WEED WHACKERS

Monsanto, glyphosate, and the war on invasive species

By Andrew Cockburn

On a Friday evening in January, a thousand people at the annual California Native Plant Society conference in San Jose settled down to a banquet and a keynote speech delivered by an environmental historian named Jared Farmer. His chosen topic was the eucalyptus tree and its role in California's ecology and history. The address did not go well. Eucalyptus is not a native plant but a Victorian import from Australia. In the eyes of those gathered at the San Jose DoubleTree, it qualified as "invasive," "exotic," "alien"—all dirty words to this crowd, who were therefore convinced that the tree was dangerously combustible, unfriendly to birds, and excessively greedy in competing for water with honest native species.

In his speech, Farmer dutifully highlighted these ugly attributes, but also quoted a few more positive

Andrew Cockburn is the Washington editor of Harper's Magazine *and the author, most recently, of* Kill Chain: The Rise of the High-Tech Assassins.

Photographs of eucalyptus trees in California by Chad Ress

remarks made by others over the years. This was a reckless move. A reference to the tree as "indigenously Californian" elicited an abusive roar, as did an observation that without the aromatic import, the state would be like a "home without its mother." Thereafter, the mild-mannered speaker was continually interrupted by boos, groans, and exasperated gasps. Only when he mentioned the longhorn beetle, a species imported (illegally) from Australia during the 1990s with the specific aim of killing the eucalyptus, did he earn a resounding cheer.

California native-plant partisans are a committed lot, and not only in their dislike of eucalyptus trees. Many of them are influential in local government, and they yearn to restore the treeless "native" grassland that greeted the first European settlers of the Bay Area in 1769. (For centuries, Native Americans had cleared the trees to facilitate hunting.) Thus the romantic Monterey cypress is a frequent target for the chain saws of the San Francisco Recreation and Parks Department—even though two small stands in Monterey, just fifty miles south, are cherished and protected as natives. The cypress is not the only item on the nativist hit list. Over the next few years, more than 450,000 trees in Oakland, Berkeley, and neighboring areas are due to be destroyed in the name of "wildfire-risk reduction."

Defining "native" and "invasive" in an ever-shifting natural world poses some problems. The camel, after all, is native to North America, though it went extinct here 8,000 years ago, while the sacrosanct redwood tree is invasive, having snuck in at some point in the past 65 million years. The National Invasive Species Council defines the enemy as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." But the late, great evolutionary biologist Stephen Jay Gould dismissed such notions as "romantic drivel." Natives, he wrote, are simply "those organisms that first happened to gain and keep a footing," and he ridiculed the suggestion that early arrivals "learn to live in ecological harmony with [their] surroundings, while later interlopers tend to be exploiters."

Even so, anti-invasive ideology is prevalent across the country, from university biology departments to wildlife bureaucracies to garden clubs. In Virginia, where I spend part of my time, a nice lady from the Virginia Native Plant Society told me that her idea of a truly natural landscape was the one viewed by the Jamestown settlers in 1607. To that end, she sternly urged me to uproot my yellow-blossomed forsythia (of Balkan origin) and replace it with a "good native shrub." In Texas, George W. Bush used to devote much of his presidential vacation time to destroying the tamarisk trees—reviled Eurasian imports—that grew on his ranch. Many states maintain invasive-plant councils (and sometimes exotic-pest-plant councils) to monitor and eradicate alien invaders. Last year, the North Carolina Invasive Plant Council gave its annual Certificate of Excellence to two forest rangers who had detected a small patch of cogongrass—an invasive unwittingly imported from Asia in packing crates, which the Vietnamese call "American weed," because it spread on land defoliated by Agent Orange.

