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S P E C I A L D O U B L E I S S U E

Pesticide Use: The Most Preventable Pollution

by Reg Gilbert

Today's unbridled use of synthetic pesticides is surely the bitterest irony of the environmental movement.

Three decades after Rachel Carson published *Silent Spring*, the critique of pesticide use that launched the modern environmental movement, pesticide pollution remains North America's most unnecessary pollution problem. In fact, the use of pesticides is three times as pervasive by weight and very nearly as unfettered in 1992 as the day the *New Yorker* first serialized Carson's seminal book.

Pesticide use stands alone among major pollution problems in being undiminished as a threat to human health by twenty years of seemingly extensive legislative scrutiny. The names of the chemicals and the ways they harm the environment and the human body have changed, but the overall threat to human health is as severe as ever, arguably more severe.

No resident of Chicago would prefer the air of twenty years ago, no Lake Erie angler the water quality of that time. But production of the active ingredients in pesticides has risen from 600 million pounds a year in 1960 to more than 2 billion pounds a year today.

Average citizens, (particularly children, who are extremely vulnerable to pesticide effects), are more exposed to pesticides than ever. Ten million American households, one in seven, employs chemical lawn treatment, up from almost none in 1960; 17 million households use synthetic pesticides inside the home.

Pesticide residues, pesticide manufacturing contaminants, and pesticide breakdown products are found in nearly everyone's food and water, even in the wood of our homes. The migration to our bloodstreams, body fat, and mothers' milk is a short one.

Apparent progress

There have, of course, been changes that can be called progress. DDT and a few other particularly egregious pesticides have been banned in the United States and Canada, and some of the wildlife they were killing brought back from the edge of extinction. Other pesticides have had their uses drastically limited.

Many of the pesticides in use today last for a shorter time in the environment and kill a narrower range of living things, lessening the possibility of human exposure and the likelihood of human health effects if there is an exposure.

Since 1988 the largely untested pesticides of the 1950s and 1960s have lost some of their de facto regulatory immunity in the United States. Substantial fees must now be paid to keep them registered with the U.S. Environmental Protection Agency while the decades-long process of assembling and analyzing health data about them continues.

Unwilling to pay the fees, manufacturers have let more than 20,000 U.S. pesticide registrations lapse, two out every five, with up to a quarter having been in recent production. However, these substances accounted for a very small percentage of all pesticides produced.

The process for bringing new pesticide products to market was significantly toughened in the 1972 changes to federal pesticide law. Much more now needs to be known about a pesticide's health and other effects before it can be registered. Unfortunately, new pesticides are also allowed to be prematurely registered so they have a chance to compete with the older, untested substances.

Perhaps most significant, localities are beginning to reduce and eliminate government (and school) use of synthetic pesticides. Almost as usefully, local governments are sometimes mandating that private users post signs after applications. Sometimes localities even require private applicators to call and warn area residents listed in a registry of pesticide-sensitive people that a pesticide application is scheduled to take place in the neighborhood near future.

Dubious progress

But the big picture remains as problematic as ever, if in different ways. Synthetic pesticide use is far more widespread and remains nearly as careless as in decades past. About two-thirds of North America's annual net use of pesticide active ingredients (about 1.4 billion pounds) is directly released to the environment, the rest (about 0.7 billion pounds) is applied to wood, where some unknown percentage is released slowly, through decay or escape to the air.

Human exposure has moved from extensive to pervasive at the same time that pesticide-related human health effects, despite large research efforts, remain for the most part unknown.

Some progress is even under threat of being rolled back. Notification requirements exist under a cloud of proposed state and federal laws intended to take away local authority to regulate private pesticide use. And a critical protection against pesticide contamination in food, the so-called Delaney clause of the U.S. federal pesticide law, is under perpetual threat of excision.

Unnecessary risks

The problem of pesticide pollution is particularly unfortunate because it is so generally unnecessary.

In some cases this is incontestable. Many lawn, golf, grounds, and road vegetation uses, and even some agricultural uses, are purely aesthetic; the pests under attack impact only appearance, not funtionality. In many of these cases there are well-researched nontoxic or substantially less toxic pest control alternatives already available.

Alternatives are also available for many of the huge number of synthetic pesticide uses with some functional rationale, although these substitutes generally require a little more (usually *just* a little more) planning, money, or labor. With very few exceptions, that extra cost is offset, and often dwarfed, by the savings in human health improvement, environmental protection, resource conservation, and even avoidance of pest problems created by the use of pesticides itself (a particular drawback of agricultural use of insecticides).

Of course, it is difficult to assign a monetary value to many of the benefits of toxic pesticide abstinence. It is likewise difficult to assign a value to many of the detriments of pesticide use. There is, for only one example, no way to esti-

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Instant Reference to Pesticide Types and Effects

Uses[1,5]

A pesticide is any substance used to kill or neutralize living things considered pests by humans.

Although most pesticides are intended for a specific pest, they usually kill more forms of life than those for which they are intended.

Any given pesticide active ingredient can have dramatically different effects depending on the "inert" ingredients present in its formulation

Wood preservatives
"Broad-spectrum" pesticides accounting for nearly half of all U.S. pesticide production, intended to kill insects, fungi, marine borers, algae, and bacteria: pentachlorophenol (Penta®), chramated copper arsenates (Osmiase®)

Insecticides
Kills insects: carbaryl (Sevin®), terbufos (Counter®)

- *Termiticides*
  Kills termites: chlordane, methyl bromide, sadium borate (Tim-bar®)
- *Larvicides*
  Kills larvae: boric acid, methaprene
- *Ovicides*
  Kills eggs: diflubenzuron, horticultural oils

Herbicides
Kills plants: atrazine (AAtrex®), metalachlor (Dual®)

- *Fungicides*
  Kills fungi: mancozeb (Manzate®), pentachlorophenol
- *Algaecides*
  Kills algae: copper compounds
- *Silvicides*
  Kills trees and woody plants: 2,4-D, triclopyr (Garlon®)

Rodenticides
Kills rodents: warfarin, fluaroacetamide (Fluorakil®)

Nematocides
Kills nematodes, microscopic, worm-like creatures: dichloropropenes + dichloropropones (Diazol®)

Bactericides and Antimicrobials
Kills bacteria and other microbes: oxytetracycline, phenol (Lysol®), methyl bromide

Acaricides (or miticides)
Kills mites: avermectin (Avid®)

Molluscicides
Kills snails and slugs: metaldehyde, trimethacarb

Piscicides
Kills fish: rotenane

Types of Substances[1,2]

Just as houses could be classified according to the size of their living rooms or the slope of their roofs rather than the number of their bedrooms, so pesticides can be put into different classes according to their chemical or structural features of interest.

Some pesticides fall into multiple classes, and toxic and other effects can vary greatly within a class

Inorganics
arsenicals, boric acid (Roach Prufe®), diatomaceous earth (Shellshock®)

Halogenated hydrocarbons
Classes of chemicals that share a hydrocarbon (hydrogen and carbon) core but vary according attached molecules containing chlorine, fluorine, bromine, or iodine

- *Organochlorines*
  Also called chlorinated hydrocarbons, the first widely used synthetic pesticides, developed in the 1930s in Germany and commercially popularized in America in the 1940s

  Most of the pesticides cancelled by the U.S. federal government have been organochlorines: captan, DDT, mirex, pentachlorophenol

Organophosphates
Also first developed in the 1930s, used as replacements when insects began to develop resistance to organochlorines in the 1950s: acephate (Orthene®), chlorpyrifos, diazinon, malathion

Carbamates
Came into use as resistance to organophasphates began to appear, but were not as widely useful: aldicarb (Temik®), carbaryl (Sevin®), carbofuran (Furodan®), propoxur (Baygan®)

Pyrethroids
Synthetic chemicals based on pyrethrum, an insecticide of the chrysanthemum plant, commercially popularized in the 1970s: allethrin, decamethrin, permethrin (Pounce®), resmethrin

Horticultural oils
Petroleum-based insect and egg suffocators: Sunspray®

Pesticidal soaps
Fatty-acid-based desiccants: Attack®, Safer® (insects); Sharpshooter® (plants)

Botanicals
Pesticidal chemicals found in nature: neem, nicotine, pyrethrum (ZAP®), ratenone

Micrabial

- *Bacterial*
  Bacillus thuringiensis (Trident®, Javelin®, Mosquito Attack®), B. papilliae (Doom®)
- *Fungal*
  Beauveria bassiana
- *Protozoan*
  Nosema locustae (Grasshopper Attack®)
- *Viral*
  gypsy moth nucleor polyhedrosis virus (Gypchek®)
- *Nematode*
  Steinernema feltiae

Formulations[1]

Baits
Poisan mixed with attractant

Dusts

Granules

Fumigants
Poisan gas

Sprays

- *Aerasals*
- *Emulsifiable concentrates*
  Petraleum-based liquids plus substances that allow them to be mixed with water
- *Flowables*
  Require agitation when mixed and sprayed
- *Microencapsulates*
  Pesticide particles given plastic coatings for time-release effect
- *Slurries*
  Thin, watery mixtures of dusts

Water-soluble concentrates

Wettable powders
Water-insaluble active ingredients plus a fine powder that can be mixed with water

Heterocyclic nitrogen compounds

- *Hydrazides*
  maleic hydrazide
- *Picolinic acids*
  picloram (Trodan®)
- *Pyridines*
  triclapyr (Garlon®), poraquat (Dextrone X®), diquat (Aquakill®)
- *Triazines*
  atrazine (AAtrex®), simazine (Princep®), terbutryn (Igran®)
- *Triazoles*
  amitrale

Phenoxy compounds
dichlarprop, MCPA, mecoprap (Mecoturf®), silvex, 2,4-D and 2,4,5-T

Substituted phenol compounds
dinoseb (Ninitro®), dinoprop, DNOC, pentachlorophenol, sodium pentachlorphenate

Substituted ureas
diuron (Karmex®), fenuron, lenuron (Lorox®), tebuthiuron

Amino acids
glyphosate (Roundup®)

Arsenicals
MSMA

Benzoic acids
dicamba (Banvel®)

Benzonitriles
bromoxynil (Brominal®)

Carbanilates
phenmedipham (Betenal®)

Dinitroanilines
trifluralin (Treflan®)

Phenyl ethers
nitrafen

Phthalic acids
DCPA (Dacthal®)

Pyridazinones
pyrazon (Pyramin®)

Substituted amides
alachlor (Lasso®)

Uracils
bromacil (Hyvar®)

Modes of Killing[2,3]

Nervous system
Interferes with the ability to contral the body

- *Central*
  Brain and spinal cord: avermectin (Avid®)
- *Peripheral*
  dichlorvos

Respiration
On the cell level, interferes with the ability to produce energy

Desiccants
Absarbs the oils out of, or otherwise penetrates, an insect's cuticle, or covering, causing it to die of dehydration: diatomaceous earth (Shellshock®), insecticidal soaps (Attack®, Safer®)

Stomach poisons
Damages the digestive tract: boric acid (Roach-Prufe®), Bacillus thuringiensis

Photosynthesis
Interferes with the ability to convert sunlight into food and energy: glyphasate (Raundup®)

Growth

- *Plant*
  Causes plants to grow so quickly that they die: 2,4-D
- *Insect*
  Called insect growth regulators, or IGRs, these substances interfere with an insect's ability to progress from one stage of development to another: methoprene (Altosid®, Pharorid®)

Sterilants

- *Insect*
  Destroys the ability to reproduce. (none that do not kill the insect first are yet commercially available)
- *General*
  Kills a wide range of organisms in a given area, usually soil: methyl bromide

Repellant
Causes creatures to avoid an organism or an area: neem oil (Margo-San®) (insects), Hubsco®, Stickem® (birds)

Attractant
Usually mixed with a poisan so that an insect will come and eat or touch it

- *Sex-based*
  Insect pheromones (Trappit®, Bio-Lure®)
- *Food-based*
  Boric acid mixed with peanut butter (Ltwarks®) and apple jelly (Drax®)

Systemics
Materials absorbed into an organism that then kill anything that feeds on the poisoned tissue: metosystox-R, benomyl

Significant Characteristics

Active ingredients
Type and quantity of substances in a pesticide formulation said to be the main agents of its ability to contral pests

"Inert" ingredients
Type and quantity of componian ingredients in a pesticide formulation, unlabeled, often secret, and little regulated, added to increase the effectiveness of the pesticide's active ingredients.

A pesticide's "inert" ingredients can be much more toxic to humans than its active ones

Persistence
Length of time a substance or its potentially harmful degradates or metabolites remains in the environment

Toxicity
Degree and kind of health effects a substance has on living things

Specificity
Ability to harm one, only a few, or many kinds of living things

Volatility
Ability to turn into a gas, a factor in how easily a substance can become airborne

Solubility
A substance's ability to dissolve in water, fat, or other media, which determines how it moves through the environment and how it is stored in, and affects, living things

Leachability
Ability to move from soil into groundwater

Synergism
Heightening of a substance's toxicity or other capobilities when it is in the presence of certain other chemicals

Bioaccumulation
Accumulation of a substance in living things over the course of long-term exposure to it

Biomagnificatian
Accumulatian of substances in living things as a result of their eating other living things that have accumulated those substances

Breakdown products
Metabolites and degradates, terms sometimes used interchangeably, can be more toxic to humans than the pesticides from which they come

- *Metabolites*
  Chemicals created when a substance is altered by digestion, detoxification, and other living processes
- *Degradates*
  Chemicals created when a substance is altered by exposure to non-living things, including light, heat, and other chemicals.

