

## Animal Agriculture in the News

Animal agriculture stories often make the morning news. Following are some examples from recent years. Searching the Internet will likely turn up more stories.

### The Effects of Hurricane Floyd

Hurricane Floyd was arguably the most significant environmental event of 1999. Up to 24 inches of rain fell on eastern North Carolina. Twenty-six hog farms were flooded. Vast amounts of pollution were released into the environment including manure, mud, sewage, chemicals, petroleum and animal carcasses.<sup>1</sup> This caused great concern among environmentalists who feared damage to the estuaries of the state.

In December 1999, Governor Jim Hunt and other state officials were still concerned about losses to the fishing industry. But others closer to the industry felt that things were not so bad; losses had been higher in earlier, smaller hurricanes. Clamming was suspended as it is following any large storm. Some species were washed downstream where they were caught by a different group of fishermen. Overall, fall fishing was average or better.<sup>2</sup> However, the Marine Fisheries Division reported in July 2000, that the overall catch for 1999 was down from 180.2 million pounds worth \$101 million in 1998 to 153.4 million pounds of fish and shellfish worth \$98.9 million in 1999.<sup>3</sup>

In March 2000, top water researchers at their annual meeting were still uncertain what the impact of Floyd would ultimately be. The early days after the hurricane had seen vast plumes of pollution extending into North Carolina's rivers. Fresh water extended farther than usual down the rivers. An extra dose of nitrogen and phosphorus equal to six months to a year's normal input was washed into the rivers. However, the vast amount of rainwater diluted the contaminants. Thus, in March it was unclear whether the net effect on aquatic life would be negative from oxygen depletion or have a positive impact on the food chain. One NCSU researcher noted that pfiesteria is unusual after a large storm.<sup>4</sup>

Hurricane Floyd highlighted some problem areas in the state. Some enterprises should be prohibited in flood plains and flood maps need to be examined and updated.<sup>5</sup> The aftermath Floyd has provided a window of opportunity to buy out some of these firms. In November 1999, the Raleigh News & Observer reported that North Carolina's Clean Water Management Trust Fund had granted

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<sup>1</sup> Raleigh News and Observer, September 26, 1999, p A26.

<sup>2</sup> Raleigh News and Observer, January 16, 2000, p A1.

<sup>3</sup> Raleigh News and Observer, July 12, 2000, p A3.

<sup>4</sup> Raleigh News and Observer, March 31, 2000, p A3.

<sup>5</sup> Raleigh News and Observer, October 31, 1999, p A1.

the Department of Environment and Natural Resources \$5.7 million for a voluntary buyout program aimed at removing hog waste lagoons from flood-prone areas. However this sum would only purchase about 15 farms and 180 hog farms are currently located in flood plains.<sup>6</sup> In August 2000, the buyout began with environmental easements being purchase from 14 farms for an average of \$288,000. These farms represent 32 lagoons and 25,000 hogs. Another 30 farms were identified from applications as good candidates for buyout, but another \$30 million are needed.<sup>7</sup>

A fish kill on the Neuse River in June 2000 could well have been caused by lingering pollution from Hurricane Floyd. Much of the pollution was flushed out by rainwater, but enough remains in the sediment at the bottom of the river to cause problems. Although the river is prone to low oxygen areas, this year's extends much further.<sup>8</sup>

A early July fish kill in the Pamlico River was likely caused by pfisteria. Ninety percent of the dead fish had sores though testing was needed to confirm the cause.No mention of Hurricane Floyd was made.<sup>9</sup> Shrimp trawlers dragging their nets through the waters of Moore Creek and Bay River killed 110,000 fish as the shrimping season opened. Oxygen levels should remain normal since crabs will likely scavenge the dead fish before they can decompose.<sup>10</sup> A fish kill in Marsh Creek in Raleigh was caused by a homeowner's draining his swimming pool into the creek. The number of fish killed was not known. Weekend rains flushed the killer chlorine from the creek. Marsh Creek drains into Crabtree Creek which drains into the Neuse River.<sup>11</sup> On a July tour of a section of the Pamlico River, Governor Jim Hunt found that the fisheries had returned to normal. Tests to determine if problems might lurk in the river sediments will be performed.<sup>12</sup>

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<sup>6</sup> Raleigh News and Observer, November 20, 1999, p A22.

