Staying Green: Adaptations of Evergreens

When vibrant autumn foliage has withered and deciduous trees have shed their leaves, evergreen plants remain to brighten the landscape. In many cold-climate cultures, evergreens have long been a symbol of endurance and resilience. Indeed, the custom of bringing evergreen plants indoors, including trees, wreaths, holly, and mistletoe, dates back to ancient times. Variously believed to safeguard against malevolent forces, bring strength and vitality to inhabitants, and cleanse and purify surroundings, evergreen plants were not only displayed but also transformed into medicines and health-promoting tonics and burned as fragrant incense.

Why did some plants evolve to remain green year-round, while others evolved to drop their foliage and go dormant? Because being evergreen gave them an evolutionary advantage.

Many deciduous trees are native to temperate regions with distinct seasons. They have broad, thin leaves that are ideal for maximizing photosynthesis but are vulnerable to extreme cold or seasonal drought. Deciduous plants make maximum use of their foliage during the growing season and then discard it, producing new leaves every year. Many evergreen plants, in contrast, are native to northern regions with long winters. Since their seasonal window for photosynthesizing is short, they can't "afford" to take the time and expend the energy needed to regrow all new foliage every spring. There are also many evergreens native to tropical climates, where the conditions for growth remain relatively steady year-round, so there's no advantage to dropping their leaves.

Types of Evergreens

Evergreens can be classified into three groups based on the type of foliage:

Needle-leaf (e.g., fir, hemlock, pine, spruce).
Scale-leaf (e.g., arborvitae, cypress, juniper).
Broadleaf (e.g., boxwood, camellia, holly, rhododendron); this group also includes non-woody evergreen perennials, such as hellebore and liriope, as well as tropical plants like ficus and schefflera.

Many, but not all, evergreen plants are conifers ("cone-bearing"). They are wind-pollinated, and their seeds develop inside a protective cone. Pines, spruces, and junipers are all produce cones. However, not all evergreens plants produce cones. For example, yews (*Taxus* spp.) are also conifers; their seeds are surrounded by fleshy scales that develop into a red, berry-like structures called arils that look nothing like the familiar pinecone!

Evergreen Adaptations for Cold Climates

In regions with abundant snowfall, many native evergreens have the familiar cone shape – narrow at the top, with downward-facing, drooping branches that shed snow and ice.
In northern regions where the growing season is short, evergreens are able to photosynthesize year-round, though this process slows during winter and may cease when the ground freezes.
Where temperatures drop to extreme lows, evergreens alter their chemistry. They concentrate substances in their leaves that act as antifreeze to prevent ice from forming and damaging cells. Some of these chemicals are aromatic, giving trees like spruce and pine their signature scents.

The foliage of many evergreens has a waxy coating that protects tender cells and reduces moisture loss. This is especially true of evergreen trees that are native to cold climates, where the ground is frozen much of the year and the trees cannot take up water to replace that lost during photosynthesis. Evergreens with needle-like foliage tend to be more cold-hardy than broadleaf evergreens. Although the shape and size ranges widely, the foliage of broadleaf evergreens is often relatively thick and has a protective, sometimes waxy coating. Even so, they tend to be less tolerant of extreme cold than needled evergreens.

Other Advantages to Being Evergreen

Since evergreens don't have to produce all new leaves each spring, they can get by with fewer nutrients. This gives them an advantage in areas with nutrient-poor soils that are unfavorable to deciduous plants. In cold-winter regions, for example, organic matter is slow to break down and release its nutrients into the surrounding soil. Rocky and sandy soils tend to be low in nutrients. In acidic soils, many of the nutrients are bound up in forms unavailable to plants; this gives evergreens like rhododendrons an advantage over nutrient-hungry deciduous plants that require soils with a more neutral pH.

Is Evergreen Foliage Truly Evergreen?

Although evergreen plants appear green year-round, individual leaves go through growth cycles. Needles of different types of conifers, for example, have varying life spans and do not remain green and attached to the tree indefinitely. White pines produce needles that live for two to three years, then turn yellow and fall to the ground during a seasonal needle drop. The needles on other types of pines grow for three or four years before they drop.

The leaves on most tropical evergreens age and fall throughout the year, making way for new growth to take over the job of photosynthesis.

Fun Facts

Not all conifers are evergreen. Native to cool climates of the temperate northern hemisphere, tamarack (aka larch, *Larix laricina*) has green needles that turn bright yellow before they drop in autumn. Dawn redwood (*Metasequoia glyptostroboides*) is a large, deciduous conifer with feathery, bright green needles that turn reddish brown and drop in each fall. Occurring naturally in west-central China, dawn redwood has become a popular ornamental tree.

The Southern live oak, *Quercus virginiana*, is "almost" evergreen. Unlike most oaks, it retains its broad green leaves throughout the winter. In spring, it drops its leaves just before the new leaves emerge.

The term semi-evergreen describes plants that tend to keep their foliage in normal years but might lose all their leaves during an especially cold winter or severe dry season, or when the plants grown on the edge of their optimal hardiness range.