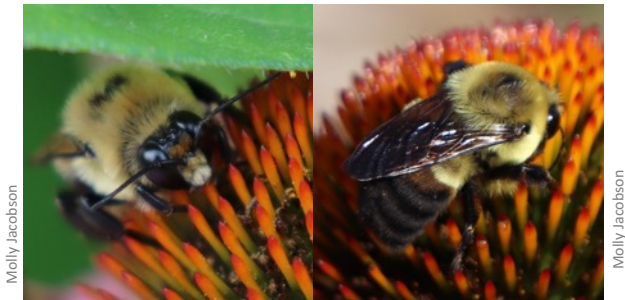
The two-spotted bumble bee is often mistaken for its close relatives, the common eastern bumble bee (*B. impatiens*) and the brown-belted bumble bee (*B. griseocollis*). Females can be differentiated by their longer face and the presence of two yellow patches on the abdomen; males are highly variable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



Sabine Nooten

*Bombus bimaculatus*

## Bumble bees *continued*



*Bombus griseocollis* (male)

The brown-belted bumble bee *B. griseocollis* received this name from the brown stripe across its 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 across eastern 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 uncommon or 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*)



*Bombus perplexus*  
(male)

Molly Jacobson



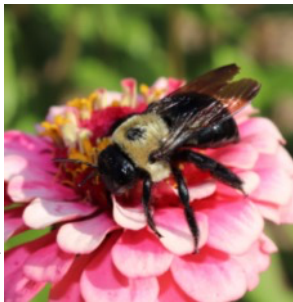
# Large carpenter bee Apidae

## *Xylocopa*

The large carpenter bee, *Xylocopa virginica*, is the largest North American bee species (~40mm 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 behaviour 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.



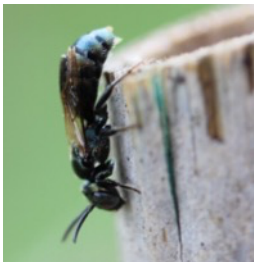
Molly Jacobson

*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 centre - 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 coloured with a metallic sheen and water bottle ridge shaped abdomen. The small carpenter bee, *C. calcarata*, is common throughout eastern North America. 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.



Cullen Franchino

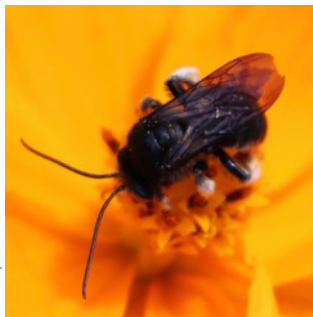
*Ceratina calcarata*

# 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 solitary, 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 colouration.



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*

Anne Ewert



*Helianthus annuus*

The orange sunflower bee, *Melissodes trinodis*, is a medium sized bee with vibrant yellow-orange coloured 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.

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 North America and 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.



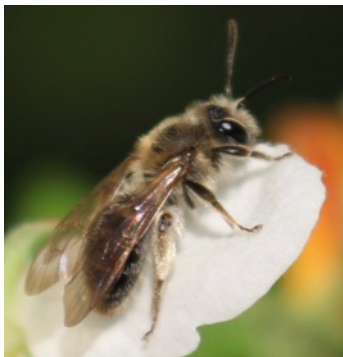
*Eucera pruinosa*

# 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

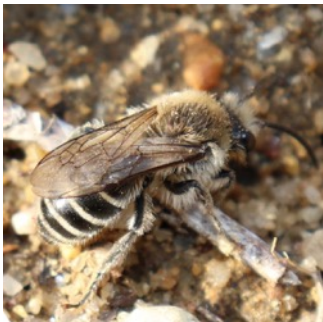
*Colletes* sp.

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 North American 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.

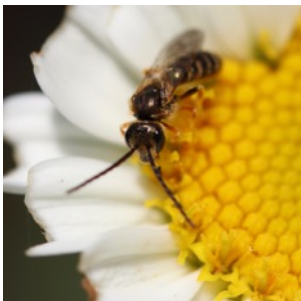


Molly Jacobson

*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 across North America during spring and summer months.



Molly Jacobson

*Halictus confusus*

The sweat bee *Halictus ligatus* is medium sized (7-8mm) and black with light coloured 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.



