

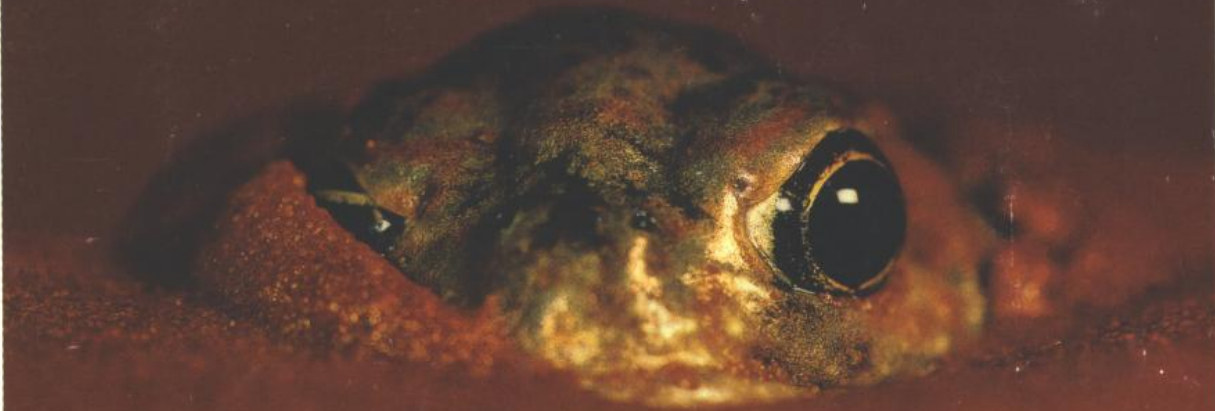
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## The Fragile Web

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**Tread with care.** Millions of seeds of *Miconia*, at far right, a fast-spreading alien tree that shades out natives, litter the soil around this infestation near Hilo, Hawaii. "We clean our boots before we go to uncontaminated areas," says Duane Nelson, leader of a team that roams the island like

**A**T THE ROYAL BOTANIC GARDENS at Kew, in London, botanists have set themselves what seems at first glance an impossible challenge: Collect and store seeds from all the flowering plants of the British Isles by the year 2000. But, in fact, says Roger Smith, director of Kew's Millennium Seed Bank, it's perfectly doable; indeed the seeds from more than 60 percent of the flora are already in hand. "In part that's because these are small islands with limited habitats and relatively few species," about 1,570, says the lanky Smith, leaning back in his chair in his office at Wakehurst Place, one of Kew's satellite gardens, 45 miles south of London. "But it shows what can be done."

Now the Kew botanists have set their sights still higher: collecting 10 percent of the world's flora by the year 2010. "I'm not saying that these plants are necessarily the ones that are most at risk of going extinct," says Smith, "but it gives us an insurance policy. We're losing habitats worldwide at a phenomenal rate—and when habitats go, the plants go. This gives us the possibility of restoring them at some future date."

No one knows, of course, when that date might be, particularly in the case of islands, where many plants are usually natives found only in that place and particularly vulnerable to extinction. That's why a key part of the Seed Bank is storage.

In a low brick building across from Smith's office two young women pull on fiber-filled suits, hats with long earflaps, mukluks, and two layers of wool gloves, equipping themselves as if heading into the Arctic. But their destination is actually only a few feet away: the Seed Bank's cold rooms, where the temperature is minus 20 degrees Celsius (-4°F). It's in these icy chambers that the seeds collected from the wild are stored. Keeping the seeds cold and dry will preserve them for at least 200 years. "That buys us some time to understand the implications of worldwide habitat loss—and the time, I hope, to restore or save them," says Smith. After all, the goal, he adds, "is not to have these seeds sitting in the cold in little foil packets.

It's to see the plants thriving again in the wild."

But storing seeds is not the only way to save biodiversity. Other scientists are looking for ways to demonstrate in practical terms the economic value of native plants and animals. On a grassy peninsula that juts into Lake Victoria, Zeyaur Khan, an entomologist at the Kenya-based International Centre of Insect Physiology and Ecology, leads the way to several test plots of corn and native grasses he has planted.

"African farmers have a big problem with stem borers," explains Khan, describing how the larvae of moths burrow into cornstalks. He stops at a corn plot surrounded by a two-foot swath of tall grass. "It used to be thought that the native grasses were the cause, that they were the primary hosts of the borers. It was even suggested that by getting rid of the grasses, we'd be rid of the stem borers too."

But no one had ever studied the relationship between the borers and grasses in depth, so in 1994 Khan launched a survey. Of the 600 species of grass he examined in Kenya, only 30 were hosts to stem borers. A few of these 30 were especially sought after by the moths. This led Khan to think that they could be used to control the stem-borer problem in corn.

One grass that the moths like to lay their eggs on, he found, has a clever defense: When attacked by larvae, it produces a gummy substance that traps the pests, so that only 5 to 10 percent emerge as adults.

"Look at this," Khan says, slicing open a stalk of the grass. Inside are curled several cream-colored larvae, about an inch long. "Now look at this corn," he says, cutting open a stalk growing beside the grass. Its interior is pest free, the stalk firm and healthy. The stem borers have apparently chosen the grass as a host over the corn. Another grass gives double protection. It exudes chemical signals that repel the moths and, at the same time, attract wasps that inject their eggs into stem borer larvae. When the wasps' eggs hatch, their larvae eat the pests. Drawn to a cornfield by this grass, the wasps lay their eggs in the larvae infesting corn.

By planting such grasses side by side with his crop, Khan has cut borer damage by almost

epidemiologists, killing invaders and warning locals. *Miconia* arrived 40 years ago as a backyard ornamental. Now up to 20,000 acres are overrun with what's being called green cancer. Perhaps leaf spot fungus, a disease from *Miconia's* home in the tropical Americas, will check its advance.



70 percent. "It's a simple way to improve our crop yields," he says, "and very clearly demonstrates why we need to save biodiversity."

**I**N COSTA RICA'S Guanacaste Conservation Area, Dan Janzen and his wife, Winnie Hallwachs, both ecologists, take a broader approach to the problem. "It's simple: Buy every scrap of trashed land anybody wants to sell and add it to the conservation area," says Janzen, a robust man who's so intent on saving the tropical dry forest in the country's far northwest that the mundane tasks of life never seem to get done. Wearing an unbuttoned shirt, he stomps through the woods in hiking boots only half-laced; his trifocals are spotted, his shoulder-length white hair finger combed. But his words and energy are messianic: Costa Rica's reputation as an ecologically enlightened country has some roots in his beliefs. "Yes, you want to save this forest because you might find a new drug or new pest control or attract tourists, but none of these are *the* reason for wanting to keep this a wildland.

For me, there's only one objective: that this biodiversity survive."

Janzen leads the way through a young forest of thin, spindly trees, now naked during the dry season, their brown leaves scuttling under our feet. He stops when it turns abruptly cool and looks up. The trees here have huge girths, and their leafy branches cast a cool, welcoming shade. "These trees aren't bigger or greener because it's wetter here," Janzen says. "It's because they're old-growth original forest—evergreen mahoganies and chicle trees that once grew everywhere here." The spindly trees we hiked through are juveniles of what 500 years from now will once again be a semi-evergreen closed canopy.

"At one time, dry forests like this made up more than half the tropics' forest," Janzen says. "But less than 2 percent of it remains. Why? Because it's where people want to live and farm and ranch. From San José [Costa Rica's capital] to the Pacific—all that land was dry forest." When Janzen arrived in 1963, the Guanacaste lowlands were thriving ranches, and the