Iowa Manure Matters

Odor and Nutrient Management

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Iowa Plan for Open Feedlots

by Karen Grimes, Department of Natural Resources

More than 800 open feedlot producers have registered with the Iowa Department of Natural Resources (DNR) since the Iowa Cattlemen's Association (ICA) and the DNR agreed on a three-part plan to bring open feedlots into compliance with current laws on March 21. The federal and state laws have been in place since the 1970s but have not been actively enforced.

The agreement was driven by the U.S. Environmental Protection Agency's (EPA) criticism of the DNR's permitting and enforcement efforts. The EPA reviewed state programs and inspected open feedlots in the four-state EPA Region VII of Iowa, Nebraska, Kansas, and Missouri last year. The EPA's data show that Iowa has issued permits for less than 10 percent of the 310 open feedlots that need a National Pollutant Discharge Elimination System permit.

The three-part plan includes voluntary registration by producers, an in-house environmental assessment by the DNR to determine environmental priorities, and producer compliance with current regulations.

Producers who want to take advantage of the program have until December 31 of this year to register their feedlots. Those who register will not be fined by the DNR if they need a federal

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permit and do not have one. The DNR also has agreed not to conduct routine inspections on registered open feedlots during 2001 and not to fine producers for minor water quality violations, provided they are working to comply with the regulations.

Producers with registered open feedlots also can expect the EPA to bypass them during 2001. Any inspections done by the EPA will focus on unregistered, unpermitted open feedlots. EPA inspections could result in substantial penalties for producers who are required to have permits but do not have them.

Permits are issued through the DNR and are required for open feedlots with more than 1,000 animal units (1,000 beef cattle, 700 dairy cattle, or 2,500 swine). Depending on their location, smaller operations with more than 300 animal units (for example, 300 beef cattle or 200 dairy cows) also may need a permit.

The voluntary registration with the DNR will start the permit process. After registration, there will be an in-house assessment by using existing geographic information systems (GIS) soils and topography maps to assign a high, medium, or low environmental priority to each feedlot. Then DNR field staff will go on-site to work with producers, to determine whether the in-house assessment is accurate and decide whether anything needs to be done to reach compliance. The goal is to have all open feedlots in compliance within 5 years. Higher priority lots will be the first to receive visits and will be asked to have a compliance schedule within 2 years. Lots with 300 or less animal units will not be prioritized or assessed by the DNR.

Current state and federal laws require all open feedlots to settle out solids and for all manure to be land applied in a way that will not cause surface or groundwater pollution. Additional controls are required of feedlots that need a permit.

More information and registration forms can be found on the Iowa Manure Management Action Group's (IMMAG) Web site, located at http://extension.agron.iastate.edu/immag/ and the DNR Web site at http://www.state.ia.us/dnr/organiza/epd/

In addition to the ICA and the DNR, the following groups contributed to the Iowa Plan for Open Feedlots: Iowa State University Extension, Iowa Beef Center, Iowa Farm Bureau Federation, USDA Natural Resources Conservation Service, Iowa Department of Agriculture, Conservation Districts of Iowa, Iowa Environmental Council, Izaak Walton League, and Iowa Dairy Products Association.

For more information, contact Wayne Gieselman, DNR Animal Feeding Operations Coordinator, at 515-281-5817; Barb Lynch, DNR Field Office 3 Supervisor, at 712-262-4177; Carol Balvanz, Vice President of Public Policy, ICA, at 515-296-2266; Dave Petty, Past President, ICA, at 641-486-2220; or John Lawrence, Director, Iowa Beef Center, at 515-294-6290.

Number of Registered Lots as of June 19, 2001.

	Number	%
Total number of registered lots	809	100
More than 1,000 animal units	151	19
More than 300 and up to 1,000 animal units	441	54
300 or less animal units	217	27

Location of Registered Lots as of June 19, 2001.

	Number	%
Northeast Iowa	70	9
North central Iowa	47	6
Northwest Iowa	337	42
Southwest Iowa	228	28
South central Iowa	87	11
Southeast Iowa	37	4
Total	806*	100

*Three registration forms did not have a county location.