As it happens, an erstwhile supplier of Agent Orange, the Monsanto Company, also manufactures America's most popular remedy for cogongrass: glyphosate. The active ingredient in Monsanto's Roundup and many other weed killers, glyphosate is the weapon of choice for battling all sorts of invaders. A 2014 study by the California Invasive Plant Council found that more than 90 percent of the state's land managers used the compound, which is particularly recommended as a slayer of eucalyptus trees. Discussing *Phragmites australis*, the reed found in wetlands throughout the country, Massachusetts conservation officials similarly tout this "effective" weed killer. Pennsylvania urges glyphosate's deployment against purple loosestrife, while Illinois recommends it for Japanese knotweed. The Louisiana Department of Wildlife and Fisheries prescribes it for cogongrass but warns that "multiple applications for full control" may be required.

This anti-invasive mania is not merely a local phenomenon. It is the official position of the federal government, as expressed by the State Department, that "invasive alien species pose one of the most serious threats to our environment, affecting all regions of the United States and every nation in the world." In February, National Invasive Species Awareness Week was celebrated in Washington, complete with a reception on Capitol Hill. Last year, the federal government spent more than $2 billion to

fight the alien invasion, up to half of which was budgeted for glyphosate and other poisons.

That's small change, nativists argue, when measured against the damage such interlopers inflict on the national economy. The Department of the Interior claims that the annual tab is $120 billion. But this number comes from a 2005 report by David Pimentel, an ecologist and scholar at Cornell, whose dislike of aliens apparently extends to the human variety, as evidenced by his public opposition to both legal and illegal immigration. Pimentel extrapolated at least some of his findings from such dubious assumptions as the dollar value of grain consumed by each rat in the United States. In an earlier paper, he concluded that cats were costing us $17 billion every year, after calculating that our furry (and, in his view, non-native) friends kill an annual 568 million birds, and arbitrarily valuing each bird at $30.

On close examination, other examples of the damage said to be caused by exotic invaders look no less questionable. The supposedly supercombustible eucalyptus, for example, survives fires that consume surrounding plant life—and rather than unfairly appropriating water, the tree actually irrigates soil by absorbing moisture from the coastal fogs through its leaves and funneling it out through its roots. (Though still cited as the prime culprit in the devastating 1991 Oakland firestorm, the eucalyptus was in fact cleared of responsibility in a FEMA report.) Monarch butterflies belie its reputation for repelling wildlife, the eucalyptus being their favored wintering abode in California.

As for the tamarisk, it consumes no more water than the beloved cottonwood, native to the Southwest. Nor, contrary to rumor, is it inhospitable to other species, as certified by the endangered southwestern willow flycatcher, which delights in roosting amid the tamarisk's foliage. According to Matthew Chew, a historian of biology at Arizona State University, the tree's sorry reputation dates to a ploy during the 1940s by a local mining corporation, whose operations required enormous quantities of river water—which had already been allocated to local farmers and other businesses. The solution was to generate studies demonstrating the heinous quantities consumed by the thirsty tamarisk. The destruction of the trees would theoretically free up huge quantities of "new" water in the rivers, which could then be used by the selfsame mining corporation.

Then there is the zebra mussel. This immigrant from the Caspian Sea is a perennial target of the nativists, thanks to its tendency to reproduce in vast numbers, encrust jetties, clog water-intake pipes, and crowd out God-fearing American mussels. But zebra mussels have successfully filtered pollution in the notoriously filthy Lake Erie and other waterways, thus promoting the revival of aquatic plants. The mussel also feeds a growing population of smallmouth bass and lake sturgeon.

THE DREAM OF ERADICATING THE INTERLOPER IS INTERTWINED WITH A FANTASY OF RESTORING THE "ORIGINAL" LANDSCAPE

It is the common reed, however, that has inspired one of the most determined and dubious campaigns of extermination. Phragmites is accused of robbing other plants, fish, and wildlife of essential nutrients and living space. Delaware has responded by spraying and respraying on an annual basis a 6,700-acre expanse of the Delaware River estuary with thousands of gallons of glyphosate-based weed killer. In 2013, locals in the Hudson River community of Piermont, New York, discovered a plan to destroy a 200-acre reed marsh fronting the town. Outraged, they fought back. "We love the marsh," an indignant Marthe Schulwolf, who is active in opposing the scheme, told me. "It's beautiful, a living environment, with lots of wildlife, and it protected us from the Hurricane Sandy storm surge." The townspeople were especially alarmed to learn that the state's "toolbox" for eradication included heavy spraying of herbicides—glyphosate being the customary choice—right next to two playgrounds.

