RISKS FROM LAWN-CARE PESTICIDES

Including Inadequate Packaging and Labeling

ENVIRONMENT & HUMAN HEALTH, INC.

Risks From Lawn-Care Pesticides

Including Inadequate Packaging and Labeling

Research and publication of this report was made possible by the Beldon Fund, the Tortuga Foundation, the Dome Foundation, and the Alida R. Messinger Charitable Lead Trust, No. 2.

Environment & Human Health, Inc.
1191 Ridge Road • North Haven, CT 06473
Phone: (203) 248-6582 • Fax: (203) 288-7571
www.ehhi.org

Environment and Human Health, Inc.

Mission Statement

Environment and Human Health, Inc., founded in 1997, is a nonprofit organization made up of doctors, public health professionals and policy experts dedicated to the purpose of protecting public health from environmental harms through research, education and the promotion of sound public policy. We are committed to improving public health and to the reduction of environmental health risks to individuals.

Our mission is:

1. To conduct research to identify environmental harms affecting human populations.

2. To promote public education concerning the relationships between the environment and human health.

3. To promote effective communication of environmental health risks to those exposed and to responsible public and private officials, thereby empowering individuals and groups to take control over the quality of their environment and be more protective of themselves and their families.

4. To promote policies in all sectors that ensure the protection of human and environmental health with fairness and timeliness.

Environment and Human Health, Inc. has put human health at the center of its environmental agenda.

Risks From Lawn-Care Pesticides

Including Inadequate Packaging and Labeling

John Wargo, Ph.D.
Yale University

Nancy Alderman, MES
President, Environment and Human Health, Inc.

Linda Wargo, MES

This project was developed and managed by Environment and Human Health, Inc.

Editing and Graphic Design by
Jane Bradley, MALS, Medical/Science Writer

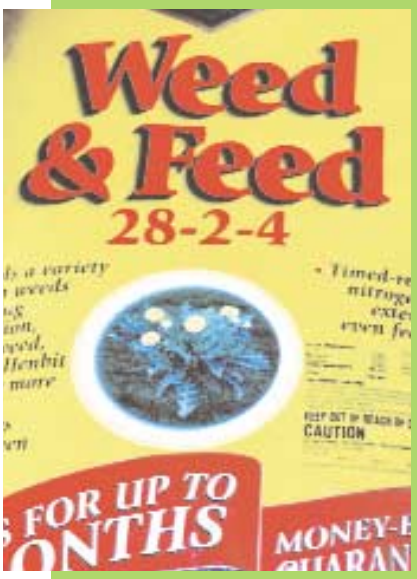
Additional editing by
Susan Addiss, MPH, MUrS

Research Assistance and Pesticide Bag Photography by
Lauren Carlton Hartzell
Connecticut College Goodwin/Niering Environmental Summer Intern Program

Table of Contents

Summary of Findings

"Homeowners use up to 10 times more chemical pesticides per acre on their lawns than farmers use on crops."[4]
— U.S. Fish and Wildlife Service



Pesticide Use

- EPA permits over 200 different pesticides to be used for lawn care, and these are often mixed together and sold as chemical combinations.
- Approximately 35 pesticides are used in over 90 percent of lawn treatments.[1]
- Nearly 80 million pounds of pesticide active ingredients are used on U.S. lawns annually.[2]
- Lawns cover 30 million acres of the U.S. and the industry that has evolved to take care of lawns is now a multibillion-dollar business.[3]
- The U.S. Fish and Wildlife Service reported that "homeowners use up to 10 times more chemical pesticides per acre on their lawns than farmers use on crops."[4] Homeowners applying their own pesticides may be directly exposed to the chemicals through inhalation, dermal (skin) exposure, and/or ingestion.
- Statistics on the amount of lawn-care chemicals used in Connecticut are not available. Environment & Human Health, Inc. found in an earlier study that among homeowners interviewed, 72 percent used pesticides on their lawns and/or trees.[5]

Pesticide Health Effects

- Pesticides are intentionally toxic substances. Some chemicals commonly used on lawns and gardens have been associated with birth defects, mutations, adverse reproductive effects, and cancer in laboratory animals.
- Children, infants, and fetuses may be especially vulnerable to the health effects of pesticides before the age of five, when their cells are normally reproducing most rapidly.

- Children may be more susceptible to loss of brain function if exposed to neurotoxins, and may be more susceptible to damage to their reproductive systems.[6]

- Lawn-care pesticides are not tested for their chronic health effects, unless they are also licensed for food uses.[7] The third most heavily used herbicide in the U. S., MCPP, has not been fully tested for chronic health effects since it is not allowed for use on foods. MCPP is commonly found in weed and feed products.

- EPA has tested only nine of 750 registered pesticides for their effects on the developing nervous system; six of the nine tested were more harmful to young animals than adults.[8]

- Pesticides are composed of active ingredients and inert ingredients. Some inert ingredients may be more toxic than active ingredients and can comprise 90 to 95 percent of the product. Some inert ingredients are suspected carcinogens, while others have been linked to central nervous system disorders, liver and kidney damage, birth defects, and some short-term health effects.[9]

- Increased odds of childhood leukemia, brain cancer and soft tissue sarcoma have been associated with children living in households where pesticides are used.[10] Other childhood malignancies associated with pesticide exposures include neuroblastoma, Wilms' tumor, Ewing's sarcoma, non-Hodgkin's lymphoma, and cancers of the brain, colorectum, and testes.[11]

- Nearly 100,000 accidental pesticide exposures are reported to poison control centers each year. Many of these exposures involve children, providing clear evidence that current efforts to protect children by manufacturers and others are inadequate.

- By-products of the insecticide chlorpyrifos were found in 93 percent of urine samples taken from children ages three to 13.[12] In a separate study, 99 percent of 110 Seattle area children ages two to five had detectable levels of organophosphate residues in their urine.[13]

Increased odds of childhood leukemia, brain cancer and soft tissue sarcoma have been associated with children living in households where pesticides are used.[10]

96 percent of all fish analyzed in major rivers and streams contained residues of one or more pesticides at detectable levels. —*United States Geological Survey*

Ecological Effects

- Nearly 30 million acres of lawn are routinely treated with lawn-care chemicals. Some of these treated lawns may be toxic to birds. Recent Canadian studies found that between three and 14 bird deaths may occur due to pesticides per acre of farmland. It only takes one granule of diazinon to kill a bird.[14] Recent testing of dead birds for the West Nile virus by the State of New York found that birds had commonly died from pesticide poisoning. Lawn-care pesticides were found to be among the most common causes of death among the birds tested.[15]

- The U.S. Geological Survey found that 96 percent of all fish analyzed in major rivers and streams contained residues of one or more pesticides at detectable levels.[16]

- Pesticides have been identified as a potential cause of amphibian declines and deformities and have been implicated as one of the reasons that wild and managed pollinators are disappearing at alarming rates.[17]

Pesticides in Water

- Most lawn-care chemicals have the potential to contaminate underlying groundwater. The top five selling lawn-care pesticides, 2,4-D, glyphosate, MCPP, dicamba, and diazinon, are all listed by the State of California as having the potential to contaminate groundwater based on their physical and chemical characteristics.[18]

- Studies of major rivers and streams have documented that 100 percent of all surface water samples contained one or more pesticides at detectable levels.[19]

- While pesticides are heavily used in Connecticut, neither groundwater nor surface water monitoring is routinely conducted by the State of Connecticut to detect contamination.

- Homeowners may unknowingly contaminate their own well water by using pesticides on their lawns. Factors that influence a pesticide's potential to contaminate water include physio-chemical factors, environmental factors, application methods and other practices associated with the pesticide use.

- Only two of the top five lawn-care pesticides, 2,4-D and glyphosate, are regulated under the Safe Drinking Water Act, despite governmental acknowledgement of the intensity of effects of their release on the environment, and their potential to leach into groundwater supplies.

- Pesticides—especially herbicides—have contaminated drinking water throughout the country. Removing pesticides from contaminated water supplies is difficult, expensive, and not always successful. A California study found that among 600 water suppliers that have detected pesticides in their water sources, only 40 use treatment facilities that effectively reduce concentrations of pesticides.[20] Another expert estimated that it cost an average of $3,000 per well to rid it of pesticide contamination using filtration.[21]

Pesticide Packaging, Labeling and Sales

- EHHI surveyed 18 stores in Connecticut and found that most stores displayed pesticide packages with visible tears or rips. Their contents had visibly contaminated store shelves, floors, and storage areas.

- The packaging of many lawn-care chemicals is porous, releasing vapors from the chemicals into nearby air. These vapors are easily detected by sense of smell, and often contaminate indoor air where sold.

- The risks of long-term health effects, such as cancer and neurotoxicity, are not reported on product labels. Only summaries of acute toxicity are required on labels.

- Pesticide labels do not provide the consumer with sufficient warning and instruction regarding the toxicity of contents, pesticide potential to contaminate water supplies, effects on fish and wildlife, and proper handling and disposal.

- Pesticide labels claim product benefits in multicolored letters often several inches high. Warning information, directions for safe use and disposal are commonly displayed in minute type on the backs of 25-pound packages.

EHHI surveyed 18 stores in Connecticut and found that most stores displayed pesticide packages with visible tears or rips.

Some pesticides commonly used on lawns and gardens in Connecticut…have been banned or restricted in other countries because of concerns about health effects. Many Canadian municipalities have banned or severely restricted the use of lawn-care pesticides.

- Some lawn and garden packages require you to remove a plastic wrapping to access multi-paged warnings about product ingredients, often printed in minute type.

- Pesticides are commonly sold in stores that also sell food and other consumer products.

Pesticide Regulations

- Current laws and regulations do not demand safe and effective pesticide packaging that ensures proper containment of the product throughout the process of shipping, storage, sale, and disposal.

- The Connecticut Commissioner of Environmental Protection holds the exclusive authority to regulate "pesticide spraying" on private lands in the state, depriving local governments of the right to restrict pesticide use on private property.[22]

- Local governments do have the legal authority to limit the use of pesticides on public lands, such as parks, highway rights-of-way, schools and other grounds.

- Some pesticides commonly used on lawns and gardens in Connecticut, including 2,4-D, MCPP, dicamba, and diazinon, have been banned or restricted in other countries because of concerns about health effects.

- A number of cities in North America have restricted pesticide use on public lands or limited the uses and types of pesticides.

- Many Canadian municipalities have banned or severely restricted the use of lawn-care pesticides. The Province of Quebec recently set "the highest standards in North America to decrease exposure to pesticides"[23] when it prohibited some commonly used lawn care pesticides (including 2,4-D and MCPP) from use on public lawns. These pesticides will be prohibited from use on private and commercial lawns in 2006.[24]

2.

Health Effects of Lawn-Care Pesticides

HEALTH EFFECTS OF THE MOST COMMONLY USED LAWN AND GARDEN PESTICIDES

- Over 90 percent of lawn treatments comprise 35 active ingredients and about 220 chemicals have home lawn uses.[25]

- The table below shows the 10 most commonly used conventional pesticide active ingredients in the home and garden market. Six of the top 10 pesticide active ingredients in the home and garden sector are herbicides and four are insecticides. The rankings are based on the estimated amount of conventional pesticides used in the non-agricultural sector taken from proprietary EPA databases.

- Five of the most popular pesticides in the U.S. home and garden sales market (2,4-D, glyphosate, MCPP, dicamba, and diazinon) have been associated with non-Hodgkin's lymphoma (NHL) in epidemiological studies, as shown in the chart on the following page. Non-Hodgkin's lymphoma is the sixth most common malignancy in America, with nearly 54,000 cases estimated to have occurred in 2002. Between 1973 and 1997, the incidence increased by 80 percent.[26] According to scientists at the National Cancer Institute, "Since the use of pesticides, particularly phenoxy herbicides, has increased dramatically preceding and during the time period in which the incidence of NHL has increased, they could have contributed to the rising incidence of NHL."[27]

- Four of the five top-selling pesticides have also been associated with birth and/or reproductive effects, and at least three of these pesticides can cause nervous system damage at high doses. All five of these pesticides are sold in Connecticut and three, 2,4-D, dicamba, and MCPP, are the most common pesticides found in popular "weed and feed" products.

MOST COMMONLY USED CONVENTIONAL PESTICIDE ACTIVE INGREDIENTS

Home and Garden Market Sector, 1999

(Ranked by Range in Millions of Pounds of Active Ingredient)

Active Ingredient	*Type*	*Rank*	*Range*
2,4-D	H	1	7-9
Glyphosate	H	2	5-8
MCPP	H	3	3-5
Dicamba	H	4	3-5
Diazinon	I	5	2-4
Chlorpyrifos	I	6	2-4
Carbaryl	I	7	2-4
Benefin	H	8	1-3
Malathion	I	9	1-3
DCPA	H	10	1-3

Note: H indicates herbicide and I, insecticide.
Based on EPA proprietary data.
Source: USEPA. 1998-1999 Pesticide Market Estimates. Available at http://www.epa.gov/oppbead1/pestsales/99pestsales/usage1999_3.html#table3_7a

Health Risks of Most Commonly Used Conventional Pesticide Active Ingredients

Active Ingredient	EPA Cancer Classification [28]	IARC Classification	Other Cancer Studies	Birth Defects/ Reproductive Effects	Neurological Effects	Other Risks
2,4-D	Unclassifiable, ambiguous data	2B, Possible	Higher incidence of NHL in people exposed to 2,4-D.[29 30 31 32]	May cause birth defects at high doses[33] and reproductive effects at moderate doses in animals.[34]	Neurotoxin.[35] Skin exposure may affect the nervous system.[36]	Direct contact may cause irreversible eye damage.[37] Long-term exposure may damage kidneys and liver.[38 39]
Glyphosate	Not likely	Not listed	Associations found between glyphosate exposure and NHL.[40]	Industry-sponsored tests showed no birth/reproductive effects.[41]	Industry-sponsored tests showed no neurotoxic effects.[42]	Inert ingredients in glyphosate formulations may be more toxic than glyphosate.
MCPP	Not listed	2B, Possible	Associated with cancer of soft tissues and NHL in people employed in the manufacture of MCPP.[43]	Causes birth defects in rats at moderate to high doses.[44]	Data not available.[45]	Mutagenic at high doses.[46]
Dicamba	Unclassifiable, inadequate data	Not listed	Study of men found risk of NHL statistically significantly increased.[47]	Suspected of causing birth defects in humans.[48]	Neurotoxic in animals.[49]	May cause severe and permanent damage to the eyes.[50] A manufacturing contaminant is linked to adverse health effects.[51]
Diazinon	Not likely	Not listed	Parental use associated with increased risk of brain cancer in children;[52] associated with an increased risk of NHL in men.[53 54]	Birth/reproductive effects in animals and birds.[55 56]	Neurotoxic.[57]	May be mutagenic.[58]

Weed and Feed Pesticides Commonly Contain 2,4-D, Dicamba, MCPP

2,4-D

- 2,4-D is the most commonly used herbicide in the world[59] and the most widely used pesticide by homeowners and lawn-care professionals in the U.S. American homeowners applied between seven and nine million pounds of 2,4-D on their lawns and gardens in 1997–1999.[60]

- EPA has concluded that 2,4-D is "not classifiable as to human carcinogenicity."[61] Several studies, however, have found a statistically higher incidence of non-Hodgkin's lymphoma in people exposed to 2,4-D.[62 63 64 65]

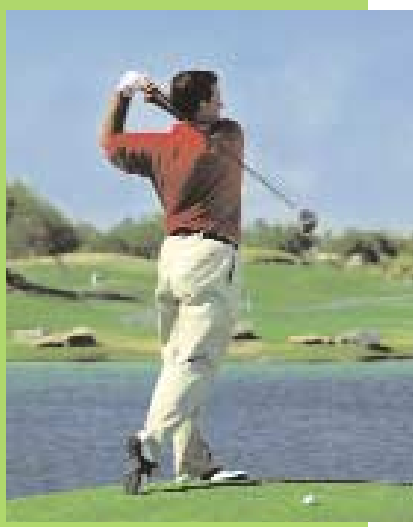
- A scientific review of the data on 2,4-D has concluded that 2,4-D may cause birth defects at high doses and that humans may be at risk for birth and reproductive effects though no direct evidence in humans exists.[66 67 68]

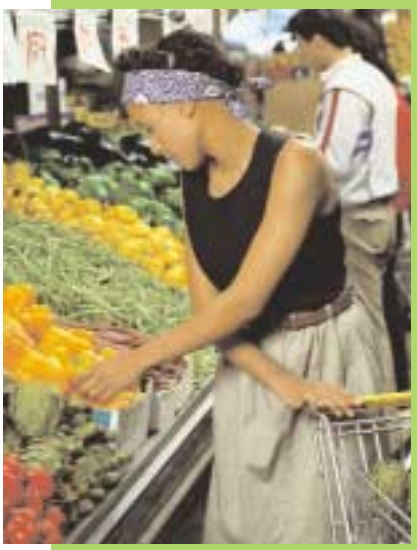
- In the mid-1990s, studies of Minnesota farming regions found a higher rate of birth defects among children of crop workers who conceived the children during the months when 2,4-D was sprayed. Areas with high 2,4-D and MCPA use had higher incidence of birth defects compared with regions that had low use of 2,4-D and MCPA.[69]

- Due to uncertainty about 2,4-D's reproductive and developmental effects, the U.S. Forest Service advises that "female workers should not be employed in back-pack or hack-and-squirt applications of 2,4-D."[70]

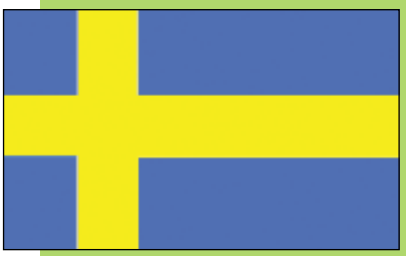
- Short-term exposure to 2,4-D at levels above the maximum contaminant level (MCL) for short periods of time has been linked to nervous system damage,[71] while long-term exposure can cause damage to the nervous system, kidneys and liver.[72] Skin exposure may affect the nervous system and direct contact to the eyes may cause irreversible eye damage.[73] Liver disease has been reported in several golfers who licked their golf balls while playing golf on 2,4-D treated golf courses.[74 75]

Several studies... have found a statistically higher incidence of non-Hodgkin's lymphoma in people exposed to 2,4-D. [62 63 64 65]





Three countries have banned 2,4-D and at least three have severely restricted its use.



- Residues of 2,4-D have been found on fruits, vegetables, and wheat.[76]

- Studies have detected 2,4-D inside homes following outdoor application. Studies have found that 2,4-D can be tracked from lawns into homes, leaving residues of the herbicide in carpets, on surfaces, and in indoor air.[77 78] A simulation study calculated that it would be expected to persist in carpet dust up to one year after a lawn application.[79]

- Three countries have banned 2,4-D and at least three have severely restricted its use. Kuwait banned 2,4-D for environmental reasons[80] and Norway banned it because of concerns about health effects, especially cancer.[81] It is severely restricted in Denmark[82] due to concerns about groundwater pollution[83] and it was voluntarily withdrawn in Sweden because of concerns about health effects.[84] Belize restricted the use of 2,4-D to use on pastures due to hazards to livestock, crops, and the environment from drift[85] and Korea banned aerial spraying on forage crops and turf.[86]

Dicamba

- Dicamba is one of the most widely used pesticides by volume. Homeowners applied between three and five million pounds of dicamba on their lawns and gardens in 1997–1999.[87]

- EPA claims that data are insufficient to determine whether dicamba can cause cancer;[88] however, a Canadian study of men found the risk of NHL increased following exposure to dicamba.[89]

- Herbicide applicators experienced a 20 percent inhibition of the AChE nervous system enzyme. Researchers also demonstrated AChE inhibition in laboratory tests.[90] Neurological effects of dicamba have also been reported in animal studies.[91]

- Dicamba is suspected of causing birth defects (a human teratogen),[92] is moderately toxic by ingestion, is slightly toxic by inhalation or dermal exposure, and can cause severe and permanent damage to the eyes.[93]

- In 1991, South Africa banned dicamba from aerial application in Natal and totally prohibited the use of dicamba in other areas.[94]

MCPP

- MCPP is one of the most widely used pesticides by volume. Homeowners applied between three and five million pounds of MCPP in their homes and gardens in 1997–99.[95] The majority (96 percent) of the MCPP that is produced in the U.S. is used on turf (lawns, sport turf and commercial sod production). MCPP is registered for use on terrestrial nonfood crops,[96] so chronic toxicity testing is not required.

