NORTHWEST COALITION FOR ALTERNATIVES TO PESTICIDES

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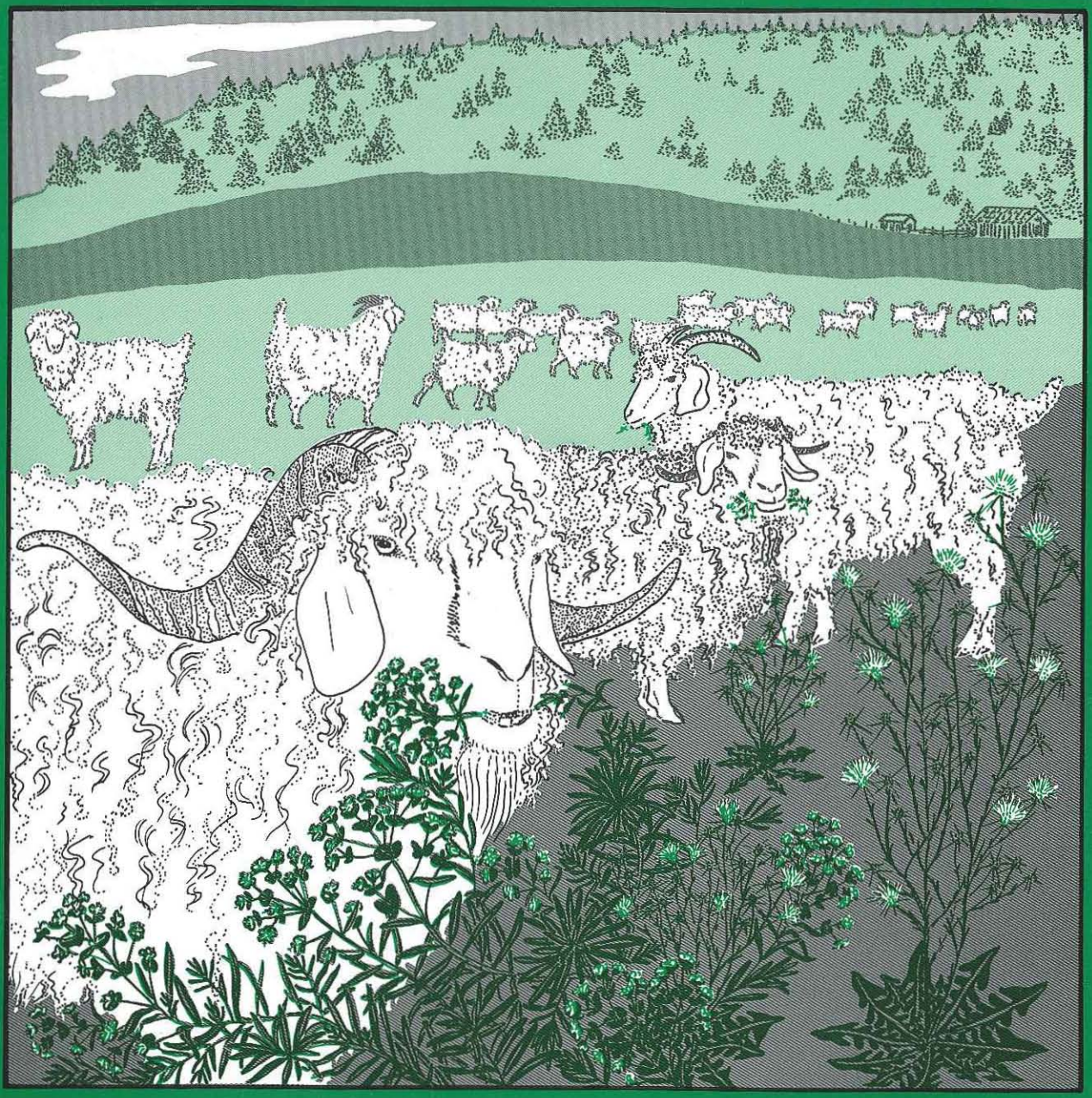

NONCHEMICAL MANAGEMENT OF NOXIOUS WEEDS

● FROM THE EDITOR

WEED PROBLEMS? STEP BACK AND TAKE A LOOK AT THE BIG PICTURE

While researching noxious weeds for this issue of JPR, I read a perceptive and thought-provoking article[1] written last year by James Luken, a professor of biology at Northern Kentucky University. It brings a perspective to weed management that is missing from most noxious weed control programs and will reduce reliance on herbicides.

First, he described the usual approach that weed science takes towards weeds. That traditional approach involves "directing chemical, physical, or biological control methods at the problem species."[1] Success is simply measured "in terms of kill."[1] Herbicides, potent plant killers, can be successful from this point of view.

However, real life is not this simple. Plant communities are not static. Instead, they are constantly changing, in a process that ecologists call succession. Over time, individual species rise and fall in importance.[1] Efforts to maintain any plant community frozen in a single point in time are likely to be futile, and efforts to manage a particular weed species must consider the constantly changing community of which the weed is a part.[1] Management activities should be directed "at the full range of system processes contributing to system change through time."[1]

Oregon Department of Agriculture

Yellow starthistle.

Success, instead of being measured by counts of dead weeds, is measured by changes in the importance of all the participating species. Instead of a narrow focus on killing weeds, we need to look at the "big picture," the entire plant community that we're trying to manage. Long-term changes are more important than short-term kills. Herbicides are not the successful tool that they can be in the "weed science" approach, and managers are led to sustainable management strategies. — *Caroline Cox*

1. Luken, J.O. 1997. Management of plant invasions: Implicating ecological succession. *In* Luken, J.O. and J.W. Thieret (eds.). *Assessment and management of plant invasions.* Springer series in environmental management. New York, NY: Springer-Verlag. Pp.133-144.

● ANNOUNCEMENTS

NEW PHONE AND VOICE MAIL SYSTEM

With the generous support of the Norcross Wildlife Foundation, Inc., NCAP recently installed a new automated phone and voice mail system. The purpose of the new system is to make NCAP more efficient in its work, and to make it possible for all of you who call NCAP to leave voice mail messages for individual staff members.

We know that automated phone systems can be tedious and unpleasant to use, but we'd like to make ours one of the best. Please let us know if you have problems with our new system, or if you have suggestions about how we can improve it.

MAIL FROM NCAP MORE OFTEN?

NCAP is participating in a membership development program sponsored by Training Resources for the Environmental Community (TREC) in Seattle. The program will help NCAP increase its membership and the power that we have to promote pesticide alternatives.

As part of this program, you're going to be getting more mail from NCAP: requests for your membership renewal, opportunities to contribute to special NCAP programs, and occasionally a survey. We hope most of the mail is interesting! Please let us know if you'd like not to receive certain types of mailings.

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● TABLE OF CONTENTS

NORTHWEST COALITION FOR ALTERNATIVES TO PESTICIDES
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● NONCHEMICAL MANAGEMENT OF NOXIOUS WEEDS

LESSONS FROM LEAFY SPURGE AND YELLOW STARTHISTLE

Noxious weeds are non-native plants, mostly weeds of rangeland or pasture, that are classified under federal and state law as having negative impacts on agriculture. In many states, counties, and cities, control of noxious weeds is mandated by law.

Leafy spurge and yellow starthistle are examples of noxious weeds that are widespread in the Pacific Northwest. Both species are commonly found in disturbed areas, have characteristics that make them successful weeds, and have been difficult to manage with herbicides. For both of these weeds nonchemical management techniques are successful, including mowing, grazing, burning, mulching, seeding of desirable plants, and introduction of biological control agents.

What can leafy spurge and yellow starthistle teach us about management of noxious weeds in general? Seven important lessons emerge: 1) Noxious weeds have been with us for decades, and there is time to develop successful and sustainable management strategies; 2) A focus on eliminating the *causes* of weed problems is imperative, so that we create long-term solutions; 3) Biological control is a useful and cost-effective technique; 4) Management techniques need to include tools to reduce seed populations; 5) Encouragement of desirable vegetation is crucial; 6) Proper timing can maximize the effectiveness of nonchemical controls; and 7) Techniques must be appropriate for the treatment site.

BY CAROLINE COX

Many of us have heard the negative rhetoric that is often used in reference to noxious weeds. Their encroachment is reaching "epidemic proportions"[1]; they are "alien, exotic, and invading"[1]; their spread is "rendering wetlands and habitat unusable by wildlife"[1]; and they represent a "catastrophic shift toward weedy vegetation."[1] Most of us have also heard this kind of language used as a justification for herbicide spray programs on hundreds or thousands of acres.

This article presents a different perspective on noxious weeds. Two case studies of noxious weeds, leafy spurge and yellow starthistle, show that nonchemical techniques can successfully manage weeds, and have done so throughout the Northwest. Then, from these two examples, NCAP draws some general conclusions that can be used in evaluating management programs for any noxious weed.

Caroline Cox is JPR's editor.

Leafy Spurge

Leafy spurge (*Euphorbia esula*) is a perennial weed whose milky sap is toxic to cattle, causing skin irritation and digestive problems.[2] It is widespread on millions of acres in the western United States and Canada,[2] and estimates of economic losses are over 140 million dollars.[3]

Spurge is not native to North America; its native range is Eurasian, from Siberia southwest to the Mediterranean and west to northern Europe. It was introduced to North America over a hundred and fifty years ago, most likely as a contaminant in soil used as ballast in ships and in imported seed grains.[4] The oldest preserved specimen of spurge was collected in Massachusetts in 1827.[2]

Several physical characteristics make spurge a tenacious weed. It has an extensive root system, and average-sized plants (2 feet tall) can have roots that extend 10 feet into the soil.[2] These roots crowd out neighboring plants and also store food, enabling the plant to survive unfavorable conditions. In addition, buds on the roots can sprout and produce new shoots,[2] and a root fragment as small as 2 inches can produce a mature plant in one season.[2] Spurge seeds grow inside a capsule that bursts when the seed is ripe, dispersing seeds up to 15 feet.[5] The seeds can live for up to 7 years in the soil,[5] so that germination of new seedlings can occur long after visible plants are gone.

Leafy spurge is primarily, although not exclusively, found in disturbed areas. A study of a native prairie found that 95 percent of the spurge plants were associated with soil disturbances. Seedling establishment was 45 times greater on bare soil than in undisturbed vegetation.[6]

Chemical control of spurge has been problematic. Herbicides that kill leafy spurge also kill desirable plants. Also, herbicide costs can easily exceed the value of the land on which they are used. The U.S. Department of Agriculture has estimated that the costs of spraying outweigh the benefits by as much as 10 to 1.[5]

In addition, spurge is hard to kill with herbicides because the plant is able to block movement of the chemicals to the root system, allowing the roots to survive herbicide treatment.[5] For example, Rich Sacchi, a rancher in south-central Oregon, spent four years and over 100,000 dollars trying to control spurge on a 700 acre ranch[7] that had been overgrazed by its previous owners.[8] His evaluation of the efficacy of the herbicides? "The chemicals were a joke."[7] In central Montana, rancher Tom Elliot spent two seasons and over 25,000 dollars trying to control spurge with chemicals. The result? "You would have thought we put fertilizer on the stuff,"[9] he reported.

The picture painted here is clearly one of a difficult weed. Yet, nonchemical techniques for managing leafy spurge are both available and effective.

One management tool is biological control, the importation and distribution of the weed's natural enemies. In spurge's native areas it is of little or no economic significance.[2] According to USDA, "insects and diseases in the Old World have put such stress on spurge that it remains an insignificant component of the landscape."[5] The insects and diseases were not introduced to North America along with the weed.[5] Biological control involves bringing these natural enemies to North American spurge infestations.