Fly control starts with manure management

by Ken Holscher, Department of Entomology

House flies are the predominant flies found in and around livestock and poultry facilities. Although house flies can develop in just about any type of decaying organic material, the large accumulations of manure generated in these facilities has the potential to produce significant fly populations. Thus, manure management is of critical importance and should form the basis of an effective house fly control program.

During warm weather house flies can complete their life cycle in as few as 10 to 14 days. Removing manure that accumulates in livestock and poultry facilities on a weekly basis and spreading this manure thinly on fields to dry could provide effective house fly control. However, the lack of available land on which to spread the manure, increased labor requirements, and other factors seriously limit the usefulness of this approach and have necessitated the development of facilities designed for long-term manure storage.

Although house flies can develop in any type of manure, they cannot develop in manure that is too wet or too dry. Therefore, confinement facilities that incorporate long-term manure storage are usually designed with either a dry manure system or a liquid manure system. For example, most caged layer facilities incorporate a dry manure system where birds are housed in the top floor of the unit and the manure accumulates on the bottom floor. The key is to promote rapid and thorough drying of the manure and to eliminate or minimize moisture buildup. To do so requires effective ventilation, inspection and repair of leaking watering systems, evaluation of feed and water salinity, proper grading of outside areas to promote adequate runoff of rainwater, and identification of other factors that may contribute to excessive moisture problems. If additional moisture problems are avoided the manure can cone and effectively dry so that fly reproduction is substantially reduced. It also promotes the establishment of naturally occurring predators and parasites, which further aid in reducing fly numbers.

Rather than a dry system, many swine facilities incorporate a system where liquefied manure is stored in a pit. These facilities typically experience excellent fly control for the first year or two of operation. However, after that time a crust may form over the manure, which provides an excellent breeding source for house flies. Unfortunately, removing or breaking up this crust or treating the crust with an insecticide is extremely difficult.

Manure management is also important in open livestock facilities such as beef feedlots. In these facilities the lots should be stocked to maximum capacity to facilitate trampling and subsequent drying of manure. Mounds should be constructed or maintained to dry rapidly and allow adequate and thorough runoff of rainwater. Low areas within lots should be filled or graded to prevent water accumulation. Watering tanks should be adequately maintained to prevent water from collecting around the base. Manure that accumulates underneath fences or in similar adjacent areas should be removed. Other potential fly breeding materials such as spilled feed and wet bedding also should be removed on a frequent basis.

Although manure management forms the basis for an effective fly control program, supplemental measures may be needed. Chemical control options include space sprays, residual wall sprays, larvicide sprays, baits, and feed additives. Space sprays provide a quick knockdown of adult flies but provide no residual control and may need to be applied on a frequent basis. Residual wall sprays applied to areas where flies rest can provide some level of control for several weeks. Sprays are also available for application to manure to control fly larvae but are not generally effective and are only recommended as a spot-treatment. Baits can aid in the reduction of house flies but should only be used in limited areas to avoid unnecessary exposure to nontarget animals. Feed additives are available for use in some production systems and can aid in control if fed before fly numbers have reached high

levels. Biological control options include the release of commercially available parasitic wasps. These wasps can help reduce fly numbers if they are introduced early in the spring before fly populations have had a chance to build up. Although these wasps can be released into all types of livestock and poultry facilities, they seem to work best in caged layer facilities as opposed to swine facilities or open feedlots.

Proposed EPA rule changes address livestock feeding operations

by Angela Rieck-Hinz, Department of Agronomy

In January 2000 the U.S. Environmental Protection Agency (EPA) released a new proposed rule to address animal feeding operations. The changes are the result of lawsuits filed against the EPA and the need to revise current regulations so that they more clearly reflect technological changes in the livestock industry. The current rules are more than 25 years old.

The current effort in Iowa to bring open feedlots into compliance with state regulations (see article on pages 1–2) is a different issue. The current state regulations are functionally equivalent to current EPA regulations. The newly proposed regulations will be the driving force for future implementation of state regulations. The Iowa Department of Natural Resources (IDNR), under the authority of the EPA, is responsible for implementing state as well as federal regulations governing animal feeding operations.

Newly proposed regulations will affect open lots as well as confinement systems, all species, and potentially smaller livestock operations than are currently regulated in Iowa. Listed below are a few of the proposed rule changes.

