

# Victoria BC Land Manager Guide to Creating Pollinator Habitat on Corporate, Public & Private

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**POLLINATOR  
PARTNERSHIP**  
C A N A D A

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Pollinator Partnership Canada

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### Disclaimer:

The Government of British Columbia is committed to working with industry partners. Opinions expressed in this document are those of Pollinator Partnership Canada and not necessarily those of the Government of British Columbia or the Investment Agriculture Foundation of BC.

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## Introduction

In landscapes fragmented by urbanization and agriculture, small tracts of land – from a small flower bed to a large clearing – are increasingly important for species conservation.

Commercial or municipal buildings and lands with green space provide a perfect opportunity to create pollinator habitat and beautify your community, while demonstrating your support for pollinators and the environment. Whether you are interested in planting a carefully designed formal garden, restoring a natural meadow, or creating something that falls

somewhere in between, this guide will help you select a site and manage your project step by step. Small patches make a significant contribution to conservation by adding to regional habitat and enhancing connectivity. By enhancing pollinators, you will be supporting ecosystems and the pollination needs of urban gardens and neighbouring farms.



Xylocopa Carpenter Bee, Anthony Colangelo

*THIS GUIDE HAS BEEN DEVELOPED TO PROVIDE THOSE RESPONSIBLE FOR MANAGING PUBLIC, PRIVATE, OR CORPORATE LANDS IN VICTORIA, BC CANADA WITH THE MOST CURRENT SCIENCE, TOOLS, AND RESOURCES TO SUPPORT POLLINATORS.*

The guide is specifically designed for small- to medium-sized pollinator habitat creation, anywhere from a few square meters (several square ft) up to about ½ hectare (1 acre). These are dimensions that most corporate, municipal and private land managers/owners can realistically and economically incorporate into their land management plans.

Use this guide on its own, or in conjunction with, Pollinator Partnership Canada's (P2C) other management guides for roadside, utility, and agricultural lands, depending on the scope and type of project. Additionally, P2C's Ecoregional Planting Guide for Victoria, BC area home owners, land managers, and farmers provide regionally specific pollinator plant species options (Visit our [website](#) for complete list of guides). By working together to manage our lands to support pollinators, we also help to keep our ecosystems productive and resilient for generations to come. This resource provides concrete actions to guide your efforts. Local, site-specific actions add up to significant change. By considering these three simple actions, you can help to support pollinators in your neighbourhood and across the Capital Regional District:

1. **Preserve** existing natural vegetation and habitats
2. **Enhance** habitats using methods that promote pollinator richness and diversity
3. **Maintain** habitats using methods that minimize disturbance and harm to pollinators

## Importance of Supporting Pollinators

Unlike many of the environmental issues facing contemporary society, you can have a direct, positive impact on pollinators by creating habitat. Not only can pollinator habitat help your long-term budget by reducing maintenance costs, it can also help you reach sustainability goals for your organization. Native plants and grasses have evolved for thousands of years with the surrounding ecology and climate patterns, allowing them to thrive in local conditions, generally requiring much less care than ornamental plants. Often, native plants and grasses are able to develop much deeper root systems than most ornamental landscaping plants, meaning they are more self-sufficient in terms of water and nutrient requirements. This can translate to fewer resource-related costs for water use, and pesticide and fertilizer applications. Creating pollinator habitat helps to support an essential ecosystem service, pollination, and can also improve the quality of the surrounding environment by enhancing water quality, soil health, and biodiversity. By creating habitat that supports pollinators, you are also providing habitat and food for other wildlife, including birds.

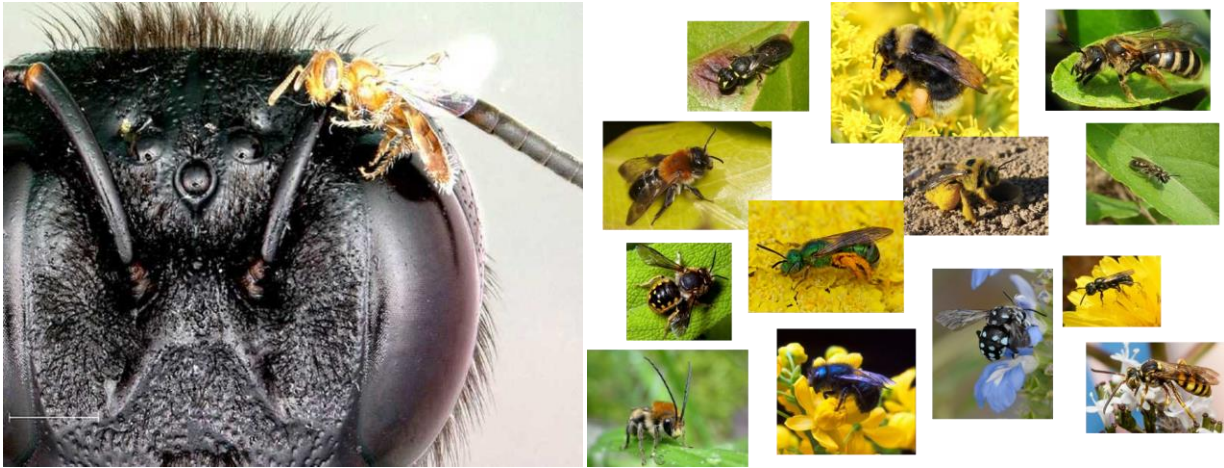
Pollinators are a diverse group of animals that visit flowers to feed on pollen and nectar. Through their visits, they transfer pollen from one flower to another, thereby helping plants to reproduce. Their pollination services contribute to 1 out of every 3 mouthfuls of food we eat, including the nutrient-rich fruits and vegetables that are essential for healthy diets. It is estimated that pollinators, both native and managed, provide upwards of \$217 billion to the global economy through their pollination services. Bees are the best known and the most important pollinators of natural ecosystems and of agricultural crops. While all pollinators visit flowers, bees are the only pollinators that actively collect pollen, which they use to feed their young. Because of this, they have evolved special pollen-carrying hairs and behaviours that make them particularly effective at moving pollen from one flower to the next.