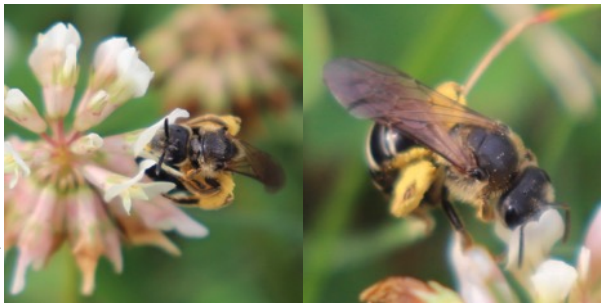
Sabine Nooten

*Halictus ligatus*

## 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 projection 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

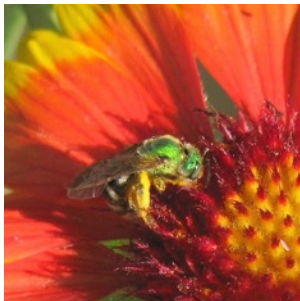
*Halictus rubicundus*

## 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 coloured, race-car green species can look very similar. The females of all genera are entirely green, except for the bicoloured 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 its own brood cells.



Sandra Rehan

*Agapostemon virescens*

Bicolored striped-sweat bee

Different from other *Agapostemon* species, male bicoloured 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

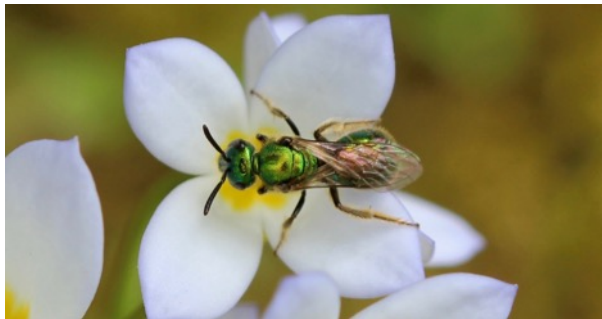
*Agapostemon texanus*

Both *A. sericeus* and *A. texanus* are medium sized bees with all green females. Males of both species have 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 geographical location of the individual. *A. texanus* is more widespread across North America than *A. sericeus*.

Both species are 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 about 120 species in eastern North America.

They range from 3-12mm in size. Members in this genus range in colour from black and dull to green and metallic species. Many appear similar in colour 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*

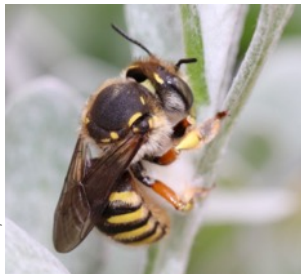
The small, dark sweat bee *Lasioglossum pilosum* is a very common bee. This golden green bee is small in size and has dense woolly hairs covering most of its body. It is found throughout eastern North America between March and October. As a broad generalist pollinator, it has been recorded visiting over 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. About five species of *Anthidium* can be found in eastern North America, two of which are invasive. A particularly striking behaviour 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 colourations and brightly coloured eyes. Despite this colouration they should no be confused with wasps – see photo below for comparison.

Molly Jacobson



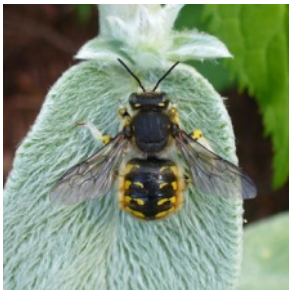
*Anthidium manicatum*  
(bee)



*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 eastern North America 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 colouration. 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*, is an important crop pollinator for example, 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.



