As You Sow:
Toxic Waste in California Home and Farm Fertilizers

Environmental Working Group™

CALPIRG
California Public Interest Research Group

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California Public Interest Research Group Charitable Trust

The CALPIRG Charitable Trust is the 501(c)(3) sister organization of the California Public Interest Research Group (CALPIRG), a non-profit, non-partisan research and advocacy organization working on behalf of consumers and the environment. With over 70,000 members and 14 offices statewide, CALPIRG is the largest consumer group in California.

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1. Executive Summary

State and private laboratory tests show that fertilizer manufacturers routinely add undisclosed amounts of toxic waste to farm and home fertilizers sold in California.These companies buy toxic waste from industrial facilities to obtain low-cost plant nutrients, such as zinc or iron.Unfortunately, such waste streams are often highly contaminated with persistent toxic chemicals, including heavy metals and dioxins. Many of these contaminants are known to cause cancer, reproductive and developmental toxicity or other serious health effects and, to varying degrees, are available to be absorbed from the soil by food crops. Sold as household products, they may also pose a risk to home gardeners and their families. In spite of these risks, the California Department of Food and Agriculture has now proposed to legalize the practice recycling toxic waste into fertilizers.

Every test sample of a popular home fertilizer exceeded State of California toxic waste standards for lead and arsenic.

Tests find popular home fertilizer highly contaminated

In tests of a widely-used home fertilizer sold throughout California, every sample exceeded State of California criteria for classification as hazardous waste, according to an analysis conducted for the California Public Interest Research Group (CALPIRG) and the Environmental Working Group (EWG). State data analyzed by CALPIRG and EWG also show that more than one-sixth of the commercial fertilizers tested by the California Department of Food and Agriculture (CDFA) exceeded State of California hazardous waste criteria for heavy metals including lead and arsenic.

Testing 10 samples of Ironite brand fertilizer purchased from home and garden stores in Los Angeles, San Diego, San Francisco, Sacramento and Fresno, an accredited independent laboratory found lead at three to four times the concentration that would require the fertilizer itself to be disposed of as hazardous waste. All ten samples also exceeded the hazardous waste criteria for arsenic, some by more than two times the standard. Thirty percent of the Ironite samples equaled or exceeded the hazardous waste criteria for mercury, and another 50 percent were barely below the standard. An average Ironite sample contained seven heavy metals, with average levels of lead at 3.7 times the hazardous waste threshold, arsenic at 1.9 times the threshold and mercury at 95 percent of the threshold. (Table 1.)

Ironite is recommended by its manufacturer for use on vegetables, flowers, lawns, potted plants, shrubs and trees. It is made by the Ironite Products Co. of Scottsdale, Ariz., using as raw materials the tailings from an abandoned lead and zinc mine. Due to its high levels of lead and

health officials issued a warning to consumers that Ironite could be "dangerous" and that ingestion of less than half a teaspoon could be toxic to small children. Using too much Ironite for only two years, state health officials said, could make a back yard as contaminated as a hazardous waste site. As a result of these findings, Ironite reduced the product's recommended application rate -- but not its toxicity -- to comply with Washington State regulations.

In state tests, 1 in 6 commercial fertilizers exceeded State of California hazardous waste criteria.

Table 1. Average Ironite sample compared to State of California levels for toxic waste.

Heavy Metal	Level
Lead	370%
Arsenic	190%
Mercury	95%
Selenium	45%
Cadmium	27%
Barium	<1%
Chromium	<1%
Silver	Not Detected

SOURCE: CALPIRG/EWG tests of home fertilizers, Oct. 1999

One in six commercial fertilizers tested more toxic than hazardous waste

Contamination of agricultural fertilizers may be even more widespread. State data analyzed by CALPIRG and EWG show that more than one-sixth of the commercial fertilizers tested by the California Department of Food and Agriculture (CDFA) exceeded federal hazardous waste criteria for heavy metals including lead and arsenic. Between 1994 and 1998, CDFA tested more than 250 samples of commercial (mostly agricultural use) fertilizer products for lead, arsenic and cadmium. Thirteen percent of the cadmium-tainted samples exceeded hazardous waste criteria, as did seven percent of the lead-containing samples and two percent of the arsenic-containing samples.

Spreading these contaminants on farm soils is a particular concern because lead, cadmium, arsenic and other contaminants persist and even accumulate in soil for decades where they may be absorbed by food crops. CDFA's assessment of the health risk posed by toxic fertilizer says that eating food grown with contaminated fertilizer will be the greatest single source of exposure for commercial products. (Risks posed by home-use products were not evaluated). Combined with the potential for exposures of toxic fertilizers stored at home, it is evident that contaminated fertilizers are a threat to

farmers and farm workers, residents of agricultural communities, consumers anywhere of California produce, and home gardeners and their families.

Proposed state regulations won't protect Californians from toxic fertilizers

In the face of this evidence that home and farm fertilizers may be contaminated at levels harmful to human health, the State of California is about to issue proposed regulations that would continue to allow lead, arsenic and other toxic wastes to be added to commercial fertilizers at up to four times the level allowed in Washington State and up to 85 times the amount allowed in some European countries. Because the contaminants in question are highly persistent, and are expected to remain and accumulate in soils for decades or even hundreds of years, the Department is gambling with the future health of our farms and gardens. Given that many fertilizer products on the market are relatively clean, this is an unnecessary risk.

Proposed rules permit up to 85 times as much toxic waste in fertilizers as allowed in Europe

The state's proposed regulations are flawed at every turn:

- Toxic wastes in home fertilizers would not be regulated at all, even though they present an obvious potential exposure route for children and other vulnerable populations.

- The proposed rule would deny Californians the right even to know what toxins, and in what amounts, are in the fertilizer products they purchase.

- The rule would regulate only three of the many contaminants found in fertilizer.

- The proposed rule is based on a risk analysis that was designed with input from the fertilizer industry but not from environmental or public interest organizations; that has been widely criticized; inadequately peer reviewed; and that misses important sources of risk. A member of the state Scientific Review Panel called the proposed risk analysis "severely deficient."

Recommendations

State and independent tests that found highly contaminated samples of Ironite, the fact that it is not approved for use in Canada, and the consumer health warnings issued last year by Washington State argue strongly that this product may pose unacceptable health risks to Californians. CALPIRG and EWG urge California retailers to voluntarily remove Ironite from their shelves, and the state to require future packages of the fertilizer to carry warnings both of its toxicity to children at low doses and the potential for soil contamination.

Fertilizer labels should disclose name and amount of all toxic wastes added to the product

The larger issue is that California farms and gardens should not be dumping grounds for industrial toxic waste. CALPIRG and EWG also urge the California Department of Food and Agriculture to reconsider its "risk-based" approach to regulating fertilizer. Rather than gamble with high levels of persistent contaminants in fertilizers, CDFA should:

- Set soil standards that ensure that cropland and home gardens are not degraded by fertilizer use. Allowable contaminant levels in fertilizers should be set a level that would not result in increased contamination of soils.

- Prohibit the use of toxic waste in fertilizers unless the waste is first fully treated according to federal and state guidelines for hazardous waste treatment.

- Guarantee Californians' right to know about toxics in the fertilizers they buy, with labeling requirements that fully disclose the kind and amount of all toxic waste in the product.

2. An Overview of Toxic Waste in Fertilizers

The fertilizer tests by CALPIRG/EWG and CDFA are further proof of a fact that, until exposed last year in an investigation by *The Seattle Times*, was the fertilizer industry's dirty secret. Every year, U.S. factories send mountains of "recycled" toxic waste to fertilizer companies, presumably for use as raw materials in fertilizer production. Federal data show that U.S. industries shipped more than 270 million pounds of toxic waste to farms and fertilizer companies between 1990 and 1995. (EWG/CALPIRG 1998.)