### Managed Pollinators: Honey Bees

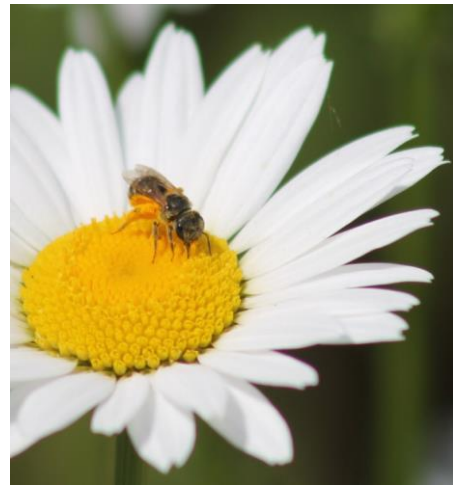
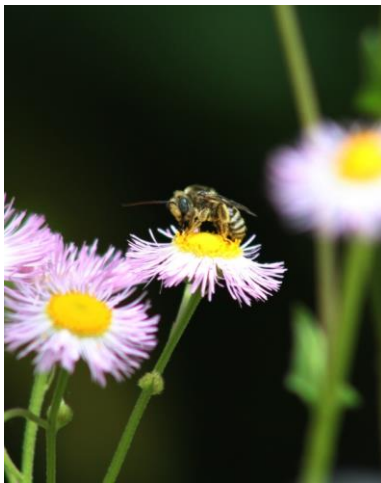
When people think of pollinators, often the first thing they think of are honey bees. Honey bees were introduced to North America from Europe for honey production and eventually were also used to pollinate crops. They remain important components of modern agricultural production but as an introduced species, do not have the natural relationships with our native ecosystems in Victoria. Other bees are managed for crop pollination and include bumble bees, leafcutter bees, and alfalfa bees. Combined, managed honey bees and bumble bees pollinate more than \$4 billion in agricultural crops in Canada each year. Key crops such as blueberries, canola, clover, apples, tomatoes, cherries, other stone-fruits, pears, soybeans, squash, and pumpkins are often pollinated by managed bees.

## Native Pollinators

Although most of us are familiar with honey bees, few of us are aware that there are in fact over 800 native species of bees in Canada, and over 4000 in North America! Native bees have a diversity of nesting behaviours, flower preferences, and life cycles, and all require our protection and support. In addition to pollinating wild plants, native bees also play an important role in crop production, and in many cases, they are better at transferring pollen than honey bees. Beyond native and managed bees, there are thousands of native species of butterflies, beetles, wasps, birds, and flies that provide pollination to crops, gardens, and wild ecosystems. When you think of pollinators, think of all these amazing animals!



S. Buchmann



## Threats to Managed and Native Pollinators

Many pollinator species are in decline due to habitat loss, disease, climate change, and prophylactic use of pesticides. Native bumble bee species, including the rusty-patched bumble bee (*Bombus affinis*), and the western bumble bee (*Bombus occidentalis* ssp. *occidentalis*), whose populations previously dominated landscapes within their range, have now become much less common, causing a reason for concern. Both species are listed species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC); the rusty-patched bumble bee has a COSEWIC status of Endangered, and the western bumble bee has a COSEWIC status of Threatened. Only the rusty-patched bumble bee has been federally listed under the Species at Risk Act (SARA), with a status of Endangered. Native pollinators are not the only species experiencing population losses; managed honey bees are also experiencing health problems, resulting in high annual losses and threatening agricultural pollination. There are many factors likely contributing to poor honey bee health and colony loss, the main ones likely being inadequate amounts of healthy forage (flowers), pests and diseases, and exposure to pesticides.

Pollinators contribute to maintaining air and water quality, soil health and wildlife, in addition to helping flowering plants reproduce. Clearly, given their critical role, their disappearance from our landscapes would have large impacts on our lives and the life of our planet. Indeed, the losses we have experienced so far are already being felt in the reduction of some crop yields, the decline of song birds and the quiet disappearance of wildflowers from the landscape. The decline of managed honey bees, and native pollinators is a serious problem that requires immediate action to ensure that Canada's food and ecosystems are productive and resilient. Despite the effort and good intentions of those who want to keep honey bee hives, purchasing your own honey bee hive is not a conservation action or beneficial for agriculture, ecosystems, or native pollinators. The best action you can take to help all pollinators is to create habitat. This guide will equip you with the information you need to effectively protect, restore, and enhance pollinator habitat.

## Components of Pollinator Habitat

Pollinator habitat is composed of three key components: **food, nesting sites, and overwintering sites**. Food, of course, is pollen and nectar as well as the stems and leaves of plants used by butterflies and moths as host plants for their caterpillars. Nesting and overwintering sites can be provided by features like bare soil, dead logs, pithy stems, bunching grasses, rock walls and piles of plant litter. The conditions are created to sustain a resident population of bees and butterflies when these components are found together in a mostly sunny, open area.

Below is a checklist for you to use as you plan your habitat project. Other than providing nectar and pollen resources (primarily from native plants for the greatest benefit to pollinators and ecosystems), not all of these elements are essential in your habitat; however, by including more, you will support a greater diversity and abundance of pollinators. Whether you are a farmer, a public or private land manager, or a gardener with a small lot, by creating habitat, you will increase the abundance and diversity of pollinators on your land.

### Food

- ✓ **Nectar and pollen:** It is essential to incorporate a variety of native flowers that provide nectar (high in sugar and necessary amino acids) and pollen (high in protein). Various types of pollinators use nectar as a fuel source, and pollen provides the main provisions for bee larvae.
- ✓ **Continuous bloom:** Strive to maintain a continuous bloom from late April into mid-October by choosing three flowering species per season (spring, summer and fall). Use our Ecoregional Guides to assist you in selecting plants native to your region in Canada (<http://pollinator.org/guides>).
- ✓ **A diversity of native plants:** Choose a mix of plants that provide a diversity of flower colours and shapes. This will increase the diversity of pollinators that can make your habitat home. Don't forget that trees and shrubs are an important food source for pollinators in early spring when few other plants are flowering. They create vertical texture in a garden or habitat and provide shelter for pollinators, birds and other wildlife.
- ✓ **Other Host plants:** Provide other host plant species that support local butterflies and moths. Many butterfly and moth species require specific host plants, which can be flowers, grasses, shrubs or trees (eg. Native stinging nettle is a host plant for many butterfly species). Note: Monarch butterflies (and milkweed) are not a part of our ecosystems on Vancouver Island.
- ✓ **Ornamental plants that provide resources:** Although not a requirement, you may choose to include some non-native plants in your pollinator habitat. Some ornamentals can provide a lot of resources, especially for 'generalist' pollinators, those that don't only forage on native plants. Many so-called pollinator seed mixes and plant stores include plants that out-

compete native plants. Always make sure that the ornamental plants you choose are not invasive in your region by searching if species are considered invasive in your area (through your agricultural ministry or local invasive species council websites).

- ✓ **Fermented fallen fruit:** Fermented fallen fruit may provide food for bees, beetles, and butterflies.

## Shelter

- ✓ **Bare soil:** Leave some patches of bare soil for bees to nest in. Most species of wild bees in Canada nest in the ground, including in abandoned south-facing slopes and rodent burrows.
- ✓ **Pithy stems, dead logs, wood, leaf litter:** Many species of wild bees nest in cavities such as the pithy stems of berry bushes, dead tree logs or the wooden planks of fences and sheds. Leave the stems of shrubs standing through winter and into spring, as some bees may have laid their eggs there to overwinter. Leave at least some amount of leaf litter in your habitat as many insects will overwinter there. Leaf litter also helps enrich and protect soil.
- ✓ **Bunching grasses, compost piles, and rock walls and piles:** Bumble bees will often make their nests in these types of shelter.
- ✓ **Different canopy layers:** Include a variety of plant heights (canopy layers) into the pollinator habitat by planting trees, shrubs, and different-sized perennial plants.
- ✓ **Dead snags and accessible soil:** Leave dead plant material and leaf litter to provide nesting sites and shelter for native bees.