Molly Jacobson

*Megachile rotundata*

## Leaf-cutter bees *continued*

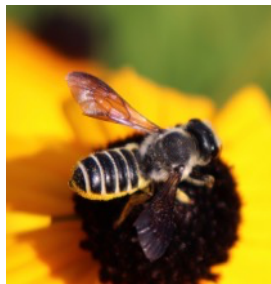
*Megachile mendica* is a medium-sized, black bee with white hairs on its head, thorax, and abdomen, forming lateral bands on the latter. It is perhaps the most common native *Megachile* species. It nests in the soil and can be found during summer and autumn. This species uses leaf or flower clippings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



*Megachile mendica*

Molly Jacobson

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



*Megachile inimica sayi*

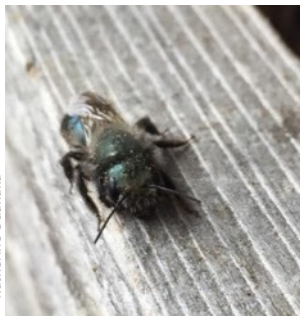
Molly Jacobson

# 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.



Katherine Odanaka

*Osmia lignaria*



Sabine Nooten

*Osmia cornifrons*

## Mason bees *continued*

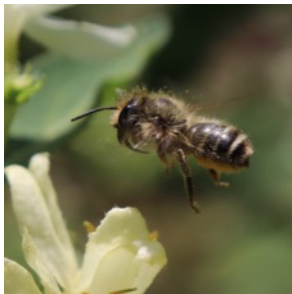
Molly Jacobson



*Osmia lignaria*

The blue orchard bee *Osmia lignaria* is a native species of *Osmia*. This medium sized bee is recognized by its metallic blue colour 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



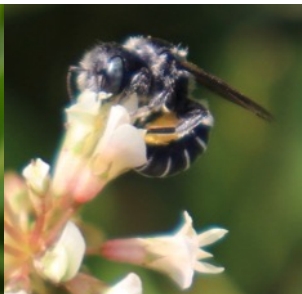
# Mason bees Megachilidae

## *Hoplitis*

Cullen Franchino



*Hoplitis producta*



Molly Jacobson

*Hoplitis* sp.

The mason bee genus *Hoplitis* is a small to medium sized bee varying in size from 6-13mm. They are smaller and darker in colouration 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 labour of other bees. Called cuckoo bees, or cleptoparasites, 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 North America, they are the only bee observed to be entirely red in colour.



Molly Jacobson

*Nomada* sp.

There are an estimated 75 species of *Nomada* in eastern North America. Most of them parasitize the nests of *Andrena*, although there are records of them using other genera including *Agapostemon*.

©Charley Eiseman; www.charleyeiseman.com



*Nomada* sp.

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

# Cuckoo bees Apidae

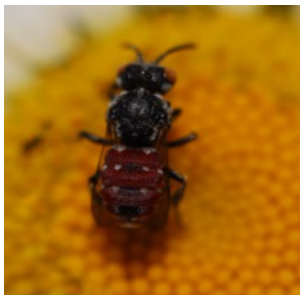
*Nomada* and *Holcopasites*

Like most *Nomada*, *N. luteoloides* is dark brown and yellow in colour. It is widespread across eastern North America. Females can be observed hovering along the ground searching for host nests while males are commonly seen nectaring at flowers throughout the spring.



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. At only 6mm in body length, these bees are often overlooked. There are three species in eastern North America and often parasitise the nests of the *Calliopsis* and other 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 colouration 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.



*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 colourful 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.



Molly Jacobson

*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. Planting native species is recommended, but we include common flowers and many non-natives that are well established in eastern North America. 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 centre

