

Health and Environmental Effects of Herbicide Spray Campaigns in Colombia

Jim Oldham and Rachel Massey¹
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Introduction

In February 2002, a three-year peace process in Colombia came to an end with President Andrés Pastrana's decision to retake the demilitarized zone ceded to rebel forces in 1998 as a safe haven for peace talks.² With this decision, Colombia appears to have returned to full-scale civil war, continuing a decades-long cycle of violence. Ostensibly with the purpose of supporting the "war on drugs," both the Clinton and the Bush administrations have provided substantial military aid to Colombia.³ The majority of U.S. aid to Colombia consists of assistance to the Colombian military and police forces. These forces are closely tied to paramilitary organizations responsible for the most serious human rights violations in Colombia's vicious civil war.⁴ Recently, the Bush administration expanded the possible scope of U.S. military aid to Colombia, requesting Congressional approval for \$98 million in military aid to protect an oil pipeline. Some lawmakers advocate providing US military equipment for counterinsurgency operations as well.⁵

The pretext for U.S. military aid to Colombia remains the effort to halt the drug trade. In this context, a key element of the aid is support for aerial spraying of herbicides in regions where drug crops are produced. Under U.S. sponsorship, large areas of the Colombian countryside are being sprayed by plane with herbicides. Supporters say these campaigns eradicate coca plants and opium poppies, the raw materials for cocaine and heroin respectively, and will thereby reduce production of these drugs.

According to the U.S. State Department, "the spray mixture [used] against coca throughout Colombia...contains three components: water, a commercially available formulation of the herbicide glyphosate, and the surfactant cosmo-flux 411f."⁶ While the U.S. government has refused to name the brand name of the glyphosate herbicide,⁷ it has been widely reported to be

¹ The authors are, respectively, Amazon Projects Director and Research Fellow at the Institute for Science and Interdisciplinary Studies (Prescott House, 893 West Street, Amherst, MA 01002; isis@hampshire.edu; <http://isis.hampshire.edu>).

² Juan Forero, "Colombia Attacks Rebel Zone as Leader's Patience Snaps," *New York Times* (February 22, 2002)

³ For details on U.S. aid to Colombia, see Center for International Policy, <http://www.ciponline.org/colombia>.

⁴ Human Rights Watch, "The 'Sixth Division': Military-paramilitary Ties and U.S. Policy in Colombia," (September 2001). Available at <http://www.hrw.org/reports/2001/colombia/> (visited November 26, 2001).

⁵ Juan Forero, "Colombia Attacks Rebel Zone as Leader's Patience Snaps," *New York Times* (February 22, 2002)

⁶ U.S. State Department, written answer to questions from U.S. Representative James McGovern (D, MA), (March 14, 2002.)

⁷ Deposition of Rand Beers, Assistant Secretary of State for International Narcotics and Law Enforcement Affairs (February 27, 2002). United States District Court for the District of Columbia, Case No. 1:01CV01908, Venacio Aguasanta Arias et al. vs. Dyncorp et al., pp. 42-3.

Roundup Ultra, an herbicide made by the agrochemical company Monsanto.⁸ These reports have been confirmed by the Narcotics Division of the Colombian National Police in information provided to the Colombian People's Ombudsman.⁹ The composition of Roundup Ultra (41% glyphosate, 14.5% surfactant, and 44.5% water¹⁰) also corresponds exactly to a description of the unnamed herbicide provided by the U.S. Embassy in Bogotá.¹¹

According to the U.S. State Department, the aerial eradication program is directed primarily against large coca producers.¹² But news stories from *The New York Times*, *The Washington Post*, the *St. Petersburg Times*, the BBC, and other sources make it clear that small land owners, peasant farmers, and indigenous communities have been directly affected by the spray campaigns. Some of these individuals and communities grow coca or opium poppy alongside other crops; many do not grow any drug crops.¹³

U.S. government authorities have often dismissed complaints of adverse health and environmental effects of the spray campaigns as scientifically unsound or otherwise lacking in credibility. Based on our review of news reports, eyewitness accounts, scientific information available on the chemicals being used, and arguments for and against the spray campaigns from governmental and nongovernmental sources, we believe the following to be true:

1) Aerial spraying has a significant negative impact on the lives of large numbers of people, particularly the rural poor, in Colombia. There is strong evidence linking spraying with serious human health effects; large-scale destruction of food crops; and severe environmental impacts in sensitive tropical ecosystems. There is also evidence of links between fumigation and loss of agricultural resources, including fish kills and sickness and death of livestock.

2) Many of the reported effects are consistent with the known effects of the chemicals used and with the manner in which they are applied. Reports of even more serious effects highlight the need for further study of hazards posed by the particular mix being used in Colombia.

3) Criticisms and complaints are based on sound facts and come from a wide range of respected national and international individuals and organizations—not from unreliable or self-interested sources as U.S. government sources often suggest.

⁸ Hugh O'Shaughnessy, "How global battle against drugs risks backfiring," *Observer* (June 17, 2001); "Guerra contra los cocaes," BBC World Service, <http://www.bbc.co.uk/spanish/news010117colombia.shtml> (visited Nov. 7, 2001); Paul de la Garza, "Roundup Works -- But Too Well?" *St. Petersburg Times*, (Mon., Aug 6 2001).

⁹ Eduardo Cifuentes Muñoz, Colombian Human Rights Ombudsman, "Responses to questions from the Colombian Congress" (July 2001).

