inner-city pesticide use as an environmental injustice

a boston neighborhood case study

neighborhood pesticide action committee
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Neighborhood Pesticide Action Committee (NPAC) is grateful to the many individuals and organizations who contributed to this report, some as NPAC members, who generously gave of their specialized knowledge and skills. Others, though not members, cared enough about the issue to donate their precious time, expertise, and other resources.

We would like to extend our thanks to Margaret Connors, primary author and researcher; Linda Hillyer, primary editor; Diedre Fisher and Enna Grazier, photographers; Kurt Danielson, graphic designer; Daniel R. Faber, major inspiration for this report and author of its foreword; and Marla Hayes (not her real name), Roxbury resident and frequent visitor to the Southwest Corridor Park.

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Where you live does make a difference with respect to environmental quality. In Massachusetts, lower-income neighborhoods and communities of color are disproportionately impacted by the presence of toxic waste sites, trash transfer stations, polluting power plants and industrial facilities, and other environmentally hazardous sites and facilities. Communities of color, for instance, have 23 times more hazardous waste sites per square mile than do white communities and receive 10 times more pollution from large industrial facilities. Furthermore, communities of color receive more than one-third of the cancer-causing pollutants (carcinogens) and reproductive toxins released by these industries, even though they account for only 9.4 percent of all communities in the state. Twenty-four of the 30 most environmentally overburdened towns in the state are communities of color.

Jamaica Plain, as well as Mattapan, Roxbury, Dorchester, Hyde Park, and Roslindale, are among these 24 most environmentally overburdened communities. One explanation for this concentration of burden is that businesses and local/state agencies often adopt pollution practices that are not only more economically efficient but also the most politically expedient. And in Massachusetts, the less political power a community possesses, the fewer resources that community has to defend itself from ecological abuses; the lower the level of community awareness—and the less able the community is to mobilize against potential pollution threats—the more likely that community is to experience arduous environmental and human health problems at the hands of government and industry.

As a result, residents of these communities must often live each day with substantially greater risk of exposure to environmental health hazards than the general citizenry. In addition to living, working, and playing in close proximity to polluting industrial facilities and waste sites, these residents are regularly exposed to (1) deteriorating schools and substandard housing (with lead paint, asbestos, and molds); (2) higher rates of “indoor” exposure to toxic pollutants of all kinds at the jobsite; (3) air pollution from nearby highways, bus terminals, and airports (source of asthma and other respiratory diseases); and (4) closer contact with arsenic, pesticides, and other poisons in schoolyards, parks and playgrounds, and other public spaces.

While much attention has been afforded to issues of lead paint, industrial air pollution, etc., insufficient attention has been paid to the potential health threats posed by pesticide use. According to the U.S. Environmental Protection Agency, 95 percent of the pesticides used on residential lawns are possible or probable carcinogens. In fact, working as a Golf Course Superintendent has been found to significantly increase the risk of dying of four cancer types—brain cancer, lymphoma, prostate cancer, and cancer of the large intestine.
Pesticide exposure in children is especially problematic, given the vulnerability of their still-developing neurological systems. Children who live in homes where indoor or outdoor pesticides are used regularly face a far greater chance of developing leukemia—nearly 6.5 times greater—than those who live in homes that are pesticide free. American children typically have about 100 toxic chemicals (including many pesticides) present in their bodies—a body burden that is believed to be a major factor in the growing cancer epidemic among children. For the first time in history, cancer now kills more American children than any other disease (and is second only to accidents as the leading cause of death). Yet Congress recently found that 90 percent of the pesticides on the market lack even the minimal required safety screening. For instance, of the 34 most used lawn pesticides, 33 have not been fully tested for human health hazards.

In response to the threats posed by environmental injustices, a new wave of grassroots environmentalism is building in Massachusetts. In lower-income neighborhoods and communities of color across the Commonwealth, people who have traditionally been at the periphery of environmentalism are now joining ranks to challenge the ruination of the land, water, air, and community health by indifferent government officials and corporate polluters. Fusing the struggles for civil rights, social justice, and a healthy environment, these community-based movements for
environmental justice are committed to reversing the manner by which industry and the state disproportionately displace ecological and economic burdens onto white working families and people of color. In Boston, the Neighborhood Pesticide Action Committee (NPAC) has taken up the cause of protecting the residents of Jamaica Plain and surrounding communities from the dangers posed by pesticides. This report is a critical component of this important struggle.

Widespread public exposure to pesticides and other poisons constitutes a fundamental violation of our basic human right to a clean and safe environment. Citizens must come together to stop the poisoning, strengthen our laws and regulations, and hold our government officials accountable. More importantly, we must begin to move away from the use of poisons in general in favor of a more precautionary and preventive approach to pesticides, including the use of safe substitutes and alternative pest-management systems. Dedicated organizations such as the Neighborhood Pesticide Action Committee are essential to this effort, as is the involvement of ordinary citizens from all walks of life. Utilizing the information provided in this excellent report, working together we can make a difference.

DANIEL FABER is a Professor of Sociology at Northeastern University and Director of the Northeastern Environmental Justice Research Collaborative. He is also a Board Member of the Alliance for a Healthy Tomorrow (AHT), a broad-based coalition of citizens, scientists, health professionals, union officials, business leaders, and environmentalists working to implement a precautionary and preventive approach to environmental policy in Massachusetts. In 2006, Dr. Faber received the “Champion for Justice Award,” granted by the Alliance for a Healthy Tomorrow for his contributions in forging new environmental policy initiatives in Massachusetts around safer alternatives to toxic chemicals and environmental equity. Dr. Faber is also a co-founding member of the Massachusetts Environmental Justice Alliance.
It has been well established that working class communities and communities of color in Massachusetts are disproportionately burdened with environmental toxins due to the unequal distribution of such hazards as toxic waste sites and commercial/industrial polluters. This report contends that the use of pesticides may be an additional contributor to the toxic burden in many of these communities. In the pages that follow, we show the application of pesticides to be a significant additional assault in the case of one Boston neighborhood, Jamaica Plain. This case provides evidence that pesticide use must be among the environmental hazards that are weighed in determining environmental risk and burden in our communities.

This report provides a detailed analysis as to why we need to replace current pesticides with safer alternatives. At the present time, there are more than 6,000 certified pesticide products on the market with over 500 registered active ingredients. Of these 500 ingredients, 90 percent were certified 25 to 45 years ago. This means that there are hundreds of pesticides sold to the public containing ingredients that were assessed based on standards much less rigorous than those that are deemed acceptable today.

Our city and town parks departments and our state government have become habituated in their use of pesticides to kill weeds and insects, often justifying their use with research conducted as much as 20 to 30 years ago. Many of our public health departments include pesticides in their arsenal against such illnesses as West Nile virus and Eastern Equine Encephalitis (EEE), despite the relatively low risk these illnesses pose to overall public health. Residential pesticide use has increased by over 25 percent in the past decade in Massachusetts. The Centers for Disease Control and Prevention has found that, at any given time, 25 percent of Americans contain 2,4-D (the most commonly used chemical pesticide in the U.S.) in their bodies, with children carrying higher levels than adults. 2,4-D has been linked to human cancer and was banned by the European Union in 2003. Nevertheless, our state government, local municipalities, and the general public continue to overlook the facts. What is now known and supported by indisputable evidence is that when we use chemicals to harm other living things, they almost always cause similar harm in humans.

The writing of this report was inspired by the discovery that the neighborhood of Jamaica Plain (where the Neighborhood Pesticide Action Committee [NPAC] is conducting a campaign for pesticide-free parklands) has been identified as the 15th most intensively environmentally burdened of the state’s 362 communities. A study from the Philanthropy and Environmental Justice Research Project documenting the unequal distribution of environmental hazards in poor and minority communities has found that pesticide use needs to be among the environmental hazards that are calculated in determining environmental burden.
Jamaica Plain has more active hazardous waste sites within its borders than 348 other communities in Massachusetts. NPAC has re-analyzed the original data used for this study with respect to Jamaica Plain. We have found that within the three square miles of Jamaica Plain’s borders, there is a one-square-mile section that is burdened with over three-quarters of all of its environmentally hazardous sites and a full two-thirds of its most severely hazardous sites. In this one square mile, there are currently 76 unremedied hazardous waste sites in what we refer to in this report as the Southwest Corridor Park (SWCP) community. A joint report by MIT and the Boston Public Health Commission has called the SWCP community “a hot spot of environmental risk.”

Our research and analysis has found the following:

- **There is an historical legacy of toxic-waste dumping, poor air quality, and industrial pollution in minority communities throughout Massachusetts.** Because environmental pollutants play a role in the health disparities seen in poor communities of color in the state, these facts need to be communicated to residents, health and environmental groups, and public officials.

- **Jamaica Plain ranks as the community with the sixth largest percentage of people of color in the state.** Fifty percent of the population are ethnic minorities, and 21 percent of the population live below the poverty level.

- **Asthma rates in poor communities of color in Massachusetts are 50 percent higher than in the state’s white affluent communities.** The asthma hospitalization rate among children ages five and under living in Jamaica Plain is 20 percent higher than the overall Boston rate. In contrast, the three predominantly white neighborhoods surrounding Jamaica Plain have rates 35 percent below the overall Boston rates.

- **There is now ample evidence that pesticide exposure increases a person’s risk of developing asthma and cancer, among other illnesses.** Similar to other toxic chemicals produced by polluting industries and leaching waste dumps, pesticides have the potential to cause harm to humans. Common pesticide products that have been used in parks, such as 2,4-D, Roundup, and resmethrin, are known respiratory irritants that have been reported to trigger the onset of asthma attacks. Children under the age of one that have been exposed to pesticides show increased rates of asthma.

- **Research studies have consistently found a greater likelihood of susceptibility to the adverse effects of pesticides among children.** The National Academy of Sciences Committee on Children’s Health states that the
“critical differences” between child and adult susceptibility to illness have prompted the need for children’s health to be held to a standard different from that used for adults. For example, a six-month-old child will receive twice the exposure of an adult when in the presence of a pesticide, and that child’s lungs and cells, which are not yet fully developed, can sustain permanent damage. In six recently published studies, home pesticide use during pregnancy or childhood was found to be associated with childhood acute leukemia.

• **Inner-city children especially bear the burden of greater exposure to numerous environmental toxins, including pesticides.** Use of pesticides in urban areas carries particular risks due to urban density coupled with other factors, such as the persistence of pesticides in both the outdoor and indoor environment, which are detailed in this report.

• **There is no system in place that allows a citizen of Boston to know on any given day what pesticide is being used and where.** The MBTA regularly sprays herbicides along its tracks without notifying the public. Warning flags in city parks are highly ineffective at keeping kids away; children either cannot or do not read them. Adults not fluent in English cannot read them either and often do not know their meaning. Pesticides typically remain dangerous for weeks to months after flags have been removed.

• **In certain areas of Jamaica Plain, residents have no choice but to use the public parks, even if they fear for the parks’ effect on their health.** The most densely populated areas of the city contain much more built environment than private open space. Residents of these neighborhoods simply have fewer choices as to where they might enjoy outdoor space or where their children might play. If residents must use public parks as their only source of outdoor space, then this becomes an environmental justice issue, especially when that lack of choice is disproportionately born by a poor minority community.

• **State and local policies do not adequately protect citizens and often reach poor communities last.** The evidence presented in this report suggests that preventing public exposure to chemicals suspected of causing cancer and asthma should be a priority. Yet state laws protect children only while they are on school grounds, and local laws protect only our wealthiest communities.

In order that residents’ health be protected, the public has, first and foremost, a right to know and be adequately informed of risks to their health that are before them. Additionally, policies that protect all citizens must be instituted and passed by state legislators. (For up-to-date information about bills before the Massachusetts legislature concerning pesticides and public health, go to
Lastly, local actions to reduce pesticide use should be employed by residents and encouraged by city and state officials.

We hope this report will

(1) provide information for SWCP residents on their community’s environmental burden and serve as a model for others to follow in researching their own community’s pesticide burden;

(2) increase health and environmental organizations’ understanding of the effects of pesticides on human health and the environment and its link to environmental injustice so that the practice of promoting environmental justice can be effectively integrated into the work that these organizations undertake; and

(3) communicate to public officials and city and state agencies the need for changes in the policies and practices in the use of pesticides at the community, city, and state levels.

This could be accomplished firstly by employing the precautionary principle* to protect the public from the hazards of using pesticides in public spaces; and secondly by expanding the state’s environmental justice definition to include pesticides as hazards that can impact the environmental burden in a community.

*The precautionary principle holds that “precautionary measures” should be taken when an activity threatens to harm human health or the environment, even if it has not been fully established scientifically that harm will result.
Many of us make the assumption that our neighborhoods are healthy places to live, that they will not harm us. Unfortunately, we are not always right. The more we are made aware of the pollution around us, the more we are forced to recognize the hazards that we live with each day. Ideally, parks and open spaces, particularly in our urban neighborhoods, would serve as a refuge from the pollution of our city streets and play an essential role in contributing to the health of our communities. In the words of some advocates for open space, “Land can give us space to exercise; help our children develop socially, emotionally, and spiritually; provide gathering spaces that build community; and produce our food.”¹ However, land can also be a major source of pollution.

This report looks at how parks and open spaces contribute to neighborhood pollution, specifically through pesticide use. It focuses on one Boston, Massachusetts, neighborhood as an example of the problem, examining where and how pesticides are used and the probable effects of their use on the local community. It looks at how their use constitutes an environmental injustice and how children in particular are adversely affected.

