

Carnivorous Plants and their Habitats



Have you ever heard of meat-eating plants? Just like many animal species, some plant species are carnivorous—that is, they consume insects and other small animals for a primary source of nutrients and minerals for growth. Instead of actually eating insects, carnivorous plants trap them by various means, depending on the kind of plant. After animals such as flies, grasshoppers, and spiders are trapped, a pool of enzymes secreted by the plant digests the prey.

Carnivorous plants are found in many parts of the U.S., but are particularly abundant and diverse in some floodplains and small wetlands in the Southeast. Wetlands that are good for carnivorous plants generally have little or no drainage and low levels of essential plant nutrients. Nutrient-poor habitats typically have soils that are acidic or high in clay content; therefore, nutrients and minerals are not available in forms that are accessible to plants. The ability of carnivorous plants to capture and digest insects, supplemented by their capacity to make energy stores by photosynthesis as other green plants do, makes them highly competitive in nutrient-poor habitats.

Researchers have discovered that not only do carnivorous plants depend upon the nutrition from devoured insects for survival, but some invertebrates also depend solely upon carnivorous plants for food and/or reproduction. In the Yellow Trumpet pitcher plant, *Sarracenia flava*, for example, some mosquito and other insect species somehow evade capture and reproduce inside the rainwater-filled leaves.

Carnivorous plants are found in and near three wetland habitats that are increasingly rare due to impacts from mining, agriculture, and development. These three wetland types that occur on the Coastal Plain of the Southeast are pocosins (an Algonquin name meaning “swamp on a hill”), pine flatwoods, and cypress savannas. Anyone who has driven across the Coastal Plain has seen that it is a vast flatland, but a flatland with an elevation gradient nonetheless. The soil composition varies from place to place, and in areas where soils have high clay content water tends to collect; the flat topography helps retain the water in these sites. In some spots rainwater tends to pool and saturate the ground for a long time period...longer in some areas than others, resulting in hydroperiods (the amount of time an area is wet) that vary from wetland to wetland. The “normal” length of the annual hydroperiod will determine what kind of tree species will dominate an area. For example, cypress trees are dominant in areas with long hydroperiods because they are adapted to long periods of flooding.

On the Coastal Plain flatland landscape, cypress savannas tend to occur at the lowest (i.e., wettest) elevations, wet pine savannas at intermediate elevations, and pocosins at higher elevations. In ecology, though, the rules are never simple. Factors other than elevation and hydroperiod also influence what plant species occur where in the flatlands. Disturbances such as hurricanes or fire often play a large role in determining the presence or absence of a particular species. Within flatlands, pocosins and savannas are believed to have experienced different intensities of disturbance, perhaps related to differences in elevation.

Pocosins are an especially good habitat for carnivorous plants. Pocosins have poor drainage and a high coverage of sphagnum moss, an abundant plant species in these wetlands. Sphagnum moss wicks up water like a paper towel and holds it,

creating a very moist environment. Sphagnum also acidifies, or lowers, the pH of the water. An acidic environment slows decomposition of leaf litter and ties up nutrients and minerals in a chemical form not accessible to plants. Sphagnum mats are layers of live leaves on top of layers of dead leaves, which makes the mats very springy. When you walk on a sphagnum mat you can feel a little bounce in your step! All in all, it is a wonderful place to be a carnivorous plant!



A broadleaved evergreen shrub understorey and scattered pines are characteristic of pocosin wetlands.

photo by B. E. Taylor

On parts of the Coastal Plain in the Carolinas, another type of wetland similar to pocosins occurs: Carolina bays. Carolina bays have special features of shape and origin that won't be discussed here, but as nutrient-poor wetlands they are often good habitats for carnivorous plants, just as pocosins are.

