Lessons from the Flood: Will Floyd Change Livestock Farming?

Rick Dove, Neuse Riverkeeper (© 1999 Rick Dove)

If anything surpasses the sensory experience of a lagoon full of hog waste, it's a breached lagoon with its contents floating downstream. Eastern North Carolina suffered episodes of this type of damage in the aftermath of Hurricane Floyd, the "500-year event" that tore through the state and devastated its livestock industry last September. Whether state livestock regulations will be revised to accommodate future flood conditions—particularly regarding facility siting and waste management—is a common question in the storm's aftermath.

Flood Impacts on Agriculture

It's difficult to overestimate the impact of the flooding on North Carolina's livestock industry. As many as 50 waste lagoons, many of them several acres in size, were inundated by flood waters. The storm caused five lagoons to breach, meaning that the dikes holding them in place broke, releasing their contents. The Agricultural Statistics Service of the North Carolina Department of Agriculture and Consumer Services reports that up to 28,000 hogs, 2 million chickens, 750,000 turkeys, and 700 cattle were killed in the flooding. In addition to the economic damage (estimated to be in the hundreds of millions of dollars), damage to livestock operations also contributed to

the effect of the flood on North Carolina's environment. Waterborne animal and human wastes produced nutrient pollution and raised the potential for both exposure to pathogens and the risk of disease.

According to Donald Reuter, director of public affairs for the North Carolina Department of Environment and Natural Resources (DENR), most of the flood-related environmental damage caused by the livestock industry came from swine farms, which produce voluminous amounts of waste. Swine wastes in North Carolina are stored in anaerobic lagoons. Lagoon levels are maintained by removing wastes and spraying them on "sprayfields" as fertilizer. These systems were considerably more vulnerable to flood damage than the dry litter systems used on poultry farms.

This is not to say that damage to poultry farms was inconsequential. Dewey Botts, assistant secretary for natural resources at the DENR, says that poultry farmers are busy replacing the many clay floor liners lost during the flood. These liners prevent fecal wastes containing nutrients such as nitrogen and phosphorus, as well as by-products such as ammonia, from leaching to groundwater. Such nutrient pollution contributes to excessive algal growth in aquatic systems, which depletes dissolved oxygen in the water.

Damage to waste management systems on hog farms has been a vastly more serious problem, however. It's likely that many lagoons suffered structural damage, and preventing future ruptures is now a priority in reconstruction efforts. Furthermore, experts fear the ground will be saturated during the already-wet winter months and that, rather than being absorbed, sprayed wastes will simply run off the land and continue to pollute surface waters.

State officials are currently working on an emergency waste management plan for affected animal operations. "We're trying to minimize water quality impacts and protect our natural resources while still helping these farmers through difficult times," says Bill Holman, secretary of the DENR. A priority of the strategy is confirming the structural integrity of the roughly 2,000 hog waste lagoons located in eastern North Carolina, where most of the state's hurricane damage occurred. The objective is to prevent any additional waste runoff to surface waters, but achieving this goal will be difficult. Many of the lagoons are full, and the DENR is working with growers to find ways to deal with the waste. According to DENR spokesman Ernest Seneca, the agency may ultimately restrict the number of animals allowed on a farm, either by prohibiting repopulation of lost animals or by removing animals from farms that can't manage the waste.

Achieving consensus on how best to manage the crisis has been difficult. In October, the DENR issued an emergency waste management plan strictly regulating the amount of waste that farmers could spray on their fields. The swine industry protested these rules, insisting that additional spraying would be needed to relieve pressure on swollen lagoons. In response to industry pressure, in November state officials relaxed restrictions on winter spraying. This move was in turn attacked by local environmental organizations, who argued that additional spraying allowed under the relaxed standards would exceed "agronomic levels," which are the amounts of nutrients that plants can absorb as fertilizer. The Southern Environmental Law Center, an environmental advocacy organization based in Chapel Hill, North Carolina, filed a suit in December on behalf of several environmental groups seeking to block the relaxed standards. At press time, a temporary restraining order prohibiting spraying at amounts above agronomic levels was in place. This order, which essentially allows farmers to spray at prestorm levels, was issued by administrative law judge Fred G. Morrison of the North Carolina Office of Administrative Hearings.

