



REFUSE TO USE  
**ChemLawn**  
Be TRULY GREEN

Why Lawn Care  
Pesticides  
are Dangerous to  
Your Children,  
Pets and the  
Environment



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TOXICS ACTION CENTER

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March, 2005

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For 17 years, Toxics Action Center has assisted residents and neighborhood groups across New England address toxic pollution issues in their community. For more information on Toxics Action Center, please contact our main office at 617-292-4821 or visit [www.toxicsaction.org](http://www.toxicsaction.org)

Be Truly Green – Refuse to Use ChemLawn.

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Toxics Action Center  
March, 2005

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# Executive Summary

Lawns are where families play, picnic and relax.

Over the past fifty years, the plush green lawn has become the pride of suburban America. With the aid of sophisticated marketing strategies backed by millions of dollars in advertising, the lawn care and pesticide industry has successfully created the desire for “the perfect lawn”. More importantly, the industry has succeeded in convincing many Americans that to have a green and healthy lawn, one needs to use an arsenal of pesticides and synthetic fertilizers.

The desire for the perfect lawn is leading millions of households across the nation to expose their children, pets, and water supplies to toxic pesticides that threaten public health and the environment.

While the amount of pesticides used in agriculture, industry, commercial and government sectors has decreased over the past twenty years, the use of residential lawn and garden pesticides is on the rise. It is the one sector of the pesticides market that is growing.<sup>1</sup>

TruGreen ChemLawn is the largest lawn care provider in the United States serving more than 3.4 million households and annually generating more than \$1.3 billion in income. TruGreen ChemLawn contributes to the yearly application of more than 70 million pounds of pesticides on some of America’s 30 million acres of lawns. The amount of pesticides applied is significant; the rate of pesticides used on lawns is on average ten times more per acre than what is used on agricultural land.

TruGreen ChemLawn’s standard customer receipt lists 32 pesticides

available for use through its residential lawn care program. An analysis of these pesticides by Toxics Action Center based on information from the pesticide manufacturer’s Material Safety Data Sheets reveals:

- 17 of 32 (53%) of TruGreen ChemLawn’s pesticide products include ingredients that are possible carcinogens, as defined by the United States Environmental Protection Agency (USEPA) and the World Health Organization’s International Agency for Research on Cancer (IARC).
- All 32 of TruGreen ChemLawn’s pesticide products include ingredients that pose threats to the environment including water supplies, aquatic organisms, and non-targeted insects.
- 9 of 32 (28%) of TruGreen ChemLawn’s pesticide products include ingredients that are known or suspected reproductive toxins (7/32 known, 22%).
- 11 of 32 (34%) of TruGreen ChemLawn’s pesticide products include ingredients that are known or suspected endocrine disruptors

(4/32 known, 12.5%).

- 13 of 32 (41%) of TruGreen ChemLawn's pesticide products include ingredients that are banned or restricted in other countries.

Despite these dangers, TruGreen ChemLawn continues to grow and recruit new residential and commercial customers. Even though these pesticides are proven to be hazardous to public health and the environment, USEPA's pesticide regulatory system has put its stamp of approval on the use of these pesticides. Although a growing pool of research links exposure to the pesticides used by TruGreen ChemLawn to nausea, vomiting, dizziness, and headaches and chronic illnesses like lymphoma, leukemia, bladder cancer, and learning disabilities, the USEPA continues to register these pesticides for commercial and residential use.

In addition, national, state and local regulatory structures set up to control the use of these pesticides do not adequately protect public health and the environment. For example, state laws to prevent incidences of pesticide spray drifting from one property to another are rarely enforced. Most state laws prohibit municipalities from passing regulations to locally control the use of lawn pesticides.

Over the past six months, Toxics Action Center asked residents to call TruGreen ChemLawn to inquire about their lawn care service. Through this informal survey we found anecdotal evidence that shows that TruGreen ChemLawn's customer service procedures make it difficult for potential customers to acquire factual information about the dangers of their pesticide products. When asked, TruGreen ChemLawn phone marketing representatives often

did not readily release the names of the pesticides they would use on the customer's lawn. In addition, the marketers generally did not even know about the public health threats of the products. Written information was often not offered or provided for customers. The TruGreen ChemLawn website has no mention of its roster of pesticide products and their health and environmental impacts. In addition, TruGreen ChemLawn representatives at times misrepresented their pesticide products as "safe", a possible violation of federal law.

TruGreen ChemLawn conducts aggressive telemarketing campaigns to sell its product and also has used children to help market its product. Their past affiliation with the US Youth Soccer provided them with an inside track to influence soccer-playing kids and their parents.

Children, pets and the environment need to be protected from dangerous pesticides. Lawn care and landscaping services can deliver healthy green lawns through non-toxic organic programs. Groups like the Northeast Organic Farming Association (NOFA) regularly train and certify professionals who offer pesticide-free services.

Toxics Action Center urges residential and commercial customers to *Refuse to Use ChemLawn* until TruGreen ChemLawn changes the way it does its business. Toxics Action Center calls on TruGreen ChemLawn, as the industry leader in pesticide-based lawn care services, to take immediate steps to protect the health and safety of children, pets, and the environment from the dangers of their services.

Toxics Action Center demands that TruGreen ChemLawn:

- Phase out the use of pesticides. TruGreen ChemLawn should immediately stop the use of those pesticides considered possible carcinogens by the USEPA and the IARC.
- Disclose all ingredients in their pesticide products, including the so-called inert ingredients. TruGreen ChemLawn should educate consumers by readily providing information to its customers over the phone, in writing, and on its website about the health and environmental effects of its products.
- Offer a comprehensive organic lawn care program that does not use pesticides or synthetic fertilizers. TruGreen ChemLawn should require its applicators to pass an accredited organic lawn care program.
- Stop using children to market products. TruGreen ChemLawn should not enter into any promotional campaign similar to its partnership with US Youth Soccer, which encouraged families to hire TruGreen ChemLawn with promises of financial support for the town's youth soccer league.

Residents are taking the **Be Truly Green: Refuse to Use ChemLawn** campaign to their neighborhoods by setting up outreach campaigns to educate their communities on the dangers of lawn pesticides.

Visit [www.RefuseToUseChemLawn.org](http://www.RefuseToUseChemLawn.org) for more information about the campaign.



## Chapter One

# ■ The History and Growth of TruGreen ChemLawn

The modern pesticide industry began after World War II. Companies that produced chemical and biological weapons for the military needed a new market for their products. The chemical industry saw money making possibilities in the lawns of the growing postwar suburban communities. Chemical companies like Dow and Dupont produced the pesticides, and lawn care pesticide applicators marketed them to consumers. Many of today's pesticides include components of war-time defoliants like Agent Orange, nerve-gas type insecticides, and artificial hormones.<sup>2</sup>

TruGreen ChemLawn's history began in 1929. In that year, Marion E. Wade, a former minor league baseball player and entrepreneur, founded ServiceMaster out of his Chicago home. In the beginning, ServiceMaster was a business designed to keep moths out of wool carpets. Over the past 75 years, ServiceMaster has evolved into a multinational corporation that now houses TruGreen ChemLawn as one of its subsidiaries.

In the early 1950's, franchising was a relatively new and exciting concept. Wade jumped on this bandwagon and in 1959 ServiceMaster opened its first international franchise in the United Kingdom. By 1974 ServiceMaster had approximately 1,000 franchises; by 1984 the number had tripled.<sup>3</sup> In 1988, ServiceMaster moved beyond carpet cleaners via the acquisition of Merry Maids, the nation's largest home cleaning business. In 1986 ServiceMaster acquired Terminix's 450 pest control franchise operations. Three years later, home protection service was added to the growing list of ServiceMaster's business segments.

In 1990 ServiceMaster purchased the lawn care giant TruGreen, previously a small private owned company founded in 1947.<sup>4</sup>

Two years later TruGreen purchased ChemLawn, merging the two to make this business unit the largest professional lawn care provider in the nation. TruGreen ChemLawn continued to grow. In 1994 TruGreen ChemLawn expanded and launched its home delivery service, and in 1995 it expanded its services to maintaining interior plants as a new line to commercial customers. In 1998, TruGreen ChemLawn entered the commercial landscape management industry. In 1999, TruGreen purchased LandLawn USA, creating the nation's largest commercial landscaping company, TruGreen LandLawn. In 2001 TruGreen ChemLawn entered the residential maintenance business in selected markets offering total lawn care and landscaping services<sup>5</sup>.

## ServiceMaster Company

### Overview

ServiceMaster is a national service company serving both residential and commercial customers through a network of more than 5,400 company-owned and franchised locations. ServiceMaster operates under five principal operating segments: TruGreen, Terminix, American Home Shield, American Residential Services

and American Mechanical Services. With the exception of Terminix, all of the operating segments are wholly owned subsidiaries of ServiceMaster. The TruGreen segment provides residential and commercial lawn care and landscaping services through TruGreen ChemLawn and TruGreen LandLawn.

**Table 1: ServiceMaster Subsidiaries (% of Business)**

|  | 2003 | 2002 | 2001 |
|--|------|------|------|
| TruGreen   | 38%  | 37%  | 37%  |
| Terminix   | 26%  | 26%  | 24%  |
| American Res. Services/<br>American Mechanical<br>Services | 19%  | 21%  | 24%  |
| American Home Shield                                       | 13%  | 12%  | 11%  |

### TruGreen ChemLawn Overview

TruGreen ChemLawn is the leading provider of lawn care services in the United States, operating in 46 states with approximately 3.4 million residential and commercial customers, 205 company-owned locations, and an additional 52 franchise locations. Revenue for 2003 was \$3.6 billion, a growth of two percent above 2002. Competition in the market of lawn care services comes mainly from local, independently owned firms and from individual homeowners who care for their own lawns.

**Table 2: Operating Revenues of ServiceMaster (in thousands)**

|                         | 2003        | 2002        |
|-------------------------|-------------|-------------|
| TruGreen                | \$1,347,400 | \$1,284,616 |
| Terminix                | \$945,258   | \$924,384   |
| American Home<br>Shield | \$450,264   | \$423,526   |
| ARS / AMS               | \$673,558   | \$718,892   |
| Other Operations        | \$152,106   | \$149,303   |

### Spotlight on Scott's Company

While ChemLawn is the largest lawn care provider, Scott's Company is the world's leading supplier and marketer of do-it-yourself lawn products. Started by a Civil War veteran in 1868, Scott's has emerged through various mergers as the leading brand name in gardening and lawn care. The company relies heavily on advertising and in the United States, "4 out of 5 advertising messages in the lawn care and garden industry come from Scott's." The advertising system works well as the company's net sales in 2002 were \$1.76 billion. TruGreen ChemLawn's net revenue for 2002 was \$1.2 billion, less than Scott's.\*

Scott's uses many of the same pesticide products as TruGreen ChemLawn, yet its primary market is the do-it-yourselfer who spreads his or her own fertilizer and pesticides. Scott's also has an application service.

Do-it-yourself lawn treatments pose different health and safety issues to the homeowner. As the applicator, the homeowner is exposed to the pesticides while spreading. In addition, homeowners may not read the application directions or follow them closely, creating more exposure to the product. Misapplications can lead directly lead to acute poisoning of children, pets, and the environment.

Scott's is a step ahead of ChemLawn in that it names the products it uses on its website and has the Material Safety Data Sheet (MSDS) for each products available online. Unfortunately, MSDS are not written for a laypersons' eyes as they are detailed and technical. Having this information readily available is the first step toward increasing education about the hazards associated with pesticide use.

\* Corporate Watch UK, Scotts: A Corporate Profile, September 2003, <http://www.corporatewatch.org.uk/profiles/scotts/scotts.pdf>

Of the five major operating segments the TruGreen segment constitutes the largest percentages of ServiceMaster's revenues. Table 2 lists the revenues derived from ServiceMaster subsidiaries. The TruGreen subsidiary segment constituted 38%, 37% and 37% in 2003, 2002 and 2001 respectively<sup>6</sup>.

TruGreen ChemLawn has a checkered history with its consumer relations practices and its use of pesticides. Through its marketing and outreach strategies, TruGreen ChemLawn has been attacked as being misleading and overly aggressive. Here are examples of the public's and government's concerns about TruGreen ChemLawn's practices:

- In May, 2004, the state attorney general's office reached a consent judgment with TruGreen, who was accused of violating Wisconsin's no-call list by calling "at least 72" residents whose numbers appeared on the state's no-call list.<sup>7</sup>
- Brenda Jones, a registered nurse living in Bradenton, Florida, hired TruGreen ChemLawn not knowing the health risks. The applicator told her that the chemicals he was using were so safe he didn't need to wear a mask. TruGreen ChemLawn used active ingredients bifenthrin and atrazine on her lawn. As soon as he began spraying, Brenda, standing 15 feet away, felt a burning in her chest and throat and developed a cough. That evening her children began complaining of dizziness and stomach aches, and her dog was wheezing and vomiting. Ms. Jones was diagnosed by her doctor with pesticide poisoning, and had to quit her job as a nurse. Her eight year old son has been permanently removed from his school due to the

reactions he gets to nearby pesticide treatments or those on the school property.<sup>8</sup>

- The website **www.ConsumerAffairs.com** reports complaints detailing instances of TruGreen ChemLawn treating lawns after the homeowners had specifically requested treatment to stop, or never requested treatment at all. TruGreen ChemLawn often still pressed for payment in full.<sup>9</sup>
- On February 12, 2002, TruGreen ChemLawn pleaded guilty in the Middle District of Pennsylvania, which charged the company with killing migratory birds through a misapplication of the grub killing insecticide Diazinon. In the fall of 2001, a Snyderstown, PA resident found several mallard ducks dead on his property after a grub treatment by TruGreen ChemLawn. The resident notified the PA Game Commission and the United States Federal Wildlife Service inquired as to what could have killed the ducks. Toxicological tests determined that the ducks had died after ingesting Diazinon. Diazinon is well known to be extremely lethal to waterfowl and the investigation determined that TruGreen ChemLawn was the source of the Diazinon. TruGreen ChemLawn was ordered to pay the maximum fine for a corporation, \$10,000, under the Migratory Bird Treaty Act.<sup>10</sup>

## Chapter Two

# ■ The Dangers of Lawn Pesticides

Lawns are spaces where residents should feel safe to play with their kids and pets, to relax with family and friends, to grow gardens, and to enjoy nature. The United States has 30 million acres of grass lawns, and that number is growing each year. Many homeowners entrust the care of this important space to lawn care service providers, like TruGreen ChemLawn.

As a result of sophisticated and aggressive marketing efforts by lawn care applicators and pesticide companies, an estimated 70 and 80 million pounds of pesticides<sup>11</sup> are annually sprayed on home lawns, trees, and shrubs. The amount of pesticides applied is significant; the rate of pesticides used on lawns is on average ten times more per acre than is used on agricultural land.

Approximately 3.4 million residential and commercial customers use TruGreen ChemLawn services, making it the largest lawn care service in the United States.<sup>12</sup> When potential customers call TruGreen ChemLawn, they are offered a lawn care plan and a price quote. TruGreen ChemLawn's prescription for this is usually a heavy dose of chemical pesticides and synthetic fertilizers.<sup>13</sup> Many customers are unaware that this method of lawn care threatens their health and the health of their children, pets and the environment.

## TruGreen ChemLawn's Products Threaten Public Health and the Environment

Toxics Action Center's analysis of TruGreen ChemLawn's lawn care service and their pesticide products is based on a customer receipt of a TruGreen ChemLawn care customer from the metro Boston area dated November of 2004. The receipt lists 32 pesticide products available to consumers. See Appendix I for a copy of the receipt. (Toxics Action Center has been unable to obtain a list from TruGreen ChemLawn of their products used in their lawn care service.)

Using the TruGreen ChemLawn receipt, Toxics Action

### Pesticides Used in TruGreen ChemLawn's Products (November, 2004)

Acclaim Extra  
Barricade (4FL & 65 WG)  
Compass Fungicide  
Confront  
Cool Power  
Dimension (1 EC & Ultra)  
Drive 75 DF  
Dylox 6.2G  
Eagle Fungicide  
Manage  
Merit (2F & 75 WSP)  
Millenium Ultra  
MSMA  
Pre-M 3.3EC  
Quicksilver  
Razor Pro  
Sevin (6.3G & SL)  
Talstar  
Tempo (20WP & SC Ultra)  
Triplet  
Tri-Power  
Turflon Ester  
Vanquish

*\*A more detailed list of TruGreen ChemLawn's products and the threats they pose to public health and the environment can be found in Appendices II & III.*

Center analyzed the 32 pesticide products and their known chemical ingredients, investigating and compiling the health and environmental research associated with those ingredients. The primary reference for the analysis was the chemical manufacturers' own Material Safety Data Sheet, (MSDS) for each pesticide product. MSDS's are documents that detail the public health and environmental impacts of toxic materials. The United States government requires manufacturers to produce an MSDS for their chemical product. The analysis was done on both the "active" and identified "inert" ingredients of the product. Active ingredients, which are listed on the pesticide label, are agents that target the particular weed or pest. Inert ingredients, which are mostly exempt for labeling requirements, are chemicals in pesticides used as carriers for the active ingredients, in order to make the active ingredients effective.<sup>14</sup> Because of the labeling exemptions for inert ingredients, Toxics Action Center's analysis was unable to examine many of the ingredients in TruGreen ChemLawn's pesticide products. (See box on page nine for more information on active and inert ingredients.)

Through its research, which is detailed and referenced in Appendix III, Toxics Action Center found that:

- 17 of 32 (53%) of TruGreen ChemLawn's pesticide products include ingredients that are possible carcinogens, as defined by the United States Environmental Protection Agency (USEPA) and the World Health Organization's International Agency for Research on Cancer (IARC).
- 9 of 32 (28%) TruGreen ChemLawn's pesticide products include ingredients that are known or suspected reproductive toxins (7/32 known, 22%).
- 11 of 32 (34%) TruGreen ChemLawn's pesticide products include ingredients that are known or suspected endocrine disruptors (4/32 known, 12.5%)
- 12 of 32 (38%) TruGreen ChemLawn's pesticide products include ingredients that are classified as Class II toxins, as classified by the World Health Organization.
- 13 of 32 (41%) of TruGreen ChemLawn's pesticide products include ingredients that are banned or restricted in other countries.

## Acute and Chronic Health Impacts of Pesticide Exposure

Acute toxicity refers to the immediate effects of a particular dose of a pesticide on human health. Acute effects can present numerous symptoms, including respiratory problems, nervous system disorders, and aggravation of pre-existing conditions such as asthma. Symptoms range from mild irritations to death. Pesticides can cause irritation of the eyes, nose, and throat; burning, stinging, itches, rashes, and blistering of the skin; nausea, vomiting, and diarrhea; and coughing, wheezing, headache, and general malaise. Because these symptoms are similar or identical to those caused by other illnesses, acute pesticide poisoning is often misdiagnosed.\*

Exposure to pesticides are also linked with chronic illness, such as cancer, behavioral impairment, reproductive dysfunction, endocrine disruption, developmental disabilities, learning disabilities, skin conditions, and respiratory diseases such as asthma. Chronic health effects from pesticides are problematic to study in humans because most people are exposed to low doses of pesticide mixtures, and delayed health effects are difficult to link to past exposures. Pesticides are biologically active: some are genotoxic; others disrupt normal neurotransmitter function, while still others mimic human hormones, any of which may create subtle health effects.\*\*

*\*Pesticides and Human Health: A Resource for Health Lawn Professionals. Physicians for Social Responsibility, 2000, p 7. Gina Solomon, MD, MPH*

*\*\*Pesticides and Human Health: A Resource for Health Lawn Professionals. Physicians for Social Responsibility, 2000, p 8. Gina Solomon, MD, MPH*

- All 32 of TruGreen ChemLawn’s pesticide products include ingredients that pose threats to the environment; including, threats to water supplies, aquatic organisms, and beneficial insects like bees, ladybugs and butterflies.

## Carcinogens

17 of 32 (53%) of TruGreen ChemLawn’s pesticide products include ingredients that are possible carcinogens.

Table 4 (page 10) lists the ingredients in TruGreen ChemLawn’s products that are possible carcinogens. The first column in Table 4 lists the product name, the second column lists the active or inert ingredient of the specified product, the third column lists the pesticides chemical class, the fourth column lists the cancer classification, and the fifth column is the national or international government agency that has issued the health warning: the International Agency for Research on Cancer (IARC) or the U.S. Environmental Protection Agency.<sup>15</sup>

The IARC is part of the World Health Organization (WHO), the United Nations’ agency focused on world health.<sup>16</sup>

Cancer rankings range from known human carcinogens to evidence of noncarcinogenicity for humans. Known human carcinogens are those compounds in which there are enough human evidence to prove that the compound causes cancer to humans. Possible carcinogens are those compounds in which there is evidence that these compounds cause cancer in animals and the human data is inconclusive. These compounds are lacking sufficient human evidence and testing on animals to declare their carcinogenicity.<sup>17</sup> All of the compounds listed in Table 4 are possible carcinogens. ChemLawn states on its website that it will not use pesticides that are known or probable carcinogens.<sup>18</sup> With the information that was available for the active and inert ingredients, the analysis of the 32 products confirmed this as true.

