



Art, Science, and Pollinators

A Teacher's Guide

Developed by Border Free Bees, a research project of
The University of British Columbia Okanagan and Emily Carr University of Art + Design

Nancy Holmes and Cameron Cartiere



Photo by Cameron Cartiere

Lower Mainland Edition



a place of mind



Social Sciences and Humanities
Research Council of Canada

Conseil de recherches en
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Canada

Dear Teachers

There are few creatures as marvellous as the bee. Studying and helping bees can engage young people in a wide range of learning—writing, art, science, history, and culture. This guide contains information about pollinators in the Lower Mainland, especially bees, and some art-related classroom activities. The suggested activities can require a minimum of materials or a much greater investment. All are adaptable to the needs of different grade levels. We have included some resource links for further exploration of this fascinating subject, as well as links to art projects that are bee-related and science-focussed.

Program Goals

The goals of this guide are as follows:

- to help teachers deliver programming that fits with the new BC curriculum.
- to support teachers who want to create courses, modules, thematic units or learning experiences that focus on local contexts—in this case the plight of pollinators in the Lower Mainland.
- to provide tools for a unit that can fit into the social responsibility mandate of the new curriculum: especially the mandates to consider the interdependence of people with each other and the natural environment; and to contribute positively to one's family, community, society, and the environment.
- to provide some basic facts about bees and pollinators in the Lower Mainland so that students can understand the relationship between them and the wider world.
- to create artworks using ideas inspired by imagination, inquiry, experimentation and purposeful play.



Bee ID Workshop, Cambie Secondary School, March 2017. Photos by Geoff Campbell

Pollinators in General

What are Pollinators?

Pollinator species are animals and insects that distribute pollen from one flower to another, thus allowing plants to create seeds for the next generation of plants. We normally think of bees when we think of pollinators as they are probably the most important pollinators on the planet. However, beetles, wasps, hummingbirds, butterflies, and (in some places) even bats can pollinate. All these animals play a crucial role in both sustaining the natural environment and maintaining our food sources. AS MUCH AS ONE IN THREE BITES OF FOOD WE EAT IS THE RESULT OF POLLINATION!

What's the Problem?

Pollinator species numbers are declining, especially the numbers of wild pollinators. They are suffering from diseases, pesticide use, and loss of habitat. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) was established in 2012, and is roughly modelled on the Intergovernmental Panel on Climate Change (IPCC). Its first report, released in early 2016, warns that the ongoing decline in the number of pollinating insects and animals seriously threatens global crop production.

Faced with this complex and troubling issue, people can feel overwhelmed. With major ecological crises, it is difficult to believe you can make a difference. Fortunately, there are simple and powerful ways for us all to contribute to the sustainability of bees and other pollinators: namely, the creation of pollinator-friendly habitats in our community. Children are wonderful participants in this hopeful and useful project to save bees! And there are many projects ongoing that would welcome the help of you and your students.

Border Free Bees uses art and art methods to educate and support children, teachers, and all community members to take an active role in habitat solutions.

Link to BC Teacher Science Toolkit from Bees Matter:

http://www.beesmatter.ca/wp-content/uploads/2015/05/BeeMatter_BC_TeacherToolKit.pdf

Activity: Have students list all the foods they and their families normally eat for breakfast. Research what foods need pollinators. Create a breakfast (in reality or through photographs) of “before” and “after” – if “after” is what would happen when all the foods that need pollination are removed. Write stories and make artwork that visualize a world with no pollinators.

Coffee, berries and fruit, and even chocolate need pollinators! Even though dairy products don't seem to need pollinators, cows eat crops like clover and alfalfa that DO. Cooking oils from sunflower and canola also need pollinators.

Lower Mainland Pollinator Information

There are over 20,000 bee species in the world, over 800 are found in Canada. About 450 are found in British Columbia and **over 100 bee species are native to the Lower Mainland**. From bumble bees to mason bees, miner bees and leafcutter bees to the famous honey bees, there are more types of bees in British Columbia than anywhere else in the country.

Most people think of honey bees when they think of bees, but honey bees are not native to North America. They were brought over by European settlers. Honey bees are amazing animals to study and learn about but they are usually managed bees—in other words, they are like farm animals. For the most part, they are kept and maintained by human beings.

