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Animal Waste Management To Protect Water Quality

Animal Waste And How It Affects Water Quality

In Alabama, animal wastes are responsible for many of the agriculture-related water pollution problems. In fact, more water quality complaints have been attributed to animal wastes during recent years than all the other agricultural-related pollutants combined.

Animal waste includes the fecal and urinary wastes of livestock and poultry; the water used in processing; the feed, bedding, litter, and soil with which the manure or water becomes mixed; and the carcasses of dead animals. Because Alabama is one of the leaders in poultry production, large poultry operations produce huge amounts of animal waste including litter and carcasses. These wastes must be used or disposed of in a manner safe to the environment.

Traditionally, most animal wastes have been either burned, buried, or diluted throughout the environment. However, environmental, economic, and health concerns are forcing a reorientation toward recycling and resource recovery. The primary concern is that animal wastes be managed so that they do not pollute air, soil, and water resources or introduce toxic substances into the food chain.

Animal Waste Pollutants: Point And Nonpoint Sources

Any major concentration of animal waste or waste products could be defined as a potential site for point source pollution. At the present time, the Alabama Department of Environmental Management (ADEM) does not regulate concentrations of animal wastes as point sources unless there is intentional discharge into waters of the state. This may change in the near future.

Animal confinement operations such as swine farrow houses, cattle feedlots, and poultry houses are, however, potential point sources of surface water and groundwater contamination.

Manure stockpiles and poorly designed and maintained treatment and storage lagoons that allow dispersal of animal waste products into the environment at concentrations that cause problems could also be considered point sources.

Dead stock which are disposed of properly and in a timely manner may present little pollution potential. Burying dead stock, however, may result in some nitrate being available to leach to groundwater. The larger the volume buried, the greater the risk. This type of concentration of animal waste could also be considered a point source.

Once animal waste is applied to land, it becomes a potential nonpoint source of water pollution just like fertilizers and pesticides. Methods to control runoff and leaching losses of animal waste products from land are essentially the same as those for efficient and environmentally safe fertilizer management. All the standard practices for erosion and sediment control generally reduce losses of animal waste pollutants to surface water systems.

Contaminants From Animal Wastes

The potential pollutants of concern in manure are oxygen-demanding organic matter, plant nutrients, infectious agents, salts, and heavy metals. These pollutants can cause fish kills, turbidity, taste and odor problems, and health hazards to humans or animals that drink the water. These contaminants may be either leached to groundwater or transported to surface waters by runoff.

Organic Matter. The high organic matter associated with livestock waste runoff is capable of rapidly depleting the oxygen supply typically found in a stream or lake system, resulting in fish kills and severe disruptions of other aquatic life. Also, nutrients are released as organic matter is biodegraded. Decomposing organic matter may also cause color, taste, and odor problems in public or private water systems using surface sources.

Plant Nutrients. The two nutrients of most concern from a water quality perspective are nitrogen and phosphorus. Animal wastes can contribute both nitrate concentrations in excess of drinking water standards and phosphorous concentrations in excess of what has been determined to stimulate rapid aquatic algae growth. Excessive levels of nutrients in surface

ANR-790

Water Quality 4.6.1

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waters can cause algal blooms, fish kills, odors, and increased turbidity. Nutrients—primarily nitrogen in the nitrate form—can also be leached through the soil profile to groundwater.

Potential groundwater contamination by nitrates from poultry wastes has become a public health concern in Alabama since nitrate levels in groundwater appear to be increasing in some of the more intensive poultry producing areas. The primary reason for the concern is the fact that 50 percent of the state population drinks water from groundwater and up to 98 percent of the population uses groundwater for drinking water in many rural areas. As of yet, no detailed survey in the state has determined from which sources these nitrates may be coming. Septic systems may be a primary contributor

Nitrates are not toxic in the human body but may be changed to other forms or other compounds, such as nitrites, which are harmful. Nitrites are toxic because they react with hemoglobin to form methemoglobin, which reduces the blood's capacity to carry oxygen to all body cells. Nitrites can also interact with other nitrogen compounds to form compounds that are carcinogenic in animals.

Phosphorus as phosphate is one of the major nutrients required for plant nutrition and has been linked to the accelerated eutrophication of streams and lakes. High concentrations stimulate excessive or nuisance growths of algae and other aquatic plants. These algal blooms can reduce aesthetic quality, making water bodies less desirable for swimming, fishing, and boating. Algal growths can also impart undesirable tastes and odors to water and interfere with water treatment and purification. When large masses of algae or other aquatic plants die, the dissolved oxygen in the water decreases and certain toxins are produced, both of which can cause fish kills.

Infectious Agents. Animal wastes can carry pathogens to any swimming or drinking water they impact. These wastes are sources of bacteria, viruses, and other microorganisms that can infect people and animals and cause outbreaks of disease in the aquatic environment.

Salt contents associated with animal wastes result from high salt content in animal rations. The excess salts pass through the animals and remain in the manure. If this manure is then applied to fields at high rates, considerably higher salt concentrations may be found on these fields versus those without applied manure. Excess potassium and sodium in particular can contribute to soil structure deterioration and in some cases reductions in crop yields.

Heavy metals, including zinc, copper, and occasionally arsenic, are present in many animal rations. There is increasing concern that the level of heavy metals, mainly copper and zinc, is building up in agricultural lands where animal waste is being applied. Most of these metals are fairly immobile in soils (pH 6.0 to 6.8) and rarely appear to have adverse effects on crop production. In other words, they seldom accumulate in crops at levels that present a danger to people or animals consuming these crops. Even so, animal and poultry scientists are investigating whether these heavy metals are necessary in rations.

Animal Waste And Water Quality In Alabama

A Sand Mountain area watershed making up portions of Jackson, Marshall, and DeKalb counties in northeastern Alabama has been identified by the Alabama Agricultural NPS Task Force as the top priority watershed in Alabama. The 626 square mile area has approximately 3,000 farms, 12,000 cattle, 12,000 swine, 6.8 million poultry, and 65,000 acres of cropland eroding at greater than twice the tolerance level. Water supplies, local tributaries, and Guntersville Lake are severely impacted by sediment, nutrients, agrichemicals, and bacteria.

The two river basins with the greatest nonpoint source impacts from agriculture in Alabama are the Tennessee and Black Warrior. Stream segments in both the Tennessee and Black Warrior rivers that drain into Guntersville and Lewis Smith lakes, respectively, have pollution problems attributed to animal wastes.

Conclusion

One of the future challenges facing agriculture in Alabama is managing and handling animal waste products to minimize water contamination. With more and larger animal operations confined to smaller and smaller areas of land, the likelihood of water contamination increases. That is why there is concern for both surface water and groundwater in areas where great concentrations of animals produce large amounts of manure and other waste products.

Expanding animal production systems can meet increasing environmental concerns either by reducing the amount of waste generated or by using and handling waste to prevent environmental contamination. Both approaches will require, among other things, extensive efforts by farm managers.

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