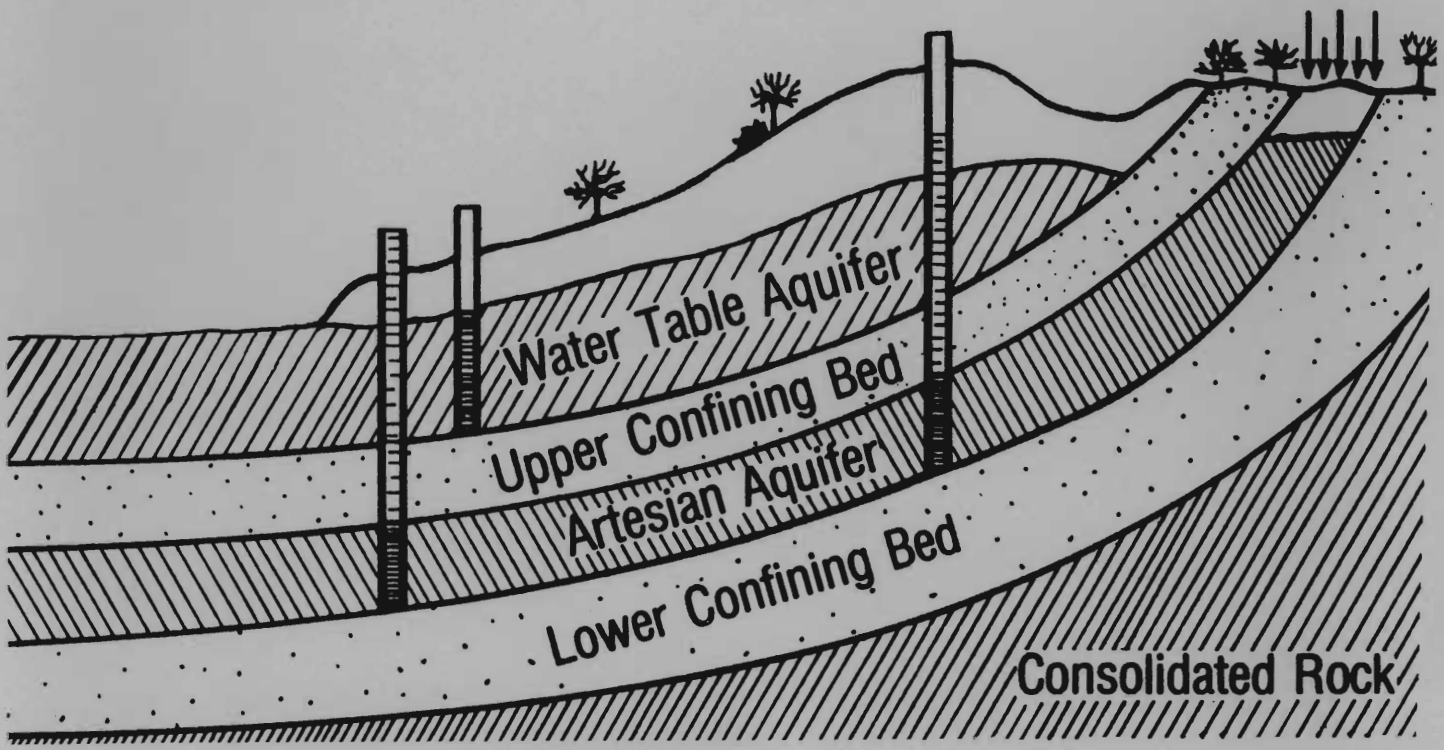
NJ Department of Environmental Protection

PESTICIDES IN NEW JERSEY:

Implications in Groundwater Quality



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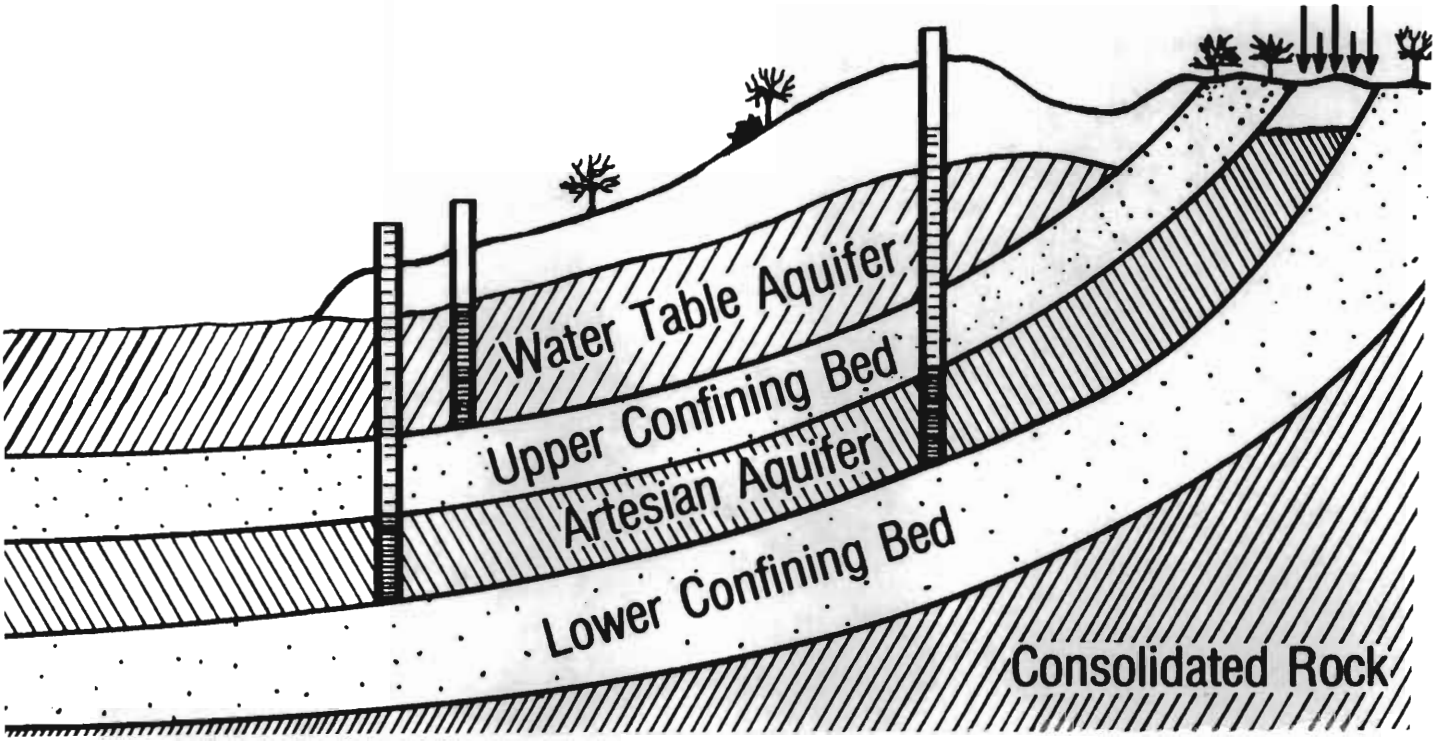

Office of Science and Research

PESTICIDE USE IN NEW JERSEY:

IMPLICATIONS FOR GROUNDWATER QUALITY

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ABSTRACT

The normal use of pesticides may result in contamination of groundwater. The potential for such contamination in New Jersey was investigated here by coallating and perusing the chemical characteristics of 150 pesticides. This list of pesticides was compiled by scientists at New Jersey Department of Environmental Protection/Office of Science and Research (NJDEP/OSR) and relinquished to researchers at Rutgers University for further investigation.

A thorough literature search was completed for each compound to assimilate all the available data aquired through known research efforts in the field. Communication with officials at regulatory agencies like the Environmental Protection Agency (EPA) was conducted also to determine whether any of the pesticides was monitored for its presence in groundwater in any state, and, if so, whether it was detected in significant concentrations.

A set of criteria, described in detail in the methodology section of this report, was assembled and used to classify the pesticides as leachers, potential leachers, not likely leachers and non-leachers. From this classification scheme and from information regarding New Jersey's hydrogeology, the compounds were predicted to be potential contaminants, small threats, no threats, and unknown threats to New Jersey groundwater resources.

The overall purpose of this report was to evaluate the potential of the given pesticides to leach through soils, given the available data in the literature. From this data source, estimations were made regarding the compounds' likelihood to contaminate aquifers used as drinking water sources in New Jersey.

INTRODUCTION

To date, 23 states have discovered a total of 17 pesticides in groundwater as a result of non-point source agricultural practices (Cohen, S.Z., et. al., 1986). Compounds included in this report which have been detected in groundwater elsewhere are:

TABLE 1

COMPOUND	CONCENTRATION (PPB)	STATES
alachlor	0.1-10	IA,MD,NE,PA
aldicarb	1-50	AR,AZ,CA,FL, MA,ME,NC,NJ, NY,OR,RI,TX, VA,WA,WI
atrazine	0.3-3	IA,MD,NE,PA,WI
bromacil	300	FL
carbofuran	1-50	MD,NY,WI
cyanazine	0.1-1	IA,PA
DBCP	0.02-20	AZ,CA,HI,MD,SC
DCPA	50-700	NY
1,2-dichloroprop.	1-50	CA,MD,WA
dinoseb	1-5	NY
dyfonate	0.1	IA
metolachlor	0.1-0.4	IA,PA
metribuzin	1-4.3	IA
oxamyl	5-65	NY,RI
picloram	1-50	NE,WA,WVA,Ont.
simazine	0.2-3	CA,MD,PA

Compounds that have been detected in groundwater and are not included in the report are:

TABLE 2

EDB (banned in US)	0.05-20	AZ,CA,CT,FL,GA, MA,SC,WA
1,2,3-trichloropropane (banned in US)	0.1-5	CA,HI

It is apparant from these tables that some pesticides pose a significant threat to groundwater resources throughout the United States.

Most states do not determine which pesticides being used may be leachers until the chemicals have been found in groundwater samples. In New Jersey, scientists are concerned with determining what pesticides may leach before their detection in groundwater. Groundwater monitoring programs are being run in addition. In this way, regulatory officials can monitor those pesticides which pose a threat to grounwater resources before these compounds have an opportunity to reach the water table.

PESTICIDES

The importance of combating pests in agricultural crops is undisputed. Currently, the most widely employed technology is the application of agricultural chemicals specific for the elimination of a particular pest, i.e. fungus, insect or weed. However, these poisons may also be harmful to non-target organisms such as human beings.

There are a number of routes through which the human population may become inadvertently exposed to pesticides. The route being examined in this report is drinking water supplied via underground aquifers. Leachable pesticides applied to vulnerable areas may pose a threat to human beings using the underlying aquifer as a drinking water source.

It is difficult to determine the pesticides which are being used currently in New Jersey. No records are available in this state indicating what pesticides are actually used and in what quantities they are applied. However, the Bureau of Pesticide Control (BPC) has recently initiated a Pesticide Survey in 1986 asking farmers throughout New Jersey to report the types, quantities and formulations of the pesticides they use. This data base will be an invaluable resource for future projects. This report relied on the pesticide recommendations published by Rutgers Cooperative Extension Service for field, fruit and vegetable crops in order to determine which pesticides are recommended for use in New Jersey. Most farmers follow a pesticide program described in these publications.

HYDROGEOLOGY OF NEW JERSEY

The geology and hydrogeology of parts of New Jersey are conducive to contamination by mobile compounds. Especially vulnerable is the Coastal Plain portion of the state which begins at the Fall Line in the central region and extends to the state's

southernmost tip.

Several major aquifers and confining beds have been identified and classified in these Coastal Bed deposits. Their ages range from Cretaceous through Holocene (Zapecza, 1984). The soils in this area are comprised of a seaward-dipping and seaward-thickening wedge of unconsolidated deposits of sand, silt and clay. These deposits are arranged in parallel beds and overlay a hard crystalline bedrock (Gill, H.W., 1962; Gill, H.W., 1963; Vowinkel, E.F. & Foster, W.K., 1981; and Widmer, K., 1964).

The outcrop areas of aquifers are especially prone to contamination problems and are often sampled first in monitoring programs. These areas in New Jersey are characterized by shallow water tables and sandy, acidic soils (Uchrin & Mangels, 1986). Since most of the recharge to an aquifer occurs in its outcrop region, the quality of the water here is vital. The water here is also most vulnerable to contamination.

METHODOLOGY

The list of 150 pesticides compiled by NJDEP/OSR scientists was evaluated by a specified criteria. These criteria included examination of the chemical characteristics of the pesticides, their use and prevalence in New Jersey, and their detection in the groundwater of other states. These parameters will be discussed in detail below. Leachability classification of the pesticides was based on:

1. chemical characteristics,
2. use in New Jersey,
3. hydrogeology of vulnerable areas in New Jersey,
4. detection in other states,
5. EPA's leaching assessments.

Researchers at EPA in Washington, D.C. have completed leaching assessments on some of the pesticides included in this report. Using information offered from pesticide manufacturers through a data call-in program, researchers were able to prioritize pesticides which they felt posed the most significant threat to groundwater throughout the country. These prioritizations were based predominantly on chemical characteristics with significant weighting given to compounds detected in the groundwater of states which have initiated monitoring programs. Priority I chemicals are described as likely leachers. Priority II chemicals are also likely leachers, but data gaps make the categorization inconclusive. Priorities III and IV represent those compounds which are probably not leachers or have a small potential to leach.

Emphasis was placed on these leaching priorities assigned by

EPA. Much of the data used in these assignments was inaccessible to Rutgers staff, since the data call-in program is confidential. Whenever possible, Patricia Ott of the Bureau of Pesticides Programs at USEPA supplied necessary information. She is in charge of producing "one-liner" files which sum up data retrieved from the manufacturers for the data call-in program.

The criteria used in this project for determining the leachability of the 150 compounds were taken from those described by I. Pomerantz (Pesticides and Toxic Substances Bureau, USEPA, 1984) and are described below:

- water solubility greater than 30 ppm

It has been observed that the more water soluble compounds are more mobile through the soil profile. It follows that compounds having a relatively high aqueous solubility may move laterally with water through soil.

- K_d less than 5

This is the soil-water distribution coefficient or adsorption constant. Its value is calculated from column leaching or thin layer chromatography studies (Cohen, 1985; EPA, 1986; Kenenga, 1980; and Ott, 1986). A low K_d value signifies a relatively poorly adsorbed compound. Consequently, a low K_d value may indicate that a compound is mobile through soil.

Simply, a basic proportionality equation can be used to describe the distribution between two phases, in this case, between soil and water:

$$x/m = K_d C_{eq}$$

(Hamaker & Thompson, 1972)

where x/m is the amount of organic compound adsorbed per unit weight of soil, K_d is the distribution constant, and C_{eq} is the equilibrium solution concentration.

It is useful to know the soil type used in experiments designed to calculate K_d, since K_d changes with the soil type used. However, the soil characteristics were seldom delineated in the literature reviewed.

- K_{oc} less than 500

This value represents the soil-water distribution coefficient divided by the organic carbon content of the media used in experimentation. Once again, soil type is valuable information but seldom specified in the reports. K_{oc} can be calculated in a

number of ways, two of which are presented below:

$$\log k_{oc} = 3.64 - 0.55 \text{ (log water solubility in ppm)} + 1.23$$

(Kenega, 1980).

and

$$K_{oc} = \frac{x/m \text{ (ug/g of organic carbon)}}{C_{eq}} = \frac{K_d \text{ (ug/g of soil)}}{\% \text{ organic carbon}} \times 100$$

(Hamaker & Thompson, 1972).

K_{oc} is usually a more definitive measure of adsorptive capacity of a compound onto a particular soil than is K_d because K_{oc} measures the adsorption per unit organic carbon. Organic carbon and adsorption by soil are positively correlated.

While K_d values for high organic soils tend to be much larger than those for other soil types, K_{oc} values are generally lower. Hamaker and Thompson (1972) suggest that this phenomenon may be due to loss of surface area when organic matter coagulates in high organic soils. This would limit the adsorbing surface per unit weight of organic carbon.

High K_d and high K_{oc} values are generally indicative that adsorption of the compound onto organic matter is occuring to a significant degree.

- mobility

Charles Helling (1968) devised a mobility classification scheme, based on thin-layer chromatography, which is being used by EPA in its assessment of pesticides. The basic outline is:

class 5	very mobile
class 4	mobile
class 3	intermediate mobility
class 2	slightly mobile
class 1	immobile

Only a limited number of pesticides have been analyzed by this technique. Those that have been are listed in this report.

- hydrolysis half-life greater than 25 weeks

The hydrolysis half-life is the time required for one-half of the applied compound to undergo hydrolysis. The hydrolysis phenomenon involves the reaction of a water molecule with another molecule resulting in the net release of hydrogen ion, H^+, or in the uptake of hydroxy ion, OH^-, or both. Pertaining to adsorption of organic compounds onto soil constituents, hydrolyzed species tend to be preferentially adsorbed onto surfaces as compared to the free ion species. Accordingly, a pesticide which hydrolyzes more rapidly in the soil, especially in the upper layers, has a better chance of being adsorbed than one which hydrolyzes at a slower rate or not at all.

-photolysis half-life greater than 1 week

The photolysis half-life is the time required for one-half of the applied compound to undergo photolysis. This parameter is not so important as the others listed because many compounds susceptible to decomposition by sunlight are soil-incorporated so do not have an opportunity to degrade by this route.

- soil half-life greater than 3 weeks

The soil half-life is the time required for one-half of the applied compound to dissipate by one-half the applied amount. It represents that compound's approximate persistence in the field. A relatively persistent compound is one whose soil half-life is greater than 3 weeks.

The fact that a compound leaches does not mean that it will contaminate groundwater resources. Soil half-life reflects a compound's propensity to be degraded either chemically or biologically as it travels laterally or vertically through the soil column. It is possible for the compound to be degraded before reaching the water table.

-has been found in groundwater

If a compound has already been found in groundwater, it is considered a leachable compound. Although this category was weighted heavily when a pesticide was reported as having been detected in groundwater, it was considered less significant when no reports could be located. Some states have not initiated groundwater monitoring programs. Of those states that have adopted such programs, many looked for a limited, specific list of compounds. The fact that a pesticide has not been detected in groundwater does not imply that it is or is not there. Rather, its presence is unknown.

After evaluation of the pesticides using these chemical data as the criteria for leaching, the compounds were categorized as leachers, potential leachers, not likely leachers and unknown leachers. These categories are described below:

LEACHER: a compound is described as a leacher if: its chemical characteritics are indicative of a leacher, as defined by the criteria; the research literature regarding its mobility and degradation indicates that it is mobile and persistent; and it has already been detected in groundwater.

POTENTIAL LEACHER: a compound is described as a potential leacher if: its chemical characteristics are indicative of a leacher, as defined by the criteria; and the research literature regarding its mobility and degradation indicates that it may be mobile and persistent. A potential leacher has not been detected in groundwater to date.

NOT LIKELY LEACHER: a compound is described as an unlikely leacher if: its chemical characteristics are not indicative of a leacher, as defined by the criteria; the research literature regarding its mobility and degradation indicates that it is immobile and not persistent; and it has not been detected in groundwater.

UNKNOWN LEACHER: a compound is described as having unknown leachability when insufficient data are available regarding its chemical characteristics and/or mobility, degradation and persistence.

The pesticides were further estimated as to their potential to contaminate New Jersey groundwater resources: 1) potential contaminant; 2) small threat; 3) no threat; and 4) unknown threat to New Jersey groundwater resources.

Leachers and potential leachers that are recommended for use in New Jersey are potential contaminants. Some compounds, due to their probable non-use in this state, are thought to exhibit a small threat to groundwater even when the compound is a potential leacher. Pesticides that are not likely leachers and are not used in New Jersey represent no threat to groundwater here.

RESULTS

A synopsis of the findings in this report is presented in tabular form below.

TABLE 3

POTENTIAL CONTAMINANTS OF NEW JERSEY GROUNDWATER

COMPOUND	LEACHING ASSESSMENT	RECOMMENDED FOR USE IN NJ
acephate	potential	yes
alachlor	leacher	yes
aldicarb	leacher	yes
atrazine	leacher	yes
bentazon	potential	yes
butylate	potential	yes
carbofuran	leacher	yes
carboxin	potential	yes
chloramben	potential	yes
chlorothalonil	potential	yes
chlorthal dimethyl	leacher	yes
cyanazine	leacher	yes
cycloate	potential	yes
dalapon	potential	yes
dicamba	potential	yes
1,2-dichloropropane	leacher	yes
dinoseb	leacher	yes
diphenamid	potential	yes
disulfoton	leacher	yes
diuron	potential	yes
ethoprop	potential	yes
fenamiphos	potential	yes
fonofos	potential	yes

formetanate	potential	yes
hexazinone	potential	yes
linuron	potential	yes
MCPA	potential	yes
methomyl	potential	yes
metolachlor	leacher	yes
metribuzin	leacher	yes
monocrotophos	potential	yes
napropamide	potential	yes
oxamyl	leacher	yes
oxydemedon-methyl	potential	yes
phosphamidon	potential	yes
pronamide	potential	yes
propazine	potential	yes
simazine	leacher	yes
terbacil	potential	yes

TABLE 4

SMALL THREAT TO NEW JERSEY GROUNDWATER

COMPOUND	LEACHING ASSESSMENT	RECOMMENDED FOR USE IN NJ
ametryne	potential	no
amitrole	unknown	no
ammonium sulfamate	potential	no
azinphos methyl	not likely	yes

bendiocarb	unknown	no
bufencarb	unknown	yes
carbaryl	not likely	yes
chlordimeform	unknown	no
chlorpyrifos	not likely	yes
dialifor	unknown	no
diallate	unknown	no
dicrotophos	unknown	yes
difenzoquat	not likely	no
diflubenzuron	not likely	yes
endothall	unknown	no
EPTC	unknown	yes
ethiofencarb	unknown	no
fluometuron	potential	no
fosthietan	unknown	no
isofenfos	not likely	yes
mefluidide	unknown	no
methiocarb	not likely	yes
monuron	potential	yes
neburon	unknown	no
paraquat	not likely	yes
phenmedipham	unknown	yes
phosmet	not likely	yes
prometone	potential	yes
propham	potential	no
propachlor	potential	yes
terbutryne	not likely	no

triallate	not likely	no
triadimefon	not likely	yes
ziram	unknown	no

TABLE 5

NO THREAT TO NEW JERSEY GROUNDWATER

COMPOUND	LEACHING ASSESSMENT	RECOMMENDED FOR USE IN NJ
aminocarb	not likely	no
diazinon	not likely	yes
diclofop methyl	not likely	no
dipropetryn	not likely	no
mobam	unknown	no
molinate	potential	no
prometryne	potential	no
simetryne	unknown	no
terbutol	not likely	no
thidiazuron	not likely	no
trifluralin	not likely	yes

TABLE 6

UNKNOWN THREAT TO NEW JERSEY GROUNDWATER

COMPOUND	LEACHING ASSESSMENT	RECOMMENDED FOR USE IN NJ
allidochlor	unknown	yes

anilazine	unknown	yes
aspon	unknown	no
asulam	potential	no
bromacil	leacher	no
bromoxynil	unknown	yes
cacodylic acid	unknown	no
calcium arsenate	unknown	no
carbophenothion	unknown	yes
chloropicrin	unknown	yes
chlormequat chloride	unknown	no
4-chloropyridine	unknown	no
chlorpropham	unknown	yes
crotoxyphos	unknown	no
cryolite	unknown	no
dazomet	unknown	no
demeton	unknown	yes
desmedipham	unknown	no
dichlone	unknown	yes
dichloran	unknown	yes
dichlorbenil	unknown	yes
1,3-dichloropropene	unknown	yes
dimethoate	unknown	yes
dinocap	unknown	yes
diquat	unknown	yes
DSMA	unknown	no
fenaminosulf	unknown	yes
fensulfothion	unknown	yes
ferbam	unknown	yes

fosamine ammonium	unknown	no
lead arsenate	unknown	yes
maleic hydrazide	potential	no
mecoprop	unknown	yes
metam-sodium	unknown	yes
methidathion	unknown	yes
methyl bromide	unknown	yes
methyl isothiocyanate	unknown	yes
mevinphos	unknown	yes
MSMA	unknown	no
naptalam	unknown	yes
pebulate	unknown	yes
phorate	unknown	yes
picloram	leacher	no
propanil	unknown	no
siduron	unknown	no
tebuthiuron	potential	no
thiabendazol	unknown	yes
trichlorfon	unknown	yes
2,3,6-TBA	unknown	no

ACEPHATE (30560-19-1)

O,S-dimethyl acetylphosphoamidothioate

A systemic insecticide, acephate is better known by its trade name, ORTHENE. It has moderate persistence with residual activity lasting 10-15 days (5).