The neighborhood we focus on is densely populated and ethnically and economically diverse, with mixed residential, commercial, and industrial zoning. Many of its residents have a strong sense of community rooted in years of social activism. Running through the neighborhood is a 52-acre park known as the Southwest Corridor Park (SWCP). With its numerous ball fields, playgrounds, and community gardens, the SWCP is heavily used by residents for sports and recreation. A large number of these residents are children. In addition, the 22 daycare centers and schools located within a block of the SWCP regularly use the park as their backyard.

Marla Hayes and her five-year-old son Malik are two Boston residents who spend a lot of time on the Southwest Corridor Park because it gets them away from the drugs that are prevalent in their neighborhood. From her perspective, the park is “safe.”² Marla explains:

> The older kids that hang [in the parks near our home] can be a little bit intimidating for the younger kids and even the parents. So, we take extra-long walks to the other parks. Especially as I don’t have a car, I can just cut through Franklin Park to get [to the Southwest Corridor Park]. We just make a journey of it till we get there. It takes about 45 minutes, and if we stop, it takes a bit longer.

> I know they use pesticides in the back of my building where there is a little bit of grass. I know they use something back there, so we don’t really use the backyard. I’d rather go somewhere that is a little more natural. He likes to be close to the earth, you know what I mean? He loves to lay

their own neighborhood parks and yards, if there are any, are off-limits for their children.
there. He’d rather lay in the grass than anywhere. He likes to pick it and trickle it over his head, and I don’t want to have to worry.

Marla is not alone in being drawn to the SWCP. It is an enormous draw for children and their parents living in the neighborhoods of Jamaica Plain, Roxbury, and Dorchester for some of the same reasons as Marla’s. Their own neighborhood parks and yards, if there are any, are off-limits for their children.

The application of hazardous pesticides in the SWCP has raised concerns among this community’s residents who have begun to question and oppose their use. Many residents once used the park as the choice place to walk and play with their dogs—until the particularly wet spring of 2003. Pesticide applications leached from the soil of the park and gathered in standing puddles to form a toxic soup. Dogs who were walked there became severely ill after drinking from these puddles or licking their paws. Some dog owners made the connection between these illnesses and pesticide use; they contacted NPAC and wrote letters to local papers, describing their animals as suffering with bloody stools, loss of muscle control, shaking, and severe diarrhea.

While symptoms suffered by local dogs have been the most immediately severe, pets are not the only ones at risk from the kinds of pesticides used on the park; pesticides can be just as dangerous to humans. Young children in particular bear a large burden of risk due to their small size and still developing immune systems.

State Representative Liz Malia and Donna Johnston of the SWCP Conservancy have emphasized the great number of children who use the park and the lack of alternate outdoor space. They asked that the SWCP be given more resources for its maintenance. “We don’t have yards in the city. These parks are our yards,” says Johnston.

The very lack of alternatives to this park puts these children at unequal risk of chemical exposure.

The five pesticides used routinely on the Southwest Corridor Park until the spring of 2006 are capable of causing serious health conditions. Two pesticides that were used on the park through 2005 are classified by the EPA as either “highly” or “very” toxic; two others contain ingredients that are known human carcinogens; and another is linked to statistically significant increases in birth defects and in neuro-developmental disorders. Adding to the toxic-chemical load are applications of four additional pesticides in adjacent non-residential areas to control mosquito populations and on the MBTA railways directly below the park to control vegetation.

At the present time, there are more than 6,000 certified pesticide products on the market with over 500 registered active ingredients. Out of these 500 ingredients, 300 were approved before
1981, and more than 150 were approved before 1960. This means that there are hundreds of pesticides sold to the public containing ingredients that were assessed based on standards much less rigorous than those that are deemed acceptable today.¹⁵

Residential pesticide use has increased by over 25 percent in the past decade in Massachusetts.⁶ Additionally, our state government and city and town parks departments have become habituated in their use of pesticides, often justifying their use with research conducted as long as 20 to 30 years ago. Even many of our public health departments include pesticides in their arsenal against such illnesses as West Nile virus and Eastern Equine Encephalitis (EEE), despite the relatively low risk these illnesses pose to overall public health.⁷

The Centers for Disease Control and Prevention (CDC) has found that, at any given time, the most commonly used chemical pesticide in the U.S., 2,4-D, is found in the bodies of 25 percent of Americans, with children carrying higher levels than adults.⁸ This pesticide has been linked to human cancer and was banned for use in Europe by the European Union in 2003.⁹ Nevertheless, our state government, local municipalities, and the general public continue to use this substance.¹⁰

What is now known and supported by indisputable evidence is that when we use chemicals to harm any living thing, these chemicals almost always cause similar harm in humans.¹¹ This report was initially inspired by our discovery that the neighborhood of Jamaica Plain (where NPAC—the Neighborhood Pesticide Action Committee—is located) has been identified as the 15th most intensively environmentally burdened of the state's 362 communities.¹² A study from the Philanthropy and Environmental Justice Research Project documenting the unequal distribution of environmental hazards in poor and minority communities found that Jamaica Plain has more active hazardous waste sites within its borders than 348 other communities in Massachusetts.¹³ In analyzing the original data from this study,¹⁴ we found that within the three square miles of Jamaica Plain’s borders, there is a one-square-mile area—which we will refer to as the Southwest Corridor Park (SWCP) community—that is burdened with over three-quarters of all of the neighborhood’s environmentally hazardous waste sites, including a full two-thirds of the sites that are the most severely hazardous. In total, there are currently 76 unremedied hazardous waste sites in the SWCP community. A joint report by MIT and the Boston Public Health Commission has determined this same community to be “a hot spot of environmental risk.”¹⁵ In this so-called hot spot, 60 percent of residents are ethnic minorities and 23 percent live below the poverty level.¹⁶
We propose that pesticides are an additional assault to our communities, which have, until recent years, been lacking sufficient scientific data to determine potential harm. There is now ample evidence that pesticide exposure increases a person’s risk of developing asthma and cancer, as well as many other illnesses. Recent studies have found that children exposed to herbicides and insecticides during their first year of life have two to five times more asthma than unexposed children.¹⁷ As leading researchers in the field have also argued, inner-city children, even more than adults, bear the burden of disproportionate exposure to numerous environmental toxins, including pesticides.¹⁸ Pesticide use needs to be among the environmental hazards that are calculated in determining environmental burden. Their use in urban areas carries particular risks due to factors detailed in this report, such as urban density and zoning regulations that favor development.

As awareness of the harm caused by pesticides grows, NPAC anticipates that more and more communities will be asking how pesticides are an environmental hazard, the mechanisms by which they harm human health, and how they fit into the broad definition of environmental justice that we lay out in this report. We have focused on a single community out of the 362 in Massachusetts because this is the one we live in, yet numerous others in the state share similar profiles. We call this report a “Community Case Study” because we see the potential for its use as a prototype for replication by other communities. We believe it provides a roadmap for how others can calculate their own environmental burden. It also provides an example of the sheer weight of environmental burden that is borne by a community with one of the highest numbers of minority residents in this state. The report does not directly address the indoor use of pesticides in public and private housing or outdoor residential use of pesticides, although they are important in understanding the volume of toxins we expose ourselves to.¹⁹ These issues are subjects for another study.

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**The Boston Globe**

**Between a Rock and a Harsh Chemical**

By Jim Cronin, Globe Correspondent

February 4, 2007

The state’s Department of Conservation and Recreation will continue using Roundup to kill weeds along Southwest Corridor Park, despite receiving more than 400 signed cards and letters urging the agency to stop using the product. It contains the chemical compound glyphosate, which critics say could leach into ground water.

Cards and letters were dropped off at the Harvest Co-op Markets in Jamaica Plain and Cambridge, which the Neighborhood Pesticide Action Committee in Jamaica Plain sent to the department in December.

The department has refused to yield. “It’s only a spot treatment and it’s necessary to maintain the park,” spokeswoman Vanessa Gulati said of the pesticide in a phone interview. Gulati said the chemical is used only on an as-needed basis, such as when weeds grow between cracks in sidewalks or in flower beds.

“The only alternative would be to burn the grass,” she said.

Linda Hillyer, codirector of the pesticide action committee, said the group will be working to identify other organizations that oppose pesticide use and are especially interested in the effects the chemicals might have on ground water.

“We’re hopeful that we can work with DCR to find some grounds where we can both be satisfied,” she said. “It will just take some more time and more steps.”

The pesticide action committee was founded in 2000 with the goal of stopping all pesticide use in Jamaica Plain.

The city’s Parks and Recreation Department agreed in 2005 to a three-year pilot program of not using pesticides in Corridor Park, and the state Department of Conservation and Recreation agreed last spring to stop using four out of the five it had used in the past, excluding Roundup.
When pesticides are used to create greener lawns and efficiently kill weeds on public lands and in gardens, the negative effects generally outweigh any of the positive ones, especially in terms of environmental and human health. Pesticides, designed to kill living things, are, by their very definition, toxic substances and inherently harmful. For this reason, even commonly used pesticides can cause adverse effects on human health, ranging in severity from rashes to the development of diseases such as asthma and cancer or death from toxic poisoning. Children are especially susceptible to damages from these chemicals due to a unique set of environmental and biological factors (see “Differential Risks for Children” on page 30). To demonstrate the extent to which humans “pay” for their use of pesticides, four common but serious health effects associated with pesticide exposure are detailed in Appendix B, “Effects of Pesticides on Reproductive and Children’s Health.” In this appendix, we thoroughly review the current medical and public health research on the links between pesticides and cancer, neurological disorders, and asthma in children, and between pesticides and hormone disruption in the general population.

Photo by Enna Grazier. One of the park’s many community gardens
Both on and around the Southwest Corridor Park, the use of pesticides over the past 20 years has been prolific. Pesticides applied by the state’s Department of Conservation and Recreation (DCR), the Massachusetts Bay Transportation Authority (MBTA), and the Suffolk County Mosquito Control have the potential for a significant environmental impact on the neighborhoods surrounding the park. Appendix A provides a full review of each pesticide used by these agencies and shows that all of them have been demonstrated in public health, animal, and basic science laboratory studies to increase a person’s chances of developing or exacerbating illnesses and conditions including, but not limited to, asthma, cancer, nervous system disorders, birth defects, and fertility problems. According to a study linking pesticide exposure to Parkinson’s disease, both past and present exposures can play a role in the development of this disease.

Like many pesticides, those used on the SWCP do not necessarily dissipate immediately after application. Pesticides rarely disappear as soon as they have done what they were intended to do. Most of them retain their strength long after they are applied. A measure called half-life is used to determine the time it takes for half of the product to lose its potency in soil (soil half-life) or water (hydrolysis half-life).

The longer a chemical’s half-life, the more likely it is to travel beyond the area on which it was applied, either by vaporizing and becoming airborne (at which point it can easily be taken into the lungs) or by leaching through the soil. Pesticides can also be tracked into homes or schools. Once they enter these indoor environments, they can persist even longer than on application areas because they cannot be dissipated by exposure to natural elements such as sunlight, rain, or wind. According to the National Resources Defense Council, some pesticides can stay in a carpet for up to one year. A well-publicized study has shown that 2,4-D, a pesticide commonly used in Jamaica Plain, can remain potent indoors for a full week after its outdoor application, thereby continually re-exposing people who frequent the indoor area, especially young children close to the ground.

Pesticides have the potential for long-term effects, not only through their ability to remain potent in the environment both indoors and outdoors for an extended period of time, but also because they can remain in the body for years before being detoxified by the liver. This is especially true for children. The consequence is that the damage they do at the cellular level may take years to surface and not present until much later in life. It also means that the potentially adverse effects of the pesticides applied to the SWCP may not yet be fully evident to residents who have already been exposed.

In urban settings, where pesticides are used on residential and commercial properties and on
public lands (such as parks and right-of-ways), all in close proximity to each other, there is an additional risk: Exposure is often not limited to a single chemical but may involve any number of chemicals simultaneously and serially.⁷ Around the SWCP, for example, pesticides are applied by DCR on the park itself and by the MBTA below the park on open tracks. Since the two agencies do not coordinate their applications, it is entirely possible that each will apply different pesticides very near to each other during the same 24-hour period. There has been little research into the synergistic effects of pesticides, and we do not know what the results to humans, other animals, and the environment may be when we are exposed to more than one chemical at the same time or within a short period of time. (See “The Unknown Synergistic Effects of Multiple Pesticide-Product Applications” in Appendix C.)

