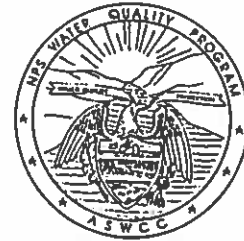
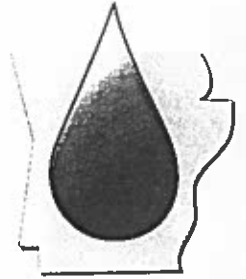


Fact Sheet no. 2

Water Quality and Poultry Disposal Pits



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Executive Director



A joint publication of the Arkansas Soil and Water Conservation Commission and the Arkansas Water Resources Center

Disposing of poultry that die during grow out is a serious management problem for poultry producers in Northwest Arkansas and across the country. Poultry disposal can affect water quality and the health of wildlife, livestock and people.

The numbers show why. A typical two-house broiler operation will, on average, produce about 80 pounds of dead birds a day or nearly 600 pounds a week. Arkansas producers grow approximately 1 billion broiler chickens a year of which about 200 million are grown in Benton and Washington counties. A conservative mortality rate of 3 percent for the production cycle translates into about 27 million carcasses statewide—6 million in the two-county area—that must be disposed of each year. That's just broilers. Arkansas farmers grow millions of turkeys and laying hens each year, too.

Most poultry carcasses are thrown into pits that dot the landscape throughout Northwest Arkansas and the nation where poultry is raised. Disposal pits remain long after poultry houses have disappeared. As pits fill, new ones are installed to take their place, making it difficult to know how many pits exist.

Pit disposal, though an undesirable practice, is better than dumping birds in an out-of-the-way corner of a farm. Rotting carcasses can spread disease quickly through scavengers, and the likelihood that surface water may be harmed through storm runoff greatly increases when dead animals are left to decompose in the open.

Pit disposal has been an accepted, even encouraged practice since the 1950s. A 1985 state law made incineration or pit disposal mandatory within 24 hours of death. Only recently has a connection between ground-water pollution and dead-bird pits



"We have determined that this pit is putting a lot of ammonium in the nearby subsurface water."

—Jeff Nichols,
UA Research Specialist

been made. Now, disposal pits are strongly discouraged, and it is likely that constructing new pits will soon be outlawed in Arkansas.

It was thought that a properly constructed pit in the right soil could safely dispose of dead poultry much the same as a household septic tank disposes of domestic sewage. Instead, many pits fail to work because the bacteria that decompose the birds lack oxygen. Rather than being eaten by bacteria, the birds may become pickled or mummified. Because ground water can move through the pits, pollutants associated with dead poultry, including nitrate, ammonium, phosphate, organic carbon, and bacteria—some possibly dangerous—may move to an aquifer.

A typical two-house broiler operation will produce about 13 tons of dead chickens a year and

150 tons to 200 tons of chicken litter, which is a dry mixture of manure and sawdust or some other bedding material.

Early results from a study being conducted by University of Arkansas scientists show that disposal pits can pollute nearby ground water.

"We have determined that this pit is putting a lot of ammonium in the nearby subsurface water," Jeff Nichols, a UA research specialist, said.

Nichols is part of a team of UA researchers that has been monitoring shallow ground-water quality near a dead-bird disposal pit in Washington County, Ark., since May 1992. Samples taken three feet from the pit have shown concentrations as high as 560 milligrams per liter (ppm) of ammonium. At 15 feet down slope, the ammonium concentration has registered 200 milligrams per liter (ppm).

"You can smell the ammonia in the water," Nichols said, "and a lot of it can become nitrate."

