

Promoting Pollinators in Agriculture

A Nordic-Baltic Guide To Measures For Wild Pollinators



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Introduction

A report from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2016) concludes that 75% of our food crops and nearly 90% of wild flowering plants depend at least to some extent on animal pollination. The assessment also mentions that a high diversity of wild pollinators is critical to pollination, even when managed bees are present in high numbers.

This brochure is a product of a Nordic-Baltic collaboration project called “Nordic Project on Edge Zones and Green Corridors in the Agricultural Landscape”. This project was created in order to promote better conditions for pollinators in the Nordic-Baltic countries, especially in agriculture. The project is funded by Nordic Council of Ministers, and this brochure is written by La Humla Suse, Pollinera Sverige, Vilde Bier, Hämeen Ammattikorkeakoulu and Põllumajandusuringute Keskus.

This brochure contains information about bumblebees and other pollinators, why their status is threatened, and what we can do to help them. Feel free to distribute this brochure among farmers, authorities, governmental bodies, various institutions and organizations.

Bumblebees in Northern Europe

Bumblebees are primarily important as pollinators, not as a decomposer or as prey for other species. Bumblebees are effective pollinators, and crucial for food production, especially here in the colder Northern Europe. They are also the most important pollinators of wild berries such as blueberries, lingonberries and raspberries. Bumblebees are also the main species pollinating tomatoes in greenhouses, as this job does not suit honeybees.

Bumblebees are common pollinators in the northern hemisphere. There are around 250 species globally. Norway has 35 species, Finland has 37 species, Sweden has 42 species, Denmark has 29 species and Estonia has 28 species. This means that the Nordic-Baltic countries house around 14,5% of all bumblebee species in the world. In comparison, we only have about 1% of the world's bee species.

We can categorize the bumblebees into two main groups, the ones with short tongues and the ones with long tongues. Short-tongued bumblebees are important pollinators of plants with short flower tubes and easy access to nectar, such as dandelions (*Taraxacum officinale*), white clovers (*Trifolium repens*) and field scabious (*Knautia arvensis*).





Bumblebees with longer tongues often depend on semi-natural pastures and hay meadows, fields with some special agricultural crops and some flower rich permanent grasslands. Bumblebees pollinate more specialized plants like different types of legumes such as red clover (*Trifolium pratense*), bird vetch (*Vicia cracca*), lungwort (*Pulmonaria officinalis*) and columbine (*Aquilegia vulgaris*). Long-tongued bumblebees' state is rapidly decreasing due to an increase in monoculture farming in the industrialized agriculture sector.

The varying tongue length of the bumblebee species allows it to pollinate a larger selection of flowers than any other wild bee species. This extensive pollination contributes to greater biodiversity in plants, and in turn, to greater biodiversity in general.

Bumblebees stand out from other pollinators as they have a pollination strategy called "buzz pollination". Some plants make their pollen hard to get by packing it tightly into a small space. The bumblebees are able to get this pollen by vibrating their wings, which makes the pollen loosen from the plant. This is called "buzz pollination" because the vibration makes a very loud buzzing-noise. Without bumblebees, tomato and eggplant yields would be smaller, and their seeds to a large extent be selfed.

The Life Cycle of a Bumblebee

In order to understand bumblebees and their needs better, a basic understanding of their life cycle is important. Their life cycle is similar to the honeybees (*Apis melifera*), but there are some key differences.

The fertilized bumblebee queens usually wake up from their winter slumber in early spring. The first thing they need is nutrition, nectar, from flowering plants. Trees and bushes in the *Salix* genera are usually a life saver for bumblebees, as they bloom early in the spring. Bumblebees don't build their own nests like many other social insects do (ants, wasps, honeybees). They often search for abandoned rodent nests to live in, but can also use underground burrows, bird boxes and even house walls, garden pots and brick fences. When the bumblebee queen has found a place to nest, she lays fertilized eggs in a jar-like structure that she builds of wax. She will sit on top of the jar and incubate the eggs.





The hatched larvae depend on the queen to feed them with pollen in order to grow. After about two weeks the larvae will pupate and develop into their final stage as adult bumblebees.

