

**THE REGULATION OF
ENVIRONMENTALLY SENSITIVE AREAS:**

AN ASSESSMENT OF
MISSOURI CLEAN WATER COMMISSION
PROPOSALS ON
CONCENTRATED ANIMAL FEEDING OPERATIONS

THE UNIVERSITY OF MISSOURI

APRIL 1996

07-96

Abstract

This report is limited in scope and addresses only the agricultural effects of the regulations proposed by the Clean Water Commission. Given the time constraints, the joint research team could not address in detail the economic and environmental effects on other resources. The following issues should be taken into account:

1. The T factor does not achieve the goal of reducing phosphorus in storm water runoff;
2. It is unclear to what degree a phosphorus-based standard, as proposed, would reduce phosphorus loading into surface waters of the state;
3. Nutrient Management Plans should be evaluated to achieve long-term economic and environmental goals at the watershed level.

The University of Missouri's limited review of the proposed regulations indicates the need for a more comprehensive long-term research effort. This research should involve many different academic disciplines and would require substantial input from individuals and organizations within the public and private sectors.

Table of Contents

	Page
Abstract	i
Introduction	1
T Factor	1
The Proposed Phosphorus Rules	2
Will the Proposed Rules Reduce Phosphorus Loss From Agricultural Land?	3
Impact of the Proposed Rule on Manure Application Rates	3
Impact of Changing Phosphorus Concentration in Lakes and Streams	5
Appendices:	
Appendix 1: Text of Proposed Regulations	7
Appendix 2: Sensitive Watershed Team	18
Appendix 3: Nitrogen vs. Phosphorus Removal Rate based on Estimates of Manure Applications	19
Appendix 4: Estimated Land Requirements for Three Sizes of Operations Based on Nitrogen or Crop Removal of Phosphorus	20
Appendix 5: Variability of Manure	21
Appendix 6: Assumptions for Appendices 3 and 4	22
Appendix 7: Preliminary Research and Extension Education Areas	24

Introduction

On April 1, 1996, two sets of proposed regulations (Appendix 1) on Concentrated Animal Feeding Operations (CAFO) were filed with the Missouri Secretary of State. The regulations, filed by the Missouri Clean Water Commission (Commission), were designed to “provide greater environmental protection from CAFOs located in certain environmentally sensitive areas of the state.” Alternative One applies to CAFOs greater than 7,000 animal units (an animal unit is a unit of measurement to allow comparisons of various animal types) and contains a less inclusive listing of sensitive areas. Alternative Two applies to CAFOs greater than 300 animal units and contains a more inclusive listing of sensitive areas.

The proposed regulations were filed after several months of discussion amongst interested parties. At the request of Missouri agricultural organizations, two University of Missouri research teams (Appendix 2) began reviewing the proposed regulations. Dean Roger Mitchell formed a multi-disciplinary team and Dr. Rex Ricketts initiated an analysis through University Extension--Commercial Agriculture Program. This report represents a joint response by the groups. The joint multi-disciplinary team includes agronomists, animal scientists, biologists, rural sociologists, water-quality and fisheries specialists, economists, engineers and College administrators.

Initial meetings of the watershed team indicated there are many questions concerning the dynamics of land management at the watershed level. There was not sufficient time to address all pertinent issues in this report, and additional information will be needed to balance the long-term environmental and economic vitality of natural and human resources at the watershed level. It is expected that a longer-term research approach will yield a framework from which policy decisions that optimize profitability of agriculture and the well-being of Missouri’s unique natural resources.

This report addresses certain aspects of the proposed regulations and identifies longer-term research and extension needs. Insufficient information precluded the evaluation of the proposed regulations’ environmental effects. New technology should be incorporated into the longer-term study. Additional time and research is necessary to identify production alternatives that are both environmentally and economically sustainable. It is also important to value the aggregate benefits and costs of additional regulation on animal agriculture as well as on the well being of the state’s natural resources.

T Factor

Both sets of the proposed regulations state that “soil and water conservation practices shall be utilized at all application sites to achieve soil erosion T levels established by the Natural Resources Conservation Service and to minimize phosphorus levels in storm water runoff.”

The T factor is the soil loss that can be tolerated on an annual basis. It is the maximum rate of annual soil erosion that will permit crop productivity to be sustained economically and

The phosphorus test used in Missouri to determine crop response to phosphorus fertilizer is called the Bray-1 phosphorus test. The Bray-1 phosphorus soil test is used in the Missouri soil testing program as a basis for making phosphorus recommendations for crops. It has been calibrated by measuring crop response to applied phosphorus up to a level beyond which there is little probability of economic return to added phosphorus. The test is not designed to predict environmental hazards due to added phosphorus regardless of source. Ongoing work in Arkansas and the USDA-Agricultural Research Service is designed to model the environmental aspects of addition of phosphorus to soils.

Will the Proposed Rules Reduce Phosphorus Loss from Agriculture Land?

The primary assumption of the rules is that reducing manure application rate on land with medium to high soil test phosphorus will decrease phosphorus loss in runoff. Research in Arkansas demonstrates that lowering manure rates reduces the potential phosphorus loss on a per acre basis for runoff events soon after application. This may benefit areas in the watershed currently receiving manure by lowering phosphorus concentrations. However, the reduced potential loss on land currently receiving manure is balanced with greater potential phosphorus loss from the additional acres needed for application at the lower rate.