Biotechnological

- *Resistance*
  Genetic enhancement of crop strains to resist insect and fungus damage
- *Microbial*
  Genetic enhancement of the toxicity of microbes used as pesticides

Human Health Effects[2,3]

Acute/Chronic
Health effects are commonly categorized by their duration and time of appearance.

Acute health effects appear immediately and last for a relatively short time. They can be of any severity, ranging from skin rash, headache, and nausea to blindness, convulsions and death.

Chronic health effects are effects, also of any severity, that last a long time, and can first appear long after exposure. Chronic health effects range from asthma to cancer

Mutagens
Substances that cause changes in the DNA of a cell's genetic material

Carcinogens
In general, substances that cause cancer by making changes in that part of a cell's genetic material that governs growth and differentiation. About 10% of carcinogens cause cancer in other ways, which are not yet fully understood

Teratogens
Not to be confused with (systemic) reproductive effects

- *Mutagenic*
  Substances that cause gross birth defects (terata) by causing changes in the genetic material of egg or sperm cells
- *Nonmutagenic*
  Substances that cause gross birth defects by acting on a fetus directly, without causing changes in the genetic material of egg or sperm cells

Children
Compared to adults in the same environment, children:

- *Exposure*
  Experience more skin and oral contact with pesticide-covered surfaces and breathe in more contaminated but less ventilated air zones
- *Received doses*
  Absorb higher doses of pesticides for a given exposure (for example, children have more permeable skin)
- *Vulnerability*
  Have immature immune and detoxification systems, increasing their susceptibility to toxic effects

Systemic

- *Nervous, physical*
  Substances that affect control of the body and some perception problems
- *Nervous, cognitive*
  Substances that cause learning disabilities and some perception problems
- *Reproductive*
  interference with a creature's ability to reproduce, such as reducing sperm counts or damaging reproductive organs, and causing minor birth defects. Often, and incorrectly, used interchangably with teratogenic effects
- *Cardiavascular*
- *Eye*
- *Immune*
  Leading to health effects in the other systems
- *Kidney*
- *Liver*
  Leading to other health effects, because the liver is responsible for detoxifying poisons
- *Respiratory*
- *Skin*

Disease vectors
Pesticides can control rats, mosquitoes, and other disease-carrying animals

Environmental Effects

Insect predators killed
Creating "secandary" pests, insects formerly eaten by the killed predators

Resurgence
Pests come back stranger after an interval because their natural predators have been killed

Beneficial insects killed
Effects on honey bees are a particular concern, due to their role in pollinating plants

Wildlife
Harmed by death or reproductive difficulty

Persistence
Pesticide pollution can remain in the environment for decades after application

- *Crop residues*
  Farmer, farmworker, and consumer exposure
- *Groundwater contamination*
  50% of Americans get their drinking water from wells
- *Runoff*
  Surface water contamination

Drift/Migration
Crop, ecosystem, and human exposure to pesticides far from the site of application due to local (drift) or regional and continental (migration) winds

Resistance
Pesticide failure because targets develop biochemical defenses, forcing more applications or the use of different pesticides

Soil changes

- *Degradation*
  Nutrient poverty
- *Erosion*

Secondary ecosystem disturbances
Alteration of plant and animal activities and populations due to pesticide action on predators, predator foods, plants, plant foods, pollinators, or other organisms that maintain a particular state of ecological balance

Points of Pollution

North America's annual output of a billion pounds of conventional active pesticide ingredients, plus unknown but huge quantities of "inert" ingredients, are almost all released into the environment.

These substances require even larger quantities of crude oil and other raw materials, involve many levels of preliminary manufacture, and necessitate much movement of dangerous substances. Any assessment of pesticide-related pollution must ascribe to pesticides a portion of the pollution generated in all these activities.

Resource extraction
Primarily oil drilling

- *Volatilization*
- *Waste disposal*
- *Explosions/leaks*
  Especially ocean and lake spills

Manufacturing

- *Volatilization*
  Chemical industry workers are very heavily exposed
- *Waste disposal*
  Chemical companies have tremendous air emissions. (93 million pounds in 1989 at one Kansas maker of pentachlorophenol alone) and are responsible for many of the continent's worst waste dumps on the continent, such as Love Canal
- *Explosions/leaks*
  A 1985 leak at a carbamate pesticide factory in Bhopal, India, killed more than 1,500 and poisoned more than 100,000

Transportation

- *Volatilization*
- *Explosions/leaks*
  A 1979 train wreck, explosian, and two-day fire in Mississauga, Ontario, involving tank cars filled with chlorine and other chemicals, required evacuation of 240,000

Storage/Retail

- *Volatilization*
  Child exposure a particular concern
- *Explosians/leaks*

Consumer products

- *Volatilization*
  Home and lawn application a particular concern due to child exposure
- *Waste disposal*
  Particularly improper disposal of containers and unused stocks
- *Leaks*
  Particularly from aged stocks

Application

- *Atmospheric migration*
  Volatilization and wind put large amounts of pesticides into the air, where they can move far. Significant quantities of DDT and PCBs, banned in the U.S. for two decades, are detectable in the Great Lakes.

  Depending on the lake, up to 90% have been found to come from the atmosphere, that is, from Mexica and south, where bath are still used
- *Aerial*
  Significant drift for up to 50 miles
- *Ground*
  Significant drift for several miles
- *Waste disposal*
  Cantainers and unused stocks
- *Explosions/leaks*

Economic Effects

Health costs/ lost worker productivity

- *Primary*
  Farmers and farmworkers, chemical industry workers, exterminators, maintenance workers
- *Secondary*
  Building occupants, homeowners, possersby, people who eat contaminated fish, meat, crops
- *Child*
  Learning effects

Waste

- *Disposal*
- *Dump cleanup*

Water supply remediation
Treatment system construction

Natural resources loss

- *Water*
  Fishing and recreational uses impoired
- *Soil*
  Erosian

Regulation

- *Business*
  Paperwork, planning, and legal burdens
- *Government*
  Manitaring, enforcement

Emergency cleanups
Oil spill remediation, factory, truck, and train accident response efforts, neighborhood evacuations

Research
Few resources devoted to developing nan-toxic pest contral technologies

Retail prices
According to Cornell agriculture researcher David Pimentel, a 50% reduction in pesticide use would cause a 25% increase in pest control costs, but only a 1% increase in consumer food prices

Crop losses
Possible serious reduction in crop yields in the long term. Yields have increased dramatically since WWII, but not due to pest control: losses due to weeds are the same; losses due to insects have doubled, to 13%

U.S. Federal Hazard Levels[4]

Terms
The oral LD_{50} (lethal dose, 50 percent) is determined by finding out how much of a substance, measured in milligrams per kilogram of body weight, must be fed to a group of animals such that half of them die.

The inhalatian LC_{50} (lethal concentration, 50 percent) and dermal LD_{50} ratings are similar analyses applied to breathing and skin exposure.

Corneal opocity is a scientific way of saying blindness.

The listed effects are for a hypotheticol healthy adult male, the kind of human least vulnerable to toxic effects

Hazard Level I

- *Label warning*
  "Danger" and "Danger—Poison" (the latter if having one of the oral, inhalation, or dermal characteristics)
- *Warning meaning*
  "High toxicity"
- *Oral LD_{50}*
  <50 mg/kg
- *Inhalation LC_{50}*
  <0.2 mg/l
- *Dermal LD_{50}*
  <200 mg/kg
- *Eye effects*
  Corrosive; corneal opocity not reversible within 7 days
- *Skin effects*
  Carrasive

Hazard Level II

- *Label warning*
  "Warning"
- *Warning meaning*
  "Moderate toxicity"
- *Oral LD_{50}*
  50 to 500 mg/kg
- *Inhalation LC_{50}*
  0.2 to 2 mg/l
- *Dermal LD_{50}*
  200 to 2000 mg/kg
- *Eye effects*
  Corneal opocity reversible within 7 days; irritation persisting for 7 days
- *Skin effects*
  Severe irritation at 72 hours

Hazard Level III

- *Label warning*
  "Caution"
- *Warning meaning*
  "Low toxicity"
- *Orol LD_{50}*
  500 to 5,000 mg/kg
- *Inhalation LC_{50}*
  2 to 20 mg/l
- *Dermal LD_{50}*
  2,000 to 20,000 mg/kg
- *Eye effects*
  No corneal opocity; irritation reversible within 7 days
- *Skin effects*
  Moderate irritation at 72 hours

Hazard Level IV

- *Label warning*
  "Caution"
- *Warning meaning*
  "Slight toxicity"
- *Oral LD_{50}*
  >5,000 mg/kg
- *Inhalation LC_{50}*
  >20 mg/l
- *Dermal LD_{50}*
  >20,000 mg/kg
- *Eye effects*
  No irritation
- *Skin effects*
  Mild or slight irritation at 72 hours

Sources (footnotes indicate major, but not sole, sources of a column's information): [1]*Common-Sense Pest Control*, William Olkowski, Sheila Daar, Helga Olkowski, Bio-integral Resource Center, 510-524-2567 (1991, Taunton Press, Newton, Connecticut); [2]"On the Trail of a Pesticide," Mary O'Brien (1984, Northwest Coalition for Alternatives to Pesticides, Eugene, Oregon, 503-344-5044); [3]*Casarett and Doull's Toxicology*, Curtis Klaassen, Mary Amdur, John Doull, eds., 3rd ed. (1986, Macmillan, New York); [4]40 Code of Federal Regulations 156.10 (July 1991, U.S. Government Printing Office, Washington, D.C.); [5]"Status of Pesticides in Reregistration and Special Review" (May 1992, U.S. Environmental Protection Agency, 401 M St. SW, Washington, D.C. 20460).

. . . Pesticide Use

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mate the number of birth defects caused by pesticides, although many pesticides have been shown to cause birth defects in animal studies.

Accordingly, cost-benefit analyses of pesticide use, even those conducted by sympathetic researchers, end up finding a net economic benefit to substantial levels of pesticide use.

The most famous of these, a comprehensive 1991 study conducted by a team of eleven led by Cornell agricultural researcher David Pimentel, concluded that synthetic pesticide use saved $16 billion annually in crop production while costing $4 billion to apply and $8 billion in "social and environmental costs," including $787 million in human health impacts, most of which was attributable to an estimated 70,000 pesticide-related cancers priced at $70,000 each and 27 deaths priced at $2 million each.

Other major contributors to the environmental costs of pesticide use were groundwater contamination, $1.2 billion, bird losses (conservatively estimated at 67 million killed every year due to pesticide poisoning), $2.1 billion, pest resistance (causing repeated applications), $1.4 billion, and crop *losses*, about $1 billion.

All that figuring still left a $4 billion net benefit to society, but it would not be hard to imagine that much money and a good deal more in currently undocumented costs. The most significant of these is probably the considerable share attributable to pesticides of the chemical manufacturers' ground, water, and particularly air pollution emissions (amounting to tens of millions of pounds for single plants), as well as a share of the cost of oil spills and other accidents involving pesticide ingredients.

Government oversight

Pesticide use oversight in North America is unique. Pesticide law and regulation has no overall environmental protection goals like those found in regional air quality standards and other environmental protection efforts.

There are only a few specific standards for environmental contamination, as are typical in water discharge permitting (a few pesticides have been restricted based on persistence in groundwater and accumulation in animals).

And the only serious (if flawed) standard for human health exposure is in the determination of "tolerances" for pesticide residues on food. Worker exposure standards are hundreds, even thousands of times more lenient than food standards, with no rationale save business practicality for the difference. And bystander, homeowner, and other typical forms of exposure are analyzed and regulated poorly, negligibly, or not at all.

"Risk-benefit"

Because pesticide use is considered essential by one of America's economic and legislative powerhouses—agriculture—pesticides are not judged solely by their impact on human health and the environment. By law such impacts must be considered only in the context of loosely determined economic and other benefits. Government decides whether a pesticide can be used based on a subjective, infinitely flexible standard—the pesticide's "risk-benefit ratio."

The historical and (increasingly thin) intellectual justification for this state of affairs lies in the fact that, like cigarette smoking, the use of synthetic pesticides is dangerous even when carried out as directed. To judge pesticides by traditional standards of human safety would certainly put an end to most synthetic pesticide use.

That option is not as radical as it may seem. Today's massive pesticide applications can very feasibly be replaced by what is known as "integrated pest management," a pest control method that rarely requires synthetic pesticides and uses them only as a last resort. IPM theory was worked out decades ago and its practice has since been refined successfully in all areas of pest control.

But most government entities and the pesticide-oriented economic forces they represent have foreclosed examination of IPM because they see the benefits of pesticide use as a given. Naturally this necessitates a regulatory scheme that, in general, facilitates rather than hinders pesticide use.

A modest comparison

For many casual observers, this general approach seems sensible, even if some of its practical effects do not. But the strangeness of the pesticide regulatory scheme becomes apparent with comparison to government regulation of all other uses of dangerous chemicals.

The industrial activity most analogous to pesticide application is discharge of hazardous waste. Whether to water, air, or land, waste discharge usually undergoes preliminary treatment and almost always requires permitting. The permits are often subject to renewal and increasing restrictions over time. Dumping of industrial wastes without these safeguards, meager though they often are under close inspection, is seriously illegal and considered by all concerned a gross threat to human health.

Pesticide spraying is little different, however, despite its government sanction. Rhetorically, it is arguable that covert dumping of hazardous waste is the lesser danger to human health. Dangerous as it is, hazardous waste is at least not specifically designed to kill living things.

The sad fact is that dumping many kinds of hazardous wastes in a rural ditch at night would expose fewer people less seriously than the average aerial pesticide spraying of neighboring corn fields the next morning.