As usual, the nativist dream of eradicating the interloper is intertwined with a fantasy of restoring the landscape to its "original" condition. The common reed has also covered vast stretches of the New Jersey Meadowlands, to the irritation of nativists who yearn for the return of the original cordgrass. Peter Del Tredici, formerly a senior research scientist at Harvard's Arnold Arboretum, points out that the New Jersey Turnpike bears much of the blame: by blocking tidal flows, inimical to phragmites, it has allowed the reed to flourish. Ripping out the highway would bring back the cordgrass soon enough. "Meanwhile," he adds, "there are over five hundred landfills in this area that are leaking nitrogen and phosphorus, and phragmites is actually cleaning the site up." In any case, he said, the very idea of "re-creating a lost landscape is an impossibility, because the conditions under which these landscapes evolved no longer exist. The world is a totally different place as a result of human activity. There's no going back in time."

Mark Davis, a professor of biology at Macalester College and a frequent critic of anti-invasive hysteria, put it more pungently. "It's the same perspective as ISIS wanting to re-create the seventh-century caliphate," he remarked. "It's ecological fundamentalism, the notion that the purity of the past has been polluted by outsiders." Far from crowding out native species, he argued, invasives tend to move into areas that have been ravaged, or at least disturbed, by human activity. They are, in other words, a symptom, not a cause. Cogongrass is one striking example, but the same pattern recurs with many vilified species. Ailanthus, a salt-friendly seaside tree from China, spread inland from the East Coast along the fringes of America's interstates, tracking the salt religiously spread by highway departments during winter snowstorms.

If the anti-invasive movement rests on such debatable foundations, why has it flourished in this country, winning endorsement from activists, local, state, and federal bureaucracies,

and respected academics? It's not as though hostility to newly arrived plant species has been a great American tradition.[1] In California, the eucalyptus was once universally cherished for its graceful and colorful appearance in a land often devoid of trees—indeed, during the 1870s, it was planted by the hundreds of thousands. A century ago, the tamarisk was promoted by the U.S. Army Corps of Engineers as an ideal means to prevent soil erosion in the Southwest. Even kudzu was once hailed as the "Lord's indulgent gift to Georgians": government nurseries grew millions of seedlings and distributed them to farmers as a restorative for depleted soil.

Nowadays, the notion that plants and animals have a "natural" habitat, from which outsiders must be expelled, has taken firm hold in the United States—first among a cadre of biologists, then in the media, and ultimately at the highest levels of the federal government. What happened? David Theodoropoulos, a California naturalist and seed merchant and the author of *Invasion Biology: Critique of a Pseudoscience,* is blunt about what he sees as a deadly inversion of environmental priorities. "Thirty years ago," he told me, "the greatest threats to nature were chain saws, bulldozers, and poisons. Now the greatest threats are wild plants and animals. And what do we use to fight them? Chain saws, bulldozers, and poisons. Who does this serve?"

Retracing some recent history may help to answer his question. During the Reagan era, when environmentalists were still imbued with the spirit of Earth Day, nobody worried about invasive species. Instead, well-organized, militant groups were busy fighting chemical pollution, nuclear power, shale-oil drilling, logging devastation, and other corporate onslaughts. According to Jeffrey St. Clair, a historian of environmentalism, "People like [Reagan's interior secretary] James Watt definitely mobilized the movement, and so the corporations weren't really able to get all that they wanted."

