CHAPTER 2

Water Quality

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INTRODUCTION

On November 13, 1997 the South Carolina Department of Health and Environmental Control Approved regulation R.61-43, Standards for the Permitting of Agricultural Animal Facilities. The State Legislature approved these standards on June 26,1998. The primary purpose listed for setting these standards is to protect the environment and the health and welfare of citizens of South Carolina from pollutants generated by the growing or confining of animals, processing of animal waste, and the application of animal waste.

This section on water quality is included in your training manual because of a concern to protect public health and the quality of the state's water resources. The goals of this section are to explain the concern for water quality, to provide information concerning your operation may influence water quality, and provide examples of Best Management Practices (BMPs) that help protect our State's waters from pollution. This section will also provide definitions and explanations of the terminology used in the Standards Permitting Document.

WATER RESOURCES

The water resources on the earth appear unlimited. <u>In fact nearly 75 % of the earth's surface is water, but most of that (97 %) is salt water in the oceans. Only 2.9% of the total is fresh water, with most of that fresh water total (2.2%) residing in ice caps and glaciers.</u> This leaves 0.5 % of the earth's total water supply in groundwater, 0.018 % in lakes, 0.001% in the atmosphere, and 0.0001% in rivers. Although the volume of fresh water is small, the cycling of water between the atmosphere and the land is quite rapid.

If the total world supply of water (including the oceans) was considered as a 55-gallon drum, freshwater would be equivalent to a 5 ounce glass of water in that drum. The sum of all fresh water in the earth's rivers would be equivalent to one drop or 0.01 ounce of water in that drum.

Table 1. Water Resources of the Earth

Saltwater	**% of total**
Oceans	97.28
Freshwater	
All icecaps and glaciers	2.19%
Groundwater	0.5 %
Freshwater lakes	0.009
Inland seas/salt lakes	0.008
Soil moisture	0.005
Atmosphere	0.001
All rivers	0.0001
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Total	**99.99**

Clean water is one of South Carolina's greatest and most important resources. Our coastal shoreline, lakes, and rivers provide water for drinking, recreation, industry, and agricultural activities. South Carolina has abundant supplies of fresh water including 29,898 miles of rivers and 366,576 acres of lakes. With so much water it is easy to assume that our supply of clean water is unlimited. However, approximately 17% of our surface water bodies are currently not suitable to support aquatic life, and 20% of our surface water bodies are not suitable for recreational uses (SCDNR, 1998).

BASIC CONCEPTS

The Hydrologic Cycle: How water moves on the Earth

As water falls to the earth it either evaporates, soaks into the soil or runs off the surface of the land. Water that does not evaporate either moves as surface runoff into streams, rivers and lakes or percolates through the soil. Water on the land in streams and lakes is called ***surface water***, Water under the surface is called ***groundwater***. The movement of water over the land, through the ground and in the air is called the ***hydrologic cycle***.

The hydrologic cycle has been in motion since the earth first cooled and water condensed. The water that currently cycles through rivers, lakes, and oceans is the same water that was formed ages ago. The hydrologic cycle is a sun-driven, natural mechanism that is constantly moving water from rivers, lakes, plants and the ocean into the atmosphere and back to the land. The sun provides energy, and together with gravitational forces, keeps the water in a continual cycling motion.

Water moves from the earth to the atmosphere by processes called evaporation and transpiration. Water then moves from the atmosphere to the earth as precipitation and condensation. Finally, water moves between points on earth as surface flow and groundwater flow. This system is a continuous cycle. We might visualize the oceans as the major source of water, the atmosphere as the major deliverer, and the land as the major user. No water is ever lost or gained, but the amount available at any one place in time is variable.

As precipitation falls directly to the earth a large portion is returned directly to the atmosphere by evaporation. Water that is taken up or absorbed by plants is lost to the atmosphere during exchange of gases needed for green leaf growth (photosynthesis). This process, called transpiration, is a major source of atmospheric water.