But in the eyes of the government and most pesticide users, such comparisons are only semantic. To judge pesticide applications by the same standards as industrial discharges (that is, to carry them out only when absolutely necessary) would be, well, um, uh—impractical.

Health standards: risks

Underlying government regulation of pesticides is the idea of "acceptable risk," the contention that exposure to certain small quantities of pesticides are of "negligible" harm to human be-

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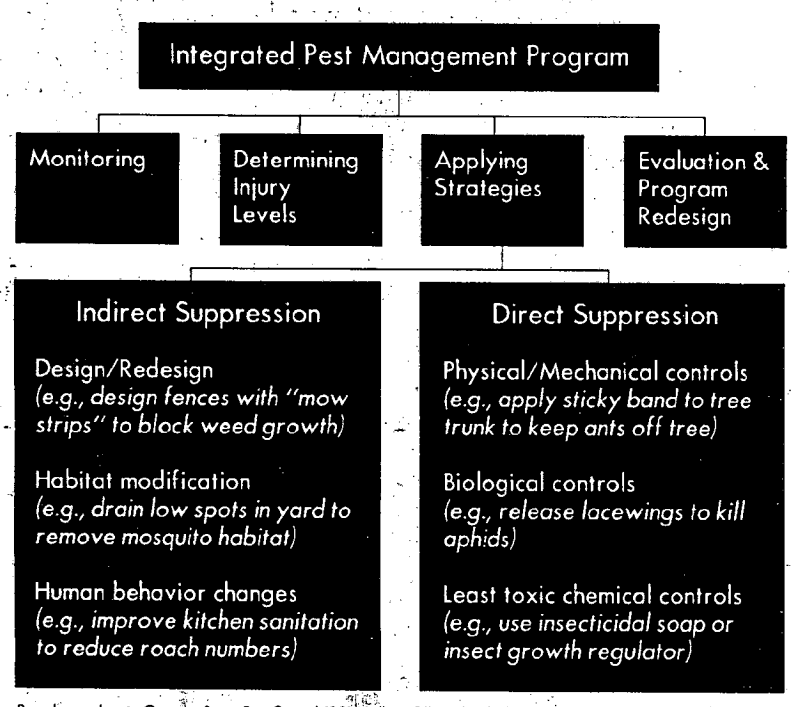
An Introduction to Integrated Pest Management

by William Olkowski, Sheila Daar, Helga Olkowski

Integrated pest management is an approach to pest control that utilizes regular monitoring to determine if and when treatments are needed, and employs physical, mechanical, cultural, biological, and educational tactics to keep pest numbers low enough to prevent intolerable damage or annoyance. Least-toxic chemical controls are used as a last resort.

In IPM programs, treatments are not made according to a predetermined schedule; they are made only when and where the monitoring has indicated that the pest will cause unacceptable economic, medical, or aesthetic damage. Treatments are chosen and timed to be most effective and least disruptive to natural pest controls. . . .



Based on a chart in *Common-Sense Pest Control*, 1991, William Olkowski, Sheila Daar, Helga Olkowski

IPM, developed originally for agriculture, provides a process for identifying and reducing the factors causing pest problems; it is also designed to determine whether the cost of a particular pest management action is worth the result. Determining economic damage to a crop, where you have yield amounts and marketplace returns against which to measure results, is relatively straightforward. But putting a dollar amount on the revulsion caused by an organism or the desire for a "perfect lawn" is much more difficult.

You must ask yourself whether preventing the damage is worth exposing your family and pets to the potential health-impairing chemicals in "conventional" pesticides, or, alternatively, whether you are willing to put the requisite time and effort into less-toxic alternatives. Clearly these are not straightforward questions, because both the costs and the benefits are harder to quantify than in traditional agriculture. Even in agriculture the evaluation is becoming more difficult as costs that once where considered external to production--groundwater contamination, pesticide residues on and in the food, regulatory requirements, educational activities, the purchase and use of safety equipment, occupational exposure to toxic materials are beginning to be factored into the calculations.

The kinds of pest problems, the environments in which they occur and the personal values and community standards of those experiencing the problems vary enormously and change over time. . . .

Ultimately, the decisions about what is tolerable, either in terms of pest numbers or exposure to potentially hazardous materials, is yours. These decisions are not so very different from deciding whether you want smoking in your house or whether riders in your car must buckle their seat belts.

From "Common-Sense Pest Control," 1991.

But ChemLawn Said . . .

by Mary H. O'Brien

. . . 1. Integrated pest management is not whatever people say it is. IPM has an historical origin and classical meaning.

2. IPM is not what chemical company salespeople say it is, namely a mixture of chemicals. IPM arose out of a need to reduce pesticide use, not perpetuate it.

3. IPM is not what roads departments and agencies like the Forest Service and the federal Bureau of Land Management have sometimes claimed, namely a mixture of chemicals and a little bit of nonchemical methods and a biological control agent or two. IPM is not merely a collection of chemical and nonchemical tools; it is a system approach to a pest and involves certain critical steps that have nothing to do with tools.

4. IPM does not preclude the use of pesticides, although IPM programs that obviate or eventually eliminate the use of toxic chemicals are cause for satisfaction.

From "Preparing an Excellent Pesticide Environmental Impact Statement," 1987.

Common Lawn Pesticides: Known Dangers

	Human Health Effects						Environmental Effects				
	Cancer	Birth defects	Reproductive effects	Nervous system effects	Kidney or liver damage	Sensitizer or irritant	Detected in groundwater	Potential leacher to groundwater	Toxic to birds	Toxic to fish/aquatic organisms	Toxic to bees
Insecticides											
Acephate	x1			x		x			x		x
Bendiocarb				x		x			x	x	x
Carbaryl		x	x	x	x	x	x		x	x	x
Chlorpyrifos			x	x	x	x	x		x	x	x
DDVP	x1			x				x		x	x
Diazinon				x	x	x	x		x	x	x
Isazophos				x		x		x	x	x	
Isofenphos				x		x			x	x	x
Malathion		x		x		x	x		x	x	x
Methoxychlor			x			x	x			x	x
Trichlorfon		x		x		x		x	x	x	x
Herbicides											
Atrazine	x1	x		x	x	x	x			x	
Benefin						x					
Bensulide				x	x	x			x		
2,4-D	x2	x	x	x	x	x	x			x	x
DSMA				x		x					
Dacthal	x3				x	x	x7				
Dicamba			x		x	x	x			x	x
Diphenamid								x			
Endothall		x								x	
Glyphosate			x			x				x	
Isoxaben	x1				x					x	
MCPA		x	x	x		x	x				
MCPP		x	x	x	x	x			x		
MSMA				x		x					
Pendimethalin	x4	x4		x	x		x			x	
Pronamide	x1				x	x		x			
Siduron						x					
Trifluralin	x1		x		x	x	x			x	
Fungicides											
Benomyl	x1	x	x	x		x			x		
Chlorothalonil	x5				x	x	x		x	x	
Maneb	x5	x		x	x	x				x	
PCNB		x				x	x				
Sulfur						x		x			
Triadimefon		x									
Ziram	x6	x	x	x		x				x	

x1--EPA's possible human carcinogen rating; x2--Based National Cancer Institute epidemiological evidence; x3--Based on contamination by TCDD (dioxin) and hexachlorobenzene (HCB); x4--Based on contamination by chlorobenzene; x5--EPA's probable human carcinogen rating; x6--Based on National Toxicology Program published studies; x7--Dacthal acid metabolites.

Sources: Based on two charts in "Lawn Pesticide Facts and Figures," National Coaltion Against the Misuse of Pesticides, 701 E St. SE, Washington, D.C. 20003, 202-543-5450. NCAMP's sources are listed as "EPA documents, standard toxicology references and NCAMP's extensive files."

. . . Pesticide Use

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ings. Given a certain benefit gained from use of a pesticide, such as cheaper food or fewer vermin in kitchens, the risks inherent in such exposures can be acceptable.

In government's view, using pesticides is analogous to any number of human activities in which risks and benefits have to be balanced in order to decide on a course of action. Traffic engineers decide where to place stop lights by balancing the risk of an accident against installation costs and effects on traffic flow. Not every intersection can have a light, so standards of acceptable risk must be developed.

To put it another way, seatbelts harm a few people every year by trapping them in their cars after an accident. But the likelihood is that wearing a seatbelt will save one's life or prevent injury. This makes the risk of being trapped by a seatbelt acceptable.

Just as statistics were looked at and the decision made in many states and provinces to require the use of seatbelts, so the government looks at risks of given pesticide exposures and decides which carry acceptable risks.

If exposure to quantity *x* of a pesticide has a negligible effect as determined by animal studies (say a one-in-a-million cancer risk), but the quantity a person is likely to be exposed to is less than or the same as *x*, then the government in effect considers the pesticide safe.

The problems with such a scheme are many. Study results may or may not be accurate and may or may not apply to human beings. People may be exposed to much more of a pesticide than the quantity in question, and the chemical may act, or the human being may react, much differently given the presence of other chemicals.

Perhaps more significantly, however, the claimed benefits of a pesticide's use and its countervailing risks are not nearly so comparable as in seatbelt use. In fact, benefits are sometimes completely undocumented.

Health standards: benefits

The benefit side of government's "risk-benefit" approach to regulating pesticides is even more flawed than its risk-assessment scheme.

The risk-benefit concept is a child of the U.S. Federal Insecticide, Fungicide and Rodenticide Act. This act governs the U.S. Environmental Protection Agency's pesticide regulation efforts. According to the act, pesticides are not to be registered for use if they pose

> unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide.

The two key words here are "unreasonable" and "benefits."

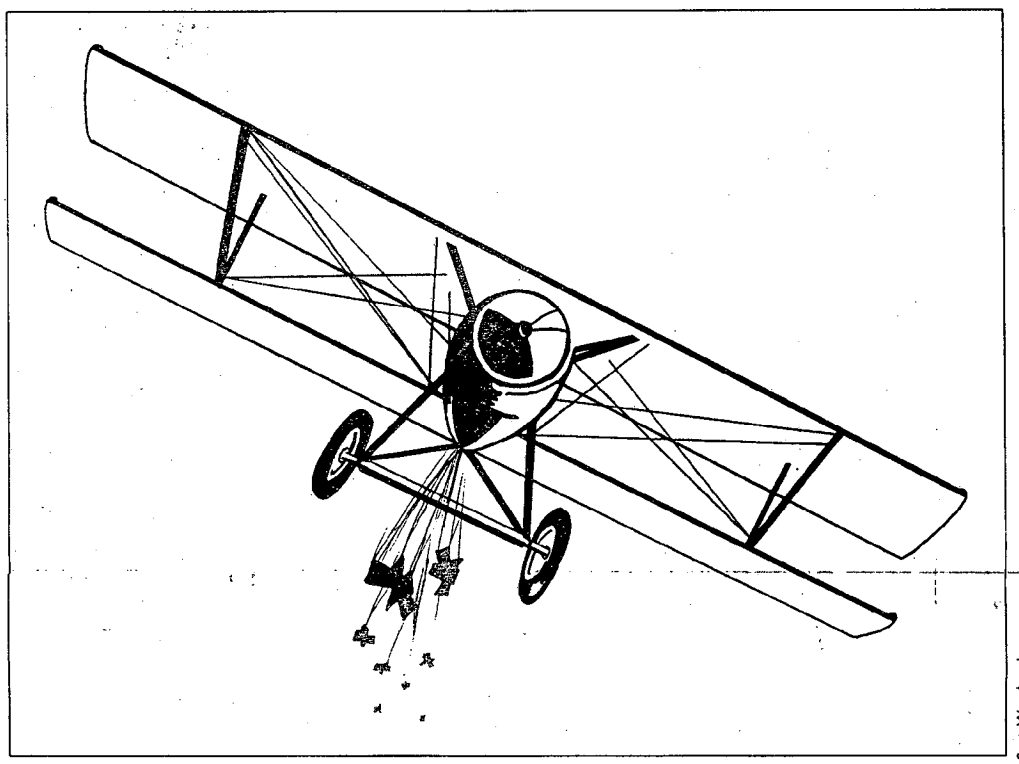
Mandating that risks be considered on the basis of whether or not they are reasonable allows substantial regulatory latitude, either strong or lax. Of course, the latter has been the case in the United States for the last decade.

But mandating the inclusion of offsetting benefits in pesticide regulatory decision making acts to force regulatory lenience. There is little specificity in the law on the how benefits of a pesticide should be measured, and there is a presumption of economic benefit based on the very fact that a company has bothered to bring the pesticide to market.

While substantial health data must be submitted if a pesticide is to be registered, there is no such requirement to document the benefits of a pesticide's use. When a manufacturer does provide benefit information, it is almost always to fight impending restrictions, and can be as flimsy as a single report that a pesticide works well to kill a particular pest.

Reasonable risk-benefit analysis

As applied to pesticide regulation, government risk-benefit analysis is fatally problematic because pesticide health risks are difficult to assess and almost impossible to quantify. However, any reasonable implementation of the risk-benefit approach would require at minimum a detailed analysis of the pest problem at issue and the lack (or excessive costs) of current methods of solving it.



Scott Woodworth

Outlining these two basic justifications for using a pesticide would force an assessment of the range of pest management strategies available. There is no benefit to using synthetic pesticides that risk human health if there is a nontoxic alternative available, that is, if there is no need to take the risk in the first place.

Under any legitimate "risk-benefit" scheme, pesticide companies would first document savings from the use of a pesticide. This might be, say, $1.35 per acre in pesticide control costs over a nontoxic alternative. Then the company would claim that this savings is worth the pesticide's documented health risk of, say, 1.5 incidences of cancer or birth defects per million people exposed.