<sup>7</sup> Raleigh News and Observer, August 12, 2000, p A3.

<sup>8</sup> Raleigh News and Observer, June 17, 2000, p A3.

<sup>9</sup> Raleigh News and Observer, July 3, 2000, p A3.

<sup>10</sup> Raleigh News and Observer, July 21, 2000, p A3.

<sup>11</sup> Raleigh News and Observer, July 21, 2000, p N11.

<sup>12</sup> Raleigh News and Observer, July 22, 2000, p A3.

## North Carolina's Agreement on Lagoons

On July 25, 2000, North Carolina Attorney General Mike Easley announced that an agreement had been reached with Smithfield Foods to phase out hog waste lagoons on farms owned by Smithfield. Smithfield controls 70% of the hogs produced in North Carolina. In addition to the 276 company owned farms, the company contracts with 1204 other operators. Although the agreement officially covers only the company owned farms, Smithfield asserts that it will provide assistance to its contract growers in the form of information on new technologies as well as financial assistance.<sup>13</sup>

Under the agreement, Smithfield will pay \$15 million to North Carolina State University for research on new technologies to replace lagoons as the waste disposal system of choice. Smithfield will spend an additional \$50 million on environmental projects over 25 years. NC State reports having five technologies ready for testing and another dozen under development.<sup>14</sup> Smithfield has agreed to implement the new technology within three years when one has been approved. NC State has been given the authority to make binding decisions on acceptable technologies.<sup>15</sup>

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<sup>13</sup> Raleigh News and Observer, July 27, 2000, page A1.

<sup>14</sup> Raleigh News and Observer, July 26, 2000, page A1.

<sup>15</sup> Raleigh News and Observer, July 29, 2000, page A3.

## Innovative Solutions

Many cities, states, universities, corporations and other groups are seeking solutions to the problems associated with animal agriculture, in particular, manure. These are often tailored to specific situations, but they can provide ideas that may lead to even better solutions. The following are just a sampling. No endorsement of any specific system is to be inferred.

In Texas, transportation officials and environmental officials are working together to solve two problems. Manure that is a threat to water supplies will be composted and then mixed with organic matter such as grass clippings and tree trimmings. The mixture will be applied to roadsides where it has been difficult to grow grass such as the Aransas Pass. This will reduce erosion, beautify roadsides and remove the threat of manure contamination of streams.<sup>16</sup> A system of grants will encourage participation by farmers and state agencies.<sup>17</sup>

In Colorado, a pilot project is hauling yard waste, restaurant and food processor waste and brewery waste to a farm in Longmont where it will be mixed with manure to be composted. If the pilot project is successful, a network of farms for composting will be established. Using farms is cheaper than setting up an independent composting site for the Boulder community. Again, two problems have a combined solution.<sup>18</sup>

In New Mexico, Corrales Elementary School constructed a wetlands to treat school waste when its septic tank system began to fail. The school could not afford to build or operate a conventional treatment system, but needed to protect local wells and the nearby Rio Grande. The school's waste has extremely high levels of ammonia. Traditional wetlands break down ammonia, but cannot break down the resulting nitrates. Therefore, a treatment system was developed using both anaerobic and aerobic bacteria in different layers of the pond. A subsurface aeration system adds oxygen to promote plant activity during the winter months. The system is so innovative that it has been granted a patent.<sup>19</sup> Constructed wetlands have been used to treat animal waste.

In Wisconsin, the state is proposing to generate electricity from methane produced from manure. Manure will be collected from farms and taken to a larger farm where it will be pumped into a tank. Microbes will attack the manure producing methane, carbon dioxide and potentially useful solids. They estimate the microbes could produce 300,000 cubic feet of methane a day. Nearby generators would burn the methane to produce electricity which would then be sold to electric utilities.<sup>20</sup>

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<sup>16</sup> Anna M. Tinsley, Corpus Christi Caller Times, August 21, 2000.

<sup>17</sup> Richard L. Smith, Waco Tribune Herald, August 26, 2000.