Water reaching the ground surface may travel a number of different pathways - it may be absorbed by plants, become groundwater, or enter stream channels, lakes, or oceans. Soils may absorb a certain amount of water over a period of time. The ability of soil to absorb water is called ***infiltration capacity*** and is dependant on the ***soil type*** as well as the amount of moisture previously in the soil. Water accumulates on the surface when rainfall exceeds the infiltration capacity of the soil. If the excess water collects in a depression a small pond may form. If infiltration capacity is reached on a hillside, water will move as ***runoff*** or overland flow. Runoff water can carry any loose material lying on the ground, including pesticides, oils, loose soil or sediment, and animal wastes applied as fertilizers. Scouring and erosion can occur when this water movement is rapid - such as on hillsides or in non-vegetated ditches.

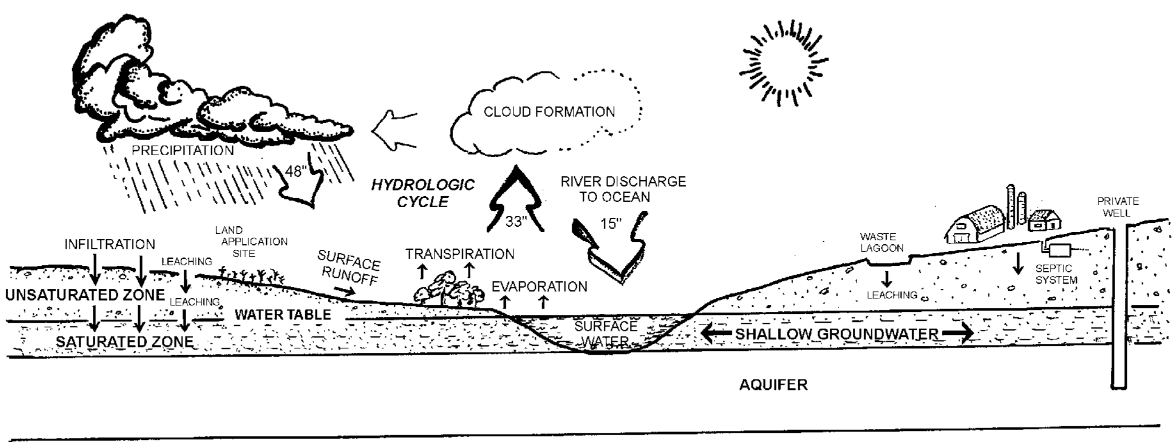

Figure 2.1. The Hydrologic Cycle. Zones of groundwater (**bold print**) and movement of water through the soil are shown. The average depth of water in South Carolina in inches moving in the various portions of the hydrologic cycle is shown in large arrows.

SURFACE WATER AND GROUNDWATER

Any water residing on the surface of the earth is considered ***surface water***. This includes lakes, ponds, seas, oceans, streams, rivers, and estuaries. In a broad sense, surface water may include large ditches, channelized streams, wetlands or any other features that have a potential to carry water. ***Groundwater***, on the other hand, is considered "water below the land surface in the saturated zone. Shallow soil profiles are usually not "saturated" with groundwater - that is, groundwater exists in these areas, but some of the void space between soil particles is also taken up by air. This "unsaturated" area is where most plants retrieve their water. Since this area is unsaturated, water can readily move down through it until it reaches the saturated area of the soil profile. This water movement can "leach" or move excess nutrients and pesticides down through the soil, carrying them past the crop root depth and effectively preventing their utilization by crops. This leaching zone can then carry these nutrients into groundwater.

The top of the "saturated" area is commonly known as the **water table**. All of the void space between soil particles below the water table is filled with water. Many old, had-dug wells were excavated to slightly below the water table depth. Water from the water table would then flow into the well hole, filling the hole up to the water table level. Beaches provide a simple example of this concept - step into the sand near the ocean and the footprint left there will rapidly fill with water. This is because the water table near the ocean (and lakes and rivers too) is just under the soil surface. The footprint makes a hole that extends below the water table surface at that point, so water moves from the soil into the footprint. Saturated groundwater moves more quickly laterally than downward. Shallow groundwater usually moves toward rivers, lakes, and oceans, providing some amount of water to these bodies.