The proposed strategy would control the increase in soil test phosphorus associated with manured land. This loss is small when compared to other potential sources of phosphorus in runoff, e.g., erosion and phosphorus loss from fresh surface applied manure.

Other approaches exist to reduce phosphorus loss from agricultural fields. The largest potential pathways of phosphorus loss from agricultural fields are runoff events before surface applied manure has reacted with the soil, and runoff events that cause erosion. Nutrient management plans that address timing and location of manure application and erosion control could be an effective alternative means of reducing phosphorus runoff. These plans must have the flexibility to allow producers to use the best solutions suitable to their land.

Impact of the Proposed Rule on Manure Application Rates

Current manure application rates are based on the nitrogen requirement of the crop. The proposed phosphorus rules will require designated producers in sensitive watersheds that have a Bray-1 soil test phosphorus greater than medium to use manure application rates based on the amount of phosphorus removed by the crop. This change from nitrogen to phosphorus based manure application rates will have varying effects on producers in sensitive watersheds.

An analysis was conducted on the effect of the rule change on the amount of manure that could be applied per acre of land (summarized in Appendix 3). This analysis contrasted the manure application rates of two current nitrogen based strategies (the Department of Natural Resource's conservative and intensive approaches) with the manure application rate based on phosphorus removal by the crop. This analysis concluded that the two types of operations in sensitive areas most affected by the change would be poultry operations and animal producers who apply manure to pasture land.

value as phosphorus fertilizer and limited value as nitrogen fertilizer. In contrast, manure applied to increase low soil test phosphorus or to fully meet the nitrogen requirements of the crop has economic value as a fertilizer.

This analysis accounted for four sources of variation affecting manure application rates:

- 1) Variation among types of animal operations (e.g., poultry vs. swine). This variation reflects differences in the nutrient characteristics of the manure produced and the effects of manure storage on nutrients recycled to the land (see Appendix 5).
- 2) Variation among operations within an animal type. For example, the nutrient characteristics of swine lagoons differ among each other (see Appendix 5).
- 3) Variation among different crops for crop removal of phosphorus. Fescue pasture land has low phosphorus removal (4 to 5 pounds phosphorus/acre) because most phosphorus in plants eaten by the animal is immediately recycled on the field in the feces. In contrast, harvested crops are removed from the field. There is also variation among harvested crops. For example: on a per acre basis, fescue hay (four ton yield, 8 pounds phosphorus/ton) removes 32 pounds phosphorus; corn grain (120 bushels/acre yield) removes approximately 20 pounds phosphorus; and corn silage (13 ton/acre yield) removes approximately 40 pounds phosphorus.
- 4) Variation within crop for crop removal of phosphorus. For example, fescue hay can remove between four and eight pounds of phosphorus per ton of yield, and yield less than two tons to more than four tons/acre. This variability is dependent on factors such as soil type and management.

The range of values reported for phosphorus based manure application rates on hay land in Appendices 3 and 4 reflect two scenarios. The higher application rate (lower land requirement) assumed a crop removal rate of 32 pounds phosphorus/acre (4 ton yield removing 8 pounds phosphorus/ton) and manure that had a high (75th percentile) nitrogen to phosphorus ratio. The lower application rate (higher land requirement) assumed a crop removal rate of 18 pounds phosphorus/acre (3 ton yield removing 6 pounds phosphorus/ton) and manure that had a low (25th percentile) nitrogen to phosphorus ratio. Manure values were obtained from Appendix 5.

The range of values reported for phosphorus based manure application rates on pasture land in Appendix 3 and 4 reflect variability in manure sources. Manure application rates and land requirements were calculated using 25th and 75th percentile nitrogen to phosphorus ratios as determined in Appendix 5.

Impact of Changing Phosphorus Concentration in Lakes and Streams

Phosphorus, irrespective of its source, is the element of concern in managing lake and streams because it most often limits biological production in freshwater ecosystems. Phosphorus concentrations in lakes and streams varies due to natural and human activities. All other

have become aware. A written submission shall also be provided within five (5) days of the time the industrial user becomes aware of the bypass. The written submission shall contain a description of the bypass and its cause; the duration of the bypass, including exact dates and times, and, if the bypass has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate and prevent reoccurrence of the bypass. The control authority may waive the written report on a case-by-case basis if the oral report has been received within twenty-four (24) hours.

(D) Prohibition of Bypass.

1. Bypass is prohibited, and the control authority may take enforcement action against an industrial user for a bypass, unless—

A. The bypass was unavoidable to prevent loss of life, bodily injury or severe property damage;

B. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment could have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and

C. The industrial user submitted notices as required under subsection (15)(C) of this rule.

2. The control authority may approve an anticipated bypass, after considering its adverse effects, if the control authority determines that it will meet the three (3) conditions listed in paragraph (15)(D)1. of this rule.

(16) Modification of POTW Pretreatment Programs.

(A) General. Either the director or a POTW with an approved POTW pretreatment program may initiate a program modification at any time to reflect changing conditions at the POTW. A program modification is necessary whenever there is a significant change in the operation of a POTW pretreatment program that differs from the information in the POTW's submission, as approved under section (9).