### Flower diameter:

3 cm

### Foliage:

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

### Height:

20-50 cm

### 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 North America**

# Spring Blooming Plants

## Butterflyweed *Asclepias tuberosa*



Sabine Nooten

### Flower type:

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

**Flower diameter:** 3 cm

### Foliage:

Lance-shaped leaves that grow from 5-12 cm along slender, hairy stems

**Height:** 30-100 cm

**Location:** Fields

### Growth conditions:

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

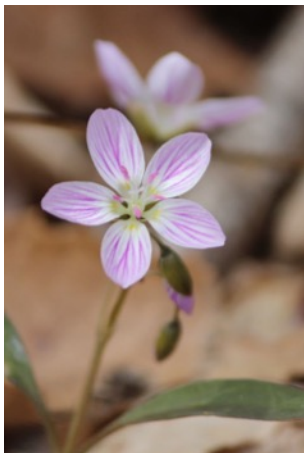
**Native to North America**

### Bee foragers:

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

# Spring Blooming Plants

## Carolina spring-beauty *Claytonia caroliniana*



SamuelFreij; Wikipedia.org

**Flower type:** Five pale pink or white petals

**Flower diameter:** 1-2 cm

**Foliage:** single pair of opposite, simple leaves

**Height:** 10-30 cm

**Location:** Floodplain, forest edges, forests

**Growth conditions:**

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

**Native to North America**

**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:

1-10 cm

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

**Height:** 5-40 cm

**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:

2-5 cm

### Foliage:

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

### Height: 10-20 cm

**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 North America**

# 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:** 2-5 cm

**Foliage:** Slender but sturdy stems lined with 8 cm long, oval-shaped leaves and forming in large groups on the forest floor

**Height:** 15-25 cm

**Location:** Woodlands

**Native to North America**

# Spring Blooming Plants

## Garden yellow rocket *Barbarea vulgaris*

### Flower type:

Dense clusters of bright yellow flowers

### Flower diameter:

1 cm

### Foliage:

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

### Height:

30-60 cm

### 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

### Flower type:

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

### Flower diameter:

2-5 cm

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

**Height:** 30-60 cm

**Location:** Prairie, meadow, open woodlands, pastures

### Bee foragers:

Bumble bees

Honey bees

Long-horned bees

### Growth conditions:

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

**Native to North America**



# Spring Blooming Plants

## Large-leaved lupine *Lupinus polyphyllus*

Dusty Durant



### Flower type:

Blue-purple pea flowers in dense 15-45 cm cone-shaped terminal clusters

**Flower diameter:** 2 cm

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

**Height:** 60-120 cm

**Location:** Fields and roadsides

### Growth conditions:

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

### Bee foragers:

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

**Native to North America**

# Spring Blooming Plants

## Purple Coneflower *Echinacea purpurea*

### Flower type:

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

### Flower diameter:

5-10 cm

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

**Height:** 30-120 cm

**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 North America**

# Spring Blooming Plants

## Quaker lady *Houstonia caerulea*

### Flower type:

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

**Flower diameter:** 1 cm

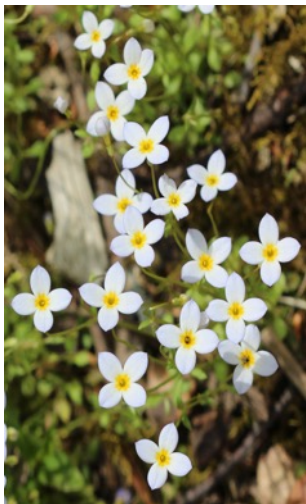
**Foliage:** slender stem, leaves at base oblong in tufts, at stem tiny and opposite

