HOLDING THE BAG

How Toxic Waste in Fertilizer Fails Farmers and Gardeners

A Washington Toxics Coalition Report

Acknowledgments

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Washington Toxics Coalition
4649 Sunnyside Avenue N
Suite 540
Seattle, WA 98103
www.watoxics.org
info@watoxics.org
206-632-1545

The Washington Toxics Coalition is a non-profit membership-based organization which protects health and the environment by preventing pollution. We accomplish our goals through advocacy, grassroots organizing, alliance building, education, research, and occasional litigation.

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Written by Erika Schreder
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Chapter 1: Introduction

In July of 1997, A *Seattle Times* investigative reporter named Duff Wilson exposed a shocking abuse of the recycling system in the United States: throughout the country, fertilizer companies were taking toxic waste and turning it into fertilizer. Mine tailings were being packaged and sold as garden fertilizers. Pulp mills were applying their wastes directly to farmers' fields. And steel mills were taking the ash from pollution-control devices and saving on disposal costs by sending it to fertilizer manufacturers, who turned it into zinc fertilizer.

All of this was occurring without the knowledge of the public, without labeling of the fertilizers, and with very little examination of the environmental and health impacts. Farmers and gardeners were getting duped, thinking they were buying valuable nutrients when in fact they were getting nutrients with lots of toxic constituents along for the ride.

Now, four years later, we've learned some more about the little-known practice of making fertilizer from toxic waste. We now know that some fertilizers have extremely high levels of heavy metals, such as arsenic, cadmium, and lead. We also know that some fertilizers are even contaminated with deadly dioxin.

Research by public interest groups has revealed that the practice is widespread. Environmental Working Group found that between 1990 and 1995, more than 600 companies in 44 different states sent 270 million pounds of toxic waste to farms and fertilizer companies (Environmental Working Group 1998).

In 1997, the American public was shocked that the federal government was allowing toxic waste to be used on our farms and gardens with little to no regulation.

Since this information came to light, some regulations have been established, such as Washington state's controversial adoption of the weak Canadian standards for heavy metals. The Environmental Protection Agency is currently engaged in a rulemaking to impose limits on levels of heavy metals and dioxin in zinc fertilizers made from hazardous waste. Largely ignored by governments, however, has been the question of whether these toxic-waste fertilizers actually serve a beneficial purpose. That is, do they promote plant growth in the same way that ordinary fertilizers do, or do they under-perform in providing nutrients while overloading the soil with metals and dioxin?

To address this question, the Washington Toxics Coalition and Dr. William Liebhardt, soil scientist with the University of California at Davis, undertook testing of agricultural and consumer fertilizers. We tested three classes of fertilizers. The first, zinc fertilizers, are fertilizers with very high zinc content used primarily in agricultural settings, either alone or mixed into blends, to provide zinc to crops. The second, agricultural and horticultural fertilizers, include blends containing the major nutrients nitrogen, phosphorus, and potassium, as well as some zinc, used in farming and/or landscaping. The third are consumer fertilizers sold for the home and garden market.

We focused on zinc fertilizers, which are widely believed to be ineffective unless their zinc content is water soluble and therefore available to plants. We tested:

- six zinc fertilizers for zinc solubility and heavy metals content to determine whether the toxic waste fertilizers were as effective as the ordinary fertilizers; and
- nine agricultural and horticultural fertilizers, and eleven consumer fertilizers, for heavy metals content and zinc solubility in order to determine whether the zinc content of these fertilizers is effective or not.

The results of our testing reveal that regulatory agencies are failing to protect farmers and gardeners from sham fertilizer products. Some fertilizers sold specifically to provide zinc contain most of their zinc in a form unavailable to plants. **In fact, our study found that the zinc fertilizer with the highest levels of toxic heavy metals had the lowest proportion of water-soluble zinc.**

Four years after the revelation that industries turn toxic waste into fertilizer, no state or federal agency is ensuring that toxic waste sold as fertilizer actually helps plants grow. In 1997, the American public was shocked that the federal government was allowing toxic waste to be used on our farms and gardens with little to no regulation. Now, we are learning that these waste-fertilizers loaded with heavy metals and other toxics may not even serve their intended purpose. State and federal agencies have clearly fallen short in their duty to ensure that products on the market are both safe and effective.

In Norfolk, Nebraska, the heart of the Corn Belt, Nucor Steel and Frit Industries teamed up to create an especially efficient transformation of toxic waste to fertilizer. Nucor invited Frit to attach its fertilizer factory to the Nucor Steel mill to recycle the mill's hazardous waste into fertilizer. Frit takes the waste from the pollution-control device in the mill's chimney and turns it into zinc fertilizer. Since they share a site, Frit avoids having to obtain a hazardous waste handling permit from the EPA.

