AMAZING CANE

written by David S. Lee

photographed by Melissa McGaw

Underappreciated for its ability to form habitat—for both itself and other species—this North American bamboo has lost immense stands to wetlands drainage.

Cane (*Arundinaria gigantea*) is the only species of bamboo native to North America. Like other bamboos, the cane's stems have a jointed, woody appearance. Bamboos are the most primitive of the grasses, based on limited differences between the vegetative and flowering parts of the plant.

This bamboo's genus name is derived from *arundo*, Latin for "reed," and there are a number of related Asian species in genus *Arundinaria*. The species name *gigantea* refers to the plant's height. Left undisturbed, individual cane stalks may grow 15 to 25 feet tall. Botanists recognize two forms of cane, which were once considered separate species. Most grass experts no longer separate the two forms. It is clear that this is another of many organisms for which our concepts of speciation fail to fit the reality of variation.

In North Carolina, both forms grow throughout the state, but their overall ranges in the Southeast are not identical. The two differ in size, and the smaller of the two—once given the distinct species name *tecta*—flowers more frequently. It can grow on drier soils. This smaller variety produces distinct flowering shoots that arise from its dense underground roots, or rhizomes. The larger cane has its flowers coming directly off the cane stalks.

Cane, at least the tall form, has a genetically controlled life expectancy. After about 15 years, the stalks flower for the first time and die. The underground stems also die. If the plants are clones—that is, they all developed at the same time—then all the flowering occurs simultaneously, and cane suddenly disappears from large areas. But the seeds left behind soon sprout, and the cane thicket looks the same after only a few years.

The same laws of determinate age also govern the flowering and dying back of the larger, treelike bamboos of Asia. Some species take decades between flowering, and the people of a bamboo-rich region often mark time and age by the flowering cycles of particular indigenous species. Instead of stating age in years, someone may say, "She has seen the bamboo flower three times."

RICH IN CANE

To see how a seemingly unimportant and less-than-glamorous species can have far-reaching impacts on entire ecosystems and regional economies, look no further than cane. It is a characteristic plant of pocosins, Carolina bays, alluvial stream terraces and the higher portions of southern river swamps. Cane grows abundantly in wetland soils of North Carolina, and dense continuous stands are often referred to as canebrakes.

Canebrakes were once a conspicuous component of southeastern North America's landscape. At the time of European contact, canebrakes covered hundreds of thousands of acres. Descriptions of "vast tracts" of cane and stands "many miles in extent" can be found in the literature of the period. In the late 1700s, a single southeastern canebrake was estimated to have covered an area of more than 800,000 acres. Today, while cane is still a common species in many wetland sites, it is seldom dominant. And many of the wetlands that once supported cane stands have been drained.

Cane ranges throughout the Southeast, as far north as southern Maryland and southern Ohio. Under the right conditions, like other bamboo, it can be an aggressive grass. Its rapid growth and ability to regenerate, as well as its evergreen nature, have made cane economically important as a forage crop for livestock. Up through the 1950s, the North Carolina Department of Agriculture distributed a number of pamphlets on the value and management of cane.

Of even greater importance is cane's key role in the creation of peat deposits in the southeastern Coastal Plain. Over time, cane actually improves its own habitat, building up the soil above saturated areas to create the moist conditions where it thrives. Radiocarbon dating has shown that many of today's peat formations are less than 3,500 years old. Where cane is abundant, peat can accumulate up to 1 millimeter per year.

One of the many benefits of intact cane-produced peatlands is retention of water, nutrients and suspended materials. The wet soil allows wetland plant communities and their associated fauna to persist even through prolonged droughts. The ability of the peat to retain water extends the hydroperiod of the soil. Prolonging the period of time soils remain damp influences what plants can grow there. Peat soils also improve habitat for aquatic species. Like a sponge, peat soaks up stormwater runoff, filtering pollutants out of the water cycle. The sponge action also reduces the surge of fresh water into estuaries, protecting habitat for shellfish and other commercial estuarine species downstream.

The ability of peat to retain moisture and change the soil acidity has horticultural implications, which many gardeners have grasped over the years. Small amounts of the state's peat resources have been sold for horticultural use, but most peat purchased by gardeners comes from Canada.