Regulatory and Policy Implications

The U.S. Environmental Protection Agency (EPA) delegates regulatory authority over animal waste laws to the states, with federal agencies functioning mainly in a support capacity. North Carolina state officials, when queried on whether regulatory changes would emerge from North Carolina's flood experiences, were reluctant to provide any definitive answers; most responded that their current focus is on emergency response. According to Botts, any long-term regulatory changes would almost certainly fall primarily on the state's $1.9-billion swine industry. "Dairy and beef farms don't present the same kinds of problems with wastes and odors," he says. "The same goes for poultry. It's the odors and the big, open lagoons you get with swine operations that are driving most of the public concern."

With 10 million animals statewide, North Carolina is the second-largest hog producer in the nation, after Iowa. Ninety percent of the state's 2,400 hog farms are located east of Interstate 95, in the region of the state that sustained the most flood-related damage. According to Botts, 82% of North Carolina's hog farms are run by megaproducers that often house thousands of animals each. Already the subject of passionate controversy because of their size, odor, and waste management practices, these massive farms are now under fire by those who claim their location in low-lying areas makes them vulnerable to flooding. "We predicted that this would happen," says Donald Webb, president of the Alliance for a Responsible Swine Industry, a public-interest group based in Burgaw, North Carolina. "We said that they were putting these facilities in the wrong areas. They shouldn't build back there, knowing what's already happened and that it could happen again."

State officials acknowledge the need for long-term strategies to reduce hog farming's environmental impacts and point out that efforts in this regard were a priority even before the storms. In some ways, the flood has accelerated these efforts, they say. For example, the Clean Water Responsibility and Environmentally Sound Policy Act, passed

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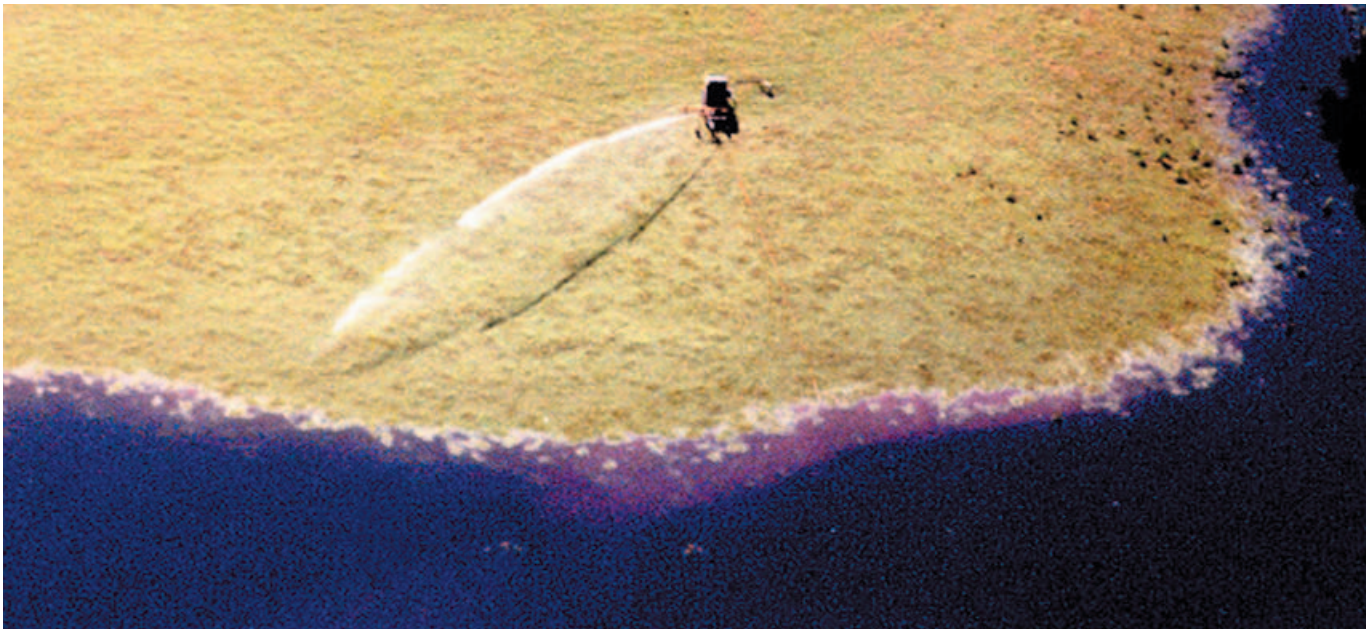
From pink-to-blue lagoons. Pink hog waste seeps from flooded lagoons into the Neuse River watershed. The waste is pink due to a normal biological reaction in the lagoon.