The first hatched bumblebees are all female bumblebees, called worker bees. They dedicate their lives to work for the queen, and their job is to search for pollen and nectar to bring home, as well as helping with the new larvae. Only the queen will reproduce. The worker bees become sterile under her rule. The bumblebee queen will late in the summer start to lay eggs, which she signals are going to be new queens. These larvae are fed a lot more pollen and grow larger than the worker bees. The queen will also produce unfertilized eggs hatching male bumblebees. They leave the nest as soon as they can fly. Usually the male bees spend their days and nights on flowers, waiting for the new bumblebee queens and trying to mate. The fertilized bumblebee queens continue to consume a lot of nectar preparing themselves for the winter. Late in the season they dig themselves a winter nest a couple of centimeters into the soil at a slope facing north. Here, the queens will lie until spring arrives and a new season can begin.

The bumblebees need sufficient floral resources and nesting sites in order to complete their life cycle. The bumblebee life cycle, pollination and food production are dependent on traditional farm landscapes containing flower rich pastures and meadows. For bumblebees it is crucially important that flowers are available from early spring to late fall. It has become harder for bumblebees to find suitable nesting sites in the modern agricultural landscape as there are fewer old rodent nests available. Less rodent nests is good for the agricultural production, but bad news for bumblebees looking for nests.





Agriculture in the Nordic-Baltic Countries

In the past flower rich semi-natural hay meadows and pastures covered large areas in the Nordic countries. Due to modernizing of agriculture these nature types have rapidly declined and remaining areas are fragmented. This makes it difficult for pollinators to move from one to another habitat. Land use processes are the main threat to bumblebees and other wild pollinators. Modern monocrop farmlands with wind pollinated food crops are often food deserts for pollinators. In addition, transformation of suitable habitats to other "deserts" as large industrial areas, highway roads and urban cities also contributes to the negative development for pollinators.

Clover has been grown for a long time as animal feed. This is a highly desired plant for many pollinating insects. *Bombus distinguendus* is even called "Clover-bumblebee" in several countries in Northern Europe, as this species has grown to be more or less dependent on this flower. Today, growing clover has become less common. This is probably the main contributing factor to the dramatic decrease in *Bombus distinguendus* in several European countries.

Pesticides

The increased use of pesticides in agriculture is also a huge problem for pollinating insects. Pesticides are meant to harm weeds and unwanted pests on farm crops, but unfortunately, the insecticides are equally harmful to wild bees, including bumblebees. In addition herbicides may change the flora both in the field and in the field verges in a negative way for pollinators.



Toxins like neonicotinoids, until recently one of the most common insecticides in Europe, can lead to dysfunction in basic motor skills in bees - such as flying, walking and grooming. Research shows that when bees are exposed to the toxins over a longer period of time, their food consumption and foraging functions are impaired, which ultimately affects the whole colony. Moreover, scientific studies show that when bumblebee workers are exposed to neonicotinoids, they also affect the reproduction of new bumblebee queens. Over time this will result in fewer bumblebee nests. Several countries have started to restrict the use of neonicotinoids, but there are still other pesticides and insecticides that are harming our pollinating insects.



Meadows, Flowering Zones and Flowering Stripes

Bumblebees and other pollinating insects are completely dependent on flowering plants. They collect nectar to feed themselves and pollen to feed the larvae. Semi-natural hay meadows, specifically, are crucial to bumblebees as they represent a large and important food source. These meadows mostly have a high diversity of flower species, which means a high diversity of insects as well. Such traditional managed meadows were mowed late in the season. Mowing keeps the areas open and free from bushes and trees and maintains a vegetation with many different plants resulting in flowering from spring to autumn. Because of this, pollinating insects had access to stable sources of food throughout the flowering season. Semi-natural pastures are more grass dominated but also contain many of the same flowers as the hay meadows.

