POLLUTION PREVENTION FACT SHEETS:
PEST CONTROL

Description

This management measure involves limiting the impact of pesticides on water quality by educating residents and businesses on alternatives to pesticide use and proper storage and application techniques. The presence of pesticides in stormwater runoff has a direct impact on the health of aquatic organisms and can present a threat to humans through contamination of drinking water supplies. The pesticides of greatest concern are insecticides, such as diazinon and chloropyrifos, (CWP, 1999 and Schueler, 1995) that even at very low levels can be harmful to aquatic life. A recent study of urban streams by the U.S. Geological Survey found that some of the more commonly used household and garden insecticides occurred at higher frequencies and concentrations in urban streams than in agricultural streams (USGS, 1999). The study also found that these insecticide concentrations were frequently in excess of US EPA guidelines for protection of aquatic life. For more information see, *Urban Pesticides: From the Lawn to the Stream*, Article 5 in The Practice of Watershed Protection.

The major source of pesticides to urban streams are home applications of products designed to kill insects and weeds in the lawn and garden. It has been estimated that an average acre of a well maintained urban lawn receives an annual input of five to seven pounds of pesticides (Schueler, 1995). Pesticide pollution prevention programs try to limit adverse impacts of insecticides and herbicides by providing information on alternative pest control techniques other than chemicals or explaining how to determine the correct dosages needed to manage pests. Lawn care and landscaping management programs often include pesticide use management as part of their outreach message.

Applicability

The US EPA estimates that nearly 70 million pounds of active pesticide ingredients are applied to urban lawns each year. Table 1 compares surveys on residential pesticide use in eleven different areas of the country, broken down by insecticide and herbicide use. At first glance, it appears that pesticide application rates vary greatly, ranging from a low of 17% to a high of 87%.

Table 1. A Comparison of Eleven Surveys of Residential Insecticide and Weedkiller Use

Study	Number of Respondents	% Using Insecticides	% Using Herbicides

Table 1. A Comparison of Eleven Surveys of Residential Insecticide and Weedkiller Use			
Chesapeake Bay Swann, 1999	656	21%	- -
Maryland Kroll and Murphy,1994	403	42%	32%
Virginia Aveni, 1998	100	66%	- -
Maryland, Smith *et al.*, 1994	100	23%	n/a
Minnesota, Morris and Traxler, 1997	981	- -	75%
Michigan, De Young, 1997	432	40%	59%
Minnesota, Dindorf, 1992	136	- -	76%
Wisconsin, Kroupa, 1995	204	17%	24% **
Florida, Knox *et al*., 1995	659	83%	- -
Texas, NSR, 1998	350	87%	- -
California, Scanlin and Cooper, 1997	600	50%	- -
** note difference in self reported herbicide use and those that use a weed and feed product (herbicide combined with fertilizer)			

Some patterns do emerge, however. For example, insecticides tend to be applied more widely in warm weather climates where insect control is a year round problem (such as Texas, California, and Florida). Anywhere from 50 to 90% of residents reported that they had applied insecticides in the last year in warm-weather areas. This can be compared to 20 to 50% levels of insecticide use reported in colder regions where hard winters can help keep insects in check.

In contrast, herbicide application rates tend to be higher in cold weather climates to kill the weeds that arrive with the onset of spring (60 to 75% in the Michigan, Wisconsin and Minnesota surveys). For more information see *Understanding Watershed Behavior*, Article 126 in The Practice of Watershed Protection.

Design Considerations

The use of integrated pest management (IPM) is a popular way for program managers to educate residents and businesses on alternatives to chemical pesticides. IPM reflects a holistic approach to pest control that examines the interrelationship between soil, water, air, nutrients, insects, diseases, landscape design, weeds, animals, weather and cultural practices to select an appropriate pest management plan. The goal of an IPM program is not to eliminate pests but to manage them to an acceptable level while avoiding disruptions to the environment. An IPM program incorporates preventative practices in combination with nonchemical and chemical pest controls to minimize the use of pesticides and promote natural control of pest species. Three different nonchemical pest control practices - biological (good bugs that eat pests), cultural (handpicking of pests, removal of diseased plants, etc) and mechanical (zappers, paper collars, etc) - are used to limit the need for chemicals. In those instances when pesticides are required, programs seek to have users try less toxic products such as insecticidal soaps. The development of higher tolerance levels among residents for certain weed species is a central concept of IPM programs for reducing herbicide use.