Corn is the most widely grown crop in the United States, and is known for requiring zinc applications for top production. Frit Industries supplies much of this need, selling its Nucor zinc product to Nebraska fertilizer dealers, in the heart of corn country, and to custom blenders throughout the Midwest.

Source: Duff Wilson, *The Seattle Times*, "Fear in the Fields," July 1997.

Chapter 2: Zinc Fertilizers

Uses of Zinc Fertilizer

Zinc fertilizer is commonly used in Washington state and around the country. Zinc is a micronutrient that is required by plants for normal growth and development. Crops that are most sensitive to zinc deficiency include corn, sorghum, flax, and grapes (Amrani 1997). Zinc fertilizers are typically used on farmland with calcareous soils, organic soils, and soils that are frequently leveled for furrow or flood irrigation. Nationally, zinc fertilizers are most commonly used for corn.

In 1999, the Washington State Department of Agriculture (WSDA) conducted a study of micronutrient fertilizer use and collected survey data from fertilizer dealers on zinc fertilizer applications (Washington Agricultural Statistics Service 1999). Very high percentages of the potato and hops crops—86.6% and 100%, respectively—were treated with zinc fertilizers, as well as relatively high percentages of the sweet corn, asparagus, peach, apple, pear, and grape crops. In terms of acreage, the largest use was for winter wheat, but because the application rate for wheat is relatively low, by far the largest application was for potatoes (940,000 total pounds). Applications were also notably high for the apple crop (610,000 pounds) and for hops (250,000 pounds).

How Zinc Fertilizers are Made

Federal and state regulatory agencies do not currently require documentation of the feedstocks and processes used to turn industrial waste into zinc fertilizer. Therefore, we are unable to state definitively which manufacturers use which feedstocks and what process they use. The following describes three processes of which we are aware.

1. Zinc Sulfate Monohydrate Processes

Zinc sulfate monohydrate fertilizers are typically produced from wastes generated by the steel-galvanizing process or by the brass production process. For example, Tetra Micronutrients obtains source material from the galvanizing industry, in the form of zinc oxide that forms during galvanizing (Smallwood 2000). Tetra takes zinc complexed with other metals such that it cannot be remelted and dissolves it in sulfuric acid; some of the impurities precipitate in this process. Other manufacturers take waste from brass production and use various processes to remove contaminants.

2. Zinc Oxysulfate Processes

When steel-mill waste is minimally processed to make zinc fertilizer, the resultant product is known as zinc oxysulfate. Secondary steel mills use what is known as an electric arc furnace to recover steel from scrap metal. In this type of furnace, an electric arc is used to create heat to melt the metals, and pollution control equipment captures materials that vaporize. Because the dust captured contains zinc, steel mills have been able to provide the dust to fertilizer manufac-

turers. They can then make zinc oxysulfate fertilizer by processing the dust into granules with sulfuric acid.

3. Thermal Processing of Steel-mill Waste

Steel-mill waste can also be processed at very high temperatures to recover the zinc component.

Zinc Fertilizer Solubility and Effectiveness

Several studies have evaluated the effectiveness of zinc fertilizers in promoting plant growth, as correlated with the water solubility of the zinc in the fertilizer. The most comprehensive studies have been completed at the University of Colorado, using greenhouse experiments with corn to determine whether more-soluble zinc fertilizers were more effective in promoting plant growth.

A 1997 study tested eight zinc fertilizers with zinc solubility ranging from 0.3% to 99.9%. Shortly after germination, corn plants treated with zinc fertilizer of 11% or less solubility showed visual zinc deficiency symptoms (Amrani 1997). Measurements at the end of the growing period showed that production was highly correlated with percentage of water-soluble zinc. While there was no significant growth response to the low-solubility zinc (zinc oxysulfate), high-solubility zinc sulfate monohydrate and high-solubility zinc oxysulfate increased plant growth substantially. Researchers concluded that at an application rate of five pounds per acre, the fertilizer should contain at least 40 to 50% water-soluble zinc for maximum corn growth. The most recent Colorado study (Gangloff 2000) also included zinc fertilizers containing zinc complexed with organic industrial by-products (such as sugar-refining waste), and confirmed that water solubility is the primary factor in governing zinc fertilizer effectiveness.

