Lawns: Pesticide use and alternatives

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In spring many folks are making plans for their lawn. You may be planning a trip to the store to get lawn supplies or calling a lawn care company that promises to transform your lawn into a lush, green carpet of grass.

Green grass is an iconic part of American home life. There is nothing like running your toes through the lush green or smelling the freshly mown grass. Some amount of lawn in the right place can be great, but our love affair with lawns can have some unexpected consequences. Before you start your annual lawn routine, consider that in the home and garden market, 163 million pounds of pesticide active ingredients were used in the United States in 2001, the most recent year for which data is publicly available. The next sections discuss the potential of these pesticides to cause cancer and suggest tips for creating a lawn that is safe for all.

Step 1: Forget the pesticides

Children and pets like to play on lawns. There are 35 active ingredients in pesticides used frequently on lawns, and over 185 other active ingredients which are used less frequently.[2] Pesticides include herbicides to control weeds, insecticides, and fungicides. Weed-and-feed products contain pesticides.

How are lawn pesticides tested for safety? According to the U.S. Environmental Protection Agency (EPA) lawn pesticides are tested to see whether they cause irritation, sensitization, or toxicity after a single exposure to various parts of the body. EPA has often required additional studies for new pesticides based on their chemical structure. However, they do not routinely require long-term toxicity testing.[3]

The EPA reviewed the top 10 lawn and garden pesticides for their potential to cause cancer. The results of their review are shown in Table 1. One of the pesticides is a probable carcinogen, three are possible carcinogens, and two have suggestive evidence of carcinogenicity.

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Table 1: Top 10 home and garden pesticides

Pesticide	Type	Pounds of active ingredient used in the U.S. in 2001[2]	Potential to cause cancer[3]
2,4-D	H	8-11 million	Not classifiable as to human carcinogenicity
Glyphosate (Roundup)	H	5-8 million	Evidence of non-carcinogenicity for humans
Diazinon	I	4-6 million	Not likely to be carcinogenic to humans. EPA eliminated all residential uses December 31, 2004[4]
MCPP	H	4-6 million	Suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential
Pendimethalin	H	3-6 million	Possible human carcinogen
Carbaryl	I	2-4 million	Probable human carcinogen
Dicamba	H	2-4 million	Not classifiable as to human carcinogenicity
Malathion	I	2-4 million	Possible human carcinogen
DCPA (Dacthal)	H	1-3 million	Possible human carcinogen
Benfluralin (Benefin)	H	1-3 million	Suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential

H=herbicide, I=insecticide

How do lawn pesticides affect wildlife? Birds are injured and killed more by insecticides than any other type of pesticides. People should be extremely cautious when using insecticides and should attempt to limit their use to emergency situations only. At least 40-50 different insecticides (organic-phosphates and carbamates, which include malathion and carbaryl from the top 10 list of lawn pesticides above) are known to kill birds even when the label instructions and rates are followed.[5]

Carcinogen: a chemical that causes cancer

Herbicides and fungicides are usually not considered acutely toxic to birds, but have been shown to cause endocrine and other internal system effects, which can impact reproduction and other normal functioning of birds.[6]

A 2004 study found that frogs exposed to Roundup, which contains glyphosate, the most common lawn pesticide, had abnormal growth and abnormal sex organs.[6]

Step 2: Consider all the options for your yard

How do you want to use your yard? Clearly there are many landscaping options and your choices will likely depend on what uses you have in mind for your yard. Do you want to use your yard as a place to play… relax…watch birds…have a picnic…plant flowers or tomatoes…or all of these?

Once you've decided how you want to use your yard, consider the following recommendations for creating and maintaining a pesticide-free lawn[7] as well as other areas in the yard to explore.

Key #1: Start with healthy turf

Maintaining a weed free lawn without pesticides can be as simple as keeping the turf canopy dense by judiciously using fertilizers, using corn gluten meal annually to prevent weeds, and pulling or spot-treating the occasional weed. Eliminating existing weeds will rely on hand pulling or renovation of weed-infested areas. If you're establishing a lawn or renovating problem areas, laying sod is a good place to start because it has no weeds and provides dense turf cover.

Key #2: Fertilize properly
Proper fertilization, along with appropriate watering and mowing practices, is one of the most critical aspects of a successful pesticide-free turf management program. If recommended by a soil test report, apply fertilizer or lime at the appropriate times of year and at the correct rate. Lawn & Garden Fertilizers is a UW-Extension publication that includes details about when and how much to fertilize.[8]

Key #3: Consider using corn gluten meal for weed control
Applying corn gluten meal to established lawns at 10 to 50 pounds per 1,000 square feet in May is a way to prevent weeds and fertilize at the same time. Applying corn gluten meal at a rate in the higher part of this range will more effectively prevent weeds, cost more and deliver more nitrogen. Ten pounds of corn gluten meal contains 1 pound of nitrogen.

Key #4: Water seldom if at all
Rainfall alone is often sufficient to sustain lawns. Watering is very rarely recommended by UW-Extension specialists for home lawns. This is due in part to the fact that ground water levels are falling in southeast Wisconsin, Dane County and central Wisconsin.[9] During extended periods of drought the grass leaves will stop growing and turn brown, but dormant plants can remain alive for 2-3 months. For pesticide-free lawns, watering may be used during droughts to keep the grass growing when plants that are more tolerant of drought (including crabgrass and many broadleaf weeds) have a competitive advantage. Consider rainbarrels to collect the runoff from rooftops to water plantings. Any watering should be done early in the morning to reduce the amount of water that is lost to evaporation.