¹⁰ Material Safety Data Sheet for Roundup Ultra, available at <http://www.cdms.net/lдат/mp178020.pdf>

¹¹ Information provided by William Duncan of the Anti-Narcotics Section of the U.S. Embassy, to Lisa Haugaard of Latin America Working Group (February 20, 2002). Dr. Anna Cederstav (pers. comm.) of the Interamerican Association for Environmental Defense reports that recent information from the EPA's Office of Prevention, Pesticides, and Toxic Substances points to the use of a different glyphosate herbicide, Roundup SL, considerably more toxic than Roundup Ultra. This requires further clarification from the government.

¹² Bureau for International Narcotics and Law Enforcement Affairs, U.S. Department of State, "Fact Sheet: Eradication of Illicit Crops: Frequently Asked Questions," November 30, 2001.

¹³ See, for example: Judy Mann, "Waging Chemical Warfare in Colombia," *Washington Post* (March 16, 2001), p. C11; Jared Kotler, "Colombian Candidate Questions Plan," Associated Press (Sunday August 26, 2001), available at

The Human Impacts of the Aerial Eradication Program

Numerous individuals and community groups in Colombia have registered formal complaints about adverse effects of the spray campaigns. Many of these complaints were reviewed and summarized by the National Environmental Justice Advisory Council (NEJAC), a Federal Advisory Committee to the U.S. Environmental Protection Agency. NEJAC issued a letter on July 19, 2001, stating that:

aerial eradication has seriously affected weak and marginalized communities of poor farmers, Indigenous Peoples, and settlers. Hundreds of complaints from these communities were registered with local and national offices of the Colombian Human Rights Ombudsman. Aerial spraying of the herbicide has caused eye, respiratory, skin and digestive ailments; destroyed subsistence crops; sickened domestic animals; and contaminated water supplies.¹⁴

Affected communities have lodged two principal complaints: aerial spraying causes adverse human health effects, and aerial spraying has destroyed food crops and sickened or killed livestock and farmed fish.

Reports from the ground: Human health effects

Major U.S. and international media have reported frequently over the past year and a half on widespread impacts of spraying on human health. For example, in the southern Colombian province of Putumayo, a representative of the indigenous Cofán people was quoted by the BBC as saying that the people of his community were suffering from headaches, fever, and rashes associated with the spraying.¹⁵ Also in Putumayo, the *New York Times* reported that the Health Department received many complaints of dizziness, diarrhea, vomiting, itchy skin, red eyes, and headaches in the aftermath of aerial spraying. Skin reactions were reported to be particularly prevalent among children.¹⁶ In the department of Nariño, a physician in the town of Aponte reported that aerial spraying on indigenous people's lands had caused "an epidemic" of "rash, fever, diarrhea and eye infections."¹⁷

In February 2001, the Health Department in Putumayo published a preliminary report on interviews conducted with residents, health care providers, and police in the municipalities of Orito, Valle del Guamuez, and San Miguel.¹⁸ These municipalities were targeted by spray campaigns from December 22, 2000 to February 2, 2001. According to the report, medical personnel in three local hospitals reported increased visits due to skin problems such as

bbc.co.uk/spanish/news010117colombia.shtml; Juan Forero, "No Crops Spared in Colombia's Coca War," *New York Times* (January 31, 2001); Paul de la Garza, Op. Cit.

¹⁴ Peggy Shepard, Chair, National Environmental Justice Advisory Council, letter to Christine Todd Whitman, Administrator, U.S. Environmental Protection Agency (July 19, 2001).

¹⁵ "Guerra contra los cacaos," BBC World Service, Op. cit.

¹⁶ Juan Forero, "No Crops Spared in Colombia's Coca War," *New York Times* (January 31, 2001).

¹⁷ Marjon van Royen, Op. Cit.

¹⁸ Departamento Administrativo de Salud, Oficina de Planeación, Sección Epidemiología, "Efectos de la fumigación: Valle del Guamuez y San Miguel Putumayo," (February 2001).

dermatitis, impetigo, and abscesses, as well as abdominal pain, diarrhea, gastrointestinal infections, acute respiratory infection, and conjunctivitis following spraying in the rural areas surrounding their respective municipalities.

In August 2001, a commission from the European Network of Brotherhood and Solidarity with Colombia visited the Province of Santander. The commission reported that “contrary to official declarations about the harmlessness of glyphosate, we were able to verify skin conditions (rashes and itching caused by the skin drying to the point of cracking) in both children and adults who were exposed directly to spraying while they worked their land or played outside their homes.”¹⁹

Even in neighboring Ecuador, communities near the Colombian border have reported illnesses after aerial spraying was conducted on the Colombian side. In October 2000, the health center in Mataje, Esmeraldas, a community of 154, reported treating 44 residents and another 29 people from surrounding areas for skin and eye irritation, vomiting and diarrhea in the aftermath of spraying.²⁰ The Ecuadorian press also reported in June 2001, that the Marco Vinicio Iza hospital, in Sucumbios Province, which borders the Colombian province of Putumayo to the south, was treating 10 to 15 patients a day for skin, respiratory, and other problems that local doctors attributed to the spraying.²¹ In September 2001, a class action suit was filed in U.S. federal court in Washington D.C. against DynCorp Corporation—the private contractor conducting the spraying in Colombia—on behalf of Ecuadorian Indians living near the Colombian border. The suit alleges that the spray campaign “caused severe physical and mental damage to Plaintiffs, their children, and other similarly situated lawful residents of Ecuador who have nothing whatever to do with the production of illegal drugs in Colombia.”²²

Reports from the ground: destruction of food crops and harm to livestock and farmed fish

Sources including the UN Drug Control Programme, municipal police within affected areas, and human rights monitors have documented adverse effects of aerial spraying, including the destruction of many acres of food crops; harm to livestock and farmed fish raised by poor rural communities; and damage to natural ecosystems.