The many, many other bees in our region are generally wild and native to this place. All bees are part of the same biological family, but they are widely diverse species. Many bees are not striped yellow and black. Some can be black, blue or bright green. Very few live in hives — about 80% live in the ground. Very few bees are social; most live by themselves. Most do not make honey, especially not enough for us. Some bees are bigger than your thumb, others are smaller than a grain of rice.

Bees descended from the wasp branch of the insect world about 100 million years ago; they are, in fact, vegetarian wasps. Wasps are omnivorous as you know when you sit in your backyard in August and the yellow jackets come for the BBQ steak; nearly every bee eats just nectar and pollen. Wild bees are hard to identify or even notice for the average person, even gardeners and farmers. However, as all recent research shows, wild bees and some other insects do the bulk of the pollination for our food.

Areas of the Lower Mainland, like all agricultural places, depend on bee pollinators for its economy. Most research shows that wild bees are key pollinators, even when honey bees are around. Wild bees are extremely efficient. Wild bees also pollinate flowers in the forests and meadows that create food for wild animals like birds and bears. It is very important that we preserve the wild bees!

A great resource for Bees of the Lower Mainland is Dr. Elizabeth Elle's Pollinator Ecology Lab at Simon Fraser University: https://www.sfu.ca/people/eelle/bee_info.html

Activity: The western bumble bee (*Bombus occidentalis*) is one of the Lower Mainland's most threatened bees. Unlike the honey bee, the western bumble bee is native to this area. Bumble bees are very important pollinators as they pollinate more flowers than honey bees, and there are many flowers that can only be pollinated by bumble bees through a process called "buzz pollination." See this great info and video: <http://www.anneleonard.com/buzz-pollination/> Essentially the bumble bees "sing" to the flowers so they release their pollen. There are many art, writing and science projects you can do with this wonderful piece of information:

- write poems that convey the song of the bumble bee to their flowers
- research what plants need buzz pollination- create an artistically interesting menu of buzz pollinated foods
- music classes can create songs that include the famous “buzz” sound of the buzz pollination
- draw and paint impressions of flowers releasing their pollen
- create sculptural models of bees and flowers engaged in buzz pollination
- in spring go out and film bumbles buzz-pollinating

See our webpage that has the winning poems for the Pollinator Poetry Contest:

<https://blogs.ubc.ca/theecoartincubator/pollinator-poetry-post/>

A great bumble bee resource is found on Hinterland Who's Who:

<http://www.hww.ca/en/wildlife/invertebrates/bumble-bees.html>



Bumble bee in the sun. Photo by Vance Williams

How do you tell the difference between a bee and a wasp?

Bees and wasps have four wings and flies have only two wings.

Dr. Elle says: “bees have cute faces and wasps look mean!”

Wasps often have narrow waists and are smooth and shiny; bees are more often hairy. But wasps are good pollinators and have other functions in the environment – so we need them too!

GET INVOLVED IN COMMUNITY PROJECTS with *Border Free Bees*

1. RICHMOND'S PUBLIC ART POLLINATOR PASTURE

In March 2015, Emily Carr University of Art + Design and the City of Richmond agreed to partner on a habitat restoration project at the Bridgeport Industrial Park located near IKEA in East Richmond. We have created a 2.6 acre Pollinator Pasture on this site. The entire pasture has been planted with native and naturalized seed beneficial to a broad range of pollinators. We also have two wild bee apiaries on site – one with educational didactics about bees, the other with nesting habitats for different species of wild bees. Additionally, eco-artist Sharon Kallis worked closely with the community in the summer of 2016 to harvest and process an invasive plant species to create butterfly net sculptures that are hung in the trees. We are currently developing a second pasture in Terra Nova Adventure Park for Spring 2018 – stay tuned to our website for community engaged projects!

How you can participate:

- visit the site and help us identify the numbers of pollinators using our citizen science app
- help us and the City of Richmond maintain the pasture through weeding, apiary upkeep, and seed sowing
- ask Border Free Bees for a field trip tour!