- Data on delayed neurotoxicity are not available and are not required because MCPP and its derivatives and metabolites are not organophosphates or cholinesterase inhibitors.[97]

- Data suggest that MCPP may cause cancer, birth defects, and mutagenic effects. A Danish epidemiological study found an association between MCPP and cancer of soft tissues and NHL in people employed in the manufacture of the herbicides,[98] while a more recent Canadian study of men found the statistical risk of NHL significantly increased following exposure to MCPP.[99]

- MCPP has not been thoroughly evaluated for its human carcinogenic potential.[100] EPA's Office of Pesticide Programs determined in 1988 that MCPP carries a risk of birth defects, and that it may be mutagenic.[101]

- MCPP is severely restricted in Denmark due to concerns about groundwater pollution[102] and was banned in Thailand because of concerns about its carcinogenicity.[103]

Data suggest that MCPP may cause cancer, birth defects, and mutagenic effects.[98]

Glyphosate is implicated in more pesticide exposure incidents than all other herbicides listed by the American Association of Poison Control Centers. — *American Journal of Emergency Medicine*

Glyphosate

- Glyphosate is not classified by EPA as being known to cause cancer, reproductive, teratogenic, or mutagenic effects, although there is some evidence to suggest risk for each type of effect.[104] A recent Swedish population-based study, for example, found associations between glyphosate and NHL.[105]

- While the nature of the toxicity of glyphosate is debated, it is noteworthy that glyphosate is implicated in more pesticide exposure incidents than all other herbicides listed by the American Association of Poison Control Centers (AAPCC).[106]

- Glysophate is the third most commonly reported cause of pesticide poisoning among agricultural workers in California[107] and is the most common cause of poisoning among California landscape workers.[108]

- Glyphosate ranked twelfth among pesticides resulting in poisonings when presented as "number of acute illnesses reported per million pounds used" in California.[109]

- Glyphosate has been found to be less toxic than Roundup, the popular formulation in which it is used. Roundup is advertised as "America's #1 weed and grass killer"[110] and is acutely toxic to humans when ingested intentionally or accidentally.[111] The inert ingredient polyoxyethyleneamine (POEA) was believed to be a possible cause of Roundup's toxicity in poisoning cases studied.[112]

- Roundup contains a number of inert ingredients that may cause adverse health effects. Some Roundup products contain up to 99 percent inert ingredients.[113]

Diazinon

- Homeowners applied between two and four million pounds of diazinon in their homes and gardens in 1999.[114]

- Nearly 75 percent of diazinon has been used in residential settings.[115] Recently the chemical constituted roughly 30 percent of the home insecticide market.[116] It is highly toxic to fish, aquatic invertebrates and birds.[117]

- Between 1994 and 1995, diazinon was believed to be responsible for more bird mortality than any other pesticide. Residential uses of the chemical are believed to be responsible for 50 percent of this mortality. Broadcast application of diazinon on turf is one of the greatest pesticide risks to birds; one granule or seed treated with the insecticide can kill a small bird.[118]

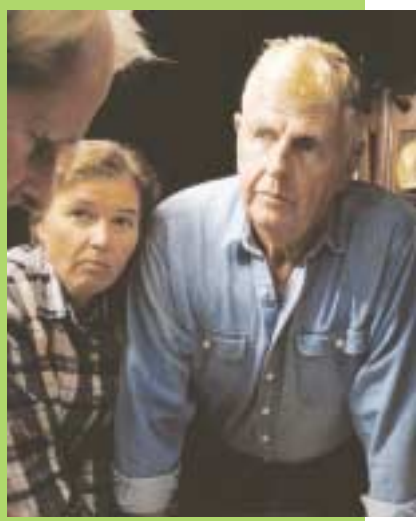
- Monitoring data indicate that diazinon is widespread in surface water nationally and is most commonly found in surface water in urban areas, as a result of runoff from residential use.[119]

- Diazinon has not been found to be carcinogenic in laboratory animals and has been classified as "not likely" to be a carcinogen by EPA. Epidemiological studies, however, have found an association between diazinon use and the risk of certain types of cancer. In a Missouri study of children, garden diazinon use by parents was positively associated with brain cancer in their children.[120] Several studies of men by the NCI found that exposure to diazinon increased the farmers' risk of contracting non-Hodgkin's lymphoma.[121] [122]

- Diazinon inhibits cholinesterase, an enzyme that governs signal transmission across nerve cells. High levels of dermal and oral exposure to diazinon have induced death. Symptoms associated with poisoning in humans include weakness, headaches, tightness in the chest, blurred vision, nausea, vomiting, diarrhea, abdominal cramps, and slurred speech.[123]

- Diazinon has been associated with increased numbers of stillbirths and neonatal deaths in beagle dogs and birth defects (skull malformations) in pigs,[124] while reproductive effects of diazinon have been observed in birds.[125]

Broadcast application of diazinon on turf is one of the greatest pesticide risks to birds; one granule or seed treated with the insecticide can kill a small bird.[118]



Some inert ingredients are suspected carcinogens; others have been linked to central nervous system disorders, liver and kidney damage, birth defects, and some short-term health effects.
— Attorney General's Office of New York

- Diazinon was banned in Denmark in 1997 because of concerns about groundwater pollution, persistence in soil, and ability to poison aquatic organisms, birds and mammals.[126]

- Diazinon was banned in 1990 by EPA for use on golf courses and sod farms because of bird kills, but was still available for other lawn uses until 2003. In 2000, EPA, citing concerns over risks to children, announced that all indoor uses of diazinon would be terminated and outdoor residential lawn and garden uses would be phased out, ending about 75 percent of the current use of diazinon. Sales of diazinon for residential lawn-care use will be prohibited in 2003.[127]

Health Effects of Inert Ingredients

- Pesticide products contain "active" and "inert" ingredients. Active ingredients target pests or act as plant regulators, defoliants, desiccants or nitrogen stabilizers and must be identified on the label. Inert ingredients are not intended to affect a target pest (they are added to pesticides to help dissolve active ingredients, make them easier to apply, or preserve them) and they are not identified on pesticide labels.[128]

- The term "inert" is not defined on the basis of toxicity and may present a health risk. Some inert ingredients are suspected carcinogens; others have been linked to central nervous system disorders, liver and kidney damage, birth defects, and some short-term health effects.[129]

- The identity of inerts is protected as a trade secret under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) unless the agency determines that "disclosure is necessary to protect against an unreasonable risk of injury to health or the environment."[130]

- Inert ingredients can make up the majority of consumer pesticide products. The New York Attorney General's office examined pesticide products and found that 90 percent contained over 90 percent inert ingredients.[131] Roundup Fence and Yard Edger, for example, is 99 percent inert ingedients.[132]

- In 1987, EPA developed an "Inerts Strategy" designed to eliminate the most toxic "inert" ingredients from use, require improved label disclosure of "inert" ingredients, and increase the toxicity testing required for "inerts." EPA's inerts strategy resulted in categorizing inert ingredients into four lists.[133]

- **List 1 -** Inert Ingredients of Toxicological Concern. Product containing a List 1 ingredient must include the label statement "This product contains the toxic inert ingredient (name of inert)." There are seven chemicals on this list.

- **List 2 -** Potentially Toxic Inert Ingredients/High Priority for Testing. There are nearly 100 chemicals on this list.

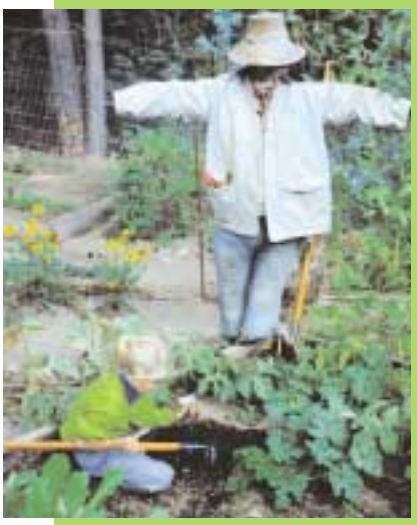
- **List 3 -** Inerts of Unknown Toxicity. There are 55 pages of chemicals on this list.

- **List 4 - List 4A** (minimal risk inert ingredients) and **List 4B** (inerts which have sufficient data to substantiate that they can be used safely in pesticide products). There are 27 pages of inert chemicals on this list.

- Lists of inert ingredients used in pesticide products are not readily available. A 1996 court decision, *NCAP v. Browner*, made information about inert ingredients in some pesticide products available under the federal Freedom of Information Act.[134] Some of these inerts are quite toxic. For example, Bonide Poison Ivy Killer, a 2,4-D product, contains naphthalene[135], a List 3 "inert of unknown toxicity" associated with destruction of red blood cells, nausea, vomiting, and diarrhea.[136] Another 2,4-D product, Brushmaster, contains xylene[137] (a List 2 inert) which, at high levels, can cause headaches, lack of muscle coordination, dizziness, confusion; difficulty in breathing and problems with the lungs; delayed reaction time and memory difficulties; increased numbers of fetal deaths; and delayed growth and development in animal studies.[138]

- In 1998, EPA was petitioned to require listing of all ingredients on product labels. EPA formally denied the petition in 2001.[139]

"In 1998, EPA was petitioned to require listing of all ingredients on product labels. EPA formally denied the petition in 2001."
—Northwest Coalition for Alternatives to Pesticides



Children are exposed to a variety of pesticides as a result of homeowners and condominium managers routinely using herbicides and insecticides.

Pesticide Poisonings

- Exposure to pesticides can lead to acute and chronic health effects. There are many symptoms of acute exposure, some of which include:[140]
  - Sweating
  - Headache
  - Fatigue
  - Slow pulse
  - Nausea and diarrhea
  - Central nervous system depression
  - Loss of coordination
  - Confusion
  - Coma
- In addition to the above side effects, pesticide poisoning can harm the reproductive system, nervous system, gastrointestinal tract and liver, kidneys, cardiovascular system, respiratory system, endocrine system, and blood.[141]
- According to the AAPCC's Toxic Exposure Surveillance System, of the 90,000 exposure incidents reported in 2001, more than half of these involved children younger than six.[142] EPA believes the AAPCC underestimates pesticide incident exposures by 50 percent and estimates that 25 percent of the childhood exposures result in adverse health effects.[143]
- People can be exposed to pesticides through food, air, and water. Runoff from pesticide use can contaminate groundwater, rivers, lakes, and streams. Although drinking water provided through municipal systems is tested regularly for increased levels of pesticides, private wells are not. Air currents can carry pesticides that have been sprayed to nearby areas. This "pesticide drift" can contaminate the air.
- Children are exposed to a variety of pesticides as a result of homeowners and condominium managers routinely using herbicides and insecticides. Accidental exposure can occur when pesticides are used or stored inappropriately by consumers who do not read the label or do not understand the information or the importance of the information provided on the label.[144]

- Examples of pesticide misuse are widespread. The Wisconsin Department of Agriculture, Trade and Consumer Protection has investigated numerous cases of residential pesticide misuse. Examples include a home treated with 37 pounds of carbaryl to control fleas; and a family that developed cardiac and neurologic symptoms soon after their home was fogged with nicotine.[145]

- The National Home and Garden Pesticide Survey performed by EPA found that:[146]

    - "85 percent of households had at least one pesticide on the property;
    - 76 percent of homeowners applied pesticides themselves, without professional help;
    - 47 percent of homes with children under the age of six stored pesticides within a child's reach;
    - 33 percent of individuals failed to take precautions while applying pesticides."

- The number of poisonings in the U.S. reported for active ingredients in lawn-care chemicals are listed in the table at right.

- Incident data from the AAPCC indicates that from 1993 to 1996, 90 percent of all reported accidental pesticide exposures were residential, and 50 percent of those involved insecticides.[148]

- EPA has no data on adverse reactions from exposure to treated lawns.[149]

- Organophosphates, including chemicals such as diazinon, are responsible for the most pesticide incidents reported to the AAPCC.[150] Organophosphate insecticides are the most widely used and available insecticides on the market. There are more than 30 organophosphate pesticides registered for use and all are associated with risks of acute and subacute toxicity.[151]

Number of Poisonings in the U.S. for Most Popular Lawn/Garden Pesticides[147]

Pesticide	*Number of Exposures*
2,4-D	155
Glyphosate	4,426
Dicamba	N/A
MCPP	2,000 (chlorophenoxy poisonings)
Organophosphates	9,564

In 1993, the Government Accounting Office (GAO) concluded that existing sources of information on pesticide illnesses in the U.S. were limited in coverage.... In 2000, a GAO report found that little had changed since 1993.

- EPA considers glyphosate to have low oral and dermal acute toxicity,[152] though the inert ingredients in glyphosate formulations may be more toxic. Glyphosate poisonings are responsible for a large number of reported pesticide poisonings.[153] The inert ingredient POEA in Roundup has been found to be more toxic than glyphosate in studies on rats.[154]

- In 1993, the Government Accounting Office (GAO) concluded that existing sources of information on pesticide illnesses in the U.S. were limited in coverage, comprehensiveness, and quality and that without a system of monitoring pesticide illnesses, problems that might occur with the different uses of pesticides could not be identified. In 2000, a GAO report found that little had changed since 1993 and concluded that establishing state-pesticide illness reporting systems is key to improving the national information on acute pesticide illness. According to GAO, only six states (California, Florida, New York, Oregon, Texas and Washington) have a formal pesticide illness reporting and investigation system, and another three states (Arizona, Louisiana and New Mexico) have more limited systems.[155] The Centers for Disease Control and Prevention (CDC) indicates that Michigan and Iowa also have pesticide poisoning surveillance programs.[156]

- Connecticut is not among the states listed by GAO or CDC as having a pesticide surveillance program.

Data Inadequacies

- Data on the amount of pesticides used on residential lawns by homeowners in Connecticut are not available. Some states, including California and New York, currently collect and release pesticide use data and a few other states have recently passed laws to establish their own reporting programs.[157]

- Many pesticides used on lawns are not tested for chronic health effects. Only data on acute health effects are used to evaluate potential hazards associated with pesticides that are used on lawns. For lawn-care chemicals that are approved for use on food or feed crops, EPA has more extensive databases that include sub-chronic and chronic toxicity data.[158]

- Pesticides in many "weed and feed" products are found in combinations, yet EPA does not test for toxicity of these mixtures. For example, EPA has no data on the toxicity of the herbicides 2,4-D, MCPP and dicamba when combined. University researchers recently tested a weed killer (comprised of 2,4-D, MCPP and dicamba) by giving it to mice at low doses in their water and found a 20 percent increase in failed pregnancies at doses seven times lower than the maximum allowable rate for U.S. drinking water.[159]

- Most laboratory testing is done at high doses. Studies like the one cited above and the study on atrazine's effects on frogs at low, "ecologically relevant" doses[160] suggest that lower dose testing, the dose at which actual exposures occur, may have different toxicity findings.

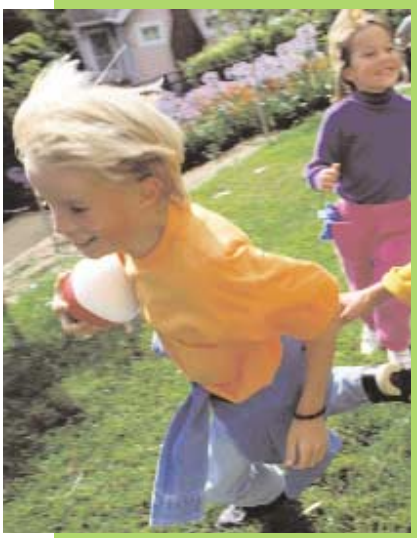
- Due to concerns about the uncertainty of long-term health effects of low-dose pesticide exposures and lack of surveillance systems to characterize potential exposure problems related to pesticide usage or pesticide-related illnesses, the American Medical Association has recommended that homeowners and others limit pesticide exposures and consider the use of the least toxic chemical pesticides or non-chemical alternatives.[161]

Health Effects of Pesticides on Children

- Children are often more susceptible to the toxic effects of pesticides than adults;[162] they take in more pesticides relative to body weight than adults, and have developing organ systems that are more vulnerable and less able to detoxify toxic chemicals.[163] In addition, the likelihood of developing cancer is greater if exposure occurs early in life, since cancer develops over time.

- Children are especially vulnerable to carcinogens before the age of five, when their cells are normally reproducing most rapidly, may be more susceptible to loss of brain function if exposed to neurotoxins, and may be more susceptible to damage to their reproductive systems.[164]

Children are often more susceptible to the toxic effects of pesticides than adults; they take in more pesticides relative to body weight than adults...



The use of household pesticides has been associated with a variety of childhood cancers.

- Children can be exposed to lawn-care pesticides by playing near an area where pesticides are being applied or by playing outside following a pesticide application, drinking or bathing in water contaminated with lawn-care pesticides, or from parental exposure to lawn-care chemicals during the child's gestation or prior to conception. Exposure to lawn-care pesticides can even occur inside a child's home. Studies have found that 2,4-D can be tracked from lawns into homes, leaving residues of the herbicide in carpets, on surfaces, and in indoor air.[165] [166] Estimated post-application indoor exposure levels for young children from non-dietary ingestion may be as high as 30 micrograms/day from contact with tabletops. By comparison, dietary ingestion of 2,4-D is approximately 1.3 micrograms/day.[167]

- Childhood malignancies linked to pesticides in studies include leukemia, neuroblastoma, Wilms' tumor, soft-tissue sarcoma, Ewing's sarcoma, NHL, and cancers of the brain, colorectum, and testes.[168] Many of the reported increased risks are greater than those noted in studies of pesticide-exposed adults, indicating that children may be particularly sensitive to the carcinogenic effects of pesticides.[169]

- The use of household pesticides has been associated with a variety of childhood cancers. Yard treatments have been associated with soft tissue sarcomas[170]; household pesticides have been associated with childhood leukemia[171] [172] [173] [174] [175] and NHL[176]; flea/tick products have been associated with pediatric brain tumors[177]; and home and garden pesticides have been associated with neuroblastoma, particularly in children diagnosed after their first birthday.[178]

- Numerous studies have found that children living in households where pesticides are used have elevated rates of leukemia, brain cancer and soft tissue sarcoma.[179] The greatest risks of childhood leukemia have been found in children exposed to insecticides early in life,[180] children exposed during pregnancy,[181] children whose parents use pesticides in the home,[182] and in children whose families use pest strips.[183]

- Urine samples from 102 children ages three to 13 years old were tested as a part of the Minnesota Children's Pesticide Exposure Study during the summer of 1997. By-products of chlorpyrifos

were found in 93 percent of the samples.[184] In a separate study, 99 percent of 110 Seattle area children ages two to five had detectable levels of organophosphate residues in their urine.[185]

Toxicological Data Requirements for Lawn Pesticide Registration

- Before pesticides can be marketed and used in the U.S., they must meet toxicological data requirements. The producer of the pesticide must provide data from tests done according to EPA guidelines.[186] Pesticides registered for use on food crops must undergo testing to evaluate whether they have the potential to cause harmful effects on humans, wildlife, fish, and plants. Pesticides not intended for use on food are not required to undergo the same degree of testing as those used on food.

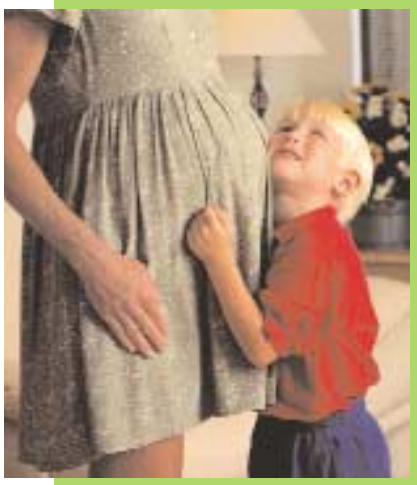
- Lawn pesticides are categorized by EPA as "terrestrial nonfood use" pesticides and are required to have the following data requirements for registration:[187]

    - Acute oral toxicity - rat
    - Acute dermal toxicity - rabbit
    - Acute inhalation toxicity - rat
    - Primary eye irritation - rabbit
    - Primary dermal irritation - rabbit
    - Dermal sensitization - guinea pig
    - Acute delayed neurotoxicity - hen (only for organophosphates or compounds structurally related to substances that cause delayed neurotoxicity).

- Data are not required to evaluate the long-term toxicity of lawn-care pesticides because EPA assumes that "exposure to lawn-care pesticides does not occur on a routine basis over long periods of time."[188]

- Since the majority of the most commonly used lawn-care chemicals (29 out of the 35) also are used on food or feed crops, the EPA has more extensive data bases for these chemicals, including sub-chronic and chronic toxicity data.[189] The third most heavily used herbicide, MCPP, has not been fully tested for chronic health effects since it is not allowed to be used on food crops.

Pesticides not intended for use on food are not required to undergo the same degree of testing as those used on food.



80 million pounds of conventional active ingredients are used on lawns and gardens in the United States. Herbicides/plant growth regulators are the most common type of pesticide used by homeowners.

- Despite EPA's requirements, most pesticides have not been fully tested to determine their potential to adversely affect developing organ systems and functions. During the past decade, scientists have become especially concerned that pesticides, including organophosphates, may interfere with normal growth and development in fetuses and children.

- In 1993, the NAS Committee on Pesticides in the Diets of Infants and Children concluded: "The data strongly suggest that exposure to neurotoxic compounds at levels believed to be safe for adults could result in permanent loss of brain function if it occurred during the prenatal and early childhood period of brain development."[190] Organophosphates are acutely toxic to the central and peripheral nervous systems of humans, and they can cause irreversible damage and death at high doses.

- EPA has largely neglected the testing of pesticides to identify possible harm to the developing nervous system. In one of its only reviews, EPA found that among nine pesticides tested, six were more harmful to young animals than to adults.[191]

Amount of Pesticides Used on Lawns and Gardens

- There is no national pesticide use reporting system in place in the U.S., although EPA and USDA do provide estimates of pesticide use based on statistical sampling methods and/or survey data. EPA uses information that it collects along with USDA surveys and other public and proprietary sources in order to estimate pesticide sales and usage in the U.S.[192]

- The table on the opposite page shows that 80 million pounds of conventional active ingredients are used on lawns and gardens in the United States. Herbicides/plant growth regulators are the most common type of pesticide used by homeowners.

U.S. Pounds of Conventional Pesticide Active Ingredient
By Pesticide Type and Market Sector, 1999 Estimates
(a.i. = active ingredient)

	Herbicides/ Plant Growth Regulators		*Insecticides/ Miticides*		*Fungicides*		*Nematicide/ Fumigant*		*Other Conventional (1)*		*Total*	
Sector	*Mil lbs of a.i.*	%	*Mil lbs of a.i.*	%	*Mil lbs of a.i.*	%	*Mil lbs of a.i.*	%	*Mil lbs of a.i.*	%	*Mil lbs of a.i.*	%
Agriculture	428	80%	93	74%	45	57%	115	82%	25	76%	706	77%
Ind/Comm/ Gov	52	10%	19	15%	24	30%	24	17%	7	21%	126	14%
Home & Garden	54	10%	14	11%	10	13%	1	1%	1	3%	80	9%
Total	534	100%	126	100%	79	100%	140	100%	33	100%	912	100%

Source: USEPA. 1998-1999 Pesticide Market Estimates. Available at http://www.epa.gov/oppbead1/pestsales/99pestsales/usage1999_table3_4.html
(1) "Other Conventional" pesticides include rodenticides, mulluscicides, aquatic and fish/bird pesticides, and other miscellaneous conventional pesticides.

- Though the home and garden use of pesticides represents a small percentage of overall pesticide application when compared to the agricultural sector, it may cause greater human exposure. Homeowners use up to 10 times more chemical pesticides per acre on their lawns than farmers use on crops.[193] In addition, homeowners applying their own pesticides may be directly exposed through inhalation, dermal exposure, and ingestion.

- The percent of pesticides used in homes and garden varies by state. In New York, the Office of the New York Attorney General estimates that in New York, more pesticides are used by commercial applicators in non-agricultural settings than by farmers for food crops. This estimate was developed from reports by commercial applicators demonstrating "the overwhelming amount of pesticides that are used in suburban and urban areas."[194]

The Office of the New York Attorney General estimates that in New York, more pesticides are used by commercial applicators in non-agricultural settings than by farmers for food crops.[194]

Lawns cover 30 million acres of land in the United States. The industry that has evolved to take care of lawns has become a multibillion-dollar business.[195]

Percent of Households Using Pesticides in the Home and Garden in the U.S.

- According to the most recent data available, nearly 75 percent of U.S. households used some type of pesticide in their home and over half of all households (56 million) are estimated to have used insecticides.
- Lawns cover 30 million acres of land in the United States. The industry that has evolved to take care of lawns has become a multibillion-dollar business.[195] Consumers spent about $2 billion on pesticides for the home and garden in 1997.[196]

Number of U.S. Households Using Pesticides, 1996

	Number of Households (In millions)
Total U.S. households	100
Insecticides	56
Fungicides	38
Herbicides	14
Repellants	17
Disinfectants	42
Any pesticides	74

Source: Aspelin A and Grube A. Pesticide industry sales and usage: 1996 and 1997 market estimates. USEPA Office of Pesticide Programs. Table 7. Available at http://www.epa.gov/oppbead1/pestsales/97pestsales/table9.htm. EPA estimates based on Agency file information and various other sources, including 1997 Census of Agriculture.

User Expenditures for Pesticides in the U.S. For Home and Garden, 1997 Estimates[197]

	Million Dollars	*Percent of Total Pesticide Sales(1)*
Herbicides/ Plant Growth Regulators	$493	7%
Insecticides/ Miticides	$1,378	39%
Fungicides	$26	3%
Other (2)	$164	24%
Total	$2,061	17%

(1) Includes agriculture and industry/commercial/government sales
(2) Includes nematicides, fumigants, rodenticides, molluscicides,
Source: USEPA. 1996–1997 Pesticide Market Estimates: Tables and Charts. Table 2.

3.

Ecological Effects of Lawn-Care Pesticides

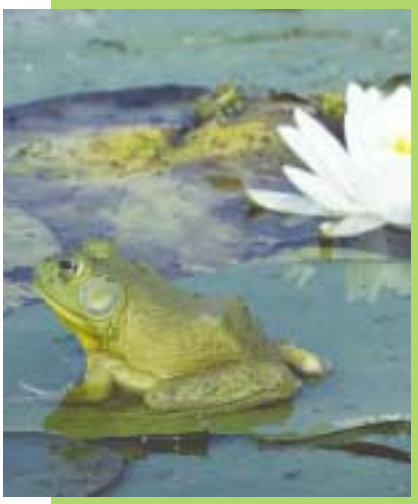
- The use of pesticides often harms wildlife and their habitats. The toxicity of pesticides to wildlife depends on the persistence and degree of toxicity of the chemicals, dose, and time and duration of application. Wildlife is most susceptible to pesticide effects during nesting, nursing of young or during times of low food availability.[198]

- Lawn-care pesticides differ in how long they persist in the environment before they are degraded. Pesticides' half-lives are different in soil than in water. Half-life is the time (days, weeks or years) required for half of the pesticide to break down into degradation products. The rate of breakdown depends on a number of factors, including temperature, pH, soil microbe content and the amount of light, water and oxygen present. Some of the breakdown products are also toxic and may have additional half-lives.