Because cane is an important peat builder in southern wetlands, it is actually responsible for the tangled evergreen thickets where this bamboo best thrives—pocosins. In acidic peat soils, well-established

cane thickets can hold their own against many wetland plants, even encroaching on them through root competition. In dense cane stands, the underground stems, or rhizomes, become a tangled mass. Walking through pocosins, you notice the ground often becomes drier than in surrounding vegetative types. This is because the underground cane rhizomes interlock, building a mat slightly higher than the saturated soils. This plant thrives in wetland soil, not doing well in places regularly flooded and dying out in areas where the soils become dry.

The result of peat production is good soil for cane, but poor soil for other plant species. Our Coastal Plain acidic peat deposits are usually thick enough to keep plant roots from reaching the underlying mineral soils. But cane enjoys the benefits of another, more powerful policing agent to remove competitive vegetation.

BLAZING CANE

Cane is a fire-dependent species that also acts as a fire accelerator. With the help of high winds, fire can leap 40 feet into the air as the cane stalks crackle and explode. The sound can equal that of a battlefield. The heat is tremendous, the smoke is thick, and the fire burns hot and fast, often evaporating water from ditches and igniting pines and other trees growing in the same wetlands. The rhizomes, which run deep into the mucky soils, usually survive. New cane shoots can emerge within days after a fire. The cane quickly spreads into adjacent burned areas.

In intense fires, the peat soils themselves burn. Where the rhizomes of the cane and the roots of other wetland plants are killed back, Atlantic white cedar often becomes dominant. A continuous, even-age forest of white cedar indicates a site where the soils have burned, killing off wetland plants and allowing the cedars to germinate on the exposed peat. With the decline of canebrakes, and truly hot fires in wetland systems, large stands of Atlantic white cedar are becoming uncommon.

Pond pine is another tree directly benefiting from cane. These pines do well in the acidic peat beds the cane helps produce, and they are also fire-dependent and fire-resistant. The bark of pond pine is essentially immune to hot ground fires. Small resin wells on the trunk explode when they get too hot, extinguishing fire on the tree's trunk. Fire is a requirement for reproduction in pond pine. Seeds remain locked in cones for years, with the heat of ground fires causing the cones to open slowly. The fire is long past by the time the seeds are released. Thick cane growth under the pond pine assures that fires burn hot and fast, maximizing seed release.

Because peat burns, our state's Coastal Plain peat deposits have generated interest as an alternate energy source. Yet, while an assessment of 560 million tons of moisture-free peat on more than 600,000 acres of land in North Carolina sounds impressive, it would meet our state's energy needs for only about eight years. And this estimate was based on mid-1970s energy use. Furthermore, both peat mining and the conversion of peat to energy raise logistical problems and a number of environmental issues as well. To date, no permits have been issued for energy-based peat mining.

Cane's entangled *roots, or rhizomes, help form the spongy peat soil in which the plant thrives.*

Much of our peatland loss in North Carolina is not from mining but from land drainage. The organic materials in peat decompose once exposed to dry air.

CANE HABITAT

Bamboo specialists, or species that are totally dependent on bamboo forests for their existence, are common in South America, southeastern Asia and several other regions of the world where bamboos grow larger and are a more prevalent part of the landscape. The best known of these species, of course, is the giant panda, which feeds almost exclusively on bamboo shoots. In addition to a number of birds, mammals and amphibians restricted to bamboo habitats, there are frogs, bats, insects and other invertebrates that actually live within the hollow chambers of the bamboo stalks. In some bamboo, the woody chambers are filled with water, supporting unique aquatic invertebrates.

In North America, known bamboo specialists are limited to six species of butterflies—southern pearly eye, creole pearly eye, southern swamp skipper, cobweb little skipper, yellow little skipper and cane little skipper. There is some speculation that the now-extinct Bachman's warbler was habitat-dependent on canebrakes, but there is no evidence to support this. A number of species thrive in cane-dominated habitats, such as the aptly named canecutter, an alternate name for the swamp rabbit, and the canebrake rattlesnake. The canecutter confines itself to cane communities in the northern portions of the Mississippi drainage. The canebrake rattlesnake is now regarded as a southern race of the widespread timber rattlesnake. Swainson's warblers, another species indigenous to the Southeast, are widely cited as being cane specialists. But for the most part they, like cane, are responding to canopy gaps in the forest caused by storms or logging. They are not dependent on the cane *per se*.