Between 1990 and 1995, California industries sent 30 million pounds of hazardous waste to fertilizer companies and farms

Even though these wastes are often laden with toxic heavy metals and chemical impurities, fertilizer manufacturers use smokestack ash from steel mills, air pollution scrubber brine and other industrial byproducts as the raw materials for a substantial portion of the nation's fertilizers. The resulting waste-derived fertilizers (particularly micronutrient fertilizers) typically contain high levels of toxic materials, such as dioxin and heavy metals including arsenic, lead and cadmium. Naturally mined rock phosphate fertilizers may also be contaminated with cadmium.

In 1998, EWG and CALPIRG used data from the federal Toxics Release Inventory (TRI) to track, state by state, the nationwide flow of hazardous wastes from industries to fertilizer companies and farms. (Factory Farming: Toxic Fertilizer in the United States, 1990-1995.) According to the TRI, between 1990 and 1995, California companies sent nearly 30 million pounds of industrial chemicals to fertilizer companies and farms to be recycled and applied to land. Most of the wastes, nearly 24 million pounds, were sent from the state's electronics industry, which accounted for 79 percent of the wastes sent to fertilizer companies and facilities listed as farms in the TRI.

In that same period, California fertilizer makers and farms received nearly 38 million pounds of toxic waste, making California not just a net importer of toxic wastes to fertilizer companies, but the U.S. state receiving the most waste. Fertilizer maker Phibro-Tech of Santa Fe Springs, Calif., received 36 million pounds of waste for recycling, more than any other company or farm in the nation. In 1995, Phibro-Tech received more than 9 million pounds of waste containing 10 different toxic chemicals, including ammonia, chlorine, chromium, copper and copper compounds, hydrochloric acid, nickel, nitric acid, sulfuric acid and zinc compounds.

Dioxins and some heavy metals are very toxic to humans, can accumulate in soils over time, and are highly persistent in the environment. Heavy metals do not biodegrade. Furthermore, the scientific literature indicates that these metals are biologically available to plants — that is, they may be taken up through the roots from the soil — and may pose a health risk to humans. (PPI 1998.)

Food crops can absorb contaminants from soils

Eating foods grown with contaminated fertilizers will be greatest source of public exposure

According to a risk assessment commissioned by the California Department of Food and Agriculture, the regular use of contaminated fertilizers will dramatically increase levels of heavy metals in farm soil.(Foster Wheeler 1998.) The risk study also reviews numerous scientific studies indicating that a wide array of food crops may absorb heavy metals when present in the soil. (Table 2.) In fact, after reviewing numerous "exposure pathways" to heavy metals in commercial fertilizers, (i.e. inhalation of fertilizer dust, dermal exposure, water contamination, etc.), the study concluded that ingestion of crops grown with contaminated fertilizers is expected to be the single greatest source of exposure. This means that contaminated fertilizers are not only a risk to farm workers and people living in agricultural communities, but threaten consumers everywhere who eat California produce.

Table 2: Food crops that absorb contaminants detected in fertilizers.

Toxin	Vulnerable Crops	Health Effects of Contaminant
arsenic	carrots, onions, potatoes, other root crops	carcinogenic
cadmium	lettuce, corn, wheat	kidney disease, carcinogenic, birth defects, diminished fertility
lead	fruits and grains	seizures, mental retardation, behavioral disorders
dioxin	zucchini, pumpkin, cucumber	carcinogenic, diminished fertility, birth defects, immune system dysfunction

SOURCES: *The Seattle Times*, July 3, 1997, citing U.S. Agency for Toxic Substances Disease Registry, U.S. Public Health Service, Environmental Protection Agency; Hulster, A., et al , "Soil-Plant Transfer of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans to Vegetables of the Cucumber Family," *Environ. Sci. Technol.*, 1994, vol. 28, pp. 1110-1115; "Dioxins – the View from Europe," *Rachel's Environment and Health Weekly*, vol. 636, February 4, 1999, citing International Agency for Research on Cancer and Environmental Health Perspectives.

Current laws are inadequate to regulate toxic materials in fertilizers

No law exists to protect California farmers, gardeners or food consumers from fertilizer products made with industrial waste. Contaminants in fertilizer products made with industrial waste are subject only to regulations regulating the use and disposal of hazardous waste. For example, waste-derived fertilizers may not be disposed of on land (except in a specially regulated hazardous waste facility) unless the product meets certain toxicity standards, called Land Disposal Restrictions (LDRs).

Current and proposed fertilizer labeling requirements don't include listing of toxic ingredients.

However, this law is inadequate to protect the public from contaminated fertilizers for two reasons. LDRs were designed to prevent hazardous wastes from escaping from Class I, lined and regulated landfills - not for material being dumped on farmlands. Therefore they do not reflect the potential for fertilizer contaminants to enter the food chain, contaminate surface and ground waters or accumulate in farm soils. In addition, state and federal regulators appear not to have enforced LDRs for fertilizer products.

No labeling of toxic ingredients

Short of a laboratory analysis, there is no way a buyer of fertilizer can know the amounts of the toxic ingredients. Fertilizer labeling requirements exist but don't include labeling of toxic ingredients.

Currently in California, a fertilizer product label must include a "statement of composition showing the percent of each active ingredient." Percentiles must be given for total nitrogen, water soluble organic nitrogen, water insoluble organic nitrogen, phosphoric acid, and soluble potash. If claimed, secondary and micro-nutrient ingredients must meet minimum concentrations to appear on the label. Secondary and micro nutrients include boron, calcium, chlorine, cobalt, copper, iron, magnesium, manganese, molybdenum, sodium, sulfur and zinc. Yet no requirements exist for labeling the concentrations of toxic heavy metals, keeping consumers and growers in the dark about these persistent toxins. The fact that fertilizer makers are required to know the chemistry of their products suggests they could easily list the added toxins.

Landowners have a particular interest in knowing all the ingredients in fertilizer: They may be held liable for future clean-up costs if their land becomes degraded by persistent heavy metals or other toxins.

Waste-derived fertilizers may not benefit plants

Recent studies indicate that zinc fertilizers are not effective when the zinc has a water solubility of less than 40 percent. Yet more than half of a surveyed group of zinc-based fertilizer products failed to meet this water solubility level. Two-thirds of these ineffective products also contained very high levels of lead (greater than 1 percent), suggesting that they were derived from industrial waste. These findings indicate that waste-derived zinc-based fertilizers may not even benefit plants.

3. Toxic Waste in Home Fertilizer

Lab tests conducted for CALPIRG and EWG found that home fertilizer products purchased at retail outlets may contain hazardous heavy metals. While the levels of toxins were low for most products, every sample of one widely used home product exceeded State of California hazardous waste thresholds for at least two highly toxic heavy metals.

Home fertilizers are a big business. For the year ending June 1998, the state estimates that California consumers bought 420 million pounds of fertilizer for non-farm use (compared to 10 billion pounds for production agriculture).

All home fertilizers tested contained one or more hazardous heavy metals

To get an idea of the extent of toxic contamination of home fertilizers, CALPIRG and EWG developed a sampling plan consisting of two phases: In the first phase, we screened 15 home-use fertilizer products purchased from around the San Francisco Bay Area to identify potentially contaminated products; any highly contaminated products were then re-sampled using multiple products in the second phase. In both phases, CALPIRG and EWG retained Delta Environmental Laboratories of Benicia to perform the laboratory analysis.

All fifteen products tested contained small amounts of one or more hazardous heavy metals, including lead, arsenic, mercury, silver, barium, cadmium, chromium and selenium. Almost all tested well below State of California thresholds for hazardous waste. But one product, Ironite, which is advertised to neutralize alkaline soils and, according to the label, "turn[s] yellow to green," was found to contain lead at levels more than three times higher than hazardous waste criteria.