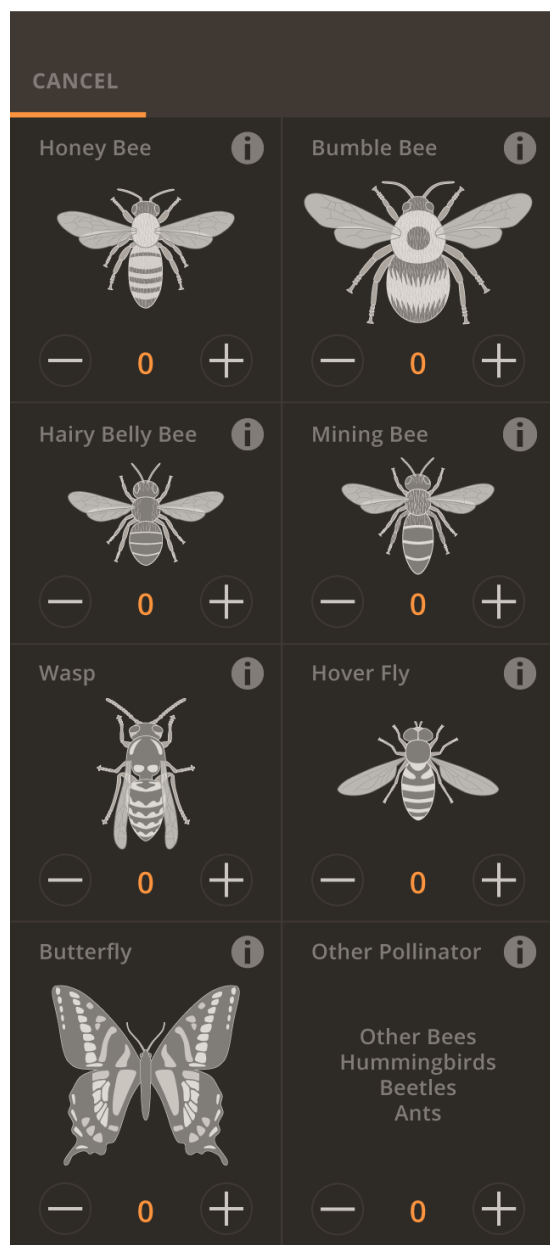
Contact info@borderfreebees.com if you would like more information.



Community created eco-art with Sharon Kallis - *Blackberry/Butterfly Net*. Photos by Megan Smetzer

2. CITIZEN SCIENCE APP

With bumble bees, honey bees and other important pollinators facing population decline, there is a growing need for data that will help scientists determine the density and diversity of pollinators across different environments. We have developed a web-based Smart Phone app called *Insight* to make it easy to participate in this essential research and learn about the different types of pollinators. Sign on, watch the video to learn how to use it, and begin to count! This project is for older students. They will need to create an account and login. See information about the app here: <http://www.insightcitizenscience.com/>



Pesticides - Beginning in the mid-2000s, beekeepers began to notice massive die-offs of honey bee colonies. This has been called Colony Collapse Disorder. Research seems to indicate that there are several serious stresses on bees — both honey bees and wild bees — including diseases and parasites such as mites; serious habitat loss as wild lands are developed; and monoculture agriculture providing very limited food. Recently, the use of fungicides and pesticides is also being blamed for contributing to the terrible plight of the bee. Research suggests that exposure to insecticides made with neonicotinoids may be especially responsible for the loss of bees. One of the most important things you can do for bees is to NOT USE pesticides in general and specially to avoid “neonics.” A book for teachers is Bee Time by B.C. scientist Mark Winston — it is a great read to learn more about the state of bees today. It would make a good book club selection!

MORE ACTIVITIES - EASY

1. Build a Bee Bath

You can make an easy and beautiful bath for bees for your garden or school. Like all animals, bees need water. It's easy to make a bath for bees. A shallow dish, some well-placed stones and rocks and some water. See instructions on this website:

<http://www.davidsuzuki.org/blogs/queen-of-green/2015/06/how-to-make-a-bee-bath/>

Children can take this home and put in their own gardens or gardens of friends and families. This makes a great Christmas gift for gardeners. If you make one for your school, you'll not be able to leave it out all summer unless someone is tending your garden as the water will evaporate.

Make this a beautiful object, and set it somewhere where you can watch the insects come to the water on warm, sunny days.

There are many great places to go see an amazing number of bees in the Lower Mainland. The Garry Oak ecosystem at the UBC Botanical Garden is just one of the many collections that attract wild bees.

These gorgeous gardens are full of plants that are great for the Lower Mainland. The gardens are buzzing from spring to fall and are a great place for field trips.

See their website:

<http://botanicalgarden.ubc.ca>



Crimson clover, California poppy, and Phacelia in the Bridgeport Industrial Park pasture.

Photo by Megan Smetzer

2. Create a Pollinator Menu

Identify foods created through pollination. Then create a restaurant menu! Use a symbol, such as a bee, on your menu to indicate which foods require pollinators. People will be surprised at how much of the food they eat is brought to them by pollinators.