Acephate has demonstrated leaching characteristics in the laboratory (1) but has not to date been detected in the groundwater of any state that has monitored for it.

EPA considers this pesticide a potential leacher. Its chemical characteristics are indicative of a leaching compound. It is currently recommended for use on vegetables and soybeans in New Jersey (2,3,4).

	Acephate	Concern Level
solubility	790,000 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	3 (calc)	< 500
hydrolysis t 1/2	2-8	> 25 wks
soil t 1/2	8 (field)	> 3 wks
photolysis t 1/2	< 1-4	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

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ALACHLOR (15972-60-8)

2-chloro-2',6'-dithyl-N-(methoxymethyl)-acetanilide

Alachlor, or LASSO, has been detected in the groundwater of four states (Iowa, Nebraska, Pennsylvania, and Maryland) (2,3,5,6,7,8,11,13,14,15,19,20). Although there is discrepancy in the scant literature on this herbicide's mobility, the fact that it has been detected in states where it is used (usually in combination with atrazine), warrants its classification as a leacher.

No researcher has reported that alachlor will not move through the soil. However, Wu (1980) and Hayden & Smith (1980) report that degradation and volatilization occur too rapidly for leaching to pose a significant threat. Putnam & Rice (1979) on the other hand, describe alachlor as a ready leacher with volatility having an insignificant effect on dissipation in the field. Other studies show that alachlor may move through the soil, and that it is not biomagnified in the food chain (23). Researchers at EPA consider this compound a leacher and have classified it as priority I.

LASSO is recommended for preplant use on corn crops in combination with atrazine, and on soybean crops in combination with linuron or chloramben. It is also recommended for use on vegetable crops in New Jersey (10, 12, 18).

	Alachlor	Concern Level
solubility	245 (25°C)	> 30 ppm
K_d	0.6-8.1	< 5
K_{oc}	213	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	1-10 wks	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	yes	

LEACHER : potential contaminant in N.J. groundwater

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ALDICARB (116-06-3)

2-methyl-2-(methylthio) propionaldehyde O-(methyl carbamoyl) oxime

Aldicarb, also known by the manufacturer's name TEMIK is a systemic insecticide, acaricide and nematicide usually applied directly to soil. It is especially useful for control of the Colorado Potato Beetle and the Golden Nematode. Although used on other crops, aldicarb has been employed primarily on potato crops.

This compound is one of the most water soluble of the non-fumigant insecticides, and it is moderately persistent in soil. Aldicarb is almost indisputably a leacher. It has been detected in the ground water of 15 states to date including New Jersey (3,5,6,7,9,10,11,12,13,14,16,17,18,23,26,27,28,29, 30,32,33,36). These states are: Arizona, California, Florida, Maine, Missouri, North Carolina, New Jersey, New York, Oregon, Rhode Island, Texas, Virginia, Washington and Wisconsin. Levels detected in these states ranged from 1-50 ppb total aldicarb residues (6). The findings have not been in public wells but rather seem to be restricted to observation, irrigation and private domestic wells (6).

The copious research literature on aldicarb describes this compound as weakly adsorbed and readily mobile (1,2,19,35). Generally, aldicarb is quickly degraded to its sulfoxide and sulfone which may be further broken down, albeit much more slowly, to the oxime. States which have detected aldicarb in water have usually analyzed for total aldicarb thereby ensuring that the sulfoxide and sulfone are included. Jones (1985) points out that most aldicarb residues degrade in the upper portion of the unsaturated zone. Further, he purports in another study (19) that most, if not all, aldicarb residues will degrade in this zone with half-lives of 0.5 and 2.0 months ensuring their absence in drinking water supplies.

Aldicarb is apparantly retained by loam and clay soils but not by sandy and peat soils. This phenomenon has been attributed to water flow, in conjunction with physical binding ofthe compound to soil particles. Researchers conducting laboratory studies have observed that aldicarb is more readily leached through columns of sandy, sandy-loam and peat soils than through those of loam and clay soils (1,2). Accordingly, Uchrin & Mangels (1985), who conducted a laboratory batch study using sandy and sandy loam New Jersey soils, observed that these types of soils demonstrate little affinity for aldicarb residues.

Jones et. al. (1985) offered an application modification of TEMIK to reduce its potential to leach through the soil. They found that top-dressing emergence application of the insecticide

resulted in less leaching and shorter degradative half-life than early in-furrow application at planting. Wyman and co-workers observed the effect of two different irrigation schemes on leaching when aldicarb was applied as a top-dress at plant emergence. Not surprisingly, excess irrigation increased the downward movement of aldicarb.

Aldicarb may be used in some parts of New Jersey with some restrictions. These modifications, advised by Union Carbide, restrict the application rate and timing and consider site location for aldicarb application. Farms near private wells used for drinking water for instance, are not recommended to use aldicarb. Union Carbide sampled wells in New Jersey in 1980 and 1983 and found two irrigation wells and one domestic well showing residues of 3.4 and 50 ppb. Follow-up sampling of these sites in 1983 and 1984 showed no detectable concentrations of the compound. The New Jersey State Department of Health (DOH) sampled wells in 1984 and found two sites having residues < 10 ppb and one having 18 ppb (Rosenman, 1985).

This compound should be watched in New Jersey. However, due to label restrictions and less frequent use, the probability of its contaminating ground water in this state has been considerably lessened.

	Aldicarb	Concern Level
solubility	6,000 (room temp)	> 30 ppm
K_d	<4	< 5
K_{oc}	36 (calc)	< 500
hydrolysis t 1/2	10-650	> 25 wks
soil t 1/2	1-8 (soil)	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	yes	

LEACHER : potential contaminant in N.J. groundwater

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ALLIDOCHLOR (93-71-0)

N,N-diallyl-2-chloroacetamide

RANDOX and CDAA are the trade names by which allidochlor is known. It is a pre-emergence herbicide used on vegetable crops, soybeans, sorghum and ornamentals.

No information is available regarding this compound's leaching potential. There is little data describing its chemical characteristics. It is included in the recommendations for New Jersey vegetable crops (1,2,4).

	CDAA	Concern Level
solubility	1.97% (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N. J. groundwater

REFERENCES

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AMETRYNE (834-12-8)

2-(ethylamino)-4-isopropylamino-6-methylthio-s-triazine

Ametryne, or EVIK, is a product of the reaction of atrazine with sodium methylmercaptide. It is used as a selective herbicide when soil applied pre- and post-emergent.

Although virtually no literature has been found on the degradation and leaching of ametryne alone, some studies have been conducted where ametryne has been included in the study of triazine pesticides (5). In addition, many researchers have conducted lengthy projects to determine degradation rates of a number of different pesticides including ametryne. Rodgers and Wilcox (1965), cited by Mrak (1974), in a comparative mobility study, determined that ametryne leached three inches in a fine sandy plot after an 8 lb/acre application. Ametryne, in this study, was slightly more mobile than its relative, prometryne.

No state has reported the detection of ametryne in its groundwater to date. In their one-liner files, EPA researchers have determined that ametryne may be a leacher; therefore, it should be considered as such in areas where it is recommended for use. Ametryne has not been recommended for use on New Jersey field, fruit or vegetable crops (3,4,6).

	Ametryne	Concern Level
solubility	185 (20°C)	> 30 ppm
K_d	1.05 - 18.2	< 5
K_{oc}	388; 392	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	8-24 wks	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	no	

POTENTIAL LEACHER : small threat to N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
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3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
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6. Robson, M.G., & Johnson, W.B., 1985.
7. Worthing, C.R., 1979.

AMINOCARB (2032-59-9)

4-(dimethylamino)-3-methylphenyl methylcarbamate

MATACIL is the trade name for the non-systemic insecticide-mollescicide, aminocarb. Its primary use is against lepidopterous larvae and other biting insects in cotton, tomatoes, tobacco and some fruit crops.

Aminocarb is practically non-volatile, but its persistence in soil is short. It undergoes microbial degradation as its major dissipative route (4), while hydrolysis predominates in its metabolism in animals. Although it shows a low to intermediate mobility, its short half-life in soil indicates that its potential to leach through soil is low. EPA does not consider aminocarb a leacher, and its chemical parameters seem to support this decision. It is not currently recommended for use on New Jersey vegetable, fruit or field crops (1,2,5).

	Aminocarb	Concern Level
solubility	2,000 (20°C)	> 30 ppm
K_d	4.2	< 5
K_{oc}	NA	< 500
hydrolysis	< 1-7	> 25 wks
soil t 1/2	1-2 d	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

NOT LIKELY LEACHER : no threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1985.
3. Kuhr, R.J., & Dorough, H.W., 1976.
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7. Worthing, C.R., 1979.

AMITROLE (61-82-5)

3-amino-1,2,4-triazole

Amitrole, also known as AMIZOL or WEEDAZOL, is a nonselective systemic herbicide used on established apple and pear stands between harvest and before planting on wheat, oats, corn, potatoes and other crops.

It has been assigned mobility class 4 (mobile) by the EPA. Very little has been reported on the movement of this compound through soil or on its degradation in soil. It is not listed as a recommended herbicide for New Jersey crops (2,3,5).

	Amitrole	Concern Level
solubility	28,000 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER: small threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1985.
4. Mrak, E.M., 1974.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

AMMONIUM SULFAMATE (7773-06-0)

ammonium sulfamate

Ammonium sulfamate is an inorganic contact and translocative non-selective herbicide used on fruit orchards for control of poison ivy or as an overall spray to control most woody plants.

EPA has assigned Helling class 5 (very mobile) and priority II to this compound based upon its chemical characteristics. EPA considers ammonium sulfamate a possible leacher. It is not a recommended for use as a pesticide in New Jersey agriculture (3,4,5).

	Ammonium Sulfamate	Concern Level
solubility	684,000 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	no	

POTENTIAL LEACHER: small threat to N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1985.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

ANILAZINE (101-05-3)

4,6-dichloro-N-(2-chlorophenyl)-1,3,5-triazin-2-amine

Anilazine is known by the trade name DYRENE. It is a foliar fungicide used to control diseases which attack lawns and turf, cereals, coffee and similar crops. It is also helpful to control leaf spots on potato and tomato plants.

Scant research exists on the degradation or movement of anilazine in soil. EPA has not attempted a classification of this compound. More data are necessary before a leaching assessment can be assigned. It is recommended for use in New Jersey on vegetable crops (2,3,4).

	Anilazine	Concern Level
solubility	insoluble	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER: unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

ASPON (3244-90-4)

O,O,O,O-tetra-n-propyl dithiopyrophosphate

Aspon can go by the trade name NPA. This insecticide is used for the control of chinch bugs in lawns and turf.

Limited data are available regarding the mobility of aspon. EPA does not have a classification for it. The chemical characteristics of aspon suggest that it may be a leacher. Therefore, although no definitive conclusions can be drawn at this time, aspon should be reguarded as a potential leacher. At this time, it is not included on the lists of recommended pesticides for New Jersey (2,3,4).

	Aspon	Concern Level
solubility	160 (unknown temp)	> 30 ppm
K_d	32-61	< 5
K_{oc}	6,300-7,500	< 500
hydrolysis	stable	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER: unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1985.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

ASULAM (24951-45-9)

methyl 4-amino-phenylsulphonylcarbamate

The trade name, ASULOX, is used when referring to the compound asulam, a translocative post-emergence carbamate herbicide used in pastures, deciduous fruit orchards, and on sugarcane and linseed.

Dissipation of asulam from soil is due primarily to leaching and breakdown (7). It is non-volatile but subject to microbial attack (7). Its relatively short persistence is affected by soil temperature and moisture levels (7). Smith & Walker (1977) performed a laboratory and corresponding field study to test asulam persistence in a heavy clay soil. The half-life at 34% soil moisture and a temperature of 20°C was 7 days. Movement in the field occurred to the greatest extent when application occurred in July (high temperature and moisture). After 7 and 14 days, almost 20% of the amount applied was recovered from the deeper soil layers (5-15 cm). Hayden & Smith (1980) also found breakdown of asulam to be fast but concluded that minimal leaching would occur. Less than 5% of herbicide applied was recovered at 0-5 cm level. These researchers claim that less than 5% was recovered at the 5-10 cm level as well, but these data are not presented in the report. In a later study conducted by Smith (1980), asulam was demonstrated to have a very rapid breakdown in soil using heavy clay, sandy loam and clay loam soils. Again, soil samples were taken only down to 10 cm, where after 10 weeks, there was no detectable amounts of asulam present.

EPA has refrained from assigning a leachability classification for asulam. From the limited data available, it appears that there is a potential for this herbicide to leach, but this conclusion may be premature. Asulam is not currently included in the New Jersey recommendations for fruit, vegetable or field crops (3,4,5).

	Asulam	Concern Level
solubility	5,000 (25°C)	> 30
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	1-2 wks	> 3 wks

photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

POTENTIAL LEACHER: unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hayden, B.J., & Smith, A.E., 1980.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1985.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Smith, A.E., 1980.
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ATRAZINE (1912-24-9)
2-chloro-4-ethylamino-6-isopropyl-amino-1,3,5-triazine

A triazine herbicide, atrazine, also known by the trade names AATREX is probably a leacher. It has already been detected in the groundwater of at least three states.

Atrazine is used most commonly as a selective herbicide on corn and is applied as a pre- and post-emergent. At higher rates than recommended for selective protection, it is used as a non-selective herbicide.

There is little discrepency throughout the copious literature available on the leaching and degradation of atrazine in soils and/or aqueous solutions that atrazine may leach through soils with the possibility of contaminating groundwater (4,6,9,10,17,23,24,28,35,37,42,43,44,46). This is primarily due to the herbicide's water solubility, its rather long half-life in soil, and the fact that it is not metabolized by microbes in the soil.

The primary degradative pathway for atrazine seems to be chemical hydrolysis with microbial decomposition having minimal to no importance (2,4,9,13,14,16,22,35,40,41,44). However, microbes can play a minor role under certain conditions. For instance, Goswami and Green (1971) studied microbial degradation of atrazine and of its metabolite, hydroxyatrazine, under laboratory conditions. They determined that the chemical hydrolysis of atrazine to hydroxyatrazine prepares the compound for ring cleavage and eventual breakdown by microbes. Under submerged conditions, the microorganisms were capable of degrading the hydroxyatrazine ring with greater ease than the atrazine ring. Both aerobes and facultative aerobes were identified as contributors in the breakdown of hydroxyatrazine.

In general, it remains a consensus that chemical hydrolysis of atrazine is its primary degradative pathway. Further, it has been demonstrated that the hydrolysis reaction occurs more rapidly in acidic soils (4,22,24,35,39) and is catalyzed by humic and fulvic acids found in organic soils (2,11,29,35).

Along a similar vein, some researchers have discovered that the organic content of the soils is a more significant factor than clay in determining the hydrolysis rate of atrazine (and the adsorption of the herbicide onto soil colloids) (1,2). Atrazine hydrolyzes faster in soils having higher organic contents.

An interesting relationship between pesticide degradation and the liming of soils was reported in the atrazine literature. Apparantly, atrazine degradation occurs more slowly in limed soils (4,25,31,35,40). The determination of the effects of liming actually come as no surprise considering the effects of pH on atrazine degradation. Researchers have concluded that

atrazine hydrolysis tends to take place faster at the more acid pH's (4,25,31,35,40). This phenomenon occurs because adsorption of the atrazine molecule is favored under acid conditions. Adsorption of atrazine onto soil colloids catalyzes the hydrolysis reaction in soil.

Researchers in Iowa have discovered a correlation between the appearance of atrazine in ground water and nitrate-nitrogen (16). But the tillage system and use of fertilizer have been correlated with atrazine degradation. Bauman & Ross (1983) found that atrazine was less persistent under coulter than chisel or conventional plow tillage. Kells, et. al. (1980) determined that no-tillage systems were more prone to experience the effects of the addition of lime and/or fertilizer. A non-tilled, limed soil encouraged longer atrazine persistence in the field. Research by Lowder & Weber (1982) support these conclusions as well.

Acid hydrolysis probably results from protonation of a ring or chain nitrogen atom followed by cleavage of the C-Cl bond by water. Adsorption of atrazine by soil colloids appears to enhance this reaction. The hydrogen bonding between the ring or side chain nitrogen atoms and weak acid groups in the soil organic fraction increases the tendency for attack by water thereby increasing the rate of hydrolysis (2).

Atrazine has been detected in the groundwater of Iowa, Nebraska and Wisconsin, where it is used extensively on corn and sorghum crops (8,9,19,20,21,22,29,31,32,34,37,43,44). EPA considers atrazine a priority I compound and has labelled it a leacher. This herbicide is currently recommended for use on New Jersey corn crops as a pre-emergent in combination with butylate, EPTC, alachlor or metolachlor, simazine, linuron, or pendimethalin, or as a post-emergent alone or in combination with cyanazine or pendimethalin on vegetable crops (26,28,39).

Data from a current DEP-USGS-Rutgers research project has shown that atrazine is being used on New Jersey crops. Therefore, the possibility of its leaching into New Jersey's groundwater is relatively high.

	Atrazine	Concern Level
solubility	33 (25°C)	> 30
K_d	0.4-8	< 5
K_{oc}	51: 163	< 500
hydrolysis t 1/2	10-106 wks	> 25 wks
soil t 1/2	4-52 wks	> 3 wks

photo. t 1/2	NA	> 1 wk
in gw	yes	

LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Anderson, J.R., Stephenson, G.R., & Corke, C.T., 1980.
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3. Bauman, T.T. & Ross, M.A., 1983.
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AZINPHOS-METHYL (86-50-0)

O,O-dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl) methyl] phosphorodithioate

Azinphos-methyl, otherwise known as GUTHION, is a non-systemic insecticide and acaricide used against biting and sucking insect pests in blueberry, grape, maize, vegetable, cotton and citrus crops. It is rapidly hydrolyzed by cold alkali and acid and has a long field persistence (5).

Degradation of guthion in the soil occurs both chemically and biologically (1,9). Temperature seems to exert a significant influence on both types of decomposition in the soil environment (9).

Staiff and co-wokers (1975) studied the persistence of azinphos methyl over an 8 year period. At the 8th year, the researchers analyzed sections of the test plot for possible leaching of this organophosphorous herbicide. They found that essentially no guthion had penetrated the 30 cm level after 8 years of normal precipitation.

Most researchers claim that although guthion may be persistent in upper soil zones, its leaching potential is rather small.

Guthion is a recommended pesticide in New Jersey and is used especially on blueberries. Due to its low soil mobility, it should not be considered a significant threat to New Jersey groundwater resources.

	Guthion	Concern Level
solubility	29 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	1 (wet) 12 (dry)	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : small threat to N.J. groundwater

REFERENCES

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BENDIOCARB (22781-23-3)

2,2-dimethyl-1,3-benzodioxol-4-yl-N-methylcarbamate

Bendiocarb is the active ingredient in the marketed insecticide, FICAM. It works as a residual insecticide against mosquitoes, flies, wasps, and a variety of storage and soil pests. Normally used as a seed treatment on sugar beet and maize, bendiocarb is also sprayed on the foliage with sucrose, painted on for fly control or applied as granules on turf.

No information exists in the literature relative to groundwater leaching of this compound. It is currently not recommended for use on New Jersey vegetable, fruit or field crops (1,2,3). Its use on other crops is unknown.

	Bendiocarb	Concern Level
solubility	40 (25°C)	> 30
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable (pH5) 4 d (pH7)	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER: small threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1985.
3. Robson, M.G., & Johnson, W.B., 1985.
4. Worthing, C.R., 1979.

BENTAZON (25257-89-0)

3-(1-methyl ethyl)-1H-2,1,3-benzothiadiazin-4(3H)-one 2,2-dioxide

Bentazon, otherwise known as BASAGRAN, is a contact and selective post-emergence herbicide used to control weeds on cereal crops, soybeans, peas, rice and onions. Its persistence is brief (6). It is a priority II compound according to EPA, which also considers it very mobile and a potential leacher.