All Ironite samples exceeded hazardous waste thresholds

In the second phase, follow-up tests were conducted on ten samples of the product. Between Oct. 17-26, 1999, we purchased 10 Ironite packages from retail garden or hardware stores in Los Angeles, San Francisco, Sacramento, Fresno and San Diego. The samples were again sent to Delta Labs, using standard chain of custody procedures.

All ten Ironite samples exceeded the State of California hazardous waste criteria for both lead and arsenic. All ten contained lead at more than three times the hazardous waste threshold; four exceeded the arsenic threshold by at least a factor of two. In addition, 30 percent of the Ironite samples equaled or exceeded the hazardous waste standard for mercury, and another 50 percent were just below the standard. (Figs. 1-3.)

The primary raw materials found in Ironite come from tailings dug from a lead and zinc mine in Humboldt, Arizona. Ironite Products Co. is privately held, so sales figures are unavailable. However, Ironite says it sells the product in all fifty states and approximately fifty other countries, and projects worldwide sales of 400 million pounds a year in the next decade. (Hobson 1998.)

Washington State officials warn that ingesting half a teaspoon of Ironite may be toxic for small children

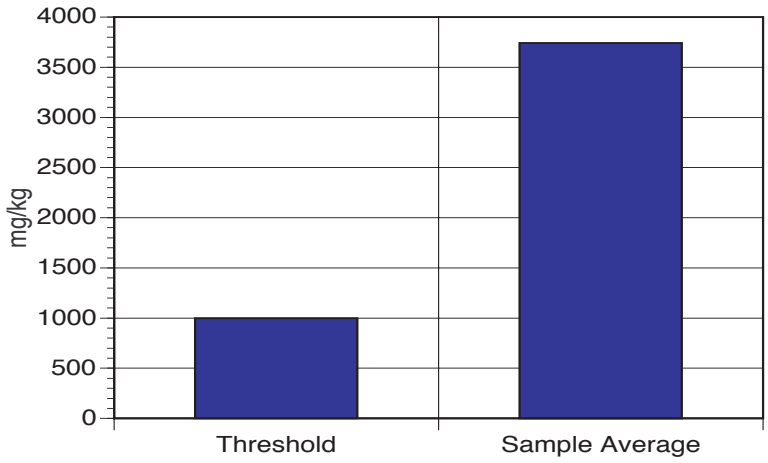
Our findings were particularly disturbing because Ironite — which is not approved for use in Canada because it has not been shown to meet that nation's standards designed to limit the buildup of heavy metals in soils — had already been the source of health warnings in Washington State. In May and June 1998, Washington State officials issued two consumer warnings about Ironite. The first warned that "young children who may accidentally eat some of this fertilizer, either out of the bag or after it has been applied on the ground" could suffer lead or arsenic poisoning. The Department said ingestion of as little as a half-teaspoon or less of Ironite could cause arsenic poisoning, the effects of which range from nausea to death at higher exposures. As for lead, there is no known "safe" exposure for children; even tiny amounts can stunt a child's growth, lower IQ and cause nerve damage.

Washington regulators' second warning expressed concern that "people who regularly use Ironite on their lawns and gardens don't realize that they're putting a lot of arsenic on their yards." State officials estimated that just two years' use of Ironite, as directed on the label then in use, could raise the arsenic levels in a homeowner's soil above the Washington State standards for cleanup of toxic waste sites.

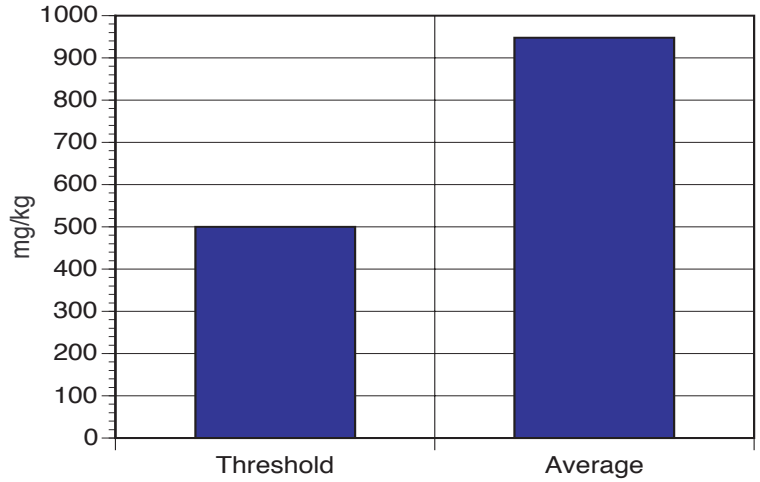
As a result of these findings, Ironite reduced the product's recommended application rate — but not its toxicity — to comply with new state health regulations. Washington regulators also asked the company to remove deceptive labeling which read "environmentally safe" and "does not pollute." However, in October 1999, the Washington State Toxics Coalition found packages of Ironite on retail shelves that still carried those claims. State officials ordered the packages removed from stores.

Figures 1-3. Levels of lead, arsenic and mercury found in Ironite samples, compared to State of California toxic waste thresholds.

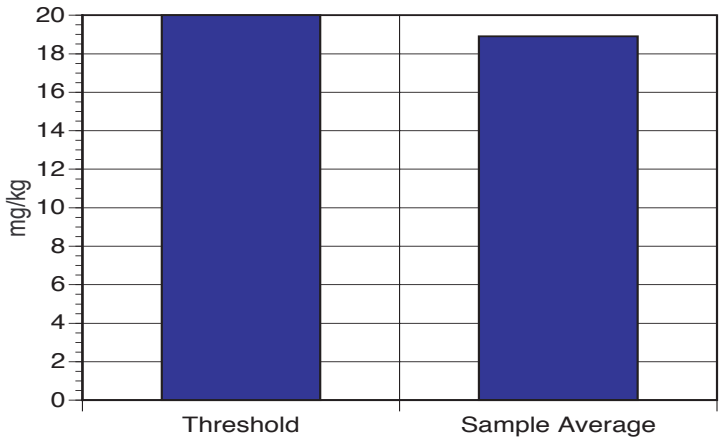
1. Lead



2. Arsenic



3. Mercury



SOURCE: CALPIRG/EWG tests, Oct. 1999

Home fertilizer tests in Washington State

The California results are consistent with testing conducted in 1998 by *The Seattle Times* and the State of Washington. In testing conducted for its widely acclaimed series "Fear in the Fields," *The Times* found heavy metals in many fertilizer samples, including high levels of arsenic, lead and mercury in Ironite. The newspaper found arsenic in Ironite at levels nine times more toxic than hazardous waste, lead at levels three times more toxic than hazardous waste and mercury at 85 percent of the hazardous waste level.

Furthermore, testing by *The Times* indicated that Ironite may not be the only highly contaminated product being sold over-the counter to home gardeners. *The Times*' tests found that an otherwise unidentified fertilizer product from the Western Processing Co. contained levels of lead more than 11 times the hazardous waste standard. A sample of Frit Industries' Micro-Nutrients contained 1.4 times the hazardous waste threshold for lead and just under the hazardous waste standard for mercury.

4. Toxic Waste in Farm Fertilizers

Contaminated fertilizers appear to be even more widespread in the agricultural market. Between 1994 and 1998, CDFA tested more than 250 samples of farm-use fertilizer products for lead, arsenic, cadmium and other metals. Overall, 17 percent of all fertilizers sampled by CDFA during this period were more toxic than the State of California standards for hazardous waste. Thirteen percent of the cadmium-tainted samples exceeded hazardous waste criteria, as did seven percent of the lead-containing samples and two percent of the arsenic-containing samples.