Exchanges between surface and groundwater often occur. A simple exchange site would be a depression or small valley. If the valley's bottom is below the surrounding water table level, a pool or pond is formed. This pool is then considered surface water. Similarly, water pooled on the surface after a rain can sink or "infiltrate" slowly into the ground, then becoming groundwater.

Concerns for Groundwater

Groundwater is a critical natural resource for most people living in South Carolina. Ninety percent of rural residents and 50 percent of all the US population use groundwater for drinking water. Groundwater is usually of excellent quality and can be used without treatment or additional purification. Rural citizens rely heavily on wells for drinking water. For some it is the only source of water.

The underground formation through which groundwater moves is called an ***aquifer***. Water in the aquifer occupies spaces within fractured rock or between particles of sand, gravel, silt or clay. It is not an underground lake or river. Water moves slowly through the aquifer- movement rates in these spaces may be only a few feet per month or year.

Contamination of drinking water is a major public concern. The groundwater pollutants that may come from confined animal wastes are nitrate (NO_3) and bacteria. Pollution of groundwater at one location may result in contaminated drinking water at another well some distance from the contamination site. Pumping water from a well will draw water from the surrounding area, and can draw water upstream against natural underground flow. The range of effects depends on the pumping rates and size of the aquifer.

Concerns for Surface Water

Precipitation that does not cycle to the atmosphere by evaporation and transpiration (evapotranspiration) or become groundwater through infiltration is available for surface runoff. When the rate of rainfall exceeds the ability of the soil to absorb or store water the excess pools on the surface to form puddles or ponds or runs off to surface streams. The amount of runoff water entering streams depends on rainfall intensity and duration, type and amount of vegetative cover, soil type and slope of the land surface.

The area of land from which runoff drains to a stream, river, lake or other body of water is called the ***watershed***. Its boundaries can be identified by locating the highest points of land around the waterbody. A waterbody can be as small or as large as you want it to be.

Streams and river channels are self-forming, self-adjusting, and influence the shape of the valley floor through which they course. The flat area near the stream is the floodplain. The floodplain is constructed by the river and flooded at times of high discharge.

South Carolina has three major physiographic provinces: Blue Ridge, Piedmont, and Coastal Plain. Because stream type and flow are a result of rainfall and physiography (characteristics of the land surface), streams located within each province exhibit flow characteristics representative of that region.

The ***Blue Ridge Province*** is found in the mountainous northwestern corner of the state. Stream gradients are steep (some over 250 feet per mile) and the deeply incised channels intercept aquifers. As a result, groundwater contributes considerably to surface stream flow Because of the steep terrain and semipermeable soils, much of the rainfall runs off rapidly into stream channels. Typically, this province has rapidly fluctuating flows resulting from rainfall but maintains good base flows because of the groundwater discharge.

The ***Piedmont Province*** is located in the rolling foothills where elevation ranges from 1000 feet near the mountains to 400 feet at the fall line. Stream gradients are not as steep as in the mountains, ranging from 60 feet per mile to 5 feet per mile. Groundwater storage and stream base flow decrease down slope because the streams are less deeply eroded so there is less aquifer interaction with surface waters and soil characteristics result in greater surface runoff. As a result, Piedmont stream flow is highly dependant on rainfall and runoff with little contribution from groundwater. The lower Piedmont region typically has intermittent streams which have no flow during the summer and fall.

The ***Coastal Plain Province*** lies along the Atlantic coast and may be divided into three sections- the Upper Coastal Plain and Middle and Lower Coastal Plain.