Bentazon is recommended for post-emergent use on no-tillage corn to control nutsedge. It is also recommended for use on soybeans (3,4,5).

There appears to be ample information about the chemical characteristics of bentazone to consider it a potential leacher.

	Bentazone	Concern Level
solubility	50 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	0	< 500
hydrolysis t 1/2	>> 5	> 25 wks
soil t 1/2	2-14 (field)	> 3 wks
photolysis t 1/2	3 (soil)	> 1 wks
in groundwater	unknown	

POTENTIAL LEACHER: potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1985.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

BROMACIL (314-40-9)

5-bromo-3-sec-butyl-methyluracil

Bromacil is known by the trade names BOREA, HYVAR and KROVAR. It is a non-selective, systemic uracil herbicide used for broad weed control on non-crop areas.

When applied at higher than recommended rates, this compound may persist for more than one growing season (10). It is stable to photodegradation (1). Bromacil has been found in groundwater in Florida (3,4,11), and it has been assigned to the priority I EPA list. The chemical characteristics indicate that this herbicide may leach through soil. Bromacil is not a recommended for use as an herbicide on vegetable, fruit or field crops, but it is unknown whether New Jersey non-crop fields are treated with it (6,7,9).

	Bromacil	Concern Level
solubility	815 (25°C)	> 30 ppm
K_d	0.2-1.8	< 5
K_{oc}	69-70	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	49 (field)	> 3 wks
photolysis t 1/2	stable	> 1 wks
in groundwater	yes	

LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Acher, A.J. & Dunkelblum, E., 1979.
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5. EPA one-liner files and memos, 1986.
6. Hopfinger, J.A., 1985.

7. Justin, J.R., 1985.
8. Mrak, E.M., 1974.
9. Robson, M.G., & Johnson, W.B., 1985.
10. Worthing, C.R., 1979.

BROMOXYNIL (1689-84-5)

3,5-dibromo-4-hydroxybenzonitrile

Bromoxynil is a contact,post-emergence herbicide, usedon cereal crops and newly sown turf. It is known by the trade names BROMINAL and BUCTRIL.

Smith (1980) determined that bromoxynil undergoes rapid degradation in heavy clay soil, sandy loam and clay loam (90% of the amount applied is not detectable after 7 days). It is also subject to breakdown by microbes (5).

Very little data exist by which to evaluate bromoxynil's potential movement through the soil profile. It is currently recommended for use in New Jersey on wheat and barley (1,2,4).

	Bromoxynil	Concern Level
solubility	130 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	1-3wks	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	no	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1985.
3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Smith, A.E., 1980.
6. Worthing, C.R., 1979.

BUFENCARB (2282-32-0)

m-(ethyl propyl) phenyl methylcarbamate PLUS m-(1-methyl butyl) phenyl methylcarbamate

Bufencarb, trade name BUX, is an insecticide effective against a wide range of soil and foliage pests, including corn rootworm larvae. It is rapidly degraded in soil (6), and micro-organisms seem to play an important role in this breakdown (4). Bufencarb is more easily inactivated in dry sand and in moist organic soils than in moist sand (4). The rate of hydrolysis increases with a rise in either pH or temperature (6).

The manufacture of this chemical was discontinued by Chevron in 1984 (3). However, it is included in the list of recommended pesticides for New Jersey vegetable crops (5). The inclusion of bufencarb may have been an oversight. The fact that it is not being manufactured indicates that only leftover stocks are bein used.

	Bufencarb	Concern Level
solubility	50 (room temp)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	< 1	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER : small threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1985.
3. Ott, P., personal communication, 1986.
4. Kuhr, R.J. & Dorough, H.W., 1976.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

BUTYLATE (2008-41-5)

S-ethyl diisobutyl thiocarbamate

SUTAN is the trade name for butylate, a selective preplant herbicide used on corn crops. It is a relatively non-persistent compound (7) with a half-life of 3 weeks (5) to 10 weeks (1), depending upon the soil type. It has been assigned a priority II place on EPA's list of pesticides of concern, so it may be a leacher. The available chemical characteristics appear to support this liklihood. Butylate is recommended for use in New Jersey on corn (3,4,6).

	Butylate	Concern Level
solubility	45 (room temp)	> 30 ppm
K_d	1.4-5.0	< 5
K_{oc}	540 (calc)	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	3-10 (lab)	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	no	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Mrak, E.M., 1974.
6. Robson, M.G., & Johnson, W.B., 1985.
7. Worthing, C.R., 1979.

CACODYLIC ACID (75-60-5)

hydroxydimethylarsine oxide

Cacodylic acid is known by a number of trade names including CHEXMATE, DILIC, and PHYTAR 138. It is an organic arsenical that works as a non-selective herbicide on non-crop plants or as a dessicant/defoliant in silviculture and on cotton crops. Not much is known about this compound except that it is almost completely inactivated in soil by surface adsorption and ion exchange (1,6). Woolson & Isensee (1981) applied cacodylic acid at 1, 2 and 10 times the recommended maximum rate and found that arsenic residues did not accumulate. Movement through the soil column was not tested.

There is too little data to attempt a leachability assessment on cacodylic acid. Its use on non-crop areas in New Jersey is unknown. It is not recommended for fruit, field or vegetable crops (2,3,4).

	Cacodylic Acid	Concern Level
solubility	667,000 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1985.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Woolson, E.A., & Isensee, A.R., 1981.
6. Worthing, C.R., 1979.

CALCIUM ARSENATE (1333-25-1)

calcium arsenate

Calcium arsenate, an inorganic arsenical, is known by the trade names PENCAL, CHIP-CAL, and SPRA-CAL. It decomposes in carbonic acid and alkaline solutions (4). Hence, it is more likely to degrade at faster rates in limed soils than in unlimed soils.

EPA files report no information on calcium arsenate, and there is nothing in the literature concerning its movement to groundwater. It is not a recommended for use pesticide on New Jersey vegetable, fruit or field crops (1,2,3).

	Calcium Arsenate	Concern Level
solubility	insoluble	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1985.
3. Robson, M.G., & Johnson, W.B., 1985.
4. Worthing, C.R., 1979.

CARBARYL (63-25-2)

1-naphthyl N-methylcarbamate

SEVIN, active ingredient carbaryl, is one of the most widely used carbamate insecticides available on the market. Its uses are myriad, and it is effective on a variety of food crops. Carbaryl is typically sprayed for maximum crop protection.

Most researchers who have worked with carbaryl have determined that this pesticide is rather non-persistent, being poorly adsorbed by soils (1,11) and rapidly degraded both microbiologically and chemically (6,10,13). Only one study related carbaryl dissipation with leaching. LaFleur (1976) monitored carbaryl's movement and fate in a sandy loam soil over a 16 month period. Soil samples were taken down to 100 cm.. Two months after application, carbaryl was detected in the groundwater at 0.3 umol/L, and it persisted at lower concentrations throughout the 8th month. It was not detected in the groundwater nor in the 20-40 cm layer of soil after the 16th month. LaFleur concluded from this study that the risk of carbaryl contamination in groundwater is short-lived. It disappears rapidly, and, since it is relatively non-toxic to mammals, its possible presence at such low concentrations poses no threat to the human population.

EPA does not consider this compound a leacher. Its chemical characteristics and degradative information show that there is little potential for carbaryl to reach groundwater in significant amounts. It is recommended for use in New Jersey on field corn, soybeans, small grains, sorghum, vegetables and fruit (5,7,12).

	Carbaryl	Concern Level
solubility	120 (30°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	1	> 3 wks
photolysis t 1/2	stable	> 1 wks
in groundwater	no	

NOT A LEACHER : no threat to N.J. groundwater

REFERENCES

1. Aly, M.I., Bakru, N., Kishk, F., & El-Sebae, A.H., 1980.
2. Caro, J.H., Freeman, H.P., & Turner, B.C., 1974.
3. Cohen, S.Z., EPA memo, 1985.
4. EPA one-liner files, 1986.
5. Hopfinger, J.A., 1985.
6. Johnson, D.P. & Stansbury, H.A., 1965.
7. Justin, J.R., 1985.
8. Kuhr, R.J. & Dorough, H.W., 1976.
9. LaFleur, K.S., 1980.
10. LaFleur, K.S., 1976.
11. Leenheer, J.A. & Ahlrichs, J.C., 1971.
12. Robson, M.G., & Johnson, W.B., 1985.
13. Sharom, M.S., Miles, J.R.W., Harris, C.R., & McEwen, F.L., 1980.
14. Worthing, C.R., 1979.

CARBOFURAN (1563-66-2)

2,3-dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate

Carbofuran is a widely used broad-spectrum carbamate insecticide, known most commonly by the trade names COUNTER and FURADAN. It can be applied as a spray to foliage, as a paste or granule to seed furrows, or as a spray broadcast to the whole crop.

Many researchers have studied carbofuran's persistence and degradation in soil. Generally, it has been found that carbofuran is relatively persistent in soil (2,9,11,18). Persistence is longer in dry, acid and low temperature soils, especially witg in-furrow incorporation (1,2,11,12,18). Carbofuran appears to undergo both chemical and microbial degradation, but there is some argument as to which process is more important in the soil environment. Gorder et. al. (1982) determined that degradation was more important than leaching in the dissipation of carbofuran from soil, and that microbial attack was the major form of degradation. These studies were done on an alkaline soil with a high moisture content. Greenhalgh & Belanger (1981) performed a study using a humic soil type and a sandy loam soil and concluded that microbial attack was more significant than chemical attack in both soils. Felsot et. al. (1981) discovered two microbial isolates in prior-use soils capable of decomposing carbofuran: Pseudomonas sp. and Achromobacter sp.. This study concluded that microbial attack is prevalent in soils with at least a 3 year history of carbofuran use.

Only one group of researchers, Sharom et. al. (1980), pointed out that chemical degradation is more significant than microbial degradation when carbofuran is dissolved in water.

In summary, this compound appears to be poorly adsorbed onto soil material (7,21), rather mobile through the soil profile (7,8,10), and somewhat persistent. Its metabolites (3-hydroxy- and 3-keto carbofuran) exhibit similar characteristics with 3-hydroxy carbofuran being slightly more unstable and hence more subject to hydrolysis.

EPA has classified carbofuran as a priority I chemical and has labelled it a leacher. All evidence indicates that it plus its metabolites may leach through the soil column. It has been found in the groundwater of New York, Wisconsin and Maryland (3,4,18). It is currently recommended for use in New Jersey on field corn, alfafa, fruit and vegetables (12,13,20).

	Carbofuran	Concern Level
solubility	700 (25°C)	> 30 ppm
K_d	0.25-8.7	< 5
K_{oc}	30-60;120;29	< 500
hydrolysis t 1/2	2-50	> 25 wks
soil t 1/2	1-37	> 3 wks
photolysis t 1/2	1 (water)	> 1 wks
in groundwater	yes	

LEACHER : potential contaminant in N. J. groundwater

REFERENCES

1. Ahmad, N., Walgenback, D.D., & Sutter, G.R., 1979.
2. Caro, J.H., Freeman, H.P., & Turner, B.C., 1974.
3. Cohen, S.Z., EPA memo, 1985.
4. Cohen, S.Z., Creeger, S.M., Carsel, R.F., & Enfield, C.G., 1984.
5. Cohen, S.Z., Eiden, C., & Lorber, M.N., 1986.
6. EPA one-liner files and memos, 1986.
7. Felsot, A., Maddox, J.V., & Bruce, W., 1981.
8. Felsot, A., & Wilson, J., 1980.
9. Fuhremann, T.W. & Lichtenstein, E.P., 1980.
10. Gorder, G.W., Dahm, P.A., 1981.
11. Gorder, G.W., Dahm, P.A., & Tollefson, J.J., 1982.
12. Greenhalf, R., & Balanger, A., 1981.
13. Hopfinger, J.A., 1985.
14. Justin, J.R., 1985.
15. Kuhr, R.J. & Dorough, H.W., 1976.
16. Lemley, A.T., Zhong, W.Z., Janauer, G.E., & Rossi, R., 1984.
17. Leppert, B.C., Markle, J.C., Helt, R.C., & Fujie, G.H., 1983.
18. Ou, L.T., Gancarz, D.H., Wheeler, W.B., Rao, P.`S.C. & Davidson, J.M., 1982.
19. Pesticide & Toxic Chemical News, 1984.
20. Robson, M.G., & Johnson, W.B., 1985.
21. Sharom, M.S., Miles, J.R.W., Harris, C.R., & McEwen, F.L., 1980.
22. Worthing, C.R., 1979.

CARBOPHENOTHION (786-19-6)

S-[{(p-chlorophenyl)thio}methyl] O,O-diethyl phosphorodithioate

Carbophenothion, known in the trade as TRITHION, is a non-systemic insecticide-acaricide used in combination with petroleum oil as a spray to control overwintering mites, aphids and scale insects on dormant deciduous fruit trees.

Scant information is available in the literature by which to assess this compound's leachability. It is recommended for use in New Jersey on fruit orchards and on vegetable crops in (2,3,4).

	Carbophenothion	Concern Level
solubility	2 (20 °C)	> 30
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	3-4; 15	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1985.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

CARBOXIN (5234-68-4)

5,6-dihydro-2-methyl-1,4-oxathiin-3-carboxanilide

Carboxin, also known as VITAVAX, works as a systemic fungicide and seed protectant for cereals against smuts and bunts. This chemical is mobile with its sulfoxide metabolite more mobile than the parent.

EPA includes carboxin on its priority II compound list and asserts that it is a possible leacher. The sulfoxide is a more likely leacher. Carboxin's chemical characteristics are indicative of a leacher, although it has not been detected in groundwater. It is recommended for use on New Jersey vegetable crops (3,4,6).

	Carboxin	Concern Level
solubility	170 (25°C)	> 30 ppm
K_d	0.5-0.78	< 5
K_{oc}	260	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	no	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1985.
5. Ott, P., personal communication, 1986.
6. Robson, M.G., & Johnson, W.B., 1985.
7. Worthing, C.R., 1979.

CHLORAMBEN (133-90-4)

3-amino-2,5-dichlorobenzoic acid

Chloramben, also known as AMIBEN, is a pre-emergent herbicide used on soybeans, dry beans, corn and sweet potatoes. It is rapidly mobile in soil (2,7). Its ester metabolites are more strongly adsorbed by soil and are leached to a lesser extent than the parent.

EPA considers chloramben a priority I compound. It has a mobility class of 5 (very mobile). It's potential to leach is high. Since chloramben works best on heavy, high organic matter soils, its use in New Jersey (which is characterized by sandy, lighter soils) is limited. However, it is used as a pre-emergent on soybeans and on vegetables in this state (3,4,6).

	Chloramben	Concern Level
solubility	700 (25°C)	> 30 ppm
K_d	0.1-6.5	< 5
K_{oc}	190	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	no	

POTENTIAL LEACHER : potential contaminant in N. J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1985.
5. Mrak, E.M., 1974.
6. Robson, M.G., & Johnson, W.B., 1985.
7. Worthing, C.R., 1979.

CHLORDIMEFORM (6164-98-3)

N'-(4-chloro-o-tolyl)-N--N-dimethyl-formamidine

Chlordimeform is the active ingredient in the marketed acaricides FUNDAL and SPANON. Effective against the eggs and immature stages of acarids, it is normally used as an ovicide.

Little information is available in the literature describing chlordimeform's mobility, degradation or chemical parameters. EPA has not attempted to assess it. The same is true for chlordimeform hydrochloride, which is more water soluble than the parent. It is not included in the recommendations for New Jersey vegetable, fruit or field crops (2,3,4).

	Chlordimeform	Concern Level
solubility	250 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER : small threat to N. J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

CHLORMEQUAT CHLORIDE

2-chloroethyl trimethylammonium chloride

Chlormequat chloride or CYCOCEL, acts as a plant growth regulator usually used to enhance harvests rather than kill weeds. It is known by the trade names CECECE, CYCOGAN and LINOCIN among others. In wheat and poinsettas, it acts to shorten and strengthen the stem, while in pears and tomatoes, it causes an increased flowering. It is rapidly degraded in soil by enzyme activity of microbes (5). EPA has not attempted to rank this compound. It is not recommended for use on New Jersey fruit, field or vegetable crops (1,2,4).

	Chlormequat chloride	Concern Level
solubility	100 % (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979

CHLOROPICRIN (76-06-2)

trichloronitromethane

Chloropicrin is known by the trade names CHLOR-O-PIC and PICFUME. It has a plethora of functions including use as an herbicide, nematicide, insecticide, fumigant and fungicide. This highly toxic compound is generally used direct for the fumigation of stored grain, and on soils to control nematodes and other soil-dwelling pests.

Very few research endeavors have focused on chloropicrin, and accordingly, the literature is sparse. It has not been tested for its presence in groundwater. In short, there is not enough information available on this compound to assess its leachability. It may be used in New Jersey on vegetables (2,3,4).

	Chloropicrin	Concern Level
solubility	2,270 (room temp)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N. J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1985.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

4-CHLOROPYRIDINE N-OXIDE

4-chloropyridine N-oxide

4-Chloropyridine N-oxide is actually the chemical name for chloropropylate, a non-systemic contact acaricide. Its trade names are ROSPIN and ACARALATE (a discontinued variety). It is used on fruits, nuts, cotton, sugar beets, vegetables and other crops to control spider mites. It is effective especially on apple and pear orchards.

There is too little data available on this compound to assess its leachability. EPA does not have a file on it. It is not a recommended pesticide on vegetable, fruit or field crops in this state (1,2,3).

	4-chloropyridine	Concern Level
solubility	< 10 (room temp)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N. J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Robson, M.G., & Johnson, W.B., 1985.
4. Worthing, C.R., 1979.

CHLOROTHALONIL (1897-45-6)

tetrachloroisophthalonitrile

A commonly used fungicide, chlorothalonil is known by the trade names BRAVO and TERMIL. It is used to control a wide range of plant pathogens which attack vegetable crops.

EPA considers chlorothalonil a priority II compound. From the chemical characteristics, one can suppose that this compound may be persistent and mobile; however, there is little research reported in the literature on its mobility. The phenolate metabolite is probably more mobile that the parent (1,2). Currently, chlorothalonil is recommended for use in New Jersey on vegetables and soybeans.

	Clorothalonil	Concern Level
solubility	0.5 (25°C)	> 30 ppm
K_d	3-29	< 5
K_{oc}	1377; 571	< 500
hydrolysis t 1/2	7	> 25 wks
soil t 1/2	4-8 (field)	> 3 wks
photolysis t 1/2	stable	> 1 wks
in groundwater	unknown	

POTENTIAL LEACHER : potential contaminant in N. J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

CHLORPROPHAM

isopropyl-m-chlorocarbanilate

CHLORO IPC, FURLOE, and SPROUT NIP are the trade names for this carbamate herbicide. It can be used as a pre-emergent either alone or in combination with other herbicides to control a diverse range of weeds in blueberry, cranberry, tomato and sugar beet crops. It also inhibits potato sprouting.

EPA has given this pesticide a Helling class 2 (slight mobility) categorization. Given this low mobility class and the compound's chemical characteristics, it seems unlikely that it will exhibit a propensity to move through the soil. It is recommended for use directly on alfafa when applied in cold weather, and on vegetables (2,3,4).

	Chlorpropham	Concern Level
solubility	108 (20°C)	> 30 ppm
K_d	5-8	< 5
K_{oc}	590; 816	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	4	> 3 wks
photolysis t 1/2	5 days (lab)	> 1 wks
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N. J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

CHLORPYRIFOS (2921-88-2)

O,O-diethyl O-(3,5,6-trichloro-2-pyridyl)-phosphorothioate

Chlorpyrifos is the active ingredient in DURSBAN, LORSBAN and DOWCO 179. It is a non-systemic contact insecticide useful in the control of mosquitos, flies and other foliar and household pests.

Sharom et. al. (1980) found that this insecticide is relatively immobile, being rather strongly adsorbed to soil particles. Accordingly, EPA has described chlorpyrifos as not likely to leach. Its chemical properties are indicative of a non-leacher. It is recommended for use on field corn, soybeans, vegetables and fruit in New Jersey (2,3,4).

	Chlorpyrifos	Concern Level
solubility	0.4 (23°C)	> 30 ppm
K_d	199-1,203	< 5
K_{oc}	13,600	< 500
hydrolysis t 1/2	1-9 (lab)	> 25 wks
soil t 1/2	2-8 (field)	> 3 wks
photolysis t 1/2	6 hrs-24wks	> 1 wks
in groundwater	unknown	

NOT LIKELY LEACHER : small threat to N. J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Sharom, M.S., Miles, J.R.W., Harris, C.R., & McEwen, F.L., 1980.
6. Worthing, C.R., 1979.

CHLORTHAL DIMETHYL (1861-32-2)

dimethyl tetrachloroeterephthalate

Chlorthal Dimethyl or DCPA, trade name DACTHAL, is a priority I compound as classified by EPA. It acts as a selective pre-emergence herbicide and is effective against annual grasses and some broadleaf weeds common in monocultures.

This compound has been detected in the groundwater of New York (2,3) and is accordingly considered a leacher by EPA. Its chemical characteristics support this label. It is a recommended for use pesticide for New Jersey vegetable crops (5,6,7).

	Chorthal Dimethyl	Concern Level
solubility	5000 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	3-5 (lab)	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	yes	

LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. Cohen, S.Z., Creeger, S.M., Carsel, R.F., & Enfield, C.G., 1984.
3. Cohen, S.Z., Eiden, C., & Lorber, M.N., 1986.
4. EPA one-liner files and memos, 1986.
5. Hopfinger, J.A., 1985.
6. Justin, J.R., 1984.
7. Robson, M.G., & Johnson, W.B., 1985.
8. Worthing, C.R., 1979

CROTOXYPHOS (7700-17-6)

dimethyl phosphate of alpha-methyl-benzyl 3-hydroxy-cis-crotonate

CIODRIN is the manufacturer's name by which crotoxyphos, an insecticide, is known. It is a contact and stomach poison having rapid action with moderate residual effects. It is used primarily to co livestock pests (5).

The chemical parameters of crotoxyphos do not aid in the attempt to assess its leachability. While it is very water soluble, it is also dissipated quickly in aerobic soil. EPA does not rate its mobility. It is not recommended for use on fruit, vegetable or field crops in New Jersey (2,3,4), but it is not known whether this chemical is used on livestock in this state.