In the early 1980s, my wife and I conducted extensive surveys on birds and mammals associated with Carolina bays, pocosins, streamhead forests and other North Carolina Coastal Plain wetlands that often supported rich growths of cane. In more than 200 days of fieldwork, we set and checked 17,000 small mammal traps, set mist nets to catch bats and conducted surveys for signs and evidence of larger mammals.

We documented 40 species of mammals using these habitats. At least eight used cane-associated wetlands to the extent that they considerably extended their northern or southward distributions within these habitats only. Others increased their numbers, benefiting from the same fires and clearings made by wind damage, which encourages cane growth. In pure stands of cane and pond pine, we found limited diversity of mammals. But one species, the golden mouse, existed here in densities 10 times greater than in any other habitat we studied. Several hundred hours of surveys for breeding birds in these same communities yielded 40 to 50 species per subcommunity type for cane-associated habitats and 16 to 38 species for wetland communities that did not support cane.

Though this would lead to a conclusion that cane is important for all sorts of wildlife, this is not really the case. The diverse bird and mammal assemblages responded to rich wetland soils and the plant communities they support. And cane, like some of the birds and mammals, received additional benefit from fire and other factors that caused openings in the forested wetlands. Thus, cane was simply a part of these particular plant communities. At the same time, however, it was the agent responsible for them because of peat building, necessary protracted soil-water retention and the fuel it provided for fires. Such an indirect relationship is actually ecologically stronger than a direct one.

RAZING CANE

Indian nations used fire for clearing land for agriculture, hunting and warfare. This was a benefit to cane, and vast stands developed that were fire-managed by the Native Americans. They burned the canebrakes once every seven to 10 years, maintaining and expanding the cane by eliminating competing vegetation. Within a few decades of the arrival of Europeans and the introduction of Old World diseases, the Native American population collapsed to 10 percent of its former level. The crash of the native human population resulted in a corresponding decline in agriculture and the regeneration of the abandoned fields. Much of this agriculture was corn grown along river floodplains. Historic accounts of the abandoned agriculture lands of Native Americans describe them as being reclaimed by cane. In the mid-1700s, when explorers began to map the interior of the continent, much of what they found was not pristine wilderness but a 200-year-old, second-growth forest supported by a landscape that had been heavily modified.

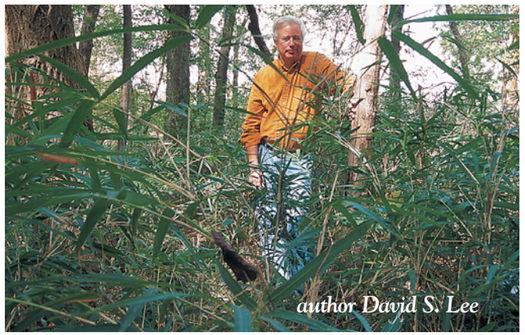
WAYNE IRVIN

Countless wildlife *species rely on cane-formed wetlands habitat—from the aptly named canebrake rattlesnake to the Chinese mantid to the Swainson's warbler. As wetlands are drained, and cane-dominant ecosystems decline, these animals lose critical habitat.*

Canebrake inhabitants, such as the spotted turtle (left), are plentiful. But few North American species are dependent on cane to the point that they can't live anywhere else. One is the Creole pearly eye butterfly (caterpillar, right).

The decline of vast canebrakes was well under way by the 1700s and continued to proceed rapidly. Existing canebrakes were gradually destroyed by the overgrazing of domestic animals, new burning schedules, European-style agriculture, land draining and major flood-control projects in bottomlands. Prior to the invention of chemical fertilizers, the very bottomlands that supported cane were prime agricultural lands because of the moist, nutrient-rich alluvial soils. Farmers burned the land in late winter and early spring, killing the new growth of cane. The few remaining rhizomes that resprouted were removed by hand. The surviving canebrakes were excellent native grass pastures because of their evergreen foliage. Partly because of this, the frontier of the South became a major livestock-producing region. By 1860 more than 12 million cattle and an even larger number of hogs were supported by open-range grazing. These large herds were not compatible with the cane. To generate new cane growth, frontier farmers burned the ranges annually. The overgrazing resulted in the conversion of canebrakes to savannahs supporting other species of grasses.

