

## The Tree

*Tilia cordata*, the Littleleaf Linden tree is native to Europe. It has been at the center of several bumble bee kills in Oregon. *T. cordata* often produces more flowers than other linden trees. It also produces mannose in its nectar that may be slightly toxic. Many native bees and wasps do not have the enzyme to break down mannose. European honey bees, *Apis mellifera*, do not appear to be as affected by mannose; at least one theory is that because they are from Europe, they share a developmental history with *T. cordata*. In general, linden trees have few pest problems; aphids are listed as one of the only insect pests of *Tilia* trees.

## How to Identify a Linden (*Tilia* spp.)

### DURING THE WINTER/DORMANT SEASON:

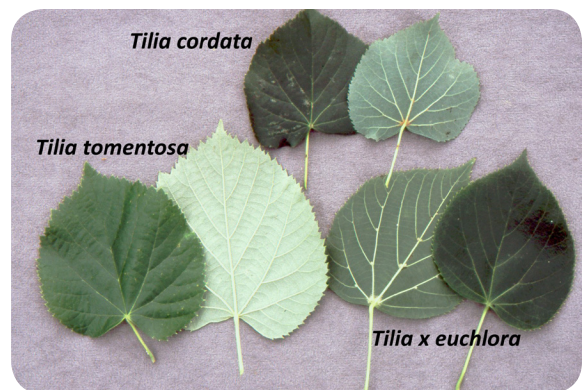
1. **Bark** is gray-brown and on mature trees is ridged or plated.
2. **Twigs** are light brown to gray, or may be red-tinged.
3. **Buds** are prominent, single, plump and often bulge on one side, and are red-brown to dark red in color.
4. **Floral bracts** and fruit may remain on the tree through winter.

### DURING THE GROWING SEASON:

1. **Leaves** are singular, alternate, heart-shaped, finely toothed, and the undersides of leaves often are fuzzy. Leaves at the stem end are asymmetrically attached to the stem.
2. **Flowers** are attached by floral bract that is 2-to-4 inches long. White to yellow flowers with five petals in hanging clusters of five-to-seven bloom in mid-June or early July. Flowers are fragrant and highly attractive to pollinators.
3. **Fruit** is a nut-like drupe, round in shape and often slightly fuzzy.

## The Pesticides

Neonicotinoids are systemic insecticides. They are taken up by plants and move throughout the plants' vascular system. This system 'pumps' and moves water and nutrients from the soil up into the leaves, and it also moves the sugars made in the leaves to the roots and other plant tissues. Every cell in the tree gets water, nutrients, and sugars because of this system. Scientists are studying whether neonicotinoid pesticides move with the water and sugar and get delivered to various parts of the plant, including the nectar and pollen. They also are studying whether repeated applications build up in plant tissues and pose a greater risk to pollinators. However, during a bee-kill investigation, flowers, leaves, and bees are all tested for the presence of specific pesticides.



**Tilia leaf comparison**



**Fruit with brack and leaves**



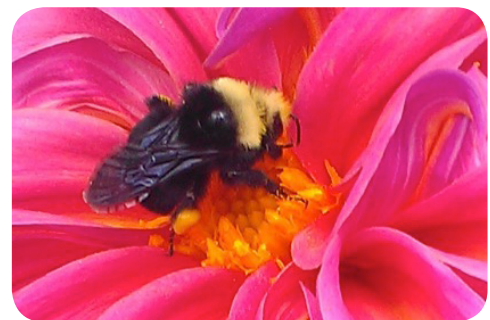
**Winter twig Tilia cordata**

## The Pest

*Eucallipterus tiliae*, the linden aphid, is a Eurasian species notorious for making a mess. Once aphids are on a tree, they can reproduce rapidly. Aphids pierce plant tissues using their straw-like mouth parts, and tap into the plant's vascular system. As an aphid sucks up the tree's sugar water, it also sucks up systemic pesticides, killing the aphid.

## The Bumble Bee

Oregon has 25 native bumble bee species, and because of their biology and habits, bumble bee populations can be impacted by pesticide applications in unique ways. They fly in dim light, cooler temperatures, earlier in the morning and later in the evening than honey bees. Some bumble bees spend the night tucked into the petals of flowers rather than return to a nest, exposing them to evening and early morning applications. Bumble bee workers die at the end of summer. Only the hibernating queen survives the winters. A single queen must generate her new colony each spring. Scientists also are studying whether there are feeding behavior differences between bumble bees and honey bees, and whether there are differences in the ability to detoxify pesticides.



**Yellow-faced bumble bee, *Bombus vosnesneskii***

***Tilia cordata***

## Why have there been bumble bee deaths in Oregon?

In the last few years, there have been a number of large bumble bee kills associated with linden trees treated with neonicotinoid insecticides, and people are asking why is this happening in Oregon. Unfortunately, it appears that there is a convergence of several factors that are unique to this area.

- In Western Oregon, European linden trees (*Tilia cordata*) commonly are used as shade trees in urban areas, including areas where people park their cars.
- The flowers of linden trees are highly attractive to many types of bees. Bloom time coincides with the seasonal increase of Oregon's native bumble bees, including *Bombus vosnesenskii*.
- Linden trees also are a host to the Eurasian aphid, *Eucallipterus tiliae*, and large populations can develop. Aphids excrete excess sugar in the form of a sticky, sap-like honeydew, which can drip onto cars parked beneath infested trees.
- To combat the sticky honeydew and kill the aphids, trees historically have been treated with systemic insecticides that travel throughout the tree.

## What can you do to protect bumble bees?

- There are several species of lindens commonly planted as shade trees. Learn how to identify linden trees at all growth and development stages, including when dormant.
- Do not apply neonicotinoid insecticides before or during bloom because they may travel to the pollen and nectar. In the state of Oregon, it is prohibited to apply products containing imidacloprid, dinotefuran, thiamethoxam, or clothianidin to linden trees, regardless of application method or time of year.
- Avoid planting trees which require insecticide applications as part of their regular maintenance program. This would include the use of *Tilia* as a street or parking lot shade tree.

In general, the public and storeowners do not want to contend with aphid honeydew on vehicles.

- If flowers are present on a plant, do not apply an insecticide. If the plant will be in bloom soon, do not apply an insecticide with a long residual or that is a systemic.
- Read pesticide labels completely, paying particular attention to environmental hazards statement and pollinator protection application restrictions.
- Learn about bumble bee biology and habits, such as sleeping in flowers overnight.



Winter habit of *Tilia x europaea*



Bumble bee on a *Tilia* flower

Bark of a *Tilia* tree

### Contact us

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Department  
of Agriculture

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# BUMBLE BEES, TREES, AND NEONICOTINOIDS

OREGON DEPARTMENT OF AGRICULTURE