**Table 3: TruGreen ChemLawn Products that include ingredients that have known or suspected reproductive and developmental effects**

| PRODUCT                  | CHEMICAL     | CHEMICAL CLASS               |
|--------------------------|--------------|------------------------------|
| Confront + Vanquish      | Dicamba      | Organochlorine, benzoic acid |
| Cool Power               | Dicamba      | Organochlorine, benzoic acid |
| Eagle Fungicide          | Myclobutanil | Azole                        |
| Millennium Ultra         | Dicamba      | Organochlorine, benzoic acid |
| Talstar                  | Bifenthrin   | Pyrethroid                   |
| Talstar + Fertilizer     | Bifenthrin   | Pyrethroid                   |
| Triplet                  | Dicamba      | Organochlorine, benzoic acid |
| Tri-Power                | Dicamba      | Organochlorine, benzoic acid |
| Turflon Ester + Tripower | Dicamba      | Organochlorine, benzoic acid |

**Table 4: TruGreen ChemLawn Products that include ingredients with likely or possible carcinogenic chemicals**

| <b>Product</b>               | <b>chemical</b> | <b>chemical Class</b> | <b>Health Concern</b> | <b>Agency</b> |
|------------------------------|-----------------|-----------------------|-----------------------|---------------|
| Acclaim Extra                | Naphthalene     | - - -                 | Possible Carcinogen   | IARC          |
| 0.21% Barricade + Fertilizer | Prodiamine      | Dinitroaniline        | Possible Carcinogen   | USEPA         |
| Barricade 4 FL               | Prodiamine      | Dinitroaniline        | Possible Carcinogen   | USEPA         |
| Barricade 65W                | Prodiamine      | Dinitroaniline        | Possible Carcinogen   | USEPA         |
| Cool Power                   | MCPA            | Phenoxy               | Possible Carcinogen   | IARC          |
| Dimension 1 EC               | Naphthalene     | - - -                 | Possible Carcinogen   | IARC          |
| Dimension Ultra              | Naphthalene     | - - -                 | Possible Carcinogen   | IARC          |
| Millenium Ultra              | 2,4 D           | Phenoxy               | Possible Carcinogen   | IARC          |
| Pre-M 3.3EC                  | Pendimethalin   | Dinitroaniline        | Possible Carcinogen   | USEPA         |
| Pre-M 3.3EC + Fertilizer     | Pendimethalin   | Dinitroaniline        | Possible Carcinogen   | USEPA         |
| Sevin 6.3G                   | Carbaryl        | Carbamate             | Possible Carcinogen   | USEPA         |
| Sevin SL                     | Carbaryl        | Carbamate             | Possible Carcinogen   | USEPA         |
| Talstar                      | Bifenthrin      | Pyrethroid            | Possible Carcinogen   | USEPA         |
| Talstar + Fertilizer         | Bifenthrin      | Pyrethroid            | Possible Carcinogen   | USEPA         |
| Triplet                      | 2,4 D           | Phenoxy               | Possible Carcinogen   | IARC          |
|                              | MCPA            | Phenoxy               | Possible Carcinogen   | IARC          |
| Tri-Power                    | MCPA            | Phenoxy               | Possible Carcinogen   | IARC          |
|                              | MCPA            | Phenoxy               | Possible Carcinogen   | IARC          |
| Turflon Ester + Tripower     | MCPA            | Phenoxy               | Possible Carcinogen   | IARC          |
|                              | MCPA            | Phenoxy               | Possible Carcinogen   | IARC          |

## Active and Inert Ingredients

Pesticides consist of both “active” and “inert” ingredients. “Active” ingredients are agents that will prevent, destroy, repel or mitigate any pest, as defined by the United State’s main law governing pesticides, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). They are the part of the pesticide that is designed to kill the pest.

“Inert” ingredients are chemicals in the pesticide mixture that are used as solvents, propellants, and carriers for the active ingredients, in order to make the active ingredients effective.<sup>19</sup> Although the name sounds innocuous, inerts can actually be more harmful than the active ingredients. Some inerts are known carcinogens capable of causing central nervous system disorders, liver and kidney damage, and birth defects. The short-term symptoms that may occur as a result of exposure include eye and skin irritation, nausea, dizziness and respiratory difficulties.<sup>20</sup>

Inert ingredients usually make up half, if not most, of the pesticide product. Some pesticide products are 99% inerts. Unfortunately, the vast majority of inert ingredients are not disclosed by the pesticide manufactures or applicators.

FIFRA regulations allow information on inert ingredients to be kept secret when the manufacturers request confidentiality of their pesticide mixture “trade secrets”. Most manufacturers claim this confidentiality. This trade secrecy section of FIFRA was intended to protect manufacturers from competitors in their market. However this regulation has become out-dated due to the fact that companies often use “reverse engineering techniques” in order to identify the inert ingredient mixtures, leaving consumers the ones without the information.

FIFRA allows the USEPA to mandate disclosure of inert ingredients if the agency declares “that disclosure is necessary to protect against an unreasonable risk of injury to health or the environment.”<sup>21</sup> In 1987 the USEPA expanded labeling requirements of inert ingredients by designating inerts into these four categories:

- 1) Inert Ingredients of Toxicological Concern-Substances known to cause long term health and environmental damage.
- 2) Potentially Toxic Inert/High Priority for Testing Inerts-Substances suspected of causing long-term health and environmental damage.
- 3) Inerts of unknown toxicity.
- 4) Minimal risk inert ingredients.<sup>22</sup>

The USEPA declared that inerts listed in the “Inert Ingredients of Toxicological Concern” category had to be labeled by the manufacturer. No label was required for inerts in the other three categories.<sup>23</sup> Yet, the law has done little to educate consumers about the chemicals in pesticides. Only eight out of 2,300 inert ingredients are required to be listed by the USEPA on the pesticide label.<sup>24</sup> Despite a 93% increase since 1987 in the number of inerts used in pesticide products, the public continues to know little about the inert ingredients in pesticide products.



## Reproductive and Developmental Toxins

9 of 32 (28%) TruGreen ChemLawn's pesticide products include ingredients that are known or suspected reproductive toxins.

Reproductive toxins are chemicals that affect the reproductive systems of animals, including humans. Exposure to a possible reproductive toxin before conception can "produce a wide range of adverse effects including reduced fertility, an abnormal fetus, reduced libido, or menstrual dysfunction."<sup>25</sup> Exposure to a mother after conception can cause "perinatal death, low birth weight, birth defects, developmental and/or behavioral disabilities and cancer"<sup>26</sup> in her baby. Developmental toxins, also known as teratogens, are a subset of reproductive toxins. Table 4 lists TruGreen ChemLawn's products that have ingredients that are suspected

or known to have reproductive and developmental effects.

## Endocrine Disruptors

11 of 32 (34%) TruGreen ChemLawn's pesticide products include ingredients that are known or suspected endocrine disruptors.

Endocrine disruptors impact animals by promoting the development of tumors, and interfering with sexual development. These chemicals mimic hormones and interfere with the hormone's functions, changing or stopping the translation of a signal. Similar to reproductive toxins, endocrine disruptors can have severe effects on developing fetuses. Exposure to endocrine disruptors "can result in learning disabilities, testicular cancer, impaired thyroid function, declining sperm counts, and male genital defects."<sup>27</sup> Endocrine disruptors can

**Table 5: TruGreen ChemLawn Products that include ingredients that are suspected or known to act as endocrine disruptors.**

| PRODUCT                      | CHEMICAL      | CHEMICAL CLASS |
|------------------------------|---------------|----------------|
| 0.21% Barricade + Fertilizer | Prodiamine    | Dinitroaniline |
| Barricade 4FL                | Prodiamine    | Dinitroaniline |
| Barricade 65WG               | Prodiamine    | Dinitroaniline |
| Millennium Ultra             | 2,4 D         | Phenoxy        |
| Pre-M 3.3EC                  | Pendimethalin | Dinitroaniline |
| Pre-M 3.3EC + Fertilizer     | Pendimethalin | Dinitroaniline |
| Sevin 6.3G                   | Carbaryl      | Carbamate      |
| Sevin SL                     | Carbaryl      | Carbamate      |
| Talstar                      | Bifenthrin    | Pyrethroid     |
| Talstar + Fertilizer         | Bifenthrin    | Pyrethroid     |
| Triplet                      | 2,4 D         | Phenoxy        |

mimic estrogen in the body and "it is suspected [that] they are linked to the growing incidence of breast cancer."<sup>28</sup> Table 6 lists TruGreen ChemLawn's products that act as endocrine disruptors.

## Pesticides Banned or Restricted in Other Countries

Thirteen out of TruGreen ChemLawn's thirty-two products (41%) are banned or restricted for use internationally. For example, 2,4-D (the main ingredient in Millennium Ultra and Triplet) is banned in Kuwait, Denmark, and Norway. Belize has also severely restricted its use. These chemicals and respective products are listed in Table 7.

## Toxicity Ratings

12 of 32 (38%) TruGreen ChemLawn's pesticide products include ingredients that are classified as Class II toxins according to the World Health Organization.

Toxicity class ratings by the USEPA are based on the dose of the pesticide that proves to be lethal for 50% of a test population, known as the LD<sub>50</sub>. Classically, the toxicity ratings are

**Table 6: Toxicity Categories**

| ORAL LD <sub>50</sub> | TOXICITY CLASS | SIGNAL WORD |
|-----------------------|----------------|-------------|
| Up to 50 mg/kg        | I              | Danger      |
| 50-500 mg/kg          | II             | Warning     |
| 500-5000 mg/kg        | III            | Caution     |
| Above 50000 mg/kg     | IV             | Caution     |

based on laboratory tests to rats and mice. The "Occupational Health and Safety Commission (OSHA), the Consumer Product Safety Commission (CPSC), Environmental Protection Agency (USEPA), the Department of Transportation (DOT), and the World Health Organization (WHO) have all adopted the same [toxicity ratings] for regulating and labeling chemical substances."<sup>29</sup> Toxicity categories range from I to IV, with Class I being the most lethal. For reference, ingesting one teaspoon to one tablespoon of a toxicity Class II chemical can kill a human. Class II chemicals must be labeled with the signal word "warning" and specific safety measures should be used when handling these chemicals.<sup>30</sup> Light interactions with Class II chemicals cause skin and eye irritation. Table 6 lists toxicity categories, LD<sub>50</sub>, and signal words for each category. Table 8 lists the twelve products used by TruGreen ChemLawn that are in toxicity Class II, which represents 38% of TruGreen ChemLawn's products.

## Dangers of TruGreen ChemLawn Pesticides to the Environment

The pesticide products used by TruGreen ChemLawn all have ingredients that threaten the environment, potentially impacting groundwater and non-target organisms, such as pets, fish, birds, or frogs. In Table 10, the pesticide product is followed by the chemical name, the environmental impact, and the source for that information. Toxics Action Center used the manufacturer's own Materials Safety Data Sheet (MSDS), the USEPA, the Pesticide Action Network of North America (PANNA) and the Journal for Pesticide Reform for

**Table 7.: TruGreen ChemLawn Products that include ingredients that are banned or restricted in other countries.**

| <b>PRODUCTS</b>          | <b>CHEMICAL</b> | <b>CHEMICAL CLASS</b>        | <b>COUNTRIES BANNED OR RESTRICTED</b> |
|--------------------------|-----------------|------------------------------|---------------------------------------|
| Confront + Vanquish      | Dicamba         | Organochlorine, Benzoic Acid | South Africa                          |
| Cool Power               | MCPA            | Phenoxy                      | Denmark                               |
|                          | MCPP            | Phenoxy                      | Thailand, Denmark                     |
|                          | Dicamba         | Organochlorine, Benzoic Acid | South Africa                          |
| Dylox 6.2G               | Trichlorfon     | Organophosphate              | Indonesia, Kuwait                     |
| Millennium Ultra         | 2,4 D           | Phenoxy                      | Kuwait, Demark, Norway, Belize        |
|                          | Dicamba         | Organochlorine, Benzoic Acid | South Africa                          |
| Pre-M 3.3EC              | Pendimethalin   | Dinitroaniline               | Sweden                                |
| Pre-M 3.3EC + Fertilizer | Pendimethalin   | Dinitroaniline               | Sweden                                |
| Sevin 6.3G               | Carbaryl        | Carbamate                    | Angola, Sweden, Germany, Austria      |
| Sevin SL                 | Carbaryl        | Carbamate                    | Angola, Sweden, Germany, Austria      |
| Talstar                  | Bifenthrin      | Pyrethroid                   | Netherlands                           |
| Talstar + Fertilizer     | Bifenthrin      | Pyrethroid                   | Netherlands                           |
| Triplet                  | 2,4 D           | Phenoxy                      | Kuwait, Demark, Norway, Belize        |
|                          | Dicamba         | Organochlorine, Benzoic Acid | South Africa                          |
| Tri-Power                | MCPA            | Phenoxy                      | Denmark                               |
|                          | MCPP            | Phenoxy                      | Thailand, Denmark                     |
|                          | Dicamba         | Organochlorine, Benzoic Acid | South Africa                          |
| Tuflon Ester + Tri-Power | MCPA            | Phenoxy                      | Denmark                               |
|                          | MCPP            | Phenoxy                      | Thailand, Denmark                     |
|                          | Dicamba         | Organochlorine, Benzoic Acid | South Africa                          |

testing results. In depth research on pesticides impact on the environment by government agencies is limited.

With more than 70 million pounds of pesticides applied each year on lawns, the potential for harm to the environment is significant. The limited testing that has been conducted reveals threats to many non-targeted organisms, including pets.

David Pimentel of Cornell University conservatively estimates the number of birds lost each year to pesticides at 67 million on farmland alone.<sup>31</sup> Test results over the last four years clearly identify chemical lawn and garden pesticides as a leading cause of bird mortality in New York. Domestic use of pesticides now accounts for the majority of wildlife poisonings reported to the USEPA.<sup>32</sup>

## Impacts of TruGreen ChemLawn Fertilizers

The fertilizer used by TruGreen ChemLawn and other pesticide applicators can also impact the environment. Nitrate and phosphate runoff from fertilizer treatment flows into lakes and streams, causing algae blooms that choke other plant and animal life. In one dramatic example, nitrogen runoff from fertilizers used on farms and suburban lawns because a major cause of pollution in the Chesapeake Bay. In 2003, an alarming depletion of oxygen in a 100-mile stretch of water below the Bay Bridge is believed to have caused what environmental scientists called a dead zone.<sup>33</sup>

**Table 8: TruGreen ChemLawn Products that contain ingredients with a Toxicity Class of II.**

| PRODUCT              | CHEMICAL      | CHEMICAL CLASS              |
|----------------------|---------------|-----------------------------|
| Merit + Fertilizer   | Imidacloprid  | Nicotinoid/ Chloronicotinyl |
| Merit 2F             | Imidacloprid  | Nicotinoid/ Chloronicotinyl |
| Merit 75             | Imidacloprid  | Nicotinoid/ Chloronicotinyl |
| Millennium Ultra     | 2,4 D         | Phenoxy                     |
| Sevin 6.3G           | Carbaryl      | Carbamate                   |
| Sevin SL             | Carbaryl      | Carbamate                   |
| Talstar              | Bifenthrin    | Pyrethroid                  |
| Talstar + Fertilizer | Bifenthrin    | Pyrethroid                  |
| Tempo 20             | Cyfluthrin    | Pyrethroid                  |
| Tempo SC             | Cyfluthrin    | Pyrethroid                  |
| Tempo WP 20          | Ethyl Benzene | Aromatic Hydrocarbon        |
| Triplet              | 2,4 D         | Phenoxy                     |

Many urban watersheds are facing serious water quality issues because of the increased volume of nutrients from fertilizers entering their waterways. The nutrients spark massive algae blooms, which use up the oxygen, killing other aquatic life and ultimately impacting recreation and property values.

Communities are targeting this nutrient runoff problem in a variety of ways, but most are "end-of-pipe" solutions. For example, the town of Arlington, Massachusetts installed special storm drains that are designed to settle out particulate nutrients before the storm water is sent into waterways. This engineering approach to nutrient removal is expensive and relatively inefficient. A "front end" solution is to decrease or stop the use of fertilizers

used on suburban lawns.

Another effect of pesticide use is the impact on water resources. TruGreen ChemLawn advises use of water after pesticide and fertilizer application to ensure the product migrates into the soil. Precious urban freshwater is being used by the millions of gallons. In some cities two-thirds of available freshwater goes on lawns.<sup>34</sup> The Environmental Protection Agency reports that in a typical year, the average lawn consumes about 10,000 gallons of water over and above rainfall. Nearly a third of urban water use in the Eastern US goes to

## Organophosphates

Organophosphate products (OPs) work by inhibiting important enzymes of the nervous system that play a vital role in the transmission of nerve impulses. Organophosphates were first created as insecticides, but during World War II the German military found that they worked particularly well as neurotoxin weapons.<sup>36</sup> Nerve impulses usually travel along neurons (nerve cells) by way of electrical signals. However, at a junction between two neurons (a synapse) and between a neuron and a muscle (neuromuscular junction) the impulse is transmitted in the form of a chemical substance (neurotransmitter). The neuro-transmitter operating in the autonomic nervous system, neuromuscular junctions and parts of the central nervous system is acetylcholine, which is released by cholinergic neurons. It is broken down and inactivated in milliseconds by the enzyme cholinesterase. With exposure to OPs, the enzyme is unable to function and a build up of acetylcholine occurs, which causes interference with nerve impulse transmission at nerve endings.

watering lawns.<sup>35</sup>

## The Different Classes of Pesticides and How They Work

Pesticides are designed to kill living things. Some pesticides target neural synapses, others interfere with enzymes. Unfortunately, pesticides do not only affect the target organism. The human body uses similar chemical pathways as the target pests. Even the herbicide-class of pesticides, those that are designed to target plants, can interfere with a human's chemical development and processes.

In humans, poisoning symptoms include excessive sweating, salivation and lachrimation, nausea, vomiting, diarrhea, abdominal cramp, general weakness, headache, poor concentration and tremors. In serious cases, respiratory failure and death can occur.<sup>37</sup> Children are more susceptible to organophosphates than adults because their nervous systems are not fully developed.

## Carbamates

Carbamates are some of the most common chemical classes used in insecticide production. Carbamates function similarly to OPs by inhibiting the enzyme acetyl cholinesterase. This enzyme is responsible for transmitting nerve impulses through nerve and muscle cells. When the enzyme is present, it passes on the nerve impulse. Yet when the enzyme is missing the impulse is discontinued. Carbamates block acetyl cholinesterase and cause a build up the enzyme acetylcholine at the nerve ending. Carbamates inhibit nerve impulses in both target and non-target species. Acute symptoms of carbamate poisoning include excessive urination,

nausea, vomiting, muscle spasms, convulsions, and in severe cases respiratory failure. Carbamates are possible carcinogens according to USEPA and they are highly toxic to birds and aquatic organisms.<sup>38</sup>

## Phenoxy and Benzoic Acid

Phenoxy and benzoic acid herbicides are grouped together as a single chemical class. The two groups have similar structures and mechanisms. Herbicides like 2,4 D, MCPP, MCPA are all included in this chemical class. The active compound 2, 4, 5-T is a phenoxy compound and was used in the creation of Agent Orange during the Vietnam War era. Phenoxy and benzoic acid compounds work as growth hormones by disrupting normal cell growth in plants by stimulating rapid growth in older cells and rapid expansion in younger cells. Rapid growth without cell division crushes the existing plant structure; destroying the nutrient and water transport systems. In mammals the herbicide affects the central nervous system. Acute symptoms of exposure include involuntary twitching, loss of sensation, vomiting, abdominal pains, diarrhea, weakness, fatigue, dermatitis, and aching muscles. Chronic symptoms of exposure include reproductive effects, birth defects, cancer of soft tissues, non-Hodgkin's lymphoma, and negative effects on the liver and kidneys. The herbicides are moderately toxic to birds and aquatic organisms. These compounds are mobile in soils; therefore, they can enter and contaminate groundwater supplies.<sup>39</sup>

A 1999 study by the American Cancer Society showed an increase in non-Hodgkin's lymphoma for individuals who used herbicides and fungicides,

with the biggest impact seen from exposure to MCPA, a phenoxy used by TruGreen ChemLawn.<sup>40</sup>

## Pyrethroids

Pyrethroids are rated as possible carcinogens according to the USEPA as they "interfere with ionic conductance of nerve membranes by prolonging the sodium current".<sup>41</sup> The chemicals affect the central and peripheral nervous systems. Pyrethroids are neurotoxins that "cause hyper-excitability in poisoned animals". Signs and symptoms of pyrethroid poisoning include asthma-like reactions, sneezing, headache, nausea, lack of coordination, convulsions, tremors, facial flushing and swelling, and burning and itching sensations. Pyrethroids are also thought to be endocrine disruptors. In the environment, pyrethroids are extremely toxic to aquatic organisms and moderately toxic to birds. Direct sunlight will break down pyrethroids in a few days, but in areas with limited sunlight they can persist for months.<sup>42</sup>

## Organochlorines

Organochlorines are a chemical class which includes other well known toxic compounds, such as PCBs, tetrachloroethylene, aldrin, chloroform, DDT, dieldrin, and heptachlor. These compounds work by interfering with the sodium/potassium balance surrounding nerve fibers. This imbalance sends nerve impulses continuously instead of just in response to stimuli.<sup>43</sup> Immediate and long term effects include, but are not limited to convulsions, nausea, hypertension, cancer, central nervous system damage, lung damage, and anemia. Organochlorides are suspected teratogens and mutagens.