- Commonly used lawn-care chemicals can persist in soil and water for weeks, which can lead to the contamination of aquatic resources and local wildlife. The California Department of Pesticide Regulation (CDPR) has determined that pesticides with a water half-life greater than 14 days, together with additional physiochemical properties, have the potential to contaminate groundwater.[199]

- The top five selling lawn-care pesticides, 2,4-D, glyphosate, MCPP, dicamba, and diazinon, are all listed by the CDPR as having the potential to contaminate groundwater.[200]

The use of pesticides often harms wildlife and their habitats.... Commonly used lawn-care chemicals can persist in soil and water for weeks, which can lead to the contamination of aquatic resources and local wildlife.



- The EPA's Office of Pesticide Programs is responsible for ensuring that a pesticide will not pose unreasonable adverse effects to the environment and must ensure that use of pesticides it registers will not result in harm to species listed as endangered or threatened under the federal Endangered Species Act. In addition, EPA's Endangered Species Protection Program (ESPP) was initiated in 1988 partly to provide information on pesticide use limitations intended to minimize impacts to threatened and endangered species. Despite EPA's efforts, pesticides are responsible for declines in populations of amphibians (including some endangered species), pollinators, fish and birds.

- The most commonly used lawn and garden pesticides in the U.S. can be toxic to amphibians, pollinators, birds, and aquatic life.

Half-Life of Commonly Used Lawn-care Chemicals in Soil and Water

Pesticide	*Half-Life in Days*		
	In Soil (Aerobic)	*In Soil (Anaerobic)*	*In Water*
2,4-D	34	333	39
Glyphosate, isopropylamine salt	96	22	35
Glyphosate, trimesium	6	52	796
MCPP	13	541	31
Dicamba	10	88	30
Diazinon	40	16	138

Source: California Department of Pesticide Regulation. 2000 status report pesticide contamination prevention act. December 2000. Available at http://www.cdpr.ca.gov/docs/empm/pubs/ehapreps/eh0014.pdf.

Non-Target Toxicity of Common Lawn and Garden Care Pesticides[201]

Pesticide	*Non-target Toxicity*
Diazinon	Very toxic to birds, fish, amphibians, crustaceans, bees, aquatic insects; toxic to some plants. Teratogen in birds.
2,4-D	Low to very high for fish, crustaceans; low to high for birds, non-target insects; low to medium for amphibians, bees; medium for molluscs; low for soil organisms. Birds – can affect egg production; fish – cumulative; amphibians – inhibits frog egg development; crustaceans – may significantly reduce population; molluscs – reduction in population, cumulative; plants – leaf malformation;
Glyphosate	Low for bees and birds; low to medium for fish and crustaceans. Surfactant: medium to high for fish. Plants – mutagen.
MCPP	Low for fish; low to medium for bees; medium for birds.
Dicamba	Acute toxicity: low for fish; low to medium for crustaceans; medium for birds.

Amphibians

- Amphibians are sensitive to the toxic effects of pesticides and fertilizers. Since frogs, toads, and salamanders absorb water and breathe through their skin, contaminants such as pesticides and fertilizers have an easy pathway into their bodies.

- Amphibian eggs and larvae are particularly susceptible to contaminants, and exposure can cause many types of malformations, including missing eyes or extra or missing legs. Some malformations lead to death.[202] Pesticides have been identified as a potential cause of amphibian declines and deformities (there are 18 amphibian species classified as endangered or threatened and eight species waiting to be listed).[203] [204] A recent study found that some tadpoles and young frogs ate less, were more lethargic, developed physical abnormalities, became paralyzed and eventually died when exposed to nitrates (at levels considered safe in drinking water).[205]

- Another recent study published in the proceedings of the National Academy of Sciences (NAS) showed that male African clawed frogs exposed to low doses (0.1 parts per billion) of atrazine (the most commonly used herbicide in the U.S.) can develop multiple sex organs. EPA permits up to 3.0 parts per billion of atrazine in drinking water.[206]

- Deformities in Pennsylvania wood frogs have been linked to a parasite infection combined with a weakened immune system caused by pesticide exposure, according to another study published by the NAS.[207]

- Frogs with extra legs or toes or missing legs or eyes have been found in Connecticut, possibly due to pesticide contamination.[208]

Pollinators

- Honey bees, birds, bats and insects, are critical to flowering plant reproduction and to the production of most fruits and vegetables; more than 90 percent of all flowering plants and more than three-quarters of the staple crop plants rely on pollinators.[209] According to the U.S. Department of Agriculture, wild and managed pollinators are disappearing at alarming

Honey bees, birds, bats and insects, are critical to flowering plant reproduction and to the production of most fruits and vegetables.

Popular Lawn-care Pesticides Toxic to Bees[214]

Bendiocarb

Carbaryl

Chlorpyrifos

Diazinon

Malathion

Pesticides can poison pollinators or impair their reproduction.

rates.[210] Pesticides have been implicated as one reason for the decline in pollinators.

- Pesticides threaten pollinators in many ways. They may directly poison them, or reduce their reproductive success. They may also harm them indirectly by reducing sources of nectar, diminishing materials favored for nests, and destroying plants hosting insects that pollinators favor.[211]

- Since the late 1940s, U.S. bee colonies have declined from nearly six million to less than three million in 1995. Experts estimate that pesticides are partly responsible for the decline.[212]

- Beekeepers in Connecticut have suffered because of declining bee populations, partly as a result of the overuse of pesticides.[213]

Birds

- Some common lawn-care pesticides are toxic to birds (including. 2,4-D and diazinon), while others kill the plants relied upon by insects, which in turn can reduce the available food supply for insectivorous birds. When pesticides contaminate rivers and streams, aquatic life may be poisoned, which can poison birds such as waders, shorebirds, waterfowl, kingfishers, and fish-eating raptors. Some herbicides are toxic to invertebrates and can reduce their numbers, directly reducing the available food supply for birds.[215]

- Significant bird kills have resulted from the use of pesticides in the U.S.[216] DDT, an organochlorine pesticide banned in the U.S. in the 1970s, was responsible for dramatic population declines of bald eagles, peregrine falcons and brown pelicans. The pesticide caused eggshell thinning and inability of eggs to survive full-term. After application, DDT was found in waterways in low concentrations; but DDT had biomagnified 10 million times by the time it had reached birds at the top of the food chain.[217]

- The peregrine falcon was a regular nester in Connecticut through the early 1900s. By 1975, the entire population of peregrines in the eastern U.S. was considered extirpated due directly to the effects of pesticides, particularly DDT, on breeding populations.[218]

- Alternatives to organochlorine pesticides have been developed because of the problems associated with DDT. These chemicals are less persistent in the food chain than organochlorines, but some are more immediately toxic.[219]

- EPA's wildlife mortality incident database shows that three of the chemicals commonly used in the garden and home—diazinon, chlorpyrifos, and brodifacoum—kill thousands of birds each year.[220]

- Many incidents of bird kills have been reported after chlorpyrifos use on residential lawns and golf courses throughout the country. About 100 American robins were killed in Florida after chlorpyrifos was used on a golf course; 78 Canada geese were killed in New York after chlorpyrifos was used on a golf course; and 60 robins were killed in Florida on one residential lawn.[221]

- Diazinon has one of the highest incidents of bird kills of any pesticides, and residential use accounts for half of these incidents. According to EPA, only one granule or seed treated with diazinon can kill a small bird. Broadcast application of diazinon to turf has been found to be one of the greatest pesticide risks to birds. Diazinon use on golf courses and sod farms was stopped in the early 1990s because of repeated bird kills. Many bird species have been killed as a result of diazinon, including ducks, geese, hawks, songbirds, and woodpeckers.[223]

- Even after the removal of diazinon and DDT, birds continue to die of pesticide poisoning. New York State's wildlife pathologist revealed that in the year 2001, thousands of bird deaths were attributed to the aesthetic use of lawn pesticides.[224] Dead birds collected by the New York State wildlife pathologist in 2002 continue to demonstrate that pesticides used by homeowners on residential lawns threaten the lives of many birds.[225]

- Most homeowners are not aware that they will break the law if a migratory bird is killed because of the use of a pesticide. Under the Migratory Bird Treaty Act,[226] an international agreement enforced by the U.S. Fish and Wildlife Service, it is a violation to cause the death of a migratory bird from pesticide poisoning.

Dead birds collected by the New York State wildlife pathologist in 2002... demonstrate that pesticides used by homeowners on residential lawns threaten the lives of many birds.[225]

Pesticides in Water

In addition to contaminating surface water, pesticides can contaminate groundwater, potentially causing health problems in those people drinking the water.

PESTICIDES IN SURFACE AND GROUNDWATER

- Pesticides in streams and groundwater are a concern for human health. Studies of major rivers and streams have documented that 100 percent of all surface water samples contained one or more pesticides at detectable levels.[227] Seventy-four of the 83 pesticide compounds analyzed were detected at least once in streams or groundwater. Major rivers, as well as agricultural and urban streams, had relatively similar, high frequencies of pesticides detected.

- A recent study published by Environment Canada provides evidence that pesticides applied on lawns and gardens can contaminate local streams. The most frequently detected pesticides in Toronto streams were MCPP (30 percent of samples), diazinon (29 percent of samples) and 2,4-D (7 percent of samples). These three pesticides are some of the most popular lawn-care pesticides. Twenty percent of the river samples collected in the study contained diazinon at levels exceeding the Ontario Water Quality Objective for Protection of Aquatic Life.[228]

- An analysis of patterns in pesticide use revealed that insecticide concentrations were highest in urban streams. Insecticides were detected more frequently in urban streams than in most agricultural streams. The most common insecticides detected were diazinon, carbaryl, malathion, and chlorpyrifos, which nationally rank 1st, 8th, 13th, and 4th among insecticides in frequency of home and garden use.[229]

- In addition to contaminating surface water, pesticides can contaminate groundwater, potentially causing health problems in those people drinking the water. Lawn and garden chemicals can be carried by rainwater into a stream as runoff and eventually reach groundwater supplies, or, more commonly, they can saturate the soil and seep down to the groundwater table. Pesticides have the ability to move into groundwater based on their water solubility, ability to bind to soils (Koc), and half-life.

- The top five selling lawn-care pesticides—2,4-D, glyphosate, MCPP, dicamba, and diazinon—are all listed by the California Department of Pesticide Regulation as having the potential to contaminate groundwater based on chemical properties.[230]

Aquatic Life

- The majority of streams in the U.S. that are sampled for pesticides contain pesticide residues that may be harmful to aquatic life. Nearly two-thirds of all streams sampled by the United States Geological Survey (USGS) as part of the National Water Quality Assessment Program (NAWQA) had at least one pesticide at a concentration exceeding a guideline for the protection of aquatic life. At least one pesticide was detected by USGS in more than 95 percent of stream samples collected at 115 sites.[231] In a study conducted by the USGS in the Puget Sound Basin, five out of 23 pesticides were detected in water from urban streams at levels that exceeded limits set to protect aquatic life. Four of the pesticides that exceeded these limits have also been used on lawns (diazinon, carbaryl, malathion, and chlorpyrifos).

- Several studies have reported widespread distribution of pesticides in urban surface water as a result of frequent use by homeowners.[232] [233] According to studies conducted by the USGS, more types of pesticides are found in some urban streams than in agricultural streams, and pesticides used on lawns and gardens contribute to the occurrence of pesticides in urban streams. The USGS studied sales data from home and garden stores and found that diazinon, 2,4-D, and MCPP are the most frequently purchased pesticides by local residents. These pesticides were also detected in water sampled from all study sites.[234]

- Significant fish kills have resulted from the legal application of pesticides, such as the 1991 death of more than one million fish in Louisiana.[235]

- Studies of major rivers and streams have documented that 96 percent of all fish contained one or more pesticides at detectable levels.[236]

At least one pesticide was detected by USGS in more than 95 percent of stream samples collected at 115 sites.[231]

Only two of the top five lawn-care pesticides—2,4-D and glyphosate—are restricted by the Safe Drinking Water Act (SDWA).

- Pesticides pose a serious threat to aquatic life. Insecticides can kill beneficial stream insects and sport fish. Herbicides can kill oxygen-producing water plants and reduce the food supply of aquatic animals. Even low doses of certain pesticides can cripple fish, sterilize them, or increase their susceptibility to diseases and parasites.[237]

- Guidelines to protect aquatic life have been developed for only 18 of the 88 pesticides analyzed by NAWQA. The criteria that have been developed for individual chemicals do not account for exposure to chemical mixtures or high concentrations that may occur seasonally.[238]

Pesticides in Drinking Water

- Exposure to pesticides in drinking water even at low levels over a long period of time may be associated with chronic health problems.

- The federal Safe Drinking Water Act (SDWA) sets minimum standards for drinking water from community and non-community water systems. EPA has established maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs) for 83 contaminants, 24 of which are pesticides. Of those pesticides, 14 are currently registered for use in the U.S.[239] Once the MCL is established for a contaminant, the contaminant is included on the list of regulated contaminants. Only two of the top five lawn-care pesticides—2,4-D and glyphosate—are restricted by the Safe Drinking Water Act (SDWA). This means that many other commonly used lawn and garden pesticides are not regulated in drinking water.

- Drinking water standards that have been established for pesticides may not be stringent enough to protect human health. Of the 14 pesticides with established MCLs, five present health risks at concentrations below the MCLs.[240] As noted in the table opposite, several pesticides have MCLs greater than the Public Health Goal (PHG), a level of drinking water contaminant at which adverse health effects are not expected to occur. For example, the MCL for atrazine is 20 times higher than the PHG.

Pesticides with MCLs Higher than Levels Believed to Threaten Human Health

Pesticide	*MCL (ppb)*[241]	*Lower Health Level (ppb)*[242]	*Potential Health Effects from Ingestion of Water*[243]
Atrazine	3	PHG: 0.15	Cardiovascular system or reproductive problems
Alachlor	2	EPA cancer level 0.4	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer
Aldicarb	3		Nausea, diarrhea and relatively minor neurological symptoms[244]
Carbofuran	40		Problems with blood, nervous system, or reproductive system
2,4-D	70		Kidney, liver, or adrenal gland problems
Diquat	20		Cataracts
Endothall	100		Stomach and intestinal problems
Glyphosate	700		Kidney problems; reproductive difficulties
Lindane	0.2	PHG: 0.032	Liver or kidney problems
Methoxychlor	40		Reproductive difficulties
Oxamyl	200	PHG: 50	Slight nervous system effects
Pentachlorophenol	1		Liver or kidney problems; increased cancer risk
Picloram	500		Liver problems
Simazine	4	EPA cancer level 0.3	Problems with blood

PHG: Public Health Goal required by 1996 SDWA Amendments.
Based on new risk analysis based only on health concerns.

- Pesticides have contaminated drinking water throughout the country. Analyses of state and federal surface and groundwater databases in California found that 101 pesticides and related compounds have been detected in the state's drinking water sources over the past 10 years in 46 of California's 58 counties.[245]

- Homeowners may unknowingly contaminate their own well water by using pesticides on their lawns. Factors that influence a pesticide's potential to contaminate water include: physio-chemical factors (water solubility, ability to bind to soils (Koc), and half-life); environmental factors (weather, season, and distance to water sources); and application methods and other practices associated with the pesticide use.

- If drinking water becomes contaminated by pesticides, removing the pesticides is difficult and not always successful. Drilling a new well does not guarantee that the new groundwater source will not be contaminated.[246] A California study found that of the 600 water suppliers that have detected pesticides in their water sources, only 40 use treatment facilities that effectively reduce concentrations of pesticides.

Homeowners may unknowingly contaminate their own well water by using pesticides on their lawns.

About 600,000 Connecticut residents get their drinking water from private residential wells that remain largely untested for pesticides.[250]

- Only specialized home filters remove pesticides from residential water. Bottled water is not regulated as strictly as tap water, and some brands are filtered water from public water supplies.[247]

Pesticides in Connecticut Water Supplies

- Data on the amount of pesticides used on residential lawns by homeowners or governmental entities (e.g., schools, parks departments, highway maintenance departments) in Connecticut are not available. However, the use of pesticides on lawns in Connecticut is believed to be widespread.

- A 1998 study of pesticide use in Woodbridge, Connecticut, by Environment & Human Health, Inc. (EHHI) found that of the 53 homeowners who volunteered to have their wells tested for pesticides, 72 percent used pesticides on their lawns and/or trees.[248] Pesticide traces were detected in 11 percent of the tested wells.

- About one-third of the population in Connecticut obtains drinking water from public-supply systems that rely on groundwater.[249]

- About 600,000 Connecticut residents get their drinking water from private residential wells that remain largely untested for pesticides.[250] Although Connecticut is a small state, it has over 3,200 public water systems. About 600 of these systems are community water systems that serve at least 25 residents throughout the year. About 84 percent of Connecticut's population of 3.4 million is served by community systems.[251]

- Connecticut's major aquifer systems are shallow (generally less than 300 feet deep with the water table within 50 feet of the land surface) and are therefore susceptible to contamination.[252]

- Ninety percent of all pesticides detected in a USGS study of 120 monitoring wells located in the Connecticut, Housatonic, and Thames River Basins in New England and eastern New York were herbicides, with triazine herbicides detected most commonly. Detections of the triazine herbicide atrazine and its metabolite, desethylatrazine, accounted for 53 percent of all pesticide detections.[253]

5.

Pesticide Packaging

PESTICIDE PACKAGING STUDY

- In July 2002, EHHI surveyed large Connecticut retail stores that sell pesticides to determine the presence of any torn or broken pesticide packages.[254]

- Torn and broken bags of lawn-care products were found spilling their contents on the shelves and floors of a variety of home and hardware stores. Some of these stores also sell grocery items, including produce. Many of the torn packages contain pesticides. Products such as "Weed-and Feed," "Weed-B-Gon," "Turf Builder with PLUS2 Weed Control" contain pesticides such as 2,4-D and MCPP, which have been linked to NHL. MCPP has also been linked to soft tissue cancers. "Bug-B-Gone" and "Turf Builder with Insect Control" contain pesticides such as carbaryl and diazinon. Diazinon is presently being phased out by the EPA because of its high toxicity level; carbaryl is suspected of being an endocrine disrupter; and both diazinon and carbaryl are neurotoxins. The types of pesticides carried by each of the Connecticut stores surveyed are listed in Appendix A.

- In addition to the health effects associated with the active ingredients in these pesticide products, the inert ingredients may also be toxic, and some of them may be considered hazardous waste when discarded.

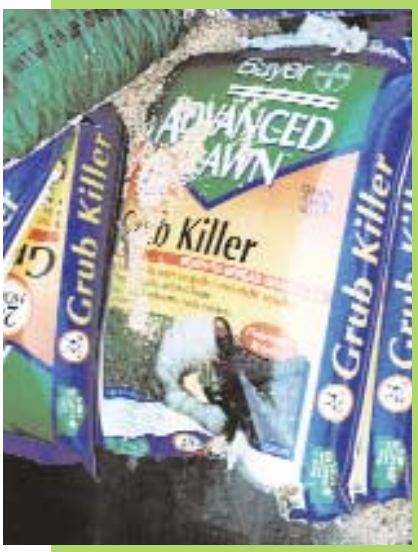
- There was a general belief among employees interviewed by EHHI that pesticide packages are currently not strong enough to withstand customer and employee handling and shipping.

TORN PACKAGES AND LIABILITY

- In several states, stores selling open and leaking pesticide containers have been sued.

- In California, the Sacramento County Agricultural Commissioner's Office fined two Home Depot stores $10,000 for having open and leaking pesticide containers on shelves that were accessible to the public. As a result of the fine, the Home Depot stores changed their case-opening procedures to minimize damage to

There was a general belief among employees interviewed by EHHI that pesticide packages are currently not strong enough to withstand customer and employee handling and shipping.



In several states, stores selling open and leaking pesticide containers have been sued.

pesticide containers, formalized their pesticide inspection procedures with a log sheet, and placarded their pesticide sales areas with customer instructions.[255]

- The Minnesota Department of Agriculture (MDA) collected a $26,500 civil penalty settlement from Kmart Corporation for several violations of the Minnesota Pesticide and Fertilizer Laws that occurred in 1999. Stores violated state law by storing open bags of fertilizer and pesticide outdoors without adequate safeguards. Some bags were stored near a storm drain that ran into a river, and there was evidence that recent rains had washed some spilled fertilizer into the drain. Other bags were torn open with material spilled on the pavement. The bags were uncovered and had been soaked by recent rains. The MDA ordered the stores to clean up the spilled fertilizer and store the damaged bags properly, and assessed a $26,500 civil penalty for violating state fertilizer and pesticide laws. The MDA also instructed Kmart to educate its managers and employees about the proper storage of fertilizers and pesticides at retail facilities.[256]

Child-Resistant Packaging

- FIFRA authorizes EPA to set standards for child-resistant packaging of pesticides to protect children and adults from serious injury or illness resulting from accidental ingestion or contact with pesticides. Pesticide products are required to be distributed and sold in child-resistant packaging if they meet a toxicity criterion and if they are intended for residential use.

Toxicity criteria:

(1) The pesticide has an acute oral LD50 of 1.5 g/kg or less;
(2) The pesticide has an acute dermal LD50 of 2000 mg/kg or less;
(3) The pesticide has an acute inhalation LC50 of 2 mg/liter or less;
(4) The pesticide is corrosive to the eye or causes corneal involvement or irritation persisting for 21 days or more;
(5) The pesticide is corrosive to the skin or causes severe skin irritation at 72 hours; or
(6) The Agency determines there is serious hazard of accidental injury or illness which child-resistant packaging could reduce; and

Use criterion:

The product's labeling either directly recommends residential use or reasonably can be interpreted to permit residential use.

6.

Pesticide Labeling

Federal Pesticide Labeling Requirements

- Federal law to control pesticide risks relies heavily on labels to provide consumers with information on product ingredients, directions for safe use, specific health and environmental warnings, and acceptable methods of disposal. Pesticide packaging and labeling remain the exclusive authority of the federal government.

- FIFRA gives EPA broad power to register and regulate the use, sale and labeling of pesticides. EPA may approve pesticide labels in the process of registering a pesticide under FIFRA if:[257]

    - Its composition warrants the proposed claims for it;
    - Its labeling/other material required comply with the requirements of FIFRA.
    - It will perform its "intended function" without "unreasonable adverse effects" on the environment; When used in accordance with widespread and commonly recognized practice it will "not generally cause unreasonable adverse effects" on the environment.

- EPA requires pesticide labels to carry a signal word, "Caution," "Warning," or "Danger" to indicate the level or type of hazard associated with the ingredients in the products. "Caution" is the lowest level and "Danger" is the highest. The table on the following page demonstrates the level of toxicity associated with each signal word.

- Under FIFRA (40CFR156), pesticide labels are standardized and must be in 6-point type or larger. The size of print required for the warning signal words "Danger," "Warning," or "Caution" and the size of the statement "keep out of reach of children" depend upon the size of the label in square inches. For example, if the size of the label is between five and 10 inches, the size of the warning signal words must be in 10-point font ("Danger") and the size of the statement "keep out of reach of children" must be in 6-point font ("keep out of reach of children"). As illustrated, the 6-point font is barely legible.