Children can design the menu, do the research, decorate and create menus for their “own” restaurant. As a bonus, they could host a special picnic or lunch featuring only foods and recipes created with the help of pollinators. Not only will this activity increase awareness of pollinators, people will also receive your tasty treats at this event.

3. Make Ground-Nesting Bee Signs

About 70% of bee species nest in the ground, not in hives or in colonies. They often live by themselves (they don't have “queens” and “workers”). These bees will use many different types of soil and landscape conditions though they prefer to build nests in bare, sunny locations with un-mulched sandy soil. Although they live by themselves, some of them like building nesting sites near to each other.



Ground nesting bee going into her nest.

Photo by Robert Lalonde

Many ground nesting bees use vertical tunnels with side passages leading to egg chambers. These nests are often accidentally destroyed by gardeners unaware of these native bees in their yards and gardens. Setting aside an area of sparsely covered, sandy soil in a sunny location will help provide a safe habitat to encourage these little pollinators to nest in your area.

A great activity is to get children to bring a plain wooden spoon to school. Get them to paint the wooden spoon with weather-resistant paint. They can decorate with flowers, bees, designs (get them to think about the colours that bees like best (see text box on Page 11)). Get them to leave room to write (or have someone write for them) with a Sharpie or with paint “GROUND BEES LIVE HERE” or something like that.

A cluster of mining bee holes.

Photo by Nancy Holmes



Then a great activity is to walk around the school ground and look for bee holes - find sandy or bare patches of lawn. Chances are if there are a bunch of little holes, they are bee habitat — though it could be ants! If you see holes in bare ground, sit and watch for a while to see if bees fly in and out. If they do, put your “Bees Live Here” sign there! Or the children can take their signs home and educate their families.

See info on ground nesters on <http://beefriendly.ca/>



Ground Nesting Bee Signs created by students in Kelowna. *Photo by Fionncara MacEoin*

MORE ACTIVITIES - MEDIUM EFFORT AND TIME REQUIRED

1. Make Mason Bee Homes

Follow the instructions at the end of this guide for building a mason bee home.

Mason Bees are SUPER pollinators - they can pollinate more than 400 times the number of flowers than honey bees. They are sometimes called orchard bees or blue orchard bees. Make mason bee homes for gardens and your school!

Children should bring from home a one litre plasticized milk carton (the plasticized paper cartons are best) or any water proof container that is at least seven inches deep/ long. You will also need a roll of newsprint paper or kraft paper to roll into seven- inch long tubes. Pencils help with the rolling and you'll want to tape the tubes so they won't unroll. The goal is to fill the container with tubes. See the instructions at the end of this guide for details!



Mason bee house, photo by John Hritz, creative commons license,
<https://www.flickr.com/photos/jhritz/4549220650/>; Mason Bee, Photo by Robert Lalonde

2. HANDMADE SEED PAPER

Make handmade seed paper from recycled paper at your school!

In 2015 Border Free Bees brought the pasture to the Richmond Art Gallery in the form of an installation made from 10,001 western bumble bees laser-cut from seed paper made by students and community members throughout the Lower Mainland. The bees were distributed for planting at the end of the exhibition to create new food sources throughout the region. Making seed paper is easy and can be a beautiful gift for the ecologically minded. Here is a link to the David Suzuki Foundation's Queen of Green with basic instructions on how to do it:
<http://www.davidsuzuki.org/what-you-can-do/make-your-own-recycled-seed-paper/>



Making seed paper. Photos by Geoff Campbell

3. Design Your Own Seed Packets

Research the best seeds for pollinators in a mild, wet climate like the Lower Mainland. Create a Pollinator Seed Mix. Purchase packets—probably at least two or three packs of seeds of each type are needed for one class and you should probably have about 4 – 6 species. Split the seeds among all your packets—each packet should have 18 – 25 seeds.

You can find easy seed packet templates on the Internet (especially on Pinterest). Print off the templates or create your own artistic envelopes. Use stencils that you have created or draw, collage, stamp or paint the packets.

Cut, fold and fill the packets. These can be used for gifts or sell the seeds for a fundraiser to create your school garden or an insect hotel.

Some easy to grow plants for Lower Mainland gardens:

Alyssum	Aster
Blanket Flower	Borage
California Poppy	Cat Mint
Cone Flower	Cosmos
Lavender	Oregano
Sage	Sedum
Sunflower	Yarrow
Zinnia	

What Colours do Bees Like Best?

