Nonpoint Source Pollution in Kansas

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Water is one of our most precious natural resources. All of us depend on water for drinking and household use. In addition, we use water for agriculture, industry, and recreation. Concerns exist in Kansas about the quality of our surface and groundwater.

A report in 1994 by the Kansas Department of Health and Environment indicated 97 percent of streams and 82 percent of lakes in Kansas would not fully support all uses as designated by state statute.

A high percentage of streams are contaminated by bacteria (an indicator of possible pathogens) and sediment. A high percentage of lakes are contaminated by nutrients and pesticides (Figure 1). Sources of water quality problems include both natural and man-made pollution. Pollution reaches water from many sources and pathways, which can generally be divided into point source and nonpoint source pollution.

Point Source Pollution

Point source pollution comes from specific, single locations, such as municipal sewage treatment plants, manufacturing plants, or large confined livestock feeding operations. These sources are often easy to identify and control. Controlling point source discharges came under federal regulation in 1972. It is estimated that only about 20 percent of today's water quality problems result from point sources.

Nonpoint Source Pollution

Nonpoint source pollution generally occurs:

- Over a large area,
- Over an intermittent period of time,
- From diverse sources, such as farms, ranches, transportation corridors, and urban areas.

Stormwater runoff and the pollutants it carries are the most common causes of nonpoint source pollution of lakes, rivers, and streams. Another example is the leaching of nitrate or other chemicals down through the soil into domestic wells or groundwater aquifers.

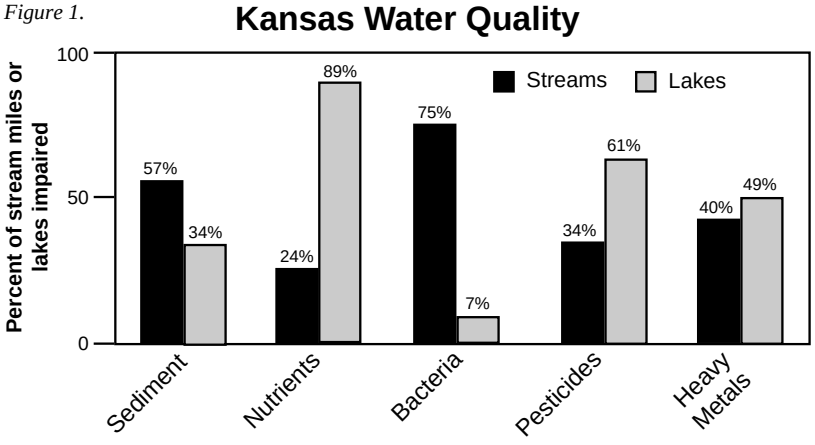
Nonpoint source pollution is not easily monitored at the point of origin. Contaminants are not generally traceable to an exact source. It usually occurs sporadically, and is often correlated with climatic events. Atrazine herbicide contamination of surface water is an example of nonpoint source pollution in Kansas. Atrazine in surface water is the result of runoff from hundreds, possibly thousands, of farm fields in a watershed. Sometimes, after years of data collection, the problem can be pinpointed to specific fields. Often, many farms over an entire region must be targeted for use of a system of Best Management Practices (BMPs) to reduce this nonpoint pollution source.

Many water quality specialists believe most future improvements in water quality in the United States will be made by reducing nonpoint source pollution.

Major Contaminants of Water in Kansas

Many types of contaminants may enter surface water and groundwater from urban and agricultural sites. Pollutants may come from crop fields, livestock waste, septic systems, lawns

Figure 1.



Source: Kansas Department of Health and Environment, 1994

and gardens, construction sites, underground fuel tanks, and urban storm water runoff. Some contaminants, such as bacteria from livestock wastes or septic systems, may pose a public health hazard. Others, including sediment from erosion of cropland, are a nuisance and may result in increased costs for water treatment plants.

Major water pollutants in Kansas are sediment, nutrients, bacteria, pesticides, and hazardous materials (Table 1).

