Lawn Care and Water Quality: Finding the Balance

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Abstract

When land is converted from natural areas to developed urban areas, pavement and rooftops replace grass and trees. Water flows over driveways, streets and parking lots taking with it particles and debris in its path and depositing them, via storm sewers, into nearby lakes, creeks and rivers. This non-point source pollution can contain sediment, debris, fertilizers, pesticides, leaves, grass clippings, motor oil, or pet wastes. Small amounts of these materials entering a lake or river are not generally considered harmful. But when small amounts are multiplied by thousands or tens of thousands they can cause serious water quality problems.

Since 1993, the Minnesota Department of Agriculture, in cooperation with several other organizations, has been gathering information on homeowner use of pesticides and fertilizers in the Twin Cities metropolitan area. This information includes the amounts of lawn care products used by homeowners, where they are purchased, how they are applied, and whether or not they have an effect on nearby lakes, creeks or rivers.

Residents living in two watersheds were selected to participate in a focused study. Lake Harriet represents urban watersheds and Lake Alimagnet represents suburban watersheds. Based on survey results and water quality monitoring, education materials were developed to promote public awareness of lawn practices and their potential to affect water quality. These educational materials incorporate the concept that "everyone lives in a watershed" and that everyone has the potential to affect water quality, whether or not they actually live on a lake shore.

What are the Lake Harriet and Lake Alimagnet Watershed Awareness Projects?

The projects have two purposes: (1) to inform urban and suburban homeowners about living in a watershed, and (2) to help them learn how their lawn care habits can affect the quality of Twin Cities water. The project's goal is to improve water quality by reducing the quantity of pesticides and nutrients through responsible use of those materials.

How has this goal been achieved?

Project members have:

- Surveyed the current lawn care habits of homeowners and measured the effects of those habits by monitoring pesticide and nutrient runoff into Lake Harriet
- Informed homeowners about how their lawn care habits affect Twin Cities waters
- Asked homeowners how the projects have affected their lawn care practices
- Monitored runoff into Lake Harriet to quantify changes brought about by homeowner actions
- Drawn on detailed Lake Harriet experience to design urban watershed education materials for use throughout Minneapolis and Minnesota--these materials were tested in the Lake Alimagnet watershed

What is a watershed?

It is an area of land over which rain and melted snow flows to lakes, rivers, and wetlands. There are 46 major watersheds and 255 sub-watersheds in the Minneapolis-St. Paul metropolitan area.

The Lake Harriet watershed is a 1,139-acre area in a well-established residential neighborhood with almost 6,000 homeowners. The Lake Harriet study area is a 148-acre portion of the watershed. About 40% of the study area is covered with hard surfaces, such as pavement and rooftops. About 700 homeowners live in the study area, most in detached, single family houses built in the early 1900s. The water quality in Lake Harriet is very good for a Twin Cities lake.

A survey of 105 Lake Harriet watershed residents most familiar with lawn care done on their own properties, showed that:

- They are highly educated (college or post-graduate degrees predominate)
- Their average age is 47
- They have middle- to upper-level incomes
- They care for their lawns by mowing regularly and using fertilizers and herbicides
- A few use professional lawn care services

The Lake Alimagnet watershed has approximately 3600 suburban households. Of this number, a large proportion is made up of townhouse residents. The Lake Alimagnet watershed was developed in the 1960s. Homeowners are well-educated and have middle- to upper-middle incomes. The water quality in Lake Alimagnet is considered poor, algae blooms are common, and the predominant fish species is bullhead.

Why are we studying the Lake Harriet and Lake Alimagnet watersheds?

Because they provide good examples (respectively) of how urban and suburban development affect our water resources and because they are sources of year-round recreation for many Twin Cities residents. These residents are vitally interested in keeping the water clean.

What are we finding out?

Though Lake Harriet had some of the highest quality water in the Twin Cities, that quality has also declined over time. Lake Harriet has poor quality water and area residents want to reverse the trends.

These projects and others have monitored storm water, rainfall, and lake water to determine the levels of non-point source pollutants in Lake Harriet. Specifically, this project monitored two types of pollutants: pesticides, which can affect water quality, and phosphorus, which can increase lake algae growth and reduce water quality.

Pesticide monitoring

The Lake Harriet project monitored storm runoff, rainfall, and lake water. The water quality monitoring consisted of a permanent automatic sampling station installed in a storm drain outlet which carried watershed runoff into Lake Harriet; samples were taken during storm events, from which mass loading of pesticides and nutrients were calculated. In addition, a rainfall monitoring station sampled rain events. Finally lake monitoring samples were collected during the growing season. Several hundred samples were analyzed for more than 30 pesticides.