State tests found more than 20 commercial fertilizers contaminated above State of California toxic waste levels

Among the products tested by CDFA was Ironite, which is also sold as a farm fertilizer. In each year's tests, samples of Ironite exceeded State of California hazardous waste criteria, by 2.6 to 5.4 times the toxic waste threshold for lead and 9.8 to 11.8 times threshold for arsenic. But CDFA sampled at least 20 other commercial fertilizer products that exceeded hazardous waste criteria for lead, cadmium or arsenic. (Table 3)

Of the other commercial fertilizers tested by CDFA, at least four individual samples had far higher levels of lead than even the most contaminated samples of Ironite. A sample of Monterey Key Zinc, a product of Monterey Chemical Co., tested at more than 27 times the hazardous waste threshold for lead. A sample of Iron-Manganese Zinc Sulfate Granules, by Mineral King Minerals, Inc., contained almost 18 times the lead threshold, and a sample of Blu-Min Zinc, made by Bay Zinc Company, Inc., had more than 17 times the hazardous waste level.

A sample of Granusol Manganese, manufactured by American Minerals Corp., was the only product other than Ironite to exceed hazardous waste criteria for arsenic, at more than four times the threshold. But samples of at least 14 other products exceeded hazardous waste criteria for cadmium, which is listed as a known carcinogen and reproductive toxin in California. It is also toxic to the human placenta and can damage the developing lung.

The cadmium-tainted products included a sample of Iron Sulfate, manufactured by Koos, Inc., which tested at more than 39 times the cadmium threshold; a sample of Mineral King Micros, which contained more than 10 times the threshold; and a sample of Monterey Key Zinc, which had more than five times the hazardous waste level.

Table 3. Commercial fertilizers tested by CDFA that exceeded State of California hazardous waste levels (expressed as a percentage of the federal standard).

Year	Manufacturer	Product (as it appears on label)	Lead	Cadmium	Arsenic
1994	IRONITE PRODUCTS COMPANY	IRONITE 12% IRON 1-0-0	263%	21%	990%
	LIQUID CHEMICAL CORP	GRANULATED IRON, MANGANESE-ZINC SULPHATE	1340%	95%	14%
	NU-WEST INDUSTRIES INC	0-52-0	0	150%	2%
	SIMPLOT J R COMPANY	SIMPLOT PHOSPHORIC ACID 0-52-0	0	140%	4%
	SIMPLOT J R COMPANY	PHOSPHORIC ACID 0-52-0	0	136%	4%
	WESTERN FARM SERVICE INC	18-12-12 + MINORS	360%	95%	2%
1995	AMERICAN MINERALS	GRANUSOL 5044	150%	1%	54%
	BAY ZINC COMPANY INC	BLU-MIN ZINC-18%	1740%	400%	5%
	BAY ZINC COMPANY INC	BLU MIN ZINC 18%	1675%	400%	6%
	DUNE COMPANY OF IMPERIAL	0-52-0	N/A	150%	3%
	IRONITE PRODUCTS COMPANY	IRONITE 12% IRON	440%	30%	1020%
	SIMPLOT J R COMPANY	0-52-0	0	139%	3%
	SIMPLOT J R COMPANY	0-52-0	0	163%	3%
	SIMPLOT J R COMPANY	SUPERPHOSPHONIC ACID 0-68-0	0	170%	3%
	SIMPLOT J R COMPANY	18-46-0	1%	150%	4%
	SIMPLOT J R COMPANY	0-52-0	0	145%	3%
	SIMPLOT J R COMPANY	NO LABEL (0-52-0)	N/A	160%	2%
1996	AMERICAN MINERALS	GRANUSOL 5044	154%	2%	44%
	BAY ZINC COMPANY INC	BLU-MIN ZINC-18%	1303%	315%	8%
	IRONITE PRODUCTS COMPANY	IRONITE 1-0-0	540%	39%	1046%
	MINERAL KING MINERALS INC	MINERAL KING 36% ZINC - GRANULAR	162%	260%	9%
	RHONE-POULENC BASIC CHEM CO	18% ZINC MICRO-NUTRIENT FERTILIZER MIX ZINC SULFATE	0	205%	0
	SIMPLOT J R COMPANY	0-52-0	0	140%	3%
	SIMPLOT J R COMPANY	0-45-0	0	105%	3%
	SIMPLOT J R COMPANY	0-68-0	0	160%	2%
	SIMPLOT J R COMPANY	0-68-0 SUPERPHOPHORIC ACID	0	133%	3%
	SIMPLOT J R COMPANY	SUPER PHOSPHORIC ACID 0-68-0	0	150%	4%
1997	AGRIUM U S INC	UNLABELED (0-52-0)	0	129%	5%
	AMERICAN MINERALS	GRANUSOL MANGANESE Mn 40%	1320%	0	440%
	BRITZ FERTILIZERS INC	9.2-43.8-0	186%	45%	3%
	IRONITE PRODUCTS COMPANY	IRONITE 12% IRON 1-0-0	340%	32%	1180%
	MINERAL KING MINERALS INC	MINERAL KING MICROS 12% ZINC	1%	1020%	26%
	MONTEREY CHEMICAL CO	MONTEREY KEY ZINC (12% ZINC)	2770%	510%	15%
	MONTEREY CHEMICAL CO	MONTEREY MICRONIZED NEUTRAL ZINC 52	2%	130%	7%
	MONTEREY CHEMICAL CO	MICRONIZED NEUTRAL ZINC 52%	9%	175%	2%
	SIMPLOT J R COMPANY	PHOSPHORIC ACID 0-52-0	0	130%	4%
	SIMPLOT J R COMPANY	SUPERPHOSPHORIC ACID 0-68-0	0	150%	4%
	SIMPLOT J R COMPANY	0-45-0	0	120%	2%
	WESTERN FARM SERVICE INC	ZINC SULFATE 12%	0	110%	3%
1998	BRITZ FERTILIZERS INC	7.1-33.8-6.7-3.3 Zn	180%	85%	N/A
	BRITZ FERTILIZERS INC	ZINC SULFATE	528%	41%	6%
	BRITZ FERTILIZERS INC	ZINC SULFATE	450%	20%	6%
	IRONITE PRODUCTS COMPANY	IRONITE 1-0-0	296%	130%	1018%
	KOOS INC	IRON SULPHATE	44%	3900%	2%
	MINERAL KING MINERALS INC	IRON-MANGANESE ZINC SULFATE GRANULES	1795%	20%	13%

SOURCE: CALPIRG/EWG, from California Department of Food and Agriculture tests, 1994-98.

Overall, 13 percent of the 261 fertilizer samples tested for cadmium by CDFA exceeded hazardous waste criteria. For each year, the average of all samples was below hazardous waste thresholds for all three metals, but in 1998 the average was 75 percent of the threshold for cadmium. Seven percent of the 260 samples tested for lead exceeded hazardous waste criteria, and in 1995 the average level was just below the threshold. Finally, two percent of the 250 samples tested for arsenic exceeded hazardous waste criteria; yearly arsenic averages were well below the standard (Table 4.)

Table 4. Percentage of fertilizers tested by CDFA that exceeded State of California toxic waste standards for three heavy metals.

	No. Products Tested	Threshold (mg/kg)	Maximum (mg/kg)	Average (mg/kg)	Percent Exceeding Haz. Waste Threshold
Lead	260	1,000	27,700	652	7%
Cadmium	261	100	3,900	48	13%
Arsenic	250	500	5,900	124	2%

SOURCE: CALPIRG/EWG, from CDFA test results, 1994-98.