**Height:** 5-20 cm

**Location:** Grassy meadows, fields, and open woods

### Growth conditions:

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



Célia Bordier

### Bee Foragers:

Sweat bees

**Native to North America**

# Spring Blooming Plants

## Red-osier dogwood *Cornus sericea*



Sabine Nooten

### Flower type:

Dense, flat clusters of white flowers

**Flower diameter:** 1 cm

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

**Height:** 1-4 m

**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 North America**

# 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: 3 cm

**Foliage:** Leaves deeply divided into toothed lobes on slender stems

### Height: 30-90 cm

### 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 North America**

# Spring Blooming Plants

## Yellow woodsorrel *Oxalis stricta*

### Flower type:

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

**Flower diameter:** 1 cm

### Foliage:

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

**Height:** 7-38 cm

**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 North America**

# 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:

1 cm

### Foliage:

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

### Height: 5-50 cm

### Location:

Fields and roadsides

### Growth conditions:

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

### Non-native



# Summer Blooming Plants

## Blue vervain *Verbena hastata*



Cody Hough; Wikipedia.org

### Bee foragers:

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

### Flower type:

Narrow spikes with small tubular purple flowers

### Flower diameter: 1 cm

**Foliage:** Square stems with opposite, simple leaves

### Height: 60-150 cm

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

### Growth conditions:

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

**Native to North America**



# 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:

1 cm

**Foliage:** simple, opposite leaves; 1-4 cm long

**Height:** 2-6 m

**Location:** river and lake shores, swamps, wetland margins

### Growth conditions:

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

### Bee foragers:

Bumble bees  
Sweat bees

**Native to North America**

# 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: 1 cm

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

### Height: 60-180 cm

**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 North America**

# 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:** 1-5 cm height

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

**Height:** 25-50 cm

**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:

2-5 cm

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

### Height:

5-18 cm

### 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 North America**

# Summer Blooming Plants

## Foxglove beardtongue *Penstemon digitalis*

Sabine Nooten



### Flower type:

Deep, tubular, white flowers made of two lips

**Flower diameter:** 1-3 cm

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

**Height:** 90-150 cm

**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 North America**

# Summer Blooming Plants

## Mountain mint *Pycnanthemum virginianum*

### Flower type:

Dense, small, white flowers; two-lipped petals

**Flower diameter:** 2 cm

**Foliage:** Narrow, opposite, simple leaves; Leaves 6 cm long

**Height:** 90 cm

**Location:** Meadows, forest edges, and disturbed habitats

### Growth conditions:

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

**Native to North America**



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:** 1 cm

**Foliage:** Alternate and compound leaves; leaflets 5 cm long

**Height:** 30-90 cm

**Location:** fields, roadsides, waste areas, disturbed soil

### **Growth conditions:**

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

### **Bee foragers:**

Bumble bees  
Masked bees  
Sweat bees

**Native to North America**

# Summer Blooming Plants

## Sensitive partridge pea *Chamaecrista nictitans*

**Flower type:** Yellow flowers with five irregular petals

**Flower diameter:** 1 cm

**Foliage:** Hairless, multiple stems; alternate, oblong leaves; leaves 3-6 cm long

**Height:** 30-60 cm

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

**Growth conditions:**

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

**Native to North America**



Forest and Kim Starr; Wikipedia.org

**Bee foragers:**  
Bumble bees  
Mason bees  
Mining bees  
Sweat bees



# 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:** 5-8 cm

**Foliage:** Shrub without prickles along its stems; leaves are alternate and compound; leaflets are 2-4 cm long

**Height:** 1-2 m

**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 North America**

# Summer Blooming Plants

## Spotted jewelweed *Impatiens capensis*



D. Gordon E. Robertson; Wikipedia.org

**Flower type:** Orange flowers with three lobed corolla

**Flower length:** 2 cm

**Foliage:** Ovate, alternate leaves, 13 cm long

**Height:** 60-150 cm

**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 North America**



Fritz Geller-Grimm; Wikipedia.org

# Summer Blooming Plants

## Steeplebush *Spiraea tomentosa*

### Flower type:

Pyramid shaped clusters;  
dense pink to rose  
purple flowers

### Flower diameter:

1.5 cm

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

**Height:** 60-120 cm

**Location:** wetlands;  
sandy marshes;  
shorelines

### Growth conditions:

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

**Native to North America**



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



### Flower type:

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

**Flower diameter:** 1 cm

**Foliage:** Leaves in leaflets of threes with distinct light-coloured markings

**Height:** 15-60 cm

**Location:** Fields, roadsides and meadows

### Bee foragers:

Bumble bees  
Honey bees  
Mason bees  
Mining bees  
Sweat bees

### 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:** 1 cm

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

**Height:** 60-180 cm

**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 North America**

# 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:** 4 cm

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

**Height:** 60-90 cm

### **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 North America**

# 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:

5-10cm

**Foliage:** Thinly toothed leaves along a coarse bristly stem

**Height:** 30-90 cm

**Location:** Open spaces

### Growth conditions:

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

**Native to North America**



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: <1 cm

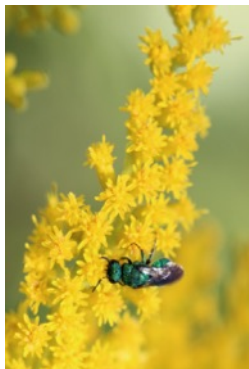
**Foliage:** Leaves lance shaped, sharply toothed, uniform in size, smooth stem near the base, downy above