To our knowledge, no studies have tested whether low-solubility zinc fertilizers become more available to plants in years subsequent to application. However, one study suggests that availability in the year of application is crucial. The study found that in at least some soils, zinc becomes complexed with other soil elements and actually becomes less available over time (Rico 1996).

Chapter 3: Results of Fertilizer Testing

1. Most fertilizers are still contaminated with heavy metals. Of the 26 fertilizers we tested, 20 contained toxic heavy metals above background soil levels in Washington. The fertilizer with the highest levels of the heavy metals lead and arsenic is Ironite, a consumer fertilizer made from mining waste. Ironite tested at 3600 parts per million (ppm) arsenic and 2700 ppm lead. The fertilizer with the second-highest levels of metals was Frit 503G, a zinc micronutrient fertilizer made from steel-mill waste, with 330 ppm lead and 16 ppm arsenic. According to Washington State Department of Ecology records (Ecology 2001), seven of the consumer fertilizers and one of the horticultural fertilizers we tested contain Frit 503G. These include the Lilly Miller products, several of the Webfoot products, and Woodburn Fertilizer's Perfection Royal Green 19-3-16.

Table 1: Levels of Selected Metals in Fertilizer Products

	Arsenic	Cadmium	Cobalt	Mercury	Molybdenum	Nickel	Lead	Selenium
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Washington State Background Levels	7	1	*	0.07	*	38	17	*
Agricultural & Horticultural Fertilizers								
Cenex 10-20-20	6.1	48	2.2	<0.01	4.6	88	1.4	<0.5
Cenex 16-16-16	4.4	45	1.6	<0.01	4.2	80	1.3	<0.49
Simplot 23-4-12	1.9	6	5.6	<0.01	1	42	5.4	<0.49
Simplot 14-0-28	2	15	5	0.019	1.8	46	3.6	<0.5
Apex 21-7-6 Cool Weather Special	1.8	8.8	11	0.065	5.3	25	35	<0.47
Apex 14-14-14 Landscape Color	1.5	0.23	1.4	0.024	1.9	28	2.7	<0.49
Meister 18-7-11	<0.5	0.23	4.4	0.032	0.52	0.56	14	<0.5
Regal 21-4-21	0.87	1.6	6.3	<0.01	0.68	11	25	0.63
Perfection Royal Green 19-3-16	1.4	7.9	4.8	0.042	2.8	16	4.8	<0.5
Consumer Fertilizers								
Fred Meyer Plant Food	3.8	26	4.5	<0.01	3.6	44	7.1	<0.5
Fred Meyer Rhododendron Food	1.3	11	2.8	<0.01	1.7	22	<0.46	<0.46
Ironite	3600	19	14	<0.01	3.1	7.4	2700	28
Webfoot Lawn Food & Moss Control	<0.5	<0.025	42	0.32	<0.25	19	<0.5	<0.5
Webfoot 5-10-10 All Purpose Plant Food	<0.5	31	8.4	0.11	3.4	34	<0.5	<0.5
Webfoot 15-10-10 Tomato & Vegetable Food	4.8	33	3.3	0.037	4.7	66	28	<0.5
Webfoot Turf Start 10-30-10	<0.05	100	5.6	0.054	13	170	23	<0.5
Lily Miller Azalea Camellia & Rhody Food 10-5-4	<0.5	0.31	26	<0.01	750	13	<0.5	<0.5
Lily Miller Rhododendron & Evergreen Food 10-8-6	<0.5	34	12	0.11	10	40	35	<0.5
Lily Miller Bulb & Bloom Food 4-10-10	<0.5	16	12	0.065	13	100	17	6.2
Lily Miller All Purpose Planting and Growing Food	<0.5	<0.025	1.2	<0.01	<0.25	10	<0.5	<0.5
Zinc Fertilizers								
Maximo 360 Zinc Sulfate	<0.5	7.1	5.5	0.053	<0.25	110	<0.5	<0.5
Old Bridge Chemicals Zinc Sulfate	<0.5	18	6	<0.01	<0.25	1.3	<0.5	<0.5
Frit 503G	16	6.6	210	0.53	57	390	330	19
Blu-Min Zinc Sulfate LHM	0.67	4.6	4	0.065	0.32	4.8	12	<0.49
Tetra 31%	0.59	0.45	5	<0.01	<0.005	0.71	<0.01	<0.01
Tetra 35.5%	1.1	52	4.8	<0.01	<0.25	14	36	<0.5

* The Department of Ecology did not determine background levels of this metal. ppm = parts per million

Shaded entries identify measurements found to be at or above Washington state background levels.