According to the UN Drug Control Programme’s representative in Colombia and Ecuador, Klaus Nyholm, the United Nations has collected extensive evidence that herbicides are being sprayed on small farmers’ food plots. “We know that despite the government’s policy, sometimes small farmers’ plots are hit as well, and that legal crops such as bananas and beans are being fumigated by mistake,” he told a news conference in Bogotá.²³

¹⁹ Red Europea de Hermandad y Solidaridad con Colombia, “Informe Sobre Los Efectos de las Fumigaciones y las Constantes Violaciones a los DDHH en el Valle del Río Cimitarra,” Equipo Nizkor--Serpaj Europa, September 3, 2001. (Contact nizkor@derechos.org for more information.)

²⁰ *El Comercio*, Quito, (October 22, 2000) cited in Adolfo Maldonado, Ricardo Buitrón, Patricia Granda, Lucía Gallardo, *Reporte de la Investigación de los Impactos de las Fumigaciones en la Frontera Ecuatoriana*. June 2001.

²¹ “La muerte viene del cielo,” *La Hora*, Quito, (June 27, 2001).

²² *Aguasanta Arias et al. vs. DynCorp*, Class Action Complaint For Equitable Relief and Damages, Filed in the United States District Court for the District of Columbia, September 11, 2001.

²³ Cesar García, “U.N. Calls for Drug Crop Monitors,” Associated Press (July 24, 2001).

Within the Colombian government itself, the Human Rights Ombudsman reported in February 2001 that the aerial spraying had destroyed crops in eleven government-sponsored crop substitution and alternative development programs, programs specifically intended to provide poor farmers with economic alternatives to drug crop production. The Ombudsman expressed special concern about the effects of spraying on indigenous communities, including Cofáns, Awa, Paeces, Sionas and Pastos.²⁴

In January 2001, the BBC and the *New York Times* reported on the effects of spraying in Putumayo. The BBC quoted Jesús Ortega, Mayor of the small town of Puerto Guzmán: "Several months ago they sprayed here...but they did not respect the conventions laid out in the government decrees. It was done in an indiscriminate manner, without considering that it was going to affect agricultural food crops such as bananas, yucca, corn, and beans as well as pastures and forests. They sprayed water courses, cattle, and people." Ortega cited spontaneous abortions among livestock following the spraying, as well as adverse health effects in people.²⁵ After viewing the Valley of Guamuez from an army helicopter, a *New York Times* reporter added his own eyewitness account to farmers' complaints about the destruction of legal crops: "fields that once were bright green with coca and other plants were a pale brown, wiped free of vegetation for miles around."²⁶

An inspection and accounting by the municipal police in the single township of Valle del Guamuez (population 4289) in the Province of Putumayo found that 17,912 acres had been sprayed with herbicides as of February 21, 2001. Of this area, less than 12% was dedicated to coca cultivation. Crop and animal losses in the 59 settlements and neighborhoods that make up the township included: 2263 acres of bananas, 1030 acres of yucca, 1032 acres of corn, 7064 acres of pasture, 1665 acres of other crops (coffee, peanuts, fruit trees, timber, and vegetables), 1112 acres of forest, 38,357 domesticated birds (chickens, ducks), 719 horses, 2767 cattle, 6635 guinea pigs, 128,980 fish (from aquaculture), and 919 other animals (pigs, cats, dogs).²⁷ A similar review for the municipality of La Hormiga, also in Putumayo, reported the destruction of 20,239 acres of food crops and adverse effects in 171,643 farm animals (including large livestock, poultry, and farmed fish).²⁸

In the Cimitarra River Valley in Santander, the European Network of Brotherhood and Solidarity with Colombia found that, after aerial spraying between August 5 and 25, 2001, the 242 families interviewed (less than 10% of the total number affected) had lost a total of 1350 acres (over two square miles) of food crops including corn, yucca, bananas, rice and yam. They also reported adverse effects on 600 acres of fruit trees and pasture land. The report notes that "the lack of

²⁴ Eduardo Cifuentes Muñoz, Human Rights Ombudsman, "Sobre el impacto de fumigaciones en 11 proyectos de desarrollo alternativo en el Putumayo," Resolución Defensorial No. 004, February 12, 2001.

²⁵ "Guerra contra los cocales," BBC World Service (January 18, 2001), available at <http://www.bbc.co.uk/spanish/news010117colombia.shtml> (visited November 15, 2001).

²⁶ Juan Forero, "No Crops Spared in Colombia's Coca War," *New York Times* (January 31, 2001).

²⁷ Luz Angela Pabón, España, Municipal Police Inspector, Valle de Guamuez, Putumayo, Colombia "General Summary of Losses due to Fumigation through 21 February 2001."

²⁸ Lisa Haugaard, Latin American Working Group, "Ten questions for Colombia Policy", question 7. Available at <http://lawg.org/10questions.htm>.

food and the contamination of water supplies caused the death of a number of domestic animals (including cattle, mules, and chickens) as secondary impacts of spraying.”²⁹

Plausibility of Complaints

Responding to complaints of adverse effects from the spray campaigns, the U.S. government has argued that reported effects are implausible or impossible. Our review suggests that, in fact, the complaints lodged by affected communities are plausible and that many of the reported effects would be expected based on what we know about the formulation's toxicological properties.

