

Moss Hunters Roll Away Nature's Carpet, and Some Ecologists Worry

By JOSHUA TOMPKINS

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While a rolling stone may gather no moss, what Dr. Robin Wall Kimmerer wants to know is how quickly a stationary stone can collect it. Specifically, how quickly moss, when stripped from boulders or tree trunks or the forest floor, will grow back.

Dr. Kimmerer, a professor of environmental and forest biology at the State University of New York College of Environmental Science and Forestry, is one of a growing number of researchers and land managers who are worried about the effect of commercial moss gathering.

She has seen the aftermath of such gathering firsthand, having once bushwhacked her way up a muddy hillside in western Oregon, following the trail of harvesters to a grove of maple trees hiding in the mist.

Winded by the climb and bloody from thorn scrapes, she took in the scene, described last year in her book "Gathering Moss." On the far side of a stream, the trees were swaddled in moss, its lush fabric wrapped around the trunks in woolly pelts and hanging from the branches like green gossamer beards.

But on her side of the water, the maples were bare. Their moss had been torn off, stuffed into burlap sacks, and hauled back down the hill. Frowning at a cigarette package left by one of the harvesters, Dr. Kimmerer marveled at how they had gotten their heavy prize through the salmonberry bramble and wondered if they knew what they had plundered. "What it was, of course, is a living carpet that might have been a hundred years old," she said recently in a telephone interview.

Her frustration stresses the contradictory relationship humans have with moss, an ancient, primitive plant whose role in forest ecology is still just partly understood. Overlooked in its habitat - or even mistaken for a blight - moss is nevertheless sought for its aesthetic value at nurseries, craft stores and floral shops around the country, lining baskets and adorning wreaths.

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Four years after moss was harvested for an experiment, a maple branch, above, remains virtually bare. To help replenish the supply, some inmates at the Cedar Creek facility in Washington are trying different methods for growing it.

With gatherers roaming public and private property for fresh pickings, the loosely regulated industry faces scientific scrutiny as biologists and businesses clash over research findings and land managers struggle to enforce collection policies across huge tracts with scarce personnel.

Last year, harvesters in the United States bagged as much as 17 million pounds of moss, according to an estimate by Dr. Patricia Muir, a professor of botany and plant pathology at Oregon State University. Most of the moss is from the Pacific Northwest and Appalachia, where moderate winters and abundant rain allow moss to thrive.

Gatherers favor a few popular species, none of them endangered or threatened (no mosses are), pulling them from rocks and logs in the East and hardwoods in the West. Harvesters use bare hands and an occasional rake or ladder, but sometimes they get brazen: Oregon officials once saw harvesters who had strung a cable down a small valley and strapped a shopping cart to it to hoist moss up to the road.

The question is how soon new moss can take its place. A tree shrouded in moss may have needed decades or longer to get that way, and after harvesting, regeneration is even slower. Dr. Kimmerer's study of an experimentally harvested area found in some cases a recovery rate of only 1 percent per year. "You're looking at 100 years to get back to the initial volume," she said. "Yes, it's a renewable resource, but not on any meaningful time scale."

Land managers in the Pacific Northwest and Appalachia are trying to curtail legal and illicit gathering. The Monongahela National Forest in West Virginia has ceased issuing collection permits, and the Siuslaw National Forest in Oregon limits the amount of moss that can be taken each year - a few thousand pounds in some districts - but many gatherers flout restrictions.

"It's a continuous problem," said Rich Babcock, the special forest products coordinator for the Hebo District in Siuslaw, the busiest collection area. "You see a lot of moss going down the road in the late evening, and you really don't know where it's coming from."

At Washington's Olympic National Park, where no commercial harvesting of any forest product is allowed, Dan Pontbriand, a ranger, said moss poachers were venturing farther and farther onto the property for their quarry.

Gathers will often pile bags of moss in a secluded location and haul it away under cover of darkness. He estimates that for every arrest forest officials make, confiscating the crop and issuing a \$250 fine, another 10 harvests go unnoticed.

For years, the moss industry itself went largely unnoticed as well. Last spring, Dr. Muir finished the first comprehensive survey of the American moss harvesting industry in a report to the Fish and Wildlife Service and the United States Geological Survey.