Although a number of different insects have been introduced to manage leafy spurge, the most promising natural enemies are the leafy spurge flea beetles. One beetle, *Aphthona nigriscutis*, has given "excellent control"[10] in areas with lighter soils. In Alberta, Canada, leafy spurge was reduced 99 percent five years after release of the beetle.[10] In Manitoba, spurge was reduced 93 percent 7 years after release.[11] In Fremont County, Wyoming, over 50,000 square feet of leafy spurge was eliminated in the first four years after release.[12] On a Montana ranch, beetles provided 80 percent control of spurge over an area three miles long and a mile wide in six years.[9] A related species *Aphthona cyparissiae*, which prefers moister soils, has also been widely distributed. Researchers believe that these flea beetles "should solve the prairie leafy spurge problem on dry, light, open soils."[11] What is needed now are similarly effective natural enemies on wetter, heavier soils. Another related flea beetle, *Aphthona czwalinae*, has the potential to meet this need.[13]

Another nonchemical tool that has successfully managed spurge is grazing by sheep and goats. Unlike cattle and horses, sheep and goats like spurge, particularly after they become accustomed to the weed. On experimental plots in Canada, 5 years of sheep grazing reduced the amount of spurge 93 percent. Successful grazing of spurge requires starting early in the season because sheep prefer small spurge plants.[14] Sheep grazing of spurge provides income for ranchers because they can lease their range to sheep producers.[9]

Grazing by angora goats is also a successful management tool. In North Dakota, 3 years of grazing by angora goats resulted in a decrease in leafy spurge biomass of 44 percent, and an increase in grass biomass of 57 percent.[15] Angora goats have also been used on infested range in Oregon and Idaho.[7,16] These projects are new, with only one season of grazing, but results so far are promising.[8] Seed production was completely eliminated in the Oregon project.[17]

Along roadsides, planting of competitive grasses, including the native grass little bluestem, has successfully reduced spurge abundance. In an experiment

WHAT IS A NOXIOUS WEED?

As defined by federal law, noxious weeds are weeds that are "of foreign origin"[1] and "new or not widely prevalent in the United States"[1] when such weeds "can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture."[1] The phrase "interests of agriculture" is defined to also include irrigation, navigation, or fish and wildlife resources.[1]

Many states designate weeds as noxious, and both state and local governments commonly have laws that require landowners to control noxious weeds that grow on their property.

7 U.S.C. 61 § 2802.

Aphthona flea beetles on leafy spurge. The beetles have been introduced as biological control agents of leafy spurge and have effectively reduced spurge populations on light well-drained soils.

funded by the Minnesota Department of Transportation, spurge declined 67 percent two years after grass seeding.[18]

Yellow Starthistle

Yellow starthistle (*Centaurea solstitialis*) is an annual weed, one that completes its life cycle in a single growing season. Seeds germinate anytime between October and June, depending on when rain occurs.[19] The plant then grows as a rosette with a robust tap root that can reach a depth of 6 feet by early summer. In May or June, the plant bolts, then flowers, and sets seed.[20]

The weevil *Eustenopus villosus* has been introduced in the pacific Northwest to reduce yellow starthistle populations.

Starthistle is toxic to horses and causes a fatal nervous system disease.[20] Mature plants are unpalatable to cattle because of their spiny flower heads.[21]

Starthistle is widespread throughout the Pacific Northwest. It occupies 10 million acres in California,[19] 980,000 acres in Oregon, 200,000 acres in Idaho, and 130,000 acres in Washington.[21]

Like spurge, yellow starthistle is not native to North America. It was introduced into California over a hundred years ago as a contaminant in alfalfa seed brought to California from Spain and Chile. The oldest preserved specimens were collected in 1897. Efforts to control this weed were begun in 1917.[22]

Three attributes of yellow starthistle make it a successful weed. First, its long tap root allows it to use water deep in the soil and gives the plants a high tolerance for drought. Second, patches of seedlings are often dense, and block sunlight from reaching the soil surface. This suppresses the growth of other species.[19] Finally, starthistle plants produce an extraordinary amount of seed. Each plant produces between 700 and 10,000 seeds;[20] an acre of starthistle will produce between 50 and 200 million seeds.[19] While most seeds are short-lived, some persist in the soil for up to 10 years.[23]

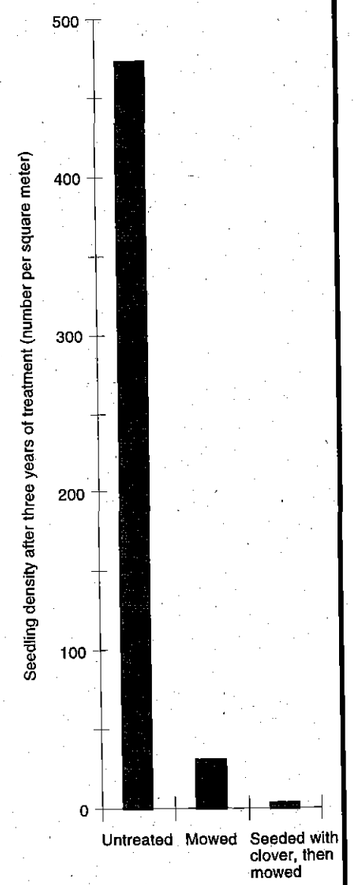
Starthistle thrives in areas where other vegetation has been disturbed by fire, construction, or overgrazing. For example, in an experiment at Washington State University, artificial cattle grazing (clipping that simulates grazing) reduced the ability of four perennial grasses to resist invasion by yellow starthistle.[24]

Management of yellow starthistle with herbicides "is not ideal and often results in failure,"[25] according to a researcher from the University of California at Davis's Weed Science Program. Many herbicides that control starthistle also injure desirable grasses. Several combinations of herbicides provide only moderate control. Often multiple applications are required because seed germination occurs over a long period.[21] Resistance to multiple herbicides has been documented in yellow starthistle populations that have been frequently treated with herbicides.[26]

Overall, yellow starthistle is clearly a weed that is difficult to manage. Yet, as with leafy spurge, nonchemical techniques for managing this weed are both available and effective.

One successful nonchemical technique for managing starthistle is grazing by sheep or goats. To be successful, grazing must occur during bolting, and then be continued to remove any regrowth. If plants are only grazed when they are rosettes, starthistle thrives. With appropriate timing, however, grazing is highly effective. In one set of experiments in California, grazing reduced the number of flower heads up to 90 percent.[27]

Figure 2
Yellow Starthistle Abundance Is Reduced by Mowing and Seeding Clover



Source: Thomsen, C.D., M. P. Vayssieres, and W.A. Williams. 1997. Mowing and subclover plantings suppress yellow starthistle. *Calif. Agricul.* (Nov.-Dec.):15-20.

In field experiments, mowing of yellow starthistle combined with seeding of clover reduced yellow starthistle populations by over 99 percent.

Mowing is also an effective nonchemical tool. Again, timing is crucial. Early mowings can increase starthistle density, probably because it suppresses competing vegetation. However, mowing when plants had just started to bloom reduced subsequent flower head density between 63 and 86 percent. Seedling density the following fall was reduced between 73 and 89 percent.[27]

When a second mowing removed regrowth, starthistle densities were reduced even further. Density of flower heads was reduced up to 97 percent, while densities of seedlings the following fall was reduced up to 98 percent.[27] When these treatments were repeated for three years, the results were especially striking: seedling numbers decreased by 99.5 percent, and seedlings were 20 times more abundant on plots that were only mowed once.[28]

Seeding of competitive vegetation combined with mowing has been particularly successful. Researchers at the University of California at Davis showed that seeding of clover, followed by three years of mowing, reduced flower head production to zero and reduced fall seedling densities by over 99 percent. It was crucial to select a clover variety that competed strongly with starthistle and was well adapted to the site.[28] Also, planting of an aggressive competitor (vetch) has been successful without mowing.[20]

Burning is useful, especially where fire has historically been frequent. At California's Sugarloaf Ridge State Park, carefully timed burns have "nearly eliminated" starthistle. A single burn reduced the number of seeds by 74 percent, and the number of new seedlings by 81 percent. Three years of burns reduced both seed and seedling numbers over 99 percent. Declines in starthistle were accompanied by increases in the abundance and diversity of native species.[29]

Because yellow starthistle is an introduced weed, biological control is also a promising management tool. Potential biological control agents include seed head weevils, seed flies, and seed head gall flies. The one that has the most potential is probably the weevil *Eustenopus villosus*. *Eustenopus* has more impact on starthistle than the other insects because both larvae and adults feed on developing flower heads.[30] Near Myrtle Creek, Oregon, densities of yellow starthistle were "greatly reduced"[31] following introduction of the weevil, combined with a reduction of cattle grazing and increases in competition from perennial grasses.[31]

On small sites, other nonchemical techniques can be useful. Straw mulch provides good control of starthistle, with a 3.5 inch mulch yielding 98 percent control.[32] Hand-weeding, and hoeing are also useful tools. They are most successful early in the season before the plant has had a chance to develop a large taproot. Another small-scale management technique involves depleting the soil's seed bank with repeated irrigation and cultivation. Irrigation causes seedlings to germinate, and then they can be removed by disking the area.[20]

"Attempts to control weeds without addressing the causes of the invasion are doomed because they treat symptoms rather than causes."

-- R.J. Hobbs and S.E. Humphries

Lessons Learned

What can we learn about management of noxious weeds in general from looking at these examples, leafy spurge and yellow starthistle? Seven important lessons emerge:

1. Don't Panic

There's no need to rush to treat noxious weeds. Like leafy spurge and yellow starthistle, many noxious weeds were introduced into North America over a hundred years ago and have been here since. Although infestations are often portrayed as crises, there is always time to develop successful, sustainable strategies.

The only time quick action is mandatory is when a small population of a newly introduced weed is found. In this situation simply pulling the undesirable plants is the appropriate response.

2. Identify and Eliminate the Causes of Weed Problems

Like leafy spurge and yellow starthistle, most noxious weeds thrive in disturbed areas. For example, roadsides and heavily grazed rangeland are often sites of noxious weeds. Weed management needs to focus on how to manage these disturbed areas so they are less open to weeds. As two researchers from the Commonwealth Scientific and Industrial Research Organization have written, "attempts to control weeds without addressing the causes of the invasion are doomed because they treat symptoms rather than causes. The changes ... that allow the initiation or intensification of weed invasion have to be addressed before effective weed control can be achieved."[33] Unless the causes of disturbances are identified and eliminated, noxious weed management is like running on a treadmill; there is lots of action but little permanent progress.

3. Promote Biological Control

Most noxious weeds are not native to the area in which they are a problem. Either accidentally or intentionally, they have been introduced from around the globe. Most noxious weeds have been introduced without the insects and diseases that regulate their abundance in their native range, so they are good candidates for biological control. Biological control is not a silver bullet. It can take years for populations of a biological control agent to build up enough to impact weed populations. Also, biological control needs to be done carefully, to avoid irreversibly introducing an insect or disease that im-

pacts native or crop plants.[34,35] But, with these caveats, biological control offers "environmentally safe, energy self-sufficient, cost-effective, and self-sustaining"[36] management strategies for noxious weeds.

4. Find Effective Ways to Reduce Seed Numbers

Weed seeds are future weed populations. Reducing the number of seeds in the soil, or the number of plant parts capable of vegetative reproduction, is essential. Even though seeds and root buds are often invisible, they hold the key to long-term successful management.

5. Encourage Desirable Vegetation

Sustainable weed management requires not just a reduction of weed populations, but also the encouragement of desirable vegetation, the vegetation we'd like to see replace the weed. Unless both issues are addressed, a weed management program is incomplete and will probably lead to repeat weed problems.

6. Experiment With Timing to Improve Success

The success of many nonchemical management techniques changes dramatically depending on the life stage of the weed at the time the technique is used. For example, mowing of yellow starthistle increases its abundance if the mowing is done early in the season, but effectively reduces seed and subsequent seedling populations if done later in the season. It's crucial to determine these effective management "windows."

7. Use Site-appropriate Techniques

No one nonchemical technique will be appropriate everywhere. For example, sheep grazing is usually unacceptable on a nature preserve, but may be appropriate to manage weeds on a cattle ranch. All techniques should be compatible with larger management goals.

Conclusion

Noxious weed control does not have to mean widespread use of toxic chemicals. Alternative techniques can successfully reduce weed populations and encourage vegetation whose presence is desirable, thus reducing or eliminating the need for repeated treatment. Implementing nonchemical strategies and reducing the herbicide dependence of noxious weed programs provides long-term and cost-effective weed management. +

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• NEWS FROM NCAP

NCAP PETITIONS EPA TO END "INERT" SECRECY

NCAP and a coalition of 180 organizations from 36 states petitioned the U.S. Environmental Protection Agency (EPA) on January 20th to require manufacturers to list all ingredients on pesticide product labels. The public's right to know drives this effort to disclose the toxic, secret ingredients in pesticides that are used in schools, workplaces, stores, and other public places.

Over 2,500 inert ingredients are added to pesticide products. Many of these are toxic or hazardous. Inerts can constitute up to 99 percent of a pesticide formulation, yet are rarely disclosed on labels.