## Sun

- ✓ **Warm, sunny areas:** Add a few rocks to your planting project to provide a warm resting area where adult butterflies can bask. Adult bees require the warmth from the sun in order for their flight muscles to warm up and activate. Southeast facing areas are the most suitable for habitat. Adult butterflies also need warm, sunny areas to regulate their temperatures or bask.

# Steps to Creating Pollinator Habitat on Public, Private, and Corporate Lands

**Step 1: Site Selection**

**Step 2: Building a Team**

**Step 3: Planning and Budgeting**

**Step 4: Site Preparation**

**Step 5: Planting and Seeding**

**Step 6: Maintenance**

**Step 7: Education, Outreach, and Certification**



## STEP 1: SITE SELECTION

Creating pollinator habitat does not need to take acres of land. In fact, it is recommended that your first project area be less than a quarter of an acre (1,000 m<sup>2</sup>). A grassy island in your parking lot or the front of your office building will suit this project perfectly. Consider enlarging the habitat after achieving success with your initial small plot, either by expanding it or by creating new sites. Using the **Site Evaluation Rubric on page 31**, begin evaluating potential project sites.

### What to look for:

- **Mostly sunny**
- **Access to irrigation or accessible for watering during plant establishment**
- **Visible to community or clients**
- **Distance from pesticide use**

Rob Bowen

The potential for partnerships is also an important factor to consider in site selection. For example, if a parcel of land has an environmentally active neighbour, or is in the jurisdiction of a public land owner, his/her participation will bring greater success to the project. Additionally, sites that may be used for public outreach or that are more accessible to the public can enrich your project's impact.

## STEP 2: BUILDING A TEAM, GAINING SUPPORT

To make pollinator habitat projects as smooth and as successful as possible, it is important to gain support from within your company or the community. Establish an internal Pollinator Habitat Team, and then reach out to the community for additional members as needed. Including community members in your land management planning process increases support and confidence in the project. For example, if you are a corporation, you may want to invite representatives from the government and non-profit sector.

When it is reasonable to do so, begin assigning roles and responsibilities. Roles and responsibilities will grow and change as your actions develop. Delegate tasks to bring diversity and increase commitment to the project.

Name	Title	Contact	Role
<b>Ben Williams</b>	<i>Sustainability Officer</i>	<a href="mailto:BW@company.com">BW@company.com</a>	Project Management and Budget
<b>Eve Kramer</b>	<i>Head of Grounds</i>	<a href="mailto:EK@company.com">EK@company.com</a>	Site Prep & Maintenance
<b>Jenny Lotz</b>	<i>Ecologist, Pollinator Partnership</i>	<a href="mailto:JL@pollinator.org">JL@pollinator.org</a>	Plant List & Procurement

### STEP 3: PLANNING AND BUDGETING

As a team, evaluate the potential sites determined in Step 1. Provide the site rubric results to the entire team to stimulate an objective discussion, and hold a meeting to review the pros and cons of each site based on the site evaluations. Ultimately, select a site with as few obstacles to success as possible.

#### Budget

Determine the amount of funding your group can spend on this project and seek support from departments other than your own. Approach your team and determine if additional support can be leveraged from the local government, community members, or other companies. Although volunteer hours are not monetary, seek commitments from groups such as Master Gardeners or Naturalists Clubs in your community. Weekly or even monthly commitments to perform specific site maintenance tasks will reduce overall maintenance costs.

ITEM	COST
Mulch	<b>\$500</b>
Plants	<b>\$2000</b>
Water Truck	<b>\$150</b>
Signage	<b>\$200</b>

Budget and scale are important factors when determining the correct combination of plants and/or seeds for your project. Generally, plants are used for gardens and seeds are used in larger naturalization projects. Plants give you a ‘head start’ and are generally more successful than seeds. Seeds can be less expensive but require more maintenance in the short term and are best suited to creating a wild meadow than a landscaped garden. However, plant materials such as plugs are usually more costly than purchasing seeds. Plants are showier and more appealing to community

members, but may require advance ordering. Below is a chart highlighting the pros and cons of seeds versus plants.

### Plants vs. Seeds

	Plants	Seeds
<b>Habitat Type</b>	Garden	Meadow
<b>Labour</b>	Intensive	Less Intensive
<b>Cost</b>	High	Low
<b>Water</b>	Generally needed for establishment	Generally not required (for native seeds planted at the proper time)
<b>Development Period</b>	Plants can flower the same season they are planted	Development can take up to 3 years
<b>Availability</b>	Inventories are usually sold off seasonally	Can be purchased year-round

### Timeline

Timing is key to success. Consider these issues when you develop your timeline:

- Ordering plants: place your plant order with a native plant nursery as soon as possible. For plugs and pots, order as early as winter to ensure the nursery has enough stock. For seeds, ordering in spring and summer for a fall delivery will also ensure your order is well filled.
- Site preparation and weed removal.
  - Meadow: Remove existing vegetation, especially aggressive weed. Various methods are described below but most often, site preparation is done over the course of spring and summer in time for a fall sowing.
  - Garden: Removing existing vegetation can also be done in a variety of ways as described below. Often, a new garden will be planted where there used to be lawn. When that is the case, remove the lawn as close to the planting event as possible, to limit the opportunities for weeds to establish on the bare soil.
- Establishing plants and seeds
  - Meadow: In most cases, seed should be sown on clean, cleared soil in late fall since many native plant seeds need to overwinter to germinate.
  - Garden: In most cases, planting a garden with plugs and potted plants should be done in spring and no later than early summer. It becomes harder for roots to take hold as the summer gets hotter and drier.

### Define the Habitat

As noted in Step 1, creating pollinator habitat does not need to take acres of land. It is highly recommended that your first project area be less than a quarter of an acre (1,000 m<sup>2</sup>). You will need to determine where on the spectrum between natural meadow and formal garden your habitat will fall.

### **Soil Testing**

Conduct a soil test to determine pH levels and soil composition (sand, clay and/or loam). Choose your plant species based on the soil conditions, including moisture level (wet, mesic or dry). Inexpensive soil test kits can be purchased online or at a hardware store. Depending on the results of your soil test, you may wish to alter the conditions of your soil. There are many organic soil amendments available to help enhance your soil. The amendments work by bringing in nutrients, and adjusting pH and soil moisture content to attain optimum conditions, depending on the requirements of your site. If you are planning a meadow, choosing plants that suit the existing soil and moisture conditions is important.