Information distributed by the U.S. State Department defends the aerial spray campaign on the basis of the following claims: “glyphosate has been extensively tested and evaluated;” the U.S. Environmental Protection Agency has “approved glyphosate for general use;” “glyphosate is poorly absorbed from the digestive tract and is largely excreted unchanged by mammals;” “when received orally or through the skin, [glyphosate] has a very low acute toxicity;” “toxicological studies have shown that glyphosate is less toxic than common salt, aspirin, caffeine, nicotine and even Vitamin A;” and a “major peer-reviewed article...concluded that ‘under present and expected conditions of use, Roundup herbicide does not pose a health risk to humans.’”³⁰

However, significant facts are omitted in the State Department's claims. These facts may help to explain the adverse effects reported so widely in Colombia.

1. The scientific review article cited by the State Department as justification for the spray campaigns assesses the hazards from “present and expected conditions of use” of glyphosate herbicides.³¹ However, the term “present and expected conditions of use” implies adherence to the manufacturer's recommendations. For example, the Manufacturer’s label for Roundup Ultra warns against applying the herbicide “in a way that will contact workers or other persons, either directly or through drift.” The label also calls for the removal of livestock prior to spraying and waiting periods of 2 to 8 weeks before harvesting crops or using sprayed areas for grazing. The label warns against contact of the “herbicide with foliage, green stems, exposed non-woody roots or fruit of crops...desirable plants and trees, because severe injury or destruction may result.”³² These conditions are not met in Colombia, where airplanes apply herbicides over acres at a time with no prior warning to land owners. In the U.S., such failure to follow the label instructions would be a violation of Federal law.³³

²⁹ Red Europea de Hermandad y Solidaridad con Colombia, 2001, Op. Cit.

³⁰ U.S. Embassy in Bogotá, Narcotics Affairs Section, “The Aerial Eradication Program in Colombia: Background and Environmental Impact,” <http://usembassy.state.gov/bogota/wwwhglyph.html> (visited November 7, 2001).

³¹ Gary M. Williams et al., “Safety Evaluation and Risk Assessment of the Herbicide Roundup and its Active Ingredient, Glyphosate, for Humans,” *Regulatory Toxicology and Pharmacology* 31, (2000) pp. 117-165.

³² Roundup Ultra sample label, 1999. (current as of January 13, 1999), available at <http://www.cdms.net/ldat/ld178005.pdf> (visited March 12, 2002).

³³ Roundup Ultra sample label, 1999.

2. Even assuming application according to U.S.-approved label instructions, the label and product safety information make it clear that spraying with Roundup Ultra can cause³⁴:

- skin and eye irritation in people who are sprayed directly or contaminated by drift, or who come into contact with sprayed crops immediately after crop dusting;
- illness and gastrointestinal irritation in people or animals if they ingest large quantities of the crops or other contaminated materials shortly after spraying;
- fish kills and ecological harm to aquatic ecosystems that are contaminated or sprayed; and
- death of non-target plants, and associated environmental damage.

3. The State Department defense of the herbicide spraying focuses on the active ingredient, glyphosate. However, 14.5% of Roundup Ultra is a surfactant. (The manufacturer describes the surfactant as "a phosphate ester neutralized polyethoxylated tallowamine mixture,"³⁵ but has not disclosed its precise identity.) Surfactants can be a significant source of toxicity of glyphosate herbicides. For example, a Japanese study of attempted and successful suicides through ingestion of Roundup herbicide concluded that the surfactant was probably the main cause of Roundup's toxic effects.³⁶

4. The label for Roundup Ultra warns that "this is an end-use product. Monsanto does not intend and has not registered it for reformulation."³⁷ Yet in Colombia at least one other additive—an additional surfactant known by the brand name Cosmo-Flux 411F—is added to the chemical mix.³⁸ Since neither the U.S. nor the Colombian government has made available any studies on these additives' effects, alone or in combination with Roundup Ultra, there is no basis for assuming that these products are safe when sprayed in the vicinity of rural populations, their food crops and water sources. In June 2001, the British chemical company ICI, manufacturer of one ingredient of Cosmo-Flux, refused permission for its use in the spraying program, responding to concerns about health effects from this unintended use of its product.³⁹

5. The herbicides used against coca crops in Colombia are both more concentrated and applied in greater doses than the maximum levels recommended by the manufacturer on the U.S. EPA-approved label. Sources in both the U.S. and Colombia indicate that the spray mixture contains 44% by volume of the commercial herbicide.⁴⁰ In contrast, the U.S. label for Roundup Ultra

³⁴ Roundup Ultra sample label.

³⁵ Monsanto company website, "Information About Roundup Ultra™ Ingredients," Available at http://www.monsanto.com/monsanto/media/backgrounders/00mar22_ultra.html, visited January 31, 2002.

³⁶ Sawada, Y., et al., "Probable toxicity of surface-active agent in commercial herbicide containing glyphosate," *The Lancet* 1:8580 (1988), p. 299.

³⁷ Roundup Ultra sample label, 1999.

³⁸ U.S. State Department, written answer to questions from U.S. Representative McGovern Op. Cit. Also see Eduardo Cifuentes Muñoz, Colombian Human Rights Ombudsman, Letter to Rómulo González Trujillo, Colombian Minister of Justice (July 12, 2001).

³⁹ Antony Barnett and Solomon Hughes, "ICI pulls out of cocaine war," *The Observer* (July 1, 2001).