Blue, purple, white, and yellow flowers seem to be most attractive to bees.

Click here for a downloadable version of our native and naturalized pollinator friendly plant poster:

<http://borderfreebees.com/wp-content/uploads/2017/11/pollinator-friendly-plants-poster-v7.pdf>

Native plants are best, but they are hard to grow from seed. A good pollinator garden in the Lower Mainland is fine with many of the plants above as long as it gets some water.

ACTIVITIES - LONG TERM

1. Plant a Pollinator Garden

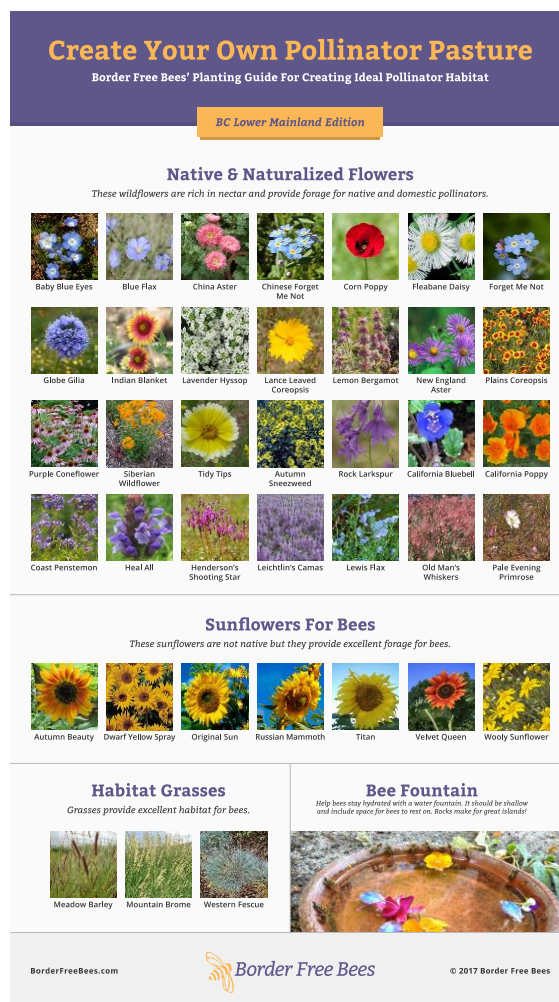
Planting a pollinator garden at your school is one of the best things you can do, especially if you are aware of how your garden links to other gardens in the area. You can continue to add beautiful features to it such as bee baths and bee homes. This is a long-term commitment but it can be one of the most enjoyable things your students can do. They can have their classes outdoors and learn from the greatest teacher of all: Nature. You should contact your principal and the school district horticulture and facilities people. Older students can earn volunteer hours by working with the community to develop a nectar trail – flower garden patches (3'x3') that can create a pollinator highway through your area.

2. Make an Insect Hotel or Apiary

Creating a fabulous structure near your garden is a great way to provide huge learning opportunities for your students and to help your garden. Learning what different insects need to overwinter and to lay their eggs is interesting and helps everyone keep good habitat for bees.

You can visit either the Bridgeport Industrial Park pasture or the Terra Nova meadow to see our Wildlife Apiaries. You can also find many wonderful images online. Our Kelowna partners built their insect hotels by stuffing wooden fruit boxes with habitat materials such as logs with holes drilled in them, mason bee paper tubes, pine cones, hollow sticks and other gorgeous stuff. Here is a photo of their habitat boxes:

Here are bee habitats as part of our didactic apiary in the Bridgeport Industrial Park Pasture. photo by Geoff Campbell





Habitat boxes for Kelowna's Wildlife Apiary, before and after installation.

Photo by Melisa Hernandez



Do Bees sting? Yes, some bees sting (though not all). Only the females sting when they are threatened, angry or in distress. Bees are more interested in collecting their pollen and nectar than they are interested in stinging people. If you have reason to think you or any child may be seriously allergic to bee venom, you should carry an EpiPen. If you are not allergic (the majority of us are not) but you DO get stung by a bee (or nettle) learn to recognize the common weed plantain - chew it up, spit the chewed-up leaf and saliva on the sting

Bumble bees are gentle when you are calm. Photo by Vance Williams

3. Make Bumble Bee Houses

Making houses for bumble bees is more complicated than Mason bee homes and requires more woodworking skills. Check out our *Short Guide to Bumble Bees*; you can find it online at <http://blogs.ubc.ca/theecoartincubator/files/2016/04/Bumble-Bee-Guide.pdf> It contains lots of interesting facts about bumble bees and instructions on how to build a home. We have simpler version of a bumble bee house in the appendix.