Sarracenia Family—Pitcher Plants

Pitcher plants occur along the margins of Carolina bays, pocosins, and savannas. All pitcher plant species are rare or uncommon, due mostly to habitat loss and destruction. The Green Hooded Pitcher Plant, *Sarracenia minor*, provides a good example of the pitcher plant way of life. This species occurs in wet pine savannas and along Carolina bay margins. In the springtime, the plants have pale yellow flowers on a leafless stem, in addition to a new growth of leaves (its "pitchers"). As the name implies,



Two Carolina bays where pitcher plants and sundews are known to occur.

the Green Hooded Pitcher Plant has hollow, green, hood-like leaves. The hood prevents the pitcher from filling with water. All pitcher plants produce insect-attracting nectar in strategic places.



Green Hooded Pitcher Plant

On the Green Hooded Pitcher Plant, the nectar is located along the lip and the inside of the pitcher-shaped leaves. Insects cannot resist following the nectar trail and eventually they lose their balance and fall into the pitcher. The inside of the leaf is coated with a slick wax and thick downward

pointing hairs. In addition, the pitcher on this species has translucent "windows" on the back of the hood that aid in capturing insects. Insects see light through the "windows" and fly toward the light in an attempt to get out of the leaf. Eventually, the insect falls into the hollow part of the leaf and is trapped. Once trapped, a fluid of secreted enzymes kills the insect and slowly digests it. The pitcher plant absorbs the nutrients and minerals resulting from the captured insect.

The Sweet Pitcher Plant (*Sarracenia rubra*) has narrow, hollow red-veined leaves. This pitcher plant has a partial hood, which doesn't quite cover the top the leaves, so the pitcher often fills with rainwater. The flower is a deep red to maroon color on a leafless stem. It occurs not only in pocosins and wet pine savannas but also along Carolina bay margins and in sandhill seep areas.

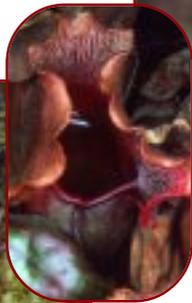
Frog's Britches (*Sarracenia purpurea*) also has a hooded leaf, but the leaves are arranged almost horizontal instead of vertical. This arrangement allows the leaves to fill with rainwater. Frog's Britches have secreted enzymes and also a bacterium that aids in digesting the prey. The flower and leaves are a reddish, golden color. This pitcher plant is found primarily in areas covered with sphagnum.



Sweet Pitcher Plant



Frog's Britches



Yellow Trumpets (*Sarracenia flava*) have a different strategy for capturing insects. This pitcher plant does not have hooded leaves. Instead, the vertical, hollow leaves will fill with rainwater. Insects attracted to its nectar will fall in, drown, and be broken down by the mixture of rain water and digestive juices. Yellow Trumpets' flowers have pale yellow, droopy petals. They grow best in open wet pine savannas.



Yellow Trumpets



Parrot Pitcher Plants (*Sarracenia psittacina*) are found in wetter areas of low-lying savanna that often flood during heavy rains. The pitchers of this species lie flat along the ground and end in hollow, puffed, beaked hoods that are baited with nectar. Insects and small animals that enter the tubes are forced to proceed into the pitcher by numerous long needlelike hairs that point toward the base of the leaf, preventing escape.



Parrot Pitcher Plant

The White Trumpet (*Sarracenia leucophylla*) is considered by many to be the most beautiful of the American pitcher plant species. As the name implies, White Trumpets have pitchers that are green toward the bottom while the upper portion of the pitcher and the pitcher lid are bright white, laced with green or red veins. The flowers of this species are large and red. This species has become rare in some areas where it once occurred due to habitat loss and overharvesting for the cut-flower trade.



White Trumpets

Droseraceae Family—Sundews

Sundews, like pitcher plants, have digestive enzymes that allow them to absorb minerals and nutrients from captured insects. Most species within this carnivorous plant family grow low to the ground, enabling the plant to capture crawling as well as flying insects. In some species the leaves are red, which is unusual but very functional. Red pigments absorb ultraviolet light and are very attractive to insects, which can see wavelengths that humans cannot. In effect the red pigments are a visual lure for the insect prey. Leaves are covered with slimy hairs tipped with sticky glands that reflect sunlight, so they appear to sparkle like dew in the sun. When an insect crawls across a sundew leaf the sticky hairs trap it. As the insect struggles, the leaves secrete more of the mucus-like digestive substance. The leaf ends roll into a cup shape, which further prevents the insect from escaping and enhances digestion of the prey. Sundew habitats include pocosins, savannas, Carolina bay margins, and moist sandy ditches.