Sediment. Sediment is the largest water pollutant in Kansas as measured by weight or volume, but it is not a health hazard. Sedimentation occurs when water carrying eroded soil particles slows long enough to allow soil particles to settle out. Eventually, sedimentation fills streams, rivers, and lakes. Turbidity from soil erosion clouds the water and reduces light penetration. This, in turn, reduces photosynthesis and has an adverse effect on fish and other aquatic life. Sediment may carry other contaminants, such as nutrients, organic matter, pesticides, and hazardous materials.

Nutrients. Nutrients, especially nitrogen and phosphorus, impair Kansas water quality. Nitrogen contamination is a concern to both groundwater and surface water, while phosphorus is mainly a problem for surface water. Both nutrients are essential for the growth of aquatic life. However, excess nitrogen and phosphorus levels in lakes and streams can lead to excessive aquatic plant growth referred to as algae blooms. This unwanted burden of aquatic plant growth is termed "eutrophication."

Water clogged with overabundant aquatic plant growth can lead to a number of undesirable consequences. The water can become undesirable for recreational activities. In addition, when these plants die and decompose, they consume oxygen in the water and severe fish kills may occur. Decaying algae and plants may cause undesirable odor and taste in drinking water.

Table 1.

Pollutant	Primary Causes	Potential Health or Environmental Hazards	Water Supplies Most At Risk:
Sediment	Soil erosion from cropland, construction sites, streambeds, etc.	Causes cloudy water and fills lakes Reduces aquatic plant and animal life May also carry phosphates or other pollutants	Lakes Ponds Streams
Nitrate	Fertilizer use on farm and home sites Livestock waste Wastewater treatment systems Decomposition of organic matter	Health hazard to infants Health hazard to young livestock Excessive aquatic plant growth	Domestic wells Underground aquifers Lakes Streams
Phosphorus	Fertilizer use on farm and home sites Wastewater treatment systems Livestock waste systems Soil erosion	Excessive aquatic plant growth resulting in oxygen depletion, fish kills, undesirable odor and taste	Lakes Ponds Wetlands
Pesticides	Crop applications Lawn and garden applications Spills and handling accidents Manufacturing discharges	Cancer Birth defects Direct toxicity to animals or plants Harmful to desirable plants	Lakes Rivers Streams Domestic wells Underground aquifers
Bacteria (*E. coli*)	Septic systems Sewage system discharge Livestock wastes	Sickness and/or possibly death May be harmful to aquatic animals	Domestic wells Lakes Streams Underground aquifers
Hazardous Materials (Solvents) (Gasoline) (Oil) (Industrial wastes) (Metals)	Spills and leaks Dumping	Sickness or death Harmful to aquatic life Harmful to plants	Lakes Rivers Domestic wells

Lack of phosphorus is usually the limiting factor to aquatic growth. As a result, most efforts to keep aquatic plant growth in proper balance concentrate on controlling the amount of phosphorus entering the water body. Phosphorus comes from both point and nonpoint sources. Many of the nonpoint source pollution control programs in Kansas are designed to reduce phosphorus movement into surface waters.

Nitrogen, in the form of nitrate, is a public health concern in drinking water supplies. Nitrate contamination is a greater problem in groundwater than surface water. Nitrate may come from nitrogen-containing fertilizer, livestock waste, septic systems, and decomposing animal and plant materials. Contamination of water wells generally results from an abundance of sources near the well. It is also influenced by poor well location, faulty construction, or inadequate maintenance. Contamination of underground aquifers, although less common than contamination of water wells, may occur when nitrogen levels exceed plant or microbial needs and water containing the excess nitrogen leaches down through the soil.