	Crotoxyphos	Concern Level
solubility	1,000 (room temp)	> 30 ppm
K_d	NA	< 5
K_{oc}	170	< 500
hydrolysis t 1/2	1-3	> 25 wks
soil t 1/2	2 hrs-3 d	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979

CRYOLITE (15096-52-3)

sodium aluminofluoride

Cryolite or KRYOCIDE is a stomach and contact insecticide having an almost exclusive use on grapes. It is generally incompatible with other alkaline pesticides because it decomposes in their presence.

This insoluble insecticide is virtually unknown in the literature. There is little data available to assess its leachability. It is used in New Jersey in limited amounts on grapes.

	Cryolite	Concern Level
solubility	insoluble	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Robson, M.G., & Johnson, W.B., 1985.
4. Worthing, C.R., 1979

CYANAZINE (21725-4446-2)

2-(4-chloro-6-ethylamino-s-triazin-2-ylamino)-2-methylpropionitrile

Cyanazine, also known as BLADEX, is a selective herbicide that can be applied either as a pre- or post-emergent to crops. It has a short persistence in soil (1,5,15,17,20) probably due to a high reactivity of the nitrile group on the molecule. The nitrile group is hydrolyzed in soil and in plants to the corresponding carboxylic acid. This reaction occurs faster at higher temperatures and acidities (5). Also, the chlorine atom may be replaced by a hydroxy group, and conjugates of this group may be formed albeit more slowly. Hydrolysis of cyanazine is its major degradative pathway. The same is true for atrazine (in fact, for most of the triazines), but the reaction occurs more rapidly to cyanazine (1,5).

One might assume that since cyanazine is rapidly hydrolyzed in the soil, thereby having a low soil persistence, movement through the soil column would be minimal. However, researchers have discovered that cyanazine does demonstrate mobility especially in sandy, high acid soils. The high acidity soils probably favor adsorption of the herbidide subsequently increasing its soil persistence. Muir & Baker (1978) in a three year study found cyanazine and its two degradative products to be relatively mobile in Canadian sandy soils. They took soil cores down to 40 cm. Cyanazine products were detected in the 30-40 cm cores 12 months after herbicide application. Yoo, et. al. (1981) and Majka & Levy (1977) also detected cyanazine below 20 cm in their studies.

Hall, et. al. (1984) determined that the efficacy and therefore the persistence of cyanazine was increased in no-tilled crop systems, as compared to conventional tillage systems. This might correspond to an increased persistence of the pesticide, and hence an increased opportunity for it to move through the soil column.

Cyanazine has been detected in Iowa and Pennsylvania groundwater (3,7,8,9,10,13,14). Currently, it is recommended for use in New Jersey on corn crops as a pre-emergent in combination with alachlor, and as a post-emergent alone, or in combination with atrazine or pendimethalin (11,12,18).

	Cyanazine	Concern Level
solubility	171 (25°C)	> 30 ppm
K_d	3.4-4.6	< 5

K_{oc}	200	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	1-5 wks	> 3 wks
photolysis t 1/2	minimal	> 1 wk
in groundwater	yes	

LEACHER : potential contaminant of N.J. groundwater

REFERENCES

1. Anderson, J.R., Stephenson, G.R., & Corke, C.T., 1980.
2. Cohen, S.Z., EPA memo, 1985.
3. Cohen, S.Z., Eiden, C., & Lorber, M.N., 1986.
4. EPA one-liner files and memos, 1986.
5. Grayson, B.T., 1980.
6. Hall, J.K., Hartwig, N.L., & Hoffman, L.D., 1984.
7. Hallberg, G.R., Libra, R.D.,Bettis, E.A. III, & Hoyer, B.E., 1984.
8. Hallberg, G.R., Libra, R.D., Bettis, E.A. III, & Hoyer, B.E., 1983.
9. Hallberg, G.R., Libra, R.D., & Hoyer, B.E., 1984.
10. Hallberg, G.R., Libra, R.D., Ressmeyer, G.G., Bettis, E.A. III & Hoyer, B.E., 1984.
11. Hopfinger, J.A., 1985.
12. Justin, J.R., 1984.
13. Kelly, R.D., 1985.
14. Libra, R.D., Hallberg, G.R., Ressmeyer, G.G. & Hoyer, B.E., 1984.
15. Majka, J.T., & Lavy, T.L., 1977.
16. Mrak, E.M., 1974.
17. Muir, D.C.G., & Baker, B.E., 1978.
18. Robson, M.G., & Johnson, W.B., 1985.
19. Worthing, C.R., 1979
20. Yoo, J.Y., Muir, D.C.G., & Baker, B.T., 1981.

CYCLOATE (1134-23-2)

S-ethyl cyclohexylethylthiocarbamate

Cycloate, known also as RO-NEET, is a preplant selective herbicide which is soil-applied to spinach and sugar beet crops.

This pesticide has been included in the priority II list of EPA's pesticides of concern. It exhibits moderate mobility and its persistence is uncertain although some researchers claim it is nonpersistent (6). It has not been detected in the groundwater of any state which has monitored for it. It is recommended for use in New Jersey on vegetables (3,4,5).

	Cycloate	Concern Level
solubility	85 (22°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	345	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	4-8	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : potential contaminant of N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979

DALAPON (75-99-0)

2,2-dichloropropionic acid

BASFAPON and DOWPON are the trade for the selective contact herbicide, dalapon. When used to control annual and perennial grasses, it is applied as a salt rather than in the acid form.

The compound is readily broken down by soil organisms, but it is not subject to hydrolysis (6). Its propensity to leach is high: EPA has classified it as a 5 (very mobile). However, since dalapon is so quickly dissipated from soil, the probability of its existing long enough to leach through the soil column is small. It is recommended in New Jersey to control Johnsongrass in field corn and on fruit and vegetable crops (3,4,5).

	Dalapon	Concern Level
solubility	502,000 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	3 (calc)	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	1-2	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979

DAZOMET (533-74-4)

tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione

Dazomet goes by a number of trade names including CRAG FUNGICIDE, MYCLONE, and MICROFUME. It acts as a nematicide, fumigant and herbicide.

Very little has been reported concerning dazomet's mobility through soil. EPA does not attempt to assess its leachability and data concerning its chemical characteristics are too sparce to attempt an assessment at this time. It is not recommended for use in this state (1,2,4).

	Dazomet	Concern Level
solubility	3,000 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979

DEMETON (8065-48-3)

0,0-diethyl-0-[2-(ethylthio)ethyl] phosphorothioate

Demeton is known as SYSTOX and acts systemically as an insecticide and acaricide. Since it is subject to hydrolysis under alkaline conditions, it is incompatible with lime additives.

EPA has not ventured a leachability class for this compound. Little information is available concerning its movement through the soil. It is recommended for use in New Jersey on some fruit and vegetable crops (2,3,4).

	Demeton	Concern Level
solubility	60 (room temp)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979

DESMEDIPHAM (13684-56-5)

ethyl m-hydroxycarbanilate

Desmediphan, or BETANEX, is a carbamate post-emergence herbicide used to control a broad range of weeds in beet crops, especially sugar beets. It is frequently used in combination with phenmedipham.

EPA considers this compound slightly mobile. It is moderately persistent and has a low aqueous solubility. There have been no reports in the literature describing its mobility through soil. Currently, desmedipham is not recommended for vegetable, fruit or field crops in New Jersey (2,3,4).

	Desmedipham	Concern Level
solubility	7 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	$\leq$1	> 25 wks
soil t 1/2	2-32 (field)	> 3 wks
photolysis t 1/2	$\leq$1	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979

DIALIFOR (10311-84-9)

S-(2-chloro-1-phthalimido-ethyl) 0,0-diethyl phosphorodithioate

Dialifor, known as TORAK, is an insoluble non-systemic insecticide and acaricide effective in controlling many insects and mites common to apples, citrus, grapes and pecans.

It is non-corrosive and readily hydrolyzed by concentrated alkali's (6). Winterlin and colleagues applied the highest permissable dose of dialifor onto a San Joaquin, CA grape crop. The study determined that dust treatments of the pesticide had little influence on dissipation or oxygen analogue formation of dialifor. These researchers pointed to a possible exposure threat to workers spraying this relatively toxic compound in the field.

There is no known information describing this compound's mobility through soil. EPA has not attempted to assess its leaching potential. It is not currently a recommended pesticide for use on apples in New Jersey (2,3,4).

	Dialifor	Concern Level
solubility	insoluble	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : small threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Winterlin, W., Walker, G., Hall, G., McFarland, J. & Mourer, C., 1980.
6. Worthing, C.R., 1979

DIALLATE (2303-16-4)

S-(2,3-dichloroallyl) diisopropylthiocarbamate

AVADEX is the trade name by which the pre-emergence selective herbicide, diallate, is known. It is commonly used to control wild oats and blackgrass in brassicas, sugarbeets and red beets. Immediate incorporation into the soil is recommended, since it is a rather volatile compound.

Smith (1976) concluded that diallate does not leach through the soil. However, this researcher only analyzed soil cores down to 10 cm., and frequency of sampling was not reported. Little else has been reported in the literature about the movement of diallate. Little can be found about its chemical characteristics. It is not included in the crop recommendations for New Jersey (2,3,4).

	DiAllate	Concern Level
solubility	14 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	190	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : small threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Smith, A.E., 1976.
6. Worthing, C.R., 1979.

DIAZINON (333-41-5)

O,O-diethyl O-(2-isopropyl-4-methyl-6-pyrimidinyl) phosphorothioate

The active ingredient in the insecticide-nematicide BASUDIN and SAROLEX is the compound diazinon. It is effective non-systemically against soil insects and household pests.

Diazinon seems to be rather tightly adsorbed onto the soil (6,9) and degrades rapidly upon application (6). It may be volatilized from soil, but this process decreases as the chemical becomes adsorbed (8). Microbial degradation may occur in soil, but investigation of this route of dissipation is just beginning. Honeycutt et. al. (1984) discovered that degradation of diazinon was increased in the presence of an enzyme, parathion hydrolase, produced from a mixed culture of Pseudomonas sp..

Ample evidence exists about the behavior and characteristics of this compound to warrant its designation as a non-leacher. EPA also labels it thusly, and considers it immobile. It is used in New Jersey on field corn, vegetables and fruit crops (4,5,7).

	Diazinon	Concern Level
solubility	40 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	570 (calc)	< 500
hydrolysis t 1/2	0,52-4	> 25 wks
soil t 1/2	8-24 (field)	> 3 wks
photolysis t 1/2	1 d (field)	> 1 wk
in groundwater	no	

NOT LIKELY LEACHER : no threat to N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Honeycutt, R., Ballantine, L., LeBaron, H., Paulson, d., & sEIM,

V., 1984.
4. Hopfinger, J.A., 1985.
5. Justin, J.R., 1984.
6. Ritter, W.F., Johnson, H.P., Lovely, W.G., & Molnau, M., 1974.
7. Robson, M.G., & Johnson, W.B., 1985.
8. Sanders, P.F., & Seiber, J.N., 1984.
9. Sharom, M.S., Miles, J.R.W., Harris, C.R., & McEwen, F.L., 1980.
10. Worthing, C.R., 1979.

DICAMBA (1918-00-9)

2-methoxy-3,6-dichlorobenzoic acid

The active ingredient of BANVEL, a commonly used herbicide, is dicamba. This compound is generally used as a post-emergent to control weeds in cereals and other similar types of food crops.

The literature on dicamba suggests that it is readily mobile in most soils and that much of this mobility is related to water solubility (3,4,6). Less leaching was observed in these studies overall in soils having high organic content.

One study, conducted by Smith (1976), outlined the mobility of eight pesticides on different Canadian soil types. This researcher determined that negligible amounts of any herbicide, including dicamba, were recovered from the 5 to 10 cm soil depths over a three year period. These results may be explained by the relatively high organic matter in the soils usedin the study, or, the herbicide may have leached below the 10 cm level.

Dicamba is included as a priority I chemical by EPA and is described as a leacher. It is a mobility class 5 (very mobile) on the Helling classification scheme. Its chemical characteristics signify leaching capabilities though it has not been detected in groundwater to date. It is a recommended for use pesticide on field corn and small grains (5,7,8).

	Dicamba	Concern Level
solubility	4,500 (25°C)	> 30 ppm
K_d	0; 0.11	< 5
K_{oc}	0.4; 2.2	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	1-6 (lab)	> 3 wks
photolysis t 1/2	stable (lab)	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Friesen, H.A., 1965.
4. Harns, C.I., 1964.
5. Hopfinger, J.A., 1985.
6. Hotzman, F.W., & Mitchell, W.H., 1977.
7. Justin, J.R., 1984.
8. Robson, M.G., & Johnson, W.B., 1985.
9. Smith, A.E., 1976.
10. Worthing, C.R., 1979.

DICHLONE (117-80-6)

2,3-dichloro-1,4-naphthoquinone

The fungicide dichlone, also known as PHYGON, is primarily used on fruit, vegetable and field crops.

This compound's chemical parameters indicate that it is probably not a leacher. However, little data in the literature exists to support this conclusion. EPA has not attempted to assess it but considers it immobile. Dichlone is currently recommended for use on New Jersey vegetable and fruit crops (1,2,4).

	Dichlone	Concern Level
solubility	insoluble	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	5 d (pH 7)	> 25 wks
soil t 1/2	1 d-12 wks	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.

DICHLORAN

2,6-dichloro-4-nitroaniline

Dichloran is the active ingredient in the fungicides, BOTRAN and ALLISAN. It can be applied to fruit, vegetable and ornamental crops.

There is virtually no information available in the literature regarding the chemical characteristics nor the mobility of dichloran. Therefore, a leachability assessment cannot be completed. It is recommended for use in New Jersey on vegetable and fruit crops (2,3,4).

	Dichloran	Concern Level
solubility	NA	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979

DICHLORBENIL (1194-65-6)

2,6-dichlorobenzonitrile

This nitrile herbicide goes by the trade name CASORON. It is used effectively against annual and perennial weeds in both seedling and advanced stages or as a selective weed killer in cranberry bogs.

Dichlorbenil appears to be a rather persistent compound having little mobility through the soil column. Hogue et. al. (1981) found that it moved only slightly down a loam soil column with 40 or 80 cm of irrigation (corresponding to 2 years worth) in a laboratory experiment. However, mobility was greater in a sandy soil.

Williams & Eagle (1979) discovered that the half-life of dichlorbenil residues in soil increased with time. Soil samples taken 4 and 8 weeks after the time of application demonstrated a 4 week half-life, while those taken after 1 year showed half-lives of 1 year. These researchers attributed this phenomenon to rapid volatilization for the first few weeks after application, followed by slower degradation in the soil later.

EPA has not reviewed dichlorbenil to assess its leachability. The literature suggests that although dichlorbenil may be persistent in soil, the liklihood of its moving through soil is small. It is currently recommended for use on New Jersey fruit crops (2,3,4).

	Dichlorbenil	Concern Level
solubility	18 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	2-20 (lab)	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Hogue, E.J., Khan, S.U., & Gaunce, A., 1981.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Smith, A.E., 1976.
6. Williams, J.H., & Eagle, D.J., 1979.
7. Worthing, C.R., 1979.

1,3-DICHLOROPROPENE (542-75-6)

1,3-dichloropropene

This compound's chemical name is the same as its common name. In the trade, it is known as TELONE. It is a soil fumigant for nematode, fungal and weed control. Another compound, 1,2-dichloropropane, also a fumigant, has a similar trade name, TELONE II.

1,3-dichloropropene is non-persistent and is quickly hydrolyzed in soil to its corresponding 3-chloroallyl alcohol (8). It is very water soluble. EPA does not attempt to label this compound. The literature on its groundwater contamination potential is sparse. It is a recommended for use as a pesticide on New Jersey fruits (5,6,7).

1,2-dichloropropane, on the other hand, is an established leacher. It has been detected in the groundwater of California, Maryland, New York and most recently in Washington (1,2,3,4). It is extremely persistent and water soluble. It may be used on vegetables in New Jersey (5,6,7). Therefore, 1,2-dichloropropane should be added to the list of compounds to watch in this state.

1,3-dichloropropene Concern Level		
solubility	1,000 (20°C)	> 30
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

	1,2-dichloropropane	Concern Level
solubility	2,600-2,700 (20°C)	> 30
K_d	0.43	< 5
K_{oc}	46	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	6mo-years	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	yes	

LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, D.B., 1985.
2. Cohen, S.Z., EPA memo, 1985.
3. Cohen, S.Z., Creeger, S.M., Carsel, R.F., & Enfield, C.G., 1984.
4. Cohen, S.Z., Eiden, C., & Lorber, M.N., 1986.
5. EPA one-liner files, 1986.
6. Hopfinger, J.A., 1985.
7. Justin, J.R., 1984.
8. Robson, M.G., & Johnson, W.B., 1985.
9. Worthing, C.R., 1979.

DICLOFOP METHYL (51338-27-3)

methyl 2-[4-(2',4'-dichlorophenoxy)-phenoxy] propanoate

HOELON 3EC is a post-emergence herbicide that works by the action of its active ingredient, diclofop methyl. This diphenyl ether controls annual grassy weeds in a variety of crops.

The chemical characteristics of this compound demonstrate that it may be moderately persistent but probably not a leacher. EPA considers it immobile and not a leacher. It is not included in the recommendations for vegetable, fruit or field crops in New Jersey (2,3,4).

	Diclofop methyl	Concern Level
solubility	3 (22°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	78,000	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	5-6 (field)	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : no threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Roboen, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

DICROTOPHOS (141-66-2)

dimethyl phosphate of
3-hydroxy-N,N-dimethyl-cis-crotonamide

The common name for insecticides BIDRIN, CABICRON and EKTAFOS is dicrotophos. This carbamoyl pesticide works systemmically and by contact against sucking, boring and chewing insects.

Although no data could be found regarding this compound's movement in soil, its relatively short persistence in soil indicates that its potential to contaminate groundwater is low. EPA does not assess this compound's leachability. It is not included in the lists of recommended pesticides for New Jersey (1,2,4).

	Dicrotophos	Concern Level
solubility	miscible	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	8	> 25 wks
soil t 1/2	< 1-2	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : no threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

DIFENZOQUAT (49866-87-7)

1,2-dimethyl-3,5-diphenyl-1H-pyrazolium
(methyl sulphate)

AVENGE, active ingredient difenzoquat, is a post-emergenct herbicide used to control wild oats in wheat and barley.

Although difenzoquat is relatively persistent in soil and has a rather high aqueous solubility, it is classified as immobile by the Helling system and, accordingly, is not considered a leacher by EPA. It is not included in the lists of recommended pesticides for vegetables, fruits or field crops in this state (2,3,4).

	Difenzoquat	Concern Level
solubility	760,000 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	16-100	> 3 wks
photolysis t 1/2	> 8	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : small threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

DIFLUBENZURON (35367-38-5)

1-(4-chlorophenyl) 3-(2,6-difluorobenzoyl) urea

Diflubenzuron, or DIMILIN as it is called by the manufacturer, is a contact insecticide used to control leaf-feeding larvae and leaf miners in forests, woody ornamentals and fruit trees.

It is rapidly degraded in soil with the soil microbial population having a significant role (6). Ivie et. al. (1980), in a laboratory study investigating the fate of diflubenzuron in aqueous media with variable pH, found that this compound degrades rapidly in neutral or alkaline media, but more slowly under acidic conditions (pH < 6). Since most farmers in New Jersey lime their soils, persistence or accumulation due to acid conditions would not be expected to have a significant effect. The chemical parameters of diflubenzuron suggest that it is probably not a leacher. It is not a recommended for use as an insecticide on fruit, vegetable or field crops in this state (2,4,5), however, it can be used for gypsy moth suppression.

	Diflubenzuron	Concern Level
solubility	0.2 (20°C)	> 30 ppm
K_d	245	< 5
K_{oc}	6,790	< 500
hydrolysis t 1/2	< 1	> 25 wks
soil t 1/2	< 1	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : no threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Ivie, G.W., Bull, D.L., & Veech, J.A., 1980.
4. Justin, J.R., 1984.

5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

DIMETHOATE (60-51-5)

O,O-dimethyl S-(N-methyl carbamoyl-methyl) phosphorodithioate

Dimethoate, trade names CYGON and DE-FEND, works as a contact and systemic insecticide-acaricide against a broad range of insects and mites on a variety of crops. It is stable in aqueous solution but readily hydrolyzes under alkaline conditions (5).

EPA does not attempt a leachability assessment on dimethoate; there is very little data available. It is currently recommended for use on soybeans, vegetable and fruit crops in New Jersey (2,3,4).

	Dimethoate	Concern Level
solubility	25,000 (21°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	8	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

DINOCAP (34300-45-3)

2,4-dinitro-6-octyl-phenyl-crotonate

Dinocap, or KARATHANE, is a foliage fungicide and acaricide. In a lab column study, neither dinocap nor its phenolic metabolite, DNOP, leached (3); however, the compound seems to be fairly persistent in soil.

EPA does not appear to believe that this chemical is a leacher, but this determinaiton is based on very little data. Currently, experts in the field recommend dinocap for use on vegetables and fruit in New Jersey (1,2,4).

	Dinocap	Concern Level
solubility	insoluble	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	< 1-33	> 25 wks
soil t 1/2	20-30 (lab)	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER: unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

DINOSEB (88-85-7)

2-sec-butyl-4,6-dinitrophenol

Dinoseb, otherwise known as BASANITE or PREMERGE, is a contact herbicide applied post-emergence to peas, beans, and potatoes. It can also be used as a pre-harvest dessicant of potatoes and leguminous seed crops.

Dinoseb has been shown to leach in some types of soils. Degradation of this compound includes some microbial decomposition (4). EPA researchers consider dinoseb a leacher in their one-liner report. This decision is based primarily on the compound's chemical parameters. Dinoseb has been found in the groundwater of New York (2,3). It is currently recommended for pre-emergent use on soybeans, alfafa and vegetables in New Jersey (5,6,7).

	Dinoseb	Concern Level
solubility	50 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	124; 497	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	yes	

LEACHER: potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. Cohen, S.Z., Creeger, S.M., Carsel, R.F., & Enfield, C.G., 1984.
3. Cohen, S.Z., Eiden, C., & Lorber, M.N., 1986.
4. EPA one-liner files and memos, 1986.
5. Hopfinger, J.A., 1985.
6. Justin, J.R., 1984.
7. Robson, M.G., & Johnson, W.B., 1985.
8. Worthing, C.R., 1979.