<sup>18</sup> Elizabeth Mattern, Boulder Daily Camera, July 27, 2000.

<sup>19</sup> NewsReal's IndustryWatch, July 31, 1999.

<sup>20</sup> Associated Press, August 25, 2000

The Land Grant Universities are actively involved in research looking for solutions to the manure problem. Here are a few of the ideas being looked into.

Clemson University is looking at the problem from several angles. The Agriculture and Biological Engineering Department has projects looking at the application of swine and poultry waste to commercially grown trees. In the Manning project, they have found no groundwater contamination despite the fact that the monitoring wells are located within the stands of trees where the waste is applied. Various application schedules are being followed. Only the spring fertilization plots received sufficient rainfall for the trees to use the nutrients, but these trees showed up to a 40% increase in wood volume produced over the course of the experiment so far. Previous work with the application of municipal sludge to trees has shown that tree diameters increase. This means that the timber shifts into higher value classes. A second project at the Sandhills REC has not been underway long enough to show growth results, but the groundwater has remained clean. This project will also investigate the results of a one-time, heavy application of turkey litter to trees. This could lead the way to long term arrangements between poultry farmers and tree growers where an entire stand of trees could be fertilized over a long period of time. At Clemson's Starkey Swine Center, loblolly pines and sycamores are being fertilized with liquid manure. Although the sycamore is one of the less valuable pulpwoods, the fact that the stumps will regenerate, avoiding the large initial costs of establishing a stand, may make it an economical crop. Harvests every five to six years might be possible with fertilization.

Clemson University is also looking into separation technologies to segregate the solid matter in waste from the liquids. Some of these systems use settling or mechanical separators. Another involves the addition of a biodegradable polymer to manure; this can remove 80% of the volatile solids. Although researchers at Clemson have found the generation of electricity from manure to be uneconomical, they find potential for the use of methane directly for water or space heating in winter and manure drying in summer. Dried manure can be transported more cheaply because it has less volume and weight.

Researchers at Penn State University are getting the jump on another potential waste disposal problem associated with hogs: lard and other fats. Health conscious Americans are consuming less lard, but hogs continue to produce lard and other fats as by products. Penn State "found that lard and choice white grease can replace No. 4 or No. 6 fuel oil in a process steam boiler with little or no retrofitting." Because there is virtually no sulfur or sulfur compounds in pig fat, no sulfur dioxide is produced. Only about one-third of the nitrogen oxides are produced and almost no ash. While these fats currently sell for more than fuel oil, that could change as the market changes.<sup>21</sup>

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<sup>21</sup> Pennsylvania State University News, August 21, 2000.

Purdue University researchers have determined that the amount of nutrients excreted in manure can be reduced and thus odor reduced by managing the feeding of hogs. When feed is ground finer, digestibility increases and nutrient loss decreases. Feeding of excessive proteins should be avoided although some situations require higher levels of protein than others. Supplementing diets with amino acids can reduce nitrogen excretion and with phytase enzyme can reduce phosphorus.<sup>22</sup>

Oklahoma State University has planned a new state of the art swine research center. They plan to remove 90% of offensive odors using microbe remediation and biofilters made from hay.<sup>23</sup> The University of Minnesota has done research on manure aspects of manure use and disposal.<sup>24</sup> The University of Arkansas received a grant of \$600,000 from the state of Arkansas in July 2000 to study the causes of odor at swine farms, specifically what part of the hog's digestive system causes the noxious odors.<sup>25</sup> Among other universities with extensive research on manure problems are North Carolina State University,<sup>26</sup> Iowa State University,<sup>27</sup> and Texas A&M University.<sup>28</sup>

Several for-profit companies are marketing systems or products to reduce the problems associated with manure. Ammonia Hold, Inc.<sup>29</sup> manufactures products to reduce odor on the farm and in other settings. The products work by reducing ammonia levels rather than by masking the odors. Anoka Aquaculture of Minnesota has developed a device to run an electric current through the slurry stream as it flows from barns to the lagoon. The alternating current reduces odor by converting the noxious compounds in the slurry to less offensive ones. A bonus effect is that the current kills fly pupae and larvae in the slurry.<sup>30</sup>

NVIRO International Corporation<sup>31</sup> has a system that adds mineral byproducts such as the kiln dust from the cement and lime industries to manure and other biosolids. A chemical reaction produces heat which kills pathogens and eggs. A marketable soil amendment is the final product. This is another process than uses two waste streams to produce a valuable product. Bion Environmental Technologies, Inc.<sup>32</sup> uses biological and engineering processes to convert organic waste streams such as manure into a soil amendment.