2. The most contaminated zinc fertilizer is also likely to be the least effective. We tested eight zinc fertilizers, and the solubility of the zinc they contain ranged from 38% to 97%. Frit 503G, the zinc fertilizer that had by far the highest levels of toxic heavy metals, tested at only 38% soluble. This result puts the solubility of this steel-mill waste fertilizer at less than the 40% to 50% considered the minimum necessary. All of the other zinc fertilizers we tested contained 90% or more soluble zinc. Thus, it appears that the most contaminated zinc fertilizer we tested provides significantly less nutrients to crops than other zinc fertilizers on the market.

Table 2: Zinc Levels and Solubility in Fertilizer Products

	Soluble Zinc	Total Zinc	Soluble Zinc
	ppm	ppm	percent
Washington State Background Levels	n/a	86	n/a
Agricultural and Horticultural			
Cenex 10-20-20	44.2	640	6.91
Cenex 16-16-16	53	630	8.41
Simplot 23-4-12	1500	2000	75.00
Simplot 14-0-28	440	1500	29.33
Apex 21-7-6 Cool Weather Special	180	2400	7.50
Apex 14-14-14 Landscape Color	16	160	10.00
Meister 18-7-11	330	860	38.37
Regal 21-4-21	530	1600	33.13
Perfection Royal Green 19-3-16	95	460	20.65
Consumer			
Fred Meyer Plant Food	240	400	60.00
Fred Meyer Rhododendron Food	68	180	37.78
Ironite	2590	5200	49.81
Webfoot Lawn Food & Moss Control	110	250	44.00
Webfoot 5-10-10 All Purpose Plant Food	500	580	86.21
Webfoot 15-10-10 Tomato & Vegetable Food	970	2000	48.50
Webfoot Turf Start 10-30-10	380	2100	18.10
Lily Miller Azalea Camellia & Rhody Food 10-5-4	37	1800	2.06
Lily Miller Rhododendron & Evergreen Food 10-8-6	900	8000	11.25
Lily Miller Bulb & Bloom Food 4-10-10	64	3600	1.78
Lily Miller All Purpose Planting and Growing Food	45	12	100.00
Zinc Fertilizers			
Maximo 360 Zinc Sulfate	360000	370000	97.30
Old Bridge Chemicals Zinc Sulfate	360000	400000	90.00
Frit 503G	17900	47000	38.09
Blu-Min Zinc Sulfate LHM	324000	330000	98.18
Tetra 31%	290000	310000	93.55
Tetra 35.5%	322000	350000	92.00

ppm = parts per million

3. Many fertilizers contain zinc with low solubility. The solubility of the zinc in the nine standard agricultural and horticultural fertilizers we tested ranged from 7.5% to 75%. The solubility of most of the products was on the low end of this range, with only one having a solubility greater than 39%. While some of the products that had low zinc solubility do not "guarantee" for zinc, meaning that

they make no claims regarding zinc content, several of them do make these claims. For example, a product called Meister 18-7-11 guarantees 0.14% zinc. Its zinc content according to our testing is 0.24%. However, since only 7.5% of its zinc content is soluble, it contains only 0.018% soluble zinc—much less than implied by its guarantee. Thus, the product may not serve one of its intended functions, that of preventing zinc deficiency.

The water solubility of zinc in consumer fertilizers also varies widely, from 1.8% to 100%, with eight of eleven products testing at under 50%. Many of the consumer fertilizers that provide a zinc guarantee also contain mostly insoluble zinc. The solubility in three Lilly Miller products, for example, was below 12%. All of these products contained the steel-mill waste-derived fertilizer Frit 503G, presumably added to provide zinc.

Despite ample evidence that many fertilizers are contaminated with dioxin, at levels many times above cleanup levels for Superfund sites, Washington state never limited, prevented, or required testing for dioxins in fertilizer.

Chapter 4: Policies Currently in Place and Changes Needed

Current Policies and EPA's Proposed Rules

Federal Rules

There are currently no federal standards for metals and other contaminants designed specifically to apply to fertilizers. The only federal standards currently in place that apply to fertilizers are the metals standards designed for wastes going to landfills, since EPA regulations deem fertilizer to be a form of "land disposal." These standards are contained in the Land Disposal Restrictions, established under EPA's rules promulgated under hazardous waste laws, which set treatment standards for metals in hazardous waste going to lined and highly regulated hazardous waste landfills. These standards are designed to ensure that toxic constituents in the wastes will not leach, since EPA's primary concern for wastes going to landfills is whether toxic contaminants will leach out of the landfill into waters used for drinking and recreation.