5. State Proposal Gambles With Public Health

According to records of a state agriculture department task force, both CDFA and the Department of Toxic Substances Control have known for seven years that "unacceptable levels" of toxic chemicals were being recycled into fertilizer. CDFA's Heavy Metals Task Force began meeting in 1992 — unnoticed by the public until 1997 when Duff Wilson of *The Seattle Times* attended while researching his series on toxic fertilizer. According to Wilson, CDFA staff tried to keep him out of the meeting, even though lobbyists for the fertilizer industry were present. (Wilson 1998.) After tests on more than 250 samples from 1994 to 1998 found evidence of highly contaminated products, CDFA commissioned Foster Wheeler, an international environmental consulting firm, to conduct a risk assessment as a next step in the development of regulations.

The State of California has known about toxics in fertilizer since at least 1992.

The risk assessment was made public not long after Wilson's series raised nationwide awareness of the health risks of toxic fertilizer. California Sen. Byron Sher, Chair of the Environmental Quality Committee, was outraged by CDFA's closed-door decision-making process, and demanded that the agency convene a task force that included public interest groups (including CALPIRG) to develop regulations on toxins in fertilizer "that are protective of the public health and the environment."

The task force, which included a representative from CALPIRG, met from September 1998 to February 1999, but to the end remained sharply divided over the most basic question: Whether toxic waste — at any level — is necessary in fertilizers. CDFA and representatives of the fertilizer industry consistently blocked requests to assess alternatives to allowing toxins, and when the department issued a report on the process to the Legislature, it failed to mention the concerns of CALPIRG, as well as the departments of Toxic Substances Control and Health Services.

"Risk-based" regulations on farm fertilizer, none for home products

CDFA's proposed regulations, which are open to public comment through December 2, 1999, would let the fertilizer industry continue to manufacture and sell fertilizers made from toxic waste. For commercial products, the rule would allow very high levels of arsenic, cadmium and lead to remain in fertilizers. Home-use products would be exempt from regulation.

Rather than adopting a precautionary approach and keeping toxic waste out of fertilizers, CDFA has proposed a "risk-based" standard for three heavy metals, permitting a maximum amount of contamination in fertilizers before a "significant risk" level is reached. This means that public exposure to toxic waste in fertilizer will be allowed to contribute additional risk of cancer, birth defects, and other serious illnesses at levels regulators consider "acceptable." And those "acceptable" levels will be based on the health risks of only three of the dozens of toxic chemicals known to be found in fertilizers.

Proposed state rules risk future health of California agriculture

Risk-based standards also require betting the future health of Californian's farms and gardens on the accuracy of highly complex mathematical models that have been widely criticized and have never been field-tested. The process by which toxic materials in fertilizer product accumulate in farm soils and become a hazard via food contamination or other exposure pathways is enormously complex and varies with changes in weather, soil characteristics, crop species, contaminant type, geography and even human behavior. If the models turn out to be wrong, there could be considerable impact to California agriculture, the state's largest industry.

The CDFA proposal would allow the continued sale of fertilizers to be more toxic than State of California standards for hazardous waste. Under the proposed risk-based standards, most products would be permitted to contain levels of arsenic, cadmium and lead far above the levels defining hazardous waste. (Table 5.)

Micronutrient fertilizers would be permitted to contain particularly high levels of toxins. For example, a 19-9-4 zinc-iron-manganese product

Table 5. CDFA's proposal would allow fertilizers to exceed hazardous waste thresholds

Toxin	Maximum contaminant concentrations in fertilizers allowed under CDFA's proposal (mg/kg)			California hazardous waste threshold (mg/kg)
	N-P-K Fertilizers	Phosphate Fertilizers	Micronutrient Fertilizers	
arsenic	454	1,286	2,945	500
cadmium	655	1,105	2,540	100
lead	3,906	6,591	14,022	1,000

SOURCES: Shull, L., "Non-technical Summary: Development of Risk-Based Concentrations for Arsenic, Cadmium, and Lead in Inorganic Commercial Fertilizers," Newfields, Inc., p.17; 22 CCR 66261.24

would be allowed to contain 2,945 parts per million (ppm) of arsenic, 2,540 ppm of cadmium and 14,022 ppm of lead. (That would mean that lead made up more than 1 percent of the total product.) Such a product would contain more than five times the hazardous waste level for arsenic, 25 times the level for cadmium and 14 times the level for lead. Fertilizer products made from recycled industrial materials containing contaminants at these levels may not even meet federal land disposal restrictions.

Much stricter standards in Canada and Europe

State's proposal offers Californians less protection than in any other developed economy

According to a comparison distributed by CDFA, the proposed risk-based standards would allow more heavy metal input to farm fields per year than comparable Canadian or Washington State standards for arsenic, cadmium and lead. For vegetable and root crops, the proposed standard for cadmium would exceed the Canadian/Washington standard by a factor of four. For allowable levels of cadmium in rock phosphate fertilizers, the proposed standards for cadmium would exceed every such standard worldwide. For vegetable and root crops, for example, the proposed cadmium standard would be 10 times that of Australia, 21 times that of Austria, and 85 times that of Switzerland. CDFA's proposal would provide Californians with less protection than any other jurisdiction in the developed world.

Allowing toxic waste to be sold in fertilizers is risky business. Although fertilizer manufacturers have insisted that toxic waste should be permitted in their products, CDFA has not assessed the assumed benefits of allowing this practice or even evaluated the viability of alternative clean fertilizers. In fact, most commercial and home-use fertilizer products are relatively uncontaminated, demonstrating the availability and economic viability of safer alternatives.

"Severely deficient" risk assessment

CDFA's proposed rule is based on a risk assessment developed by Foster Wheeler, a private consulting firm. This risk assessment is fundamentally flawed and does not address key human and environmental health risks posed by fertilizer contaminants. Among other weaknesses, the study relies on grouping and averaging, which may overlook many potentially large sub-populations, such as children or vegetarians; it does not address critical exposure pathways, such as consumer use of contaminated fertilizer products; it fails to consider background exposures for arsenic and cadmium; and it does not even attempt to evaluate the environmental impact of spreading persistent toxic materials on California farmlands. (See Appendix.)

Furthermore, the risk assessment study has not been adequately peer reviewed and has been widely criticized by leading scientists from the state Environmental Protection Agency and University of California. The scientists who were asked by CDFA to peer review Foster Wheeler's risk assessment study identified fundamental deficiencies and highlighted that much of the model remains "untested" with actual field data. Deficiencies identified by peer reviewers include inadequate lead modeling, no inclusion of background exposures for cadmium and arsenic, no field validation of estimated values, inadequate presentation of estimated risks, inability to verify calculations, and others.

State scientists level harsh criticisms of toxic fertilizer risk assessment

Peer reviewers from the state Department of Toxic Substances Control, the U.S. Department of Agriculture, and the UC faculty reported serious flaws that would render the study inappropriate for use in developing state regulations. Said Dr. Hanspeter Witschi of UC Davis, member of the state's Scientific Review Panel: "If one had to evaluate this document as a member of an official State of California review panel it would be deemed severely deficient because it does not tell the reader anything useful for evaluation of an actual risk assessment. "

Public would be kept in the dark about toxins in fertilizers

The most glaring shortcoming of the CDFA proposal, however, is that it denies Californians the right to choose safer fertilizer products. Not only are home and garden products exempted from all disclosure of toxic waste, but the disclosure requirements for commercial products are virtually worthless. In order to provide California growers and consumers with a means of choosing the safest product, the name and quantity of all persistent toxins must be stated on the product label. California fertilizer products must already disclose the name and amount of all product nutrients, so including toxic contaminants is only reasonable.

References

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Appendix: Scientific Critique of CDFA's Proposed Toxic Fertiizer Standards

Overview

The California Department of Food and Agriculture has recently proposed using a risk assessment study produced by the Foster Wheeler Environmental Corporation entitled "Development of Risk-Based Concentrations for Arsenic, Cadmium, and Lead in Inorganic Commercial Fertilizers" (hereafter "the risk assessment study") as the basis for regulating allowable heavy metal content in fertilizer products. CDFA's proposal is an attempt to address the widespread practice of recycling industrial materials, which often include persistent toxic chemicals, into fertilizer products.