The ***Upper Coastal Plain*** extends from the Fall Line to the Citronelle Escarpment located about 80 miles inland from the coast. Streams are moderately sloped 5 to 20 feet per mile, irregularly shaped with rounded terrain. Streams are deeply incised and intercept shallow ground-water aquifers that support stream flow especially during drought periods. The aquifers absorb great quantities of rainfall thereby reducing peak runoff to streams. As a result, Upper Coastal Plain streams have low variability in flow and maintain well-sustained base flow.

The ***Middle and Lower Coastal Plain*** area is a band approximately 80 miles wide along the Atlantic coast line. Stream slope is moderate to low with gradients approximately 3.5 feet per mile and there are extensive swamps bordering large river systems. Here stream flow is dependant on rainfall and runoff rather than groundwater recharge. Soils are highly permeable like those of the Upper Coastal Plain so there is little surface runoff entering streams. Stream flows do not rise or fall rapidly. There is shallow stream incisement so little groundwater enters the stream channels. As a result these streams have poorly sustained base flows and intermittent streams are not uncommon.

Streams that continuously flow through periods without rainfall are called ***perennial streams***. These streams have most of their water supplied by groundwater sources. ***Intermittent streams*** and rivers "generally have a defined natural water course which does not flow year-round but flows beyond periods of rainfall or snowmelt". These streams have very little groundwater supply, hence they easily dry up during extended periods with no rainfall. ***Ephemeral streams*** "flow only in direct response to rainfall or snowmelt in which discrete periods of flow persist no more than twenty-nine consecutive days per event".

POINT SOURCE AND NONPOINT SOURCE POLLUTION

Point source pollution can be broadly described as any pollution source that can be traced to a single discharge pipe or point of release. Point sources of pollution can usually be determined and corrective measures implemented to solve problems quickly with immediate results. In the past, South Carolina has concentrated on reducing the impact of pollution from point sources. These sources are usually municipal and industrial facilities discharging into our State's waters. We have made progress in reducing pollutants from point sources by controlling this pollution primarily through construction of wastewater treatment facilities for both cities and industry.

Nonpoint source pollution is by its very nature more difficult to trace. ***Nonpoint source*** pollution is considered as any pollution that enters surface or groundwater over a broad area, either from runoff waters or groundwater movement. Collecting samples from any one point would indicate a very small amount of sediment or pollutant entering the water, which would be of virtually no concern if that single point were the only source. However, this small amount combined with a large area in a watershed can produce quite a large amount of total pollutant entering the water. Nonpoint source pollution, then, can best be described as pollution from a widely-dispersed area that cannot be traced to a single source. Nonpoint source pollution, then, can best be described as pollution from a widely-dispersed area that is difficult to trace to a single source. Nonpoint source pollution can be a serious problem in South Carolina affecting many rivers, lakes and coastal areas.

Nonpoint source pollution comes from almost anywhere. There is even a certain amount of natural nonpoint source pollution. There is some pollution in undisturbed areas from decaying plant materials, sediment from soil erosion, and wildlife animal wastes that enter our waterways with runoff water. Levels of these pollutants are usually so low that they are absorbed, changed, decomposed, or diluted to the point that they do not significantly harm water quality. When land uses change to meet the needs of man the level of pollutants in the runoff water and the actual quantity of runoff water increase. The natural processes that remove or alter many of these natural pollutants may then be eliminated or have their efficacy greatly reduced.

WATER QUALITY AND ANIMAL CONFINEMENT FACILITIES

Nonpoint source pollution from animal confinement production is complex. This section is designed to inform you of the nonpoint source water quality pollutants of major concern and the reason for this concern. Other sections of this manual will help you to understand how to prevent the pollutants from impacting our State waters.

<u>The major nonpoint source pollutants from animal confinement facilities are sediment, nutrients and microbes.</u> The possible impact of these pollutants on water quality will depend on the type of production and management practices used by the farmer.

Eroded Sediment

<u>In the United States sediment is considered the most damaging pollutant from agriculture.</u> The erosion of soil is the main source of sediment in agricultural areas. Sediment may enter surface waters when animals are allowed to congregate in and along the shorelines of streams or lakes, where they breakdown banks, trample shoreline vegetation and increase shoreline erosion.

