Conservation in conflict: Illegal drugs versus habitat in the Americas

Book Section

Conservation in Conflict

Illegal Drugs versus Habitat in the Americas

LILIANA M. DÁVALOS
AND ADRIANA C. BEJARANO

In 1995, we hiked the Sierra de la Macarena National Park in Colombia, seeking adventure and documenting wildlife. By day, we backpacked across breathtaking rivers and into forests full of surprises—the roar of monkeys, the call of toucans—and sometimes the dark forests would open upon small clearings with tiny huts. The clearings invariably contained rows of lively green shrubs that stood in clear contrast to the shades of the surrounding canopy. At night, small aircraft zoomed above where we slept without a roof over our heads, but Villavicencio, the closest city, was some eighty-two miles away and had no nighttime flights. It did not take long to discover that the light green fields were coca (*Erythroxylum coca*)—the leaves of which produce cocaine—and that it was being flown out under the cover of darkness.

Today, the Sierra de la Macarena is at the center of a political storm. The clearings carved out of the forest add up to more than 32,000 acres (13,000 ha) of coca planted across the park and its buffer zone.[1] In 2005, the park was the testing ground for a coca eradication policy that involved spraying massive amounts of herbicide. The contradiction became obvious: the government was

---

LILIANA M. DÁVALOS's research and writing on the effects of illegal drug trafficking on forests and wildlife was inspired by her visit to the Serranía de la Macarena, Colombia, in 1995. Her work has helped draw the attention of conservationists to this growing threat. Due to the dangerous nature of the work, she used the pseudonym María D. Álvarez until recently.

ADRIANA C. BEJARANO is an environmental toxicologist who has published widely on issues related to environmental pollutants, particularly on pesticide toxicity. She recently joined the Department of Environmental Health Sciences at the University of South Carolina as an adjunct faculty member working on ecological risk-assessment for conservation strategies in the Americas.

using toxic chemicals on a park it had promised to protect. Meanwhile, thousands of settlers were encroaching on this land, far from any market or public service, but connected to the rest of the world through clandestine drug-running flights. Trade in illegal drugs damages habitat and threatens species, not just in Sierra de la Macarena but throughout the Western Hemisphere.

Although coca prices have declined over the last fifteen years, coca is a valuable commodity in the global market, particularly when compared to legal crops like coffee. In 2005, a farmer could earn about $7,040 annually from a 2.5-acre (1 ha) coca plot,[2] almost four times Colombia's average per capita income, and many times the wealth of a subsistence farmer.

Source: Leonardo Correa/SIMCI-UNODC.

The borders of protected areas do not deter illicit crop growers, as shown in this field cleared in the Amazonian forest of National Natural Park Puinawaii in southeast Colombia.

Cultivating coca, opium poppy (*Papaver somniferum*)—the basis for morphine and heroin—and marijuana (*Cannabis sativa*) pays well, given demand for illegal drugs worldwide. But, although marijuana can grow in greenhouses practically anywhere, poppy and coca grow only where adequate habitat is paired with the absence of law enforcement. In the Americas, cultivation of coca occurs in tropical and subtropical regions of Colombia, Peru, Bolivia, and, to a lesser extent, Venezuela and Ecuador. Poppy is grown in the highlands of Mexico, Colombia, and Peru.[3]

Until recently, illegal drug cultivation and trafficking in the Americas were not considered drivers of habitat degradation, perhaps because their environmental impact is overshadowed by social and political effects. But the promise of even a fraction of the profits of the international illegal drug trade—estimated between $45 and $280 billion per year[4]—provides powerful incentives to clear Andean and Amazonian forests and wreck coastal habitats and parks throughout Mexico, Central America, and the West Indies. Cultivation, processing, trafficking through remote areas, and eradication by herbicide occurs from Paraguay to northern California. Separated as these four drug-related activities are in time and space, they combine to consistently degrade natural areas, threaten species, and obstruct conservation.

Cultivation

Marijuana is so ubiquitous that national agencies throughout the Americas have practically given up quantifying the total area planted. In California, marijuana-eradication programs operate in nine protected areas, including Sequoia

National Forest.[5] In Chihuahua, Mexico, deforestation and water appropriation for marijuana and poppy cultivation impact the temperate forest and fauna—including the endemic Zacatecan deer mouse (*Peromyscus difficilis*) and several reptile species.[6] The highland ecosystems in Mexico, Peru, and Colombia are prone to erosion, and poppy cultivation there destabilizes fragile water catchments by exhausting the soil's capacity to retain moisture.[7]

Source: Leonardo Correa/SIMCI/UNODC.