In the spring of 2006, DCR halted the use of four of the five pesticides it had applied to SWCP grounds in previous years.⁸ This clearly reduced the chemical load on the park and surrounding neighborhoods and was a welcome shift in DCR policy. The shift may, however, have been temporary; when DCR announced its policy shift in 2006, it made only a one-year commitment to it, and at the time of this writing, DCR has not yet made public whether it plans to revert to its previous pesticide practices. It has stated its intention to continue using the fifth pesticide, whose product name is Roundup.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Ingredients of Concern</th>
<th>Health Risks</th>
<th>Persistence in the Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Momentum</td>
<td>2,4-D</td>
<td>Cancer, hormone disruption</td>
<td>7-14 days outdoors; up to one month when tracked indoors</td>
</tr>
<tr>
<td>Merit</td>
<td>Imidacloprid, crystalline silicia, naphthalene</td>
<td>Cancer</td>
<td>Up to 550 days and prone to volatilization (become airborne as a vapor)</td>
</tr>
<tr>
<td>Snapshot</td>
<td>Isoxaben, trifluralin, crystalline silicia</td>
<td>Cancer, hormone disruption suspected</td>
<td>Up to 365 days</td>
</tr>
<tr>
<td>Dimension</td>
<td>Dithiopyr</td>
<td>Liver, blood toxification</td>
<td>Unclear</td>
</tr>
<tr>
<td>Baystate Fertilizer (Sludge)</td>
<td>Heavy metals, synthetic compounds (PCBs, etc.), radioactive contaminants, pathogens</td>
<td>Infection by pathogens, cancer, neurological problems</td>
<td>Long-term</td>
</tr>
<tr>
<td>Roundup</td>
<td>Glyphosate</td>
<td>Cancer, hormone disruption</td>
<td>Up to 365 days and easily airborne</td>
</tr>
<tr>
<td>Krenite</td>
<td>Fosamine ammonium</td>
<td>Few health-effect studies conducted</td>
<td>Unclear</td>
</tr>
<tr>
<td>Arsenal</td>
<td>Imazapyr</td>
<td>Cancer</td>
<td>Over 365 days</td>
</tr>
<tr>
<td>Scourge</td>
<td>Resmethrin, piperonyl butoxide (PBO)</td>
<td>Cancer likely, hormone disruption</td>
<td>Not very persistent when exposed to sunlight</td>
</tr>
</tbody>
</table>

Source: DCR and MBTA Material Safety Data Sheets
In October of 2002, Massachusetts proposed to protect communities that it had determined to be most at risk from environmental pollutants due to disenfranchisement, lack of awareness, or limited English-language proficiency. The Executive Office of Environmental Affairs (EOEA) stated that no segment of the population should bear a disproportionate burden of environmental impacts and defined environmental justice as follows:

Environmental justice is based on the principle that all people have a right to be protected from environmental pollution and to a clean and healthful environment. Environmental justice is the equal protection and meaningful involvement of all people with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies and the equitable distribution of environmental benefits.

The state defined an environmental justice (EJ) community as having a population that meets one or two of the following criteria: (1) its median income is at or below 65 percent of the state’s median income and (2) at least 25 percent are minorities.
The issue of environmental justice applies to many communities throughout the state but is of special concern in Jamaica Plain for a number of reasons:

- Within Jamaica Plain there exists a hot spot of environmental risk due to historic concentrations of hazardous waste facilities dating back to 1880 (see Figure 1);³²
- Jamaica Plain has one of the highest rates of asthma in the city and consequently the state;³³ and
- Jamaica Plain is the sixth largest minority community in the state.³⁴

Jamaica Plain, one of 16 neighborhoods within Boston, has a population of 38,000.³⁵ The Jamaica Plain neighborhood as a whole, including the areas surrounding the SWCP (the SWCP community), meets the state definition of an EJ community in that it has significant minority and low-income populations.³⁶ Fifty percent of its residents are non-white, with one quarter of Hispanic origin, followed by African Americans at 14 percent. Twenty-one percent of all Jamaica Plain residents live below the poverty level. In the highest minority-population areas within the SWCP community, where 88 percent of its 6,700 residents are minorities, there are concentrated areas of poverty that rise to 32 percent.³⁷

We have defined members of the SWCP community to be those who live within a ten-minute walk from the park. This report focuses on the SWCP community for several reasons:

- It is the area of Jamaica Plain that is most intensely burdened by environmental hazards listed for remediation by the Massachusetts Department of Environmental Protection.
- It is very densely populated.
- It is in this area of Jamaica Plain where the majority of pesticides are applied.

In addition to the state’s definition of what qualifies as an environmental justice community, we offer the following criteria as further evidence of environmental injustice in the SWCP community:

**I. Elevated health impacts**

Massachusetts has one of the highest rates of childhood asthma in the country.³⁸ New England as a whole has rates higher than the rest of the country, and Massachusetts ties with the state of Maine for having the highest in the region.

Boston itself has the highest rate of asthma in the state, with nearly twice the percentage of people with asthma as that of Hampden County (home to the second highest rate in the state).³⁹ Of Boston’s 16 neighborhoods, Jamaica Plain has the fifth highest rate of asthma hospitalizations.
among children five years old or younger.\textsuperscript{40} Jamaica Plain’s asthma hospitalization rate is 20 percent higher than the overall Boston rate.

Two other Boston neighborhoods with more hazardous waste sites per square mile than the SWCP community—Roxbury (which borders about one-third of the SWCP) and North Dorchester—rank first and second respectively for asthma rates in the city.\textsuperscript{41} Table 2 shows this correlation.

While it is clear from Table 2 that JP has fewer hazardous waste sites than either Roxbury or Dorchester, it has significantly more waste sites than predominantly white communities (91 percent of all Massachusetts towns), which average a mere 2.1 sites per square mile.

The three predominantly white neighborhoods of West Roxbury, Hyde Park, and Roslindale that surround Jamaica Plain (averaging 62 percent white residents) have rates 35 percent below the overall Boston rates. What is particularly striking about the asthma rates by neighborhood is that they are clustered in two distinct ways. Those neighborhoods with the greatest percentage minority population (with a combined average minority population of 73 percent) match exactly the neighborhoods with the highest rates of asthma. Likewise, those neighborhoods in Boston with the lowest average minority population (17 percent) have the lowest rates of asthma at 4.8 percent, as Table 3 shows.

Additionally, it is important to note that about one-third of the SWCP borders Roxbury, the neighborhood with the highest rate of asthma in the city.

This data shows that minorities in the city had more than a 100 percent increase in asthma hospitalizations from 1998 to 2002.\textsuperscript{42} As residents of Boston, poor minorities are much more likely to have asthma, in part due to the environmental conditions of their communities, where they are exposed to more pollutants than are residents of wealthier communities. Asthma is a disease that is being increasingly linked to environmental causes and exacerbated by environmental triggers.

A study conducted by the New England Asthma Regional Council found children from the poorest families almost twice as likely to have the illness as children from the wealthiest families. The study also found asthma rates to be 50 percent higher in black and Hispanic families than in white families. What are the unique characteristics that place low-income communities of color at the top of the illness chart for this disease? Laurie Stillman, Executive Director of the New England Asthma Regional Council states,

There is something external going on to account for the continuing increases in adult and childhood asthma over the last two decades. We know, at a minimum, that environmental factors play a

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Table 2
Number of Hazardous Waste Sites per Square Mile and Rank of Asthma Rates

<table>
<thead>
<tr>
<th>Number of Hazardous Waste Sites</th>
<th>Rank of Asthma Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jamaica Plain</td>
<td>5</td>
</tr>
<tr>
<td>Roxbury</td>
<td>1</td>
</tr>
<tr>
<td>North Dorchester</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: Massachusetts (DEP) Bureau of Waste Site Cleanup “Cleanup of Sites and Spills” and BPHC, The Health of Boston 2004, The Health of Boston 2006 (see endnotes 14 and 33)

Table 3
Comparison of Asthma Rates in Boston Neighborhoods

<table>
<thead>
<tr>
<th>Average Asthma Hospitalizations per 1000 Children</th>
<th>High Minority Population</th>
<th>Low Minority Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attorney General</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Back Bay</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Fenway</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>South Boston</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>West Roxbury</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Jamaica Plain</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Roslindale</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>North Dorchester</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Roxbury</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Study Dorchester</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>

role in asthma incidence, severity and burden. It is unknown whether there is one major environmental factor or a variety of factors that are working together that may be contributing to the problem. The role of pesticides is one issue we need further research on. We need to take a precautionary approach to environmental pollutants if we are to begin addressing asthma effectively. Waiting for concrete answers will take too long.⁴³

As we show in Appendix B, “Effects of Pesticides on Reproductive and Children’s Health,” pesticide exposure increases the risk of not only asthma, but also cancer and several other disorders.

II. Cumulative Burden of Environmental Hazards

In the state of Massachusetts, if you live in a community of color, there is a 71 percent chance that you are residing in one of the most environmentally hazardous places in the state. If you live in a white community, those chances are reduced to 2 percent. This is according to Faber and Krieg, authors of a report on environmental justice in Massachusetts. The authors’ extensive analysis of environmentally hazardous sites and facilities and census tract data has revealed that not all Massachusetts residents are polluted equally. Because of an historical legacy of toxic waste dumping, poorer air quality, and industrial polluting plants in what was, is, and has become minority communities throughout the state, “working class families and people of color are disproportionately impacted.”⁴⁴

Jamaica Plain is one of these disproportionately impacted communities. In fact, Faber and Krieg rank it as the 15th most intensively burdened community for environmental hazards in Massachusetts. Intensity of burden is defined by the total number of hazards present in a community divided by the total area (square miles) of the town. Being ranked 15 out of a total of 362 means that more environmental hazards are clustered in this community than in 347 other communities. Jamaica Plain ranks as the 6th largest community of color—one of 20 communities statewide where over 25 percent of the population consists of people of color.

Controlling for the size of the community allows for an understanding of the density of the environmental hazards by square mile. Jamaica Plain is 3.07 square miles, a small percentage of Boston’s total land area of 120 square miles. It contains 106 hazardous waste sites overall, with an average of 35 sites per square mile. Over three-quarters (76 percent) of these sites are within an area of 1.15 square miles. These 1.15 square miles comprise the SWCP community.

In addition, two-thirds of Jamaica Plain’s 18 most severely hazardous sites are located in the SWCP community.⁴⁵ These sites receive a special Massachusetts Department of Environmental

<table>
<thead>
<tr>
<th>Table 4 Comparison of Tiered Waste Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No. of Tiered Waste Sites</strong></td>
</tr>
<tr>
<td><strong>West Roxbury</strong></td>
</tr>
<tr>
<td><strong>1302/3</strong></td>
</tr>
<tr>
<td><strong>Jamaica Plain</strong></td>
</tr>
<tr>
<td><strong>SWCP</strong></td>
</tr>
<tr>
<td><strong>Low Minority</strong></td>
</tr>
<tr>
<td><strong>High Minority</strong></td>
</tr>
</tbody>
</table>

Source: Massachusetts Department of Environmental Protection (DEP) Bureau of Waste Site Cleanup “Cleanup of Sites and Spills” (see endnote 14)
Protection (MassDEP) rating due to a combination of four factors: the nature of the hazard (for example, a junkyard with cancer-causing PCBs, a level-seven oil furnace, or a dumping ground contaminated with mercury, dioxin, arsenic, lead, and heavy metals such as chromium), proximity to ground water, the quantity of the toxic substance(s) present, and the total exposed area.

Table 4 (on page 25) shows that even in the most densely populated area of West Roxbury—a moderate-income neighborhood in Boston of similar size (tracks 1302/3, 1.13 square miles) to the SWCP community but with one of the lowest percentages of minority residents in the city (9.3 percent)—there are fewer than half the number of hazardous waste sites per square mile than exist in the SWCP community.

West Roxbury, like Jamaica Plain, is urban, which explains why the neighborhood has more hazardous waste sites per square mile than both the statewide average and the state average for predominately white communities. Yet even in the most densely populated neighborhoods of West Roxbury (with 9,029 people per square mile), we find just 5 of the most severely hazardous waste sites, as compared to the SWCP community’s 12 worst waste sites. This exemplifies the point made by Faber and Krieg that “exposure to hazards significantly drops off in white suburban communities, as well as in rural communities, but almost all communities of color have problems.” Even in communities that border one another, these disparities by race and income are readily apparent.

In addition to the Faber and Krieg report (one of the most comprehensive statewide studies on environmental justice ever conducted), a Boston-based historical study also finds the SWCP community to be unequally burdened by environmental hazards. This study, using historic and current census maps to locate industrial sites, highlights hot spot areas of significant industrial activity and cumulative environmental-risk potential over time. Utilizing data sources dating from 1880 through 1997, researchers found the greatest potential for hazardous chemical contamination in two communities of Boston: Jamaica Plain and Roxbury—with the areas of highest risk (highest density of population and greatest concentration of hazardous facilities) forming “a corridor” directly overlapping the community surrounding the railway system (the MBTA orange line and commuter rails), otherwise known as the Southwest Corridor Park.

The darkest area on the composite map in Figure 2 (courtesy of the Boston Industrial Archeological Project) represents the section of Boston that received the highest ranking for environmental risk. Measurements ranged from 0 to 3 based on the types of chemicals likely to have been discharged by the facility(ies), whether these contaminants are likely to have remained soil bound for long periods of time, and the total number of sites.
of active hazardous sites present. For example, volatile organics released in 1882 were given 0 points (as they would have dissipated into the atmosphere long ago), whereas a facility releasing lead, mercury, or PCBs in 1967 or 1997 were given the highest ranking of 3. The community within this darkened corridor (made up for the most part by the SWCP community) accumulated between 28 and 57 points and is referred to by the report authors as “a hot spot of environmental risk.”

Because many chemicals persist in soil and water over long periods of time, a community’s historical environmental burden must be calculated into any measurement of its current burden. This study provides evidence that the cumulative environmental burden in the SWCP community is quite significant when we consider both its recently identified hazardous sites and its historic legacy. The authors state that, due to the level of hazard potential in the area, “this tract needs urgent attention from both public health officials and environmental planners.” The residents of these sites, they suggest, might request maximum allocation of resources with respect to remediation projects and local health services.

This is not to say that hazardous sites are the direct and exclusive cause of asthma and all other diseases in residents who live near them, but they are one of many kinds of environmental burdens that have the potential to negatively impact the health of area residents. In section 3, we will show that exposure to pesticide residue (not examined in the historical study) is yet an additional environmental burden placed upon this community.