The end result would be an ugly "one human life is worth $2.5 million" type of assessment, and it is just this kind of ugliness, while sometimes necessary, that is needed as a check against easily indulged economic recklessness.

Women and children last

The government's regulatory scheme has serious flaws even if its basic risk-benefit premises are accepted. Pesticide health standards are based on the likely effects of pesticides on a hypothetical healthy adult male—the kind of human often least vulnerable to pesticide effects.

The most vulnerable of humans—children and pregnant women—are by the government's implicit admission at unacceptable risk from pesticide use.

- As is common knowledge, fetuses are susceptible to effects from a wide variety of environmental influences transmitted by the mother at any of several stages of development. There is little direct knowledge of pesticide effects on human fetuses, but fetal pesticide effects are often researched in animal studies, and many pesticides, including many of the most commonly used lawn pesticides (see table), are in fact shown to cause birth defects in those studies.

- Children's playing and sanitation habits, and their height (that is, their breathing zones), expose them to significantly more pesticides than adults in the same environment.

- Children's bodies absorb and retain significantly more pesticides than adults for the same exposure.

- Children often suffer a greater toxic response than adults for the same exposure.

The specifics of these generalizations are legion. Children crawl and walk, often wearing minimal clothing, on sprayed turf, shrubbery, and indoor surfaces, and on wood-preservative-treated playground equipment and back yard decks. This directly exposes them to substantial quantities of pesticide residues.

Children tend to put hands and objects into the mouth, one of the body's most efficient points of pesticide absorption. Children's skin is more permeable than adults' and many of the chronic skin maladies suffered by children are known to reduce the ability of skin to act as a barrier.

Children's breathing zones are closer to pesticide-covered surfaces and studies have shown these zones to contain higher levels of pesticides. Indoor ventilation systems do a poorer job of circulating air in lower breathing zones.

In this more toxic breathing environment children breathe more often than adults, processing a greater amount of total air and therefore total air contaminants for their body weight than adults.

Children's kidney, liver, and protein-binding detoxification systems are underdeveloped, increasing the amount of pesticides that remain in their bodies. Children's immune systems are also underdeveloped, heightening the effects of these pesticides on their health, sometimes dramatically.

Finally, many pesticides are cancer-causing. Since cancer usually requires long gestation before harming its host, exposure to cancer-causing agents early in life is particularly dangerous.

Everywhere children go they encounter pesticides—on neighborhood lawns, in school kitchen and sports facilities, on city streets and in city parks, in malls, post offices, and neighborhood grocery stores. But despite the huge cumulative exposure of most children, pesticide health standard-setting is not even nominally oriented toward protecting them.

Explained one national anti-pesticide leader to Congress in 1990, "While children occupy a very special place in our culture, they do not occupy a special place in our environmental health policies."

Health testing inadequacies

The designation of healthy men as the measuring stick for pesticide health standards is only one of the government's many pesticide-related health protection failures.

- Testing for health risks is performed only on pesticide active ingredients, not on actual, marketed pesticides. Marketed pesticides usually have companion ingredients (so-called "inert" ingredients) added to increase their effectiveness. Many of these substances are known to be more toxic than the active ingredients they supplement. Furthermore, the combination of active and inert ingredients sometimes causes "synergistic" effects, toxic effects much more severe than those caused by either active or inert ingredients acting alone.

- Just as actual pesticide formulations need not be tested, so common combinations of pesticides and even their known synergistic effects also need not be investigated.

- Pesticide manufacturers are allowed to keep most inert ingredients secret from the public, denying to farmers, applicators and consumers what should be a basic right to know about the contents of the potentially dangerous products they are using.

- Testing for many health effects is not required. Testing for some health effects is required only of certain pesticides. And the government has permitted most testing that *is* required to remain undone or incomplete.

- In a subsidiary catch-22 caused by statutory lenience granted

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older pesticides, new pesticides are frequently exempted from testing requirements for long periods of time because competing older pesticides have not completed their testing.

- Testing for pesticide residues in food is poor—the U.S. Food and Drug Administration tests for only about 40 percent of the pesticides used on food.

- EPA testing requirements leave testing up to the pesticide manufacturers, who contract with private laboratories. This arrangement lends itself to fraud and, in fact, a single case of organized fraud invalidated a third of all pesticide tests performed up to 1983.

The health dangers of exposure to pesticides are serious, many, and difficult to identify and quantify.

The places and routes of exposure to pesticides are many and difficult to predict or control.

The regulation of pesticides is geared toward allowing their use rather than protecting human health or the environment.

Most pest control needs can be achieved by nontoxic means and with only modest extra effort.

Like energy waste and throwaway consumption, pesticide use is an environmental problem that reaches deep into all our lives. We are all exposed to pesticides on a daily basis, and the consequences of that exposure are poorly understood theoretically and almost always unknown individually.

But the pervasiveness of the pesticide problem itself is a force for reducing pesticide use. Except for those with a stake in pesticide manufacture, the constituency for pesticide use is a weak one. People fear encephalitis-bearing mosquitoes and want their lawns weed-free. But first they fear for the children's health. The undeniable facts are that pesticide use is dangerous and alternatives are available.

As a result, there are good opportunities for reducing and eliminating pesticide use on every level of social existence—individual, local, regional and national.

The most winnable issue on any of these levels is surely child exposure. With time, perhaps several years, and persistence, no school administration can resist pressure to eliminate the use of pesticides. Likewise no city, state or province can long resist organized campaigns to restrict the use of pesticides in areas frequented by children.

Any successful campaign to reduce pesticide use is a beachhead for more extensive efforts. The biggest barrier to reform is ignorance of nontoxic and less toxic alternatives. Any public or private entity that begins to reduce its pesticide use can then be much more easily coaxed into doing more.

Time is on the side of those of us urging sanity on a pesticide-happy world. We need merely press our case.

Erie County, New York's Pesticide Procurement Policy

Erie County includes the city of Buffalo and borders the eastern tip of Lake Erie.

1. Pesticides may only be used at Erie County facilities where application of those products is necessary. Facilities at which application is permitted are: [List of facilities]
2. Purchase of pesticides at facilities not listed above must be justified by the Erie County Division of Environmental Compliance.
3. *All departmental purchase requests for pesticides are to be sent to the Erie County Division of Environmental Compliance* for product evaluation. . . . [Emphasis is original.]
4. No pesticides may be purchased by a department that does not employ a New York State Certified Pesticide Applicator. The applicator must be certified for the appropriate application category. [List of categories attached.]
5. All County departments must send a list of names, work locations, and Certified Pesticide Applicator numbers and categories to the Erie County Division of Environmental Compliance. Information is to be updated each year.
6. Prior to purchase of pesticides, each department should determine if the product is registered with the New York State Department of Environmental Conservation. Since pesticides are registered for a two-year duration, ensure that the entire amount being purchased will be used up prior the registration expiration.
7. Purchase only a one-year (maximum) supply of pesticides.
8. Should a pesticide become "banned," the Division of Environmental Compliance staff will request the vendor or manufacturer to accept the unused portion of the material at no cost to Erie County. [Responsibility for disposal becomes the manufacturer's.]
9. No County employee is to accept "samples" of pesticide products from salespersons.
10. Pesticides "banned" by the New York State Department of Environmental Conservation and presently stored at Erie County facilities must be disposed of in an environmentally sound manner.
11. Each County facility shall send a complete inventory of pesticide products stored at that location to the Division of Environmental Compliance annually. Completed forms are due [date]. [Form attached.]
12. When application is necessary every effort should be made to use a nonhazardous or the least toxic pesticide available.
13. The Department of Environment and Planning, Division of Environmental Compliance, will provide technical assistance to all departments covered by this policy.

For more information contact Mike Raab at 716-858-6370.

IPM Is Everywhere in Thurston County, Wash.

by Mark Swartout

Thurston County government has taken the lead in Washington state in regulating its pesticide use. In 1985, the Environmental Health Department drafted and the County Commissioners adopted a first attempt at developing a pesticide use policy. This first policy targeted the use of herbicides by the Roads Division of the Public Works Department. The policy applied only to county operations, not to pesticide use by private or commercial users.

Citizens were concerned that this policy needed a broader approach. In 1987 the county commissioners appointed a citizen committee charged with studying pesticide use by county departments and making recommendations for a new pesticide use policy. The result of their work was a new policy adopted in 1989. The Pesticide Use Policy and Procedures have several goals:

- To ensure that all non-pesticide pest/vegetation control methods, such as biological and mechanical means, are given full consideration in accordance with classical integrated pest management principles wherever practical and economically feasible.
- To ensure that Thurston County provides full public accountability for any use of pesticide.
- To ensure that any use of pesticide will be done with no adverse impact on human health or the environment.
- To ensure the safety, operation, and maintenance of roadways and other public lands within Thurston County.

In order to achieve these goals, the Pesticide Use Policy and Procedures have several important components:

- All county departments and their contractors who use pesticides are covered.
- Pesticides used by the county must pass a review by the Environmental Health Department using the following criteria:
  - Low toxicity
  - Environmentally degradable
  - Not a developmental toxin
  - Not cancer-causing
  - Not mutation-causing
  - Not a cause of reproductive problems
- Departments must use an integrated pest/vegetation management approach to solving all pest problems.
- If a department wants to apply a pesticide to an environmentally sensitive area (such as aquifer-sensitive areas, wetlands, and lakes), it needs permission from the Board of Health.
- A citizen Pest and Vegetation Management Advisory Committee was established to oversee implementation of the policy.

A permanent staff position was created to oversee policy implementation and to be a resource for departments developing alternative methods of pest and vegetation control.

Since the adoption of the last policy the use of pesticides by the county has dropped dramatically.

Roads

At its peak in 1985, the county used more than 5,000 pounds of Cal 90 and more than 600 gallons of other pesticides to control vegetation on the shoulders, ditches and backslopes of county roads. In 1992, no herbicides were used on shoulders and to date none in ditches or backslopes.

The new methods of vegetation control are mechanical, requiring a change in maintenance standards. For a time the Roads Division had difficulty maintaining road vegetation at the previous "level of service." The ideal way to develop an IPM program is to have a "build down" approach: changing only a part of the program first, creating a success, then adding another part. This method builds on the successes.

The sudden elimination of a tool (herbicides) required rapid addition of mechanical equipment and training for operators. The learning curve needed to properly apply the new techniques caused what was seen a drop in the level of service to roadside vegetation, creating a backlash of concern from citizens.

The Roads Division is now writing an integrated vegetation management program. Its goals and objectives are:

Goal

To provide safe conditions for motorists, pedestrians, bicyclists, and county employees.

Objectives

1. Maintain proper sight distance (ensure road visibility).
2. Maintain visibility of signs and other roadside fixtures (e.g., the guardrail).
3. Minimize standing water on the road surface.
4. Provide sunlight and air circulation to reduce ice and snow duration.
5. Promote a safe work environment.

Goal

To be a "good neighbor" to adjacent property owners of county rights of way and properties.

Objectives

1. Respond to public concerns in a timely and cooperative manner.
2. Manage county properties so the needs of adjoining property owners are considered.
3. Develop, promote, and encourage an "owner will maintain" program for citizens who want to maintain their own frontages.
4. Develop vegetation management plans for rights of way next to special-use lands such as agriculture that meet the needs of the property owner and comply with the Thurston County Pesticide Use Policy and Procedures.

Goal

To be good "environmental stewards" of the land.

Objectives

1. Develop an environmentally sound integrated vegetation management program. Any pesticides will be used in accordance with the county's pesticide use policy.
2. Encourage establishment of self-sustaining native plant material.
3. Protect and enhance wildlife, habitat, and endangered or threatened plants.
4. Maximize surface and groundwater quality to the extent possible, as we manage vegetation and stormwater within the needs of the roads system.
5. Reduce the opportunity for noxious weeds and other undesirable vegetation by enhancing the environment for the desired native vegetation and stressing undesired species.
6. Encourage vegetation management practices which safeguard environmentally sensitive areas.

Goal

To promote long-term, cost-effective management of public resources.

Objectives

1. Promote professionalism in the vegetation management staff of Public Works by providing educational and career opportunities that will enhance staff's knowledge of current vegetation practices and stewardship of the land.
2. Develop vegetation management strategies that promote stable plant communities.

Lakes

The county has a lake management program. Property owners around lakes in Thurston County can form lake management districts. The purpose of the districts can be various, including plant control, lake restoration, and addressing water quality problems. The county pesticide use policy helps develop guidelines for the districts to follow if they propose to use aquatic herbicides or aluminum sulfate (a lake restorative that is not technically an herbicide).

The policy requires Thurston County to discourage the use of pesticides by private application or by public agencies. This is the only time the pesticide use policy applies outside of county operations. All applications of this category require a permit from the Washington State Department of Ecology. During the permitting process local government is given an opportunity to provide comments on the permit.

Thurston County requires applicators to develop integrated control methods, using pesticides as a last resort. This requires applicators to look at their problems more holistically, with an ecological perspective.

One of the positive outcomes of this program is that it gets residents and property owners to become involved with both the definitions of their problems and the solutions to them. Often their main problem is education and the realization that they may be contributing to the problem. This then allows them to solve the problem themselves.

Noxious Weeds

The noxious weeds program helps Thurston County property owners identify and eradicate noxious weeds identified through state law. Before adoption of the pesticide use policy the program would provide advice on the control of noxious weeds using various strategies, pesticide use being a significant one. The program even provided herbicide application equipment to property owners. An IPM approach to controlling noxious weeds was developed under the county's new IPM policy, and it received an award from the Washington State Department of Agriculture for its pioneering nature.