Proposed change to definition of concentrated animal feeding operation (CAFO). The EPA has proposed two alternative criteria, two-tier or three-tier, for defining CAFOs. Two-tier structure establishes which livestock operations are defined as CAFOs based on size alone. The EPA has proposed to lower the threshold from the current 1,000 animal units to 500 or 750 animal units. Facilities with less than the threshold animal units may become CAFOs if designated by the permit authority. The three-tier structure is very similar to the current structure but requires the middle tier animal feeding operations to either apply for a National Pollutant Discharge Elimination System permit or certify that they do not meet any of the conditions that would require them to obtain a permit.

Change to definition of co-permitting. The EPA is proposing that permit authorities co-permit entities that exercise substantial operational control over CAFOs along with the owner or operator of the facility.

Proposed changes in land application of manure from CAFOs. Several changes are being proposed by the EPA that concern land application of manure. Currently, land application of manure is not considered a discharge and therefore does not require a permit for the field. The EPA is proposing to change the stormwater exemption such that permit exemptions would apply to a field only if the manure were applied at a proper nitrogen or phosphorus application rate.

Permit Nutrient Plans will be required to be developed and implemented by all CAFO operators. The Permit Nutrient Plan will be a site-specific plan that describes how the operator intends to meet the effluent discharge limitation and other requirements such as manure application rate, manure sampling, soil sampling, and manure application equipment calibration.

The EPA is considering establishing regulations prohibiting manure application on frozen, snow-covered, or saturated ground. They also are requesting input on requiring the use of erosion control practices on land receiving manure to reduce the amount of manure and sediment from leaving fields and entering water bodies. In addition, the EPA is soliciting comments regarding the economic viability of these rules and the impact of compliance on livestock operations.

These are just a few of the many changes in the proposed rule. It is anticipated that the earliest this rule would become effective would be 2003. All producers are encouraged to submit comments regarding these proposed changes. They must be sent to the EPA and postmarked by July 30, 2001. Please send an original and three copies of your comments to the address in the box.

For more information about the proposed changes to the CAFO rule, including a copy of the rule, the supporting documents developed to support the rule changes, and a fact sheet, visit the CAFO page on the IMMAG Web site at http://extension.agron.iastate.edu/immag/afocafo.html or call 515-294-9590. In addition to links to the EPA material, you will find local information developed specifically for Iowa produces, including a guide for making comments developed by the College of Agriculture and Iowa State University Extension.

By mail:	Concentrated Animal Feeding Operation Proposed Rule Office of Water, Engineering and Analysis Division (4303), U.S. EPA 1200 Pennsylvania Avenue, NW Washington, DC 20460
Hand deliveries:	Concentrated Animal Feeding Operation Proposed Rule, U.S. EPA Waterside Mall, West Tower, Rm 611, 401 M Street, SW Washington, DC 20460
E-mail:	CAFOS.comments@epa.gov
Phone:	CAFO Hotline: 202-564-0766

Manure treatment for control of odor and odorous gases

by Jeff Lorimor, Department of Ag and Biosystems Engineering

Manure treatment methods for odor control include maintaining aerobic conditions (with free oxygen) during storage, aerobic treatment (aerated lagoons or composting), anaerobic digestion (without free oxygen), or biochemical treatment. For open lot surfaces, rapid drying is the key to odor control. This article discusses minimizing odor from open feedlots.

Keeping open feedlots dry minimizes odors.

Wet manure on a feedlot or dairy lot surface can be responsible for the generation of substantial odor, in terms of both odor concentration and offensiveness. Research has determined a 60-fold difference in odor units (measured with a dynamic forced-choice triangle olfactometer, a device to quantify odor intensity) between dry and wet feedlot surfaces. Odors were highest at mid-day. Odor generation peaked at 2–3 days after rainfall and at a surface moisture content of 60–67% (wet basis). Results showed that ration had less effect on odor concentration than did moisture content. Therefore, open feedlots or feedyards with wet, anaerobic manure accumulation produce odor of greater concentration, offensiveness, and duration than a well-drained and well-maintained feedlot. It is also beneficial to conduct frequent, uniform removal of surface manure and have good drainage in which manure is regularly harvested, leaving a smooth, uniformly sloped pen surface with the interfacial layer intact to maintain surface-sealing.