⁴⁰ U.S. State Department, written answer to questions from U.S. Representative McGovern Op. Cit. See also Narcotics Division of the Colombian National Police. "Dosis De Aplicación y Composición de la Mezcla Utilizada Según Tipo de Cultivo" (table provided to members of the Colombian Congress, reproduced in Anna Cederstav, "Rejoinder to the State Department's Nariño Study," <http://www.usfumigation.org>, visited March 1, 2002.)

allows concentrations of 1.6% to 7.7%⁴¹. In addition, the EPA-approved label states that in most situations aerial application should not exceed 1 quart per acre of the formulated product⁴²; in Colombia, the rate is almost 4 ½ times that amount.⁴³

6. In addition to hazards from oral and dermal exposure to the chemical mix, aerial spraying over residential and farming land creates conditions for inhalation exposure.⁴⁴ Laboratory studies suggest that inhalation of Roundup can be significantly more dangerous than ingestion of the same formulations. In one study, the exposure level required to kill 100% of the test animals through inhalation was just 4% that required to kill 100% of the test animals through ingestion.⁴⁵ Therefore, the tests and studies cited as justification for the spray campaigns may significantly underestimate the severity of likely health effects, both for people and for animals.

Summary

In sum, the herbicides being sprayed over Colombia are a chemical mixture that has never been tested. They are being sprayed in concentrations in excess of the manufacturer's recommendations, in combination with other additives not approved for use in the U.S., and, in many if not all cases, with methods that would be illegal in the U.S.

⁴¹ Roundup Ultra sample label, 1999, p.3. Section 7.1. (The label calls for mixing one quart of herbicide with 3 to 15 gallons of water "unless otherwise specified in this label." None of the exceptions appear to apply to the wide ranging, aerial spraying of coca crops as carried out in Colombia.)

⁴² Ibid.

⁴³ U.S. State Department, written answer to questions from U.S. Representative McGovern Op. Cit. See also Narcotics Division of the Colombian National Police. Op. Cit.

⁴⁴ Linda Farley, Pesticides and Birds Campaign, American Bird Conservancy, "The Environmental Effects of Glyphosate, "Roundup" on Colombian Ecosystems," (November 20, 2000), available at <http://www.usfumigation.org/NovPressConfSpeakers/LindaFarley/LindaFarley.htm> (visited November 7, 2001).

⁴⁵ T.T. Martinez, W.C. Long, and R. Hiller, "Comparison of the Toxicology of the Herbicide Roundup by Oral and Pulmonary Routes of Exposure," *Proc. West. Pharmacol. Soc.* 33 (1990), pp. 193-197.

Expected ecological effects of herbicide spray campaigns in Colombia

Many individuals and institutions have expressed concern about damage to ecosystems resulting from the spray campaigns. For example, in 2001, a report from Colombia's Comptroller-General's office reported that the spray campaigns were damaging the environment and failing to curb drug production. The report stated that "the majority of the environmental damages are irreversible," and called for a halt to spraying until scientists were able to study the herbicide's environmental effects.⁴⁶

Also in 2001, the IX General Assembly of Ecofondo—a consortium of over 200 Colombian environmental organizations including both NGOs and some regional governmental bodies—approved a statement rejecting Plan Colombia and saying that it "seriously affects biodiversity and strategic regional and national ecosystems."⁴⁷ The World Wildlife Fund (WWF) has expressed concern about the environmental effects of the spraying through letters to members of the U.S. Congress and to U.S. newspapers. Earthjustice, a U.S.-based non-governmental organization, has submitted a statement to the UN Commission on Human Rights arguing that the spraying has violated human rights through its human health and environmental impacts.⁴⁸

These and other expressions of concern about environmental effects of the spray campaigns are well founded. By definition, broad-spectrum herbicides kill a wide range of plants; thus they may destroy rare plant species and disrupt habitats. In addition, the herbicides being sprayed in Colombia may exert toxic effects on wildlife directly. All the concerns about possible adverse ecological effects of the spray campaigns are compounded by the lack of basic information on characteristics of the spray formulations and the concentrations in which they are being applied, as well as the lack of any monitoring system to detect damage if it occurs.

Biodiversity and ecosystem complexity

The areas targeted by spray campaigns in Colombia are characterized by delicate ecosystems and populated by rare and endangered species. The World Wildlife Fund (WWF) notes that "Colombia is among the richest countries for plants and animals on the planet and has been a WWF priority for more than 20 years."⁴⁹ Many plant, bird, and other species are endemic to these areas, so the destruction of their habitats could well mean their extinction. According to the website of the Colombian Ministry of the Environment, Colombia is home to 55,000 plant species, of which 1/3 are endemic, making Colombia the country with the second highest number

⁴⁶ Michael Easterbrook, "Government Study Raises Doubts on Drugs," Associated Press (September 2, 2001).

⁴⁷ IX General Assembly of Ecofondo, "Un Pronunciamiento Frente a la Paz y el Plan Colombia" (Bogotá, April 28-29, 2001), available from Ecofondo at ecodir@ecofondo.org.co.

⁴⁸ Earthjustice and Amazon Alliance, "Spraying Toxic Herbicides on Rural Colombian and Ecuadorian Communities," Written Statement of Earthjustice and Amazon Alliance for Agenda Item 10: Economic, Social, and Cultural Rights, United Nations Commission on Human Rights, 58th Session, March 18-April 26, 2002. Available at http://www.usfumigation.org/Literature?Press_Articles/earthjustice.htm, visited February 10, 2002.)