By 1992, the movement had a self-appointed standard-bearer in the political arena: Senator Al Gore of Tennessee. That year he published his best-selling *Earth in the Balance*, in which he manfully vowed to bear the political costs of his environmental crusading:

> Every time I pause to consider whether I have gone too far out on a limb, I look at the new facts that continue to pour in from around the world and conclude that I have not gone far enough.… The time has long since come to take more political risks—and endure more political criticism—by proposing tougher, more effective solutions and fighting hard for their enactments.

These uplifting sentiments were not always matched by actions. Critics noted Gore's championship while in Congress of the $8 billion Clinch River breeder-reactor project, riddled with fraud and bribery. They also pointed out his legislative maneuvers on behalf of the Tellico Dam, on the Little Tennessee River, a $100 million boondoggle denounced by David Brower, the founder of Friends of the Earth, as "the beginning of the end of the Endangered Species Act." Following the 1992 election, former Gore staffers moved into key environmental posts at the EPA and elsewhere. There they would benefit would-be polluters such as Disney (which had just been fined for dumping sewage in the Florida wetlands) and food processors (irked by a 1958 ban on carcinogens, soon to be repealed under the 1996 Food Quality Protection Act).

Nevertheless, as far as the public was concerned, nature had no more stalwart defender than Gore. So when Senator Bob Graham of Florida wrote to him in June 1997 about "the growing environmental threat posed by alien (non-indigenous) invasive species," he received an enthusiastic response. In fact, the issue was already on Gore's mind. A few weeks earlier, he had received a letter signed by a large group of biology professors, including the eminent scholar and ant expert E. O. Wilson, warning that "a rapidly spreading invasion of exotic plants and animals not only is destroying our nation's biological diversity but is costing the U.S. economy hundreds of millions of dollars annually." Among the ominous examples cited were the zebra mussel and the invasion of San Francisco Bay by a new exotic species "on the average of once every twelve weeks."

Gore sprang into action. He reassured Graham that Clinton's circle of scientific advisers had already established a Biodiversity and Ecosystems Panel, which would "be considering the issue of invasive species and will report their recommendations at the end of the year." The panel's chair, he noted parenthetically, was Peter Raven.

The official White House biography of Peter Raven listed him as the director of the Missouri Botanical Garden, and noted that he held a professorship at Washington University in St. Louis. That description failed to convey the full reach of his power and prestige as America's leading botanist. Wade Davis, an ethnobotanist at the University of British Columbia, describes Raven as a "total force of nature. He took a staid Midwest botanical garden and put it on steroids, turning it into the greatest institution of its kind on earth." A former president of the American Association for the Advancement of Science, *Time* magazine Hero for the Planet, chairman of the National Geographic Society's Committee for Research and Exploration, Raven was (and is) a hugely influential figure, with a network that extends through academic, government, and corporate bureaucracies.

He originally made his name in scientific circles with a 1964 paper, "Butterflies and Plants: A Study in Coevolution," written with Paul Ehrlich, a biologist later famous for the dire (and largely unfulfilled) predictions sketched out in his 1968 bestseller, *The Population Bomb.* Like Ehrlich, Raven tended

[1] *Overseas, it was another matter, notably in Hitler's Germany. Nazism's view of non-native plants was consistent with its view of non-native humans. "As with the fight against Bolshevism, in which our entire Occidental culture is at stake, so with the fight against this Mongolian invader, in which the beauty of our home forest is at stake," wrote a team of German biologists in 1942 regarding* Impatiens parviflora, *a small plant native to Asia. "In advocating native plants along the Reichsautobahnen," wrote Stephen Jay Gould, "Nazi architects of the Reich's motor highways explicitly compared their proposed restriction to Aryan purification of the people."*

to express a gloomy view of the planet's prospects. He regularly lamented the wholesale loss of our biodiversity, brought about by the accelerating extinction of plant and animal species. "We're over the mark anyway in preserving the world's sustainability," he told me in a recent conversation. "We've passed the point at which we can really do that effectively."