Well-drained feedlot surfaces with relatively low quantities of manure dry rapidly after rainfall, restoring odor intensities to original levels. Feedlot maintenance and manure collection strategies should be aimed at 1) avoiding chronic wet spots caused by poor drainage, potholes, or spills; 2) harvesting only the top one-half to two-thirds of the feedlot manure; and 3) preserving an uncomposted manure–soil interfacial layer for surface sealing and denitrification. This strategy helps reduce odor, maintains reasonable manure quality as a fertilizer, and protects groundwater. A feedlot should be designed and managed to shed water. Pen slope of at least 3 to 5 percent away from feedbunks or feeding alleys is needed, with discrete drainage provided for each feed pen into a drainage channel that accelerates runoff away from the feedlot surfaces with minimal solids deposition. Potholes should be backfilled as soon as they develop, and overflows or leaks from cattle-watering facilities onto the feedlot surface should be avoided. Proper stocking density in pens can ensure that moisture excretion by cattle plus rainfall does not exceed average evaporation in the winter as well as the summer.

In short, keeping your feedlot as dry as possible through proper design and management is the best way to minimize feedlot odors.

This article was excerpted from the article *Odor Mitigation for Concentrated Animal Feeding Operations* by Dr. John Sweeten of Texas A&M University, Amarillo, Texas.

Settling basins for open feedlots

by Jeff Lorimor, Department of Ag and Biosystems Engineering

Current Iowa Department of Natural Resources rules require all open feedlots to have settling basins below them to settle out the settleable solids before any liquid is allowed to leave. Proper settling basin design ensures good performance and optimum operator convenience. Good design can help achieve both these requirements.

Settling can occur in basins, terraces, diversions, or other natural areas. The law specifies the following minimum requirements:

- Basins must be designed to settle solids from runoff from a 1-hour, 10-year storm (approximately 2.5 inches per hour).
- Liquid velocity in the basin must be reduced to 0.5 foot per second or less for at least 5 minutes.
- Settling basins must have 1 square foot of surface area for every 8 cubic feet of runoff per hour from the feedlot.
- Basins must include adequate capacity to store the settled solids between cleanouts.

Although these requirements sound confusing, we can use some approximations to make settling basin design relatively easy and still be sure to meet the requirements and be effective. The two most important criteria are the storm size and the basin surface area requirement.

Storm size. The 1-hour, 10-year storm varies from 2.1 inches in the northeastern corner of Iowa to 2.5 inches in the southwestern corner. The storm size, lot slope, lot surface (earth or concrete), and lot area determine the amount of runoff that occurs. For such a large, intense storm, assume that 100 percent of the rainfall runs off the lot. Using the conservative assumptions of 2.5 inches per hour and 100 percent runoff ensures that the settling area will be large enough.

Basin surface area. The second requirement, 8 square feet per cubic feet per hour runoff, coupled with the storm size, determines the minimum basin size. The following example shows a minimum settling basin design for a 1-acre lot using 100 percent runoff and 2.5 inches per hour:

(2.5 inches/hour) × (1 acre) × (3,600 conversion factor*) = 9,000 cubic feet/hour

*1 acre-inch/hour = 1 cubic foot/second, and 3,600 seconds = 1 hour

By using the Department of Natural Resoruce's requirement of 8 square feet of surface area for each cubic foot/hour, the minimum basin size = (9,000 cubic feet/hour)/8 = 1,125 square foot surface area.

We must add solids storage to this area. (Notice that the ratio of the lot surface area to the settling basin surface area is 43,560/1,125 = 39). The rule of thumb for settling basins in Iowa is as follows: the settling basin must be at least 1/40th of the lot drainage area. This size is the absolute minimum size without any solids storage added.

Now that we have determined the size of the basin, we need to design it to maximize its effectiveness and to be convenient to manage. To do so consider the following four criteria.

Slope. Use a very flat slope so the flow slows immediately when it hits the basin. Generally use from 0.5 percent (½ of 1 percent) or less slope.