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<sup>22</sup> Nutritional Strategies for Reducing Manure DM, N, and P Concentrations, Brian Richert and Alan Sutton Purdue University.

<sup>23</sup> Progressive Farmer Today, May 2000.

<sup>24</sup> <http://www.bae.umn.edu/extens/manure/compost/index.html>

<sup>25</sup> Dallas Morning News, July 30, 2000.

<sup>26</sup> [http://www.cals.ncsu.edu/waste\\_mgt/](http://www.cals.ncsu.edu/waste_mgt/)

<sup>27</sup> <http://extension.agron.iastate.edu/immag/PolicyResearchFr.html>

<sup>28</sup> <http://tammi.tamu.edu/>

<sup>29</sup> [www.ammoniahold.com](http://www.ammoniahold.com)

<sup>30</sup> Deborah Hyk, Hogs Today Magazine, November/December 1998.

<sup>31</sup> [www.nviro.com](http://www.nviro.com)

<sup>32</sup> [www.biontech.com](http://www.biontech.com)

Environmental Products and Technologies Corporation<sup>33</sup> has a closed-loop system for treating all aspects of the waste stream.

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<sup>33</sup> [www.eptcorp.com](http://www.eptcorp.com)

## Controversies

There continue to be instances of controversy over animal agriculture around the country. Many of these occur where traditional animal agriculture exists in an area that is being developed for other purposes such as housing developments. Sometimes they pit farmer against farmer. Here is a sampling of recent events.

In Olivia, Minnesota, a beet farmer returned from vacation to find his beets (and the soil they were growing in) missing. While he was gone, a neighboring farm was transferring manure when a hose burst, spilling manure into the beet fields. The farmer estimates that 100,000 gallons were spilled although those responsible put the spill at 10,000 gallons. Some of the beet plants left behind were killed by the manure.<sup>34</sup>

In California, the Center on Race, Poverty and the Environment has slowed expansion of the dairy industry in traditional dairy areas such as Tulare County and Kings County. They claim that the potential for pollution has been inadequately studied. Dairymen are concerned that new dairies will chose to locate in other states.<sup>35</sup>

Controversy arose over plans by a family farm to build a 500 cow dairy confinement barn in the karst area of southeastern Minnesota. The karst area is particularly susceptible to sinkholes because of limestone caverns under the surface. Environmentalist fear that sinkholes could open up under the storage bins or in a field that had been spread with manure.<sup>36</sup> The Minnesota Pollution Control Agency Citizens Board decided that the environmental concerns were not serious enough to stop the project.<sup>37</sup>

The Delmarva Peninsula (parts of Delaware, Maryland, and Virginia) is home to an unusual concentration of chicken farms. Only recently have the states made a serious effort to police the farms. In August 2000, Maryland announced plans for more stringent regulations. The proposed rules would make the poultry companies rather than the contract growers responsible for the proper disposal of chicken litter. The poultry companies are opposed to taking the responsibility of policing their growers and will contest the proposal.<sup>38</sup> Although the Delaware Nutrient Management Commission has expressed their opposition to similar rules in that state<sup>39</sup>, the US EPA is proposing similar regulations for Delaware.<sup>40</sup> Large poultry companies in the area such as Purdue, Townsends, and Allen Family Farms have long histories of improper disposal of poultry

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<sup>34</sup> West Central Tribune, August 8, 2000.

<sup>35</sup> Scripps-McClatchy Western Service, August 6, 2000.

<sup>36</sup> St. Paul Pioneer Press, May 22, 2000.

<sup>37</sup> St. Paul Pioneer Press, May 24, 2000.