(B) Procedures. POTW pretreatment program modifications shall be accomplished as follows:

1. For substantial modifications, as defined in subsection (16)(C) of this rule—

A. The POTW shall submit to the director a statement of the basis for the desired modification, a modified program description, or such other documents the director determines necessary under the circumstances;

B. The director shall approve or disapprove the modification based on the requirements of subsection (7)(E), following the procedures in subsections (9)(B)—(F);

C. The modification shall be incorporated into the POTW's state operating permit after approval. The permit shall be modified to incorporate the approved modification; and

D. The modification shall become effective upon approval by the director; and

2. The POTW shall notify the director of any other (that is, nonsubstantial) modifications to its pretreatment program at least thirty (30) days prior to when they are to be implemented by the POTW, in a statement similar to that provided for in subparagraph (16)(B)1.A. of this rule. Such nonsubstantial program modifications shall be deemed to be approved by the director unless the director determines that a modification submitted is in fact a substantial modification, ninety (90) days after the submission of the POTW's statement. Following such approval by the director, such modifications shall be incorporated into the POTW's permit. If the director determines that a modification reported by a POTW in its statement is in fact

a substantial modification, the director shall notify the POTW and initiate the procedures in paragraph (16)(B)1. of this rule.

(C) Substantial Modifications.

1. The following are substantial modifications for the purposes of this rule:

A. Changes in the POTW's legal authorities;

B. Changes to local limits, which result in less stringent local limits;

C. Change to the POTW's control mechanism, as described in subparagraph (7)(E)1.C.;

D. Changes to the POTW's method for implementing categorical pretreatment standards (for example, incorporation by reference, separate promulgation, etc.);

E. A decrease in the frequency of self-monitoring or reporting required of industrial users;

F. A decrease in the frequency of industrial user inspections or sampling by the POTW;

G. Changes to the POTW's confidentiality procedures;

H. Significant reductions in the POTW's pretreatment program resources (including personnel commitments, equipment, and funding levels); and

I. Changes in the POTW's sludge disposal and management practices.

2. The director may designate other specific modifications, in addition to those listed in paragraph (16)(C)1. of this rule, as substantial modifications.

3. A modification that is not included in paragraph (16)(C)1. of this rule is nonetheless a substantial modification for purposes of this rule if the modification—

A. Would have a significant impact on the operation of the POTW's pretreatment program;

B. Would result in an increase in pollutant loadings at the POTW; or

C. Would result in less stringent requirements being imposed on industrial users of the POTW.

AUTHORITY: section 644.041, RSMo [(1986)] (1994). Original rule filed Feb. 1, 1988, effective June 13, 1988. Amended: Filed March 1, 1996.

PUBLIC ENTITY COST: This Proposed Amendment is estimated to cost the state agencies and political subdivisions less than \$500 in the aggregate.

PRIVATE ENTITY COST: This Proposed Amendment is estimated to cost private entities less than \$500 in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: The Missouri Clean Water Commission will hold concurrent public hearings on this Proposed Amendment and other proposed rulemaking beginning at 9:00 a.m., May 15, 1996. The public hearing will be held at the Holiday Inn Executive Center, 2200 I-70 Drive, S.W., Columbia, Missouri. Those wishing to speak at the public hearing should send a written request to speak to the secretary, Missouri Clean Water Commission, P.O. Box 176, Jefferson City, MO 65102, by 5:00 p.m., May 8, 1996. Written comments will also be accepted for the record until 5:00 p.m., May 22, 1996.

Title 10—DEPARTMENT OF NATURAL RESOURCES

**Division 20—Clean Water Commission
Chapter 6—Permits**

PROPOSED AMENDMENT

Alternative One

13. One-in-ten (1-in-10)-year precipitation—The wettest precipitation expected once every ten (10) years for a three hundred sixty-five (365)-day period, based on at least thirty (30) years of records from the National Climatic Data Center;

14. Process wastes—Process waste includes manure, wastewater and any precipitation which comes into contact with any manure, litter or bedding or any other raw material or intermediate or final material or product used in the production of animals or direct products. It includes spillage or overflow from animal watering systems; washing, cleaning or flushing of pens, barns, manure pits or other associated animal facilities; washing or spray cooling of animals; dust control; storm water runoff from animal confinement areas and loading and unloading areas; storm water runoff from deposits of airborne dust from building ventilation systems or spillage of feed or manure; discharges from land application fields that occur during land application; and storm water runoff from land application fields if wastes are applied during frozen, snow covered or saturated soil conditions or if application rates exceed the maximum nitrogen utilization of the vegetation grown;

15. [Sensitive watersheds—Watersheds for public drinking water lakes (LI lakes in Table G), along with Outstanding National Resource Waters (Table C), Outstanding State Resource Waters (Table D) and Losing Streams all defined in 10 CSR 20-7.031; and] Sensitive areas—Areas defined as the following:

A. Watersheds for public drinking water lakes (LI lakes defined in 10 CSR 20-7.031 and identified in Table G);

B. Watersheds located upstream of all drinking water intake structures on lakes;

C. Areas in the watershed and within five (5) miles upstream of any stream or river drinking water intake structure, other than those intake structures on the Missouri and Mississippi Rivers; and

D. Watersheds of the Current (headwaters to Northern Ripley County Line), Eleven Point (headwaters to Hwy. 142) and Jacks Fork (headwaters to mouth) Rivers; and

16. Wet handling system—Wet handling system is the handling of manure that contains less than fifty percent (50%) dry matter or has free draining liquids. Wet handling includes the storage of dry manure or dry litter so that it is exposed to rainfall or storm water runoff.