Shutting Down a Disposal Pit

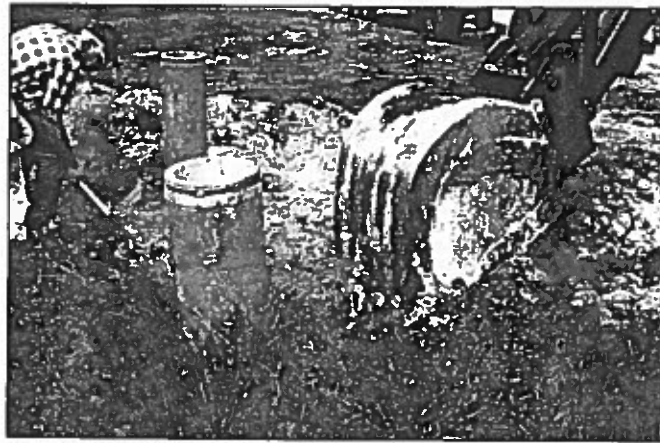
When it becomes necessary to shut down a disposal pit, remove the chute or chutes and the concrete slab. Cover the contents of the pit with lime. About 50 pounds should do it. Collapse the pit and backfill it with soil. Sod or seed the area.

You may wish to remove rather than merely close a disposal pit. Perhaps an old pit lies in an area that you want to build on, or you discover that a pit is contaminating a nearby well. If you decide to remove a pit and its contents, here are some guidelines.

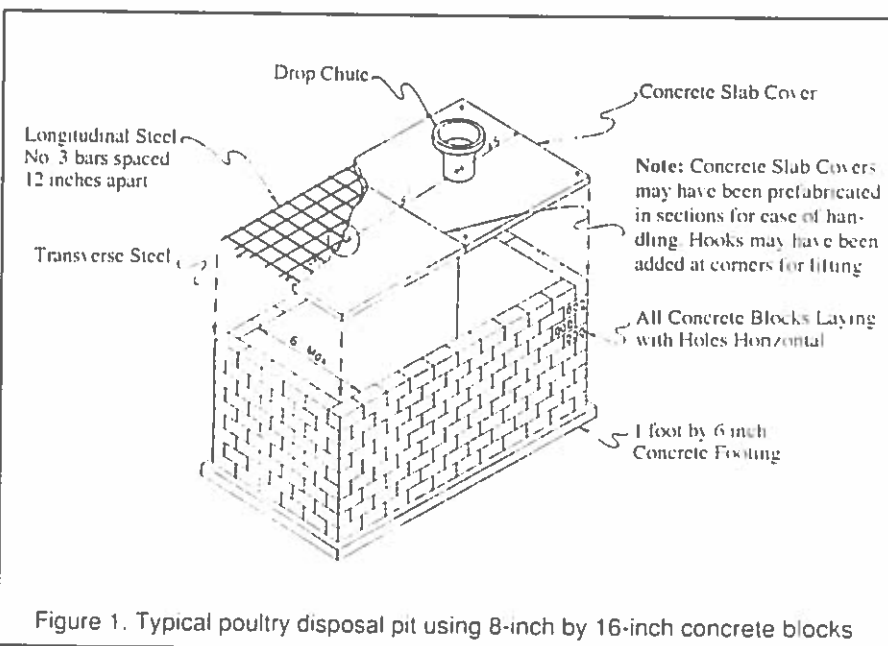
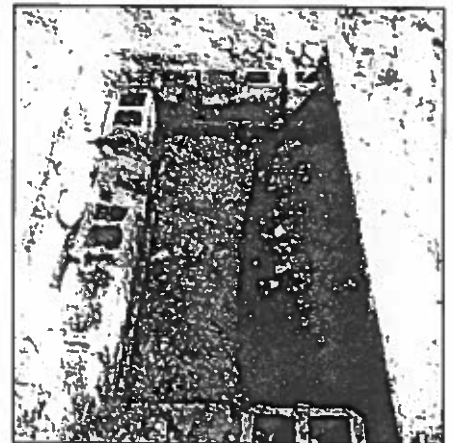
Don't toss the contents away casually. You'll only move the problem from one place to another. Composting or approved burning are two acceptable ways to get rid of any remaining birds. Disposing of the contents in a landfill that has been approved for hazardous waste is another. After the contents have been removed, collapse the pit, cover it

with lime and backfill with soil. Sod or seed the area.

A word of caution: If the pit isn't doing any harm, collapse it or cap it and leave it alone. Remember, the idea is to remove an old problem, not create a new one. In any event, be sure to contact your Arkansas Cooperative Extension agent or your local Soil Conservation Service office. Their guidance can help you save time and money and improve water quality on your farm.