Parks

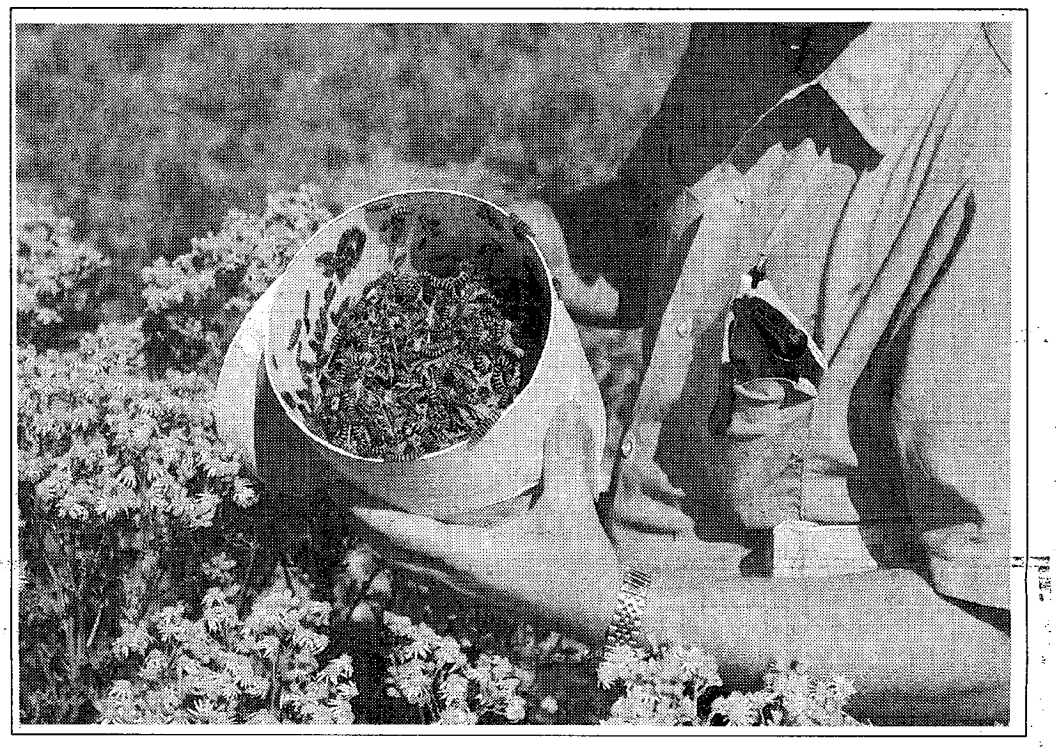
The Parks Department maintains the landscape and facilities in two county parks and the landscape at the County Courthouse Complex. Pesticide use in the facilities was minimal, but of a wide variety due to the various nature of the vegetation and insect pest problems in the facilities.

The difficulties in implementing the policy for the Parks Department include developing training for employees, changing attitudes, and developing a knowledge base of parks problems and solutions. These have been addressed by holding IPM classes, providing technical expertise when needed, and establishing program development timeline requirements. Developing IPM programs should improve the ability to identify: pests and infestation causes, the number of natural predators useful for pest control, the choice of plant material, and alternatives to the use of pesticides.

The Parks Department is increasing the amount of land it is responsible for. Keeping IPM programs in mind during the design and acquisition of new parks can greatly increase their eventual effectiveness in those new areas.

The Pest and Vegetation Management Advisory Committee is currently developing a revised policy. It will broaden current policy by including all county operations that have pest and vegetation management programs, not just those that use pesticides. Chief among these is the county's stormwater utility, with its swales, retention/detention ponds, and infiltration basins. The concern is that some of these other pest management practices either do not solve the pest problem or use methods that have a negative environmental impact.

For more information, contact Mark Swartout at 206-754-4111.



Courtesy Thurston County Board of County Commissioners

Cinnabar moth caterpillars control tansy ragwort, which is poisonous to cows.

Mark Swartout is vegetation management coordinator for the Thurston County Department of Community and Environmental Programs.

RESOURCES

General Resources

Bio-Integral Resource Center (BIRC), the premier information clearinghouse on alternatives to pesticides, P.O. Box 7414, Berkeley, CA 94707, 510-524-2567.

Common-Sense Pest Control, a codifcation of many sources, particularly articles appearing in the magazine of the same name, updated and supplemented with further research, rapidly becoming a bible of the integrated pest management movement, 1991, $40, BIRC (see above).

Common-Sense Pest Control Quarterly, a hands-on publication aimed at the lay person, $30 per year, BIRC (see above).

Environmental Protection Agency, Public Information Center, 401 M St. SW, Washington, D.C. 20460, 202-475-7751.

General Accounting Office, federal government investigating body producing many pertinent reports, most free. Also free is a monthly bulletin of available publications listed by subject, 202-275-6241.

IPM Practitioner, a technical journal monitoring integrated pest management, $25 for 10 issues a year, BIRC (see above).

Journal of Pesticide Reform, superlative quarterly, a different focus each issue plus news and detailed analysis of a featured pesticide, a steal at $15 per year—donate more, NCAP (see below).

National Coalition Against the Misuse of Pesticides (NCAMP), the continent's most prominent advocate for pesticide restrictions, a good source of pesticide overview material and up-to-date information on federal, state and local legislation, 701 E St. SE #200, Washington, D.C. 20003, 202-543-5450.

National Pesticide Telecommunications Network, a national clearinghouse for pesticide toxicity and crisis information--the people to call for scientific data and what to do (or not do) if you are worried about pesticide events ranging from spraying to accidents, Health Sciences Center, Rm. 1A111, Lubbock, TX 79430, 1-800-858-7378.

Northwest Coalition for Alternatives to Pesticides (NCAP), a comprehensive information service and policy organization specializing in forestry, urban pesticide use, and agriculture, P.O. Box 1393, Eugene, Ore., 97440, 503-344, 5044, 11 a.m. to 5 p.m.

Noyes Data Corporation, scientific publisher, compiles pesticide and other federal information in forms cheaper than would be available from the government, free catalog, Park Ridge, NJ, 201-391-8484.

"On the Trail of a Pesticide: Learning About the Chemistry, Testing, and Effects of Pesticides," an excellent primer, 1984, $18.50, NCAP (see above).

Pesticide Action Group Canada, P.O. Box 22021, Westmount Postal Outlet, Waterloo, Ontario N2L 6J7.

Pesticide Action Network (International Pesticide Clearinghouse), a collection of 12,000 publications and audio-visual materials about pesticide production, trade, regulation, toxicology, safety, training, and food and water residues, with many Spanish, Portuguese, German, and French sources available. The group makes referrals to experts in a number of fields, and has sources and makes referrals in particular on safe pest control methods and sustainable farming. 965 Mission St. #514, San Francisco 94103, 415-541-9140.

Pesticide Alert: A Guide to Pesticides in Fruits and Vegetables, Lawrie Mott and Karen Snyder, 1987, $7, Sierra Club Books, available from NCAP (see above).

"Pesticide Exposure, Health Effects, and the Need for Public Notification," James Chapman, 1992, $8, New York Coalition for Alternatives to Pesticides, 33 Central Avenue, Albany, NY 12210, 518-426-8246.

Pesticide Fact Books, U.S. Environmental Protection Agency, 1988, 1990, $96, $78, summaries of use patterns, toxicology, and gaps in data about health and environmental effects of 130 and 87 major pesticides, Noyes Data Corporation (see above).

Pesticide Handbook: Profiles for Action, S. Rengam and K. Snyder, 1991, $18, a resource book for groups and individuals working on pesticide reform, available from PAN (see above).

Rodale Press, a major publisher of sustainable farming and gardening books and magazines, 33 E. Minor St., Emmaus, PA 18049, 800-441-7761.

Toronto Environmental Alliance, 401 Richmond St. W #104, Toronto, Ontario M5V3A8, 416-348-0660

Agriculture

American Journal of Alternative Agriculture, peer-reviewed scientific journal, not a how-to publication, but "oozes with practical implications," Institute for Alternative Agriculture, 9200 Edmonston Rd. #117, Greenbelt, Md. 20770, 301-441-8777.

Americans for Safe Food, project of the Center for Science in the Public Interest, resources for food safety and promotion of awareness that "buying organic food is the single best personal thing you can do to promote a good environment," 1875 Connecticut Ave. NW #300, 20009.

Appropriate Technology Transfer for Rural Areas (ATRA), a national sustainable agriculture information center, extensive resources on alternatives to pesticides in agriculture, many technical specialists on staff, P.O. Box 3657, Fayetteville, Arkansas, 72702, 1-800-346-9140.

California Certified Organic Growers, P.O. Box 8136, Santa Cruz, CA, 95061, 408-423-2263.

Farmworkers Justice Fund, referrals, some technical assistance, 202-462-8192.

Organic Crop Improvement Association, a professional organic farming association that can provide names of certified organic farmers around the United States, 3185 Twp. Rd. 179, Bellefontaine, OH 43311, 513-592-4983.

Rodale Institute, promotes sustainable agriculture, 222 Main St., Emmaus, PA 18098, 215-967-5171.

Sustainable Agriculture Program, Agronomy Extension, University of California, Davis, CA 95616, 916-752-8667.

Canada

Pesticide Action Group Canada (see "General Resources").

"Recommendation for Federal Pesticide Regulatory System, Final Report," free copies can be called by calling Canadian government officials at 613-991-0216.

"Regulating the Urban Cosmetic Use of Synthetic Pesticides -- An Action Plan for the Province of Ontario," Urban Pesticide Caucus, available from the Toronto Environmental Alliance (see "General Resources").

Toronto Environmental Alliance (see "General Resources").

Forests

Northwest Coalition for Alternatives to Pesticides (NCAP), whose origins lie in forest pesticide issues, remains the continent's leading advocate for IPM in forest management (see "General Resources").

Lawn Care

Chemical-Free Yard and Garden, Fern Marshall Bradley, ed., $27, and ***Chemical-Free Lawn,*** Warren Schultz, Rodale Press (see "General Resources").

How to Get Your Lawn and Garden Off Drugs, Carole Rubin, Friends of the Earth of Canada, 701-251 Laurier Ave. W., Ottawa, Ontario, K1P 5J6, 416-287-6144.

"Least Toxic Pest Management for Lawns," information on vertebrate, insect, weed and disease pests, BIRC (see "General Resources").

Safety at Home, NCAMP (see "General Resources").

Products/Organic Foods

"Directory of IPM Products and Services," $5, free to members, BIRC (see "General Resources").

Early's Farm and Garden Centre, pest management and fertilizing supplies and organic foods, catalog $2, refundable, Box 3024, Saskatoon, Saskatchewan S7K3S9, 306-931-1982.

Gardens Alive!, oriented toward gardens and home pests, 812-537-8650.

Natural Gardening Research Center, pest management products, Hwy. 48, P.O. Box 149, Sunman, IN 47041.

"Organic Food Mail-Order Suppliers," $1.50, Americans for Safe Food (see "Agriculture").

Organic Foods Production Association, a trade group of farm and business organizations, P.O. Box 1078, Greenfield, MA 01302.

Ringer's, oriented toward lawns, trees, shrubs, composting, 1-800-654-1047.

U.S. Ordinances

"Pesticides: EPA/State Efforts on Safe Use of Lawn Pesticides," GAO/T/RCED-91-50, free, GAO (see "General Resources").

"State and Local Pesticide Ordinances," $25 NCAMP (see "General Resources").

Rights of Way

"Avoid Trouble Down the Road," 1988, $18.50, NCAP (see "General Resources").

"Guide to Rights of Way Management," $5, NCAMP (see "General Resources").

Schools

"Contaminated Classrooms," Nancy Watzman et al., ongoing reports on schools, Public Citizen 215 Pennsylvania Ave. SE, Washington, DC 20003, 202-546-4996.

Environmental Health Coalition, perhaps the foremost U.S. advocates for IPM in schools, comprehensive information for school operators, 1717 Kettner Blvd. #101, San Diego, CA 92101, 619-235-0281.

Mothers and Others for Pesticide Limits, protecting children from pesticides in food, a project of the Natural Resources Defense Council, 40 W. 20th St., New York, NY 10011, 212-727-2700.

"Pesticides and Schools," NCAMP (see "General Resources")

"Pollution Prevention in Schools: An Environmental Management Guide for Michigan School Districts," in press, Michigan Department of Education, call 517-373-7802 or 313-652-4903 for information.

"School Pesticide Use Reduction," $12, book and slide show, $95, Environmental Health Coalition (see above).

Why Notification?

by James Chapman

There is a valid need for public notification of pesticide applications. The position that current pesticide uses are safe because the products have been registered by the federal government is not justified, and, in fact, pesticide distributors are prohibited by law from making such claims ...

The right of citizens to choose to minimize their contact with pesticides should be recognized for several reasons:

- Toxicological evaluations of the majority of pesticides are inadequate and incomplete.
- Organophosphate and carbamate poisoning is often difficult to diagnose correctly when there is no record of pesticide exposure.
- Epidemiological studies and medical case reports indicate adverse health effects can result from nonoccupational exposure to pesticides.
- Risk analyses and monitoring studies indicate high levels of potential exposure following indoor pesticide applications (especially in carpeted areas) even when used according to directions.
- Children are likely to have higher levels of exposure to pesticides applied to surfaces within their reach than adults have.
- There is some evidence children are more susceptible to the effects of pesticides than adults are.
- Some effects are potentially devastating but susceptibility cannot be predicted.
- Pesticides do not stay solely in the places where they are applied.

... Notification of lawn pesticide use is important primarily to avoid direct exposures to children and sensitive or concerned adults, but also to identify problems of spray drift, runoff, and groundwater or well contamination. The same is true of applications on rights-of-way, roadsides, parks, schoolgrounds, golf courses, and other noncrop and agricultural applications.