(2) General.

(A) All persons who build, erect, alter, replace, operate, use or maintain facilities for generation, storage, treatment, use or disposal of process wastes from concentrated animal feeding operations shall obtain permits as follows:

1. Class I concentrated animal feeding operations;

2. Class II concentrated animal feeding operations which discharge through a man-made conveyance;

3. An operation designated on a case-by-case basis under subsection (2)(B) of this rule;

4. Small scale pilot projects or demonstration projects for beneficial use that do not exceed a period of one (1) year may be exempted by written project approval from the permitting authority, provided the facilities are three hundred (300) animal units or smaller. The department may extend the permit exemption for up to one (1) additional year after review of the first year's results. A permit application shall be submitted at least ninety (90) days prior to end of the demonstration period if the facility intends to continue operation; or

5. A permit is not required for animal feeding operations of less than three hundred (300) animal units when the operation utilizes applicable best management practices approved by the department; or

16. A permit or letter of approval is required for animal feeding operations that equal or exceed one hundred fifty

(150) mature lactating dairy cows, five hundred (500) dry cows and heifers or an equivalent combination of dairy animals.]

(C) [Reserved.] Sensitive Areas.

1. Class IA concentrated animal feeding operations (both new and those facilities that wish to expand to Class IA size) are prohibited from the identified watersheds of the Current, Jacks Fork and Eleven Point Rivers (10 CSR 20-6.300(1)(B)15.D.).

2. Class IA concentrated animal feeding operations, located in the drinking water intake areas defined in 10 CSR 20-6.300(1)(B)15.A. and B. shall apply animal waste at a nutrient management application rate based on the following criteria:

A. Laboratory testing shall be conducted to determine the nutrient content of the animal waste;

B. Animal waste application rates shall not exceed the plant uptake rate for phosphorus unless soils are deficient in plant available phosphorus based on soil testing results;

C. In no case shall the application rate exceed the nitrogen requirements of the plants; and

D. Soil and water conservation practices shall be utilized at all application sites to achieve soil erosion T levels established by the Natural Resources Conservation Service and to minimize phosphorus levels in storm water runoff.

3. Class IA concentrated animal feeding operations, located in drinking water intake structures defined in 10 CSR 20-6.300(1)(B)15.A.—C. shall submit a spill prevention plan for department approval. New and expanding facilities shall submit within ninety (90) days of the effective date of the rulemaking.

(5) Letters of Approval.

(B) Letters of approval shall require the following:

1. The facility shall be constructed and operated so that the wastewater or wastewater treatment residuals will be land applied to provide beneficial use in agriculture or silviculture;

2. Class II (or smaller sized) facilities, applying for the letter of approval shall be designed, constructed and operated so as not to discharge through a man-made conveyance; except for those caused by rainfall events exceeding the twenty-five (25)-year, twenty-four (24)-hour rainfall event; and

3. [Letters of approval shall not be issued for constructed wetlands treatment systems or other similar treatment systems which produce a discharge of treated wastewater.] Facilities smaller than Class II applying for the letter of approval shall use best management practices approved by the department.

AUTHORITY: section 644.026, RSMo [(1994)] (Supp. 1995). Original rule filed June 1, 1995, effective Jan. 30, 1996. Amended: Filed March 1, 1996.

PUBLIC ENTITY COST: This Proposed Amendment is estimated to cost the state agencies and political subdivision less than \$500 in the aggregate.

PRIVATE ENTITY COST: This Proposed Amendment is estimated to cost private entities less than \$500 in the aggregate.

NOTICE OF PUBLIC HEARING NOTICE AND TO SUBMIT COMMENTS: The Missouri Clean Water Commission will hold concurrent public hearings on this Proposed Amendment beginning at 9:00 a.m., May 15, 1996. The public hearing will be held at the Holiday Inn Executive Center, 2200 I-70 Drive, S.W., Columbia, Missouri. Those wishing to speak at the public hearing should send a written request to speak to the secretary, Missouri Clean Water Commission, P.O. Box 176, Jefferson City, MO 65102, by 5:00

grass waterways, constructed wetland treatment systems, overland flow treatment systems or similar systems. It also includes the improper land application of process wastes so as to allow runoff of applied wastewater during land application:

[11.] 12. Operating location—All contiguous lands owned, operated or controlled by one (1) person or by two (2) or more persons jointly or as tenants in common or noncontiguous lands if they use a common area for the disposal of wastes. State and county roads are not considered property boundaries for purposes of this rule:

[12.] 13. No-discharge facility—A facility designed, constructed and operated to meet each of the following conditions:

A. To hold or irrigate, or otherwise dispose without discharge to surface or subsurface waters of the state, all process wastes and associated storm water flows except for discharges that are caused by catastrophic storm events;

B. Process wastes are not land applied during frozen, snow covered or saturated soil conditions; and

C. Basins are sealed in accordance with 10 CSR 20-8;

[13.] 14. One-in-ten (1-in-10)-year precipitation—The wettest precipitation expected once every ten (10) years for a three hundred sixty-five (365)-day period, based on at least thirty (30) years of records from the National Climatic Data Center;