Raven's panel set to work and released its report, *Teaming with Life: Investing in Science to Understand and Use America's Living Capital,* in March 1998. The report took a bearish view of the ecological future, sounding an apocalyptic note on the first page:

> Collectively, all human beings, including Americans, are playing a crucial role in the sixth major extinction event to occur in the course of more than three billion years of life on Earth.... During the history of the United States, more than 500 of its known species have been eliminated (half of these since 1980) by various causes, including destruction of habitat by human activities or invasive species.

Although the document repeatedly stressed the virtues of biodiversity, it showed little sympathy for "invasive species such as killer bees, zebra mussels, fire ants, and the Mediterranean fruit fly," which were supposedly devastating the natural environment and posing "threats to the health of our human population." The zebra mussel, receiving no thanks for its heroic pollution-control efforts, was singled out for obloquy, having "cost more than $5 billion just to clean out pipes clogged by extremely densely clustered populations." (A decade later, a careful study by a team of Cornell scientists assessed zebra-mussel damage at one twentieth of that amount over fifteen years.)

Amid the gloom, however, the report identified a ray of hope: genetically modified organisms (GMOs). "It is anticipated that the U.S. market for seeds of genetically modified crops will grow to $6.5 billion during the next ten years," it noted, "and the annual production value of the plants derived from those seeds will be many times that amount."

The Monsanto Company could not have put it better. This was not surprising, since Raven (who retired in 2010) and Monsanto were close, both geographically and financially. The Missouri Botanical Garden was located just a few miles from Monsanto headquarters in St. Louis, and it owed much of its explosive growth to the beneficence of the corporation, which was in the process of changing its public identity from a chemical manufacturer and purveyor of Agent Orange to a "life sciences company"—one heavily invested in GMOs. In April 1996, Monsanto CEO Robert Shapiro joined Raven to break ground for the Monsanto Center, a four-story structure designed to house the garden's unique collection of botanical books and dried plants. Monsanto had contributed $2 million toward the center's construction, and had also donated the land and $50 million for the Danforth Plant Science Center, another GMO-intensive research facility.

"Monsanto loved Raven," a former senior executive at the company told me. "They were always showing off the Missouri Botanical Garden, bringing important visitors down to meet him, having him give tours, talks. He was definitely our showpiece."

For his part, Raven spoke publicly about the virtues of GMOs. The company's grand scheme was to genetically modify crops—particularly corn, soybeans, and cotton—to render them immune to the glyphosate in Roundup. This would allow farmers to spray weeds without killing the crops. *Teaming with Life* featured a Monsanto photograph of a flourishing bioengineered plant next to a pathetic nonengineered plant obviously about to expire. "Major companies will be, *are,* a major factor if we are going to win world sustainability," Raven told an interviewer in 1999. "There is *nothing* I'm condemning Monsanto for." (In his conversation with me, Raven defended his former patron even more stoutly, noting Monsanto's many civic philanthropies and absolving the company of any ill intent: "They obviously have no interest in poisoning everybody or doing something bad.")

I asked Raven whether his efforts to protect the natural world didn't clash in some way with his support for something very unnatural: GMO technology. "What's natural anymore?" he

replied. "If we're going to play God, we might as well be good at it."

While Monsanto played God during the 1990s, the Clinton Administration had its back—a policy consistent with its corporate-friendly approach to environmental issues. When, for example, the French balked at allowing GMO corn into their country, the president, the secretary of state, the national-security adviser, and assorted U.S. senators pleaded Monsanto's cause. (The French finally caved when Gore himself phoned the prime minister to lobby on the corporation's behalf.)[2] In addition, Washington's revolving door whirled many Clinton Administration officials onto the Monsanto payroll, while the president's committee of science and technology advisers included Virginia Weldon, the corporation's senior vice president for public policy.