III. Constrained Choice in Open-Space Usage

Constrained choice in open-space usage refers to the relative proportion of residents for whom there is insufficient personal outdoor space, forcing the use of public space instead—resulting in unequal exposure to pesticides. There is a disproportionate exposure to the chemicals used by municipalities for residents in the SWCP neighborhoods due to the following factors:

A. population density
B. disproportionate concentration of children
C. environmental density

A. Population Density

The 2000 census shows that, despite rising housing costs in Jamaica Plain, the proportion of minorities and low-income residents in that neighborhood has not changed since 1990. This is largely due to the prominence of local housing advocates who have grown low-income housing amidst extensive neighborhood gentrification. As Table 5 depicts, the main demographic change has, rather, been a steady increase in the number of residents per household, otherwise known as “population density.”

The term “gross population density” refers to the number of persons living in an area as measured...
by the square mile. The greater the density of the population, the greater the number of people likely to be exposed to a chemical or pesticide in the air, on the ground, or through groundwater contamination.  

Jamaica Plain is 3.07 square miles with a total population of 38,074. Jamaica Plain as a whole has a gross population density of 12,442, whereas the SWCP community has a population density of 15,471. The proportion of people who live in a little over one-third the total area of Jamaica Plain is 30 percent greater than those living in the remaining two thirds. The SWCP community is, in other words, 30 percent more populated than other parts of Jamaica Plain.

As Table 6 indicates, the SWCP community is also more than twice as densely populated as the most populated community in West Roxbury.

### B. Disproportionate Concentration of Children

There is a greater proportion of children living in the SWCP community than in other neighborhoods of Jamaica Plain. As Figure 3 shows, of the 6,900 children who live in Jamaica Plain, 4,309 (nearly two-thirds, or 62 percent) live in the 1.15-square-mile area of the SWCP community (one-third the total area of Jamaica Plain).

Additionally, the SWCP sees a dramatic increase in children daily due to the high number of local daycare centers, schools, and in-home childcare businesses. Within one block of the park, there are 22 schools and daycare centers, including English High School and Nativity Preparatory School, to which the majority of students commute from other neighborhoods of Boston. A number of these schools and businesses use the park for recreation because of the lack of private yard space available in the community. This regular influx of students adds as many as 1,000 to 1,200 children to their total number in the SWCP area every weekday.

### C. Urban Environmental Density

“Urban environmental density” (UED) is a term that we have developed for the purposes of this report to assess the proportion of the population residing in a particular land area. In calculating for UED, we can compare neighborhoods based on their available private open space (all unbuilt-upon land that is not a park, urban wild, or city-owned undeveloped land). The most densely populated areas of the city contain proportionally more built environment than private open space. For urban environmental density, the unit of measurement is population per square mile of private unbuilt-upon land.

While you can tell that the SWCP community is densely populated just by walking through the neighborhood, we calculated ratios so that we could compare this area to other areas of the city.
The point of this comparison is to determine differences in residents’ options for useable open space based on the proportion of private open space available to them. Simply put, some neighborhoods give locals greater choice in where they enjoy outdoor space, while others give less. In neighborhoods where the UED is high, residents’ choice of where they and their children enjoy outdoor space is constrained. There is a greater chance that more residents in high-UED neighborhoods will have no choice but to use a public park because they do not have access to private open space.

Choice is important here because when residents have the opportunity to choose where their children play, they can do so based on the comparative safety of what is available to them. Considerations of safety here refer to a variety of factors, including the use of pesticides and other toxic substances. If a resident does not have that choice and must use public parks as his or her only source of outdoor space, then this becomes an environmental justice issue, especially when the outdoor space available is environmentally unsafe and the lack of choice is disproportionately born by either a poor or a minority community or both.

Table 7 shows population per square mile of private unbuilt-upon land in three neighborhoods: the SWCP community, the rest of Jamaica Plain, and the entire neighborhood of West Roxbury. The SWCP community has more than twice the number of people proportional to private land available than either the rest of Jamaica Plain or West Roxbury.

When zoning regulations favor development at the expense of open space, choice is constrained to an even greater extent. In the SWCP community, there are many mixed residential/commercial areas. According to the Boston Redevelopment Authority (BRA) Zoning Department, commercial and industrial zoning districts are not required to abide by useable open space requirements, which other single- or multi-family zoning districts must do. This means that in a commercially zoned neighborhood, or on parcels of land zoned for commercial use, developers can erect buildings without the need to consider the amount of open space on individual plots, even if the buildings they erect are residential. As the former principal toxicologist at the Boston Public Health Commission, Jalal Ghaemghami, explains, “When there is a need for housing in a city, nobody cares about how much space is left outside.”
There is mounting evidence that health during childhood sets the stage for adult health, with healthy children far more likely to become healthy adults.\textsuperscript{5} This creates an important ethical, social, and economic imperative to ensure that all children are as healthy as they can be.

In examining this issue, the National Academy of Sciences Committee on Children’s Health has found critical differences in how children respond to environmental assaults as compared to adults. From the committee’s perspective, conceptualizations of health that have been developed for adults do not easily transfer to children, demonstrating the need for their health to be held to a different standard. The committee proposes a new definition of children’s health that considers multiple interrelated factors as influences:

\textit{This model includes the category of safety that refers to aspects of the environment that contribute to health, including the physical environment (e.g., absence of toxins or pollutants in groundwater, use of car seats and bicycle helmets), social environment (e.g., low neighborhood crime rates, low rates of risky behaviors either by the children or adults), and psychological environment (e.g., the perception of not being in personal danger). Some environmental and behavioral influences might be conceptualized as contributing to less safe situations, while others might be viewed as health-promoting or protective.}\textsuperscript{56}

At any given moment in time, children are exposed to a range of risky and protective influences. The goal of the National Academy of Sciences Committee on Children’s Health is to develop a model that creates a standard characterization of children’s social or biological environments—at levels such as risky, relatively safer, or health-promoting—by looking at a set of influencing variables. Analysis of these variables could then be used to make statements about the likely current or future health of this population and, in effect, could be used as “proxies” for the actual health of a given population.

In the case of the SWCP community, it is possible to characterize this environment as “less safe” than it should be due to a number of environmental hazards, including unremedi-ated hazardous waste sites, zoning laws that limit availability of open spaces in residential communities, and chemical exposure due to multi-agency use of pesticides.
Children are significantly more vulnerable than adults to the ill-effects of pesticides due to their size, their developing body systems, their greater consumption of oxygen, their frequent use of parks for play, and even their inability to read and interpret the significance of pesticide warning labels and signs. Children also have the greatest potential for multiple exposure to pesticides because they typically have continual contact with sources of pesticide residue, often being re-exposed through close contact with parents, park grounds, and tracking of pesticides indoors on shoes and clothing.

Urban children experience even more exposure than do most other children. A report issued by the New York State Attorney General’s Office explains:

> Although many institutions recognize the need to reduce their reliance on pesticides to control pests, children living in low-income urban housing developments are exposed to pesticides in and around their homes, in their school and at their neighborhood park. In some cities, children are potentially exposed to pesticides in all of these places—places where these children spend virtually all of their time.

Prior to being approved for sale to the public, pesticides are often tested based on an average-size male’s exposure. Few children weigh 155 pounds. In fact, children that are most susceptible developmentally to the negative effects of pesticides typically weigh one quarter or less than this standard weight. In effect, they are taking more into their bodies, which have a larger proportional surface area than adults, and accumulating more toxins in their smaller frames. In addition, a child’s ability to detoxify these chemicals is far less efficient than that of an adult’s.

Children are more susceptible than adults to any airborne pollutants because they breathe in more air and their lungs have not yet fully developed the mechanisms to not react to chemical particulates. Exposure to any air pollutant, according to the National Academy of Sciences Committee, is therefore greater for children on a weight-adjusted basis. For example, a six-month-old child will receive twice the exposure of an adult when in the presence of an airborne pesticide. If pesticide exposure has the effect of damaging cells during a key time of neurological development, the damage may be permanent and irreversible. Researchers have cautioned that “these developmental immaturities create early windows of great vulnerability.”

Low-level exposure has not been adequately researched and has historically been considered inconsequential to health. Yet studies in children have so far demonstrated subtle neurotoxic effects of low-level exposures to a variety of environmental agents, including lead, methyl mercury, and PCBs. According to a report by the Ontario College of Family Physicians, while there
are still insufficient studies on low-level exposures to pesticides, the authors see the likelihood of such exposures causing similar brain damage to lead poisoning, given that some pesticides are by design neurotoxins.⁶⁵

Pesticide flags are designed to warn of a recent pesticide application and to communicate the message to “stay off” or away from the area until the flags are removed. Unfortunately, children usually do not read warning signs, either because they cannot read (children do not often learn to read until approximately six to seven years of age), they do not read English well enough, or they do not know that the three-by-five inch flag is intended to be read. Adults also face English literacy problems (particularly in a community such as Jamaica Plain, where 30 to 40 percent of its residents are foreign-born minorities) and may not even see the sign nor know that it constitutes a warning. Interviews with SWCP visitors by a Boston Banner reporter reveal that people with young children who play in the park do not know the meaning of the warning signs.⁶⁶

The above evidence regarding children and pesticide exposure leads us to conclude that, within their communities, children bear the greatest burden of risk and lifelong consequences from exposure to pesticides. As such, their exposure is an environmental injustice. Children who live in the SWCP community shoulder a disproportionate share of environmental impacts two times over: once because they are members of an environmental injustice community; a second time simply because they are children.
In their 2005 report *Poisoning Ourselves*, the Environmental League of Massachusetts cites pesticides as one of the few toxins we intentionally subject ourselves to, despite their known toxicity to humans, other mammals, and insects.6⁷ Actually, when it comes to the application of pesticides by government agencies, the term “intentional exposure” fails to accurately describe the manner by which the public generally comes into contact with them. In fact, there is no effective or reliable mechanism for informing the public that they are being subjected to a pesticide exposure. City, state, and county agencies that apply pesticides themselves or contract out to licensed pesticide applicators may not always comply with the Massachusetts state law that requires posting of warning flags for 72 hours after application or notification through local media sources.6⁸ Even when an area is posted, the short period of warning often does not correspond to the length of time the pesticide application remains potent.6⁹

Local and state laws and policies that protect poor and minority Massachusetts residents are few and far between. Those that do exist, though valuable in principle, are often limited in their effectiveness. The above-mentioned notification law is one such example. Another is the state law known as Chapter 85 of the Acts of 2000, An Act Protecting Children and Families from Harmful Pesticides. This act requires notification of pesticide use in, and on the grounds of, schools and daycare centers and permits their use only if that pesticide does not fall under the category of a known, likely, or probable human carcinogen. According to the state Pesticide Bureau, however, the law has been implemented in only 70 percent of the state’s schools and only 50 percent of the state’s daycare facilities.⁷⁰ Furthermore, it fails to protect children and their families anywhere else they may spend their time, including in public parks and other public spaces.

Environmental injustice is just one lens through which to view the effects of environmental pollution on predominantly poor or minority communities. When government entities are made aware of the risks posed by their practices and then continue in those practices anyway, this active participation of parties in enhancing risk to human health requires a different label, such as “structural violence.”⁷¹ This term, coined by Paul Farmer, describes the ultimate effect of policies and practices (or lack thereof) that impact a population with the least social and political capital. Structural violence in this context means that some groups of people are, from the outset, at higher risk of being adversely affected by environmental pollutants, while other groups are shielded. In fact, communities with greater political capital, which are some of the wealthiest communities in Massachusetts, have already passed laws prohibiting the use of pesticides. The towns of Marblehead, Wellesley, and Sherborn are a few examples.

**the precautionary principle:**
one antidote to inadequate policies and practices

*there is currently in the state of Massachusetts no effective or reliable mechanism for informing the public that they are being exposed to a pesticide.*
The Precautionary Principle can be used as an antidote to the perpetuation of structural violence. It proposes that “when an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically.” Unlike in Canada and Europe, in America the public has typically carried the burden of proving that a particular activity or substance is dangerous, while the companies or industries undertaking the potentially dangerous activities or manufacturing the potentially hazardous substances are considered innocent until proven guilty. As Tickner and colleagues suggest, “Chemicals, dangerous practices, and companies often seem to have more rights than citizens and the environment.” According to Tickner et al., this burden of scientific proof has posed a monumental barrier in the campaign to protect health and the environment. Actions to prevent harm are usually taken only after significant proof of harm is established, at which point it may be too late for many of those already exposed. Hazards are generally addressed by industry and government agencies one at a time, in terms of a single pesticide or chemical rather than as broader issues, such as the need to promote organic agriculture and nontoxic products or to phase out whole classes of dangerous chemicals.

The head of the Environmental Department of San Francisco, the first city in the nation to adopt the Precautionary Principle, asked how much air pollution the Bay Area should tolerate before stating absolutely that it causes respiratory illnesses. With hundreds of studies linking pesticides to a host of serious health conditions, NPAC asks if we need further proof of their danger before taking measures to protect ourselves from them. We think not. We believe it is essential, as the Precautionary Principle suggests, that we replace pesticides with safer alternatives and that we start doing so now, before causing more harm to ourselves, the environment, and the future well-being of our children.