The 14-page petition documents how so-called "inerts" can harm human health and the environment. It also addresses major flaws in current policy that prevent EPA from adequately protecting the public. (View the petition on NCAP's web site at www.efn.org/~ncap/.) For instance, EPA claims it does not know anything about the toxicity of the 1,981 inert ingredients on List 3 (see "EPA's Lists of Inerts", below), even though 276 of those ingredients are currently or formerly registered "active" pesticide ingredients. Two examples, chlorothalonil and chlorpicrin, are on List 3 yet are restricted use pesticides that only a licensed applicator can purchase or apply.

Pesticide manufacturers will benefit from full ingredient disclosure on product labels. EPA's 1996 Consumer Labeling Initiative found that consumers look positively upon detailed safety information on labels. In fact, consumers are more likely to buy a product with explicit warnings. In addition, label disclosure encourages manufacturers to use less toxic pesticide ingredients.

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Norma Grier is NCAP's executive director.

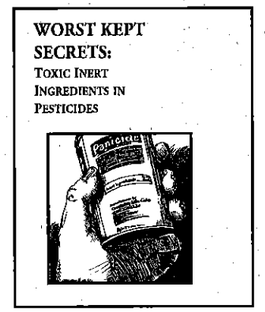
EPA has the authority to require label disclosure of inert ingredients. In previous Freedom of Information Act litigation brought by NCAP and others, the court ruled that the identities of inerts are not trade secret, and most are not confidential business information. EPA is not prohibited by statute from disclosing inert ingredients. (See JPR 16(4):8.)

The coalition of national, state and local organizations includes environmental, health, labor, consumer, and religious groups. Coalition members include AFL-CIO, World Wildlife Fund, US Public Interest Research Group, National Coalition Against the Misuse of Pesticides, as well as California Indian Basketweavers Association, and the Long Island Neighborhood Network.

On the same day, the New York attorney general and the attorneys general from the states of Massachusetts, Connecticut, New Hampshire, Minnesota, Wisconsin, and Alaska, as well as the territory of Guam, submitted a parallel petition to EPA.

NCAP will continue working with the coalition groups and others until we get an adequate response about "inert" disclosure from EPA. — *Norma Grier*

WORST KEPT SECRETS



NCAP recently released a new report, authored by Holly Knight, about the hazards of inert ingredients. The report identified 664 "inert" chemicals that have been identified as hazardous by federal, state, or international agencies.

The report recommends that all pesticide ingredients be fully disclosed on product labels. In addition, all health and safety testing required for pesticides should use the complete pesticide product.

Copies of the report are available on NCAP's web page, www.efn.org/~ncap/, or by mail for $3.00.

EPA's Lists of Inerts

EPA currently categorizes 2,518 ingredients in the following lists:[1-3]

List 1	Inerts of toxicological concern	8 compounds
List 2	Potentially toxic inerts	101 compounds
List 3	Inerts of unknown toxicity	1,981 compounds
List 4A	Inerts generally regarded as safe	119 compounds
List 4B	Inerts for which EPA has sufficient information to reasonably conclude that the current use patterns in pesticide products will not adversely affect public health and the environment	309 compounds

1. 52 *Federal Register* 13305
2. 54 *Federal Register* 48314
3. US EPA, Office of Pesticide Programs. 1995. List of Pesticide Product Inert Ingredients. Washington, DC. (May.)

●NEWS FROM THE NORTHWEST

NEW USGS STUDY HIGHLIGHTS NEED FOR PESTICIDE USE DATA

A new study by the U.S. Geological Survey (USGS) found pesticides in every one of the 95 samples taken from twenty small streams in the Willamette River Basin. The Willamette River is the largest and most heavily populated river basin in Oregon, and the study has prompted discussion about the need for site specific information on what pesticides are used where, when, and in what amounts.

Unlike earlier studies of the Willamette, this time the USGS tried to understand the relationship between pesticide contamination and land use. To do this, the researchers sampled the water in sixteen randomly selected small streams in agricultural areas and four in urban areas. The USGS looked for 86 pesticides, sampling each site five times during 1996. The researchers also mapped the land use patterns for each of these small subbasins (3-15 square miles) and tried to estimate the pesticide use in the agricultural areas. That process, however, was fraught with difficulty due to the lack of good information on pesticide use.

Among the study's findings are:

• A total of 36 different pesticides (29 herbicides and 7 insecticides) were found at the 20 sites.

• Certain pesticides tended to show up in higher concentrations in intensive agricultural areas (atrazine, diuron, and metolachlor) than at urban sites. Conversely, five other compounds tended to appear in urban areas at higher levels than they did in agricultural areas (carbaryl, diazinon, dichlobenil, prometon, and tebuthiuron).

• Herbicides that showed up extremely often were atrazine (99% of the samples), desethylatrazine (93%), simazine (85%), metolachlor (85%), and diuron (73%). All of these compounds, except diuron, were detected in every one of the twenty streams, regardless of whether the surrounding land use was agricultural or urban. Atrazine showed up in every single sample, except one.

The USGS found 17 pesticides in this tributary of Flat Creek near Junction City, Oregon. The creek's drainage is dominated by grass seed production.

• In a large number of samples, the pesticide concentrations were "unusually high." Yet, state and federal water quality standards for aquatic life have been established for only three of the 36 pesticides detected.

Existing estimates of pesticide use failed to predict the extent and nature of the contamination. There was no information available to estimate urban pesticide use. Also, the USGS detected seven compounds in the water for which there was no estimated use during 1996.

In another anomaly, concentrations of atrazine — an herbicide linked to breast cancer that has been banned by seven European countries — were particularly high in the subbasins planted largely with grass seed crops. But there is no information indicating atrazine is even used on these crops currently. According to the report, atrazine levels "cannot be predicted by reported application rates under current reporting methods."

The report confirms once again that pesticides are polluting our water. It also shows that without good information on pesticide use, it is extremely difficult to determine the sources of contamination. Most importantly, the lack of reliable data makes it difficult to develop appropriate strategies for preventing pesticide pollution. For these reasons, NCAP is advocating that Oregon and other states establish pesticide use reporting policies to track what pesticides are used where, when, and in what quantities.

—Neva Hassanein

Anderson, C. W., T. M. Wood, and J. L. Morace. 1997. Distribution of dissolved pesticides and other water quality constituents in small streams, and their relation to land use, in the Willamette River Basin, Oregon, 1996. Water Resources Investigations Report 97-4268. Portland, OR: US Geological Survey.

Neva Hassanein is a program associate at NCAP.

INFORMATION ABOUT WATER IN YOUR AREA

The USGS is studying pesticide contamination of water in nearly 60 geographic areas that have been selected for analysis under the National Water Quality Assessment (NAWQA). The data collected are the most extensive ever compiled.

To learn more, check out the NAWQA web site: http://wwwrvares.er.usgs.gov/nawqa/nawqa_home.html or contact Chief, NAWQA Program, USGS Water Resources Division, 12201 Sunrise Valley Drive, Mailstop 413, Reston, VA 20192. (703)-648-5716.

●NEWS FROM THE NORTHWEST

PESTICIDE USE LINKED TO BELLINGHAM LEUKEMIA CLUSTER

Whatcom County, Washington is an area known for its natural beauty: rolling agricultural land, large scenic lakes, views of the San Juan Islands to the west, and Mt. Baker and the North Cascade Range to the east. Whatcom County is also becoming well known for its rapid decline of water quality: contaminated sediments in Bellingham Bay, effects of population growth pressure around Lake Whatcom, and agricultural pesticides in groundwater. It is this last issue — pesticides in groundwater — that has recently gained the attention of state and local health officials due to a concerted effort on the part of citizens and environmentalists.

Prompted by a resident whose daughter had contracted leukemia and who had heard of several other cases in the area, the state Department of Health (DOH) researched childhood leukemia rates in northern Whatcom County. The Department found a sharply elevated rate: whereas the national rate for childhood leukemia is 6.7 per 100,000 children, in northern Whatcom County the rate is 42 per 100,000 children. County officials are now studying possible causes.

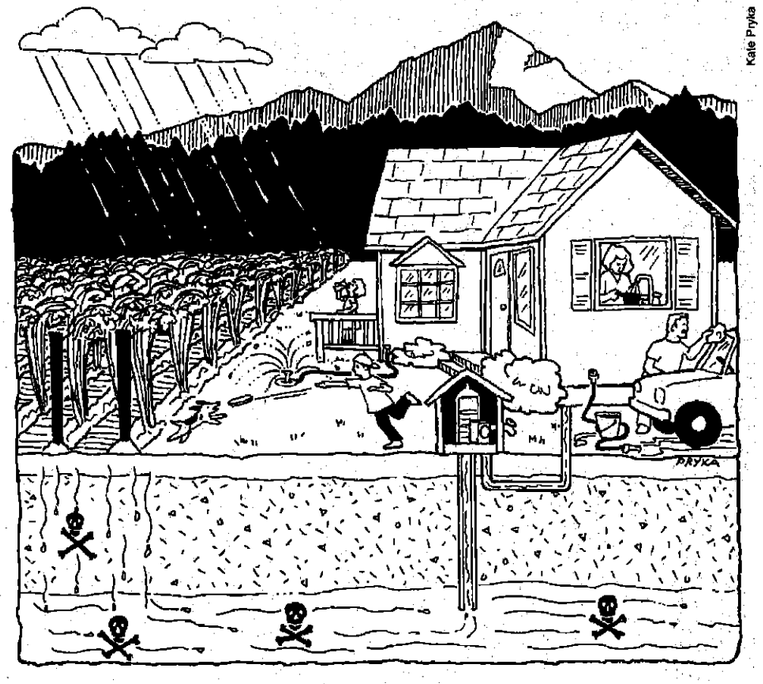
The answer may well be in the groundwater. Near the town of Lynden, the soil fumigants ethylene dibromide (EDB) and 1,2-dichloropropane (1,2-DCP) have been found in the groundwater. EDB and 1,2-DCP were extensively used in the past (primarily by berry farmers) in Whatcom County until use of both chemicals was banned by the U.S. Environmental Protection Agency (EPA) in the 1980s. Testing done over a decade ago found EDB levels as high as 6.17 parts per billion (ppb) — hundreds of times above state guidelines — and 1,2-DCP levels up to 24 ppb in private and public wells in the area, five times the EPA drinking water standard.

EDB and 1,2-DCP are classified as probable human carcinogens, and have been linked to respiratory, liver, and kidney damage. Both persist in groundwater.

Some remedial action was taken by the Department of Ecology (DOE) during the past decade. Residents on an EDB-contaminated public water system were connected to an alternate water supply. DOE has provided other residents with bottled water since the mid-80s, and continues to do so.

However, no agency has ever attempted to determine the extent of the groundwater contamination, despite warnings by DOE. In a 1996 report, DOE noted, "There is an urgent need to conduct an extensive investigation of possible pesticide contamination.... The potential for widespread contamination is very real." DOE also states that households currently receiving bottled water are "only a fraction of the homes in the settlement area." Additionally, providing bottled drinking water does not address exposure through bathing or cooking with contaminated water.

EDB levels hundreds of times higher than the health advisory limit have also been found in berry farm wells. Approximately 1,000 workers are employed by berry farms in the area. In the mid-80s, state health officials ordered the county to deny operating permits to the farms because of the threat to workers' health. Additionally, in the late 1980s DOE received anonymous reports of illegal dis-



Bonnie Rice lives in Bellingham, Washington, and has been working in the areas of toxics organizing and sustainable agriculture for the last 5 years.

posal of pesticides and/or pesticide containers by berry farmers. DOE did an initial investigation but encountered resistance when the department attempted to conduct sampling in the area. As a result, DOE dropped the investigation.

Adding insult to injury, in the summer of 1997 Whatcom County became the first county in the country that did not cooperate with the U.S. Geological Survey (USGS) in its National Water Quality Assessment project. USGS had requested access to county rights-of-way in order to drill test wells. However, resistance from the raspberry growers and cooperative extension personnel convinced the county executive to ignore USGS's repeated requests for access. As a result, the USGS study was severely limited in scope, with only 7 wells included instead of the 19 that were planned.

In response to pressure by local citizens, some action is now being taken. The Whatcom County Health Department is undertaking a survey about possible causes of the leukemia cluster; and DOE is planning once again (after 7 years) to sample the wells of the households receiving bottled water to determine current EDB and 1,2-DCP levels.

Additionally, the County has now invited the USGS back and will assist the USGS in finding additional wells to test. The County is also proposing a meeting between the various agencies involved to attempt to resolve many of the outstanding issues related to the contamination, including testing of wells in a wider area.