In situations where the number or frequency of notifications to adjacent residents would be unwieldy, or overly expensive, a system of annual notifications or public notifications could be devised. Farmers (particularly those with family farms) should not be overburdened with excessive paperwork or expenses. The purpose of notification is to safeguard public health, not to make pesticide use impossible. Another possibility would be to require individual notification only to adjacent residents who request it.

Notifications in businesses are also needed. A prime example concerns spraying of laundromats ... Once the job is completed ... there is no way for customers to know that the premises were recently sprayed with insecticides. Children would receive higher exposures to the vapors than the adults in the establishment would, and would receive additional exposure to the pesticide, even if it had dried, through the usual oral exposure that children have to substances on surfaces in their reach.

Even if it could be shown that the insecticide were completely harmless to children, the solvents that are part of many spray mixtures are certainly not. For example malathion is one of the least toxic pesticides in use, but the formulation contains a high percentage of xylene. It is inexcusable that public areas may be sprayed without any notification being provided to the people who could come in contact with the chemicals being applied.

The business community strongly objects to notification ... in particular, restaurant and hotel businesses are concerned such notifications might result in a loss of trade. This indicates the owners and managers recognize a substantial portion of their customers might object to being exposed if they were properly informed concerning when and where pesticides were applied. It seems hardly appropriate to choose not to notify in order to prevent people from making the decisions they might otherwise prefer.

... The risk of pesticide exposures differs from other kinds of personal risks in that (with the exception of home applications) the exposure is often involuntary, and, in most areas, often occurs without knowledge of what has happened. Posting regulations would not only give people the option of informed consent (or informed avoidance), but should also induce more careful evaluation of the reasons for pesticide use and the possible alternatives if the public does, in fact, choose as the business community seems to think they will.

From "Pesticide Exposure, Health Effects, and the Need for Public Notification," March 1992.

Notification and Goverment IPM in Ann Arbor

by Vivienne Armentrout

Citizens in Ann Arbor, Michigan, began an effort to change pesticide use by the city and school system in 1986. The resulting changes in policy and reduction in pesticide use may offer lessons to other citizens working to change the way local governments manage pests.

Regulations

The objectives of the Ann Arbor citizens' group, the Pesticide Task Force, were to reduce or eliminate pesticide use, encourage the use of alternatives to pesticides, and protect humans from pesticide exposure. To these ends, PTF advocated public notice of all city and school pesticide applications and the use of integrated pest management (IPM) as the guiding philosophy of city and school pest control (see sidebar).

City notification provisions included:

1. Establishing a registry for individuals wanting to be notified (by telephone) before pesticides are applied near their homes

2. Posting large, conspicuous yellow signs wherever pesticides are applied. The school district's notification policy requires principals to notify parents by letter before pesticides are applied in or near the schools.

City IPM policies include applying pesticides only when a serious threat is posed to the health of trees, or when a target density of weeds is reached. No routine applications are allowed. Least-toxic or biological control measures are to be chosen when possible. School district policy is similar, but also calls for a specific management plan for each area of pest problem. Indoor pest control requires monitoring for a threshold population of insects.

Passage

A number of hurdles had to be surmounted before workable regulations could be passed. Many PTF members were victims of pesticide incidents, or were concerned about health effects on their children. Some had contracted MCS (multiple chemical sensitivity) syndrome as a result of pesticide exposure. People with this syndrome are severely affected with rashes, breathing difficulty, dizziness, and often much worse by even small exposure to pesticides. With such a membership, PTF's initial impulse was to advocate the banning of these materials. Some hard discussion was required to persuade members that city staff needed to be given management guidelines instead.

The next step was to obtain legislative support. One city councilmember had received calls from constituents about pesticide incidents and was interested in supporting a regulation. PTF members wrote opinion pieces in the local newspaper and lobbied other councilmembers.

The regulation soon got more publicity than desired: city parks staff members told a newspaper reporter they would be unable to do their job if the proposed regulations passed as proposed. A meeting was hastily called; Parks Department foresters and turf managers sat down with a PTF member knowledgeable about IPM. The city staff had a number of constructive suggestions and key provisions of the draft regulations were revised, especially those dealing with notification procedures.

With staff support secured, the regulations were passed unanimously by the City Council in March 1987. The changes applied almost exclusively to outdoor use. Additional regulations governing pesticide use in city buildings were not passed until late 1991.

The mistake of ignoring staff was unintentionally repeated in the drive to change school pesticide policy. The school administration was approached before the school board, and within six months the board adopted a policy that called for IPM and parent notification when pesticides are applied in the schools. Strangely, the policy was ignored at first. Three months after adoption, the schools hired a commercial lawn-care company to spray herbicides on all school turf areas. There was no notification, and the herbicide chosen contained 2,4-D, which is possibly cancer-causing and was definitely offensive to concerned parents and the PTF. After a flurry of newspaper articles and many calls to school administrators, the policy was dusted off and several PTF members helped refine it in meetings with school staff and administrators. The policy was then reaffirmed by the Ann Arbor School Board in December 1988.

City outcomes

Implementation is the true test of any policy. By summer 1992, Ann Arbor was buying pesticides on an as-needed basis rather than in mass, eliminating a storage and disposal problem. Treatment of trees had been reduced by two-thirds, with no concomitant increase in pest damage. Many of the current treatments, such as the use of horticultural oils and *Bacillus thuringiensis* (B.t.), are least-toxic methods.

Turf pesticide applications were reduced by 90 percent. Since budget limitations have prevented the intensive turf management practices that would result in lower weed densities, there is some visible dandelion infestation along rights-of-way. However, the city has used the pesticide policy to justify buying more efficient mowing equipment (for better weed management) and high-traffic areas are now being given more attention. Furthermore, some Ann Arbor parks have been modified so that less area is in turf and more in wild, meadow-type cover. Indeed, the newest park in Ann Arbor was specifically planned for more prairie and only a small formal area that receives regular mowing. The Parks Department has been able to institute such practices as making slopes into special features such as butterfly gardens with explanatory signs. These would not have been undertaken in the old days of widespread herbicide applications.

The notification requirements have raised citizen awareness of pesticide applications. Every sign posted results in telephone calls. These can present frustrations for park personnel, but also help to focus staff on the need for good justification for each use. The signs are also educational for the public.

Relatively few Ann Arbor residents have registered for notification by the city, probably because the registry's significance has been reduced as the number of city pesticide applications have decreased. At one time, local commercial firms were persuaded to call individuals on the registry; this practice needs encouragement to be continued.

School outcomes

Until 1988, school kitchens and locker rooms were sprayed with insecticides once a month to control cockroaches. The head of custodial maintenance stopped these applications and worked closely with a PTF member to devise a monitoring system to test IPM for cockroaches. The system and the concept were severely tested with an outbreak of cockroaches in one of the school kitchens. In December 1988 the traps were catching up to 50 cockroaches each week.

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Following IPM tactics developed for cockroach problems, professional pesticide applicators put boric acid in all discernible cracks and crevices, and school staff caulked these openings. Sealed bait traps containing pheromone attractant were placed at heavily infested spots. Weekly monitoring of test traps showed a gradual decline in cockroach populations. Six weeks after the cockroach problem became apparent, virtually all the traps were empty. The kitchen has been monitored continuously since then, with no increase in cockroach infestation.

Similar methods were used in the rest of the city's schools. In March 1989 a workshop for all custodial employees explained the new approach, and all cans of pesticides were recalled and disposed of in a hazardous waste facility. No pesticides (except for bait stations and boric acid) have been used inside Ann Arbor's schools since 1989.

The school administration has been well satisfied with the pest management policy as applied to school interiors. There has been no additional cost and, because principals are involved in notification and decisionmaking, school authorities have been better able to manage pest problems by preventive action rather than merely reacting to them. One administrator has incorporated these approaches into a handbook published by the Michigan State Board of Education (see the resources listing elsewhere in this issue).

Management of pests on school grounds was more difficult. There was some initial resistance by grounds staff, which had difficulty dealing with certain weed problems. No formal management plans have yet been written, and because of budget limitations only athletic fields receive full turf management (fertilizing, watering, aeration). However, new mowers and more frequent mowing have improved the appearance of other turf areas and reduced complaints about weeds. Weeds around buildings are cut mechanically by custodians. No herbicides have been used since 1988.

Lessons

It must be kept in mind that while political boards or councils may be responsive to citizen concerns about pesticides, staff are responsible for successful implementation of resultant policies. IPM often pulls staff in two directions, because there is always at least some constituency for pesticide use: many taxpayers have strong feelings about weed control in public places, and about the need to exterminate vermin in school locker rooms and kitchens. A management plan to preserve the quality of services at some level will help minimize this conflict, as will public education about new policy. It must be kept in mind that existing pesticide use is often not based on any conscious policy. IPM provides a decisonmaking *process*, where before there was often none. Notification forces good rationales for decisions arrived at through that process.

Citizens working on local government pesticide policy might also consider these points of advice:

1. Discuss objectives with staff who work at the hands-on level when formulating new pesticide policies. They can make useful suggestions based on how they already work, and it is important to assure that they understand the basis of policy changes.

2. Try to achieve "buy-in" at supervisory levels as well. The staff will not implement a policy successfully if they are not receiving support from their bosses.

3. Good IPM requires technical knowledge. This may mean that citizen activists will have to help lay some groundwork by providing staff with both information and feedback. Of course, in doing so, it is also important to respect professional staff competence.

4. Keep budgetary issues in mind. Some solutions may be expensive, at least initially. An effort should be made to cost out various alternatives to current practice. Staff can help estimate budgetary impacts for councils and boards. Don't forget to put significant effort into ferreting out savings that can offset costs, from the cost of buying the pesticides to reductions in potential disability claims. Citizens can help by organizing support for funding requests at the constituent level.

5. Follow up. Encouragement is helpful, or some prodding may be necessary. You cannot assume good policy will be implemented, or implemented well, and problems encountered may necessitate policy changes.

6. Give credit where credit is due. When staff do successfully implement reduced pesticide policies, they should get recognition for the achievement. This will encourage continued improvement of management strategies.

The Pesticide Task Force elected to

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Vivienne Armentrout, Ph.D., is a plant pathologist, a consultant in least-toxic pest management, and a longtime citizen pesticide activist.

Ontario: Fighting Pesticide Use in Guelph . . .

by Clover Woods

The Guelph chapter of the Pesticide Action Group became active after children complained of feeling ill after their public school grounds were sprayed with pesticides (2,4-D and mecoprop) in late spring 1989. The group made presentations and petitions to the public school board to stop pesticide use, the media covered the "actions" of the group, and many people started contacting us with support and requests for alternatives to synthetic pesticides.

We learned a lot in the ensuing struggle to limit pesticide use in Guelph and elsewhere. When all was said and done, we got very little satisfaction from the local school board but a better response from minicipal bodies.

In both arenas we asked for a ban on pesticide use. The school board took two years to respond to our pleas but all we got for the substantial effort we put into to educating them was the promise of unspecified reductions in pesticide use. This is even less useful than it seems because we are unable to monitor what is actually ocurring. When it comes to mass exposure of children, really, a ban on pesticide use is the only responsible way to go.

Municipal officials set up a pesticide use review committee, which, after five months of intensive deliberation, recommended that the city ban the use of the phenoxy herbicides it was relying on at the time for broadleaf weed control. To our astonishment, the city simply refused to do so. Like the school board, it promised reductions, however, and it appears to be making good-faith attempts at implementing a number of alternatives, such as naturalizing some park areas, setting mowers higher, and performing more aeration and other maintenance chores to prevent problems before they start.

We spent a great deal of time researching the hazards of pesticides and the alternatives (this is a must). Groups that support the use of pesticides (i.e., the Ontario Corn Producers, various professors from the University of Guelph, chemical company representatives, and representatives from lawn maintenance companys like Chemlawn) tried to discredit what we were doing and reassure the public that pesticides are government regulated and scientifically tested and therefore safe. Of course, government registration is not a certification of safety, there being no government testing involved. These groups write letters and/or appeals to any and all bodies that we approach to stop pesticide use (the school boards, and all levels of government).

The media coverage about us sparked many letters to the editor in local papers, for and against us. This is a great opportunity to get information regarding pesticide hazards and alternatives in the public eye. There has been a steady coverage in our local papers over the past three years so take advantage of local press. Public information meetings can also be very good to get information and interest out. Neighborhood and church groups also appreciate speakers on "safe, alternative lawn maintenance."

Lobby government on all levels through letters and/or petitions. Avoid "task force/review panel" type ideas when asking your workplace, school board, municipal councils, or other levels of government to stop synthetic pesticide use. Simply ask any or all of the above to stop. You should have your reasons and alternatives well researched. Offer to work with staff or others on a committee, and so on only to find and implement alternatives.

The Pesticide Action Group has chapters in Guelph, Cambridge, Waterloo, Toronto, and North York. The PAG has worked with the Toronto Environmental Alliance (TEA) to produce the document, "Regulating the Urban Cosmetic Use of Synthetic Pesticides–An Action Plan for the Province of Ontario" (see resources listing elsewhere in this issue). The group that put this document together, the Urban Pesticide Caucus, presented it to the Ontario Minister of the Environment for approval in September 1991. We have been told they are reviewing it.

We are awaiting the Ontario Environmental Bill of Rights, and hope it will reinforce our rights to clean air, soil, water and quality of life, and protection from exposure to pesticides that jeopardize the safety of the previously mentioned.

