Science & Ecology

Indian Pipe – A Ghostly Inhabitant of the Forest

By Edna Greig

When you escape to the cool shade of rich woods during the summer, you may spot odd looking waxy white stems with downturned tops rising from the forest litter. They look like some type of fungus but are actually the flowering stems of a plant called Indian pipe (*Monotropa uniflora*). The common name comes from the upside-down, pipe like shape of the plant stem and its single, downturned tubular flower. It's also known as ghost flower and corpse plant because of its eerie appearance and the fact that the plant decomposes and turns black if handled. The early 20th-century naturalist Neljte Blanchan described Indian pipe as "Colorless in every part, waxy, cold, and clammy, Indian pipes rise like a company of wraiths in the dim forest that suits them well."

Indian pipe is usually found in deep shade because, unlike most plants, it doesn't photosynthesize its own carbohydrates. It thrives where the sunlight is too dim for most photosynthesizing plants to survive. It gets needed carbohydrates by being a parasite, a trait shared by only about 1 percent of the world's plant species.

Indian pipe is fairly common in rich woodlands throughout our area, and the white pipes are usually conspicuous in the shade. The flower stems push through the forest duff in mid- to late summer, either singly or in small clusters. The stems usually emerge after a soaking rainfall and, in dry summers, far fewer plants emerge. The

Look in the shade for this pale plant.

virtually smooth stems have only tiny, vestigial leaves and grow to a height of 3 to 10 inches. Bumblebees are the primary pollinators of Indian pipe's flowers. Once fertilized, the downward facing flowers turn upward giving the genus its name of *Monotropa*, meaning "one turn." Indian pipe produces copious, dust-like seeds. After the seeds mature, the entire plant turns black but remains upright and visible for up to several weeks.

Since Indian pipe doesn't photosynthesize, it doesn't need chlorophyll and so has no green coloration. It also doesn't need leaves to gather sunlight. What it does need is to have its roots connected with an underground, mycorrhizal fungus that, in turn, is connected to the roots of a living tree. Symbioses between mycorrhizal fungi and photosynthesizing plants like trees are common. The tree's roots gather water and nutrients from the soil by way of the fungus, and the fungus takes carbohydrates that the tree has produced with energy from the sun. It is a mutually beneficial relationship. Indian pipe is an interloper in this symbiosis, stealing the tree's carbohydrates from the fungus and giving nothing in return. Scientists consider Indian pipe a parasite of the fungus.

Indian pipe parasitizes only a limited number of fungi species. Its dust-like seeds also will only germinate in the presence of an appropriate fungi species, so the germination rate is very low. Because of this, Indian pipe is slow to colonize new areas.

Scientists think that Indian pipe descended from a photosynthesizing ancestor plant that inhabited the forest understory. The ancestor plant probably shared the services of a mycorrhizal fungus with a tree, possibly a conifer. The ancestor plant was very efficient in tapping into the resources of the fungus and began to confiscate the carbohydrates that the fungus obtained from its conifer host. The ancestor plant became so efficient at stealing carbohydrates from the fungus that it no longer needed to photosynthesize. Over time, it lost its green coloration and its leaves and evolved into today's Indian pipe.

When you're in the shade of the forest this summer, especially after a rainfall, be on the lookout for these ghostly inhabitants.

Member Edna Greig is a regular contributor to Trail Walker *on natural history topics.*