Local citizens and environmentalists have also filed petitions with EPA and the Agency for Toxic Substances and Disease Registry, calling for a federal assessment of the public and environmental health threat posed by EDB and 1,2-DCP in Whatcom County. —*Bonnie Rice*

●FOOD NEWS

PERVASIVE ORGANOPHOSPHATE PESTICIDES THREATEN KIDS

Since the Oprah Winfrey "food disparagement" trial recently made headlines across the country, it might be a risky time to suggest that the safety of our food supply is not all it should be. But keeping consumers in the dark about potential health threats poses even greater risks.

So a new study, *Overexposed: Organophosphate Insecticides in Children's Food,* which finds that one million U.S. children age five and under are exposed to unsafe levels of 13 different neurotoxic insecticides in the foods they eat deserves our attention and reaction.

The study, conducted by the Environmental Working Group (EWG), examined government data on food consumption and pesticide residues. Researchers found that 13 of the 39 organophosphate pesticides registered for use on food show up in or on food children eat. Organophosphates are a class of pesticides that are used to kill insects. However, these

chemicals don't differentiate between the nervous system of a cockroach and the nervous system of a two-year-old.

Like lead, organophosphates can disrupt a growing child's nervous system, producing behavioral problems and learning disorders. Children are more vulnerable to toxic compounds because of their small size and because their bodies are growing and developing.

The EWG study found that peaches, apples and nectarines are the most common sources of exposure to unsafe levels of organophosphates for young children. For infants 6 to 12 months old, the dominant source of exposure is commercial baby food, particularly apple juice, pears, applesauce, and peaches.

The report looked *only* at health risks from food. Many of these chemicals are also commonly used in homes, schools, lawns and parks. For example, diazinon and malathion are commonly used for killing insects in lawns and gardens. Another organophosphate, chlorpyrifos, is not only sprayed on fruits and vegetables, but is also used to kill carpenter ants and cockroaches in homes and other buildings. Pesticides are more pervasive than many people realize.

While the information in the EWG report raises legitimate concerns, the answer is *not* to stop eating produce. A balanced diet high in fruits and vegetables remains essential for everyone's health, especially our children's. Rather, the answer is for growers and regulatory agencies to rid these healthful foods of toxic pesticides. Until that happens, we deserve the right to know about the chemicals that are used routinely in agriculture and elsewhere. Only with full information about pesticide use can we make informed decisions that will ensure the food we eat is safe for all of us.

Copies of the report are available on the World Wide Web at www.ewg.org. Printed copies are available by mail for $20.00 from EWG, 1718 Connecticut Ave., N.W. Suite 600, Washington, D.C. 20009.— *Laura Weiss and Randy Tucker*

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Laura Weiss is the pesticide program director for the Oregon Environmental Council. **Randy Tucker** is the Oregon State Public Interest Research Group's environmental advocate on toxics issues.

●FOOD NEWS

MAJOR OVERHAUL OF PROPOSED ORGANIC STANDARDS NEEDED

Fruits and vegetables rallied outside the Seattle Center, in Seattle Washington while 120 people waited inside to voice their concerns about the draft organic standards released by the U.S. Department of Agriculture (USDA) on December 16, 1997. Similar scenes have played out around the country — from Austin, Texas to Ames, Iowa. Hundreds of people have testified against the rule; thousands more have submitted written comments.

Among the people who testified in Seattle was NCAP's executive director, Norma Grier. "Under USDA's proposed rule toxic chemicals and pesticides will be applied to organic food under the guise of inert ingredients. For example, chlorothalonil is a pesticide that is highly toxic and would not now be allowed in organic production. But under USDA's proposed rules regarding inert ingredients, chlorothalonil and hundreds of other toxic chemicals will be allowed to be used. This is outrageous."

Environmentalists, family farm organizations, and the organic industry cite a broad range of problems with the rules ranging from the fees to dramatic changes in the list of materials that are allowed to be used in organic production. Organic advocates state that a major overhaul of the proposed rules is needed.

History

On December 16, 1997, USDA released proposed standards for a national organic program. Since 1990, the natural foods industry had been working with the USDA to establish new federal rules to define "organic" food, rules meant to promote consumer demand and expand the number of organic farms.

Previously, rules governing organic practices were developed and enforced by state and private certifiers. In order to establish consistent standards across all states and certifiers, the organic industry worked with Congress to pass the Organic Foods Production Act in 1990.

The Act established the National Organic Standards Board (NOSB) and charged it with recommending to USDA materials and practices that should be considered "organic" under the new law. The NOSB toiled for years and developed recommendations that embodied consumers' expectations for "organic". But the rules released in December barely reflect any of the NOSB's work.

Key Problems

1) Organic advocates feel that the proposed rules are so flawed that USDA needs to develop a second draft rule.

2) USDA virtually ignored the recommendations from the NOSB on the materials that could be used in organic production. The NOSB is made up of organic producers, certifiers, processors and representatives from environmental organizations with years of experience in developing organic laws and regulations. USDA opened the door to include practices that would be unacceptable to most people who grow, consume, and process organic food. Such practices include use of sewage sludge, ionizing radiation, and genetically engineered organisms in organic production. There are also a myriad of other changes that would change organic production as we know it.

3. USDA watered down the standards for organic livestock. NOSB recommended that animals have access to the outdoors, prohibited refeeding of animal parts and manure, severely limited the use of antibiotics, and required organic feed. USDA's proposed rules would allow 20 percent non-organic feed, confinement operations, and liberal use of antibiotics.

4. The proposed rules would allow the use of toxic inert ingredients.

5. Although NOSB recommended that USDA not penalize small farmers, certifiers, and processors, USDA proposed regressive flat fees. This discriminates against small-scale farmers and processors.

6. The language regarding eco-labeling is sufficiently vague that it would enable USDA to prohibit the use of eco-labels such as pesticide-free, no antibiotics or hormones, IPM grown, etc. While many people may have concerns about the proliferation of eco-labels, there is no reason to prohibit their growth and development under this rule.

There are many issues of concern under the proposed rules. This list of six items just begins to capture some of the problems. If you're concerned about what these rules will do to organic food production, then please send in your comments to USDA before April 30. Also send a copy of your comments to your federal representative and senators.

Send your comments to: Eileen Stommes, Deputy Administrator, USDA, AMS, Room 4007-S, Ag. Stop 0275, P.O. Box 96456, Washington, D.C. 20090-6456. Include the docket number — #TMD-94-00-2.

— *Karen Murphy*

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Karen Murphy is NCAP's sustainable agriculture program associate.

●NEWS FROM AROUND

NEW RESOURCES: SCHOOLS, CHILDREN, AND PESTICIDES

In the past year, there has been an impressive amount of activism centered around the special risks that pesticides pose to children. Parents and school administrators will want to know about the following resources that have recently become available. Use them as you work to reduce children's exposure to pesticides in your community's schools.

• *Our Children at Risk: The 5 Worst Environmental Threats to Their Health*, published by the Natural Resources Defense Council (NRDC). Copies are available from NRDC, 40 West 20th Street, New York, NY 10011 for $14.00. The publication is also available on the Web at http://www.nrdc.org/nrdcpro/ocar/ocarinx.html. The book covers children's vulnerability, lead, air pollution, pesticides, tobacco smoke, and drinking water contamination.

• *Resource Guide on Children's Environmental Health*, published by the Children's Environmental Health Network (CHEC). Copies are available from CHEC, 5900 Hollis St., Suite E, Emeryville, CA 94608 for $15.00. This book is a directory of organizations and agencies working on children's environmental health issues. Multiple index categories aid in searching for resource organizations and materials.

• *Failing Health: Pesticide Use in California Schools*, published by the California Public Interest Research Group (CalPIRG). Copies are available from CalPIRG, 450 Geary St., #500, San Francisco, CA 94102. Summaries are on the web at http://www.igc.org/cpr. The report summarizes pesticide use in 46 California school districts. Almost 90 percent of the districts use pesticides identified as carcinogens, reproductive toxins, hormone mimics, or neurotoxins.

• *Reducing Pesticide Use in Schools: An Organizing Manual*, published by Pesticide Watch. Copies are available from Pesticide Watch, 450 Geary Street, Suite 500, San Francisco, CA 94102 for $5.00. This manual summarizes the pesticide problem, least-toxic integrated pest management (IPM), and ten steps to reducing pesticide use in schools. It includes a model IPM policy and a school survey.

• *IPM for Schools: A How-to Manual*, produced by the U.S. Environmental Protection Agency (EPA) Region 9. Copies are available from Urban Pesticide Initiative Coordinator, EPA, Region 10, 1200 Sixth Ave., ECO-084, Seattle, WA 98101-1128. This manual describes the IPM approach, and treatment strategies for many specific school pests. It also includes chapters on IPM for lawns, trees and shrubs, and sample monitoring forms and inspection checklists.

• *No Place for Poisons; Reducing Pesticides in Schools* published by the Washington Toxics Coalition (WTC). Copies are available from WTC, 4516 University Way NE, Seattle, WA 98105 for $5.00. This book documents the progress of WTC's 1996-97 school IPM project. It also summarizes the problem of pesticides in the school environment, and includes a model IPM policy. — *Becky Riley*

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Becky Riley is a program associate at NCAP.

●NEWS FROM AROUND

DECLINING MALE FERTILITY

A recent study published by researchers at the California Department of Health Services concludes that human sperm counts in the Unites States and Europe have declined significantly in the last twenty to fifty years.[1]

Six years ago, a team of Danish researchers made headlines when they reported that average human sperm production had declined, by about 50 percent, in the fifty years between 1938 and 1988. They based their conclusions on an analysis of 61 published sperm count studies and suggested exposure to endocrine-disrupting chemicals might be a cause.[2] Not surprisingly, their research was controversial. Many follow-up studies were published; some supported the original study while others argued that either the data or the analysis were faulty and that sperm counts had not actually declined.[3]

The California researchers reanalyzed the 61 studies used by the Danish scientists. They used sophisticated techniques to determine if the decline in sperm counts was a statistical artifact. They also looked at the importance of possible confounding factors. They concluded that the decline was "not likely to be an artifact of bias, confounding, or statistical analysis."[1] They did find significant differences between geographical regions. While the study did not look for environmental causes of sperm decline, the authors say that research to identify them is "clearly warranted."[1] — *Caroline Cox*

1. Swan, S.H., E.P. Elkin, and L. Fenster. 1997. Have sperm densities declined? A reanalysis of global trend data. *Environ. Health Persp.* 105:1228-1332.
2. Carlsen, E. at al. 1992. Evidence for decreasing quality of semen during the past 50 years. *BMJ* 305:609-613.
3. For example, see Auger, J. et al. 1995. Decline in semen quality among fertile men in Paris during the past 20 years. *N. Engl. J. Med.* 332:281-285. and Fisch, H. et al. 1996. Semen analysis in 1,283 men from the United States over a 25-year period: no decline in quality. *Fertil. Steril.* 65:1009-1014.

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Caroline Cox is JPR's editor.

●HERBICIDE FACTSHEET

PICLORAM

The herbicide picloram (commonly sold under the trade names Tordon and Grazon) is typically used to kill unwanted broad-leaved plants on rangeland and pastures, in forestry, and along rights-of-way.

In laboratory tests, picloram causes damage to the liver, kidney, and spleen. Other adverse effects observed in laboratory tests include embryo loss in pregnant rabbits, and testicular atrophy in male rats. The combination of picloram and 2,4-D causes birth defects and decreases birth weights in mice.

Picloram is contaminated with the carcinogen hexachlorobenzene. Hexachlorobenzene, in addition to causing cancer of the liver, thyroid, and kidney, also damages bones, blood, the immune system, and the endocrine system. Nursing infants and unborn children are particularly at risk from hexachlorobenzene.

Picloram is toxic to juvenile fish at concentrations less than 1 part per million (ppm). Concentrations as low as 0.04 ppm have killed trout fry. In Montana, roadside spraying of Tordon killed 15,000 pounds of fish in a hatchery 1/4 mile downstream from the Tordon treatment.

Picloram is persistent and highly mobile in soil. It is widely found as a contaminant of groundwater and has also been found in streams and lakes. It is also extremely phytotoxic, and drift and runoff from picloram treatments have caused startling damage to crops, particularly tobacco and potatoes.

Because of these characteristics, both the Ecological Effects Branch and the Environmental Fate and Ground Water Branch of the U.S. Environmental Protection Agency (EPA) recommended that use of picloram not be continued. These recommendations were not accepted by EPA when it evaluated picloram in 1995.