⁴⁹ Kathryn S. Fuller, President, World Wildlife Fund, "Fumigation Dangers," *Chicago Tribune* July 23, 2001.

of plants in the world; Colombia is also home to the greatest number of bird species in the world, with 60% of the bird species in South America and 19% of the bird species found worldwide.⁵⁰

As discussed above, the herbicide concentrations and rate of application used in Colombia appear to be inconsistent with the label instructions for herbicide application in the US. As the World Wildlife Fund has pointed out, U.S. EPA's evaluations of pesticides' environmental effects "are valid only when there is adherence to the formulation, application, storage, disposal, worker safety and general safety precaution requirements specified by the manufacturer." Even if existing application guidelines are followed, they may be inappropriate for Colombia. WWF notes that EPA's evaluation of glyphosate's environmental effects is based on "the typical usage patterns for which the product will be applied in the U.S.," and that EPA has not evaluated application of glyphosate in tropical forest ecosystems.⁵¹

The very complexity of ecosystems in southern Colombia may make them particularly vulnerable to disruption. American Birds Conservancy (ABC) staff scientist Linda Farley argues that due to the complexity of the ecosystems affected by the spray campaigns, herbicide damage may be more severe than the damage that would result from similar herbicide applications in the temperate ecosystems where application protocols have been designed and tested. According to Farley, the complexity of tropical ecosystems increases the likelihood that damage to one organism will translate into damage to others.⁵² Interdependent and coevolved relationships that could be affected by spraying include "pollination systems, insect and plant mutualisms and host-plant interactions, [and] vertebrate habitat requirements."

Habitat destruction

By design, a broad-spectrum herbicide such as glyphosate kills most plants with which it comes into contact. In the Colombian ecosystems targeted by the spray campaigns, some of these plants are likely to be rare, endangered, and/or economically important. Furthermore, damage to plants can translate into broader ecological damage with long term consequences. For example, loss of plant cover can lead to soil erosion and drying of water courses.

Herbicide damage to plants can also affect animals, by altering the habitats on which they depend. For example, birds may be affected by the loss of trees they nest in or plants that produce edible fruit. Insects may, similarly, be affected by the loss of plants on which they depend for food or habitat. Linda Farley of American Birds Conservancy notes that the Santa Marta conure, a bird listed as "globally threatened" by Birdlife International, is found only in the Santa Marta mountains, a small area that is "almost completely encompassed within the known coca growing region," and that "herbicide-induced habitat destruction has been implicated as a

⁵⁰ Colombian Ministry of the Environment web page:

<http://www.minambiente.gov.co/biogeomenu/ingles/number.htm>, visited March 1, 2002.

⁵¹ William Eichbaum (Vice-President, Endangered Spaces Program, World Wildlife Fund), letter to Senator Russ Feingold, November 21, 2001.

⁵² Linda Farley, Pesticides and Birds Campaign, American Bird Conservancy, "The Environmental Effects of Glyphosate, "Roundup" on Colombian Ecosystems," (November 20, 2000), available at <http://www.usfumigation.org/NovPressConfSpeakers/LindaFarley/LindaFarley.htm> (visited November 7, 2001).

reason for the bird's decline."⁵³ A letter to the editor from WWF notes that some regions of Colombia, such as the northern Andes, are the wintering ground of some North American migratory bird species;⁵⁴ thus, damage to habitats in Colombia can have direct adverse effects on bird populations in North America as well. A recent study of drug crop cultivation and bird populations found that some of the areas where drug crops are grown include sites of high conservation priority for endangered birds; further habitat destruction in these areas could lead to the extinction of some bird species.⁵⁵

The spray campaigns also lead to habitat loss indirectly when farmers respond to the destruction of legal or illegal crops by clearing new areas of previously undisturbed forest. A statement prepared by Earthjustice for presentation to the United Nations Human Rights Commission notes that this phenomenon has resulted in the loss of critical bird habitats.⁵⁶ The process of "triple deforestation": sowing, spraying, and sowing again in another area," is described in detail by the office of the Colombian Human Rights Ombudsman⁵⁷. Once coca crops have been planted, usually by settlers who have been internally displaced by conflict elsewhere in the country:⁵⁸

Aerial fumigation programs for the eradication of illegal crops are established without significant controls and they affect not only the hectares of land planted with coca but also food crops and natural ecosystems. With the destruction of coca and food crops, the farmer moves not down river but deeper into the jungle, farther from the access route, the river, and starts the process over. Eradication of coca crops drives farmers deeper into the jungle, to more remote locations where they will not be found so easily, thus leading to deforestation of new parcels.⁵⁹

Direct effects on wildlife

In addition to adverse effects resulting from habitat destruction, wildlife may suffer toxic effects from contact with the spray. Fish, birds, insects, and soil microorganisms are among the organisms that may be affected by the spray formulations. No studies have been conducted on effects of the specific spray formulation currently used in Colombia, or on effects of glyphosate herbicides in the specific ecosystems and under the application procedures currently being used in Colombia. However, studies conducted in other contexts show toxic effects on a wide range of organisms.

⁵³ Ibid.

⁵⁴ Kathryn S. Fuller (President, World Wildlife Fund), "Fumigation dangers" Chicago Tribune, (July 23, 2001).

⁵⁵ Maria D. Alvarez, "Illicit Crops and Bird Conservation Priorities in Colombia," *Conservation Biology* Vol. 16 (2002). Available at <http://www.columbia.edu/~mda2001.SCB.html>, visited February 10, 2002.

⁵⁶ Earthjustice and Amazon Alliance, "Spraying Toxic Herbicides on Rural Colombian and Ecuadorian Communities," Written Statement of Earthjustice and Amazon Alliance for Agenda Item 10: Economic, Social, and Cultural Rights, United Nations Commission on Human Rights, 58th Session, March 18-April 26, 2002. Available at http://www.usfumigation.org/Literature?Press_Articles/earthjustice.htm, visited February 10, 2002.)

⁵⁷ Jose Fernando Castro Caycedo, Nelson Caicedo Rodríguez, Luis Fernando Maldonado Guerrero, and others. *Los Cultivos Ilícitos. Política Mundial y Realidad en Colombia*. Defensoría del Pueblo. Bogotá. August 2000. pp. 88-89.

⁵⁸ Ibid.

⁵⁹ Ibid.