The size of the warning signal words must be in 10 point font ("Danger") and the size of the statement "keep out of reach of children" must be in 6 point font ("keep out of reach of children"). As illustrated, the 6 point font is barely legible.

EPA Signal Words and Toxicity Category[258]

Study	*Category I*	*Category II*	*Category III*	*Category IV*
Acute Oral	≤ 50 mg/kg	>50-500 mg/kg	>500-5000 mg/kg	>5000 mg/kg
Acute Dermal	≤ 200 mg/kg	>200-2000 mg/kg	>2000-5000 mg/kg	>5000 mg/kg
Acute Inhalation	≤ 0.05 mg/liter	> 0.05 thru 0.5 mg/liter	> 0.5 thru 2 mg/liter	>2 mg/liter
Eye Irritation	Corrosive or corneal involvement or irritation persisting >20 days	Corneal involvement or irritation clearing in 8-21 days	Corneal involvement or irritation clearing in < 7 days	Minimal effects clearing < 24 hrs
Skin Irritation	Corrosive	Severe irritation >72 hrs	Moderate irritation > 72 hrs	Mild or slight irritation
Signal Word	DANGER	WARNING	CAUTION	NO REQUIREMENT

Size of Warning Font Depends on Label Size

Size of Label on Front Panel in Square Inches	*Minimum Type Size of Warning (Danger, Warning or Caution)*	*"Keep Out of Reach of Children"*
< 5	6 point	6 point
> 5 & <10	10 point	6 point
> 10 & < 15	12 point	8 point
> 15 & < 30	14 point	10 point
> 30	18 point	12 point

- Pesticide registrants are required to provide instructions on what to do if a pesticide container is damaged, or if a pesticide is leaking or has spilled. Instructions are to include precautions to minimize exposure if damage occurs. "Many products bear statements that are inadequate or inconsistent with current disposal registrations under the Resource Conservation and Recovery Act," according to the EPA.[259]

Consumers' Understanding of Pesticide Labels

- The Consumer Labeling Initiative (CLI)[260] surveyed over 800 people about their knowledge of outdoor pesticide labels and found that many consumers do not want to purchase a pesticide product that will cause harmful effects. (Nearly 90 percent of consumers surveyed believe that a pesticide's potential for causing harmful effects is a determining factor in whether to purchase it.) Many consumers, however, are confused about the labels on outdoor pesticide products and do not know the difference between the signal words CAUTION, WARNING, or DANGER.

- Additional findings of the survey indicate:[261]

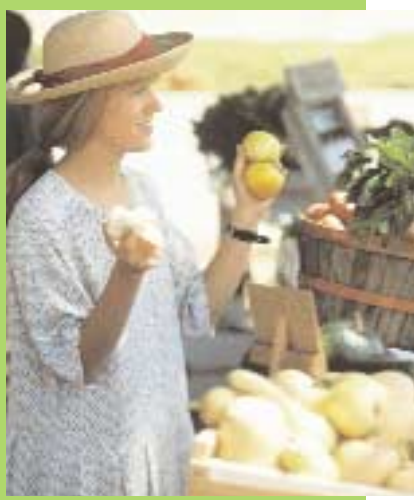
  - Outdoor pesticide labels are confusing. Labels on outdoor pesticide products are more complex and less familiar to consumers. Survey respondents indicated that they should be simplified and arranged for easier reading.

  - Many consumers do not consistently or thoroughly read labels on pesticide products.

  - Many consumers (nearly one-third of survey respondents) were unable to correctly identify effects on personal and children's health or safety of outdoor pesticide products.

  - Nearly one–third of the respondents indicated that they do not look at product packaging for possible harmful effects.[262]

"Many products bear statements that are inadequate or inconsistent with current disposal registrations under the Resource Conservation and Recovery Act," according to the EPA.[259]



Pesticide Law and Regulations

Legal Issues Surrounding Lawn-Care Chemicals

- Pesticide law in the U.S. is governed primarily by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). FIFRA requires that EPA register pesticides, and that EPA regulate ingredients, formulations, packaging, storage labeling, and specify safe conditions of use and disposal.

- Current law does not require that pesticide labels warn consumers about long-term (chronic) health effects such as cancer, neurotoxicity, or birth defects.

- The Federal Food, Drug and Cosmetic Act (FFDCA) regulates pesticide residues in foods, and pesticide concentrations must be limited to levels reasonably certain to induce no harm to children and others. EPA has set nearly 10,000 tolerances, or pesticide residue limits in foods. Many lawn-care chemicals are also used on food crops, and some remain as residues in the marketplace.[263]

- Pesticides are also regulated under many other federal statutes, including the Food Quality Protection Act, the Safe Drinking Water Act, the Clean Air Act, the Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation and Liability Act (Superfund), and the Hazardous Materials Transportation Act.

- EPA may classify a pesticide as "restricted-use" if it poses a special threat to human health or environmental quality. Restricted-use pesticides may be purchased and applied only by a "certified applicator," trained and licensed under EPA guidelines. Pesticide products sold in commercial establishments for residential use are not "restricted-use" chemicals. The same active ingredients in pesticide products available for residential use to unlicensed consumers may exist at higher concentrations in products that are classified as "restricted-use." Licensed applicators may apply more dangerous "restricted-use" chemicals in residential settings, and consumers rarely direct lawn-care companies not to apply restricted-use products.[264]

Food Quality Protection Act (FQPA)

- The FQPA, enacted in 1996, requires that food tolerances be set at "safe" levels. *Safe* is defined as "a reasonable certainty that no harm will result from aggregate exposure to the pesticide chemical residue, including all anticipated dietary exposures and all other exposures for which there is reliable information." The former standard permitted the federal government to balance the health threats against economic benefits associated with crop protection.

- FQPA governs the management and regulation of lawn-care chemicals, since many lawn and garden chemicals are also used in crop production, creating the possibility of human exposure from many different sources. Unless a pesticide is exclusively used for non-food purposes, EPA must apply the same standard of safety to lawn-care chemicals and food-use chemicals.

- The Agency must find explicitly that the pesticide uses it permits do not pose a significant health threat to children. To do so, the EPA must estimate the likelihood of childhood exposure to the pesticides from different sources—air, water, food, soil, pets, and contact with contaminated surfaces and products.

- The law requires EPA to employ an additional 10-fold safety factor beyond the existing 100-fold uncertainty factor when setting allowable levels of exposure to account both for the heightened physiological susceptibility of children and their more intense exposure.

- When considering the health threat posed by any single chemical, EPA must also consider possible human exposures to other chemicals that are toxic in a similar manner. This requirement was designed to prevent the Agency from continuing its one-at-a-time chemical review practice.[265] Organophosphate insecticides are one example of a class of chemicals that may act in such an additive manner, and triazine herbicides are another.

- EPA is slowly applying the new FQPA safety standards to the 23,000 pesticide products currently registered. It has recently focused attention on organophosphate insecticides. Among these, it has further restricted chlorpyrifos and diazinon from residential markets,[266] [267] based upon a finding that these chemicals pose a special threat to the developing nervous systems of fetuses, infants, and children. Methoxychlor, an organochlorine, has also been reviewed through the FQPA. EPA determined that existing data concerning methoxychlor suggest significant hazards resulting from exposure to the pesticide, such that the EPA cannot determine that there is a reasonable certainty of no harm.[268]

Preemption: Federal, State, and Local Roles in Pesticide Control

- States are permitted by federal law to regulate and ban pesticides. Most states require that pesticide products be registered with appropriate state regulatory authorities. EPA has delegated the authority to enforce FIFRA to some states.[269] However, states may not in any way require labels or packaging different from that required by FIFRA.[270]

- The U.S. Supreme Court in *Wisconsin Public Intervenor v. Mortier* (1991) found that federal law does not prohibit local governments from limiting pesticide use within their jurisdictions. Justice White wrote that although Congress has the power to preempt local control in this field, it has not chosen to exercise it. "As the Wisconsin Supreme Court recognized, FIFRA nowhere expressly supersedes local regulation of pesticide use."[271]

- Many states, however, have adopted statutes that prohibit local governments from regulating pesticides on private property, while permitting local regulation and bans of pesticide use on public property, such as schools, town greens, parks, and highway rights-of-way.

- This ruling left pesticide manufacturers facing the possibility of thousands of different local ordinances to control pesticides. The economic advantages of uniform regulation are enormous for producers, formulators, and applicators.

- Manufacturers then lobbied within individual states to adopt statutory language that expressly prevents local regulation of pesticides on private lands.

- Connecticut in 1983 adopted P.A. 83-193, giving the Commissioner of Environmental Protection "exclusive authority in the regulation of pesticide spraying."[272] The effect of this statute is to deny the right of any Connecticut local government to restrict use of pesticides on private property. Local governments have the right to limit the use of pesticides on public lands, such as parks, highway rights-of-way, schools and other public grounds.

- California has also adopted law that prevents local governments from regulating pesticides on private lands.[273]

Federal Pesticide Use Reporting Systems

- USDA's Agricultural Marketing Service administers the Federal Pesticide Record-Keeping Program, which requires all certified *private applicators* to keep records of their use of *federally restricted pesticides* for a period of two years. The program, authorized by the Food, Agriculture, Conservation, and Trade Act of 1990 (referred to as the 1990 Farm Bill) requires all certified private pesticide applicators who have no requirement through state regulations to maintain records to comply with the federal pesticide record-keeping regulations.[274]

- There are no federal requirements to keep track of all pesticides used, whether for agricultural or non-agricultural use.

State Pesticide Use Reporting Systems

- Several states have established pesticide use reporting systems. California was the first state in the U.S. to require full reporting of all agricultural and governmental agency pesticide use. Arizona mandates reporting of pesticide applications by commercial applicators, the applications of certain pesticides registered with the state and certain applications of pesticides included on the Arizona Department of Environmental Quality (DEQ) Groundwater Protection List (GWPL).[275] New York enacted a pesticide use reporting system in 1997, and Oregon recently implemented a sate pesticide use reporting system. Wisconsin recently passed a bill mandating development of a pesticide reporting system.[276]

State Pesticide Use Reporting Systems

State	*Year Enacted*	*Pesticides Reported*	*Pesticides Not Reported*
California	1990	All agricultural pesticide use and applications to parks, golf courses, cemeteries, rangeland, pastures, and along roadside and railroad rights-of-way. Structural pest control operators, professional gardeners, and other non-agricultural pest control operators are also required to report the amounts of pesticides used.	Home and garden use and most industrial and institutional uses.
New York	1996	Pesticide use data must be submitted by all commercial applicators. Includes lawn and garden applicators; exterminators; custodial and grounds-keeping staff in schools, office buildings, and other structures; and municipal employees who apply pesticides in such places as parks or on roadsides.	Homeowner use and sales of general use pesticides (except to farmers).
Oregon	1999	Pesticide use reports are required of anyone who uses or applies a pesticide in the course of business, for a government entity, or in a location intended for public use/access. Includes ranchers, farms, nurseries, forests, government agencies, vector control districts, utility companies, railroads, pest control companies, property managers, landlords, restaurants, hotels, and stores.	Home and garden use.
Arizona	Early 1990s	Pesticide use reports required by commercial applicators, the applications of certain pesticides registered with the State and certain applications of pesticides included on the State's Groundwater Protection List.	Limited to commercial applicators and certain pesticides.

California

- California was the first state to require pesticide use reporting and has the most comprehensive database of pesticide use in the U.S. The California Department of Pesticide Regulation (DPR) began full use reporting in 1990 to estimate dietary risk, exposure, and potential risk to workers. Under the program, all agricultural pesticide use is reported monthly to the county agricultural commissioner, who reports the data to DPR. Reports include the date and location where the application was made, and detail the kind and amount of pesticides used. Agricultural use includes pesticide applications to parks, golf courses, cemeteries, rangeland, pastures, and along roadside and railroad rights-of-way. The primary exceptions to the full use reporting requirements are home and garden use, and most industrial and institutional uses. Structural pest control operators, professional gardeners, and other nonagricultural pest control operators are also required to report the amounts of pesticides used.[277]

New York

- The Pesticide Reporting law was enacted in New York in 1996, and pesticide use data have been submitted to the state since 1997 by all commercial applicators. A commercial applicator is defined as anyone who applies pesticides for hire, including: lawn and garden applicators; exterminators; custodial and grounds-keeping staff in schools, office buildings, and other structures; and municipal employees who apply pesticides in parks or on roadsides. Some pesticide dealers are required to report on their pesticide sales to farmers, and manufacturers and importers are required to report their aggregate statewide sales of restricted use pesticides. Homeowner use and sales of general use pesticides (except to farmers) are not reported.[278]

Oregon

- In 1999, Oregon passed a law requiring full pesticide use reporting. Annual pesticide use reports are required of anyone who uses or applies a pesticide in the course of business, for a government entity, or in a location intended for public use or access. The Oregon Department of Agriculture (ODA) is responsible for its implementation. Pesticide use reporters include ranches, farms, nurseries, forests, government agencies, vector control districts, utility companies, railroads, pest control companies, property managers, landlords, restaurants, hotels, and stores. The only pesticide users that are excluded from reporting under this system are those who use pesticides around their own homes. Data collection began in 2002.[279] The Oregon Department of Agriculture has hired a private company to develop and send out a survey to more than 500 homeowners annually and use the information as a sampling of homeowner use throughout the state.[280]

Arizona

- Arizona has employed statewide pesticide use reporting since the early 1990s. Arizona mandates reporting of pesticide applications by commercial applicators, the applications of certain pesticides registered with the state, and certain applications of pesticides included on the Arizona Department of Environmental Quality (DEQ) Groundwater Protection List (GWPL).[281]

Connecticut

- Connecticut General Statutes Sec. 22a-58(c) requires pesticide applicators to keep records of restricted-use pesticide (as required by the 1990 Farm Bill) use and submit these records annually to the Connecticut Department of Environmental Protection.[282] Keeping records of *all pesticides used* satisfies the requirements necessary to be exempted from the financial obligations of providing potable water to people affected by groundwater contamination from the agricultural use of pesticides. The State of Connecticut considers a farmer responsible for any contamination due to the use of a pesticide, even if it was properly applied. Connecticut General Statutes 22a B 471a, requires maintaining records of all pesticide applications for not less than 20 years, including all invoices or purchase receipts of pesticides used. Implementing an IPM (integrated pest management) plan is one of the other conditions that farmers should meet under this Act. However, compliance with developing an IPM is totally optional.[283]

PESTICIDE USE RESTRICTIONS IN U.S. MUNICIPALITIES

- A number of cities in the U.S. have restrictions prohibiting the use of pesticides on public lands or limiting the use and/or types of pesticides.
- In New York, seven municipalities have eliminated the use of pesticides on public land and more are actively considering such a policy.[284]
- Some towns in California have also eliminated or restricted the use of pesticides. Arcata, a Northern California coastal town of 16,000, experimented with a ban on pesticides for 14 years and in 2000 created an ordinance that officially eliminated the use of pesticides on all city properties.[285] Other California towns, including San Francisco[286] and Santa Cruz, have banned pesticides in Toxicity Category I and II from use on public lands.[287]

INTERNATIONAL RESTRICTIONS ON LAWN-CARE CHEMICALS

- Some pesticides commonly used on lawns and gardens throughout the U.S. have been banned or restricted in other countries because of concerns about health effects.

COMMON LAWN AND GARDEN PESTICIDES BANNED OR RESTRICTED IN OTHER COUNTRIES

Pesticide	*Country*	*Type of Restriction*	*Reason*
MCPP	Denmark	Restricted	Groundwater pollution[288]
	Thailand	Banned, 2000	Carcinogenicity[289]
2,4-D	Kuwait	Banned, 1975	Environmental reasons[291]
	Norway	Banned, 2000	Health effects (cancer)[292]
	Denmark	Severely restricted	Groundwater pollution[293]
	Sweden	Voluntarily withdrawn, 1991	Health effects[294]
	Belize	Restricted to pastures, 1985	Damage to livestock, crops, and environment from drift[295]
	Korea	Banned for aerial spraying, feed crops, grass	Potential carcinogenicity[296]
Diazinon	Denmark	Banned, 1997	Groundwater pollution, persistence in soil, toxic effects on aquatic organisms, wildbirds and mammals.[297]
	U.S.	Banned on golf course & sod farms, 1990	Bird kills.[298]
	U.S.	Banned indoors & outdoors (residential lawn/garden uses), 2001	Health concerns.[299]
Dicamba	South Africa	Banned in some areas, 1991[300]	
	U.S.		

Note: this table does not include all cancellations and restrictions.

Sweden and Denmark

- Sweden is planning to further restrict the non-agricultural use of pesticides in 2003. The National Chemicals Inspectorate in Sweden plans to limit the use of herbicides in home gardens and is proposing to require authorization for domestic use of herbicidal products in an effort to prevent all traces of pesticides being detected in ground and surface water. About 25 products are concerned, including Roundup. Insecticides and fungicides will still be allowed for use by the general public. These products only account for 3 per cent of the total amount of pesticides used in gardens in Sweden.[301]

- The Danish Ministry of the Environment and Energy has banned many products as a result of new risk assessments. The Ministry has signed an agreement with local authorities to phase out the use of pesticides in public parks and gardens, beginning January 1, 2003.[302]

Canada

- Many Canadian municipalities have banned "cosmetic" lawn pesticides. Hudson, Quebec, was the first Canadian municipality to outlaw the use of pesticides on lawns.[303] In 2001, the Canadian Supreme Court upheld the 1991 pesticide by-laws of Hudson, Quebec, and ruled that cities could ban the use of pesticides in residential areas.[304] Two Quebec lawn-care companies that claimed Hudson was wrong to prohibit the use of chemicals that had been approved by federal and provincial authorities brought the case to court. The court concluded that, "our common future, that of every Canadian community, depends on a healthy environment…based on the distinction between essential and nonessential uses of pesticides, it is reasonable to conclude that the town by-law's purpose is to minimize the use of allegedly harmful pesticides in order to promote the health of its inhabitants."[305]

List of Active Ingredients Prohibited For Lawn Maintenance in Quebec[309]

Insecticides	Carbaril Dicofol Malathion
Herbicides	2,4-D (all chemical forms) Chlorthal dimethyl MCPA (all chemical forms) Mecoprop (all chemical forms)
Fungicides	Benomyl Captan Chlorothalonil Iprodione Quintozene Thiophanate-methyl

- In March 2003, the Province of Quebec established a Pesticide Management Code that sets "the highest standards in North America to decrease exposure to pesticides."[306] These standards are designed to control the use of pesticides to limit "the harmful effects of pesticides on human health—especially on the health of children—and on the environment."[307] The Pesticide Management Code prohibits some of "the most toxic pesticides" (see table) from use on lawns of public, semi-public and municipal green spaces. In 2006 these pesticides will also be prohibited from use on the lawns of private and commercial green spaces. The code also prohibits the sale of fertilizer-pesticide mixtures and mixed packages (e.g., herbicide and insecticide), as of April 2004; prohibits the display of products intended for domestic use in a way that makes these products accessible to the public, as of April 2005; and prohibits the sale of certain pesticides intended for domestic use, as of April 2006.[308]

8.

Recommendations By Level of Government

RECOMMENDATIONS FOR THE FEDERAL GOVERNMENT

PACKAGING

- Lawn-care pesticide products should be contained in packaging that will neither tear nor rip.
- Lawn-care pesticide packaging should prevent pesticide vapors from escaping so that odors cannot be detected.
- All consumer lawn-care pesticide packaging should be required to be childproof, as are some other pesticide products under current law.

LABELING

- Pesticide labels should be required to warn consumers of long-term (chronic) health risks, such as carcinogenicity, reproductive effects, and neurotoxicity. Currently, only acute health risks must be labeled.
- All warnings and instructions for safe use, storage, disposal and emergency advice should be printed in type not less than 18 points in size.

- Fifty percent of the front of the consumer lawn-care packaging should be required to contain:
  (1) pesticide or pesticides contained in the product;
  (2) what the pesticide or pesticides are designed to target;
  (3) precautions to prevent exposures;
  (4) protective clothing to be worn when using the product or cleaning up spills;
  (5) emergency procedures for accidental exposures;
  (6) storage instructions; and
  (7) disposal instructions.

- Labels should warn pregnant women and women expecting to become pregnant of the special hazards pesticides pose to unborn children.

- Pesticide product labels should identify all product ingredients, including "inert" ingredients. Labels should also include a summary of the acute and chronic toxicity of inert ingredients.

- Labels should include clear disposal instructions and should discourage indoor storage of partially used and open containers.

Advertising Requirements and Additional Testing Needs for Pesticides

- Lawn-care pesticide manufacturing companies should be required to state the long-term health risks to consumers whenever they advertise their products.

- Lawn-care pesticides that are not licensed for use on food crops should be required by EPA to be tested to determine their potential chronic effects, including carcinogenicity, reproductive toxicity, developmental neurotoxicity and hormonal and immune system effects.

Recommendations for the State Government

- Lawn-care pesticides should not be sold indoors or near food. Stores should be required to store pesticides outdoors in a covered storage facility with non-permeable floors without floor drains.

- State law should be amended so that local governments may regulate lawn-care pesticides more strictly than the state does. Local governments should have the legal authority to create lawn-care pesticide regulations tailored to their ecological and land use conditions. Given Connecticut's heavy reliance on shallow drinking water supplies, communities should be concerned about intensive homeowner use of lawn-care pesticides.

- Establish a tax on lawn-care pesticide products. Currently the costs of monitoring, regulating, and cleaning up pesticide contamination are passed on to private individuals or local authorities. California taxes provide roughly half of the total amount spent on pesticide-related environmental protection in California (about $50 million annually).[310]

- Disposal of pesticides should be regulated as hazardous waste. Lawn-care pesticides are often discarded along with household waste. All pesticide products should be disposed of in a manner that prevents the release of pesticides to the environment, protects groundwater, and minimizes human exposures.

- Collect lawn-care pesticide sales data and make the data publicly available. Currently, no federal or state programs track the use of pesticides, other than restricted-use pesticides. Information on non-agricultural pesticide use, including applications to public and private lands, is not available. Connecticut should develop a database to track the

amount of pesticides used on public and private property, including pesticide applications to parks, golf courses, cemeteries, rangeland, pastures, and along roadside and railroad rights-of-way, as well as the amount of pesticides purchased by homeowners. This information should be made available to the public. Several other states collect and release pesticide use data.[311] [312] [313]

- Identify zones of highest water vulnerability to lawn-care pesticides. Consideration should be given to areas with high water tables, floodplains, proximity to water bodies and wetlands, soils, and relevant geological formations when identifying vulnerable zones. Areas within one-half mile of drinking water reservoirs should be restricted from lawn-care pesticide uses.

- Develop a formal pesticide illness reporting system. Connecticut is not listed on CDC's list of State-Based Pesticide Poisoning Surveillance Programs[314] and was not included on GAO's list of states with formal pesticide reporting systems.[315] Both the National Institute for Occupational Safety and Health and the National Center for Environmental Health have identified steps that are prerequisites to establishing effective state pesticide illness reporting systems, such as passing laws requiring health care professionals to report pesticide-related illness and injury conditions and improving the training of health care professionals in pesticide incident handling.[316] Connecticut should take these steps to improve the understanding of pesticide poisonings in the state and establish a reporting system for people exposed to harmful pesticides through either accidental poisonings or accidental exposures.

- Establish a water-monitoring program for pesticides in groundwater. Long-term statewide monitoring is necessary to evaluate trends in water quality.