Sediment will also enter our surface water when rain drops hit an unprotected soil surface and soil is washed into the streams and lakes. We usually think of soil erosion coming from deep gullies washed into steep hillsides, but much of the erosion that occurs comes as sheet erosion which takes place when water moves rapidly as a thin layer along the entire soil surface. This type of erosion commonly occurs after a storm and may not be easily noticed. Sheet erosion may also carry animal wastes that have been recently applied. These wastes add fertility to the receiving water just as they did to the crop land.

Sediment can fill in lakes, wetlands, canals, road ditches, and streams. The soil particles bury gravel areas where fish lay eggs and fish larvae and fish food are produced. Suspended soil particles make the water appear cloudy and turbid, which limits light penetration needed for growth of aquatic plants. Aquatic plant growth is accomplished through photosynthesis, and requires sunlight. This process provides dissolved oxygen needed by fish and other aquatic organisms. Because many of our sport fish are sight feeders, sedimentation affects the fish's ability to find and capture prey. Sedimentation affects fish fitness and may lower reproduction levels. Sedimentation also causes water temperatures to increase by increasing the water's efficiency in absorbing solar radiation. Additionally, nutrients can be strongly bound to sediment - especially small soil particles - and can be carried with sediment to surface waters and alter the nutrient balance in waters. Sediment will increase the cost of water treatment if the water body receiving the sediment is used as a source of drinking water for humans.

Nutrients

Phosphorus and nitrogen are essential elements for plant growth. They are normally added to the soil in the form of fertilizers or manure. Nitrogen-fixing plants may also add nitrogen to the soil. Phosphorus and nitrogen may become pollutants when they are transported to surface waters in runoff or are leached in the groundwater below the root zone of plants.

The nutrients phosphorus and nitrogen may enter surface water through surface runoff either in solution in the water or attached to soil particles in the runoff. Together these nutrients can accelerate enrichment of water resources which results in excessive algal blooms, reduced transparency, undesirable shifts in algal and fish populations, and even fish kills. ***Eutrophication*** is the natural enrichment of streams and lakes. Excessive amounts of nutrients from point and nonpoint sources pollution, especially nitrogen and phosphorus, speed up the eutrophication process. Nutrient levels in rivers vary seasonally due to changes in hydrology, growing season, and land uses of man. A review of phosphorus and nitrogen levels in unpolluted rivers around the world shows nutrient concentrations similar to that found in rain water. Natural levels of dissolved phosphorus average around 0.10 mg/l for PO_4^{-3} and 0.25 mg/l total dissolved phosphate (including organic forms). Natural levels of dissolved inorganic nitrogen including ammonium, nitrate, and nitrite average about 0.12 mg/l. Nitrate (NO_3) was the major fraction of these nitrogen sources. (Meybeck 1982)

Phosphorus

In surface waters phosphorus is the nutrient of greatest concern. It is usually the nutrient that limits aquatic plant growth. When phosphorus is added to natural waters an increase in plant growth occurs, which if excessive can cause severe problems. Plants rooted in rivers and lakes will flourish and can soon clog waterways. Microscopic plants called algae also live in the water column. There is a direct relationship between phosphorus levels and algal blooms in water. Problems occur when algal blooms become so dense that they shade the deeper part of the water column from the sun. This causes the deeper plants to die, which then in turn removes oxygen from the water during their decomposition. This may result in a fish kill because of low oxygen levels in the water.

Excessive phosphorus may also cause a shift in the type of algae found in waterways. Growth of blue-green algae is enhanced when the ratio of nitrogen to phosphorus is less than 16:1. If excessive phosphorus is added to a body of water that ratio will become smaller (e.g. 16:4 = 4:1) and this nutrient ratio will favor the growth of blue-green algae. Most blue-green algae are considered unfavorable because they produce odors, off-flavor in fish, and toxins that kill fish and other animals.