<sup>38</sup> Washington Post, August 9, 2000, p. B01.

<sup>39</sup> [www.delawareonline.com](http://www.delawareonline.com), August 10, 2000.

<sup>40</sup> [www.delarwareonline.com](http://www.delarwareonline.com), September 7, 2000.

wastes.<sup>41</sup> In one case, Tysons built the manure storage sheds required by a settlement, but didn't bother to actually use them.<sup>42</sup>

In Missouri, over a dozen farmers contend that hog megafarms are improperly disposing of wastes. They claim that their wells have been contaminated. The Missouri Clean Water Commission is investigating.<sup>43</sup>

In Florida, a golf club that was built across from an existing hog farm sued in 1998 to get the farmer to reduce the volume of the country music that he played to keep his hogs happy. In August 2000, the club decided to drop the suit and use a pig motif around the course. They said the volume had been reduced. They had also built a protective berm. The farmer insisted that he had not turned down the volume (although a judge ordered him to.)<sup>44</sup> He was outraged that he had wasted time and money on the suit.<sup>45</sup>

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<sup>41</sup> Washington Post, August 2, 2000, p. A01.

<sup>42</sup> Washington Post, August 16, 2000, p. B01.

<sup>43</sup> Kansas City Star, July 12, 2000.

<sup>44</sup> Associated Press, July 22, 2000.

<sup>45</sup> St. Petersburg Times, September 14, 2000.

## Questions and Answers

A recent letter to the editor of *The State* (May 7, 2001) raised some questions that point out some possible opinions and misconceptions of the general public. Dr. John Chastain of Clemson University has given thoughtful answers to the questions.

The first question concerned the similarities between human and hog excrement given that hog heart valves are sometimes used in human surgery. Humans and swine have similar digestive tracts – both are monogastric animals. The main difference in the manure characteristics between hogs and people is their diet. If we could get people to eat a diet that consisted of 78% ground corn and 21% soybean meal then the manure would be basically the same.

The second question concerned the comparison of human communities and large hog farms. Using the 5-day biological oxygen demand (BOD<sub>5</sub>) standard usually used by municipal treatment plants, an average weight finishing hog produces 0.43 BOD<sub>5</sub> per day and an average person produces 0.18 BOD<sub>5</sub> per day in bodily waste. If we add in other sources of BOD<sub>5</sub> that are associated with human activity (hospitals, food processing plants, factories, etc.), the per capita waste can double to 0.36 BOD<sub>5</sub>. Thus one hog is the equivalent of 1.2 to 2.4 people in terms of loading on a waste treatment plant. SC regulations define a large finishing swine farm as a facility with more than 420,000 lb average live weight, which is the same as a facility that houses 3,000 head of finishing swine. A single 3,000-head finishing farm would provide the same daily BOD<sub>5</sub> load as 3,600 to 7,200 people. Considering the most recent estimates that the human population of SC is 4,012,012 and the hog population is 290,000, the humans produce about 6 to 12 times as much waste as the hogs.

The third question asks about the comparison between hog waste lagoons and municipal sewage loads. Both waste treatment processes are designed for the amount and kind of waste they treat.

The primary difference between municipal sewage and hog manure that can impact treatment is that hog manure does not contain large concentrations of heavy metals and other toxic substances that can occur in municipal sewage. Essentially, the only substances that exist in hog manure are the by-products of the feed fed to the animal. In the case of municipal sewage, the waste treatment plant operator has no idea when a toxic substance is flushed down the toilet or discharged into the system by a factory. Waste treatment operators often test for a variety of toxic substances to determine what they must deal with based on time of day and season of the year. Treatment lagoons were first used as a treatment process for municipal waste and are still often a component of municipal and industrial treatment systems. Anaerobic and facultative treatment lagoons for animal waste are designed based on the same concepts used for municipal lagoons. It is also important to remember that not all human waste is treated by municipal treatment plants. There are still over 700,000 septic tanks in

use in SC as well as over 200 human waste lagoons. This is not to argue the point that properly designed septic systems and human waste lagoons are not effective. They can be, just as a properly designed animal waste system can be.