### Height: 30-150 cm

**Location:** Fields and roadsides

### Growth conditions:

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



Molly Jacobson

### Bee foragers:

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

**Native to North America**



# 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:** 3 cm

**Foliage:** Simple and alternate leaves; leaves are 2-15 cm in length

**Height:** 30-90 cm

**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 North America**

# Autumn Blooming Plants

## Common boneset *Eupatorium perfoliatum*

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

**Flower diameter:**  
1 cm

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

**Height:** 1-2 meters

**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 North America**

# 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:** 2-5 cm

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

**Height:** 30-180 cm

**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 North America**

# 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: 1 cm

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

### Height: 30-150 cm

### Location:

Fields, roadsides and disturbed areas

### Growth conditions:

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

**Native to North America**



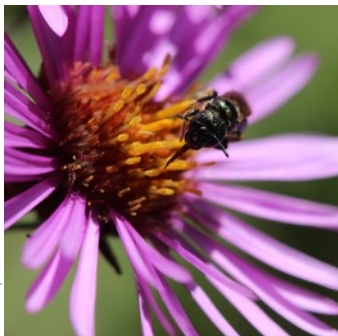
Sabine Nooten

### Bee foragers:

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

# 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:** 2-5 cm

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

**Height:** 60-240 cm

**Location:** Fields and damp meadows

**Bee foragers:**  
Bumble bees  
Carpenter bees  
Sweat bees

### **Growth conditions:**

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

**Native to North America**

# Autumn Blooming Plants

## Red clover *Trifolium pratense*

### Flower type:

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

**Flower diameter:** 1 cm

**Foliage:** Leaves in leaflets of threes with a white, crescent shape

**Height:** 15-60 cm

**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:** 5 cm

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

**Height:** 60-150 cm

**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 North America**

# 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: 1 cm

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

### Height: 60-200 cm

**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 North America**



# Autumn Blooming Plants

## Purple giant hyssop *Agastache scrophulariifolia*



USDA NRCS

### Bee foragers:

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

### Flower type:

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

### Flower diameter: 1 cm

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

### Height: 60-120 cm

**Location:** Woods; along streams and rivers

### Growth conditions:

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

**Native to North America**

# Bee conservation

Globally, we have seen dramatic declines of wild bees. In North America alone, eight native bees have been placed on the endangered species list, seven of which are masked bees from Hawaii. The most notable, and only bee to be found in continental North America, 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.



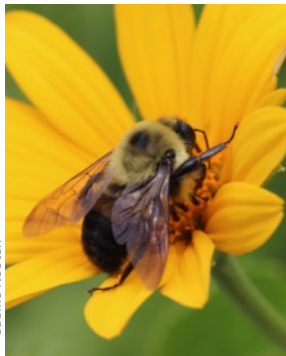
*Bombus terrestris*

Human activities, such as substantial monocultures and expansive agriculture and urbanization, 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 emerge at the same time that their preferred flowers start to

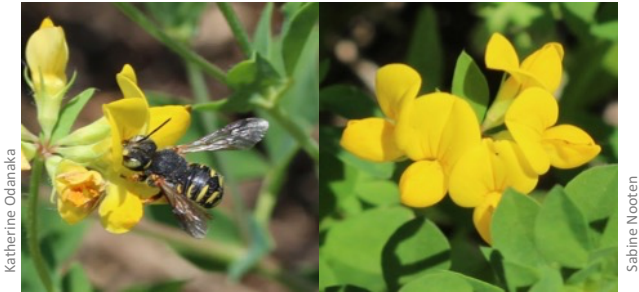
bloom. If the timing is off, bees may emerge too early or too late and the flowers they feed on will have already finished their blooming cycle. Changes in emergence of both flowers and bees is most detrimental to pollen and nectar specialists.



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 which 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 North America. 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 neighbours 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 North America!



*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 metre of un-mowed lawn along the outskirts to allow flowers to bloom and provide bees with a food source.

## Pesticide control

Herbicides can kill plants that bees can forage on. Fungicides target fungi but are also harmful to bees. Insecticides are used to kill insects and these chemicals can also affect the native bees. The use of herbicides, fungicides, and insecticides 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 North America construct their nests in pre-existing cavities or burrow into the soft centres 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 centres, 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.



Obscurasky [CC BY-SA 4.0] Wikipedia Commons

Examples of bee hotels

## 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](http://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/](http://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](http://pfaf.org/user/Default.aspx)

Wilson JS & Carril OM. 2016. *The Bees In Your  
Backyard*. Princeton University Press.