Phosphorus has little potential for leaching in most soil. In some sandy soils considerable leaching may occur so any lateral flow would interact with surface waters. There is also evidence of leaching in some organic soils in Carolina Bays. Phosphorus has no direct toxic effects on humans, fish or wildlife.

Nitrogen

Nitrogen is found in several forms in the environment. Animal wastes are a common source of ammonium nitrogen which is toxic to fish. Ammonium can be converted to nitrate and nitrite forms in a process called nitrification which consumes large amounts of oxygen. This process can also kill fish by lowering dissolved oxygen levels in water.

Nitrate nitrogen is naturally found in water at low levels. When excessive nitrogen is applied to crops or when excessive leaching occurs nitrates may reach below the root zone of plants and enter the groundwater. Groundwater with high concentrations of nitrates present health hazards to infants who may ingest this water. Drinking water with nitrate levels higher than 10 parts per million can cause blue baby syndrome (methhemoglobinemia), which can cause death in infants. Adults can tolerate higher nitrate levels, but studies indicate long term use may cause some forms of cancer. Young livestock are also particularly susceptible to health problems from high nitrate-nitrogen levels.

Nitrate is very soluble and moves readily with water. Once nitrates are in water they are difficult to control. Nitrate pollution is most difficult to control on sandy soils due to the well-drained characteristics of these soils, which in turn foster leaching of nitrates into groundwater.

Bacteria

Bacterial contamination of drinking water is a serious concern for public health. Microbes from domestic and agricultural wastewater have been linked to ear, nose, throat and intestinal ailments in humans. Fecal coliform (a measure of *Escherichia coli* bacteria) is used to determine bacterial contamination of water. Although coliform bacteria themselves are generally not harmful, they indicate the possible presence of pathogenic (disease causing) bacteria, viruses, and protozoans that also live in human and animal digestive systems. The microorganisms of concern include *Cryptosporidium parvum*, *Giardia duodenalis*, *Campylocbacter spp*., *Salmonella spp*., pathogenic strains of *E. coli*, and *Yersinia spp*. Drinking water standard for the EPA set acceptable levels of zero colonies of fecal coliform bacteria per 100 ml of water. Water contaminated with the fecal coliform indicator bacteria must be treated and disinfected before drinking to prevent such intestinal diseases as gastroenteritis and typhoid fever. It is generally recommended that recreational activities such as wading and swimming not occur in waters with high fecal coliform bacteria concentrations. Agricultural sources of fecal coliform bacteria are run-off from pastures, feedlots, land applied waste areas and leaking animal waste lagoons. Sources of bacterial contamination are variable and complicated. Both soil and bottom sediments act as reservoirs for coliforms. Wildlife, livestock and human wastes contribute to the total coliform contamination.

SURFACE AND GROUNDWATER PROTECTION

Following are the sections of R61-43 that deal directly with ground and surface water protection requirements:

200.80 Facility, Lagoon, Treatment Systems and Manure Storage Pond Siting Requirements.

200.80.A 1, 2, 3, 4
200.80.B 1, 2, 3, 4 5
200.80.C 1, 2, 3, 4
200.80.D

200.90 General Requirements for Animal Manure Lagoons, Treatment Systems, and Animal Manure Storage Ponds.

200.90.D
200.80.E

200.100 Manure Utilization Area Requirements.

200.100.A
200.100.B 3, 4, 8, 19, 20
200.100.C 2, 3, 4, 5

200.110 Spray Application System Requirements.

200.110.D 1
200.110.E

200.130 Dead Animal Disposal Requirements.

200.130. B 2, 4, 5, 6

200.140 Other Requirements.

200.140. A
200.140. B
200.140. C 1, 2, 3, 4
200.140. D
200.140. E

Once pollutants enter our waterways there is little that can be done to reduce their impact. The best protection we have for water is to prevent the transfer of pollutants into the water. These preventative measures are often referred to as Best Management Practices (BMPs).