The fourth question implies that hog waste is allowed to flow into the waters of the state. South Carolina law (The Standards for the Permitting of Agricultural Animal Facilities, R.61-43) prohibits the discharge of animal manure into waters of the state for any reason. Therefore, if you visit a hog farm that has a treatment lagoon you will not find a pipe or other source of discharge that connects the lagoon to any stream. Instead of discharging the effluent into a waterway, the lagoon water is used as a source of fertilizer (that is nitrogen, phosphorous, and potassium) for pastures, hay fields, or row crops. Current research at Clemson University is also investigating the use of animal manure as fertilizer for commercial pine plantations. In other words, animal producers try to gain benefit from manure by recycling the nutrients to grow plants that have economic value. Procedures for spreading animal manure must protect surface and ground water quality and be based on sound science.

South Carolina law requires the following:

- (1) samples must be collected on each farm each year to determine the amount of nitrogen, phosphorous, potassium, and other micro-nutrients contained in the manure,
- (2) the quantity of manure to apply to each acre must be determined based on the fertilizer recommendations for a particular crop as recommended by Clemson University Extension,
- (3) the application equipment must be calibrated each year so that the proper amount of manure is applied,
- (4) the farmer is required to maintain specific separation distances between where manure is land applied and waters of the state, and drinking water wells,
- (5) the farmer is required to maintain records of all manure sample results, spreader calibration records, and where and when swine manure is used to fertilize crops,
- (6) every farmer pays an annual permit fee to cover the cost of an annual inspection by SCDHEC, and
- (7) every swine producer that has received a permit under the current law is required to take a confined animal manure management certification course and pass a written exam within one year of receiving an operating permit.

The certification course is required by state law and is taught by Clemson University Extension. The course provides instruction on the proper use of animal manure as a fertilizer, management of manure treatment lagoons and storage structures, and methods to reduce odor.

Municipal waste treatment plants are designed to treat the liquid portion of the waste to the point where it can be discharged into a river. The permit for an individual treatment plant will specify the allowable concentrations of various substances that can be found in the effluent. The concentrations of

these pollutants are monitored frequently and if the concentrations exceed the allowable limits the plant is in violation. During periods of very high rainfall, municipal treatment plants often discharge partially treated wastewater into the river through a pipe. Swine farms must be designed to contain all the rainfall so as to prevent a discharge.

The solid part of the municipal or industrial waste stream, called biosolids or sludge, is often disposed of in a landfill. Land application of biosolids for fertilization of crop or forestland, and composting of biosolids is becoming more common. In some cases, municipal treatment plants have considered the idea of land applying the liquid portion of the waste to eliminate discharges to rivers and to increase the daily capacity of a plant without a major investment in new facilities. This would be a practice that is similar to what happens on hog farms and is better from a water pollution standpoint since the daily discharge of small amounts of pollutants into our rivers would be eliminated. However, the main deterrents to such practices are limited access to crop or forest land and concerns about maintenance of stream flow levels.

Since it is illegal and undesirable to design swine waste systems to discharge effluent to our rivers, then how much treatment is really needed on a hog farm? Water is used to remove the manure from the buildings on most swine farms – in many ways similar to a large toilet. A large fraction of the water used for cleaning the buildings can be recycled if the liquid portion of the waste stream from these buildings is treated well enough. A properly designed and managed treatment lagoon can provide this level of treatment. Therefore, as we look at new alternatives to treatment lagoons our goal is to define a cost-effective system that will provide a recyclable effluent. The other issue of great importance is odor. One of the main reasons for looking at treatment of hog manure is to reduce the level and frequency of odor.

The fifth question concerned the impact of increased treatment standards on the price of pork and on the profitability of smaller-scale hog farms. From an economics viewpoint, a universal requirement for stricter standards that increases the cost of producing pork will certainly raise the price of pork. Many studies have shown that the demand for food does not respond very much to price increases. Since other animals such as chickens and cattle are also covered by the regulations, their prices would also increase and there would be little movement from pork consumption to chicken or beef. Unless there is another source of pork such as cheap imports or large numbers of people become vegetarians, most of the cost increases would be passed along to consumers.