Photo on opposite page by Diedre Fisher. A Southwest Corridor Park playground
NPAC’s firm belief is that by replacing pesticide use with safer alternatives and by shifting decision making about such practices from government agencies alone to a collaboration between the government and concerned citizens, we will, over time, see lower rates of asthma, cancer, and other disorders linked to pesticides and other local environmental toxins. Additional improvements to the community’s environmental well-being—such as the replacement of diesel buses with pollution-free trolleys, full implementation of integrated pest management (IPM) plans for every school and daycare center, and clean-up of the hazardous waste sites found in our communities, especially our communities of color—will contribute to this goal as well.\(^4\)

This report provides evidence of the correlations between certain health conditions and the use of outdoor pesticides and has linked this body of research to statewide data on environmental hazards.\(^5\) There is now sufficient research on the detrimental effects of pesticides to provide solid evidence of harm and the manifestation of harm in specific illness conditions. Pesticides can no longer be overlooked as a significant contributor to a community’s burden of environmental toxins, whether applied outdoors or indoors and whether applicators are homeowners or licensed by the state.
recommendations

NPAC recommends the following actions be taken to minimize our exposure to pesticides in and around our homes and our communities:

- Learn how to use alternatives to pesticides around your home. Go to www.bphc.org or www.npacboston.org, or call the Boston Public Health Commission (617-534-5966) to obtain copies of brochures on alternatives to both indoor- and outdoor pesticide use.

- Ask state and local health agencies to institute “right to know” policies and practices: The public has the right to be adequately informed of risks they may be taking. Warning flags are not sufficient because they do not adequately inform the public.⁷⁶

- Investigate what your community uses to maintain its parks and open spaces; urge state and local officials to pass legislation restricting pesticide use on public property by state, county, and city governments; and encourage the adoption of organic pest management practices instead. An increasing number of municipalities across the country—including the cities of San Francisco and Buffalo, and Westchester, Suffolk, and Albany counties of New York—are phasing out the use of chemical pesticides on public property.

- If you live in Boston, support NPAC’s campaign to put an end to the use of pesticides in all public parks and other open spaces of Jamaica Plain. Our aim is to convince the agencies that are overseeing the open spaces to replace pesticide use with organic pest management (OPM). To find out more, visit www.npacboston.org or e-mail info@npacboston.org.⁷⁷
1. **Alliance for a Healthy Tomorrow:**
   Elizabeth Saunders, Toxics Campaign Organizer, Clean Water Action, 262 Washington Street, Room 301, Boston, MA 02108; 617-338-8131 x204; Fax: 617-338-6449; esaunders@cleanwater.org; www.healthytomorrow.org

2. **Alternatives for Community & Environment (ACE):**
   2181 Washington Street, Suite 301, Roxbury, MA 02119; 617-442-3343; www.ace-ej.org

3. **Beyond Pesticides:**
   701 E Street SE, Washington, DC 20003; 202-543-5450; www.beyondpesticides.org/pesticidefreelawns/actions/index.htm

4. **Boston Public Health Commission:**
   Department of Communications, 1010 Massachusetts Avenue, Boston, MA 02118; 617-534-2606; www.bphc.org

5. **Massachusetts Environmental League:**
   14 Beacon Street, Suite 714, Boston, MA 02108; 617-742-2553; www.environmentalleague.org

6. **Neighborhood Pesticide Action Committee (NPAC):**
   info@npacboston.org; www.npacboston.org

7. **Toxics Action Center:**
   Sylvia Broude, Lead Organizer, 44 Winter Street, 4th Floor, Boston, MA 02108; 617-747-4407; sylvia@toxicsaction.org

8. **Urban Ecology Institute:**
   355 Higgins Hall, 140 Commonwealth Avenue, Chestnut Hill, MA 02467; 617-552-6792; www.bc.edu/research/researchcenters.html#anc_urban_eco

**Jamaica Plain Representatives:**

1. **Representative Jeffrey Sánchez (JP):**
   State House, Room 42, Boston, MA 02133; 617-722-2130; Rep.JeffreySanchez@hou.state.ma.us

2. **Representative Liz Malia (JP):**
   State House, Room 33, Boston, MA 02133; 617-722-2060; Rep.LizMalia@hou.state.ma.us

3. **Senator Sonia Chang-Díaz (JP/Roxbury):**
   State House, Room 413-C, Boston, MA 02133; 617-722-1673; Sonia.Chang-Diaz@state.ma.us
Used before the Spring of 2006

1) Momentum (active ingredient: 2,4-D) has been used as a broad-spectrum weed-control herbicide. It has been rated by the U.S. Environmental Protection Agency (EPA) as “highly toxic” (Toxicity Category I) for eye and skin exposure. Several studies show an association of exposure to 2,4-D with cancer in Kansas and Nebraska farmers. Two studies show liver dysfunction from chronic exposure to the chemical while golfing. Studies of 2,4-D indoor exposure levels show an increase following lawn applications, due to indoor tracking of the pesticide. Dogs fed low amounts daily for two years died due to inability to excrete the acids. Rats and mice fed small doses developed malignant tumors, including malignant brain tumors and sarcomas. Because 2,4-D resembles a hormone that may mimic estrogen, concerns have been raised about the chemical’s implication in breast cancer. 2,4-D was banned by the European Union in 2003.

2) Merit (active ingredient: imidacloprid; inert ingredients: crystalline silica and naphthalene) is routinely applied on grass for grub control. The pesticide is toxic to a number of birds (particularly sparrows), bees, and invertebrates and acutely toxic to mammals. Numerous studies of mammals exposed to imidacloprid show acute nervous system breakdown (loss of movement, labored breathing, trembling) lasting up to 5 days and up to 12 days when tested with both active and inert ingredients. Merit’s two inert ingredients are considered to be carcinoogenic to humans: Crystalline silica has been classified as such by the EPA, and the National Toxicological Program finds naphthalene to show clear evidence of carcinoenic activity. Naphthalene is particularly prone to volatilization, especially when mixed with, or discharged into, water. Based on a thorough review of the research, naphthalene was identified among the top 30 compounds contributing to urban air toxins that are proposed to have the highest impact on asthma and respiratory health. Merit has a half-life of 48 to 190 days, closer to 190 when used along with sewage sludge. The half-life of naphthalene varies from 71 to 550 days. Given Merit’s long period of potency once applied, chemical residues on food products as well as the possibility of the chemical being tracked indoors on shoes and by pets should be considered.

3) Snapshot (active ingredients: isoxaben and trifluralin; inert ingredient: crystalline silica) is used as a pre-emergent herbicide (killing the seeds before they grow) for crabgrass and weed control. Trifluralin, which easily volatilizes and has a half-life of 25 days to over one year, is listed by the EPA as a suspected endocrine disruptor. Isoxaben, which in one test was associated with an increase in non-malignant liver tumors, is listed by the EPA as a possible human carcinogen. Crystalline silica, listed as a known human carcinogen, has been shown to cause cancer in laboratory animals and humans.
Southwest Corridor Park
4) **Dimension** (active ingredient: dithiopyr) is applied as a crab-grass control/fertilizer. The chemical is a suspected cardiovascular or blood toxicant and a gastrointestinal or liver toxicant. Field studies of this product indicate that the active ingredient volatilizes and is degraded in air by exposure to light (photolysis).  

5) **Roundup** (see description below under “Pesticides Applied for Vegetation Control on the Southwest Corridor Park”)

6) **Sewage sludge** is a byproduct of sewage treatment at wastewater treatment plants. It has been widely disseminated as a land fertilizer, a method treatment plants use to dispose of the byproduct. Sewage sludge may include human, industrial, hospital, and radioactive waste, as well as runoff, landfill leachate, and hazardous waste from unknown sources. Sewage sludge is a toxic mix of heavy metals, synthetic organic compounds (e.g., PCBs and related compounds), surfactants, pathogens, and radioactive contaminants. Out of the 411 pollutants that the EPA has identified in sewage sludge (a fraction of what is actually there), only 9 heavy metals are monitored. Heavy metals, which do not break down, accumulate over time in the soil. Garden vegetables, such as carrots, potatoes, and beets, that grow in this soil then absorb these heavy metals into their plant tissue as they grow.

Sludge from Boston’s Deer Island wastewater treatment plant is designated “Class A” (rather than “Class B”), a result of its pelletization. Sludge designated as Class A by the EPA is more stable than Class B sludge due to the product’s further digestion, drying, composting, or liming. These processes reduce odors and vector attraction. But neither composting nor heating nor pelletizing can do more than reduce pathogens; elimination of disease organisms is a practical and economic impossibility. Thus, regrowth is of significant concern. The Water Environment Research Foundation (WERF) funded a project in 2006 indicating that “fecal coliform bacteria may re activate during certain biosolids treatment processes.” Not only is regrowth of concern, but so is the persistence of heavy metals and chemicals. “None of the heavy metals nor thousands of chemicals in sewage sludge are eliminated by ‘stabilization,’ whether composting, heating, or pelletizing,” reports Laura Orlando, Executive Director of the Jamaica Plain–based ReSource Institute for Low Entropy Systems (RILES), which invests in technologies for sustainable development.

The EPA has neither conducted nor funded any public health studies on sludge. Deer Island sewage sludge, sold to the public under the name Baystate Fertilizer, was applied to the Southwest Corridor Park in 2003 for one season.
Currently in Use

Pesticides Applied for Vegetation Control on the Southwest Corridor Park

Department of Conservation and Recreation (DCR)

Roundup (active ingredient: glyphosate) is applied to the Southwest Corridor Park’s weeds around bushes, trees, and in open areas. The peer-reviewed literature in prominent public health environmental and medical journals has shown glyphosate (the main ingredient in Roundup) and Roundup itself to cause cancer (non-Hodgkin’s lymphoma), genetic damage, and increased risk of miscarriages and birth defects. These recent studies discussed below were conducted by university scientists in Canada, Sweden, and the U.S., as well as by the American Cancer Society.

A study of over 1,500 children from farm families found that more than 10 percent of farmers who applied glyphosate had at least one child with a birth defect who had been conceived in the springtime (when the pesticide was used), resulting in significantly more then the average number of children born with defects. (The average rate of birth defects in the U.S. is 3.7 percent.) Glyphosate has caused genetic damage in human blood cells and interferes with the production of a protein called StAR, which is, in turn, key to the production of testosterone.96 A 1999 American Cancer Society study found humans exposed to glyphosate to be 2.7 times more likely to develop non-Hodgkin’s lymphoma.97 Glyphosate is acutely toxic to fish and kills over 50 percent of exposed beneficial insects (ladybugs, lacewings, parasitoid wasps).98 It has been given a rating of “toxic” (Toxicity Category II) by the EPA.

Data confirms that Roundup is both persistent and mobile in the soil. Seven separate studies show its range of half-life to be wide (from 3 to 365 days) and dependent on environmental conditions. Tests by the manufacturer, Monsanto, show that breakdown to half its original strength can take as few as 3 days to as many as 141 days. Because plants absorb this chemical, it cannot be completely removed by washing or peeling and has been shown to persist in food products for up to two years.99 The EPA summarizes its findings from its review of the research on this product: “This herbicide is extremely persistent under typical application conditions.”100

Because Roundup is particularly prone to drift (traveling through the air beyond its target), application guidelines recommend that it be administered when there is no wind. By observation, there are few days without wind.101
Pesticides Applied for Vegetation Control on the Railway System

Massachusetts Bay Transportation Authority (MBTA)

The following herbicides are routinely applied to the railway beds and surrounding areas of both the Commuter Rail and the Orange Line trains. The Southwest Corridor Park runs on either side of the railway beds. No pesticide warning signs are posted.

1) **Roundup** (see description above under “Pesticides Applied for Vegetation Control on the Southwest Corridor Park”)

2) **Krenite** (active ingredient: fosamine ammonium) is not registered to be used on cropland, so the EPA does not require the manufacturer to perform health-effect studies on it prior to registration. Most independent studies on this product were conducted in the mid-seventies. Resulting from tests on the skin of animals, its active ingredient, fosamine ammonium, is classified by the EPA as Toxicity Category II for acute dermal exposure. This classification represents the second most severe level of acute toxicity for studies using laboratory animals. In the late eighties, the U.S. Forest Service concluded that it would not use Krenite because the data, where it existed, was of such poor quality that it was unable to adequately quantify its risks.

3) **Arsenal** (active ingredient: imazapyr) is a broad-spectrum herbicide used to kill unwanted plants at industrial sites and railroad right-of-ways. Animal studies conducted on the chemical’s potential to cause cancer have found it to increase the existing number of brain and thyroid tumors as well as the incidents of cancer. It moves readily in soil and can persist in the soil for over a year.

Pesticides Applied for Mosquito Nuisance and West Nile Virus

Suffolk County Mosquito Control

**Scourge** (active ingredient: resmethrin; inert ingredient: piperonyl butoxide [PBO]) is the insecticide most often used in Boston against mosquitoes. It has been identified as a hormone disruptor and a likely human carcinogen and has been reported to cause nerve damage.

In December 2002, the European Union banned the product’s main ingredient, resmethrin. In May 2006, the EPA reclassified resmethrin as a likely human carcinogen. This reclassification makes the application of the chemical no longer legal for use on Massachusetts school properties.

Resmethrin is in a class of nerve toxins known as pyrethroids, which have been identified as interfering with normal reproduction in laboratory animals. As nerve toxins, they have also been reported to adversely affect the peripheral...
and central nervous systems, some even causing seizures in cases of severe poisoning. Pyrethroids are highly toxic to bees, fish, frogs, and many other organisms, some of which are natural mosquito predators. Such organisms are endangered whenever pyrethroids are sprayed into the environment, since sprayed pesticides inevitably hit other wildlife besides the targeted mosquitoes.