DIPHENAMID (957-51-7)

N,N-dimethyl-2,2-diphenyl acetamide

Diphenamid is a selective pre-emergence herbicide that goes by the trade names, DYMID and ENIDE. It can be used on a wide range of crops for control of a broad spectrum of weeds.

It is considered to have a class 3 (intermediate) mobility, and EPA one-liner files have labelled this herbicide a leacher. In fact, EPA has given this compound a priority I designation. Not tightly adsorbed by soil colloids, diphenamid would not be expected to have a long persistence in soil, however, its soil half-life can range from 12-24 weeks. It does not volatilize nor does it photodegrade. It is currently recommended for use in New Jersey on vegetable and fruit crops (3,4,5).

	Diphenamid	Concern Level
solubility	260 (27°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	12-24	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	no	

POTENTIAL LEACHER: potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files, 1986.2.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

DIPROPETRYN (4147-51-7)

2-ethylthio-4,6-bis (isopropylamino)-s-triazine

Dipropetryn is the common name for compounds known in the trade as SANCAP and COTOFOR. It is a selective herbicide applied at planting or within 2 days after planting to control weeds in cotton and melon crops.

This compound is not very persistent nor does it have a high water solubility. EPA one-liner files do not consider dipropetryn a groundwater threat. It is not recommended for use on vegetables, fruit or field crops in New Jersey (2,3,4). Given the limited information on degradation and mobility, the assessment of leachability cannot be accurately made. It is probably not a leacher due to its chemical characterisitcs and would therefore not be considered a threat to New Jersey's groundwater resources. However, at this point, a definitive conclusion cannot be asserted.

	Dipropetryn	Concern Level
solubility	16 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	4 (field)	> 3 wks
photolysis t 1/2	3 (soil)	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : no threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

DIQUAT (2764-72-9)

1,1'-ethylene-2,2'-bipyridium ion

Diquat goes by the names REGLONE and AQUACIDE. It is a contact herbicide and dessicant used primarily to control weed growth in aquatic systems.

This compound adsorbs readily to clay soil and is, in fact, inactivated by soil contact. It has been classified as immobile (5) based on studies using silty clay loam soil. Leaching may be more apparant in sandy and low organic matter content soils, which are prevalent in New Jersey.

Since this chemical is highly water soluble and stable to hydrolysis yet is considered immobile and is adsorbed readily, the assessment of its leachability is difficult. It appears, however, that the risk of diquat contaminating groundwater is minimal. It is not recommended for use on vegetable, fruit or field crops in New Jersey (1,2,4), but may be in use for aquatic weed control.

	Diquat	Concern Level
solubility	700,000 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER: unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Mrak, E.M., 1974.

4. Ott, P., personal communication, 1986.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

DISULFOTON (298-04-4)

O,O-diethyl-S [2-(ethyulthio)-ethyl] phosphorodithioate

Disulfoton, which goes by the trade name DI-SYSTON, is a systemic insecticide and acaricide used mainly for treatment of seeds. It can also be applied in the granular form directly to soil to protect seedlings. It is metabolized in plants to its corresponding sulfoxide and sulfone.

It is susceptible to microbiological attack in soil (11). Persistence has been reported from 85% dissipation in 4 weeks (11) to the same in 6-8 weeks (12). It is relatively stable to hydrolysis at pH's below 8 (13).

EPA considers disulfoton a leacher and a priority II compound. The metabolites are likely leachers as well and are also considered priority II compounds. The parent has been detected in Iowa groundwater (3,4,5,6,9,10). Currently this insecticide is recommended for use on vegetable crops in New Jersey (3,4,6).

	Disulfoton	Concern Level
solubility	25 (room temp)	> 30 ppm
K_d	3-100	< 5
K_{oc}	1780; 1603	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	8-10	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	yes	

LEACHER: potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hallberg, G.R., Libra, R.D., Bettis, E.A. III, & Hoyer, B.E., 1984.

4. Hallberg, G.R., Libra, R.D., Bettis, E.A. III, & Hoyer, B.E., 1983.
5. Hallberg, G.R., Libra, R.D., & Hoyer, B.E., 1984.
6. Hallberg, G.R., Libra, R.D., Ressmeyer, G.G., Bettis, E.A. III & Hoyer, B.E., 1984.
7. Hopfinger, J.A., 1985.
8. Justin, J.R., 1984.
9. Kelly, R.D., 1985.
10. Libra, R.D., Hallberg, G.R., Ressmeyer, G.G. & Hoyer, B.E., 1984.
11. Mathur, S.P., Belanger, A., Hamilton, H.A., & Khan, S.U., 1980.
12. Robson, M.G., & Johnson, W.B., 1985.
13. Worthing, C.R., 1979.

DIURON (330-54-1)

3-(3,4-dichlorophenyl)-1,1-dimethylurea

The trade names for the herbicide diuron are KARMEX and KROVAR. It is somewhat persistent, but its phytotoxic residues disappear within a growing season (3,6,9,11).

Miller, et. al. (1978) in a field study found detectable levels of diuron below the tilled zone; however, the herbicide did not accumulate to the next growing season. These researchers found rather high concentratons in the 45-60 cm layer below the surface (0.25 ppm) and could detect residues at smaller concentrations to 120 cm.

EPA has included this herbicide on its priority II list of chemicals. Its chemical parameters signal a leaching tendency. Diuron is currently recommended for use on vegetable and fruit crops and on established stands of alfafa (4,5,10). It has not yet been detected in the groundwater of any state that has looked for it.

	Diuron	Concern Level
solubility	42 (25°C)	> 30 ppm
K_d	0.2-83	< 5
K_{oc}	383; 400	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	28	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	no	

POTENTIAL LEACHER: potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.

3. Hance, H.W. & Segal, G.M., 1980.
4. Hopfinger, J.A., 1985.
5. Justin, J.R., 1984.
6. Majka, J.T. & Lavy, T.L., 1977.
7. Miller, J.H., Keeley, P.E., Thullen, R.J., & Carter, C.H., 1978.
8. Mrak, E.M., 1974.
9. Peck, B.E., Corwin, D.L., & Farmer, W.J., 1980.
10. Robson, M.G., & Johnson, W.B., 1985.
11. Worthing, C.R., 1979.

DSMA (144-21-8)

disodium methanearsonate

DSMA is the common name for the selective herbicides ANSUL, ANSAR 8100 and DMA. This organic arsenical is very soluble in water. It is used post-emergent on cotton and on non-crop areas to combat weed growth.

Little is reported in the literature on this compound. EPA does not have a file on it. Information about its chemical parameters is not available. In short, insufficient data are at hand by which to offer an accurate leaching assessment on DSMA. Its use on New Jersey non-crop areas is unknown. It is not recommended for use in this state on vegetable, fruit or field crops (1,2,3).

	DSMA	Concern Level
solubility	4,000 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER: unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Robson, M.G., & Johnson, W.B., 1985.
4. Worthing, C.R., 1979.

ENDOTHALL (145-73-3)

7-oxabicyclo- (2,2,1) heptane-2,3-dicarboxylic acid

AQUATHOL, active ingredient endothall, is used to control weed growth in aqueous environments. It can also be used pre- and post- emergent on sugar beets, red beets and spinach to control weeds in these crops as well.

Data from EPA's call-in program signify that endothall demonstrates a leaching potential. The chemical characteristics available support this estimation: endothall is relatively stable to hydrolysis and to photolysis, and it is very water soluble. It is, however, rapidly degraded in water (6). Endothall is not included in the recommendations for use on vegetable, fruit or field crops in New Jersey (1,2,5).

	Endothall	Concern Level
solubility	100,000 (20°C)	> 30 ppm
K_d	1-40	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	> 5	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER: small threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Mrak, E.M., 1974.
4. Ott, P., personal communication, 1986.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

EPTC (759-94-4)

S-ethyl-N,N-dipropyl thiocarbamate

The selective herbicide, EPTC, or EPTAM, is used on vegetable crops to inhibit development of many types of perennial weeds.

Buzio & Burt (1980) studied the leaching of EPTC in a comparative study using this compound and R-25788. Four Maryland soils were employed in the laboratory study where it was found that EPTC mobility decreased in soils having high organic matter and clay contents and low sand contents. These researchers concluded that soil type is a significant factor in the movement of this chemical. The authors did not attempt extrapolation of mobility to the field.

Cliath and co-workers (1980) determined in a California study using alfafa crops that EPTC loss occurs via volatilization especially when "herbigation" (applying herbicide while irrigating) is employed.

Little else has been done to help in the assessment of EPTC's leachability. EPA has not attempted a label as yet, although it has ranked EPTC a moderately mobile compound. It is currently recommended for weed control in alfafa and on vegetables in this state (4,5,6).

	EPTC	Concern Level
solubility	365 (20°C)	> 30 ppm
K_d	3.5	< 5
K_{oc}	240	< 500
hydrolysis t 1/2	$\leq$ 1 (field)	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER: small threat to N.J. groundwater

REFERENCES

1. Buzio, C.A., & Burt, G.W., 1980.
2. Cliath, M.M., Spencer, W.F., Farmer, W.J., Shoup, T.D., & Grover, R., 1980.
3. EPA one-liner files, 1986.
4. Hopfinger, J.A., 1985.
5. Justin, J.R., 1984.
6. Robson, M.G., & Johnson, W.B., 1985.
7. Worthing, C.R., 1979.

ETHIOFENCARB (29973-13-5)

2-ethyl-mercaptomethyl-phenyl-N-methylcarbamate

Ethiofencarb, active ingredient in insecticides CRONETON and HOX 1901, is generally soil- or foliar- applied to fruit crops to control aphids.

This compound is stable to hydrolysis on acidic environments but hydrolyzes rapidly at pH 7 and higher (1). There is little information in the literature to warrant a complete leaching assessment on this chemical. EPA does not rank it. It is not listed in the recommendations for New Jersey vegetable, fruit or field crops (2,3,4).

	Ethiofencarb	Concern Level
solubility	1,820 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	6 min - 1 wk (pH 11-7)	> 25 wks
soil t 1/2	6-7 (lab)	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : small threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Mrak, E.M., 1974.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Senesi, N., & Testini, C., 1980/
7. Weber, J.B., Weed, S.B., & Ward, T.M., 1969.
8. Worthing, C.R., 1979.

ETHOPROP (13194-48-4)

O-ethyl-S,S-dipropylphosphorodithioate

Ethoprop goes by the trade names MOCAP and PROPHOS. It is a non-systemic, non-fumigant contact insecticide and nematicide commonly used on potatoes for control of potato cyst nematodes. It demonstrates some residual activity and has been determined to be very mobile in sandy loam soil (1,4,6). In humic soils, penetration through the soil is inhibited (4). Adsorption of this compound depends on the soil type: there is greater insecticidal activity in moist sandy soils than in humic soils (4).

Mocap is recommended for use on vegetable crops in New Jersey (2,3,5). Since it has been established that ethoprop is a mobile compound in sandy soils, and since much of New Jersey soils are comprised of sand, this compound will be considered a potential threat to groundwater resources in this state.

	Ethoprophos	Concern Level
solubility	750 (unknown temp)	30 ppm
K_d	1-3	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	17 (pH 4) 63 (pH 8)	> 25 wks
soil t 1/2	1-6	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Leistra, M., 1979.
5. Robson, M.G., & Johnson, W.B., 1985.

6. Worthing, C.R., 1979.

FENAMINOSULF (140-56-7)

sodium [4-(dimethylamino) phenyl] diazene sulfonate

Fenaminosulf, or LESAN as it is known in the trade, is a soil and turf fungicide which slowly decomposes in the presence of water (5). This decomposition process is accelerated by light and alkali.

Fenaminosulf does not appear to be persistent in soil or water but does seems to be mobile (3). The data are too sparse to efficiently evaluate its leaching potential. It is currently recommended in New Jersey for use on vegetables (1,2,4).

	Fenaminosulf	Concern Level
solubility	20,000-30,000 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	rapid	> 25 wks
soil t 1/2	2 d (lab)	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

FENAMIPHOS (22224-92-6)

ethyl 3-methyl-4-(methylthio)phenyl-1(1-methylethyl)phosphoramidate

NEMACUR is the trade name by which the insecticide fenamiphos is known.

Fenamiphos has been observed to be less mobile in and more strongly adsorbed to soil than oxamyl, a compound similar in structure to fenamiphos and a leacher (1). It is a priority I chemical according to EPA and is considered a possible leacher.

Currently, NEMACUR is recommended for use in New Jersey on fruits and vegetables (3,4,5). Although it has not yet been detected in groundwater, fenamiphos appears to exhibit the physical characteristics of a leacher.

	Fenamiphos	Concern Level
solubility	700 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	655	< 500
hydrolysis t 1/2	1-3	> 25 wks
soil t 1/2	4-24	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Bromilow, R.H. & Lord, K.A., 1979.
2. Cohen, S.Z., EPA memo, 1985.
3. EPA one-liner files and memos, 1986.
4. Hopfinger, J.A., 1985.
5. Justin, J.R., 1984.
6. Robson, M.G., & Johnson, W.B., 1985.

FENSULFOTHION (115-90-2)

O,O-diethyl-O-p-(methylsulfinyl-phenyl) phosphorothioate

DASANIT, the trade name for fensulfothion, is an effective contact insecticide-nematicide which is used to control free-living cyst-forming and root-knot nematodes. It is usually soil incorporated for maximum efficiency.

This compound is moderatley persistent in the field (5) and is very water soluble. These two factors make it a a potential leacher. However, the literature is sparse regarding fensulfothion's mobility through soil. Since it is recommended for use on New Jersey vegetables (2,3,4), it should be considered a potential groundwater contaminant.

	Fensulfothion	Concern Level
solubility	1,540 (25°C)	> 30 ppm
K_d	2.45; 7.44	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	21-30	> 25 wks
soil t 1/2	$\leq$ 1	> 3 wks
photolysis t 1/2	8 (soil)	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files and memos, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

FERBAM (14484-64-1)

ferric dimethyldithiocarbamate

Ferbam is similarly named by its manufacturer, FERMATE. This non-phytotoxic compound is used to protect foliage from a variety of fungal pathogens. It tends to decompose on prolonged storage or exposure to moisture and heat, and its decomposition products are flammable (5).

There is insufficient information available in the literature about the chemical parameters, mobility and degradation of this chemical to assess its possible impact on groundwater. It is recommended for use on fruits and vegetables in New Jersey (2,3,4).

	Ferbam	Concern Level
solubility	120-130 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files and memos, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

FLUOMETURON (2164-17-2)

1,1-dimethyl-3-(a,a,a trifluro-m-tolyl) urea

Fluometuron is referred to as LANEX and COTORAN in the trade. This selective herbicide exhibits weak foliar activity, but is readily adsorbed through plant roots. This makes fluometuron especially suited for broad-leaf weed control. It is moderately persistent in soil systems (7).

Miller et. al. (1978), in a field study, found high concentrations of fluometuron 20-45 cm below the soil surface. In this same study, smaller yet detectable concentrations of this compound were found as deep as 120 cm below the soil surface, indicating that fluometuron may be mobile in soil.

EPA has included this chemical on its priority I list. The listed chemical parameters signify a potential for it to leach. It is not a recommended pesticide in New Jersey (3,4,7).

	Fluometuron	Concern Level
solubility	105 (20 °C)	> 30 ppm
K_d	NA	< 5
K_{oc}	175	< 500
hydrolysis t 1/2	110-144	> 25 wks
soil t 1/2	< 24	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : small threat to N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.

4. Justin, J.R., 1984.
5. Miller, J.H., Keeley, P.E., Thullen, R.J., & Carter, C.H., 1978.
6. Mrak, E.M., 1974.
7. Robson, M.G., & Johnson, W.B., 1985.
8. Worthing, C.R., 1979.

FONOFOS (944-22-9)

O-ethyl-S-phenyl-ethylphosphonodithioate

Fonofos is known by the trade name DYFONATE. It is a soil-applied insecticide useful for the control of rootworms, wireworms, crickets and similar crop pests.

Fuhremann & Lichtenstein (1980) conducted a comparative persistence and movement study using water-soluble versus slightly water-soluble pesticides. They found that the lower water-soluble pesticides, including fonofos, were less mobile overall than the more water-soluble compounds. Since this was a comparative study, the extent of leaching was not described.

EPA considers this chemical a marginal leacher with a low priority. However, it has been detected in Iowa's ground water albeit in low concentrations (1,5,6,7,8,11,12). It is recommended for use on vegetable crops and field corn in New Jersey (9,10,13).

	Fonofos	Concern Level
solubility	13 (unknown temp)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	8	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	yes	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. Cohen, S.Z., Eiden, C., & Lorber, N.M., 1986.
3. EPA one-liner files and memos, 1986.

4. Fuhremann, T.W., & Lichtenstein, E.P., 1980.
5. Hallberg, G.R., Libra, R.D., Bettis, E.A. III, & Hoyer, B.E., 1984.
6. Hallberg, G.R., Libra, R.D., Bettis, E.A. III, & Hoyer, B.E., 1983.
7. Hallberg, G.R., Libra, R.D., & Hoyer, B.E., 1984.
8. Hallberg, G.R., Libra, R.d., Ressmeyer, G.G., Bettis, E.A. III, & Hoyer, B.E., 1984.
9. Hopfinger, J.A., 1985.
10. Justin, J.R., 1984.
11. Kelly, R.D., 1985.
12. Libra, R.D., Hallberg, G.R., Ressmeyer, G.G., & Hoyer, B.E., 1984.
13. Robson, M.G., & Johnson, W.B., 1985.
14. Worthing, C.R., 1979.

FORMETANATE (22259-30-9)

(3-dimethylamino-(methyleneimino phenyl)-N-methylcarbamate hydrochloride

This insecticide-acaricide is known by the trade name CARZOL. It can be used to control mites and insects on fruit and alfafa and is especially effective against mites resistant to organophosphorous compounds. Formetanate is very soluble in water and has moderate to short persistence in soil. It degrades more rapidly in alkaline soils where parent half-lives of less than 1 week have been reported (3). Some complexing with soil colloids may occur, but this phenomenon has not been studied in detail.

Hydrolysis of formetanate occurs in soil. Rates were high in a clay loam soil and rather low in a loamy sand soil (3). EPA's data sources indicate that formetanate may be a potential leacher since it leached in sandy loam soil columns (3). Apart from this, very little information is available in the literature regarding this compound's mobility and degradation in soil. It is currently recommended for use on fruit crops in New Jersey (1,2,5).

	Formetanate	Concern Level
solubility	<1,000 (room temp)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	4 (field)	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Kuhr, R.J. & Dorough, H.W.,1976.
4. Ott, P., personal communication, 1986.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

FOSAMINE AMMONIUM

ammonium ethyl carbamoylphosphonate

DPX 1108 and KRENITE are trade names for the active compound, fosamine ammonium. A contact herbicide, this chemical is effective against woody plants when applied during a 60-day period before fall coloration. Its use is selective in forestry. It is subject to decomposition under acid conditions (2) and appears to be somewhat persistent.

EPA has not assessed this compound. There is insufficient data to determine whether it may contaminate ground water or not. Its silvicultural use in New Jersey is unknown. Its chemical characteristics are indicative of a leacher: high aqueous solubility, high soil persistence, and high water and sunlight persistence. It should be watched as a potential leacher.

	Fosamine Ammonium	Concern Level
solubility	179,000 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	> 56 (lab)	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER: unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Worthing, C.R., 1979.

FOSTHIETAN (21548-32-3)

(diethoxyphosphinylimino)-1,3-dithietane

Fosthietan, an insecticide-nematicide, is aptly named by the trade as NEM-A-TAK. This chemical has been discontinued by American Cyanamid Co., the only known manufacturer of the pesticide (3).

There appears to be no data available by which to assess fosthietan's leaching potential. However, if it has been discontinued, there is little risk that residues in groundwater will be significant. It is not recommended for use in New Jersey (1,2,4).

	Fosthietan	Concern Level
solubility	50,000 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	1-7	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : small threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

HEXAZINONE (5123500-04-2)

3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4-(1H, 3H)-dione

Hexazinone, or VELPAR, is a contact and residual post-emergent herbicide used on non-crop areas. Rainfall is needed for activation in soil (7). Although there is not a lot of research studies available on hexazinone leachability, Rhodes (1980) has completed a comprehensive series of soil studies with this compound. Using three different types of soils from three disparate regions of the U.S. and ensuring identical procedural conditions, he found that the persistence varied from a soil half-life of 4 weeks in Delaware (sandy loam) to 24 weeks in Mississippi (silt loam). The major degradative routes were thought to involve both demethylation and hydroxylation. Rhodes also performed a TLC experiment to determine the compound's mobility class. Hexazinone was determined to have class 4 mobility (mobile).

EPA considers this compound a leacher. It is not recommended for use in New Jersey on fruit or vegetable crops, but may be used on alfafa (3,4,7). Given its chemical properties and the data from the literature, this compound will be considered a leacher.

	Hexazinone	Concern Level
solubility	33,000 (25°C)	> 30 ppm
K_d	0.2-1	< 5
K_{oc}	20-27	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	4-24 (field)	> 3 wks
photolysis t 1/2	4	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Mrak, E.M., 1974.
6. Rhodes, R.C., 1980.
7. Robson, M.G., & Johnson, W.B., 1985.
8. Worthing, C.R., 1979.

ISOFENPHOS

1-methylethyl 2-[[ethoxy[(1-methylethyl) amino] phosphinothioyl] oxy] benzoate

OFTANOL is the manufacturer's name for the pesticide, isofenphos. A stomach and contact insecticide, isofenphos is effective in controlling soil-dwelling and leaf-eating pests. It is subject to hydrolysis under alkaline conditions.

EPA information collected during that agency's data call-in program indicates that this chemical is not a leacher. It is described as having low soil mobility. It is not currently recommended for use on vegetable, fruit or field crops in New Jersey (2,3,4). It is used extensively by homeowners to control turf insects.