**Table 9: TruGreen ChemLawn's products that include ingredients that have adverse environmental effect (continued on next page)**

| <b>PRODUCT</b>   | <b>PESTICIDE</b>   | <b>ENVIRONMENTAL EFFECT</b>   | <b>SOURCE</b> |
|--|--------------------|---|---------------|
| Acclaim Extra  | Fenoxzprop-p-ethyl | Toxic to fish and aquatic invertebrates   | MSDS          |
| Barricade 4FL, Barricade 65WG, 0.21% Barricade + Fertilizer              | Prodiamine         | Highly toxic to fish and invertebrates  | MSDS          |
| Compass Fungicide  | Trifloxystrobin    | Slightly to highly toxic to fish  | MSDS          |
| Confront + Vanquish, Millennium Ultra                                    | Clopyralid         | Groundwater threat  | USEPA         |
| Confront + Vanquish, Tuflon Ester, Cool Power, Turflon Ester + Tri-Power | Triclopyr          | Groundwater threat<br><br>Endangered species threat<br><br>Toxic to beneficial insects and plants | USEPA         |
| Dimension Ultra and Dimension 1 EC                                       | Dithiopyr          | Highly toxic to aquatic organisms   | MSDS          |
| Drive 75 DF  | Quinclorac         | Slightly toxic to fish and birds  | MSDS          |
| Dylox 6.2 G  | Trichlorfon        | Highly toxic to birds, aquatic invertebrates, and some fish                                       | USEPA         |
| Eagle Fungicide  | Myclobutanil       | Highly toxic to aquatic organisms. Slightly toxic to birds  | MSDS          |

|   |                     |   |  |
|---|---------------------|---|--|
| Manage  | Halosulfuron-methyl | Groundwater threat. Slightly toxic to fish  | PANNA                                      |
| Millennium Ultra, Triplet   | 2,4 D               | Toxic to aquatic organisms. Linked to lymphoma in Dogs  | MSDS, Journal of Pesticide Reform          |
| Merit 2F, Merit 75 WSP, Merit + Fertilizer  | Imidacloprid        | Highly toxic to birds, toxic to fish and aquatic organisms  | Journal of Pesticide Reform, USEPA         |
| Millenium Ultra, Triplet, Tri-Power, Turflon Ester + Tri-Power, Confront + Vanquish, Cool Power | Dicamba             | Groundwater threat. Range of toxicity to aquatic organisms  | Journal of Pesticide Reform                |
| Pre-M 3.3EC, Pre-M 3.3EC + Fertilizer   | Pendimethalin       | Highly toxic to some fish species   | PANNA                                      |
| Quicksilver   | Carfentrazone-ethyl | Moderately toxic to aquatic organisms   | PANNA, MSDS                                |
| Razor Pro   | Glyphosate          | Potential water contaminant. Toxic to beneficial invertebrates. Moderately toxic to some fish species | USEPA, Journal of Pesticide Reform, MSDS   |
| Sevin SL and Sevin 6.3 G  | Carbaryl            | Highly toxic to beneficial invertebrates, birds, and aquatic organisms. Groundwater threat.           | USEPA, Journal for Pesticide Reform, PANNA |
| Talstar, Talstar + Fertilizer   | Bifenthrin          | Highly toxic to fish  | MSDS                                       |
| Tempo Sc Ultra, Tempo 20 WB   | Cyfluthrin          | Highly toxic to aquatic organisms. Toxic to birds.  | MSDS, Journal of Pesticide Reform          |
| Tri-Power, Cool Power, Turflon Ester + Tri-Power  | MCPA                | Toxic to mammals, highly toxic to some fish. Groundwater threat                                       | USEPA, Mass DFA                            |
| Triplet, Tri-Power, Turflon Ester + Tri-Power   | MCPP                | Water contaminant.  | PANNA, Washington DOE                      |
|   |                     | Slightly toxic to fish  |  |



Organochlorines are very persistent in the environment and they bioaccumulate in plants and animal tissues.<sup>44</sup>

## **Children Are the Most Vulnerable to the Dangers of Pesticides**

Children are at a higher risk for health effects from exposure to pesticides than adults. Children's internal organs are still developing and maturing and their enzymatic, metabolic, and immune systems provide less natural protection than those of an adult. There are "critical periods" in human development when exposure to a toxin can permanently alter the way a child's biological system develops and operates.<sup>45</sup>

Children eat more and drink more per body weight than adults, so pesticide exposure has a bigger impact on their bodies. A child's behavior outdoors or in the home brings them in contact with the ground more than an adult, potentially exposing him or her more directly to pesticides when playing on grass or carpets. Pesticides are often tracked indoors by pets and shoes. Young children also engage in more frequent hand-to-mouth behavior.<sup>46</sup>

A National Cancer Institute study states that, "although research is underway to characterize the risks of childhood cancer associated with pesticides and identify the specific pesticides responsible, it is prudent to reduce or, where possible, eliminate pesticide exposure to children, given their increased vulnerability and susceptibility. In particular, efforts should be focused to reduce exposure to pesticides used in homes and gardens

and on lawns and public lands, which are major sources of exposure for most children."<sup>47</sup>

A number of studies have linked lawn pesticides to childhood illnesses:

- A University of Southern California study showed that children whose parents used garden pesticides were 6.5 times more likely to develop leukemia.<sup>48</sup>
- According to EPA's Guidelines for Carcinogen Risk Assessment, children receive 50 percent of their lifetime cancer risks in the first two years of life.<sup>49</sup>
- Children with brain cancer are more likely than normal controls to have been exposed to insecticides in the home.<sup>50</sup>
- Children in families that use professional pest control services are at higher risk of developing leukemia than children in families that don't use pesticides.<sup>51</sup>
- A 1990 study by the US Congress Office of Technology Assessment concluded that "in general, [human health] research demonstrates that pesticide poisoning can lead to poor performance on tests including intellectual functioning, academic skills, abstraction, flexibility of thought, and motor skills; memory disturbances and inability to focus attention; deficits in intelligence, reaction time, and manual dexterity; and reduced perceptual speed. Increased anxiety and emotional problems have also been reported."<sup>52</sup>

## Pesticides are Persistent and Remain Threats for Extended Periods

Pesticides can linger for days, months and even years. Although the potency and danger of pesticides tend to diminish over time after their initial application, the rate of that degradation varies.

TruGreen ChemLawn literature tells customers to stay off their lawns for 24 hours. Pesticides lose their potency when they are exposed to sunlight and water. Yet, it is difficult to determine how long a pesticide stays active because sunlight and contact with water varies.

Pesticides will move from their intended targets through air, water, food and surface contact. Evaporation occurs with liquid, powder and even granular pesticides. Once pesticides evaporate, they become part of the water cycle. The USGS has found virtually every pesticide they have investigated in the air, snow, rain or fog.<sup>53</sup>

Pesticides persist for even longer inside homes. Without exposure to sunlight or rain, pesticides will last longer when they are tracked inside. A USEPA study found that residues from outdoor pesticides are tracked in by pets and people's shoes, and can increase the pesticide loads in carpet dust as much as 400-fold. These pesticides, intended for outdoor use, will persist for years indoors because they are sheltered from sun, rain and other forces that can degrade them.<sup>54</sup> A study published in November 2003 by the Silent Spring Institute, which was funded by the Massachusetts Department of Public Health, showed that residents may be continuously exposed to dangerous levels of pesticides in their home decades after

## Pets and Pesticides

Pets are at serious risk due to pesticide exposure. A study, published in the Journal of American Veterinary Medical Association, by scientists at Purdue University in Indiana, found that Scottish terriers were four to seven times more likely to develop bladder cancer if they had been exposed to lawn chemicals.\* Pets, like canaries in coal mines, can be thought of as indicator species for humans. Suzanne Snedeker, associate director of the Breast Cancer and Environmental Risk Factors program in Cornell's Center for the Environment, points out that "[cancer] in pets often progress more rapidly, thus reducing the time required to make conclusions about causal associations, and in contrast to human cancers, cancer development in companion animals is not subject to confounding risks such as smoking and alcohol consumption."\*\*

A 1991 National Cancer Institute case-control study of canine malignant lymphoma reports a positive association with an owner's use of the popular crabgrass killer 2,4-D and their pet dog's chances of getting cancer.\*\*\*

In 2004, in Melrose, Massachusetts, a TruGreen Affiliate applied "Manage" (halosulfuron-methyl) and "Merit" (Imidacloprid) on Joanna Gleason's lawn after being assured that the chemicals were totally "safe". After waiting the recommended 24 hours, she let her dog out on her yard. Right away, Joanna's dog became acutely ill, exhibiting symptoms Joanna had "never seen before" including excessive drooling, vomiting, and swelling of the face, and was treated by her veterinarian for pesticide poisoning from the grub control pesticide "Merit."\*\*\*\*

\*Pet Bladder Cancer Linked to Pesticide Applications, Journal of the American Veterinary Medicine Association, April 15, 2004

\*\*Waltner, Linda, "A dog is Man's Best Friend in more ways than one," October 9, 2003, <http://www.healthlink.org/petlink7.html>

\*\*\* Howard M. Hayes and others, "Case-Control Study of Canine Malignant Lymphoma: Positive Association With Dog Owner's Use of 2,4-Dichlorophenoxyacetic Acid Herbicides," JOURNAL OF THE NATIONAL CANCER INSTITUTE Vol. 83 (Sept. 4, 1991), pgs. 1226-1231.

\*\*\*\*Conversation with Ingrid Nelson, Toxics Action Center, 2004.

application.<sup>55</sup> One pesticide found in the study was DDT, which has been banned from use for over 30 years.

Because pesticides persist, they have more opportunities to get into our bodies. The Centers for Disease Control and Prevention (CDC), in a study of 9,282 people nationwide, found pesticides in 100% of the people who had both blood and urine tested. The average person carried 13 of 23 pesticides tested. The study found that children carried the highest body burden of pesticides.<sup>56</sup> Fat soluble pesticides accumulate over time in our bodies. Pesticides that accumulate in women can be passed to children through breast milk.<sup>57</sup>

A number of doctors in Canada have concluded that pesticides pose a major public health threat. The Ontario College of Family Physicians is strongly recommending that people reduce their exposure to pesticides wherever possible after compiling a comprehensive review of research on the effects of pesticides on human health. The review showed consistent links to serious illnesses such as cancer, reproductive problems and neurological diseases, among others.

“Many of the health problems linked with pesticide use are serious and difficult to treat – so we are advocating reducing exposure to pesticides and prevention of harm as the best approach”, said Dr. Margaret Sanborn of McMaster University, one of the review’s author’s.<sup>58</sup>

## ■ Despite the Risks, TruGreen ChemLawn Continues to Expand and Take on New Customers

Chapter Two describes the dangers of using TruGreen ChemLawn products. With the ingredients used in its pesticides products posing such a clear threat to public health issues and environmental harm, why do homeowners continue to use services like TruGreen ChemLawn in record numbers?

Toxics Action Center's research and analysis reveals that it is difficult for consumers to find out the true public health and environmental impacts of lawn pesticides. A lenient federal government registration process approves pesticides, inherently implying the products are not dangerous and acceptable to consumers. TruGreen ChemLawn's customer service makes information on its pesticide products hard to access, leaving the customer without the information needed to understand the risks of using pesticides.

### **The Federal Government Has Given a Questionable Stamp of Approval to TruGreen ChemLawn's Pesticides**

If a TruGreen ChemLawn customer questions the safety of a TruGreen ChemLawn product, the company can rely on the fact that all the pesticides they use are registered and approved by the USEPA.

Yet, the USEPA approval process is flawed and full of contradictions. On one hand the USEPA approves pesticides for use. On the other, it clearly states that approval does not mean safety. In fact,

federal law states that it is illegal to say that a pesticide is safe even if used as directed on the label.<sup>59</sup> In addition, warning labels must be applied to pesticide labels (DANGER, WARNING, or CAUTION) showing that these products pose a threat to public health or the environment.

The USEPA pesticide approval procedure reveals a process full of loopholes and potential conflicts of interest. The result is a flawed approval process for pesticides that allows dangerous products on the market and fails to protect the health and safety of millions of Americans.

On the federal level, the primary law regulating pesticides is the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). Enacted in 1947, the law was originally passed to assure farmers that the pesticide product they purchased would actually perform and that the product was not acutely toxic. The law was designed to protect economic interests, not to protect human health or the environment.<sup>60, 61</sup>

In 1970, the administration of FIFRA was changed from the Department of

## The Dangers of Diazinon

For the past few generations, RAID was a common household item used by families across the country to get rid of ants and roaches.

Yet after it was forced to go through re-registration in the 1990s, testing showed that RAID's active ingredient Diazinon posed a significant threat to public health. As of December 31, 2004, the USEPA banned consumer sales of Diazinon. The USEPA has classified Diazinon as a Class II to III toxin (on a scale of I to V, with class I being the most toxic).\*

According to Marla Cone from the Los Angeles Times "13 million pounds of Diazinon were used annually in the US, 80% of this is for residential purposes"\*\*.

Diazinon is an organophosphate that severely impacts neurological development, especially in children. The chemical is still being used in agriculture practices, but it is slowly being phased out.

The history of Diazinon shows why timely and comprehensive retesting and reregistering of pesticides is vital for protecting public health and the environment.

\*Beyond Pesticides, ChemicalWatch Fact Sheet, Diazinon, <http://www.beyondpesticides.org/pesticides/factsheets/Diazinon.pdf>.

\*\*Cone, Marla, Los Angeles Times, January 18, 2005 *Diazinon Ban in Effect*, <http://www.landandlivestockpost.com/crops/011805diazinon.htm>.

Agriculture to the newly created USEPA. Under the EPA in 1972, FIFRA required chronic toxicity and environmental concerns to be included in the testing for registration. The USEPA was directed to retest and reregister the 50,000 products already approved to be on the market.<sup>62</sup>

Unfortunately, 32 years later after the USEPA's re-registration directive, many dangerous pesticides have not been "re-registered". Rather than remove potentially harmful untested pesticides from the market, these pesticides have remained in use. Most believe the USEPA's goal for finishing re-registration in 2006 will not be met. Some of the pesticides that have gone through re-registration were subsequently banned for use by consumers. Diazinon, for example, a common pesticide used in RAID, was found to be too dangerous for consumer use and was banned in 2005 (see sidebar).

The re-registration process is no guarantee of safety. The USEPA has re-registered pesticides it also classifies as "possible human carcinogens." The USEPA also allows "conditional registration" of new pesticide products even though health and safety tests are missing.<sup>63</sup>

The Northwest Coalition for Alternatives to Pesticides surveyed 41 new conventional pesticides registered between 1997 and 2001 and found over half were "conditionally registered". Even pesticides with full (not conditional) registrations do not always have complete testing. In NCAP's survey, over half of the pesticides with full registrations were incompletely tested at the time they were registered.<sup>64</sup>

Even when the pesticides go through the entire re-registration process, the American public cannot be assured of the safety of the pesticides.

- The USEPA uses the pesticide manufacturers' own in-house studies of the chemical's toxicity, a potential conflict of interest between the USEPA's need for unbiased data and the manufacturer's need for data that show their product is safe for use.

- FIFRA is not a health or safety-based law. Economic interests are an integral part of the equation in the registration process. As a result, health and safety issues may be overshadowed by the financial interests of the pesticide corporation. The USEPA evaluates the pesticide by balancing the projected health impacts of pesticide use with the economic benefits of use.<sup>65</sup>
- The testing of the pesticides is not comprehensive. The USEPA does not require studies that look at what combinations of pesticides can do, even though there is evidence that combinations of pesticides are more harmful than the individual chemicals alone. A University of Rochester study showed a link between pesticides and Parkinson's disease when they studied the effect of the combination of two widely used agricultural pesticides. Separately the pesticides had minimal impact, but the combination created in mice the exact pattern of brain damage that doctors see in patients with Parkinson's disease.<sup>66</sup>
- The USEPA does not require testing of pesticides for:
  - Potential to harm reproductive systems.
  - Immunological toxicity.
  - Effects on learned behaviors.
  - What multiple exposures to the same chemical in food, water, and air will do.
  - Unique risks to children. For example, more than 90 percent of pesticides and inert ingredients are never tested for their effects on developing nervous systems.<sup>67</sup>

the environment can be and repeatedly are registered as long as they offer enough economic benefits. The manufacturer must demonstrate that the pesticide "will perform its intended function without unreasonable adverse affects on public health or the environment," which is defined as "any unreasonable risk to man or the environment, taking into account the economic, social and environmental costs and benefits of the use of any pesticide."<sup>68</sup>

### **Customers Often Do Not Know the Dangers of TruGreen ChemLawn's Products**

Over the past six months, Toxics Action Center asked residents to call TruGreen ChemLawn to inquire about their lawn care service. Through this informal survey we found anecdotal evidence that shows that TruGreen ChemLawn's customer service procedures make it difficult for potential customers to acquire factual information about the dangers of their pesticide products.

Despite requests to TruGreen ChemLawn telemarketers, potential customers found it difficult to obtain health and safety information about the pesticides being proposed for their lawns. TruGreen ChemLawn marketing representatives told customers that the impacts of the pesticides were negligible and did not readily offer access to health and safety information. In addition, TruGreen ChemLawn representatives at times misrepresented their pesticide products as "safe", a possible violation of federal law.<sup>69</sup>

TruGreen ChemLawn's website lists no specific products that are used, and by

Pesticides hazardous to health and to

extension, details no potential health threats of their products. Although it provides links to an EPA web page to find references for the details of health impacts, a potential customer does not know which pesticide to investigate.

Even if the customer was provided information about the pesticide, the data would not include information about the inert ingredients in the pesticides. As detailed on Page Nine, inert ingredients are not required to be listed and this health data for the vast majority of these ingredients is not available for the consumer.

TruGreen ChemLawn's literature and corporate marketing culture pushes the concept of "safety" despite USEPA regulations which specifically prohibit the following claims or statements on any pesticide label. The USEPA restricts claims as to the safety of the pesticide or its ingredients, such as "safe", "nonpoisonous", "harmless", or "nontoxic to humans and pets", with or without a qualifying phrase such as "when used as directed".<sup>70</sup>

In addition to applying the USEPA labeling standards to pesticide advertising, the FTC publishes a "Guide for the Use of Environmental Marketing Claims," which provides a basis for voluntary compliance with consumer protection laws. Among other things, these guidelines prohibit incomplete safety comparisons, such as "safer" or "less toxic," which do not indicate what the product is being compared to or the basis upon which the comparison is being made.<sup>71</sup>

Despite the fact that the FTC has the power to regulate pesticide advertising,

very little enforcement is taking place. According to a US General Accounting Office report completed in 1990, the FTC failed to initiate any investigations involving lawn pesticide safety claims. The GAO concluded that federal regulations are inadequate.<sup>72</sup>

A statement on TruGreen ChemLawn's website appears to be in violation of these principles. "A scale used for rating the toxicity of chemicals from Clinical Toxicology of Commercial Products, Gosselin, Smith and Hodge: Williams and Wilkins, Baltimore, 1984 indicate that the test results for liquid mixtures diluted for use in TruGreen ChemLawn programs can be rated as Practically Non-Toxic."<sup>73</sup>

## **TruGreen ChemLawn is an Aggressive Marketer**

The need for a year-round green lawn has become an addiction for many homeowners, thanks to marketing by companies like TruGreen ChemLawn. TruGreen ChemLawn has capitalized on this demand and has become the largest lawn pesticide provider in the country.

The money spent by pesticide applicators has made the lawn a symbol of a person's worth. As TruGreen ChemLawn states on their website, "A healthy landscape says a lot about you and your home. . . . A healthy landscape, including a green lawn and vibrant trees and shrubs, creates a positive first impression."<sup>74</sup> TruGreen ChemLawn and the lawn care industry have convinced many homeowners that the ideal can be easily and safely attained through pesticides and fertilizers.

To drive home the need for a pesticide based lawn care program, TruGreen

ChemLawn employs aggressive telemarketing strategies campaign to enlist and retain clients. Through an informal survey by potential customers in Massachusetts, anecdotal reports revealed high pressure sales tactics, misleading claims saying the pesticide application was “safe”, and an unwillingness to provide clear information on the public health and environmental impacts of the pesticides to be used. A number of states have penalized TruGreen ChemLawn for its aggressive and misleading marketing. (See Chapter One.)

TruGreen ChemLawn is going on the offensive to counter efforts by governments and public health experts to control lawn care pesticide application. They have recently joined an industry “front” group to battle criticism of lawn pesticides. Project Evergreen, a trade association formed by pesticide makers, applicators, garden centers and lawn mower manufacturers has plans to launch a national public relations campaign the spring of 2005 touting the health and lifestyle benefits of thick, green lawns ([www.projectevergreen.com](http://www.projectevergreen.com)). The group was formed in response to activities in the province of Quebec and nearly 70 cities and towns - including Toronto, Montreal, Vancouver and Halifax have all passed laws banning or restricting the use of pesticides for lawns.<sup>75</sup>

### **TruGreen ChemLawn Uses Children to Market its Product**

One of TruGreen ChemLawn’s primary targets has not been the homeowner or corporate groundskeeper, but your children, who use lawns and fields for soccer and other sports. From May of 2003 through December

2004, TruGreen ChemLawn teamed up with US Youth Soccer (USYS). As part of the promotion, TruGreen ChemLawn sent a mailer addressed to the “family of” children who are members of USYS. The mailing featured pictures of a young boy playing soccer and the USYS logo. If a customer signed up, his or her child’s soccer league would get a financial donation from TruGreen ChemLawn for field upkeep. Under pressure from public health and environmental groups, USYS ended its relationship with TruGreen ChemLawn on January 1, 2005.

In the past decade, marketing through children has become more and more acceptable, and corporations have quickly adopted this approach. In 1999, they spent approximately \$12 billion on such efforts. The strategy is simple: not to appeal directly to parents, but to teach kids to influence what their parents buy.<sup>76</sup> As a result, in 1999, children spent more than \$28 billion of their own money and by 2000 directly influenced the spending of more than \$600 billion of their parents’ money.

### **Statewide and Local Pesticide Regulations**

All states are required to meet the regulations of FIFRA, while retaining the right to enact more restrictive standards. Federal law preempts the right of local jurisdictions to ban specific pesticides.

Over the last several years, the pesticide industry has successfully lobbied state legislatures to pass what are known as “pre-emption laws.” These give states responsibility for pesticide regulation and prevent cities and towns from enacting their own laws. So far, 41



states have adopted pre-emption laws. Maine is the only New England state which does not have a preemption law.

At the same time, however, 20 states have adopted laws requiring signs or some sort of public notification when pesticides are applied to s. Dozens of communities have also adopted policies barring or restricting the use of pesticides on school property, public ball fields and parks.

## Chapter 4

# ■ Alternatives: A Truly Green ChemLawn Free Lawn

Green and healthy lawns do not need toxic pesticides and synthetic fertilizers. Alternatives exist that do not put our families, children, pets, and water supplies at risk.

A recent survey sponsored by Organic Gardening magazine in conjunction with the National Gardening Association estimates that of the 90 million U.S. households with yards, about five million are exclusively using organic methods, 31 million are using a combination of organic and chemical methods and 35 million are using primarily chemical methods.<sup>77</sup>

The market for organic lawn care services is growing. Even Scott's, an aggressively pro-pesticide company, will soon be selling an organic fertilizer. Bruce Butterfield, research director at the Vermont-based National Gardening Association, reports that 11.7 million U.S. households purchased organic fertilizers with no synthetic chemicals in 2003, compared with 7.7 million in 2002.<sup>78</sup>

Truly organic lawn does not use pesticides or synthetic fertilizers to create a healthy lawn. An organic strategy is more than changing the types of sprays applied to lawns. It involves a different approach, one that looks at things like soil pH, water retention, and compactness of soil. Organic approaches are about as expensive as chemical approach, and take a bit longer for results, especially if the lawn is used to chemicals. In the past, organic lawn care was a term with no specific definitions or standards. To

parallel the stringent standards farmers must meet to be certified as "organic," The Northeast Organic Farming Association (NOFA) has developed standards for organic lawn care, based on the rigorous standards used in organic agriculture.<sup>79</sup>

For the past five years, NOFA has held classes to certify lawn care companies in truly organic lawn care approaches. Its website lists trained companies at: [www.organiclandlawn.net/professionals.php](http://www.organiclandlawn.net/professionals.php).