Adding to the problem? Hog waste from flooded lagoons is sprayed onto fields bordering floodwaters of the Neuse River. Environmentalists and the swine industry are at odds over the amount of spraying that should be allowed under North Carolina's emergency waste management plan.

by the North Carolina General Assembly in 1997 to establish a two-year moratorium on the construction or expansion of any swine farms with 250 or more animals, has been extended until July 2001. Contained in the same bill was a ban on any new liquid animal waste management systems within the state's 100-year floodplain. Now, as part of the DENR's emergency strategy, waste management systems that sustained greater than 50% damage during the flood won't be allowed to rebuild in the 100-year floodplain, either. According to Botts, as many as 10% of the 187 waste systems that operated in the 100-year floodplain before the flood may not be allowed to rebuild. "We'd like to move all waste management systems, including municipal systems and junkyards, out of the 100-year floodplain," he adds. "The Federal Emergency Management Agency [FEMA] is even buying houses and moving them out of these areas."

Botts emphasizes the state's concern for the economic welfare of the hog farmers affected by this measure. In some cases, he says, the state may buy out the affected farms altogether. Also under discussion are temporary cost-sharing arrangements with hog farmers through which the state would purchase easements, allowing farmers to shift to other kinds of production such as crops.

Some environmentalists say that state agencies should work toward removing even more livestock operations from the 100-year floodplain. "Eastern North Carolina has a very high water table," says Molly Diggins, state director of the North Carolina Chapter of the Sierra Club in Raleigh. "The proximity to wetlands in the 100-year floodplain means that we can have chronic problems with discharges from hog waste lagoons even without flood conditions." According to Diggins, her group has called for removing concentrated animal feeding operations (defined in North Carolina as containing 250 or more animals) out of the 100-year floodplain, with a priority on removing operations with open-air waste lagoons. Botts expresses DENR concerns that many locations within the 100-year floodplain are adjacent to coastal areas such as the famed Outer Banks, which provide close to $7 billion annually in tourism and fisheries revenue. These areas are ecologically sensitive and susceptible to nutrient contamination from agriculture. Furthermore, the presence of numerous barrier islands slows the flushing of coastal estuaries by the sea, and polluted waters can stay that way for long periods of time.

Ironically, the true borders of the 100-year floodplain aren't even entirely certain. William Patton, a program manager with the EPA in Atlanta, Georgia, and chairman of an ad hoc EPA task force that was established to provide assistance in flood response, says that many of the maps delineating the floodplain in North Carolina have long been out of date. "If you say to someone 'you can't rebuild in the floodplain,' the first thing they ask is 'where's the floodplain?'" he says. "That's often not an easy question to answer. Many of the maps are so old they're useless; some areas aren't mapped at all, some are incorrectly mapped, and land-use changes restructure the floodplain all the time." State officials are currently working with FEMA to find ways to speed up the process of updating these maps.

In the meantime, Reuter maintains that problems delineating the floodplain won't stop the DENR from doing its job. In most cases, he says, floodplains get bigger over time—meaning that properties within previously designated areas are likely to remain well within more current delineations. "The old lines are suitable for our purposes, but the need for recalculation [of the floodplain] is significant," he says.

Not everyone agrees that the more heavily damaged systems in the 100-year floodplain shouldn't be allowed to rebuild. Some swine industry representatives point out that most lagoons actually held up well during the storm. They suggest that swine farmers are being singled out after a natural disaster that no one could have avoided. Walter Cherry, executive director of the North Carolina Pork Council, a pork industry advocacy organization based in Raleigh, says, "It's extremely difficult to plan for an event that delivers 50 inches of rain over a 45-day period. I don't think it makes any difference what kind of waste management system you have. All types of systems malfunctioned, whether they were agricultural, municipal, or industrial; it didn't matter."