[14.] 15. Process wastes—Process waste includes manure, wastewater and dry precipitation which comes into contact with any manure, litter or bedding or any other raw material or intermediate or final material or product used in the production of animals or direct products. It includes spillage or overflow from animal watering systems; washing, cleaning or flushing of pens, barns, manure pits or other associated animal facilities; washing or spray cooling of animals; dust control; storm water runoff from animal confinement areas and loading and unloading areas; storm water runoff from deposits of airborne dust from building ventilation systems or spillage of feed or manure; discharges from land application fields that occur during land application; and storm water runoff from land application fields if wastes are applied during frozen, snow covered or saturated soil conditions or if application rates exceed the maximum nitrogen utilization of the vegetation grown;

[15.] 16. Sensitive (watersheds—Watersheds for public drinking water lakes (L1 lakes in Table G), along with Outstanding National Resource Waters (Table C), Outstanding State Resource Waters (Table D) and Losing Streams all defined in 10 CSR 20-7.031; and) areas—

A. Watersheds for public drinking water lakes (L1 lakes defined in 10 CSR 20-7.031 and identified in Table G);

B. Areas in the watershed and within five (5) miles upstream of any surface drinking water intake structure, other than those identified as an L1 lake or those intake structures on the Missouri and Mississippi Rivers;

C. Watersheds of Outstanding National Resource Waters (Table E of 10 CSR 20-7.031);

D. Areas in the watershed and within five (5) miles upstream of Outstanding State Resource Waters (Table E of 10 CSR 20-7.031);

E. Areas identified as critical habitat for rare and/or endangered aquatic species as identified by the United States Fish and Wildlife Service or the Missouri Department of Conservation;

F. Areas within five (5) miles upstream of lakes identified in the Ozark Plateau;

G. Watershed of Table Rock Lake; and

H. Areas tributary to and within two (2) miles of losing streams as designated in 10 CSR 20-7.031; and

[16.] 17. Wet handling system—Wet handling system is the handling of manure that contains less than fifty percent (50%) dry matter or has free draining liquids. Wet handling includes the

storage of dry manure or dry litter so that it is exposed to rainfall or storm water runoff.

(2) General.

(A) All persons who build, erect, alter, replace, operate, use or maintain facilities for generation, storage, treatment, use or disposal of process wastes from concentrated animal feeding operations shall obtain permits as follows:

1. Class I concentrated animal feeding operations;

2. Class II concentrated animal feeding operations which discharge through a man-made conveyance;

3. An operation designated on a case-by-case basis under subsection (2)(B) of this rule;

4. Small scale pilot projects or demonstration projects for beneficial use that do not exceed a period of one (1) year may be exempted by written project approval from the permitting authority, provided the facilities are three hundred (300) animal units or smaller. The department may extend the permit exemption for up to one (1) additional year after review of the first year's results. A permit application shall be submitted at least ninety (90) days prior to end of the demonstration period if the facility intends to continue operation;

5. A permit is not required for animal feeding operations of less than three hundred (300) animal units when the operation utilizes applicable best management practices approved by the department; or

6. [A permit or letter of approval is required for animal feeding operations that equal or exceed one hundred fifty (150) mature lactating dairy cows, five hundred (500) dry cows and heifers or an equivalent combination of dairy animals] Construction permits are not required for any dry litter poultry or turkey animal feeding operations.

(C) [Reserved.] Sensitive Area Requirements.

1. Existing animal feeding operations without a permit or letter of approval, larger than three hundred (300) animal units and located in a sensitive area, shall submit the following information to the department within three hundred sixty-five (365) days of the effective date of this rule, unless required to receive a permit per 10 CSR 20-6.300(2)(A) and (B):

A. A map showing the location of the facility and a legal description of the facility;

B. The size of facility, including type and number of animals confined;

C. A hand drawn sketch showing animal confinement areas and waste handling facilities; and

D. The waste management plan for the facility.

2. New or expanding animal feeding operations, larger than three hundred (300) animal units and located in sensitive areas, shall apply for a letter of approval or permit as required in 10 CSR 20-6.300(2)—(5).

3. Facilities larger than three hundred (300) animal units and located in the L1 lake watersheds, within five (5) miles upstream of Ozark Plateau lakes and within the watershed of Table Rock Lake (10 CSR 20-6.300(1)(B)16.A., F. and G.), shall apply animal waste at a nutrient management application rate based on the following criteria:

A. Laboratory testing shall be conducted to determine the nutrient content of the animal waste;

B. Animal waste application rates shall not exceed the plant uptake rate for phosphorus unless soils are deficient in plant available phosphorus based on soil testing results;

C. In no case shall the application rate exceed the nitrogen requirements of the plants; and

D. Soil and water conservation practices shall be utilized at all application sites to achieve soil erosion T levels established by the Natural Resources Conservation Service and to minimize phosphorus levels in storm water runoff.