The Raven panel's recommendation to join battle with invasives got rapid traction. "The invasion of noxious weeds has created a level of destruction to America's environment and economy that is matched only by the damage caused by floods, earthquakes, wildfire, hurricanes, and mudslides," cried Interior Secretary Bruce Babbitt when the report was released. Within a year, Clinton signed Executive Order 13112, creating the National Invasive Species Council "to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause." Among the founding members of the council's advisory committee was Nelroy E. Jackson, a product-development manager and weed scientist for Monsanto who had helped to develop Roundup formulations specifically for "habitat-restoration markets"—that is, for eradicating invasives.

For all Monsanto's talk of "life sciences," the company's profits, especially in those days, rode on glyphosate. According to Tao Orion's book, *Beyond the War on Invasive Species,* the compound was originally invented to clean dishwashers and other appliances. Then someone noticed that it destroyed any plant it touched. By the late 1990s, Monsanto's Roundup revenues were growing at 20 percent a year, and the compound was duly revered inside the corporation. As the former company executive put it to me: "Roundup was God at Monsanto."

Such divine status was assured by its symbiotic relationship with Monsanto's bioengineered corn and soybeans. The strategy worked. Farmers were planting GMO crops in ever-increasing amounts—from just over 4 million acres worldwide in 1996 to 430 million in 2013.

The results of this exotic intervention were not so positive, however, for Raven's treasured biodiversity. The larva of the monarch butterfly, for example, feeds exclusively on milkweed, a plant that glyphosate is tremendously effective at killing: unlike other herbicides, it attacks the milkweed's roots. As the rain of glyphosate increased, surpassing 141,000 tons on U.S. crops in 2012, the butterfly's food supply dwindled to the vanishing point. In 1995, at the dawn of the Roundup Ready era, a billion monarchs fluttered over America's fields; by 2014, the number had fallen to 35 million, and there was talk of declaring the butterfly an endangered species.

Raven remains optimistic about the monarch, citing Monsanto's "very exciting" plan to foster milkweed growth in noncultivated areas. Such natural oases, however, are few and far between in the Corn Belt. Those that remain are likely to host other invasive plants, such as garlic mustard, denounced as a "serious invader from the east" by Iowa State University, which inevitably recommends "spot applications" of glyphosate as a remedy.

Meanwhile, the growth curve in glyphosate use has steepened, thanks to a practice that began in 2004. Late in the season, many farmers are now spraying the compound on crops that are *not* bioengineered to resist it, in order to kill them off and produce artificially early harvests.

"You can imagine the residue levels on the damn wheat," said Charles Benbrook, an agricultural economist at Washington State University. "If you buy whole-wheat bread, the glyphosate will be ground up with the whole-wheat kernel and it will be part of the flour. It's a very high exposure. When they make white flour, the bran gets separated out and is used in the food supply in other places. That bran will have three or four times the concentration of glyphosate, because that's where the residues are lodged. It's insanity."

Over the years, there have been repeated allegations that glyphosate is dangerous for humans—charges vehemently denied by Monsanto and its friends in high places. "Table salt and baby shampoo are more toxic, or as toxic, as glyphosate," Rand Beers told *60 Minutes* in 2001. Beers, George W. Bush's assistant secretary of state for international narcotics, was defending the U.S.-funded spraying of a glyphosate-based compound on millions of acres in Colombia as part of an effort to wipe out coca plantations. Despite Beers's dutiful denials, however, the mixture turned out to be a lot more dangerous than baby shampoo, afflicting the population with painful rashes and other ailments. It also did a fine job of wiping out the vegetables and poultry that made up the local food supply, while often failing to kill the coca plant, its intended target.

This disaster made no difference. Nor did a 1985 EPA study suggesting that glyphosate might give humans cancer, a finding that the EPA reversed in another study six years later. In 2013, a French report on the compound's carcinogenic effect on rats was withdrawn in the face of an intense lobbying effort by the company. Through thick and thin, Monsanto stuck to its mantra: in the words of a company spokesperson, "All labeled uses of glyphosate are safe for human health and supported by one of the most extensive worldwide human health databases ever compiled on an agricultural product."