Questioning dozens of botanists, land managers and moss dealers, she calculated that 10 million to 40 million pounds of moss had been collected annually nationwide in recent years. Accurate figures are impossible because many land managers still allow unlimited harvesting.

Furthermore, Dr. Muir said: "You've got a permit, let's say, for 200 pounds. Nothing's going to stop you from harvesting 10 times that much."

Laws in some states say otherwise. In Washington and Oregon, the small storehouse operations and larger forest-product distributors that buy moss from harvesters are required to check the seller's permit for each haul. Yet whether or not the moss came from the area designated by the permit is practically impossible for buyers to know.

The Forest Products Packaging Company of Independence, Ore., buys more than 300,000 pounds of moss from harvesters every year. Its owner, Dick Reinhard, said the burden of obtaining permits and avoiding prohibited areas has forced many smaller gathering outfits out of the business. He also says he believes moss grows back faster than scientists claim. After an area is picked clean, with adequate shade and moisture it "will be regrown within five years to the point where you can't tell," he said.

At retailers, moss can fetch as much as \$5 for a four-ounce bag, and much of it is sold on the Internet. Moss export figures are compiled by the United States Department of Commerce, but domestic sales are not. Dr. Muir puts total annual sales anywhere from \$6 million to \$165 million. The market has fluctuated sharply in the last decade, dropping off in 2001 but doubling last year.

If harvesters and wholesalers regard moss as a commodity, many park visitors don't notice it at all. Flourishing in the shadowy boscage of old-growth forests, moss is nature's wallpaper, with all the lack of sexiness that implies. And though its perseverance can evoke a kind of meditative sympathy - the poet and occasional gatherer Theodore Roethke wrote of the guilt he felt after "pulling off flesh from the living planet" - the experts calling attention to the plight of moss realize it hardly possesses the majesty of a humpback whale or the pathos of a harp seal pup.

"We conservation biologists think of those as the charismatic megafauna," Dr. Kimmerer said. "I like to think of the mosses as charismatic microflora, but you have to look close."

Indeed, under the magnifying glass the seemingly featureless facade becomes a tiny forest unto itself, a microcosm of stalks and leaves. Without roots, seeds or a vascular system, moss works hard to build this infrastructure, enduring a two-stage reproductive cycle that sends millions of spores out a few inches to start new growth. Only a tiny fraction succeed, though moss can also clone itself with nearly any piece: a broken-off shoot or leaf can foster a whole new plant.

Trees and logs are the most hospitable substrates, though some moss species have learned to conquer the barren surfaces of rocks, where spores face astronomical odds of success.

Harvesting removes more than just moss. The coral reef of the forest, it's the home of dozens of tiny creatures - mites, springtales, microscopic rotifers, and others. Dr. Neville Winchester, an entomologist at the University of Victoria, has counted more than 300 species in some tree canopy moss colonies. And the marbled murrelet, an endangered seabird, flies miles inland to nest on moss mats.

Moss also retains several times its weight in water, serving as a humidity regulator for the forest. A descendant of early algae, moss was the first plant to migrate from water to land as life on earth was first brewing, and it still depends on copious moisture for its survival, with tiny sperm fanning out in search of eggs on a delicate, interstitial film of liquid. No surprise, then, that moss lies dormant in the warm, dry summer, when most harvesting takes place, and begins growing with the first rains of fall as the trees shed their leaves and sunlight trickles down to start photosynthesis.

Concerns about the sustainability of wild moss lead to one question: can it be raised instead? Though bryology, the study of mosses, lichens, and liverworts, has been around for centuries, virtually nothing is known about cultivation. "It really is time that we start learning how to farm them just like we do corn and tobacco and everything else," said Dr. Nalini Nadkarni, a forest ecologist at Evergreen State College in Olympia, Wash.

Predicting that moss's low-key nature would be well suited to the prison setting, where horticulture has become a popular rehabilitation therapy, Dr. Nadkarni began a moss program last fall at the nearby Cedar Creek Corrections Center in which about a half-dozen inmates experiment with different growing methods. Despite promising results, Dr. Nadkarni realizes that even a large commercial moss farm or two will barely dent the market. "It might start out as a boutiquey thing," she said, hoping eco-conscious consumers may go for hand-tended moss the way they have flocked to cachets like green timber products and shade-grown coffee. "If we don't come up with ways to provide an alternative, then we're stuck with naked branches."