Pest Management and Water Quality

April 2000

PEST MANAGEMENT AND WATER QUALITY

Developing effective pest management strategies ensures pest problems are monitored and assessed continually, while allowing for a more efficient use of inputs. This **Water Quality Matters** publication provides information on the impact of pesticides on water quality and how the adoption of an *Integrated Pest Management Plan* can help improve your bottom line and reduce environmental risks.

HOW DO PESTICIDES AFFECT THE ENVIRONMENT?

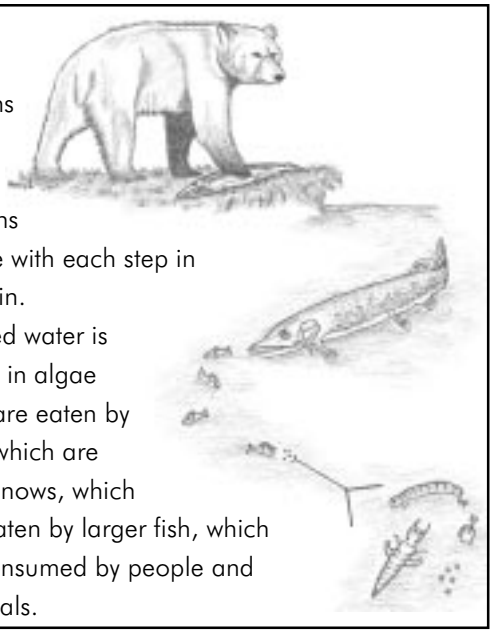
When pesticides are used to control a target insect or weed species, beneficial insects and plants may also be adversely affected by direct contact with the pesticide. Pesticides can also harm beneficial organisms through a process called biomagnification. This refers to the increase in the concentration of a chemical in an organism over time, compared to the concentration of the chemical in the environment.

Biomagnification occurs if a pesticide does not break down quickly. As insects, birds and animals eat contaminated food, the chemical accumulates in their bodies. With every step in the food chain, larger quantities of accumulated pesticide are eaten. This may continue to the point where these animals are adversely affected, or are unsafe for consumption.

BEST MANAGEMENT PRACTICES

Sustainable agriculture requires that soil and water quality be maintained. Some farm practices have the potential to cause environmental harm, which may affect rural and urban areas alike. Many of the potential negative impacts of farming can be greatly reduced by the use of *Best Management Practices*. These are agricultural practices that reflect current knowledge about conserving soil and water without sacrificing productivity.

Water is continually cycling. The water that we use has been used before. Producers and consumers, rural and urban people and the public and private sectors, are all responsible for using water wisely and ensuring that the resource is maintained for others. *Best Management Practices* are one way for the agricultural sector to help preserve water quality.



Although pesticide concentrations in water may be very low, concentrations may increase with each step in the food chain. Contaminated water is incorporated in algae cells, which are eaten by water fleas, which are eaten by minnows, which are in turn eaten by larger fish, which are finally consumed by people and other mammals.

