Trees and Night Lighting

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Having light around the house at night is comforting. It provides security and is essential for getting around in the dark. Some lights are used to emphasize evening landscapes and house architecture. Unfortunately, these nightlights can disrupt the growth of trees.

Table 1. Sensitivity of selected trees to night-light pollution.

Sensitive	Yellow-Poplar	**Tolerant**
Maple	Cottonwood	Ash
Birch	Sumac	Holly
Catalpa	Black Locust	Sweetgum
Dogwood	Hemlock	Magnolia
Sycamore		Bradford Pear
Elm		Oak
Zelkova		Arborvitae
Redbud		Pine
Basswood		Hickory
Honey locust		Walnut
Goldenrain-tree		Gingko
Silverbell		Spruce

This leads to increased winter dieback. Continuous lighting also inhibits the formation and maintenance of chlorophyll in leaves. Yellowing or bleaching of foliage can occur and leaves will be more sensitive to air pollution.

A night-light shining down on one side of a tree may cause all of the branches on that side to grow much more than the rest. The crown becomes misshapen and the branches look long and spindly.

Night-lights can also change the amount of flowering, the timings of flowering, and can lead to no flowers being produced at all. For example, some trees require short days to produce flower buds. With the tree constantly in the light it may never produce flowers.

Night lighting will disrupt the growth habit of many different types of trees. Some trees are very susceptible to light pollution and some are tolerant. (See Table 1.)

Trees that are sensitive to light pollution may expand their buds early. These buds can be damaged by frosts and attacked by pests. Branches continue to grow longer and longer. This growth disrupts internal branch control. In time, the tree will lose its natural form.

Trees under night lighting need extra care. Timely and proper branch pruning, plus extra water and proper fertilization, will be required. Trees under night-lights work twice as hard as normal trees and need extra care to remain healthy.

Proper placement of night lighting can eliminate most problems with trees. Special lenses and light shields can be used to direct light to targets, like driveways. If trees will be illuminated all the time, use a lamp with a "safe" spectrum. A light source disrupts growth in a tree because of its red light content. For example, high pressure sodium and incandescent-folament lamps greatly alter growth responses of many trees because they are rich in red light. Mercury vapor lamps emit so little red light that they disrupt growth on only the most sensitive trees. (See Table 2).

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Table 2. Light given off by selected lamps in the red (580-700 nm.) wavelengths as a percentage of total visible light produced.

Lamp	Red light
Incandescent filament (Standard frosted)	66%
High-pressure sodium	65%
Metal halide	50%
Florescent (cool white)	34%
Mercury (clear)	7%

Mercury lights are the best for trees. These lights may not be the best where trees and humans coexist. Metal halide lamps may represent a compromise. Metal halide lamps produce red light but they do not attract insects the way the rich blue colored mercury lights do. Insect activity around a lamp can be a problem. Also, some lamps are more energy efficient than others.

Degree Days as a Pest Management Tool

Insect development takes place at approximately the same rate as plant development. This makes sense if you consider that if this did not occur, the insects would be left without a reliable food source.

The temperature at which growth starts for woody plants in the midwest is approximately 45-50 degrees Fahrenheit. To standardize the calculations, the base temperature has been arbitrarily set to 50 degrees. To calculate DD the following formula is used:

$$\frac{\text{Maximum} + \text{Minimum Temp.} - \text{Base Temperature (50)}}{2} = \text{DD}$$

Example: If the maximum temperature on March 1 is 60 and the minimum is 50, then the DDB50 for March 1 is:

$$\frac{60 + 50}{2} = \frac{110}{2} = 55\text{ F} - 50\text{ F} = 5\text{ DDB50}$$

Degree-days values are totaled daily, and accumulate as the season progresses. For any days when the temperatures average below 50, the degree day accumulation is zero. Temperatures averaging lower than 50 are not subtracted from the total.

The degree day method takes into account the average daily temperature accumulations which influence insect and plant development. For each day that the average temperature is one degree above the base temperature (which in this case is 50), one degree daily accumulates. Due to temperature differences, insect development varies from year to year, and among locations; therefore, the calendar method for timing insect activity is less accurate than using degree-days. For example, at the Chicago Botanic Garden, which is close to Lake Michigan, temperature accumulation is typically around 100 degree-days (base 50) behind suburbs that are further west, such as Lisle, where the Morton Arboretum is located.

The use of degree days in conjunction with phenology data, such as that found in **Coincide**, by Don Orton increases the accuracy of timing pest controls. For example, birch leaf miner is listed as being in the young larval stage at the same time that Robinia pseudoacacia (Black locust) is in bloom. The corresponding degree-day range is 275-500 DDB-50. By observing the actual degree-day values that occur when Robinia is in bloom, and birch leaf miner larvae are present, you can arrive at a more accurate time for treatment in your geographic area. If you don't have the indicator plants around, you can begin monitoring shortly before the beginning number of degree days listed in the range.