Steep slopes and heavy rainfall strip the soil cover from the remnant Andean forests cleared for illicit cultivation, here in northwest Colombia.

Coca is closely monitored by government agencies in the Americas. Cultivated in the Andes since pre-Columbian times and used to stave off hunger and treat everything from altitude sickness to menstrual cramps, the coca leaf contains about 0.15 percent of its weight in cocaine. Traditional uses are still legal in Bolivia and Peru, and in Colombia are restricted to the Kogui community of the Sierra Nevada de Santa Marta.

The rapid expansion of illicit coca crops for the international cocaine market, however, threatens the last repositories of imperiled forest species more efficiently than most other causes of forest fragmentation. Forest-dwelling species have nowhere to go when the forests are burned or cleared for coca plantations, and species such as Todd's parakeet (*Pyrrhura caeruleiceps*) in the Serranía del Perijá, the Baudó guan (Penelope ortoni) in the Chocó, or the long-haired spider monkey (*Ateles belzebuth*) in the Macarena park are sometimes hunted for food or the pet trade by encroaching growers and traffickers.[8]

In Peru, coca cultivation is concentrated in the northern Huallaga Valley and the regions of Apurimac, La Convención, and Tambopata. In Bolivia, most of it

is produced in the lowlands of Chapare and the highland Yungas. This includes cloud forests and lowland forests. By the 1980s, both countries had hundreds of thousands of coca acres,[9] and international demand had encouraged the clearing of hillsides and steep mountain slopes, causing significant erosion. Subsequent degradation of mountain forests has reduced suitable habitats for threatened bird species such as the southern helmeted curassow (*Pauxi unicornis*) and the cinnamon-breasted tody-tyrant (*Hemitriccus cinnamomeipectus*).[10]

By the end of the 1990s, illegal coca cultivation in Peru and Bolivia declined. But total coca production in the Neotropics did not: instead, Colombia became, and remains today, the world's largest producer. In Colombia, deforestation linked to drug cultivation and transport was likely responsible for more than half the forest loss during the 1990s.[11] Coca cultivation began in small plots at the edge of the Amazonian frontier, far from law enforcement and farther from legal markets. The Colombian conflict, spanning more than 4 decades, fosters conditions for illegal crops and their trafficking. Guerrillas and paramilitaries struggle against each other and against the state for control of areas of the countryside, and almost every militia controls some production, processing, and even trafficking of coca. In regions effectively beyond the reach of the government, growing coca is not a matter of choice; militias force *campesinos* to grow the crop so the local faction can take a cut of the profit. Even when not coerced, many *campesinos* turn to coca because it is a virtually risk-free investment; processors and traffickers guarantee the purchase and transport of the crop and even provide startup funds and chemicals to clear and fertilize land.

The combination of economic incentive and coercion has allowed coca cultivation to expand swiftly to any part of Colombia with significant forest, including protected areas. In the southern department of Caquetá, the rate of deforestation partly linked to coca peaked during the late 1990s at around 4.1 percent per year, which ranked among the highest in the world and was equivalent to clearing eighty thousand football fields annually.[12] Nature reserves are not exempt: in 2005, twelve of the fifty-one national protected areas had illegal coca production within their borders, and total park area known to be under cultivation increased 14 percent from the year before.[13] Deforestation is only part of the damage caused by coca cultivation: Colombian coca growers use approximately 210 million pounds (95 million kg) of chemical fertilizers and about 3 million pounds (1.4 million kg) of herbicides in their fields annually.[14]

In Colombia, deforestation linked to drug cultivation and transport was likely responsible for more than half the forest loss during the 1990s.

Quantifying how coca cultivation affects wildlife is difficult. Coca directly threatens with extinction only a handful of endemic birds, because birds generally have large geographic ranges. Nevertheless, intense clearing poses a great risk to less mobile, more narrowly endemic species. For example, a sin-

gle township in Caquetá encompasses the entire known distribution of the frog *Atelopus petriruizii*.[15] This frog is critically endangered precisely because its narrow range is an area where coca has spread quickly over the last fifteen years. Habitat loss such as this likely threatens dozens of other narrowly endemic amphibian species.