For example, studies have found that glyphosate formulations have toxic effects on aquatic organisms including fish, amphibians, insects, crawfish and water fleas.⁶⁰ Glyphosate can also affect soil organisms including earthworms, fungi, and microbes. A New Zealand study showed that glyphosate significantly affected growth and survival of earthworms;⁶¹ several studies have found that glyphosate can enhance the growth of disease-causing fungi;⁶² and one recent study found that glyphosate can interfere with beneficial mycorrhizal relationships between fungi and plants.⁶³

Effects of glyphosate herbicides can vary significantly depending on the circumstances of exposure. The U.S. Embassy states in a November, 2001 "fact sheet" that the herbicides used in the spray campaigns are "practically nontoxic to fish."⁶⁴ In fact, there is reason to believe that the mixture as sprayed in Colombia can have serious adverse effects on fish life, especially since exposure circumstances in Colombia are quite different from those under which tests have been conducted. Effects of glyphosate and Roundup on fish vary widely depending on species affected, temperature, and other factors. In general, formulations including a surfactant are more toxic to fish than pure glyphosate. The toxicity of surfactant ingredients can vary according to the hardness and acidity of the water where it is sprayed. Perhaps most importantly for tropical regions, toxicity of Roundup to some fish has been found to increase with increasing water temperature.⁶⁵ Little to no information is available on the likely effects of the specific exposure conditions that exist in Colombia, but it is plausible to expect that effects on fish would be more serious than is predicted based on experiences in temperate climates.

⁶⁰ See A. A. Abdelghani, "Toxicity evaluation of single and chemical mixtures of Roundup, Garlon-3A, 2,4-D, and Syndets surfactant to channel catfish (*Ictalurus punctatus*), bluegill sunfish (*Lepomis microchirus*), and crawfish (*Procambarus* spp.)." *Environmental toxicology and water quality* 12: 3 (1997), pp. 237-243; L. C. Folmar et al., "Toxicity of the Herbicide Glyphosate and several of its formulations on fish and aquatic invertebrates." *Archives of Environmental Contamination and Toxicology* 8 (1979), pp. 269-278; Hartman, WA and Martin, D.B. "Effect of suspended bentonite clay on the acute toxicity of glyphosate to *Daphnia pulex* and *Lemna minor*." *Bulletin of Environmental Contamination and Toxicology* 33 (1984) pp. 355-361; and J. A. Servizi, "Acute Toxicity of Garlon 4 and Roundup herbicides in salmon, *Daphnia*, and trout." *Bulletin Environment Contamination Toxicology* 39 (1987) pp. 15-22, cited in Jeremy Bigwood, "A Brief Overview of the Scientific Literature Regarding Reported Deleterious Effects of Glyphosate Formulations on Aquatic and Soil Biota," document prepared for the Ministry of the Environment of Ecuador, March 6, 2002. Available at <http://www.usfumigation.org/Literature/Scientific%20Papers/ReviewRoundup.pdf>, visited March 18, 2002.

⁶¹ J. A. Springett and R. A. J. Gray, "Effect of repeated low doses of biocides on the earthworm *Aporrectodea caliginosa* in laboratory culture." *Soil. Biol. Biochem* 24: 12 (1992), pp. 1739-1744, cited in Bigwood 2002, op. cit.

⁶² See literature review in Bigwood 2002, op. cit.

⁶³ M. T. Wan et al., "A new technique for determining the sublethal toxicity of pesticides to the vesicular-arbuscular mycorrhizal fungus *Glomus intraradices*." *Environ-Toxicol-Chem.* 17:7 (July 1998) p. 1421-1428, cited in Bigwood 2002, op. cit.

⁶⁴ Bureau for International Narcotics and Law Enforcement Affairs, U.S. Department of State, "Fact Sheet: Eradication of Illicit Crops: Frequently Asked Questions," November 30, 2001.

⁶⁵ World Health Organization, International Programme on Chemical Safety, International Labour Organization, *Glyphosate*. Environmental Health Criteria #159, (1994). Geneva, Switzerland, pp. 110-112.

Critiques of the Spray Campaigns

The U.S. State Department has dismissed many complaints as the self-serving fabrications of narcotraffickers. A State Department "question and answer" fact sheet poses the question, "If glyphosate is so benign, why are there complaints of harm from its use in Colombia?" and answers: "Negative press reports in Colombia concerning glyphosate have been largely based on unverified accounts provided by farmers whose illicit crops have been sprayed. In addition, we believe that the illegal armed groups are the source of many of the complaints. These groups receive vast sums of money from narcotraffickers to protect illicit crops and therefore have a significant interest in maintaining opposition to the spray program."⁶⁶

In fact, the complaints come from many sources. Both within Colombia and internationally, governmental and non-governmental institutions have called for review of the spray campaigns and for development of alternative approaches. As a report by the Transnational Institute shows, the critiques cover a range of perspectives: some simply criticize technical aspects of the campaigns' implementation, without actually recommending or demanding that they cease, while others recommend that they be suspended based on "technical, legal and economic objections," and still others reject aerial spraying categorically as a means for addressing the drug trade.⁶⁷ All these critiques share a common concern that the spray campaigns are damaging the health and livelihoods of Colombian citizens and damaging delicate tropical environments.