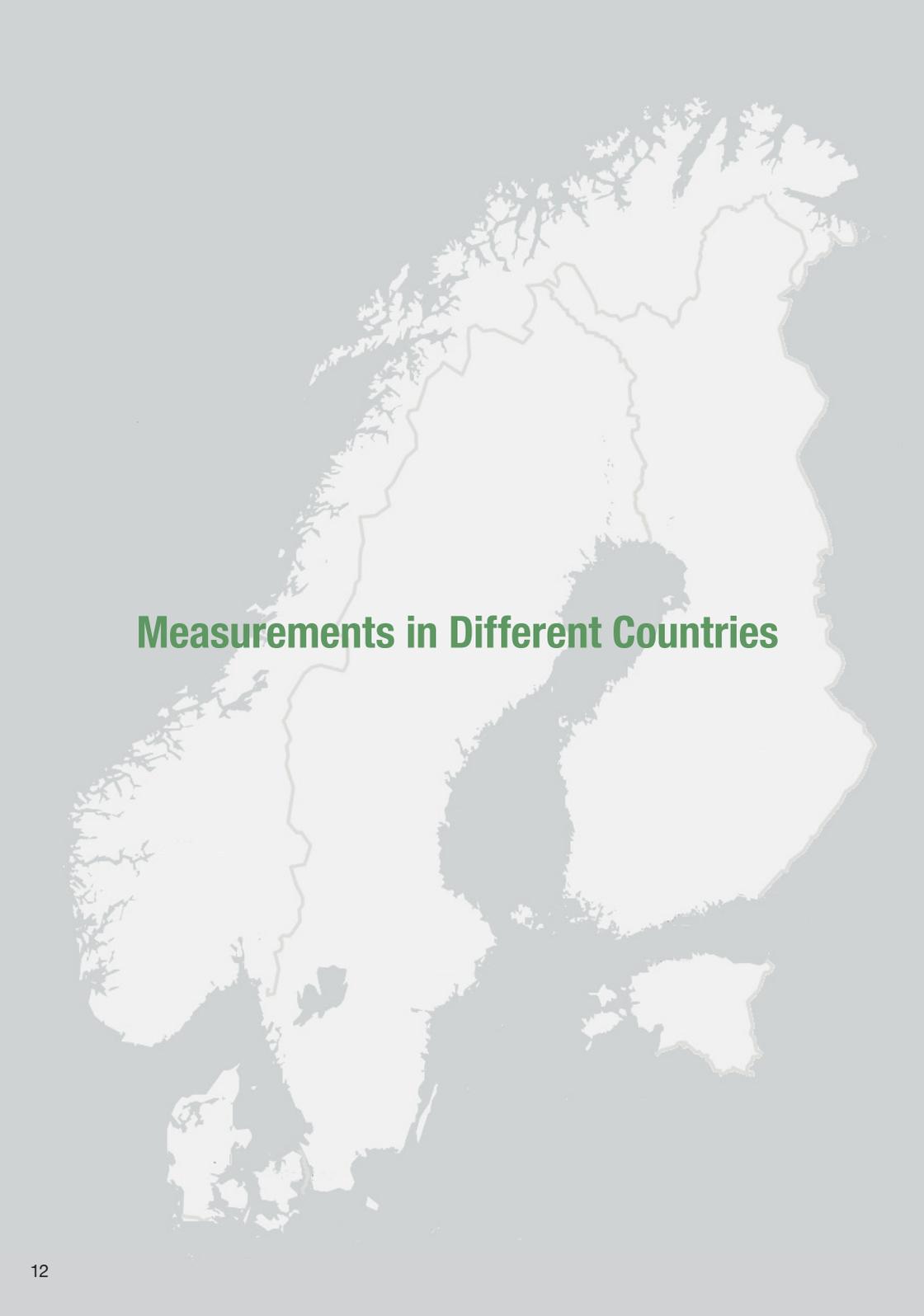


Since the area of flowering habitats for pollinators has been so dramatically reduced and fragmented, some farmers establish flowering fields or flowering zones/flowering stripes in order to improve living conditions for pollinating insects. The flowering stripes are usually established on fields or along the crop fields by sowing annual flowering species. However, in the Nordic countries semi-natural meadow vegetation still exists in several places in pastures, field edges and road verges.



These habitats are mostly more species rich than sown flowering strips and thereby give opportunities for more pollinator species. In addition, research shows that field edges with local flora may attract insects which feed on pests, resulting in lesser need for pesticides. Maintenance of local meadow vegetation thus may become a win-win situation. Sometimes the pasture remnants and field edges are about to become overgrown. They then must be restored by clearing shadowing bushes, trees and invasive species before they can be managed by mowing or grazing.