A poultry disposal pit near Lincoln, Ark., served as the test site for water quality research by University of Arkansas scientists. Shutting down the pit was the final stage in the field work portion of the study.



Ground water may move through a disposal pit accumulating contaminants as it does. A disposal pit may rest on bed rock, which in Northwest Arkansas is likely to be made of limestone. This rock is brittle and cracks easily. It dissolves fairly easily, and once a crack opens it tends to widen as water and substances in the water act on it. While bedrock may not be cracked directly under or even near a disposal pit, water will percolate through the soil until it is blocked by rock or clay, creating a perched water table, or the polluted water may find its way into a shallow aquifer, domestic well or spring.

Nitrogen, one of the elements that forms nitrate and nitrite, is essential to life, but too much nitrogen as nitrate can be toxic to livestock and infants.

Blue-baby syndrome, or methemoglobinemia, can rob a 3-to-4-month-old infant's blood of oxygen. Nitrate is converted in the infant's stomach into the more toxic nitrite, which when it reaches the infant's blood, oxidizes the iron in the hemoglobin to form methemoglobin. This substance, unlike hemoglobin, cannot carry oxygen. If more than half of the hemoglobin is converted, death is likely. While the potential for this health risk exists, Arkansas has never had a documented case of infant death attributed to nitrogen-contaminated drinking water. Nevertheless, wells should be tested before being used as a drinking water source.

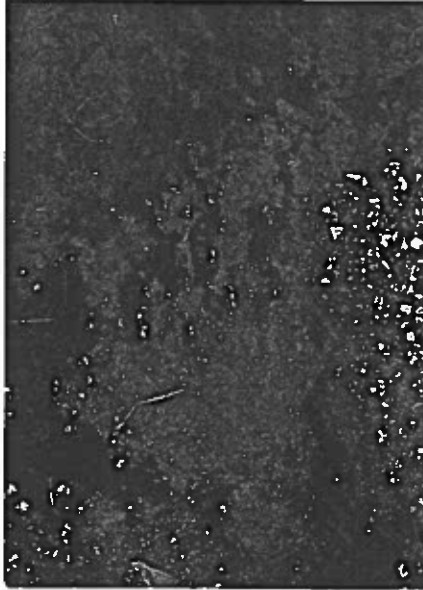
Considered individually, disposal pits can be considered a point-source of pollution, but because many pits are scattered across the region, they can collectively be considered a non-point source of pollution, as well.

Nitrogen, an excellent fertilizer, has helped turn Northwest Arkansas's pastures into lush hay fields that support one of the most productive cattle industries in the nation. But in addition to turning hay fields green, too much nitrogen can stimulate noxious algae and aquatic weed growth, turning ponds, lakes and rivers green too. These algal blooms can choke a pond or stream by cutting off sunlight, robbing the water of oxygen necessary for fish and other aquatic life. Also, water degraded by algae tends to be difficult and expensive to purify for drinking. Even after treatment, water degraded by algae may have an unpleasant taste.

Nitrogen isn't the only pollutant that has the potential to seep into ground water from disposal pits. There also exists the possibility of dangerous bacteria and pathogens,

such as *Salmonella*, being introduced into ground water through these pits.

It is also possible that ammonium not bound in the soil or converted to nitrate may reach a stream or pond through ground water. Ammonia is highly poisonous to fish. While many factors must be considered, including



ALGAL BLOOMS can choke a pond or stream by cutting off sunlight, robbing the water of oxygen necessary for fish and other aquatic life.

water temperature, the acid content of the water and length of exposure, concentrations as low as 3 milligrams per liter can kill trout. Other species are more resilient, but ammonia is toxic to fish nonetheless.

Unfortunately, there is no reliable or practical way to determine where ground water goes once it has percolated through a particular pit. Besides, there are so many pits throughout the state that any kind of meaningful testing would be impossibly expensive. Ground-water levels may fluctuate throughout the year, and a pit may be constructed over fractured bedrock, allowing contaminated water to move quickly to a nearby domestic well or spring.

