



Bee Plant Finder Tool (BPFT)

Feature Descriptions

Group A: Site Conditions and Plant Tolerances

SOIL TYPES: Three single-state features to cover soils are dry, moist, wet.

You can specify the soil moisture of your site as an initial screen to select suitable bee forage plants. You can select more than one soil moisture type to cover seasonal changes. This means that you are selecting only plants that prefer or tolerate **both soil types**. This will give you a restricted set of plants -- in technical terms we want the intersection set of soil moisture categories to cover large seasonal changes in moisture because the plants must tolerate both conditions.

For example, your site might normally have moist soils that occasionally get wet and/or dry. Plants that tolerate combinations of moist with wet or moist with dry are common. However, few plants can tolerate both extremes of wet and dry. Yet there are a few that do (e.g. *Alnus nitida*).

It is worth noting that these soil types are general definitions. For example, plants that tolerate or prefer wet soils does not necessarily mean they tolerate prolonged flooded sites. Similarly, plants that tolerate or prefer dry soils does not necessarily mean they tolerate prolonged drought. You will need to do further research on specific capacities of plants to tolerate extreme in soil moisture.

A_1. Dry soils

Single category: plant prefers or tolerates dry soils which may be indicated by any of the following:

- have a low moisture content and may appear dry or dusty
- are typically well-drained
- are located in areas with low rainfall or high evaporation rates
- are often characterised by their sandy or gravelly texture.

A_2. Moist soils:

Single category: plant prefers or tolerates moist soils which may be indicated by any of the following:

- have moderate levels of moisture and may feel damp or slightly wet to the touch
- are typically found in areas with regular rainfall or good water retention in the soil
- are often characterized by their loamy texture, which is a mix of sand, silt, and clay

A_3. Wet soils

Single category: plant prefers or tolerates wet soils which may be indicated by any of the following:

- have high levels of moisture and may be waterlogged or even flooded for short periods
 - are typically found in low-lying areas or areas with poor drainage
 - are often characterized by their heavy, clayey texture
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A_4. Light Conditions

Three categories in this feature are: full shade, partial sun, and full sun.

You can specify shade/sun levels as an initial screen to select suitable bee forage plants for your site. We advise you to select only one light condition per search for each type of area within your site.

- Separate searches are needed for sites that include different light conditions.
- Selecting two categories in one site search can result in putting plants in an unsuitable light condition if they are not tolerant of more than one condition.
- Plants that tolerate two light conditions are uncommon to rare.

When your site has different areas with more than one category of light condition (e.g., full sun and partial shade), then separate searches are needed for each area.

If you did select two categories in one search then you would not be able to capture the distinction among, for example, plants that tolerate full sun only, plants that tolerate partial shade only, and plants that tolerate both full sun and partial shade.

This means you are running the risk of installing plants that tolerate only one condition (e.g., full sun only) in the wrong area of the site (e.g., partial shade). Nevertheless, it will not be a problem for any plants that are able to tolerate both light conditions but not many plants have such wide tolerances.

In other words, if you select more than one sun/shade type per search then you will be selecting not only plants that are tolerant of both states but also plants that are tolerant to only one state. In technical terms you are selecting the union set of tolerances to (1) full sun only, and (2) partial shade only, and (3) full sun and partial shade. This could lead to errors in placing plants.

Tolerates or prefers full shade

Plants that need full shade thrive in areas with limited or no direct sunlight, usually recommended as less than three hours of direct sunlight per day.

Tolerates or prefers partial shade

Plants that need partial shade thrive in areas with at least three hours but less than six hours of direct full sun. They generally need some direct sun to photosynthesize, but also need protection from the intense heat of the sun.

Tolerates or prefers full sun

Plants that need full sun thrive in areas with six hours or more direct sunlight per day. They need a lot of sunlight to photosynthesize and produce energy and are tolerant of intense heat and light for most of the day.

Group B: Plant Features

B_1. Life Form: type of plant required for the bee plantation.

You can select more than one category of life form, or you can run a number of searches for each type of life form for parts of your plant lists.

Categories are for seven types of plants as follows:

Tree: a large woody plant that reaches greater than 3 m in height when fully grown. Trees usually have a single main trunk that is bigger than 10 cm.

Shrub: a woody plant that rarely reaches greater than 3m in height when fully grown. Shrubs usually have several woody stems which branch close to ground level.

Herbaceous perennial: a flowering plant that lives and produces flowers for multiple years but does not produce woody stems or branches. Herbaceous perennials can continue to grow and bloom for many years under the right conditions.

Herbaceous annual or biennial: an annual flowering plant completes its entire life cycle, from germination to flowering and seed production, within a single growing season. These plants typically produce soft, non-woody stems and leaves and do not survive the winter. A biennial flowering plant requires two growing seasons to complete its life cycle. It flowers in the second year.