The ingredient PBO makes up more than 50 percent of Scourge. Although when acting on its own the acute toxicity of PBO has been reported to be low, the EPA has classified it as a possible human carcinogen. PBO functions as a “synergist,” which means that it makes Scourge much more potent than it would be were resmethrin acting alone. It does this by inhibiting the liver enzymes responsible for the breakdown of certain toxins, causing people and other organisms to become vulnerable to them.

The spraying of pesticides has not been shown effective in protecting against West Nile virus. Because mosquitoes breed so rapidly and in so many locations, pesticides have only local and temporary effects in reducing their numbers. Routine spraying may lead to pesticide-resistant mosquitoes, which would be more difficult to control in the event of a public-health emergency. While no pesticides have been sprayed in response to West Nile virus in Boston since 2000, Suffolk County Mosquito Control routinely sprays city neighborhoods that are near wetlands to reduce the number of nuisance mosquitoes.

**Pesticides Applied to Kill Mice and Rats**

**MBTA, construction sites, public housing**

**Rodenticides** kill rodents by three different methods: baiting through a feeding station, the application of tracking powders, and fumigating. Feeding stations should be placed in areas inaccessible to non-target wildlife and, of course, out of the reach of children.

The American Association of Poison Control Centers ranks rodenticides second in their annual tally of human exposures to pesticides compared to three other major categories of pesticides. Nationwide, nearly 90 percent of poisonings from this type of chemical occur in children under six. According to Boston’s Children’s Hospital Poison Control Center, 44 percent of all children poisoned by pesticides in Boston in 2004/5 were poisoned by rodenticides. Children come in contact with these poisons because of youthful curiosity and their improper use or placement.

Pets and non-target wildlife fall victim to exposure as well. In the spring of 2006, three hawks found in Jamaica Plain were poisoned by a rodenticide. The one hawk that survived will not be released back into its original habitat due to the likelihood of re-poisoning.

**nearly 90 percent of poisonings from rodenticides occur in children under six.**
How rodenticides affect the body is quite different depending on the brand used. Anti-coagulant-style poisons kill by preventing the blood from clotting, causing internal bleeding. Others increase absorption of calcium and phosphorus, which ultimately leads to death. Still others are neurotoxins. Zinc phosphide, another type of rodenticide, can be ingested, absorbed through the skin, or inhaled from fumes. It reacts with stomach juices to release a gas that causes death from lung and liver damage.

Urban areas are often breeding grounds for rodents. There are therefore more of these poisons in densely populated neighborhoods than in other locations. According to one source, it is illegal not to have rat poison at a construction site. However, the city’s Inspectional Services director says that controlling rodents does not always require using poisons; eliminating habitats, cleaning up garbage, and trapping are all preferred options.
Cancer

Cancer is the second leading cause of childhood mortality in the United States, exceeded only by accidents.¹¹ It has long been the leading cause of death by disease among children, and rates of childhood cancer continue to grow. Despite an increase in survival rates in recent years due to diagnostic improvements and anticancer treatments, the incidence of some types of childhood cancer has surprisingly risen. The incidence of acute lymphoblastic leukemia increased nearly 30 percent, brain cancer by 40 percent, and testicular cancer by 68 percent between the 1970s and the 1990s.¹¹

While some cases may be due to genetic factors, many medical studies are indicating that environmental factors, such as exposure to pesticides, are playing a large part in the increased rates of cancer development, especially among children. Because their bodies are still developing, they are even more susceptible to the effects of toxic chemicals during these years than are adults. In addition to immediate effects, pesticides can reside in human tissue and fat for decades, so development of cancer is a continual risk after pesticide exposure. The earlier children are exposed to pesticides and the longer the exposure period, the more likely cancer will develop.¹²

Accounting for almost one-third of all cancer cases in the U.S., leukemia is the most prevalent childhood cancer. For this reason, many studies of childhood cancer have focused on this one type, with a large number of the studies linking the disease to pesticide exposure. A study of household exposure to pesticides and development of childhood leukemia found a connection between the disease and use of pesticides both inside the home and, because of indoor tracking (see Appendix C), outside in gardens.¹² Home pesticide use during pregnancy or childhood was associated with childhood acute leukemia in six studies, including one by Leiss and Savitz (1995), who reported an association with pesticide-strip use during pregnancy and childhood. The authors cited the culpable chemical to be dichlorvos, which is carcinogenic in animals and classed as possibly carcinogenic for humans by the International Agency for Research on Cancer (IARC).¹²

Another study linked the disease with the use of pest-control services: “The use of professional pest control services at any time from 1 year before birth to 3 years after was associated with a significantly increased risk of childhood leukemia.”¹³ There is also medical evidence that some forms of leukemia are initiated in utero.¹⁴ In fact, exposure in utero was found to be associated with the highest risk of developing leukemia, which may be because the growing fetus is particularly sensitive to toxic substances. Overall, the IARC considers the use of any insecticide likely to be carcinogenic to humans.¹⁵
Neurological Disorders

The role of pesticides in the development of pediatric neurological disorders is a major area of concern, since children’s brains are especially susceptible to environmental influences both in utero and after birth. This is due to incompletely developed blood-brain barriers, a system that is meant to simultaneously protect the brain from harmful substances in the bloodstream and supply the brain with the required nutrients for proper function. It is also due to the fact that significant brain development occurs until at least six years of age. This renders the presence of toxic compounds such as pesticides particularly damaging because they interfere with this development.

A variety of neurological disorders can occur in children starting with the fetal stage through infancy into adolescence, from delayed development and mental retardation to diseases or conditions such as cerebral palsy, epilepsy, autism, and attention deficit hyperactivity disorder (ADHD). Mental and behavioral problems are some of the most common of these disorders. Up to three percent of the world’s children may experience some form of intellectual disability, which includes “arrested or incomplete development of the mind characterized by impairment of skills and overall intelligence in areas such as cognition, language, and motor and social abilities.” While these and other neurological disorders may be caused by either genetics or physical damage, especially in the womb, a growing body of research is linking such disorders with exposure to pesticides.

In a landmark study of two groups of preschoolers in Mexico, Elizabeth Guillette discovered a link between pesticide exposure and developmental disorders, characterized by a decrease in stamina, gross and fine eye-hand coordination, and memory. Guillette studied two groups of four- to five-year-old children living in the Yaqui Valley of northwestern Mexico, one group living in the agricultural region of the valley, in which pesticides had been used since the 1940s, and the other group living in the foothill area with historically little pesticide use. A 1990 study found high levels of various pesticides “in the cord blood of newborns and in breast milk” of residents in the pesticide-laden valley.

In her study, Guillette examined the developmental differences between the two groups of children by asking them to draw the figure of a person. The foothill children, who had had little exposure to pesticides, demonstrated a much greater capacity for creating an image of an actual person than the valley children. “The valley children averaged 1.6 body parts to a drawing, compared to the foothill children’s 4.4 body parts. In addition, it was noticed that foothill children compared their drawing to an actual person to make necessary corrections. Valley children would look at an individual but continue to draw meaningless circles.”
Figure 1
Representative Drawings of a Person by Four-year-old Yaqui Children From the Valley and Foothills of Sonora, Mexico

Drawings of a Person
4 year olds

FOOTHILLS

VALLEY

54 mos female
55 mos female
54 mos female
53 mos female

Figure 2
Representative Drawings of a Person by Five-year-old Yaqui Children From the Valley and Foothills of Sonora, Mexico

Drawings of a Person
5 year olds

FOOTHILLS

VALLEY

60 mos female
71 mos male
71 mos female
71 mos male
Major differences were also noted in the children’s spontaneous play. Despite similar access to toys and opportunities for play and comparable home environments, foothill children engaged in much more creative play that often included cooperation among several children, such as doll parties, whereas the valley children frequently roamed aimlessly by themselves and were involved in violent behavior, such as hitting siblings.¹³

Another study found evidence that for children who are already at a disadvantage due to inadequate access to food, exposure to pesticides is an additional assault. This study, which looked at the neurological development of malnourished children who had had prenatal pesticide exposure, used a drawing test that, as in Guillette’s study, asked children to draw a replication of an image. In the test, those children who were exposed to pesticides during fetal development demonstrated a developmental delay of four years compared to children in the same community not exposed prenatally.¹³ Another study found clinical neurologic examination showed a marginal increase in abnormalities among the exposed children. While the authors of the study conclude that “prenatal pesticide exposure may cause lasting neurotoxic damage and add to the adverse effects of malnutrition in developing countries [where children lack access to enough food],”¹³⁴ we would add that pesticide exposure can also be a serious problem in poor inner-city communities in industrialized countries, where children may also lack access to enough food or are not always fed nutritionally balanced meals. In America, “4.1 percent of households (6.9 million adults and 4.3 million children) showed a recurring pattern of hunger due to inadequate resources for one or more of their adult and/or child members sometime during the period” of April 1994 to April 1995.¹³⁵

**Asthma**

Asthma is a life-threatening disease characterized by repeated episodes of wheezing, breathlessness, coughing, and chest tightness. These episodes are caused by constriction and inflammation of the tiny vessels that bring air to the lungs and can be brought on by various triggers such as exercise, irritants, and environmental toxics.¹³⁶

Over the past few decades, asthma rates have dramatically increased. In recent research reviews, doctors from the University of California San Francisco Pediatric Environmental Health Unit observed that “although it is clear that some people inherit a genetic predisposition to asthma, the increase in the rate of asthma and its severity almost certainly results from environmental, rather than genetic, factors.” They also found this disease to be more common among low-income people living in urban areas and that “asthma is more common in African-Americans and has worse outcomes, with a hospitalization rate about four times higher and a death rate about two times higher than among Caucasians.”¹³⁷
Asthma is now the number one chronic health condition among children in the United States. It is estimated that one in eight schoolchildren experiences asthma, and it is the leading cause of childhood school absenteeism, as well as hospitalization.¹³ As we have seen, children are more susceptible to the ill effects of chemicals, and this includes airborne health hazards.¹⁹ Recent scientific studies have validated the significance that various pesticides play in the occurrence of asthma among children.¹⁴

**Pesticides' role in causing asthma**

Research shows that environmental factors serve as both underlying causes and triggers for asthma. Increasing evidence supports the idea that childhood exposure to environmental factors like pesticides has a profound effect on the occurrence of asthma throughout the life span. Researchers at the University of Southern California Medical School examined how pesticide exposure in the first year of life can be a determining factor in the occurrence of asthma later in life. They concluded that children exposed to herbicides and other pesticides during their first year of life had a 2.53-fold higher risk for asthma compared to unexposed children. This higher occurrence can be attributed to the fact that this stage of life is the crucial period for immune- and respiratory-system development. They suggest that children’s “hand-to-mouth behavior, closeness to the playground, low ratio of skin surface to body mass, and their reduced ability to detoxify toxic substances, make them more vulnerable to the toxic effects of pesticides.” Pesticides also act as disruptors; in addition to inhibiting the growth of the immune and respiratory systems, they have the potential to decrease those systems’ proper functioning.¹⁴¹

**Pesticides as respiratory irritants (triggers)**

While pesticides can be linked to the higher occurrence of asthma, they can also be pointed to as major triggers in the onset of asthma symptoms (often referred to as asthma attacks) in children and adults who have already been diagnosed with the disease. Several pesticides are known to cause airway constriction and respiratory irritation. For example, the chemicals 2,4-D, glyphosate, and resmethrin—active ingredients in pesticides that either were, or are still being, applied in the SWCP community—are respiratory irritants that have been reported to trigger the onset of potentially deadly asthma attacks.¹⁴²

**Endocrine Disruption and Reproductive Effects**

An alarming number of pesticides have known or suspected effects on human hormones and reproduction. Various pesticides are considered to be endocrine disruptors because of their ability to either activate or block hormone receptors. This is significant because hormones are the chemical messengers that regulate all biological processes, including reproduction.¹⁴³ Recent studies have
found certain pesticides to have endocrine disrupting abilities that can result in altered reproductive processes for both males and females, which, in turn, can lead to sterility.

In Guillette’s 2005 study of Mexican agricultural workers, researchers found that organophosphorous pesticides (OP) reduced sperm counts and ovulation by limiting certain brain chemicals responsible for the proper functioning of two reproductive hormones: follicle-stimulating hormone (FSH) and luteinizing hormone (LH). Additional experimental animal studies show similar results. Another study conducted by researchers from Texas Technical University Health Sciences Center discovered that Roundup (active ingredient, glyphosate) reduced hormone production in Leydig cells located in the testes. Leydig cells play an essential role in the reproductive function of males by producing testosterone, a hormone related to sperm production. Lower sperm production can reduce the chances of egg fertilization in women, resulting in a failure to become pregnant.

A recent breakthrough study testing Roundup at levels generally considered nontoxic found the pesticide to be toxic to human placental cells within 18 hours of exposure. Ultimately, it was concluded that both low-level and one-time exposure have dangerous implications and that the dangers of these implications increase as the time and dose of exposure increase. The findings of this study are crucial in recognizing the impact of what has been previously considered small, “safe” amounts of pesticide exposure.