These landfill disposal rules were not designed to protect farmland, food crops, farmers, and consumers from toxic metals and dioxins that routinely appear in hazardous wastes. Clearly, limits based on wastes going to landfills are highly inappropriate for fertilizers. The primary health concerns when waste is made into fertilizer are uptake by food crops, consumption by dairy cattle, exposures to farmers, gardeners, and others applying fertilizers, and exposures to residents of farming communities. None of these concerns are addressed by standards based on leaching.

Companies using waste to manufacture fertilizer are under no legal obligation to divulge to regulatory officials the waste streams used in their fertilizer.

Even worse, the current rules have major loopholes for some of the most contaminated wastes. For example, steel-mill waste has been tested at 800 parts per trillion dioxin and over one percent lead. But when steel-mill wastes are turned into fertilizer, they are exempted altogether from the Land Disposal Restrictions described above, meaning there are no federal limits on toxic heavy metals in fertilizer made from steel-mill waste. The same is true for mining waste. EPA has never provided sufficient technical justification for these loopholes.

Current federal rules do contain a limitation stating that industrial waste can only be recycled if the waste is "an effective substitute for a commercial product"(40 CFR §1 261.1). However, we are unaware of any enforcement actions by EPA on this rule.

In most circumstances, current federal rules provide for "cradle to grave" tracking of hazardous wastes through a "manifest" system. The purpose of manifesting is to track the origins of hazardous wastes, their transportation, treatment, storage, and disposal. Hazardous waste facilities are required to document each

stage of the history of a particular load of waste. Discrepancies between shipping papers and actual waste shipments must be reconciled, or reported to EPA. Facilities must maintain manifests for three years. Also as part of the manifest system, operating records must be kept which tell the type and quantity of hazardous wastes received, and the method of treatment, storage, or disposal. These records also must certify that the facility has a hazardous waste reduction program in place. All of these records must be available for inspection by EPA.

Moreover, a "bi-ennial report" must be filed with EPA describing wastes received, their sources, and how the wastes were treated, stored and disposed. Further reporting is required for unmanifested wastes, fires, explosions, groundwater contamination, and other irregularities.

The manifest system applies to hazardous wastes destined for fertilizer manufacture, up to the point that the waste is considered a "product." Once they are products, wastes used as fertilizers are no longer deemed hazardous wastes—even if they still contain high levels of toxic constituents—and so escape the manifesting requirement.

Washington State Law

Washington state set weak limits for heavy metals in fertilizer in 1998 by adopting the standards developed in Canada. The Canadian standards were established based on allowing a doubling of the background levels of the metals over a period of 45 years. Washington state did not adapt the standards to background levels found in the state but rather used the standards set for Canadian soils. These standards allow a buildup of heavy metals in farm and garden soils. Moreover, the Washington metals standards are indexed to the application rates recommended by fertilizer manufacturers rather than the actual metals content of the fertilizers. Fertilizers can thus still have high levels of heavy metals and meet the standards, as long as the application rate is low enough. The standards can and have been met in some cases with changes to words on label directions rather than by cleaning up the fertilizer.

The Canadian and Washington standards were not designed to protect health, the environment, or soils. They simply allow continued additions of metals to soil. During the legislative debate over Washington's Fertilizer Act, public interest groups lobbied for standards based on natural background levels in soils (or based on health if naturally occurring levels of metals were unsafe), and for a ban on any fertilizers with wastes containing dioxin.

Despite ample evidence that many fertilizers are contaminated with dioxin, at levels many times above cleanup levels for Superfund sites, Washington state never limited, prevented, or required testing for dioxins in fertilizer.

Washington state law does require that fertilizer companies submit information on the levels of eight heavy metals as part of their fertilizer registration with the state Department of Agriculture. The Department's Web site includes a publicly-accessible database with information on the metals levels submitted by the companies (www.wa.gov/agr/pmd/fertilizers/index.htm#database).

American Association of Plant Food Control Officials Proposal

The American Association of Plant Food Control Officials (AAPFCO), which is made of up state fertilizer regulators from the United States and Canada and is heavily lobbied by the fertilizer industry, is currently developing weak metals standards that may serve as a model for states to adopt. These standards use a risk-based approach, which presumes that a certain amount of harm to public health is acceptable. Risk assessments using this approach have been conducted by the fertilizer industry, the U.S. EPA, and the California Department of Food and Agriculture. These risk assessments include inadequate evaluations of human health risks from exposure to metals in fertilizers. The AAPFCO-recommended concentrations of metals in fertilizer are based on these risk assessments, which presume an allowable cancer risk of one additional cancer per 100,000 people.