Large-tufted plant: Plant with one or more groups of short branches all arising at the same level as in *Astelia* and *Phormium* (NZ flax)

Climber, vine: plants with long, flexible, climbing stems that are rooted in the ground, and usually have long dangling branches. A plant that either relies on others for support (climber or liane) or the stems lie loosely along the ground (creeper). It may be woody or non-woody.

Crop plant for seeds, green manure, or pasture: plants that are planted in large areas as perennial, biennial, or annual plants. Such large patches can be important to bees if the crop is allowed to flower.

B_2. Plant height maximum at maturity: in metres and divided into 8 categories.

Categories are: Less than 1 metre; from 1 to 2 metres, from 2.1 to 5 meters, 6-10 m, 11-15 m, 16-20 m, 21-30 m, greater than 30 m.

The maximum plant height at maturity is the height the fully grown plant might achieve. Multiple height categories can be selected to give a wider range for this feature. These height categories are aligned with the types of planting outlined in the *Handbook for Planting Trees for Bees on Farms* – refer to section 3.4 Spacing and arranging plants.

Our height scores are based on maximum height to indicate the upper limit. In contrast, nurseries might specify height at age ten years, which for larger trees can be well short of their full height. Plants might not reach their maximum specified height if growing conditions are poor and may exceed the maximum height if conditions are exceptional. Consult local nursery or plant experts.

B_3. Flowering season: time of year when flowers open to full bloom

Categories are: spring, summer, autumn, winter

More than one season can be selected. The flowering season is when a plant opens its flowers to deliver pollen and/or nectar. The bee's need for pollen or nectar depends on the stage of the bee colony life cycle. For example, in spring bees need plentiful pollen for colony build-up while in autumn bees collect more nectar.

Our scores for flowering time are based on the four flowering seasons as provided in the plant and nursery literature: **spring** (September to November); **summer** (December to February); **autumn** (March to May); and **winter** (June to August). **READ MORE...**

However, New Zealand beekeepers often define five seasons based on bee colony life cycle stages: **early spring** (August to September); **late spring** (October to November); **summer** (December to February); **autumn** (March to May) and **winter** (June to August).

It is worth noting that in both systems, flowering times are usually reported at a national level so the months of flowering in your location may be earlier in the far north and later in the far south.

The flowering time information is therefore at a coarse scale because regional climatic differences and local habitat conditions change flowering times by many weeks. To confirm local flowering times consult local nurseries or other experts.

To work with the adjusting of your flowering time profiles see *Handbook for Planting Trees for Bees on Farms* – Section 4: How to Prepare a Bee Forage Plan <https://treesforbeesnz.org/download-planting-handbook>.

B_4. Deciduousness for trees and shrubs

Categories are: deciduous or evergreen.

A deciduous plant sheds its leaves annually, typically in the autumn season in temperate climates such as New Zealand but some plants shed leaves in a dry seasons or drought. Many exotic trees and shrubs are deciduous (e.g., maples, oaks) but most native trees and shrubs are evergreen.

An evergreen plant retains its leaves or needles throughout the year, rather than shedding them seasonally. This means that evergreen plants remain green year-round, even in cold or dry seasons.

Evergreen plants are important for reliable shelter and winter production of flowers, whereas deciduous species can be helpful where you don't want to shade paddocks or apiaries in winter.

Some plants are semi-deciduous because they partially or only occasionally shed leaves (e.g., *Fuchsia*). These plants have been scored as both evergreen and deciduous in the key so you can select either deciduous or evergreen and the plant will still be included in your candidate list.

B_5. Plant native or exotic (tick one or neither)

Categories are: native or exotic.

You must only select one or the other category. Do not select both because the other features in the subsequent bee-related section will not function properly. If you do not tick either, then the key will retain all native and exotic plants and your plant list will not be restricted by this feature.

A native plant occurs naturally and belongs to the indigenous New Zealand flora. Native bee plants are important bee forage in areas where there is a risk of exotic plants invading natural habitats.

An exotic plant is non-native and has been introduced to New Zealand by intentional or unintentional human activities. Exotic bee plants often have an advantage because they usually produce copious nectar and plentiful pollen and flower at times when few native plants are flowering such as early spring and late autumn.

Exotic plants range from cultivated only, which have no weed risk, to fully naturalised, which have various levels of invasiveness. We excluded all plants from the key that are on the New Zealand invasive weed lists of the NPPA (www.mpi.govt.nz/biosecurity) and Weedbusters (www.weedbusters.org.nz) LINK. We included some important bee forage plants that are weedy for some regions only so check with your regional council to see which ones are local unwanted pest plants.