Research can show what contaminants are produced, and it can describe the *possible* fate of those contaminants. However, because so many factors influence each pit, including geology, soil characteristics, fluctuating ground-water levels, and the volume of birds being disposed, it is impossible to accurately predict the fate or the intensity of the pollutants that may eventually find their way to ground water.

If pollution from these pits cannot be accurately predicted, at least with the current data base, what can be done to prevent future problems?

Two management practices, composting and freezing, show great promise. These practices are essentially recycling techniques that turn a waste by-product—the dead birds—into a valuable commodity.

Composting provides a way for the farmer to safely dispose of dead birds. The composting process destroys harmful bacteria and produces a rich organic fertilizer for use on fields and pastures. The compost consists of a mixture of straw, chicken litter, water and dead birds. These ingredients are layered one on top of another and the compost is allowed to work for several weeks.

Freezing for later processing into protein for animal feed is another management practice under development by Tyson Foods Inc., the nation's largest poultry producer. The company is developing and demonstrating techniques for freezing, storing and transporting the dead birds.

University researchers continue to study water-quality problems connected with poultry production, and growers concerned about water quality are embracing new ways of dealing with poultry carcasses. Continued cooperation between government, industry, farmers and researchers is the key to understanding and controlling water-quality problems associated with poultry carcass disposal.

Figure 2.

Nitrate ($\text{NO}_3\text{-N}$) and ammonium ($\text{NH}_4\text{-N}$) concentrations 15 ft. up slope from the test pit and 15 ft. down slope from the test pit.