What we can do

In all of our communities there are people whose very lives are in danger because of lawn care pesticide use. We can help them, our environment and the health of us all. We can stop using chemical pesticides and chemical fertilizers in our lawn maintenance programmes. There are alternatives:

1. Those who have contracted with commercial companies for lawn maintenance can ask the companies to use organic or natural products rather than man-made chemicals, and to treat problems only where and when needed. Be careful and ask lots of questions if you take this route. One definition of an "organic" substance (the academic chemical definition) is any substance that contains carbon. Many very dangerous pesticides are organic by this definition.

2. Do-it-yourselfers might consider changing a few maintenance techniques. Leave the grass longer–mow it regularly at a height of 2-1/2 to 3 inches. Mower blades should be kept sharp so as not to tear and damage the grass. Leave grass clippings to help nourish the other plants. Water infrequently but deeply, during early morning, so surface water can evaporate after dawn.

3. Consider replacing some or all lawn areas with low-maintenance, drought-resistant kinds of groundcover. There are many types of plants suited for this. Replanting can be done gradually.

Remember: pesticides are compounds manufactured for the sole purpose of destroying some form of life. All can have at least some toxicity in humankind (Goodman and Gilman, *The Pharmacological Basis of Therapeutics*).

Stopping lawn use

There are a number of steps you can take as an individual to stop the use of lawn pesicides in your neighborhood.

1. When you see a truck in your neighbourhood, write down the name of the company, the date, time, address of home being sprayed and truck licence plate.

2. Phone the local weather office and ask for the current wind speed and direction.

3. Call the lawn spray company and register your disapproval. Ask them to please phone you before applying chemicals next time.

4. Put pesticide information through your neighbour's mailbox, including your name, address, and phone number.

5. Call the city (preferably the mayor) or write and register your concern that there is no by-law in place to control this violation of your right to clean air and the enjoyment of your property.

Contacts

The Honourable Bob Rae, Premier of Ontario, Legislative Building, Queen's Park, Room 281, Toronto, Ontario M7A 1A1.

The Honourable Frances Lankin, Ontario Minister of Health, Hepburn Building, 10th Floor, 80 Grovesner St., Toronto, Ontario M7A 2C4.

The Honourable Ruth Grier, Minister of the Environment, 135 St. Clair Ave. W., 15th Floor, Toronto, Ontario M4V 1P5.

The Honourable Jean Charest, Minister of the Environment, Environment Canada, House of Commons, Ottawa, Ontario K1A 0A6.

Canadian Centre for Occupational Health and Safety, 250 Main St. E., Hamilton, Ontario L8N 1H5, 1-800-263-8276 (inquiry service and free chemical summaries).

Canada Pesticide Action Group, P.O. Box 22021, Westmount Postal Outlet, Waterloo, Ontario N2L 6J7.

Ministry of Environment, District Pesticides Control Officer, 119 King St. W., Hamilton, Ontario L8N 3Z9, 416-521-7658 (to register pesticide complaints).

Canadian Mortgage and Housing Corp., 613-748-2367 (information on housing for the environmentally sensitive).

National Center for Environmental Health Strategies, 1100 Rural Ave., Voorhees, NJ, 08043, 609-429-5358 (information and publications).

Canadian Organic Growers, Box 6408, Station J, Ottawa, Ontario K2A 3Y6 (information on alternative gardening, organic farms).

Canadian Environmental Law Association, 517 College St. #401, Toronto, Ontario M6G 4A2.

Greenpeace, 185 Spadina Ave., 6th Floor, Toronto, Ontario M5T 2C6, 416-345-8408.

Friends of the Earth, 701-251 Laurier Ave. W., Ottawa, Ontario K1P 5J6, 416-287-6144.

Pollution Probe, 12 Madison Ave., Toronto, Ontario M5R 2S1, 416-926-1907.

Agriculture Canada Pesticide Hotline, 1-800-267-6315 (to complain).

Asthma Society of Canada, Toronto, 416-977-9684.

Clover Woods is a member of the Pesticide Action Group, Guelph.

. . . and in Cambridge

by Bonnie Walter

Pesticides are registered in Canada by the federal government through Agriculture Canada. The provinces may further restrict, but not expand, on any use. The Provincial Ministry of the Environment amended reg. 751 of the Pesticides Act in 1988 to include requirements for pre- and post-spray signs on public land and post-spray signs on private property. This certainly alerted many people to the scope of the problem. The wind speed guideline remains at 11 kph.

Municipalities, when approached, usually fall back on the argument that they do not have the power under the Municipal Act to ban pesticide use on private property. As far as I know the provincial government is not about to grant them that power.

We had hoped, here in Cambridge (population 90,000) for a ban on pesticide use by the city on public property, which would have set an example for private citizens. But when the pesticide task force was set up in October 1990, its mandate was confined to parks only. There were eight people on the task force, activists, citizens, politicians, and parks staff. The meetings were at times confrontational and unpleasant. The single public hearing, where industry brought in its experts, was a gruelling four hours long.

It was apparent quite early in the process that an all-out ban was not to be hoped for, so a reluctant consensus was reached and council adopted the recommendations in February 1991. Mostly they were expressions of intent to look at using less pesticides and adopting integrated pest management.

A change to IPM is an improvement, but IPM as a political reality has its drawbacks. It is open to interpretation because it calls for considerable expertise, it may cloak almost the same amount of chemical use and is nearly impossible for an outsider to monitor.

In nearby Waterloo (population 79,000) a similar process took place, but Waterloo's task force had an astonishing 19 members, mostly male, and was seriously polarized even before meetings began. Their recommendations, which had to be reached by voting, resulted in little more than continuation of the status quo.

It has been suggested that task forces and the like are only public relations exercises. There may be some truth to this. Probably the most positive result, where the local press covers the issue in a reasonable manner, is that the public has been alerted to the seriousness of the problem.

Our hopes were perhaps too high due to political naivete. But then, without belabouring the point, most of us are women, as 80 percent of grassroots groups are. To find ourselves forced into adversarial positions with mostly male establishment figures is exhausting and emotionally draining, financially too. Indeed, one of the members of the Cambridge task force was quoted saying, "The concern over pesticides was the result of a few hysterical voices"–and this while the task force were still going on!

This has turned into a cautionary tale, I find. But rather than trying to prevent anyone from going the route we did, which *must* somewhere produce significant results, I hope that our experiences will forearm them.

My own opinion, finally, is this. The information on the health and environmental effects of pesticides has been out of the realm of the arcane for years, and any municipality with the least awareness of environmental issues could avail itself of this knowledge and legitimately, and with impunity, ban pesticide use on public lands without delay. Convincing elected officials of this is the hard part.

For our own part, we've done what we can at the municipal and provincial level (the Ontario Action Plan–see the resources section elsewhere in this issue) and must now concentrate on public education.

Bonnie Walter is a member of the Pesticide Action Group, Cambridge.

Bulletin of Pollution Prevention

Reg Gilbert
editing, design, production

Pollution Prevention Project

Tony Luppino
research writer

Karen Murphy
field coordinator

Great Lakes United

Buffalo State College, Cassety Hall
1300 Elmwood Ave., Buffalo, N.Y. 14222, or
P.O. Box 548, Station A,
Windsor, Ontario N9A6M6

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Sevin and the Power of Public Opinion in Buffalo

by Karen Murphy

The struggle for safe, effective pest management in Buffalo has been underway for two years now, resulting in both success and frustration. On the one hand, broadcast spraying of the city's trees with synthetic pesticides has been nearly ended. On the other hand, the city still has not developed and integrated pest management plan, and it has no plans to do so. Ours is the story of trying to change pesticide use by an administration that is hostile to such change.

It all started with private meetings by Buffalo citizens worried about the city's use of Sevin, a particularly dangerous carbamate insecticide, to kill the elm leaf beetle. Working with two members of the Common Council, the city's legislative body, we developed and the council passed an ordinance establishing an integrated pest management policy for the city.

In the legislation we term the policy "least toxic pest management," to make sure there is no confusion that the aim of the policy is to reduce, not simply "manage," pesticide use. We did not want IPM to be interpreted the way the chemical industry has been trying to redefine it, as integrated *chemical* management.

The ordinance set up a nine-member volunteer "Pest Management Board" to advise city departments and residents on least toxic pest control methods. The board has a small publications budget and is given about half a day's assistance per week by council staff. Two members are selected by the mayor, five by the Common Council, and one by the city's Environmental Management Commission, a volunteer "conscience of the city" body set up by the council.

Our initial task was to ensure that the appointees were, first, committed to the philosophy of least toxic pest management, and second, drawn from diverse backgrounds. We were successful in this. The board includes two environmentalists, an attorney, a cancer researcher, a biology professor, a representative from an organization involved in worker health issues, a representative from the cooperative extension, and two representatives from the city bureaucracy.

Initially we broke the committee up into three subcommittees concerned with school pesticide use, elm leaf beetle control, and assessment of current city pest management practices. This year we decided to establish a fourth subcommittee for long-range planning and public education and outreach.

At first we focused on developing:

1. An IPM elm leaf beetle program
2. IPM bid specifications for the schools
3. Public education on IPM lawn care options
4. A survey of all pest management programs run by the city's various departments.

"Cooperation"

Cooperation was the key word during our first year and a half of work. We had regular, open dialogue and exchange of information with both city and school staff. Eventually, however, we realized that all of our talking, all our cooperating, was having no lasting impact on the pest management practices of any executive body.

Buffalo government is probably like that of many other cities: operating with insufficient resources, burdened by too many patronage jobs, and hampered by city workers poorly trained for many of the jobs they do. Integrated pest management, which requires political and professional commitment, openness to change, accountability, and some initial financial investment, does not thrive very well in such an atmosphere, if at all.

The Parks Department's initial stabs at least toxic pest control were not characterized by an enlightened, integrated approach. The city decided to use Bt and later insecticidal soap to control elm leaf beetles in the 1990 and 1991 spraying seasons. This was only a chemical substitution program. There was no monitoring carried out, no action thresholds established, and no worker training in application of insecticidal materials. The Bt manufacturer conducted a review of the city's 1990 spray program and found that the material was applied at the wrong time and in insufficient amounts. Our subsequent reviews confirmed these findings.

Our proposals

To address the deficiencies of the previous two years' elm leaf beetle control programs, in 1992 we presented the Parks Department and the Common Council with a formal IPM program that included public education, monitoring, establishment of treatment thresholds, worker training, program evaluation, and a dual treatment program using less toxic chemicals. We estimated that the program would cost the city between $15,000 and $24,000 (not including the labor required to apply materials to the trees).

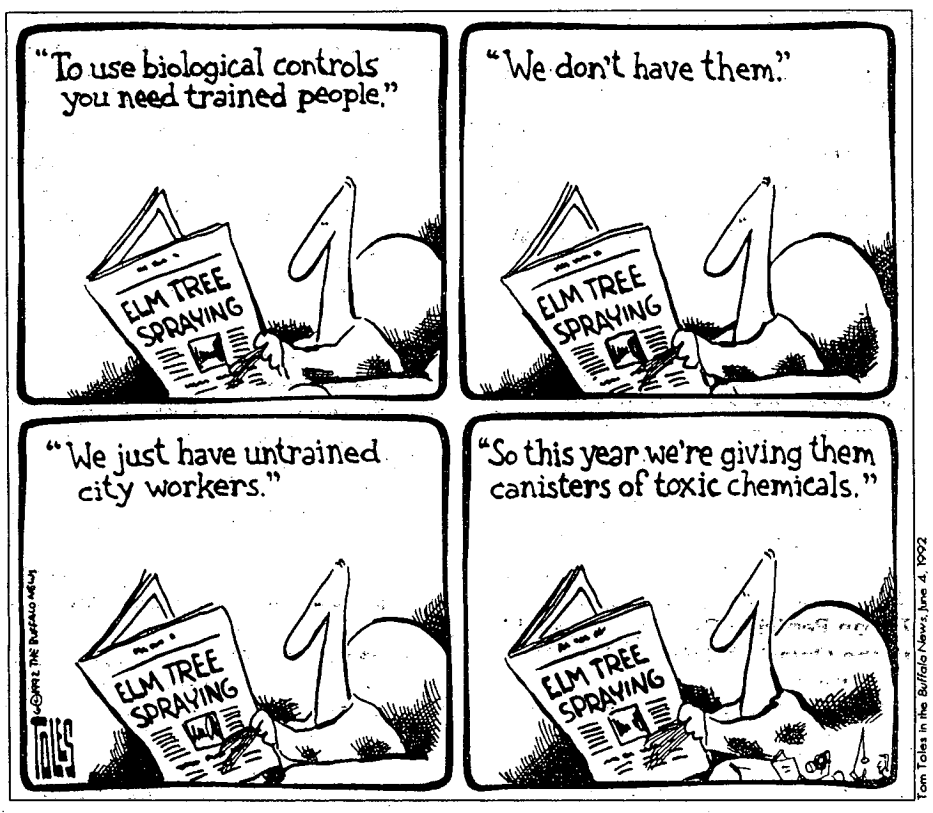
Despite its relatively low cost, our program faced two significant barriers: the city was facing its worst budget deficit since the 1970s, and the parks department had a huge stock of Sevin already on hand, making it harder to convince legislators to spend suddenly scarce money on a less toxic program. The parks commissioner would not support our proposed program, but did agree to conduct an IPM effort in a pilot area, if the council came up with extra money.

The council budgeted about $3,000 to conduct a pilot program on 300 trees involving only monitoring and spraying with Bt and horticultural oils. A local neighborhood group had already developed a program to band the trees with burlap.

The city carried out the program, and we are presently analyzing its success. It may not matter. In deliberations on the upcoming 1993 budget further efforts were left completely unfunded. The parks commissioner refused to ask for money for IPM in his budget, and the Common Council, faced with the specter of police and fire department layoffs, were unwilling to raise the issue. At mid-summer neither the council not the commissioner perceived that there was significant opposition to spraying among city residents.