If wastes are mixed into agricultural and consumer fertilizers but don't provide useful nutrients, it's not recycling—it's dumping toxic waste on farmers and gardeners.

EPA's Proposed Rule

In November 2000, EPA proposed rules to regulate hazardous waste in fertilizers as a result of a lawsuit brought by the Washington Toxics Coalition and the Sierra Club (65 Fed. Reg. 70953, Nov. 28, 2000). A final rule must be completed by July 2002.

In the rulemaking, EPA proposed tightening fertilizer regulations in the following ways:

- Adopting technology-based limits on metals in zinc fertilizer made from hazardous waste;
- Setting dioxin standards based on current national average levels in soil; and
- The elimination of a loophole that provides special treatment for steel-mill waste when it is used for fertilizer.

EPA also describes and solicits comments on several stronger regulatory actions:

- A prohibition on the use as fertilizer of wastes from dioxin-polluting industries;
- The elimination of a loophole for mining waste when it is used for fertilizer; and
- Full reporting and tracking, including product labeling, of the use of hazardous waste in fertilizer.

Finally, EPA proposed loosening fertilizer regulations in the following ways:

- Lifting the existing cradle-to-grave tracking for wastes destined for zinc fertilizer manufacturers, to be replaced by a one-time notice; and
- Lifting the requirement that facilities turning zinc waste into fertilizer have a hazardous waste handling permit.

Policy Changes Needed

1. Federal and state agencies must enforce federal law requiring that wastes and by-products serve as an effective commercial substitute when recycled into fertilizer. If wastes are mixed into agricultural and consumer fertilizers but don't provide useful nutrients, it's not recycling—it's dumping toxic waste on farmers and gardeners. Industries that create waste and fertilizer manufacturers must prove to EPA and state agencies that fertilizer made from waste is safe and effective. That means that the product must help plants grow, usually by providing nutrients, organic matter, or improving pH, and that the product does not damage plants, the environment, or public health.

The public has a right to know exactly which wastes are used in fertilizers, and EPA needs a comprehensive way of tracking this practice so that it can protect public health and the environment.

2. All fertilizers should be subject to standards based on natural background levels in soil. In order to protect our soils in farms and gardens for future generations, we must stop allowing the buildup of toxic heavy metals. There are currently no federal standards for metals in fertilizer. While EPA has proposed standards for zinc fertilizers made from hazardous waste, they must be much more stringent to prevent the buildup of heavy metals. Moreover, the current proposal would apply to only a small subset of fertilizers. EPA and the U.S. Department of Agriculture should work together to develop background-based standards for metals in all fertilizers.

3. The public must be given full information about the contents of fertilizers. We were able to obtain limited information about the sources used to manufacture the fertilizers we tested by searching Washington State Department of Ecology files and interviewing industry members. However, companies using waste to manufacture fertilizer are under no legal obligation to divulge to regulatory officials the waste streams used in their fertilizer. EPA's current rulemaking describes an option for the establishment of a comprehensive tracking system for wastes being used for fertilizers, including testing for and labeling of all contaminants. The public has a right to know which industries are turning which wastes into fertilizers. Regulatory officials also need this information to prevent the most-toxic wastes from being made into fertilizer.

4. EPA should ban turning toxic waste into fertilizer. It is difficult to imagine a much more dangerous idea than to use toxic waste to produce our food supply. Arsenic, cadmium, and lead in fertilizer can be taken up by plants and turn up in the food we eat. Dioxin is already in our bodies at levels that can cause harm, and any addition of dioxin to the environment must be prevented. EPA should do everything in its power to end the practice of turning toxic waste into fertilizer, starting with the wastes from known dioxin sources, such as pulp mills, cement kilns, and steel mills.

Chapter 5: Recommendations for Action

It is abundantly clear that the way state and federal agencies are interpreting and enforcing the law has resulted in the continued duping of farmers and gardeners with contaminated and ineffective fertilizers. Reform must take place at both the federal and state level to end the sham recycling practice of calling toxic waste fertilizer.

Environmental Protection Agency

The Environmental Protection Agency is the federal agency charged with protecting our environment, and which has the primary authority for the regulation of toxic chemicals and waste recycling practices. EPA has taken a first step by proposing regulations to limit the metals and dioxin concentrations in zinc fertilizers made from hazardous waste.

The ultimate solution to this problem is a ban on the use of toxic waste in fertilizer. EPA must move in this direction by going forward with the proposed rulemaking in strengthened form.