On behalf of our 70,000 members in California, the California Public Interest Research Group strongly opposes the approach now being adopted by CDFA for the following three reasons.

1. CDFA proposes to allow very high levels of heavy metals in fertilizer products without first assessing the availability and viability of alternative non-toxic fertilizer materials.
2. The risk assessment study is fundamentally flawed and does not address key human and environmental health risks posed by fertilizer contaminants.
3. CDFA has not adequately peer reviewed the risk assessment study and has not addressed fundamental criticisms raised by reviewers.

These reasons are presented in greater detail below.

Reason 1: CDFA proposes to allow very high levels of heavy metals in fertilizer products without first assessing the availability and viability of alternative non-toxic fertilizer materials.

A.The risk assessment study would permit very high levels of persistent toxicants in fertilizer products.

Under the proposed risk-based standards, most products would be permitted to contain levels of arsenic, cadmium and lead far above criteria levels used for characterizing hazardous waste.1 Micronutrient fertilizers would be permitted to contain particularly high levels. A 19-9-4 zinc-iron-manganese product, for example, would be allowed to contain 2,945 ppm arsenic (As), 2,540 ppm cadmium (Cd) and 14,022 ppm lead (Pb) (1.4%!). Such a product would exceed the toxicity criteria for hazardous waste for As, Cd and Pb by approximately 5 fold, 25 fold and 14 fold, respectively.2 Fertilizer products made from recycled industrial materials containing contaminants at these levels may not even meet federal land disposal restrictions.

According to a comparison distributed by CDFA, the proposed risk-based standards would allow more heavy metal input to farm fields per year than comparable Canadian/Washington State standards for As, Cd and Pb. For vegetable and root crops, the proposed risk-based standard for cadmium would exceed the Canadian/Washington standard by a factor of 4.3 For allowable levels of cadmium in rock phosphate fertilizers, the proposed risk-based standards for cadmium would exceed every such standard worldwide. For vegetable and root crops, for example, the proposed cadmium standard would exceed the allowable levels set by Australia (proposed standards would allow 10 times more), Japan (11x), Belgium (18x) (voluntary), Germany (18x) (voluntary), Austria (21x), Denmark (36x), Norway (36x), Sweden (36x) and Switzerland (85x).4

In light of the many uncertainties and shortcomings of the risk assessment study (discussed here and in the comments of designated peer reviewers), we fail to see any justification for providing Californians with the least degree of regulatory protection relative to other developed nations.

B. CDFA has not assessed non-toxic alternatives or established that waste-derived benefits offer significant economic or agronomic benefit.

The study seeks to identify acceptable risk-based concentrations of heavy metals in fertilizer products without first establishing the need to incur any additional risk posed by these contaminants. If, for example, non-toxic fertilizer products can be obtained for little or no additional cost, allowing risk-based levels of fertilizer contaminants does not serve the public interest. According to CDFA fertilizer product monitoring data, most fertilizer products contain relatively low levels of hazardous materials, indicating that alternatives are in fact available and economically viable.

In addition to assessing available alternatives, CDFA should also characterize the alleged benefits posed by waste-derived fertilizers. Recent evidence suggests that zinc based fertilizers made from recycled industrial materials may be ineffective as well as being highly toxic. At least two studies, for example, have determined that zinc fertilizers are not effective when their solubility is less than 40% or 50%.5 6 More than half (61%) of 73 recently surveyed zinc-based fertilizer products, selected from all around the country, fail to meet the 50% solubility criteria.7 Two thirds of these ineffective products also contained very high levels of lead (greater than 1%), suggesting that they contain industrial waste. These findings indicate that waste-derived fertilizers, at least for zinc-based products, may not even be beneficial to plants.

Reason 2: The risk assessment study is fundamentally flawed and does not address key human and environmental health risks posed by fertilizer contaminants.

The risk assessment study is entirely dependent upon mathematical modeling to estimate risks posed by contaminated fertilizer products and has not been tested in the field. Because of the enormous complexity and variability inherent in fertilizer application, soil accumulation, plant-uptake and other exposure pathways, this modeling must resort to the use of averages, numerous assumptions, and vast over-simplifications of real-world biological and ecosystem processes. By relying on assumptions and averages, this model gives the appearance of quantifying the data with some precision that is wholly unjustified.

A.The risk assessment study is inadequate in design and scope.

The risk assessment study does not adequately characterize all likely risks posed by contaminated fertilizer products.

Example: The risk assessment evaluates the concentrations of only three metals: arsenic (As), cadmium (Cd), and lead (Pb). The risk assessment does not evaluate the risks posed by other metals that are found in fertilizers, such as mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), copper (Cu), or zinc (Zn). Furthermore, the risk assessment does not evaluate the risks posed by dioxins in fertilizer products.

Example: The risk assessment addresses the use of fertilizers only in California commercial farming operations. The risk assessment does not evaluate other potential avenues of human exposure to the three metals, such as manufacturing and processing of parent materials, handling by retail distributors, and non-commercial use, such as lawn and garden use.

Example: The study does not address the ecological impact of allowing toxic chemicals to be used in fertilizers, but rather, addresses solely the human impact. The risk assessment study does not attempt to characterize the ecological risks posed releasing heavy metals in agriculture or even the agronomic effects of permitting these contaminants to accumulate in farm fields. According to an analysis by DTSC, the proposed risk-based levels for Cd and Pb in fertilizer may result in a 2 to 4 fold increase in equilibrium soil concentration for these contaminants as they accumulate over decades (if the model's estimates for leaching and erosion are incorrect, heavy metal concentration increase may be far greater).8 The impact of this heavy metal burden on plants, including crop health and productivity, and other non-plant organisms is not even considered by the study.

Example: Some exposure pathways are not included. For instance, exposure of infants to metals via mother's milk was not included. In addition, ground water was also excluded as a likely exposure pathway.

Example: Foliar applications are not included. It appears that the study does not consider foliar applications of contaminated fertilizer products (applications of liquid product made directly to the leaves). Application directly to leafy parts of the plant may result in greater plant uptake of contaminants than the soil-to-plant pathway modeled in the study.

Example: The risk assessment study does not address reproductive and developmental toxicity of cadmium, which is widely established in the scientific literature. Cadmium is toxic to male reproductive function and the human placenta and causes birth defects in animals. In addition, cadmium damages the developing lung and may predispose to infant respiratory distress syndrome.9

Example: The study does not consider background exposures to arsenic and cadmium. Californians are already exposed to cadmium from a wide array of sources, including food, occupational sources, hobby materials, cigarette smoke, drinking water and contaminated shellfish.10 Similarly, arsenic exposures may also be widespread, generally resulting from consumption of arsenic-contaminated drinking water, nutritional supplements, and food residues.11 When actual exposures to these chemicals are added to the "acceptable" fertilizer-generated exposures proposed by the risk assessment study, unsafe and unacceptable exposures will result.

B. Proposed risk-based standards are based on mathematical modeling that has not been field-tested and cannot represent real-world complexity and diversity.