Once eliminated, cane is slow to recover. Except for its single blooming effort every 15 years, it does not propagate from seed, but through vegetative spreading of the underground rhizomes. By the early 1900s, canebrakes had all but disappeared. A few remained in isolated areas well into the 20th century.



author David S. Lee

Cane is still common, and rhizomes supporting a few stalks can be found in most undisturbed wetlands. Where sunlight can reach the soil—along road cuts and power line rights of way—cane flourishes, responding quickly to openings in the forest canopy. Several years back, a misdirected flood control program run by the federal Soil Conservation Service paid to have woody vegetation removed from the creeks that wind through the pocosins and streamhead forest on my property. This was not something I wanted to have done to my property, but a team of government workers had cleared much of the stream edges before I discovered what they were doing. This resulted in increased light levels along the streams. Within a year, a forest of cane stalks emerged from rhizomes that had previously been dormant and from ones that sprouted only a few random stalks. It's now harder to walk along the creeks, but the dense cane stalks at least add a high degree of concealment for the spotted turtles, cottonmouths and canebrake rattlesnakes that patrol the stream edges.

The historical use of land in the Southeast has resulted in a situation where the plant itself is common. But canebrakes as plant communities, and the white cedar stands that often follow, have all but disappeared from the landscape. A number of biologists and wetland conservationists are concerned and calling for programs to restore these habitats. This might be an unjustified reaction.

Were the canebrakes only a result of man-made disturbance in the first place? The fact that they were maintained by Native Americans is moot, in that these people were present on the continent for only about 11,000 years. The suggestion that this is a man-made—and thereby artificial—community type is supported by the limited number of species that seem to prefer it. Consider this when comparing North American canebreaks to those in other regions of the world: Those in North America shelter no real obligate species, ones that cannot exist without the presence of dense, continuous stands of cane. The butterflies dependent on cane are not extraordinary; most butterflies have caterpillars that are dependent on some specific food plants. The other species associated with cane are simply coinhabitants, with cane, of bottomlands. Several of these species, like cane, respond positively to natural or man-induced clearings in the forest.

The interrelationships of cane and cane communities are very peculiar—and less than straightforward. Although it is clear that cane is an important element in the long-term building of acidic soils that allow for protracted hydroperiods, and as a fuel for fires that control community structure, it is not necessary to have vast stands of cane to accomplish either. No native species are dependent on vast tracts of cane, and canebrakes developed historically simply as a result of man's use of wetlands. Yet the very wetland communities in which cane and other wetland species thrive are built in the self-serving environment that this bamboo helps create.

Cane, like cypress and Spanish moss, is characteristic of the Southeast. Although it grows elsewhere in North America, only here in the South does it become a conspicuous species. Last summer I encountered a large canebrake rattlesnake crossing a road that winds through our property. It was right at the place where a creek runs under the road and where the cane now grows lush and tall. This is the same little creek bottom that has supported a pair of nesting Swainson's warblers for the last four years. The snake was fat with her unborn vipers. We exchanged stares for a few minutes, and then she continued across the road and disappeared into the bamboo. I followed for a few steps, but the snake's cryptic pattern, the broken light, and the dried cane stems and leaves made her invisible. I stomped about a bit hoping I could get her to rattle but had no luck. My movements startled a Creole pearly eye that had been resting on the shaded side of a red maple. I was impressed with its speed as I watched the small brown butterfly, nondescript except for its conspicuous eye-spotted wings, fly quickly out of sight. I was also impressed, and somewhat embarrassed, by the fact that I was squandering time watching butterflies.

Still, that particular section of the property instantly became a little more precious than it was just the day before. And although the snakes, butterflies and birds are what grab my attention and interest, the cane itself is the real biological marvel. Its rhizomes, like an unseen deity, were literally supporting and holding together a wetland community that it had helped create. The resulting deep peat deposits with their acidic soils and extended watery periods arrested the growth of competitive vegetation. Fires fueled by the dry leaves and aerial stems of the bamboo kept the few other species that could grow here in check. The pocosin community growing along our creek is as perennial as the grass that glues it together.