**FISCAL NOTE
STATE AGENCY COST**

Division: Clean Water Commission
Chapter Name: Permits
Type of Rulemaking, Rule Number and Name: Proposed Amendment to
10 CSR 20-6.300 Concentrated Animal Feeding Operations

Prepared February 2, 1996 by the Water Pollution Control Program
for the Division of Environmental Quality

Affected Agencies: Department of Natural Resources

The existing rule sets the requirements and process for permitting and other requirements for concentrated animal feeding operations (CAFO). This proposed amendment clarifies when CAFO facilities need discharge permits, letters of approval (LOA), or are exempt from the regulation.

Expected fiscal impact to the Department of Natural Resources is staff time to review and process the applications for permits and letters of approval.

The proposed amendment will reduce the number of construction permit applications required for poultry dry litter operations by about 30 per year. This will result in potential lost revenue of the \$500 permit fee for each construction permit for a total of \$15,000 per year. This will result in a decrease in work load of 30 permit applications.

The proposed amendment will increase the number of letter of approval applications required in sensitive areas. It is estimated that 10 additional facilities per year will need to apply for construction and operating letter of approvals. The required staff time to process these applications will be offset by the reduction in construction permit applications for poultry dry litter.

Therefore, there will be no increase in workload but a reduction in permit fees.

The total annual aggregate cost for the public entity is about \$15,000 per year for the life of the rule.

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facilities are required by federal regulations and existing state regulations found in 10 CSR 20, Chapter 8 and, therefore, are not attributed to this rule. It is estimated about 10 facilities per year will need to apply for a Letter of Approval at a cost of about \$3500 per operation. This cost is to develop as-built engineering plans and LOA applications and was estimated by the University Extension Service. Total cost is estimated to be 10 facilities X \$3500 = \$35,000.

4. Class IA (7,000 animal units or more) operations are prohibited from the watersheds of LI drinking water supply lakes. There are currently no IA operations in these areas. No anticipated costs are included for this requirement.
5. New or expanding operations of 300 animal units or more are prohibited from watersheds of Outstanding National Resource Waters. This area includes three streams located in portions of Carter, Dent, Howell, Oregon, Shannon and Texas Counties. A large portion of the area is part of the Mark Twain National Forest System. Currently there are five known class II operations and no class I operations in these watersheds. This is based on the actual legal descriptions for LOA facilities in the WPCP files for these counties. No projected costs are included for this requirement.
6. Animal waste must be applied at a nutrient management application rate for those facilities larger than 300 animal units and located in the LI drinking water lake watersheds, within five miles of Ozark Plateau Lakes and within the watershed of Table Rock Lake. Costs include laboratory testing costs and increased costs of spreading the manure over a larger number of acres.

Laboratory testing of animal wastes and soils is required for nitrogen and phosphorus. Standard soil testing and wastewater nutrient testing provided by the University of Missouri testing labs will provide the required information. The estimated cost per facility is \$100 per year.

Application rates for most of these facilities will need to be based on phosphorus instead of nitrogen. For each 100 pounds of total nitrogen/acre/year applied, the total phosphorus application rate in lbs/acre/year would be 16 for swine lagoons, 26 for swine manure slurry pits, 50 for dairy lagoons, 23 for dairy slurry pits, 48 for poultry broiler dry litter and 44 for turkey dry litter. This is based on University of Missouri publication WQ 201.

be realized as public awareness of the program is realized through the rulemaking process.

The total annual aggregate cost expected for the private entity is \$83,000 in the first year and \$74,000 in succeeding years. This annual cost will continue for the life of the rule.

Appendix 2 - Sensitive Watershed Team

Roger Mitchell	Dean, College of Agriculture, Food and Natural Resources
Gary Allee	Swine Nutritionist, Animal Science
Dan Cassidy	Food and Agricultural Policy Research Institute
Michael Chippendale	Acting Associate Director, Missouri Agriculture Experiment Station
Chris Fulcher	Associate Director, Center for Agricultural, Resource and Environmental Systems (CARES)
Charles Fulhage	Extension Agricultural Engineer, University Extension
Rob Hayward	Aquatic Ecologist/Fisheries Scientist, School of Natural Resources
Norlin Hein	Interim Associate Dean for Agriculture Extension, University Extension
John Hoehne	Extension Agricultural Engineer, Commercial Agriculture
Jack Jones	Limnologist, School of Natural Resources
Monty Kerley	Animal Scientist, Animal Science
Newell Kitchen	Soil Fertility and Crop Production Systems, Soil and Atmospheric Science
John Lory	Environmental Nutrient Management Specialist, Commercial Agriculture, University Extension
Ray Massey	Agricultural Economist, Commercial Agriculture
Russ Mills	Food and Agricultural Policy Research Institute
Rex Ricketts	Coordinator, Commercial Agriculture
Sandy Rikoon	Rural Sociologist, Rural Sociology
Abner Womack	Co-Director, Food and Agricultural Policy Research Institute
Robert Young	Co-Director, Food and Agricultural Policy Research Institute

Appendix 3 - Manure Application Rates Based on Nitrogen and Crop Removal of Phosphorus

Animal Type	Manure Storage Type	Fescue Management	Conservative Approach ¹	Intensive Approach ²	Phosphorus based rate ³
Poultry	dry litter	hay	1.9 tons/acre	5.1 tons/acre	0.4 - 1.6 tons/acre
		pasture	1.9 tons/acre	NA ⁴	0.1 - 0.2 tons/acre
Swine farrow/finish	anaerobic lagoon	hay	1.0 acre-inch	2.8 acre-inch	0.5 - 2.2 acre-inch
Dairy	anaerobic lagoon	hay	1.4 acre-inch	4.0 acre-inch	0.6 - 1.9 acre-inch
Dairy	slurry	hay	3,800 gal/acre	10,600 gal/acre	2,400 to 10,600 gal/acre

¹ Conservative approach is a nitrogen based rate defined by DNR as application of 100 pounds of total manure nitrogen per acre per year. Manure nitrogen content based on Table 1 of University of Missouri Extension WQ Guide 201, "Reduce Environmental Problems With Proper Land Application of Animal Wastes."

