

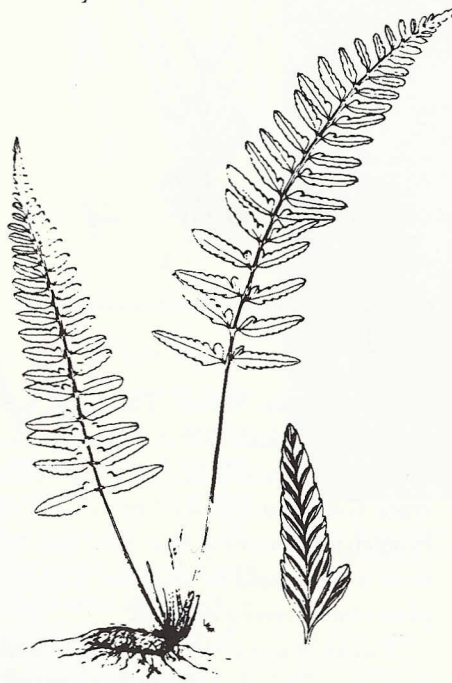
Plant Adaptations in the Fakahatchee

by Daniel F. Austin

Fakahatchee Strand State Preserve, east of Naples in Collier County, is seven miles wide and 18 miles long (126 square miles; 80,640 acres). Since the strand was first visited by naturalists — J. G. Cooper in 1860, Moses A. Curtiss in the 1880s, Pliny A. Reasoner in 1887, Alvah A. Eaton in 1903, and John K. Small in 1921 — people have known that it harbors many unique species. Indeed, for a century, Fakahatchee has been famous for its plants.

After Fakahatchee became a preserve in 1974, it was studied more thoroughly. We know of 484 plant species within the preserve, and endangered species constitute almost one-quarter (22.5%) of them. Much of the endangered flora are tropical epiphytes within temperate plant communities. Although only 69% of the tree species are tropical, 86% of the ferns and 88% of the orchids are tropical. The tropical flora of Fakahatchee Strand State Preserve is unique in North America.

Adaptations for tropical living abound in Fakahatchee. Shared methods include sensitivity to prolonged freezes. Yet, even in Fakahatchee, susceptible populations are reduced periodically when temperatures dip below freezing for a few minutes. Standing water usually moderates the temperatures enough to protect some plants. Also, many of the flowering species have self-fertilizing flowers. That adaptation allows them to survive without pollinators on the northern fringe of their ranges. Other specializations are diverse.



Asplenium auritum, eared spleenwort, habit and underside of fertile pinnule.

PALMS

Royal palm (*Roystonea elata*). Fakahatchee has been called the “only royal palm-cypress forest in the world.” Cypress (*Taxodium distichum*) grows only in seasonally flooded sites. Palm seeds dispersed in animal scat also take root in the swamps, but are drowned during wet seasons. However, if seeds germinate on stumps or fallen logs above flood level, they grow into adults. So, by growing in different places, the palms and cypress divide resources and space.

Paurotis palm (*Acoelorrhaphe wrightii*). Reasoner first found this palm in Fakahatchee in 1887. This clump-palm sprouts clusters of erect trunks from a horizontal underground stem. The clusters, saw-like teeth along the leaf-stalks, and the fiber-bound trunks protect the growing apical buds from herbivores such as bears. Long, maturing stalks of “flaming” red or purple

fruits contrast with the green leaves to attract hungry birds.

FERNS

Eared spleenwort (*Asplenium auritum*). This fern was found in Sumter County in 1895 and later extirpated. Fakahatchee is one of the few remaining locations that has not been drained. The “ear,” a basal lobe on the pinnae, possibly serves to divert excess moisture from the leaf to the roots. These epiphytes grow on branches just above water level within the shaded swamp forest.

Narrow strap-fern (*Campyloneurum angustifolium*). In 1903 this fern was found in Miami. Later the epiphyte was found on acidic cypress trunks near a Calusa Indian mound in Fakahatchee. Those plants have not been relocated since the early 1980s, probably having been killed by cold. However, a few populations remain elsewhere in Fakahatchee.