Then came a massive speed bump. This past March, seventeen scientists met in Lyon, France, under the auspices of the International Agency for Research on Cancer, an arm of the World

[2] *For years, Monsanto's MON810 corn was the only GMO crop cleared for cultivation within the European Union. In May 2014, however, the French parliament reversed its earlier policy and banned the crop as a threat to the environment.*

Health Organization, to assess the carcinogenic potential of several chemicals. The group was led by Aaron Blair, an internationally renowned epidemiologist and the author of more than 450 scientific papers, who spent thirty years at the National Cancer Institute. Among the chemicals they evaluated was glyphosate.

As Blair explained to me, the group reviewed three kinds of data: lab tests on animals, epidemiological studies on humans who had been repeatedly exposed to glyphosate, and "mechanistic" analyses of the ways in which the compound could cause cancer.

The animal studies, Blair said, "found excesses of rare tumors." Absent glyphosate exposure, the tumors "are *really* rare. They almost never just occur." The studies on human beings, conducted in the United States, Canada, and Sweden, pointed to an equally grim conclusion. "They showed a link between people who used or were around glyphosate and an increased risk of non-Hodgkin's lymphoma. Different studies, in different places, suggested that they might go together."

According to Blair, there were good grounds to declare that glyphosate definitely causes cancer. This did not happen, he said, because "the epidemiologic data was a little noisy." In other words, while several studies suggested a link, another study, of farmers in Iowa and North Carolina, did not. Blair pointed out that there had been a similar inconsistency in human studies of benzene, now universally acknowledged as a carcinogen. In any case, this solitary glitch in the data caused the group to list glyphosate as a probable (instead of a definite) cause of cancer.[3]

The reaction from Monsanto was predictably irate. GMO Answers, a P.R. website put together by the biotech-food industry, featured a host of derisive posts about the study. Sympathetic journalists went to bat on behalf of the lucrative toxin. Hugh Grant, Monsanto's chairman and CEO, was curtly dismissive: "It's unfortunate that junk science and this kind of mischief can create so much confusion for consumers."

As it had on previous occasions, the company demanded a retraction of the report. When we talked, it didn't sound as if Blair was likely to do any such thing. "Historically, the same thing happened with tobacco, the same thing happened with asbestos, the same thing happened with arsenic," he said. "It's *not* junk science."

The French government agreed, promptly banning the sale of Roundup by garden stores in response to Blair's report. The Colombian authorities meanwhile halted the coca-spraying program, over U.S. government protests. The program had not been a huge success, of course, given the target plant's remarkable ability to survive the spray.

But unintentional glyphosate resistance is not confined to coca. Although Monsanto scientists had deemed such a development nearly impossible for weeds targeted by the Roundup Ready system, species subjected to prolonged exposure began to adapt and survive even as farmers were harvesting their first bioengineered crops. "It's a disaster," said Benbrook. "As resistant weeds spread and become more of an economic issue for more farmers, the only way they know how to react—the only way that they feel they *can* react—is by spraying more." It has now become common for farmers to spray three times a season instead of once, and Benbrook estimates that the extra doses of herbicide will add up to 75,000 tons in 2015.

All of which brings us to horseweed, or mare's tail, a plant native to North America and once highly prized for its medicinal qualities. It has hairy stems, and grows about four feet tall. A nuisance in corn and soybean fields, it has naturally been a glyphosate target. But in recent years, farmers have been encountering a new kind of mare's tail: a superweed produced by years of glyphosate treatment. Not only does it refuse to die when drenched with four times the recommended dose but it appears to gain strength from the experience, growing up to eight feet tall, with stems thick enough, according to one farmer, to "stop a combine in its tracks."

In other words, a very alien invasive, made right here in America. ■

[3] *When asked about Blair's report, the Monsanto spokesman reiterated that "glyphosate is not a carcinogen" and cited a 2013 EPA study that concluded, "Glyphosate does not pose a cancer risk to humans." He also noted that the I.A.R.C., in its own words, identifies cancer hazards "even when risks are very low with known patterns of use or exposure."*