RECOMMENDATIONS FOR TOWNS

- Eliminate the use of lawn-care pesticides on town property. Towns should be especially careful to avoid use of lawn-care pesticides on their parks and athletic fields where children play.

- Educate residents to reduce their use of lawn-care pesticides. Encourage residents to avoid lawn-care pesticide use for cosmetic reasons**.** This is especially important in towns relying on wells for drinking water.

- Towns should demand "home-rule" so they have stricter control over lawn-care pesticides. Currently in Connecticut, towns are not allowed to have more restrictive lawn-care pesticide regulations than the state. Many towns have unique ecological and land use conditions that demand local control for the greatest protection of vulnerable water resources.

RECOMMENDATIONS FOR STORES

- Lawn-care pesticides should only be sold in covered outside facilities. These facilities should have non-permeable floors without floor drains and should be physically separated from areas containing food and other consumer products. Signs should be posted to warn consumers of the dangers of pesticides, and the need to separate them from other consumer products.

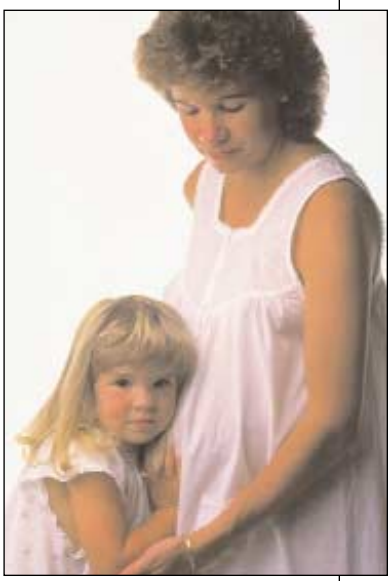
- Broken bags of lawn-care pesticides should be disposed of as hazardous waste.

- Employees should be trained in proper handling of pesticide products, including procedures to follow in the event of accidental spills.

- Large retail stores such as Walmart, Home Depot, and Lowe's should strongly encourage the federal government to require more effective packaging to ensure protection of their customers and their work force from dangerous pesticide exposures.

Recommendations for Individuals

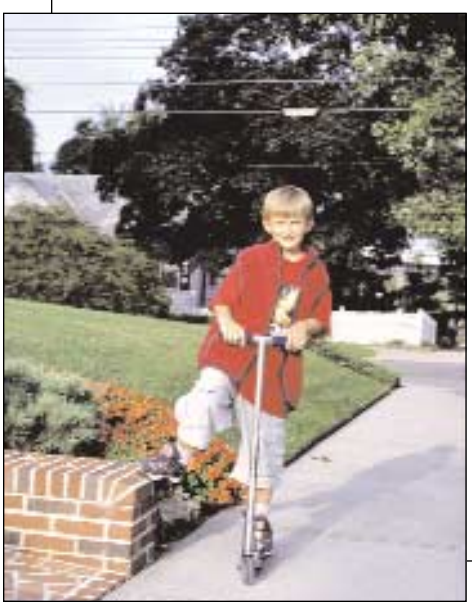
- Avoid the use of lawn-care pesticides in order to minimize health and environmental risks. Obtain expert advice regarding non-chemical solutions to your lawn and gardening problems. Consider pesticide-free landscaping alternatives that make use of native plant species tolerant of conditions in your area.



- Pregnant women should be especially careful to avoid lawn-care pesticides. Each of the five most popular lawn-care pesticides has been associated with birth or reproductive effects.

- If pesticides are used, long-sleeved shirts, pants, gloves, and shoes should be worn during application. The majority of pesticide poisoning incidents occur after dermal (skin) and inhalation exposures. Following application, children and pets should be kept away from treated areas.

- Pesticide containers should be stored securely in a location that is not accessible to children. Take unused and unwanted pesticides to hazardous waste collection sites for disposal. These products should never be put in the regular trash or down storm drains.



- If you or your neighbors routinely use lawn-care pesticides, and your water is supplied by a residential well, have your water tested for pesticides by a professional water chemist to assure its safety.

- Residents should ask town officials to restrict the use of lawn-care pesticides on town properties, including parks and school athletic fields where children play.

APPENDIX A. Lawn-Care Pesticides Found in Stores in Connecticut

HERBICIDES

2,4-DP (Dichlorprop)
2, 4-D (2, 4-Dichlorophenoxyacetic acid; 2-(2, 4-Dichlorophenoxy) propionic acid) (also a Plant Growth Regulator)
Benefin
Dicamba
Dithliopyr
Ferrous sulfate monohydrate (also a Wood Preservative)
Glyphosate
Imazapyr
Mecoprop (MCPP; 2-(2-Methyl-4-Chloropenoxy) propionic acid)
Oryzalin
Pendimethalin
Prodiamine
Siduron
Trifluralin

INSECTICIDES

Bifenthrin (also a Miticide)
Carbaryl
Cyfluthrin
Diazinon
Halofenozide
Imidacloprid
Lambda Cyhalothrin
Permethrin
Trichlorfron (1-(4-Chlorophenoxy)-3,3-dimethyl-1(1H-1,2,4-triazol-1-y1)-2-butanone)

FUNGICIDES

Thiophanate-methyl
Triadimefon

APPENDIX B. Lawn-Care Pesticide Products Found in Stores in Connecticut

Products by Bayer:

Advanced Garden 3-in-1 Multi-Purpose Potting Mix:
Imidacloprid 0.015%

Advanced Garden Lawn and Garden Multi-Insect Killer:
Cyflurthrin 0.75%

Advanced Lawn Fungus Control:
Triadimefon 1.0%

Advanced Lawn Grub Control:
Trichlorfron 6.2%

Advanced Lawn Grub Killer:
Trichlorfon 6.2%

Advanced Lawn Season-Long Grub Control:
Imidacloprid 0.2%

Advanced Lawn Power Force:
Cyfluthrin 0.1%

Products by Earth Care Naturals:

Insect Killer Granules:
Mint Oil 2.0%

Products by Eliminator:

Ant, Flea and Tick Killer Granules:
Permethrin 0.50%

5% Diazinon Insect Killer Granules:
Diazinon 5.0%

Products by Fortify:

Moss Control Granules for Lawns 0-0-16:
Ferrous Sulfate Monohydrate 32.5%

Products by Garden Place:

Diazinon Soil and Turf Insect Control Granules:
Diazinon 5%

Products by Garden Tech:

Sevin-5 Ready to Use 5% Dust Bug Killer:
Carbaryl 5.0%

Sevin Lawn Insect Granules Ant, Flea, Tick and Grub Killer:
Carbaryl 2.0%

Products by Green Light:

Amaze Grass and Weed Preventer:
Benefin: N-butyl-N-ethyl-a,a,a triflouro-2, 6-dinitro-p-toluidine 1%
Oryzalin: 3, 5-dinitro-N4, N4-dipropylsulfanilamide 1.0%

Products by Green Thumb:

Multi-Purpose Insect Control Granules:
Permethrin 0.25%

Premium Insect Control Plus Fertilizer:
Diazinon 3.33%

Premium Weed and Feed Lawn Fertilizer 28-3-3:
Dimethylamine Salt of 2,4-Dichlorophenoxyacetic Acid 0.7%
Dimethylamine Salt of 2-(2-Methyl-4-Chlorophenoxy)propionic Acid 0.36%
Dimethylamine Salt of 2-(2,4-Dichlorophenoxy)propionic Acid 0.36%

Products by Greenview:

2 Way Green Power Weed and Feed 30-3-3:
2,4-D 0.761%
Mecoprop 0.341%
Dicamba 0.072%

Insect Control Plus Lawn Food 25-3-3:
Diazinon 3.34%

Preen:
Trifluralin 1.47%

Preen 'n Green 9-17-9:
Trifluralin 0.74%

Summer Crabicide Crabgrass and Broadleaf Weed Control:
Disodium Methanearsonate Hexahydrate 4.75%
2,4-Dichlorophenoxyacetic Acid Sodium Salt Monohydrate 1.50%

Weed and Feed 30-3-4:
2,4-D 0.684%
Propionic Acid 0.306%
Dicamba 0.065%

Products by Jonathan Green:

Crabgrass Preventer Plus Green-Up Lawn Fertilizer 22-4-4:
Dithiopyr,3,5-pyridinedicarothioic acid,2-(difluromethyl)-4-(2-methylpropyl)-6-(tri fluoromethyl)-S,S-dimethyl ester 0.103%

Crabgrass Preventer Plus New Seeding Lawn Fertilizer 10-15-10:
Siduron 3.5%

Lawn Fungicide:
1-(4-chlorophenoxy)-3,3-dimethyl-1-(1h-1,2,4-triazol-1-y1)-2-butanone 0.5%

Pest Killer Turf Insecticide with Dylox Insecticide:
Dimethyl (2,2,2-trichloro-1-hydroyethyl)phosphonate 6.20%
Summer Survival Insect Control Plus Lawn Fertilizer 18-2-3:
Diazinon 3.33%

Weed and Feed Lawn Fertilizer with Broadleaf Weed Control 26-3-6:
Dimethylamine Salt of 2,4- Dichlorophenoxyacetic acid 0.70%
Dimethylamine Salt of 2-(2-methyl-4-chlorophenoxy)propionic acid 0.36%
Dimethylamine Salt of 2-(2,4-Dichlororphenoxy)propionic acid 0.36%

Weed Screen:
Trifluralin 1.47%

Products by Kgro:

Diazinon Soil and Turf Insect Control Granules:
Diazinon 5%

Crabgrass Preventer Plus Lawn Fertilizer 28-3-4:
Dithiopyr 0.11%

Products by Knock Out:

5% Diazinon Insect Granules:
Diazinon 5%

Products by Lesco:

Weed and Feed 18-2-9:
2, 4-Dichlorophenoxyacetic acid 0.56%
2-(2-Methyl-4-Chloropenoxy) propionic acid 0.29%
2-(2, 4-Dichlorophenoxy) propionic acid 0.29%

Products by Maxide:

Ready-to-Use Diazinon Insect Killer Granules:
Diazinon 5.00%

Products by Miracle-Grow:

Garden Weed Preventer:
Trifluralin 1.47%

Products by No-Pest:

Ant, Flea and Tick "Lawn Insect Control Granules":
Permethrin 0.25%

Products by Ortho:

Bug-B-Gon Multi-Purpose Insect Killer:
Carbaryl 6.3%

Bug-B-Gon Multi-Purpose Insect Killer:
Diazinon 5%

Diazinon Soil and Turf Insect Control:
Diazinon 5%

Ground Clear, Triox Total Vegetation Killer:
Glyphosate, isopropylamine salt 5.00%
Imazapyr, isopropylamine salt 0.08%

Home Defense Indoor and Outdoor Insect Killer:
Bifenthrin 0.05%

Lawn Insect Killer Granules:
Bifenthrin 0.1%

Weed-B-Gon Weed Killer for Lawns:
2, 4-D, dimethylamine salt 0.20%
Mecoprop, dimethylamine salt 0.20%

Weed and Grass Killer:
Glyphosate, isopropylamine salt 1.92%

Products by Parker's Premium:

Weed and Feed 26-3-4:
2, 4-Dichlorophenoxyacetic acid 0.55%
2-(2-Methyl-4-Chloropenoxy) propionic acid 0.27%
Dicamba 0.03%

Products by Pursell's STA-GREEN:

200 Plus Weed and Feed 28-3-3:
2, 4-Dichlorophenoxyacetic acid 0.64%
2-(2-Methyl-4-Chloropenoxy) propionic acid 0.31%
Dicamba (3, 6-dichloro-o-anisic acid) 0.03%

Lawn Insect Control with Fertilizer 24-3-4:
Permethrin 0.5%

Lawn Insect Control with Fertilizer 24-3-10:
Permethrin 0.5%

Lawn Insect Control with Fertilizer 28-4-6:
Diazinon 3.34%

Lawn Weed Control:
2, 4-Dichlorophenoxyacetic acid 1.3677%
2-(2-Methyl-4-Chloropenoxy) propionic acid 0.6120%
Dicamba (3, 6-dichloro-o-anisic acid) 0.1290%

Weed and Feed 28-2-4:
2, 4-D 0.55%
Mecoprop 0.27%
Dicamba 0.03%

Products by Real-Kill:

Multi-Purpose Ready-To-Use Granules: Lawn and Garden Insect Killer:
Permethrin 0.25%

Products by Sam's Choice:

Weed and Feed 28-3-3:
Dimethylamine salt of 2, 4-D 0.626%
Dimethylamine salt of Mecoprop 0.327%
Dimethylamine salt of Dichlorprop 0.322%

Products by Schultz:

Expert Gardner Crabgrass Preventer 28-3-4:
Prodiamine 0.2%

Products by Scotts:

Grubex Season-Long Grub Control:
Halofenozide 1.5%

Lawn Fungus Control:
Thiophanate-methyl 2.30%

Lawn Pro Annual Program Step 2 of 4 Easy Steps to a Better Lawn:
2,4-D 1.25%
Mecoprop 0.62%
Dicamba0.05%

Moss Control Granules for Lawns:
Ferrous sulfate monohydrate 17.5%

Turf Builder with HALTS Crabgrass Preventer:
Pendimethalin 1.29%

Turf Builder with Insect Control:
Diazinon 3.20%

Turf Builder with PLUS2 Weed Control 28-3-3:
2, 4-D 1.21%
MCPP 1.21%

Weed and Feed Weed Control plus Fertilizer:
2, 4-D 0.761%
MCPP 0.341%
Dicamba 0.072%

Winterizer with PLUS2 Weed Control Fall Weed and Feed:
2, 4-D 1.04%
MCPP 1.04%

Products by Spectracide:

Bug Stop Insect Control Granules:
Permethrin 0.25%

Soil and Turf Insect Control 6000: Diazinon Granules:
Diazinon 5%

Triazicide Soil and Turf Insect Killer Granules:
Lambda Cyhalothrin 0.04%

Products by St. Gabriel Laboratories:

Milky Spore All Natural All Season Grub Control:
Spores of Bacillus popillae-Dutky 0.02%

Products by Vigoro Ultra Turf:

Insect Control plus Fertilizer 20-3-10:
Permethrin 0.5%

Pre-Emergent Crabgrass Control plus Fertilizer 30-3-4:
Dithliopyr 0.17%

Ultra Turf 28-3-3:
2, 4-D 0.64%
Mecoprop 0.31%
Dicamba 0.03%

Weed and Feed 28-3-3:
2, 4-D 0.64%
Mecoprop 0.31%
Dicamba 0.03%

Products made without a brand name label:

Lawn Weed Control:
2,4-Dichlorophenoxyacetic acid 1.3677%
2-(2-methyl-4-chlororphenoxy)propionic acid 0.6120%
Dicamba 0.1290%

Turf Fungicide:
1-(4-Chlorophenoxy)-3,3-dimethyl-1(1H-1,2,4-triazol-1-y1)-2-butanone 0.5%

APPENDIX C. Lawn-Care Pesticide Products Found in Stores in Connecticut, Listed By Store Name

Home Depot: Waterford, CT 5/28/02

Products made by Bayer:

Advanced Lawn Fungus Control:
Triadimefon 1.0%

Advanced Lawn Grub Control:
Trichlorfron 6.2%

Advanced Lawn Season-Long Grub Control:
Imidacloprid 0.2%

Products by Greenview:

Preen:
Trifluralin 1.47%

Preen 'n Green 9-17-9:
Trifluralin 0.74%

Products made by Lesco:

Weed and Feed 18-2-9:
2, 4-Dichlorophenoxyacetic acid 0.56%;
2-(2-Methyl-4-Chloropenoxy) propionic acid 0.29%
2-(2, 4-Dichlorophenoxy) propionic acid 0.29%

Products made by Ortho:

Bug-B-Gon Multi-Purpose Insect Killer:
Carbaryl 6.3%

Ground Clear, Triox Total Vegetation Killer:
Glyphosate, isopropylamine salt 5.00%
Imazapyr, isopropylamine salt 0.08%

Home Defense "Indoor and Outdoor Insect Killer":
Bifenthrin 0.05%

Weed-B-Gon Weed Killer for Lawns:
2, 4-D, dimethylamine salt 0.20%
Mecoprop, dimethylamine salt 0.20%

Weed and Grass Killer:
Glyphosate, isopropylamine salt 1.92%

Products made by Real-Kill:

Multi-Purpose Ready-To-Use Granules: Lawn and Garden Insect Killer:
Permethrin 0.25%

Products made by Scotts:

Grubex Season-Long Grub Control:
Halofenozide 1.5%

Lawn Fungus Control:
Thiophanate-methyl 2.30%

Moss Control Granules for Lawns:
Ferrous sulfate monohydrate 17.5%

Turf Builder with HALTS Crabgrass Preventer:
Pendimethalin 1.29%

Turf Builder with PLUS2 Weed Control 28-3-3:
2, 4-D 1.21%
MCPP 1.21%

Products made by Spectracide:

Triazicide Soil and Turf Insect Killer Granules:
Lambda-Cyhalothrin 0.04%

Products by Vigoro Ultra Turf:

Insect Control plus Fertilizer 20-3-10:
Permethrin 0.5%

Pre-Emergent Crabgrass Control plus Fertilizer 30-3-4:
Dithliopyr 0.17%

Ultra Turf 28-3-3:
2, 4-D 0.64%
Mecoprop 0.31%
Dicamba 0.03%

Weed and Feed 28-3-3:
2, 4-D 0.64%
Mecoprop 0.31%
Dicamba 0.03%

Target: Waterford, CT 5/28/02

Products by Earth Care Naturals:
Insect Killer Granules
Mint Oil 2.0%

Products by Garden Place:
Diazinon Soil and Turf Insect Control Granules:
Diazinon 5%

Products by Green Light:
Amaze Grass and Weed Preventer:
Benefin: N-butyl-N-ethyl-a,a,a triflouro-2, 6-dinitro-p-toluidine 1%
Oryzalin: 3, 5-dinitro-N4, N4-dipropylsulfanilamide 1.0%

Products made by Ortho:
Bug-B-Gon Multi-Purpose Insect Killer:
Diazinon 5%

Diazinon Soil and Turf Insect Control:
Diazinon 5%

Products by Schultz:
Expert Gardner Crabgrass Preventer 28-3-4:
Prodiamine 0.2%

Products made by Spectracide:
Soil and Turf Insect Control 6000: Diazinon Granules:
Diazinon 5%

Walmart: Groton, CT 5/30/02

Products by Eliminator:
Ant, Flea and Tick Killer Granules:
Permethrin 0.50%
5% Diazinon Insect Killer Granules:
Diazinon 5.0%

Products by Garden Tech Sevin:
Lawn Insect Granules "Ant, Flea, Tick and Grub Killer":
Carbaryl 2.0%

Products made by Miracle-Grow:
Garden Weed Preventer:
Trifluralin 1.47%

Products made by Ortho:
Diazinon Soil and Turf Insect Control:
Diazinon 5%

Products by Sam's Choice:
Weed and Feed 28-3-3:
Dimethylamine salt of 2, 4-D 0.626%
Dimethylamine salt of Mecoprop 0.327%
Dimethylamine salt of Dichlorprop 0.322%

Products made by Scotts:
Grubex Season-Long Grub Control:
Halofenozide 1.5%

Lawn Fungus Control:
Thiophanate-methyl 2.30%

Turf Builder with HALTS Crabgrass Preventer:
Pendimethalin 1.29%

Turf Builder with Insect Control:
Diazinon 3.20%

Turf Builder with PLUS2 Weed Control 28-3-3:
2, 4-D 1.21%
MCPP 1.21%

Winterizer with PLUS2 Weed Control Fall Weed and Feed:
2, 4-D 1.04%
MCPP 1.04%

Walmart (Better Homes and Gardens Garden Center): Waterford, CT 5/30/02

Products made by Bayer:
Advanced Lawn Season-Long Grub Control:
Imidacloprid 0.2%

Products by Eliminator:
Ant, Flea and Tick Killer Granules:
Permethrin 0.50%
5% Diazinon Insect Killer Granules:
Diazinon 5.0%

Products by Garden Tech:
Sevin Lawn Insect Granules Ant, Flea, Tick and Grub Killer:
Carbaryl 2.0%

Products made by Miracle-Grow:
Garden Weed Preventer:
Trifluralin 1.47%

Garden Weed Prevent and Plant Food:
Trifluralin 0.74%

Products made by Ortho:
Diazinon Soil and Turf Insect Control:
Diazinon 5%

Products by Sam's Choice:
Weed and Feed 28-3-3:
Dimethylamine salt of 2, 4-D 0.626%
Dimethylamine salt of Mecoprop 0.327%
Dimethylamine salt of Dichlorprop 0.322%

Products made by Scotts:
Grubex Season-Long Grub Control:
Halofenozide 1.5%

Lawn Fungus Control:
Thiophanate-methyl 2.30%

Turf Builder with PLUS2 Weed Control 28-3-3:
2, 4-D 1.21%
MCPP 1.21%

BJ's: Waterford, CT 5/30/02

Products made by Scotts:
Turf Builder with HALTS Crabgrass Preventer:
Pendimethalin 1.29%

Products made by Spectracide:

Soil and Turf Insect Control 6000: Diazinon Granules:
Diazinon 5%

Lowe's Home Improvement Warehouse: Newington, CT 5/31/02

Products made by Bayer:

Advanced Garden 3-in-1 Multi-Purpose Potting Mix:
Imidacloprid 0.015%

Advanced Lawn Grub Control:
Trichlorfron 6.2%

Advanced Lawn Grub Killer:
Trichlorfon 6.2%

Advanced Lawn Season-Long Grub Control:
Imidacloprid 0.2%

Advanced Lawn Power Force:
Cyfluthrin 0.1%

Products made by No-Pest:

Ant, Flea and Tick Lawn Insect Control Granules:
Permethrin 0.25%

Products by Parker's Premium:

Weed and Feed 26-3-4
2, 4-Dichlorophenoxyacetic acid 0.55%
2-(2-Methyl-4-Chloropenoxy) propionic acid 0.27%
Dicamba 0.03%

Products by Pursell's STA-GREEN:

200 Plus Weed and Feed 28-3-3:
2, 4-Dichlorophenoxyacetic acid 0.64%
2-(2-Methyl-4-Chloropenoxy) propionic acid 0.31%
Dicamba (3, 6-dichloro-o-anisic acid) 0.03%

Lawn Insect Control with Fertilizer 24-3-4:
Permethrin 0.5%

Lawn Weed Control:
2, 4-Dichlorophenoxyacetic acid 1.3677%
2-(2-Methyl-4-Chloropenoxy) propionic acid 0.6120%
Dicamba (3, 6-dichloro-o-anisic acid) 0.1290%

Weed and Feed 28-2-4:
2, 4-D 0.55%
Mecoprop 0.27%
Dicamba 0.03%

Products made by Scotts:

Grubex Season-Long Grub Control:
Halofenozide 1.5%

Lawn Fungus Control:
Thiophanate-methyl 2.30%

Moss Control Granules for Lawns:
Ferrous sulfate monohydrate 17.5%

Turf Builder with HALTS Crabgrass Preventer:
Pendimethalin 1.29%

Turf Builder with PLUS2 Weed Control 28-3-3:
2, 4-D 1.21%
MCPP 1.21%

Turf Builder with Summer Guard:
Bifenthrin 0.086%

Products made by Spectracide:

Bug Stop Insect Control Granules:
Permethrin 0.25%

Triazicide Soil and Turf Insect Killer Granules:
Lambda-Cyhalothrin 0.04%

Sam's Club: New Britain, CT 5/31/02

Products by Knock Out:

5% Diazinon Insect Granules:
Diazinon 5%

Products made by Scotts:

Weed and Feed Weed Control plus Fertilizer:
2, 4-D 0.761%

Home Depot: New Britain, CT 5/31/02

Products made by Bayer:

Advanced Lawn Season-Long Grub Control:
Imidacloprid 0.2%

Products made by Lesco:

Weed and Feed 18-2-9:
2, 4-Dichlorophenoxyacetic acid 0.56%
2-(2-Methyl-4-Chloropenoxy) propionic acid 0.29%
2-(2, 4-Dichlorophenoxy) propionic acid 0.29%

Products made by Ortho:

Bug-B-Gon Multi-Purpose Insect Killer:
Carbaryl 6.3%

Products made by Real-Kill:

Multi-Purpose Ready-To-Use Granules: Lawn and Garden Insect Killer:
Permethrin 0.25%

Products made by Scotts:

Grubex Season-Long Grub Control:
Halofenozide 1.5%

Lawn Fungus Control:
Thiophanate-methyl 2.30%

Moss Control Granules for Lawns:
Ferrous sulfate monohydrate 17.5%

Turf Builder with HALTS Crabgrass Preventer:
Pendimethalin 1.29%

Turf Builder with PLUS2 Weed Control 28-3-3:
2, 4-D 1.21%
MCPP 1.21%

Turf Builder with Summer Guard:
Bifenthrin 0.086%

Products made by Spectracide:

Triazicide Soil and Turf Insect Killer Granules:
Lambda-Cyhalothrin 0.04%

Products by Vigoro Ultra Turf:

Insect Control plus Fertilizer 20-3-10:
Permethrin 0.5%

Pre-Emergent Crabgrass Control plus Fertilizer 30-3-4:
Dithliopyr 0.17%

Weed and Feed 28-3-3:
2, 4-D 0.64%
Mecoprop 0.31%
Dicamba 0.03%

Costco: Waterbury, CT 5/31/02

Products made by Ortho:

Lawn Insect Killer Granules:
Bifenthrin 0.1%

Cash True Value Home Center: Mystic, CT 6/17/02

Products by Bayer:

Advanced Lawn Grub Control:
Trichlorfron 6.2%

Products by Green Thumb:

Multi-Purpose Insect Control Granules:
Permethrin 0.25%

Premium Insect Control Plus Fertilizer:
Diazinon 3.33%

Premium Weed and Feed Lawn Fertilizer 28-3-3:
Dimethylamine Salt of 2,4-Dichlorophenoxyacetic Acid 0.7%
Dimethylamine Salt of 2-(2-Methyl-4-Chlorophenoxy)propionic Acid 0.36%
Dimethylamine Salt of 2-(2,4-Dichlorophenoxy)propionic Acid 0.36%

Products by Scotts:

Grubex Season-Long Grub Control:
Halofenozide 1.5%

Lawn Fungus Control:
Thiophanate-methyl 2.30%

Lawn Pro Annual Program Step 2 of 4 Easy Steps to a Better Lawn:
2,4-D 1.25%
Mecoprop 0.62%
Dicamba 0.05%

Moss Control Granules for Lawns:
Ferrous sulfate monohydrate 17.5%

Turf Builder with PLUS2 Weed Control 28-3-3:
2, 4-D 1.21%;
MCPP 1.21%

Products by St. Gabriel Laboratories:

Milky Spore All Natural All Season Grub Control:
Spores of Bacillus popillae-Dutky 0.02%

Products made without a brand name label:

Turf Fungicide:
1-(4-Chlorophenoxy)-3,3-dimethyl-1(1H-1,2,4-triazol-1-y1)-2-butanone 0.5%

Johnson's Hardware and Home Center (True Value): Groton, CT 6/17/02

Products by Greenview:

2 Way Green Power Weed and Feed 30-3-3:
2,4-D 0.761%
Mecoprop 0.341%
Dicamba 0.072%

Insect Control Plus Lawn Food 25-3-3:
Diazinon 3.34%

Summer Crabicide Crabgrass and Broadleaf Weed Control:
Disodium Methanearsonate Hexahydrate 4.75%
2,4-Dichlorophenoxyacetic Acid Sodium Salt Monohydrate 1.50%

Weed and Feed 30-3-4:
2,4-D 0.684%
Propionic Acid 0.306%
Dicamba 0.065%

Products by Jonathan Green:

Pest Killer Turf Insecticide with Dylox Insecticide:
Dimethyl (2,2,2-trichloro-1-hydroyethyl)phosphonate 6.20%

Products by Maxide:
Ready-to-Use Diazinon Insect Killer Granules:
Diazinon 5.00%

Home Depot: Lisbon, CT 6/17/02

Products by Bayer:
Advanced Garden Lawn and Garden Multi-Insect Killer:
Cyflurthrin 0.75%

Advanced Lawn Grub Control:
Trichlorfron 6.2%

Advanced Lawn Season-Long Grub Control:
Imidacloprid 0.2%

Products by Ortho:
Bug-B-Gon Multi-Purpose Insect Killer:
Carbaryl 6.3%

Products by Real-Kill:
Multi-Purpose Ready-To-Use Granules: Lawn and Garden Insect Killer:
Permethrin 0.25%

Products by Scotts:
Grubex Season-Long Grub Control:
Halofenozide 1.5%

Moss Control Granules for Lawns:
Ferrous sulfate monohydrate 17.5%

Turf Builder with HALTS Crabgrass Preventer:
Pendimethalin 1.29%

Turf Builder with PLUS2 Weed Control 28-3-3:
2, 4-D 1.21%
MCPP 1.21%

Turf Builder with Summer Guard:
Bifenthrin 0.086%

Products by Spectracide:
Triazicide Soil and Turf Insect Killer Granules:
Lambda-Cyhalothrin 0.04%

Products by Vigoro Ultra Turf:

Pre-Emergent Crabgrass Control plus Fertilizer 30-3-4:
Dithliopyr 0.17%

Ultra Turf 28-3-3:
2, 4-D 0.64%
Mecoprop 0.31%
Dicamba 0.03%

Weed and Feed 28-3-3:
2, 4-D 0.64%
Mecoprop 0.31%
Dicamba 0.03%

Products made without a brand name label:

Lawn Weed Control:
2,4-Dichlorophenoxyacetic acid 1.3677%
2-(2-methyl-4-chlororphenoxy)propionic acid 0.6120%
Dicamba 0.1290%

Walmart Super Center: Lisbon, CT 6/17/02

Products by Eliminator:

Ant, Flea and Tick Killer Granules:
Permethrin 0.50%
5% Diazinon Insect Killer Granules:
Diazinon 5.0%

Products by Garden Tech:

Sevin Lawn Insect Granules Ant, Flea, Tick and Grub Killer:
Carbaryl 2.0%

Products by Sam's Choice:

Weed and Feed 28-3-3:
Dimethylamine salt of 2, 4-D 0.626%
Dimethylamine salt of Mecoprop 0.327%
Dimethylamine salt of Dichlorprop 0.322%

Products by Scotts:

Grubex Season-Long Grub Control:
Halofenozide 1.5%

Turf Builder with PLUS2 Weed Control 28-3-3:
2, 4-D 1.21%
MCPP 1.21%

Ace Home Center: Norwichtown, CT 6/17/02

Products by Fortify:

Moss Control Granules for Lawns 0-0-16
Ferrous Sulfate Monohydrate 32.5%

Products by Garden Tech:

Sevin-5 Ready to Use 5% Dust Bug Killer
Carbaryl 5.0%

Sevin Lawn Insect Granules Ant, Flea, Tick and Grub Killer:
Carbaryl 2.0%

Products by Jonathan Green:

Crabgrass Preventer Plus Green-Up Lawn Fertilizer 22-4-4:
Dithiopyr,3,5-pyridinedicarothioic acid,2-(difluromethyl)-4-(2-methylpropyl)-6-(tri fluoromethyl)-S,S-dimethyl ester 0.103%

Crabgrass Preventer Plus New Seeding Lawn Fertilizer 10-15-10:
Siduron 3.5%

Lawn Fungicide:
1-(4-chlorophenoxy)-3,3-dimethyl-1-(1h-1,2,4-triazol-1-y1)-2-butanone 0.5%
Pest Killer Turf Insecticide with Dylox Insecticide:
Dimethyl (2,2,2-trichloro-1-hydroyethyl)phosphonate 6.20%

Summer Survival Insect Control Plus Lawn Fertilizer 18-2-3:
Diazinon 3.33%

Weed and Feed Lawn Fertilizer with Broadleaf Weed Control 26-3-6:
Dimethylamine Salt of 2,4- Dichlorophenoxyacetic acid 0.70%
Dimethylamine Salt of 2-(2-methyl-4-chlorophenoxy)propionic acid 0.36%
Dimethylamine Salt of 2-(2,4-Dichlororphenoxy)propionic acid 0.36%

Weed Screen:
Trifluralin 1.47%

Products by Scotts:

Lawn Fungus Control:
Thiophanate-methyl 2.30%

Turf Builder with HALTS Crabgrass Preventer:
Pendimethalin 1.29%

Lowe's Home Improvement Warehouse: Orange, CT 6/19/02

Products by Bayer:

Advanced Garden Lawn and Garden Multi-Insect Killer
Cyflurthrin 0.75%

Advanced Lawn Grub Control:
Trichlorfron 6.2%

Advanced Lawn Season-Long Grub Control:
Imidacloprid 0.2%

Advanced Lawn Power Force:
Cyfluthrin 0.1%

Products by No-Pest:

Ant, Flea and Tick Lawn Insect Control Granules:
Permethrin 0.25%

Products by Pursell's STA-GREEN:

200 Plus Weed and Feed 28-3-3:
2, 4-Dichlorophenoxyacetic acid 0.64%
2-(2-Methyl-4-Chloropenoxy) propionic acid 0.31%
Dicamba (3, 6-dichloro-o-anisic acid) 0.03%

Lawn Insect Control with Fertilizer 28-4-6:
Diazinon 3.34%

Lawn Weed Control:
2, 4-Dichlorophenoxyacetic acid 1.3677%
2-(2-Methyl-4-Chloropenoxy) propionic acid 0.6120%
Dicamba (3, 6-dichloro-o-anisic acid) 0.1290%

Weed and Feed 28-2-4:
2, 4-D 0.55%
Mecoprop 0.27%
Dicamba 0.03%

Products by Scotts:

Grubex Season-Long Grub Control:
Halofenozide 1.5%

Turf Builder with PLUS2 Weed Control 28-3-3:
2, 4-D 1.21%
MCPP 1.21%

Turf Builder with Summer Guard:
Bifenthrin 0.086%

Products by Spectracide:

Bug Stop Insect Control Granules:
Permethrin 0.25%

Soil and Turf Insect Control 6000: Diazinon Granules:
Diazinon 5%

Triazicide Soil and Turf Insect Killer Granules:
Lambda-Cyhalothrin 0.04%

Lowe's Home Improvement Warehouse: New Haven, CT 6/19/02

Products by Bayer:

Advanced Garden Lawn and Garden Multi-Insect Killer
Cyflurthrin 0.75%
Advanced Lawn Grub Control:
Trichlorfron 6.2%

Advanced Lawn Season-Long Grub Control:
Imidacloprid 0.2%

Advanced Lawn Power Force:
Cyfluthrin 0.1%

Products by No-Pest:

Ant, Flea and Tick Lawn Insect Control Granules:
Permethrin 0.25%

Products by Pursell's STA-GREEN:

200 Plus Weed and Feed 28-3-3:
2, 4-Dichlorophenoxyacetic acid 0.64%
2-(2-Methyl-4-Chloropenoxy) propionic acid 0.31%
Dicamba (3, 6-dichloro-o-anisic acid) 0.03%

Lawn Insect Control with Fertilizer 24-3-10:
Permethrin 0.5%

Lawn Insect Control with Fertilizer 28-4-6:
Diazinon 3.34%

Weed and Feed 28-2-4:
2, 4-D 0.55%
Mecoprop 0.27%
Dicamba 0.03%

Products by Scotts:

Grubex Season-Long Grub Control:
Halofenozide 1.5%

Lawn Fungus Control:
Thiophanate-methyl 2.30%

Moss Control Granules for Lawns:
Ferrous sulfate monohydrate 17.5%

Turf Builder with HALTS Crabgrass Preventer:
Pendimethalin 1.29%

Turf Builder with PLUS2 Weed Control 28-3-3:
2, 4-D 1.21%
MCPP 1.21%

Turf Builder with Summer Guard:
Bifenthrin 0.086%

Products by Spectracide:

Bug Stop Insect Control Granules:
Permethrin 0.25%

Soil and Turf Insect Control 6000: Diazinon Granules:
Diazinon 5%
Triazicide Soil and Turf Insect Killer Granules:
Lambda-Cyhalothrin 0.04%

Kmart Super Center: New Haven, CT 6/19/02

Products by Bayer:

Advanced Lawn Grub Control:
Trichlorfron 6.2%

Advanced Lawn Grub Killer:
Trichlorfon 6.2%

Products by Kgro:

Diazinon Soil and Turf Insect Control Granules:
Diazinon 5%

Crabgrass Preventer Plus Lawn Fertilizer 28-3-4:
Dithiopyr 0.11%

Products by Ortho:

Bug-B-Gon Multi-Purpose Insect Killer:
Diazinon 5%

Products by Scotts:

Grubex Season-Long Grub Control:
Halofenozide 1.5%

Turf Builder with HALTS Crabgrass Preventer:
Pendimethalin 1.29%

Turf Builder with Insect Control
Diazinon 3.20%

Turf Builder with PLUS2 Weed Control 28-3-3:
2, 4-D 1.21%
MCPP 1.21%

Winterizer with PLUS2 Weed Control Fall Weed and Feed:
2, 4-D 1.04%
MCPP 1.04%

References

1 USEPA. Questions and answers on lawn pesticides. Updated 12/16/1997. Available at http://pmep.cce.cornell.edu/issues/lawnissues.html#Pesticides.

2 USEPA. 1998-1999 Pesticide market estimates. Available at http://www.epa.gov/oppbead1/pestsales/99pestsales/usage1999_table3_4.html.

3 Jenkins V. Lawn: A history of an American obsession. Smithsonian Institution Press. 2000.

4 USFWS. Homeowner's guide to protecting frogs – lawn and garden care. Division of Environmental Contaminants. July, 2000.

5 EHHI. A survey of private drinking water wells for lawn and tree care pesticides in a Connecticut town.1998 Available at http://www.ehhi.org/pubs/survey_wells.html.

6 Wargo J. Our Children's toxic legacy. 1998. Yale University Press.

7 USEPA. 12/16/1997. Op. cit.

8 USEPA. FIFRA Scientific Advisory Panel Meeting. June 25-27, 2002. http://www.epa.gov/scipoly/sap/2002/index.htm#june. Determination of the appropriate FQPA safety factors in the organophosphate pesticide cumulative risk assessment. At 7. http://www.epa.gov/oscpmont/sap/2002/june/final_10x_cra.pdf.

9 Attorney General of NewYork. The secret hazards of pesticides: inert ingredients. NewYork State Office of the Attorney General, Environmental Protection Bureau. February 1996. Available at http://www.oag.state.ny.us/environment/inerts96.html#table1.

10 Gold E et al. Risk factors for brain tumors in children, American Journal of Epidemiology 1979 109(3): 309-319; Lowengart P et al. Childhood leukemia and parents' occupational and home exposures, Journal of the Nat Cancer Institute 1995 79(1):39-45; Reeves J. Household insecticide-associated blood dyscrasias in children, (letter) American Journal of Pediatric Hematology/Oncology 1982 4:438-439; Davis J et al. Family pesticide use and childhood brain cancer, Archives of environ contamin and toxicol 1993 24:87-923; Leiss J et al. Home pesticide use and childhood cancer: a case-control study, Am J of Pub Health 1995 85:249-252; Buckley J et al. Epidemiological characteristics of childhood acute lymphocytic leukemia, Leukemia 1994 8(5):856-864. As cited in Beyond pesticides facts and figures children, pesticides, and schools. Available at http://www.beyondpesticides.org/schools/alerts/SEPA_fact&figures.htm#_edn10.

11 Zahm SH, Ward MH. Pesticides and childhood cancer. Environ Health Perspect. 1998 106 Suppl 3:893-908.

12 Adgate J, Barr D, Clayton C et al. Measurement of children's exposure to pesticides: analysis of urinary metabolite levels in a probability-based sample. Environ Health Perspect 2001 109(6). Available at http://ehpnet1.niehs.nih.gov/docs/2001/109p583-590adgate/abstract.html.

13 Lu C, Knutson D, Fisker-Andersen J et al. Biological monitoring survey of organophosphorus pesticide exposure among pre-school children in the Seattle metropolitan area. Environ Health Perspect 2001 109:299-303. Available at http://ehpnet1.niehs.nih.gov/docs/2001/109p299-303lu/abstract.html.

14 Pimental D. Cornell University. Personal Communication. March 25, 2003. See also: Kimbrell, A. 2003. The Ecologist. http://www.theecologist.org/archive.html. "Cornell University's professor David Pimentel estimates that 672 million birds are affected by pesticide use on farmlands and 10 per cent of these—67 million—die each year."

15 http://www.mercola.com/2001/jul/4/pesticides.htm.

16 Gilliom R. 1999. Pesticides in the nation's water resources. U.S. Geological Survey. Water Environment Federation Briefing Series Presentation. Washington D.C. March 19, 1999. Available at http://water.wr.usgs.gov/pnsp/present/water/.

17 Ingram M, Nabhan GP, Buchmann S. Impending pollination crisis threatens biodiversity and agriculture. Tropinet 1996 7(1). As cited in USFWS. Pollinators. Division of Environmental Quality. Updated June, 2001. Available at http://contaminants.fws.gov/Issues/Pollinators.cfm#Ingram 1996b.

18 CDPR. 2000 Status report pesticide contamination prevention act. December 2000. Available at http://www.cdpr.ca.gov/docs/empm/pubs/ehapreps/eh0014.pdf.

19 Gilliom RJ. Op. cit.

20 California Public Interest Research Group Charitable Trust and Californians for Pesticide Reform (CPR). Toxics on tap: pesticides in California drinking water sources. 1999. Available at http://www.calpirg.org/reports/toxictap.pdf.

[21] Pimental, D. Op. cit.

[22] Connecticut Public Act 83-193; See: Chapter 441 pesticide control. Sec. 22a54a. Pesticide applicators, certification, classification, notice, fees; reciprocity; financial responsibility; aircraft, tree, public employee applicators.

[23] Environment Quebec. Press release. Health, environment and pesticides: Québec adopts the highest standards in North America to decrease exposure to pesticides. Available at http://www.menv.gouv.qc.ca/communiques_en/c20030305-pesticides.htm.

[24] Quebec's pesticide management code also has other restrictions. See Environment Quebec. Pesticide Management Code. April 4, 2003. http://www.menv.gouv.qc.ca/pesticides/permis-en/code-gestion-en/index.htm#active.

[25] USEPA. 12/16/1997. Op. cit.

[26] University of California at Davis. What are the risk factors for Non-Hodgkin's Lymphomas? 2001. Available at http://www.ucdmc.ucdavis.edu/ucdhs/health/a-z/84Lymphomas/doc84risks.html.

[27] Zahm SH, Blair A. Pesticides and non-Hodgkin's lymphoma. Cancer Res 1992 Oct 1;52(19 Suppl):5485s-5488s. Available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1394159&dopt=Abstract.

[28] Pesticide Action Network Database. Carcinogenicity. Available at http://docs.pesticideinfo.org/documentation4/ref_toxicity3.html#PANSummaryCancer.

[29] McDuffie HH, Pahwa P, McLaughlin JR et al. Non-Hodgkin's lymphoma and specific pesticide exposures in men: cross-Canada study of pesticides and health. Cancer Epidemiol Biomarkers Prev 2001;10(11):1155-63. Abstract available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11700263&dopt=Abstract.

[30] Hoar SK, Blair A, Holmes FF et al. Agricultural herbicide use and risk of lymphoma and soft-tissue sarcoma. JAMA 1986;256(9):1141-7. Abstract available at http://highwire.stanford.edu/cgi/medline/pmid;3801091.

[31] Zahm SH, Weisenburger DD, Babbitt PA et al. A case-control study of non-Hodgkin's lymphoma and the herbicide 2,4-dichlorophenoxyacetic acid (2,4-D) in eastern Nebraska. Epidemiology 1990;1(5): 349-56. Abstract available at http://highwire.stanford.edu/cgi/medline/pmid;2078610.

[32] Woods JS, Polissar L, Severson RK et al. Soft tissue sarcoma and non-Hodgkin's lymphoma in relation to phenoxyherbicide and chlorinated phenol exposure in western Washington. J Natl Cancer Inst 1987;78(5): 899-910. Abstract available at http://highwire.stanford.edu/cgi/medline/pmid;3471999.

[33] EXTOXNET. Pesticide information profile, 2,4-D. 1996. Available at http://ace.ace.orst.edu/info/extoxnet/pips/24-D.htm.

[34] EXTOXNET. 2-4-D factsheet. 1993. Available at http://pmep.cce.cornell.edu/profiles/extoxnet/24d-captan/24d-ext.html.

[35] USEPA. Consumer factsheet on: 2,4-D. Available at http://www.epa.gov/safewater/dwh/c-soc/24-d.html.

[36] Information Ventures, Inc. 2,4-D pesticide factsheet. Prepared for the U.S. Department of Agriculture, Forest Service. Available at http://infoventures.com/e-hlth/pestcide/24d.html.

[37] Id.

[38] USEPA. Consumer factsheet on: 2,4-D. Op. cit.

[39] Leonard C, Burke CM, O'Keane C, Doyle JS. "Golf ball liver": agent orange hepatitis. Gut 1997;40(5):687-8. Available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9203952.

[40] Hardell L, Eriksson M, Nordstrom M. Exposure to pesticides as risk factor for non-Hodgkin's lymphoma and hairy cell leukemia: pooled analysis of two Swedish case-control studies. Leuk Lymphoma 2002;43(5):1043-9. Available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=12148884&dopt=Abstract.

[41] EXTOXNET. Glyphosate (Roundup) chemical profile. Available at http://pmep.cce.cornell.edu/profiles/herb-growthreg/fatty-alcohol-monuron/glyphosate/herb-prof-glyphosate.html.

[42] Id.

[43] Lynge EA. Follow up study of cancer incidence among workers in manufacture of phenoxy herbicides in Denmark. Brit J of Cancer. 1985;52:259-270. As cited in EXTOXNET. Mecroprop Profile. Pesticide information profile. 1995. Available at http://pmep.cce.cornell.edu/profiles/extoxnet/haloxyfop-methylparathion/mecoprop-ext.html.

[44] EXTOXNET. Mecroprop profile. Pesticide information profile. 1995. Available at http://pmep.cce.cornell.edu/profiles/extoxnet/haloxyfop-methylparathion/mecoprop-ext.html.

[45] Data not required because MCPP and its derivatives and metabolites are not organophosphates or cholinesterase inhibitors.

[46] EXTOXNET. 1995. Op. cit.

[47] McDuffie HH, Pahwa P, McLaughlin JR et al. Op. cit.

[48] EXTOXNET. Dicamba profile. Pesticide information profile. 1994. Available at http://pmep.cce.cornell.edu/profiles/extoxnet/carbaryl-dicrotophos/dicamba-ext.html.