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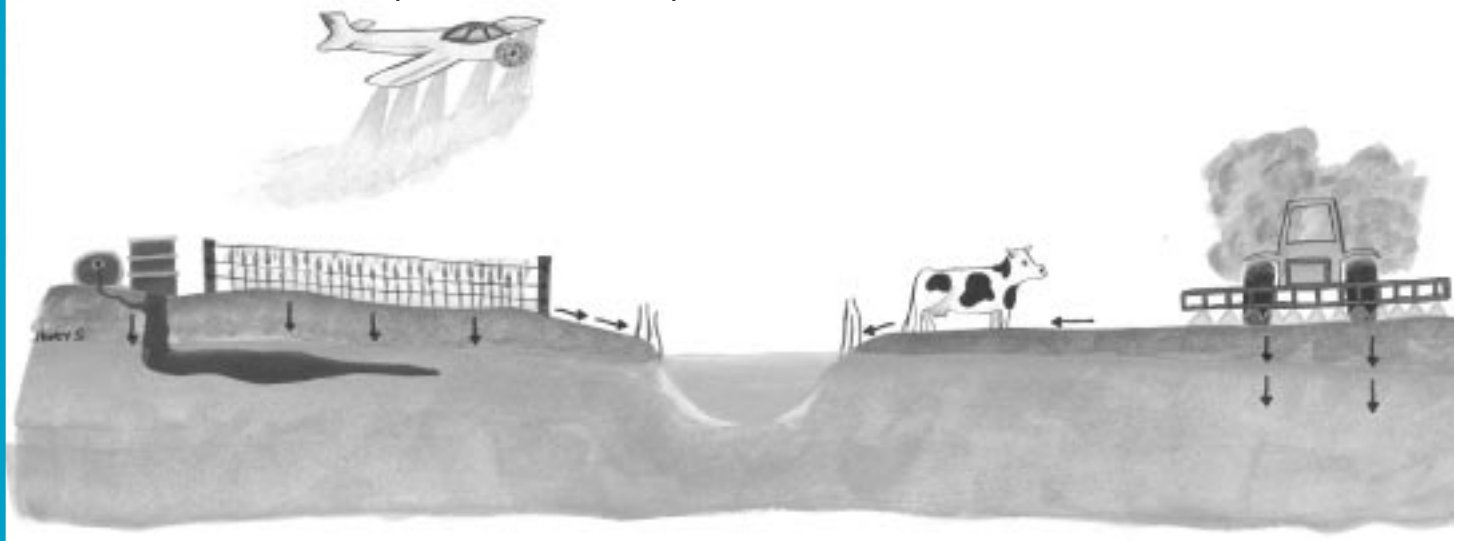
Pesticides tend to be very soluble and can easily move with water.



HOW DO PESTICIDES GET INTO WATER?

Pesticides can move into ground and surface water sources through all components of the water cycle. Characteristics such as solubility, volatility, the ability to degrade and the degree of attachment to soil particles all influence the potential of a pesticide to be transported to water.

Soluble pesticides can percolate through the soil and reach the groundwater. Volatile pesticides may move into the air and be deposited elsewhere. However, some pesticides are strongly bound onto soil particles, which means there is less risk of movement into water. Pesticides can also reach surface water sources directly through spills or improper chemical spraying practices.

WHAT IS INTEGRATED PEST MANAGEMENT AND WHY USE IT?

In time, most pests adapt to control measures that are used against them, particularly when a specific control measure is used on its own. For example, worldwide, hundreds of pest species have developed resistance to various pesticides. Over-reliance on a particular type of control measure can also lead to the replacement of one pest by another. These facts, together with the loss of some existing pesticides due to more stringent regulations, illustrate the need to employ as wide a variety of pest control measures as possible.

Integrated Pest Management (IPM) refers to a system of managing pests through a wide variety of management practices and control measures that are environmentally sound and economically feasible. The main objective of an IPM system is to keep the population density of pest species below the level that causes economic loss. It is also an important step in blocking the development of pesticide resistance.

IPM systems must be adaptable to changes in the environment, farming practices or the economic climate. Due to variability in climate and pest complexes, IPM systems are usually specific to a region and to a particular type of crop production. IPM systems have three important components, which include information collection, threshold identification and control measures.

INFORMATION COLLECTION: Identification and Monitoring of Pests and Disease

Regular monitoring of crop fields is essential to estimate the concentration of insect pests and their natural enemies, and to determine the extent of weeds or disease throughout a crop. Routine scouting of a crop allows pest

treatment to be timed to ensure it is both economically and environmentally responsible.