Yet, although coca production clearly has had a vast environmental impact, an argument can be made that it is the lesser of two evils. Farmers earn more per acre growing coca than they would with any legal crop, which potentially reduces the overall impact of agriculture on forests. But the extent of this reduction is hard to quantify, and in some places lucrative opportunities attract more colonists, converting more forest. For those concerned with wildlife, the overall deforestation rate is also less important than where deforestation occurs: illicit crops in Peru and Bolivia are grown in diverse lowland and upland forest ecosystems that support dozens of endemic and threatened species.[16]

Processing

Aside from sun drying, the processing of coca leaves into cocaine relies heavily on chemicals, including sodium bicarbonate, gasoline or kerosene, sulfuric or hydrochloric acid, potassium permanganate, ammonia, and acetone or ether. The liquid effluents in Colombia alone are estimated around 8.7 million gallons (33 million liters) per year.[17] As befits an unregulated enterprise, these effluents are dumped onto the soil and into watercourses without treatment.

Source: Leonardo Correa/SIMCI-UNODC.

Initial coca leaf processing in Guaviare, Colombia. The white powder is cement.

Coca processing was once limited to large laboratories near airstrips, navigable rivers, or ports. But large laboratories and airstrips were easy to detect, particularly with satellite images, so traffickers adapted and instead help rural growers set up small household labs to prepare the cocaine base. During 2003 and 2004, narcotics police found 14,920 clandestine laboratories in Bolivia, Peru, and Colombia, more than triple the number found a decade before, tripling the number of point sources for the discharge of drug-processing chemicals.[18] Home laboratories throughout the Amazonian forests of Colombia account for most of this growth.

Trafficking

Illegal drug users exist in every country in the world, but it is the purchasing power of users in developed countries that drives most trafficking. There are many more illegal drug users in the United States (and Europe) than in producing countries: less than 1 percent of adults in Colombia reported using cocaine (~280,000 people), compared to almost 3 percent in the US (~6 million people).[19]

Source: NPS Files.

Drug traffickers target unpopulated parts of the US–Mexico border, often trespassing into protected areas like Organ Pipe Cactus National Monument, shown here, with mortal risks to visitors and park rangers.

Drug trafficking to the US is concentrated along two routes: through the islands of the Caribbean and through Central America and Mexico. The latter route is the more used, following post–September 11 restrictions on shipping and air travel. Trafficking requires clearing land for clandestine airstrips, roads, trails, and ports along the route, and sometimes in parks. In the Guatemalan Petén, within the Maya Biosphere Reserve, drug traffickers clear new landing strips about every six months to avoid getting caught. Over the last fifteen years, by felling the tall trees bordering rivers, trafficking has eliminated close to half of the nesting sites of the scarlet macaw (*Ara macao*).[20]

Drug trafficking in protected areas poses deadly risks to staff, visitors, and conservationists. Traffickers are ruthless and command vast resources compared to underfinanced park services. In Guatemala powerful cartels have grabbed control of sections of the Maya Biosphere Reserve, undermining the authority of the park service, which has led to more clearing within the park.

Illicit crops in Peru and Bolivia are grown in diverse lowland and upland forest ecosystems that support dozens of endemic and threatened species.

One of the more insidious effects of trafficking is that the violence it brings precludes wildlife research and monitoring. In Mexico's Baja California, traffickers shipping drugs to the United States have kept conservationists and biologists away from several sea turtle nesting sites, which prevents biologists from knowing what turtle species are being endangered, or how.

Eradication

Although drug cultivation, processing, and trafficking are illegal, enforcing the law by eradicating crops with herbicides likely adds to the environmental damage. The most aggressive eradication program has been in Colombia. There, illicit crop eradication by aerial herbicide spraying began in 1978 when the highly toxic chemical Paraquat—controversially applied to eradicate marijuana in western Mexico—was used in the biodiverse northern areas of Sierra Nevada de Santa Marta.[21] By 1985, glyphosate—commercially sold as Roundup—had been introduced as a relatively benign defoliant. The total area sprayed annually increased from 2,100 acres (870 ha) in 1986 to more than 321,200 acres (130,000 hectares) in 2005.