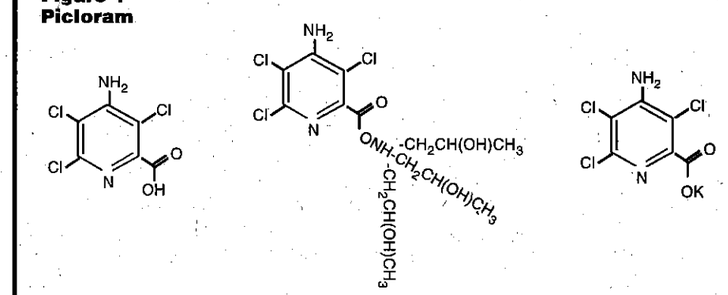
BY CAROLINE COX

Picloram is an herbicide in the pyridinecarboxylic acid family. It was first registered in the U.S. in 1964.[1] Picloram's primary manufacturer is Dow AgroSciences, and it is marketed under the brand names Tordon and Grazon.[2-6]

In 1995, picloram was reregistered by the U.S. Environmental Protection Agency (EPA), meaning that EPA had evaluated the health and safety testing submitted for picloram and found that it met current standards.[1] Picloram's registrations in California were withdrawn in 1986 because the manufacturer did not provide data about health effects and groundwater contamination required in California.[7]

Three forms of picloram are registered for use in herbicides. (See Figure 1.) Picloram acid is used only to manufacture other forms of picloram, the triisopropanolamine and potassium salts which are found in picloram herbicides.[1] A fourth form, isooctyl picloram, no longer has active registrations.[8]

Figure 1
Picloram



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Caroline Cox is JPR's editor.

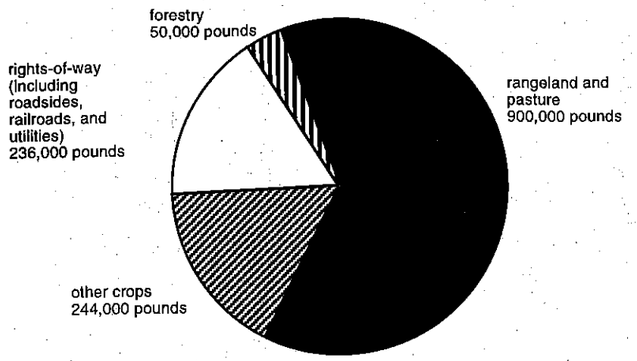
Uses

Picloram is used to kill unwanted broad-leaved plants on pastures and rangeland, in reforestation programs; in uncultivated areas; and along rights-of-way. According to EPA estimates, its major use is on pasture and rangeland. (See Figure 2.) Between 1.4 and 2.1 million pounds are used annually in the U.S.[1,9]

Mode of Action

Although herbicides that share a mode

Figure 2
Estimated Annual Use of Picloram in the U.S.



U.S. EPA. Prevention, Pesticides, and Toxic Substances. 1995. Reregistration eligibility decision (RED): Picloram. Washington, D.C., Aug.

Over 60 percent of the picloram used in the U.S. is used on rangeland and pastures.

of action with picloram have been in use for more then 50 years, their precise mode of action remains unclear.[10] In general terms, picloram kills plants by acting like auxins, plant growth hormones. It is more persistent than auxins, and inhibits the enzymes that normally break down auxins. This means it disrupts normal growth, causing abnormal stimulation and maturation of tissues. Plant growth then stops, and the roots of the plants deteriorate. This results in death.[11]

Most broad-leaved plants are susceptible to picloram, while most grasses are resistant. Susceptible species absorb more picloram than resistant ones, allow it to accumulate in meristematic (growing) tissue, and only slowly metabolize it into water soluble compounds.[12]

Acute Toxicity

Tests submitted by the manufacturer to support picloram's registration found that all three forms of picloram are of low acute toxicity.[1] However, picloram is more toxic in other tests. The oral median lethal dose for the potassium salt in an experiment conducted by an EPA researcher was about five times more toxic than the manufacturer's data, 690 milligrams per kilogram (mg/kg) for female rats and 950 mg/kg for males.[13] Picloram is also more toxic via inhalation; EPA classified picloram acid in Category I (the most toxic category) for inhalation toxicity, and both the potassium and triisopropanolamine salts are in Category II.[1]

Eye Hazards

Picloram herbicides are hazardous to the eye. Tordon K and Tordon 22K cause "substantial but temporary eye injury." Tordon RTU, Tordon 101, and Grazon P+D cause "eye irritation."[2-6]

Effects on the Immune System

Picloram and both of the picloram salts are labelled as skin sensitizers by EPA.[1] This means that an initial skin exposure can cause a more serious reaction to subsequent exposures. Skin sensitization has also been observed in humans.[11]

Subchronic Toxicity

Subchronic toxicity refers to toxic effects found after exposures of several weeks or months. Subchronic effects of picloram have been found in the liver, kidney, spleen, and skin.

In a 90-day feeding study of rats, picloram acid caused liver weight changes at three of the five doses tested.[1] In a six month feeding study of dogs, picloram acid caused decreased liver weights and decreased body weight gain at the highest dose tested.[1] In a 13-week rat feeding study of the triisopropanolamine salt, abnormal growth of liver cells was found at the two highest doses tested, and increased liver and kidney weights were found in females at the highest dose.[1] A 21-day mouse study found that picloram increased the weight of the spleen.[14] A 90-day study of rats who drank water contaminated with the potassium salt found dose-dependent mortality, and an exacerbation of kidney and liver lesions.[13]

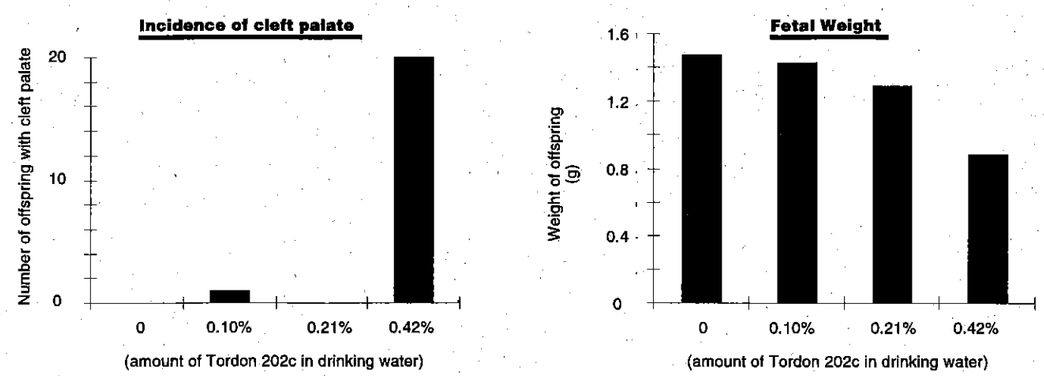
In tests of subchronic (21-day) dermal (skin) exposure in rabbits, picloram caused swelling and redness at every dose level tested. The tests were done using both the potassium and the triisopropanolamine salt.[1]

Effects on Reproduction

Tests of the triisopropanolamine salt of picloram that were submitted by Dow in support of its registration found no effects on reproduction in rats and an increased rate of miscarriages at the highest dose tested in rabbits.[1] Tests of the potassium salt found increases in the frequency of embryo loss. Also, the frequency of umbilical hernias increased at all doses tested and multiple skeletal effects were increased at both the low and high dose tested.[15] Also, in male rats, feeding of picloram resulted in an increased frequency of atrophied testicles.[16]

Serious effects of picloram occurred in the offspring of pregnant mice who drank water contaminated with Tordon 202c. Like several Tordon and Grazon products, this herbicide contains picloram and the phenoxy herbicide 2,4-D. At the middle and high doses, fetal weight was reduced. The number of dead fetuses, the size of the fetuses, and the weight of the placenta were reduced at the highest dose. In addition, the incidence of cleft palate, a birth defect, increased dramatically at the highest dose tested.[17] (See Figure 3.)

Figure 3
Reproductive Effects of Tordon 202c



Source: Blakley, P.M., J.S. Kim, and G.D. Firneisz. 1989. Effects of gestational exposure to Tordon 202c on fetal growth and development in CD-1 mice. *J. Toxicol. Environ. Health* 28:309-316.

Tordon 202c, a mixture of picloram and 2,4-D, causes significant reproductive problems, including an increase in the frequency of cleft palate and a decrease in fetal weight.

Similar decreases in fetal size and weight, along with increased incidence of cleft palate, were found in a follow-up experiment in which male mice drank Tordon-contaminated water prior to conception of their offspring. In addition, malformations of the testes were more frequent, but the frequency did not consistently increase with dose.[18] A third study in which female mice drank Tordon-contaminated water, both prior to conception and during pregnancy, found similar results. Fetal size and weight, as well as placenta weight, were reduced at all doses tested. The incidence of cleft palate also increased, similar to the results of the first experiment.[19]

The authors of these studies give two possible explanation of why their tests found more serious effects on reproduction than other picloram studies. First, the combination of the two herbicides may be more toxic than either herbicide alone. Second, the reproductive problems may be a result of the so-called "inert" ingredients or contaminants found in the herbicides. (See "Contaminants," and "Inert Ingredients, p.16.) Because the Tordon 202c studies are the only publicly available studies of reproductive effects caused by commercial picloram-containing products, there is no way to decide which explanation is correct.

Mutagenicity

Tests of picloram's mutagenicity, its ability to cause genetic damage, which were submitted by Dow AgroSciences in support of picloram's registration are negative.[1] However, a study conducted by the National Toxicology Program had different results. Chromosome aberrations increased in frequency in hamster ovary cells exposed to picloram. The frequency of sister chromatid exchanges (SCEs) also increased.[15] (SCEs are exchanges of genetic material during cell division between members of a chromosome pair. They result from point mutations.)

Carcinogenicity

Federal and international agencies that have evaluated picloram's ability to cause cancer have come to different conclusions.

EPA considers the primary cancer risk from picloram exposure to come from hexachlorobenzene (HCB; see Figure 4) Hexachlorobenzene contaminates picloram during its manufacture; as part of picloram's reregistration, concentrations of HCB were certified by its manufacturer to be no more than 100 parts per million (ppm).[1] HCB is a "probable human carcinogen"[20] and has caused liver, thyroid, and kidney tumors in laboratory tests.[20] It is also a contaminant in the commonly used fungicide chlorothalonil and the herbicide DCPA (Dacthal).[21]

According to EPA's assessment, most dietary exposure to HCB-contaminated picloram comes from eating beef or drinking milk from cattle which grazed on picloram-treated pasture and range. EPA estimates that the cancer risk from HCB-contaminated picloram totals about 70 percent of the level EPA considers acceptable. They also note that HCB "occurs as an impurity in several other pesticide technical products, so overall dietary exposure to HCB is likely to be appreciably higher than HCB considered simply as a picloram impurity as considered in this analysis."[1] The risk estimate also does not include exposure through contamination of water, air, or through contact with contaminated surfaces. In other words, it would not be difficult for the

total pesticide-related cancer risk from HCB to exceed EPA's standard.

The National Toxicology Program (NTP) has also evaluated the carcinogenicity of picloram. Unlike EPA, this agency conducts its own laboratory tests. NTP found that feeding of picloram increased the frequency of liver tumors in female mice.[22]

According to the International Agency for Research on Cancer, there is "limited evidence" for the carcinogenicity of picloram in laboratory tests. They report that picloram increased the frequency of liver tumors in rats and increased the frequency of thyroid tumors in female rats.[23]

Contaminants

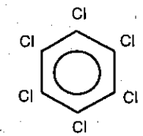
Hexachlorobenzene (see Figure 4) contaminates picloram, as well as other pesticides. Breathing hexachlorobenzene-contaminated air can harm the immune system, while ingesting hexachlorobenzene causes the liver disease porphyria cutanea tarda. Long-term feeding studies show that hexachlorobenzene harms the liver, thyroid, and nervous system, with additional damage to bones, kidneys, blood, the immune system, and the endocrine system. Hexachlorobenzene causes cancer of the liver, thyroid, and kidney in laboratory tests. Nursing infants and unborn children are particularly at risk from hexachlorobenzene because it is transferred from their mothers during pregnancy and nursing. Hexachlorobenzene is persistent, with half-lives (the amount of time required for half of the initial amount of a chemical to break down or dissipate) up to 6 years in soil and surface water, and up to 11 years in groundwater.[21]

"Inert" Ingredients

All picloram-containing herbicide products contain so-called "inert" ingredients, ingredients added to the herbicide product to make it more potent and easier to use. The identity of some of these ingredients is publicly available. According to material safety data sheets produced by Dow AgroSciences, "inert" ingredients in Tordon and Grazon products include the following:

- **Ethylene glycol** (found in Tordon RTU[5]) can irritate the eyes, nose, and throat, and cause nausea, vomiting, and headache. Repeated or high exposure can damage the kidney and the brain. It can damage a developing fetus, and has been shown to cause birth defects in laboratory animals.[24]

Figure 4
Hexachlorobenzene



- **Triisopropanolamine** (found in Tordon RTU,[5] Tordon 101,[4] and Grazon P+D[6]) is a severe eye irritant. It also can cause skin irritation, nausea, vomiting, and respiratory tract irritation. Inhalation can be fatal because of spasms, inflammation, and fluid accumulation in the lungs.[25]
- **Isopropanol** (found in Tordon 101[4] and Grazon P+D[6]) is also known as isopropyl alcohol. Commonly used as a household disinfectant, it can irritate and burn the skin and eyes and irritate the nose and throat if inhaled. Overexposure can cause headache, drowsiness, unconsciousness, and death.[26]
- **Polyglycol 26-2** (found in Tordon K[3] and Tordon 22K[2]) is a proprietary surfactant and a complex polymer. Little toxicological information is publicly available about this chemical.