	Isofenphos	Concern Level
solubility	23.8 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	6-30 (field)	> 3 wks
photolysis t 1/2	6 (water)	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : no threat to N.J. groundwater

REFERENCES

1. EPA one-liner files and memos, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

LEAD ARSENATE (7784-40-9)

acidic or basic lead arsenate

Lead arsenate, an inorganic arsenical, is known also by the manufacturer's names GYPSINE and SUPRABEL. It is a non-systemic, non-phytotoxic stomach insecticide effective against catepillars on top fruit.

No literature could be found regarding research conducted using lead arsenate. However, EPA mentions that the manufacturer has recently completed a leachability study on it using four types of soils. The results of this project were not released (3).

The data are insufficient to effectively evaluate this compound's leachability. It is currently recommended for use on fruit crops in New Jersey (1,2,4).

	Lead Arsenate	Concern Level
solubility	insoluble	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

LINURON (330-55-2)

3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea

Linuron, also known as AFALON and LOROX, is a pre- and post-emergence selective herbicide used on a variety of food crops. It can also be used along roadsides and fencerows.

Miller, et. al. (1978) and Burnside, et. al. (1969) determined, independently, that linuron tends to move downward through the soil column. Miller and co-workers observed in their field study that this compound does not accumulate from one growing season to another. Burnside and his colleagues detected levels of linuron 2-3 feet below the surface in their field study. Walker (1978) observed that linuron is a rather persistent pesticide whose degradation does not seem to be affected by temperature.

EPA recognizes linuron as a possible leacher, but has not assigned it into any priority class as yet. This herbicide is currently recommended for use in New Jersey on field corn, soybeans, and vegetables (3,4,8).

	Linuron	Concern Level
solubility	75 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	slow	> 25 wks
soil t 1/2	8-28	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Burnside, O.C., Fenster, C.R., Wicks, G.A., & Drew, J.V., 1969.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Kempson-Jones, G.F., & Hance, R.J., 1979.
6. Miller, J.H., Kelley, P.E., Thullen, R.J., & Carter, C.H., 1978.
7. Mrak, E.M., 1974.
8. Robson, M.G., & Johnson, W.B., 1985.
9. Walker, A., 1978.
10. Worthing, C.R., 1979.

MALEIC HYDRAZIDE (123-33-1)

6-hydroxy-3(2H) pyridazinone

Maleic hydrazide is called ROYAL and SUCKERSTUFF by its manufacturers. It is used chiefly as a growth retardant of grasses, hedges and trees. It can also be applied to inhibit the sprouting of potatoes and onions and to prevent sucker development in tobacco. This compound is a monobasic acid which forms water-soluble salts. It is decomposed by concentrated acids whereupon it releases nitrogen.

EPA has included maleic hydrazide on its priority I list of chemicals and considers it a leacher. It has been categorized by Helling as a class 5 compound (very mobile). Its chemical characteristics are indicative of a leacher. It is not a recommended pesticide for vegetable, fruit or field crops in New Jersey (3,4,5); however, it is unknown whether this compound is being used in non-crop areas for general weed control. It has not been found in the ground water of any state that has sampled for it to date.

	Maleic Hydrazide	Concern Level
solubility	6,000 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	2-14	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

MCPA (94-74-6)

2-methyl-4-chlorophenoxyacetic acid

MCPA is the active herbicide in the marketed BROMATE and CHIPTOX pesticides. A systemic selective herbicide, it immitates the action of hormones once absorbed by leaves and roots. This chemical is effective in the control of annual and perennial weeds in cereals, grassland and turf.

EPA considers MCPA a marginal leacher. It has been described by the Helling classification scheme as class 4 (mobile) (6). Currently, New Jersey agriculture experts recommend this compound for use on small grains (3,4,5). It should probably be watched as a possible leacher although little data on its mobility have been available.

	MCPA	Concern Level
solubility	825 (room temp)	> 30 ppm
K_d	NA	< 5
K_{oc}	110 (calc)	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
In groundwater	unknown	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

MECOPROP (93-65-2)

2-(2-methyl-4 chlorophenoxy) propionic acid

Mecoprop, an herbicide, is marketed by the trade name COMPITOX. Its adsorption and leaching characteristics are very similar to those of another phenoxy type herbicide, MCPA, a possible leacher (1).

EPA does not attempt to categorize this compound's leaching potential. Its chemical characteristics suggest that it may have a tendency to move through the soil (high aqueous solubility and long persistence). Due to its similarity to MCPA and to its chemical parameters, mecoprop should be watched in this state as a possible leacher. It is not listed as a recommended for use herbicide on New Jersey fruit, vegetable or field crops (2,3,4), but it is used extensively in turf weed control.

	Mecoprop	Concern Level
solubility	620 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	110 (calc)	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	3-4	> 3 wks
photolysis t 1/2	stable	> 1 wk
In groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files and memos, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

MEFLUIDIDE (53780-34-0)

N-[2,4-dimethyl-5-{{trifluoromethyl) sulfonyl} amino} phenyl] acetamide

Mefluidide is a plant growth inhibitor that goes by the trade names EMBARK and VISTAR.

EPA cites data from its data call-in survey which suggest that this chemical and its degradative metabolites may be prone to leaching. It is not recommended for use in New Jersey (1,2,4).

	Mefluidide	Concern Level
solubility	180 (23°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	stable	> 1 wk
In groundwater	unknown	

UNKNOWN LEACHER : small threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

METAM-SODIUM

sodium N-methyldithiocarbamate

VAPAM and VPM are the trade names under which the compound metam-sodium is marketed. It acts as a soil fumigant. This chemical is stable in concentrated aqueous solution, but unstable to dilution, acids and heavy metal salts. It starts to decompose upon contact with soil.

Data regarding the movement of metam-sodium through the soil column is limited. EPA does not describe its leachability. It may be used on New Jersey vegetables and fruit (2,3,4).

	Metam-sodium	Concern Level
solubility	722,000 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	2.6 (calc)	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
In groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

METHIDATHION (950-37-8)

0,0-dimethyl phosphorodithioate

Methidathion, or SUPRACIDE, is a non-systemic insecticide that controls a wide variety of sucking and leaf-eating insects. It is hydrolyzed under alkaline conditions and readily metabolized by plants and animals.

Insufficient data are presented in the literature by which to assess this compound's leaching potential. It is recommended for use on fruit orchards in New Jersey (2,3,4).

	Methidathion	Concern Level
solubility	240 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	210 (calc)	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
In groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

METHIOCARB (2032-65-7)

3,5-dimethyl-4-(methylthio) phenol

MESUROL is an insecticide-acaricide that also functions as a bird repellent when used as a seed dressing. It is known by the common names methiocarb, mercaptodimethur, and by the trade name, DRAZA. It is rapidly hydrolyzed at alkaline pH (9 and above).

Degradation of mesurol was highest in sandy loam soils as compared to silt loam and high-organic silt loam soils in a lab incubation study (4). Also, hydrolysis rates were higher in alkaline soils than in more acid soils (4).

This water-insoluble compound is considered a class 2 (low mobility) by the Helling scale. EPA accordingly purports that mesurol is not a leacher. It is recommended for use on New Jersey field corn, vegetables and fruit (2,3,4).

	Methiocarb	Concern Level
solubility	insoluble	> 30 ppm
K_d	12.8	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	3 (pH 7) 46 (pH 5)	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	$\geq$ 0.5 d (soil)	> 1 wk
In groundwater	unknown	

NOT LIKELY LEACHER : small threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Kuhr, R.J. & Dorough, H.W., 1976.
5. Robson, M.G., & Johnson, W.B., 1985.

METHOMYL (16752-77-5)

S-methyl-N-[methyl(carbamoyl) oxy]- thioacetimide

Methomyl, also called LANNATE and NUDRIN, works effectively against many types of insect pests on a variety of fruit, vegetable and field crops. Spraying directly onto foliage ensures optimum efficacy of this contact insecticide.

Methomyl is regarded by the EPA as a priority I compound and as a leacher. However, some research indicates that it degrades too quickly to pose a significant threat to groundwater. Harvey & Pease (1973) studied methomyl's dissipation in soil and found very little downward or lateral movement of this chemical in lab soil columns. They also observed rapid dissipation especially in fine sand and loamy sand soils.

All the chemical parameters indicate that methomyl may be a leacher. The New Jersey Extension Service recommends Lannate for use on field corn, soybeans, small wheat, fruit and vegetables (4,5,7,). It has not been detected in the groundwater of any state to date.

	Methomyl	Concern Level
solubility	10,000 (room temp)	> 30 ppm
K_d	NA	< 5
K_{oc}	160	< 500
hydrolysis t 1/2	>> 25	> 25 wks
soil t 1/2	3-6	> 3 wks
photolysis t 1/2	NA	> 1 wk
In groundwater	no	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.

3. Harvey, J. Jr., & Pease, H.L., 1973.
4. Hopfinger, J.A., 1985.
5. Justin, J.R., 1984.
6. Kuhr, R.J., & Dorough, H.W., 1974.
7. Robson, M.G., & Johnson, W.B., 1985.
8. Worthing, C.R., 1979.

METHYL BROMIDE (74-83-9)

bromomethane

BROM-O-GAS and METH-O-GAS are the trade names for the general fumigant, methyl bromide. It can be used as a soil fumigant or as a space, plant or storage fumigant. It is highly toxic to human beings (5).

Information about this chemical is too scant to complete a leachability assessment. Agricultural experts recommend it for use on vegetables (2,3,4).

	Methyl Bromide	Concern Level
solubility	17,500 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	3	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
In groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

METHYL ISOTHIOCYANATE

methyl isothiocyanate

Methyl isothiocyanate, or TRAPEX, is a soil fumigant that is used in combination with chorinated C_3 hydrocarbons in VORLEX. It controls soil fungi, insects, and nematodes but is phytotoxic, so planting must be delayed until decomposition is complete (approximately 3 weeks at 12-18°C soil temperature) (4).

Data regarding this compound's movement through soil is insufficient to warrant a leaching assessment. Experts in the agricultural field in New Jersey recommend it for use on vegetables (1,2,3).

	Methyl Isothiocyanate	Concern Level
solubility	7,600 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	3	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Robson, M.G., & Johnson, W.B., 1985.
4. Worthing, C.R., 1979.

METOLACHLOR (51218-45-2)

2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl) acetamide

Metolachlor, otherwise known as DUAL, is a selective herbicide which is rapidly metabolized by plants (14). Burkhard & Guth (1981) designed a laboratory volatilization study to determine the influence of air flow, soil organic matter content, temperature and pesticide concentration on the rate of volatilization of this compound from the soil surface. The rates increased with increasing pesticide concentration, temperature and air flow rate and with decreasing organic matter content. Apart from this, very little study has been done using metolachlor as the test compound, but much is known about the chemical parameters influencial in the determination of whether this compound is a likely leacher.

Metolachlor has been detected in Pennsylvania and Iowa groundwater (3,5,6,7,8,10,11,12), and it is fairly persistent. It has been described as a leacher by EPA. It is recommended for use in New Jersey on corn, soybeans, and sorghum (9,10,14). Since this pesticide has been detected in ground water, and since its chemical characteristics indicate that it may be a mobile compound, it will be considered a leacher with a potential to contaminate New Jersey groundwater resources.

	Metolachlor	Concern Level
solubility	530 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	> 30	> 25 wks
soil t 1/2	> 15	> 3 wks
photolysis t 1/2	> 7	> 1 wk
in groundwater	yes	

LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Burkhard, N. & Guth, J.A., 1981.
2. Cohen, S.Z., EPA memo, 1985.
3. Cohen, S.Z., Eiden, C., & Lorber, M.N., 1986.
4. EPA one-liner files and memos, 1986.
5. Hallberg, G.R., Libra, R.D., Bettis, E.A. III, & Hoyer, B.E., 1984.
6. Hallberg, G.R., Libra, R.D., Bettis, E.A.III, & Hoyer, B.E., 1983.
7. Hallberg, G.R., Libra, R.D., & Hoyer, B.E., 1984.
8. Hallberg, G.R., Libra, R.D., Ressmeyer, G.G., Bettis, E.A. III, & Hoyer, B.E., 1984.
9. Hopfinger, J.A., 1985.
10. Justin, J.R., 1984.
11. Kelly, R.D., 1985.
12. Libra, R.D., Hallberg, G.R., Ressmeyer, G.G. & Hoyer, B.E., 1984.
13. Mrak, E.M., 1974.
14. Robson, M.G., & Johnson, W.B., 1985.
15. Worthing, C.R., 1979.

METRIBUZIN (21087-64-9)

4-amino-6-tert-butyl-4,5-dihydro-3-methylthio-1,2,4-triazin-5-one

SENCOR and LEXONE are the trade names for the asymmetrical triazine herbicide, metribuzin. This compound appears to dissipate very quickly from the soil after application; in fact, some researchers feel that it degrades too quickly as it travels in the soil to ever reach the water table (12, 14). Temperature, moisture content and pH seem to have a significant influence on the degradation and adsorption of metribuzin (8,12,18). Kempson-Jones & Hance (1979) found that the half-life of the herbicide in soil was considerably shorter at higher temperature and moisture levels in the same soil type. Half-life ranged from 4-9 weeks in high temperature (22°C) and high moisture content (60%) soils, while these ranges were 9-11 weeks in lower temperature (10°C) and low moisture level (10%) soils. The highest half-life (range 15-43 weeks) occurred at 60% moisture and 10°. These researchers concluded that metribuzin does not pose a significant threat to groundwater based upon their lab and field studies.

On the other hand, metribuzin has been detected in Iowa groundwater (2,4,5,6,7,11,15). It is for this reason that metribuzin will be considered a leacher in areas where it is used. It is recommended for use on soybeans, alfafa and vegetables in New Jersey (9,10,17). Its use is conditional in this state, however, due to the light, low organic content of New Jersey soils.

	Metribuzin	Concern Level
solubility	1,200 (20°C)	> 30 ppm
K_d	0.11-0.37	< 5
K_{oc}	95	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	1-40	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	yes	

LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. Cohen, S.Z., Eiden, C., & Lorber, M.N., 1986.
3. EPA one-liner files and memos, 1986.
4. Hallberg, G.R., Libra, R.D., Bettis, E.A. III, & Hoyer, B.E., 1984.
5. Hallberg, G.R., Libra, R.D., Bettis, E.A.III, & Hoyer, B.E., 1983.
6. Hallberg, G.R., Libra, R.D., & Hoyer, B.E., 1984.
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8. Hance, R.J., & Embling, S.J., 1979
9. Hopfinger, J.A., 1985.
10. Justin, J.R., 1984.
11. Kelly, R.D., 1985.
12. Kempson-Jones, G.F., & Hance, R.J., 1979.
13. Ladlie, S., Meggitt, W.F., & Penner, D., 1976.
14. LaFleur, K.S., 1980.
15. Libra, R.D., Hallberg, G.R., Ressmeyer, G.G. & Hoyer, B.E., 1984.
16. Mrak, E.M., 1974.
17. Robson, M.G., & Johnson, W.B., 1985.
18. Walker, A., 1978.
19. Worthing, C.R., 1979.

MEVINPHOS (7786-34-7)

3-[(dimethoxyphosphinyl) oxy]-2-butenoic acid methyl ester

Little data is available on the insecticide-acaricide mevinphos, trade name PHOSDRIN. One study conducted by Sharom & colleagues (1980) analyzed the relationship between the adsorption/desorption and mobility of compounds with their water solubilities and soil types. Mevinphos was the least tightly adsorbed and most quickly desorbed of the 12 insecticides under investigation. Carbofuran, a leacher, followed very closely to mevinphos. Mevinphos was also the most mobile insecticide in this laboratory study again with carbofuran being a very close second on the mobility scale.

Apart from this study, little research has been done on this potentially mobile compound. EPA has not attempted to assess its leachability. It is included in the recommendations for vegetable crops for New Jersey (1,2,4). Although its leachability is unknown, this compound should be watched in New Jersey, based on its adsorption/desorption and mobility characteristics.

	Mevinphos	Concern Level
solubility	miscible	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	0-18	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.

3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Sharom, M.S., Miles, J.R.W., Harris, C.R., & McEwen, F.L., 1980.
6. Worthing, C.R., 1979.

MOBAM (1079-33-0)

4-benzothienyl N-methyl-carbamate

This carbamate insecticide, which is known by the manufacturer's name MCA-600, is effective against cockroaches, aphids, flies and some crop insects. It is an experimental pesticide that has not yet been fully developed by Mobil Chemical Co. (1,2).

Accordingly, little study in the available literature has been completed. Its chemical characteristics have not been fully identified. It has not been not used in New Jersey to date.

	Mobam	Concern Level
solubility	insoluble	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : no threat to N.J. groundwater

REFERENCES

1. Farm Chemicals Handbook, 1983.
2. Ott, P., personal communication, 1986.
3. Worthing, C.R., 1979.

MOLINATE (2212-67-1)

S-ethyl hexahydro-1 H-azepine-1-carbothioate

Molinate is a selective carbamate herbicide marketed under the trade name ORDRAM. Its use is primarily to control weed pests in rice, where it is rapidly adsorbed by plant roots.

The chemical characteristics of molinate hint that it may be a leacher. However, its somewhat exclusive use on rice crops lessens the probability of its contaminating New Jersey groundwater resources.

	Molinate	Concern Level
solubility	800 (21°C)	> 30 ppm
K_d	0.72 (2.2% OM) 3.03 (12.3% OM)	< 5
K_{oc}	110 (calc)	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	$\geq$ 2	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	unknown	

POTENTIAL LEACHER : no threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Worthing, C.R., 1979.

MONOCROTOPHOS (6923-22-4)

dimethyl phosphate of 3-hydroxy-N-methyl-cis-crotonamide

NUVACRON and ASODRIN are the trade names by which the contact and systemic insecticide-acaricide, monocrotophos, is known. It is incompatible with alkaline pesticides due to the fact that its hydrolysis rate increases at pH 7 and above. It is effective on a broad range of pests in cotton, sugarcane, tobacco, potatoes, ornamentals and other areas.

The chemical characteristics of monocrotophos suggest that it may leach through the soil. EPA considers it mobile and hence a possible leacher. It is currently recommended for use on New Jersey vegetable crops (2,3,4).

	Monocrotophos	Concern Level
solubility	miscible	> 30 ppm
K_d	0.077-0.615	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	4-21	> 25 wks
soil t 1/2	1-2	> 3 wks
photolysis t 1/2	< 1 (soil)	> 1 wk
in groundwater	unknown	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.R., 1985.
3. Justin, J.A., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

MONURON (150-68-5)

3-(p-chlorophenyl)-1,1-dimethylurea

MONUREX is the trade name by which monuron is better known. It acts as a root-adsorbed herbicide for total weed control of non-crop areas.

It is less strongly adsorbed by soil humic acids than are the s-triazine herbicides (6), but it appears to be a somewhat persistent compound (7). Although it is stable to hydrolysis at neutral conditions, it may undergo this degradative reaction at high temperature and acidic or alkaline conditions (7). Slow decomposition may occur in moist soils (7). Monuron has been described as a ready leacher. Since high doses are required for effective weed control (4), this compound should be regarded as a possible leacher.

EPA considers monuron mobile in soil. It is not a recommended pesticide for crop use in New Jersey (2,3,5), but may possibly be used for weed control on ditches and railroads.

	Monuron	Concern Level
solubility	230 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	24-72	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

POTENTIAL LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files and memos, 1986.
2. Hopfinger, J.R., 1985.

3. Justin, J.A., 1984.
4. Mrak, E.M., 1974.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Senesi, N. & Testini, C., 1980.
7. Worthing, C.R., 1979.

MSMA (2163-80-6)

monosodium methanearsonate

MSMA or WEED-HOE and ANSAR is an organic arsenical post-emergence herbicide used on ditches and other non-crop areas for the control of grassy weeds.

Insufficient data exist about this compound to determine its potential for reaching ground water. Its use in New Jersey on non-crop areas is unknown.

	MSMA	Concern Level
solubility	28,000 (20°C)	> 30 ppm
K_d	high	< 5
K_{oc}	3 (calc)	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	long	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Worthing, C.R., 1979.

NAPROPAMIDE (15299-99-7)

2-(a-naphthoxy)-N,N-diethylpropionamide

DEVRINOL is the marketed name for napropamide, a selective herbicide used to control annual grasses and certain annual broad-leaved weeds.

Napropamide's chemical parameters show that it may move through soil. EPA considers this compound a possible leacher based on data aquired via its ground water data call-in program. It may be used in New Jersey on fruit and vegetable crops (2,3,4). Napropamide should be watched in this state as a possible groundwater contaminant.

	Napropamide	Concern Level
solubility	73 (20°C)	> 30 ppm
K_d	6.44	< 5
K_{oc}	680	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	4-8 (field)	> 3 wks
photolysis t 1/2	4 d (soil)	> 1 wk
in groundwater	unknown	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. EPA one-liner files and memos, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

NAPTALAM (132-55-1)

N-naphthylphthalamic acid, sodium salt

Naptalam, a pre-emergence herbicide for use on soybeans, potatoes, cucurbits and ground nuts, is marketed under the trade name ALANAP.

It is hydrolyzed in solutions of pH > 9.5 and is unstable at elevated temperatures. Data regarding this compound is limited. Therefore, a leaching assessment cannot be completed at this time. EPA does not assess naptalam's mobility potential. It may be used in New Jersey on soybeans and selectively on vegetables (2,3,4).

	Naptalam	Concern Level
solubility	200 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	3-8	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

NEBURON (555-37-3)

1-n-butyl-3-(3,4-dichlorophenyl)-1-methylurea

Neburon is the active ingredient found in the pre-emergent herbicide, KLOBEN. It is used predominantly on wheat, lucerne, strawberries and ornamentals, where it is applied to control annual weeds and grasses.

This compound appears to adsorb onto soil (3) thereby decreasing its potential to leach. However, this phenomenon has not been fully established yet. It is not a recommended for use pesticide in New Jersey (1,2,4).

	Neburon	Concern Level
solubility	4.8 (unknown temp)	> 30 ppm
K_d	167	< 5
K_{oc}	3,110	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : small threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

OXAMYL (23135-22-0)

methyl N'N'-dimethyl-N [(methyl carbamoyl)oxy]-1-thiooxamimidate

Oxamyl, known by the trade name VYDATE, is an insecticide, nematicide and acaricide normally sprayed onto the foliage of a crop area. It is effective on contact and is trans-located to roots of plants (14).