The risk assessment study depends upon a dizzying array of mathematical models to estimate acceptable levels of fertilizer contamination. The core models used in the analysis, particularly those for soil metal accumulation and plant uptake, inevitably over-simplify actual rate and transport mechanisms which vary with soil type, soil acidity, soil action exchange capacity, soil organic matter content, soil moisture, surface slope, surface water infiltration capacity, soil water retention capacity, water impervious soil layers, soil porosity, species type, background mineral concentrations, plant growth stage, etc. Faulty assumptions for any of the scores of variables that are modeled in the study may result in its failure to predict actual risk (see, for example, the effect of changing the assumed soil-metal mixing depth variable, as discussed below). Even the risk assessment's author admits, "It should be understood that considerable uncertainty exists in these calculations. [N]o studies have been conducted on actual human exposure to ensure that human health is not compromised."12

According to one reviewer who was chosen because of his expertise on the subject of heavy metal uptake by plants, "[I]t should be recognized that the available information on the factors governing plant uptake of the metals of concern is extremely limited, and generally is not based on Californian conditions. Our level of understanding of this component of the risk analysis is inadequate and is a major limitation of this study." (P. Brown).

The reviewer from DTSC reported: "The assessment we have reviewed relies almost exclusively on a large number of mathematical models running the gamut from modeling soil concentrations, distributions of heavy metals in soil and produce, human intakes and toxicity. The calculation of risk-based heavy metals concentration in phosphate and micronutrient fertilizers is unique among the many risk assessments our unit has examined in that it uses a modeled rather than measured soil concentration as the primary exposure variable."13 According to the DTSC reviewer, the soil accumulation model used in the risk assessment study was "harshly criticized" by U.S. EPA's own Science Advisory Board.

In the absence of any meaningful analysis of risk management options (i.e. evaluation of alternatives and/or assessment of economic needs and benefits), we oppose the use of untested mathematical modeling to permit the accumulation of persistent toxic chemicals in farm soils.

C. The study resorts to the practice of aggregating and averaging to account for real-world variability and therefore may not protect highly exposed sub-populations.

Example: Use of averaging results in unsafe exposures to lead. The study fails to adequately account for background exposures to lead and may place large numbers of children at risk of serious lead poisoning. Citing federal agency reports, the study sets 10 μg/dL as the maximum allowable "acceptable" blood-lead level. The study further assumes an average background blood-lead level of 2.2 μg/dL in the general population. Subtracting the background exposure from the "acceptable" ceiling of 10 μg/dL, the Risk assessment study permits an additional 7.8 μg/dL exposure. That is, under the recommended risk based concentrations for lead in fertilizer, "90% of the time" fertilizer exposures would not result in blood-lead level increases above 7.8 μg/dL.

Unfortunately, these assumptions ignore the fact that, nationally, over 4 million children already exceed U.S. EPA's blood-lead action level of 10μg/dL.14 Almost 22% of African American children one to two years old currently have blood lead levels over 10ug/dL.15 This means that for millions of children, any significant additional exposure to lead is a serious concern. Lead is a reproductive and developmental toxicant and may cause permanent brain function loss in children at very low levels.

Several reviewers noted that the study's approach to estimating background lead exposure may not be adequate (DTSC, H. Witchi) and cautioned that 10μg/dL blood-lead level is too high to be considered an "acceptable" level of exposure (DTSC, W. Kasternberg, H. Witchi, and D. Woltering).

We are surprised that the authors would deem it "acceptable" to allow fertilizer use to increase the average blood-lead level in the general population and strongly oppose any fertilizer standard that has the potential to measurably increase childhood exposure to lead.

Example: The model relies on an "average" soil-metal mixing depth. Any deviation from this average may dramatically effect estimated risk. The study assumes that all fertilizers are mixed evenly into the receiving soil to a depth of 20 cm. According to DTSC, however, in many circumstances this mixing depth may be considerably less: "For example, if fertilizers are applied as solids after tilling, heavy metals would be expected to accumulate in the top few centimeters."16 A decrease in mixing depth means there is less soil available for "diluting" the contaminated fertilizer, thereby increasing contaminant concentrations in the available soil. Reducing the mixing depth variable in the study's soil accumulation model by half, for example, from 20cm to 10cm, appears to double the concentration of the contaminant in soil.17 Because the model assumes that plant uptake is directly proportional to the metal concentration in soil, this would effectively double the rate of metal uptake by plants. Considering that plant uptake is the most significant exposure pathway according to the model, this is a serious concern.

Example: Oversimplification of erosion modeling may miss toxic "hotspots." The risk assessment study assumes that erosion is constant for a theoretical farm field. However, as noted by the DTSC review, this may not be the case for a large field: "the erosion losses [of soil-bound heavy metals] downgradient on a specific site may be offset by erosion of contaminated surface soil upgradient when the area of contamination is large."18 This would mean that for large fields, metal accumulation might be greater in certain parts of the field than is currently modeled by the risk assessment study, resulting in increased contaminant loading and plant uptake. The model should reflect the possibility that erosion may be a source of heavy metal input, as well as an output.

D.The risk assessment study makes several assumptions that are not sufficiently conservative to protect public health.In general, a risk assessment study should seek to estimate the level of exposure and risk and should leave policymakers to decide the question of how much risk is acceptable. The Foster Wheeler risk assessment study, however, confuses risk assessment with risk management, defining certain levels of risk posed by contaminated fertilizer products as "acceptable." These determinations appear to be arbitrary, are not sufficiently protective and prevent the reader from gauging relative risks of different other higher or lower fertilizer standards.

Example: The study arbitrarily assumes an "acceptable" additional cancer risk of 1 x 10-5. This standard would permit a 10x higher cancer risk than that generally permitted by many other state and federal agencies.

Example: The study uses a 90% confidence interval (CI), rather than a more protective 95% or 99% CI. Using a 90% confidence interval, the study's proposed risk-based concentrations for heavy metals in fertilizer products would be expected not to meet the study's own criteria of "acceptable" risk 10% of the time. Because the target at-risk populations are presumably quite large (e.g. all growers and farm workers, all subsistence gardeners, California vegetarians, etc) "90% of the time" may leave very large numbers of people unprotected. A more protective CI may result in significantly lower fertilizer standards.

The use of a less protective confidence interval is particularly troubling in light of the model's finding that ingestion of contaminated produce contributes most of the estimated exposure and risk for all three metals of concern.19 If contaminated food is the driving total exposure, then very large numbers of people may be at risk. Again, this would suggest the need to use a more protective standard.

Reason 3: The peer review process for the risk assessment study has been inadequate, and CDFA has not ensured that reviewers' "red flags" have been addressed.

A.CDFA's peer review process has been inadequate.

Although considerable funds were allocated for a thorough peer review of the risk assessment study ($250,000), it appears that the bulk of these funds have not been used for this purpose.20 Cal-EPA's Office of Environmental Health Hazard Assessment (OEHHA) was never asked to review the document, although that agency houses the state's leading experts on toxicological risk assessment. The original peer reviewers did not receive the full document, frustrating their efforts to fully assess the study (as noted in the written reviews by M. Schum [DTSC], R. Chaney [USDA], A. Page [UC Riverside], D. Woltering [Environ], and A. Chang [UC Riverside]). A second round of peer review was requested of three University of California faculty members, though these requests resulted in cursory reviews that reflect little detailed examination. This suggests that reviewers were not provided with adequate funding for an in depth assessment. It also appears that neither the original or secondary reviewers were provided with the electronic model spreadsheets. None of the reviewers indicated that he had checked the study for mathematical accuracy and several noted that they could not with available documentation.

B. The esteemed scientists who have peer reviewed the risk assessment study have identified core deficiencies.

Although considerable funds were allocated for a thorough peer review of the risk assessment study ($250,000), it appears that the bulk of these funds have not been used for this purpose.21 Cal-EPA's Office of Environmental Health Hazard Assessment (OEHHA) was never asked to review the document, although that agency houses the state's leading experts on toxicological risk assessment. The original peer reviewers did not receive the full document, frustrating their efforts to fully assess the study (as noted in the written reviews by Dr. Michael Schum, California Department of Toxic Substances Control; Dr. Rufus Chaney, US Department of Agriculture; Dr. A. Page, Department of Soil and Environmental Sciences at UC Riverside; Dr. Daniel Woltering, Principal of Environ, and Dr. A. Chang, Department of Soil and Environmental Sciences at UC Riverside22). A second round of peer review was requested of three University of California faculty members, resulting in cursory reviews that reflect little detailed examination. This suggests that reviewers were not provided with adequate funding for an in depth assessment. It also appears that neither the original or secondary reviewers were provided with the electronic model spreadsheets. None of the reviewers indicated that he had checked the study for mathematical accuracy and several noted that they could not with available documentation.