### **Selecting Plants for Pollinators**

Selecting the right mix of plants is the backbone of any habitat enhancement project. Selecting a variety of native species will support butterflies from caterpillar to adult, and will also benefit bees, birds, and other native wildlife. A good rule of thumb is to choose plants so that at least 3 species are in bloom at any time, thereby providing flower resources for pollinators in spring, summer, and fall. Mix in some grasses, ferns, and less showy flowers too – they provide resources for some pollinators like butterfly larvae, and they provide places for pollinators to nest and overwinter. There are many pollinator-friendly native plants to choose from in all regions of Canada. Use our Ecoregional Planting Guide for Victoria (Eastern Vancouver Island Ecoregion) on the Pollinator Partnership Canada [website](#) to choose the right species for your region.

## CLEARING THE CONFUSION ON NATIVE, NON-NATIVE, AND INVASIVE PLANTS

Choosing plants for pollinators does not have to be complicated, but it helps to know commonly used terms, the different types of plants available to you, which plants to prioritize, and which to avoid. **It is important to consult your local municipality, conservation authority, or Invasive Species Council to make sure the plants you are using are not designated invasive or noxious in your region.**

### Native Plants

Native plants are plants that are a part of the natural environment of a region. Native plants, and their pollinators, have coevolved over thousands of years in a particular location. Selecting plants native to your region will provide the most benefit to pollinators and the environment. If you are creating a naturalized meadow, use only native species. In a garden, either use all native species or use them as the ‘backbone’; that is, most of the plant cover (more than 75%) should be native. This will provide the most benefit to pollinators and the environment.

### Non-Native Plants

Plants that are not historically part of a region. They arrived in the region either intentionally or accidentally by humans or some other means. Other terms used for non-native plants include ornamental, exotic, introduced, alien, and non-indigenous. Some non-natives are beautiful ornamentals and some provide resources for pollinators. There are a number of different types of non-native plants and some should never be intentionally planted.

#### Non-Invasive

A plant that originated in a different location and is not historically part of an ecosystem BUT it does not reproduce on its own and does not spread or outcompete native plants. These plants are fine to plant in your habitat project.

#### Invasive Plants

These non-native plants should never be planted. An invasive plant is a plant that is not native to the region and reproduces freely on its own. They invade natural or disturbed areas, outcompete native plants, and disrupt the ecosystem. Many seed mixes (including ‘pollinator mixes’) and plants sold at garden centres include species that are invasive in regions where they are marketed. Check species lists with local authorities and invasive species lists, and do not use if they are invasive.

#### Noxious Weeds

A plant that is particularly troublesome for agriculture, the environment, or public health. Noxious weeds should never be planted and some are illegal to plant in certain areas. Check noxious weed lists to find out what species are prohibited in your area (eg. <https://bcinvasives.ca/invasive-species/about/regulated-invasive-species-in-bc/list-of-regulated-invasive-plants-in-bc/>)

### ***How to Plant for Pollinators***

Remember to select at least 3 species per bloom period (spring, summer, and fall). Determine the quantity of plants and seed you need. Generally, one plant every 30-60cm will be plenty and about 1-1.5 kg of purelive seed (PLS) or 4.5-7 kg of bulk seed per acre (4050m<sup>2</sup>) will yield good results. Reduce quantities if using a combination of seeds and plugs. For the most immediate results, install mature plants or incorporate them into a mix of seeds and plugs. Consider using mature plants when working in a highly visible area.

## **STEP 4: SITE PREPARATION**

Before preparing the site for planting, use the **Site Evaluation Rubric on page 31** to review key components to habitat development success.

### **Site Preparation Techniques**

Weed removal is one of the most important steps to successful habitat creation. Whether there is heavy weed pressure at your site or simply turf grass, removing this vegetation is key to preparing your site for planting. Choose the method below that best suits your needs.

#### ***Solarization***

Solarization is a great method for sites one acre (1000m<sup>2</sup>) in size or smaller. Solarization reduces beneficial microbes in soil so consider using a mychorrizal inoculant before planting. Begin by mowing and tilling the site. Then wait for a rainfall or irrigate the area so that the moisture makes the dormant weed seeds germinate. Dig a canal around the site, then place a clear, UV-stabilized plastic sheet over the site, and bury it in the canal to ensure the heat is sealed in. The heat generated from the sun will become trapped under the plastic sheet, and the high temperatures will kill the vegetation and dormant weed seeds. This should be done in the spring or early summer and left until the fall, just before seeding or planting. If the soil dries out, added moisture; the steam produced will help eradicate unwanted vegetation. Do not till between solarizing and planting as this will bring up remaining weed seeds.

#### ***Hand Weeding and Clearing***

On small sites, a combination of mowing and hand weeding can be very effective, but usually requires more volunteer working hours. On such sites, the careful and selective application of herbicide to individual weed plants can also be appropriate, especially if there are shrubby plants, such as the invasive Japanese Knotweed, Autumn-Olive, and Buckthorn. This method is effective for preparing relatively small sites in spring and early summer when transplants (plugs and potted plants) are used.



### ***Herbicide Application***

While we do not encourage the use of herbicides or any chemical additives to restoration sites, herbicides are an option for sites too large for solarization and where mechanical removal is not an option. Carefully time and repeat herbicide applications over the summer in preparation for a fall seeding and planting. Begin by mowing the site. Hire a certified pesticide applicator and use a broad-spectrum herbicide to kill turf grass. When targeting woody plants, immediately apply herbicide directly to freshly cut stumps. Though herbicides are generally less likely to be toxic to bees than pesticides, some are known to be toxic to bees. Refer to our guide, 'Practices to Reduce Bee Poisoning from Agricultural Pesticides in Canada' for more information on safeguarding habitat from pesticide use, and other ways of minimizing the effects of pesticides on pollinators. To be effective, herbicide usually needs to be applied a few times, throughout the growing season, as dormant seeds germinate. A fall application will be necessary if there is an abundance of cool season grasses and other, more aggressive, noxious weeds. Wait at least two weeks after the last herbicide treatment before planting or seeding.

### ***Stripping***

Stripping the top layer of soil and adding in 'clean' soil is an invasive, labour and material expensive option, and not a normally recommended method for creating a meadow habitat. However, it can be appropriate in some situations where the land is highly degraded and/or contaminated and contains aggressive weeds. For example, at the Lochside Meadow restoration in Saanich, Peninsula Streams Society and Saanich Native Plants, in cooperation with Pollinator Partnership Canada used soil stripping to quickly eradicate invasive (rhizomatous) grasses and begin the replanting process in this highly degraded ½ acre area. The best way to strip soil is to remove the top, approximately 10cm of soil material, removing most of the problematic, invasive rhizomes and seed bank. Within a few weeks, 'clean' soil, a few cm in depth should be applied, followed by an early fall planting of plugs and seeds. For a detailed description of this technique, when it is warranted, and the Lochside Meadow Restoration, please contact Saanich Native Plants, Peninsula Streams Society, or Pollinator Partnership Canada.