In the current rulemaking, EPA should:

1. Move toward a ban of the use of hazardous wastes for manufacturing fertilizers by adopting stringent metals standards for all zinc fertilizers. It is a positive first step that EPA is considering setting standards for metals content of zinc fertilizers. However, the levels in the proposed rule are unnecessarily high and would not sufficiently protect health and the environment. EPA should adopt final standards based on the cleanest fertilizer that the industry can produce. Our testing shows that some manufacturers are achieving levels below Washington state background levels, and the industry should be held to this high standard.

2. Remove loopholes that allow hazardous steel-mill waste to be turned into zinc fertilizer, and ban its use as fertilizer altogether. Waste from steel mills destined for fertilizer enjoys a special loophole exempting it from any metals standards, despite the fact that these wastes have been known to contain extremely high levels of metals and dioxins. Washington state test results in April 1999 revealed that steel-mill waste had the highest levels of dioxin out of any of the fertilizer sources tested, including pulp-mill waste, cement-kiln dust and tire-incinerator ash. Other testing by Washington state revealed that fertilizers derived from steel-mill waste can contain 1% or more lead as well as some of the highest levels of arsenic, cadmium, and mercury found in fertilizer (Ecology 1997, Ecology 1999). Steel-mill waste-derived fertilizers are also notorious for low zinc solubility. EPA must enforce beneficial-use requirements and end the use of steel-mill waste in fertilizer.

3. Ban all dioxin-laden wastes from fertilizer. Dioxin is persistent, it builds up in the food chain and our bodies and is toxic at minute levels. There is even evidence it is taken up by certain plants in the squash family. The good news is

that we can keep it out by identifying the industries that produce dioxin wastes and prohibiting them from turning it into fertilizer. EPA must stop all hazardous waste generated by industries known to be dioxin sources from being made into fertilizer.

4. Remove the exemption for mining waste when it is used for micronutrient or *any* fertilizer product. In its rule announcement, EPA states that it is "aware of at least one iron fertilizer being produced that is exempted from hazardous waste requirements, despite evidence that the product exhibits a hazardous waste characteristic when tested . . . ." This product is Ironite, a lawn and garden fertilizer sold nationwide in stores such as Home Depot and Lowe's. The rule announcement also states, "Data compiled by EPA on fertilizer contaminants indicate that Ironite contains, by a wide margin, the highest levels of arsenic of all fertilizer products surveyed." Ironite should not receive special treatment: EPA must eliminate the mining-waste loophole.

Recent studies on lead exposure, for example, show that levels previously considered safe in fact have detrimental effects on children's ability to learn.

5. Retain existing hazardous waste management requirements for hazardous wastes being made into fertilizer. Right now, hazardous wastes that are going to be "recycled" into fertilizer must meet certain hazardous-waste regulations. For example, fertilizer manufacturers that handle the waste must obtain a hazardous-waste permit and shipments of the waste must be tracked. EPA has proposed lifting these requirements for wastes made into zinc fertilizer. All of these requirements must be maintained to ensure proper handling, tracking and treatment of the hazardous wastes.

6. Adopt a comprehensive reporting system and labeling requirements so the public knows what hazardous wastes are being made into fertilizer and what toxics are contained in their fertilizer. We do not have a complete picture of the extent to which hazardous wastes are recycled into fertilizer. Many times we find out about it when farmers lose crops, fertilizer handlers become ill or workers decide to blow the whistle. This is not good enough. The public has a right to know exactly which wastes are used in fertilizers, and EPA needs a comprehensive way of tracking this practice so that it can protect public health and the environment. EPA should adopt the tracking system described in the rule, which would require additional reporting as well as labels with information on the levels of contaminants and whether the product is made from hazardous waste.

Washington State Department of Agriculture

In most states, agriculture departments have primary responsibility for registering fertilizer products and ensuring that they are safe and effective. The 1998 Fertilizer Act established limits for heavy metals in fertilizer, and gave the Washington State Department of Agriculture authority for enforcing those limits. The Act allows, however, for adoption of more stringent limits if a public health need is shown. We believe that the evidence is clear that heavy metals and dioxin are dangers to public health, and for many of these chemicals, there is no safe level of exposure. Recent studies on lead exposure, for example, show that levels previously considered safe in fact have detrimental effects on children's ability to learn.

To protect public health and the environment, the Washington State Department of Agriculture should adopt standards for heavy metals in fertilizer equivalent to natural background levels in soils. Such standards would ensure that use of fertilizer would not increase the levels of toxic heavy metals—which do not degrade—in our precious soils used for farming and gardening.