Synergistic Effects

Two chemicals are said to be synergistic if the effect of a combination of the two chemicals is greater than the sum of the effects of the individual chemicals. Picloram is synergistic with several common herbicides with respect to its toxicity to mammals and fish. Picloram in combination with atrazine and alachlor causes liver toxicity and stimulates enzymes in the liver that are responsible for breaking down toxins.[14] As mentioned above, picloram and 2,4-D are synergistic in their negative reproductive impacts.[17-19] In livestock, the combination of 2,4-D and picloram has acted synergistically in causing mortality,[27] as well as in causing cancer of the small intestine.[28] Picloram and 2,4-D are also synergistic in their acute toxicity to trout.[29]

Occupational Hazards

EPA has estimated exposure to hexachlorobenzene for workers who mix and apply picloram-containing herbicides. The HCB exposure of workers who apply picloram via backpack sprayers or low pressure handwands[1] exceeds the minimal risk level set by the U.S. Public Health Service for intermediate-term exposures to HCB.[21] The minimal risk level is "an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of noncancer health effects."[21] The exposure estimates also exceed EPA's acceptable risk level for cancer over 10-fold.[1]

Hazards to Fish

According to EPA, the picloram salts are slightly to moderately toxic to freshwater fish. Concentrations of 25 ppm of the triisopropanolamine salt kill rainbow trout, 20 ppm kill coho salmon, 24 ppm of the potassium salt kill bluegill, and 13 ppm kill rainbow trout.[1]

However, picloram is toxic to juvenile fish at much lower concentrations. Tests with the early life-stages of rainbow trout showed that concentrations of 0.9 ppm reduced the length and weight of rainbow trout larvae, and concentrations of 2 ppm reduced survival of the larvae.[30] A study of lake trout found that picloram reduced fry survival, weight, and length at the lowest concentration tested, 0.04 ppm.[31] A study of cutthroat trout used fluctuating concentrations designed to simulate field concentrations found in streams following picloram treatment of surrounding areas. Picloram concentrations are highest immediately after rain, then decrease until the next rain when they increase again. Fluctuating concentrations with a maximum of 0.8 ppm reduced weight and length of trout fry. Unexposed fry had survival rates three times those of fry exposed to concentrations of picloram with a maximum of 1.6 ppm.[32]

Picloram-containing herbicides also cause serious sublethal effects in older fish. Yearling coho salmon exposed to 5 ppm of Tordon 22K for 6 days suffered "extensive degenerative changes" in the liver and wrinkling of cells in the gills.[33]

An incident near Sheridan, Montana, highlights the hazards of Tordon to fish.[34,35] In 1986,[36] and again twice in July, 1989,[35] a county roadside crew[35] sprayed about 1/4 mile upstream from a fish hatchery.[34] In both years,[36] rain fell within a few days of the spraying, washing Tordon 22K downstream and killing trout.[34,35] In the 1989 incident, fish turned black, became blind, and then died.[35] Eventually, 15,000 pounds of fish, all of the fish in the hatchery, were killed or left commercially unusable.[35]

Hazards to other Aquatic Animals

The triisopropanolamine salt of picloram interferes with oyster shell formation at concentrations between 10 and 18 ppm. The potassium salt is toxic to oyster larvae at concentrations between 18 and 32 ppm.[1]

Epizootics (unusually high frequencies) of gonad tumors have been recorded in Maine softshell clams exposed to runoff from forestry and agricultural herbicides containing picloram.[37,38]

Hazards to Nontarget Plants

Picloram, according to EPA is characterized by "extreme phytotoxicity." This of course is part of the reason for its commercial success. It also means that drift or runoff present serious hazards to nontarget plants. EPA evaluated the hazards to nontarget plants by calculating a "risk quotient" (RQ). RQs greater than 1 indicate what EPA calls "substantial risk." The RQ is calculated by dividing an estimate of exposure by an estimate of toxicity. The exposure values are based on estimates of drift and/or runoff, depending on the type of application. The RQs for picloram are extraordinary: for the potassium salt they range from 280 to 13,000 depending on the type of application.[1] (See Figure 5.)

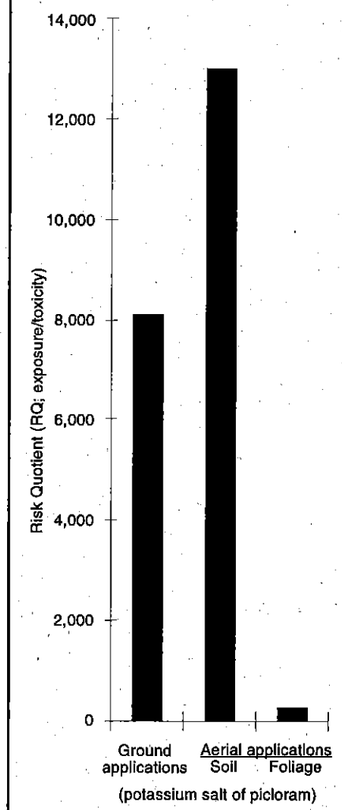
However, EPA believes these RQs *underestimate* actual risks because no assessment was done of risks at sites distant from the picloram application site. Plants at these sites could be exposed via irrigation with contaminated ground or surface water. "Effects at distant locations are plausible in view of the high persistence, mobility, and phytotoxicity of these chemicals," concluded EPA.[1]

EPA's Ecological Effects Branch (EEB) calculated that in order to reduce these risks below the "substantial" level, maximum use rates would have to be reduced to 0.0003 pounds per acre for the triisopropanolamine salt, and 0.0000473 pounds per acre for the potassium salt.[34] Since current use rates are typically 0.5 - 1 pounds per acre,[1] EEB felt that "practical mitigative measures cannot be identified"[34] for picloram. EEB "strongly"[34] recommended against the reregistration of all picloram products,[34] but its recommendation was not accepted by EPA's Reregistration Branch.[1]

Experimental support for EPA's calculations of the hazards of picloram drift or runoff comes from two studies. The first, looking at damage to tobacco caused by simulated runoff of picloram-contaminated water, found that the equivalent of 0.0002 pounds per acre of picloram reduced yields of tobacco.[39] In the second experiment, simulated drift of .05 pounds per acre reduced yields of cotton.[40]

Picloram's extreme phytotoxicity is also well illustrated by alarming incidents that have occurred in the 35 years since it was first commercially marketed. For example, mules were used to cultivate a tobacco field after they had grazed on a picloram-treated pasture. Picloram leached from their feces while they were working in the tobacco field, resulting in an "unusual spotty distribution" of stunted tobacco plants in the field.[41]

Figure 5
Picloram's Hazards to Nontarget Plants



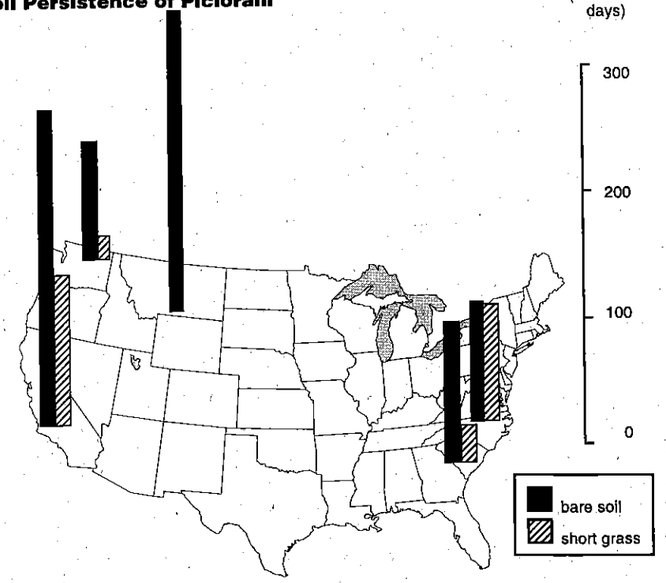
U.S. EPA. Prevention, Pesticides, and Toxic Substances. 1995. Reregistration eligibility decision (RED): Picloram. Washington, D.C., Aug.

EPA's estimates of picloram's hazards to nontarget plants are high, up to 13,000 times EPA's substantial risk level (RQ=1).

Another tobacco field was damaged by picloram following treatment of a utility right-of-way. Runoff from the right-of-way contaminated ponds that served as a irrigation water source for the tobacco fields. About 20 hectares (50 acres) of tobacco were injured, and an irrigation intake 4 kilometers (2.4 miles) from the treatment was contaminated.[39]

JOURNAL OF PESTICIDE REFORM/ SPRING 1998 • VOL.18, NO. 1

Figure 6
Soil Persistence of Picloram



Sources:
U.S. EPA. Office of Pesticide Programs. Environmental Fate and Ground Water Branch. Undated. Environmental Fate and Ground Water Branch review of picloram. Washington, D.C.
Cryer, S.A. et al. 1992. Picloram movement and dissipation in a northern rangeland environment. *Western Soc. Weed Sci.* 45:120-121.

Picloram's half-life in soil is typically over 100 days.

In Oregon, a roadside application of picloram contaminated a pond used to irrigate seed potatoes. The result was damage to 84 acres of potatoes, and a complete financial loss because the potatoes were unsalable as either seed or processing potatoes.[42]

Picloram also has other kinds of effects on plants. It can induce an increase in the frequency of chromosome aberrations in plant cells.[43] It also has inhibited nitrification in soil samples. Nitrification is the process by which ammonia is converted into nitrite and nitrate, and is the second stage of the nitrogen cycle in soil.[44] Plants depend on this cycle for usable forms of this essential nutrient.

Aquatic plants: EPA has been unable to assess picloram's hazards to aquatic plants because data for only one species were submitted as part of the registration process. Other data, however, indicates that hazards to aquatic plants are of concern. The aquatic plant *Myriophyllum sibiricum*, an important component of prairie wetlands whose fruits are eaten by waterfowl, was injured at a concentration of 0.01 ppm. A concentration of 0.1 ppm inhibited flowering. The researchers stated that because of the severity of injuries (at 0.1 ppm) "at least half, and perhaps all, of each population might have been incapable of producing viable propagules."[45] In addition, two species of algae in the genus *Hormidium* are killed by concentrations of picloram between 1 and 2 ppm.[46]

Resistance of Weeds to Picloram

Yellow starthistle (*Centaurea solstitialis*) developed resistance to picloram in a Dayton, Washington, pasture that had been treated with the herbicide over a ten-year period.[47] Wild mustard (*Sinapis arvensis*) resistant to picloram was found in a field in Manitoba, Canada, that had been treated with herbicides that have a mode of action similar to picloram (dicamba, MCPA, and mecoprop) over a ten year period.[48] This cross-resistance, resistance to one herbicide conferring resistance to another herbicide, means that picloram-resistant weeds could be found in areas where picloram has never been used.

Persistence in Soil

According to EPA, picloram is "resistant to biotic and abiotic degradation processes."[49] In other words, it is persistent in the environment because it is not easily broken down. "In some soils," continues EPA, "it is nearly recalcitrant to all degradation processes."[49] This recalcitrance is demonstrated by experimental calculations of its half-life, the length of time required for half of an applied amount of picloram to break down or move away from the application site. While the half-live under certain conditions can be as short as 21 days, in most cases the estimated half-life is over 100 days, and can be as long as 278 days.[49-50] (See Figure 6.)