Building bumble bee homes with the Marpole-Oakridge Community Centre's Environmental Youth Group, March 2017. Photo by Geoff Campbell



Constructed and painted bumble bee homes. March 2017.
Photos by Geoff Campbell and Cameron Cartiere

LINKS TO MANY RESOURCES

Border Free Bees resource page:

<http://borderfreebees.com/resources/>

Child-friendly activities and information about bumble bees and other bees:

<http://www.buzzaboutbees.net/>

<https://www.bumblebeeconservation.org/bumble-kids/activities/>

<http://beefriendly.ca/> (good video about bumble bees)

<http://www.buzzaboutbees.net/bee-plants.html>

<http://vancouver.ca/parks-recreation-culture/5th-and-pine-temporary-park.aspx>

Plants:

<http://bcfarmsandfood.com/plant-a-bee-attracting-garden/>

<http://beefriendly.ca/25-plants-for-bees-in-your-garden/>

<http://www.growgreenguide.ca/>

<http://www.davidsuzuki.org/what-you-can-do/food-and-our-planet/create-a-bee-friendly-garden/>

Pesticides information:

<http://action2.davidsuzuki.org/neonics>

[http://libcloud.s3.amazonaws.com/93/e9/4/4703/Tips for Gardeners.pdf](http://libcloud.s3.amazonaws.com/93/e9/4/4703/Tips_for_Gardeners.pdf)

http://webiva-downton.s3.amazonaws.com/877/a1/5/8972/GardenersBewareFollowupReport_4.pdf

<http://foecanada.org/en/issues/the-bee-cause/pesticide-action/>

<http://www.foe.org/projects/food-and-technology/beeaction>

Artists Who Work with Bees:

Cameron Cartiere and the Chart Collective: <http://borderfreebees.com/projects/for-all-is-for-yourself/>

Aganetha Dyck: <http://www.aganethadyck.ca/>

Jasna Guy: <https://vimeo.com/149811418>

Sarah Hatton: <http://sarahhattonartist.com/bees/>

Anne Marie Maes: <http://annemariemaes.net/works/bee-laboratory-works/the-transparent-beehive-2/>

Lori Weidenhammer: <http://beespeakersaijiki.blogspot.ca/>

We have a series of great filmed talks on our website on this page:

<https://blogs.ubc.ca/theecoartincubator/the-pollinizing-sessions/>

There is a great deal of poetry written about bees:

Emily Dickinson: <https://www.poets.org/poetsorg/poem/make-prairie-1755>

Pablo Neruda: <http://odetobeesproject.weebly.com/ode-to-bees.html>

Jo Shapcott: <http://poetrysociety.org.uk/poems/six-bee-poems/>

Here are a few golden oldies: <http://www.buzzaboutbees.net/a-poem-about-bees.html>

There is a terrific new anthology of bee poems, *If Bees Are Few*:
<https://www.upress.umn.edu/book-division/books/if-bees-are-few>

Films:

Queen of the Sun: what are the bees telling us? (2010) by Taggart Siegel- documentary (for older kids and adults)

Great little video about honey bees short, good for kids:
<http://thekidshouldseethis.com/post/46937771628>

CONTACT US

Border Free Bees is happy to share resources and talk to you about bee-related projects in your schools. Don't hesitate to contact us at info@borderfreebees.com. Also visit our website at <http://borderfreebees.com/>, which has links to many other resources and information about projects in both Richmond and Kelowna.

ABOUT

Border Free Bees is a long-term public art initiative headed by Dr. Cameron Cartiere, Associate Professor at Emily Carr University of Art + Design and Nancy Holmes, Associate Professor at The University of British Columbia, Okanagan, in collaboration with numerous strategic partners. The initiative's mission is to raise awareness of the plight of wild pollinators, empower communities to actively engage in solutions for habitat loss, and transform under-utilized urban sites into aesthetically pleasing and scientifically viable pollinator pastures.

Border Free Bees consists of several related projects in partnership with scientists, specialists, community groups, businesses, and municipalities. Their work is supported by the Social Sciences and Humanities Research Council of Canada.