Washington State Department of Ecology

The Washington State Department of Ecology is responsible for regulation of toxic wastes at the state level. The 1998 Fertilizer Act requires that Ecology make a determination for each waste on whether it can be used in fertilizer. Ecology should ban the use of any waste from a dioxin-generating industry, since those wastes are likely to contain dioxin. Wastes from dioxin-generating industries that we know are currently used in fertilizer include pulp-mill waste, steel-mill waste, and cement-kiln dust. Dioxin is extremely toxic at low levels, it is persistent, and it builds up in our bodies and in our food supply. It is imperative that strong steps be taken to prevent the use of fertilizers containing dioxin, in order to prevent the further contamination of our food supply with dioxin.

Ecology also has a duty under federal law to enforce the requirement that wastes be an effective substitute for commercial products if they are to be recycled. Ecology must establish a stringent process for making this determination.

Appendix A: Fertilizer Testing Methods

Fertilizers were purchased at retail outlets and fertilizer distributors throughout Washington state. Chain of custody records were maintained for all purchases. Fertilizers were tested by AmTest Laboratories in Redmond, Washington. Fertilizers were digested using an acid digestion for soils, method number 3050B, SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods. Total metals were measured using EPA Method 6010 (same reference), with the exception of mercury which was measured using method number 7471A (same reference). Soluble zinc was measured using AOAC method 965.09.

Appendix B

Table 3: Levels of Additional Metals in Fertilizer Products

	Antimony	Boron	Barium	Beryllium	Chromium	Iron	Magnesium	Manganese
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Washington State Background Levels	*	*	*	2	42	42100	*	1100
Agricultural and Horticultural Fertilizers								
Cenex 10-20-20	1.7	5.2	4.9	0.83	160	7200	2200	76
Cenex 16-16-16	1.6	4.3	BDL	0.71	140	2100	1900	50
Simplot 23-4-12	<0.49	BDL	2.1	0.12	18	23000	1400	62
Simplot 14-0-28	0.97	BDL	1.6	0.09	38	17000	950	91
Apex 21-7-6 Cool Weather Special	<0.47	260	8.4	0.15	33	21000	22000	870
Apex 14-14-14 Landscape Color	2.5	40	0.85	0.13	44	990	1000	46
Meister 18-7-11	1.9	BDL	0.36	BDL	BDL	4500	1200	65
Regal 21-4-21	<0.47	230	2.3	BDL	3.1	26000	1400	390
Perfection Royal Green 19-3-16	<0.5	3.8	2.7	0.04	28	11000	1100	200
Consumer Fertilizers								
Fred Meyer Plant Food	0.95	13	4.8	0.51	80	8100	11000	67
Fred Meyer Rhododendron Food	0.68	BDL	12	0.32	39	22000	50000	520
Ironite	42	BDL	17	BDL	14	100000	16000	480
Webfoot Lawn Food & Moss Control	18	BDL	1.6	BDL	130	140000	6800	740
Webfoot 5-10-10 All Purpose Plant Food	14	50	18	0.5	82	2500	41000	52
Webfoot 15-10-10 Tomato & Vegetable Food	<0.5	230	24	0.25	840	7800	33000	1600
Webfoot Turf Start 10-30-10	19	99	36	1.6	380	44000	5000	460
Lily Miller Azalea Camellia & Rhody Food 10-5-4	12	110	36	BDL	41	2500	5700	680
Lily Miller Rhododendron & Evergreen Food 10-8-6	14	200	27	0.62	240	8200	4500	1100
Lily Miller Bulb & Bloom Food 4-10-10	12	620	63	0.58	150	6600	6400	2500
Lily Miller All Purpose Planting and Growing Food	12	BDL	3.8	BDL	42	330	400	15
Zinc Fertilizers								
Maximo 360 Zinc Sulfate	23	440	BDL	20	BDL	24	12000	42
Old Bridge Chemicals Zinc Sulfate	24	76	BDL	BDL	BDL	3200	460	540
Frit 503G	7.9	7400	100	0.29	67	51000	3900	71000
Blu-Min Zinc Sulfate LHM	25	240	BDL	BDL	2.3	2000	31	340
Tetra 31%	17	76	BDL	BDL	BDL	6	18000	7900
Tetra 35.5%	21	72	BDL	BDL	BDL	1900	66	280

Shaded entries identify measurements found to be at or above Washington state background levels.

* The Department of Ecology did not determine background levels of this metal.

BDL = below detection limit
ppm = parts per million

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