Group C: Bee-related Features

C_1. Attractiveness to Bees

Two categories are highly versus moderately attractive.

Select one or both categories. To optimise your plant list for bee health, you can select plants that are highly attractive to bees. Highly attractive plants will have combinations of any these factors:

- Easy access to collect the pollen or nectar without much effort or learning
- High density of flowers covering most of the plant
- High concentration of sugar in the nectar
- High volumes of nectar even if somewhat diluted (as in bird-adapted flowers)
- High volumes of easily accessible protein-rich pollen

This feature allows you to enhance your selection of candidate bee plants by focusing in on the best bee plants that deliver the greatest rewards with the least effort for the bees.

Highly attractive bee plants can be recognised because you will hear the loud buzz of huge numbers of bees foraging on the plant on a sunny day(if bees are in the area). Highly attractive plants outcompete other good bee plants in the same area. Bees are seen visiting them even when they are in small, isolated patches.

On the other hand, moderately attractive plants are easily outcompeted, and usually only visited when they are in a large enough patch to make foraging efficient because there are enough flowers to make the effort of foraging efficient. Some flowers take a lot of work so bees do not recruit nest mates to forage on them unless they are the only plants flowering in the region. You would select this category in addition to highly attractive if there are not enough candidate plants in your search that are highly attractive, thus expanding your list of candidate plants that suit your site.

There are only two categories for this feature because if the attractiveness of plant is very low then we did not put it in the database for this key. All the plants in this key are bee forage plants at some level.

C_2. Importance for bees in New Zealand

Three categories are high, moderate, low importance.

This feature allows you to select plants that have an important role in feeding bees in New Zealand even though they may not be highly attractive or may not be as very cost effective for a foraging bee (e.g, tree lucerne (*Chamaecytisus palmensis*) or Laurustine (*Viburnum tinus*). [READ MORE...](#)

The reason why they are important is that they are abundant regionally in times when few other bee plants are blooming especially late autumn and early spring. These plants fill a gap in the bee forage calendar when little else is flowering. Therefore, they are very important plants to use for bee forage since there are no other candidates.

On the other hand, bee forage plants can have moderate or low importance because they are not planted in large enough patches or are not planted as frequently in New Zealand even though they may be highly attractive and produce excellent pollen and/or nectar resources. Many highly attractive plants are not planted in New Zealand very often and so are not important because you rarely find them but they certainly could be used in a bee forage plantation if enough of them were planted.

This feature is based on our literature searches and field experience in regions we have worked in mainly Canterbury in the South Island and Gisborne, Hawkes Bay and Wellington.

Surplus honey/nectar production

Three versions of this feature are presented: one for both exotic and native plants, a second for exotic only plants and a third for native plants only. The version that you will see depends on what you have selected in feature B_5 Exotic or Native. They are slightly different because the data available is different.

C_3. Surplus honey/nectar producer in native or exotic plants

If you want your search for your site to include both exotic and native plants, you do not tick either exotic or native feature B_5 which then allows all native and exotic plants to be retained in your search. Then when you wish to use this feature on surplus honey/nectar in native or exotic plants you will see five categories as follows:

The five categories for native or exotic plants:

1. Provides honey type in NZ commercial market
2. Known to be good nectar producer in NZ
3. May be a good nectar producer in NZ
4. Provides some nectar in NZ
5. Pollen only or mainly, little or no nectar produced.

The first category refers to high nectar producing plants that are widespread and abundant in New Zealand so that commercial level monofloral honeys are marketed.

The third category refers to exotic plants that are known to produce good nectar or monofloral honeys overseas but no data is available to confirm that they will produce good nectar in New Zealand conditions. Some exotic trees do not produce nectar as much in New Zealand and some do. However, it is likely that they are good producers but it needs to be confirmed.

C_4. Surplus honey/nectar producer in exotic plants only

The categories are the same as above except category 4 (provides some nectar in NZ) is dropped.

C_5. Surplus honey/nectar producer in native plants

The categories are the same as above except:

- category 3 (may be a good nectar producer in NZ) is dropped
- category 4 (provides some nectar in NZ) is retained
- a new category is added (provides surplus honey stores in hives)

The new category on surplus honey stores in the hive is based on data from the literature search by Butz-Huryn 1995 which provided us with information on which native plants are very good nectar producers. Surplus honey/nectar is a term used to indicate that the plant can provide enough nectar for the bees to make surplus honey beyond their own requirements and beekeepers can get honey from that surplus.

Butz Huryn VM 1995. Use of native New Zealand plants by honey bees (*Apis mellifera* L.): a review. *New Zealand Journal of Botany* 33: 497–512