Education on the proper use of pesticides can and is often included in many lawn care and landscaping management programs. Most often this is in the form of informational brochures or fact sheets on pesticide use around the home or garden. These information packets include tips on identifying pest problems and selecting treatment approaches that reduce environmental impacts, less toxic pest control products if chemical control is necessary, and the proper mixing, application rates and cleanup procedures for pesticide use. Program managers can consult cooperative extension programs and university agricultural programs for more information regarding pest control techniques that are more water quality friendly.

Limitations

The public perception that no alternative to pesticide use exists is probably the greatest limitation that program managers will face. Surveys tell us that the public has a reasonably good understanding about the potential environmental dangers of pesticides. Several surveys indicate that residents do understand environmental concerns about pesticides, and consistently rank them as the leading cause of pollution in the neighborhood (Elgin DDB, 1996). Even so, pesticide use still remains high in many urban areas (see Table 1). The time required for homeowners to learn more about alternative pest control techniques may also limit program effectiveness. Many residents prefer the ease of just spraying a chemical on their lawns to other pest control techniques they perceive as more time intensive and less reliable. Managers should recognize that IPM programs have their own limitations, including questions about the effectiveness of alternative pest control techniques.

Effectiveness

Currently, a national study of the effectiveness of alternative pest control programs at reducing pesticide use and protecting water quality has not been performed. Cooperative extension and university agriculture programs across the country have performed studies of the ability of distinct alternative pest control techniques at limiting pesticide use, but a synthesis of these individual studies into a national report has not been performed. However, the need for pesticide control programs is evident from recent studies on the presence of insecticides in stormwater. Results of recent sampling of urban streams caused the USGS to conclude that the presence of insecticides in urban streams may be a significant obstacle to restoring urban streams. (USGS, 1999). Table 2 examines eight studies on stormwater runoff and insecticide concentrations and provides an example of how insecticides persist even after their use is discontinued.

Additional research done in the San Francisco Bay Region regarding diazinon use further illustrates the need for pest control programs. Results of the study show that harmful diazinon levels can be produced in urban streams from use at only a handful of individual homes in a given watershed (CWP, 1999). Due to the solubility of diazinon, current stormwater and wastewater treatment technologies cannot significantly reduce diazinon levels. The best tool for controlling diazinon in urban watersheds is through source control by educating residents and businesses on pesticide alternatives and safe application. For more information see *Diazinon Sources in Runoff from the San Francisco Bay Region*, Article 16 in The Practice of Watershed Protection.

An example of successful use of IPM is the Grounds Maintenance Program for the City of Eugene, Oregon. This program was started in the early 1980's and includes all the city public parks and recreation areas. The city uses a variety of IPM methods, including water blasting to remove aphids, insecticidal soaps and limited use of pesticides. The city has also adopted higher tolerance levels for certain weed and pest species that reduces the need to apply pesticides and herbicides. Since the programs inception, pesticide usage by the City of Eugene has dropped by more than 75% (Lehner *et al*., 1999). No exact cost savings have been calculated from the use of the IPM program, but the city turf and grounds supervisor is convinced that it saves money and has little citizen opposition.

Table 2: Banned or Restricted Insecticides Found in Stormwater Runoff Concentrations in µg/l (ppb) (Schueler, 1995)

Study	Chlordane	Lindane	Dieldrin	Other
Baltimore Kroll and Murphy, 1994	0.52	0.18	2.44	-
Rhode Island Cohen et al., 1990	Detected	NA	NA	NA

Atlanta Hippe et al., 1994	NA	0.01 (0.048)	NA	-
Atlanta Thomas and McClelland, 1994	Detected	NX	NX	heptachlor
Milwaukee Bannerman, 1994	Detected	Detected	Detected	DDT, DDE
Washington, DC MWCOG, 1983	0.2	0.2	0.2	heptachlor
Northern VA Dewberry and Davis, 1989	ND	Trace	ND	Endrin
Toronto D'Andrea and Maunder, 1994	NA	0.5 to 2	0.1 to 2	-
ND = Not Detected, NA = Not Analyzed, NX= Detection only reported if they exceeded water quality standards				

Cost

The cost of educating residents on proper pesticide use varies greatly depending on the intensity of the effort. Like lawn care and landscaping programs, some cities have begun partnerships that include training of retail employees on IPM techniques. In addition, promotional materials and displays on safer pesticide alternatives are set up. The cost of staff time for training and production of materials must be included in any cost estimate. Since there are currently a number of good fact sheets on IPM and pesticide use available through cooperative extension programs, managers should consider using this source instead of creating a new one. Another way to save cost would be to utilize master gardener volunteers to help with training, both for residents and store employees.

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