A bumblebee needs constant access to nectar. Think of it as a car needing gas to work. A bumblebee constantly flying have less than an hour before the 'gas tank' is empty and nectar is needed. Flowering field edges and road verges may work as green corridors in which pollinating insects can find food resources and refuel their nectar tanks. With the decrease in flowering meadows and pastures in farmlands, these green corridors are essential to connect suitable habitats for the survival of pollinating insects.

A stylized map of Europe is shown in a light gray color against a dark gray background. The map is overlaid with a green, textured pattern that resembles a forest or a dense thicket of trees. The text "Measurements in Different Countries" is centered over the map in a bold, green, sans-serif font.

Measurements in Different Countries

Denmark

There is a support system for establishing flower stripes in the crop rotation system any time during the year in Denmark. The flower stripes cannot be established on permanent grasslands, permanent crop fields or other permanent natural areas. The flower stripes must be kept free from shrubs and trees. The flower stripes can be combined with other measures such as fallows. They can be maximum ten meters wide and cannot cover more than 10% of the field. If there are several flowering stripes on the same field, the distance between them must be ten meters. In such a way the corridors are not all established in one place, but spread out on the entire farmland. The flower stripes must not be fertilized.

There are no overall statistics on how many kilometers of flower stripes that are established annually in Denmark, but it may be growing. There is also a lack of data on which flower species are sown. However, we know that many of the species included in the seed mixtures used in flower stripes do not originate from wild, native species in Denmark. They come from plants grown abroad and many of the species are garden species to which wild bees in Denmark are not adapted to. Using seed mixtures containing non-native plants could become a problem. Invasive plant species is a global problem and removing them is quite expensive. It would be better if regulations required them to use local seed mixtures.

There is no requirement for farmers to establish semi-natural lands, so called marginal lands, on their property. The municipal authorities are the main managers of the roadsides. Usually traffic safety takes priority over biodiversity. Hedges are often managed rather roughly, which results in that fences are often not optimal for bees. Hedges and fences could be a good habitat for bees if there were more available information for farmers on how to take care of them in a more natural way.

Sweden

The road verges on Gotland island are divided into summer cutting and autumn cutting areas. Summer cutting is done in places that have a lot of grass as well as close to crossroads and inner curves, near permanent road related structures, and where there is high and nutritious grass growing along roads.

Summertime roadsides are cut at least 150 cm width and during the autumn a wider area is cut, at least 300 cm width. Normal straight road verges are cut less as uncut areas on these distances do not disturb the drivers view of other road users. Road verges close to crossroads may be cut more in order to get a safer view of other road users. Summertime cutting height is not less than 20-25 cm as in order to favour low growing plants. The summer cut is done from the beginning of June to mid-July.

The decision of cutting road verges is made by the client and the entrepreneur. The decision is based upon how much of the grass has been growing and if it has been a warm or cold spring. Priority maps are also made in order to show which places must be cut first. The responsibility falls on the entrepreneur that cuts the grass and his observations of flowering road parts. These flowering parts will not be cut before autumn. The autumn cut is carried out from late August to mid-October.

Sweden has a number of measures in order to achieve a diverse agricultural landscape in areas with intensive farming. The measures improve ecosystem services and increase yields by enhancing the number of pollinators. The measures are rarely associated with an actual subsidy. There is a possibility to set aside cultivation areas for environmental measures, so called Ecological Focus Areas and projects have shown that these can be used in order to increase field biodiversity. Establishing flower stripes is one of many simple efforts that may be carried out by the farmer.

The Swedish Board of Agriculture has initiated a number of Demonstration farms, currently 13 farms, to illustrate different on-farm measures for pollinating insects.

”Hela Skåne blommar” is a collaborative project with sponsors that was initiated by and administered by The Rural Economy and Agricultural Societies. By growing flowering stripes, we give bees and other pollinators pollen and nectar. The project involves more than 250 farmers who grow a total of 600 kilometers of flowering roadsides in Skåne, which is equivalent to up to 300 hectares of flowers.