### ***Tilling***

Tilling the site is a good option when weed pressure is low or multiple tills are possible to eliminate the seedbed. Conduct a survey of existing plant material before tilling. Often times, a till will work well in the short term but often brings weed seeds to the surface from the soil bed, creating a long-term weed problem. If you want to till, consider combining it with herbicide application. When tilling to exhaust the seedbed, first till, then irrigate to germinate the weed seeds, till to eliminate the plants, and repeat until the seedbed is exhausted.

**Each site is different, and preparation methods should be carefully thought-through prior to project initiation. Often, a combination of methods will be needed to prepare a site. No matter which method you use, make sure to coordinate the plant delivery so live plants can be planted after the area has been cleared of weeds (wait at least two weeks after herbicide application). If the site goes unplanted for an extended length of time, weeds will return to fill the ecological void.**

## **STEP 5: PLANTING AND SEEDING**

If herbicides have been used, schedule the planting or seeding at least two weeks after the herbicide application. Make sure water will be available on the day of planting (not needed for seeding) and volunteers know when to arrive, and what supplies to bring.

### **Broadcast Seeding**

Broadcast seeding is when seed is scattered either by hand or machine. The soil should be raked just before broadcast seeding. For sites under an acre (1000m<sup>2</sup>) in size, broadcast seeding by hand is very cost effective. Scatter the seed across the site by walking the length of it, and then scatter the seed again by walking the width of the site. Mixing the seed with sand, vermiculite or other filler can help the seed spread more evenly.



### **Drill Seeding**

Drill seeding uses mechanical equipment, a drill seeder, to cut into the soil and drop in the seed. This method is great for large meadow restoration sites, but renting specialized equipment and hiring labour can be expensive. The seed should be covered by only 3mm of soil; any more will reduce germination success.

### **Plugs and Mature Plants**

Plants are better than seed for more formally designed gardens. If you are planting a garden, design the layout so that taller plants are at the back, and shorter ones are at the front. Plant flowers of the same species in groups for a more beautiful visual effect and to make foraging by pollinators easier.

On planting day, develop a planting strategy and communicate it to your group. Holes for plug plants can be dug with a basic trowel. You can place the plants in their pots on the soil where they will be planted to fine tune the layout and minimize confusion. To save time, you can also dig the holes in advance. A good rule of thumb is to place one plant per square foot, or several plants (3-4) per square meter.

### **Mulch**

Mulch can be a good addition to a garden because it helps retain moisture in the soil and helps prevent weeds from establishing. However, mulch can also block ground nesting bees from being able to create homes in the soil.

***For your plants to survive, they will need to be watered immediately after planting, and once a week for the first 6-8 weeks.*** Planting early in the morning, late in the afternoon or on an overcast day also helps reduce heat stress on the plants.

## **STEP 6: MAINTENANCE**

Proper care and maintenance is a vital part of any pollinator habitat project. While native plants require less maintenance over time, especially compared to turf or gardens of annuals, some 'TLC' will help them establish and thrive.

### **Post-Meadow Seeding**

In most cases, meadows are seeded in the fall, which allows the seeds to overwinter and start the germination process in the spring. In these cases, nature is left to take its course and one hopes that the right amount of rain falls at the right time. However, if there is a water source nearby, you can water the site to help seedlings survive. In this case, water the seeds once a week, until the seedlings are about 10-15cm tall. After that, the seedlings will survive on rain water, unless there is a particularly dry period. Though many native plants are adapted to drought, watering during dry periods will increase plant survival, the attractiveness of the habitat, and the amount of pollen and nectar available for butterflies and other pollinators. However, watering can favour weedy, non-native plants, and could increase weed problems. If weeds and grasses start shooting up in the spring mow with the blades 15cm from the ground to set them back.

Organize a team of employees or community volunteers to hand pull weeds once a week or once a month during the first two years. Perfection is not necessary, but prioritizing weeding the most aggressive species is essential.

In the fall, after plants have browned from frost, we recommend an annual mowing of the habitat with the blades 15cm from the ground. This will distribute the flower seed throughout the site and keep any woody plants from growing up in the planting area, and is particularly beneficial in the first couple of years. In seeded meadows, always keep one section un-mowed to serve as a refuge to wildlife; rotate this section from year to year.

### **Post-Plug/Potted Planting**

Water the plants thoroughly the day of planting and as needed during the following days. Water the plants at least once a week for 4-6 weeks post-planting. If conditions are particularly dry, water more often. Have a team of staff or volunteers spend time weeding the habitat weekly or monthly.

Leave the old stems in place over the winter. These can be trimmed back in late spring or left in place. The seed heads provide a winter food source for birds while the stems can provide cover for birds and nesting habitat for bees.

### **Long-Term Habitat Maintenance**

Have a maintenance plan in place to monitor for weeds annually, focusing efforts on aggressive and invasive species (targeting them before they go to seed). As the native pollinator plants establish, the pressure from the weeds will reduce, but some weeding or targeted herbicide spraying will be required each spring/summer. Your habitat type, whether it is a smaller garden or a larger meadow restoration, will determine the type and level of maintenance required.

### ***Garden Habitat Areas***

Smaller areas of habitat, including gardens and areas of potted shrubs and herbs, will generally take less maintenance than larger meadows or seeded restoration areas. Maintenance required for these sites includes tasks such as hand pulling undesirable plant species, selective pruning, mulching, and potentially watering during times of drought.

### ***Meadow or Seeded Habitat Areas***

Mowing once a year helps stimulate plant growth, and will keep your meadow thriving. In seeded meadows, always keep one section un-mowed to serve as a refuge to wildlife; rotate this section from year to year.



Spring and early summer mowing can help keep some weeds down. Please ensure that you are not disturbing any potential native ground-nesting bees who may have found refuge there over the winter by keeping blades at least 15 cm from the ground, and ensuring not to dig or disturb the soil.

Caterpillars emerge at different times from year to year and from species to species. Before mowing, scout for butterfly eggs and caterpillars; if they are present, delay mowing.

Seeded habitat can take multiple years to establish and may look different from year to year as the perennial species form a healthy root system and begin to produce flowers. Be patient as your wildflower habitat invests in its below ground growth. Once the roots are well established, flowers will follow.

## STEP 7: EDUCATION, OUTREACH, AND CERTIFICATION

Your newly created pollinator habitat will provide an excellent learning opportunity for everyone, from school children to university students, community groups, and land management professionals. Educational visits are also a great way to showcase your commitment to the community and connect with others.

You can also use the habitat to engage existing employees and attract new hires.



### Outreach

There are many ways to reach out to the community using your new pollinator habitat. Consider installing interpretive signage at the planting site so that visitors can learn about pollinators and your commitment to the environment and community. Consider showcasing your project on your website. Pollinator Partnership (P2) and Pollinator Partnership Canada (P2C) have a wide variety of outreach materials available at [www.pollinator.org](http://www.pollinator.org) and [www.pollinatorpartnership.ca](http://www.pollinatorpartnership.ca).