Oxamyl is weakly adsorbed by soil (1,2,7,11) thereby rendering it rather mobile (7). However, this insecticide does degrade in the soil. Lemley & Zhong found that oxamyl undergoes base hydrolysis following first order kinetics. Bromilow et. al. (1980) observed first order degradation of oxamyl as well. They attributed increases in moisture level and temperature with an increase in degradation rate, although these researchers refrained from correlating rate of degradation with any single soil property.

Harvey & Han (1978) also studied hydrolysis of oxamyl. They found that the stability of this compound in aqueous solutions was markedly influenced by pH. In addition, ultraviolet light caused more extensive and more rapid degradation of oxamyl in aqueous solutions. These authors, in a concurrent field study, determined oxamyl's soil half-life to be 8 days. They concluded that although it is a mobile chemical, oxamyl degrades too quickly to travel downward very far in the soil.

EPA considers oxamyl a priority II compound and a possible leacher. It has been detected in the groundwater of New York and Rhode Island (4,5). Currently, Vydate, a rather toxic compund to animals, is recommended for use in New Jersey on vegetable and fruit crops (8,9,13). It is considered a leacher here because of its high mobility and, because it has already been detected in the groundwater of 2 states.

	Oxamyl	Concern Level
solubility	280,000 (25°C)	> 30 ppm
K_d	0.02-0.3	< 5
K_{oc}	0.2-8.6; 4.4	< 500
hydrolysis t 1/2	1 - few	> 25 wks
soil t 1/2	1 (field)	> 3 wks
photolysis t 1/2	stable	> 1 wk

in groundwater yes

LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Bromilow, R.H., Baker, R.J., Freeman, M.A.H., & Gorog, K., 1980.
2. Bromilow, R.H., & Lord, K.A., 1979.
3. Cohen, S.Z., EPA memo, 1985.
4. Cohen, S.Z., Creeger, S.M., Carsel, R.F., & Enfield, C.G., 1984.
5. Cohen, S.Z., Eiden, C., & Lorber, M.N., 1986.
6. EPA one-liner files and memos, 1986.
7. Harvey, J.Jr. & Han, J.C.Y., 1978.
8. Hopfinger, J.A., 1985.
9. Justin, J.R., 1984.
10. Kuhr, R.J. & Dorough, H.W., 1976.
11. Leistra, M., Bromilow, R.H., & Boesten, J.T.I., 1980.
12. Lemley, A.T. & Zhon, W.Z., 1984.
13. Robson, M.G., & Johnson, W.B., 1985.
14. Worthing, C.R., 1979.

OXYDEMETON-METHYL (301-12-2)

O,O-dimethyl-S-[2(ethylthio) ethyl] phosphorothioate

METASYSTOX-R is the trade name for this compound, very similar structurally to its relative, demeton. Oxydemeton-methyl is a systemic insecticide and acaricide used to control sap-feeding pests on vegetable and fruit crops and on some ornamentals. It is hydrolyzed in alkaline media and has been shown to be degraded by Pseudomonas putida in a laboratory study using cultured bacteria (6).

EPA has determined that this compound is a strong leacher but may not be persistent, based primarily on the chemical characteristics of this compound and on confidential information aquired by the manufacturer through EPA's data call-in program. It is a recommended pesticide in New Jersey for fruits and vegetables (2,3,4).

	Oxydemeton-Methyl	Concern Level
solubility	miscible	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	6-20	> 25 wks
soil t 1/2	1-2 (field)	> 3 wks
photolysis t 1/2	12 (soil)	> 1 wk
in groundwater	unknown	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. EPA one-liner files and memos, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.
6. Zeigler, 1980.

PARAQUAT (4685-14-7)

1,1'-dimethyl-4,4'-bipyridinium dichloride

Paraquat is also known as GRAMOZONE. It works as a contact herbicide and dessicant used for stubble cleaning, pasture renovation, inter-row weed control in vegetable crops and overall weed control in plantation crops. It is stable under acid conditions, but hydrolyzed by alkali.

This compound is strongly adsorbed and inactivated by soil particles (6). It is an immobile compound, and EPA classifies it as a non-leacher. It is recommended for use on vegetables, alfafa, field corn, and fruit (3,4,5). There appears to be little potential for paraquat to reach New Jersey groundwater resources.

	Paraquat	Concern Level
solubility	completely (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : small threat to N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

PEBULATE (1114-71-2)

S-propyl butylethylthiocarbamate

Pebulate, a preplant selective herbicide, goes by the manufacturer's name TILLAM. It is rapidly absorbed by roots, translocated throughout the plant and broken down to CO_2. It is used to control annual grasses, nutsedges and broad-leaved weeds in sugar beet, tomatoes and tobacco by soil incorporation.

EPA offers little information from its one-liner files, and little is available in the literature. An assessment of pebulate's potential to contaminate groundwater cannot be completed without further data. It is recommended for use on vegetable crops in New Jersey (2,3,4).

	Pebulate	Concern Level
solubility	60 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	630	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

PHENMEDIPHAM (13684-63-4)

methyl-m-hydroxy carbanilate-m-methylcarbanitate

BETANAL is the trade name by which the post-emergence herbicide, phenmedipham is known. It controls weeds in beet crops, spinach and strawberries after the weeds have developed and before true leaves have appeared.
c

Phenmedipham is subject to hydrolysis under alkaline conditions (pH > 6). It has not been detected in groundwater in states that have analyzed for it. The chemical parameters do not show distinctively whether this compound might move through soil or not. Its low water solubility and relatively short persistence in soil, however, appear to suggest that it may not have an opportunity to leach. It is recommended in special cases on vegetable crops in New Jersey (2,3,4).

	Phenmedipham	Concern Level
solubility	1 (20°C)	> 30 ppm
K_d	28-314	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	10 (pH 5)	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	3 d (soil)	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : small threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

PHORATE (298-02-2)

0,0-diethyl-S-[(ethylthio) methyl] phosphorodithioate

Phorate is better known by the trade names THIMET and RAMPART. A soil and systemic insecticide, it acts by direct contact against sucking and biting insects, mites and certain nematodes.

Fuhremann & Lichtenstein (1980), in a comparative persistence and movement study using six disparate insecticides, found that phorate, a relatively water-soluble compound, was more mobile in soils than the less water soluble chemicals. Although the extent of leaching was not discussed in the report, it has been demonstrated that phorate is somewhat mobile in soil.

EPA has not described phorate as a leacher. Knowledge about its chemical properties is not yet complete, so it is difficult to assess this chemical's leachability. However, it seems from the data available, that phorate may be a leacher. Currently, Thimet is recommended in New Jersey for use on field corn and on vegetables (3,4,5).

	Phorate	Concern Level
solubility	50 (room temp)	> 30 ppm
K_d	3.18-16	< 5
K_{oc}	3,200	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	1-2	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.

2. Fuhremann, T.W. & Lichtenstein, E.P., 1980.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

PHOSMET

N-(mercapto methyl) phthalimide S-(0,0-dimethyl phosphorodithioate)

IMIDAN is the trade name by which phosmet is known. It is a non-systemic acaricide and insecticide used on fruit, citrus, grape and potato crops. It is readily degraded in the environment and is adsorbed onto soil particles (1).

There is not an abundance of literature regarding the mobility of phosmet in the environment, but the available research indicates that its quick degradation and adsorption onto soil render it unavailable for movement. It is a recommended insecticide on New Jersey fruit and vegetable crops (2,3,4).

	Phosmet	Concern Level
solubility	25 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	12 hr (pH 7)	> 25 wks
soil t 1/2	0-2	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : small threat to N.J. groundwater

REFERENCES

1. Camazano, M.S. & Martin, M.J.S., 1980.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

PHOSPHAMIDON (297-99-4)

2-chloro-2-diethylcarbamoyl-1-methylvinyl dimethyl phosphate

A carbamoyl organophosphorous insecticide, phosphamidon is known by the trade name DIMECRON. It controls sap-feeding insects and other pests including rice and sugarcane stem-borers in a variety of crops.

Soil column studies completed by the manufacturer (Ciba-Geigy) and submitted as part of the data call-in program at EPA show that phosphamidon and its degradates leach (3). However, they are not persistent in soil, having rather short half-lives.

This chemical is recommended for use on New Jersey fruit and vegetable crops (1,2,4). Therefore, phosphamidon should be watched as a potential contaminant in New Jersey groundwater.

	Phosphamidon	Concern Level
solubility	100 %	> 30 ppm
K_d	< 1-1.4	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	1-9	> 25 wks
soil t 1/2	3 d	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Ott, P., personal communicaton, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

PICLORAM (1918-02-1)

4-amino-3,5,6-trichloropicolinic acid

Picloram, a persistent herbicide, works as an effective brush control agent. It is very resistent to degradation in the environment, and its herbicidal activity has been described as potent (2). Fortunately, it is relatively nontoxic to many animal species.

The persistence of picloram in soil seems well established (1,2,6,7,10). Some researchers have suggested that this high persistence in combination with picloram's high water solubility may lead to significant leaching problems (6,10). It has, in fact, been detected in the groundwater of 3 states and in Ontario, Canada (2,3,4,8,13).

Picloram has been shown to be more tightly adsorbed to soils at low pH values. Also, soils in the unionized or molecular form tend to adsorb picloram more strongly than ionized soils (1). Adsorption seems to be poorly correlated with soil clay content but significantly correlated with soil organic matter content (1).

In a study focussing on picloram in runoff losses insoils from semiarid regions, Johnsen (1980) found that most of the herbicide was detected below 45 cm in samples taken after the first month following application. In addition, more picloram was detected in soils 1, 2 and 3 years after application than during the initial year of investigation.

EPA has placed picloram in the class 4 mobility category indicating that this compound is mobile. Its chemical parameters are well described in the copious literature. It is not mentioned in the recommendations for fruit, vegetable or field crops for use in New Jersey (5,9,19). However, since it is a brush control agent, it may be in use in this state by municipalities for weed control in ditches, railroads and similar non-crop areas.

	Picloram	Concern Level
solubility	430 (25°C)	> 30 ppm
K_d	0.07-4.6	< 5
K_{oc}	26	< 500
hydrolysis t 1/2	stable	> 25 wks

soil t 1/2	23-73	> 3 wks
photolysis t 1/2	1-7 (water)	> 1 wk
in groundwater	yes	

LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Arnold, J.S. & Farmer, W.J., 1979.
2. Cheung, M.W., Mingelgnn, U., & Biggar, J.W., 1979.
3. Cohen, S.Z., EPA memo, 1985.
4. EPA one-liner filers and memos, 1986.
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8. Junk, G.A., Spalding, R.F., & Richard,J.J., 1980.
9. Justin, J.R., 1984.
10. Kirkland, K.J. & Keys, C.H., 1979.
11. Mrak, E.M., 1974.
12. Robson, M.G., & Johnson, W.B., 1985.
13. Spalding, R.F., Exner, M.E., Sullivan, J.J., & Lyon, P.A., 1979.
14. Worthing, C.R., 1979.

PROMETONE (1610-18-0)

2,4-bis-(isopropyleamino)-6-methoxy-1,3,5-triazine

PRIMATOL and PRAMITOL are the trade names for the non-selective herbicide, prometone. It is formed by reacting propazine with methanol in the presence of sodium hydroxide.

Prometone, like most s-triazines which are basic, tends to adsorb rather strongly to humic acids in the soil matrix (7). This adsorption is influenced most significantly by the organic colloids in the soil as opposed to clay. The pH-dependent charge on clay is small, while nearly all of the charge on the organic colloids is pH-dependent (8).

It has not been established that prometone has been found in the groundwater of any state to date; however, the EPA one-liner files label this herbicide as a leacher.

Prometone is not included in the pesticides recommended for use on fruit, vegetable or field crops in New Jersey (3,4,6). Therefore, although the compound itself may be mobile, its importance as a groundwater contaminant in New Jersey is relatively small.

	Prometone	Concern Level
solubility	620 (20°C)	> 30 ppm
K_d	150: 350	< 5
K_{oc}	524	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	26 wks	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : small threat to N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Mrak, E.M., 1974.
6. Robson, M.G., & Johnson, W.B., 1985.
7. Senesi, N., & Testini, C., 1980.
8. Weber, J.B., Weed, S.B., & Ward, T.M., 1969.
9. Worthing, C.R., 1979.

PROMETRYNE (7287-19-6)

2,4-bis (isopropylamino)-6-methylthio-1,3,5-triazine

This pre- or post-emergence selective herbicide is known by the trade names GESAGARD and CAPAROL. It is, like prometone, a reaction product of propazine, formed by reacting propazine with methanethiol in the presence of sodium hydroxide.

In the field, the primary degradative pathway for prometryne is via hydrolysis and partial N-dealkylation with biological processes having a significant role (1). Most researchers have determined that this herbicide is persistent in soil (3,6,7,8,9), but that it probably does not accumulate over time (3).

LaFleur (1976) in a study investigating desorption and movement of prometryne, found that the herbicide barely moved through the top 20 cm of lab columns. In another study by LaFleur and colleagues (1975), it was found that prometryne appeared in groundwater within two months of soil application persisting for 16 months there. Samples taken after 20 months showed no traces of prometryne. These researchers, although they detected prometryne in the shallow water table (1.1m) at a concentration of 0.1-0.2 umol/L, concluded that risk of contamination of groundwater is small. This conclusion was reached because no prometryne was found below 20 cm (sampled cores to 100 cm) in concentrations greater than 2 umol/kg.

Some researchers found that pH had an influence on the bioavailability of prometryne. Since more of the herbicide is adsorbed under acid conditions, less of the compound is available for uptake by plants. Weber et. al. (1968) showed how liming made the soil more alkaline thereby increasing the killing power of the herbicide in those soils. Prometryne is rather stable to hydrolysis even under acid conditions, though an acid environment encourages quicker dissipation (1).

Prometryne has not yet been detected as a groundwater contaminant in any state. The literature suggests that while it is a persistent herbicide, its mobility through the soil profile is expected to be minimal. It is not included in the recommendations for use in New Jersey (4,5,11). Therefore, the probability of detecting this compound in New Jersey groundwater is small.

	Prometryne	Concern Level
solubility	40 (20°C)	> 30 ppm

K_d	1.8-3.6	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	4-12; 40	> 3 wks
photolysis t 1/2	1-3 months	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : no threat to N.J. groundwater

REFERENCES

1. Best, J.A. & Weber, J.B., 1974.
2. EPA one-liner filers and memos, 1986,
3. Hamilton, K.C., 1979.
4. Hopfinger, J.A., 1985.
5. Justin, J.R., 1984.
6. Khan, S.U. & Hamilton, H.A., 1980.
7. LaFleur, K.S., 1980.
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9. LaFleur, K.S., McCaskill, W.R., & Adams, D.S., 1975.
10. Mrak, E.M., 1974.
11. Robson, M.G., & Johnson, W.B., 1985.
12. Weber, J.B., Perry, P.W., & Ibaraki, K., 1978.
13. Weber,J.B., Weed, S.B., & Ward, T.M., 1969.
14. Worthing, C.R., 1979.

PRONAMIDE

3,5-dichloro (N-1,1-dimethyl-2-propynyl) benzamide

Pronamide is a pre- or post- emergence herbicide marketed by the trade name KERB. It is used for weed and grass control in small seeded legumes grown for forage or seed. Its major metabolite is the moderately mobile ketone.

This chemical is on EPA's priority I list of priority pesticides. It has been determined by that agency to be a leacher, although it has not been detected in the groundwater of any state that has sampled for it. The chemical characteristics of pronamide suggest that it may be mobile. It has selective uses on New Jersey vegetable crops (3,4,5), so it should be watched in this state as a possible contaminant.

	Pronamide	Concern Level
solubility	15 (25°C)	> 30 ppm
K_d	0.42-7.98: 0.5-19	< 5
K_{oc}	215; 218; 200	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	1.5-13	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner filers and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

PROPACHLOR (1918-16-7)

2-chloro-N-isopropylacetanilide

Propachlor, or RAMROD, is a selective pre-emergence herbicide used on corn, soybeans and some other food crops. According to Yu et. al. (1975), this compound is rapidly degraded in water to seven products. Ritter et. al. (1974) also found that propachlor degrades quickly in soil, under field conditions. These researchers found that very little propachlor (0.04 at day 28 through 0.17 at day 14) moved below the 3 in. depth. If propachlor is mobile through the soil profile, it moves very slowly, certainly more slowly than atrazine, a relative.

It is recommended for use on New Jersey corn crops in combination with cyanazine and paraquat as a 3-way combination (2,3,6). Since studies have shown that propachlor mayleach, albeit slowly, this compound should be considered a potential leacher. Further study is needed to assess its leachability, however.

	Propachlor	Concern Level
solubility	700 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	3-5	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

POTENTIAL LEACHER : small threat to N.J. groundwater

REFERENCES

1. EPA one-liner files and memos, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Mrak, E.M., 1974.

5. Ritter, W.F., Johnson, H.P., Lovely, W.G, & Molnau, M., 1974.
6. Robson, M.G., & Johnson, W.B., 1985.
7. Worthing, C.R., 1979.
8. Yu, C.C., Booth, G.M., Hansen, D.J., & Larsen, J.R., 1975.

PROPANIL (709-98-8)

3',4'-dichlorophenyl propioanilide

SURCOPUR, ROGUE and STAM are the trade names by which the contact herbicide, propanil, is known. It is used as a selective pre-emergence herbicide on rice and potatoes. Its persistence in soil is relatively brief (6), being rapidly metabolized to azobenzenes (TCAB is the principal azobenzene derivative) (4).

There is scant literature available on the movement of propanil through the soil profile. It is not included in the recommendations for use on New Jersey vegetable, field or fruit crops (2,3,5). EPA one-liner files classify this pesticide as class 2 (slight) with its mebabolites receiving class 5 (very mobile) for TCAB and class 3 (intermediate) for DCA.

	Propanil	Concern Level
solubility	225 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	$\leq$ 1; $\leq$12 TCAB	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files and memos, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Mrak, E.M., 1974.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

PROPAZINE (139-40-2)

2-chloro-4,6-bis(isopropylamino)-s-triazine

Propazine, called GESAMIL and MILOGARD by the trade, is chemically very similar to atrazine. It is a selective herbicide applied pre-emergence to crops. Chemical hydrolysis appears to be the most important degradative pathway (1).

Burk & Guth (1981) discovered that adsorption to soil constituents increases propazine's half-life. Weber et. al. (1969) also described this phenomenon in their laboratory study. Weber and colleagues found that propazine is adsorbed most strongly at pH 2. It is adsorbed in lesser amounts in calcareous soils (near neutral). These researchers concluded that the liming of acidic soils increases the activity of herbicides like propazine, basically because the compound is more bioavailable under limed conditions.

Although propazine has not been detected in any state's survey of groundwater contaminants, it has been determined to be a mobile compound by Burnside and co-workers (1969). In this study, the researchers found detectable levels of propazine in soil samples taken 5 ft. below the soil surface. EPA researchers have described this compound as a leacher. Propazine is a recommended herbicide in New Jersey for use on sorghum in combination with metolachlor (5,6,8). The likelihood of detecting this chemical in New Jersey groundater is therefore somewhat high.

	Propazine	Concern Level
solubility	8.6 (22°C)	> 30 ppm
K_d	0.1-20	< 5
K_{oc}	154	< 500
hydrolysis t 1/2	> 10-106	> 25 wks
soil t 1/2	< 4-57≤12 TCAB	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : potential contaminant in N.J. groundwater

REFERENCES

1. Burkhard, N. & Guth, J.A., 1981.
2. Burnside, O.C., Fenster, C.R., Wicks, G.A., & Drew, J.U., 1969.
3. Cohen, S.Z., EPA memo, 1985.
4. EPA one-liner files and memos, 1986.
5. Hopfinger, J.A., 1985.
6. Justin, J.R., 1984.
7. Mrak, E.M., 1974.
8. Robson, M.G., & Johnson, W.B., 1985.
9. Weber, J.B., Weed, S.B., & Ward, T.M., 1969.
10. Worthing, C.R., 1979.

PROPHAM (122-42-9)

isopropyl carbanilate

Propham, a pre- and post- emergence herbicide applied to pea and beet crops to control annual grass weeds, goes by the trade names CHEM HOE and IPC. It is ranked as a priority II pesticide by EPA and considered a leacher by this agency.

Propham's chemical parameters indicate that it may be a leacher, but nothing definitive can be stated by these data. Little information is currently available to describe its leachability through soil.

Although chloropropham (CHLORO IPC or FURLOE), a relative of propham, is recommended for use on alfafa in New Jersey, propham is not (3,4,5).

	Propham	Concern Level
solubility	250 (20-25°C)	> 30 ppm
K_d	0.648-2.29	< 5
K_{oc}	51	< 500
hydrolysis t 1/2	2-4	> 25 wks
soil t 1/2	2-6	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : small threat to N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

SIDURON (1982-49-6)

1-(2-methylcyclohexyl)-3-phenylurea

Siduron is known by the trade name, TUPERSAN. This selective pre-emergence herbicide is effective against crabgrass and annual weed grasses in turf, cereal and other food crops.

Although siduron is stable in water, it begins to decompose in acid and alkaline media. Information from EPA's data call-in program report that siduron exhibits a moderate rate of degradation in soil. One field study described in the one-liner files at EPA reported that siduron leached throughout the top 4 in of soil, and phytotoxic residues persisted for at least 10 months. Not surprisingly, at higher application rates than recommended, the compound leached farther down the soil column. Biological degradation and adsorption are attributed as the primary factors in limiting the movement of siduron when applied at the recommended dosages. In short, siduron applied at 2-3 times the recommended rate may leach. At normal doses, however, it probably will not pose a significant threat to the groundwater.

Siduron has been classified as a 2 (slightly mobile) by the Helling scheme. It is not a recommended pesticide on vegetable, fruit or field crops in New Jersey (2,3,4), but its use on turf is unknown.

	Siduron	Concern Level
solubility	18 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	16-20	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.

SIMAZINE (122-34-9)

2-chloro-4,6-bis(ethylamino)-s-triazine

Simazine is a selective pre-emergence herbicide that goes by the trade names AQUAZINE, PRINCEP, and SIMANEX. Although not the most water soluble of the triazine herbicides, simazine appears to be among the most mobile. Movement occurs most rapidly in sandy loams and sandy soils, but leaching may occur in more organic soils as well (8,14).