Happy bee.
Photo by Vance Williams

APPENDICES

Mason Bee and Bumble Bee Home Instructions attached. These last four pages can be copied and sent home so that families know how look after their bee homes.

MASON BEE HOMES

How To Make a Small Mason Bee House

Mason Bees, the Super-pollinator

It takes 30,000 honey bees to pollinate 1 acre of land.

It takes 400 Mason Bees to pollinate 1 acre of land.

Mason bees are friendly; they rarely sting.

The female Mason Bee visits about 1875 blossoms a day!

Mason bees (or blue orchard bees, or *Osmia lignaria*) nest in tubes, not hives.

Container of house: You can use many things to house your mason bees: a tin can (big one), a waxed milk carton, a brick, a piece of wood with holes drilled in it (7.5 inches deep), a wooden box that you already have, or you can build a small box. If you use a piece of wood, the best size hole is 1/4 inch but drill the holes 3/8th inch so your tube fits in. You want the house to be **at least 7 inches deep/ long.***

Weatherproof: The important thing is your house needs to be waterproof and have a roof big enough to cover the front to keep it out of the wind and rain.

Nesting material: Mason bees are called mason bees because they use mud made of clay and water to line their tubes and separate each laid egg. Dig a little area close to your house down to the clay and make sure there's water close by for this tube liner.

Tubes: Once you have a container, you need to make the tubes. Use plain brown paper, that's the best (newspaper and other papers have dyes that are not good for bees). Cut strips that are 7 inches long by 2.5-3.5 inches wide. Roll the paper over a regular pencil and tape it closed in a couple places. Make enough so they fit snugly into your container. A one litre milk carton will need about 30 tubes.

*** important that tubes are at least 7 inches long because female bees incubate in the back 3-4 inches and male bees incubate in the front 3-4 inches. If your tube is too short your mason bees will not be balanced in terms of gender.**

Placement: Now put the tubes in your container. Then, put your container at least 4 feet off the ground facing east (south is too hot for the bees in the Okanagan). Do not put your container in a tree; rather screw it to the side of a garden shed, house, fence or similar regular-shaped, broad, flat surface. You want to make it easy for the bees to find their home when they are flying fast. Make sure it is stable and doesn't swing around in the wind.

***if you drilled holes in a piece of wood make sure the holes are a little longer than your tube, there needs to be a 'back' at the end of the tube to block light- tubes are open on one end only.**

This handout was created by Lori Mairs for Border Free Bees with help from Brian Campbell.

Life Cycle of a Mason Bee

March/April: cocoons hatch and adult bees mate and begin to forage	<i>Provide a house with tubes and lots of water and dirt to make mud so females can make their mud partitions in the tubes for their eggs.</i>
April/May: bees forage and lay eggs in the tubes (females seal up each egg and a ball of pollen with a mud partition)	<i>Provide lots of flowers and flowering trees for pollen.</i>
May/June: eggs grow into larvae in the tubes and eat the pollen	<i>Adult Mason Bee life cycle begins to come to an end and they begin to die off.</i>
June/July: larvae weave cocoons in their little partitions in the tube	<i>When you notice the bees are no longer coming back and forth to their mason bee house, bring the house inside - this will prevent parasitic wasps taking over the cocoons.</i>
July/August: larvae inside cocoons begin to develop into young bees	<i>Continue to store the house somewhere warm and dry indoors.</i>
Sept- February/March: young bees inside the cocoons “hibernate”	<i>Remove cocoons from tubes (see below) in mid to late fall and then store in a cold and dry place (refrigerator).</i>
March/April: cocoons hatch and adult bees emerge to begin cycle over again	<i>When early blooms are beginning, put cocoons outside and reinstall the mason bee house with new tubes in it.</i>

Caring for your Mason Bees

It takes about 2.5 hours a year to care for your mason bees.