From an engineering standpoint, we have many treatment alternatives to use. However, many of these alternatives are very expensive and often provide more treatment than is needed. Another troubling point is that there are economies of scale for each technology. In general, as the cost and complexity of the treatment system increase, the farm size required to make it cost-effective also increases. The more complex systems often exclude the small farmer.

Some systems cost three times as much as a conventional lagoon system and are not cost-effective for any size farm. So instead of improving the profitability of the family farm, a requirement for municipal standards of treatment, would deal a further blow to them.

The final question wondered about allowing hog waste to negate the expensive progress made by our investment in municipal sewage treatment. Properly sited, designed, and managed hog farms should not negate the progress we have made in keeping our own waste out of the rivers. The siting requirements for hog farms – regardless of treatment option – are extensive. Examples of some of the requirements are given below.

- Hog farms cannot be built in the 100 year flood plain. Municipal plants are often built in flood plains to facilitate discharge.
- The minimum separation distance between a swine lagoon or storage pond and waters of the state varies from 500 ft to 2,640 ft depending on farm size and topography. Municipal plants and industrial waste treatment lagoons and other structures are routinely built next to a river.
- Land application of manure is limited based on the fertilizer needs of the crop and cannot be applied within 100 ft of waters of the state.
- Many other set-back distances are required by law relative to siting of swine facilities with respect to public and private drinking water wells, property lines, and distances from neighbor's residences. A complete copy of the regulations is available from the SC Department of Health and Environmental Control, Bureau of Water.

## Other Sources of Pollution

Animal agriculture is certainly not the only polluter of America's waters. A recent internet search on the word "manure" turned up 58 news articles while a search at the same time on "sewage" turned up 355 news articles. Here are just a few of the stories concerning sewage spills and other pollution events.

The Tampa Tribune reported that a supervisor at a sewage treatment plant plead guilty to pumping untreated waste into a drainage canal for several hours. The man faces up to three years in prison and a \$250,000 fine.<sup>46</sup> In August 2000, the Macon (Georgia) Water Authority recorded its fourteenth sewage spill of the year, including thirteen major spills.<sup>47</sup> In Milwaukee, 123 million gallons of raw sewage mixed with rainwater were released into the Milwaukee, Menomonee and Kinnickinnic rivers following an August 2000 rainstorm. The sewage district released about 2.3 billion gallons of raw sewage in six dumps in 1999.<sup>48</sup> In San Diego 34,450 gallons of raw sewage leaked from a manhole cover and down a narrow alley over the course of nearly three days in late July 2000. It then flowed through a storm drain into the San Diego Bay requiring the closing of a public beach. This was the twenty-fourth time in 2000 that a raw sewage spill forced the closing of a beach in San Diego County.<sup>49</sup> Also in July 2000, a blocked pipe in Yosemite National Park caused 200,000 gallons of sewage to spill into the federally protected Merced River. The river was closed to swimming, fishing and other recreation for twelve miles downstream for three days.<sup>50</sup> In August 2000, an 800 gallon sewage spill at the Pirateland Swash near Myrtle Beach caused SC DHEC to post swim advisories along 1000 feet of beach.<sup>51</sup>

Sewage is not the only possible kind of pollution. On August 25, 2000, a worker at the Coors brewery in Golden, Colorado pushed the wrong button and sent 2,500 barrels of beer into a waste treatment facility at the plant. The beer was then flushed into Clear Creek. The fermenting agent in the beer killed the microorganisms that usually digest the organic matter so a large amount of organic matter entered the creek. Thousands of fish were killed.<sup>52</sup>

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<sup>46</sup> Tampa Tribune, August 10, 2000.

<sup>47</sup> Christopher Schwarzen, The Macon Telegraph, August 8, 2000.

<sup>48</sup> Gazette Extra, August 8, 2000.

<sup>49</sup> Terry Rodgers, San Diego Union-Tribune, August 1, 2000.

<sup>50</sup> Mark Grossi, Scripps-McClatchy Western Service, July 28, 2000.

<sup>51</sup> Associated Press, August 17, 2000.

<sup>52</sup> Gary Gerhardt, Denver Rocky Mountain News, August 26, 2000.