A sundew species common to the Southeast (left); closeup of a sundew leaf (center); an insect trapped by a sundew (right).



Dionaeaceae Family—Venus Fly Traps

Venus Fly Traps are so unusual and distinct that a separate plant family was created just for this one species. Venus Fly Traps are protected by law, and are on the endangered species list in South Carolina and North Carolina—these plants **cannot be harvested** nor can their habitat be disturbed. Plants for sale in nurseries are grown from tissue culture (a whole plant is raised in a glass dish from a tissue sample taken from a wild or greenhouse-grown parent plant, along with added growth enzymes and hormones). Greenhouse-grown Venus Fly Traps are often purchased for ornamental terrestrial aquariums.

Compared to other carnivorous plant species, Venus Fly Trap leaves have a very different mechanism for trapping insects. The leaves have thick claw-like hairs on the edges and inside the lobes. Insects are attracted to the leaves because of nectar glands. When an insect triggers two hairs or one hair twice, the leaf will snap shut, trapping the insect. The struggling insect stimulates the leaf to begin secreting its digestive enzymes.

Researchers discovered the trapping mechanism is only activated by insect stimulation, so the plant does not expend energy if other things touch the hairs. These plants are found along Carolina bay edges and in wet pine savannas.



Venus Fly Trap

Lentibulariaceae Family—Bladderworts and Butterworts

This family includes terrestrial and aquatic species. One of the more common aquatic species is *Utricularia inflata*, or Swollen Bladderwort. In spring to late summer, ponds and Carolina bays seem to be dotted with the floating yellow flowers of this plant. A close look reveals that the bladderwort flowers are attached to a leafless stalk held above the water's surface by submerged, inflated leaf stalks. The submerged leaf stalks radiate out from the main stem in an arrangement resembling the spokes on a wheel. Below the leaf stalks are finer leaves covered with



Swollen Bladderwort

bladders. Each bladder has a tissue flap covered with trigger hairs. When a small swimming insect or tiny crustacean triggers the hairs, the plant flap swings open, and the change in water pressure forces the insect into the bladder. When the flap closes the insect is trapped, and then is digested by bacteria and enzymes.

Four species of butterwort occur in the Southeast, growing primarily in moist sandy soil or in shallow water on the Coastal Plain. The rosette of leaves is yellowish-green and “buttery” to the touch. When small insects alight on the sticky surface they are caught and then digested. The genus name, *Pinguicula*, means “little fat one.”



Butterwort

Conservation of Carnivorous Plants and Their Habitats

Conservation efforts for carnivorous plants focus on two main threats—habitat loss and the exploitation of wild plants for the cut-flower and horticultural trades. The need that many carnivorous plant species have for small wetlands makes plants extremely vulnerable to declines, because the wetlands themselves are often destroyed. From the 1950's to the 1970's the loss of wetlands in the Southeast was greater than in any other region of the country, with a net annual loss of 386,000 acres per year. In North Carolina approximately 51% of all wetland acreage on the Coastal Plain has been lost or altered, including 70% of the pocosins. An astounding 97% of the Carolina bays on the Coastal Plain of South Carolina have been severely impacted, and fewer than 200 bays of the original thousands are relatively undisturbed. Small isolated wetlands are the most valuable wetlands for maintaining carnivorous plant biodiversity, but it is precisely these wetlands that are most at risk. In some areas where the habitat itself is intact, over-collecting of plants can be a problem. In the case of the cut-flower trade, the current levels of exploitation are almost certainly unsustainable. Collection of many carnivorous plant species is illegal, as state and federal laws protect plants. The International Carnivorous Plant Society recommends, “When you find carnivorous plants [in the wild], take photographs but leave the plants alone.”

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