TruGreen ChemLawn offers "natural organic" and "natural fertilizer" programs as an alternative to its traditional pesticide-based lawn care treatments. However these alternatives are simply fertilizer applications that provide little or no analysis of the soil and other environmental factors which impact the context in which the lawn grows. If your lawn suffers from weeds and or insects, TruGreen ChemLawn's "organic" plan will be of questionable effectiveness.

Here are some simple steps to an organic lawn, as outlined by the Erie County Environmental Management Council:<sup>80</sup>

### Use the right grass seed

- Select the proper grass for your site based on intended use, and amount of

sunlight. Choose a good quality seed mixture (look for the lowest percentage of “other ingredients” in the mix). The best time to seed new lawns is August 15 to September 15.

- Overseed (plant new seed on an existing ) in areas where the turf is thin to help grass force out the weeds. To overseed, mow close, rake to loosen soil and ensure that seeds and soil make contact. Water to get grass started.

### **Mow the correct way**

- Mow High - no shorter than 3 inches to prevent weeds from getting sun and water, essentially choking them out of your lawn. Don't cut off more than a third of the blade of grass at each mowing because it stresses the plant; mow when grass reaches 4 1/2 inches.

- Leave clippings on the lawn. It adds essential nutrients to the soil and saves you money on fertilizers.

- Sharpen mower blades at least once a year.

### **Develop Healthy Soil**

- Test soil before you buy fertilizer or lime. Choose a quality lawn care service that will provide a soil test to determine your needs.

- Many products are combinations of fertilizers and pesticides. Read labels carefully to avoid paying for product you don't want.

- Feed the roots in the fall and for healthy grass in the spring. If you need to fertilize, use a slow release product and fertilize on or around Labor Day.

- Soil pH should be between 5.5-7.0. Plant nutrients are more available and beneficial microorganisms are more active within this range. Lime and sulfur are rarely necessary. Apply lime to raise pH or sulfur to lower pH only if indicated by soil tests.

- Aerate the lawn, which helps water and nutrients reach the roots. Rent a machine or hire a lawn care professional. In the preferred method of core aeration, a plug of soil is removed by a machine. The resulting dime-size hole reverses the effects of soil compaction and brings moisture and air to the root zone. It also becomes a place where new grass seed likes to sprout.

- Organic matter is critical to soil health as it holds water and nutrients and prevents compaction. If your soil test shows less than 5% organic matter, apply a 1/4" layer of finished compost in the fall. Compost will not be visible in a few days.

- Water properly: Many people over water. If you choose to water your lawn, know that average soil needs about one inch of water a week. Water your lawn only if it's not raining enough. When you do water, place a tuna can under the sprinkler so you can measure the water you're adding. Keep in mind, lawns may turn straw-colored and go dormant during a dry spell, but will revive when it rains. To protect the dormant turf do not allow significant foot traffic.

### **Manage weeds**

- The best strategy to prevent weed invasions is to maintain a healthy lawn. Follow the tips above and you should not have a weed problem. Realize that a

lawn that is 15% weeds looks weed-free to the average observer. Putting-green perfection is not necessary.

- Identify which weed species are present before choosing a management strategy. Most weeds are not problematic, but some can be invasive. Knowing which weeds you have also provides information about your soil. For example, Broadleaf plantain thrives in heavy, compacted soil, so aerate and top dress with organic matter to discourage plantain from returning.

- Some weeds can be effectively pulled by hand. Look for hand tools for removing specific weeds and reseed bare spots.

- Be patient. It takes several seasons for a lawn to change from chemical dependency to an ecosystem in balance. In a season or two you'll fight fewer pests and spend less money.

- Be tolerant. A natural yard is not a monoculture but an abundance of pests, predators, weeds, and our favorite plant species. Some weeds are even beneficial. White clover fixes nitrogen, which benefits grass, and the much-maligned dandelion provides food for tiny parasitic wasps that attack garden pests. Many of the bugs we think of as pests are dinner for birds. Put out a bird feeder and a birdbath. Chickadees spend winter eating aphid eggs; Baltimore Orioles can eat 17 tent caterpillars a minute.

- Squirt weeds. Instead of RoundUp, use BurnOut (lemon juice and vinegar) to kill weeds along walkways.

- Realize that grass just can't grow well

in certain spots. At the base of a tree, for example, consider wood chips or shade-loving ornamentals like periwinkle or pachysandra.

## **Insect Problems**

- Know your enemies: Every insect has a population level below which spraying does more harm than good. Some species of white grubs, for example, hatch just once every seven years, so if you're treating your lawn every spring, you're not only wasting money, you're also killing beneficial insects.

- Try "natural" alternatives to chemical pesticides. Chrysanthemum-derived pesticides, diatomaceous earth and boric acid are sold in garden centers. SharpShooter (citric acid) is an effective insecticide. Make your own solution of three to six tablespoons of dishwashing soap (without degreaser) per gallon of water.

- Test your lawn. In late August cut back three sides of a square foot of sod an inch deep. Peel back the square. If you find fewer than 6 to 10 grubs, put back the sod, water it thoroughly, and relax. Your lawn will be fine.

## Chapter Five

# ■ Be Truly Green: Refuse to Use TruGreen ChemLawn

From its use of pesticides that are linked to cancer and reproductive disorders, to its aggressive marketing campaigns and reluctance to release information about the dangers of their pesticide products, TruGreen ChemLawn's lawn care program poses a threat to the health of our children, pets, and environment.

Toxics Action Center urges residential and commercial customers to Refuse to Use ChemLawn until the company changes the way it does business. Toxics Action Center calls on TruGreen ChemLawn, as the industry leader in pesticide-based lawn care services, to take immediate steps to protect the health and safety of children, families, and the environment from the dangers of their services. We demand that TruGreen ChemLawn:

- Phase out the use of pesticides. TruGreen ChemLawn should immediately stop the use of those pesticides considered possible carcinogens by the USEPA and the IARC.
- Disclose all ingredients in its pesticide products, including the so-called inert ingredients. TruGreen ChemLawn should educate consumers by readily providing information to its customers over the phone, in writing, and on its website about the health and environmental effects of its products.
- Offer a comprehensive organic lawn care program that does not use pesticides or synthetic fertilizers. TruGreen ChemLawn should require their applicators to pass an accredited organic lawn care program.
- Stop using children to market products. TruGreen ChemLawn should not enter into any promotional campaign similar to its partnership with US Youth Soccer, which encouraged families to hire TruGreen ChemLawn with promises of financial support for the town's youth soccer league.

Residents are taking the **Be Truly Green: Refuse to Use ChemLawn** campaign to their neighborhoods by setting up outreach campaigns to educate their communities on the dangers of lawn pesticides. Visit [www.RefuseToUseChemLawn.org](http://www.RefuseToUseChemLawn.org) for more information about the campaign.

# Appendix 1: TruGreen ChemLawn Receipt

## **Appendix 2: Pesticides Used by ChemLawn**

| Product                     | Chemicals                           | EPA or IARC Possible Carcinogen | Reproductive/ Developmental Effects | Endocrine Disruptor | Class II Toxicity | Number of Countries Banned or Restricted | Ecological Effects |              |
|-----------------------------|-------------------------------------|---------------------------------|-------------------------------------|---------------------|-------------------|--|--------------------|--------------|
|                             |                                     |                                 |                                     |                     |                   |  | Toxic              | Highly Toxic |
| Acclaim                     | Naphthalene                         | ✓                               |                                     |                     |                   |  |                    | ✓            |
| 0.21% Barricade +Fertilizer | Prodiamine                          | ✓                               |                                     | ✓                   |                   |  |                    | ✓            |
| Barricade 4 FL              | Prodiamine                          | ✓                               |                                     | ✓                   |                   |  |                    | ✓            |
| Barricade 65 WG             | Prodiamine                          | ✓                               |                                     | ✓                   |                   |  |                    | ✓            |
| Compass Fungicide           | Trifloxystrobin                     |                                 |                                     |                     |                   |  |                    | ✓            |
| Confront+Vanquish           | Triclopyr, Dicamba, Clopyralid      |                                 | ✓                                   |                     |                   | 0,1                                      | ✓                  |              |
| Cool Power                  | MCPA, MCPP, Triclopyr               | ✓                               | ✓                                   |                     |                   | 1,1,0                                    | ✓                  |              |
| Dimension 1 EC              | Dithiopyr, Naphthalene              | ✓                               |                                     |                     |                   |  |                    | ✓            |
| Dimension Ultra             | Dithiopyr, Naphthalene              | ✓                               |                                     |                     |                   |  |                    | ✓            |
| Drive 75 DF                 | Quinclorac                          |                                 |                                     |                     |                   |  | ✓                  |              |
| Dylox 6.2G                  | Trichlorfon                         |                                 |                                     |                     | ✓                 | 2  | ✓                  |              |
| Eagle Fungicide             | Myclobutanil                        |                                 | ✓                                   |                     |                   |  |                    | ✓            |
| Manage                      | Halosulfuron-methyl                 |                                 |                                     |                     |                   |  |                    |              |
| Merit + Fertilizer          | Imidacloprid                        |                                 |                                     |                     | ✓                 |  |                    | ✓            |
| Merit 2F                    | Imidacloprid                        |                                 |                                     |                     | ✓                 |  |                    | ✓            |
| Merit 75 WSP                | Imidacloprid                        |                                 |                                     |                     | ✓                 |  |                    | ✓            |
| Millennium Ultra            | 2,4 D, Dicamba, Clopyralid          | ✓                               | ✓                                   | ✓                   | ✓                 | 5,1                                      | ✓                  |              |
| MSMA                        |                                     |                                 |                                     |                     |                   |  |                    |              |
| Pre-M 3.3EC                 | Pendimethalin, Aromatic 200 Solvent | ✓                               |                                     | ✓                   |                   | 1  |                    | ✓            |
| Pre-M 3.3EC + Fertilizer    | Pendimethalin, Aromatic 200 Solvent | ✓                               |                                     | ✓                   |                   | 1  |                    | ✓            |
| Quicksilver                 | Carfentrazone-ethyl                 |                                 |                                     |                     |                   |  |                    | ✓            |
| Razor Pro                   | Glyphosate                          |                                 |                                     |                     |                   |  | ✓                  |              |
| Sevin 6.3G                  | Carbaryl                            | ✓                               |                                     | ✓                   | ✓                 | 4  | ✓                  |              |
| Sevin SL                    | Carbaryl                            | ✓                               |                                     | ✓                   | ✓                 | 4  | ✓                  |              |
| Talstar                     | Bifenthrin                          | ✓                               | ✓                                   | ✓                   | ✓                 | 1  |                    |              |
| Talstar + Fertilizer        | Bifenthrin                          | ✓                               | ✓                                   | ✓                   | ✓                 | 1  |                    |              |
| Tempo 20 WP                 | Cyfluthrin                          |                                 |                                     |                     | ✓                 |  | ✓                  |              |
| Tempo SC Ultra              | Cyfluthrin                          |                                 |                                     |                     | ✓                 |  | ✓                  |              |
| Triplet                     | 2,4 D, Dicamba                      | ✓                               | ✓                                   | ✓                   | ✓                 | 5,1                                      | ✓                  |              |
| Tri-Power                   | Dicamba, MCPA, MCPP                 | ✓                               | ✓                                   |                     |                   | 1,1,1                                    | ✓                  |              |
| Tri-Power + Turflon Ester   | Dicamba, MCPA, MCPP, Triclopyr      | ✓                               | ✓                                   |                     |                   | 1,1,1                                    | ✓                  |              |
| Turflon Ester               | Triclopyr                           |                                 |                                     |                     |                   |  | ✓                  |              |



## Appendix 3: Non-Toxic Lawn Care Tips

A number of lawn care companies claim to provide an organic and pesticide free service. To make sure your lawn care company delivers such a program, follow this advice from Beyond Pesticides. ([www.beyondpesticides.org](http://www.beyondpesticides.org)).

Do not simply take the company's marketing claims at face value. Be wary of "green consumer" claims. Growing consumer interest in environmental issues has encouraged many companies to pursue environmentally sound or "green" images. There are a growing number of reputable companies. Unfortunately, some businesses only change their image and not their product or service. Make sure you question salespeople with a critical ear.

When a service provider asserts that he or she has an alternative lawn care or indoor pest control service, find out the specifics of their program. An integrated pest management (IPM) program is only as good as the principles of the person providing it. It is important to know the components of a good IPM program. Here are a few questions to get you started:

- What products do they consider acceptable?
- Do they monitor for pests (good) or spray on a fixed schedule (bad)?
- Do they attempt to determine the cause of a pest problem and fix it (good) or do they treat the symptoms only (bad)?
- Do they perform yearly soil tests? (good)
- Do they keep records of their

- monitoring results? (good)
- What training do they have in alternative services?
- Is most of their business is chemically-based programs or one that is non-toxic?

Make sure you read the fine print on any contract or literature. Some companies will choose to use "plant protection chemicals" (pesticides) if a "special situation" arises. Get what you want in writing, and hold them to their commitment.

Examine the labels of the products. Don't trust the company's marketing claims. Read the label and find out the ingredients of the products being used. The ingredients speak for themselves. Investigate the toxicity and environmental effects of each ingredient and decide whether you think the product is environmentally sound. There is at least one fertilizer on the market that bills itself as "natural based," but in reality contains a small percentage of composted chicken manure mixed with a large percentage of synthetic, petroleum-based fertilizer.

# Appendix 4: Health and Environmental Comparison of TruGreen ChemLawn Pesticides

## Acclaim Extra

*Active ingredient: Fenoxaprop-p-ethyl*

### General Information

Acclaim Extra was registered in 1994 by Bayer and consists of 6.92% (by weight) fenoxaprop-p-ethyl and 93.08% inert ingredients, three of which are listed due to the USEPA requiring their disclosure.<sup>81</sup> These three inerts (listed below) make up 47.5% of the total Acclaim Extra mixture.<sup>82</sup> This mixture is an herbicide in the benzoxazole chemical group used to kill post-emergence weeds in turf grass.<sup>83</sup> It is in the chemical class known as aryloxyphenoxy propionic acid, which is a subcategory in the phenoxypropionic herbicides group and directly related to mecoprop-P.

### Known Inerts

#### *Naphthalene*

This substance is highly toxic to aquatic animals and is “dangerous for the environment” according to EU classification.<sup>84</sup> The IARC classifies naphthalene as 2B possible carcinogen and is listed on the State of California Proposition 65 Carcinogen List as a known carcinogen.<sup>85</sup> One study indicated that naphthalene displaces the carcinogenic chemical ethidium bromide by binding to DNA much more easily, indicating that naphthalene attacks DNA better than many harmful chemicals, which is of concern.<sup>86</sup> Naphthalene also can cause red blood cell hemolysis if it is ingested.<sup>87</sup> The USEPA will publish a Re-Registration Eligibility Document for naphthalene for use as an insecticide in 2008. Currently Naphthalene is listed as a Class 3 inert.

#### *Aromatic Hydrocarbons*

There are hundreds of chemicals in this

group, many of which are possible or known carcinogens, and can also cause reproductive problems and birth defects, as well as inhibit an individual’s ability to fight disease.<sup>88</sup> Aromatic hydrocarbons can cause fatal pulmonary edema if the hydrocarbons are aspirated into the lungs, and other symptoms include dizziness, eye irritation and vision problems, and drowsiness and skin irritation among the many possible symptoms of acute exposure.<sup>89</sup>

#### *Glycol Ethers*

There are many different glycol ethers and some are easily absorbed through human skin and pose potential threats to humans who come into contact with them.<sup>90</sup> The USEPA states that, “Acute (short-term) exposure to high levels of the glycol ethers in humans results in narcosis, pulmonary edema, and severe liver and kidney damage. Chronic (long-term) exposure to the glycol ethers in humans may result in neurological and blood effects, including fatigue, nausea, tremor, and anemia...Animal studies

have reported reproductive and developmental effects from inhalation and oral exposure to the glycol ethers. USEPA has not classified the glycol ethers for carcinogenicity.”<sup>91</sup> Some studies on rats involving glycol ethers resulted in cancerous effects, but the USEPA has not classified these chemicals for carcinogenicity.<sup>92</sup>

## **Health Effects**

This herbicide is harmful if swallowed, and if its vapors are inhaled and absorbed through the skin.<sup>93</sup> The basic general acute toxicity studies indicate that this product has low toxicity, and is a skin irritant.<sup>94</sup> Sub-chronic studies in rats and mice resulted in increased liver weights and reduced blood lipids and cholesterol.<sup>95</sup> Rats showed “reduced pup body weight gain during lactation” at high doses.<sup>96</sup> The MSDS states that there were no teratogenic effects observed in rats, mice, rabbits and monkeys at doses non-toxic to mothers, but does not comment on the doses that were toxic to mothers.<sup>97</sup> NFPA rates the health risk of this pesticide as 2 out of 5.<sup>98</sup>

## **Environmental Effects**

Acclaim Extra is toxic to fish and aquatic invertebrates.<sup>99</sup> Several weeds are developing resistance to fenoxaprop-p-ethyl such as black grass.<sup>100</sup>

# Barricade 4FL and Barricade 65WG

*Active Ingredient: Prodiamine*

## General Information

Both Barricade 65WG (solid granules) and Barricade 4FL (liquid) are manufactured by Syngenta Crop Protection Inc. and bear the USEPA signal word 'CAUTION.' The active ingredient is prodiamine at 40.7% of the product weight in Barricade 4FL, and 65.0% in Barricade 65WG.<sup>101 102</sup> Barricade 4FL and Barricade 65WG (registered in 1992) are dinitroaniline herbicides and Barricade 4FL contains three inert ingredients that are required to be listed, all others are kept as trade secrets.<sup>103</sup> Barricade 65WG contains three listed inerts plus many unlisted inerts.<sup>104</sup> At high temperatures, these two pesticides decompose into toxic gases.<sup>105106</sup>

## Known Inerts For Barricade 4FL

### *Propylene Glycol*

Causes "central nervous system depression (anesthesia, dizziness, confusion), headache and nausea."<sup>107</sup> Studies also indicate that prolonged oral consumption resulted in kidney and liver damage, and this substance is also an eye irritant and skin irritant.<sup>108</sup> Propylene glycol is also toxic to rainbow trout.<sup>109</sup>

### *Attapulgitic Clay (Crystalline Silica, Quartz)*

This material causes pulmonary fibrosis if repeated and prolonged inhalation of its dust occurs.<sup>110</sup> Since Barricade 4FL is a liquid product, inhalation effects due to attapulgitic clay are unknown.<sup>111</sup> There is no human data available for carcinogenicity, but some animal tests indicate that attapulgitic clay is carcinogenic.<sup>112</sup> The IARC categorizes this substance as "not classifiable" or Group 3.<sup>113</sup>

## Known Inerts For Barricade 65WG

### *Dispersing Agent*

This chemical (unidentified) causes eye,

skin and respiratory tract irritation.<sup>114</sup>

### *Kaolin Clay*

Dust remains in lungs to the extent that it is detectable by x-ray if the person is exposed repeatedly over the long term, and may cause respiratory problems.<sup>115</sup>

## Acute Toxicity for Barricade 4FL

Basic acute reactions to Barricade 4FL include allergic skin reactions, and mild eye and skin irritation.<sup>116</sup> The acute toxicity test results for Barricade 4FL indicate that this pesticide is practically non-toxic, and based on guinea pig studies, Barricade 4FL is a skin sensitizer.<sup>117</sup> The EPCRA SARA Title III Classification of this pesticide is "acute health hazard," and both the NFPA and HMIS rate it as "2, moderate."<sup>118</sup>

## Acute Toxicity for Barricade 65WG

Barricade 65WG is practically non-toxic upon ingestion, slightly toxic upon dermal exposure, and inhalation, and rabbit studies indicate that this pesticide is mildly irritating to the eye.<sup>119</sup> Barricade 65WG is also a skin sensitizer. The EPCRA SARA Title III Classification of this pesticide is "acute

health hazard, chronic health hazard, and reactive hazard, and NFPA and HMIS rates it as “1, slight.”<sup>120</sup>

## **Health Effects**

Rat fetuses exhibited prodiamine toxicity at high doses, and the maternal toxicity was 1g/kg/day.<sup>121</sup> Rats also experienced liver enlargement and thyroid problems (hormone imbalances) at high doses, and decreased body weight gains when exposed to prodiamine.<sup>122</sup> Rats also developed benign thyroid tumors.<sup>123</sup> The US USEPA classifies Prodiamine as a group C possible carcinogen. Prodiamine is also a suspected endocrine disruptor but more studies are needed.<sup>124</sup>

## **Environmental Effects**

Prodiamine is highly toxic to fish and invertebrates such as rainbow trout and sheepshead minnows.<sup>125</sup><sup>126</sup> Chronic ecological tests have not been conducted. Bioaccumulation of prodiamine is high, and prodiamine “degrades rapidly in the sunlight”<sup>127</sup> Prodiamine is persistent in soil.<sup>128</sup>

# Compass Fungicide

*Active Ingredient: Trifloxystrobin*

## General Information

Compass Fungicide (also known as Trifloxystrobin) is composed of benzeneacetic acid and methyl ester. First registered in 1999, Compass Fungicide is manufactured by Bayer Environmental Services. The USEPA mandates that the signal word CAUTION appear on its label. (MSDS p 1). This product contains 50% Trifloxystrobin, and 50% undisclosed ingredients. (MSDS p 1). Crystalline Silica, a known carcinogen, is present in the mixture. This product is not listed as a carcinogen by NTP or IARC, or regulated as a carcinogen by OSHA. However, it may contain crystalline silica (quartz), as substance which is classified by NTP as a Group 2 carcinogen and by IARC as a Group 1 carcinogen. (msds p 1). Methyl ester is an adjuvant, which Used in pesticide products to increase the effectiveness of the active ingredients, make the product easier to apply, or to allow several active ingredients to mix in one solution. Solvents, emulsifiers, and spreaders fall in this category.

## Health Effects

Acute rating from USEPA label: slightly toxic. "Caution" for rats, eye, corneal involvement or irritation, clearing in 7 days or less. Skin: Moderate irritation at 72 hours (moderate erythema)

Bayer's Material Safety Data Sheet also warns of moderate eye irritation. Harmful if absorbed through skin, prolonged or frequently repeated skin contact may cause allergic reactions in some individuals. Avoid contact with skin, eyes and clothing. Wash thoroughly with soap and water after handling.