² Intensive approach is a nitrogen based rate defined by DNR as nitrogen rate = yield goal X crop nitrogen removal rate X 1.25. Crop removal rate was assumed to be 55 pounds per acre based on Table 3 in University of Missouri Extension WQ Guide 202, "Land Application Considerations for Animal Wastes", and yield goal was assumed to be 4 tons/acre.

³ For fescue hay, the higher value assumes crop removal of 32 pounds phosphorus and a 75th percentile manure nitrogen to phosphorus ratio. The lower value assumes crop removal of 18 pounds phosphorus and a 25th percentile manure nitrogen to phosphorus ratio. Fescue pasture assumes phosphorus removal rate of 4 pounds per acre, and either 75th (high value) or 25th (low value) for manure nitrogen to phosphorus ratio.

⁴ Not applicable (NA).

Appendix 4 - Estimated Land Requirements for Three Sizes of Operations Based on Nitrogen or Crop Removal of Phosphorus

300 Animal Unit Operation	Manure Storage type	Fescue management	Conservative approach ¹	Intensive approach ²	Phosphorus based rate ³
				----- acres -----	
30,000 broilers	dry litter	hay	96	35	111 - 444
16,500 turkeys	dry litter	pasture	96	NA	898 - 2,020
		hay	256	93	296 - 1,185
80-sow farrow/finish 200-cow dairy	anaerobic lagoon	pasture	256	NA	2,394 - 5,387
	anaerobic lagoon	hay	26	10	12-49
		hay	39	14	29-90

1,000 Animal Unit Operation	Manure Storage type	Fescue management	Conservative approach	Intensive approach	Phosphorus based rate
				----- acres -----	
100,000 broilers	dry litter	hay	320	116	370 - 1,481
55,000 turkeys	dry litter	pasture	320	NA	2,993 - 6,734
		hay	855	311	990-3,959
280-sow farrow/finish 700-cow dairy	anaerobic lagoon	pasture	855	NA	7,999-17,998
	anaerobic lagoon	hay	92	34	42-171
		hay	137	50	102-316

7,000 Animal Unit Operation	Manure Storage type	Fescue management	Conservative approach	Intensive approach	Phosphorus based rate
				----- acres -----	
700,000 broilers	dry litter	hay	2,240	814	2,593-10,370
385,000 turkeys	dry litter	pasture	2,240	NA	20,950-47,138
		hay	5,987	2,177	6,929-27,716
1,900-sow farrow/finish 4,900-cow dairy	anaerobic lagoon	pasture	5,987	NA	55,993-125,984
	anaerobic lagoon	hay	635	231	292-1176
		hay	955	347	711-2,211

¹Conservative approach is defined by DNR as application of 100 pounds of total manure nitrogen per acre per year.

²The intensive approach is a nitrogen base rate defined by DNR as manure total nitrogen rate = yield goal X crop removal rate of nitrogen X 1.25. Yield goal was assumed to be 4 tons fescue/acre and crop removal of nitrogen was assumed to be 55 pounds per ton.

³For fescue hay, the lower value assumes crop removal of 32 pounds phosphorus and a 75th percentile manure nitrogen to phosphorus ratio. The higher value assumes crop removal of 18 pounds phosphorus and a 25th percentile manure nitrogen to phosphorus ratio. Fescue pasture assumes phosphorus removal rate of 4 pounds per acre, and either 25th (high value) or 75th (low value) for manure nitrogen to phosphorus ratio.

Appendix 5 - Variability of Manure as a Nutrient Resource

Manure is a highly variable material. Figure 1 shows the variability of an important indicator of manure quality as a nutrient source, which is the nitrogen to phosphorus ratio. Note the large differences in the mean value of the nitrogen to phosphorus ratio between manure types (indicated by the dot symbols, Fig. 1). The higher mean nitrogen to phosphorus ratio in swine lagoon effluent implies that on average swine producers will be less affected by the proposed rule change. The lower mean for poultry dry litter implies that on average poultry producers will be more affected by the proposed rule change. However, the effect of the proposed rule on an individual is likely to be much different than what the average indicates. The tremendous variability indicated by the boxes and lines in Figure 1 implies there will be large difference among producers depending on the unique characteristics of the manure produced by their farm.