The education program included several methods of education, including homeowner meetings, direct mail, flyers, billboards, utility bill inserts, local newspaper articles and visits by Master Gardeners. Because monitoring preceded the

education, and also followed it,reductions in pesticides can be measured. There was a decrease in average pesticide loads between the earlier and later monitoring periods. Therefore, the annual storm sewer runoff load of pesticides to Lake Harriet was reduced during the Lake Harriet project. The largest decreases came from the four compounds listed on this table:

Lawn Herbicides	Percent Decrease (1992-l 995)
MCPA	86%
Dicamba	59%
2,4-D	58%
MCPP	56%

The most prevalent pesticides found during monitoring were herbicides (weedkillers). The eight herbicides listed on the following table accounted for 95% of all pesticide detections.

Lawn Herbicides	Agricultural Herbicides
MCPA	Alachlor
Dicamba	Atrazine
2,4-D	Cyanazine
MCPP	Metolachlor

- **Storm water runoff monitoring summary:**
  - Lawn herbicides were found in 80% of the storm runoff events sampled between April and October.
  - Agricultural herbicides were detected in 35% of the storm events sampled
- **Rainfall monitoring summary:**
  - The agricultural herbicides listed above (the only herbicides found in rainfall samples) were atmospherically deposited by wind and rainfall onto the watershed and the accompanying water bodies.
  - Lawn herbicides were not detected in rainfall samples.
- **Lake monitoring summary:**
  - The three most commonly detected compounds in lake water were MCPP, Atrazine, and 2,4-D. They were also the most frequently detected compounds in stormwater entering Lake Harriet.
- **Phosphorus monitoring:**

Analyses revealed the phosphorus in runoff peaks twice a year, in the spring and in the fall.

  - In the spring, melting snow carries phosphorus attached to tiny particles of grit, sand, and organic matter as it enters the storm sewers.

. In the fall, phosphorus in leaves, grass clippings, and other organic debris enters the storm sewers. Studies conducted by other researchers established that only a small percentage of phosphorus in runoff results from appropriate use of fertilizer on lawns.

- **Water Quality Education**

Lake Harriet and Lake Alimagnet project participants have concluded that educating homeowners living in the watershed is one of the best ways of reducing pollution in the lake. Billboards, brochures, and water bill inserts have carried messages based on the following two concepts:

- **A healthy lawn and landscape promotes healthy waters.** Home landscaping with regionally adapted, healthy plants can help absorb and filter rainfall, irrigation, and runoff from melted snow.
- **Keep your lawn and landscape healthy as follows:**
  - Apply pesticides and nutrients according to recommendations
  - Aim roof downspouts onto lawns and gardens to filter and absorb runoff
  - Keep grass clippings and leaves off streets, sidewalks, and driveways
  - Leave grass clippings on the lawn or compost them
  - Use fallen leaves as winter or summer mulch, compost them, or shred them and leave them on the lawn
  - Keep lawn care products on the lawn and always follow label instructions
  - Clean up and reuse granular lawn care products that fall on streets, sidewalks, and driveways

Project Evaluation

- Based on feedback from homeowners living in the Lake Harriet and Lake Alimagnet watersheds, we have concluded the following:
  - Most homeowners in the Lake Harriet watershed apply significantly less lawn fertilizer than the University of Minnesota's recommended guidelines.
  - Most homeowners compost grass clippings or leave them on their lawns.
  - Homeowners would rather spot-treat weeds than apply herbicide to their entire yard or use non-chemical weed control methods.
  - Top soil in the Lake Harriet watershed is significantly deeper than that found in the Lake Alimagnet watershed. In many cases when suburban areas are developed, top soil is removed, but not replaced. This results in decreased plant vigor, and an increase in the need to fertilize, water, and maintain turf.
  - Most homeowners feel the educational initiative has increased their understanding of how lawn care habits affect water quality. Neighborhood newspapers and direct mail, the most common source of lawn care and water quality information, have the greatest impact.
  - Messages that are quick to read and easy to understand are the most effective in changing lawn care habits.
  - These messages are best delivered over an extended period. Homeowners have been reached through fliers, newspaper articles, brochures, direct mail, handouts, and personal contacts.

Feedback also shows that homeowners still need to hear the following messages:

- You can preserve water quality and have a healthy lawn by applying lawn care products in appropriate amounts, at the right times, and during suitable (or appropriate) weather conditions.
- By keeping leaves out of storm sewers, you can help reduce the amount of phosphorus carried to the lake in runoff water.
- Fall is the best season to apply turf fertilizers and lawn care products that control broadleaf weeds. The primary growth of turf grasses is early fall until late spring.
- Erosion, leaves, grass clippings, yard waste, pet waste, and rainfall all contain pollutants that can end up in lake water.

Lake Alimagnet Project Results

During the project period, the water quality in Lake Alimagnet improved significantly.

. Project cooperators achieved improvements in total phosphorus and chlorophyll-a.

- The best secci disk reading ever on Lake Alimagnet **was** recorded.
- The Citizens Assisted Monitoring Program improved the ranking of Lake Alimagnet from a "D" to a "C."

These results may be a result of the project, a curly leaf pond weed cutting, or may be credited to El Nino.

For more information on the Lake Harriet or Lake Alimagnet Watershed Awareness Projects and samples of homeowner education materials, please contact the Minnesota Department of Agriculture at (651) 297-7269.