Smith & Hayden (1976) field studied the persistence and movement of simazine and found that it is an extremely persistent compound especially in clay soils (found 50% of the chemical in soil 12 months after application). Soil cores were taken down to 10 cm only from which negligible amounts of simazine were detected. The authors did not conjecture about mobility below 10 cm.

Simazine adsorbs more strongly onto soil particles than does atrazine or propazine (1) probably accounting for its increased persistence in soil. It is even more persistent in no-tillage systems than in conventional tillage systems, as determined by Slack et. al. (1978). These researchers also found that simazine persistence in soil increases with increasing soil pH.

This herbicide has been detected in the ground water of California, Pennsylvania and Maryland (2,3,4,5,6,7). Simazine is considered a leacher by EPA and has been given a priority I designation. It is recommended for use in New Jersey on corn, alfafa and vegetables (9,10,12).

	Simazine	Concern Level
solubility	35 (20°C)	> 30 ppm
K_d	0.28-5	< 5
K_{oc}	138	< 500
hydrolysis t 1/2	8-30	> 25 wks
soil t 1/2	< 4-16; 52	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	yes	

REFERENCES

1. Burkhard, N & Guth, J.A., 1981.
2. Cohen, D.B., 1985.
3. Cohen, S.Z., EPA memo, 1985.
4. Cohen, S.Z., Creeger, S.M., Carsel, R.F., & Enfield, C.G., 1984..
5. Cohen., S.Z., Eiden, C., & Lorber, M.N., 1986.
6. EPA one-liner files and memos, 1986.
7. Hance, R.J. & Embling, S.J., 1979.
8. Hogue, E.J., Khan, S.U., & Gaunce, A., 1981.
9. Hopfinger, J.A., 1985.
10. Justin, J.R., 1984.
11. Mrak, E.M., 1974.
12. Robson, M.G., & Johnson, W.B., 1985.
13. Slack, C.H., Blevins, R.L., & Rieck, C.E., 1978.
14. Smith, A.E., & Hayden, B.J., 1976.
15. Walker. A., 1978.
16. Worthing, C.R., 1979.

SIMETRYNE

2,4-bix(ethylamino)-6-methylthio-1,3,5-triazine

Simetryne, or GY-BON and SATURN, is a little-known selective herbicide. It is produced by the reaction of simazine with methanethiol in the presence of a base.

Very little has been reported on this compound. It is used almost exclusively on rice for control of broad-leaved weeds and is manufactured in Japan (4). It is not surprising to find this compound absent from the recommended list of pesticides in New Jersey (1,2,3).

	Simetryne	Concern Level
solubility	450 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

UNKNOWN LEACHER : no threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Robson, M.G., & Johnson, W.B., 1985.
4. Worthing, C.R., 1979.

TEBUTHIURON (34014-18-1)

N-[5-(1,1-dimethyl)-1,3,4-thiadiazol-2-yl]-N,N'-dimethylurea

Tebuthiuron, or SPIKE, is a broad range herbicide effective for the control of herbaceous and woody plants. It is highly persistent and very mobile (1,2).

This compound is a priority I chemical as ranked by EPA. Its chemical characteristics clearly mark it as a leacher. EPA considers tebuthiuron a leacher. However, it has not been detected in groundwater where analyses have included it. It is not listed in the pesticide recommendations for fruit, field or vegetable crops (3,4,5), but its use on other crops is unknown.

	Tebuthiuron	Concern Level
solubility	860 (25°C)	> 30 ppm
K_d	0.2-10	< 5
K_{oc}	620	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	3 yrs (lab)	> 3 wks
photolysis t 1/2	stable	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

TERBACIL (5902-51-2)

3-tert-butyl-5-chloro-6-methyluracil

Terbacil, otherwise known as SINBAR, is a selective herbicide used against a variety of annual and some perennial weeds in sugarcane, apple, peache, citrus and mint crops.

Hogue et. al. (1981) in a laboratory column study, found that this highly persistent compound was very mobile in a sandy loam. Most of the pesticide leached out of the top 3 segments of the columns with only 20 cm of irrigation. Although it was also mobile in loam soil, 80 cm of irrigation was required to leach a large fraction of it. Hogue reports that other researchers have observed the same phenonmenon.

EPA considers terbacil a leacher and has assigned it a priority I classification. It is currently recommended for use on alfafa, fruit and vegetable crops in New Jersey (3,5,6).

	Terbacil	Concern Level
solubility	710 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	4-8	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

POTENTIAL LEACHER : potential contaminant N.J. groundwater

REFERENCES

1. Cohen, S.Z., EPA memo, 1985.
2. EPA one-liner files and memos, 1986.
3. Hogue, E.J., Khan, S.U., & Gaunce, A., 1981.
4. Hopfinger, J.A., 1985.

5. Justin, J.R., 1984.
6. Robson, M.G., & Johnson, W.B., 1985.
7. Worthing, C.R., 1979.

TERBUTOL (1918-11-2)

2,6-di-tert-butyl-p-tolyl-methylcarbamate

Terbutol, a selective pre-emergence herbicide, is known by its trade name AZAK. According to information reported to EPA from the groundwater data call-in program, this carbamate pesticide is persistent but not expected to leach (3). More than this is not available in the literature. Terbutol is not currently recommended for use on New Jersey vegetable, fruit or field crops (1,2,4).

	Terbutol	Concern Level
solubility	6-7 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : no threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Ott, P., personal communication, 1986.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

TERBUTRYNE (886-50-0)

2-tert-butylamino-4-ethylamino-6-methylthio-s-triazine

Terbutryne, also known as IGRAN or CLAROSAN, is a selective triazine herbicide applied pre-emergence to food crops.

In a comparison study using atrazine and terbutryne on limed and unlimed soils, Gaynor & Volk (1981) determined that terbutryne is sorbed more extensively by the soil than is atrazine even under limed conditions, when adsorption is generally decreased. PH seemed to have had little effect on terbutryne persistence. These researchers also found that terbutryne as parent tended to leach through the erodable soil zone. Although terbutryne is less water soluble than atrazine, it is much more persistent and does not undergo hydrolysis reactions very rapidly. In soils receiving significant rainfall or irrigation, terbutryne use may lead to slow leaching; Gaynor & Volk detected levels of terbutryne below 15 cm in the soil.

Terbutryne is not currently recommended for use on New Jersey field, fruit or vegetable crops (3,4,5).

	Terbutryne	Concern Level
solubility	25 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	700	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : small threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Gaynor, J.D., & Volk, V.V., 1981.
3. Hopfinger, J.A., 1985.
4. Justin, J.R., 1984.
5. Robson, M.G., & Johnson, W.B., 1985.
6. Worthing, C.R., 1979.

THIABENDAZOL (148-79-8)

2-(4'-thiazolyl)-benzimidazole

Thiabendazol is a systemic fungicide manufacured as MERTECT. It controls fungal diseases on a variety of crops as well as roundworms of cattle and livestock.

This compound is water soluble and stable to hydrolysis, indicating that it may move through soil. However, any conclusion reached on thiabendazol's leaching potential would be premature. Insufficient data are available. Experts in New Jersey recommend it for use on vegetable crops and on soybeans (2,3,4).

	Thiabendazol	Concern Level
solubility	< 50 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

THIDIAZURON (41118-83-6)

N-phenyl-N'-1,2,3-thiadiazol-5-yl urea

Thiadiazuron, or DROPP, is a urea compound used as a plant growth regulator. Its most common useage is to defoliate cotton.

Information received from EPA's ground water call-in program indicate that this chemical and its degradates probably will not leach through soil (3). Two studies using 8 soil types demonstrated no movement beyond 3 inches (3).

Thidiazuron is not a recommended for use as an herbicide in New Jersey (1,2,4).

	Thidiazuron	Concern Level
solubility	50 (23°C)	> 30 ppm
K_d	2.2-21	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	4-20 (lab)	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : no threat to N.J. groundwater

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2. Justin, J.R., 1984.
3. Ott, P., personal communication, 1986.
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TRIADIMEFON (43121-43-3)

1-(4-chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-trizol-1-yl)-2-butanone

BAYLETON is the trade name by which the systemic fungicide triadimefon is known. It is effective against mildews and rusts that attack cereals, coffee, stone fruit, grapes and ornamentals.

This chemical appears to be persistent, but data aquired by EPA indicate that it is not a leacher. EPA reports that triadimefon is a class 2 on the Helling mobility scale (slightly mobile). It is currently recommended for use in New Jersey on fruit, vegetables and small grains (1,2,4).

	Triadimefon	Concern Level
solubility	260 (20°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	12-92 (field)	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : small threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
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TRIALLATE (3203-17-5)

S-(2,3,3-trichloroallyl) diisopropyl thiocarbamate

The pre-emergence selective herbicide triallate is known by the trade names AVADEX and FAR-GO. It is incorporated into soil as a pre-sowing treatment for the control of wild oats in cereals and peas.

Triallate is more tightly adsorbed onto soils having a high organic matter content (4), and vaporization losses may be more significant in sandy soils (4). Jury and colleagues found that volatilization from sandy soils occurred to a greater extent with evaporation than without evaporation; however, this pattern was not observed in a silt loam soil where evaporation did not increase the volatilization rate.

Another Canadian researcher, Smith (1979), used triallate with trifluralin in a soil persistence experiment. He discovered that both chemicals can be carried over from one growing season to the next. However, almost 70% had disappeared within 10 weeks of application, and the soil type did not effect the rate of disappearance (heavy clay and sandy loam soils used).

Biological processes play a role in the dissipation of tri-allate from soils, but researchers claim that volatilization is the primary route (1,8). Tri-allate forms TPP (2,3,3-trichloro-prop-2-ene sulfonic acid) as a soil degradate. Not much is known about the mobility of this metabolite, but apparantly the parent will leach under worst-case conditions (1,6). EPA does not consider this herbicide a leacher. It is not currently recommended for use in New Jersey (3,5,7).

	Tri-allate	Concern Level
solubility	4 (25°C)	> 30 ppm
K_d	5-35	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	2-28	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

NOT LIKELY LEACHER : small threat to N.J. groundwater

REFERENCES

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8. Robson, M.G., & Johnson, W.B., 1985.
9. Smith, A.E., 1979.

TRICHLORFON (52-68-6)

dimethyl (2,2,2-trichloro-1-hydroxyethyl) phosphonate

Trichlorfon is known by a number of trade names including BOVINEX, DIPTEREX and TRINEX. It is a contact and stomach insecticide used primarily against flies but also to control lepidopterous larvae and other household pests. It is stable at room temperature but is decomposed by water at higher temperatures and acidic pH.

Trichlorfon is very mobile, having a class 5 on the Helling scale (1). It is also very water soluble. Its persistence in soil is unknown. It may be used in New Jersey on vegetables (2,3,4). Although a leaching assessment cannot be made at this time, it is advised that trichlorfon be watched as a possible leacher, based on limited data.

	Trichlorfon	Concern Level
solubility	154,000 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	< 1-4 (lab)	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	no	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. EPA one-liner files, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

2,3,6-TRICHLOROBENZOIC ACID (50-31-7)

2,3,6-trichlorobenzoic acid

This compound is marketed as BENZAC or 2,3,6-TBA. It is an herbicide which controls a broad range of broadleaf weeds having optimum effectiveness on deep-rooted perennials.

EPA does not have a file for 2,3,6-TBA, and little could be found in the literature describing its mobility. It is not listed as s recommended pesticide for New Jersey fruit, vegetable or field crops (1,2,3).

	2,3,6-TBA	Concern Level
solubility	(25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500
hydrolysis t 1/2	NA	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : unknown threat to N.J. groundwater

REFERENCES

1. Hopfinger, J.A., 1985.
2. Justin, J.R., 1984.
3. Robson, M.G., & Johnson, W.B., 1985.
4. Worthing, C.R., 1979.

TRIFLURALIN

a,a,a-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine

Most of the research to determine the leachability of trifluralin, trade name TREFLAN, in soil has revealed that this herbicide is relatively immobile with residues confined to the tilled soil zone (2,7,8,11,14). The virtual immobility of trifluralin has been attributed to its very low aqueous solubility (2,7) and to its strong adsorption onto soil material (7,8,19).

Trifluralin is very susceptible to photolysis (18) and volatilization, so it is normally soil-incorporated. In fact, Savage & Barrantine (1969) found that the persistence of this compound is increased by deep incorporation as opposed to shallow or surface incorporation. Biological breakdown seems unimportant (10,17). Temperature and moisture levels seem to have the greatest influence on trifluralin disappearance (2,5,7,10,4,19); as the temperature increases and the soil moisture content increases, the degradation of the chemical increases.

Some researchers ascribe organic matter content as an additional important factor in trifluralin degradation (7,14); increased organic matter demonstrated increased persistence of trifluralin. Horowitz et. al. (1974) studied the activity of trifluralin in limed soils and found that its activity increased in these soils and that this was due primarily to dilution of the organic matter and clay rather than to pH change.

This compound may have a long half-life depending upon climatic conditions and soil organic matter content. However, even when half-lives are long, the compound is so tightly adsorbed that leaching is prevented. It is therefore regarded as a small threat to New Jersey groundwater resources.

Trifluralin has not been found in the groundwater of any state to date. It is poorly soluble in water, strongly adsorbed to soil material, and relatively immobile. Currently, it is recommended for use on soybeans and fruit in New Jersey (6,9,15).

	Trifluralin	Concern Level
solubility	< 1 (27°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	NA	< 500

hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	< 1-208 (field)	> 3 wks
photolysis t 1/2	4 hr (lab)	> 1 wk
in groundwater	no	

NOT LIKELY LEACHER : no threat to N.J. groundwater

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ZIRAM

zinc dimethyldithiocarbamate

MILBAM and ZERLATE are the trade fungicides for which ziram is the active ingredient. This non-phytotoxic thiocarbamate is used on fruit and vegetable crops to control disease and as a bird and rodent repellent.

Although limited data are available on ziram, its chemical information hints that it may move in soil. It is water soluble and stable to hydrolysis, and its K_{oc} is below 500. It is not recommended for use on New Jersey fruit, vegetable or field crops (2,3,4).

	Ziram	Concern Level
solubility	65 (25°C)	> 30 ppm
K_d	NA	< 5
K_{oc}	440 (calc)	< 500
hydrolysis t 1/2	stable	> 25 wks
soil t 1/2	NA	> 3 wks
photolysis t 1/2	NA	> 1 wk
in groundwater	unknown	

UNKNOWN LEACHER : small threat to N.J. groundwater

REFERENCES

1. EPA one-liner files and memos, 1986.
2. Hopfinger, J.A., 1985.
3. Justin, J.R., 1984.
4. Robson, M.G., & Johnson, W.B., 1985.
5. Worthing, C.R., 1979.

APPENDIX

INDEX TO COMMON NAMES

TRADE NAME	COMMON NAME (AND OTHER TRADE NAMES)
aatrex	atrazine
acaralate	4-chloropyridine n-oxide
afalon	linuron (also lorox)
alanap	naptalam
allisan	dichloran (also botran)
amiben	chloramben
amizol	amitrole (also weedazol)
ansar	MSMA (also weed-hoe)
ansar 8100	DSMA (also ansul or DMA)
ansul	DSMA (also, ansar 8100 or DMA)
aquacide	diquat
aquathol	endothall
aquazine	simazine (also princep or simanex)
asodrin	monocrotophos (also nuvacron)
asulox	asulam
avadex	diallate
avadex	triallate
avenge	difenzoquat
azak	terbutol
banvel	dicamba
basagran	bentazon
basanite	dinoseb
basfapon	dalapon (also dowpon)
basudin	diazinon

TRADE NAME	COMMON NAME (AND OTHER TRADE NAMES)
bayleton	triadimefon
benzac	2,3,6-trichlorobenzoic acid (also 2,3,6-TBA)
bentanal	phenmedipham
betanex	desmedipham
bidrin	dicrotophos
bladex	cyanazine
borea	bromacil (also hyvar or krovar)
botran	dichloran (also allisan)
bovinex	trichlorfon (also dipterex or trinex)
bravo	chlorothalonil (also termil)
bromate	MCPA (also chiptox)
brominal	bromoxynil (also buctrin)
brom-o-gas	methyl bromide (also meth-o-gas)
buctril	bromoxynil (also brominal)
bux	bufencarb
cabicron	dicrotophos (also bidrin or ektafos)
caparol	prometryne (also gesagard)
carzol	formetanate
casoron	dichlorbenil
CDAA	allidochlor (also randox)
cecece	chlormequat chloride (also cycocel, cycogan or linocin)
chemhoe	propham (also IPC)
chexmate	cacodylic acid (also dilic or phytar 138)
chip cal	calcium arsenate (also pencal or spra-cal)
chiptox	MCPA (also bromate)

TRADE NAME	COMMON NAME (AND OTHER TRADE NAMES)
chloro IPC	chlorpropham (also furloe or sprout nip)
ciodrin	crotoxyphos
clarosan	terbutryne (also igran)
compitox	mecoprop
cotofor	dipropetryne (also sancap)
cotoran	fluometuron (also lanex)
counter	carbofuran (also furadan)
crag fungicide	dazomet (also microfume or myclone)
croneton	ethiofencarb (also HOX 1901)
cycocel	chlormequat chloride (also cecece, cycogan or linocin)
cycogan	chlormequat chloride (also cecece, cycocel or linocin)
cygon	dimethoate (also de-fend)
dacthal	chlorthal dimethyl (also DCPA)
dasanit	fensulfothion
DCPA	chlorthal dimethyl (also dacthal)
de-fend	dimethoate (also cygon)
devrinol	napropamide
dilic	cacodylic acid (also chexmate or phytar 138)
dimecron	phosphamidon
dimilin	diflubenzuron
dipterex	trichlorfon (also bovinex or trinex)
di-syston	disulfoton
DMA	DSMA (also ansar 8100 or ansul)
dowco 179	chlorpyrifos (also dursban or lorsban)

TRADE NAME	COMMON NAME (AND OTHER TRADE NAMES)
dowpon	dalapon (also basfapon)
DPX 1108	fosamine ammonium (also krenite)
draza	methiocarb
dropp	thidiazuron
dual	metolachlor
dursban	chlorpyifos (also dowco 179 or lorsban)
dyfonate	fonofos
dymid	diphenamid (also enide)
dyrene	anilazine
ektafos	dicrotophos (also bidrin or cabicron)
embark	mefluidide (also vistar)
enide	diphenamid (also dymid)
eptam	EPTC
evik	ametryne
far-go	triallate (also avadex)
fermate	ferbam
ficam	bendiocarb
fundal	chlordimefon (also spanon)
furadan	carbofuran (also counter)
furloe	chlorpropham (also chloro IPC or sprout nip)
gesagard	prometryne (also caparol)
gesamil	propazine (also milogard)
gramozone	paraquat
guthion	azinphos methyl
gy-bon	simetryne (also saturn)

TRADE NAME	COMMON NAME (AND OTHER TRADE NAMES)
gypsine	lead arsenate (also suprabel)
hoelon 3EC	diclofop methyl
HOX 1901	ethiofencarb (also croneton)
hyvar	bromacil (also borea or krovar)
igran	terbutryne (also clarosan)
imidan	phosmet
IPC	propham (also chem hoe)
karathane	dinocap
karmex	diuron
kerb	pronamide
kloben	neburon
krenite	fosamine ammonium (also DPX 1108)
krovar	bromacil (also borea or hyvar)
kryocide	cryolite
lanex	fluometuron (also cotoran)
lannate	methomyl (also nudrin)
lasso	alachlor
lesan	fenaminosulf
lexone	metribuzin
linocin	chlormequat chloride (also cecece, cycocel or cycogan)
lorsban	chlorpyrifos (also dowco 179 or dursban)
lorox	linuron (also afalon)
matacil	aminocarb
MCA-600	mobam
metasystox-R	oxydemeton-methyl

TRADE NAME	COMMON NAME (AND OTHER TRADE NAMES)
meth-o-gas	methyl bromide (also brom-o-gas)
microfume	dazomet (also crag fungicide or myclone)
milbam	ziram (also zerlate)
milogard	propazine (also gesamil)
mocap	ethoprop (also prophos)
monurex	monuron
myclone	dazomet (also crag fungicide or microfume)
nemacur	fensmiphos
nem-a-tak	fosthietan
NPA	aspon
nudrin	methomyl (also lannate)
nuvacron	monocrotophos (also asodrin)
oftanol	isophenphos
ordram	molinate
orthene	acephate
pencal	calcium arsenate (also chipcal or spra-cal)
picfume	chloropicrin (also chlor-o-pic)
phosdrin	mevinphos
phygon	dichlone
phytar 138	cacodylic acid (also chexmate or dilic)
pramitol	prometone (also primatol)
prophos	ethoprop (also mocap)
fampart	phorate (also thimet)
ramrod	propachlor

TRADE NAME	COMMON NAME (AND OTHER TRADE NAMES)
randox	allidochlor (also CDAA)
reglone	diquat (also aquacide)
rogue	propanil (also stam or surcopur)
ro-neet	cycloate
sancap	dipropetryn (also cotofor)
saturn	simetryne (also gy-gon)
sevin	carbaryl
simanex	simazine (also aquazine or princep)
spanon	chlordimeform (also fundal)
spra-cal	calsium arsenate (also chip cal or pencal)
spike	tebuthiuron
sprout nip	chlorpropham (also chloro IPC or furloe)
stam	propanil (also rogue or surcopur)
suckerstuff	maleic hydrazide
suprabel	lead arsenate (also gypsine)
supracide	methidathion
surcopur	pronanil (also rogue or stam)
sutan	butylate
2,3,6-TBA	2,3,6-trichlorobenzoic acid (also benzac)
telone	1,3-dichloropropene
temik	aldicarb
termil	chlorothalonil (also bravo)
thimet	phorate (also rampart)
tillam	pebulate
torak	dialifor

TRADE NAME	COMMON NAME (AND OTHER TRADE NAMES)
trapex	methyl isotiocyanate
treflan	trifluralin
trinex	trichlorfon (also bovinex or dipterex)
trithion	carbophenothion
tupersan	siduron
vapam	metam-sodium (also VPM)
velpar	hexazinone
vistar	mefluidide (also embark)
vitavax	carboxin
VPM	metam-sodium (also vapam)
vydate	oxamyl
weedazol	amitrole (also amizole)
zerlate	ziram (also milbam)

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