[49] California Dept. of Food and Agriculture. Medical Toxicology Branch. Summary of toxicology data: Dicamba.1990. Sacramento, CA. Beasley VR. 2,4-D toxicosis I: A pilot study of 2,4-dichlorophenoxyacetic acid- and dicamba-induced myotonia in experimental dogs. Vet Hum Toxicol 1991;33(5):435-440. As cited in Cox, Caroline. Herbicide Factsheet: Dicamba. J of Pest Reform 1994 14(1). Available at http://www.pesticide.org/dicamba.pdf.

[50] EXTOXNET. 1994. Op. cit.

[51] 2,7-dichlorodibenzo-p-dioxin, has been linked with abnormalities, suppression of tissue growth, and lesions in fetal hearts in pregnant rats.

[52] Davis JR et al. Family pesticide use and childhood brain cancer. Arch Environ Contam Toxicol 1993 Jan;24(1):87-92. Available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=8466294&dopt=Abstract.

[53] Cantor KP, Blair A, Everett G et al. Pesticides and other agricultural risk factors for non-Hodgkin's lymphoma among men in Iowa and Minnesota. Cancer Res 1992;1(52):2447-2455. Available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1568215&dopt=Abstract.

[54] Waddell BL et al. Agricultural use of organophosphate pesticides and the risk of non-Hodgkin's lymphoma among male farmers (United States). Cancer Causes Control 2001;12(6):509-17. Available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11519759&dopt=Abstract.

[55] Earl FL et al. Reproductive, teratogenic, and neonatal effects of some pesticides and related compounds in beagle dogs and miniature swine. In Pesticides and the environment: Continuing controversy. 1973

New York, NY: Intercontinental Medical Book Corp. Pp.253-266.

[56] Cho JH and Lee CE. Effects of diazinon on the anatomical and embryological changes in the developing chick embryo. Res Rept RDA(v) 1990;32(3):35-47.

[57] EXTOXNET. Diazinon. 1996. Available at http://ace.ace.orst.edu/info/extoxnet/pips/diazinon.htm.

[58] Id.

[59] National Pesticide Information Center. National pesticide telecommunications network fact sheet: 2,4-D., March 1999. http://ace.orst.edu/info/nptn/factsheets/2_4-D.pdf.

[60] Donaldson D, Kiely T, and Grube A. USEPA. 1998-1999 Pesticide market estimates. USEPA. August 2002. Available at http://www.epa.gov/oppbead1/pestsales/99pestsales/introduction1999.html.

[61] USEPA. 2,4-D time-limited pesticide tolerance 3/99. Federal Register: March 10, 1999 (Vol 64, Number 46) Available at http://pmep.cce.cornell.edu/profiles/herb-growthreg/24-d-butylate/24-d/24-D_tol_399.html.

[62] McDuffie HH, Pahwa P, McLaughlin JR et al. Op. cit.

[63] Hoar SK, Blair A, Holmes FF et al. Op. cit.

[64] Zahm SH, Weisenburger DD, Babbitt PA et al. Op. cit.

[65] Woods JS, Polissar L, Severson RK et al. Op. cit. Note: These authors found increased risk of NHL when phenoxy herbicides were used along with other chemicals.

[66] EXTOXNET. 1996. Op. cit.

[67] EXTOXNET. 1993. Op. cit.

[68] Id.

[69] Garry VF, Schreinemachers D, Harkins M, Griffith J. Pesticide appliers, biocides, and birth defects in rural Minnesota. Environ Health Perspectives 1996;104(4):394-9.

[70] Information Ventures, Inc. 2,4-D Pesticide factsheet. Prepared for the U.S. Department of Agriculture, Forest Service. Available at http://infoventures.com/e-hlth/pestcide/24d.html.

[71] USEPA. Consumer factsheet on: 2,4-D. Op. cit.

72 Id.

73 Information Ventures, Inc. Op cit.

74 Johnston S, McCusker G, Tobinson TJ. 'Golf ball liver': a cause of chronic hepatitis? Gut 1998 Jan;42(1):143.

75 Leonard C, Burke CM, O'Keane C, Doyle JS. "Golf ball liver": agent orange hepatitis. Gut 1997 May;40(5):687-8.

76 USDA. Agricultural Marketing Service. Pesticide data program. Summary of 1992 data (appendix 7, Apr.) and 1993 data (appendix B, June). No recent data are available. As cited in Cox C. 2,4-D: Exposure. Herbicide factsheet. J of Pest Reform 1999;19(4):14-19.

77 Nishioka MG et al. Measuring transport of lawn-applied herbicide acids from turf to home: correlation of dislodgeable 2,4 D turf residues with carpet dust and carpet surface residues, Environmental Science Technology 1996;30:3313-3320.

78 Nishioka M, Lewis R, Brinkman M, et al. Distribution of 2,4-D in air and on surfaces inside residences after lawn applications: comparing exposure estimates from various media for young children. Environ Health Perspect 2001 Nov;109(11):1185-91.

79 Nishioka MG et al. Op. cit.

80 FAO. PIC Circular X, Appendix V: Synopsis of notifications of control actions, United Nations Environment Programme, December, 1999. Page 215. Available at:http://www.fao.org/AG/AGP/AGPP/Pesticid/PIC/circular.htm..

81 FAO. PIC Circular XIII, Appendix I: Synopsis of notifications of final regulatory action received under the interim PIC procedure, Part A: Summary of each notification of final regulatory action that has been verified to contain all the information required by Annex I of the Convention, United Nations Environment Programme, June, 2001, http://www.fao.org/AG/AGP/AGPP/Pesticid/PIC/circular.htm.

82 Danish Environmental Protection Agency, Ministry of the Environment, Prohibited Products May 21, 2001, http://www.mst.dk/chemi/02030100.htm

83 FAO. PIC Circular X. Op. cit. p. 215.

84 Id.

85 Id.

86 Id.

87 Donaldson D, Kiely T, and Grube A. Op. cit.

88 USEPA. Dicamba (3,6-dichloro-o-anisic acid); pesticide tolerance. Available at http://www.epa.gov/fedrgstr/EPA-PEST/1999/January/Day-06/p99109.htm.

89 McDuffie HH, Pahwa P, McLaughlin JR et al. Op. cit.

90 Potter WT et al. Radiometric assay of red cell and plasma cholinesterase in pesticide appliers from Minnesota. Toxicol and Applied Pharm 1993;119:150-155. As cited in Cox C. Herbicide Factsheet: dicamba. J of Pest Reform 1994 Spring;14(1). Available at http://www.pesticide.org/dicamba.pdf.

91 California Dept. of Food and Agriculture. Medical Toxicology Branch. Summary of toxicology data: dicamba. 1990 Sacramento, CA. Beasley VR. 2,4-D toxicosis I: A pilot study of 2,4-dichlorophenoxyacetic acid- and dicamba-induced myotonia in experimental dogs. Vet Hum. Toxicol 1991;33(5):435-440. As cited in Cox C. Herbicide factsheet: Dicamba. J of pest reform/Spring 1994;14:1. Available at http://www.pesticide.org/dicamba.pdf.

92 EXTOXNET. Dicamba profile. Pesticide information profile. 1994. Available at http://pmep.cce.cornell.edu/profiles/extoxnet/carbaryl-dicrotophos/dicamba-ext.html.

93 Id.

94 National Department of Agriculture, Banned and restricted substances in the republic of South Africa. November 11, 2001. Available at http://www.nda.agric.za/act36/main.htm.

95 Donaldson D, Kiely T, and Grube A. Op. cit.

96 USEPA. Mecoprop (Chipco Turf Herb. MCPP) Herbicide profile 12/88. 1988. EPA pesticide fact sheet. Last modified 03/01/200.1 Available at http://pmep.cce.cornell.edu/profiles/herb-growthreg/fatty-alcohol-monuron/mecoprop/herb-prof-mecoprop.html.

97 Id.

98 Lynge EA. 1985. Follow up study of cancer incidence among workers in manufacture of phenoxy herbicides in Denmark. British J of Cancer 52:259-270. As cited in EXTOXNET. Mecroprop Profile. Pesticide information profile. 1995. Available at http://pmep.cce.cornell.edu/profiles/extoxnet/haloxyfop-methylparathion/mecoprop-ext.html.

[99] McDuffie HH, Pahwa P, McLaughlin JR et al. Op. cit.

[100] USEPA. IRIS 2-(2-Methyl-4-chlorophenoxy)propionic acid (MCPP) CASRN 93-65-2. Available at http://www.epa.gov/IRIS/subst/0067.htm

[101] EXTOXNET. Mecroprop profile. Pesticide information profile. 1995. Available at http://pmep.cce.cornell.edu/profiles/extoxnet/haloxyfop-methylparathion/mecoprop-ext.html.

[102] FAO. PIC Circular X. Op. cit. p. 215.

[103] FAO. PIC Circular XIV, Appendix I: Synopsis of notifications of final regulatory action received under the interim pic procedure, Part A: Summary of each notification of final regulatory action that has been verified to contain all the information required by Annex I of the Convention, United Nations Environment Programme, December, 2001. Available at: http://www.fao.org/AG/AGP/AGPP/Pesticid/PIC/circular.htm.

[104] Cox C. Glyphosate factsheet. J of Pest Reform 1998;108(3) rev.Oct00. Available at http://www.mindfully.org/Pesticide/Roundup-Glyphosate-Factsheet-Cox.htm.

[105] Hardell L, Eriksson M, Nordstrom M. Exposure to pesticides as risk factor for non-Hodgkin's lymphoma and hairy cell leukemia: pooled analysis of two Swedish case-control studies. Leuk Lymphoma 2002 May;43(5):1043-9. Available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=12148884&dopt=Abstract.

[106] AAPCC. Toxic Exposure Surveillance System. Am J of Emerg Med 2002 Sep;20(5)428-35. Available at http://www.aapcc.org/Annual%20Reports/01report/2001%20TESS%20tables%2022ab.pdf.

[107] Pease WS et al. Preventing pesticide-related illness in California agriculture: strategies and priorities. Environmental Health Policy Program Report. 1993. Berkeley, CA: University of Calif. School of Public Health. Calif Policy Seminar. As cited in Cox C. Glyphosate factsheet. J of Pest Reform 1998 fall;108(3) rev.Oct00. Available at http://www.mindfully.org/Pesticide/Roundup-Glyphosate-Factsheet-Cox.htm.

[108] Robinson JC et al. Pesticides in the home and community: health risks and policy alternatives. Environmental Health Policy Program Report. 1994. Berkeley, CA: University of Calif School of Public Health. Calif Policy Seminar. As cited in Cox C. Glyphosate factsheet. J of Pest Reform 1998 fall;108(3) rev.Oct00. Available at http://www.mindfully.org/Pesticide/Roundup-Glyphosate-Factsheet-Cox.htm.

[109] Pease WS et al. Op. cit.

[110] See http://2001.roundup.com/.

[111] WHO. Glyphosate. Environmental health criteria #159. United Nations Environment Programme, the International Labour Organization. 1994. Geneva, Switzerland. Available at http://www.inchem.org/documents/ehc/ehc/ehc159.htm.

[112] Sawada Y et al. Probable toxicity of surface-active agent in commercial herbicide containing glyphosate. Lancet 1988 1(8580):299. As cited in Cox C. Glyphosate factsheet. J of Pest Reform 1998 fall;108(3) rev.Oct00. Available http://www.mindfully.org/Pesticide/Roundup-Glyphosate-Factsheet-Cox.htm.

[113] Monsanto Co. Roundup fence & yard edger MSDS # 6049. Material safety data sheet. 1997 Available at http://2001.roundup.com/product_info/frameset.

[114] Donaldson D, Kiely T, and Grube A. USEPA. Op. cit.

[115] Donaldson D, Kiely T, and Grube A. USEPA. Op. cit.

[116] Donaldson D, Kiely T, and Grube A. USEPA. Op. cit.

[117] EXTOXNET. Diazinon (D.Z.N., spectracide) EPA Chemical Fact Sheet 9/86. Available at http://pmep.cce.cornell.edu/profiles/insect-mite/ddt-famphur/diazinon/insect-prof-diazinon.html.

[118] USEPA. Diazinon revised risk assessment and risk mitigation measures. Dec. 5, 2000.

[119] USEPA cancels diazinon uses. Ill Pest Rev 2001 Jan;14(1). Available at http://www.pesticidesafety.uiuc.edu/newsletter/html/v14n101.pdf.

[120] Davis JR et al. Family pesticide use and childhood brain cancer. Arch Environ Contam Toxicol 1993 Jan;24(1):87-92. Available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=8466294&dopt=Abstract.

[121] Cantor KP, Blair A, Everett G et al. Pesticides and other agricultural risk factors for non-Hodgkin's lymphoma among men in Iowa and Minnesota. Cancer Res 1992 May;1(52):2447-2455. Available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1568215&dopt=Abstract.

[122] Waddell BL et al. Op. cit.

[123] EXTOXNET. Diazinon. 1996. Available at http://ace.ace.orst.edu/info/extoxnet/pips/diazinon.htm.

[124] Earl FL et al. Reproductive, teratogenic, and neonatal effects of some pesticides and related compounds in beagle dogs and miniature swine. In Pesticides and the environment: Continuing controversy. 1973. New York, NY: Intercontinental Medical Book Corp. Pp.253-266.

[125] Cho JH, Lee CE. Effects of diazinon on the anatomical and embryological changes in the developing chick embryo. Res Rept RDA 1990;32(3):35-47.

[126] FAO. PIC Circular X. Op. cit. p. 215.

[127] USEPA cancels diazinon uses. Ill Pest Rev 2001 Jan;14(1). Available at http://www.pesticidesafety.uiuc.edu/newsletter/html/v14n101.pdf.

[128] USEPA. Office of Pesticide Programs. Inert ingredients in pesticide products. Available at http://www.epa.gov/opprd001/inerts/. Updated October 21, 2001.

[129] Attorney General of NewYork. Op. cit.

[130] FIFRA, Section 10(d)(1)(C), entitled, "Protection of trade secrets and other information".

[131] Attorney General of New York. Op. cit.

[132] Monsanto Co. 1997. Roundup fence & yard edger MSDS # 6049. Material safety data sheet. Available at http://2001.roundup.com/product_info/frameset.

[133] USEPA. Lists of other (inert) pesticide ingredients. Available at http://www.epa.gov/opprd001/inerts/lists.html. Updated October 21, 2002.

[134] See http://www.pesticide.org/FOIA/inertslinks.html.

[135] NCAP. Inert ingredients in commercial 2,4-D products. Includes all information as of June 1999. Available at http://www.pesticide.org/24Dinert.html.

[136] ATSDR. ToxFAQs for naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene. 1995. Available at http://www.atsdr.cdc.gov/tfacts67.html.

[137] NCAP. June 1999. Op. cit.

[138]ATSDR. Toxicological profile for xylenes, CAS# 1330-20-7. Available at http://www.atsdr.cdc.gov/toxprofiles/tp71.html.

[139] NCAP. Inerts disclosure campaign. Available at http://www.pesticide.org/inertspage.html.

[140] USEPA. Pesticides: health and safety. Available at http://www.epa.gov/cgi-bin/epaprintonly.cgi.

[141] Reigart J and Roberts J. Recognition and management of pesticide poisonings, 5th edition. 1999. Available at http://www.epa.gov/pesticides/safety/healthcare/handbook/contents.htm.

[142] AAPCC. Toxic exposure surveillance system. 2001Annual Report. Tables 17B and 22A. Available at http://www.aapcc.org/2001.htm.

[143] Blondell J. Personnel communication March 11, 2003.

[144] USEPA. A statewide campaign to reduce residential pesticide exposure in pre-school age children. Pesticide environmental stewardship program. Available at http://www.epa.gov/oppbppd1/PESP/regional_grants/2001/r5b-2001.htm.

[145] Id.

[146] Id.

[147] AAPCC. 2002. Op. cit.

[148] USEPA. Pesticide registration (PR) notice 2000-XX. Indoor residential insecticide product label statements. Draft for public comment. Available at http://www.epa.gov/opppmsd1/PR Notices/pr2000-lbl-draft.pdf.

[149] USEPA. 12/16/1997. Op. cit.

[150] AAPCC. 2002. Op. cit.

[151] USEPA. Recognition and management of pesticide poisonings. Office of Prevention, Pesticides, and Toxic Substances. EPA 735-R-98-002. March 1999.

[152] USEPA. R.E.D. facts. Glyphosate. EPA-738-F-93-011. September 1993. Available at http://www.epa.gov/oppsrrd1/REDs/factsheets/0178fact.pdf.

[153] AAPCC. 2002. Op. cit.

[154] Adam A, Marzuki A, Abdul Rahman H et al. The oral and intratracheal toxicities of roundup and its components to rats. Vet Hum Toxicol 1997 Jun;39(3):147-51. Available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?CMD=Display&DB=PubMed.

[155] CDC. State-Based pesticide poisoning surveillance programs http://www.cdc.gov/niosh/pestsurv/default.html#states.

[156] CDC. State-Based pesticide poisoning surveillance programs http://www.cdc.gov/niosh/pestsurv/default.html#states.

[157] Thier A. The toxic treadmill, pesticide use and sales in New York State,1997-1998. October 2000. Revised 3/29/2001. What the data reveal. Environmental Advocates and New York Public Interest Research Group. Available at http://www.eany.org/reports/treadmill/data_reveal.html.

[158] USEPA. 12/16/1997. Available at Op. cit.

[159] Cavieres MF, Jaeger J, and Porter W. Developmental toxicity of a commercial herbicide mixture in mice: I. effects on embryo implantation and litter size Environ Health Perspect 2002 Nov; 110(11).

[160] Hayes T, Collins A, Lee, M. Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses Proc Natl Acad Sci USA 2002 April;99(8):5476-5480. See http://www.pnas.org/cgi/content/abstract/99/8/5476%20.

[161] AMA. Educational and informational strategies to reduce pesticide risk. Preventive Medicine 1997:26:191-200.

[162] NRC, NAS, Pesticides in the diets of infants and children, National Academy Press, Washington, DC, 1993.

[163] USEPA, Office of the Administrator, Environmental health threats to children, EPA 175-F-96-001, September 1996.

[164] Wargo J. Id.

[165] Nishioka M et al. Measuring transport of lawn-applied herbicide acids from turf to home: correlation of dislodgeable 2,4-d turf residues with carpet dust and carpet surface residues, Environ Science Tech 1996;30:3313-3320.

[166] Nishioka M, Lewis R, Brinkman M et al. Distribution of 2,4-D in air and on surfaces inside residences after lawn applications: comparing exposure estimates from various media for young children. Environ Health Perspect 2001 Nov;109(11):1185-91.

[167] Id.

[168] Zahm SH, Ward MH. Op. cit.

[169] Id.

[170] Leiss J, Savitz D. Home pesticide use and childhood cancer: a case-control study. Am J of Pub Health. 85(2):249-252.

[171] Ma X, Buffler PA, Gunier RB et al. Critical windows of exposure to household pesticides and risk of childhood leukemia. Environ Health Perspect. 2002 Sep;110(9):955-60.

[172] Meinert R, Schuz J, Kaletsch U et al. Leukemia and non-Hodgkin's lymphoma in childhood and exposure to pesticides: results of a register-based case-control study in Germany. Am J Epidemiol. 2000 Apr 1;151(7):639-46; discussion 647-50.

[173] Lowengart RA, Peters JM, Cicioni C, et al. Childhood leukemia and parents' occupational and home exposures. J Natl Cancer Inst. 1987 Jul;79(1):39-46.

[174] Leiss J and Savitz D. Op. cit.

[175] Id.

[176] Buckley JD, Meadows AT, Kadin ME et al. Pesticide exposures in children with non-Hodgkin lymphoma. Cancer 2000 Dec 1;89(11):2315-21. Available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11147603&dopt=Abstract.

[177] Pogoda JM, Preston-Martin S. Household pesticides and risk of pediatric brain tumors. Environ Health Perspect 1997 Nov;105(11):1214-20.

[178] Daniels JL, Olshan AF, Teschke K et al. Residential pesticide exposure and neuroblastoma. Epidemiology 2001 Jan;12(1):20-7.

[179] Gold E et al. See Reference #10.

[180] Ma X, Buffler PA, Gunier RB et al. Critical windows of exposure to household pesticides and risk of childhood leukemia. Environ Health Perspect 2002 Sep;110(9):955-60.

[181] Id.

[182] Lowengart RA, Peters JM, Cicioni C et al. Childhood leukemia and parents' occupational and home exposures. J Nat Cancer Inst 1987 Jul;79(1):39-46.

[183] Leiss J, Savitz D. Op. cit.

[184] Adgate J, Barr D, Clayton C et al. Measurement of children's exposure to pesticides: analysis of urinary metabolite levels in a probability-based sample. Environ Health Perspect 2001 June;109:6. Available at http://ehpnet1.niehs.nih.gov/docs/2001/109p583-590adgate/abstract.html.

[185] Lu C, Knutson D, Fisker-Andersen J et al. Biological monitoring survey of organophosphorus pesticide exposure among pre-school children in the Seattle metropolitan area. Environ Health Perspect 2001 March; 109:299-303. Available at http://ehpnet1.niehs.nih.gov/docs/2001/109p299-303lu/abstract.html.

[186] USEPA. Pesticides: regulating pesticides: data requirements. Updated March 6, 2003. Available at http://www.epa.gov/pesticides/regulating/short-term.

[187] 49 CFR 158. Tables in 158.240-740 give the specifics of data requirements for various proposed use patterns. Data requirements for lawn pesticides are summarized in USEPA. Questions and answers on lawn pesticides. Updated 12/16/1997. Available at http://pmep.cce.cornell.edu/issues/lawnissues.html#Pesticides.

[188] USEPA. Updated 12/16/1997. Available at Op. cit.

[189] Id.

[190] NAS. Pesticides in the diets of infants and children 1993. National Academy Press.

[191] USEPA Science Advisory Panel. 1990.

[192] Donaldson D, Kiely T, Grube A. Op. cit.

[193] USFWS. Homeowner's guide to protecting frogs – lawn and garden care. Division of Environmental Contaminants. July, 2000.

[194] Thier A. Op. cit.

[195] Jenkins V. Lawn: A history of an American obsession. Smithsonian Institution Press. 2000.

[196] USEPA. 1996-1997 Pesticide Market Estimates: Tables and Charts. Table 2. Available at http://www.epa.gov/oppbead1/pestsales/97pestsales/tables_charts1997.html.

[197] USEPA. Available at http://www.epa.gov/oppbead1/pestsales/97pestsales/tables_charts1997.html.

[198] USFWS. Pesticides and wildlife — a perilous mix. Mountain Prairie Region. Vol 1 No. 3. Available at http://www.r6.fws.gov/feature/pesticid.html.

[199] CDPR. 2000 Status report pesticide contamination prevention act. December 2000. Available at http://www.cdpr.ca.gov/docs/empm/pubs/ehapreps/eh0014.pdf.

[200] Id.

[201] Briggs SA. Basic guide to pesticides. Rachel Carson Council, Inc. 1992, 283 pp.

[202] USFWS. Homeowner's guide to protecting frogs – lawn and garden care. Division of Environmental Contaminants. July, 2000.

[203] USFWS. Amphiblian declines and deformities. Division of Environmental Quality. Available at http://contaminants.fws.gov/Issues/Amphibians.cfm. Updated May 6, 2002.

[204] Hayes T, Collins A, Lee M. Op. cit.

[205] Environ Toxicol and Chem 2000;18(12):2836–2839. See http://oregonstate.edu/dept/ncs/newsarch/2000/Jan00/nitrate.htm

[206] Hayes T, Collins A, Lee M. Op. cit.

[207] NSF. Deformed frogs form when parasites and pesticides combine. Press Release July 8, 2002. Available at http://www.nsf.gov/od/lpa/news/02/pr0258.htm.