Depth. Settling basins typically should be fairly shallow to allow easy access for cleanout. One to 2 feet is often used, but if the situation warrants, deeper is fine. The shallower it is the more rapidly the solids will dry down. Some situations require settling ponds or tanks rather than flat basins. If you go deeper to more of a settling tank or pond, you must have appropriate cleanout methods available such as a back hoe, dragline, or track-type tractor.

Geometry. Settling basins below small concrete lots may only be 8 to 10 feet in width. Minimum width is the width of your loader bucket. Basins below larger lots comprising several acres will more likely be 20 feet or more in width. The length is determined by the length necessary to intercept all the runoff across the bottom of the lot, or by the minimum surface area as calculated above.

Use a concrete pad where the majority of the solids will settle. Concrete facilitates clean out. Some producers use concrete pads, others use total concrete, and some use no concrete. When using total concrete a continuous vertical concrete curb along each side helps guide the scraper bucket for cleaning and protects the sides from eroding.

Outlet. Design the outlet so the top elevation is 6 inches below the berm. If the outlet plugs, the liquid will still exit at the outlet location. Either vertical or horizontal 0.5- to 1-inch slots work. Horizontal slots are somewhat easier to construct and manage. Location is not critical for the outlet. It can be near an end or in the middle. It should be located, however, so it does not interfere with cleanout, and it should not be directly next to the inlet. A concrete end-wall to push against works well for concrete basins. Tile risers used as outlets need protection from the cleanout machinery.

General guideline summary for settling basins

- Basin surface area should be at least 1/40th of the drainage area. Using 1/20–1/10th of the drainage area allows for better settling plus solids storage, and is ISU's normal recommendation.
- Basins should be nearly flat. Use no more than 0.5 percent slope.
- Basins should not be extremely narrow. Wider, shorter designs are advantageous. The minimum width that should be used is the width of your loader bucket. Using a 16-foot minimum width often works well.
- Except for very large lots settling basins should have concrete bottoms to allow easy solids removal.
- Concrete curbs along the side(s) of the settling basin make scraping solids easier
- Slotted outlets are most common. The outlet should allow dewatering of the collected solids.
- Outlets should generally be in the side of the basin rather than on the end. A concrete wall to push against on the end facilitates solids loading.
- Settling basins require continuing management and maintenance. They should have solids removed frequently to function properly.

Pocket guide for manure management planning

by Angela Rieck-Hinz, Department of Agronomy

A revised version of Iowa State University Extension publication ICM 1, *Field Records for Integrated Crop Management, Restricted-use Pesticide Applications, and Manure Applications*, has just been released. The pocket-sized booklet provides producers with reference material and serves as a place to record field activities, such as planting date, herbicide and pesticide applications, and manure applications. Producers who are required to keep manure application records as part of their manure management plans must record the method of application, dates when the manure was applied or sold, location of the field, number of acres on which the manure was applied, and the manure application rate. These records must be kept for 3 years or the length of the crop rotation, if greater.

In addition to tables provided for keeping manure application records, ICM 1 also contains a table of manure nutrient values that can be used when developing a manure management plan. The booklet contains phone numbers for regional Department of Natural Resources field offices and an emergency number for reporting manure spills.

ICM 1 may be ordered by calling the ISU Extension Distribution Center in Ames at 515-294-5247 or for more information please see http://www.exnet.iastate.edu/Pages/pubs/Order.html

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Announcements

Manure application demo

The Professional Nutrient Applicators Association of Wisconsin is hosting a field demo of manure agitation, application (hose and tanker), and incorporation equipment on August 22 near Baraboo, WI. For more information, contact Dana Cook (Association President) at 608-963-5447 or Kevin Erb (University of Wisconsin Extension) at 920-391-4652 or kevin.erb@ces.uwex.edu

Iowa Livestock Environmental Regulations Handbook now available

The Iowa Farm Bureau Federation and the Iowa Pork Producers Association have recently updated the Iowa Livestock Environmental Regulations Handbook. The handbook contains current codes, laws, regulations, definitions, and guidelines on manure sampling, and regulatory forms. The handbook is available by contacting the Iowa Farm Bureau, Attn: Public Affairs, 5400 University Ave., Des Moines, IA 50266 or by calling 515-225-5490. The cost is $35 for nonmembers and $20 for members.

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