Tailed strap-fern (*Campyloneurum costatum*). This strap-fern with stalked leaves was first found in Fakahatchee in 1904, and a small population persists. Due to its similarity to the common strap fern (*C. phyllitidis*), tailed strap-fern is often overlooked. However, tailed strap-fern typically grows closer to the water.

Hanging clubmoss (*Lycopodium dichotomum*). Very rare in South Florida, hanging clubmoss was first discovered in Fakahatchee in 1934. I have not seen it since the early 1980s when the plants I knew disappeared after a cold winter. No one has ever found more than two to three of the plants

perched on shaded pondapple (*Annona glabra*) branches among bromeliads. The small, non-photosynthetic, gametophytes grow buried with fungi in humus on branches to produce the sporophytes.



Lycopodium dichotomum, hanging club-moss, habit and fertile branch

BROMELIADS

Powdery catopsis (*Catopsis berteroniana*). In Fakahatchee, this epiphyte grows high in popash (*Fraxinus caroliniana*), and pondapple. This is one of two known carnivorous pineapple relatives; the other (*Brocchinia*) is South American. The white “powder” just above the “tanks” on these plants not only conserves water, but its slick surface causes visiting insects to slide into a pool of water and drown. Once that happens, the plant absorbs the nutrients released from the decaying animals.

Nodding catopsis (*Catopsis nutans*) Known only in Fakahatchee, these small drooping epiphytes perch on the branches and trunks of swamp trees beside openings along pools, ponds, and streams. At those locations, they have abundant light and moisture all year. Roots serve as “holdfasts” to keep the plants in place and do little to absorb nutrients. Their small, yellowish flowers seldom open in Florida and are self-pollinated.

Fuchs’ bromeliad (*Guzmania monostachia*). Wild plants are known from two sites; the common name commemorates the collector who took the plants from



Guzmania monostachia, Fuchs’ bromeliad, habit, flower, and fruit

Fakahatchee to Miami. The light, tufted seeds of bromeliads drift in the gentle breezes and become established on rough-barked trees. *Guzmania* and the catopsis are “tank bromeliads,” meaning that their leaf bases form a water-holding reservoir. Clusters of plants form treetop marshes.

Fuzzy-wuzzy air-plant (*Tillandsia pruinosa*). This dwarf epiphyte grows in Fakahatchee and in the mangroves outside Naples. Plants may be locally dense around lakes and ponds where they balance in the sunny upper branches of pondapples. However, individuals are rare below the shady swamp canopy. Plant-hairs trap and hold a private pond of nutrient-rich water on leaf surfaces long after it rains.

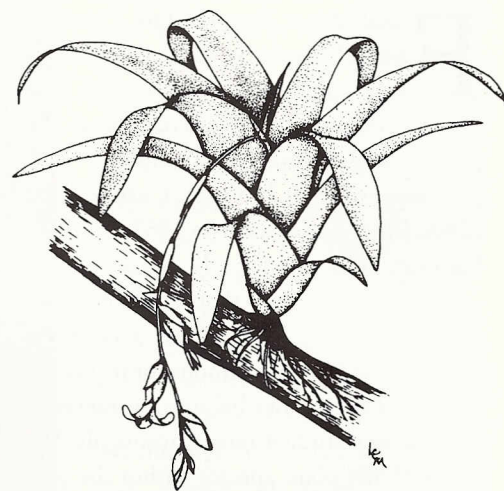
ORCHIDS

Tiny orchid (*Lepanthopsis melanantha*). Although distributed throughout the American tropics, tiny orchid occurs in one Fakahatchee slough. Plants survive by absorbing and “storing” water with multiple outer layers (velamen) on the roots. Tiny orchid grows below the more showy and abundant bromeliads and is usually “hidden” by its size — 1.5-2.8 inches tall. The purplish, self-fertilizing flowers are only slightly larger than a pinhead.