Estonia

Estonia do not yet have any support for flowering zones for wild pollinators. Farmers could apply for support for the activity “establishing foraging areas for bees” since 2015 under the Estonian Rural Development Plan (ERDP) 2014-2020. This measure is mainly related to honeybees. The applicant must have at least 10 honeybee hives or an agreement with a beekeeper, who has at least 10 honeybee hives registered in the Register of Farm Animals. The support granted is based on how much land is established with melliferous plants (flowering plants which are especially good for honey production) and the foraging area should start no farther than 200 metres from the hives. The species list of melliferous plants allowed includes 32 plant species. This is a one-year measure, and the plants are sown on arable fields. The areas must not be mowed or grazed until mid-August and glyphosates are prohibited.

Several other measures applied in the frame of ERDP 2014-2020 may have indirect positive impact on pollinators: e.g. support for the management of semi-natural habitats and organic farming, environmentally friendly horticulture, as well as environmentally friendly management support.

Farmers applying for environmentally friendly management support must follow certain requirements. E.g. there are restrictions on the use of glyphosates and leguminous crops should be grown on at least 15% of arable land – accordingly less pressure from pesticides and additional food resources for pollinators. In addition, a strip of permanent grassland or linear landscape element of 2-5 m wide must be maintained or created between eligible land larger than 20 hectares and a public road. The created strip must contain at least three plant species – mix of grasses and other herbaceous plants. Thus, it is not a mix of many flowering plant species offering abundant food for pollinators – the purpose of the requirement is biodiversity in general (included natural pest control) but the strips are also binding CO₂ during the process of photosynthesis and contribute to decreasing soil erosion.

In practice, the benefit of the strips to pollinators is variable: some of them have mainly grasses, while others also have other flowering plant species. In 2019 environmentally friendly management support was applied by ~1400 farmers and covered ~46% of the agricultural land but there is no statistical data on how many permanent grassland strips were created.

Furthermore, citizens are encouraged to cut their lawns less frequently and leave unmown (species-rich) patches. For example, Tartu city has some places where species-rich seed mixes have been sown and sparingly mowed. Garden owners are also encouraged to make their gardens into good sources of food for pollinators by growing plants suited for them.

Finland

Finland has no government support programs for growing food plants for pollinators. There are, however, some trial runs with growing *Phacelia tanacetifolia*, *Trifolium incarnatum*, *Trifolium resupinatum* var. *majus*, *Vicia sativa* and *Raphanus sativus* var. *niger*. Some farmers have recently been planting annual flowers on their fields for improving biodiversity in general and in order to increase the population of pollinators. Some cities have been planting sunflowers for self-picking. An increasing number of cities are cutting lawns less frequently, and some have also planted flowering plants in parks and other recreational areas.

Farmers still cut grass along road and field sides. Little attention has been paid to how and when the roadsides are cut. The Finnish Transport Infrastructure Agency had a project called NIINI in 2006. In this project they ran trials on cutting different roadsides at different times. Results showed that there were more butterflies and insects on roadsides cut in late August.

Norway

The term “flowering zones” has been relatively unknown until recent years in Norway. The Non-Governmental Organisation (NGO) La Humla Suse has worked with farmers since 2013, and more specifically with a project on flowering zones since 2017. Thanks to a 2018 national pollinator strategy, it is now possible for farmers to apply for funds to establish flowering zones and new flowering meadows. In addition, an action plan for semi-natural hay meadows was adopted in 2011 based on the Biodiversity Act to maintain still existing areas by supporting the farmer with knowledge and economic support.

The national pollinator strategy’s aim is to distribute information and promote pollinator habitats to increase the populations of pollinating insects. The Norwegian Public Roads Administration has monitored the roadsides to give

these areas proper management. Road verges with a high plant diversity are often not mowed until in late August. As a result the flowering plants will flower the entire season and produce seeds, which may bloom the following year.

An important objective of the strategy is to establish common goals and focus areas for coordinated national commitments, that build on what has already been initiated in public and private sectors. The individual efforts which make a difference for pollinators will be reinforced by means of effective cross-sector coordination. The sectors which are specified in the strategy include private, environmental, agricultural, transport, municipalities and the armed forces. Hopefully, a cross-sector coordination of measures will secure better living conditions for pollinating insects.