Up Slope, 15 ft. from test pit

- — NH₄-N, Ammonia
- — NO₃-N, Nitrate

Down Slope, 15 ft. from test pit

- — NH₄-N, Ammonia
- — NO₃-N, Nitrate

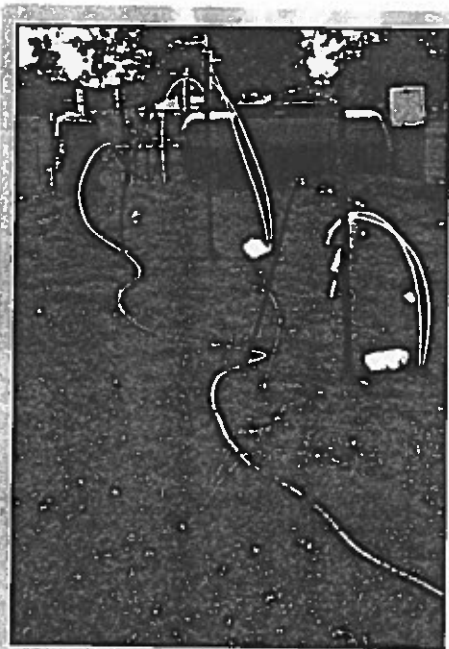


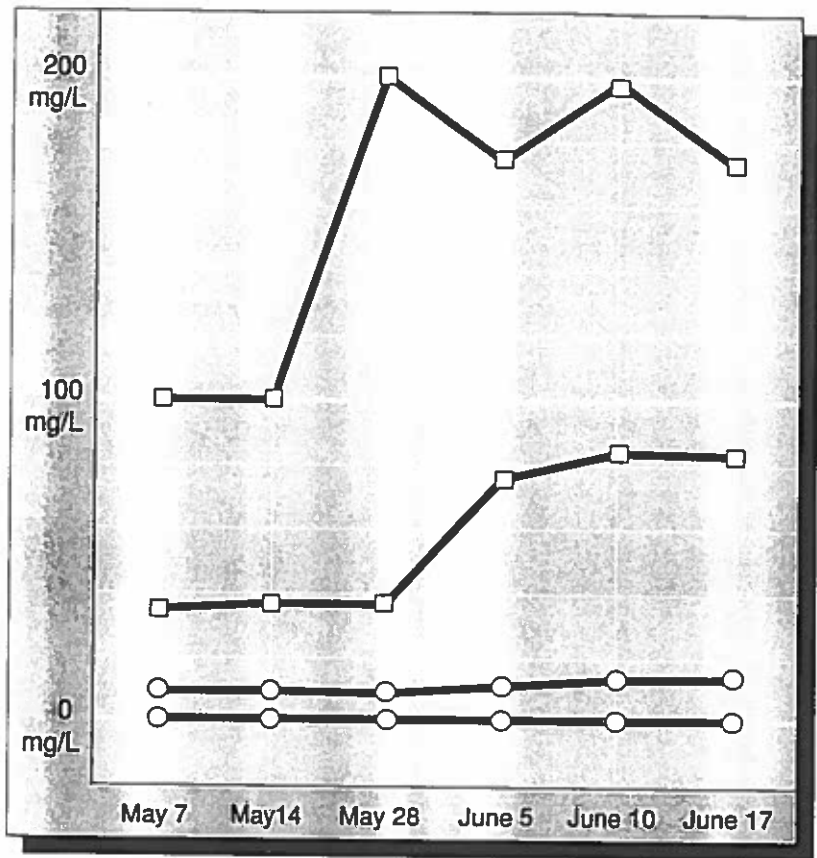
Figure 3. Lysimeter Placement

Up Slope

Depth	Distance
1) 66 inches	1) 3 feet
2) 53 inches	2) 16 feet
3) 55 inches	3) 33 feet

Down Slope

Depth	Distance
1) 89 inches	1) 3 feet
2) 78 inches	2) 16 feet
3) 73 inches	3) 72 feet
4) 36 inches	4) 16 feet



Moores Creek Water Quality Study

As part of the Moores Creek water quality study, a typical dead-bird disposal pit is being evaluated for its possible affect on ground water. Test results suggest that ground-water quality is significantly altered.

In addition to samples being taken at fifteen feet (Figure 2), lysimeters, which are porous steel tubes used to collect ground-water samples, were placed at varying depths and distances from the test pit (Figure 3). For instance, 3 feet down slope from the test pit and 89 inches deep, ammonium tested as high as 560 milligrams per liter; however, 72 feet down slope and 73 inches deep the concentration of ammonium was nil.

Because each pit is unique, it would not be correct to apply these data to other pits except in a general way. Pit construction—some are mere holes while others are substantial structures of con-

crete or treated wood—rock and soil characteristics, water levels and the volume of birds interact to influence ground-water quality near a pit.

Nevertheless, even though information gathered through studying a typical disposal pit can only be applied in a general way to other pits, it is reasonable to assume that many, if not most, disposal pits are a source of localized ground-water pollution.

The distance from a disposal pit at which ground water is evaluated is important. The further away from a pit that water is drawn, the less likely it is to be contaminated, but with the possibility of a pit sitting on fractured bedrock, which is common in Northwest Arkansas, it is possible that contaminated water may find a direct line to a drinking water well or that the contaminated water may emerge from a spring.

Composting

A Safe and Sensible Alternative

Instead of tossing chickens or turkeys into a pit, many area growers are turning to composting as a safe and sensible alternative for dead-bird disposal.

"The pits are worthless," Henry Huffacre, a poultry grower from Lincoln, Ark., said. "They're nothing but a way to get the birds out of sight. They will crust over so hard that you can't stick a post down in it. It takes oxygen. Without it, the chickens just lie there."

Huffacre has been composting poultry for about year, and he likes it.

"You have to pay attention to your mixture," he said. "The secret is not to use too much water."

He said that he spends about 20 minutes a day working the compost.