Picloram's recalcitrance to degradation is also demonstrated by measurements that have been made of the time required for picloram to be completely gone from soil. In seven different studies located throughout the United States, picloram was still present between 1 and 3 years after treatment. In almost all of these studies, picloram was detected until the last sampling date, so that these are minimum estimates of persistence.[49-52]

Because of picloram's persistence, and its mobility in soil (see "Mobility in Soil," below), EPA's Environmental Fate and Ground Water Branch recommended that "picloram should not be reregistered because its use would pose unreasonable adverse effects to the environment."[49] However, this recommendation was not accepted by the Reregistration Branch.[1]

Application Methods Causing Soil Contamination

Broadcast applications are probably the most common routes for picloram to contaminate soil. However, other more targeted application methods do have the potential to cause soil contamination. A study of leafy spurge found soil contamination after use of a "pipe-wick" applicator, a wiper-type applicator used to minimize contact of herbicides with the soil. The leaves took up the picloram, it was translocated to the roots and then released to the soil. Soil contamination was measured a week after treatment.[53] Similar root release has been measured in sweetgum and silver maple.[54]

Mobility in Soil

EPA characterized picloram's ability to move through soil profiles in strong language. Picloram acid and its salts are "highly soluble"[1] in water, with the potassium salt having the highest solubility (740,000 ppm).[1] This means that picloram is "extremely mobile under field conditions"[1]; in fact, it is "among the most mobile of currently registered pesticides."[1] In field studies, it often leaches to the deepest part of the soil profile sampled.[1]

A good example of picloram's soil mobility comes from a study conducted in Arkansas. In one soil (a loamy fine sand)[55] virtually none of the picloram in experimental soil samples degraded, but nearly 100 percent of it leached.[1]

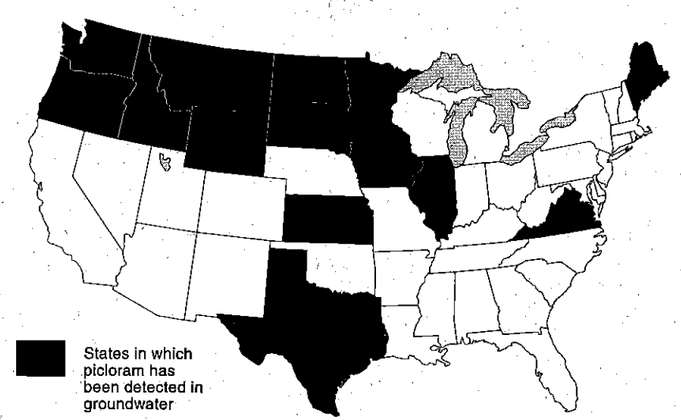
EPA's Environmental Fate and Ground Water Branch summarized their concerns about picloram's mobility in soil this way: "No practical use restriction can prevent it from contaminating the environment surrounding the target site."[49]

Contamination of Groundwater

Because picloram is highly mobile in soil, it is likely to contaminate groundwater. EPA's evaluation states, "eventual contamination of groundwater is virtually certain in areas where residues persist in the overlying soil. Once in groundwater, the chemical is unlikely to degrade even over a period of several years."[1] Their evaluation is supported by groundwater monitoring studies. Picloram has been found in the groundwater of 14 states,[56-61] (see Figure 6) and also in Ontario and Saskatchewan, Canada.[62-63]

Groundwater aquifers are particularly susceptible to picloram contamination from roadside spray programs.[64] Most roadsides have ditches that parallel the road, and these ditches typically have had about a foot of soil removed, leaving very shallow soil profiles over aquifers. In addition, the extra runoff from the road surface increases leaching of picloram. Experimental herbicide treatments showed that "large amounts of the picloram ... were found to leach through shallow road ditch soils and into the underlying aquifer material."[64]

Figure 7
Picloram Contamination of Groundwater



Source:
U.S. EPA. Office of Pesticide Programs. Environmental Fate and Ground Water Branch. Undated. Environmental Fate and Ground Water Branch review of picloram. Washington, D.C.
Cryer, S.A. et al. 1992. Picloram movement and dissipation in a northern rangeland environment. *Western Soc. Weed Sci.* 45:120-121.
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Picloram has contaminated groundwater in 14 states.

Contamination of Surface Water

Picloram also easily contaminates surface water. For example, picloram was found for up to 275 days in West Virginia streams following hand application of Tordon pellets around the base of multiflora rose growing in pastures.[65] In Saskatchewan, picloram was found in a creek up to 35 months after a helicopter application of picloram granules. Following this same application, picloram was also found in a lake 1 kilometer from the treatment site.[63] Picloram was found in the Souris River, North Dakota, 1.5 kilometers from a wildlife refuge that had been treated with picloram for several years.[66] Picloram has also been found in streams or lakes in Alabama, Montana, North Carolina, Oregon, Texas, and Wyoming.[67]

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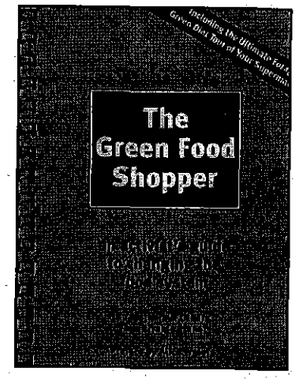
● BOOK REVIEW

THE GREEN FOOD SHOPPER: AN ACTIVIST'S GUIDE TO CHANGING THE FOOD SYSTEM

MOTHERS AND OTHERS FOR A LIVABLE PLANET. 40 WEST 20TH STREET, 9TH FLOOR. NEW YORK, NY 10011-4211. (212)242-0010. 1997. 175 PAGES. $18.00.



The Green Food Shopper is an excellent guide for anyone interested in making smart food choices for themselves, their families, and the earth. It is also an excellent guide for changing the food system, one consumer dollar at a time.

Mothers and Others chronicles their experiences with four pilot-city projects, and the experiences of mothers and activists who have worked for effective change. The results are straightforward and energizing. *The Green Food Shopper* explores options for finding or starting farmers markets, food co-ops, bulk buyers clubs, and Community Supported Agriculture (CSA) groups. In a practical way, it outlines strategies for meeting with local supermarket managers and produce buyers, as well as organizing a town meeting or giving an organic farm tour for children. The book asks and answers the question, "Where does the produce come from?", thereby establishing the links to locally grown, small-scale food production and biodiversity.

" More than a line of safer food products, organic must be a part of something bigger than itself."

A forager's tour takes the reader "on a green diet tour of your supermarket." Food contamination and resource-exhaustive production are only a few of the issues which are brought to light, and the reader is compelled to take an active part in making food choices. Generating strength and support for locally, sustainably produced goods is a step well worth taking.

Mothers and Others has a strong history of providing resources for consumers interested in creating a sustainable lifestyle. With *The Green Food Shopper*, this excellent group in a compelling and readable way offers the information and resources to begin doing just that.

— *Mariah Malcolm*

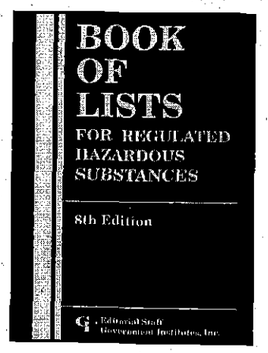
■

Mariah Malcolm is an information services assistant at NCAP and a University of Oregon student .

● BOOK/CD REVIEW

BOOK OF LISTS FOR HAZARDOUS REGULATED SUBSTANCES

GOVERNMENT INSTITUTES, INC. ROCKVILLE MD. 1997. 604 PAGES + CD. $79 (BOOK) + $110 (CD). WWW.GOVINST.COM.



The Book of Lists is a compilation of all the chemicals that are regulated by major health and environmental laws, including the Clean Air Act, the Clean Water Act, and various hazardous waste statutes. With this book, you can take the name or the Chemical Abstract Services number of a unknown chemical and figure out what public agencies have regulated the chemical. In turn, this lets you know where to go for information about the toxicology or ecological effects of the chemical.

The companion compact disc (*CFR Chemical Lists on CD ROM*) makes most of the information in the book available in electronic format, allowing easy searches for a particular name or number. The CD is Windows and Macintosh compatible.

NCAP's new report, *Worst Kept Secrets* (see p. 7), is an example of how useful this information can be. As this book and CD become more widely available, expect to see others.

— *Caroline Cox*

■

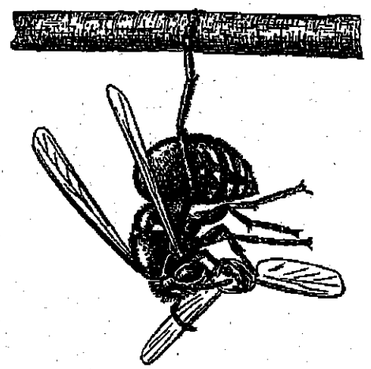
Caroline Cox is JPR's editor.

● ALTERNATIVES

SOLVING YELLOWJACKET PROBLEMS

BY POLLYANNA LIND

Yellowjackets are social wasps which are known, of course, for their painful sting. North America has nineteen species of yellowjackets, more than any other continent.[1] The most common in the Northwest are the western yellowjacket *(Paravespula pensylvanica)*, the common yellowjacket *(Paravespula vulgaris)*, the aerial yellowjacket *(Dolichovespula arenaria.)*, and the bald-faced hornet *(Dolichovespula maculata)*.[2]



Biology

Yellowjackets make two types of nests: nests below the soil in mouse burrows or similar sites (western and common yellowjackets), including inside walls of houses; and aerial nests in trees, in sheds, or under the eaves of buildings (aerial yellowjackets and bald-faced hornets).[3] The nest is started by a single inseminated queen that emerges during the spring after overwintering in a protected location.[3] Nests are generally built no more than 400 meters from a protein source or one kilometer from a honey source.[4] After selecting a site, she begins building a small nest and lays eggs.[5] Once these eggs hatch, the queen will tend the egg larvae until the first seven to ten workers emerge. Then the workers gradually take over most of the colony duties, including foraging for food and fiber, constructing more brood comb, feeding the larvae and queen, and keeping the nest clean. The queen rarely leaves the nest once the workers take over; her time is spent laying more eggs.[1,6]

Near the end of summer colonies start to decline and yellowjackets are more likely to sting. The yellowjackets that remain switch their diet from protein to sweets.[7] Also, new males and queens are produced in larger reproductive cells.[8] After the new queens and males emerge and mate, the males die and the inseminated queen seeks shelter for the winter.[3]

Usually the nest and colony are destroyed during the winter. In warmer climates, where prey populations can sustain a colony year round, a nest will survive the winter. These perennial colonies can become unusually large.[9]

Benefits

When most people think of yellow jackets, they think only of their ability to annoy and sting. While this is definitely part of their interactions with humans, yellowjackets are also important beneficial insects. They pollinate flowers, eat harmful insects and their larvae (i.e: coddling moths, flies, aphids, caterpillars), help keep leaves free of honeydew which can encourage fungi and ants, keep rotting corpses cleaned up, and possibly discourage field mice from living nearby.[4,6]

Identification

It is important to correctly identify yellowjackets because they look similar to some beneficial wasps.[3] If possible, take specimens to your county extension office or an entomologist for identification.

Preventing Stings

In the United States, approximately 40 deaths occur every year due to allergic reactions to yellowjacket stings.[10] Symptoms of an allergic reaction can vary, some examples are; hives, swelling, shock, respiratory distress, nausea, and in severe cases, loss of consciousness.[10] There is no way to know who will have an allergic reaction so it is always best to be cautious when in yellowjacket territory. People who are highly sensitive should considered a desensitizing procedures (immunotherapy) and consult their physician about emergency kits.[10]

To minimize the chances of being stung, always wear shoes, long sleeve shirts, and pants of a dull light color.[10] Avoid wearing perfumes, colognes, hairsprays, scented suntan lotion or deodorant, some bug repellents, or sweet-smelling cosmetics.[3,6,10-12] Be careful when drinking out of open drink containers.[13] If you are being bothered by yellowjackets, stay calm and move slowly away.

Extra precautions should be taken when disturbing a yellowjacket nest. Cover your hands with thick gloves and tape the shirt cuff over the top of the glove. Tuck your pant legs into a pair of thick socks and cover your head and neck with a bee keepers helmet and net.[10] If you are sensitive, consider having someone else disturb the nest. When disturbing a nest or a colony, it is always best to do at night when it is cool and dark outside and the yellowjackets are more docile. Placing a red piece of acetate film over your flashlight lens allows you to see the yellowjacket nests at night without disturbing them with direct light.[12]

■

Pollyanna Lind is NCAP's information services coordinator.