## Index of pollinators and wildflowers

### Pollinators

<i>Agapostemon</i>	43, 57
<i>Agapostemon sericus</i>	44
<i>Agapostemon texanus</i>	44
<i>Agapostemon virescens</i>	6, 43
<i>Andrena carlini</i>	23
<i>Andrena spp.</i>	21, 22, 36, 57, 60
<i>Andrena vicina</i>	24
<i>Andrena wilkella</i>	23
<i>Anthidium spp.</i>	49
<i>Anthidium manicatum</i>	49, 50
<i>Anthidium oblongatum</i>	50, 106
<i>Anthophora</i>	61
<i>Apis</i>	25
<i>Apis mellifera</i>	25
<i>Augochlora</i>	43
<i>Augochlora pura</i>	45
<i>Augochlorella</i>	43
<i>Augochlorella aurata</i>	46
<i>Augochloropsis</i>	43
<i>Augochloropsis metallica</i>	46
Banded sweat bee	40
Bee fly	19
Bee wolf	17
Bicolored striped sweat bee	43
Blue orchard bee	53, 54

<i>Bombus</i>	14, 26
<i>Bombus bimaculatus</i>	27
<i>Bombus griseocollis</i>	27, 28, 105
<i>Bombus impatiens</i>	27, 29
<i>Bombus perplexus</i>	30
<i>Bombus spp.</i>	14, 26
<i>Bombus terricola</i>	104
Bombyliidae	19
Brown-belted bumble bee	27, 28, 105
Bumble bee	9, 11, 14, 26
<i>Calliopsis</i>	58, 60
Cantharidae	19
Cellophane bees	36, 60
Cerambycidae	20
<i>Ceratina calcarata</i>	8, 10, 12, 32
<i>Ceratina</i>	32, 55
<i>Chauliognathus pensylvanicus</i>	19
cleptoparasitic bee	7
<i>Coelioxys</i>	61
<i>Colletes</i>	36, 60
<i>Colletes inaequalis</i>	37
<i>Colletes validus</i>	9, 38
Common eastern bumble bee	27, 29
Crabronidae	17
Cuckoo bee	21, 56
Digger wasp	17
<i>Dolichovespula sp.</i>	18

Eastern Carpenter Bee	6
<i>Eucera</i>	15, 33, 35
<i>Eucera pruinosa</i>	15, 33, 35
European wool carder bee	50
Flower flies	16
Green sweat bee	43
<i>Halictus</i>	40
<i>Halictus confusus</i>	41
<i>Halictus ligatus</i>	40, 41
<i>Halictus rubicundus</i>	42
<i>Hemaris diffinis</i>	17
<i>Holcopastites</i>	58
Honey bee	6, 7, 14, 25
<i>Hoplitis</i>	14, 55
Hornet	18
Horn-faced bee	53, 54
Hummingbird moth	17
<i>Hylaeus</i>	36, 39
<i>Hylaeus modestus</i>	39
<i>Laphria sp.</i>	20
Large carpenter bee	10, 11, 31
<i>Lasioglossum</i>	47, 60
<i>Lasioglossum pilosum</i>	15, 48
<i>Lasioglossum tegulare</i>	47
Leaf-cutter bee	10, 51, 61
Locust borer	20
Long-horned bee	33

Masked bee	39
Mason bee	53, 55
<i>Megachile inimica sayi</i>	52
<i>Megachile mendica</i>	52
<i>Megachile rotundata</i>	51
<i>Megachile sp.</i>	5
<i>Megacyllene robiniae</i>	20
<i>Melissodes</i>	33, 59
<i>Melissodes bimaculata</i>	33
<i>Melissodes trinodis</i>	34
Mining bee	11, 21, 22, 60
<i>Nomada luteoloides</i>	7, 58
<i>Nomada spp.</i>	56, 57
Oblong wool carder bee	50, 106
Orange sunflower bee	34
<i>Osmia</i>	53
<i>Osmia cornifrons</i>	10, 53, 54
<i>Osmia lignaria</i>	53, 54
Paper wasp	18
Perplexing bumble bee	30
<i>Philanthus gibbosus</i>	17
<i>Philanthus ventilabris</i>	49
Robber fly	20
Sand wasp	17
Small carpenter bee	8, 10, 32, 55
Small dark sweat bee	47
Soldier beetle	19