Other studies have linked pesticide exposure to birth defects and spontaneous abortions, showing that the developing fetus is particularly susceptible to the effects of pesticides. EPA researchers studying birth defects in four wheat-producing areas in the United States found that chlorophenoxy pesticides, such as 2,4-D, greatly influenced the number of birth defects in newborns. Significant increases in birth malformations, including respiratory/circulatory and musculoskeletal malformations, were observed among babies born in areas of high 2,4-D use. They also found that infants (mostly boys) conceived during the spring months, when pesticide application is high, were nearly five times more likely to be born with these types of birth defects than infants conceived during other months.

Finally, a recent study examining the effects of pesticides on spontaneous abortion rates on an Ontario farm population found that women who were exposed to glyphosate before conceiving experienced greater rates of spontaneous abortions than did women who were never exposed to this pesticide. Both women who were exposed prior to conception and women who were exposed after conception experienced more spontaneous abortions than women not living in these communities. Additionally, pre-conception exposure was linked to later-term spontaneous abortions.

the developing fetus is particularly susceptible to the effects of pesticides.

Photo on opposite page by Enna Grazier
appendix c
additional problems of pesticide use

Persistence of Pesticides in the Environment

A measure called half-life is used to describe the time it takes for half of a pesticide product to lose its potency in soil (soil half-life) or water (hydrolysis half-life). The longer a chemical remains in water or soil without breaking down, the more likely it is to leach through the soil and travel beyond the place it was applied; become airborne through drift and evaporate into a vapor, thus easily taken into the lungs; be tracked into homes; and enter groundwater, wells, and other water sources.¹⁵

Pesticides Do Not Stay Where They Are Applied

Risks from pesticides are not limited to the immediate areas of application: through processes such as drift and tracking, pesticides can be transferred from areas on which they are applied into buildings, such as homes and schools, and open lands, such as fields and streams. These processes create exposure hazards for people who live, play, and work significant distances away from the area on which the pesticides were first applied.

Drift

Pesticide drift can occur in either of two ways: particle drift or volatilization drift. Particle drift occurs when the pesticide particles are caught up by air currents, either during or after the application process, and drift off the target location as a dust. Volatilization drift occurs when pesticides are applied as liquids or oils that evaporate (volatilize) into a gaseous form after the application process and drift long distances in invisible clouds. This is the more dangerous of the two forms, as it is lighter, and can therefore travel longer distances. Not only can pesticides drift distances far from where they are applied, but once airborne, as in the case of both types of drift, they can be readily taken into the lungs.

Studies of common chemicals such as 2,4-D have shown that they can drift from parks and lawns and into homes. “It is reasonable to assume that fine particles containing 2,4-D can be re-suspended from residential turf by wind, penetrate the exterior of the home through cracks and crevices, windows, and doors, and be deposited on interior surfaces.”¹⁵ While drift is most commonly associated with aerial-spraying applications used in agriculture, it is also common with ground application. “Drift from tractor-powered application equipment can range from 16 to 60 meters (50 to 200 feet). Other types of ground applications can drift even further[.] . . . drift from roadside spraying equipment has been measured at 100 meters (320 feet); and drift from chemigation (pesticides applied through an irrigation system) at 200 meters (640 feet).”¹⁵

Tracking

In addition to drifting on wind currents, pesticides can be transported by regular human
activity through a process known as tracking. Toxic chemicals not only persist on lawns for days, weeks, or even months after application, but their residue can be tracked into homes, schools, and other buildings through regular human and pet activity. By walking over treated areas, humans and pets can pick up chemicals on their shoes, clothing, skin, and paws; these chemicals are then transferred inside, where they persist on indoor surfaces as dust particles. A study of 2,4-D found chemical residues on all surfaces in tested homes even one week after lawn application.

Once they enter the home environment, pesticides can persist even longer than on application areas because they cannot be dissipated by natural elements such as sunlight, rain, or wind. According to the National Resources Defense Council, some pesticides can stay in a carpet for up to one year. And a 2003 study of homes on Cape Cod found residues of the pesticide DDT still present in homes, despite its ban in the 1970s, indicating that pesticides persist and do not readily degrade indoors for decades after removal from the market.

Groundwater and Soil Contamination

Pesticides can also be transported away from application sites through runoff, leaching, and erosion. When they remain on the ground, pesticides naturally travel downhill until they percolate soils or are absorbed into water sources. Through these processes, the chemicals not only remain in soils as residues but are also transferred into groundwater sources, by which they can then travel farther distances. Like tracking and drift, these processes further increase both the time period and the area of pesticide exposure.

Groundwater contamination is an especially important issue for the Southwest Corridor area, because Stony Brook runs directly under a section of the park, ultimately draining into the Boston Harbor. Soil contamination is also an important issue, as the SWCP hosts eleven community gardens in which foods are grown for consumption.

The Unknown Synergistic Effects of Multiple Pesticide-Product Applications

Urban dwellers in particular may be exposed to large numbers of chemicals simultaneously since several agencies, as well as numerous private individuals, are likely to be using a variety of chemicals within a relatively small area, each for different purposes. This has two consequences: First, it becomes nearly impossible to isolate and link a single chemical exposure to any one illness or condition. Second, the harmful health effects of the chemicals may actually increase; how the combining of chemicals, whether in the air or water or in our bodies, changes their impact is still largely unknown due to a lack of research. This impact is rarely considered during pesticide application.
Organic Pest Management Agreement¹ for Our Neighborhood’s Community Parks

Spring 2020

Section 1: Statement of Intent

Whereas, according to the Environmental Protection Agency (EPA), “all pesticides are toxic to some degree, ... and the commonplace, widespread use of pesticides is both a major environmental problem and a public health issue”²; and

Whereas, according to the EPA Office of Inspector General (OIG), sewage sludge contains “toxic pollutants and disease-causing organisms” and the “EPA cannot assure the public that current land application practices [of sewage sludge] are protective of human health and the environment”³; and

Whereas Our Neighborhood’s Community Parks—by virtue of adjacent schools, after-school programs, and daycare centers—fall under the provisions of the Protecting Children and Families from Harmful Pesticides Act, which aims to (1) prevent unnecessary exposure of children to chemical pesticides, (2) promote safer alternatives, (3) ensure clear and accurate notification on pesticide use to prevent endangering children, and (4) promote the use of IPM techniques to reduce reliance on chemical pesticides⁴;

The Green Neighborhood Committee (GNC), and the community it represents, maintains that all citizens, particularly children, have a right to protection from exposure to hazardous chemicals and that it is in the best interest of public health to eliminate the use of toxic pesticides and sewage sludge on publicly owned land.
Section 2: Statement of Action

The City Parks Department (CPD), the State Parks Department (SPD), and the County Department of Mosquito Control (CDMC) agree with GNC and the community it represents to adopt an Organic Pest Management (OPM)/Low-Input Landscape Maintenance (LILM) Policy on Our Neighborhood’s Community Parks. This OPM/LILM Policy states the following:

- The use of toxic chemical pesticides and sewage sludge (both Class A and Class B) shall be prohibited;
- Organic turf and landscape cultural practices and other non-pesticide low-input maintenance practices shall be the method of choice;
- All control products used under the terms of this agreement shall be in keeping with those products on the approved list of the Northeast Organic Farming Association (NOFA/Mass);
- All employees who work with turf grass and the landscape shall receive education and training in organic turf and landscape management;
- A list of all pesticides currently stored on the maintenance sites of CPD, SPD, and CDMC, and previously designated for Our Neighborhood’s Community Parks, shall be compiled, and the products on that list properly disposed of through hazardous-waste collection programs;
- An “Our Neighborhood’s Community Parks OPM Advisory and Oversight Committee” shall be activated within one month of the signing of this agreement. The committee shall be made up of one representative from the City Public Health Commission (CPHC) and one from GNC, one grounds maintenance supervisor representing the three agencies—CPD, SPD, and CDMC—implementing this agreement, and an agronomist/horticulturist who is an expert in OPM turf and landscape management.

Section 3: Emergency Waivers

If an emergency warrants the use of pesticides not permitted under the above restrictions, the OPM Advisory and Oversight Committee shall have the authority to grant a temporary waiver for a 30-day period based on the following criteria:

- The pest situation poses a threat to human health and/or environmental quality.
- Viable alternatives consistent with the OPM/LILM policy do not exist.

Any waiver granting pesticide application(s) shall require the use of an integrated pest management (IPM) protocol. IPM involves the coordinated use of physical, biological, and cultural controls that reduce the food, water, harborage, and access used by pests. It focuses on prevention of the pest problem, thus minimizing the need for chemical treatments that may not address the cause of pest infestation.
At a minimum, the treatment must
• be the least hazardous to human health;
• be the least disruptive to natural controls present in the environment;
• cause the least negative impact possible on non-target organisms.

1. Sections of this agreement have been adapted from the Town of Marblehead Board of Health's "Organic Pesticide Management Policy for Turf and Landscape," 3 May 2001.

Some Definitions

**Pesticides**, herein, are defined as herbicides, fungicides, insecticides, miticides, larvicides, and rodenticides; and includes any pesticides classified as known, likely, or possible human carcinogens or endocrine disruptors, as well as those pesticides that meet the criteria for Toxicity Category I or II, as defined by the EPA. A list of the pesticides in the EPA's toxicity categories I and II shall be periodically updated at the maintenance sites of **Our Neighborhood's Community Parks**.

**Sewage sludge**, herein, is defined as the byproduct of human, commercial, industrial, hospital, and household waste that is marketed as fertilizer. Class A sludge has been heated to kill 98 percent of live pathogens, while Class B sludge is raw.

Among other provisions, the **Protecting Children and Families from Harmful Pesticides Act** indicates that an area "often used for school sponsored or managed activities, regardless of who maintains the property," must conform to the stipulations under the Act. Thus, **CPD, SPD, and CDMC**, as the entities responsible for maintaining **Our Neighborhood's Community Parks**, must comply with all of the Act's applicable provisions.

**Organic Pest Management (OPM)**, herein, is defined as a problem-solving strategy that prioritizes a natural, organic approach to turf grass and landscape management without the use of toxic
pesticides. It mandates the use of natural, organic cultural practices that promote healthy soil and plant life as a preventative measure against the onset of turf and landscape pest problems. Essential OPM practices include regular soil testing, soil amendments, selection of plants for hardiness, and the use of physical and biological controls. The Ecological Landscape Association and NOFA/Mass generally recommend applying OPM practices on heavily trafficked areas, such as ball fields and parks in densely populated urban environments.

**Low-Input Landscape Maintenance (LILM)** is an approach suitable for low-budget maintenance and less frequently trafficked areas, such as urban wilds, and fields and lawns not in heavy use. It is defined, herein, as embracing strategies and practices designed to eliminate the use of pesticides and other toxic chemicals and to reduce the use of other lawn care products, water, and the time and labor often required in maintaining a healthy landscape. The approach leads to sustainability, requiring few material inputs while having a positive impact on the environment. LILM methods include seeding and reseeding with grasses that require less water and fewer nutrients, mowing at three or more inches only, and leaving grass clippings on the lawn during the lawn’s natural growing cycle.

**Signed:**

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<tr>
<th>For the City Parks Department</th>
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<td>For the State Parks Department</td>
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<td>For the County Department of Mosquito Control</td>
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<td>For the City Public Health Commission</td>
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<td>For the Green Neighborhood Committee</td>
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*Photo on opposite page by Enna Grazier*
Introduction


2. Interviewee’s name has been changed. Interview conducted July 2006 by Margaret Connors.


5. In 2000, the Massachusetts Legislature passed An Act Protecting Children and Families from Harmful Pesticides, thus banning in all public and private schools, day care centers, and school-age child care programs the use of any pesticide known or likely to be linked to cancer. While this bill is significant in that it acknowledges some of the health risks that pesticides pose, it fails to address their use on public properties that are not school-based, such as parks and other outdoor areas.


7. See http://www.npacboston.org for details on West Nile virus risks. As for EEE, human cases occur relatively infrequently, largely because the primary transmission cycle takes place in and around swampy areas where human populations tend to be limited. There is an average of 5 cases per year, with a range from 0 to 15 cases across the U.S. There has been a total of approximately 220 confirmed cases in the U.S. from 1964 to 2004, http://www.cdc.gov.


9. In 2003, the European Union banned the sale of 300 chemicals that are used as active ingredients in pesticides.

10. An example of the Federal government’s reluctance to act on evidence of harm resulted in an unprecedented action: Thousands of scientists and other specialists publicly objected to imminent U.S. Environmental Protection Agency approval of a score of powerful, controversial pesticides. The scientists cited “compelling evidence” that EPA leadership is choosing to ignore that these “pesticides damage the developing nervous systems of fetuses, infants and children.” In a letter dated 24 May 2006, leaders of three unions (American Federation of Government Employees, National Treasury Employees Union, and Engineers and Scientists of California) representing these 9,000-plus individuals asked EPA Administrator Stephen Johnson to either adopt maximum exposure protections for these agents or take them off the market. (The EPA issued preliminary approval for the agents—20 organophosphate and carbamate pesticides—in September 2006.) “EPA Scientists Protest Pending Pesticide Approvals,” The Collaborative on Health and the Environment (25 May 2006), http://www.healthandenvironment.org/articles/homepage/589 (accessed October 2006).


13. The hazards that are included are industrial facilities, power plants, incinerators, trash transfer stations, landfills, and hazardous waste sites.


16. In 2007, when this subject was being researched for this report, the Federal poverty level was $20,000 in annual income for a family of four, adjusted by $3,500 for each additional or fewer persons.


19. A brochure authored by Boston Public Health Commission and NPAC for city residents that addresses alternatives to outdoor pesticide use was distributed in the communities of Roxbury and Jamaica Plain during the spring and summer of 2007.