Key #5: Optimize your mowing or plant a fine fescue mix to minimize mowing
Mow the lawn at a height of at least three inches using a sharp mower blade to maximize rooting and shade for potential weeds. Follow the “one-third rule” and never mow off more than one third of the grass tissue at a single time. Fine fescue grasses, sometimes marketed as “no mow turf,” do well in full sun and shade but are not appropriate for high traffic areas or areas with wet, compacted soils. Look for the following species in a fine fescue mix: Chewings fescue, hard fescue, and creeping red fescue. Fine fescue sod is available from many growers.

Key #6: Aerate when needed
Aeration, removing cores of soil from the ground, is recommended when soil is compacted, when the thatch layer is more than one inch thick, and before seeding into an existing lawn. Most lawns will benefit from being aerated every 1-5 years. Sandy soils generally don’t become compacted and rarely need to be aerated.[10]

In conclusion, there are many things we can do in our own yards to make them safe for kids, pets and wildlife.

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Areas to explore

People choose to have more or less lawn in their yard depending on how they use it. Some people follow the suggestion to "only mow where you go." To create areas to explore in your yard, consider:

- Trees and shrubs. Think shade, fruit, or a place to hang a swing. Native trees and shrubs can create habitat for birds – a natural source of insect control.
- Shade gardens of attractive native ferns and spring flowers that also provide homes for frogs and toads – another natural source of insect control.
- Patches of native prairie that provide long-lasting flowers – food for butterflies as well as food and nesting materials for birds.
- Trails and paths around or through natural areas.
- Gardens for flowers, herbs, strawberries or veggies.
- Boardwalks or bridges.
- Rocks and logs.

For Wisconsin-specific resources related to native plants, see:

- Wild Ones, an organization that provides information about landscaping with native plants, has 12 local chapters in Wisconsin www.for-wild.org
- Wisconsin Native Plant Sources provides a list of nurseries that sell seeds and plants for natural landscaping http://dnr.wi.gov/org/water/wm/dsfm/shore/documents/nativeplants.pdf

[1] U.S. Environmental Protection Agency, 2004. Pesticides Industry Sales and Usage: 2000 and 2001 Market Estimates. www.epa.gov/oppbead1/pestsales/01pestsales/market_estimates2001.pdf

[2] Cornell University Cooperative Extension. No date. Questions and Answers on Lawn Pesticides. http://psep.cce.cornell.edu/issues/lawnissues.aspx

[3] Information about whether lawn pesticides cause cancer comes from the following report: Chemicals Evaluated for Carcinogenic Potential. 2007. U.S. Environmental Protection Agency. Some of the data in this report is from the early 1990s (e.g. glyphosate report was published in 1991). In some cases there has been significant research published about the cancer causing potential of these chemicals since the EPA decision was made. For example the following three reports published after the EPA's glyphosate decision found exposure to glyphosate was associated with an increased incidence of non-Hodgkin's lymphoma: McDuffie, H.H. et al. 2001. Non-Hodgkin's lymphoma and specific pesticide exposures in men: Cross-Canada study of pesticides and health. Cancer Epidemiology, Biomarkers & Prevention 10:1155-1163; Hardell, L., M. Eriksson, and M. Nordström. 2002. Exposure to pesticides as risk factor for non-Hodgkin's lymphoma and hairy cell leukemia: Pooled analysis of two Swedish case-control studies. Leukemia and Lymphoma 43:1043-1049; De Roos, A.J. et al. 2003. Integrative assessment of multiple pesticides as risk factors for non-Hodgkin's lymphoma among men. Occupational and Environmental Medicine 60(9):E11.

[4] U.S. Environmental Protection Agency. Diazinon: Phase Out of all Residential Uses of the Insecticide. www.epa.gov/opp00001/factsheets/chemicals/diazinon-factsheet.htm

[5] U.S. Fish and Wildlife Service. No date. Bird Hazards: Hazards to birds that may be found in your city. www.fws.gov/birds/uctmbga/bird-hazards.html

[6] Howe, C.M. et al. 2004. Toxicity of glyphosate-based pesticides to four North American frog species. Environmental Toxicology and Chemistry 23:1928-1938.

[7] Adapted from a personal communication with Doug Soldat, Department of Soil Science, University of Wisconsin-Madison, 2/25/2010.

[8] Korb, Gary, James Hovland, and Steven Bennett. 2008. Lawn & Garden Fertilizers. UW-Extension. http://clean-water.uwex.edu/pubs/pdf/home.lgfert.pdf

[9] Wisconsin Groundwater Coordinating Council Report to the Legislature. 2009. http://dnr.wi.gov/org/water/dwg/gcc/rtl/2009fullreport.pdf; Clancy, Katherine , George J. Kraft David J. Mechenich, 2009. Knowledge Development for Groundwater Withdrawal Management around the Little Plover River, Portage County Wisconsin: A Report to the Wisconsin Department of Natural Resources in Completion of Project: NMG00000253 www.uwsp.edu/cnr/watersheds/Reports_Publications/Reports/littleplover2009.pdf

[10] Stier, John C. 2000. Lawn aeration and top dressing, University of Wisconsin-Extension. http://learningstore.uwex.edu/assets/pdfs/A3710.pdf