- **In June**, when most of the ends of the tubes are filled with mud and the female bees are no longer active, bring the house indoors somewhere high and dry (top of fridge, cupboard, garage, basement). Do not unravel tubes- leave the cocoons in the tubes and in their house- the larvae are developing inside the tubes.
- **In late September or October**, take the tubes out of the house and carefully open the tubes up. Gently remove cocoons, clean them off in a sieve—water won't hurt them-- get rid of any cocoons that are damaged or just shells- these aren't viable- and put the good ones in a small box. Dry them off for a couple of hours. Close the lid.
- **In winter**, keep the box in a dark cool place: fridge, garage or unheated basement is fine (the bees can emerge from dormancy in as little as 3-5 hours at room temperature, so cool and dark is important).
- **In the spring**, when you see the very first blossoms in bloom (apricots, plums, willows) make new paper tubes for your mason bee house. Go and get your mason bee cocoons and take them outside. Put them in a paper bag that is open or in a box with a hole in it (make sure they stay dry until they hatch- DO NOT PUT THEM IN TUBES!). Put your mason bee house where they can easily find it; add fresh new tubes for them to lay eggs in. Remember to scrape a hole in the ground down to clay and provide water so they can start building nesting chambers again.
- **From March-June**, watch the action as the bees work tirelessly pollinating and provisioning for their young in the mason bee house!

BUMBLE BEE HOMES

How to Make a Bumble Bee House



There are 46 species of bumble bees in North America

Bumble bees nest in pre-existing cavities or burrows

Bumble bees use “buzz” pollination

Bumble bees rarely sting

Bumble bees (*Bombus*) nest in colonies of 30-40, with up to 400 in the summer.

Constructing the Container: Though you can use many things to provide housing for bumble bees, these instructions are intended to reuse plastic plant pots that are at least 6 inches tall and have their drainage holes on the side of the pot, not on the bottom. You will also need a plastic saucer, a screw, washer, and nut. Fasten the saucer to the bottom of the pot using the screw, washer, and nut.

Decorating the Container: The containers can be decorated using non-toxic paint or markers. Get creative with bright flower designs, lettering, and information about bumble bees.

Nesting material: Once the container is decorated, fill the it 2/3rds of the way with non-toxic insulation, such as water repellant upholsterer's cotton (do not use fine, bleached, or surgical cotton as the bees can get caught in it).

Placement: Nest containers should be set out as early as possible in the spring (February to March) close to early blooming food sources. This type of nest house should be inverted and buried halfway in the ground in a south facing location, but out of direct sunlight. Bumble bees enter the nest through the drainage openings in the pot, which should now be situated at the top of the container and protected by the overhanging saucer.

Care of Nest Containers: Containers can be inspected and cleaned in late autumn after the colonies die. New queens overwinter in the ground, not in the nest so it will be unoccupied. To prepare the container for next year, note how the box worked and what you see. Prepare the insulation for reuse by putting it in the freezer for a few weeks to kill any live organisms. The inside of the container can be cleaned with a mild bleach solution. Place the container in the same location as the bees will return to it. Occupancy of the container is usually low in the first year or two, but increases as the bees get to know the location and habitat.

***This handout was created by Megan Smetzer for Border Free Bees
based on a design created by Brian Campbell.***

Life Cycle of a Bumble Bee

Spring/Early Summer: Mated, overwintered queens emerge from hibernation and look for a colony site.	<i>Provide a container house near early, flowering plants.</i>
Late Spring/Summer: Queen makes honeypot for nectar storage and lays her first clutch of eggs on a mass of pollen.	<i>Provide lots of flowers and flowering trees for pollen.</i>
Summer: Young larvae hatch, feed on the pollen, and create a cocoon. Queen continues to forage and adult bees hatch from the cocoons.	<i>Continue to grow flowers throughout the season.</i>
Summer: Adult bees, mostly female, act as workers for the queen, who stays in the nest to lay eggs. Workers forage and tend the new eggs.	
Late Summer: Colony begins to produce drones - male bees who mate with newly emerged queens from other colonies.	
Early Fall: Mated queens find sites to hibernate over the winter. Workers and drones die off.	<i>This is a good time to inspect and clean your nest container.</i>
Spring: The cycle begins again.	<i>When early blooms are beginning, put container outside in the same spot.</i>

A few bumble bee facts:

In a good year, only about 10 out of 10,000 queens make it through the whole cycle.

At several of these stages, colonies can be damaged by cuckoo bumble bees, bad weather, lack of food, disease, and people who deliberately or inadvertently destroy their nests.

Bumble bees need flower food sources from very early spring into the fall and they need places to nest and overwinter – keep some parts of your yard untouched. They like undisturbed earth and compost heaps. Leave patches of soil, compost, and earth alone from fall to late spring.

Learn how to identify your bumble bee species using a good guide book: Williams, P. et al. *Bumble bees of North America: An Identification Guide*. Princeton: Princeton University Press, 2014.

For a quick guide to Lower Mainland bees, download our free online bee id book: [Common Pollinators of British Columbia, 2nd Edition.pdf](#)