22. 2,4-D’s rate of breakdown in soil is 80 parts per million (ppm) on day zero, 45 ppm at 14 days, and 6 ppm at 56 days. Associate Committee on Scientific Criteria for Environmental Quality, National Research Council Canada, Phenoxy Herbicides—Their Effects on Environmental Quality (Ottawa, Ont.: National Research Council Canada, 1978).

23. Pesticides are less likely to leach when their soil half-life is less than three weeks.


26. Landrigan et al.

27. By "exposure" we mean coming into contact with a pesticide chemical residue in an acute, chronic, or incidental way. Exposure typically occurs through contact with the skin or the lungs, or with mucous membranes, primarily of the mouth or nose.

28. The City of Boston’s Parks Department has also halted the use of all pesticides for a three-year period in Jamaica Plain, as part of a pilot agreement with NPAC. Prior to entering this agreement, the city had not been using pesticides for a period of years due to major budget cuts. We have, therefore, not included the Parks Department in this report.

What Is Environmental Justice?

29. The Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) defines environmental burden as hazards from wastewater, air, or solid waste that exceed state safety thresholds and that, when measuring for ground or water pollution, are located within one mile of an EJ community and, when measuring for air pollution, are located within five miles of that community. According to Tony Chavez, a former Director of the state’s Environmental Justice Office, there is no provision for applying the policy to other types of environmental hazards such as liquefied natural gas facilities or biolabs, because there currently exist no thresholds to measure the impact of such facilities on communities.

30. Executive Office of Energy and Environmental Affairs (EOEEA) (at the time of initial publication known as the Executive Office of Environmental Affairs [EOEAI]), Environmental Justice Policy, Article 97 (Boston, Mass.: EOEEA, October 2002).

31. In 2007, when this subject was being researched for this report, to be considered low income in Massachusetts, a family of four had to earn less than $26,990 a year, increasing or decreasing that figure by $3,500 for each additional or fewer household member. If this figure had been adjusted for the true cost of housing/living in Boston, a family of four would have been allowed to earn as much as $46,665 or less to be considered low income, given that the median family income for Metro Boston was $84,100.
How the Southwest Corridor Park Community Qualifies as a Case for Environmental Injustice

32. BPHC and MIT, The Boston Industrial Archeology Project.


34. Faber and Krieg, Unequal Exposure to Ecological Hazards 2005.

35. This is the population based on Boston Redevelopment Authority (BRA) data—which is based on census tract information—and includes four communities that the U.S. postal code defines as Mission Hill (a part of Roxbury). Census tract 1203 has been added for the purposes of this report since this community considers itself part of Jamaica Plain. The Boston Public Health Commission (BPHC) data on health indicators includes census tract 1203 within Jamaica Plain but does not include census tract 808–811 (Mission Hill/Roxbury). This accounts for the difference of 10,000 people in the two agencies’ population estimates (the BRA’s estimate is 38,000, while the BPHC’s is 28,000).

36. Both communities have median incomes at or below 65 percent of the state median income level of $41,524, with 21 percent of Jamaica Plain’s residents and 23 percent of the SWCP community’s residents being of low income. Both are also communities where more than 25 percent of their residents are minority. Jamaica Plain as a whole is comprised of 50 percent minority and the SWCP community of 60 percent minority residents.

37. These are census tract 812, block 3 of census tract 813 (the Jamaica Plain area of 813), and census tract 1205. The three areas have minority populations of 91.4, 92, and 81 percent and poverty rates of 42, 35, and 17 percent respectively.

38. In Massachusetts, 14.6 percent of children have been diagnosed with the illness as compared to a national average of 12.4 percent. Asthma Regional Council, the Medical Foundation, National Survey of Children’s Health and the Burden of Asthma in New England (Boston, Mass.: Asthma Regional Council, March 2006).


41. D. Faber, “Summary of Findings: Unequal Exposure to Ecological Hazards: Roxbury, Dorchester, Mattapan, Milton, and Roslindale” (supplemental data provided by D. Faber to Margaret Connors, March 2006); BPHC, The Health of Boston 2004. The Health of Boston 2006 report also confirms Jamaica Plain as having the fifth highest rate in the city based on 2004 data.


43. Laurie Stillman, Executive Director of New England Regional Council, telephone conversation and e-mail correspondence with Margaret Connors, 6 April 2006; Massachusetts Department of Education and Care, http://www.eec.state.ma.us (accessed 1 March 2006).

44. Faber and Krieg, Unequal Exposure to Ecological Hazards 2005, vi.

45. These most hazardous sites, which are referred to as Tier A-D and Tier 2 by the Department of Environmental Protection (DEP) Bureau of Waste Site Cleanup, receive expedited clean up. DEP, “Cleanup of Sites and Spills.”

46. West Roxbury ranks 33rd, with 32 hazard points per square mile within its 5.5 square miles. Its household median income is $53,607, and 14.48 percent are minority. It has two TURA facilities, which release 184,669 pounds of chemical pollution annually, and 94 waste sites, 13 of which are tiered (17.18 sites per square mile).

47. DEP, “Cleanup of Sites and Spills.”


49. BPHC and MIT, The Boston Industrial Archeology Project.

50. Ibid.


52. Pesticide poisoning often presents with the same symptoms as other conditions, as a 2002 New York State report on pesticides shows: “A study conducted by University of Texas pediatricians dramatically demonstrated this fact. Looking at 20 children referred to them by other hospitals, and who they properly diagnosed as victims of pesticide poisoning, they found that 16 of the 20 had been misdiagnosed before the referral. Initial diagnoses included pneumonia, bronchitis, diabetes, brain aneurysm, and head trauma. In each of those cases, the symptoms were actually caused by exposure to organophosphate or carbamate pesticides.” Both of these types of pesticides are among those frequently selected for use by city dwellers, according to this report. Spitzer, Pest Control in Public Housing, Schools and Parks.

53. There are 94 registered daycare centers in Jamaica Plain caring for an estimated 1,675 children under the age of five. Seventy-seven of these (1,249 children) are in the SWCP community. Massachusetts Department of Education and Care, Providers by EEC Region, http://www.eec.state.ma.us (accessed 1 March 2006).
54. Urban environmental density differs from population density in that the latter is population divided by total land area, whereas the former is population divided by total land area minus both first-floor building area (commercial and residential) and park area, essentially leaving out private land not occupied by buildings (e.g., backyards). For population density, one square mile is our unit of measurement (the number of people per square mile of land). To measure population density of the SWCP community, we used census tracts 812, 813 (block 3 only), 1202, 1203, 1204 (minus block 5), 1205, and 1206. To measure population density of the entire Jamaica Plain neighborhood, we used all of the above plus block 5 (of census tract 1204) and census tracts 1207, 1201.03, and 1201.02. We did not include Mission Hill, as the BRA does not consider this neighborhood to be part of Jamaica Plain. For comparison, we measured population density of the most densely populated sections of West Roxbury, using census tracts 1302 and 1303. We removed parks and open space from all our calculations to better represent the communities’ access to private land over which they have ownership or relatively more control.

**Differential Risks for Children**

55. The National Academy of Sciences, *Children’s Health, the Nation’s Wealth: Assessing and Improving Child Health*, 2004, http://www.iom.edu/CMS/12552/21082.aspx. It is not just kids who are sick that end up as sick adults. Chemical exposures that may not have caused symptoms in childhood can affect adult health. For example, childhood exposure to chemicals that act as endocrine disruptors (such as those used for mosquito control in Suffolk County, where the SWCP community is located) have the potential to affect reproductive health in adulthood.

56. Ibid.

57. In addition, since children consume more food and water in proportion to body size as compared to adults, they ingest greater amounts of pesticide residue and water pollutants.


59. Spitzer.

60. Solomon et al., *Pesticides and Human Health*.

61. The National Academy of Sciences.


64. Landrigan et al., 431.


**The Precautionary Principle: One Antidote to Inadequate Policies and Practices**

67. In outdoor settings, a pest can be any species of animal or plant that causes a nuisance by damaging landscapes or gardens or by carrying disease. In addition to the more commonly recognized pests, such as certain insects, they can include mildew, molds, bacteria, and viruses as well. We define a pesticide as any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest. These include insecticides, herbicides, fungicides, rodenticides, and various other substances. Pesticides are used to control a multitude of pests that pose a variety of problems. They are used in agricultural settings to prevent insects and rodents from eating crops and weeds from invading fields. Homeowners, businesses, and governments use pesticides to maintain the desired aesthetics of lawns, gardens, and other open spaces.

68. This is the case with spot treatment using the herbicide Roundup: often, postings are not done because the herbicide is not broadcast applied; instead, the product is sprayed on weeds and weed beds directly. The state law Section 13 of 333 CMR Notification states: “The applicator shall post sign(s) on treated properties as provided for in 333 CMR 13.07. The signs should remain posted for 72 hours unless otherwise recommended by the Department of Food and Agriculture.” Massachusetts Pesticide Bureau, “Pesticide Board Standards for Application” (Boston, Mass: Massachusetts Pesticide Bureau), http://www.mass.gov/agr/legal/regs/pesticides_33313_std_application.pdf (accessed February 2006).

69. For example, 2,4-D takes anywhere from 20 to 200 days to breakdown to half its potency.
Pesticides Applied in Jamaica Plain

The term “structural violence” has been used in discussing the ways in which poor women are at greater risk for becoming infected with HIV. Their sickness may be thought of as a result of structural violence because “it is neither nature nor individual will that is at fault but rather the processes and forces that conspire to constrain individual agency.” See Paul Farmer, Margaret Connors, and Janie Simmons, eds., Women, Poverty and AIDS: Sex, Drugs and Structural Violence (Monroe, Maine.: Common Courage Press, 1996), 23.

Appendix A

Appendix A

Recommendations

76. This is an example of a public health response that is proportional to the threat. Education about the real risks of contracting these illnesses, which is actually low, is essential. It is currently quite labor intensive for a community to uncover the agencies and individual businesses that are using pesticides. In Massachusetts, many are required by the state to file vegetation-management plans, but these are often inaccessible to the public unless requests for them are made to the agency itself. Communities trying to learn what pesticides are applied in their neighborhoods—other than those used for agricultural or residential purposes—should consider the following sources: town, city, and state parks and recreation departments; local and intra-city transportation systems; county mosquito-control agencies; state highway departments; and state public works departments.

77. Residents should start by protecting themselves and their homes from mosquitoes. Communities can take additional measures, such as elimination of breeding sites, carefully targeted use of less-toxic larvicides, and introduction of natural mosquito predators into the environment where appropriate.


84. Spreacher Institute for Comparative Cancer Research, Pesticides and Breast Cancer Risk and the Evaluation of 2,4-D (March 1998).

85. Extension Toxicology Network, Cornell University, Pesticide Information Profiles Imidacloprid (June 1996).


The composition of sludge changes as often as materials are flushed into the system. On any given day, according to Cornell University and the American Society of Civil Engineers, polychlorinated biphenyls (PCBs); chlorinated pesticides such as DDT, aldrin, endrin, chlordane, and 2,4-D; heavy metals from wood preservatives, pesticides, metal plating, and batteries; bacteria; viruses; protozoa, such as amoeba, and parasitic worms. For more information, visit http://www.riles.org (the ReSource Institute for Low Entropy Systems). RILES is an independent, nonprofit organization that works in partnership with communities in English- and Spanish- speaking countries to protect public health and the environment. The organization supports non-depleting, non-wasting, non-polluting methods and technologies for sustainable development.

Correspondence with Laura Orlando, Executive Director of RILES and Adjunct Assistant Professor in the Department of Environmental Health at Boston University School of Public Health.


Beginning of the text:

West Nile virus (WNv) is a mosquito-borne virus that was first identified in New York City during the summer of 1999. That year, 62 people out of a population of over seven million—or less than .0009%—became ill with the virus; 7 of them died. By comparison, 2,600 people died of the flu in New York City during the same year. If WNv-infected mosquitoes are in your area (only 1 in 1,000 mosquitoes carries WNv where it is present), you have, on average, a 1 in 300,000 chance of getting sick. Most people with WNv don’t know it; others experience flu-like symptoms. Less than one percent of those who get infected are at risk for serious illness or death, the greatest risk being for the elderly. Linda Hillyer, NPAC, Boston’s Response to West Nile Virus, September 2002, http://www.npacboston.org.

End of the text.
128. Ibid.


130. Ibid.

131. Ibid.

132. Ibid.

133. Grandjean, Harari et al., e546–e556.

134. Ibid.


144. Ibid.


147. Solomon et al., *Pesticides and Human Health*; V. Gary et al., "Birth Defects, Seasons of Conception and Sex of Children Born to Pesticide Applicators Living in the Red River Valley of Minnesota, USA," *Environmental Health Perspectives* 110, supplement 3 (June 2002): 441–49.


Appendix C

150. Pesticides are less likely to leach when their soil half-life is less than three weeks.


156. Admundson and Wolf.
157. Ibid.

Because of groundwater contamination, city residents are at risk when they fish in the Neponset River or harvest Bay smelts in the shallow waters of the Boston Harbor. “Many herbicides designed to be applied to pre-emergent plants become inactive once they reach the soil surface. Soil-applied herbicides, however, must be soluble in water to move into the root zones of target weeds. Some move deeply into the ground to kill deep-rooted perennials. Others don’t move as deeply into the ground; instead, they kill shallow-rooted weeds and spare deeper-rooted crops.” Ibid.


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