Alternative Waste Management Strategies

Michael Williams, director of North Carolina State University's Animal and Poultry Waste Management Center in Raleigh and an expert on the design of waste management systems for the livestock industry, says it's unreasonable to assume that any

animal waste management system could be floodproof. "It's probably not possible to have a system that can be totally sealed from a flood like we had in some locations in North Carolina," he says. Most currently favored designs employ sewage treatment processes that remove pathogens and nutrients from wastes to produce a purified effluent. These processes range from simple aeration to more complex operations such as sequencing batch reactions that convert nitrogen to a benign nitrogen gas, anaerobic digesters that trap methane and allow it to be used as an energy source, and upflow biofiltration units that accelerate microbial degradation of the wastes. All these systems store liquid wastes in earthen, concrete, or fiberglass tanks that can be above- or below-ground, depending on specifications. Williams cautiously suggests that, at best, some of these systems might release a less concentrated slug of waste if inundated during a flood. But the widespread failure of municipal sewage treatment plants during Hurricane Floyd demonstrates the vulnerability of these systems as well, he says.

North Carolina governor James Hunt's administration is hoping to phase out all swine waste lagoons in the state and replace them with more environmentally protective systems during the next 10 years. Hunt's proposal, titled *Framework for the Conversion of Anaerobic Swine Waste Lagoons and Sprayfields*, which was released in early 1999, is driven not so much by the need for flood protection as by long-standing environmental concerns over waste lagoons that include surface and groundwater contamination, odor, nutrient imbalance, and effects on public health such as stress and respiratory problems. State officials believe that the goals of the plan are consistent with the flood response measures taken under the emergency strategy. "We're trying to address the flooding in a manner consistent with the key components of the lagoon conversion strategy laid out this year," says Reuter. "We're trying to encourage farms that are allowed to rebuild waste systems to look into innovative technologies. Our hope is that the flooding will accelerate investment into research on new waste management technologies and increase support for the conversion plan."

Several options intended to encourage use of alternative systems are being explored by the DENR and other state officials. These include financial incentives such as state and federal funding for farmers who test new systems on their operations, as well as additional regulations designed to minimize emissions in the first place. Reuter says that state officials are also considering setting new emissions standards for hog operations and leaving the means of attaining those standards up to the farmers themselves. "What's needed is the appropriate mix of incentives, support, and rule making," says Reuter. "I think there's increasing recognition among people in the industry that things have got to change."

One limiting factor in the conversion plan is cost. Williams says that sewage treatment processes favored by the state can cost three times more than standard lagoon and sprayfield systems, in part because electrical requirements during operation are so high. But Botts counters that after adjusting for internalized costs of pollution prevention (for example, regulatory oversight over waste lagoons), the costs for these more advanced systems are comparable in the long run. Furthermore, he adds, many advanced technologies produce value-added by-products such as methane, which can be trapped and used to power on-site generators. If one considers such products, the costs of advanced waste management systems are actually less than standard lagoons, he says.

Whether North Carolina's experience will have any effect on how the livestock industry nationwide prepares for catastrophic weather events remains to be seen. For the most part, officials from the EPA and the federal Natural Resources Conservation Service (NRCS), when asked this question, have acknowledged the need for measures to minimize storm-related effects on livestock facilities. At the same time, they suggest that the floods that swept through North Carolina in the fall of 1999 were so extreme that fully preparing for comparable events probably isn't possible. The EPA's hurricane task force, led by Patton, is coordinating a dialogue among the NRCS, FEMA, and the U.S. Army Corps of Engineers. These organizations are coordinating with citizens groups, industry representatives, and other stakeholders to share data and information. Patton says that the goal is to produce a working group that can provide information and expertise on storm readiness and response to livestock operations around the United States. In the meantime, North Carolina's livestock industry faces considerable challenges in resuming normal operations. With climatologists predicting ever-increasing hurricane activity in the years to come, they likely face an uncertain future as well.

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