## Certification and Recognition

### ***Pollinator Partnership Pollinator Steward Certification***

This unique certification program is offered only by P2. P2 has been at the forefront of pollinator research, education and habitat improvement for over 20 years. Certification as a Pollinator Steward demonstrates that you have a science-based understanding of pollinators and gives you the practical know-how to help them. Certification also shows that you have used your knowledge to create habitat and educate others. Visit <https://pollinator.org/pollinator-steward-certification> for more information on this unique certification opportunity for your organization.



### ***Million Pollinator Garden Challenge (MPGC)***

The MPGC is a campaign to register a million public and private gardens and landscapes to support pollinators. [Register](#) your pollinator garden today, it is free and easy! You can also explore other pollinator friendly SHARE (Simply Have Areas Reserved for the Environment) landscapes all over the globe by clicking the MPGC map here <https://pollinator.org/mpgcmmap>.

### ***North American Pollinator Protection Campaign***

Pollinator Partnership's signature initiative, the North American Pollinator Protection Campaign (NAPPC) offers recognition to pollinator advocates, farmers and ranchers, and roadside management. Nominate your group, or an individual or group you know that is working for pollinators, for one of these prestigious awards. Information can be found at [www.pollinator.org/awards](http://www.pollinator.org/awards).

## **Monitoring and Research**

Information about the success of pollinator habitats and local pollinator populations is essential for conservation and land management. Adding data to new and ongoing monitoring efforts is valuable, and can give concrete evidence to the community or stakeholders of the difference you are making. Consider partnering with a local citizen science program or a regional monitoring program such as Insight Citizen Science (<https://insightcitizenscience.com/>), eButterfly ([www.e-butterfly.org](http://www.e-butterfly.org)), [Bumblebee Watch](http://Bumblebee Watch) ([bumblebeewatch.org](http://bumblebeewatch.org)), or the Monarch Larva Monitoring Project ([www.mlmp.org](http://www.mlmp.org)). Partnerships with local conservation groups or universities are also great ways to support pollinators. Contact Pollinator Partnership Canada if you are interested in including your pollinator habitat in a scientific study that can aid in pollinator conservation.

## **Regulatory Considerations**

If the site is known habitat for a sensitive species, review all laws, regulations, and guidelines. Consult with your regional Ministry of Natural Resources and Forestry, or Environment Canada office for additional guidance. Even the slightest change in sensitive habitat can have negative effects on the rare, threatened, and endangered species it supports. However, with careful planning, a habitat enhancement project could benefit both species at risk AND pollinators.

## Appendix A: Pollinator Diversity

Bees are a diverse group of insects that include over 4000 species native to North America. The diversity of life cycles in the native bee community is large and includes varied nesting habitats as well as different levels of social interactions. Unlike honey bees, most bees live solitary lives – and though they don't make honey, they rarely sting either. Some bees, like carpenter bees and sweat bees, will nest side-by-side in aggregations. Our native bees can be encouraged to do more to support agricultural production if their needs for nesting habitat are met and if suitable sources of nectar and pollen are provided.

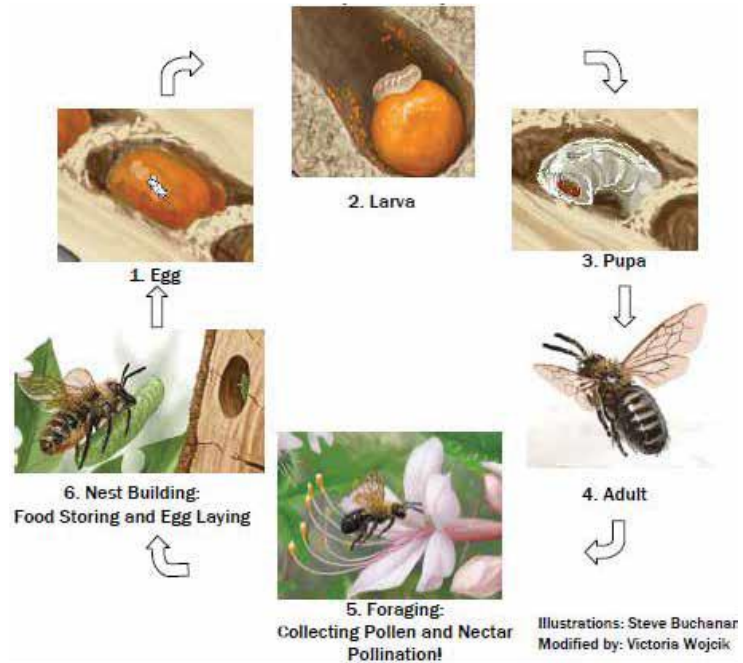
### Solitary Bees

Most solitary bees are only seen actively foraging and provisioning for their young for a very short period of their life cycle, typically for about 2 to 4 weeks. During the rest of their life cycle, native bees nest underground, or in pre-existing tunnels in nature (see below for nesting habits). Different species occur throughout the spring, summer, and early fall, and they all have unique floral preferences. Some solitary bees such as carpenter bees can live as

adults for extended periods of time, over two months in some cases, but they are annual species, meaning they do not live from year-to-year. Because of this variation in life cycle and occurrence times (known as phenology), pollinator habitats are best if they provide a wide diversity of flowers. Most native bees forage close to their nests, within a few hundred meters (with the exception of bumble bees and honey bees), meaning that to provide sufficient forage for most native bees, a greater abundance of localized floral resources is preferred to scattered resources across a large distance.

#### Nesting Habits of Solitary Bees

Some native bees build their nests underground; others use hollow stems or holes in trees, usually left by beetles; and some use their powerful jaws to make holes in wood. However, the majority of native bees in Canada nest in the ground, including digger bees (*Anthophora* spp.), sweat bees (*Halictus* spp., *Agapostemon* spp. and others), squash and gourd bees (*Peponapis pruinosa*), plasterer or cellophane bees (*Nomia* spp. and *Colletes* spp.) and mining bees (*Andrena* spp.). Ground nesting bees generally require sunny, bare or sparsely vegetated ground, and vary by species on whether they prefer coarse or fine soil and compacted or loose soil.



About 30% of native bees nest above ground. For example, large carpenter bees (*Xylocopa virginica*) nest in soft dead wood, poplar, cottonwood or willow trunks and limbs, and structural timbers. Small carpenter bees (*Ceratina* spp.) chew out nests in pithy stems including those of roses, sumac, elderberry and blackberry. Other wild bees make use of pre-existing holes and tunnels, often made by beetles. These bees include leaf-cutter bees (*Megachile* spp.), mason bees (*Osmia* spp.) and small masked bees (*Hylaeus* spp.).