## Environmental Effects:

Depending on fish species, slightly toxic (trout) to very highly toxic (bluegill and minnow).

Bayer Environmental Science Specimen Label, manufacturer of Compass, post

the following warning on the product: This pesticide is toxic to fish and aquatic invertebrates. Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Drift and run off may be hazardous to aquatic organisms in neighboring areas.

## Ground Water Advisory

Several trifloxystrobin degradates have properties and characteristics associated with chemicals detected in ground water. The use of this chemical in areas in which soils are permeable, particularly where the water table is shallow, may result in ground water contamination.

Trifloxystrobin has been classified as being highly toxic to fish and aquatic invertebrates.

# Confront

*Active Ingredients: Clopyralid and Triclopyr*

## General Information

Confront is manufactured by Dow AgroSciences and was first registered in 1989. This pesticide consists of 33.0% Triclopyr (triethylamine salt), 12.1% clopyralid and 54.9% inerts including N,N-Diethylethanamine and EDTA. The Journal of Pesticide Reform states that polyethoxylated tallowamine (POEA) is also an inert in Confront. The USEPA mandates that Confront bear a “Danger” warning. This herbicide is banned in Suffolk and Nassau counties in the state of New York, and is a selective herbicide meant to kill broad weeds and selected plants other than the species of grass listed on the label.<sup>129</sup> First registered in 1987 in the U.S., clopyralid (a member of the pyridine pesticide family) entered the pesticide market after the mandatory re-registration cutoff for older pesticides first registered before 1984. Therefore, there is no required USEPA Re-Registration Eligibility Document for this pesticide. Triclopyr, a member of the Pyridine and carboxylic acid herbicide family, is banned in South Africa and Norway and was first registered in the U.S. in 1979 and its Re-Registration Eligibility Document was signed in October of 1998.<sup>130 131</sup>

## Known Inerts

### *N,N-Diethylanamine (Triethylamine)*

Triethylamine is a class 3 inert (triethylamine).<sup>132</sup> This chemical is an irritant that affects the eyes, lungs (leading to chemical pneumonia in some cases) and the skin.<sup>133</sup>

### *EDTA (Ethylenediamine Tetraacetic Acid)(Ethanol)*

EDTA contains ethanol, which is a known human carcinogen.<sup>134</sup> EDTA is also an irritant of the eyes, skin and respiratory tract and stunted the growth of fetuses and killed fetuses of test animals.<sup>135</sup>

### *(POEA) polyethoxylated tallowamine*

POEA is a skin and eye irritant, causes nausea and diarrhea and kills fish for “three generations” in small doses (less than 5 parts per million).<sup>136</sup>

## Health Effects

The EPCRA SARA Title III

Classification of this pesticide is, “an immediate health hazard, a delayed health hazard, and a fire hazard.”<sup>137</sup> The NFPA rates this products health hazard potential as 3, or serious.<sup>138</sup>

## Acute Toxicity for Confront

Confront is corrosive and can cause corneal injury.<sup>139</sup> The vapors cause blurry vision and, if large amounts are ingested, may cause ulcers or gastrointestinal irritation.<sup>140</sup> Animal studies showed confront-induced problems in the heart, kidney, and liver.<sup>141</sup>

## Acute Toxicity and Chronic Toxicity for Clopyralid

Clopyralid causes birth defects in animals at doses highly toxic for mothers.<sup>142</sup> “The eye hazards of four clopyralid products include permanent impairment of vision or irreversible

damage.”<sup>143</sup> Reproductive effects were observed in fetuses at doses toxic to their mothers.<sup>144</sup> An article published by the USEPA which detailed, “reduction in the weight of fetuses carried by rabbits who ingested clopyralid, an increase in skeletal abnormalities in these fetuses at all doses tested, and an increase in the number of fetuses with hydrocephaly, accumulation of excess fluid around the brain.”<sup>145</sup> Subchronic toxicity tests on mice (3 months) showed increases in liver weights and cell size in male and female mice (at different doses) at high doses.”<sup>146</sup> High doses of clopyralid administered to dogs caused “increased liver weights in females, and urinary tract problems in males.”<sup>147</sup> Cox also states that, “there are no publicly available studies of the subchronic [or chronic or reproductive] effects of clopyralid-containing products.”<sup>148</sup>

## **Acute Toxicity and Chronic Toxicity for Triclopyr**

Reproductive effects were observed in fetuses at doses toxic to their mothers.<sup>149</sup> Chronic toxicity tests conducted by the USEPA showed “hyperplasia of the stomach lining,” as well as problems with the “stomach, liver, blood, and body weight.”<sup>150</sup> The main effects of clopyralid on reproduction are “substantial toxicity to fetuses (decreased weight), birth defects and skeletal abnormalities” found at “all does levels tested” in rabbits (USEPA).<sup>151</sup> The USEPA ranks triclopyr in group D for carcinogenicity or “unclassifiable” due to lack of significant data, yet triclopyr increased the incidence of mammary tumors or breast cancer in both female mice and rats and adrenal pheochromocytomas in male rats.<sup>152</sup> Caroline Cox of the NCAAP argues in her article in the Journal of

Pesticide Reform that the USEPA’s carcinogenic classification of triclopyr is inconsistent with its risk assessment guidelines since the tests that resulted in breast cancer occurred in two different species.<sup>153</sup> Triclopyr is corrosive to the eye and in high doses can adversely affect the kidneys.<sup>154</sup> Triclopyr is a skin sensitizer.<sup>155</sup> Subchronic and chronic toxicity studies found that triclopyr harmed the kidneys of rats.<sup>156</sup> One of the breakdown products of triclopyr is TCP (3,5,6-trichloro-2-pyridinol), which is also a breakdown product for the now banned insecticide chlorpyrifos.<sup>157</sup><sup>158</sup> TCP is especially detrimental for infants, children and fetuses, as it “accumulates in fetal brains,” and interferes with normal neurological development at very small concentrations (0.2ppm).<sup>159</sup><sup>160</sup>

## **Environmental Effects**

### *Clopyralid*

Clopyralid’s persistence “is as long as 14 months,” is classified as a “likely water contaminant,” and has been found in some river basins in the U.S.<sup>161</sup> A Michigan State University study found that clopyralid still remained in composted grass clippings for up to one year.<sup>162</sup> In 2002, the California Department of Pesticide Regulation (DPR) cancelled 15 clopyralid-containing herbicide products for use on residential lawns in California, citing their potential hazard to compost, since green waste from lawns is a common source of compost.<sup>163</sup> Clopyralid, although not a widely used pesticide in the US, is a concern as it is increasingly used by professional lawn services, due to it being “very soluble” in water and “very mobile in soil.”<sup>164</sup> One concern that may affect neighbors of those who use Clopyralid on their lawns is that



according to the USEPA, “[clopyralid] is volatile...it can evaporate from foliage and soil after application, move away from the application site, and “adversely affect nontarget broadleaf plants.”<sup>165</sup> Clopyralid is also toxic to three beneficial insect species: the ladybug, pirate bug and lacewing.<sup>166</sup> Some studies are also suggesting that plants can build resistance to clopyralid such as the yellow starthistle.<sup>167</sup> The USEPA confirms that Clopyralid, “is persistent in the field, very soluble in water, does not hydrolyze, and is very mobile in soil. Therefore, Clopyralid has the potential to leach to ground water and/or contaminate surface water through dissolved residues in runoff.”<sup>168</sup> But, there has been a lack of action in determining “safe” levels in drinking water etc.

### ***Triclopyr***

Triclopyr is slightly toxic to aquatic organisms and to birds (ducks), is mobile and persistent in soil, and has the potential to leach into groundwater.”<sup>169</sup><sup>170</sup><sup>171</sup> Triclopyr also kills beneficial insects and non-target plants such as “ornamental annual flowers,” and kills the fungi (mycorrhizal fungi) that help plants uptake essential nutrients.<sup>172</sup> Triclopyr also exceeds the USEPA’s established “levels of concern” for endangered “birds, mammals, and aquatic and terrestrial plants.”<sup>173</sup>

# Cool Power

*Active Ingredient: Dicamba*

## General Information

Cool Power is composed of 56.1% MCPA Ester, 5.0% Triclopyr Ester, and 3.6% Dicamba Acid. 35.3% is undisclosed inert ingredients. (Nufarm T&S, MSDS, June 2001, p 1). Manufactured by Nufarm Turf and Specialty (formerly by Riverdale). The products brochure explains “The active ingredients for Cool Power, the esters of MCPA and triclopyr combined with Dicamba acid, are all powerful and effective in and of themselves. MCPA, a phenoxy herbicide closely chemically related to 2,4-D, prevents sugar movement from the leaves to the root of the weed. Triclopyr, a pyridine-based herbicide, acts as a synthetic auxin, overdosing the weed with auxin and disrupting the weed’s hormonal balance. Dicamba, a benzoic acid, also halts the growth of the weed.

## Environmental Effects

Drift or runoff may adversely affect nontarget plants. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark.

MCPA is listed on the 2004

Groundwater Protection List with the Massachusetts Department of Agriculture. The Groundwater Protection List refers to a list of pesticide active ingredients that could potentially impact groundwater due to their chemical characteristics and toxicological profile.

## Dicamba

*Please refer to the Millenium Ultra section of this report for information on the health and environmental effects of the active ingredient Dicamba.*

## Triclopyr

*Please refer to the Confront section of this report for information on the health and environmental effects of the active ingredient Triclopyr.*

## MCPA

*Please refer to the TriPower section of this report for information on the health and environmental effects of the active ingredient MCPA.*

# Dimension Ultra and Dimension 1 EC

*Active Ingredient: Dithiopyr*

## General Information

Dow AgroSciences' Dimension EC herbicide is comprised of 12.7% dithiopyr (in the pyridine family) and 87.3% inerts including Aromatic solvent, Naphthalene, and Trimethylbenzene.<sup>174</sup> This product is a specialty herbicide designed to kill broadleaf weeds in lawns and turf.<sup>175</sup> There are actually several different 'Dimension Ultra' herbicides, from Dow AgroSciences and from Rohm and Haas Company. These all contain the active ingredient dithiopyr in different amounts and with different inert ingredients. This section outlines the information on Dow AgroSciences' Dimension Ultra 2SC herbicide (22.44% dithiopyr, 767.56% inerts) and list the hazardous inerts for this product only. Dimension Ultra 2SC bears the USEPA category of "Caution" and Dimension EC herbicide must be labeled with "Warning."<sup>176 177</sup> The USEPA ranks Dithiopyr as an unlikely carcinogen, but there are limited studies available for this product in general.<sup>178</sup>

## Known Inerts

### *Dimension EC*

Aromatic solvent (contains the following):

- ***Naphthalene (0.38%)***  
*see this chemical description under the Acclaim Extra section*

- ***Trimethylbenzene***

This chemical is ranked in category 3 for safety of inerts by the USEPA, and lacks many of the necessary health tests.<sup>179</sup> A man who ingested 400 ml of an insecticide that contained 5% methylparathion, 75% isoparaffin, 8% etoxylated oleic acid, 4% 1,2,4-trimethylbenzene, 6% naphtha, 1% 1,3,5-trimethylbenzene, 0.4% propylbenzene and 0.3% xylene received emergency treatment, but died 29 days later. The doctors who published this case study attribute his death to the inerts (including trimethylbenzene), and not to the active ingredients.<sup>180</sup> A Polish study found one isomer of

trimethylbenzene (mesitylene) to cause central nervous system damage after long-term exposure at the present "safe" exposure limits.<sup>181</sup> A man who has "extensive cutaneous contact" with industrial solvents including trimethylbenzene developed systemic sclerosis.<sup>182</sup>

### *Dimension Ultra 2SC*

Contains the following:

- ***Propylene glycol***  
*See this chemical description under the Barricade 4FL section*
- ***Aromatic solvents with Naphthalene***  
*See this chemical description under the Acclaim extra section*
- ***Methyl Methacrylate (5.28%)***  
The USEPA considers this substance to be a hazardous air pollutant and has grouped it into the inert category 2.<sup>183</sup> The IARC has ranked this chemical in terms of carcinogenicity as "unclassifiable."<sup>184</sup> The studies cited by

the IARC are inconclusive, and there is a serious need for further study of this chemical.<sup>185</sup> The majority of studies that exist, indicate that this chemical is present in products used to affix dentures, in dentistry, in bone reconstruction and other medical procedures. Some people have had allergic reactions, hypersensitivity, and neurological effects associated with this substance after dental procedures and other orthopedic surgery with artificial materials containing this chemical.<sup>186</sup>

### **Acute Toxicity for Dimension EC**

In terms of overall health ratings for this product, the EPCRA SARA Title III Classification of this pesticide is “immediate health hazard” and “delayed health hazard” and the NFPA and rates it as “3, high” in terms of health hazard.<sup>187</sup> The acute health effects of Dimension EC include irritation of the eyes (cataracts if long term exposure occurs), skin, nose and throat, and possible nervous system effects.<sup>188</sup> If ingested, Dimension EC has low toxicity, but if aspirated during ingestion or vomiting, lung damage or even death may occur (caused by chemical pneumonia).<sup>189</sup> There is a potential for excessive exposure to this product to damage the central nervous system, and the only suspected carcinogenic effects are due to the product containing naphthalene.<sup>190</sup>

### **Acute Toxicity for Dimension Ultra 2SC**

Anticipated acute health effects from exposure to this product are irritation of the eyes, skin, throat and nose.<sup>191</sup> Organs potentially affected by prolonged exposure to this chemical include the kidneys, gall bladder, blood, adrenal

gland thyroid, liver and the central nervous system.<sup>192</sup> In terms of overall health ratings for this product, the EPCRA SARA Title III Classification of this pesticide is “immediate health hazard” and “delayed health hazard” and the OSHA considers this product to be “hazardous.”<sup>193</sup>

### **Environmental Effects**

Dimension EC has a moderate to high potential for bioconcentration (moderate for dithiopyr, and high for the solvent).<sup>194</sup> This product has a high acute toxicity to aquatic organisms for dithiopyr, and a slight acute toxicity to aquatic organisms for the solvents in this product.<sup>195</sup> The potential for Dimension Ultra 2SC to bioaccumulate is moderate (based on dithiopyr) and “for mobility in soil is very high” (based on data for propylene glycol).<sup>196</sup> This product is highly toxic to aquatic organisms in acute exposures.<sup>197</sup>

# Drive 75 DF

*Active Ingredient: Quinclorac*

## General Information

Drive 75 DF herbicide is manufactured by BASF Corporation and was first registered by the USEPA in 1998.<sup>198</sup> It is comprised of 75% quinclorac as the active ingredient, and 25% inert ingredients including kaolin, which contains crystalline silica. This product is for post emergence weed control, and is labeled with an USEPA hazard rating of “caution”.<sup>199</sup> Quinclorac is an auxin-type aromatic acid herbicide under the subfamily, quinolinecarboxylic acid herbicides.

## Known Inerts

### *Kaolin*

*See this chemical description under the Barricade 65WG section.*

### *Crystalline Silica*

*See this chemical description under the Barricade 65WG section.*

## Acute Toxicity for Drive 75 DF

The EPCRA SARA Title III Classification of this pesticide is “chronic health hazard” and “acute health hazard” and bears the mandated warning, “keep out of reach of children.”<sup>200</sup> Drive 75 DF is considered slightly toxic with a rat oral LD50 of 2200 mg/kg.<sup>201</sup> This product also irritates the eyes, the skin, is a skin sensitizer, and, because it contains crystalline silica, bears the long-term risk (overexposure) of inducing silicosis

(a specific lung disease).<sup>202</sup>

## Acute, Chronic and Reproductive Toxicity for Quinclorac

Quinclorac showed developmental toxicity in rabbits at high doses that were toxic to the mothers.<sup>203</sup> At “biologically unachievable” concentrations, quinclorac damaged chromosomes (mutagenic) in human lymphocytes, but studies in mice and hamsters showed no mutagenicity.<sup>204</sup> The USEPA categorized quinclorac as a group D, unclassifiable carcinogen due to ambiguous data.<sup>205</sup> Quinclorac is also a potential ground water contaminant.<sup>206</sup>

## Environmental Effects

Quinclorac is slightly toxic to aquatic life and to fish and birds.<sup>207</sup>

# Dylox 6.2G

*Active Ingredient: Trichlorfon*

## General Information

Dylox 6.2G is a granular insecticide produced by Bayer Environmental Science and consists of 6.2% trichlorfon, and 93.8% inerts, none of which are listed.<sup>208</sup> Trichlorfon is an organophosphate insecticide used for specific pests on turf. It used be allowed on agricultural fields but after the USEPA published its Re-Registration Eligibility Document in 1997 (and later a TRe-Registration Eligibility Document in 2001), all food uses of the pesticide were cancelled.<sup>209</sup> Trichlorfon is a cholinesterase inhibitor, meaning that it interferes with normal nerve function. This chemical is also restricted in Indonesia and banned in Kuwait.

## Acute Toxicity for Dylox 6.2G

Dylox 6.2G is classified by NFPA as a level 2 for health hazard potential, and the USEPA mandates that this product bear the word “Caution” on its label.<sup>210</sup> Dylox 6.2G is a mild eye irritant, and is considered slightly toxic.<sup>211</sup>

## Acute and Chronic Toxicity for Trichlorfon

The NOEL in a 3-week inhalation rat study was 12.7 mg/m<sup>3</sup>.<sup>212</sup> As doses of trichlorfon increase in chronic and subchronic studies, cholinesterase inhibition occurs in rats, rabbits, and Rhesus monkeys.<sup>213</sup> A 2-year feeding study in rats exhibited cholinesterase inhibition, decreased body weight gain, anemia, duodena hyperplasia, and increased liver and kidney weights/damage, to name a few.<sup>214</sup> The IARC rates trichlorfon as a group 3 unclassifiable carcinogen.<sup>215</sup> One two-year study in female mice showed a statistically significant increase in lung carcinoma and adenomas as low doses.<sup>216</sup> In 1999, the Cancer Assessment Review Committee (CARC) classified trichlorfon as “not likely to be carcinogenic to humans at low doses,

but is likely to be carcinogenic at high doses.”<sup>217</sup> There is simply not enough data available to determine this chemical’s carcinogenicity, although Bayer stresses that it is not carcinogenic by lawfully stating that “there was no evidence of carcinogenicity.”<sup>218</sup> At maternally toxic doses, the fetuses of rats had reduced body weight gain and “dilated renal pelvis.”<sup>219</sup> Parents experienced kidney, liver and lung effects (increased weights of these organs).<sup>220</sup> In a developmental study, rats experienced skeletal development problems, and all doses tested were toxic to mothers (including 500 ppm).<sup>221</sup> The NOEL for maternal toxicity was 10 mg/kg.<sup>222</sup> There is also evidence that trichlorfon is mutagenic and clastogenic in human lymphocytes.<sup>223</sup> There is still a need to determine the prenatal development toxicity in rats and HIARC requested this study in 1999.<sup>224</sup> Bayer Corporation conducted most of the studies submitted. In 1989, several women in Hungary who ate fish contaminated with trichlorfon during their pregnancies had babies with birth defects (11 out of the 15 exposed).<sup>225</sup>

The USEPA has determined that the

potential exposure of toddlers to spray, exceeds the levels of concern by several routes of post-application exposure including dermal, ingestion of granular pellets, oral hand-to-mouth, and combined exposures.<sup>226</sup> These findings were based on several formulas and assumptions due to lack of data, and Bayer subsequently submitted new data after the unfavorable findings in the Re-Registration Eligibility Document for post-application exposure.<sup>227</sup>

## **Environmental Effects**

Trichlorfon has high mobility in soil and has the potential to contaminate surface water. Trichlorfon is highly toxic (acute) to birds and affects bird reproduction in low doses.<sup>228</sup> In terms of toxicity to fish, trichlorfon ranges from practically non-toxic to highly toxic, and trichlorfon is also very highly toxic to aquatic invertebrates.<sup>229</sup> The acute and chronic risk level assessment for trichlorfon on turf, exceeded levels of concern for freshwater invertebrates and birds.<sup>230</sup>

# Eagle Fungicide

*Active Ingredient: Myclobutanil*

## General Information

There are two different major formulations of “Eagle Fungicide” manufactured by Dow AgroSciences including Eagle WSP (approved in 1995), and Eagle 20EW (approved in 2003). Eagle WSP fungicide contains 40-42% myclobutanil, and 58 to 60% inerts including aluminum silicate dihydrate, nonionic surfactant, calcium silicate (synthetic), and sodium lignosulfonate.<sup>231</sup> Eagle 20EW consists of 19.7% myclobutanil and 80.3% inerts including cyclohexanone, petroleum solvent (contains naphthalene), and propylene glycol.<sup>232</sup> Regarding myclobutanil, it is considered a developmental and reproductive toxin and is highly toxic to aquatic life.

## Known Inerts In Eagle WSP

### *Aluminum silicate dehydrate*

This chemical is similar to kaolin. Please refer to the Barricade 65WG section for information on this chemical.

### *Nonionic surfactant*

The identity of this chemical is protected as a trade secret.

### *Calcium Silicate (synthetic)*

Listed by the USEPA in inert group 4A. Miners of this material over a long period of time have developed fibrosis and pneumoconiosis.<sup>233</sup>

### *Sodium Lignosulfonate*

Listed by the USEPA in inert group 4B. This chemical is also slightly toxic to mollusks.<sup>234</sup>

## Known Inerts In Eagle 20EW

### *Cyclohexanone*

The Journal of Pesticide Reform states that, “it produces eye irritation, tearing, and burning pain. It also causes skin irritation, nausea, vomiting, and diarrhea. It may cause liver and kidney damage, headache, dizziness, drowsiness, and nausea. Inhalation of cyclohexanone may be fatal as a result

of spasms, inflammation, and fluid accumulation in the lungs.”<sup>235</sup>

Cyclohexanone is ranked by the USEPA as a level 2 inert. The IARC classifies cyclohexanone as a group 3 unclassifiable carcinogen, due to mixed results and a lack of further testing.<sup>236</sup> This chemical also has the potential to be highly toxic to zooplankton.<sup>237</sup>

### *Petroleum Solvent (contains naphthalene)*

This particular solvent (CAS # 64742-94-5) is ranked by the USEPA as a class 2 inert. Please refer to the Acclaim section for information on naphthalene.