The Louisiana State Experiment Station found that Avon Skin So Soft Bath Oil is an effective repellent for some species of yellowjackets. Two ingredients in Skin-so-Soft, mineral oil and isopropyl palmitate, are similar to natural repellents produced by paper wasps.[14]

Physical Controls

Reducing a yellowjacket problem may be as easy as restricting the food supply.[1,6] Pay particular attention to garbage cans and dumpsters. A garbage can with a domed top fitted with vertical swinging doors keeps yellowjackets away from garbage. Always keep garbage cans clean.[6]

Ground nests have been eliminated by placing a clear bowl over the nest entrance. The edges were secured by pushing the bowl into the dirt and filling any gaps with cloth. Thie yellowjackets are unable to leave the nest, but because they could still see sky, they did not dig a new way out. After a few weeks the colony starved and died.[15]

Two pharmaceutical companies in the Unites States use yellowjacket venom serum for immunotherapy. These yellowjackets are collected by professionals using modified vacuum cleaners. If there is a venom collector in your area, they often are willing to remove nests inexpensively. Vacuuming can be used for underground nests, nests located in structures, and some aerial nests. Empty nests can then be destroyed. This procedure should only be done by a professional.[16]

Aerial nests, which can be more difficult to control than underground nests, can be destroyed if they are accessible. Place a large plastic bag over the entire nest, knock the nest down into the bag, and seal the bag well. Put the bag and nest in direct sun on a hot day or in a freezer. The extreme temperatures will kill the yellowjackets.[6]

Yellowjacket traps which contain food baits or pheromones as attractants are widely available.[8] It is important to use noninsecticidal baits for traps to avoid harming birds or other animals which may feed on poisoned yellowjackets or baits.[17] Traps should be placed near the nest and away from people.

The "Oak Stump Farm Yellow Jacket Wasp Trap" has been recommended by a Rhode Island entomologist who conducted tests of five commercially available traps. It captures large numbers of yellowjackets, is easy to clean without being stung, and has a competitive price.[18] (Call Oak Stump Farm, Inc. for information about where this trap can be purchased. Their phone number is (973) 812-7070.)

Yellowjacket traps should be baited with proteins in early summer, and sweets in late summer. Protein baits need to be moistened or renewed more often than sweet baits.[18] Some protein baits include catfood, spam, beef, ham, fish or liver.[3,7] Apple juice and grenadine/cherry drink baits are effective sweet attractants, better than commercial baits.[18]

Biological controls

Nematodes (*Steinernema feltiae* and *Sphecophaga vesparum)* are successful biological controls for yellowjackets.[17,19] The nematodes can be mixed with water and poured into the hole of ground nesting yellowjackets.[12] These nematodes serve as vectors for an insect disease-causing bacteria that kills the yellowjackets.[17,19]

Other natural predators of the yelllowjacket are vertebrates such as bears, raccoons, and skunks. Some pest control specialists believe that pouring honey into the entrance of a ground nest to attract a predatory vertebrate can be effective control measures.[6]

Summary

Yellowjackets can be annoying and dangerous. However, it is important to remember that they are beneficial insects, predators of other insects that we often consider pests. Yellowjacket problems can be minimized by dressing appropriately and restricting yellowjacket food sources. This usually involves keeping garbage in containers they aren't able to enter. Traps can be used when yellowjackets are a problem in a particular area. These techniques will eliminate or reduce yellowjacket problems without the need for chemical poisons. ✦

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● LETTERS TO THE EDITOR

More on Social Security

I am writing in response to the letter to the editor by John Shapiro in the last issue of the Journal of Pesticide Reform (17(4), Winter 1997) entitled "Real Cause of Social Security Bankruptcy."

Mr. Shapiro thoughtfully listed many harmful environmental factors that are responsible for injuring people who must then resort to Supplemental Social Security to survive. But the notion that Social Security is going bankrupt is a myth.

Social Security is in fine shape. It took in a surplus of $66 billion in 1996 and will be totally viable for 32 more years. Adjustments will have to be made down the line when the present baby boomers begin retiring. Adjustments have been made in the past. Usually no big deal. Why the present hype and hysteria?

The present so-called crisis has been created by special interest groups that want to get their hands on the billions of dollars in the Social Security Trust Fund. If Social Security is privatized, Wall Street firms stand to gain from $840 million to $2 billion in retirement dollars each year for commissions and fees. (Social Security spends less than 1 percent a year on administrative costs.)

To push for privatizing, Wall Street firms are spending millions of dollars on lobbying, media hype, and support of right wing "think tanks" like the Heritage Foundation and the Cato Institute. This is done to promote the myth of impending bankruptcy and the purported benefits of private savings plans.

The media have joined in the attack on Social Security. They have not printed the positive evaluations of the long range economic health of Social Security issued by senior organizations, trade unions, and independent economic institutes.

There are many ways that Social Security could be adjusted down the line. Social Security's long term health could be helped by making high wage earners, who are now assessed on only the first $68,400 of wages, pay Social Security taxes on their entire incomes. And the trust fund would be viable for 75 years if employers paid taxes on total payroll instead of on the same basis as workers.

For more information, contact: Joe Ervin, Dept. of Public Affairs and Legislation, National Council of Senior Citizens, 131 F St., NW, Washington, D.C. 20004, (202) 347-8800.

Vivian Schatz
Philadelphia, Pennsylvania

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JPR welcomes letters to the editor. We publish as many as space allows. Letters may be shortened or edited for clarity before publication. We are especially interested in hearing about alternative pest management techniques you have tried. Please write us and let us know what works and what doesn't.

NCAP; P.O. Box 1393; Eugene OR 97440. (541) 344-5044. E-mail: jpr@pesticide.org.

Pesticides, Dioxin, Cotton, and Tobacco: NCAP Should Act

NCAP is an extraordinary resource for information about pesticide problems, but for as yet unexplained reasons, one of the biggest, most controversial, perhaps most deadly pesticide crimes is routinely ignored. To my knowledge, the two most pesticide-saturated crops are cotton and tobacco. Both of these crops are used to make products that deliver dioxin to uninformed, unprotected, and uncompensated victims.

Most cotton products are chlorine-bleached. The dioxin from this ends up somewhere eventually, but the worst situation involves cotton products, like tissues, tampons, diapers, and so forth that come in intimate contact with the users. As serious and urgent as this problem is, it pales with comparison to the delivery of dioxin to tobacco users.

The dioxin in typical industrial cigarettes (it is not in tobacco itself of course) comes from the chlorine bleached paper, the dozen or so chlorinated pesticide residues and, as pointed out by Lois Gibbs in *Dying from Dioxin*, from a number of additives as well. One study reported that cigarettes delivered such a high level of dioxin (directly to the lungs!) that it was comparable to emissions from an industrial flue. It is truly a mystery that NCAP and other committed pesticide activists can ignore this most vile of all pesticide exposure routes.

Unadulterated tobacco has not yet been studied for negative health effects. Why not? Well, most studies are done by labs funded by industries closely linked to the chlorine industries.

Why don't independent scientists jump on this major indictment of the chemicals and the corrupted regulatory system? NCAP will have to answer for itself, but others have said that they fear maybe seeming to suggest that there is a "safer" way to smoke.

NCAP does not need to comment one way or the other. It might simply publicize the study on dioxin in cigarettes, or the mention in Rachel Carson's *Silent Spring* of the effect on tobacco of years of arsenic pesticide use. To attack pesticides one minor issue at a time is to attack a glacier with ice-picks while millions of people are being crushed below. The glacier barely notices. The cigarette/dioxin issue, on the other hand, can cast the broadest possible light on the subject to turn the glacier into a puddle.

Prohibiting smoking will do nothing to stop the chemical industries from poisoning all other products and the entire planet. Is any other area more of an Achilles' Heel for them? Is there a better time to act?

John Jonik
Philadelphia, Pennsylvania

● NCAP'S MEMBERSHIP SURVEY

NCAP MEMBERS CONTRIBUTE TO BUILDING A MORE EFFECTIVE ORGANIZATION

In order to learn more about who our members are and how they view NCAP's work, we recently mailed a questionnaire to both current and past members. To date almost 400 people (21% of those surveyed) have generously taken the time to answer our questions. The results from this survey are being used for several different purposes: (a) to help prioritize the issues we work on; (b) to identify the most effective approaches to use in our work; (c) to design useful publications and written material; (d) to inform people who have interests similar to those of our members about NCAP's existence and the opportunity for membership.

We want to thank those of you who helped us with this effort by filling out your survey and sending it back. Due to a remarkable number of thoughtful and detailed suggestions (sometimes several paragraphs long), it has taken considerable time and effort to compile all of the responses.

One of the survey questions asked which of NCAP's current projects you found most important. You selected the following projects: advocating for policies that inform the public about where pesticides are used, and in what amounts; providing information about the health and environmental effects of pesticides; providing information about least-toxic pest management strategies; and getting all ingredients, including the so-called "inerts," listed on pesticide labels.

Another question in the survey asked you to list issues to which you'd like to see NCAP dedicate more resources. Your answers included providing information about what pesticides are used on particular foods, more work with farmers, more NCAP information in public libraries, a more extensive web page, and more effective media coverage.

Some of the most frequently mentioned responses to other questions of general interest are listed in the box above.

In addition, almost all of the survey respondents expressed respect and appreciation for the NCAP staff. By far the most common word members used to describe NCAP was "dedicated"! Of course, there was considerable variation in the responses we received, and both the NCAP Board of Directors and the entire staff are reviewing the results in detail.

We are well aware that the 400 completed surveys we received do not perfectly represent the ideas and attitudes of all of our members. So if you have not filled out a survey but do have feedback and suggestions for us, please communicate your thoughts, even if not in survey form! — *Lita Furby*

■

Lita Furby is an NCAP member who volunteered her professional expertise to analyze the results of NCAP's membership survey. Thank you, Lita! Your help is invaluable.

SURVEY RESPONSES

What values should NCAP bring to its work?

- accuracy
- credibility
- scientific and technical expertise
- honesty
- advocacy
- thoroughness
- cooperation
- setting precedents

Why do you support NCAP as an organization?

- NCAP is an excellent information source for the public
- Healthy people and a healthy environment are important
- Reduced pesticide use is desirable
- No one else is doing NCAP's work

What makes NCAP stand out from other environmental organizations?

- A focus on pesticides
- Research-based, scientific information and advocacy
- A regional, grassroots emphasis

LITERATURE AVAILABLE FROM NCAP

INFORMATION RESOURCES

Altering Oregon's Destiny: Hormone Disrupting Pesticides inthe Willamette River. Neva Hassanein, Katie Jo Keppinger, and Caroline Cox, 1997. 9 pages, $3.00.
Children and Pesticides. Four articles from the *Journal of Pesticide Reform*, 1990. 17 pages, $4.50.
Guide to the Freedom of Information Act: Federal, California, Oregon, Washington, Montana, and Idaho. Updated by Arah Mohler. 1997. 30 pages, $5.00.
Getting Pesticides Out of Our Schools. Becky Riley, 1994. 30 pages, $5.00.
Learning About Pesticides at School: Project Ideas. Becky Riley, 1995. 30 pages. $5.50.
Toxic Water: A Report on the Adverse Effects of Pesticides on Pacific Coho Salmon and the Prevalence of Pesticides in Coho Habitat. Norma Grier, Erik Clough, and Anna Clewell, 1994. 14 pages, $3.00.
What You Don't Know Can Hurt You: Secret Ingredients in Pesticide Products. Colehour Arden. Updated by Carrie Swadener. 1994. 43 pages, $6.50.
Worst Kept Secrets: Toxic Inert Ingredients in Pesticides. Holly Knight and Caroline Cox. 1998. $3.00.

BOOKS

Dan's Practical Guide to Least Toxic Home Pest Control. Dan Stein, 1991. 87 pages, $8.95.
Natural Insect Control: The Ecological Gardener's Guide to Foiling Pests. Edited by Warren Schultz, 1994. 112 pages, $6.95.

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Contracting for Pest Control: A Consumer's Guide.
Farmworkers and Pesticides: Working with Poison on the Farm
Glossary of Pesticide Terms.
Pesticide Registration: No Guarantee of Safety
Pesticides on Golf Courses
School Pesticide Use Reduction: Where There's a Will There's a Way
Pesticides and Male Fertility
Pesticides, Hormones, and Wildlife in the Pacific Northwest
Pesticides in Rentals and Condominiums

PESTICIDE PACKETS

Synthetic Pyrethroids. Doria Mueller-Beilschmidt, 1990. 16 pages. $3.00.
Pesticide Chemical Information Packet. Compiled by Tracey Parker, 1995. $30.00. (A complete set of NCAP's pesticide factsheets)

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Complete volumes of back issues can be ordered for $12.00 per volume.

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