## Social Bees

### Honey bees

As discussed earlier in this guide, honey bees (*Apis mellifera*) are managed in many countries throughout the world for pollination services and hive products. Unlike most native bees, honey bees are social bees, meaning that they nest in colonies. The life cycle and nesting habits of social bees are much different than solitary bees. It takes about 21 days for a honey bee to go from egg to adult; as an adult, the honey bee starts out as a hive worker (adult day 1-22) and moves on to become a foraging adult (adult day 23-42) (Refer to Figure 3). Honey bees have a large foraging radius, have large numbers of bees in each colony, and are flower generalists.



Illustrations: Marguerite Meyer  
Life Cycle of Honey bees



### Bumble bees

Bumble bees (*Bombus* spp.) are large social bees that live in colonies. Bumble bees nest in bunching grasses, dead leaf litter, compost heaps, cavities in walls, abandoned rodent burrows, upside down flower pots, under boards, and in other natural and human-made cavities. Colonies are founded in the spring by a queen who has overwintered. The number of workers in a colony can grow to 300 at the peak of summer bloom. Bumble bee colonies die out in the fall after producing new queens and male drones. New queens mate and then overwinter in small crevices or



underground until the next spring. Bumble bees are usually most active during the morning hours and can forage at colder temperatures than honey bees, even flying in light rain. There are approximately 50 species of bumble bees in North America and they are some of the most easily identifiable and observable native bee species.

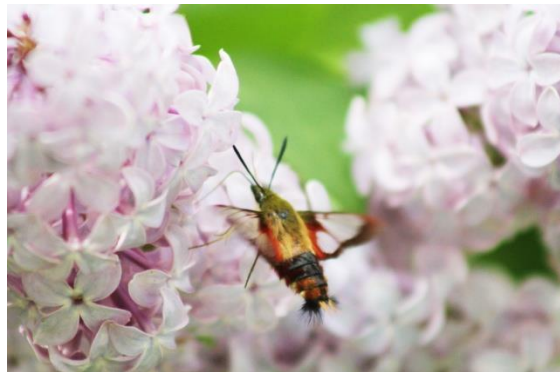
## Other Important Pollinators

### Butterflies & Moths

Butterflies and moths also visit and pollinate flowers. Many moth species are particularly active in the evening and morning hours. Butterflies on the other hand are attracted to open sunny areas where they can bask and warm themselves. Meadows, grasslands, and other open spaces are ideal



Black Swallowtail Butterfly, Anthony Colangelo



Hummingbird Moth, Anthony Colangelo

habitats for butterflies. Certain butterfly species have specific host plant (larval food) requirements for caterpillars. For example, milkweed is a host plant for Monarchs, whose caterpillars require milkweed leaves as a food source. There are many other host plant-species relationships that occur in the varying ecosystems present throughout Canada. For example, other important host plants for moths and butterflies include oaks, stinging nettle, trees/shrubs in the rose family, native lupines, willows, poplar, and many more, depending on the butterfly species present in your area.

### Flies

Flies are an often overlooked but important group of pollinators. One of the most important of all fly pollinator groups are flower flies or hoverflies, in the family Syrphidae. Many flies mimic bees in pattern and colouration in an effort to gain protection from predators. Unfortunately, less is known about landscape management for flies, which have a complex life cycle where the maggot and the adult often require very different habitats.



Syrphid fly, Anthony Colangelo

### Beetles

Beetles are the most ancient pollinators of plants and are considered to be associated with the widest range of plant species. Their role as functional and significant pollinators is debatable as many are pollen feeding and destroy pollen without significant transfer between plants. Generally, beetle pollinators (including scarabs, staphylinids and

sap beetles) forage for pollen and sometimes nectar on open bowl-shaped blossoms that offer easy access. Beetles are attracted to “primitive” blossoms including magnolia and tulip trees. As with other wild pollinators, threats from habitat loss, climate change, invasive species, and non-target exposure to pesticides can reduce populations. Management and conservation strategies for beetles are not well developed, but activities such as planting native plants and leaving ‘scrubby’ areas for other pollinators likely benefit beetles as well

### **Hummingbirds**

Hummingbirds are resident and migratory throughout North America. Adult hummingbirds feed on nectar, visiting flowers and acting as pollinators of many wild plant species. Like most birds, juvenile hummingbirds require insects as a protein-rich food source – which means that protecting insect pollinators helps secure food sources for baby birds. There are 8 hummingbird species found in Canada, three of which are rare or occasional visitors. The ruby-throated hummingbird (*Archilochus colubris*) is the most common hummingbird seen in Eastern Canada and is the only hummingbird species in Ontario. With the milder climate of coastal British Columbia, Anna’s hummingbird (*Calypte anna*) is a year-round species on south Vancouver



Island. Climate change and shifts in bloom period are expected to impact migratory species disproportionately, meaning that hummingbirds may face future challenges. Many gardeners enjoy providing sugar water for hummingbirds, but it is only in flowers that they can find the full nutrition they need for their health.



## Species at Risk

Species at Risk (SAR) are plants and animals that are in danger of disappearing from the wild. SAR species include endangered, threatened, and special concern species. Some pollinator species, such as the Karner Blue butterfly, have been extirpated from Ontario, meaning that they used to occur there, but their ranges are now restricted to other geographic areas. Other species are of conservation concern because of their rarity in Canada, but their formal conservation status has yet to be determined. The survival of a species can be put at risk by a combination of factors, and determining the cause(s) and solution is often complex.

### Monarch

Monarch butterflies (*Danaus plexippus*) are a unique migratory species that make a 5000 km journey across North America. While this species is not a part of the ecosystem on Vancouver Island, they are found in most other parts of southern Canada and are an iconic species. Their migratory journey can take four generations of butterflies to complete. There are two populations of monarchs, one east of the Rocky Mountains and the other located west. The eastern monarch migration starts in March as the butterflies overwintering in the Oyamel fir forests of central Mexico start traveling north into Texas, where they mate and continue moving northward into northern parts of America and southern Ontario and Quebec. The western population overwinters in California and migrates north throughout California, Oregon, Washington, and further into the southern interior of British Columbia.

Female Monarchs lay their eggs on milkweed plants, their species' host plant, without which they cannot reproduce. The eggs hatch 3-6 days later. The caterpillar feeds and grows over a 2-week period. Once fully grown, it chooses a safe location to form its chrysalis, and after about 10 days emerges as an adult butterfly. This life cycle repeats as each successive generation travels north, following the emergence of different milkweed species across the North American landscape. By late summer and fall, the last generation of butterflies to emerge changes direction and heads south to overwinter in the same place as their great-grandparents did in either Mexico or California.

In Canada, Monarchs are most abundant in southern Ontario and Quebec where milkweed plants are most abundant, though they are also common in the Maritimes and can periodically be spotted in the Prairies, and the southern interior of British Columbia. During the eastern population's fall migration, groups of Monarchs numbering in the thousands can be seen along the north shores of Lake Ontario and Lake Erie.