A plant list developed by several environmental NGOs and research institutes contains an overview of different flowering plants with a high pollen and nectar production. The plants listed here are either a part of the national flora or introduced species with low to no invasive potential. This plant list is published on a digital platform open for the public to use. It contains a lot of information which makes it easy for anybody to find out how to support pollinators.





Wild Bees and Honeybees

It is a popular belief that the solution to “saving the bees” is to increase the number of honeybees. The Dark Nordic honeybee (*Apis mellifera mellifera*) is threatened, but contrary to the picture painted by the media, other honeybees in the Nordic-Baltic countries are not a threatened species. They are important pollinators and their honey production makes them a beloved insect. However, an increase in honeybees may also increase the competition for the already scarce food sources between them and other wild pollinators. Scientific studies from Sweden show that an increase in honeybees in areas with wild bees decreases the wild bee population.

Furthermore, honeybees have short tongues and therefore cannot pollinate all types of flowers. Flowers with deep flower tubes need pollinators with long tongues, such as long-tongued bumblebees. Some research also suggests that crop harvest is boosted when pollinated by wild bees, especially bumblebees, compared to honeybees.

Bumblebees are native to our cold Northern Europe, unlike the modern honeybee species that are imported to Northern Europe from southern regions. The endangered Dark Nordic honeybee is however a native species in the region. Bumblebees adaptation make it possible for them to fly and pollinate in colder temperatures than the most honeybees can. Bumblebees are also better pollinators compared to honeybees. The reason for this is simple: as there are more species of bumblebees, there is a wider variety in lengths of tongue and, thus, more variety in the kinds of flowers they feed from. They are fast workers and, because of their larger bodies, they can carry larger loads. Therefore, to focus on our wild bees, especially the ones with long tongues, is highly necessary.

Helping Bumblebees and Wild Pollinators



The decrease in our pollinating insects is a global problem, and a frightening one. But the solutions are often easy, easily accessible and require little effort. Everyone, regardless of their job, social status or economic situation, can contribute.

There are two factors that should be focused on when it comes to pollinator measures – food resources and nesting places. If these two factors are met, then the wild bees should be in good hands. It is important to focus on these wild bees, instead of compensating with honeybees.

5.1. Do not use pesticides

Avoid pesticides that pose a huge problem for pollinating insects. Pesticides are meant to harm weeds and pests, but bees and bumblebees are also harmed when exposed to these toxic chemicals. By reducing the use of pesticides, the health of wild bees and honeybees will improve.

5.2. Plant flowers

You can promote pollinators by planting different types of flowers wherever possible. There are many suitable areas, such as in your backyard, on the balcony, on the rooftop, along road verges, on top of bus stops and at the entrance of office buildings.

It is important that you choose plants that flower at different times. You should have different plants to secure flowering from early spring (March/April) to late fall (October/November). In this way bees have food sources throughout their lifespan. If you choose plants benefitting long tongued bees you may especially help vulnerable wild bee species. Some countries have NGOs providing recommendations on pollinator friendly plants.

5.3. Mow the lawn less

You can mow parts of the lawn just once late in the season giving wildflowers loved by bees a chance to bloom. Weeds will likely also pop up, but some weeds like dandelions are a favourite of many bees. Try also to remove any species which are alien or invasive in your garden. In this way you support the local biodiversity, and you may make a huge benefit for the bees.



5.4. Leave some areas undisturbed

Please do leave some areas more or less undisturbed as you will then create habitats for solitary bees. Let weeds grow freely and leave dead wood and branches, but also keep trees and bushes from growing in order to keep the area open. In this way you will create both a source of food as well as nesting areas for insects.

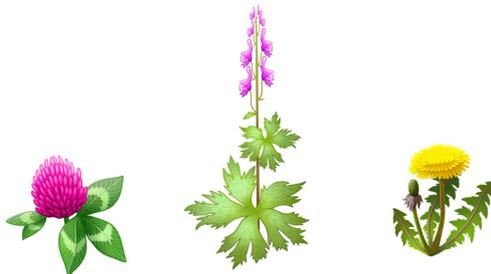
5.5. Creating nests

You can help our bees and other insects find a place to nest by making room for an insect hotel and bumblebee nesting box in your garden. You can buy it or build it yourself. Most insects, and most of the wild bee species, are solitary. This means they don't live and breed in the same place for the entire season. If they lay their eggs in an insect hotel, they leave a little "lunch box" for the larvae, and close the pipe behind them as they leave the insect hotel.