### *Propylene Glycol*

*See this chemical description under the Barricade 4FL section.*

## Acute Toxicity for Eagle WSP

Inhalation of the dust of this product and swallowing it may be harmful.<sup>238</sup> This product is a substantial eye irritant and a slight skin irritant.<sup>239</sup>

## Acute Toxicity for Eagle 20EW

This product causes moderate eye irritation including corneal injury upon direct contact with the eye. Vapor



contact also causes these symptoms.<sup>240</sup> Eagle 20EW is not a skin sensitizer but may cause moderate skin irritation.<sup>241</sup> If swallowed, this product may irritate the gastrointestinal tract or cause ulceration.<sup>242</sup> Inhaling the vapors of this product is irritating to the nose, throat, lungs, and/or the central nervous system.<sup>243</sup> This product can have an anesthetic or narcotic effect.<sup>244</sup>

## **Acute and Chronic Toxicity for Myclobutanil**

There is really very little information available besides what is included in the MSDS. In terms of systemic, subchronic and chronic effects, there are several concerning aspects of myclobutanil's potential for harm.<sup>245</sup> Target organs include the "liver, testes, adrenal gland, kidney, and thyroid."<sup>246</sup> Myclobutanil is listed as both a developmental and reproductive toxin by the California Proposition 65 listing.<sup>247</sup> Laboratory tests indicate that this chemical is toxic to fetuses at doses that are not maternally toxic.<sup>248</sup> There is also a potential for adverse reproductive effects, but at very high doses.<sup>249</sup> Myclobutanil targeted the liver in dogs and the NOEL in this test was 100 ppm (3mg/kg/day).<sup>250</sup>

## **Environmental Effects**

Myclobutanil is highly toxic to aquatic organisms and slightly toxic to birds (acute basis).<sup>251</sup> More specifically, this chemical is moderately toxic to fish and highly toxic to zooplankton.<sup>252</sup>

# Manage

*Active Ingredient: Halosulfuron-methyl*

## General Information

First registered by Monsanto in 1994, Manage Turf herbicide is comprised of 75% halosulfuron-methyl and 25% inert ingredients including amorphous precipitated silica (<3.0%) and kaolin clay (8-13%).<sup>253</sup> The USEPA mandates that this product bear the signal word 'Caution' on its label. Halosulfuron-methyl is in the Sulfonylurea herbicide chemical group.<sup>254</sup> This product is used to kill broadleaf weeds in turf.

## Known Inerts

***Silica, Amorphous Precipitated (CAS # 112926-00-8)***

If inhaled, this chemical, "can cause drying out of the mucous membranes of the eyes, nose and throat (due to absorption of moisture and oils), which may result in irritation or occasional nose bleeds."<sup>255</sup> The USEPA classifies this substance as a group 4A inert.<sup>256</sup>

***Kaolin Clay***

*See this chemical description under the Barricade 65WG section.*

## Acute Toxicity for Manage

Manage is slightly toxic if ingested, if it comes into contact with skin (practically non-toxic), or if it is inhaled (practically non-toxic).<sup>257</sup> This product causes moderate eye irritation.<sup>258</sup> This product is listed by the EPCRA SARA Title III categorization as both an "immediate" and "delayed" health hazard.<sup>259</sup>

## Acute and Chronic Toxicity for Halosulfuron-Methyl

Halosulfuron-methyl is slightly dermally toxic and irritating to the

eyes.<sup>260</sup> A 90-day feeding exposure study on rats indicated that this chemical affects the kidneys and liver (NOEL 400 ppm), and dogs displayed effects on the blood, kidneys, decreased cholesterol and body weight gain.<sup>261</sup> Different chronic studies revealed chemically-related effects in the liver, kidneys, changes in the blood, decreased body weight gain and possibly the thymus and epididymis.<sup>262</sup> At maternally toxic doses, halosulfuron-methyl cause pup malformations and decreased pup weights in pregnant rats with a NOEL of 250 mg/kg.<sup>263</sup> A 2-generation male and female rate study produced similar results plus reduced parental weights.<sup>264</sup> In rats there were increases in alterations of the fetal nervous system and skeletal system (at a 750 mg/kg/day dose).<sup>265</sup> There was a statistically significant dose-related dilation of the lateral ventricles of the brain in rat fetuses and litters.<sup>266</sup>

## Environmental Effects

Halosulfuron-methyl is slightly toxic to fish and aquatic plants and is a potential ground water contaminant.<sup>267</sup>

# Merit 2F and Merit 75 WSP

*Active Ingredient: Imidacloprid*

## General Information

Merit 2F was registered in 2003 and Merit 75 WSP was registered in 1994 by Bayer Corporation, and both pesticides are applied with mechanical sprayers (Glennon Invoice). Merit 75 WSP is comprised of 22% imidacloprid and 78% inerts including two undisclosed inerts classified as hazardous. Merit 2F consists of 22% imidacloprid, and 78% inerts, including two undisclosed hazardous inerts (different than those in Merit 75 WSP). Registered in 1994 by Bayer CropScience, the systemic insecticide imidacloprid is widely used on crops, s, in homes as a termiticide, and on pets to kill fleas and ticks just to name a few. Imidacloprid kills insects by blocking acetylcholine receptors in the central nervous system of insects, paralyzing them and eventually causing death. The World Health Organization (WHO) classifies Imidacloprid as Moderately Hazardous.<sup>268</sup>

The oral LD50 for Merit 75 WSP in the male rat is 2591 mg/kg, and 1858 mg/kg for the female rat.<sup>269</sup> Both the male and the female rat have a dermal LD50 for Merit 75WSP of >2000 mg/kg.<sup>270</sup> Merit 75 WSP was determined to be a “slight dermal irritant,” in rabbits and as causing “minimal irritation to the conjunctiva...resolving by 24 hours.”<sup>271</sup>

## Acute Toxicity for Merit 2F

In Merit 2 Insecticide, the Male and female rat oral LD50 was >4870 mg/kg and 4143 mg/kg respectively, and the dermal LD50 was the same as for Merit 75 WSP.<sup>272</sup> Irritation to the rabbit conjunctiva caused by Merit 2 Insecticide “resolv[ed] within 72 hours,” and Merit 2 Insecticide was not a dermal irritant.<sup>273</sup>

## Acute and Chronic Toxicity for Imidacloprid

A study conducted in the US found that imidacloprid might have more negative effects on acetylcholine receptors in humans and other mammals than previously thought.<sup>274</sup> A study conducted on rat cells stated that, “imidacloprid has both multiple agonist and antagonist effects on the neuronal nicotinic acetylcholine receptor-channels,” meaning that imidacloprid

both stimulates and interrupts normal receptor channel activity in rats.<sup>275</sup> Rats exposed to imidacloprid dust at 191.2 mg/cubic meters for 6 hours per day for 5 days per week for 4 weeks showed signs of “decreased body weight gains, decreased heart and thymus weights and increased liver weights.”<sup>276</sup> The NOEL was much lower at 5.5 mg/cubic meter over that time span.<sup>277</sup> Rats exposed to varying dietary concentrations of imidacloprid experienced mineralization in the colloid of the thyroid follicles, reduction in body weight gains and additional thyroid effects as doses were increased.<sup>278</sup> The NOEL was 100 ppm for this study.<sup>279</sup>

## *Carcinogenicity*

Studies in rats and mice fed high doses of imidacloprid (1800ppm and 2000ppm respectively) showed no carcinogenic effects or “potential.”<sup>280</sup> The USEPA

considers imidacloprid to be a “group E” carcinogen meaning that they have evidence that imidacloprid is not carcinogenic to humans.

### ***Mutagenicity***

The MSDS for Merit skirt around the issue and downplay mutagenicity by stating that, “taken collectively” their studies show that imidacloprid is not genotoxic or mutagenic.<sup>281</sup> A study conducted in 1997 found that in vitro application of imidacloprid-containing Admire pesticide chemically bound to the DNA in calf thymus cells.<sup>282</sup> This indicates that perhaps more research is needed to determine the genotoxicity of imidacloprid.

### ***Effects on Reproduction and Developmental Toxicity***

In a two-generation study of rats administered different doses of imidacloprid, “offspring at 700ppm (imidacloprid), exhibited reduced mean body weights and body weight gains.”<sup>283</sup> The NOEL for mothers in the study was much lower at 100ppm, and the reproductive NOEL was 250ppm.<sup>284</sup> Rat fetuses exposed to 100 mg/kg (maternally toxic) imidacloprid during gestation had deformed ribs, and the “maternal and developmental toxicity were 10 and 30 mg/kg, respectively.”<sup>285</sup> Rabbit mothers administered a toxic dose of 72 mg/kg imidacloprid had fetuses with lower body weights and skeletal development problems.<sup>286</sup> The MSDS for Merit does not mention the increase in miscarriages that also occurred in this study.<sup>287</sup>

## **Environmental Effects**

Imidacloprid is a common active ingredient in many flea and tick treatments administered to cats and

dogs, and it is important to remember that “the poison is in the dose.” A case study of a cat with cancer indicated that after treatment with imidacloprid for pest control and reacted to the drug.<sup>288</sup> The cat experienced heart failure and eventual death.<sup>289</sup> The MSDS provided by Bayer stated that there is “no ecological information available.”<sup>290</sup> However, the USEPA conducted several studies in the early 1990’s with results showing that imidacloprid was acutely toxic to fish, highly toxic to small birds, and hazardous to aquatic invertebrates; these studies, however, are no longer available to the public.<sup>291</sup> Researchers at the School of Environment at Nanjing University in Nanjing, China established the LC(50) (over 48 hours) of “165 mg/l (-1) for tadpoles of *Rana limnocharis* and 219 mg/l(-1) for tadpoles of *Rana N. Hallowell*” (sensitive amphibians ‘suitable for acting as the bioindicator of aquatic and agricultural ecosystems’).<sup>292</sup> They also found a dose-effect relationship between imidacloprid and the DNA damage to erythrocytes experienced by these amphibians.

## **Effects on Beneficial Life forms and Biological Resistance**

Researchers in China conducted studies on the acute toxicity and genotoxicity of Imidacloprid in beneficial earthworms. Concentrations of Imidacloprid greater than 0.5 mg/kg of dry soil induced a dose-effect relationship and sperm mortality in the earthworms, and comet assays showed “significant DNA damage ( $p < 0.01$ ) in earthworms.”<sup>293</sup> Scientists in South Africa found that at 48 hour and 7-day intervals, “imidacloprid was the most toxic to earthworms [(*Pheretima* group *Oligochaeta*) with an] LC50 of 5 mg/kg (-1) and 3 mg/kg (-1) respectively” compared to other insecticides included

in the study such as chlorpyrifos (now banned in the US) and others.<sup>294</sup> A French study conducted on free-flying forager honeybees fed a sugar solution with 24 micrograms/kg of imidacloprid, determined that “foraging activity” and “activity at the hive entrance” decreased and that bees “subjected to a conditioned proboscis extension response (PER) assay under laboratory conditions,” displayed significant imidacloprid-induced effects on their learning performances.<sup>295</sup> Another French study suggests that imidacloprid causes neurotoxicity symptoms in honeybees, but not mortality (caused by imidacloprid metabolites).<sup>296</sup> In terms of biological resistance, a Michigan State University study found that insects such as the Colorado potato beetle develop resistance of 100.8 (adults) times to imidacloprid after several applications of imidacloprid to the study area ( in Long Island, NY) than beetles that had not yet developed the resistance genotype.<sup>297</sup>

# Millenium Ultra

*Active Ingredients: 2,4-D, Dicamba, Clopyralid*

## General Information

Manufactured by Nufarm Riverdale since 1997, Millennium Ultra is a selective herbicide that contains 37.32% DMA salt of 2,4-D, 5.09% Clopyralid, 4.65% DMA salt of Dicamba and 52.94% inerts (undisclosed).<sup>298</sup> The SARA Title III Section 311/312 rates this herbicide as both an immediate and a delayed health hazard.<sup>299</sup> The chemical 2,4-D is a member of the phenoxy herbicide family and is toxic to broadleaf plants.<sup>300</sup> First registered in 2,4-D is used on U.S. lawns in the amount of 10 million pounds per year.<sup>301</sup> <sup>302</sup> 2,4-D acts by mimicking auxin hormones, causing abnormal plant growth, and eventually plant death.<sup>303</sup> Harmful dioxins have been known to contaminate 2,4-D products.<sup>304</sup> One study found that the use of certain sunscreens enhances the absorption of 2,4-D, so children wearing sunscreen while playing on the lawn may be at increased risk of absorbing this harmful pesticide.<sup>305</sup> 2,4-D is currently under review for re-registration in 2005, with the window for public comment closing on August 23, 2004. The Re-Registration Eligibility Document report should be released in 2005, and many companies are fighting hard to keep this dangerous con the market, since it is the fourth largest selling active ingredient in the U.S. chemicals in the same family as 2,4-D include Agent Orange and other chemicals such as MCPA and MCPP, which are also reviewed in this report. Kuwait, Denmark, and Norway have banned 2,4-D, Sweden has cancelled this chemical and Belize has severely restricted its use.<sup>306</sup> Dicamba is used to treat over three million lawns in the United States, and is used to kill broad leaf weeds in turf.<sup>307</sup> This chemical is also a widely used agricultural chemical, thus increasing the human population's overall exposure to the chemical.<sup>308</sup> Since Dicamba volatizes easily there is the potential that it will drift onto neighbor's lawns after being sprayed.<sup>309</sup> Dicamba is banned in South Africa and the US Toxics Release Inventory lists Dicamba as a known developmental toxin.<sup>310</sup> The USEPA will release the Re-Registration Eligibility Document for Dicamba in May of 2006.

## Known Inerts

None disclosed.

## Acute Toxicity for Millenium Ultra

Millenium Ultra can cause "irreversible eye damage" (corrosive to the eyes of rabbits) and will "irritate the respiratory tract or cause dizziness."<sup>311</sup> This product can cause muscle weakness, nausea, diarrhea, abdominal pain, skin irritation, drop in blood pressure and myotonia if ingested or absorbed through the skin.<sup>312</sup> This

product can also cause death.<sup>313</sup> The HMIS and NFPA both rank this product as a category 2 (slight) health/toxicity hazard.<sup>314</sup>

## Acute and Chronic Toxicity for 2,4-D

The National Toxicology Program states that the acute effects of 2,4-D include "drowsiness, nausea, vomiting, convulsions, coma, kidney and liver injury, hepatitis, diarrhea, weakness, muscle twitching, loss of reflexes, headache, numbness or pain in the arms

and legs, sweating, and incontinence.”<sup>315</sup>  
<sup>316</sup> Other acute effects include eye lesions, cataracts and skin lesions.<sup>317</sup> In terms of neurotoxicity, 2,4-D has several effects. In several studies, 2,4-D caused myotonia, a condition characterized by the inability to relax after voluntary muscles contract.<sup>318</sup> This chemical also causes peripheral neuropathy with incomplete recovery in some people including a woman who knelt on her lawn after it was treated with 2,4-D and who lost the capacity to walk for several weeks, lost 20 pounds, and was still not completely recovered three years after her exposure.<sup>319</sup> This chemical also permanently alters the level of serotonin in the brain, causing behavioral changes in exposed rats including increased inactive time and decreased active activity. Other studies have shown that 2,4-D easily enters animal brains and damages the blood brain barrier at high doses.<sup>320</sup> 2,4-D also interferes with normal blood clotting, damages the membranes of red blood cells, and interferes with hemoglobin’s ability to bind to oxygen.<sup>321</sup>

### **Chronic Toxicity For 2,4-D**

On a subchronic basis, 2,4-D decreases red blood cell count, levels of hemoglobin, muscle and decreased weight gain.<sup>322</sup> This chemical also affects the kidneys and the liver on a subchronic basis.<sup>323</sup> At doses above 1mg/kg in chronic (two-year rat) studies, 2,4-D caused kidney lesions.<sup>324</sup> Dogs also experienced lesions in the kidney as well as in the liver during a one-year chronic toxicity study.<sup>325</sup> Two golfers who habitually licked their golf balls on golf courses treated with 2,4-D experienced liver disease.<sup>326</sup> 2,4-D has also been shown to be mutagenic to human white blood cells, mice hair

follicle cells, and abnormal bone marrow cells in mice.<sup>327</sup> Rabbits exposed to 2,4-D through their drinking water exhibited changes in the chromosomes of their brain cells.<sup>328</sup> In terms of human cells, both white blood cells and connective tissue were adversely affected (changes in cell DNA and/or chromosomes).<sup>329</sup> Other mutagenic effects caused by 2,4-D may occur only in conjunction with other chemicals.<sup>330</sup>

### ***Reproductive/Developmental Effects***

Farmers who applied phenoxy pesticides including 2,4-D had decreased sperm count and quality, and other farmers in Minnesota had more children with birth defects compared with the population that did not apply their own pesticides.<sup>331</sup> Reproductive studies of 2,4-D exposure in rats found that this chemical causes skeletal malformations, and 2,4-D is found in rat fetus brains and blood after their mothers were exposed to the chemical.<sup>332</sup> This chemical is also a possible endocrine disruptor based on studies, which showed 2,4-D Leydig cells in rat testes increasing estradiol production, and decreases in blood’s ability to bind to thyroxine and the distribution of thyroxine in the body.<sup>333</sup> 2,4-D also decreased T-cells and “natural killer cells” in Italian farmers who used 2,4-D and MCPA.<sup>334</sup>

### ***Carcinogenicity***

The USEPA classifies 2,4-D as a class D carcinogen (not classifiable in terms of human carcinogenicity and the IARC classifies 2,4-D as a group 2B, possible carcinogen.<sup>335</sup> There is major controversy over the capability of 2,4-D to cause cancer because epidemiologists link 2,4-D to non-Hodgkin’s lymphoma (NHL) in humans, yet animal

experimental laboratory studies have not shown cancerous results.<sup>336</sup> The National Cancer Institute and the Laboratory Centre for Disease Control (Canada) have published several epidemiological studies concerning the greater likelihood that incidences of NHL increased when a sample population used 2,4-D.<sup>337</sup> For example, the risk of NHL increased with the acreage that Saskatchewan farmers sprayed with herbicide (75-90% 2,4-D), dogs with the canine version of lymphoma were more likely to have come from homes where 2,4-D was applied to the , especially when four or more applications per year were made (a subsequent study found high 2,4-D levels in the urine of dogs who were exposed to 2,4-D on their ).<sup>338</sup> Another study indicated that male lawn care applicators that worked for ChemLawn had a greater incidence of NHL (1.6 times) than expected, and after three years of employment, had 7 times the expected incidence.<sup>339</sup> In laboratories, however, animals did not experience increased rates of lymphoma, despite the FDA's assertion that in rats, lymphoma was 4% more likely in rats exposed to 2,4-D.<sup>340</sup>

20% acetylcholinesterase inhibition, and that these people only shared the pesticide Dicamba in common, and experimental laboratory studies were also conducted to back these findings.<sup>345</sup>

### **Acute Toxicity for Dicamba**

Dicamba is more toxic to female rats than male rats, and its LD50 was 1707mg/kg in these animals, and converted to human dosage amount (a 60kg person) this lethal dose would be about 3.5 ounces.<sup>341342</sup> This chemical is a slight skin sensitizer and irritant, can irreversibly damage the eyes, and has caused congested lungs, hemorrhages, and kidney and liver problems in sheep fed doses of 500 mg/kg.<sup>343344</sup> An epidemiological study found that herbicide applicators in Minnesota had



## **Chronic, Reproductive and Developmental Toxicity for Dicamba**

### **Carcinogenicity**

In a 90-day study of rats fed Dicamba, the rat's liver cells developed abnormalities and several cells died.<sup>346</sup> At low doses (3mg/kg) rabbit fetuses exposed to Dicamba have an increased likelihood of being miscarried according to an USEPA health advisory.<sup>347</sup> There are additional concerns over the manufacturing contaminant known as 2,7-dichlorodibenzo-p-dioxin, which caused heart lesions in rat fetuses.<sup>348</sup> An older study regarding mutagenicity indicates that Dicamba causes gaps in pesticide applicators' chromosomes during the season when they sprayed.<sup>349</sup> Another study found that injections of Dicamba in rats caused changes in the timing of DNA translation in rat livers, and also found chemically induced timing changes in DNA synthesis and sister chromatid exchanges in human blood cell cultures.<sup>350</sup>

In terms of carcinogenicity, several studies around the globe have found that Dicamba increases the risk of non-Hodgkin's lymphoma. A Canadian study published in 2001 found statistically significant NHL risk due to Dicamba, and an earlier study determined that the risk of farmers developing NHL after 20 years of exposure to Dicamba doubled.<sup>351</sup> There are also concerns with the contaminants of Dicamba such as 2,7-dichlorodibenzo-p-dioxin causing cancer (leukemia, lymphoma, circulatory system cancer and liver cancer).<sup>352</sup> A study published in 2004, determined that at concentrations considered to be without adverse effects in humans, Dicamba and other chemicals including 2,4-D tested

separately caused embryotic cell apoptosis (or programmed cell death).

## **Acute and Chronic Toxicity for Clopyralid**

*Please refer to the Confront product description for information on the toxicity and environmental effects of Clopyralid.*

## **Environmental Effects of 2,4-D**

The material safety data sheet for this product warns that runoff or drift from the application of this product is "toxic to aquatic invertebrates. 2,4-D also has the potential to harm young birds."<sup>353</sup> This chemical "bioconcentrates in fish tissues...[and] is synergistic with other pesticides in its toxicity towards fish."<sup>354</sup> 2,4-D and its breakdown product 2,4-dichlorophenol are very toxic to *Eisenia foetida* earthworms.<sup>355</sup> One study found that dogs with owners who treated their lawns with 2,4-D four times per year had twice the risk of developing lymphoma than dogs whose owners did not treat their lawns with this chemical.<sup>356</sup> The range of ecological effects of 2,4-D are far-reaching, and threaten endangered species, beneficial insects, organisms critical for nitrogen fixing and a plethora of other species important for the overall health of ecosystems.