Since the 1990s, Monarchs have suffered a worrying decline, in both the eastern and western populations (upwards of a 90% estimated loss in both populations). Canada, Mexico and the United States agreed to a tri-national conservation plan in 2008; and, in 2016 Monarchs were listed as Endangered by COSEWIC. The SARA status remains unchanged since 2003, and Monarchs are listed as a Species of Concern under the Canadian Federal Species at Risk Act. Research has identified the loss of milkweed in the American Corn Belt due to herbicide use as a significant cause of this decline. In addition, illegal logging in the Mexican overwintering grounds and development in the California overwintering grounds, as well as climate change and habitat loss generally are contributing to population declines.

### Western Bumble Bee

Western bumble bees (*Bombus occidentalis*) used to be one of the most common bumble bees in the Pacific Northwest. However, the southern subspecies has become rare since the 1990s, possibly due to pathogens that transferred from managed bumble bees (used for agricultural pollination) to wild populations, and to habitat loss. COSEWIC designated the western bumble bee as 'Threatened' in 2014, but it currently has no status under the Species at Risk Act. Recently, there are signs that some populations of the Western Bumble bee may be recovering in the US.

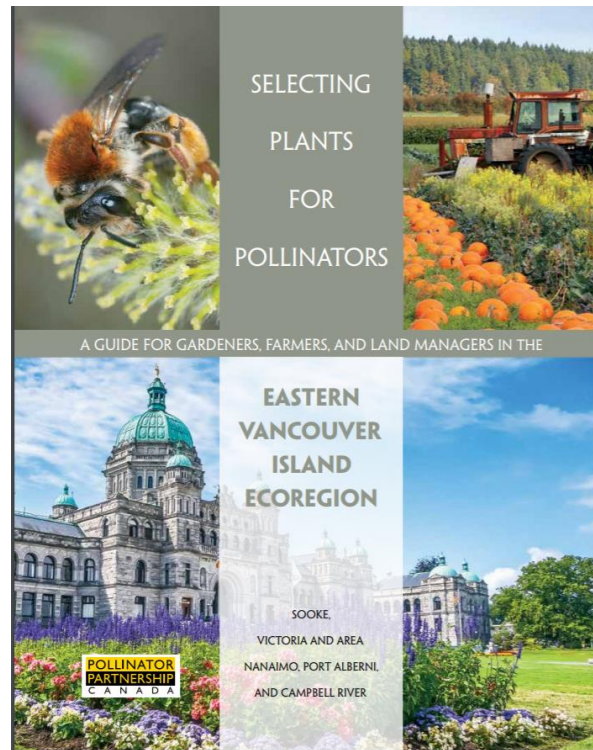


## Appendix B: Pollinator Planting Resources

There are many pollinator-friendly native plants to choose from and local, Vancouver Island resources. The free Pollinator Partnership Planting Guide for Eastern Vancouver Island has an extensive list of pollinator friendly native plants for our region

<https://www.pollinator.org/assets/generalFiles/E.Vancouver.Isl.2017.pdf>

Pollinator Partnership Guides for other regions are available at <https://pollinator.org/guides>



### Other local groups have information and resources:

Saanich Native Plants (Local source for local native plants/seeds): [www.saanichnativeplants.com](http://www.saanichnativeplants.com)

Habitat Acquisition Trust (local conservation programs, information, guides): [www.hat.bc.ca](http://www.hat.bc.ca)

CRFAIR (Local food security programs and info): [www.crfair.ca](http://www.crfair.ca)

Victoria Natural History Society (Local conservation programs, talks, field trips): [www.vicnhs.bc.ca](http://www.vicnhs.bc.ca)

Victoria Master Gardeners (Events, information, planting guides): [www.mgabc.org/content/victoria](http://www.mgabc.org/content/victoria)

Victoria Horticultural Society (Gardening education and support): [www.vichortsociety.org](http://www.vichortsociety.org)

Lifecycles (Local food programs and resources): [www.lifecyclesproject.ca](http://www.lifecyclesproject.ca)

Horticultural Centre of the Pacific (Gardens, plant sales, programs and classes): [www.hcp.ca](http://www.hcp.ca)

BC Farms & Food (local e-magazine and farm map): [www.bcfarmsandfood.com](http://www.bcfarmsandfood.com)

Border Free Bees (Resources, inspiration, citizen science): [www.borderfreebees.com](http://www.borderfreebees.com)

Victory Gardens for Bees (blog, pictures, info, book): [www.beespeakersaijiki.blogspot.ca](http://www.beespeakersaijiki.blogspot.ca)

# Appendix C: Pollinator Habitat Site Evaluation Rubric

Use this rubric to evaluate each site being considered for pollinator habitat development. Circle the description that best represents the site. Do not proceed with a site that receives a zero in any category. If a site is in between scores use the blank boxes or modify the rubric as you see fit. This rubric is just a starting point, feel free to adjust and modify to suit your project needs.

Score	0 - do not proceed with site	1	2	3	4	5	6	7	Site 1	Site 2	Site 3
Existing Vegetation Management Regime	The vegetation is mowed down weekly to about 3 inches and there is little flexibility for change.	There is not an existing vegetation management regime and the majority of plants are not desirable.	The vegetation is mowed down weekly but this practice can be changed.	The vegetation is mowed once or twice a year, invasives are not removed outside this period.	The vegetation is mowed once or twice a year and invasive are removed regularly.						
Site Size				10+ acres	3-10 acres	1.1-3 acres	0.1-1 acre				
Sunlight			Full Shade		Partial Shade		Full Sun				
Water Availability	No water available			No water on site, but ability to bring it in via truck or other means and available work hours			Accessible water sources (spickettes with hoses) and available work hours				
Slope	4-6-90 extreme slope (inaccessible)		16-45 steep slope			6-15 moderate slope	0-5 degree, gentle slope				
Soil Texture			Compacted		Clay, gravel, or sand		Well drained loam				
Soil pH	Alkaline soil, pH above 7.5 or Acidic soil, pH below 4			Acidic soil, pH between 4 and 5.5	Slightly acidic soil, pH between 6.5-5.5		Neutral pH between 6.5-7				
Existing Pollinator Plants				No existing nectar plants.	1-2 identifiable nectar/pollen plants blooming in 1 season	2-4 identifiable nectar/pollen plants blooming in 2 seasons	4+ identifiable nectar/pollen plants blooming in 3 seasons				
Ability to Reduce Undesirable Plant Species	No ability to reduce undesirable plant species			Initial removal of undesirable species will be incorporated into the project.			Aggressive and sustained removal of undesirable species will be incorporated into the management of the site.				
Visibility and Accessibility	Difficult to access for land managers			Only visible and accessible only to land managers.	Visible to the public and accessible to land managers.	Visible to the public and accessible to land managers and some of the public.	Visible to the public and accessible to land managers and public.	Visible to the public and easily accessible to land managers and children and persons with disabilities)			