CDFA has also failed to ensure that the concerns of peer reviewers have been addressed. Although spokespersons for Foster Wheeler allege that many criticisms have been addressed, several core problems clearly remain outstanding: inadequate lead modeling, no inclusion of background exposures for Cd and As, no field testing, inadequate presentation of estimated risks, etc. In addition to the concerns raised here, designated peer reviewers identified dozens of other errors, methodological problems, areas lacking clarity, and faulty assumptions that may not have been addressed. Before using the risk assessment study for developing regulations, a comprehensive peer review is necessary and should include the original reviewers to ensure that their concerns have been addressed.

Three reviewers reported serious flaws in the study that would make render it inappropriate for use in developing state regulation:

"If one had to evaluate this document as a member of an official State of California review panel it would be deemed severely deficient because it does not tell the reader anything useful for evaluation of an actual risk assessment," writes Dr. Hanspeter Witschi, member of the UC Davis faculty and the state Scientific Review Panel.23

"The simple bottom line is that so little data are provided to show the reader what the basis for the risk assessment might have been that it is wholly unconvincing," writes Rufus Chaney of the USDA.24

"On a first pass through the document, it seemed to read ok. However, as discussed below, upon more detailed review, there are significant deficiencies that must be corrected and/or clarified," writes Michael Schum of DTSC. 25

CALPIRG opposes using the risk assessment study as the basis for regulation until it has survived peer review by OEHHA and has been resubmitted to the peer reviewers, in electronic form as appropriate, and CDFA has demonstrated that it has addressed all reasonable concerns.

Notes

1 See, for example "Non-Technical Summary: Development of Risk-Based Concentrations for Arsenic, Cadmium, and Lead in Inorganic Commercial Fertilizers," prepared by Dr. Lee Shull, Newfields Inc.

2 CCR 66261.24

3 "Maximum Amount (lbs./acre) of Metals Added to Soil on an Annual Basis," distributed by Maryam Khosravifard, CDFA, at the October 15 Facilitated Rulemaking Work Group Meeting for Inorganic Fertilizers.

4 "Heavy Metals in Soils and Phosphate Fertilizers", White Paper, a publication of the Potash and Phosphate Institute, April 1998.

5 J.J. Mortvedt. Study done at National Fertilizers and Environmental Research Center, Tennessee Valley Authority, Muscle Shoals, Alabama, 35660, USA.

6 "Zinc plant availability as influenced by zinc fertilizer sources and zinc water solubility." Colorado Agricultural Experiment Station Technical Bulletin TB 97—4, Prepublication Draft, August 1997. http://www.cozinco.com/comparison.htm

7 Sampled by Cozinco, a Colorado based fertilizer manufacturer, see http://www.cozinco.com/comparison.htm

8 Carlisle, J, "Concentration of Contaminant in Soil Using Risk-Based Values," DTSC, memorandum, February 16, 1999.

9Schettler T, et al, "Generations at Risk: How Environmental Toxicants May Affect Reproductive Health in California," a report by CALPIRG and Physicians for Social Responsibility, 1998.

10 Ibid.

11 Ibid.

12 "Non-Technical Summary: Development of Risk-Based Concentrations for Arsenic, Cadmium, and Lead in Inorganic Commercial Fertilizers," prepared by Dr. Lee Shull, Newfields Inc., p. 18.

13 California Department of Toxic Substance Control, "Confidential Review of Proposed Risk-Based Acceptable Concentrations of Heavy Metals in Fertilizers for Proposition 65 Requirements," Michael Schum, Staff Toxicologist Human and Ecological Risk Division, September 5, 1997.

14 Crocette AF, Mushak P, and Schwatz J.," Determination of numbers of lead-exposed women of childbearing age and pregnant women: an integrated summary of a report to the U.S. Congress on childhood lead poisoning." Environmental Health Perspectives. 89: 121-124, 1990.

15 Ibid.

16 California Department of Toxic Substance Control, "Confidential Review of Proposed Risk-Based Acceptable Concentrations of Heavy Metals in Fertilizers for Proposition 65 Requirements," Michael Schum, Staff Toxicologist Human and Ecological Risk Division, September 5, 1997.

17. California Department of Food and Agriculture, "Development of Risk Based Concentrations for Arsenic, Cadmium and Lead in Inorganic Commercial Fertilizers," Prepared by the Foster Wheeler Environmental Corporation, March 1998; see variable Z in soil accumulation equation on p. A-3-6.

18. California Department of Toxic Substance Control, "Confidential Review of Proposed Risk-Based Acceptable Concentrations of Heavy Metals in Fertilizers for Proposition 65 Requirements, "Michael Schum, Staff Toxicologist Human and Ecological Risk Division, September 5, 1997.

19. California Department of Food and Agriculture, "Development of Risk Based Concentrations for Arsenic, Cadmium and Lead in Inorganic Commercial Fertilizers, " Prepared by the Foster Wheeler Environmental Corporation, March 1998, A-22.

20. Conversation with Kevin Walsh, Legislative Analyst for Senator Byron Sher, 2/18/99.

21. Conversation with Kevin Walsh, Legislative Analyst for Senator Byron Sher, 2/18/99.

22. Written comments of all reviewers of "Development of Risk Based Concentrations for Arsenic, Cadmium and Lead in Inorganic Commercial Fertilizers," prepared by the Foster Wheeler Environmental Corporation, March 1998, are available from CDFA.

23. Written peer review comments of Dr. Hanspeter Witschi, UC Davis, distributed by CDFA at the November 17, 1998 meeting of the Facilitated Rule Making Process

24. Written peer review comments of Rufus Chaney, USDA, submitted in a Sept.8 1997 letter to CDFA.

25. California Department of Toxic Substance Control, "Confidential Review of Proposed Risk-Based Acceptable Concentrations of Heavy Metals in Fertilizers for Proposition 65 Requirements," Michael Schum, Staff Toxicologist Human and Ecological Risk Division, September 5, 1997.

Table IR-1: Average toxicity levels of 10 Ironite samples, compared to California state hazardous waste criteria

Heavy Metal	California Hazardous Waste Criteria (mg/kg)	Average of 10 Ironite samples
Lead	1,000	3,740
Arsenic	500	948
Mercury	20	19
Selenium	100	45
Cadmium	100	27
Barium	10,000	12
Chromium	2,500	12
Silver	500	No detection

Table IR-2: Heavy Metals (mg/kg) in Ironite samples, by California metro area.

Sample	Where purchased	Arsenic	Lead	Mercury
Los Angeles 1	Orchard Supply Hardware	760	4,200	20
Los Angeles 2	Marina Del Rey Garden Center	1,100	3,700	18
San Francisco 1	Goodman Lumber Co.	1,000	3,600	16
San Francisco 2	Floorcraft Garden Center	1,200	3,400	16
Fresno 1	Home Depot	890	4,100	21
Fresno 2	Homebase	950	3,500	18
Sacramento 1	Capitol Ace Hardware	1,100	3,700	23
Sacramento 2	Home Depot	860	3,800	17
San Diego 1	Pacific Beach Gardens	760	3,700	19
San Diego 2	Green Gardens Nursery	860	3,700	19

SOURCE: CALPIRG/EWG, from Oct. 1999 tests