The governors of the six provinces most affected by the spraying have called for a halt to fumigation and propose voluntary manual eradication of coca crops as an alternative. They have requested that U.S. aid be used to support alternative development projects that can help farmers switch from coca to other viable crops. While U.S. aid has included a small amount of funding for programs of this kind, the governors say the money has not reached their communities; meanwhile, aerial spraying has wiped out many legitimate alternative development projects.⁶⁸

Colombia's Comptroller-General, Carlos Ossa, has called for a halt to spraying until environmental effects can be measured, and proposed that greater emphasis be put on economic and social programs to encourage farmers to switch to legal crops.⁶⁹

Colombia's Human Rights Ombudsman has called for the suspension of aerial spraying pending the development of plans to protect alternative economic projects, population centers and water resources, and the creation of contingency and compensation plans.⁷⁰

The UN Drug Control Programme's representative in Colombia and Ecuador, Klaus Nyholm, argues that aerial eradication is neither just nor efficient. Nyholm has called for a halt to the spraying of small producers and for a program of voluntary manual eradication.⁷¹

⁶⁶ U.S. Embassy in Bogotá, Narcotics Affairs Section, "The Aerial Eradication Program in Colombia: Background and Environmental Impact," <http://usembassy.state.gov/bogota/wwwhglyp.html> (visited November 7, 2001).

⁶⁷ Transnational Institute, "Fumigation and Conflict in Colombia: In the Heat of the Debate," *Drugs and Conflict Debate Paper No. 2* (September 2001), available at <http://www.tni.org/drugs/index.htm>, visited March 7, 2002

⁶⁸ Judy Mann, "Waging Chemical Warfare in Colombia," *Washington Post* (March 16, 2001), p. C11.

⁶⁹ Michael Easterbrook, "Government Study Raises Doubts on Drugs," *Associated Press* (September 2, 2001).

⁷⁰ Eduardo Cifuentes Muñoz, Colombian Human Rights Ombudsman, letter to Rómulo González Trujillo, Colombian Minister of Justice (July 12, 2001).

European Union representatives have questioned the effectiveness of aerial eradication campaigns and of military responses to Colombia's problems; they support social and economic programs instead. Joaquin Miranda, President of the European Parliament's Commission for Development and Cooperation wrote to Colombian President Andrés Pastrana: "We believe, and it seems that experience demonstrates this amply, that new spraying—and the militarization that necessarily accompanies it—can do nothing but displace the problem, cause new irreparable damage to people and the environment, and increase the already enormous number of displaced persons without resolving the fundamental problems that oblige thousands of indigenous people and peasants to plant crops of coca and poppies."⁷²

In August 2001, over 100 physicians, scientists, and other professionals signed an open letter to the U.S. Senate expressing concern about environmental and human health effects of the spray campaigns. The signatories note that "the spraying protocol may violate EPA requirements and restrictions on herbicide use" through failure to follow pesticide label instructions, and that "human health or environmental protection considerations have not played any significant role to date" in the decision to conduct spray campaigns. They urge the U.S. Senate to "suspend all financing and support of the fumigation program until comprehensive, independent, and peer reviewed scientific and health studies have determined whether the environmental and public health impacts of this program are acceptable," noting that "these studies must consider the specific conditions of herbicide use in Colombia and whether or not the spraying protocol meets EPA label requirements for use of the herbicide." The signatories note: "While glyphosate and the additives it is used with have quite different toxicological properties from the herbicides that made up Agent Orange, the concerns are the same: we are exposing ecosystems and citizens of another country to a toxic chemical mixture, while failing to disclose the composition of the mixture and the conditions of exposure. Peer reviewed scientific studies support the plausibility of reports of significant illness related to human exposures and damage to farm crops and animals. Essentially, we are conducting an uncontrolled experiment in crop destruction, with impacts that are likely to extend beyond non-target vegetation."⁷³

⁷¹ "ONU Critica Fumigación Aérea," *El Tiempo*, Bogotá (July 24, 2001).

⁷² Joaquim Miranda, President, European Parliament's Commission for Development and Cooperation, letter to Colombian President Andrés Pastrana, Brussels (July 13, 2001), available at <http://www.semana.com/documentos/JOAQUIM.doc>.

⁷³ Open Letter to the U.S. Senate, available at http://www.usfumigation.org/NGOsign-onletter/open_letter_to_the_u.htm

Conclusions

Adverse effects of the spray campaigns in Colombia have been widely reported by affected communities, Colombian government authorities, and outside observers. Many of these effects are, in fact, predictable based on publicly available information about toxicological properties of glyphosate herbicides and standard guidelines for these herbicides' use. The human health effects reported by large numbers of people, including government authorities, appear to be both reliable and consistent with known effects of the chemicals being used.

The crop losses and environmental impacts, also broadly reported, are natural outcomes of the widespread aerial spraying of powerful and concentrated herbicides. Some reported effects on domestic animals, such as fish kills, are consistent with known effects of glyphosate herbicides. The destruction of wildlife and habitat loss are also the logical outcomes of aerial application of herbicides over the rainforest. The predictability of these outcomes raises grave concerns regarding the policy choices behind the spraying campaigns that cause them.

Although certain reported effects of the spraying, such as widespread livestock deaths and some of the most serious human health impacts, are not clearly explained by known toxicological properties of the chemicals known to be used in the spray campaigns, several "unknowns" in the situation may contribute to these effects. These factors include the use of higher than recommended concentrations; methods of application that violate label instructions and may have led to significant inhalation exposures; secondary effects such as contamination of water and loss of feed supplies; and use of additional ingredients whose toxicological profiles in combination with glyphosate herbicides are unknown or undisclosed. Any scientific studies intended to gauge the effects of spraying will need to take these factors into consideration. The fact that significant exposures may have occurred via inhalation makes further investigation of livestock deaths particularly important.

The great number of reports that have been made regarding the health and environmental impacts of spraying, the diversity of the sources, and the detail of the documentation, justify, in our opinion, calls for a moratorium on spraying. Such a moratorium would allow time to review crop eradication policies and study health and environmental effects.