[208] Kasper C. Ring in spring with a peep. Connecticut Audubon Society. Spring newsletter 2003. Available at http://www.ctaudubon.org/news/news.htm.

[209] USFWS. Pollinators. Division of Environmental Quality. Updated June, 2001. Available at http://contaminants.fws.gov/Issues/Pollinators.cfm#Ingram 1996b.

[210] Ingram M, Nabhan GP, Buchmann S. Impending pollination crisis threatens biodiversity and agriculture. Tropinet 1996;7:1. As cited in USFWS. Pollinators. Division of Environmental Quality. Updated June, 2001. Available at http://contaminants.fws.gov/Issues/Pollinators.cfm#Ingram 1996b.

[211] Nabhan G, Buchmann, S. Pollination services: biodiversity's direct link to world food stability, in G. Daly, ed. Ecosystem Services, Island Press, Washington, D.C. 1996. As cited in Ingram M, Nabhan G, and Buchmann S. Our

forgotten pollinators: protecting the birds and the bees. Global Pesticide Campaigner 1996;6(4). Available at http://www.pmac.net/birdbee.htm.

[212] Ingram M, Nabhan G, Buchmann S. Our forgotten pollinators: protecting the birds and the bees. Global Pesticide Campaigner 1996;6(4). Available at http://www.pmac.net/birdbee.htm.

[213] Pardue L. Wild honeybees, nature's pollinators, are in trouble, victims of manmade pollution and tiny, destructive mites. Available at http://www.emagazine.com/january-february_1997/0197currbees.html.

[214] Briggs S. Basic guide to pesticides Farm Chemicals Handbook, Meister Publishing Co. 1996. As cited in Ingram M, Nabhan G, and Buchman S. Our forgotten pollinators: protecting the birds and the bees. Global Pesticide Campaigner 1996 6(4). Available at http://www.pmac.net/birdbee.htm.

[215] Herbicides and birds. Available at http://www.abcbirds.org/pesticides/herbicides_and_birds.htm.

[216] Williams T. Hard news on "soft" pesticides. Audubon. March-April. 1993. As cited in USFWS. Pesticides and Wildlife. Division of Environmental Quality. http://contaminants.fws.gov/Issues/Pesticides.cfm# Updated July 3, 2001.

[217] USFWS. Pesticides and wildlife — a perilous mix. Mountain Prairie Region. Vol 1 No. 3. Available at http://www.r6.fws.gov/feature/pesticid.html.

[218] Connecticut DEP. Connecticut's peregrine falcon story. 2001. Available at http://dep.state.ct.us/burnatr/wildlife/special/peregrine/pfstory.htm.

[219] USFWS. Pesticides and wildlife — a perilous mix. Op. cit.

[220] Bourne J. The killer in your yard. Audobon Magazine. May/June. Available at http://magazine.audubon.org/backyard/backyard0005.html.

[221] Chlorpyrifos. Available at http://www.abcbirds.org/pesticides/Profiles/chlorpyrifos.htm.

[222] USEPA. Diazinon revised risk assessment and agreement with registrants. January 2001. Prevention, Pesticides, and Toxic Substances.

[223] USEPA cancels diazinon uses. Illinois Pest Review 2001;14(1). Available at http://www.pesticidesafety.uiuc.edu/newsletter/html/v14n101.pdf.

[224] Audobon New York. Lawn pesticides implicated in bird deaths. January 16, 2002. Available at http://ny.audubon.org/020116.htm.

[225] Kinney J. Chemicals kill birds – WNV – public health report shows lawn chemicals killing birds. The Saritogian. June 12, 2002.

[226] Migratory Bird Treaty Act, s 2 et seq., 16 U.S.C.A. s 703 et seq. (West 1985 & Supp. 1995).

[227] Gilliom R. 1999. Op. cit.

[228] Struger J et al. Pesticide concentrations in the Don and Humber River Watersheds (1998-2000). Environment Canada, Ontario Ministry of Environment and Toronto Works and Emergency Service. Dec. 2002 (Interim Report).

[229] Gilliom R, Barbash J, Kolpin D, Larson, S. Testing water quality for pesticide pollution. 1999 33;7:164 A-169 A.

[230] CDPR. 2000 status report pesticide contamination prevention act. December 2000. Available at http://www.cdpr.ca.gov/docs/empm/pubs/ehapreps/eh0014.pdf.

[231] USGS. National water quality assessment program. Available at http://water.usgs.gov/nawqa/informing/pesticides.html.

[232] See http://members.aol.com/rccouncil/ourpage/birds.htm#garden.

[233] USGS. Pesticides detected in urban streams during rainstorms and relations to retail sales of pesticides in King County, Washington. USGS fact sheet 097-9. April 1999.

[234] Id.

[235] Williams T. Op. cit.

[236] Gilliom R. Pesticides in the nation's water resources. U.S. Geological Survey. Water Environment Federation Briefing Series Presentation. 1999. Capitol Building, Washington D.C. Available at http://water.wr.usgs.gov/pnsp/present/water/.

[237] Helfrich LA, Weigmann DL, Neves RJ. Landowner's guide to managing streams in the Eastern United States. 1998. Available at http://www.ext.vt.edu/pubs/forestry/420-141/420-141.html.

[238] USGS. National water quality assessment program. Available at http://water.usgs.gov/nawqa/informing/pesticides.html.

[239] Committee to Advise on Reassessment and Transition (CARAT). Safe Drinking Water Act (SDWA) coverage of pesticides. October 3, 2000. CARAT Background Document 2. Available at http://www.epa.gov/oppfead1/carat/2000/oct/dw3.pdf.

[240] California Public Interest Research Group Charitable Trust and CPR. Toxics on tap: pesticides in California drinking water sources. 1999. Available at http://www.calpirg.org/reports/toxictap.pdf .

[241] USEPA. Current drinking water standards. July, 2002. Available at http://www.epa.gov/OGWDW/mcl.html.

See also MCLs listed in CARAT. Safe Drinking Water Act (SDWA) coverage of pesticides. October 3, 2000. CARAT Background Document 2. Available at http://www.epa.gov/oppfead1/carat/2000/oct/dw3.pdf.

[242] Values from California Public Interest Research Group Charitable Trust and CPR Toxics on tap: pesticides in California drinking water sources. 1999. Available at http://www.calpirg.org/reports/toxictap.pdf.

[243] USEPA. Current drinking water standards. July 2002. Available at http://www.epa.gov/OGWDW/mcl.html.

[244] USEPA. Consumer factsheet on: ALDICARB and its by-products. Available at http://www.epa.gov/safewater/dwh/c-soc/aldicarb.html. Updated November 2002.

[245] California Public Interest Research Group Charitable Trust and Californians for Pesticide Reform. Op. cit.

[246] USEPA. Source water protection practices bulletin managing small-scale application of pesticides to prevent contamination of drinking water. EPA 816-F-01-03. July 2001. Available at http://216.239.33.100/search?q=cache:MO4PEi_9whsC:www.epa.gov/ogwdw000/dwa/electronic/swp/sspesticides.pdf+EPA+lawn+care+pesticide+contamination+surface+water&hl=en&ie=UTF-8.

[247] California Public Interest Research Group Charitable Trust and CPR. Op. cit.

[248] EHHI. A survey of private drinking water wells for lawn and tree care pesticides in a Connecticut town.1998 Available at http://www.ehhi.org/pubs/survey_wells.html.

[249] USGS. Contaminants in river basins in Connecticut. Available at http://water.usgs.gov/pubs/FS/FS-008-99/.

[250] Connecticut DPH. Water supply concept. November 16, 2000.

[251] Id.

[252] Connecticut groundwater conditions. Available at http://www.gwpc.org/gwreport/Acrobat/Connecticut.pdf.

[253] Grady S, Mullaney R. Natural and human factors affecting shallow water quality in surficial aquifers in the Connecticut, Housatonic, and Thames River Basins. USGS Water-Resources Investigations Report 98-4042. Available at http://ma.water.usgs.gov/projects/MA-100/WRIR_98-4042_abstract.htm.

[254] Wilen C. Survey of residential pesticide use and sales in the San Diego Creek Watershed of Orange County, California. 2001. Prepared for the California Department of Pesticide Regulation.

[255] California EPA. Sacramento Home Depot stores and trugreen chemlawn fined for pesticide violations. March 7, 1995. News Release. Available at http://www.cdpr.ca.gov/docs/archives/pressrls/1995/homedept.htm.

[256] Minnesota DOA. MDA collects $26,500 civil penalty from Kmart corporation. August 18, 2000. Available at http://www.mda.state.mn.us/newsreleases/2000news/aug18_02.html.

[257] USEPA. Pesticide Regulation (PR) Notice 96-4. Notice to manufacturers, producers, formulators, and registrants of pesticide products. June 3, 1996. Available at http://www.epa.gov/opppmsd1/PR_Notices/pr96-4.html.

[258] USEPA. Label Review Manual. Chapter 8: Precautionary Labeling. Available at http://www.epa.gov/oppfead1/labeling/lrm/chap-08.htm.

[259] USEPA. Pesticide registration (PR) notice 83-3 notice to manufacturers, formulators and registrants of pesticides. Available at http://www.epa.gov/opppmsd1/PR_Notices/pr83-3.html.

[260] CLI began in 1996 to "foster pollution prevention, empower consumer choice, and improve consumer understanding of household consumer product labels" including home pesticide products. CLI participants included federal and state government agencies, private industry, public interest groups, and individual citizens. See USEPA. Joint EPA-Industry Safety Campaign Urges Public To "Read The Label First!" March 6, 2000, Philadelphia, PA. Available at http://www.epa.gov/opptintr/labeling/articles.htm.

[261] USEPA. Consumer labeling initiative phase II report. Prepared for Office of Pollution Prevention and Toxics by Abt Associates. Contract Number 68-W6-0021. October 1999.

[262] Id.

[263] Wargo J. 1998. Id.

[264] 40 CFR 152.160. http://www.epa.gov/opprd001/rup/.

[265] FQPA's requirement to consider a common mechanism of toxicity states: "In establishing, modifying, leaving in effect, or revoking a tolerance or exemption for a pesticide chemical residue, the Administrator shall assess the risk of the pesticide chemical residue based on …(III) available information concerning the cumulative effects on infants and children of such residues and other substances that have a common mechanism of toxicity;" (US Code 2000, Title 21: Section 346a).

[266] USEPA. Chlorpyrifos revised risk assessment and agreement with registrants. Updated June 2000. Available at http://www.epa.gov/pesticides/op/chlorpyrifos/agreement.pdf.

[267] USEPA. EPA announces elimination of all indoor uses of widely-used pesticide diazinon; begins phase-out of lawn and garden uses. Press Release. Dec. 5, 2000. Available at http://yosemite.epa.gov/opa/admpress.nsf/b1ab9f485b098972852562e7004dc686/c8cdc9ea7d5ff585852569ac0077bd31?OpenDocument.

[268] USEPA. Methoxychlor; proposed revocation of tolerances. Federal Register: April 4, 2002;(65):16073-16078. Available at http://www.epa.gov/fedrgstr/EPA-PEST/2002/April/Day-04/p8155.htm.

[269] State authority to regulate pesticides is found in Sections, 23-25 of FIFRA.

[270] FIFRA Sec. 2. 7 USC Sec. 136(p)(2).

[271] The town of Casey, Wisconsin adopted a regulation requiring citizens to obtain a local government permit prior to home pesticide use. After the town's refusal to grant a permit for aerial spraying of his land, the plaintiff sought a declaratory judgment against the town claiming that the ordinance was preempted by federal law. The Court found that FIFRA did not preempt the local governmental regulation of pesticide use. The court found no conflict between FIFRA and the local ordinance. U.S. Supreme Court. 1991. Wisconsin Public Intervenor v. Mortier 59 U.S.L.W. 4755.

[272] Connecticut Public Act 83-193; See: CHAPTER 441 PESTICIDE CONTROL. Sec. 22a54a. Pesticide applicators, certification, classification, notice, fees; reciprocity; financial responsibility; aircraft, tree, public employee applicators.

[273] "…no ordinance or regulation of local government…may prohibit or in any way attempt to regulate any matter relating to the registration, sale, transportation, or use of economic poisons, and any of these ordinances, laws, or regulations are void and of no force or effect." California Food and Agricultural Code Sec. 11501.1.

[274] USDA. Federal pesticide recordkeeping program. Available at http://www.ams.usda.gov/science/sdpr.htm.

[275] Agnew GK and Baker PB. Pesticide use in Arizona cotton: long-term trends and 1999 data. Available at http://ag.arizona.edu/pito/articles/cottonrep2000.htm.

[276] Wisconsin strategic pesticide information project. Proposed Wisconsin pesticide database system (PDS). Available at http://www.wsn.org/pesticides/PDS_Components.shtml.

[277] CDPR. Pesticide use reporting, an overview of California's unique

full reporting system. May 2000. Available at http://www.cdpr.ca.gov/docs/pur/purovrvw/tabofcon.htm.

[278] Thier A. Op. cit.

[279] Oregon Department of Agriculture, Pesticide use reporting system. Available at http://www.oda.state.or.us/pesticide/pubform/purspresentation.pdf.

[280] Lies, M. Improvements made in Oregon pesticide use reporting system. Coast Fork Willamette Watershed Council. September 27, 2002. Available at http://www.geocities.com/coastfork/pesticidereporting.htm.

[281] Agnew GK and Baker PB. Op. cit.

[282] UCONN. Pesticide record keeping for Connecticut private applicators. Available at http://www.canr.uconn.edu/ces/ctpep/ct_recs.html.

[283] Id.

[284] Their A. The toxic treadmill, pesticide use and sales in New York State, 1997-1998. October 2000. Revised 3/29/2001. What the data reveal. Environmental Advocates and New York Public Interest Research Group. Available at *http://www.eany.org/reports/treadmill/recommendations.html*.

[285] Californians for Alternatives to Toxics. Arcata pesticide ordinance. 2000. Available at http://www.alternatives2toxics.org/arcata_ord.htm.

[286] San Francisco Integrated Pest Management Program - Chapter 39. Available at http://www.ci.sf.ca.us/sfenvironment/aboutus/policy/legislation/ipm.htm.

[287] Boulder Environmental Audit. Appendix F. 05/08/01. Available at http://www.ci.boulder.co.us/hroe/hrae/EnvMgmtAudit/AppendixF.PDF.

[288] FAO. PIC Circular X. Op. cit. p. 215.

[289] FAO. PIC Circular XIV. Op. cit.

[290] Danish Environmental Protection Agency, Ministry of the Environment, prohibited products May 21, 2001, http://www.mst.dk/chemi/02030100.htm.

[291] FAO. PIC Circular X. Op. cit. p. 215.

[292] FAO. PIC Circular XIII. Op. cit.

[293] FAO. PIC Circular X. Op. cit. p. 215.

[294] FAO. PIC Circular X. Op. cit. p. 335.

[295] FAO. PIC Circular X. Op. cit. p. 186.

[296] FAO. PIC Circular X. Op. cit. p. 262.

[297] FAO. PIC Circular X. Op. cit p. 215.

[298] USEPA cancels diazinon uses. Illinois Pest Review 2001 14;1. Available at http://www.pesticidesafety.uiuc.edu/newsletter/html/v14n101.pdf.

[299] Id.

[300] National Department of Agriculture, Banned and restricted substances in the republic of South Africa. November 11, 2001. Available at http://www.nda.agric.za/act36/main.htm.

[301] KEMI. Press release. Available at www.kemi.se/aktuellt/pressmedd/2000/200622_eng.htm.

[302] The Danish Ministry of Environment and Energy, Højbro Plads 4, 1200 København K, Tel: +45 33 92 76 00, Fax: +45 33 32 22 27, E-mail: mem@mem.dk as cited in PAN UK Pesticide restriction in Scandinavia. Available at http://www.pan-uk.org/pestnews/pn51/pn51p9b.htm.

[303] PANNA. Action alert: Canada's first province-wide ban of cosmetic pesticides threatened under NAFTA. November 15, 2002. Available at http://panna.igc.org/resources/panups/panup_20021115.dv.html.

[304] Reuters News Service. Quebec to ban most non-farm pesticides by 2005. Available at http://www.planetark.org/dailynewsstory.cfm/newsid/16716/story.htm July 5, 2002.

[305] Reuters News Service. Canada's supreme court allows lawn-pesticide ban. June 28, 2001.

[306] Environment Quebec. Press release. Health, environment and pesticides: Québec adopts the highest standards in North America to decrease exposure to pesticides. Available at http://www.menv.gouv.qc.ca/communiques_en/c20030305-pesticides.htm.

[307] Environment Quebec. Pesticide Management Code. April 4, 2003. Available at http://www.menv.gouv.qc.ca/pesticides/permis-en/code-gestion-en/index.htm#active.

[308] Quebec's pesticide management code also has other restrictions. See Environment Quebec. Pesticide Management Code. April 4, 2003. Available at http://www.menv.gouv.qc.ca/pesticides/permis-en/code-gestion-en/index.htm#active.

[309] Environment Quebec. 2003. Available at Op.cit.

[310] Pease W, Robinson J, and Tuden, D. Taxing pesticides to fund environmental protection and Integrated Pest Management. Environmental Health Policy Program, University of California Center for Occupational and Environmental Health. Available at http://www.ucop.edu/cprc/taxpest.html.

[311] CDPR. Pesticide use reporting , an overview of California's unique full reporting system. May 2000. Available at http://www.cdpr.ca.gov/docs/pur/purovrvw/tabofcon.htm.

[312] Oregon DOA. Pesticide use reporting system. Available at http://www.oda.state.or.us/pesticide/pubform/purspresentation.pdf.

[313] Their A. Op. cit.

[314] CDC. State-Based Pesticide Poisoning Surveillance Programs http://www.cdc.gov/niosh/pestsurv/default.html#states.

[315] Stephenson J. Information on pesticide illness reporting systems. USGAO Testimony before the Economic and Environmental Affairs Committee, the Senate of Maryland. March 13, 2001. Available at http://www.beyondpesticides.org/WATCHDOG/alerts/GAO_PIR_Testimony.pdf.

[316] Id.

Environment and Human Health, Inc. Board Members

Susan S. Addiss, MPH, MUrS
Past Commissioner of Health for the State of Connecticut; Past Director of Health for the Quinnipiack Valley Health District; Past President of the American Public Health Association; Past member of the Pew Environmental Health Commission.

Nancy O. Alderman, MES
President of Environment and Human Health, Inc. Past President of the Connecticut Fund for the Environment; Past member of the Governor's Pollution Prevention Task Force; Past member of the National Board of Environmental Defense; Recipient of the CT Bar Association, Environmental Law Section's, Clyde Fisher Award, given in recognition of significant contributions to the preservation of environmental quality through work in the fields of environmental law, environmental protection or environmental planning, and the New England Public Health Association's Robert C. Huestis/Eric Mood Award given to individuals for outstanding contributions to public health in the environmental health area.

D. Barry Boyd, M.D.
Oncologist at Greenwich Hospital and Affiliate Member of the Yale Cancer Center. Research areas include environmental risk factors for cancer as well as cancer etiology, including nutrition and the role of insulin and IGF in malignancy. Dr. Boyd is the Founder and Director of Integrative Medicine at Greenwich Hospital – Yale Health System.

Russell L. Brenneman, Esq.
A Connecticut environmental lawyer, has served in many public policy capacities; chaired the Connecticut Energy Advisory Board and the Connecticut Greenways Committee; served as President of the Connecticut Resource Recovery Authority; former Chairman of the Connecticut Bar Association and serves as an elected member of the International Council on Environmental Law.

David R. Brown, Sc.D.
Public Health Toxicologist; Past Chief of Environmental Epidemiology and Occupational Health in CT and previously Associate Professor of Toxicology at Northeastern College of Pharmacy and Allied Health. He has served as Deputy Director of The Public Health Practice Group of ATSDR at the National Centers for Disease Control and Prevention in Atlanta, Georgia, and is presently a consulting toxicologist with the North East States for Coordinated Air Use Management (NESCAUM).

Mark R. Cullen, M.D.
Professor of Medicine and Public Health, Yale University School of Medicine; Director of Yale's Occupational and Environmental Medicine Program and co-editor of the *Textbook of Clinical Occupational and Environmental Medicine*.

Robert G. LaCamera, M.D.
Clinical Professor of Pediatrics, Yale University School of Medicine; Practicing Pediatrician in New Haven, Connecticut from 1956 to 1996 with a sub-specialty in children with disabilities.

William A. Segraves, Ph.D.
Research Scientist and Lecturer, Yale University Department of Molecular, Cellular and Developmental Biology. Research areas include molecular biology of hormone action in reproduction and development.

John P. Wargo, Ph.D.
Director of the Yale Center for Children's Environmental Health; Professor of Risk Analysis and Environmental Policy; Author of *Our Children's Toxic Legacy*, which won the American Association Publisher's competition as best scholarly and professional book in an area of government and political science in 1997.

Environment & Human Health, Inc.
1191 Ridge Road • North Haven, CT 06473
Phone: (203) 248-6582 • Fax: (203) 288-7571
www.ehhi.org

Pictures of lawn-care pesticide bags in this publication were taken by Lauren Carlton Hartzell *in May, June, and July of 2002 in large retail stores in Connecticut. Front cover photograph taken June 19, 2002, at Kmart Super Center: New Haven, Connecticut.*

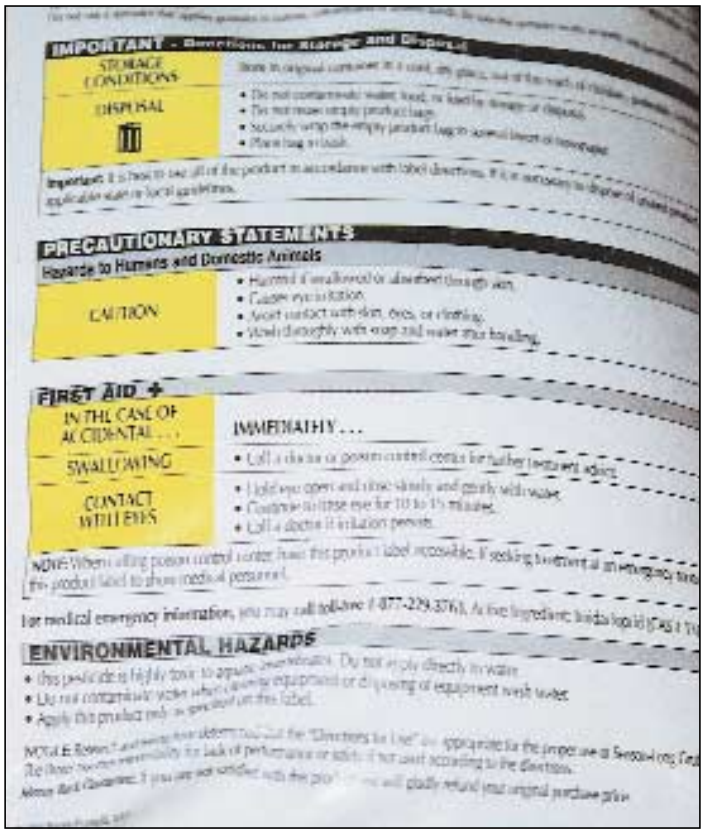
Design and Layout by Jane Bradley

Creative Advertising and Publishing Services,
West Hartford, CT 06107

www.capservices.com

RISKS FROM LAWN-CARE PESTICIDES

Including Inadequate Packaging and Labeling



ENVIRONMENT & HUMAN HEALTH, INC.

1191 Ridge Road • North Haven, CT 06473

Phone: (203) 248-6582 • Fax: (203) 288-7571

www.ehhi.org