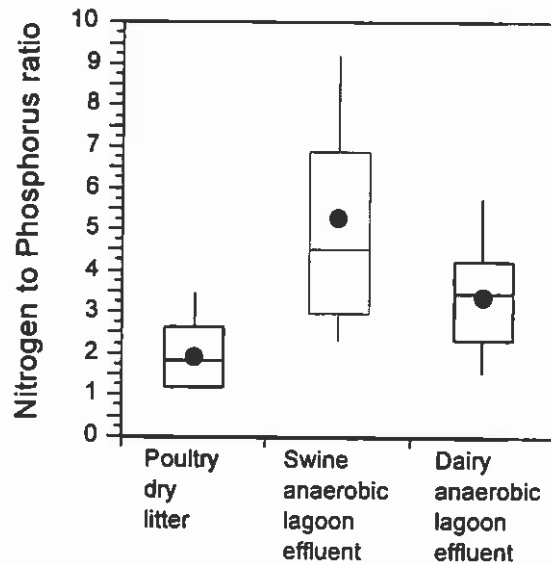


Figure 1. A box plot of the ratio of nitrogen to phosphorus concentration of three manure types from samples analyzed by the University of Missouri Agricultural Engineering Laboratory. The dot represents the mean, the horizontal lines are the 25th percentile, the median, and the 75th percentile. The vertical lines indicate the range. There were 20 poultry dry litter samples, 70 anaerobic swine lagoon effluent samples, and 44 anaerobic dairy lagoon effluent samples used in this analysis.

Appendix 6 - Assumptions For Appendices 3 and 4

- ▶ All animal unit calculations are based on the DNR regulation.
 - * Swine production is based on 9.5 - 9.55 pigs per litter weaned. Stocking rates are based on a production schedule of 3-week weaning, 7-week nursery, and 16-week finishing.
 - * Dairy cows are assumed to be 1,300 pounds.

- ▶ Estimated nitrogen production from the dairy and swine anaerobic lagoons are calculated from Manual 121, "Design Guidelines for Animal Waste Management for Concentrated Animal Feeding Operations." Details of the dry litter nitrogen production are found in University of Missouri Extension WQ Guide 203, "Estimating Land Areas Requirements for Poultry Operations, Conservative Litter Management."

- ▶ Estimated total nitrogen concentration, ammonium nitrogen, and organic nitrogen of lagoon water and dry litter are from Table 1 of University of Missouri Extension WQ Guide 201, "Reduce Environmental Problems With Proper Land Application of Animal Wastes."

- ▶ Manure nitrogen content to wet weight conversion was based on Table 1 of University of Missouri Extension WQ Guide 201, "Reduce Environmental Problems With Proper Land Application of Animal Wastes." Poultry dry litter conversion was 54 pounds nitrogen/ton; swine lagoon effluent conversion was 100 pounds total nitrogen/acre-inch; and dairy lagoon effluent conversion was 69 pounds total nitrogen/acre-inch.

- ▶ Nitrogen based manure management based on Manual 121, "Design Guidelines for Animal Waste Management for Concentrated Animal Feeding Operations", page 14. The Conservative Approach allows 100 pounds total nitrogen from manure applied per acre per year. The intensive approach is defined as manure total nitrogen rate = yield goal X crop removal rate of nitrogen X 1.25. Yield goal was assumed to be 4 tons fescue hay/acre and crop removal of nitrogen was assumed to be 55 pounds per ton.

- ▶ Nitrogen to phosphorus ratio determined from laboratory analyses done at University of Missouri Agricultural Engineering Department laboratory. Variability parameters based on 44 dairy lagoon samples, 70 swine lagoon samples, and 20 poultry litter samples analyzed since 1977.

- ▶ Crop removal for fescue hay was estimated to be between 18 and 32 pounds of phosphorus per acre per year.
 - * Estimated fescue hay yield goal was 3 tons per acre per year. Average hay yield for Missouri is 2 tons per acre per year. Fescue yields under good management range from 2 ½ tons per acre in the south to over 4 tons per acre in north Missouri.

Appendix 7 - Preliminary Research and Extension Education Areas

It is important to seek actual solutions that address the economic and environmental issues associated with animal agriculture and industries associated with the utilization of Missouri's natural resources. A preliminary list of research and extension issues include:

- ▶ Determining the variability of weather (rainfall) during periods when manure application occurs?
- ▶ Runoff is influenced by soil infiltration rates which are a function of antecedent soil water content, surface and subsoil soil texture, slope of land and soil management. Additional research needs to be conducted to determine the effects of management practices on soil infiltration.
- ▶ Developing a Dynamic Systems Model which would adequately predict how agricultural practices (e.g., nutrient application rates and terrain characteristics) would influence land runoff and loading rates of selected nutrients, and ultimately affect water quality and populations of fishes (e.g., Niangua Darter). From such a model, effects of different agricultural practices on aquatic resources could be readily evaluated.
- ▶ Determining how pasture management, including manure application, influences phosphorus and nitrogen loss from agricultural watersheds.
- ▶ Determining the impacts to society from regulating manure application practices within the state and how such regulation will impact natural resources at the watershed level.
- ▶ Developing livestock feed rations which can maximize nutritional benefits and reduce the levels of certain components of the manure.
- ▶ Quantifying phosphorus sources entering lakes for public drinking water to:
 - * estimate the relative contribution of agriculture, urban point sources, construction sites, and other sources of phosphorus.
 - * compare the cost of reducing phosphorus loss from each source by a specified amount.
- ▶ Determining the factors affecting reaction time of surface-applied phosphorus with the soil.
- ▶ Developing and evaluate indices of phosphorus loss from agricultural land.