The return of Sevin

With that mindset, the commissioner decided to revert to spraying Sevin during the 1992 season. The reason? The commissioner said that the "non-toxic just didn't work." We testified in detail to the Common Council and the commissioner on the dangers of Sevin, including strong associations with reproductive problems, birth defects, and both gastrointestinal and neurological reactions. We also explained the widely known drawbacks to foliar (on the leaf) application programs. Nonetheless, the commissioner made an implicit decision that Sevin's known health risks were less significant than damage that might occur to the trees, although the degree of potential damage and its effects on the trees has not been studied by the department.



An unfortunate underlying issue is the presence of almost 500 gallons and 450 pounds of unused Sevin stockpiled in city warehouses. The chemical will be a disposal liability if it is not used. Getting rid of it could cost as much as $1,000 for a 55-gallon drum.

The public takes a stand

The administration and to a lesser extent the council were not swayed to an alternative course of action. They did not think there was a constituency interested in least toxic pest management. We decided it was time to begin educating city residents about the proposed program and our recommendations. In newspapers and on television we spread the word on Sevin and explained the workability of our alternative.

The independent efforts of the Richmond Neighborhood Association meshed perfectly with this effort. The group had worked throughout the winter to organize its own elm tree treatment program, which involved placing burlap at the base of the elm trees to capture beetle larvae. The group had requested early on not to be included in the city's spraying plans, and the burlap program and the community spirit involved in carrying it out were well-covered by the media in throughout the spring. In effect, the group demonstrated to city residents that they could take their own, non-toxic steps to control elm leaf beetles.

As a result of this groundwork and our efforts, conditions were ripe for a political firestorm when it became clear that the city was planning to spray Sevin on the elm trees again. Hundreds of calls poured into councilmembers' and Parks Department offices. Eight of the nine councilmembers asked that their districts be withdrawn from the treatment program. The parks commissioner consented. Several councilmembers raised additional funds to place burlap and other types of bands around the trees, and then applied them with the help of dozens of volunteers.

Then, barely two weeks after the commissioner promised not to spray and after the councilmembers and volunteers had spent hundreds of hours banding trees, the spray crews came out after all, to spray "selected" trees for residents requesting it. The commissioner had completely missed the point—fear of general exposure.

The parks department's arrogance and deceit ignited a further storm of protest, finally forcing councilmembers to realize that spraying Sevin had to stop. They are now considering legislation banning city use of certain chemicals. The next step is to make the council imderstand that IPM is a budgetary issue.

Our experience has taught us the following lessons:

- For all its offical powerlessness, an advisory board can still be very useful. Committed members can make it an excellent tool for developing model programs, evaluating health and environmental impacts, drafting legislation, testifying at hearings, and speaking with the press.

- However, like any tool, an advisory board needs an agent—in this case public concern—to put it to good use. An advisory board *must* have a constituent base if it is to be effective. In the unlikely event that government is enthusiastic about implementing a program, this might not be so important. But when it is indifferent or even hostile to changing its use of pesticides, a constituent base is essential to demonstrate to politicians that there is a real desire for change by the public.

- Citizens must work to ensure that appointed board members are committed to the legislation's objectives. We know of jurisdictions that have copied our legislation and appointed a board uncommitted to IPM and reducing pesticide use. Needless to say, in those places no substantive reforms in pesticide use are taking place.

- Advisory boards must be careful not to fall into the trap of "cooperation lethargy." Bring issues before the public and create a public debate about programs you develop. Our parks commissioner is very good at attending meetings, "cooperating." But when it comes to the nuts and bolts—supporting a program with money and labor—his real feelings on the issue become very clear.

- Advisory boards can create a climate for change by actively educating city leaders, the press, and the public. We have decided that a primary area of our work in the coming year will be on outreach and education. We have targeted three groups: community leaders, neighborhood associations, and the media. It has become clear to us that we can best change administration policies by first changing private sector programs and city residents' attitudes.

- Effective IPM programs require

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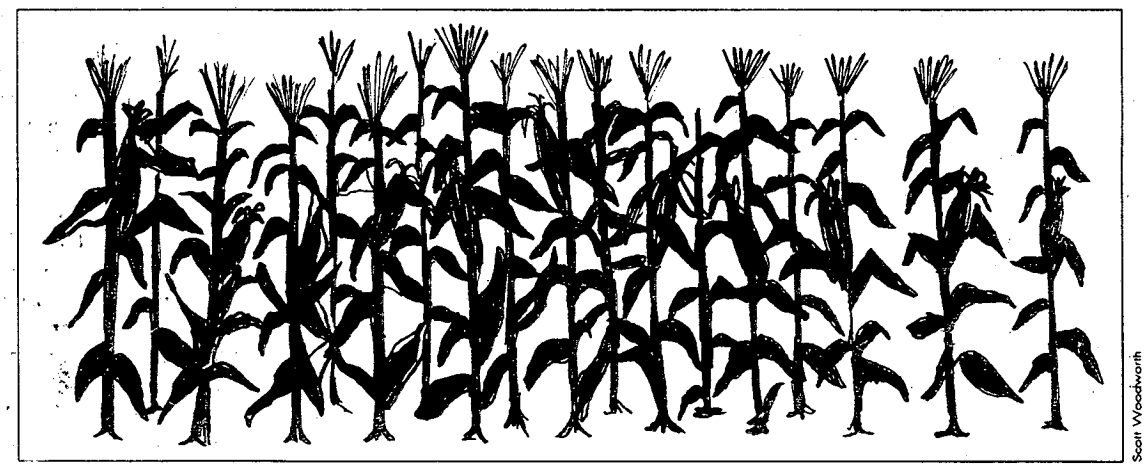
Karen Murphy is chair of the Buffalo Pest Management Board and a Great Lakes United field coordinator.

Herbicides and "Ridge Tillage" Duke It Out in Iowa

by Reg Gilbert

Agriculture accounts for more than half of America's use of herbicides, and some Iowa corn and soybean farmers are trying to do something about it.

The self-help Practical Farmers of Iowa (PFI) work with Iowa State University to design on-farm tests of various low- or no-herbicide farming techniques and to analyze their results. According to Rick Exner, an Iowa State scientist working for the program, the aim is to create and encourage farming methods that are "both profitable and environmentally sound."



Scott Woodworth

Farmers use herbicides to control weeds because they compete with crops for nutrients, light, and moisture, potentially causing serious reductions in crop yields. Practical Farmers tries to reduce the need for herbicides by developing sophisticated forms of tillage (methods for ploughing the soil and tending crop seedlings), seeding rate (the number of seeds planted per inch of row) and crop rotation (planting different crops on the land each season).

The program also brings PFI members into classes and before young people's farming organizations like the Future Farmers of America in order to expose young farmers to low- and no-pesticide farming strategies.

The Iowa program is driven by the PFI member concerns that pesticide exposure may be bad for the long-term health of the fields and the people who work in them. The program's premise, however, is the possibility of making changes in pesticide use that generate savings as well as safety.

Herbicide purchase and application (usually only one application per season is required) can cost up to $30 an acre. Crop-production costs for Iowa corn, given typical land and labor costs, might run $300 per acre for a yield of about 140 bushels selling at $2.40 each—a total of around $340 income per acre. Given the vicissitudes of farming, that yield provides only a razor-thin margin of profit, so money saved by reducing or eliminating the use of herbicides has the potential for substantial economic benefit to the farmer.

The starting point for many farmers using PFI-developed techniques is banding, the practice of applying herbicides only on the actual crop row. This can reduce herbicide use by as much as two-thirds.

Many of the techniques under development by the PFI program involve refinement of "ridge tillage." Under ridge tillage, the crop is planted with no prior disturbance of the soil into the ridge left from the previous crop. Using the right machinery, appropriate crop strains, proper timing, and suitable planting densities, it is possible to remove the previous year's weed seeds from the row zone, discourage the germination of weed seeds, and eliminate sprouted weeds.

Such efforts do reduce costs. Iowa State studies of the 1987 to 1991 seasons indicate virtually no decrease in crop yield. Two dozen trials during the 1989 to 1991 period showed savings of $7.45 and $7.81 per acre in production costs for corn and soybeans respectively.

However, the low- and no-pesticide methods are somewhat more labor and management intensive than applying herbicides, and the degree to which this is the case for a particular crop in particular soil and nutrient conditions determines the feasibility of the alternative methods.

Nonchemical weed control's biggest problem as applied to row crops is that it may raise per-acre labor requirements by 5 to 25 percent. The extra labor's cost is usually more than offset by not having to buy herbicides, but the difficulty is the availability of that labor and the machinery laborers operate: many farming communities face shortages of both at critical times in the farming cycle.

The bottom line is that most farmers today feel they cannot afford practices, even when they net them more profit per acre, if, by their labor or machinery requirements, they limit the amount of land they can put into production.

San Diego's 172 Schools Are Almost Pesticide-Free

by Becky Riley,
Northwest Coalition for Alternatives to Pesticides, and
Sharon Taylor,
Environmental Health Coalition

San Diego's 172 public school sites are safer for children thanks to three years of collaboration between the Environmental Health Coalition and the San Diego Unified School District.

The San Diego school board formally adopted an integrated pest management (IPM) policy for grounds and building maintenance in October 1991, but work with the school district safety office and the district's grounds and maintenance personnel had already led to a significant reduction of pesticide use.

In fact, the receptivity of district pest management personnel to pesticide use reduction goals and practices was a key factor in the success of the coalition's effort to get a district policy. In addition, the teacher's union unanimously supported the new policy. The National Education Association and the national Parent Teachers Association backed resolutions endorsing the concept of IPM for schools.

Although many procedures are already informally in place in the district, they will be reviewed and formally written up for inclusion in district procedures manuals. Training in IPM techniques for all San Diego County school pest management personnel was conducted in May in an all-day session with consultant Sheila Daar from the Bio-Integral Resource Center in Berkeley, California.

Meanwhile, the district is so confident that its new program will be successful that it recently let its pesticide applicator's licenses expire and will readvertise its current service contract using language consistent with the IPM policy. Operations staff are now responsible for training other district pest management personnel about the new policy and pest control procedures. The coalition is working with the PTA and other groups to set up an oversight committee to review implementation of the new policy.

The major pest problems faced by the San Diego schools include ants, roaches, fleas, mice, rats, weeds, and turf disease. These problems are being addressed through methods that include the use of sticky traps, caulking, proper sanitation and food storage procedures, and proper landscape design.

One pest exclusion plan presented to the board is the "Kids Coffee Can Campaign," in which students bring in empty coffee cans with tight-fitting lids for storage of fish or mouse food and edible art supplies like macaroni. No one is allowed to bring their (potentially flea-infested) pets to school. Several district schools have already assigned specific eating areas outdoors to avoid classroom pest problems.

Free consulting services by the San Diego County Environmental Health Department are available to the schools. The department has already adopted an IPM policy for disease-carrying pests (mosquitoes, rats, squirrels, etc.), thanks to an earlier effort by the Environmental Health Coalition.

EHC's advice to other groups advocating pesticide use reduction in their schools: "Don't try to do much too fast."

Groups and parents should first get their districts to adopt a general policy statement endorsing IPM and pesticide use reduction concepts. Then take more time to work with district maintenance personnel, teachers, and others to allow broad input and build support for the particular procedures to be adopted under the policy.

For more information, contact the Environmental Health Coalition, 1717 Kettner Blvd. #101, San Diego, CA 92101, 619-235-0281. EHC sells a "School Pesticide Use Reduction Guide" for $12, and both the guide and a slide show for $95.

. . . IPM in Ann Arbor

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focus on the practices of government itself for a reason that has changed but is still applicable today: threatened "preemption." From 1986 until just last year it was widely believed that the federal courts would eventually rule that local ordinances governing *commercial* application of pesticides would be rendered invalid by federal pesticide law. Such a ruling, however, would not affect internal government policies, which are regulation of the *public* use of pesticides.

In 1991 the Supreme Court ruled that there was no federal preemption, but legislation to bring it about anyway has now been introduced in Congress and is also under consideration in some states (one such bill has already been passed by the Michigan Senate). Given the power of the chemical companies on the national and some state levels, what was true in 1986 is true today: modifying the pesticide use policies of government itself is the only pest management reform guaranteed to stand the test of time. Citizens might consider working on government pesticide use as the first step in any pesticide-related activism.

Ann Arbor's new policies have had many beneficial effects, some planned, others not. Administrators, initially reluctant, have found that the policies help them respond to citizen inquiries and complaints. Standards set at the government level have caused subtle changes in the general perception of pesticides in Ann Arbor. Notification has had a direct public education benefit. The policies function without potential state or federal interference. And there has been a notable reduction in pesticide use in Ann Arbor.

. . . Sevin and the Buffalo Public

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> leadership and commitment from management and, at a minimum, interest from workers. We have neither in Buffalo and it is our greatest barrier to reforming pest management programs within the city Parks Department. We have reached the conclusion that as individuals we have to look at fundamentally changing the city structure if we want to see positive change in city use of pesticides.
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> * * *

At this point the most effective law for us is one that bans the use of Sevin to control the elm leaf beetle. Such a policy has drawbacks: it can create animosity between our advisory body and the departments we are supposed to advise; it can fundamentally set back movement towards government adoption of an IPM approach because it implies a lack of trust, and without trust you cannot have accountability; and it can create public resentment against less toxic pest management programs when city unwillingness to learn how to use less toxic methods results in unabated pest problems.

However, in Buffalo the issue is now one of public protection.