## **Environmental Effects of Dicamba**

There is extensive evidence of Dicamba's high mobility in soil and solubility in water, and Dicamba has been discovered in surface and ground water in the U.S. and Canada.<sup>357</sup> Studies show wide variations in results of fish and aquatic organism toxicity

tests with the greatest toxicity shown towards fish and zooplankton (slight and moderate toxicity respectively).<sup>358359</sup> Dicamba has also been found to reduce soil fertility and persist in the soil.<sup>360 361</sup>

# Pre-M 3.3EC

*Active Ingredient: Pendimethalin*

## General Information

Approved in 1994, LESCO's Pre-M 3.3EC contains 37.4% pendimethalin as the active ingredient, and 62.6% inerts including 50.0% aromatic 200 solvent (CAS 64742-94-5).<sup>362</sup> This dinitroaniline herbicide is a general use pesticide used for the control of certain grasses and broadleaf weeds.<sup>363</sup> The SARA Title III sec. 311/312 classifies this product as an immediate health hazard.<sup>364</sup> Pendimethalin is severely restricted in Sweden.<sup>365</sup> The USEPA released its Re-Registration Eligibility Document decision in 1997 for pendimethalin and mandated that the maximum use rate on lawns and turf not exceed 2 lbs. ai/acre (previously 3 lbs.ai/acre).<sup>366</sup> ChemLawn used a different type of pendimethalin product in 1992 called LESCO Pre-M 60DG.<sup>367</sup>

## Known Inerts

*Aromatic 200 solvent (CAS 64742-94-5)*  
This inert is described by the USEPA as a class 2 inert, and technically as "solvent naphtha (petroleum), heavy aromatic."<sup>368</sup> The IARC classifies this chemical as a group 3 unclassifiable carcinogen, and this chemical is listed as a California Proposition 65 known carcinogen.<sup>369</sup>

## Acute Toxicity for Pre-M 3.3EC

This product is slight to moderately toxic if oral exposure occurs (LD<sub>50</sub> 3956 mg/kg in rats), and slightly dermally toxic (>2250 mg/kg in rabbits), and causes mild eye irritation, but it not a skin sensitizer.<sup>370</sup> Because of the aromatic hydrocarbon content of this product, there is some risk of chemical pneumonia or pulmonary edema if this product is aspirated into the lungs.<sup>371</sup>

## Acute and Chronic Toxicity for Pendimethalin

According to the MSDS for this product, the chronic health effects associated with pendimethalin include:  
"statistically significant benign thyroid

proliferative lesions" and decreased body weight gain in a 2-year rat study at 5000ppm.<sup>372</sup> But, the USEPA states in its Re-Registration Eligibility Document report that these tumors qualify pendimethalin as a Group C possible carcinogen, and the Colborn list compiled by Theo Colborn and published in scientific journals in 1993 includes pendimethalin as a possible endocrine disruptor.<sup>373</sup> A study conducted in 2004 found that pendimethalin increases apoptosis in embryotic cells, which raises concerns over pendimethalin's ability to harm human reproductive health.<sup>374</sup>

## Environmental Effects

Pendimethalin is slightly to moderately toxic to crustaceans and slightly to highly toxic to fish depending on the specific species.<sup>375</sup> A German study conducted in 2003 found that organic fertilizers increase the half-life of pendimethalin by up to 70%.<sup>376</sup> On lawns pendimethalin is often used in conjunction with fertilizer. Pendimethalin has been detected in ground water at low levels, and in surface water at levels as high as 17ppm, and the USEPA states that,

“Chronic risk levels of Concern (LOCs) for fish were exceeded by a small margin. But it is presumed that overall, pendimethalin does not represent a high risk to aquatic animals and plants, including estuarine organisms.”<sup>377</sup> This is not a convincing argument.

# Quicksilver

*Active Ingredient: Carfentrazone-ethyl*

## General Information

Manufactured by FMC Corporation, Quicksilver™ T&O Herbicide consists of 21.33% active ingredient carfentrazone-ethyl and a cocktail of dangerous inerts (78.67%) including aromatic hydrocarbons (<24%), a surfactant blend (<6%), propylene glycol (<4.2%), naphthalene (<3.36%), and xylene (0.2%).<sup>378</sup> There is very little information about carfentrazone-ethyl since it was just recently registered in 1998 as a reduced risk pesticide, and only a select number of countries use this herbicide, primarily on rice and for landscaping.<sup>379</sup> Carfentrazone-ethyl belongs to the Triazolone herbicide family.<sup>380</sup> This product is categorized by the SARA Title III sec. 311 as both an immediate and delayed health hazard.<sup>381</sup>

## Known Inerts

### *Aromatic Hydrocarbons*

*Please refer to the Acclaim Extra section for information on this group of inerts.*

### *Surfactant Blend*

There is no CAS number associated with this 'blend' and any further details are not disclosed by FMC Corporation.

### *Propylene Glycol*

*Please refer to the Barricade 4FL section for more information about this inert.*

### *Naphthalene*

*Please refer to the Acclaim Extra section for information about this inert.*

### *Xylene*

This chemical causes "eye and skin irritation, headaches, nausea, and confusion. In laboratory tests it has caused kidney damage and fetal death."<sup>382</sup> The USEPA places this inert in category 2, meaning it is a potentially toxic inert and has high priority for additional testing. Other serious effects seen in laboratory tests include reduction in fetal weight and some

impaired neurological performance.<sup>383</sup> This chemical has been shown to target the central nervous system.<sup>384</sup> The IARC classifies xylene as a class 3 unclassifiable to human carcinogenicity and calls for more data. The USEPA also calls for more data by categorizing this chemical in group D (unclassifiable). Xylene is slightly toxic to amphibians and fish, highly to very highly toxic to crustaceans, and ranges from not acutely toxic to very highly toxic to mollusks and zooplankton depending on the species.<sup>385</sup>

## Acute Toxicity of Quicksilver T&O Herbicide

This product may cause acute symptoms in overexposed individuals, such as "pinpoint pupils, muscular incoordination, labored breathing, tearing, and diarrhea."<sup>386</sup> This product is considered to be a mild irritant to both the skin and eyes. The dermal LD50 and the oral LD50 in the rat were >4000 mg/kg and 4077 mg/kg respectively.<sup>387</sup>

## Chronic Toxicity of Carfentrazone-Ethyl

Chronic exposure to this active ingredient can result in problems in the liver at high long-term doses, and other tests did not show significant chronic effects.<sup>388</sup>

## **Environmental Effects**

Carfentrazone-ethyl and its metabolite F8426-chloropropionic acid have slight mobility in soil and degrade very quickly in water. Carfentrazone-ethyl is slightly to moderately toxic to fish, moderately toxic to zooplankton and very toxic to algae.<sup>389390</sup> This chemical also has low toxicity to birds and bees.<sup>391</sup>

# Razor Pro

*Active Ingredient: Glyphosate*

## General Information

Manufactured by Nufarm Riverdale Corporation, Razor Pro is comprised of 41% glyphosate (isopropylamine salt) and 59% inerts called ethoxylated tallowamines (CAS# 61791-83-6, but other sources state that the CAS# is 61791-26-2). Razor Pro is used a broad-spectrum herbicide used for broadleaf weed control on a variety of landscapes including lawns and turf.<sup>392</sup> This essentially makes Razor Pro almost the same as the popular herbicide Roundup, except for the fact that we don't know which exact surfactants are used in each product.<sup>393</sup> There is heated debate between the USEPA, manufacturers of glyphosate and independent scientists and environmentalists concerning Roundup with regard to its risks to human and environmental health. The use of glyphosate, an organophosphorus herbicide, in agriculture and in non-agricultural applications is steadily increasing and exceeded 100 million pounds in 2001.<sup>394</sup> This product is rated as a category 1 or "slight" health hazard and the SARA Hazard Notification lists this product as an immediate health hazard.<sup>395</sup> Glyphosate is one of the most common pesticides cited as used before pesticide injury to workers who mix and load glyphosate<sup>396</sup>

## Known Inerts

### *Ethoxylated Tallowamines*

The USEPA ranks these chemicals in group 4B, meaning that they have sufficient evidence that they will not cause harm.<sup>397</sup> The MSDS for Razor Pro, however, includes information that this surfactant causes "irritation to the eyes and skin...[and] ingestion may produce gastrointestinal irritation, nausea, vomiting and diarrhea."<sup>398</sup> Please refer to the Confront section for more information on the related POEA or polyethoxylated tallowamine.

## Acute Toxicity of Razor Pro

This product is slightly irritating and slightly toxic to the skin, and may cause "pain redness and tearing" and "corneal opacity" in the eyes.<sup>399</sup> Razor Pro is slightly toxic if inhaled and if ingested, but "large quantities of one similar product has been reported to result in

hypotension and lung edema."<sup>400</sup> Other similar formulations have caused gastrointestinal discomfort, nausea vomiting and diarrhea, and irritation of the mouth.<sup>401</sup>

## Acute and Chronic Toxicity of Glyphosate

The isopropylamine salt of glyphosate has been found to cause weight changes in dogs fed a product comprised of 62% this chemical over the course of six months.<sup>402</sup> A thirty-week repeated dermal exposure study of this chemical in rabbits produced skin irritation in the rabbits.<sup>403</sup> A 90-day study of glyphosate in mice caused decreased body weight gains at the highest testing level.<sup>404</sup> Glyphosate affected the livers of and reduced the body weight gain of rats at the high-dose level in a 2-year feeding study.<sup>405</sup> It is generally understood that commercial products are more toxic than glyphosate alone, as the

surfactants have synergistic qualities, rendering the total product more harmful than the active alone.<sup>406</sup> Many people have ingested glyphosate in suicide attempts and symptoms included a range of ailments including destruction of red blood cells and lung and kidney problems.<sup>407408</sup>

In all doses tested in rats and all doses except the lowest in mice, these animals developed microscopic lesions in their salivary glands in a medium duration study conducted by the National Toxicology Program.<sup>409</sup> The WHO discovered that male mice experienced “excessive cell division in the urinary bladder” in long-term studies.<sup>410</sup> In a 2 successive generation study of rats, the high dose of glyphosate had toxic effects to offspring and in the mothers.<sup>411</sup> The USEPA classifies glyphosate in category E, meaning that there is evidence that this chemical does not cause cancer. However, several studies and organizations such as NCAP do not agree since all of the referenced studies were conducted by the manufacturer.<sup>412</sup> A Swedish study found that people with occupational exposure to glyphosate have a three-times greater chance of contracting hairy cell leukemia (a type of non-Hodgkin’s lymphoma) than the average population.<sup>413</sup> Another study conducted in 2003, also supports that glyphosate is positively associated with NHL in men in the Midwestern United States.<sup>414</sup> Caroline Cox of the *Journal of Pesticide Reform* argues that there have been many cancerous results in glyphosate studies such as liver, kidney, thyroid and pancreas tumors in either rats or mice, but that the USEPA repeatedly dismisses these results and

is satisfied with the lack of further testing on the matter.<sup>415</sup> Such test results should at prompt further testing by independent scientists not associated with the manufacturer. A mutagenicity study conducted in 1997 found that glyphosate increased sister chromatid exchanges in human lymphocytes in all doses but the lowest.<sup>416</sup> An epidemiological study found that glyphosate was associated with increased miscarriages and premature births in families who used this chemical on their farms in Ontario, Canada.<sup>417</sup> Another reproductive study found that at doses of glyphosate lower than the LD50 (1/10 and 1/100), male rabbits had “increased frequency of abnormal and dead sperm.”<sup>418</sup> A study conducted in 2004, found that four products containing glyphosate as their base ingredient “induced cell cycle dysfunction” in sea urchins, which act as an indicator of the ability of a substance to cause “genomic instability and subsequent development of cancers from the initial affected cell.”<sup>419</sup>

## Environmental Effects

This product is slightly to moderately toxic to aquatic species.<sup>420</sup> Many wells and lakes have been contaminated by glyphosate.<sup>421</sup> Glyphosate is toxic to several species of beneficial beetles and arthropods and earthworms.<sup>422423</sup> This chemical is moderately persistent in soil and has “the potential to contaminate surface waters...[and] may cause adverse effects to nontarget aquatic plants.”<sup>424</sup> Glyphosate is slightly to very toxic to zooplankton, and not astutely toxic to moderately toxic to fish and moderately toxic to crustaceans.<sup>425</sup>



# Sevin SL and Sevin 6.3G

*Active Ingredient: Carbaryl*

## General Information

Both Sevin 6.3 Granular Insecticide and Sevin SL are manufactured by LESCO and contain the active ingredient carbaryl (6.3% and 41.2% by weight respectively).<sup>426427</sup> Sevin SL's other inert ingredients (58.8%) are not disclosed and Sevin 6.3G contains paraffinic oil (<1%) and calcium carbonate carrier (93.0%).<sup>428</sup> A member of the carbamate (N-methylcarbamate) insecticide family, carbaryl is a cholinesterase inhibitor and considered a group C possible carcinogen by the USEPA.<sup>429</sup> The USEPA released its Re-Registration Eligibility Document for carbaryl in June of 2003 and mandated that all "residential lawn care liquid broadcast applications will be voluntarily canceled effective July 1, 2004, pending the outcome of the data that the registrant is voluntarily generating to refine post-application risks."<sup>430</sup> The uses of this product around the residence will be limited to spot treatments and all pet uses except collars are also cancelled.<sup>431</sup> Hopefully, the spraying of this pesticide on residential lawns as liquid broadcast applications was indeed voluntarily stopped on July 1<sup>st</sup> of this year, but Sevin 6.3G may still be used since it is a granular product applied with a spreader. Carbaryl is banned in Angola, Sweden, Germany and Austria.<sup>432</sup>

## Known Inerts In Sevin 6.3

### *Paraffinic Oil (CAS# 64741-88-4)*

This inert ingredient (petroleum) is not included in the USEPA's complete inerts list of inert hazard categorization. Paraffinic oil caused, "when applied undiluted, moderate irritation and significant increase in tumor incidence" in the skin of mice.<sup>433</sup> This study concluded that this substance's ability to produce tumors is not dose-related, but related to "chronic irritation at the application site."<sup>434</sup> Several studies have been conducted regarding this topic. Exxon Biomedical Sciences Inc., a proponent of this product, conducted the aforementioned study. More studies related to this topic are needed, and scientists not associated with the production of this chemical should conduct these studies.

### *Calcium Carbonate Carrier (CAS# 1317-65-3)*

This inert is also known as limestone

and is characterized by the USEPA as a group 4A inert.<sup>435</sup>

## Inert Ingredients in Sevin SL

None disclosed.

## Acute Toxicity of Sevin 6.3G

This product can cause acute cholinesterase inhibition that subsides over time, with symptoms including nausea, vomiting, diarrhea, pinpoint pupils, tremor, muscle twitching and temporary paralysis to name a few.<sup>436</sup> The MSDS also warns that this product can cause respiratory depression and convulsions.<sup>437</sup> These symptoms increase in severity with increased dose and frequency of exposures.<sup>438</sup> This product is a mild eye irritant, and minimal skin irritant and is slightly orally and dermally toxic (oral LD50 rat is 3240 mg/kg and dermal LD50 rabbit >2000 mg/kg).<sup>439</sup> This product may aggravate already existing lung

conditions, heart conditions and skin conditions.<sup>440</sup> The SARA Title III sec. 311/312 categorizes this product as an immediate health threat and the NFPA rates this product as a level 2 or moderate health hazard.<sup>441</sup>

### **Acute Toxicity of Sevin SL**

The acute toxicity of Sevin SL is essentially the same as for Sevin 6.3G in that it is also a cholinesterase inhibitor.<sup>442</sup> This product is a minimal skin irritant and a slight eye irritant.<sup>443</sup> The oral LD50 in rats was 590 mg/kg body weight and the dermal LD50 in rabbits >2000 mg/kg body weight.<sup>444</sup> The NFPA rates this product as a category 2 or moderate health hazard, and the SARA title III sec. 311/312 categorizes this product as both an immediate and delayed health hazard.<sup>445</sup>

### **Acute and Chronic Toxicity of Carbaryl**

Carbaryl's main health concerns are that it is a known cholinesterase inhibitor and the USEPA states that, "Carbaryl is classified as a likely human carcinogen based on vascular tumors in mice."<sup>446</sup> The IARC categorizes carbaryl as a group 3 unclassifiable carcinogen due to a severe lack of sufficient information.<sup>447</sup> The USEPA admits in its Re-Registration Eligibility Document report that carbaryl poses risks to toddlers playing on the lawn and homeowners doing yard work.<sup>448</sup> The USEPA is canceling all uses of carbaryl on pets except for collars, due to the

risks posed by liquid and dust treatments to both the pets and pet owners.<sup>449</sup> Carbaryl is also included on the Illinois USEPA suspected endocrine disruptor list.<sup>450</sup> There was an increased association with Canadian farm couples who were exposed to carbaryl and other farm pesticides and who had miscarriages.<sup>451</sup> Another study involving farmers exposed to carbaryl for many years, conducted by researchers at the Yale University School of Public Health found that there is an, "increased risk of non-Hodgkin's lymphoma (NHL) associated with carbamate pesticide use, particularly Sevin."<sup>452</sup> One study found that Sevin suppresses the immune system's ability to fight bacterial infection even at doses 1/100 of the LD50.<sup>453</sup>

### **Environmental Effects**

The USEPA states in its Re-Registration Eligibility Document assessment that, "carbaryl is very highly toxic on an acute exposure to honey bees, estuarine/marine invertebrates, and other aquatic animals, including Atlantic salmon."<sup>454</sup> Carbaryl is also a potential ground water contaminant.<sup>455</sup> A study published in June of 2004 found carbaryl "in concentrations that exceeded water quality criteria for the protection of aquatic life" in the Kisco River in the Croton Reservoir system in southeastern New York State.<sup>456</sup> Carbaryl is also toxic to birds.<sup>457</sup>

# Talstar

*Active Ingredient: Bifenthrin*

## General Information

First registered in the U.S. in 1999, Talstar is produced by FMC Corporation and is comprised of 7.9% bifenthrin (active ingredient) and 92.1% inerts including propylene glycol (<6.2%).<sup>458</sup> Bifenthrin, a pyrethroid insecticide, is banned in the Netherlands and is a restricted use pesticide in the US, meaning that only certified applicators such as ChemLawn can apply this chemical.<sup>459 460</sup>

## Known Inerts

Propylene Glycol- Please refer to the Barricade 4FL section for information on the health and environmental effects of this inert ingredient.

## Acute Toxicity of Talstar

The acute symptoms associated with this product are nosebleeds, tremors and convulsions.<sup>461</sup> Other symptoms include short-term skin “rashes, numbing, burning or tingling.”<sup>462</sup> The dermal LD50 for Talstar is >2000 mg/kg in the rabbit, and the oral LD50 in the rat is 632 mg/kg.<sup>463</sup> Talstar has shown moderate inhalation toxicity, and the propylene glycol in this product may cause “reversible central nervous system depression including stupor, rapid breathing and heartbeat, profuse sweating and seizures.”<sup>464</sup> The SARA Title III sec. 311/312 classifies this product as both an immediate and a delayed hazard.<sup>465</sup>

## Acute and Chronic Toxicity of Bifenthrin

Bifenthrin causes tremors in animals repeatedly exposed to this chemical, and a study in male mice found “a slight increase in the incidence of [normally very rare] urinary bladder tumors at the highest dose.”<sup>466</sup> This prompted the

USEPA to list bifenthrin as a group C possible carcinogen.<sup>467</sup> Bifenthrin caused gene mutation in the white blood cells of mice and the overall determination of mutagenicity for bifenthrin is inconclusive.<sup>468</sup> The NOELs for reproductive and developmental toxicity are low (between 1 mg/kg/day and 2.67 mg/kg/day) and higher doses produced tremors.<sup>469</sup> This insecticide targets nerves, and can lead to paralysis if overexposure or frequent exposure occurs.<sup>470</sup> The U.S. Toxics Release Inventory has listed bifenthrin as a developmental toxin, and Theo Colborn included bifenthrin in her list of suspected endocrine disruptors, published in scientific literature.<sup>471</sup>

## Environmental Effects

Bifenthrin is slightly toxic to birds and highly toxic to fish and aquatic arthropods.<sup>472</sup> Bifenthrin may bioaccumulate in birds and is toxic to bees.<sup>473</sup> The half-life of bifenthrin ranges from 7 days to 8 months depending on the type and conditions of the soil.<sup>474</sup> One study published in 2004 found bifenthrin to be more persistent in aquatic ecosystems than previous studies claimed.<sup>475</sup> Bifenthrin was also found in the sediments of aquatic locations in Central Valley California.<sup>476</sup>

# Tempo SC Ultra and Tempo 20WP

*Active Ingredients: Cyfluthrin*

## General Information

Manufactured by Bayer Corporation, Tempo SC Ultra and Tempo 20WP are pyrethroid insecticides. Tempo SC Ultra consists of 11.8% beta-cyfluthrin as its active ingredient, and 88.2% inerts including one hazardous inert required to be listed (1-3%), but not named specifically. Tempo 20WP consists of 25% clyfluthrin as its active ingredient, two unnamed but hazardous ingredients (2-20%) protected by trade secrets (ingredients 1976 and 1975), xylenes (5-10%), ethyl benzene (1-2%), trimethylbenzenes (20-30%), and cyclohexanone (30-40%). Cyfluthrin, a type-II pyrethroid insecticide, is very toxic to aquatic ecosystems.

## Known Inerts in Tempo SC Ultra

None disclosed for this product.