Critics of aerial eradication contend that illicit crops are not eliminated, but merely displaced from one region or country to another, leading to more habitat fragmentation and social upheaval. Data from Colombia support this: the total area under illicit cultivation has risen, from approximately 61,700 acres (25,000 ha) in 1985 to around 210,000 acres (85,000 ha) in 2005.[22]

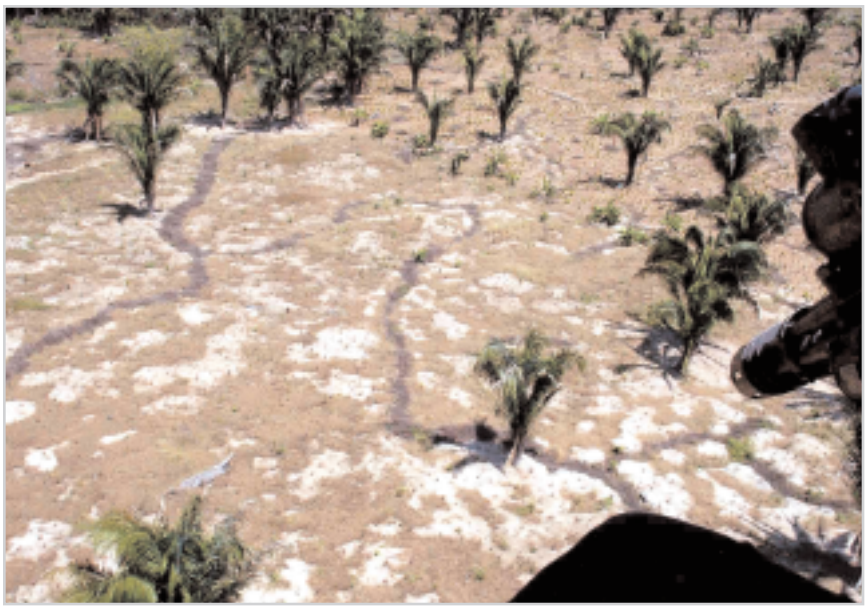
Aerial spraying spares almost no habitat. The effect on amphibians, so susceptible to chemical exposure, is of particular concern. Glyphosate, for example, can reduce larvae survival and may cause DNA damage in tadpoles, leading to population declines.[23] Yet in 2005, the Colombian government permitted defoliants in protected areas over the protest of conservationists worldwide. At the time, more than 1,900 environmentalists, mostly Latin American, addressed the Colombian president in an effort to bar aerial spraying in protected areas, arguing that aerial fumigation was ineffective and threatened amphibian populations, and that alternative development programs would be more successful because they engage the growers and their families. In fact, over the past few decades, Bolivia and Peru succeeded in decreasing the total coca crop by more than half through relatively effective eradication and law enforcement: government officials and coca growers themselves often uprooted coca plants by hand. Nevertheless, the government justified spraying because manual eradication is overtly dangerous in the face of ongoing armed conflict. Again, Colombia's violent conflict magnified the injuries to the country's environment and reduced options for conservation and natural resource management.

Critics of aerial eradication contend that illicit crops are not eliminated, but merely displaced from one region or country to another, leading to more habitat fragmentation.

The illegal drug trade has far-reaching environmental impacts in the Americas, affecting watersheds, soil cover, protected areas, coastal habitats, and the survival of numerous endemic species. Illicit crops create barren terrains that cannot sustain as many species as the rich landscapes they replace. Though ecolog-

ical disturbances in such biodiversity hotspots may be low on the priority list of international policy, they should not be ignored, particularly because cultivation and trafficking show no sign declining.

Conservationists need to establish baseline assessments of critical ecosystems and sensitive species and continuously monitor the damage from the trade. To abate that damage, international collaboration among law enforcement, local governments, and conservationists will be necessary. However, this will be a challenge on many levels.



Source: Leonardo Correa/SIMCI-UNODC.

Eradication by aerial fumigation leaves behind Dantesque landscapes, as in this picture from Guaviare.