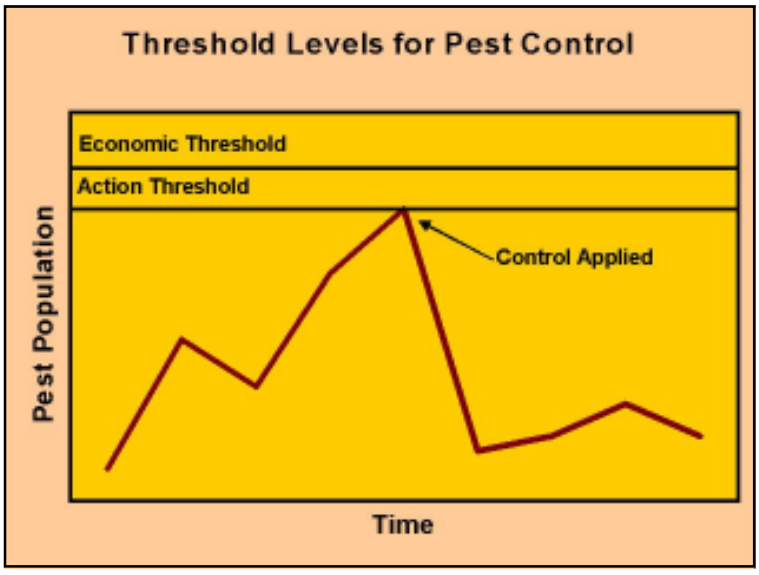
Monitoring includes taking representative samples of plants, insects and weeds to get an accurate picture of the pest problem. Methods of estimating pest concentrations include direct visual counts of the pest itself or measurement of damage to the crop.

Since some insect, disease and weed development is temperature and moisture dependent, weather monitoring can be used to predict the best timing for pest management practices.

THRESHOLD IDENTIFICATION: Action and Economic Thresholds

In any IPM system, two pest threshold levels must be identified. The first threshold is the economic threshold, which is defined as the pest density that causes damage equal in value to the cost of the treatment. The second is a treatment or action threshold, which is defined as the pest density at which control measures should be applied. The action threshold must be lower than the economic threshold to allow time for the control measures to take effect.

The action threshold for pest management must be lower than the economic threshold.



CONTROL MEASURES: Physical, Cultural, Biological and Chemical Controls

Once the action threshold has been reached, control measures need to be applied. These measures should be a combination of physical, cultural, biological and chemical controls.

- Physical control measures include barriers, traps, trap crops, tillage, fire, grazing, mowing and adjusting planting location or timing to destroy or evade pests.
- Cultural control measures include farming practices used to reduce persistent pest problems. These activities include using crop rotations, fertilizer practices, cultivation, sanitation and seeding practices (e.g. seed quality, rate, timing. and depth) to decrease the vulnerability of the crop to persistent pest problems.
- Biological control measures refer to the use of beneficial living organisms (predators, parasites, insects, diseases) to regulate or suppress pest organisms. Biological control can be achieved either by encouraging natural pest enemies, or by introducing and releasing natural enemies. Currently, very few of these measures are available for western Canadian field crop production.
- Chemical control measures involve the use of conventional pesticides and other chemicals for pest control. When chemicals are used, an attempt should be made to ensure that the chemicals are:
  - specific to the pest species being controlled and therefore non-toxic to beneficial species;
  - used at the lowest recommended label rate;
  - alternated with other chemical modes of action and control measures to help prevent resistance;
  - quickly broken down in the environment;
  - handled, stored and applied in a safe manner; and
  - applied following manufacturer's recommendation for health and environmental protection.

THE BIG PICTURE

There are many good reasons to use an IPM approach in dealing with pests. By implementing IPM, pest problems are monitored and assessed continually. This allows pest control decisions to be made based on real information, which translates into more efficient use of inputs (i.e. pesticides, water, fertilizer, labour, equipment). As well, chemical resistance of pests develops more slowly because there is less pressure from specific chemicals.

Adoption of IPM strategies can benefit a producer economically in the short-term due to reduced input costs, increased productivity and reduced pest damage. In the long-term, everyone benefits through a healthier environment.

For more information about *Best Management Practices* see the following **Water Quality Matters** publications: "Protecting Your Water", "Agricultural Best Management Practices", "Soil Texture and Water Quality", "Alternatives to Direct Access Livestock Watering", "Nutrient Management Planning" and "Riparian Area Management".

For further information on rural Prairie water quality issues:

- read the other publications in PFRA's **Water Quality Matters** series;
- visit the PFRA Website at www.agr.ca/pfra;
- read Prairie Water News available from PFRA, or on the Internet at www.quantumlynx.com/water; or
- **contact your local Prairie Farm Rehabilitation Administration Office** (PFRA is a branch of Agriculture and Agri-Food Canada)

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