Southern bronze furrow bee	41
<i>Sphecodes</i>	60
Sphingidae	17
Squash bee	15, 35
Sweat bee	11, 59, 60
Syrphidae	16
<i>Systoechus vulgaris</i>	19
<i>Toxomerus germinatus</i>	16
<i>Triepeolus</i>	59
<i>Triepeolus donatus</i>	59
Two-spotted long-horn bee	33
Two-spotted bumble bee	27
Vespid wasp	18
Wool carder bee	49
<i>Xylocopa</i>	31
<i>Xylocopa virginica</i>	11, 31
Yellow jacket	18

## Wildflowers

<i>Agastache scrophulariifolia</i>	103
Apple	22
<i>Asclepias syriaca</i>	80
<i>Asclepias tuberosa</i>	64
<i>Aster novae-angliae</i>	99
<i>Barbarea vulgaris</i>	69
Bird's-foot trefoil	50, 77, 106
Black locust	20
Black-eyed Susan	93
Bloodroot	63
Blueberry	30, 38
Blue vervain	78
Butterflyweed	64
Canada goldenrod	94
Canada hawkweed	95
Canadien St. John's wort	79
Carolina spring beauty	65
<i>Chamaecrista nictitans</i>	86
<i>Cirsium discolor</i>	82
<i>Claytonia caroliniana</i>	65
Common boneset	96
Common dandelion	66
Common milkweed	80
Common sneezeweed	97

Common strawberry	67
<i>Coreopsis lanceolata</i>	70
<i>Cornus sericea</i>	76
Creeping phlox	70
Crimson clover	81
Eastern daisy fleabane	98
<i>Echinacea purpurea</i>	72
<i>Erigeron annuus</i>	98
<i>Eupatorium perfoliatum</i>	96
Field thistle	82
Foxglove beardtongue	83
<i>Fragaria virginiana</i>	67
Garden yellow rocket	69
<i>Geranium maculatum</i>	75
<i>Helenium autumnale</i>	97
<i>Helianthus annuus</i>	34
<i>Heliopsis helianthoides</i>	101
<i>Hieracium canadense</i>	95
<i>Houstonia caerulea</i>	73
<i>Hypericum canadense</i>	79
<i>Impatiens capensis</i>	88
Lanceleaf coreopsis	70
Large-leaved lupine	71
<i>Lilium sp.</i>	13
<i>Lotus corniculatus</i>	50, 77, 106
<i>Lupinus polyphyllus</i>	71
<i>Malus pumila</i>	22



<i>Monarda fistulosa</i>	14, 92
Mountain mint	84
New England Aster	99
<i>Oxalis stricta</i>	76
<i>Penstamon digitalis</i>	83
<i>Phlox stolonifera</i>	70
<i>Potentilla norvegica</i>	85
Purple Coneflower	72
Purple giant hyssop	103
<i>Pycnanthemum virginianum</i>	84
Quaker lady	73
Red clover	100
Red-oiser dogwood	74
<i>Rosa blanda</i>	87
Rough cinquefoil	85
<i>Rudbeckia hirta</i>	93
<i>Sanguinaria canadensis</i>	63
Sensitive partridge pea	86
Spotted jewelweed	88
Smooth oxeye	5, 101
Smooth rose	87
<i>Solidago altissima</i>	102
<i>Solidago canadensis</i>	94
<i>Spiraea alba</i>	91
<i>Spiraea tomentosa</i>	89
Spotted geranium	75
Steeplebush	89

Tall goldenrod	102
<i>Taraxacum officinale</i>	66
<i>Trifolium incarnatum</i>	81
<i>Trifolium pratense</i>	100
<i>Trifolium repens</i>	90
<i>Vaccinium corymbosum</i>	30, 38
<i>Verbana hasta</i>	78
White clover	90
White meadowsweet	91
Wild bergamot	14, 92
Yellow woodsorrel	76





cm 1 2 3 4 5 6 7

in

1

2

3

4