Your Well and Groundwater Protection

Groundwater protection is critical to the health of your family and neighbors.
Your well location is crucial to your water quality and safety. A well located down hill of a livestock yard, a leaking tank or lagoon, or failing septic system is at greater risk of contamination than a well located uphill from these pollution sources. Slope does not always indicate the direction a pollutant will travel. Groundwater aquifers may slope in a different direction than surface topography suggests. Groundwater movement direction can only be determined with special monitoring equipment.

One of the BMPs to protect your well water quality is to provide a good separation distance between your well head and any sources of pollution. Remember, required distances are minimums. Separating your well from a contamination source may reduce the chance of contamination but does not guarantee that the well will be safe. Storm water and groundwater movement may carry bacteria and nitrates from one place to another. Unprotected, abandoned or improperly sealed wells can become the conduit to contaminate the aquifer that supplies your drinking water. Pollution can occur through this type of recharge and may travel great distances. The degree of pollution depends on the depth of the aquifer and the location of the well intake.

BMPs also include properly sealing abandoned wells and pouring concrete around the well head (also known as "curbing" wells)

If you have a concern for your well water quality you may sample it for nitrates and bacteria. Many private and public laboratories can conduct this analysis. Get sampling guidelines before you begin the process.

Surface Water Protection

Application of liquid animal wastes is similar to rainfall. Water and animal wastes are used by the crops, evaporate and infiltrate the soil. <u>Runoff from excessive application into surface water is considered pollution. Application rates not only consider the supply of nutrient needed by the crop, but also must consider the rate at which the soil will accept and hold waste material.</u>

There are a number of BMPs that can be used to protect surface waters located near confined animal operations.

BMPs in general are effective because they

* Reduce the amount and availability of the pollutant through a proper nutrient management plan.

* Reduce and control the delivery of the pollutant into waterways by controlled and planned application of the animal waste product. Don't apply animal wastes just before a big rainstorm.

Sediment BMP's

* Sediment loss can be reduced by keeping animals off of stream banks and by applying conservation tillage practices when applying animal wastes to cropland.

* Sedimentation can be reduced by increasing crop residue and vegetative cover, avoiding steep slopes and slowing overland water movement with terraces, field borders, grassed waterways and contour cropping.

* Sediment may be intercepted by sediment basins, vegetative strips, riparian (stream side) buffers.

Nutrient BMPs

* Nutrient management should consider matching nutrient application rates with crop needs, placing fertilizers to optimize uptake and timing applications to meet seasonal nutrient demands. These BMPs help reduce the chance of nutrient being transported while attached to soil particles (phosphorus and some types of nitrogen).

* Nutrients can be intercepted and transformed by cover crops and riparian buffers. Cover crops may absorb residual nitrogen from the soil reducing leaching losses. Nitrate may be removed in riparian buffers through both denitrification and uptake by trees and vegetation. Organic nitrogen and phosphorus, attached to sediment, may be retarded by sediment deposition.

Use of one BMP is rarely sufficient to protect water quality. Combinations of BMPs are generally considered more effective and should be tailored to the particular agricultural practice, environmental conditions and type of pollutant.

OTHER REGULATIONS

Other regulations dealing with water discharge may apply to your confined animal operation. Regulation 61-9 is the NPDES and land application permits Regulation. Permits issued under this regulation require treatment of waste to meet certain guidelines before discharge. This would only be applicable to facilities proposing to directly discharge (point source) treated waste to a waterbody. There may be additional local regulations that deal with the zoning or location of agricultural animal facilities. The operator should research local regulations to make sure they are in compliance. Information on local regulations may be obtained from county planning and zoning offices or county health department. Some local entities may also require building permits for construction of facilities.

Proper management and ensuring you are in compliance with all regulations makes good sense. This will eliminate problems with regulatory agencies and will maintain good neighbors and a positive attitude toward your confined animal operation from people in your community. You also set a good example for fellow producers.

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