The bumblebee boxes are for social bumblebee species. Wasps, honeybees and bumblebees live and nest in the same place for the entire season. They have a hierarchy with a queen, workers and males. The bumblebees are, unlike wasps, not very good at making their own nests. They tend to look for abandoned rodent nests which they use as their nesting ground. However, there is a noticeable decrease of mice and their nests in the modern agricultural landscape. A bumblebee box tries to simulate a rodent nest and may be good help for the bumblebee queens.

It is important to maintain insect hotels and bumblebee boxes. Used hotels and boxes must be cleaned before next year's use to prevent spreading diseases.





Helpful links from the different countries

Norge:

- Pollinator vennlige planter:

<http://blomstermeny.no/>

- Informasjon om humlekasser:

<https://www.lahumlasuse.no/humlekasser/>

- La Humla Suse:

www.lahumlasuse.no

- Lag ditt eget insekthotell:

<https://www.nhm.uio.no/fakta/botanikk/nyheter/2016/lag-et-insektshotell.html>

- Kantsoneprosjektet i Buskerud:

<https://www.fylkesmannen.no/nb/oslo-og-viken/miljo-og-klima/naturmangfold/kantsoner/kantsoneprosjektet-i-buskerud/>

Danmark:

- Bivenlige planter:

<https://www.bjavl.dk/bivenlig/planter/>

- Bliv bivenlig:

<https://www.bjavl.dk/bivenlig/>

- Vilde bier:

www.vildebier.dk og www.bieridanmark.dk

Sverige:

- Våkstguide och gör en fröbomb:

<https://www.pollinerasverige.se/category/odling/>

- Pollinera Sverige:

www.pollinerasverige.se

- Artikel om svensk bondes tiltak för pollinatörerna:

<https://www.pollinerasverige.se/category/jordbruk/>

- Åkerlandskapet:

<https://jordbruksverket.se/vaxter/odling/biologisk-mangfald/akerlandskapet#h-Nyttodjur>

- Trycksacker om pollinere:

<https://webbutiken.jordbruksverket.se/sv/artiklar/miljo-och-klimat/trycksaker-7/ett-rikt-odlingslandskap/gynna-mangfalden/insekter-och-spindeldjur/pollinere/index.html>

Eesti:

- Looduslike taimede seemned:

<https://www.nordicbotanical.eu/seemned-1>

- Trükis "Eesti kimalased":

https://pmk.agri.ee/sites/default/files/uploads/sites/2/2018/03/Eesti_kimalased_2017.pdf

- Facebooki grupp "Meie kimalased ja erakmesilased":

<https://www.facebook.com/groups/kimalased/>

- Elurikkust soodustavad tegevused põllumajandusmaastikus:

<https://heapold.ee/tegevused>

- Mesilaste hotellid (ava fail „Fail_Maakodu,2011,5.pdf“):

<https://www.etis.ee/Portal/Publications/Display/6a536084-b596-4716-b5ae-728787f15d27>

- Eesti maaelu arengukava 2014-2020:

<https://www.agri.ee/et/eesmargid-tegevused/eesti-maaelu-arengukava-mak-2014-2020>

Suomi:

- Maatiainen ry:

www.maatiainen.fi

- Pölyttäjäverkosto:

<https://www.facebook.com/groups/763417534023039>

- Perinnemaisemahdistys:

<https://perinnemaisemat.fi/>

- Suomen Mehiläishoitajain Liitto:

<https://www.mehilaishoitajat.fi/>

- Suomen Mehiläishoitajain Liitto: Pölyttäjiä pihalle ja puutarhaan:

https://www.vyl.fi/site/assets/files/3049/polyttajia_pihalle_ja_puutarhaan_nettiin.pdf

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Written by: Eirin Bruholt and Annika Michelson with Eneli Viik,
Jørgen Pedersen, Magnus Grøntoft, Jenny Henriksson and Björn Gustavsson.

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