Perhaps the best way to minimize the impact of illegal drugs on the environment is to pursue community-based strategies for alternative development and eradication wherever possible. Studies have shown that governance, technical support, and access to legal markets are more important than the price of coca when farmers decide what crops to plant.[24] Since 2001, development programs in Colombia have proved successful at providing support for alternative crops to coca growers, through the combined support of local and international development agencies, NGOs, and the national park system. These projects aim for social and environmental sustainability, and strategies range from incentivizing voluntary eradication to hiring former coca growers as park keepers.[25] Although social goals currently take priority, these projects provide fertile ground for subsequent conservation initiatives. The success of alternative development in Peru, Bolivia, and parts of Colombia shows that the cooperation of coca growers is indispensable to achieving lasting eradication. It also shows that governance, including agrotechnical support for *campesinos* and a reliable justice system, is critical to both antidrug and conservation efforts.

Society Working Paper, No. 27, New York, 2006.

8. C. D. Saunders et al., "The Environmental Ethics of Zoo Visitors," (presentation at the Society for Human Ecology Annual Conference, Salt Lake City, Utah, 2005).

9. O. E. Myers et al., "Emotional Dimensions of Watching Zoo Animals: An Experience Sampling Study Building on Insights from Psychology," *Curator, the Museum Journal* 47 (2004): 299–321.

Biogenetics and Conservation: Celebrate or Worry? by Stephen C. Aldrich

1. D. B. Rusch et al., "The *Sorcerer II* Global Ocean Sampling Expedition: Northwest Atlantic through Eastern Tropical Pacific," *PLoS Biology* 5, no. 3 (2007).

2. B. P. Trivedi, "Scientists Clone First Endangered Species: a Wild Sheep," *National Geographic Today*, October 29, 2001, http://news.nationalgeographic.com/news/2001/10/1025_TVsheepclone.html.

3. J. R. Reichman et al., "Establishment of Transgenic Herbicide-Resistant Creeping Bentgrass (*Agrostis stolonifera* L.) in Nonagronomic Habitats," *Molecular Ecology* 15, 13 (2006): 4243–55.

Conservation in Conflict: Illegal Drugs versus Habitat in the Americas by Liliana M. Dávalos and Adriana C. Bejarano

1. L. Correa, Sistema Integrado de Monitoreo de Cultivos Ilícitos, unpublished field data, 2006.

2. Correa, unpublished field data.

3. UN Office on Drugs and Crime, *World Drug Report*, vol. 1, *Analysis* (2006); Correa, unpublished field data.

4. F. E. Thoumi, "The Numbers Game: Let's All Guess the Size of the Illegal Drug Industry," *Journal of Drug Issues* 35 (2005): 185–200.

5. National Drug Intelligence Center, *National Drug Threat Assessment 2006: Marijuana*, www.usdoj.gov/ndic/pubs11/18862/marijuan.htm.

6. R. Gingrich, "Long Journey to Save the Sierra Madre," *Earth First!* 19 (1999): 8; G. Galster, "Mexican Deforestation in the Sierra Madre," Trade and Environment Database (TED) Case Studies 5, case 287 (1996); J. Walker and J. Leib, "Revisiting the Topia Road: Walking in the Footsteps of West and Parsons," *Geographical Review* 92 (2002): 555–81.

7. Gingrich, "Long Journey"; M. D. Álvarez, "Environmental Damages from Illicit Drug Crops in Colombia," in *Extreme Conflict and Tropical Forests*, ed. W. de Jong et al. (Dordrecht: Springer, 2007): 133–47.

8. M. D. Álvarez, "Illicit Crops and Bird Conservation Priorities in Colombia," *Conservation Biology* 16 (2002): 1086–96.

9. K. R. Young, "Threats to Biological Diversity Caused by Coca/Cocaine Deforestation," *Environmental Conservation* 23 (1996), 7–15.

10. J. Fjeldså, M. D. Álvarez, J. M. Lazcano, and B. León, "Illicit Crops and Armed Conflict as Constraints on Biodiversity Conservation in the Andes Region," *Ambio* 34 (2005): 205–11.

11. Correa, unpublished field data; M. D. Álvarez, "Illicit Crops and Bird Conservation Priorities in Colombia," *Conservation Biology* 16 (2002): 1086–96.

12. A. Etter et al., "Unplanned Land Clearing of Colombian Rainforests: Spreading Like Disease?" *Landscape and Urban Planning* 77 (2006): 240–54.