*Please refer to the Eagle 20EW section for information on the environmental and health effects of cyclohexanone.*

## Known Inerts in Tempo WP20

### *Xylenes*

*Please refer to the Quicksilver section for information on the environmental and health effects of xylenes.*

### *Ethyl Benzene (CAS# 100-41-4)*

This petroleum derivative chemical is listed in the USEPA's inert hazard category 2. The IARC categorizes this chemical as a possible human carcinogen and this chemical is highly toxic to mollusks, slightly to highly toxic to zooplankton, slightly to very highly toxic to crustaceans, and moderately toxic to some fish.<sup>477</sup> This solvent has also caused developmental damage and reproductive problems in laboratory animals, such as skeletal malformations and effects on the rat estrus cycle.<sup>478</sup>

### *Trimethylbenzenes*

*Please refer to the Dimension EC section for information on the environmental and health effects of this inert.*

### *Cyclohexanone*

## Acute Toxicity of Tempo SC Ultra

This product is listed by SARA Title III sec. 311/312 as an immediate health hazard.<sup>479</sup> This product can mildly irritate the eyes (conjunctiva) and is mildly toxic by the dermal and oral route of exposure.<sup>480</sup> This product may aggravate already existing respiratory diseases.<sup>481</sup> Other acute symptoms from exposure to this synthetic pyrethroid include paresthesia and other skin irritation, and irritation of the mucous membranes.<sup>482</sup> The oral LD50 in male rats was 960 mg/kg, and 1150 mg/kg in female rats.<sup>483</sup> The dermal LD50 for rats was >2000 mg/kg.<sup>484</sup> Subchronic studies of this mixture's enriched isomer mixture BAY FCR 4545 found that dogs vomited and had diarrhea, decreased body weight gain and motor problems (gait/hind limbs) after being fed this substance at the highest concentration (360 ppm).<sup>485</sup> Experiments with rats also produced gait problems at dietary concentrations of 500 ppm.<sup>486</sup> Rats in this and other studies of BAY FCR 4545 experienced decreased body weight gain.<sup>487</sup>

## **Acute Toxicity of Tempo 20WP**

This product may cause skin irritation and severe eye irritation and may aggravate preexisting lung and skin conditions.<sup>488</sup> Spraying this product can irritate mucous membranes and irritate the upper respiratory tract and nose and throat.<sup>489</sup> This product may also cause paresthesia upon skin contact.<sup>490</sup> The inerts (some aromatic hydrocarbons) in this product can also harm the central nervous system, and chronic exposure can cause skin and mucous membrane irritation.<sup>491</sup>

## **Acute and Chronic Toxicity of Cyfluthrin**

Cyfluthrin caused red nasal discharge, urine stains, and reduced eating in rats in a 23-day subchronic study (NOEL 100 mg/kg).<sup>492</sup> In chronic 2-year studies, Cyfluthrin caused decreased body weight gain in rats at concentrations at and above 150 ppm.<sup>493</sup> Cyfluthrin also caused breast cancer at the 450ppm concentration, but this is dismissed as not statistically significant or compound-related.<sup>494</sup> High doses in a chronic study in dogs were reduced after

observations of “severe clinical neurological symptoms” occurred (LOEL 360 ppm).<sup>495</sup> Other chronic studies of cyfluthrin showed some toxic effects to mothers and fetuses of rabbits above 20 mg/kg.<sup>496</sup> In a reproductive study, Cyfluthrin caused “coarse tremors” were observed in the offspring of rats (NOEL 50 ppm parental, NOEL 400 ppm reproductive respectively).<sup>497</sup> Cyfluthrin is also listed on the Colborn list of endocrine disruptors. Cyfluthrin, when inhaled can cause convulsions, incoordination and death to name a few symptoms of acute inhalation exposure to this chemical.<sup>498</sup>

## **Environmental Effects**

Tempo SC Ultra is “extremely toxic to fish and aquatic invertebrates, and is highly toxic to bees,” according to its MSDS.<sup>499</sup> The half-life of cyfluthrin according to the USEPA is between 56 and 63 days, and Cyfluthrin bioconcentrates “by a factor of over 800 times.”<sup>500</sup> This chemical interferes with the healthy reproduction of birds such as mallard ducks and the bobwhite quail.<sup>501</sup>

# Triplet SF

Active Ingredients: *2,4-D, Dicamba, MCPP (dimethylamine salts of all three)*

## General Information

Manufactured by Nufarm Turf and Specialty, this herbicide is comprised of 30.56% dimethylamine salt of 2,4-D, 8.17% dimethylamine salt of MCPP-p, 2.77% dimethylamine salt of Dicamba, and 58.50% undisclosed inert ingredients.<sup>502</sup> This particular product must be labeled with the signal word 'Danger' and is a restricted use pesticide in that it can only be applied by professional lawn care applicators.<sup>503</sup> Dicamba, 2,4-D, and MCPP are commonly combined in weed and feed products and are the most commonly used pesticides in the U.S. for lawn care. MCPP (mecoprop) was the third most commonly used active pesticide ingredient used in the U.S. home and garden market after 2,4-D and glyphosate in 1999 with sales between 3 and 5 million pounds of MCPP sold.<sup>504</sup> MCPP, a phenoxy herbicide used to kill broadleaf weeds on lawns and turf, which is banned in Thailand and severely restricted in Denmark due to concerns over possible carcinogenicity and groundwater contamination potential.<sup>505</sup>

## Known Inerts

None disclosed for this product.

## Acute Toxicity of Triplet

This product may cause irreversible (corrosive) eye damage, respiratory tract irritation, and myotonia (muscle spasms) if ingested or absorbed through the skin.<sup>506</sup> This product can also be fatal if ingested.<sup>507</sup> The acute oral LD50 is >500 mg/kg and >930 mg/kg in male and female rats respectively and the acute dermal LD50 was >2000 mg/kg in rabbits.<sup>508</sup> This product is a minimal skin irritant, and can aggravate pre-existing respiratory conditions.<sup>509</sup> A statement in this product's MSDS warns that, "Overexposure to phenoxy herbicides may cause liver, kidney, gastrointestinal or muscular system effects."<sup>510</sup> The SARA Title III sec. 311/312 classifies this product as both an immediate and a delayed health hazard, and the HMIS lists this product as a group 2 or slight health hazard.<sup>511</sup>

## 2,4-D

*Please refer to the Millenium Ultra section for information regarding the health effects and environmental effects of 2,4-D.*

## Dicamba

*Please refer to the Millenium Ultra section for information regarding the health effects and environmental effects of Dicamba.*

## Acute and Chronic Toxicity of MCPP

Herbicides containing MCPP, 2,4-D, and Dicamba can cause "dizziness, headaches, chest pain, and difficulty breathing."<sup>512</sup><sup>513</sup> MCPP is also an eye irritant.<sup>514</sup> Rats fed 9 mg/kg of MCPP in a three month period developed changes in their kidney and liver weights, and another study found MCPP to "reduce DNA production by 60 percent."<sup>515</sup> <sup>516</sup> This chemical damaged human white blood cells.<sup>517</sup> One study demonstrated that both 2,4-D, MCPP, and MCPA

reduced the ability of human blood to clot.<sup>518</sup> Dogs' hemoglobin decreased (leading to anemia) at doses of 20 mg/kg in both a three and twelve month feeding study.<sup>519</sup> The litter size of mice fed doses of herbicide (containing MCPP, Dicamba and 2,4-D) as low as 0.004 mg/kg/day decreased significantly compared with the control group in a University of Wisconsin study.<sup>520</sup> The IARC classifies MCPP as a 2B possible human carcinogen.<sup>521</sup> A study of male Canadian farmers found that farmers who used MCPP were more than twice as likely to develop non-Hodgkin's lymphoma.<sup>522</sup> Another study found that workers in a factory manufacturing phenoxy herbicides including MCPP had a statistically significant increase in occurrences of NHL and soft tissue cancer.<sup>523</sup> At doses "assumed to be without adverse health consequences for humans," MCPP caused apoptosis (cell death) in embryos at the 5-7 day-old

development stage in mice.<sup>524</sup> This raises concerns that MCPP and other pesticides tested individually in this study may pose a threat to reproductive success.

## **Environmental Effects of Triplet/MCPP**

Triplet is "toxic to aquatic invertebrates" according to the product MSDS, and MCPP has an average half-life of 5 to 17 days.<sup>525</sup> MCPP is very highly toxic to bay shrimp and slightly toxic to most fish.<sup>526</sup> In an urban stream in Washington State, scientists discovered that mecoprop was the third most common pesticide detected in the stream.<sup>527</sup> Another study in Washington during rainstorms in the spring found mecoprop at every stream tested in King County.<sup>528</sup> Applying fertilizers to the soil may increase MCPA and MCPP's mobility in soil.<sup>529</sup>

# Tri-Power Yes

*Active Ingredients: Dicamba, MCPA, MCPP*

## General Information

Manufactured by Nufarm Riverdale, this selective post-emergence phenoxy herbicide is comprised of 40.42% DMA Salt of MCPA, 7.99% DMA Salt of MCPP, 3.97% DMA Salt of Dicamba and 47.62% undisclosed inerts protected by trade secrets.<sup>530</sup> The particular product is required to include the signal word 'Danger' by the USEPA.<sup>531</sup> The USEPA is supposed to release its Re-Registration Eligibility Document decision for this pesticide in September of 2004, and many documents have already been made open for specific periods of public comment. MCPA is an acutely toxic chemical and its use is severely restricted in Denmark.<sup>532</sup>

## Known Inerts

None disclosed for this product.

## Acute Toxicity of Tri-Power

Tri-Power can irritate the respiratory tract if inhaled, and symptoms of overexposure include, "muscle weakness, lethargy, loss of appetite, abdominal pains, headache, or shortness of breath."<sup>533</sup> This product is corrosive to the eyes, and if ingested or absorbed through the skin, this product can cause myotonia (muscle spasm) or a decrease in blood pressure and "can be fatal."<sup>534</sup> The acute oral LD50 in rats was >1400 mg/kg, and the acute dermal LD50 in rabbits was >230 mg/kg.<sup>535</sup> This product can also "aggravate existing respiratory conditions."<sup>536</sup> The SARA Title III classifies this product as both an immediate and delayed health hazard.<sup>537</sup> The HMIS and the NFPA rate this product as a group 2 or slight health/toxicity hazard.<sup>538</sup>

## Dicamba

*Please refer to the Millenium Ultra section for information about the health and environmental effects of Dicamba.*

## MCPP

*Please refer to the Millenium Ultra section for information about the health and environmental effects of MCPP (mecoprop).*

## Acute and Chronic Toxicity of MCPA

MCPA is a severe eye irritant and in high doses can cause slurred speech, jerking and spasms and unconsciousness to name a few acute symptoms.<sup>539</sup> Small amounts (<15 mg/kg) of MCPA administered to rats were toxic to fetuses, and doses of 15 mg/kg damaged reproductive function of rats in a two-year study.<sup>540</sup> The offspring of one generation of rats has reduced weights and reduced weight gains, but other results did not support a conclusion of MCPA and a reproductive toxicant (NOEL 150 ppm or 8 mg/kg).<sup>541</sup> MCPA was also found to adversely affect dog sperm and testes over a period of 13 weeks at small doses of 8 and 16 mg/kg.<sup>542</sup> The teratogenicity of MCPA is inconclusive according to the Tri-Power MSDS.<sup>543</sup> There are several forms of MCPP, and the form included in this product and in most others is the dimethylamine salt. The



form of MCPA that caused birth defects in pregnant rats was the ethyl ester form.<sup>544</sup> According to the USEPA, “children 1 to 2 years old were the most highly exposed subpopulation group” for dietary exposure to MCPA (acute=36%aPAD, chronic=87%aPAD), but these exposure calculations alone did not exceed levels of concern (100% aPAD and cPAD).<sup>545</sup> Combined risks of dietary and residential exposure were not calculated because the residential risks alone exceed levels of concern.<sup>546</sup> This is because no developmental neurotoxicity study had been submitted.<sup>547</sup> The USEPA also determined that, “The acute total MOE (margin of exposure) for toddlers is 280 and the short term total MOE ranges from 280 to 470.” This chemical targets the liver, kidneys, thymus and spleen.<sup>548</sup> The IARC classifies MCPA as a group

2B possible carcinogen.<sup>549</sup> An Italian study found that farmers exposed to MCPA (acid) and 2,4-D experienced “short term immunosuppressive effects.”<sup>550</sup>

## **Environmental Effects**

The half-life of MCPA is 20-60 days according to the Tri-Power MSDS.<sup>551</sup> The USEPA determined that, “the acute risk level of concern (LOC) was exceeded for small mammals (15g) consuming short grass.”<sup>552</sup> The USEPA also found that, “for mammals, all application rates greater than 0.6 lb ae/acre of MCPA...the chronic LOC was exceeded.”<sup>553</sup> Additional concern was raised for non-target plants, and MCPA acid is extremely mobile.<sup>554</sup> MCPA is highly toxic to guppies and slightly toxic to other fish species.<sup>555</sup>

# Turflon Ester

*Active Ingredient: Triclopyr*

## General Information

Approved in 1994, Turflon Ester is manufactured by Dow AgroSciences and by Monterey chemical Company, and both types contain triclopyr as their active ingredient. For the purposes of this report, this section refers to the Dow AgroSciences mixture. This product contains 61.6% triclopyr and 38.4% inerts including kerosene and other undisclosed proprietary surfactants. Triclopyr is outlined in the Confront section of this report.<sup>556</sup>

## Known Inerts

### *Kerosene*

The USEPA categorizes kerosene (CAS# 8008-20-6) as a group 3 inert. Kerosene irritates the upper respiratory tract, burns the eyes and skin, and has the potential to damage the kidneys.<sup>557</sup>

Kerosene has been responsible for many poisonings in children around the world.<sup>558</sup> Kerosene is also used as an insecticide.

pneumonia.<sup>563</sup> Inhaling this product may irritate the nose and throat and upper respiratory tract in general.<sup>564</sup> Kerosene contributes to the overall health risks of this product. The SARA Title III sec. 311/312 categorizes this product as an immediate and a delayed health hazard, and the NFPA rates this product as a group 2 or slight health hazard.<sup>565</sup>

## Acute Toxicity of Turflon Ester

This product has an acute oral LD<sub>50</sub> of 1581 mg/kg and 1338 mg/kg in male and female rats respectively.<sup>559</sup> The dermal LD<sub>50</sub> is >2000 mg/kg and >5000 in rabbits and rats respectively.<sup>560</sup> Turflon Ester can cause both skin and eye irritation.<sup>561</sup> The product MSDS states that, "Repeated skin contact may result in absorption of harmful amounts."<sup>562</sup> If aspiration of the product into the lungs occurs, the affected person may develop lung-damaging or even fatal chemical

## Acute and Chronic Toxicity of Triclopyr

*Please refer to the Confront section of this report for information on the health and environmental effects of the active ingredient Triclopyr.*

## Environmental Effects

This product is highly toxic to aquatic organisms (acute), has a moderate potential for bioconcentration, and biodegrades at a moderate rate.<sup>566</sup>

# Vanquish

*Active Ingredient: Dicamba*

## General Information

First registered in 1997, Vanquish Herbicide is manufactured by Syngenta Corporation (previously Novartis). The USEPA mandates that this product include the signal word 'Caution' in its label.<sup>567</sup> Vanquish is comprised of 56.8% Dicamba and 43.2% undisclosed inerts.<sup>568</sup> The SARA Title III sec. 311/312 lists this product as an acute health hazard, and NFPA ranks this product as a group 1 or slight health hazard.<sup>569</sup>

## Known Inerts

None disclosed for this product.

## Health Effects

For information on the active ingredient Dicamba, please refer to the Millenium Ultra section of this report. The acute health effects of this product include moderate eye irritation and can target the skin, although it is not a skin sensitizer.<sup>570</sup> Vanquish had an oral LD50 in the rat was 3,512 mg/kg and the dermal LD50 in rats was >2000 mg/kg.<sup>571</sup> Chronic effects of this product

are unknown due to a lack of testing and the secrecy of the inert ingredients. One can use the chronic data collected for Dicamba to predict possible chronic effects. The Toxics Release Inventory includes Dicamba in its list of developmental toxins.<sup>572</sup>

## Environmental Effects

Vanquish may be slightly toxic to fish and zooplankton and a potential groundwater contaminant due to its Dicamba content.<sup>573</sup>

# Appendix 5: Chemical Comparison Chart

Carcinogenic compounds ranking systems

| USEPA Classification | IARC Classification | California Classification | Description  |
|----------------------|---------------------|---------------------------|--|
| A                    | 1                   | Known Carcinogen          | Human Carcinogen   |
| B1                   | 2A                  |                           | Probable Human Carcinogen (limited human data available)   |
| B2                   | 2A                  |                           | Probable Human Carcinogen (sufficient evidence in animals and inadequate or no evidence in humans) |
| C                    | 2B                  |                           | Possible Human Carcinogen  |
| D                    | 3                   |                           | Not classifiable as to human carcinogenicity   |
|                      | 4                   |                           | Probably not carcinogenic to humans  |
| E                    |                     |                           | Evidence of noncarcinogenicity for humans  |

\* Table 5-9, page 290, "Hazardous Waste Management, 2nd Edition", LaGrega, Buckingham, Evans, Environmental Resources Management, McGraw Hill Higher Education, 2001, NY, NY

## Appendix 6: Resources

[www.epa.gov/pesticides/factsheets/index.htm](http://www.epa.gov/pesticides/factsheets/index.htm)

Exttoxnet pesticide database:

[www.Ace.orst.edu/info/exttoxnet/pips/ghindex.html](http://www.Ace.orst.edu/info/exttoxnet/pips/ghindex.html)

Environmental Defense pesticide profiles:

[www.scorecard.org/chemical-profiles](http://www.scorecard.org/chemical-profiles)

Pesticide Action Network pesticide database:

[www.Data.pesticideinfo.org](http://www.Data.pesticideinfo.org)

Journal of Pesticide Reform fact sheets on pesticide toxicology

[www.pesticide.org/factsheets.html](http://www.pesticide.org/factsheets.html)

Environmental Health Information Service of the National Institutes for Health

[www.Ehis.niehs.nih.gov](http://www.Ehis.niehs.nih.gov)

List of accredited organic landscapers:

[www.massorganic.org](http://www.massorganic.org)

# Endnotes

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<sup>1</sup> Donaldson, David, Timothy Kiely, and Arthur Grube, Ph.D. "Pesticides Industry Sales and Usage: 1998 and 1999 Market Estimates." Washington, D.C.: U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances, Office of Pesticide Program, Biological and Economic Analysis Division, August 2002. 14 September 2004.

<[http://www.epa.gov/oppbead1/pestsales/99pestsales/market\\_estimates1999.pdf](http://www.epa.gov/oppbead1/pestsales/99pestsales/market_estimates1999.pdf)>.

<sup>2</sup> Dyro, Dr. Francis. "Organophosphates," March 14, 2003. <<http://www.emedicine.com/neuro/topic286.htm>> ( 28 February 2005).

<sup>3</sup><http://www.bitmark.com/nancyscott/franchising%20articles%20html/franchisors%20carve%20niches.html>

<sup>4</sup>TruGreen website: [www.trugreen.com](http://www.trugreen.com), history

<sup>5</sup> [http://jobsinnh.com/seek/coprofiledetail.asp?co\\_num=3804](http://jobsinnh.com/seek/coprofiledetail.asp?co_num=3804)

<sup>6</sup> <http://www.hoovers.com/free/co/secdoc.xhtml?ipage=2670050&doc=0&attach=on>

<sup>7</sup> Waukesha News Briefs, *The Journal Sentinel*, Wisconsin, May 25, 2004

<sup>8</sup> Kepner, John. "Pesticides and You." Vol 23, No. 4, 2004, p7. Beyond Pesticides

[http://www.beyondpesticides.org/infoservices/pesticidesandyou/Summer%2002/Around\\_Country.pdf](http://www.beyondpesticides.org/infoservices/pesticidesandyou/Summer%2002/Around_Country.pdf).

<sup>9</sup>[http://www.consumeraffairs.com/homeowners/trugreen\\_toomuch.html](http://www.consumeraffairs.com/homeowners/trugreen_toomuch.html)

<sup>10</sup> *The Federal Wildlife Officer*, vol.15, no.1, spring 2002, p4, <<http://www.fwoa.org/news/fwoanws27d.html>>

<sup>11</sup> EPA/ Santa Cruz- 70 million, E Magazine, Bradley article, 80 million. In 1999, the last year such figures were available, 78 million pounds of yard insecticides, herbicides, and fungicides were sold to US households - not including professional applications, the EPA said.

<sup>12</sup> TruGreen website: [www.trugreen.com/tg/homepage.dsp](http://www.trugreen.com/tg/homepage.dsp)

<sup>13</sup> Over a six month period (July 04-Jan 05), Toxics Action Center asked residents to call TruGreen ChemLawn to inquire about their lawn care service.

<sup>14</sup> "Inert Ingredients in Pesticide Products." *U.S. Environmental Protection Agency*, <<http://www.epa.gov/oppr001/inerts/>> (1 December 2004).

<sup>15</sup> The International Agency for Research on Cancer (IARC) is part of the World Health Organization. IARC's mission is to coordinate and conduct research on the causes of human cancer, the mechanisms of carcinogenesis, and to develop scientific strategies for cancer control. The Agency is involved in both epidemiological and laboratory research and disseminates scientific information through publications, meetings, courses, and fellowships. The World Health Organization is the United Nations specialized agency for health. WHO's objective, as set out in its Constitution, is the attainment by all peoples of the highest possible level of health. Health is defined in WHO's Constitution as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

<sup>16</sup> The IARC's mission is to identify "causes of cancer, so that preventive measures may be adopted against them." IARC Mission Statement, 2004, <<http://www.iarc.fr/ENG/General/index.html>> (24 February 2005).

<sup>17</sup> Standard USEPA classifications, Green Facts, February 2005, <<http://www.greenfacts.org/glossary/toolboxes/epa-cancer-classification.htm#3>> ( 7 March 2005).

<sup>18</sup> TruGreen website: [www.trugreen.com](http://www.trugreen.com).

<sup>19</sup> "Inert Ingredients in Pesticide Products." *U.S. Environmental Protection Agency*, <<http://www.epa.gov/oppr001/inerts/>> (1 December 2004).

<sup>20</sup> "The Secret Hazards of Pesticides: Inert Ingredients." Attorney General of New York, *Environmental Protection Bureau*, February 1996. <<http://www.oag.state.ny.us/environment/inerts96html>> (2 December 2004).

<sup>21</sup> "The Secret Hazards of Pesticides: Inert Ingredients." Attorney General of New York, *Environmental Protection Bureau*, February 1996. <<http://www.oag.state.ny.us/environment/inerts96html>> (2 December 2004).

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- <sup>22</sup> "Inert Ingredients in Pesticide Products." *U.S. Environmental Protection Agency*, <<http://www.epa.gov/opprd001/inerts/>> (1 December 2004).
- <sup>23</sup> Marquardt, Sandra. "Toxic Secrets: Inert Ingredients in Pesticides." *NCAP Journal* 1998.
- <sup>24</sup> "Inert Ingredients Explained." *The Townsend Letter for Doctors and Patients*, June 2004, <<http://www.townsendletter.com/june/2004>> (2 December 2004).
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