Ghost orchid (*Polyrrhiza lindenii*). This is one of Florida’s three species of “root orchids,” where adult plants lack stems and leaves. Roots have assumed the roles of photosyn-

thesis and water absorption. Also, the frog-shaped flower is pollinated by adults of Florida’s largest moth, the giant sphinx (*Cocytius antaeus medor*). The moth has a soda-straw proboscis that fits the 4-6.7 inch long spur-nectary of the flower. Giant sphinx larvae feed only on pondapple leaves.

Hidden orchid, Jaw-bone orchid (*Maxillaria crassifolia*). This epiphyte is rare, and is often overlooked because it resembles the more common butterfly orchid (*Encyclia tampensis*). *Maxillaria* has swollen stems (pseudobulbs) that store nutrients and water; it carries out a special kind of photosynthesis called *crassulacean acid metabolism* (CAM). CAM plants open their stomata at night, when water loss is minimal, to store



Catopsis nutans, nodding catopsis, habit.

carbon dioxide. When sunlight is available, the carbon dioxide is converted to carbohydrates. Both swollen storage stems and CAM metabolism are adaptations shared by desert and salt-tolerant species.

ORCHID RELATIVES

Fakahatchee burmannia (*Burmannia flava*). Leonard J. Brass was lost in Fakahatchee when he became the second person to find this plant in 1946! John Popenoe relocated the species in 1984. These plants grow in acidic, nutrient-poor sites. Fakahatchee burmannia has little chlorophyll and is probably mycotrophic (obtains nutrition from fungi on its roots). Fungi obtain water, sugars and other compounds from decaying organic materials, and burmannia takes these from the fungi.

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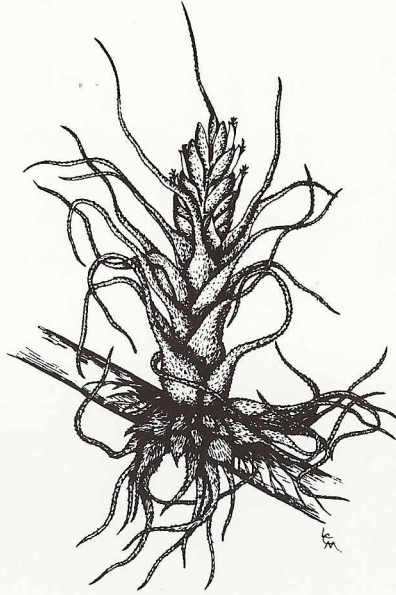
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BLACK PEPPER RELATIVES

Peperomia (*Peperomia humilis*). This little pepper is less common than plants from farther north called *P. cumulicola* by Small. Some have combined the two, but they grow in different pH and moisture regimes. *Peperomia humilis* is confined to the moist, acidic, organic bases of swamp trees, while *P. cumulicola* requires alkaline or neutral substrates in inorganic, drier sites.

Cypress peperomia (*Peperomia glabella*). This plant sprawls over the branches of pondapple trees. Peperomias require the moisture of swamps, and can change their metabolism to use different photosynthetic pathways under stress. They store water in the fleshy leaf tissues.

We can only dream of Fakahatchee before logging and partial drainage, but we can experience the remaining fabulous collection of tropical and temperate plants in this lush, incompletely surveyed wilderness. This is



Tillandsia pruinosa, fuzzy-wuzzy air-plant, habit.

still an enchanted emerald jewel with many examples of plant adaptations that insure survival. ✨

FOR ADDITIONAL READING

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About the Author: Dan Austin (Director of Environmental Sciences, Florida Atlantic University) has been studying Fakahatchee since 1970. He is a founding member of the FNPS and frequent contributor to *The Palmetto*. Support by the Fakahatchee staff, FAU-FIU Joint Center for Environmental and Urban Problems, and the U.S. Fish & Wildlife Service, Office of Endangered Species, is gratefully acknowledged.

Ed note: All illustrations used in this article are from *Rare and Endangered Plants of Florida, Volume 5: Plants*, by Daniel Ward (published by University Press of Florida, Gainesville, 1978).