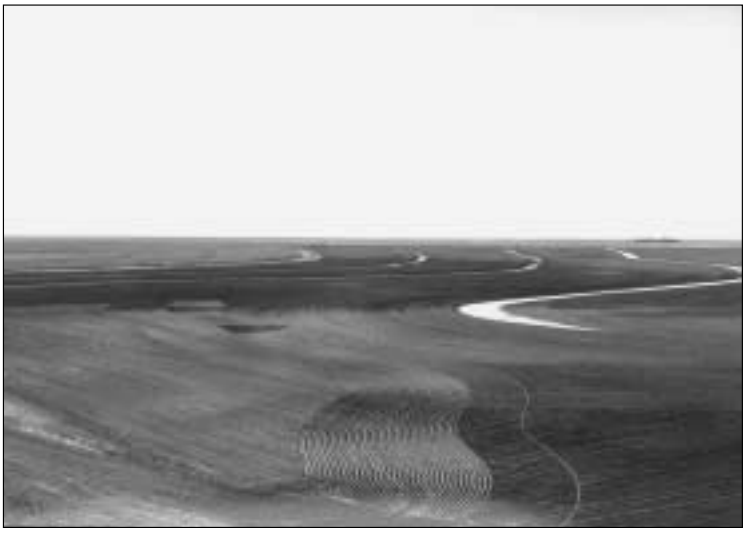
Bacterial indicators. The presence of *E. coli* or fecal coliform bacteria indicates that water is unsuitable for drinking and other domestic uses. Recreational uses and aquatic life also may be impaired. Potential sources of bacterial contamination include livestock wastes, septic system wastes, and sewer overflows. Wildlife is thought to be a less important source. These organisms live in the intestines of humans and warmblooded animals. Some will enter and contaminate lakes, streams, and water wells. They normally do not occur naturally in groundwater, but may enter wells because of poor well location, faulty construction, or inadequate maintenance.

Pesticides. Pesticides are used to control weeds, insects, diseases, and rodents in agriculture and urban areas. Pesticides applied by farmers, homeowners, or industrial users may be moved by wind and surface runoff into streams and lakes. Pesticides may also leach into groundwater. In Kansas, pesticide contamination is a greater problem for surface water than for groundwater. Pesticide runoff into surface water is generally the most concern from mid-May to July, during and immediately following pesticide application. After entering streams and lakes, pesticides generally decompose to either more toxic or less toxic compounds, or may stay in their original form. Normally, the rate of decomposition is slower in water than in soil.

Hazardous Materials. Solvents, gasoline, oil, industrial wastes, and heavy metals are examples of hazardous materials that may be washed into streams and lakes. These substances can have detrimental effects on drinking water, aquatic life, plant growth, and associated equipment (pipes, pumps,

Before improvements (above), cattle on this farm were being kept near a stream. This was a pollution concern. The cattle were later moved into a new feeding area well away from the stream. A holding pond now collects waste runoff and passes it over a grass filter area to help keep pollutants from reaching surface water (below).

Soil erosion leads to a number of nonpoint source pollution problems, including sediment, phosphorous, and certain pesticides. A system of storage terraces (below) is one of many Best Management Practices that can be used to reduce erosion.



etc.). The effects of low levels of these substances is not known in most cases. Generally, the chance of contamination by hazardous materials is greatest near urban areas, business and industry, transportation routes, and farmsteads These substances can cause severe water contamination that can be difficult and expensive to clean up. Lead, zinc, copper, chromium, cadmium, nickel, and mercury are the metals that are most frequently present in urban runoff.

Managing Nonpoint Source Pollution

Because of the diverse nature of nonpoint source pollution and the large number of people contributing to the problem, it is difficult to manage and control. Nonpoint source control plans call for education and voluntary actions to reduce chances of contaminants reaching surface or groundwater.

Laws and regulations are being used only to address point source pollution and the effects of nonpoint source pollution. For example, water treatment plants are required by law to clean water to a certain standard. Additionally, higher water treatment costs are generally passed on to consumers.

Most nonpoint source pollution control programs in Kansas are aimed at voluntary acceptance of appropriate management practices. In agriculture, voluntary adoption by farmers of BMPs that reduce runoff and leaching losses of nutrients, pesticides, sediment, and animal wastes is key to reducing nonpoint source pollution. In urban areas, education through Kansas State University Research and Extension programs, state and local agencies, media, and lawn care services is the focus of nonpoint source pollution control efforts.

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