13. UN Office on Drugs and Crime, *Coca Cultivation in the Andean Region: A Survey of*

Bolivia, Colombia and Peru (2006), 1–228.

14. UN Office on Drugs and Crime, *World Drug Report*, vol. 2, *Statistics*.

15. M. C. Ardila-Robayo, *Atelopus petriruizii* in *Ranas Arlequines*, ed. J. V. Rueda-Almonacid et al., 100 (BogotÁ, Colombia: Conservación Internacional, 2005).

16. Fjeldså, Álvarez, Lazcano, and León, "Illicit Crops and Armed Conflict."

17. This may be an overestimate because the reagents are routinely reused; see M. D. Álvarez, "Environmental Damages from Illicit Drug Crops in Colombia," in *Extreme Conflict and Tropical Forests*, ed. W. de Jong, et al. (Dordrecht: Springer, 2007): 133–47.

18. UN Office on Drugs and Crime, *World Drug Report*, vol. 2, *Statistics*, 259.

19. UN Office on Drugs and Crime, *World Drug Report*, vol. 2, *Statistics*, 259.

20. Personal communication, WCS Guatemala program, 2007.

21. R. Vargas Meza, *Cultivos ilícitos y proceso de paz en Colombia* (2000), 1–55 (Bogotá: TNI/Acción Andina, 2000); R. Jeffrey Smith, "Spraying of Herbicides on Mexican Marijuana Backfires on US," *Science* 199 (1978): 861–64.

22. UN Office on Drugs and Crime, *World Drug Report*, vol. 2, *Statistics*; L. Sherret, "Futility in Action: Coca Fumigation in Colombia," *Journal of Drug Issues* 35 (2005): 151–68; M. D. Álvarez, "Environmental Damages from Illicit Drug Crops in Colombia," in *Extreme Conflict and Tropical Forests*, ed. W. de Jong, et al., 133–47 (Dordrecht: Springer, 2007).

23. R. A. Relyea, "The Lethal Impact of Roundup on Aquatic and Terrestrial Amphibians," *Ecological Applications* 15 (2005): 1118–24.

24. E. DÁvalos, "Modelo de toma de decisiones de los sembradores de cultivos ilícitos" (undergraduate thesis, Universidad del Valle, Cali, 2004), 1–29; L. Correa, unpublished field data, 2006.

25. Asociación Interamericana para la Defensa del Ambiente, Estrategias de desarrollo alternativo en Colombia: la necesidad de acciones mÁs allÁ de las fumigaciones a cultivos ilícitos (Oakland, California: Asociación Interamericana para la Defensa del Ambiente, AIDA, 2006): 1–23.

Rewilding the Islands by C. Josh Donlan

1. D. W. Steadman, "Prehistoric Extinctions of Pacific Island Birds: Biodiversity Meets Zooarchaeology," *Science* 267 (1995): 1123–31; T. H. Worthy and R. N. Holdaway, *The Lost World of the Moa: Prehistoric Life of New Zealand* (Bloomington: Indiana University Press, 2002): 718.

2. D. R. Towns et al., "Have the Harmful Effects of Introduced Rats on Islands Been Exaggerated?" *Biological Invasions* 8 (2006): 863–91.

3. B. W. Thomas and R. H. Taylor, "A History of Ground-Based Rodent Eradication Techniques Developed in New Zealand, 1959–1993," in *Turning the Tide: The Eradication of Invasive Species*, ed. C. R. Veitch and M. N. Clout (Gland, Switzerland: IUCN SSC Invasive Species Specialist Group, 2002): 301–10.

4. Ian MacFadden, Phil Moors, Rowley Taylor, and Bruce Thomas were among the New Zealand conservationists who developed the initial bait stations.

5. R. H. Taylor and B.W. Thomas, "Rats Eradicated from Rugged Breaksea Island (170 Ha), Fiordland, New Zealand," *Biological Conservation* 65 (1993): 191–98.

6. G. Howald et al., "Invasive Rodent Eradications on Islands," *Conservation Biology*, 21 (2007): 1258–68.

7. P. McClelland and P. Tyree, "Eradication: The Clearance of Campbell Island," *New Zealand Geographic* 58 (2002): 86–94.