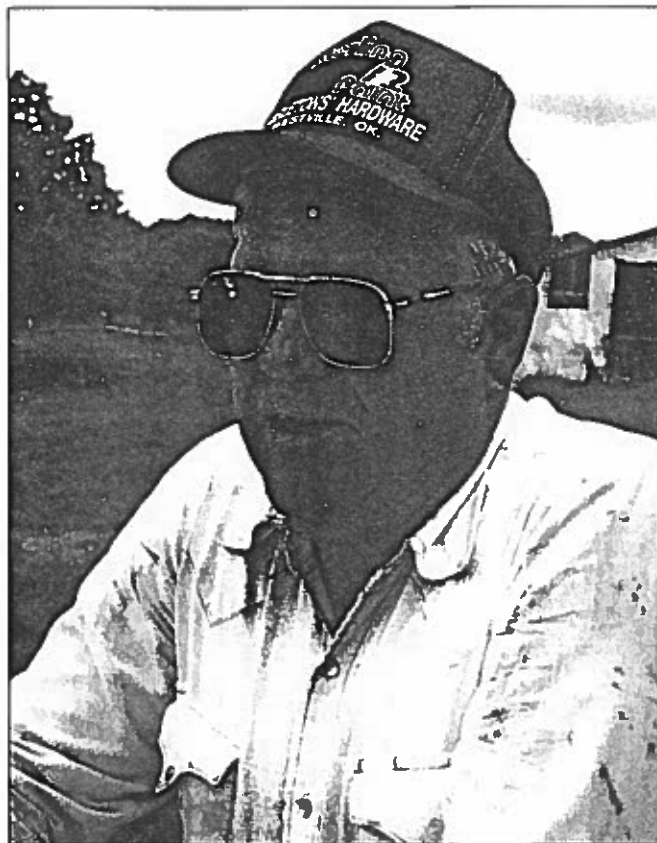
Huffacre said that freezing the birds for rendering into protein for animal feed, a new management practice under development, will be the best way to deal with the birds, but in times of high stress, when mortality rates rise dramatically, freezer capacity probably won't be able to keep pace. Except when losses run to catastrophic levels, however, composters should be able to handle the load, he said.

A composter can be designed to fit any size operation, and they are approved for cost sharing through the USDA Agriculture Stabilization and Conservation Service (ASCS). Composters can be constructed on the farm, or there are companies that can supply them ready-made.

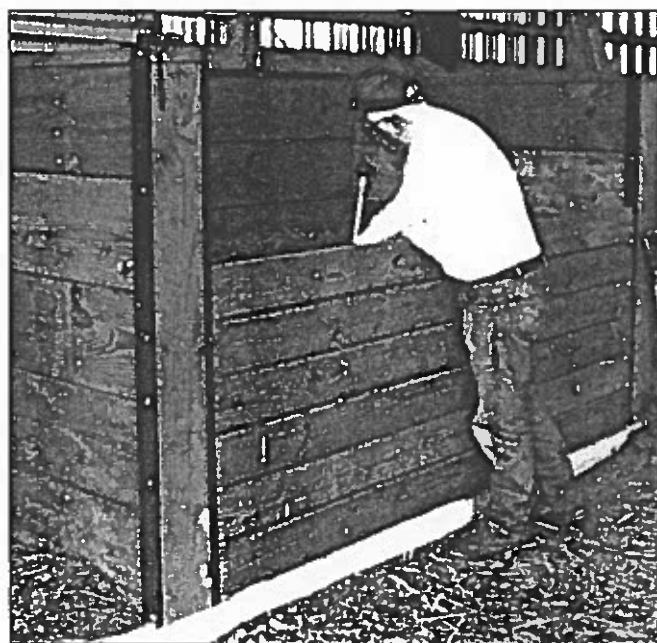
Composting is simple. The 'recipe' calls for wheat straw or some other carbon source such as saw dust, manure and birds to be disposed of. The size composter needed depends on the size of the operation.

While composting is strongly encouraged, it should be given a good deal of thought before being adopted on a farm. It does require 20 to 30 minutes of maintenance each day. Letting things go can lead to an odor problem, flies and other vermin. By building or purchasing a composter that fits the operation and by following the recipe, however, none of these problems should occur.

An excellent booklet produced by the University of Arkansas Cooperative Extension Service titled *Composting Poultry Carcasses* explains how to construct a composting system. It discusses compost management, has composter construction plans and answers many frequently asked questions concerning composting.



Henry Huffacre



Composting is relatively easy. It turns waste into valuable fertilizer, protects the ground water, and unlike disposal pits, composters have very little odor and few flies. For more information about composting, contact your Cooperative Extension agent or a representative of the USDA Soil Conservation Service.

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K.F. Steele, director and professor; Steve Wilkes, information specialist.*

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